



Panasonic

Electronic Components

Capacitors
Resistors
Ceramic Products
Inductors/Filters
Switches

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– QUICK REFERENCE/CAPACITORS –

Miniature Radial Aluminum Capacitors

Series	Features	Part No.	W.V. [Vdc] Cap. [μ F]	Temp. Range [$^{\circ}$ C]	L.C. [μ A] max 2 min.	Load Life	Case Size	Page
SU	General Purpose Standard Size	ECE AxxUxxx	[6.3~450] 0.47~15000	-40~+85	0.01CV or 3	2000h/ 85 $^{\circ}$ C	5x11~ 18x35.5	7
KA	General Purpose Small Size (7mm hgt.)	ECE AxxKAxxx	[4~50] 0.1~470	-40~+85	0.01CV or 3	1000h/ 85 $^{\circ}$ C	4x7~ 8x7	22
KS	General Purpose Small Size (5mm hgt.)	ECE AxxKSxxx	[4~50] 0.1~330	-40~+85	0.01CV or 3	1000h/ 85 $^{\circ}$ C	3x5~ 8x5	24
NHE	Industrial Grade Standard Size	ECE AxxGExxx	[6.3~450] 0.1~15000	-55~+105 -25~+105	0.01CV or 3 0.06CV + 10	1~2000h/ 105 $^{\circ}$ C	5x11~ 18x35.5	10
KG	Industrial Grade Small Size (7mm hgt.)	ECE AxxKGxxx	[6.3~50] 0.1~220	-55~+105	0.01CV or 3	1000h/ 105 $^{\circ}$ C	4x7~ 8x7	26
HFG	Low Impedance 2-5000 hours/105 $^{\circ}$ C	ECA xxFGxxx	[6.3~63] 0.1~15000	-55~+105	0.01CV or 3	2~5000h/ 105 $^{\circ}$ C	5x11~ 18x35.5	13
HFQ	Low Impedance 2-7000 hours/105 $^{\circ}$ C	ECA xxFQxxx	[6.3~63] 6.8~15000	-55~+105	0.01CV	2-7000h/ 105 $^{\circ}$ C	4x11~ 18x40	16
HFZ	Low Impedance 5000 hours/105 $^{\circ}$ C	ECA xxFZxxx	[6.3~63] 22~5600	-55~+105	0.002CV + 2	5000h/ 105 $^{\circ}$ C	8x15 ~ 18x40	19

Miniature Axial Aluminum Capacitors

SU	General Purpose Standard Size	ECE BxxUxxx	[6.3~450] 0.47~22000	-40~+85 -25~+85	0.01CV or 3 0.06CV + 10	2000h/ 85 $^{\circ}$ C	3.5x7~ 22.4x50	1
NHE/NH	Industrial Grade Standard Size	BxxGExxx BxxGxxxS	[6.3~450] 0.1~15000	-55~+105 -25~+105	0.01CV or 3 0.06CV + 10	1 ~2000h/ 105 $^{\circ}$ C	5x11 ~ 18x35.5	4

Surface Mount Aluminum Capacitors

VA	General Purpose +85 $^{\circ}$ C	ECE VxxAxxx	[4~50] 0.1~820	-40~+85	0.01CV or 3	2000h/ 85 $^{\circ}$ C	4.0x5.7~ 10.0x10.2	47
VV	Industrial Grade +105 $^{\circ}$ C	ECE VxxVxxxS	[4~50] 0.1~220	-40~+105	0.01CV or 3	2000h/ 105 $^{\circ}$ C	4.0x5.4~ 6.3x5.4	50
SP-CB	Extra Low Impedance 1000 hours/+105 $^{\circ}$ C	ECG CxxBxxx	[6.3~16] 4.7~33	-40~+105	0.04CV or 3	1000h/ 105 $^{\circ}$ C	Chip 7.9x5.3x3.3	52

Snap-Mount Aluminum Capacitors

TS-U	General Purpose Standard Size	ECE SxxUxxx	[16~450] 33~47000	-40~+85 -25~+85	see specs.	2000h/ 85 $^{\circ}$ C	22x25~ 35x51	28
TS-UP	General Purpose Small Size	ECO SxxPxxx	[16~450] 56~68000	-40~+85 -25~+85	see specs.	2000h/ 85 $^{\circ}$ C	20x25~ 35x50	37
TS-NH	Industrial Grade High Ripple	ECE SxxGxxx	[10~400] 33~33000	-40~+105 -25~+105	see specs.	2000h/ 105 $^{\circ}$ C	22x25~ 35x51	31
TS-HA	Industrial Grade High Ripple, Miniature	ECO SxxAxxx	[10~400] 56~68000	-40~+105 -25~+105	see specs.	2000h/ 105 $^{\circ}$ C	20x25~ 35x50	42
TS-NXA	Industrial Grade Long Life	ECO SxxXxxx	[160~400] 39~1200	-40~+105 -25~+105	see specs.	5000h/ 105 $^{\circ}$ C	20x25~ 35x40	34

Tantalum Capacitors

EF	Resin Dipped Leaded High Reliability	ECS FxxExxxx	[4~50] 0.047~470	-55~+105	0.008CV or 0.5	1000h/ 105 $^{\circ}$ C	see specs.	151
TE	Surface Mount Chip General Purpose	ECS Txx[]xxxx	[2.5~35] 0.047~150	-55~+125	0.01CV or 0.5	2000h/ 125 $^{\circ}$ C	see specs.	154
TEH	Surface Mount Chip High Reliability	ECS Hxx[]xxxx	[4~35] 0.047~100	-55~+125	0.01CV or 0.5	2000h/ 125 $^{\circ}$ C	see specs.	157

Electric Double Layer (“Gold”) Capacitors

Series	Features	Part No.	W.V. [Vdc] Cap. [F]	Temp. Range [°C]	Backup Current	Load Life	Case Size	Page
EL	Coin Type w/Terminals	EEC E0ELxxx	[2.5] 0.1~2.0	-25~+70	μA range	1000h/ 70°C	diameter 6.8-20.0	97
NF	Flat Can Type Low Profile	EEC F5R5Uxxx	[5.5] 0.022~1.0	-25~+70	μA range	1000h/ 70°C	13.5x7.5~ 21.5x8.0	99
F	Flat Can Type Industrial Grade	EEC F5R5Hxxx	[5.5] 0.033~0.68	-25~+85	μA range	1000h/ 85°C	13.5x9.5~ 21.5x9.5	100
SG	Miniature Flat Type w/Terminals	EEC S5R5[]xxxx	[5.5] 0.022~1.0	-25~+70	μA range	1000h/ 70°C	11.5x4.5~ 19.0x6.0	101
ST	Miniature Flat Type Taped	EEC S5R5Txxx	[5.5] 0.022~0.22	-25~+70	μA range	1000h/ 70°C	11.5x4.5	102
D	Molded Case High Current	EEC W5R5Dxxx	[5.5] 0.1~3.3	-25~+70	mA range	1000h/ 70°C	see specs.	103
AL	Radial Leaded Can High Current	EEC A0ELxxx	[2.5] 0.22~10.0	-40~+70	A range	1000h/ 70°C	6.8x21~ 18.0x35.0	104

Film Capacitors

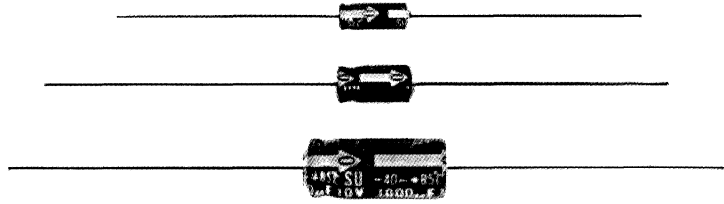
Series	Features	Part No.	W.V. [Vdc] Cap. [μF]	Temp. Range [°C]	Tolerance	Dissip. Factor (20°C, 1kHz)	Dielectric	Page
ECQ-E(F)	General Purpose High Voltage	ECQ ExxxxF	[100~1250] 0.001~10	-40~+85	5%,10%,20%	1.0% max.	Metallized Polyester	113
ECQ-B(F)	General Purpose Low Voltage	ECQ BxxxxxF	[50~200] 0.0001~0.47	-40~+85	5%,10%	0.8% max.	Polyester	105
ECQ-V	General Purpose Low Volt., Miniature	ECQ Vxxxxxxx	[50~100] 0.01~2.2	-40~+85	5%	1.0% max.	Metallized Plastic	110
ECW-F	High Frequency Intermediate Voltage	ECW Fxxxxxxx	[250~450] 0.15~3.3	-25~+85	5%,10%	0.1% max.	Metallized Polyprop.	119
ECW-H	High Frequency High Voltage	ECW Hxxxxxxx	[800~2500] 0.001~0.068	-25~+85	3% 5%,10%,20%	0.1% max.	Metallized Polyprop.	121
ECH-S	High Frequency High Tolerance/Temp.	ECH Sxxxxxxx	[50~100] 0.001~0.47	-40~+125	1%,2%,5%	0.3% max.	PPS	126
ECQ-P	Low Loss High Tolerance	ECQ PxxxxxZ	[50~100] 0.001~0.47	-40~+85	1%,2%,5%	0.1% max.	Polyprop.	129
ECQ-F	Low Loss Moisture Resistant	ECQ Fxxxxxx	[200~630] 0.001~0.47	-40~+85	5%,10%,20%	0.1% max.	Polyprop.	134
ECQ-U(V)	Interference Suppress. Molded Case, Class X	ECQ UxxxxxV	[250Vac] 0.001~1.0	-40~+85	10%,20%	1.0% max.	Metallized Polyester	137
ECQ-U(Y)	Interference Suppress. Resin Dipped, Class Y	ECQ UxxxxxY	[250Vac] 0.001~0.047	-40~+85	10%,20%	1.0% max.	Metallized Polyester	139
ECW-U(B)	Surface Mount Chip General Purpose	ECW UxxxxxxB	[16~100] 0.001~0.22	-55~+105	5%	1.0% max.	Metallized Polyester	147
ECH-U(B)	Surface Mount Chip Industrial Grade	ECH UxxxxxxB	[16~50] 0.0001~0.1	-55~+125	2%,5%	0.6% max.	Metallized PPS	147

Ceramic Disc Capacitors

Series	Features	Part No.	W.V. [Vdc] Cap. [pF]	Temp. Range [°C]	Tolerance	Dissip. Factor (20°C, 1kHz)	Temperature Character.	Page
KBP	High Voltage Y5P Temp. Char.	ECK DxxxxKBP	[1~3kVdc] 100~5600	-25~+125	10%	2.5% max.	B/Y5P	61
DGL	Safety Regulation (1500Vac Withstand.)	ECK DGLxxxx	[125/250Vac] 100~10000	-25~+85	20%	2.5% max. 5.0% max.	E/Y5U, B/Y5P V	63
DNS	Safety Regulation Class II (4000Vac)	ECK DNSxxxx	[125Vac] 100~22000	-25~+85	20%	2.5% max. 5.0% max.	E/Y5U, B/Y5P V	63
DRS	Safety Regulation Class I (2600Vac)	ECK DRSxxxx	[125Vac] 100~10000	-25~+85	20%	2.5% max. 5.0% max.	E/Y5U, B/Y5P V	63

Features

- For general purpose
- Wide CV value range
- Life 2000 hours at +85 °C
- Compact size (ø3.5 x 7 ~)



Specifications

Item	Performance Characteristics																										
Rated Working Voltage Range	6.3to100V DC	160 to 450V DC																									
Operating Temperature Range	-40 to +85 °C	-25 to +85 °C																									
Nominal Capacitance Range	0.1 to 22000μF	1 to 470μF																									
Capacitance Tolerance	±20% (120Hz, +20 °C)																										
Leakage Current	I ≤ 0.03CV or 4 [μA] after 1 minute I < 0.01CV or 3 [μA] after 2 minutes whichever is greater measured with rated working voltage applied at +20 °C	I ≤ 0.06CV + 10 [μA] after 2 minutes application of rated working voltage at +20 °C																									
tan δ	<table border="1"> <tr> <td>Working voltage [V]</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td>tan δ max-</td> <td>0.22</td> <td>0.19</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.09</td> <td>0.08</td> </tr> </table>									Working voltage [V]	6.3	10	16	25	35	50	63	100	tan δ max-	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08
	Working voltage [V]	6.3	10	16	25	35	50	63	100																		
tan δ max-	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08																			
(120 Hz, +20 °C)	<table border="1"> <tr> <td>Working voltage [V]</td> <td>160</td> <td>200</td> <td>250</td> <td>350</td> <td>400</td> <td>450</td> <td colspan="2"></td> </tr> <tr> <td>tan δ max.</td> <td>0.16</td> <td>0.18</td> <td>0.18</td> <td>0.20</td> <td>0.20</td> <td>0.20</td> <td colspan="2"></td> </tr> </table> <p>For capacitance value >1000μF, add 0.02 per every 1000μF Refer to standard products table for ø3.5mm</p>									Working voltage [V]	160	200	250	350	400	450			tan δ max.	0.16	0.18	0.18	0.20	0.20	0.20		
Working voltage [V]	160	200	250	350	400	450																					
tan δ max.	0.16	0.18	0.18	0.20	0.20	0.20																					
Ripple Current	Refer to standard products table (120Hz, +85 °C) Correction factor for frequency																										
	Frequency[Hz]		50/60	120	1k	10k																					
Correction factor (Multiplier)		0.7	1	1.3	1.7																						
Impedance	Maximum C-Z (rated Cap. [μF] × Impedance [Ω]) value at 10kHz																										
	Working voltage [V]	6.3	10	16	25	35	50	63	100																		
	C-Z max. at +20 °C	220	160	125	90	80	60	55	50																		
C-Zmax. at -25 °C	3000	1900	1300	800	650	560	500	450																			
Working voltage [V]		160	200	250	350	450																					
C-Z max. at +20 °C		100	140	150	170	270																					
C-Z max. at -25 °C		2400	2500	3100	3500	12000																					
High Temperature Loading	Test conditions																										
	Duration	: 2000 hours																									
Ambient temperature	: +85 °C																										
Applied voltage	: Rated DC working voltage																										
Post test requirements at +20 °C																											
Leakage current	: ≤ Initial specified value																										
Capacitance change	: ±20% of initial measured value (s 25% for ~3.5 ~ 4.5mm)																										
tan δ	: ≤ 150% of initial specified value																										
Shelf Life	Test conditions																										
	Duration	: 1000 hours																									
Ambient temperature	: +85 °C																										
Applied voltage	: (None)																										
Post test requirements at +20 °C																											
Same limits for high temperature loading.																											

Explanation of Part Numbers

E	C	E	B	□ □	U	□ □ □	□ □
Common code			Shape	W.V code	Series code	Capacitance code	Suffix

Suffix code	Configurations	
B	Ammo-pack	W = 26mm for ø3.5 × 7
SZ	Ammo-pack	W = 52mm for ø3.5, ø4.5
AZ	Reel-pack	W = 52mm for ø3.5 ~ ø6.3
A	Reel-pack	W = 63mm for ø3.5 ~ ø8 × 16
		W = 73mm for ø8 × 16~ø12.5

Dimensions

$L = 7: L+0.5 \text{ max}$
 $L \leq 16: L+1.0 \text{ max}$
 $L \geq 20: L+2.0 \text{ max}$

Body dia. øD	3.5	4.5	6.3	8	10	12.5	16	18	22.4
Lead dia. ød	0.45	0.5	0.6	0.6	0.6	0.8	0.8	0.8	0.8

Case size / Ripple Current

øDxL(mm) / (mA) r.m.s. (120 Hz / +85 °C)

Cap (µF)	W.V. (V.DC)	6.3 (OJ)		10 (IA)		16 (IC)		25 (IE)		35 (IV)		50 (IH)	
		Cap	Case size	Cap	Case size	Cap	Case size	Cap	Case size	Cap	Case size	Cap	Case size
0.1 (0R1)												3.5x7	0.7
0.22(R22)												3.5x7	1.6
0.33(R33)												3.5x7	2.5
0.47(R47)												3.5x7	3.5
1.0 (010)												3.5x7	7.4
2.2 (2R2)								3.5x7	9.0			3.5x7	12
3.3 (3R3)								3.5x7	11.2			3.5x7	18
4.7 (4R7)								3.5x7	14.7	3.7x7	20	4.5x10.5	30
10 (100)						3.5x7	19.6	4.5x10.5	40	4.5x10.5	45	4.5x10.5	50
22 (220)	3.5x7	20.7	4.5x10.5	40	4.5x10.5	50	4.5x10.5	60	4.5x10.5	95	6.3x10.5	100	
33 (330)	4.5x10.5	50	4.5x10.5	60	4.5x10.5	80	4.5x10.5	90	6.3x10.5	110	6.3x10.5	110	
47 (470)	4.5x10.5	70	4.5x10.5	90	4.5x10.5	110	6.3x10.5	130	6.3x10.5	130	6.3x10.5	130	
100 (101)	4.5x10.5	100	6.3x10.5	150	6.3x10.5	180	6.3x10.5	180	8 x16	210	8 x16	250	
220 (221)	6.3x10.5	240	6.3x10.5	250	8 x16	280	8 x16	310	8 x20	350	10 x20	400	
330 (331)	6.3x10.5	300	8x16	330	8 x16	350	8 x20	390	10 x20	440	10 x25	500	
470 (471)	8 x16	380	8x16	400	8 x20	440	10 x20	480	10 x25	550	12.5x25	650	
1000 (102)	8 x20	580	10x20	630	10x25	680	12.5x25	850	12.5x31.5	900	16 x25	1050	
2200 (222)	12.5x25	890	12.5x25	920	12.5x31.5	1000	16 x25	1200	16 x31.5	1250	18 x40	1300	
3300 (332)	12.5x25	1020	12.5x31.5	1090	16 x25	1200	16 x31.5	1300	16 x40	1400	22.4x40	1500	
4700 (472)	12.5x31.5	1170	16x25	1200	16 x31.5	1360	18 x40	1500	22.4x40	1600	22.4x50	1700	
6800 (682)	16x31.5	1270	16x31.5	1400	16 x40	1600	22.4x40	1700	22.4x50	1800			
10000 (103)	16x40	1450	18x40	1600	22.4x40	1800	22.4x50	1800					
15000 (153)	18x40	1700	22.4x40	1900	22.4x50	2000							
22000 (223)	22.4x40	2000	22.4x50	2100									
												Case size	Ripple current

* () shows W.V. and capacitance code

Case size/Ripple current

øD xL(mm) / (mA) r.m.s. (120 Hz / +85 °C)

W.V. (V. DC)		63 (1J)		100 (2A)		160 (2C)		200 (2D)		250 (2E)	
Cap(μF)											
0.1	(0R1)			4.5x10.5	1.5						
0.22	(R22)			4.5x10.5	3.8						
0.33	(R33)			4.5x10.5	5.0						
0.47	(R47)			4.5x10.5	10						
1.0	(010)			4.5x10.5	16	6.3x10.5	13	6.3x10.5	16		
2.2	(2R2)			4.5x10.5	24	6.3x16	24	6.3x16	27	8x16	31
3.3	(3R3)			4.5x10.5	32	6.3x16	31	8x16	36	8x16	40
4.7	(4R7)			4.5x10.5	40	6.3x16	40	8x16	45	8x20	49
10	(100)	4.5x10.5	55	6.3x10.5	70	8x20	63	10x20	72	10x20	81
22	(220)	6.3x10.5	130	8x16	115	10x20	108	10x25	126	12.5x25	144
33	(330)	6.3x10.5	130	8x16	145	10x25	144	12.5x25	157	12.5x25	171
47	(470)	8x16	160	8x20	180	12.5x25	180	12.5x25	193	12.5x31.5	207
100	(101)	8x20	270	10x25	350	16x25	270	16x31.5	306	16x40	340
220	(221)	10x25	450	12.5x31.5	550	18x40	400	18x40	440	22.4x40	500
330	(331)	12.5x25	550	16x25	700	22.4x40	490	22.4x50	540		
470	(471)	12.5x31.5	750	16x40	900	22.4x50	570				
1000	(102)	16x31.5	1100	22.4x40	1050						
2200	(222)	22.4x40	1400							Case size	Ripple current
3300	(332)	22.4x50	1600								

W.V. (V. DC)		350 (2V)		400 (2G)		450 (2W)	
Cap(μF)							
1.0		6.3x16	20	8x16	21	8x16	21
2.2		8x20	36	8x20	36	10x20	38
3.3		10x20	44	10x20	46	10x25	49
4.7		10x20	60	10x25	61	12.5x25	63
10		12.5x25	96	12.5x25	100	16x25	105
22		16x25	160	16x31.5	160	16x40	161
33		16x31.5	200	16x40	205	18x40	210
47		16x40	240	18x40	260	22.4x50	260
100		22.4x40	350	22.4x50	370	Case size	Ripple current

* () shows W.V. and capacitance code.

Features

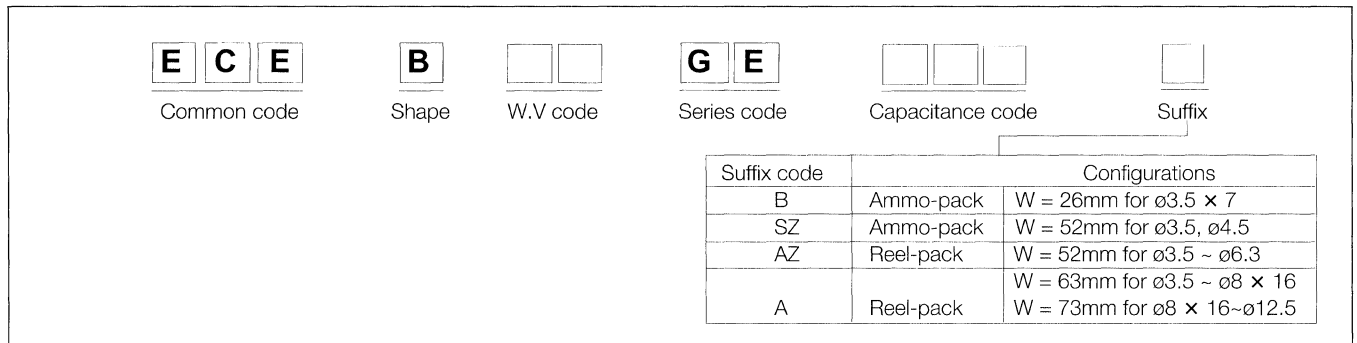
- Industrial grade/compact size
- Wide CV value range (0.1 ~ 15000 μ F/6.3 ~ 350 V)
- Long life 1000 ~ 2000 hours at + 105 °C

(PHOTO NOT AVAILABLE)

Specifications

Item	Performance Characteristics				
Operating Temperature Range	-55 to +105 °C	-25 to +105 °C			
Rated Working Voltage Range	6.3to100V DC	160 to 350V DC			
Nominal Capacitance Range	0.1 to 15000 μ F	1 to 100 μ F			
Capacitance Tolerance	\pm 20% (120Hz, +20 °C)				
Leakage Current	I < 0.01CV or 3 [μ A]/ after 2 minutes whichever is greater measured with rated working voltage applied at +20 °C	I \leq 0.06CV +10 [μ A]/ after 2 minutes application of rated working voltage at +20 °C			
tan δ	Working voltage [V]	6.3 10 16 25 35 50 63 100			
	tan δ max.	0.28 0.22 0.19 0.16 0.13 0.10 0.09 0.07			
	Working voltage [V]	160 200 250 350			
	tan δ max.	0.12 0.12 0.12 0.12			
	(120Hz, +20 °C) For capacitance value >1000 μ F, add 0.02 per every 1000 μ F				
Ripple Current	Refer to standard products table (120Hz, +85 °C) Correction factor for frequency				
	Frequency[Hz]	50/60 120 1k 10k			
	Correction factor (Multiplier)	0.7 1 1.3 1.7			
High Temperature Loading	Test conditions				
	Duration :	2000 hours \geq ϕ 10 of 6.3 ~ 100V 1000 hours 160 ~ 350V & \leq ϕ 8 of 6.3 ~ 100V			
	Ambient temperature :	+105 °C			
	Applied voltage :	DC voltage with maximum permissible ripple current specified at + 105 °C (\leq rated working voltage)			
	Post test requirements at +20 °C				
	Leakage current :	\leq Initial specified value			
	Capacitance change :	\pm 20% of initial measured value			
	tan δ :	\leq 150% (160 ~ 350V), \leq 200% (6.3 ~ 100V) of initial specified value			
Shelf Life	Test conditions				
	Duration :	1000 hours			
	Ambient temperature :	Post test requirements at +20 °C Same limits for high temperature			
	Applied voltage :	+105 °C loading. (None)			
Cleaning	Capacitors rated working range of 6.3V to 100V shall be capable of withstanding exposure to the following cleaning solvents.				
	Conditions Solvents	Solvent condition	Exposure time	Temperature	Ultrasonic wave
	Freon-TE, TES, TP35 or equivalents	Liquid or vapor	\leq 5 min (total)	\leq boiling point at 1 atm	Acceptable

Explanation of Part Numbers (6.3~100V)



Case size/Ripple current

øDxL (mm)/(mA) r.m.s. (120 Hz/ +105 °C)

Cap. (µF)	W.V. (V, DC)	6.3 (OJ)		10 (1A)		16 (1C)		25 (1E)		35 (1V)		50 (1H)		63 (1J)		100 (2A)	
		0.1 (0R1)												5x10.5	1.1		
0.22 (R22)												5x10.5	2.3				
0.33 (R33)												5x10.5	3.5				
0.47 (R47)												5x10.5	5			5x10.5	9
1.0 (010)												5x10.5	10			5x10.5	14
2.2 (2R2)												5x10.5	18	5x10.5	20	6.3x10.5	21
3.3 (3R3)												5x10.5	22	6.3x10.5	25	6.3x16	31
4.7 (4R7)							5x10.5	22	5x10.5	24	6.3x10.5	26	6.3x10.5	30	6.3x16	38	
10 (100)							5x10.5	33	6.3x10.5	36	6.3x16	39	6.3x16	51	6.3x16	61	
22 (220)			5x10.5	41	6.3x10.5	46	6.3x10.5	49	6.3x16	62	6.3x16	70	6.3x16	84	8x16	98	
33 (330)			6.3x10.5	50	6.3x10.5	57	6.3x16	70	6.3x16	84	6.3x16	91	6.3x16	98	8x20	130	
47 (470)			6.3x10.5	60	6.3x16	77	6.3x16	91	6.3x16	98	6.3x16	100	8x16	30	8x20	160	
100 (101)	6.3x10.5	91	6.3x16	110	6.3x16	120	6.3x16	130	8x16	160	8x16	170	8x20	210	10x25	280	
220 (221)	6.3x16	150	6.3x16	160	8x16	210	8x16	220	8x20	260	10x20	330	10x25	400	12.5x31.5	510	
330 (331)	8x16	230	8x16	230	8x16	260	8x20	300	10x20	360	10x25	440	12.5x25	550	16x25	650	
470 (471)	8x16	250	8x16	270	8x20	330	10x20	410	10x25	480	12.5x25	580	12.5x31.5	700	16x40	880	
1000 (102)	10x20	450	10x20	500	10x25	600	12.5x25	720	12.5x31.5	840	16x25	940	16x31.5	1130			
2200 (222)	12.5x25	780	12.5x25	850	12.5x31.5	1010	16x25	1110	16x31.5	1270	18x40	1490					
3300 (332)	12.5x25	920	12.5x31.5	1080	16x25	1210	16x31.5	1380	16x40	1540							
4700 (472)	12.5x31.5	1150	16x25	1270	16x31.5	1490	18x40	1690									
6800 (682)	16x31.5	1440	16x31.5	1530	16x40	1740											
10000 (103)	16x40	1700	18x40	1840													
15000(153)	18x40	1910															
																Case size	Ripple current

*() shows W.V and capacitance code.

Explanation of Part Numbers (160 ~ 350V)

E C E	B		G		S
Common code	Shape	W.V code	Series code	Capacitance code	Suffix

Suffix code	Configurations	
B	Ammo-pack	W = 26mm for ø3.5 × 7
SZ	Ammo-pack	W = 52mm for ø3.5, ø4.5
AZ	Reel-pack	W = 52mm for ø3.5 ~ ø6.3
A	Reel-pack	W = 63mm for ø3.5 ~ ø8 × 16
		W = 73mm for ø8 × 16~ø12.5

Case size/Ripple current

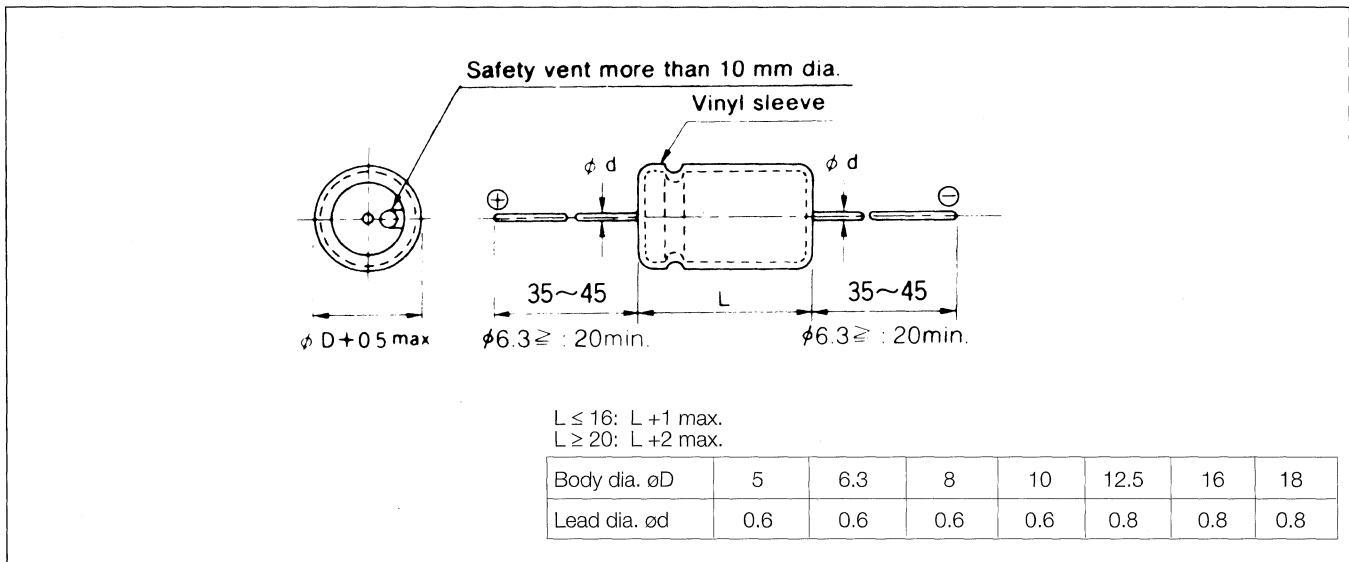
øDxL (mm)/(mA) r.m.s. (120Hz/+105 °C)

Cap (µF)	W.V. (V, DC)	160 (2C)		200 (2D)		250 (2E)		350 (2V)	
		Case size	Ripple current	Case size	Ripple current	Case size	Ripple current	Case size	Ripple current
1.0	(010)	6.3x10.5	15	6.3x16	17	8x16	20	8x16	25
2.2	(2R2)	6.3x16	25	8x16	30	8x16	35	8x20	45
3.3	(3R3)	8x16	35	8x20	40	8x20	45	10x20	55
4.7	(4R7)	8x16	45	8x20	50	10x20	55	10x25	75
10	(100)	10x20	70	10x20	80	10x25	90	12.5x25	120
22	(220)	10x25	120	12.5x25	140	16x25	160	16x25	200
33	(330)	12.5x25	160	16x25	175	16x25	190	16x31.5	250
47	(470)	16x25	200	16x25	215	16x31.5	230	Case size	Ripple current
100	(101)	16x31.5	300	16x40	340				

* () shows W.V. and capacitance code.

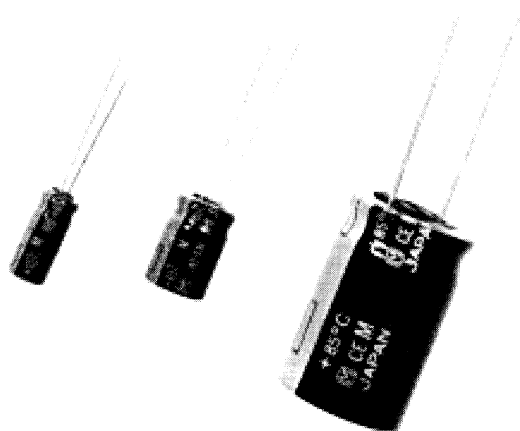
Dimensions

(mm)



Features

- General purpose
- Wide CV value range
- Life 2000 hours at +85 °C
- Safety vent construction for ø6.3mm products



Specifications

Item	Performance Characteristics																										
Operating Temperature Range	-40 to +85 °C	225 to +85 °C																									
Rated Working Voltage Range	6.3to100V DC	160 to 450V DC																									
Nominal Capacitance Range	0.1 to 15000µF	0.47 to 220µF																									
Capacitance Tolerance	±20% (120Hz, +20 °C)																										
Leakage Current	I ≤ 0.03CV or 4 [µA] after 1 minute I < 0.01CV or 3 [µA] after 2 minutes whichever is greater measured with rated working voltage applied at +20 °C	I ≤ 0.06CV + 10[µA] after 2 minutes application of rated working voltage at +20 °C																									
tan δ (120 Hz, +20 °C)	<table border="1"> <tr> <td>Working voltage [V]</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td>tan δ max.</td> <td>0.22</td> <td>0.19</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.09</td> <td>0.08</td> </tr> </table>									Working voltage [V]	6.3	10	16	25	35	50	63	100	tan δ max.	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08
	Working voltage [V]	6.3	10	16	25	35	50	63	100																		
	tan δ max.	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08																		
<table border="1"> <tr> <td>Working voltage [V]</td> <td>160</td> <td>200</td> <td>250</td> <td>350</td> <td>400</td> <td>450</td> <td colspan="2"></td> </tr> <tr> <td>tan δ max.</td> <td>0.16</td> <td>0.18</td> <td>0.18</td> <td>0.20</td> <td>0.20</td> <td>0.20</td> <td colspan="2"></td> </tr> </table>									Working voltage [V]	160	200	250	350	400	450			tan δ max.	0.16	0.18	0.18	0.20	0.20	0.20			
Working voltage [V]	160	200	250	350	400	450																					
tan δ max.	0.16	0.18	0.18	0.20	0.20	0.20																					
For capacitance value >1000µF, add 0.02 per every1000µF																											
Ripple Current	Refer to standard products table (120Hz, +85 °C) Correction factor for frequency																										
	Frequency[Hz]		50/60	120	1k	10k																					
Correction factor (Multiplier)		0.7	1	1.3	1.7																						
Impedance	Maximum C-Z (rated Cap. [µF] × Impedance []) value at 10kHz																										
	Working voltage [V]	63	10	16	25	35	50	63	100																		
	C-Z max. at +20 °C	220	160	125	90	80	60	55	50																		
	C-Z max. at -25 °C	3000	1900	1300	800	650	560	500	450																		
	Working voltage [V]	160	200	250	350	450																					
	C-Z max. at +20 °C	100	140	150	170	270																					
	C-Z max. at -25 °C	2400	2500	3100	3500	12000																					
High Temperature Loading	Test conditions																										
	Duration	: 2000 hours																									
Ambient temperature	: +85 °C																										
Applied voltage	: Rated DC working voltage																										
Shelf Life	Post test requirements at +20 °C																										
	Leakage current	: ≤ Initial specified value																									
	Capacitance change	: ±20% of initial measured value																									
	tan δ	: ≤150% of initial specified value																									
Shelf Life	Test conditions																										
	Duration	: 1000 hours																									
	Ambient temperature	: +85 °C																									
	Applied voltage	: (None)																									
		Post test requirements at +20 °C				Same limits for high temperature loading.																					

Explanation of Part Numbers

E C E	A		U		
Common code	Shape	W.V code	Series code	Capacitance code	Suffix

Suffix	Configuration
—	Standard long lead
E	Snap-in lead forming Lead taping in ammo-pack
B	5mm pitch for $\phi 5 - \phi 12.5$ 7.5mm pitch for $\phi 16 - \phi 18$
i	Lead taping in ammo-pack 2.5mm pitch for $\phi 5 - \phi 6.3$

Dimensions in mm (not to scale)

Body Dia. ϕD	5	6.3	8	10	12.5	16	18
Lead Dia. ϕd	0.5	0.5	0.6	0.6	0.6	0.8	0.8
Lead space P	2	2.5	3.5	5	5	7.5	7.5

$L \leq 16 : L + 1.0 \text{ max.}$
 $L \geq 20 : L + 2.0 \text{ max.}$

Case size/Ripple current

$\phi D \times L$ (mm)/(mA) r.m.s. (120 Hz/ +105 °C)

Cap. (μF)	W.V. (V. DC)		6.3 (OJ)		10 (1A)		16 (1C)		25 (1E)		35 (1V)		50 (1H)		63 (1J)		100 (2A)	
0.47 (R47)													5x11	5	5x11	5	5x11	10
1.0 (O10)													5x11	10	5x11	10	5x11	20
2.2 (2R2)													5x11	20	5x11	29	5x11	30
3.3 (3R3)													5x11	35	5x11	40	5x11	40
4.7 (4R7)										5x11	35	5x11	45	5x11	45	5x11	50	
10 (100)										5x11	60	5x11	65	5x11	70	6.3x11.2	70	
22 (220)					5x11	60	5x11	75	5x11	90	5x11	95	5x11	100	6.3x11.2	105	8x11.5	115
33 (330)				5x11	60	5x11	110	5x11	110	5x11	110	6.3x11.2	110	6.3x11.2	130	10x12.5	145	
47 (470)				5x11	90	5x11	130	5x11	130	6.3x11.2	130	6.3x11.2	130	8x11.5	160	10x16	180	
100 (101)	5x11	130	5x11	150	6.3x11.2	180	6.3x11.2	180	8x11.5	210	8x12.5	250	10x12.5	270	12.5x20	350		
220 (221)	6.3x11.2	240	6.3x11.2	250	8x11.5	280	8x12.5	310	10x12.5	350	10x16	400	10x20	450	16x25	550		
330 (331)	6.3x11.2	300	8x11.5	330	8x12.5	350	10x12.5	390	10x16	440	10x20	500	12.5x20	550	16x25	700		
470 (471)	8x11.5	380	8x12.5	400	10x12.5	440	10x16	480	10x20	550	12.5x20	650	12.5x25	750	16x31.5	900		
1000 (102)	10x12.5	580	10x16	630	10x20	680	12.5x20	850	12.5x25	900	16x25	1050	16x31.5	1100				
2200 (222)	12.5x20	890	12.5x20	920	12.5x25	1000	16x25	1200	16x31.5	1250	18x35.5	1300						
3300 (332)	12.5x20	1020	12.5x25	1090	16x25	1200	16x31.5	1300	18x35.5	1400								
4700 (472)	16x25	1170	16x25	1200	16x31.5	1360	18x35.5	1500										
6800 (682)	16x25	1270	16x31.5	1400	18x35.5	1600												
10000 (103)	16x31.5	1450	18x35.5	1600												Case size	Ripple current	
15000 (153)	18x35.5	1700																

* () shows W.V. and capacitance code.

Aluminum Electrolytic Capacitors Radial Lead Type

SU Series

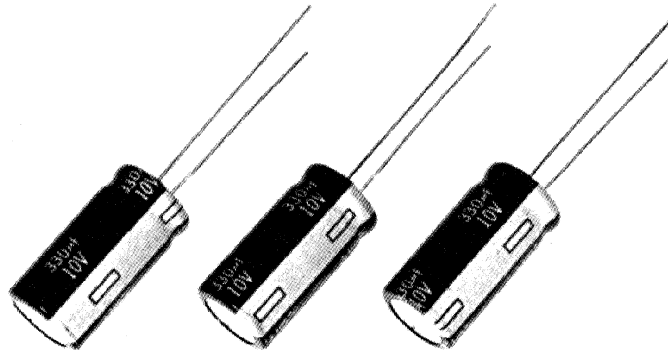
Cap. (μF)	W.V. (V. DC)	160 (2C)		200 (2D)		250 (2E)		350 (2V)		400 (2G)		450 (2W)	
0.47	(R47)	5x11	9.5										
1.0	(010)	6.3x11.2	13	6.3x11.2	16	6.3x11.2	18	6.3x11.2	18	8x11.5	18	10x12.5	19
2.2	(2R2)	6.3x11.2	22	6.3x11.2	27	8x11.5	31	10x12.5	28	10x12.5	28	10x16	29
3.3	(3R3)	•6.3x11.2	31	8x11.5	36	10x12.5	40	10x16	35	10x16	35	10x20	35
4.7	(4R7)	8x11.5	40	10x12.5	45	10x12.5	49	10x16	40	10x16	45	12.5x20	50
10	(100)	10x12.5	66	10x16	72	•10x16	81	10x20	70	12.5x20	70	12.5x25	75
22	(220)	•10x16	110	10x20	126	•12.5x20	144	12.5x25	110	16x25	110	16x31.5	110
33	(330)	•10x20	144	•12.5x20	160	12.5x25	171	16x25	140	16x25	140	18x31.5	150
47	(470)	•12.5x20	180	12.5x25	193	16x25	210	16x31.5	170	16x31.5	170		
100	(101)	16x25	300	16x31.5	330	•18x31.5	320						
220	(221)	•18x31.5	510									Case size	Ripple current

*() shows W.V. and capacitance code.

** suffix "W" for items marked •

Features

- Compact size (Same case size as SU series) and long life (1000 ~ 2000 hours at +105°C)
- Wide CV value range (0.1 ~ 15000μF/6.3 ~ 450V)



Specifications

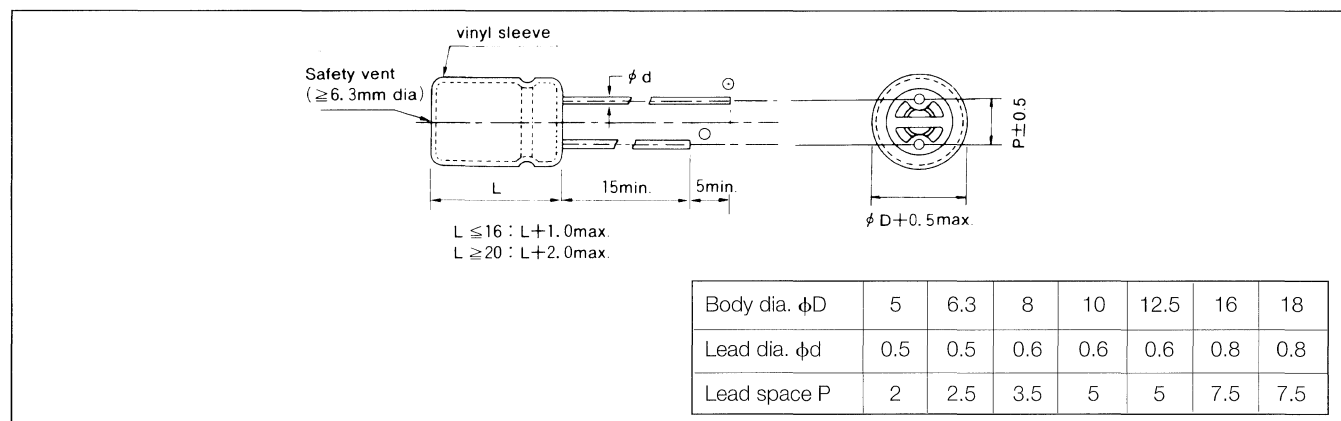
Item	Performance Characteristics																																																																
Rated Working Voltage Range	6.3 to 100V DC	160 to 450V DC																																																															
Operating Temperature Range	-55 to +105°C	-25 to +105°C																																																															
Nominal Capacitance Range	0.1 to 15000μF	0.47 to 220μF																																																															
Capacitance Tolerance	±20% (120Hz, +20°C)																																																																
Leakage Current	$I \leq 0.01 CV$ or $3 [\mu A]$ whichever is greater	$I \leq 0.06CV + 10 [\mu A]$																																																															
	after 2 minutes application of rated working voltage at +20°C																																																																
tan δ	<table border="1"> <tr> <td>Working voltage [V]</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td>tan δ max.</td> <td>0.22</td> <td>0.19</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.09</td> <td>0.07</td> </tr> </table>									Working voltage [V]	6.3	10	16	25	35	50	63	100	tan δ max.	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.07																																						
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(120Hz, +20°C)	<table border="1"> <tr> <td>Working voltage [V]</td> <td>160</td> <td>200</td> <td>250</td> <td>350</td> <td>400</td> <td>450</td> </tr> <tr> <td>tan δ max.</td> <td>0.15</td> <td>0.15</td> <td>0.15</td> <td>0.20</td> <td>0.24</td> <td>0.24</td> </tr> </table> <p>For capacitance value >1000μF, add 0.02 per every 1000μF</p>									Working voltage [V]	160	200	250	350	400	450	tan δ max.	0.15	0.15	0.15	0.20	0.24	0.24																																										
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Maximum Permissible Ripple Current	Refer to standard products table (120Hz, +105°C) Correction factor for frequency																																																																
	<table border="1"> <tr> <td rowspan="2">W.V. [V.DC]</td> <td rowspan="2">Cap. [μF]</td> <td colspan="5">Freq. [Hz]</td> </tr> <tr> <td>60</td> <td>120</td> <td>1k</td> <td>10k</td> <td>100k</td> </tr> <tr> <td rowspan="3">6.3~50</td> <td>0.1~ 330</td> <td>0.85</td> <td>1</td> <td>1.30</td> <td>1.40</td> <td>1.55</td> </tr> <tr> <td>470~3300</td> <td>0.95</td> <td>1</td> <td>1.15</td> <td>1.20</td> <td>1.25</td> </tr> <tr> <td>≥4700</td> <td>0.95</td> <td>1</td> <td>1.10</td> <td>1.20</td> <td>1.20</td> </tr> <tr> <td rowspan="3">63~100</td> <td>0.47~ 33</td> <td>0.75</td> <td>1</td> <td>1.55</td> <td>1.65</td> <td>1.80</td> </tr> <tr> <td>47~ 220</td> <td>0.75</td> <td>1</td> <td>1.40</td> <td>1.60</td> <td>1.65</td> </tr> <tr> <td>≥ 330</td> <td>0.80</td> <td>1</td> <td>1.30</td> <td>1.35</td> <td>1.40</td> </tr> <tr> <td>≥160</td> <td>1~ 220</td> <td>0.70</td> <td>1</td> <td>1.30</td> <td>1.70</td> <td>1.70</td> </tr> </table>									W.V. [V.DC]	Cap. [μF]	Freq. [Hz]					60	120	1k	10k	100k	6.3~50	0.1~ 330	0.85	1	1.30	1.40	1.55	470~3300	0.95	1	1.15	1.20	1.25	≥4700	0.95	1	1.10	1.20	1.20	63~100	0.47~ 33	0.75	1	1.55	1.65	1.80	47~ 220	0.75	1	1.40	1.60	1.65	≥ 330	0.80	1	1.30	1.35	1.40	≥160	1~ 220	0.70	1	1.30	1.70
W.V. [V.DC]	Cap. [μF]	Freq. [Hz]																																																															
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63~100	0.47~ 33	0.75	1	1.55	1.65	1.80																																																											
	47~ 220	0.75	1	1.40	1.60	1.65																																																											
	≥ 330	0.80	1	1.30	1.35	1.40																																																											
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Low Temperature Characteristics	Impedance ratio max. at 120Hz.																																																																
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Working voltage [V]	6.3	10	16	25	35	50	63	100																																																									
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-40°C/+20°C	8	6	4	3	3	3	3	3																																																									
-55°C/+20°C	12	10	8	6	6	6	6	6																																																									
Working voltage [V]	160	200	250	350	400	450																																																											
-25°C/+20°C	3	3	3	6	6	15																																																											

Specifications

Item	Performance Characteristics												
High Temperature Loading	<p>Test conditions</p> <p>Duration : 2000 hours (1000 hours for $\leq \phi 8$ mm. products)</p> <p>Ambient temperature : +105°C</p> <p>Applied voltage : DC voltage with maximum permissible ripple current specified at +105°C (Sum of the DC voltage and super-imposed peak AC voltage for maximum permissible ripple current should be equal to rated DC working voltage.)</p> <p>Post test requirements at +20°C</p> <p>Leakage current : \leq Initial specified value</p> <p>Capacitance change : $\pm 20\%$ of initial measured value</p> <p>tan δ : $\leq 200\%$ of initial specified value</p>												
Shelf Life	<p>Test conditions</p> <p>Duration : 1000 hours</p> <p>Ambient temperature : +105°C</p> <p>Applied voltage : (None)</p> <p>Post test requirements at +20°C</p> <p>Same limits for high temperature loading.</p>												
Cleaning	<p>Capacitors for ratings of 6.3V to 100V shall be capable of withstanding exposure to following cleaning solvents.</p> <table border="1"> <thead> <tr> <th>Solvents</th> <th>Conditions</th> <th>Solvent condition</th> <th>Exposure time</th> <th>Temperature</th> <th>Ultrasonic wave</th> </tr> </thead> <tbody> <tr> <td>Freon-TE, TES, TP35 or equivalents</td> <td></td> <td>Liquid or vapor</td> <td>≤ 5 min (total)</td> <td>\leq boiling point at 1atm</td> <td>Acceptable</td> </tr> </tbody> </table>	Solvents	Conditions	Solvent condition	Exposure time	Temperature	Ultrasonic wave	Freon-TE, TES, TP35 or equivalents		Liquid or vapor	≤ 5 min (total)	\leq boiling point at 1atm	Acceptable
Solvents	Conditions	Solvent condition	Exposure time	Temperature	Ultrasonic wave								
Freon-TE, TES, TP35 or equivalents		Liquid or vapor	≤ 5 min (total)	\leq boiling point at 1atm	Acceptable								

Dimensions

[mm]



Explanation of Part Numbers

E C E	A		G E																				
Common code	Shape	W.V code	Series code	Capacitance code	Suffix																		
<table border="1"> <thead> <tr> <th>Suffix code</th> <th colspan="2">Configurations</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>Ammo-pack</td> <td>5mm pitch for $\phi 4 \sim \phi 12.5$ 7.5mm pitch for $\phi 16 \sim \phi 18$</td> </tr> <tr> <td>BQ</td> <td>Ammo-pack</td> <td>H = 18.5mm height for $\phi 8 \sim \phi 12.5$</td> </tr> <tr> <td>i</td> <td>Ammo-pack</td> <td>2.5mm pitch for $\phi 3 \sim \phi 6.5$ & $\phi 8 \times 5$</td> </tr> <tr> <td>AX</td> <td>Reel-pack</td> <td>5mm pitch for $\phi 4 \sim \phi 8$ + lead first</td> </tr> <tr> <td>AZ</td> <td>Reel-pack</td> <td>5mm pitch for $\phi 4 \sim \phi 8$ - lead first</td> </tr> </tbody> </table>						Suffix code	Configurations		B	Ammo-pack	5mm pitch for $\phi 4 \sim \phi 12.5$ 7.5mm pitch for $\phi 16 \sim \phi 18$	BQ	Ammo-pack	H = 18.5mm height for $\phi 8 \sim \phi 12.5$	i	Ammo-pack	2.5mm pitch for $\phi 3 \sim \phi 6.5$ & $\phi 8 \times 5$	AX	Reel-pack	5mm pitch for $\phi 4 \sim \phi 8$ + lead first	AZ	Reel-pack	5mm pitch for $\phi 4 \sim \phi 8$ - lead first
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B	Ammo-pack	5mm pitch for $\phi 4 \sim \phi 12.5$ 7.5mm pitch for $\phi 16 \sim \phi 18$																					
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Aluminum Electrolytic Capacitors Radial Lead Type

NHE Series

Case Size/Ripple current

øDXL (mm)/(mA) r.m.s. (120 Hz/ +105 °C)

W.V.[V.DC] Cap. [μ F]	6.3 (OJ)	10 (1A)	16 (1C)	25 (1E)	35 (1V)	50 (1H)	63 (1J)	100 (2A)										
0.1 (OR1)						5 x 11	1.1											
0.22 (R22)						5 x 11	2.3											
0.33 (R33)						5 x 11	3.5											
0.47 (R47)						5 x 11	5					5 x 11	9					
1 (O10)						5 x 11	10					5 x 11	14					
2.2 (2R2)						5 x 11	18					5 x 11	21					
3.3 (3R3)						5 x 11	22					5 x 11	31					
4.7 (4R7)						5 x 11	26					5 x 11	38					
10 (100)						5 x 11	39	5 x 11	51	6.3 x 11.2	61							
22 (220)						5 x 11	70	6.3 x 11.2	84	8 x 11.5	98							
33 (330)					5 x 11	84	6.3 x 11.2	91	6.3 x 11.2	98	10 x 12.5	130						
47 (470)			5 x 11	77	5 x 11	91	6.3 x 11.2	98	6.3 x 11.1	100	8 x 11.5	130	10 x 16	160				
100 (101)	5 x 11	91	5 x 11	110	6.3 x 11.2	120	6.3 x 11.2	130	8 x 11.5	160	8 x 12.5	170	10 x 12.5	210	12.5 x 20	280		
220 (221)	6.3 x 11.2	150	6.3 x 11.2	160	8 x 11.5	210	8 x 12.5	220	10 x 12.5	260	10 x 16	330	10 x 20	400	16 x 25	510		
330 (331)	6.3 x 11.2	230	8 x 11.5	230	8 x 12.5	260	10 x 12.5	300	10 x 16	360	10 x 20	440	12.5 x 20	550	16 x 25	650		
470 (471)	8 x 12.5	250	8 x 12.5	270	10 x 12.5	330	10 x 16	410	10 x 20	480	12.5 x 20	580	12.5 x 25	700	16 x 31.5	880		
1000 (102)	10 x 12.5	450	10 x 16	500	10 x 20	600	12.5 x 20	720	12.5 x 25	840	16 x 25	940	16 x 31.5	1130				
2200 (222)	12.5 x 20	780	12.5 x 20	850	12.5 x 25	1010	16 x 25	1110	16 x 31.5	1270	18 x 35.5	1490						
3300 (332)	12.5 x 20	920	12.5 x 25	1080	16 x 25	1210	16 x 31.5	1380	18 x 35.5	1540								
4700 (472)	16 x 25	1150	16 x 25	1270	16 x 31.5	1490	18 x 35.5	1690										
6800 (682)	16 x 25	1440	16 x 31.5	1530	18 x 35.5	1740												
10000 (103)	16 x 31.5	1700	18 x 35.5	1840													Case size	Ripple current
15000 (153)	18 x 35.5	1910																

W.V.[V.DC] Cap. [μ F]	160 (2C)	200 (2D)	250 (2E)	350 (2V)	400 (2G)	450 (2W)												
0.47 (R47)	6.3x11.2	12	6.3x11.2	12	6.3x11.2	12	8x11.5	11	8x11.5	11								
1.0 (O10)	6.3 x 11.2	17	6.3 x 11.2	17	6.3 x 11.2	17	10 x 12.5	18	10 x 12.5	18	10x12.5	18						
2.2 (2R2)	6.3 x 11.2	25	6.3 x 11.2	25	8 x 11.5	29	10 x 16	31	10 x 16	30	10x16	29						
3.3 (3R3)	8 x 11.5	36	8 x 11.5	36	10 x 12.5	42	10 x 16	38	10 x 20	40	10x20	41						
4.7 (4R7)	8 x 11.5	43	10 x 12.5	50	10 x 12.5	50	10 x 20	49	10 x 20	45	12.5x20	49						
10 (100)	10 x 12.5	70	10 x 16	80	10 x 20	88	12.5 x 20	82	12.5 x 25	79	12.5x20	75						
22 (220)	10 x 20	130	10 x 20	140	12.5 x 25	155	16 x 25Z	130	16 x 25	145	16x25	115						
33 (330)	12.5 x 20	180	12.5 x 25	190	12.5 x 25	190	16 x 25	175	16 x 31.5	185	16x31.5	145						
47 (470)	12.5 x 25	220	12.5 x 25	220	16 x 25	230	16 x 31.5W	230	18 x 31.5	230								
100 (101)	16 x 25	330	16 x 31.5	335	18 x 31.5W	340											Case size	Ripple current
220 (221)	18 x 31.5W	500																

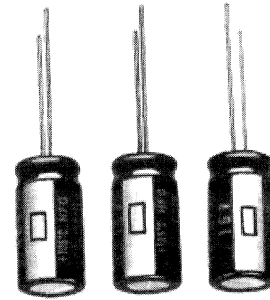
* W or Z in above case size table is suffix code.

Example ECEA □□ GE □□□^WZ

** () shows W.V. and capacitance code.

Features

- High CV value per standard case size (same size as SU series)
- Low impedance (approx. 1/2 of HFS series)
- Long life: 2000-5000 hours at +105 °C



Specifications

Item	Performance Characteristics																																		
Operating Temperature Range	-55 to +105 °C																																		
Rated Working Voltage Range	6.3 to 63V DC																																		
Nominal Capacitance Range	0.1 to 15000µF																																		
Capacitance Tolerance	±20% (120Hz, +20 °C)																																		
Leakage Current	$I < 0.01CV$ or 3 [µA] whichever is greater measured after 2 minutes application of rated working voltage applied at +20 °C																																		
tan δ (120Hz, +20 °C)	<table border="1"> <thead> <tr> <th>Working voltage [V]</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> </tr> </thead> <tbody> <tr> <td>tan δ max.</td> <td>0.22</td> <td>0.19</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.08</td> </tr> </tbody> </table>	Working voltage [V]	6.3	10	16	25	35	50	63	tan δ max.	0.22	0.19	0.16	0.14	0.12	0.10	0.08																		
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	For capacitance value >1000µF, add 0.02 per every 1000µF																																		
Frequency correction factor for R.C.	Refer to standard products table. (100kHz, +20 °C)																																		
	<table border="1"> <thead> <tr> <th rowspan="2">Cap. [µF]</th> <th colspan="2">Freq. [Hz]</th> <th rowspan="2">50/60</th> <th rowspan="2">120</th> <th rowspan="2">1k</th> <th rowspan="2">10k</th> <th rowspan="2">100k</th> </tr> <tr> <th>0.1 ~ 330</th> <th>470 ~ 3300</th> </tr> </thead> <tbody> <tr> <td></td> <td>0.1 ~ 330</td> <td>470 ~ 3300</td> <td>0.55</td> <td>0.65</td> <td>0.85</td> <td>0.90</td> <td>1.00</td> </tr> <tr> <td></td> <td>4700~</td> <td></td> <td>0.75</td> <td>0.80</td> <td>0.90</td> <td>0.95</td> <td>1.00</td> </tr> <tr> <td></td> <td></td> <td></td> <td>0.80</td> <td>0.85</td> <td>0.95</td> <td>1.00</td> <td>1.00</td> </tr> </tbody> </table>	Cap. [µF]	Freq. [Hz]		50/60	120	1k	10k	100k	0.1 ~ 330	470 ~ 3300		0.1 ~ 330	470 ~ 3300	0.55	0.65	0.85	0.90	1.00		4700~		0.75	0.80	0.90	0.95	1.00				0.80	0.85	0.95	1.00	1.00
	Cap. [µF]		Freq. [Hz]							50/60	120	1k	10k	100k																					
		0.1 ~ 330	470 ~ 3300																																
	0.1 ~ 330	470 ~ 3300	0.55	0.65	0.85	0.90	1.00																												
	4700~		0.75	0.80	0.90	0.95	1.00																												
			0.80	0.85	0.95	1.00	1.00																												
Ripple Current	Refer to standard products table (120Hz, +85 °C)																																		
High Temperature Loading	Test conditions Duration : 2000 hours (for ø5 ~ ø8mm) 3000 hours (for ø10mm) 5000 hours (for ø12 ~ ø18mm) Ambient temperature : +105 °C Applied voltage : DC voltage with maximum permissible ripple current specified at +105 °C (Rated working voltage)																																		
	Post test requirements at +20 °C Leakage current : ≤Initial specified value Capacitance change : ±20% of initial measured value tan δ : ≤150% (160 350V), 200% (6.3 ~ 100V) of initial specified value																																		
Shelf Life	Test conditions Duration : 1000 hours Ambient temperature : +105 °C Applied voltage : (None)																																		
	Post test requirements at +20 °C Same limits for high temperature loading.																																		

Explanation of Part Numbers

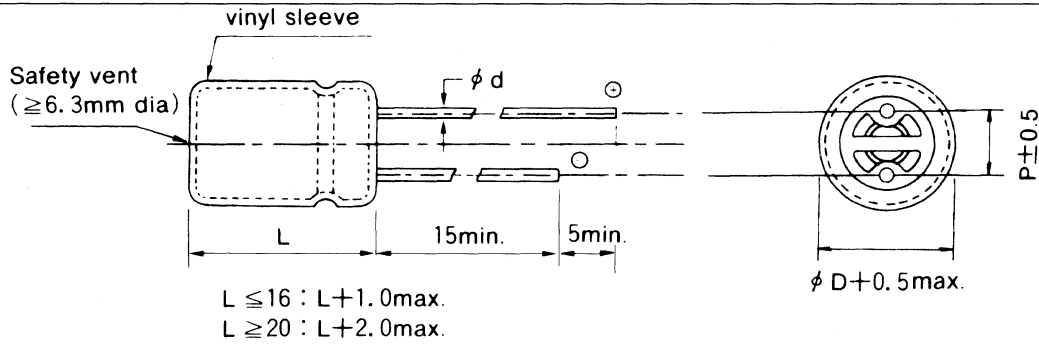
E C A	□ □	F G	□ □ □	□																		
Common code	W.V code	Series code	Capacitance code	Suffix																		
Capacitances in µF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits. Example: 331—330 µF, 332—3300 µF		<table border="1"> <thead> <tr> <th>Suffix code</th> <th colspan="2">Configurations</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>Ammo-pack</td> <td>5mm pitch for ø4 ~ ø12.5 7.5mm pitch for ø16 ~ ø18</td> </tr> <tr> <td>BQ</td> <td>Ammo-pack</td> <td>H = 18.5mm height for ø8 ~ ø12.5</td> </tr> <tr> <td>i</td> <td>Ammo-pack</td> <td>2.5mm pitch for ø3 ~ ø6.5 & ø8x5</td> </tr> <tr> <td>AX</td> <td>Reel-pack</td> <td>5mm pitch for ø4 ~ ø8 + lead first</td> </tr> <tr> <td>AZ</td> <td>Reel-pack</td> <td>5mm pitch for ø4 ~ ø8 - lead first</td> </tr> </tbody> </table>			Suffix code	Configurations		B	Ammo-pack	5mm pitch for ø4 ~ ø12.5 7.5mm pitch for ø16 ~ ø18	BQ	Ammo-pack	H = 18.5mm height for ø8 ~ ø12.5	i	Ammo-pack	2.5mm pitch for ø3 ~ ø6.5 & ø8x5	AX	Reel-pack	5mm pitch for ø4 ~ ø8 + lead first	AZ	Reel-pack	5mm pitch for ø4 ~ ø8 - lead first
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AZ	Reel-pack	5mm pitch for ø4 ~ ø8 - lead first																				

Aluminum Electrolytic Capacitors Radial Lead Type

HFG Series

Dimensions

[mm]



Body dia. ϕD	5	6.3	8	10	12.5	16	18
Lead dia. ϕd	0.5	0.5	0.6	0.6	0.6	0.8	0.8
Lead space P	2	2.5	3.5	5	5	7.5	7.5

Standard Products Table

W.V. [V.DC]	Cap. [μF]	Part No.	D.C.L (+20 °C/2 min.) [μA] max.	$\tan\delta$ (120Hz, +20 °C) max.	Impedance (100kHz/+20 °C) [Ω] max.	Ripple current (100kHz/+105 °C) [mA] rms max.	Dimensions [mm]			
							ϕD	L	P	ϕd
6.3 (ϕJ)	100	ECAOJFG101	6.3	0.22	1.0	140	5	11	2.0	0.5
	220	ECAOJFG221	13.8	0.22	0.42	245	6.3	11.2	2.5	0.5
	330	ECAOJFG331	20.7	0.22	0.42	245	6.3	11.2	2.5	0.6
	470	ECAOJFG471	29.6	0.22	0.21	400	8	11.5	3.5	0.6
	1000	ECAOJFG102	63.0	0.22	0.15	560	10	12.5	5.0	0.6
	2200	ECAOJFG222	138.6	0.24	0.050	1280	12.5	20	5.0	0.6
	3300	ECAOJFG332	207.9	0.26	0.050	1280	12.5	20	5.0	0.6
	4700	ECAOJFG472	296.1	0.28	0.031	1970	16	25	7.5	0.8
	6800	ECAOJFG682	428.4	0.32	0.031	1970	16	25	7.5	0.8
	10000	ECAOJFG103	630.0	0.40	0.028	2220	16	31.5	7.5	0.8
	15000	ECAOJFG153	945.0	0.50	0.023	2770	18	35.5	7.5	0.8
10 (1A)	100	ECA1AFG101	10.0	0.19	1.0	140	5	11	2.0	0.5
	220	ECA1AFG221	22.0	0.19	0.42	245	6.3	11.2	2.5	0.5
	330	ECA1AFG331	33.0	0.19	0.21	400	8	11.5	3.5	0.6
	470	ECA1AFG471	47.0	0.19	0.21	400	8	11.5	3.5	0.6
	1000	ECA1AFG102	100.0	0.19	0.11	720	10	16	5.0	0.6
	2200	ECA1AFG222	220.0	0.21	0.050	1280	12.5	20	5.0	0.6
	3300	ECA1AFG332	330.0	0.23	0.040	1560	12.5	25	5.0	0.6
	4700	ECA1AFG472	470.0	0.25	0.031	1970	16	25	7.5	0.8
	6800	ECA1AFG682	680.0	0.29	0.028	2220	16	31.5	7.5	0.8
	10000	ECA1AFG103	1000.0	0.37	0.023	2770	18	35.5	7.5	0.8
16 (1C)	47	ECA1CFG470	7.5	0.16	1.0	140	5	11	2.0	0.5
	100	ECA1CFG101	16.0	0.16	0.42	245	6.3	11.2	2.5	0.5
	220	ECA1CFG221	35.2	0.16	0.21	400	8	11.5	3.5	0.6
	330	ECA1CFG331	52.8	0.16	0.21	400	8	11.5	3.5	0.6
	470	ECA1CFG471	75.2	0.16	0.15	560	10	12.5	5.0	0.6
	1000	ECA1CFG102	160.0	0.16	0.076	940	10	20	5.0	0.6
	2200	ECA1CFG222	352.0	0.18	0.040	1560	12.5	25	5.0	0.6
	3300	ECA1CFG332	528.0	0.20	0.031	1970	16	25	7.5	0.8
	4700	ECA1CFG472	752.0	0.22	0.028	2220	16	31.5	7.5	0.8
6800	ECA1CFG682	1088.0	0.26	0.023	2770	18	35.5	7.5	0.8	

* () shows W.V. code for part number

Aluminum Electrolytic Capacitors Radial Lead Type

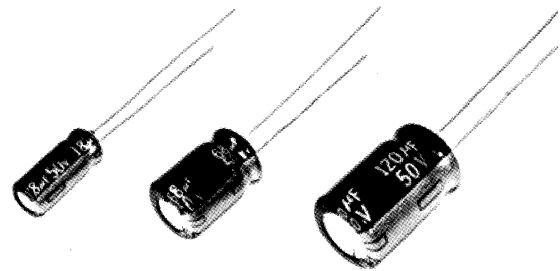
HFG Series

W.V. [V. DC]	Cap [μF]	Part No.	D.C.L. (+20 °C/2min.) [μA]max.	tanδ (120Hz,+20 °C) max.	Impedance (100kHz/+20 °C) [Ω]max.	Ripple current (100kHz/+105 °C) [mA] rms max.	Dimensions [mm]			
							øD	L	P	ød
25 (1E)	47	ECA1EFG470	11.7	0.14	1.0	140	5	11	2.0	0.5
	100	ECA1EFG101	25.0	0.14	0.57	245	6.3	11.2	2.5	0.5
	220	ECA1EFG221	55.0	0.14	0.21	400	8	11.5	3.5	0.6
	330	ECA1EFG331	82.5	0.14	0.15	560	10	12.5	5.0	0.6
	470	ECA1EFG471	117.5	0.14	0.11	720	10	16	5.0	0.6
	1000	ECA1EFG102	250.0	0.14	0.050	1280	12.5	20	5.0	0.6
	2200	ECA1EFG222	550.0	0.16	0.031	1970	16	25	7.5	0.8
	3300	ECA1EFG332	825.0	0.18	0.028	2220	16	31.5	7.5	0.8
	4700	ECA1EFG472	1175.0	0.20	0.023	2770	18	35.5	7.5	0.8
35 (1V)	33	ECA1VFG330	11.5	0.12	1.3	125	5	11	2.0	0.5
	47	ECA1VFG470	16.4	0.12	0.57	210	6.3	11.2	2.5	0.5
	100	ECA1VFG101	35.0	0.12	0.32	325	8	11.5	3.5	0.6
	220	ECA1VFG221	77.0	0.12	0.23	450	10	12.5	5.0	0.6
	330	ECA1VFG331	115.5	0.12	0.18	565	10	16	5.0	0.6
	470	ECA1VFG471	164.5	0.12	0.13	720	10	20	5.0	0.6
	1000	ECA1VFG102	350.0	0.12	0.074	1140	12.5	25	5.0	0.6
	2200	ECA1VFG222	770.0	0.14	0.034	2010	16	31.5	7.5	0.8
50 (1H)	0.1	ECA1HFGOR1	3.0	0.10	24.0	2.0	5	11	2.0	0.5
	0.22	ECA1HFGR22	3.0	0.10	10.0	4.5	5	11	2.0	0.5
	0.33	ECA1HFGR33	3.0	0.10	7.2	6.7	5	11	2.0	0.5
	0.47	ECA1HFGR47	3.0	0.10	5.0	9.5	5	11	2.0	0.5
	1	ECA1HFG010	3.0	0.10	2.4	20	5	11	2.0	0.5
	2.2	ECA1HFG2R2	3.0	0.10	1.3	45	5	11	2.0	0.5
	3.3	ECA1HFG3R3	3.0	0.10	1.3	65	5	11	2.0	0.5
	4.7	ECA1HFG4R7	3.0	0.10	1.3	95	5	11	2.0	0.5
	10	ECA1HFG100	5.0	0.10	1.3	125	5	11	2.0	0.5
	22	ECA1HFG220	11.0	0.10	1.3	125	5	11	2.0	0.5
	33	ECA1HFG330	16.5	0.10	0.57	210	6.3	11.2	2.5	0.5
	47	ECA1HFG470	23.5	0.10	0.57	210	6.3	11.2	2.5	0.5
	100	ECA1 HFG101	50.0	0.10	0.32	325	8	11.5	3.5	0.6
	220	ECA1HFG221	110.0	0.10	0.18	565	10	16	5.0	0.6
	330	ECA1HFG331	165.0	0.10	0.13	720	10	20	5.0	0.6
	470	ECAI HFG471	235.0	0.10	0.088	965	12.5	20	5.0	0.6
1000	ECA1HFG102	500.0	0.10	0.047	1600	16	25	7.5	0.8	
2200	ECAIHFG222	1100.0	0.12	0.024	2710	18	35.5	7.5	0.8	
63 (1J)	10	ECA1JFG100	6.3	0.08	2.2	95	5	11	2.0	0.5
	22	ECA1JFG220	13.8	0.08	0.94	165	6.3	11.2	2.5	0.5
	33	ECA1JFG330	20.7	0.08	0.94	165	6.3	11.2	2.5	0.5
	47	ECA1JFG470	29.6	0.08	0.68	220	8	11.5	3.5	0.6
	100	ECA1JFG101	63.0	0.08	0.36	360	10	12.5	5.0	0.6
	220	ECA1JFG221	138.6	0.08	0.20	580	10	20	5.0	0.6
	330	ECA1JFG331	207.9	0.08	0.14	765	12.5	20	5.0	0.6
	470	ECA1JFG471	296.1	0.08	0.12	900	12.5	25	5.0	0.6
1000	ECA1JFG102	630.0	0.08	0.052	1630	16	31.5	7.5	0.8	

* () shows W.V. code.*

Features

- Low impedance at high frequency and low temperature
- Wide operating temperature range from -55 to +105 °C
- Various case sizes (flat to slim) are provided
- Anti-solvent: Freon-TE, TES, TP35 or equivalents



Specifications

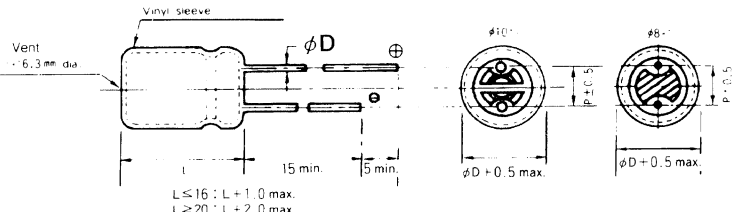
Item	Performance Characteristics								
Operating Temperature Range	-55 to +105 °C								
Rated Working Voltage Range	6.3 to 63V DC								
Nominal Capacitance Range	6.8 to 15000µF								
Capacitance Tolerance	±20% (120Hz, +20 °C)								
Leakage Current	I < 0.01CV or 3 [µA] whichever is greater measured with rated working voltage applied at +20 °C								
tan δ (120Hz, +20 °C)	Working voltage [V]	6.3	10	16	25	35	50	63	
	tan δ max.	0.22	0.19	0.16	0.14	0.12	0.10	0.08	
	For capacitance value >1000µF, add 0.02 per every 1000µF								
Impedance at High Frequency	Refer to standard products table. (100kHz, +20 °C)								
Ripple Current	Refer to standard products table. (100kHz, +105 °C)								
High Temperature Loading	Test conditions								
	Duration	2000 hours (1000 hours for øD ≤ 8mm)							
	Ambient temperature	+105 °C							
	Applied voltage	DC voltage with maximum permissible ripple current specified at + 105 °C (the sum of the DC voltage and super-imposed peak AC voltage for maximum permissible ripple current should be equal to rated DC working voltage.)							
	Post test requirements at +20 °C								
	Leakage current	≤ Initial specified value							
	Capacitance change	±30% of initial measured value							
	tan δ	≤ 300% of initial specified value							
Shelf Life	Test conditions								
	Duration	1000 hours					Post test requirements at +20 °C		
	Ambient temperature	+105 °C					Same limits for high temperature loading.		
	Applied voltage	(None)							
Cleaning	Capacitors shall be capable of withstanding exposure to the following cleaning solvents.								
	Conditions		Solvent condition	Exposure time	Temperature	Ultrasonic wave			
	Solvents	Freon-TE, TES, TP35 or equivalents	Liquid or vapor	≤5 min (total)	≤boiling point at 1 atm	Acceptable			

Explanation of Part Numbers

<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">E</div> <div style="border: 1px solid black; padding: 2px;">C</div> <div style="border: 1px solid black; padding: 2px;">A</div> </div> <p>Common code • shape</p>	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 15px; height: 15px;"></div> <div style="border: 1px solid black; width: 15px; height: 15px;"></div> </div> <p>W.V. code</p>	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">F</div> <div style="border: 1px solid black; padding: 2px;">Q</div> </div> <p>Series code</p>	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 15px; height: 15px;"></div> <div style="border: 1px solid black; width: 15px; height: 15px;"></div> <div style="border: 1px solid black; width: 15px; height: 15px;"></div> </div> <p>Capacitance code</p>	<div style="border: 1px solid black; width: 15px; height: 15px;"></div> <p>Suffix</p>
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Capacitances in μF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits.
 Example: 331—330 μF ,
 332—3300 μF

Dimensions



Body Dia. ϕD	4	5	6.3	8	10	12.5	16	18
Body Length L						15-25	30-40	
Lead Dia. ϕd	0.45	0.5	0.5	0.6	0.6	0.6	0.8	0.8
Lead space P	1.5	2	2.5	3.5	5	5	5	7.5

Case size/Capacitance

Case size $\phi D \times L$ (mm)	W.V. (V, DC)						
	Capacitance (μF)						
	6.3V(OJ)	10V(1A)	16V(1C)	25V(1E)	35V(1V)	50V(1H)	63V(1J)
4x11	68	47	39	27	18	10	6.8
5x11	100	82	56	39	27	18	12
5 x15	150	100	82	56	39	27	18
6.3x11.2	220	180	120	82	56	33	22
6.3x15	330	220	180	120	82	56	39
8 x12.5	470	330	270	180	120	68	56
8 x15	680L	470L	330L	220L	150L	100	82
8 x20	1000	680	470	330	220	150	100L
10 x12.5	680	470	330	220	150	82	68
10 x16	820	560	390	270	180	120	100
10 x20	1200L	1000L	680L	470L	330L	220L	150L
10 x25	1500	1200	820	560	390	270	180
10 x30	2200L	1500L	1200L	820L	560L	390L	270L
12.5x15	1200	1000	680	470	330	220	150
12.5x20	2200	1800	1200	820	560	330	220
12.5x25	2700	2200	1500	1000	680	470	330
12.5x30	3900	2700	2200L	1500L	1000L	560	390
12.5x35	4700L	3300L	2700L	1800L	1200L	680L	470L
12.5x40	5600L	3900L	3300L	2200L	1500L	820L	560L
16 x15	2700S	1800S	1500S	820S	560S	390	270
16 x20	4700	3300	2200	1500	1000	680	470
16 x25	5600	3900	2700	1800	1200	820	560
16 x31.5	6800	5600	3900	2700	1800	1000	680
16 x35.5	8200	6800L	4700L	3300L	2200L	1200L	820
16 x40	12000	8200L	5600	3900L	2700L	1500L	1000L
18 x15	3300	2200S	1800	1200	820	470S	330S
18 x20	5600S	3900S	3300S	2200S	1500	680S	560S
18 x25	6800S	5600S	3900S	2700S	1800S	1000S	680S
18 x31.5	10000	6800	4700	3300	2200	1200	1000
18 x35.5	12000S	8200	6800	3900	2700	1500	1200
18 x40	15000	10000	8200	4700	3300	1800	1500

* L or S in above case size table is suffix code. Example ECA□□□FQ□□□S

** () show W.V. code

Maximum Impedance & Ripple Current vs Case Size Table

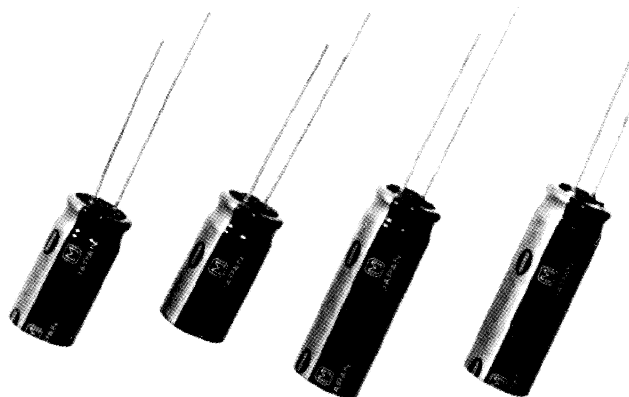
Case size φD x L [mm]	Item W.V. [V. DC]	Maximum impedance [Ω] at 100KHz, +20 °C			Maximum ripple current [mA] rms at 100kHz, +105 °C		
		6.3~35V	50V	63V	6.3~35V	50V	63V
4x11		1.000	2.500	3.500	120	90	80
5x11		0.650	1.300	2.000	175	155	145
5x15		0.460	0.900	1.300	235	215	200
6.3x11.2		0.300	0.600	1.000	290	260	240
6.3x15		0.200	0.400	0.700	400	360	330
8x12.5		0.170	0.300	0.380	445	410	370
8x15		0.120	0.230	0.300	575	500	450
8x20		0.090	0.160	0.190	760	670	600
10x12.5		0.120	0.230	0.300	625	510	470
10x16		0.090	0.160	0.190	795	640	580
10x20		0.065	0.110	0.140	1015	890	820
10x25		0.055	0.090	0.120	1190	1040	950
10x30		0.045	0.075	0.095	1440	1300	1110
12.5x15		0.065	0.130	0.160	1010	920	890
12.5x20		0.042	0.080	0.095	1400	1200	1140
12.5x25		0.034	0.070	0.090	1690	1440	1420
12.5x30		0.030	0.060	0.080	1950	1680	1620
12.5x35		0.024	0.050	0.065	2220	1850	1780
12.5x40		0.021	0.043	0.060	2390	2010	1950
16x15		0.046	0.084	0.100	1360	1270	1220
16x20		0.034	0.053	0.070	1730	1470	1450
16x25		0.028	0.044	0.060	2070	1810	1750
16x31.5		0.025	0.033	0.050	2350	2120	2050
16x35.5		0.022	0.028	0.042	2550	2260	2220
16x40		0.018	0.026	0.034	2900	2410	2370
18x15		0.038	0.070	0.085	1620	1470	1410
18x20		0.028	0.050	0.065	2000	1810	1750
18x25		0.025	0.041	0.057	2200	2000	1940
18x31.5		0.023	0.031	0.048	2800	2220	2110
18x35.5		0.021	0.027	0.041	2900	2460	2300
18x40		0.017	0.025	0.033	3000	2560	2510

Frequency Correction Factor for Ripple Current

W.V. [V.DC]	Cap. [μF]	Frequency [Hz]				
		60	120	1k	10k	100k
6.3 ~ 63	6.8 ~ 330	0.55	0.65	0.85	0.90	1.0
	390 ~ 1000	0.70	0.75	0.90	0.95	1.0
	1200 ~ 2200	0.75	0.80	0.90	0.95	1.0
	2700 ~ 15000	0.80	0.85	0.95	1.00	1.0

Features

- Long life: 5000 hours at + 105°C
(Expected life: 13 years at + 60°C)
- Low impedance at high frequency & low temperature
- Wide operating temperature range from -55 to +105°C
- Anti-solvent: Freon-TE, TES, TP35 or equivalents
- Various case sizes (flat to slim) are provided



Specifications

Item	Performance Characteristics							
Operating Temperature Range	-55 to +105 °C							
Rated Working Voltage Range	6.3 to 63V DC							
Nominal Capacitance Range	22 to 5600μF							
Capacitance Tolerance	±20% (120Hz, +20 °C)							
Leakage Current	I ≤ 0.01CV or 3 [μA] whichever is greater measured with rated working voltage applied at +20 °C for 2 minutes							
tan δ (120Hz, +20°C)	Working voltage [V]	6.3	10	16	25	35	50	63
	tan δ max.	0.17	0.15	0.10	0.08	0.07	0.06	0.05
	For capacitance value >1000μF, add 0.02 per another 1000μF							
Impedance at High Frequency	Refer to standard products table (100k/300k/500kHz, +20 °C)							
Impedance at Low Temperature	Z(100kHz/-10°C): ≤ 2 times of the specified value (100kHz, +20°C)							
Ripple Current	Refer to standard products table (100kHz, +105°C)							
High Temperature Loading	Test conditions							
	Duration	5000 hours						
	Ambient temperature	+105 °C						
	Applied voltage	DC voltage with maximum permissible ripple current specified at + 105 °C (the sum of the DC voltage and super-imposed peak AC voltage for maximum permissible ripple current should be equal to rated DC working voltage)						
	Post test requirements at +20 °C							
	Leakage current	≤ Initial specified value						
	Capacitance change	± 20% of initial measured value						
	tan δ	≤ 200% of initial specified value						
	Impedance	≤ 200% of initial specified value						
Shelf Life	Test conditions							
	Duration	1000 hours						
	Ambient temperature	+105 °C						
	Applied voltage	(None)						
	Post test requirements at +20 °C							
	Leakage current	≤ Initial specified value						
	Capacitance change	± 15% of initial measured value						
	tan δ	≤ 150% of initial specified value						
	Impedance	≤ 200% of initial specified value						
Cleaning	Capacitors shall be capable of withstanding exposure to the following cleaning solvents.							
	Conditions	Solvent condition	Exposure time	Temperature	Ultrasonic wave			
	Solvents	Freon-TE, TES, TP35 or equivalents	Liquid or vapor	≤5 min (total)	≤boiling point at 1 atm	Acceptable		

Explanation of Part Numbers

E C A	F Z	□ □	□ □ □	□ □	□
Common code	Series Code	W.V.code	Capacitance code	Suffix	

Capacitances in μF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits.
Example: 331—330 μF ,
332—3300 μF

Suffix code	Configurations
B	Ammo-pack 6mm pitch for $\phi 4 - \phi 12.5$ 7.5mm pitch for $\phi 16 - \phi 18$
BQ	Ammo-pack H=18.5mm height for $\phi 8 - \phi 12.5$
i	Ammo-pack 2.5mm pitch for $\phi 3 - \phi 6.5$ & $\phi 8 \times 5$
AX	Reel-pack 5mm pitch for $\phi 4 - \phi 8$ + lead first
AZ	Reel-pack 5mm pitch for $\phi 4 - \phi 8$ + lead first

Case size variation code if any

Dimensions

[mm]

$L \leq 16 : L + 1.0 \text{max.}$
 $L \geq 20 : L + 2.0 \text{max.}$

$\phi D + 0.5 \text{max.}$

Body dia. ϕD	8	10	12.5	16	18
Body length L	—	—	≤ 25	≥ 30	—
Lead dia. ϕd	0.6	0.6	0.6	0.8	0.8
Lead space P	3.5	5	5	7.5	—

Case Size vs Capacitance

Capacitance [μF]

Case Size D x L [mm]	W.V.[V.DC]						
	6.3 (0J)	10 (1A)	16 (1C)	25 (1E)	35 (1V)	50 (1H)	63 (1J)
8 x 15	330	220	150	82	56	33	22
8 x 20	470	390	220L	120L	82L	47	33L
10 x 16	390	330	220	120	82	39	33
10 x 20	560	470	330	180	120	68	47
10 x 25	820	680	390	220	150	82	56
10 x 30	1200L	1000L	560	330L	220L	120L	82L
12.5 x 20	1000	820	470	270	180	100	82
12.5 x 25	1200	1000	680	330	220	120	100
12.5 x 30	1500	1200L	820L	470L	330L	180L	120
12.5 x 35	2200L	1800L	1000L	560L	390L	220L	150L
12.5 x 40	2700L	2200L	1200L	680L	470L	270L	180L
16 x 20	1800	1200	820	470	330	180	150
16 x 25	2200	1800	1000	560	390	220	180
16 x 31.5	3300	2200	1500	820	560	330	220L
16 x 35.5	3900L	2700	1800L	1000L	680	390L	270
16 x 40	4700L	3300L	2200L	1200L	820L	470L	330L
18 x 20	2200S	1800S	1200	560S	470	220S	180S
18 x 25	2700	2200S	1500S	680	560S	270	220
18 x 31.5	3900	3300	1800	1000	820	390	330
18 x 35.5	4700	3900	2200	1200	1000	470	390
18 x 40	5600	4700	2700	1500	1200	560	470

* L and S of above nominal capacitance are the last suffix code of part numbers

** () shows W.V. code

ex. ECA1AFZ102L ... $\phi 10 \times 30$

ECA1AFZ102 ... $\phi 12.5 \times 30$

Aluminum Electrolytic Capacitors Radial Lead Type

HFZ Series

Case Size vs Ripple Current Table

[mA] rms max. at 100kHz, +105°C

Case Size D x L [mm]	W.V. [V.DC]	6.3-35V	50V	63V
	8 x 15		575	500	450
8 x 20		760	670	600
10 x 16		795	640	580
10 x 20		1015	890	820
10 x 25		1190	1040	950
10 x 30		1440	1300	1110
12.5 x 20		1400	1200	1140
12.5 x 25		1690	1440	1420
12.5 x 30		1950	1680	1620
12.5 x 35		2220	1850	1780
12.5 x 40		2390	2010	1950
16 x 20		1690	1470	1450
16 x 25		2010	1810	1750
16 x 31.5		2350	2120	2050
16 x 35.5		2550	2260	2220
16 x 40		2900	2410	2370
18 x 20		2010	1810	1750
18 x 25		2200	2000	1940
18 x 31.5		2800	2220	2110
18 x 35.5		2900	2460	2300
18 x 40		3000	2560	2510

Frequency Correction Factor for Ripple Current

W.V. [V.DC]	6.3 - 63V				
	Cap. [μF]	22-330	390-1000	1200-2200	2700-
Freq. [Hz]					
60		0.55	0.70	0.75	0.80
120		0.65	0.75	0.80	0.85
1k		0.85	0.90	0.90	0.95
10k		0.90	0.95	0.95	1.00
100k		1.00	1.00	1.00	1.00

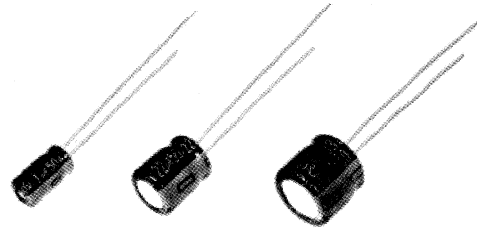
Case Size vs Impedance Table

Impedance [Ω] max. at +20°C

Case Size D x L [mm]	W.V. [V.DC]	6.3 - 35			50			63		
	Frequency	100kHz	300kHz	500kHz	100kHz	300kHz	500kHz	100kHz	300kHz	500kHz
8 x 15		0.120	0.132	0.144	0.230	0.253	0.276	0.300	0.330	0.360
8 x 20		0.090	0.099	0.108	0.160	0.176	0.192	0.190	0.209	0.228
10 x 16		0.090	0.099	0.108	0.160	0.176	0.192	0.190	0.209	0.228
10 x 20		0.065	0.072	0.078	0.110	0.121	0.132	0.140	0.154	0.168
10 x 25		0.055	0.066	0.071	0.090	0.099	0.108	0.120	0.132	0.144
10 x 30		0.045	0.054	0.058	0.075	0.083	0.090	0.095	0.105	0.114
12.5 x 20		0.042	0.054	0.063	0.080	0.104	0.120	0.095	0.124	0.143
12.5 x 25		0.034	0.044	0.051	0.070	0.091	0.105	0.090	0.117	0.134
12.5 x 30		0.030	0.039	0.045	0.060	0.078	0.090	0.080	0.104	0.120
12.5 x 35		0.024	0.031	0.036	0.050	0.065	0.075	0.065	0.085	0.093
12.5 x 40		0.021	0.027	0.031	0.043	0.056	0.065	0.060	0.078	0.090
16 x 20		0.034	0.051	0.061	0.053	0.080	0.095	0.070	0.105	0.126
16 x 25		0.028	0.042	0.050	0.044	0.060	0.079	0.060	0.090	0.108
16 x 31.5		0.025	0.037	0.045	0.033	0.050	0.059	0.050	0.075	0.090
16 x 35.5		0.022	0.033	0.039	0.028	0.042	0.050	0.042	0.063	0.076
16 x 40		0.018	0.027	0.032	0.026	0.039	0.047	0.034	0.051	0.061
18 x 20		0.028	0.044	0.061	0.050	0.080	0.110	0.065	0.104	0.143
18 x 25		0.025	0.040	0.055	0.041	0.067	0.090	0.057	0.092	0.125
18 x 31.5		0.023	0.036	0.050	0.031	0.050	0.068	0.048	0.077	0.106
18 x 35.5		0.021	0.033	0.046	0.027	0.043	0.059	0.041	0.066	0.090
18 x 40		0.017	0.027	0.037	0.025	0.040	0.055	0.033	0.053	0.073

Features

- Low profile 7mm height for $\phi 4 \sim \phi 8$ mm
- Various lead taping for high density insertion
- Anti-solvent: Freon-TE, TES, TP35 etc.



Specifications

Item	Performance Characteristics								
Operating Temperature Range	-40 to +85 °C								
Rated Working Voltage Range	4 to 50V DC								
Nominal Capacitance Range	0.1 to 470 μ F								
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20 °C)								
Leakage Current	$I \leq 0.01CV$ or 3 μ A whichever is greater measured after 2 minutes application of rated working voltage applied at +20 °C								
tan δ (120Hz, +20 °C)	Working voltage [V]	4	6.3	10	16	25	35	50	
	tan δ max.	0.35	0.24	0.20	0.16	0.14	0.12	0.10	
Characteristics at Low Temperature	Impedance ratio max. at 120Hz.								
	Working voltage [V]	4	6.3	10	16	25	35	50	
	-25 °C/+20 °C	7	4	3	2	2	2	2	
	-40 °C/+20 °C	15	8	6	4	4	3	3	
High Temperature Loading	Test conditions								
	Duration	:						1000 hours	
	Ambient temperature	:						+105 °C	
	Applied voltage	:						Rated DC working voltage	
	Post test requirements at +20 °C								
	Leakage current	:						\leq Initial specified value	
	Capacitance change	:						$\pm 20\%$ of initial measured value	
	tan δ	:						$\leq 200\%$ of initial specified value	
Shelf Life	Test conditions								
	Duration	:						1000 hours	
	Ambient temperature	:						+85 °C	
	Applied voltage	:						(None)	
	Post test requirements at +20 °C								
	Same limits for high temperature loading.								
Cleaning	Capacitors shall be capable of withstanding exposure to the following cleaning solvents.								
	Conditions	Solvent condition	Exposure time	Temperature	Ultrasonic wave				
	Solvents	Freon-TE, TES, TP35 or equivalents	Liquid or vapor	≤ 5 min (total)	\leq boiling point at 1 atm	Acceptable			

Explanation of Part Numbers

E C E	A	□ □	K A	□ □ □	□
Common code	Shape	W.V code	Series code	Capacitance code	Suffix

Suffix code	Configurations	
B	Ammo-pack	5mm pitch for ø4 ~ ø12.5 7.5mm pitch for ø16 ~ ø18
BQ	Ammo-pack	H = 18.5mm height for ø8 ~ ø12.5
i	Ammo-pack	2.5mm pitch for ø3 ~ ø6.5 & ø8x5
AX	Reel-pack	5mm pitch for ø4 ~ ø8 + lead first
AZ	Reel-pack	5mm pitch for ø4 ~ ø8 - lead first

Dimensions in mm (not to scale)

Body Dia. øD	4	5	6.3	8
Lead Dia. ød	0.45	0.45	0.45	0.45
Lead space P	1.5	2	2.5	3.5

Case size/Ripple current

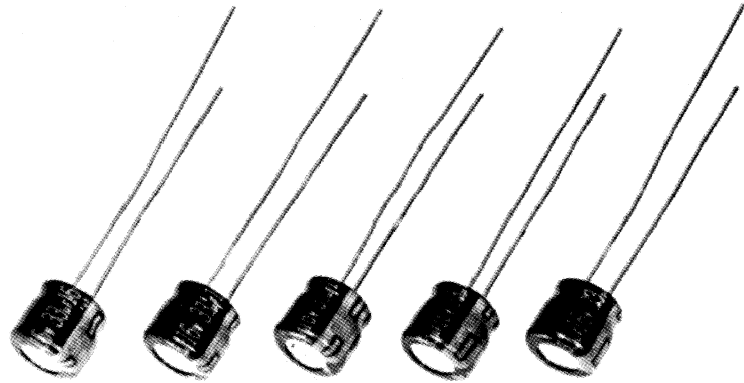
øDxL (mm)/(mA) r.m.s. (120 Hz/ +85 °C)

Cap. (µF)	W.V. (V. DC)		4 (0G)		6.3 (0J)		10 (1A)		16 (1C)		25 (1E)		35 (1V)		50 (1H)	
0.1 (0R1)															4x7	1
0.22 (R22)															4x7	2
0.33 (R33)															4x7	3
0.47 (R47)															4x7	5
1.0 (010)															4x7	10
2.2 (2R2)															4x7	16
3.3 (3R3)															4x7	18
4.7 (4R7)											4x7	21	4x7	22	4x7	23
10 (100)									4x7	28	4x7	28	5x7	30	5x7	35
22 (220)							4x7	35	4x7	39	5x7	55	6.3x7	60	6.3x7	60
33 (330)							4x7	43	5x7	60	6.3x7	65	6.3x7	65	8x7	75
47 (470)	4x7	34	4x7	46	5x7	65	5x7	70	6.3x7	70	8x7	85				
100 (101)	5x7	61	5x7	71	6.3x7	80	6.3x7	91								
220 (221)	6.3x7	82	6.3x7	103	8x7	120										
330 (331)	8x7	110	8x7	130												
470 (471)	8x7	140														
															Case size	Ripple current

* () shows W.V. and capacitance code.

Features

- Low profile 5mm height for $\varnothing 3 \sim \varnothing 8$ mm
- Various lead taping for high density insertion



Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40 to +85 °C							
Rated Working Voltage Range	4 to 50V DC							
Nominal Capacitance Range	0.1 to 330 μ F							
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20 °C)							
Leakage Current	$I \leq 0.01CV$ or 3 [μ A] whichever is greater measured after 2 minutes application of rated working voltage applied at +20 °C							
tan δ (120Hz, +20 °C)	Working voltage [V]	4	6.3	10	16	25	35	50
	tan δ max.	0.35	0.24	0.20	0.16	0.14	0.12	0.10
Characteristics at Low Temperature	Impedance ratio max. at 120Hz.							
	Working voltage [V]	4	6.3	10	16	25	35	50
	-25 °C/+20 °C	7	4	3	2	2	2	2
	-40 °C/+20 °C	15	8	6	4	4	3	3
High Temperature Loading	Test conditions Duration : 1000 hours Ambient temperature : +85 °C Applied voltage : Rated DC working voltage Post test requirements at +20 °C Leakage current : \leq Initial specified value Capacitance change : $\pm 20\%$ of initial measured value tan δ : $\leq 200\%$ of initial specified value							
Shelf Life	Test conditions Duration : 1000 hours Ambient temperature : +85 °C Applied voltage : (None) Post test requirements at +20 °C Same limits for high temperature loading.							

Explanation of Part Numbers

E	C	E	A			K	S				
Common code			Shape	W.V code		Series code		Capacitance code			Suffix

Series code	KK	KS
Size	ø3	ø4~ø8

Suffix code	Configurations	
B	Ammo-pack	5mm pitch for ø4 ~ ø12.5 7.5mm pitch for ø16 ~ ø18
BQ	Ammo-pack	H = 18.5mm height for ø8 ~ ø12.5
i	Ammo-pack	2.5mm pitch for ø3 ~ ø6.5 & ø8x5
AX	Reel-pack	5mm pitch for ø4 ~ ø8 + lead first
AZ	Reel-pack	5mm pitch for ø4 ~ ø8 - lead first

Dimensions in mm (not to scale)

Body Dia. øD	3	4	5	6.3	8
Lead Dia. ød	0.4	0.45	0.45	0.45	0.45
Lead space P	1.0	1.5	2	2.5	2.5

Case size/Ripple current

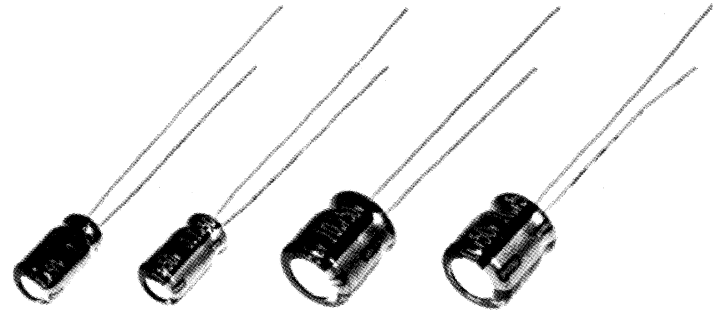
øDxL (mm)/(mA) r.m.s. (120 Hz/ +85 °C)

Cap. (µF)	W.V. (V, DC)		4 (0G)		6.3 (0J)		10 (1A)		16 (1C)		25 (1E)		35 (1V)		50 (1H)	
	W.V.	(V, DC)														
0.1	(0R1)														•4x5	1
0.22	(R22)														•4x5	2
0.33	(R33)														•4x5	3
0.47	(R47)														•4x5	5
1.0	(010)														•4x5	10
2.2	(2R2)										3x5	8			4x5	16
3.3	(3R3)										3x5	10	4x5	16	4x5	18
4.7	(4R7)										•4x5	22	4x5	22	5x5	23
10	(100)								•4x5	28	5x5	28	5x5	30	6.3x5	35
22	(220)	3x5	19	4x5	29	5x5	35	5x5	39	6.3x5	55	6.3x5	60	8x5	60	
33	(330)	4x5	26	5x5	38	5x5	43	6.3x5	60	6.3x5	65	8x5	65			
47	(470)	4x5	34	5x5	46	6.3x5	65	6.3x5	70			8x5	85			
100	(101)	5x5	61	6.3x5	71	6.3x5	80	8x5	91							
220	(221)	6.3x5	82			8x5	120									
330	(331)			8x5	130											
															Case size	Ripple current

* ø3x5 size is available on request (shown with •).
 Products of 63 V DC is available on request.
 ** () shows W.V. and capacitance code.

Features

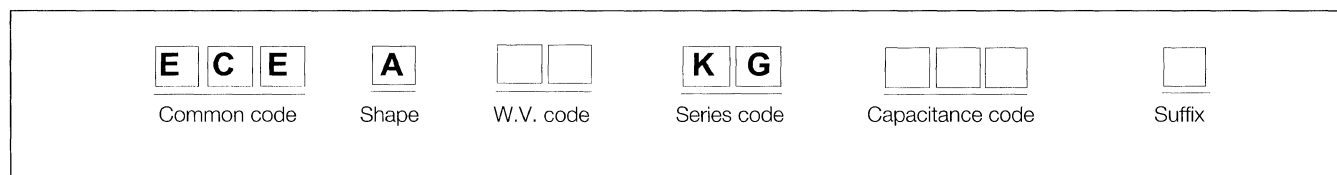
- Low profile 7mm height for $\phi 4 \sim \phi 8$ mm
- Long life: 1000 hours at +105 °C
- Various lead taping for high density insertion
- Anti-solvent: Freon-TE, TES, TP35 etc.



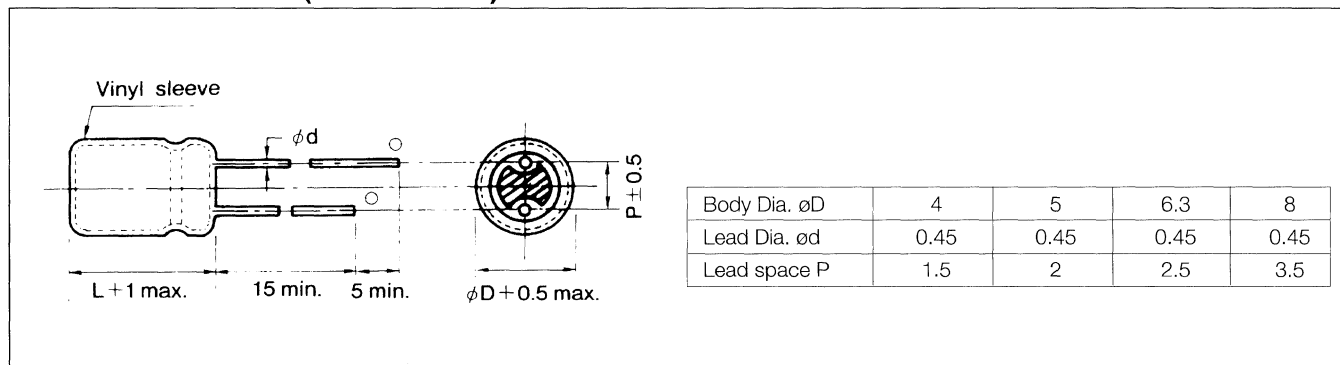
Specifications

Item	Performance Characteristics							
Operating Temperature Range	-55 to +105 °C							
Rated Working Voltage Range	6.3 to 50V DC							
Nominal Capacitance Range	0.1 to 220 μ F							
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20 °C)							
Leakage Current	I \leq 0.01CV or 3 [μ A] whichever is greater measured after 2 minutes application of rated working voltage applied at +20 °C							
tan δ (120Hz, +20 °C)	Working voltage [V]	6.3	10	16	25	35	50	
	tan δ max.	0.22	0.19	0.16	0.14	0.12	0.10	
Characteristics at Low Temperature	Impedance ratio max. at 120Hz.							
	Working voltage [V]	6.3	10	16	25	35	50	
	-25 °C/+20 °C	3	2	2	2	2	2	
	-40 °C/+20 °C	6	5	3	3	3	3	
	-55 °C/+20 °C	8	6	4	4	4	4	
Impedance	Refer to standard products table (100kHz, +20 °C)							
High Temperature Loading	Test conditions							
	Duration	:	1000 hours					
	Ambient temperature	:	+105 °C					
	Applied voltage	:	Rated DC working voltage					
	Post test requirements at +20 °C							
	Leakage current	:	\leq Initial specified value					
	Capacitance change	:	$\pm 20\%$ of initial measured value					
	tan δ	:	$\leq 200\%$ of initial specified value					
Shelf Life	Test conditions							
	Duration	:	1000 hours					Post test requirements at +20 °C Same limits for high temperature loading.
	Ambient temperature	:	+105 °C					
	Applied voltage	:	(None)					
Cleaning	Capacitors shall be capable of withstanding exposure to the following cleaning solvents.							
	Conditions	Solvent condition	Exposure time	Temperature	Ultrasonic wave			
	Solvents	Liquid or vapor	≤ 5 min (total)	\leq boiling point at 1 atm	Acceptable			
	Freon-TE, TES, TP35 or equivalents							

Explanation of Part Numbers



Dimensions in mm (not to scale)



Case size/Ripple current

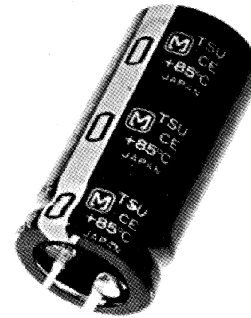
$\phi D \times L$ (mm)/(mA) r.m.s. (120 Hz/ +85 °C)

Cap. (μF)	W.V. (V. DC)	6.3 (0J)			10 (1A)			16 (1C)			25 (1E)			35 (1V)			50 (1H)		
0.1	(0R1)																4x7	1.7	22
0.15	(R15)																4x7	2.5	16
0.22	(R22)																4x7	3.5	12
0.33	(R33)																4x7	5.4	10
0.47	(R47)																4x7	7.6	10
0.68	(R68)																4x7	10	10
1.0	(010)																4x7	16	10
1.5	(1R5)																4x7	24	10
2.2	(2R2)																4x7	36	10
3.3	(3R3)																4x7	47	10
4.7	(4R7)															4x7	47	10	
6.8	(6R8)							4x7	47	10	4x7	47	10	4x7	47	10	5x7	70	5
10	(100)							4x7	47	10	4x7	47	10	5x7	70	5	6.3x7	121	2
15	(150)							4x7	47	10	5x7	70	5	6.3x7	121	2	6.3x7	121	2
22	(220)	4x7	47	10	4x7	47	10	5x7	70	5	5x7	70	5	6.3x7	121	2	8x7	190	1.2
33	(330)	5x7	70	5	5x7	70	5	6.3x7	121	2	6.3x7	121	2	8x7	190	1.2	8x7	190	1.2
47	(470)	5x7	70	5	6.3x7	121	2	6.3x7	121	2	8x7	190	1.2	8x7	190	1.2			
68	(680)	6.3x7	121	2	6.3x7	121	2	8x7	190	1.2	8x7	190	1.2						
100	(101)	6.3x7	121	2	6.3x7	121	2	8x7	190	1.2									
220	(221)	8x7	190	1.2															

* () shows W.V. and capacitance code.

Features

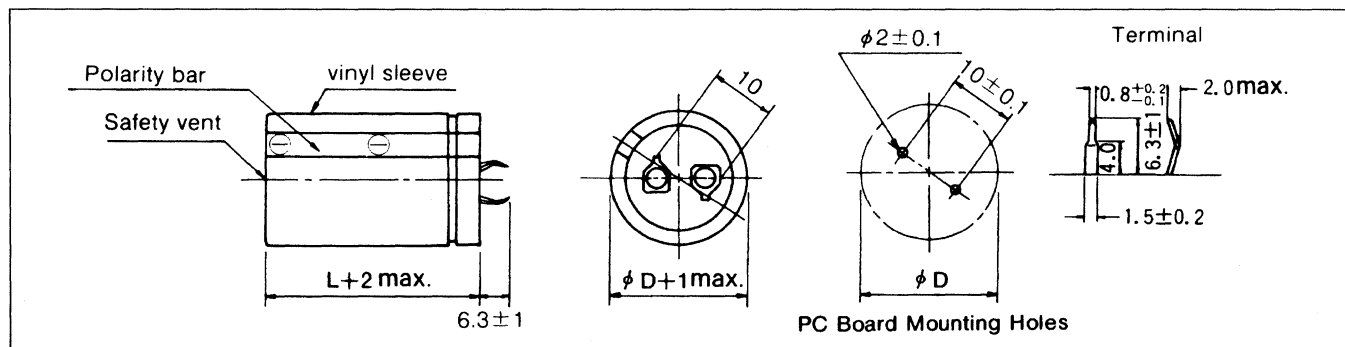
- For general purpose
- Wide CV value range (33 ~ 47000 μ F/16 ~ 450V)
- Various case sizes
- Top vent construction



Specifications

Item	Performance Characteristics						
Rated Working Voltage Range	16 to 250V DC	400 to 450V DC					
Operating Temperature Range	-40 °C to +85 °C	-25 °C to +85 °C					
Nominal Capacitance Range	120 to 47000 μ F	33 to 390 μ F					
Capacitance Tolerance	\pm 20% (120Hz, +20 °C)						
Leakage Current	$I \leq 0.01CV$ or $3 [\mu A]$ $CV \leq 100,000$ for 16 ~ 100V $I \leq 3\sqrt{CV} [\mu A]$ $CV > 100,000$ for 16 ~ 100V & all items of 160 ~ 450V						
	Leakage current shall be measured after 5 minutes application of rated working voltage at +20 °C. (C=nominal capacitance in μ F, V=rated working voltage in V)						
tan δ (120Hz, +20 °C)	Working voltage [V]	16 25 35 50 63 80~450					
	tan δ max.	0.35 0.30 0.25 0.20 0.20 0.15					
Ripple Current	Refer to standard products table (120Hz, +85 °C) Correction factor for frequency						
	Frequency [Hz]	50	60	120	500	1k	10k-50k
	16~100V	0.93	0.95	1.00	1.05	1.08	1.15
160~450V	0.75	0.80	1.00	1.20	1.25	1.40	
High Temperature Loading	Test conditions Duration : 2000 hours Ambient temperature : +85 °C Applied voltage : DC voltage with maximum permissible ripple current specified at +85 °C (\leq rated working voltage)						
	Post test requirements at +20 °C Leakage current : \leq Initial specified value Capacitance change : \pm 20% of initial measured value tan δ : \leq 150% of initial specified value						
Shelf Life	Test conditions Duration : 1000 hours Ambient temperature : +85 °C Applied voltage : (None)						
	Pre-treatment for measurements Measurements shall be conducted after application of DC working voltage for 30 minutes Post test requirements at +20 °C Same limits for high temperature loading.						

Dimensions [mm]



Explanation of Part Numbers

E	C	E	S			U				
Common code			Shape	W.V code		Series code	Capacitance code			Case code

W.V. code	1C	1E	1V	1H	1J	1K	2A
W.V. (V)	16	25	35	50	63	80	100

W.V. code	2C	2D	2E	2T	2G	2W
W.V. (V)	160	200	250	385	400	450

Capacitances in μF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits.
 Example: 331—330 μF ,
 332—3300 μF

ϕD [mm]	L [mm]	25	31.5	40	50
22	D	E	G	H	
25	J	K	M	N	
30	Q	R	T	U	
35	—	X	Y	(Z)	

Z:L = 51mm

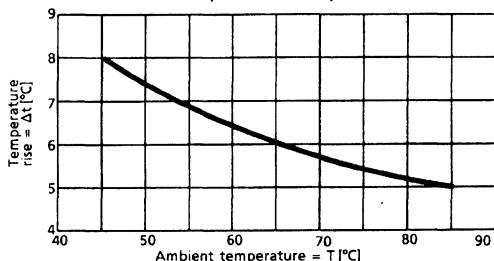
Expected Life for Ripple Current & Ambient Temperature Stress

• Calculation Formula

The life of aluminum electrolytic capacitors is highly affected by applied Where: ripple current and ambient temperature. In general the relation between life time, ripple current and ambient temperature is known as:

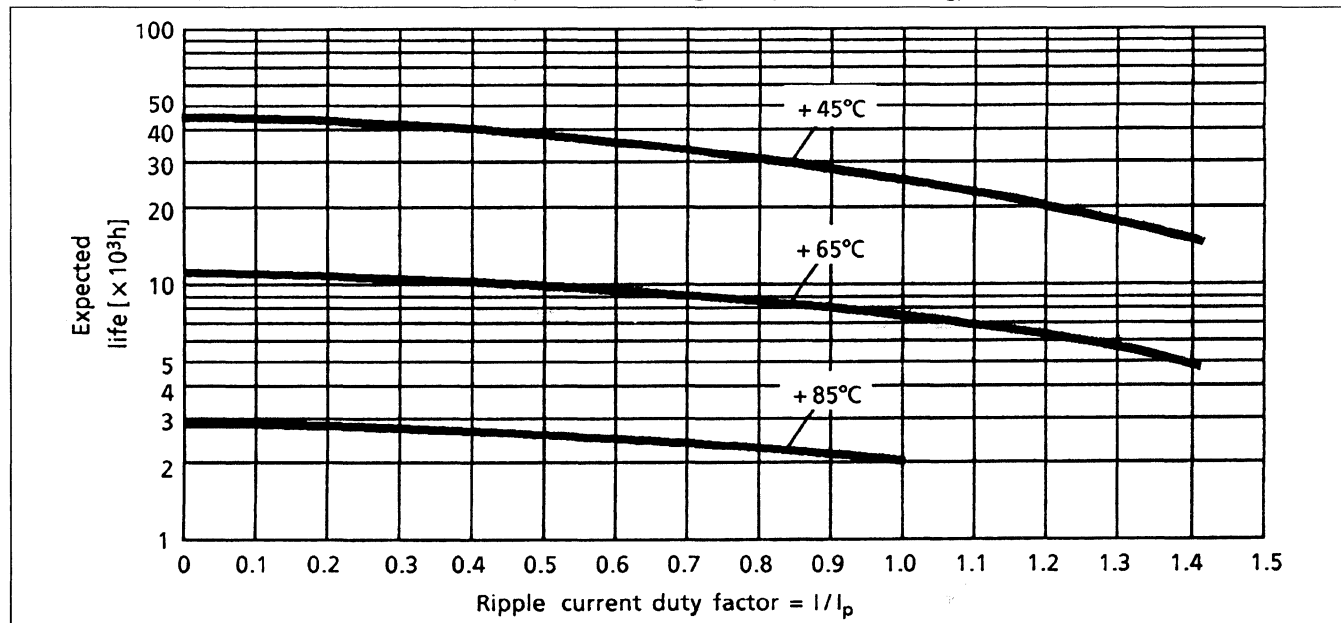
$$L = L_0 \times 2^{\frac{T_0 - [T + \Delta t (I/I_p)^2]}{10}}$$

Δt vs T (i = constant)



- I : Ripple current to be applied to the capacitor at T°C (120Hz)..... [A rms]
 - I_p : Specified maximum permissible ripple current at 120Hz, +85°C[A rms]
 - L : Expected life at T°C.....[h]
 - L_0 : Specified life (TSU series: 2000 hours).....[h]
 - T : Ambient temperature.....[°C]
 - T_0 : Hot spot temperature in the capacitor element = [maximum operating temperature] + [Δt at maximum ambient temperature] = [maximum temperature (TSU series: +90 °C)].....[°C]
 - Δt : Temperature rise at constant current flow of maximum permissible ripple current value specified at +85 °C (see the graph ' Δt vs T).....[°C]
- [Conditions: $(I/I_p)^2 \leq 2$ times]

• Expected Life (calculated on the basis of specified life in high temperature loading)



Case Size Table

(16V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
4700	1.60	22x25			
6800	1.80	22x31.5	25x25		
10000	2.40	22x40	25x31.5	30x25	
15000	3.20	22x50	25x40	30x31.5	
22000	3.60		25x50	30x40	35x31.5
33000	4.40			30x50	35x40
47000	4.70				35x51

(25V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
3300	1.60	22x25			
4700	1.80	22x31.5	25x25		
6800	2.30	22x40	25x31.5	30x25	
10000	2.70	22x50	25x40	30x31.5	
15000	3.40		25x50	30x40	35x31.5
22000	4.20			30x50	35x40
33000	4.60				35x51

(35V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
2200	1.40	22x25			
3300	1.70	22x31.5	25x25		
4700	2.00	22x40	25x31.5	30x25	
6800	2.40	22x50	25x40	30x31.5	
10000	3.00		25x50	30x40	35x31.5
15000	3.70			30x50	35x40
22000	4.00				35x51

(50V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
1500	1.20	22x25			
2200	1.40	22x31.5	25x25		
3300	1.70	22x40	25x31.5	30x25	
4700	2.10	22x50	25x40	30x31.5	
6800	2.60		25x50	30x40	35x31.5
10000	3.40			30x50	35x40
15000	3.70				35x51

(63V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
1000	1.20	22x25			
1500	1.30	22x31.5	25x25		
2200	1.50	22x40	25x31.5	30x25	
3300	1.90	22x50	25x40	30x31.5	
4700	2.30		25x50	30x40	35x31.5
6800	3.00			30x50	35x40
10000	3.30				35x51

(80V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
680	1.00	22x25			
1000	1.20	22x31.5	25x25		
1500	1.40	22x40	25x31.5	30x25	
2200	1.70	22x50	25x40	30x31.5	
3300	2.10		25x50	30x40	35x31.5
4700	2.60			30x50	35x40
6800	3.10				35x51

(100V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
470	1.00	22x25			
680	1.10	22x31.5	25x25		
1000	1.20	22x40	25x31.5	30x25	
1500	1.50	22x50	25x40	30x31.5	
2200	1.80		25x50	30x40	35x31.5
3300	2.40			30x50	35x40
4700	2.70				35x51

(160V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
180	0.65	22x25			
270	0.87	22x31.5	25x25		
390	1.10	22x40	25x31.5	30x25	
560	1.30	22x50	25x40	30x31.5	
820	1.50		25x50	30x40	35x31.5
1200	1.80			30x50	35x40
1500	2.00				35x51

(200V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
150	0.65	22x25			
220	0.87	22x31.5	25x25		
330	1.10	22x40	25x31.5	30x25	
470	1.30	22x50	25x40	30x31.5	
680	1.50		25x50	30x40	35x31.5
1000	1.80			30x50	35x40
1200	2.00				35x51

(250V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
120	0.45	22x25			
150	0.65	22x31.5	25x25		
220	0.87	22x40	25x31.5	30x25	
330	1.10	22x50	25x40	30x31.5	
470	1.30		25x50	30x40	35x31.5
680	1.50			30x50	35x40
1000	1.90				35x51

(385/400V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
47	0.25	22x25			
68	0.35	22x31.5	25x25		
100	0.47	22x40	25x31.5	30x25	
150	0.60	22x50	25x40	30x31.5	
220	0.75		25x50	30x40	35x31.5
270	0.90			30x50	35x40
390	1.10				35x51

(450V)

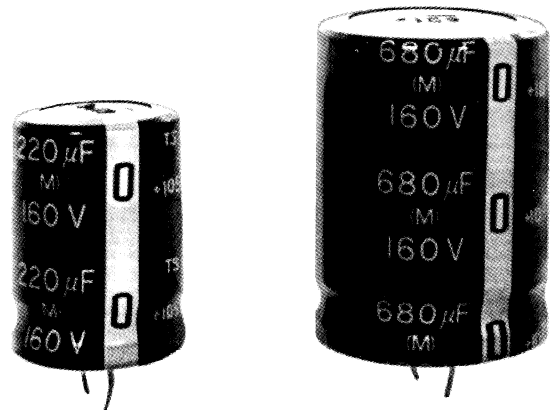
Cap. [μF]	Ripple current	Case size øD x L [mm]			
33	0.20	22x25			
47	0.29	22x31.5	25x25		
68	0.38	22x40	25x31.5	30x25	
100	0.52	22x50	25x40	30x31.5	
150	0.70		25x50	30x40	35x31.5
220	0.92			30x50	35x40
330	1.10				35x51

* Ripple current: [A] rms at 120Hz, +85 °C

** Capacitors of ø35x51 should be reinforced with supplementary adhesive when mounting to P.W.B.

Features

- Long life 105 °C 2000 hours & high ripple current
- Wide CV value range (47 ~ 47000 μ F/10 ~ 400V)
- Various case size & top vent constructions



Specifications

Item	Performance Characteristics							
Rated Working Voltage Range	10 to 250V DC			400V DC				
Operating Temperature Range	-40 to +105 °C			-25 to +105 °C				
Nominal Capacitance Range	68 to 47000 μ F			33 to 220 μ F				
Capacitance Tolerance	\pm 20% (120Hz, +20 °C)							
Leakage Current	$I \leq 0.01CV$ or 3 [μ A]			$CV \leq 100,000$ for 16 ~ 100V				
	$I \leq 3\sqrt{CV}$ [μ A]			$CV > 100,000$ for 16 ~ 100V & all items of 160 ~ 450V				
Leakage current shall be measured after 5 minutes application of rated working voltage at +20 °C. (C=nominal capacitance in μ F, V=rated working voltage in V)								
tan δ	Working voltage [V]	10	16	25	35	50	63	
	tan δ max.	0.45	0.35	0.30	0.23	0.18	0.16	
	Rated working voltage [V]	80	100	160	200	250	400	
	tan δ max. (120Hz, +20 °C)	0.12	0.11	0.10	0.10	0.10	0.10	
Ripple Current	Refer to standard products table (120Hz, +105 °C)							
	Correction factor for frequency							
	Frequency [Hz]	50	60	120	500	1k	10k-50k	
	10~100V	0.93	0.95	1.00	1.05	1.08	1.15	
160~450V	0.75	0.80	1.00	1.20	1.25	1.40		
High Temperature Loading	Test conditions							
	Duration	2000 hours						
	Ambient temperature	+85 °C						
	Applied voltage	DC voltage with maximum permissible ripple current specified at +85 °C (\leq rated working voltage)						
Post test requirements at +20 °C								
Leakage current	\leq Initial specified value							
Capacitance change	\pm 20% of initial measured value							
tan δ	\leq 150% of initial specified value							
Shelf Life	Test conditions							
	Duration	1000 hours			Post test requirements at +20 °C			
	Ambient temperature	+85 °C			Same limits for high temperature loading.			
	Applied voltage	(None)						
Pre-treatment for measurements								
Measurements shall be conducted after application of DC working voltage for 30 minutes								

Explanation of Part Numbers

E C E	S	□ □	G	□ □ □	□
Common code	Shape	W.V code	Series code	Capacitance code	Case code

W.V. code	1A	1C	1E	1V	1H	1J	1K	2A
W.V. (V)	10	16	25	35	50	63	80	100

W.V. code	2C	2D	2E	2G
W.V. (V)	160	200	250	400

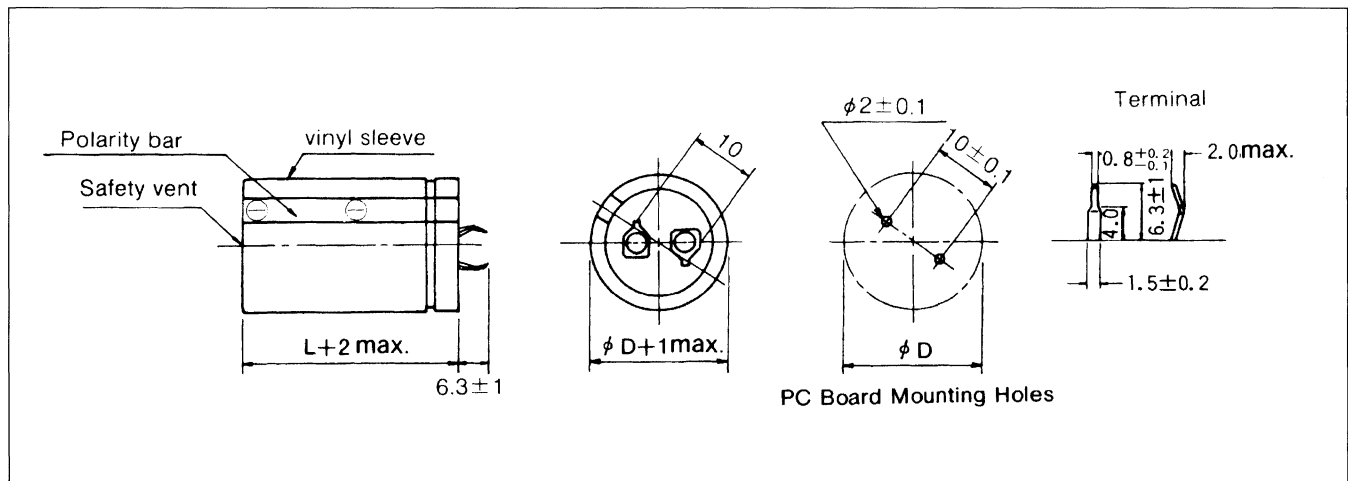
Capacitances in μF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits.
 Example: 331—330 μF ,
 332—3300 μF

L [mm]	25	31.5	40	50
ϕD [mm]	22	25	30	35
	D	E	G	H
	J	K	M	N
	Q	R	T	U
	-	X	Y	(Z)

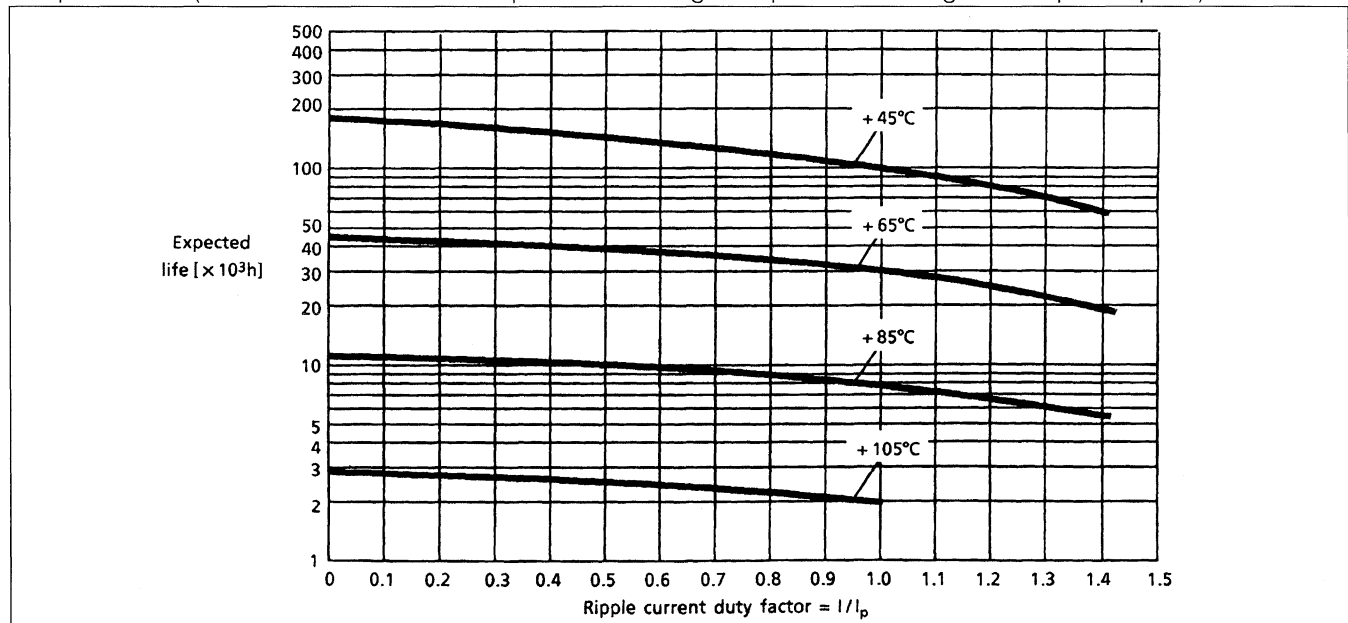
Z:L = 51mm

Dimensions

[mm]



- Expected Life (calculated on the basis of specified life in high temperature loading – see equation p. 29)



Case Size Table

(10V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
4700	1.80	22x25			
6800	2.10	22x31.5	25x25		
10000	2.50	22x40	25x31.5	30x25	
15000	3.10	22x50	25x40	30x31.5	
22000	3.40		25x50	30x40	35x31.5
33000	3.90			30x50	35x40
47000	4.90				35x51

(16V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
3300	1.60	22x25			
4700	2.00	22x31.5	25x25		
6800	2.40	22x40	25x31.5	30x25	
10000	2.90	22x50	25x40	30x31.5	
15000	3.50		25x50	30x40	35x31.5
22000	4.20			30x50	35x40
33000	4.80				35x51

(25V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
2200	1.50	22x25			
3300	1.70	22x31.5	25x25		
4700	2.20	22x40	25x31.5	30x25	
6800	2.60	22x50	25x40	30x31.5	
10000	3.10		25x50	30x40	35x31.5
15000	3.50			30x50	35x40
22000	4.00				35x51

(35V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
1500	1.40	22x25			
2200	1.60	22x31.5	25x25		
3300	1.80	22x40	25x31.5	30x25	
4700	2.30	22x50	25x40	30x31.5	
6800	2.90		25x50	30x40	35x31.5
10000	3.50			30x50	35x40
15000	3.90				35x51

(50V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
1000	1.30	22x25			
1500	1.50	22x31.5	25x25		
2200	1.90	22x40	25x31.5	30x25	
3300	2.30	22x50	25x40	30x31.5	
4700	2.80		25x50	30x40	35x31.5
6800	3.20			30x50	35x40
10000	3.70				35x51

(63V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
680	0.90	22x25			
1000	1.30	22x31.5	25x25		
1500	1.60	22x40	25x31.5	30x25	
2200	2.00	22x50	25x40	30x31.5	
3300	2.50		25x50	30x40	35x31.5
4700	2.90			30x50	35x40
6800	3.30				35x51

(80V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
470	0.80	22x25			
680	1.20	22x31.5	25x25		
1000	1.50	22x40	25x31.5	30x25	
1500	1.80	22x50	25x40	30x31.5	
2200	2.30		25x50	30x40	35x31.5
3300	2.80			30x50	35x40
4700	3.00				35x51

(100V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
330	0.70	22x25			
470	1.20	22x31.5	25x25		
680	1.40	22x40	25x31.5	30x25	
1000	1.70	22x50	25x40	30x31.5	
1500	2.10		25x50	30x40	35x31.5
2200	2.60			30x50	35x40
3300	2.90				35x51

(160V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
150	0.70	22x25			
220	1.00	22x31.5	25x25		
330	1.20	22x40	25x31.5	30x25	
470	1.40	22x50	25x40	30x31.5	
680	1.70		25x50	30x40	35x31.5
820	2.00			30x50	35x40
1200	2.30				35x51

(200V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
100	0.72	22x25			
150	0.80	22x31.5	25x25		
220	1.00	22x40	25x31.5	30x25	
330	1.20	22x50	25x40	30x31.5	
470	1.40		25x50	30x40	35x31.5
680	1.70			30x50	35x40
1000	2.10				35x51

(250V)

Cap. [μF]	Ripple current	Case size øD x L [mm]			
68	0.45	22x25			
100	0.72	22x31.5	25x25		
150	0.80	22x40	25x31.5	30x25	
220	1.05	22x50	25x40	30x31.5	
330	1.25		25x50	30x40	35x31.5
470	1.45			30x50	35x40
680	1.80				35x51

(400V)

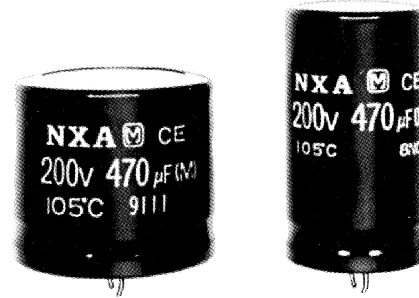
Cap. [μF]	Ripple current	Case size øD x L [mm]			
33	0.33	22x25			
47	0.47	22x31.5	25x25		
68	0.56	22x40	25x31.5	30x25	
100	0.69	22x50	25x40	30x31.5	
150	0.82		25x50	30x40	35x31.5
220	1.00			30x50	35x40
330	1.20				35x51

*Ripple current: [A] rms at 120Hz, +105 °C

** Capacitors of ø35x51 I should be reinforced with supplementary adhesive when mounting to P.W.B.

Features

- Premium industrial grade
- Long life 5000 hours at +105°C with ripple current applied
- Expected life: 75000 hours at +65°C with ripple current applied
- Various case sizes & top vent construction

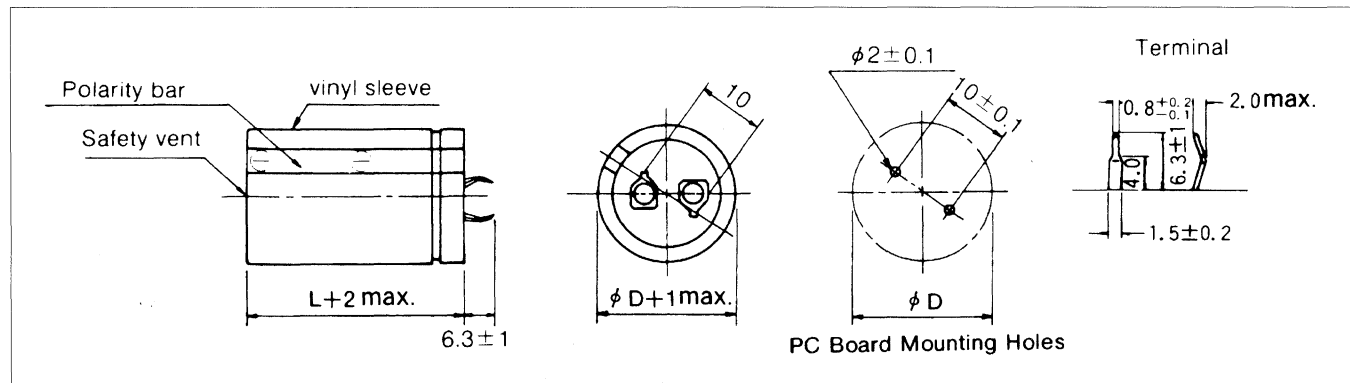


Specifications

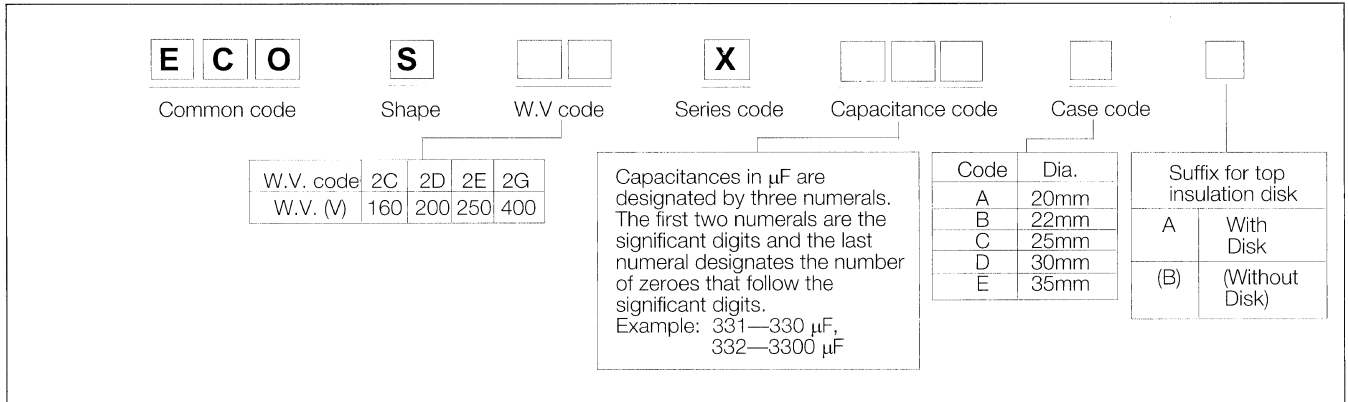
Item	Performance Characteristics	
Rated Working Voltage Range	160 to 250V DC	400V DC
Operating Temperature Range	-40 to +105 °C	-25 to +105 °C
Nominal Capacitance Range	39 to 1200µF	
Capacitance Tolerance	±20% (120Hz, +20 °C)	
Leakage Current	$I \leq 3 \sqrt{CV} [\mu A]$	after 5 minutes application of rated working voltage at +20 °C. (C=nominal capacitance in µF, V = rated working voltage in V)
tan δ	0.15 max (120Hz, +20°C)	
Ripple Current	Refer to standard products table (120Hz, +85°C) Correction factor for frequency	
	Frequency [Hz]	50 60 120 500 1k 10k-50k
	Correction factor	0.75 0.8 1.0 1.2 1.25 1.4
	For capacitance value >1000µF, add 0.02 per another 1000µF	
High Temperature Loading	Test conditions	
	Duration : Ambient temperature : Applied voltage :	5000 hours +105 °C DC voltage with maximum permissible ripple current specified at + 105 °C (≤rated working voltage)
	Post test requirements at +20 °C	
	Leakage current : Capacitance change : tan δ :	≤ Initial specified value ± 20% of initial measured value ≤ 200% of initial specified value
Shelf Life	Test conditions	
	Duration : Ambient temperature : Applied voltage :	1000 hours +105 °C (None)
	Post test requirements at +20 °C	
	Leakage current : Capacitance change : tan δ :	≤ Initial specified value ± 15% of initial measured value ≤ initial specified value
	Pre-treatment for measurements. Measurements shall be conducted after application of DC working voltage for 30 minutes	

Dimensions

[mm]



Explanation of Part Numbers - Regular Size

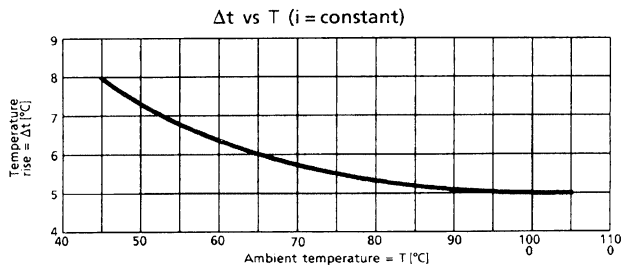


Expected Life for Ripple Current & Ambient Temperature Stress

• Calculation Formula

The life of aluminum electrolytic capacitors is highly affected by applied ripple current and ambient temperature. In general the relation between life time, ripple current and ambient temperature is known as:

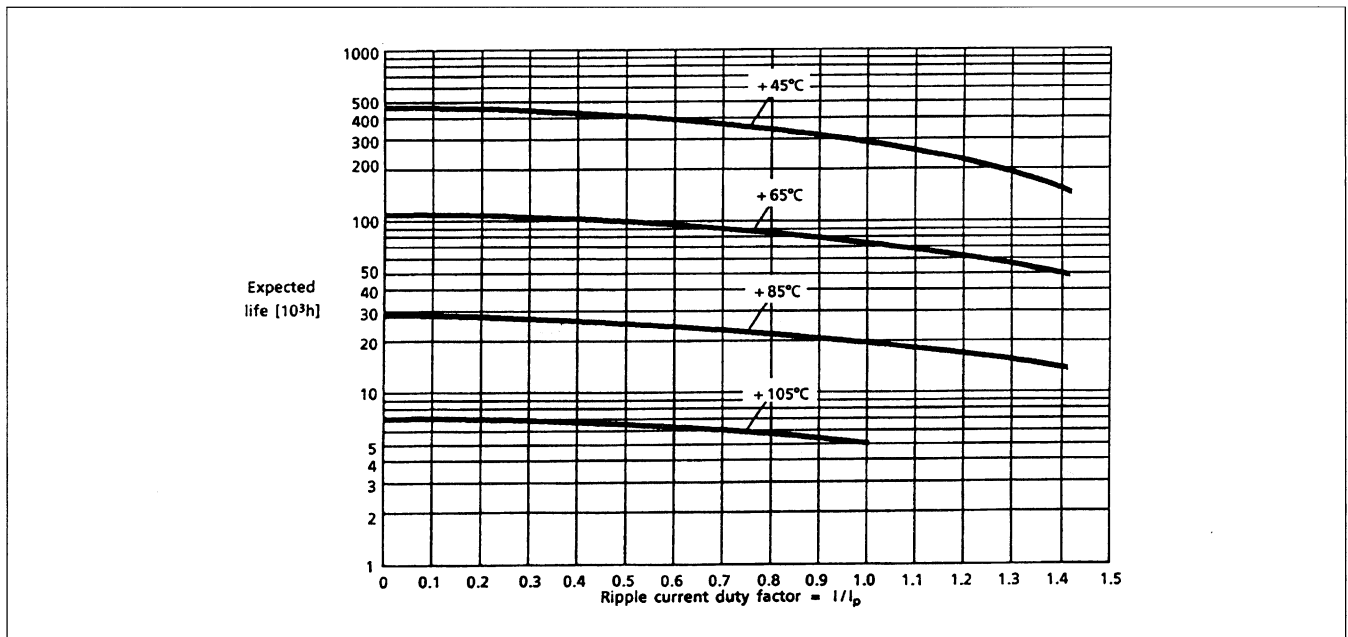
$$L = L_0 \times 2^{\frac{T_0 - [T + \Delta t (I/I_p)^2]}{10}}$$



Where:

- I : Ripple current to be applied to the capacitor at T°C (120Hz)..... [A rms]
 - I_p : Specified maximum permissible ripple current at 120Hz, +105°C.....[A rms]
 - L : Expected life at T°C.....[h]
 - L_0 : Specified life (TSNXA series: 5000 hours).....[h]
 - T : Ambient temperature.....[°C]
 - T_0 : Hot spot temperature in the capacitor element = [maximum operating temperature] + [Δt at maximum ambient temperature] = [maximum temperature (TSNXA series: +110 °C)].....[°C]
 - Δt : Temperature rise at constant current flow of maximum permissible ripple current value specified at +105 °C (see the graph ' Δt vs T).....[°C]
- [Conditions: $(I/I_p)^2 \leq 2$ times]

• Expected Life (calculated on the basis of specified life in high temperature loading)



Case Size Table

(160V)

Cap [μF]	Ripple current	Case code	Case size øD x L [mm]					
			A	B	C	D	E	
100	0.70		20x25					
150	0.85			22x25				
180	0.90			22x25				
220	1.00			22x30	25x25			
270	1.10			22x30	25x25			
330	1.20			22x35	25x30	30x25		
390	1.30			22x40	25x30	30x25		
470	1.40			22x45	25x35	30x30		
560	1.50				25x40	30x30		
680	1.70				25x45	30x35	35x30	
820	2.00					30x40	35x30	
1000	2.20					30x50	35x35	
1200	2.30							35x40

(200V)

Cap [μF]	Ripple current	Case code	Case size øD x L [mm]					
			A	B	C	D	E	
100	0.70		20x25					
120	0.75			22x25				
150	0.85			22x25				
180	0.90			22x30	25x25			
220	1.00			22x35	25x30	30x25		
270	1.10			22x40	25x30	30x25		
330	1.20			22x45	25x35	30x30		
390	1.30				25x40	30x30	35x25	
470	1.40				25x45	30x35	35x30	
560	1.50					30x40	35x30	
680	1.70					30x45	35x35	
820	2.00					30x50	35x40	

(250V)

Cap [μF]	Ripple current	Case code	Case size øD x L [mm]					
			A	B	C	D	E	
82	0.64			22x25				
100	0.70			22x30	25x25			
120	0.75			22x30	25x25			
150	0.85			22x35	25x30			
180	0.90			22x40	25x30	30x25		
220	1.00			22x45	25x35	30x30		
270	1.10			22x50	25x40	30x30		
330	1.20				25x45	30x35	35x30	
390	1.30				25x50	30x40	35x30	
470	1.40					30x45	35x35	
560	1.50					30x50	35x40	

(400V)

Cap [μF]	Ripple current	Case code	Case size øD x L [mm]					
			A	B	C	D	E	
39	0.40			22x25				
47	0.47			22x30				
56	0.51			22x35	25x25			
68	0.56			22x40	25x30			
82	0.64			22x45	25x35	30x25		
100	0.70			22x50	25x40	30x30		
120	0.75				25x45	30x35	35x25	
150	0.85				25x50	30x40	35x30	
180	0.90					30x45	35x35	
220	1.00					30x50	35x40	

*Ripple current:[A] rms at 120Hz, +105°C

Features

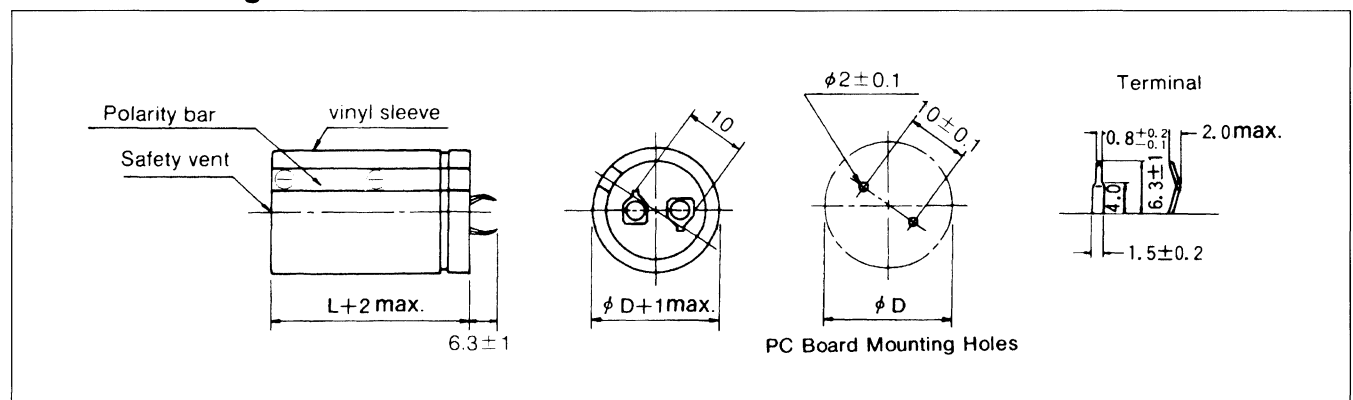
- Compact size & for general purpose
(20 ~ 40% less volume than TS-U series)
- Various case size & wide CV value range
- Top vent construction
- Flat Type available for low profile applications



Specifications

Item	Performance Characteristics						
Rated Working Voltage Range	16 to 250V DC	400 to 450V DC					
Operating Temperature Range	-40 to +85 °C	-25 to +85 °C					
Nominal Capacitance Range	180 to 68000μF (120 to 15000μF for Flat Type)	56 to 560μF (33 to 150μF for Flat Type)					
Capacitance Tolerance	±20% (120Hz, +20 °C)						
Leakage Current	I ≤ 3√CV [μA] after 5 minutes application of rated working voltage at +20 °C (C=nominal capacitance in μF, V=rated working voltage in V)						
tan δ (120Hz, +20 °C)	Working voltage [V]	16 25 35 50 63 80					
	tan δ max.	0.50 0.40 0.35 0.30 0.25 0.20					
	Working voltage [V]	100 160 200 250 400 450					
	tan δ max.	0.20 0.15 0.15 0.15 0.15 0.15					
	For capacitance > 33000μF, add the value of $\frac{\text{rated capacitance} - 33000\mu\text{F}}{10000\mu\text{F}} \times 0.1$						
Ripple Current	Refer to standard products table (120Hz, +85 °C) Correction factor for frequency						
	Frequency [Hz]	50	60	120	500	1k	10k-50k
	16~100V	0.93	0.95	1.00	1.05	1.08	1.15
	160~450V	0.75	0.80	1.00	1.20	1.25	1.40
High Temperature Loading	Test conditions						
	Duration	: 2000 hours					
	Ambient temperature	: +85 °C					
	Applied voltage	: DC voltage with maximum permissible ripple current specified at +85 °C (≤rated working voltage)					
	Post test requirements at +20 °C						
	Leakage current	: ≤ Initial specified value					
	Capacitance change	: ±20% of initial measured value					
	tan δ	: ≤ 200% of initial specified value					
Shelf Life	Test conditions			Post test requirements at +20 °C			
	Duration	: 1000 hours		Same limits for high temperature loading.			
	Ambient temperature	: +85 °C					
	Applied voltage	: (None)					
	Pre-treatment for measurements Measurements shall be conducted after application of DC working voltage for 30 minutes						

Dimension - Regular Size



Explanation of Part Numbers - Regular Size

E	C	O							S			P				A		
Common code			Shape						W.V code			Series code			Capacitance code			Case code

W.V. code	1C	1E	1V	1H	1J	1K	2A
W.V. (V)	16	25	35	50	63	80	100

W.V. code	2C	2D	2E	2T	2G	2W
W.V. (V)	160	200	250	385	400	450

Capacitances in μF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits.
 Example: 331—330 μF ,
 332—3300 μF

Code	Dia.
A	20mm
B	22mm
C	25mm
D	30mm
E	35mm

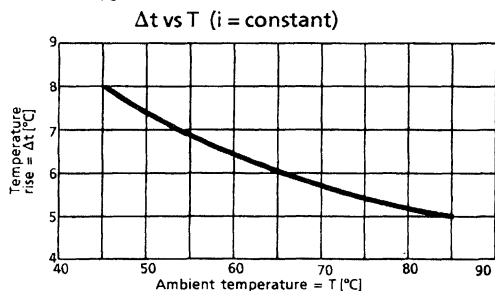
Suffix for top insulation disk	
A	With Disk
(B)	(Without Disk)

Expected Life for Ripple Current & Ambient Temperature Stress

• Calculation Formula

The life of aluminum electrolytic capacitors is highly affected by applied ripple current and ambient temperature. In general the relation between life time, ripple current and ambient temperature is known as:

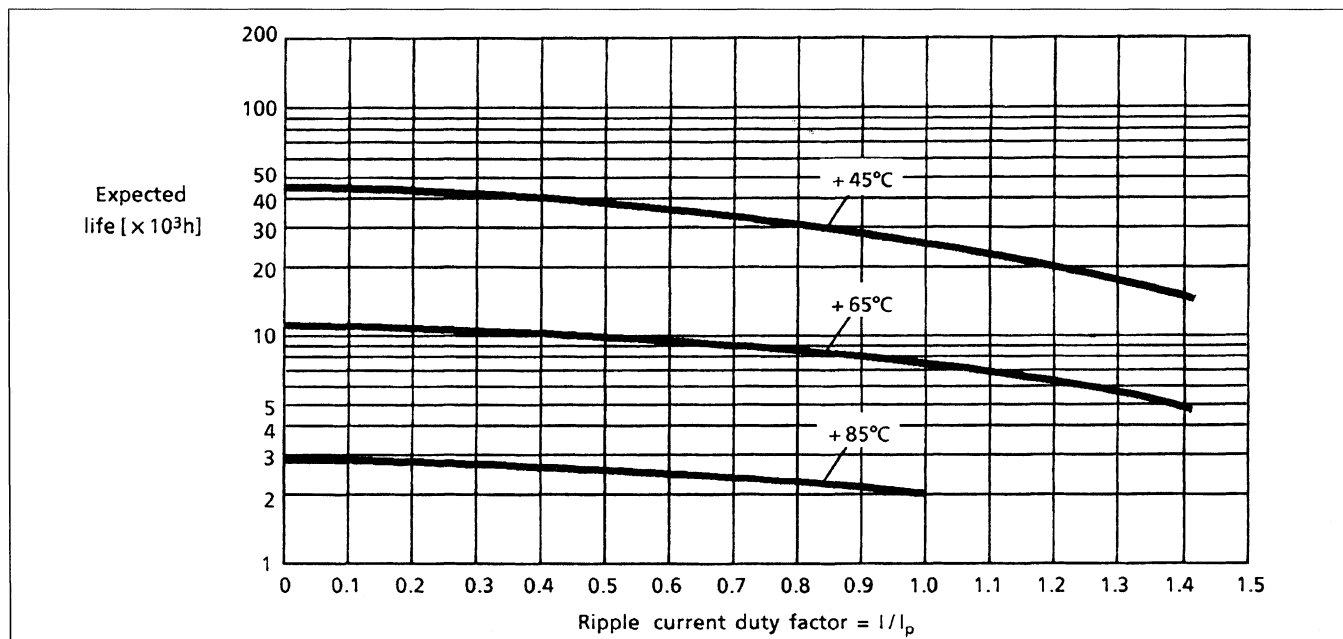
$$L = L_0 \times 2^{\frac{T_0 - [T + \Delta t (I/I_p)^2]}{10}}$$



Where:

- I : Ripple current to be applied to the capacitor at T°C (120Hz)..... [A rms]
 - I_p : Specified maximum permissible ripple current at 120Hz, +85°C.....[A rms]
 - L : Expected life at T°C.....[h]
 - L_0 : Specified life (TSU series: 2000 hours).....[h]
 - T : Ambient temperature.....[°C]
 - T_0 : Hot spot temperature in the capacitor element = [maximum operating temperature] + [Δt at maximum ambient temperature] = [maximum temperature (TSU series: +90 °C)].....[°C]
 - Δt : Temperature rise at constant current flow of maximum permissible ripple current value specified at +85 °C (see the graph ' Δt vs T).....[°C]
- [Conditions: $(I/I_p)^2 \leq 2$ times]

• Expected Life (calculated on the basis of specified life in high temperature loading)



Case Size Table - Regular Size

(16V)

Cap. [μF]	Case code Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
6800	3.15	20 x 25				
8200	3.47	20 x 30				
10000	3.78	20 x 35	22 x 30	25 x 25		
12000	4.52	20 x 40	22 x 30	25 x 25		
15000	5.26		22 x 35	25 x 30	30 x 25	
18000	5.57		22 x 40	25 x 35	30 x 30	
22000	6.10		22 x 50	25 x 40	30 x 30	
27000	6.31			25 x 45	30 x 35	
33000	6.84			25 x 50	30 x 40	35 x 30
39000	6.94				30 x 45	35 x 35
47000	7.47				30 x 50	35 x 40
56000	8.73					35 x 45
68000	9.05					35 x 50

(25V)

Cap. [μF]	Case code Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
4700	3.05	20 x 25				
5600	3.36	20 x 30				
6800	3.47	20 x 35	22 x 30	25 x 25		
8200	3.57	20 x 40	22 x 30	25 x 25		
10000	3.78		22 x 35	25 x 30	30 x 25	
12000	4.10		22 x 40	25 x 35	30 x 30	
15000	4.63		22 x 50	25 x 40	30 x 30	
18000	5.47			25 x 45	30 x 35	
22000	6.10			25 x 50	30 x 40	
27000	6.21				30 x 45	35 x 35
33000	6.84				30 x 50	35 x 40
39000	7.36					35 x 45
47000	8.00					35 x 50

(35V)

Cap. [μF]	Case code Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
3300	2.73	20 x 25				
3900	2.94	20 x 30				
4700	3.26	20 x 35	22 x 30	25 x 25		
5600	3.36	20 x 40	22 x 30	25 x 25		
6800	3.68		22 x 35	25 x 30		
8200	4.00		22 x 40	25 x 35		
10000	4.42		22 x 50	25 x 40	30 x 30	35 x 25
12000	5.05			25 x 45	30 x 35	35 x 30
15000	5.57			25 x 50	30 x 40	35 x 30
18000	5.68				30 x 45	35 x 35
22000	6.10				30 x 50	35 x 40
27000	6.84					35 x 45
33000	7.15					35 x 50

(50V)

Cap. [μF]	Case code Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
2200	2.26	20 x 25				
2700	2.52	20 x 30				
3300	2.73	20 x 35	22 x 30	25 x 25		
3900	2.75	20 x 40	22 x 30	25 x 25		
4700	3.03		22 x 35	25 x 30	30 x 25	
5600	3.42		22 x 40	25 x 35	30 x 30	
6800	3.85		22 x 50	25 x 40	30 x 30	
8200	4.41			25 x 45	30 x 35	
10000	4.97			25 x 50	30 x 40	
12000	5.58				30 x 45	35 x 35
15000	6.44				30 x 50	35 x 40
18000	6.94					35 x 45
22000	7.57					35 x 50

(63V)

Cap. [μF]	Case code Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
2200	2.52	20 x 35	22 x 30	25 x 25		
2700	3.73	20 x 40	22 x 35	25 x 30		
3300	4.10		22 x 40	25 x 30	30 x 25	
3900	4.44		22 x 45	25 x 35	30 x 30	
4700	4.86		22 x 50	25 x 40	30 x 30	35 x 25
5600	5.36			25 x 45	30 x 35	35 x 30
6800	5.84			25 x 50	30 x 40	35 x 30
8200	6.00				30 x 45	35 x 35
10000	6.52					35 x 40
12000	7.15					35 x 50

(80V)

Cap. [μF]	Case code Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
1500	2.26	20 x 35	22 x 30	25 x 25		
1800	2.52	20 x 40	22 x 30	25 x 25		
2200	2.73		22 x 35	25 x 30	30 x 25	
2700	2.78		22 x 40	25 x 35	30 x 30	
3300	3.21		22 x 50	25 x 40	30 x 30	
3900	3.59			25 x 45	30 x 35	
4700	4.09			25 x 50	30 x 40	
5600	4.55				30 x 45	35 x 35
6800	5.16				30 x 50	35 x 40
8200	5.83					35 x 50

* Ripple current: [A] rms at 120Hz, +85 °C

* When ø35 x 45 and ø35 x 50 capacitors are mounted in P.C.B, reinforce them with supplementary utensil or adhesives. (Avoid using adhesives including halogenated composition.)

Case Size Table - Regular Size

(100V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
1000	1.96	20 x 35	22 x 30	25 x 25		
1200	2.31	20 x 40	22 x 35	25 x 30		
1500	2.57		22 x 40	25 x 30	30 x 25	
1800	2.84		22 x 45	25 x 35	30 x 30	
2200	3.14		22 x 50	25 x 40	30 x 30	
2700	3.71			25 x 45	30 x 35	
3300	4.06			25 x 50	30 x 40	
3900	4.54				30 x 45	35 x 35
4700	5.13				30 x 50	35 x 40
5600	5.75					35 x 45
6800	6.60					35 x 50

(160V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
330	1.45	20 x 30	22 x 25			
390	1.62	20 x 35	22 x 30	25 x 25		
470	2.11		22 x 30	25 x 25		
560	2.25		22 x 35	25 x 30	30 x 25	
680	2.50		22 x 40	25 x 35	30 x 25	
820	2.75		22 x 50	25 x 40	30 x 30	
1000	3.00			25 x 45	30 x 35	35 x 25
1200	3.25			25 x 50	30 x 35	35 x 30
1500	3.73				30 x 45	35 x 35
1800	4.20				30 x 50	35 x 40
2200	4.78					35 x 45
2700	5.45					35 x 50

(200V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
270	1.41	20 x 30	22 x 25			
330	1.56	20 x 35	22 x 30	25 x 25		
390	1.68		22 x 30	25 x 25		
470	1.85		22 x 35	25 x 30	30 x 25	
560	2.43		22 x 40	25 x 35	30 x 25	
680	2.68		22 x 50	25 x 35	30 x 30	
820	2.93			25 x 45	30 x 35	35 x 25
1000	3.25			25 x 50	30 x 40	35 x 30
1200	3.50				30 x 45	35 x 35
1500	3.87				30 x 50	35 x 40
1800	4.32					35 x 45
2200	4.92					35 x 50

(250V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
180	1.07	20 x 30	22 x 25			
220	1.17	20 x 35	22 x 30	25 x 25		
270	1.31		22 x 30	25 x 25		
330	1.75		22 x 35	25 x 30	30 x 25	
390	1.91		22 x 40	25 x 35	30 x 25	
470	2.11		22 x 45	25 x 40	30 x 30	
560	2.25			25 x 45	30 x 35	35 x 25
680	2.52			25 x 50	30 x 40	35 x 30
820	2.77				30 x 45	35 x 35
1000	3.32				30 x 50	35 x 40
1200	3.53					35 x 45
1500	4.04					35 x 50

(385/400V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
68	0.76	20 x 30	22 x 25			
82	0.83	20 x 30	22 x 25			
100	0.92	20 x 35	22 x 30	25 x 25		
120	1.02	20 x 40	22 x 35	25 x 30		
150	1.16		22 x 40	25 x 30	30 x 25	
180	1.44		22 x 45	25 x 35	30 x 30	
220	1.49		22 x 50	25 x 40	30 x 30	
270	1.67			25 x 45	30 x 35	35 x 30
330	1.90				30 x 40	35 x 35
390	2.13				30 x 45	35 x 40
470	2.39					35 x 40
560	2.69					35 x 50

(450V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
56	0.70	20 x 30	22 x 25			
68	0.76	20 x 35	22 x 30			
82	0.83	20 x 35	22 x 30	25 x 25		
100	0.93		22 x 35	25 x 30	30 x 25	
120	1.04		22 x 40	25 x 30	30 x 25	
150	1.19		22 x 50	25 x 40	30 x 30	
180	1.35			25 x 45	30 x 35	35 x 25
220	1.55			25 x 50	30 x 40	35 x 30
270	1.78				30 x 45	35 x 35
330	2.01				30 x 50	35 x 40
390	2.24					35 x 45
470	2.53					35 x 50

* Ripple current: [A] rms at 120Hz, +85 °C

* When ø35 x 45 and ø35 x 50 capacitors are mounted in P.C.B, reinforce them with supplementary utensil or adhesives. (Avoid using adhesives including halogenated composition.)

Explanation of Part Numbers - Flat-Type

E	C	O	S	□ □	P	□ □ □	□	G
Common code			Shape	W.V code	Series code	Capacitance code	Case code	

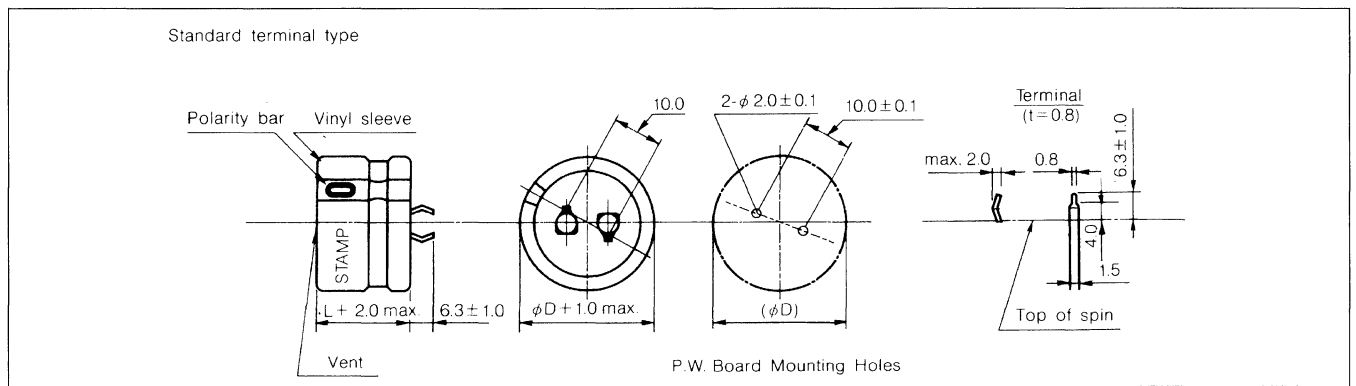
W.V. code	1C	1E	1V	1H	1J	1K	2A
W.V. (V)	16	25	35	50	63	80	100

W.V. code	2C	2P	2D	2E	2G	2W
W.V. (V)	160	180	200	250	400	450

Capacitances in μF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits.
Example: 331—330 μF , 332—3300 μF

Code	Dia.
B	22mm
C	25mm
D	30mm
E	35mm

Dimensions in mm (not to scale)



Case size/Ripple current - Flat-Type

$\phi D + 1 \times L$ max. [mm]
[A] rms (120Hz/+85°C)

Cap. [μF]	W.V. [V. DC]	16		25		35		50		63		80		100		
		470														22 x 20	1.0
680													22 x 20	1.0	25 x 20	1.1
1000										22 x 20	1.2	25 x 20	1.2	30 x 20	1.2	
1500								22 x 20	1.2	25 x 20	1.3	30 x 20	1.4	35 x 20	1.5	
2200						22 x 20	1.4	25 x 20	1.4	30 x 20	1.5	35 x 20	1.7			
3300			22 x 20	1.6	25 x 20	1.7	30 x 20	1.7	35 x 20	1.7						
4700	22 x 20	1.6	25 x 20	1.8	30 x 20	2.0	35 x 20	2.1								
6800	25 x 20	1.8	30 x 20	2.3	35 x 20	2.4										
10000	30 x 20	2.4	35 x 20	2.7										Case size	Ripple current	
15000	35 x 20	3.2														

Cap. [μF]	W.V. [V. DC]	160		200		250		400		450	
		33									22 x 20	0.20
47								22 x 20	0.25	25 x 20	0.29
68								25 x 20	0.35	30 x 20	0.38
100								30 x 20	0.47	35 x 20	0.52
120						22 x 20	0.45				
150				22 x 20	0.65	25 x 20	0.65	35 x 20	0.60		
220	22 x 20	0.75	25 x 20	0.87	30 x 20	0.87					
270	25 x 20	0.87									
330			30 x 20	1.00	35 x 20	1.10					
390	30 x 20	1.10									
470			35 x 20	1.30						Case size	Ripple current
560	35 x 20	1.30									

Features

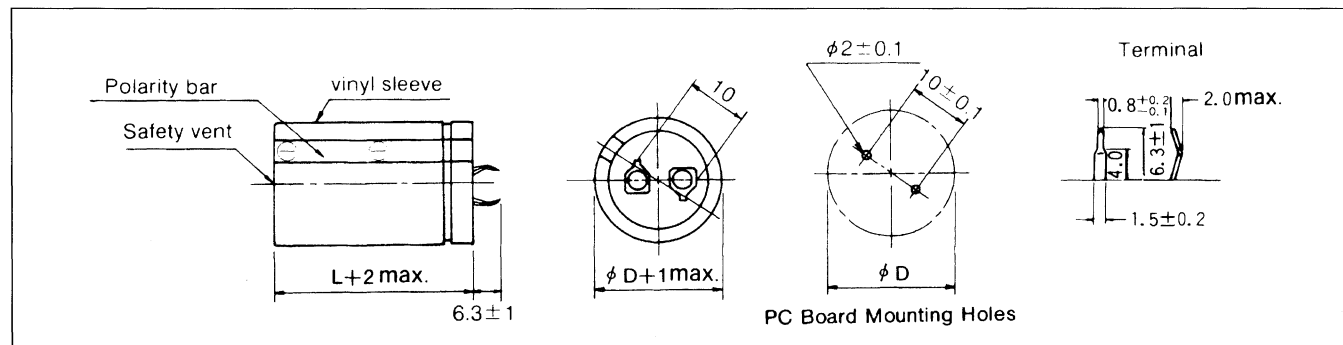
- Compact size(30 ~ 40% less volume than TS-NH series)
- Long life 105 °C 2000 hours & high ripple current
- Various case size & top vent construction
- Flat Type available for low profile applications



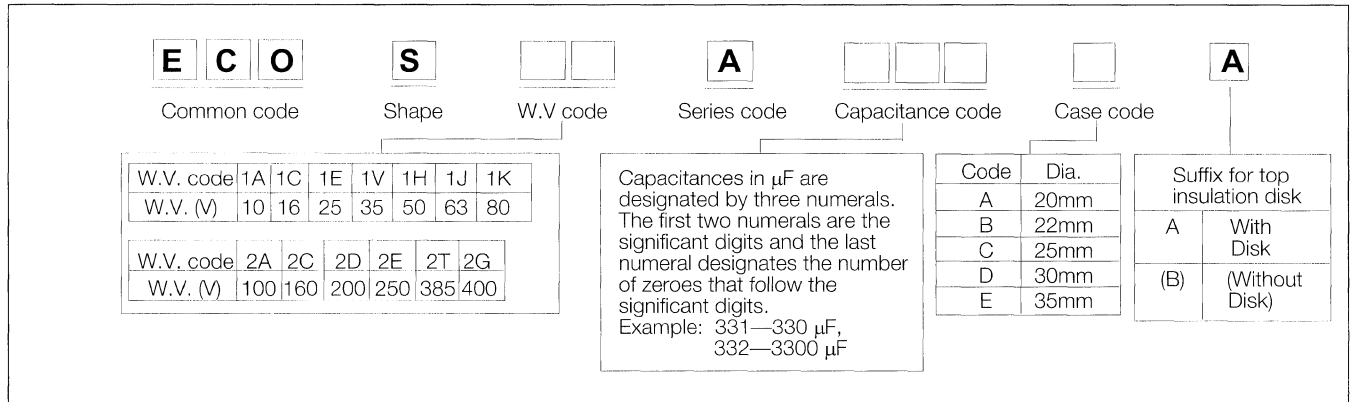
Specifications

Item	Performance Characteristics	
Rated Working Voltage Range	10 to 250V DC	400V DC
Operating Temperature Range	-40 °C to +105 °C	-25 °C to +105 °C
Nominal Capacitance Range	180 to 68000µF (68 to 10000µF for Flat Type)	56 to 470µF (33 to 100µF for Flat Type)
Capacitance Tolerance	±20% (120Hz, +20 °C)	
Leakage Current	$I \leq 3\sqrt{CV}$ [µA] after 5 minutes application of rated working voltage at +20 °C (C=nominal capacitance in µF, V=rated working voltage in V)	
tan δ (120Hz, +20 °C)	Working voltage [V]	10 16 25 35 50 63 80
	tan δ max.	0.55 0.45 0.35 0.30 0.25 0.20 0.17
	Working voltage [V]	100 160~400
	tan δ max.	0.15 0.15
	For capacitance value >33000µF, add the value of $\frac{(\text{rated cap. } [\mu\text{F}] - 33000\mu\text{F})}{10000\mu\text{F}} \times 0.1$	
Ripple Current	Refer to standard products table (120Hz, +85 °C) Correction factor for frequency	
	Frequency [Hz]	50 60 120 500 1k 10k-50k
	10~100V	0.93 0.95 1.00 1.05 1.08 1.15
	160~400V	0.75 0.80 1.00 1.20 1.25 1.40
High Temperature Loading	Test conditions Duration : 2000 hours Ambient temperature : +105 °C Applied voltage : DC voltage with maximum permissible ripple current specified at +105 °C (≤rated working voltage)	
	Post test requirements at +20 °C Leakage current : ≤ Initial specified value Capacitance change : ±20% of initial measured value tan δ : ≤ 200% of initial specified value	
Shelf Life	Test conditions Duration : 1000 hours Ambient temperature : +105 °C Applied voltage : (None)	
	Post test requirements at +20 °C Same limits for high temperature loading. Pre-treatment for measurements Measurements shall be conducted after application of DC working voltage for 30 minutes	

Dimension - Regular Size



Explanation of Part Numbers - Regular Size

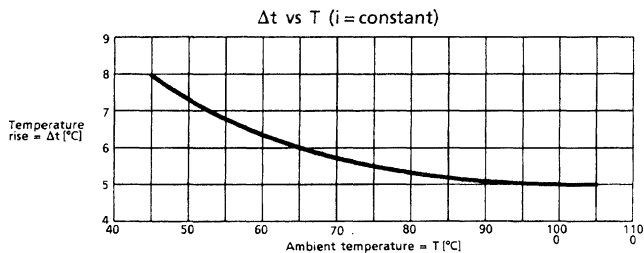


Expected Life for Ripple Current & Ambient Temperature Stress

• Calculation Formula

The life of aluminum electrolytic capacitors is highly affected by applied ripple current and ambient temperature. In general the relation between life time, ripple current and ambient temperature is known as:

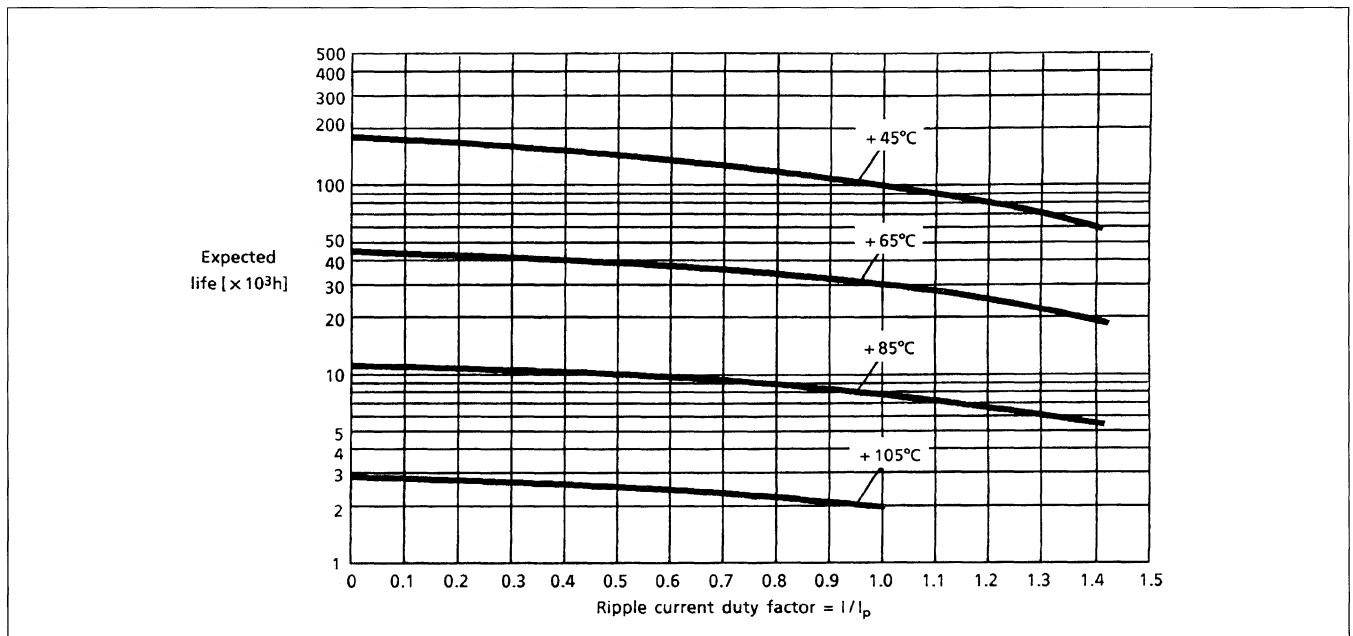
$$L = L_0 \times 2^{\frac{T_0 - [T + \Delta t (I/I_p)^2]}{10}}$$



Where:

- I : Ripple current to be applied to the capacitor at T°C (120Hz).... [A rms]
 - I_p : Specified maximum permissible ripple current at 120Hz, +105°C....[A rms]
 - L : Expected life at T°C....[h]
 - L_0 : Specified life (TSHA series: 2000 hours)....[h]
 - T : Ambient temperature....[°C]
 - T_0 : Hot spot temperature in the capacitor element = [maximum operating temperature] + [Δt at maximum ambient temperature] = [maximum temperature (TSHA series: +110 °C)]....[°C]
 - Δt : Temperature rise at constant current flow of maximum permissible ripple current value specified at +85 °C (see the graph ' Δt vs T)....[°C]
- [Conditions: $(I/I_p)^2 \leq 2$ times]

• Expected Life (calculated on the basis of specified life in high temperature loading)



Case Size Table - Regular Size

(10V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
6800	1.30	20 x 25				
8200	1.60	20 x 30				
10000	1.80	20 x 30	22 x 25			
12000	2.20	20 x 35	22 x 30			
15000	2.30	20 x 40	22 x 35	25 x 25		
18000	2.40		22 x 40	25 x 30		
22000	2.60		22 x 45	25 x 35	30 x 25	
27000	3.10		22 x 50	25 x 40	30 x 30	35 x 25
33000	3.40			25 x 45	30 x 35	35 x 30
39000	3.70			25 x 50	30 x 40	35 x 30
47000	4.20				30 x 45	35 x 35
56000	5.00				30 x 50	35 x 40
68000	5.50					35 x 50

(16V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
6800	2.20	20 x 30	22 x 25			
8200	2.40	20 x 35	22 x 30			
10000	2.60	20 x 40	22 x 30	25 x 25		
12000	2.90		22 x 35	25 x 30	30 x 25	
15000	3.20		22 x 40	25 x 35	30 x 30	
18000	3.50		22 x 45	25 x 40	30 x 30	35 x 25
22000	3.80			25 x 45	30 x 35	35 x 30
27000	4.20			25 x 50	30 x 40	35 x 30
33000	4.70				30 x 45	35 x 35
39000	5.10				30 x 50	35 x 40
47000	5.50					35 x 45
56000	6.00					35 x 50

(25V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
4700	2.00	20 x 30	22 x 25			
5600	2.20	20 x 35	22 x 30			
6800	2.40	20 x 40	22 x 30	25 x 25		
8200	2.70		22 x 35	25 x 30	30 x 25	
10000	3.00		22 x 40	25 x 35	30 x 30	
12000	3.20		22 x 50	25 x 40	30 x 30	35 x 25
15000	3.60			25 x 45	30 x 35	35 x 30
18000	3.90			25 x 50	30 x 40	35 x 35
22000	4.30				30 x 45	35 x 35
27000	4.80					35 x 45
33000	5.50					35 x 50

(35V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
3300	1.90	20 x 30	22 x 25			
3900	2.00	20 x 35	22 x 30			
4700	2.20	20 x 40	22 x 35	25 x 25		
5600	2.40		22 x 35	25 x 30	30 x 25	
6800	2.60		22 x 40	25 x 35	30 x 30	
8200	2.90		22 x 50	25 x 40	30 x 30	35 x 25
10000	3.20			25 x 45	30 x 35	35 x 30
12000	3.50			25 x 50	30 x 40	35 x 30
15000	3.90				30 x 45	35 x 35
18000	4.30					35 x 40
22000	5.00					35 x 45

(50V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
1800	1.50	20 x 30	22 x 25			
2200	1.70	20 x 35	22 x 30			
2700	1.80	20 x 40	22 x 30	25 x 25		
3300	2.00		22 x 35	25 x 30		
3900	2.20		22 x 40	25 x 35	30 x 25	
4700	2.50		22 x 45	25 x 40	30 x 30	35 x 25
5600	2.80		22 x 50	25 x 40	30 x 35	35 x 30
6800	3.30			25 x 50	30 x 40	35 x 30
8200	3.60				30 x 45	35 x 35
10000	4.00				30 x 50	35 x 40
12000	4.50					35 x 45
15000	4.80					35 x 50

(63V)

Cap. [μF]	Ripple current	Case size øD x L [mm]				
		A	B	C	D	E
1200	1.40	20 x 30	22 x 25			
1500	1.50	20 x 35	22 x 30			
1800	1.70	20 x 40	22 x 30	25 x 25		
2200	2.00		22 x 35	25 x 30		
2700	2.20		22 x 40	25 x 35	30 x 25	
3300	2.50		22 x 50	25 x 40	30 x 30	35 x 25
3900	2.70			25 x 45	30 x 35	35 x 30
4700	3.00			25 x 50	30 x 40	35 x 30
5600	3.30				30 x 45	35 x 35
6800	3.60				30 x 50	35 x 40
8200	3.90					35 x 45
10000	4.40					35 x 50

* Ripple current: [A] rms at 120Hz, +85 °C

* When ø35 x 45 and ø35 x 50 capacitors are mounted in P.C.B, reinforce them with supplementary utensil or adhesives. (Avoid using adhesives including halogenated composition.)

Case Size Table

(80V)

Cap. [μF]	Ripple current Case code	Case size øD x L [mm]				
		A	B	C	D	E
820	1.20	20 x 30	22 x 25			
1000	1.30	20 x 35	22 x 30	25 x 25		
1200	1.50	20 x 40	22 x 30	25 x 25		
1500	1.70		22 x 35	25 x 30		
1800	1.80		22 x 40	25 x 35	30 x 25	
2200	2.10		22 x 45	25 x 35	30 x 30	35 x 25
2700	2.40			25 x 45	30 x 35	35 x 30
3300	2.60			25 x 50	30 x 40	35 x 30
3900	3.00				30 x 45	35 x 35
4700	3.30				30 x 50	35 x 40
5600	3.70					35 x 45
6800	3.90					35 x 50

(100V)

Cap. [μF]	Ripple current Case code	Case size øD x L [mm]				
		A	B	C	D	E
560	1.10	20 x 30	22 x 25			
820	1.40	20 x 35	22 x 30	25 x 25		
1000	1.70	20 x 40	22 x 35	25 x 30		
1200	1.80		22 x 40	25 x 35	30 x 25	
1500	2.10		22 x 45	25 x 40	30 x 30	35 x 25
1800	2.30			25 x 45	30 x 35	35 x 30
2200	2.60			25 x 50	30 x 40	35 x 30
2700	2.90				30 x 45	35 x 35
3300	3.20				30 x 50	35 x 40
3900	3.60					35 x 45
4700	3.80					35 x 50

(160V)

Cap. [μF]	Ripple current Case code	Case size øD x L [mm]				
		A	B	C	D	E
220	1.00	20 x 25				
270	1.10	20 x 30	22 x 25			
330	1.20	20 x 35	22 x 30			
390	1.30	20 x 40	22 x 30	25 x 25		
470	1.40		22 x 35	25 x 30		
560	1.50		22 x 40	25 x 30	30 x 25	
680	1.70		22 x 45	25 x 35	30 x 30	
820	2.00			25 x 40	30 x 30	
1000	2.20			25 x 45	30 x 35	
1200	2.30			25 x 50	30 x 40	
1500	2.50				30 x 45	35 x 35
1800	2.70				30 x 50	35 x 40
2200	2.90					35 x 50

(200V)

Cap. [μF]	Ripple current Case code	Case size øD x L [mm]				
		A	B	C	D	E
220	1.00	20 x 30	22 x 25			
270	1.10	20 x 35	22 x 30	25 x 25		
330	1.20	20 x 40	22 x 30	25 x 25		
390	1.30		22 x 35	25 x 30	30 x 25	
470	1.40		22 x 40	25 x 35	30 x 25	
560	1.50		22 x 45	25 x 35	30 x 30	
680	1.70			25 x 40	30 x 30	
820	2.00			25 x 50	30 x 35	35 x 30
1000	2.20				30 x 45	35 x 35
1200	2.30				30 x 50	35 x 40
1500	2.50					35 x 50

(250V)

Cap. [μF]	Ripple current Case code	Case size øD x L [mm]				
		A	B	C	D	E
180	0.90	20 x 35	22 x 30	25 x 25		
220	1.00	20 x 40	22 x 30	25 x 25		
270	1.10		22 x 35	25 x 30	30 x 25	
330	1.20		22 x 40	25 x 35	30 x 25	
390	1.30		22 x 45	25 x 35	30 x 30	
470	1.40			25 x 45	30 x 35	35 x 30
560	1.50			25 x 50	30 x 35	35 x 30
680	1.70				30 x 45	35 x 35
820	2.00				30 x 50	35 x 40
1000	2.20					35 x 45
1200	2.30					35 x 50

(385/400V)

Cap. [μF]	Ripple current Case code	Case size øD x L [mm]				
		A	B	C	D	E
56	0.51	20 x 30	22 x 25			
68	0.56	20 x 35	22 x 30	25 x 25		
82	0.64	20 x 40	22 x 35	25 x 25		
100	0.69		22 x 35	25 x 30		
120	0.75		22 x 40	25 x 35	30 x 25	
150	0.82		22 x 50	25 x 40	30 x 30	
180	0.90			25 x 45	30 x 35	35 x 25
220	1.00			25 x 50	30 x 40	35 x 30
270	1.10				30 x 45	35 x 35
330	1.20				30 x 50	35 x 40
390	1.30					35 x 45
470	1.40					35 x 50

* Ripple current: [A] rms at 120Hz, +85 °C

* When ø35 x 45 and ø35 x 50 capacitors are mounted in P.C.B, reinforce them with supplementary utensil or adhesives. (Avoid using adhesives including halogenated composition.)

Explanation of Part Numbers - Flat-Type

E C O	S	□ □	A	□ □ □	□	G
Common code	Shape	W.V. code	Series code	Capacitance code	Case code	Suffix

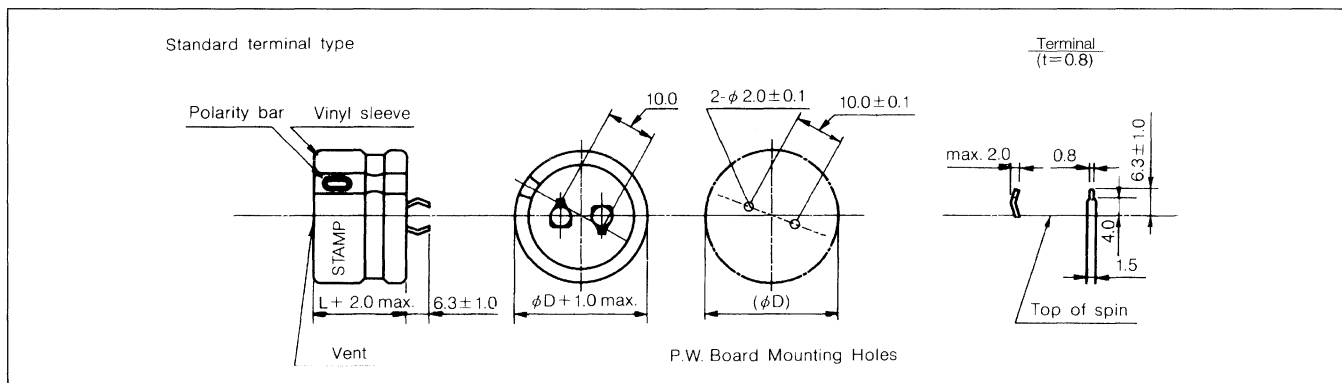
W.V. code	1C	1E	1V	1H	1J	1K
W.V. (V)	16	25	35	50	63	80

W.V. code	2A	2C	2D	2E	2G	
W.V. (V)	100	160	200	250	400	

Capacitances in μF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits.
Example: 331—330 μF , 332—3300 μF

Code	Dia.
B	22mm
C	25mm
D	30mm
E	35mm

Dimensions in mm (not to scale)



Case size/Ripple current - Flat-Type

$\phi D + 1 \times L \text{ max. [mm]}$
[A] rms (120Hz/+105°C)

Cap. [μF]	W.V. [V. DC]	16		25		35		50		63		80		100		
		330														22 x 20	0.8
470													22 x 20	0.8	25 x 20	1.0
680										22 x 20	0.9	25 x 20	1.0	30 x 20	1.1	
1000								22 x 20	0.9	25 x 20	1.2	30 x 20	1.2	35 x 20	1.2	
1500						22 x 20	1.1	25 x 20	1.2	30 x 20	1.3	35 x 20	1.4			
2200				22 x 20	1.3	25 x 20	1.4	30 x 20	1.4	35 x 20	1.5					
3300	22 x 20	1.3	25 x 20	1.6	30 x 20	1.7	35 x 20	1.7								
4700	25 x 20	1.6	30 x 20	1.8	35 x 20	2.0										
6800	30 x 20	1.8	35 x 20	2.3												
10000	35 x 20	2.4														

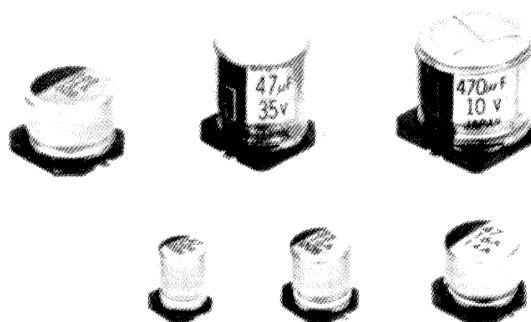
Cap. [μF]	W.V. [V. DC]	160		200		250		400	
		33							22 x 20	0.20
47							25 x 20	0.25	
68						22 x 20	0.40	30 x 20	0.35
100				22 x 20	0.50	25 x 20	0.50	35 x 20	0.47
150		22 x 20	0.55	25 x 20	0.65	30 x 20	0.65		
220		22 x 20	0.75	30 x 20	0.87	35 x 20	0.87		
330		30 x 20	1.00	35 x 20	1.10			Case size	Ripple current
470		35 x 20	1.15						

Aluminum Electrolytic Capacitors Surface Mount Type

VA Series

Features

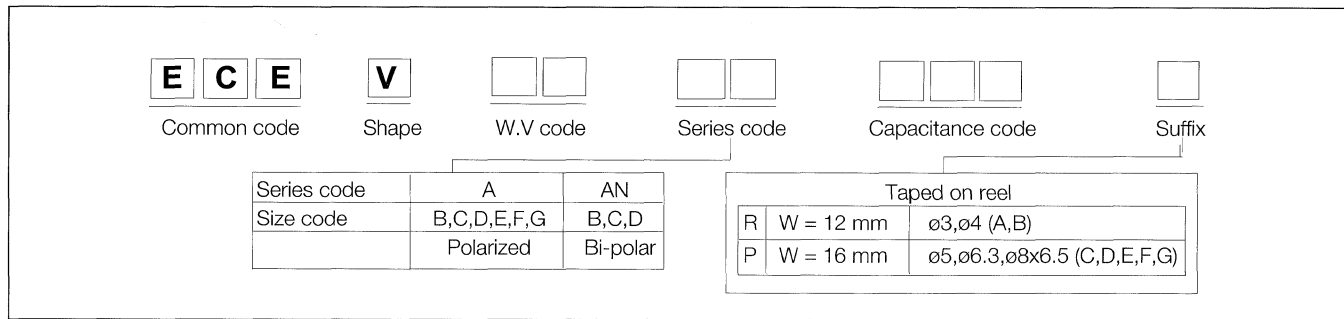
- For general purpose
- Life: 2000 hours at 85 °C
- $\varnothing 4 \times 6$ to $\varnothing 10 \times 10.5$ mm products
- Excellent space factor
- Bi-polar type is available on request



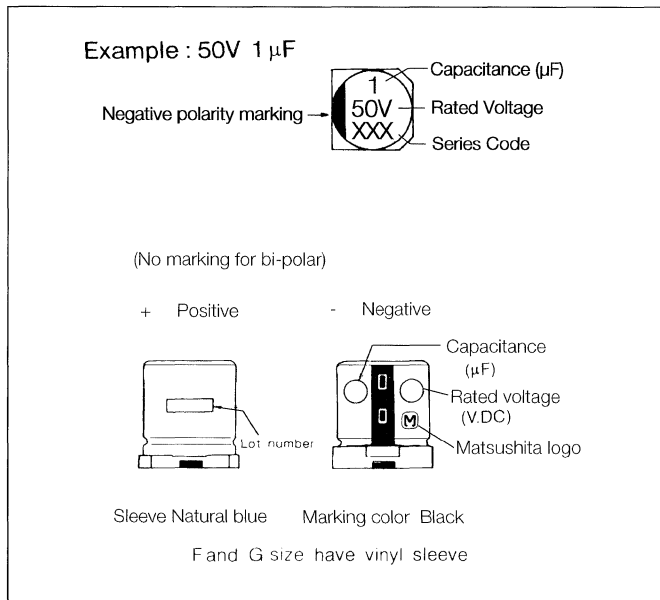
Specifications

Item	Performance Characteristics																					
Operating Temperature Range	-40 to +85 °C																					
Rated Working Voltage Range	4 to 50V DC																					
Nominal Capacitance Range	0.1 to 820 μ F																					
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20 °C)																					
Leakage Current	$I \leq 0.01CV$ or 3 [μ A] whichever is greater measured after 2 minutes application of rated working voltage at +20 °C. (Bi-polar type: $I \leq 0.02CV$ or 6 [μ A])																					
tan δ (120Hz, +20 °C)	Working voltage [V]	4	6.3	10	16	25	35	50														
	tan δ max.	0.35	0.26	0.20	0.16	0.14	0.12	0.12														
	tan δ (Bi-polar) max.	0.70	0.52	0.40	0.32	0.28	0.24	0.24														
Characteristics at Low Temperature	Impedance ratio max. at 120Hz.																					
	Working voltage [V]	4	6.3	10	16	25	35	50														
	-25°C/+20°C	7	4	3	2	2	2	2														
	-40°C/+20°C	15	8	6	4	4	3	3														
High Temperature Loading	Test conditions Duration : 2000 hours Applied voltage : Rated DC working voltage (Bi-polar type: 500 hours for each polarity) Ambient temperature : +85 °C																					
	Post test requirements at +20 °C Leakage current : \leq Initial specified value Capacitance change : $\pm 20\%$ of initial measured value ($\pm 30\%$ for 4 W.V.) tan δ : $\leq 200\%$ of initial specified value																					
Shelf Life	Test conditions Duration : 1000 hours Ambient temperature : +85 °C Applied voltage : (None)																					
	Post test requirements at +20 °C Leakage current : \leq Initial specified value Capacitance change : $\pm 30\%$ of initial measured value ($\pm 30\%$ for 4 W.V.) tan δ : $\leq 150\%$ of initial specified value																					
Resistance to Soldering Heat	Test conditions Capacitors shall be placed for 30 seconds on a plate (termination face down onto the plate) heated to +250 °C																					
	Post test requirements at +20 °C Leakage current : \leq Initial specified value Capacitance change : $\pm 10\%$ of initial measured value tan δ : \leq Initial specified value																					
Cleaning	Capacitors shall be capable of withstanding exposure to the following cleaning solvents.																					
	<table border="1"> <thead> <tr> <th>Conditions</th> <th>Solvent condition</th> <th>Exposure time</th> <th>Temperature</th> <th>Ultrasonic wave</th> </tr> </thead> <tbody> <tr> <td>Solvents</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Freon-TE, TES, TP35 or equivalents</td> <td>Liquid or vapor</td> <td>≤ 5 min (total)</td> <td>\leqboiling point at 1 atm</td> <td>Acceptable</td> </tr> </tbody> </table>	Conditions	Solvent condition	Exposure time	Temperature	Ultrasonic wave	Solvents					Freon-TE, TES, TP35 or equivalents	Liquid or vapor	≤ 5 min (total)	\leq boiling point at 1 atm	Acceptable						
Conditions	Solvent condition	Exposure time	Temperature	Ultrasonic wave																		
Solvents																						
Freon-TE, TES, TP35 or equivalents	Liquid or vapor	≤ 5 min (total)	\leq boiling point at 1 atm	Acceptable																		

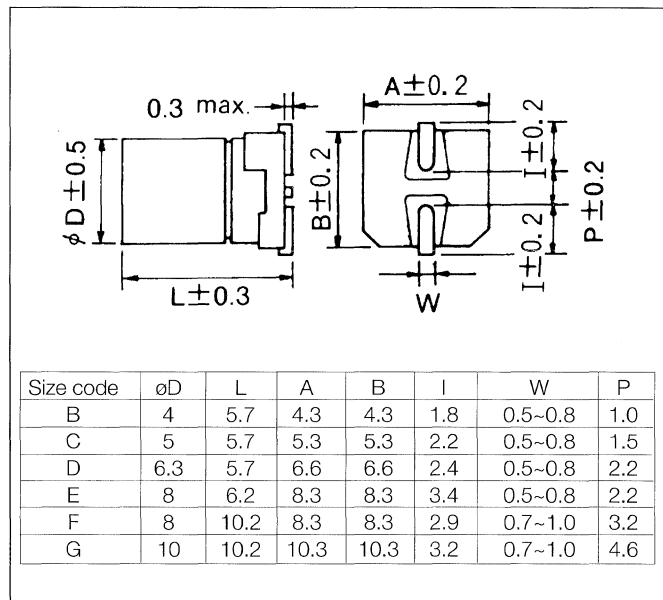
Explanation of Part Numbers



Marking



Dimensions in mm (not to scale)



Case size/Ripple current

Polarized

(mA) r.m.s. (120 Hz/ +85 °C)

Cap. (μ A)	W.V. (V)	4 (0G)	6.3 (0J)	10 (1A)	16 (1C)	25 (1E)	35 (1V)	50 (1H)
0.1 (0R1)								B 1
0.22 (R22)								B 3
0.33 (R33)								B 3
0.47 (R47)								B 5
0.68 (R68)								B 7
1.0 (0I0)								B 10
2.2 (2R2)								B 16
3.3 (3R3)								B 16
4.7 (4R7)						B 22	B 22	C 23
6.8 (6R8)						B 25		D 27
10 (100)					B 28	C 28	C 30	D 35
22 (220)			B 29		C 39	D 55	D 60	E 120
33 (330)	B 26			C 43		D 65	E 130	F 110
47 (470)	B 34	C 46			D 70		E 165	G 130
100 (101)	C 61	D 71			E 200	F 180	G 210	
220 (221)	D 82			E 250		G 310		
330 (331)			E 300	F 330				
470 (471)			F 380	G 400				
680 (681)			G 550					
820 (821)			G 660					
								Size code
								Ripple current

* () shows W.V. and capacitance code

Case size/Ripple current

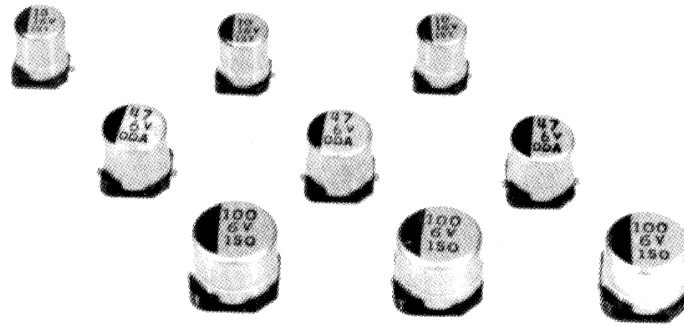
Bi-polar

Cap. (μA)	W.V. (V)	6.3 (0J)		10 (1A)		16 (1C)		25 (1E)		35 (1V)		50 (1H)	
0.22	(R22)											B	2
0.33	(R33)											B	3
0.47	(R47)											B	5
1.0	(010)											B	10
2.2	(2R2)									B	12	C	16
3.3	(3R3)					B	14	C	18			C	21
4.7	(4R7)					B	20	C	25			D	28
10	(100)			B	25	C	25	D	28				
22	(220)					D	39						
33	(330)			D	43							Size code	Ripple current
47	(470)	D	46										

* () shows W.V. and capacitance code

Features

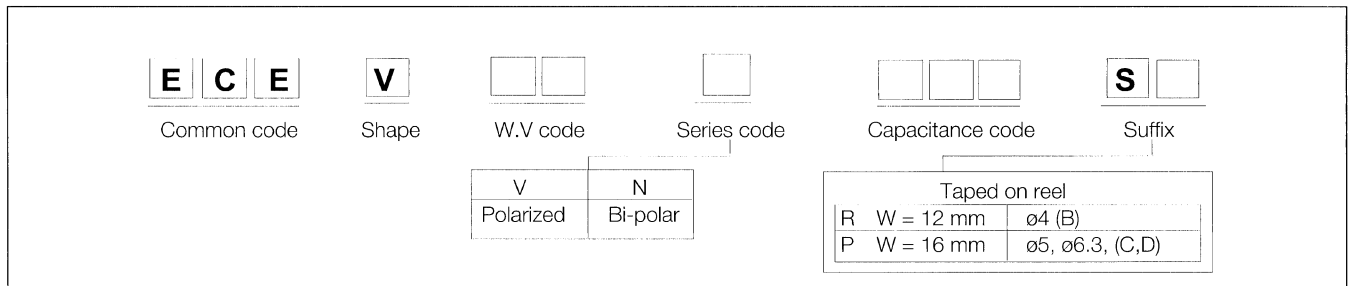
- High reliability surface mount type
- Long life: 2000 hours at +105 °C
- 5.5mm max. height
- Excellent space factor
- Bi-polar type is available on request



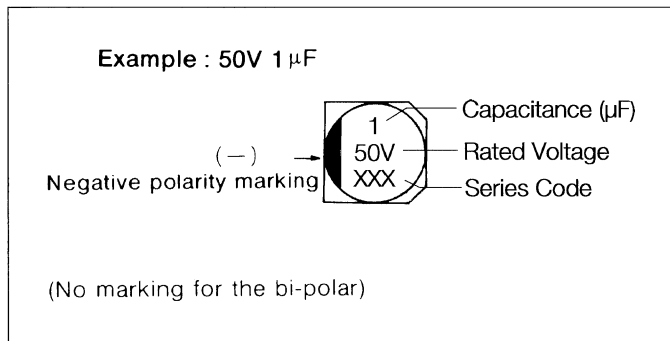
Specifications

Item	Performance Characteristics								
Operating Temperature Range	-40 to +105 °C (Bi-polar type -40 to +85 °C)								
Rated Working Voltage Range	4 to 50V DC								
Nominal Capacitance Range	0.1 to 220μF								
Capacitance Tolerance	±20% (120Hz, +20 °C)								
Leakage Current	I ≤ 0.01CV or 3 [μA] whichever is greater measured after 2 minutes application of rated working voltage at +20 °C. (Bi-polar type: I ≤ 0.02CV or 6 [μA])								
tan δ (120Hz, +20 °C)	Working voltage [V]	4	6.3	10	16	25	35	50	
	tan δ max.	0.35	0.26	.20	0.16	0.14	0.12	0.12	
	tan δ (Bi-polar) max.	0.70	0.52	.40	0.32	0.28	0.24	0.24	
Characteristics at Low Temperature	Impedance ratio max. at 120Hz.								
	Working voltage [V]	4	6.3	10	16	25	35	50	
	-25°C/+20°C	7	4	3	2	2	2	2	
	-40°C/+20°C	15	8	6	4	4	3	3	
High Temperature Loading	Test conditions								
	Duration	: 2000 hours (Bi-polar type: 1000 hours for each polarity).							
	Applied voltage	: Rated working voltage							
	Ambient temperature	: +105 °C (Bi-polar type: +85 °C)							
	Post test requirements at +20 °C								
	Leakage current	: ≤ Initial specified value							
	Capacitance change	: ±20% of initial measured value (≤ ±30% for 4 W.V.)							
	tan δ	: ≤ 150% of initial specified value							
Shelf Life	Test conditions								
	Duration	: 1000 hours							
	Ambient temperature	: +105 °C (Bi-polar type: +85 °C)							
	Applied voltage	: (None)							
	Post test requirements at +20 °C								
	Leakage current	: ≤ Initial specified value							
	Capacitance change	: ±20% of initial measured value (±30% for 4 W.V.)							
	tan δ	: ≤ 150% of initial specified value							
Resistance to Soldering Heat	Test conditions								
	Capacitors shall be placed for 30 seconds on a plate (termination face down onto the plate) heated to +250 °C								
	Post test requirements at +20 °C								
	Leakage current	: ≤ Initial specified value							
	Capacitance change	: ±10% of initial measured value							
	tan δ	: ≤ Initial specified value							
Cleaning	Capacitors shall be capable of withstanding exposure to the following cleaning solvents.								
	Conditions	Solvent condition	Exposure time	Temperature	Ultrasonic wave				
	Solvents								
	Freon-TE, TES, TP35 or equivalents	Liquid or vapor	≤5 min (total)	≤boiling point at 1 atm	Acceptable				

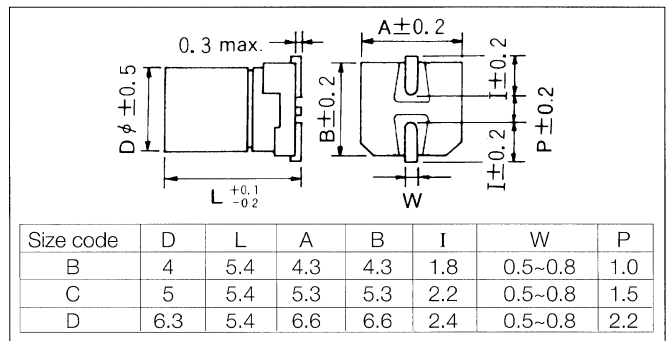
Explanation of Part Numbers



Marking



Dimensions in mm (not to scale)



Case size/Ripple current

Polarized

(mA) r.m.s. (120 Hz/ +105 °C)

Cap. (μ A)	W.V. (V)	4 (0G)		6.3 (0J)		10 (1A)		16 (1C)		25 (1E)		50 (1H)	
0.1	(0R1)											B	1
0.15	(R15)											B	1.5
0.22	(R22)											B	2.3
0.33	(R33)											B	3.5
0.47	(R47)											B	5
0.68	(R68)											B	7
1.0	(010)											B	10.6
1.5	(1R5)											B	13
2.2	(2R2)											B	16
3.3	(3R3)											B	18
4.7	(4R7)									B	21	C,D	22,23
6.8	(6R8)									B	25	C,D	27,29
10	(100)							B	28	C	28	D	35
22	(220)			B	29			C	39	D	55		
33	(330)	B	26	B	26	C	43			D	65		
47	(470)	B	26	C	46			D	70				
100	(101)	C	61	D	71								
220	(221)	D	82										
												Size code	Ripple current

Bipolar

(mA) r.m.s. (120 Hz/ +85 °C)

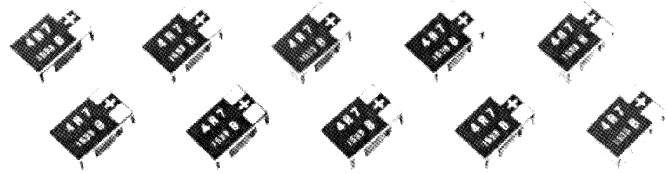
Cap. (μ A)	W.V. (V)	6.3 (0J)		10 (1A)		16 (1C)		25 (1E)		50 (1H)	
0.22	(R22)									B	2
0.33	(R33)									B	3
0.47	(R47)									B	5
1.0	(010)									B	10
3.3	(3R3)							B	12	D	16
4.7	(4R7)							B	12	D	23
10	(100)	B	20	B	**	C	25	D	28		
22	(220)	C	26					D	55		
33	(330)	D	29	D	**						
47	(470)	D	35								
										Size code	Ripple current

* () shows W.V. and capacitance code.

** contact factory.

Features

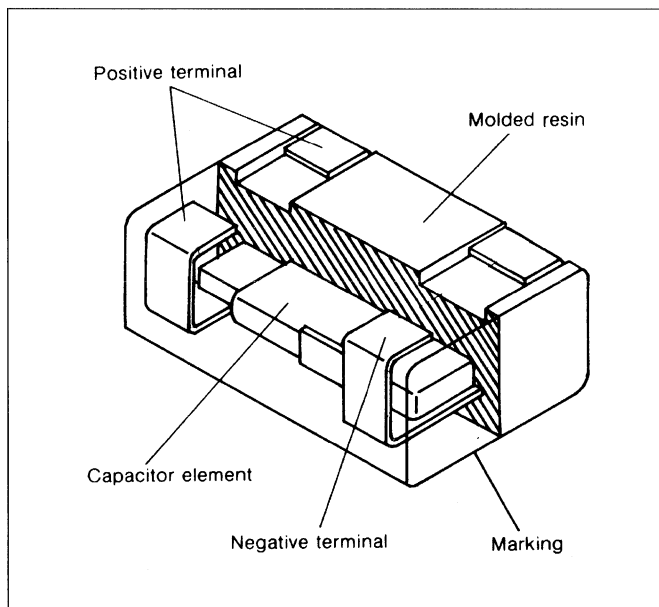
- Ideal low impedance at high frequency (300kHz to 10MHz)
 (Reduced ESR due to an applying speciality polymer with high conductivity.)
- Excellent noise-absorbent characteristics
- Surface mountable (Reflow soldering method available.)
- Very stable capacitance against temperature and frequency
- Excellent endurance characteristics due to adoption of solid electrolyte
- 4-terminal-construction realize further low impedance



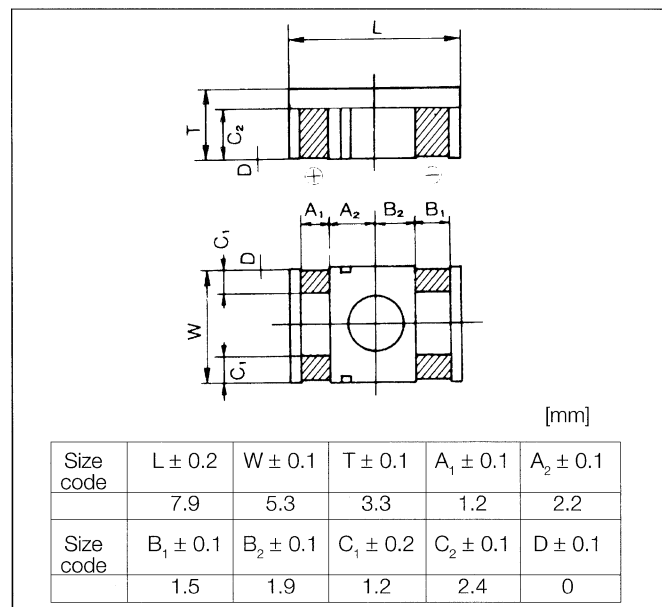
Specifications

Item	Performance Characteristics
Operating Temperature Range	-40 to +105 °C
Rated Working Voltage Range	6.3to16V DC
Nominal Capacitance Range	2.2 to 33μF
Capacitance Tolerance	±20% (120Hz, +20 °C)
Leakage Current	I ≤ 3 μA after 2 min.
tan δ	≤ 0.06 (120kHz/+20 °C)
Impedance	Refer to standard products table (400kHz/+20 °C)
Permissible Ripple Current	Refer to standard products table (100kHz/+20~+105 °C)
Surge Voltage	rated working voltage x 1.25
Endurance	After applying rated working voltage for 1000 hours at +105 °C, and then being stabilized at +20 °C, capacitor shall meet following limits. Capacitance change : ±10% of initial measured value tan δ : Initial specified value Leakage current : Initial specified value
Moisture Resistance	After storing for 500 hours at +40 °C, 90 to 95% RH Capacitance change : +40 - 20% of initial measured value tan δ : Initial specified value Leakage current : Initial specified value
Permissible Current between terminals with same polarity	2A DC max. (This shall be applicable only when each terminal is landed or the circuit individually.)

Construction

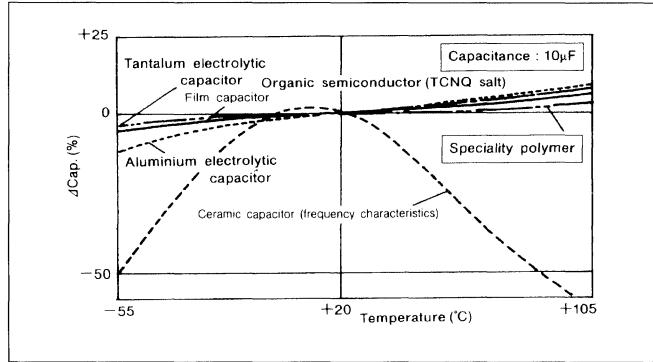


Dimensions

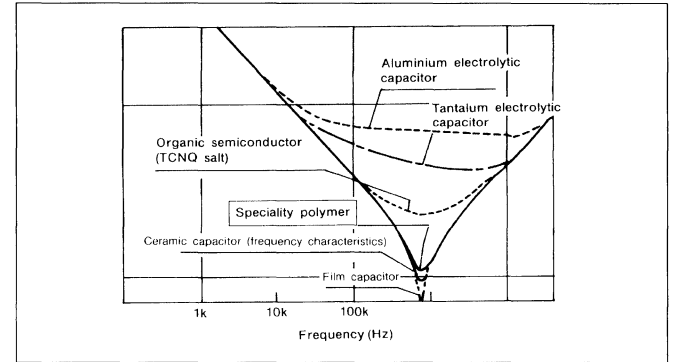


Stable Capacitance Characteristics

Capacitance-temperature Characteristics

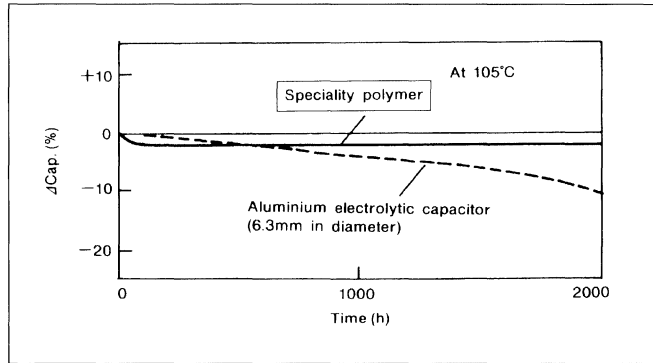


Impedance-frequency Characteristics

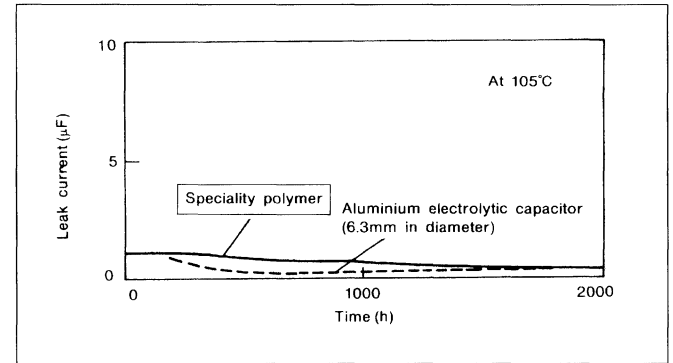


Endurance

Capacitance range



Leakage Current



Explanation of Part Numbers

E C G	C	<input type="text"/>	<input type="text"/>	B	<input type="text"/>	<input type="text"/>	<input type="text"/>	R	<input type="text"/>
Common code	Shape	W.V code		Series code	Capacitance code			Suffix	

W.V. codes	0J	0K	1A	1B	1C
W.V. [V]	6.3	8	10	12.5	16

Capacitance in μ F are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits. The letter 'R' is used for the decimal point, and if it is used, all numerals are significant digits.
Example: 0.1 μ F — 0R1, 1 μ F — 010, 4.7 μ F — 4R7, 10 μ F — 100.

Impedance (400kHz/+20 °C) / Ripple current (100kHz/+20 ~ +105 °C)

Cap. [μ F]	W.V. [V. DC]	6.3 (0J)	8 (0K)	10 (1A)	12.5 (1B)	16 (1C)
4.7 (4R7)						*
6.8 (6R8)						*
8.2 (8R2)			0.4 Ω	1000mA		
10 (100)		*				
15 (150)			0.3 Ω	1300mA		
22 (220)		*	0.2 Ω	1600mA		
33 (330)		*				

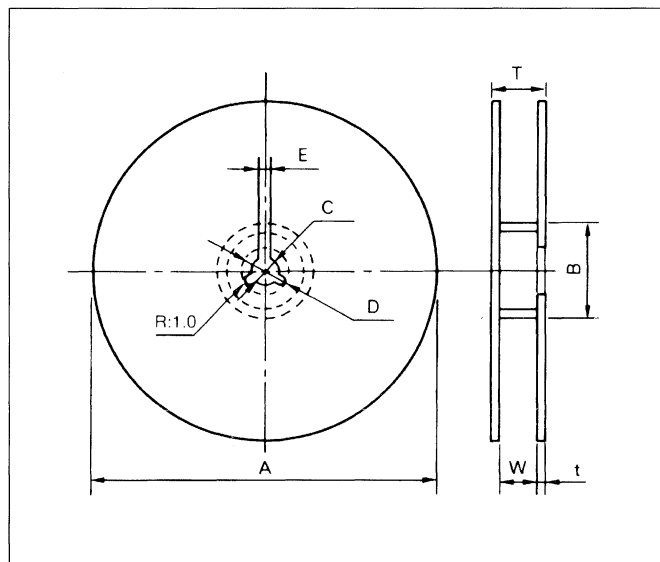
* denotes product under development.

Packaging

Standard Packing Quantity

Embossed taping
3000 pcs./reel

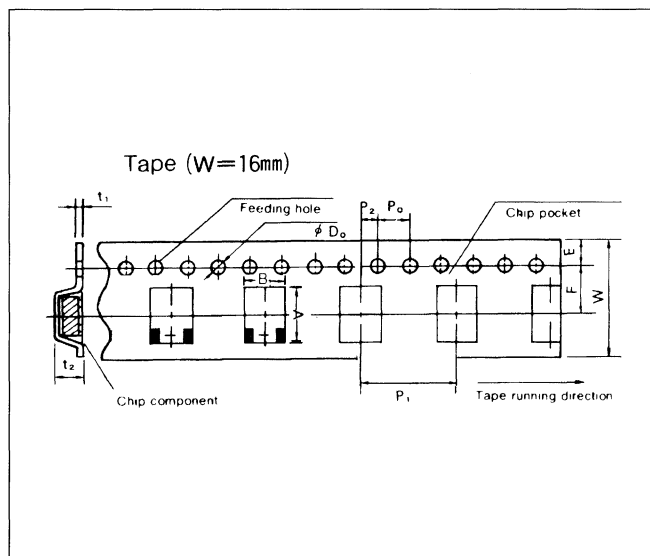
Reel dimensions [mm]



A	B	C	D	E	W	T	t
380 ± 2	50 min.	13.0 ± 0.5	21.0 ± 0.8	2.0 ± 0.5	18 ± 1	22	2.0

Embossed Taping

[mm]



$A \pm 0.2$	$B \pm 0.20$	$W \pm 0.3$	$F \pm 0.1$	$E \pm 0.10$	$P_1 \pm 0.1$
8.4	5.65	16.0	7.5	1.75	8.0

$P_2 \pm 0.1$	$P_0 \pm 0.1$	ϕD_0	t_1	$t_2 \pm 0.1$
2.0	4.0	1.50	0.4	3.6

Marking

W.V. [V. DC]	6.3	8	10	12.5	16
W.V. code	j	k	A	B	C

Packaging Quantities

[unit: pcs.]

A type (Radial type) bulk

Case size [mm]	Long lead		Lead formed	
	Inner packaging	Outer packaging	Inner package	Outer packaging
ø3 x 5 ~ ø6.3 x 7	200	10000	200	10000
ø6.3 x 9 ~ ø6.3 x 16	200	5000	200	5000
ø8 x 5 ~ ø8 x 12.5	200	4000	200	4000
ø8 x 15 ~ ø8 x 16	200	3000	200	3000
ø8 x 20	200	2000	200	2000
ø10 x 9 ~ ø12.5 x 16	200	2000	200	2000
ø12.5 x 15	100	2000	100	2000
ø12.5 x 20 ~ ø12.5 x 25	100	2000	100	1000
ø12.5 x 30 ~ ø12.5 x 40	100	1000	100	500
ø16 x 16 ~ ø16 x 20	50	1000	50	1000
ø16 x 25 ~ ø16 x 31.5	50	1000	50	500
ø16 x 35.5	50	500	50	200
ø16 x 40	50	500	50	200
ø18 x 15 ~ ø18 x 20	50	1000	50	500
ø18 x 25 ~ ø18 x 40	50	500	50	200
ø20 x 30	50	500	—	—

B type (Axial type) bulk

Case size [mm]	Long lead		
	Inner packaging	Outer packaging	
ø3.5 x 7	200	6000	
ø4.5 x 10.5 ~ ø5 x 10.5	100	4000	
ø6.3 x 10.5 ~ ø10 x 31.5		2000	
ø12.5 x 25 ~ ø16 x 40		1000	
ø18 x 40	50	500	
ø22.4 x 40	25		400
ø25 x 50			200

A type (Radial type) taping

Case dia. [mm]	Box		Reel	
	Inner packaging	Outer packaging	Inner packaging	Outer packaging
ø3	20000	10000	—	—
ø4	2000	10000	2000	8000
ø5	2000	10000	1500	6000
ø6.3	2000	10000	1000	4000
ø8	1000	5000	750	3000
ø10	500	2000	—	—
ø12.5	500	2000	—	—
ø16 • 18	250	1000	—	—

B type (Axial type) taping

Case dia. [mm]	Box		Reel	
	Inner packaging	Outer packaging	Inner packaging	Outer packaging
ø3.5	1000	10000	—	—
W = 26mm				
ø3.5	2000	12000	4000	20000
W = 52mm				
ø4.5	1500	9000	3000	15000
ø5	—	—	1500	7500
ø6.3	—	—	1000	5000
ø8	—	—	1000	5000
ø10	—	—	500	2500

V type (Chip type) taping

Case code	Inner packaging	Outer packaging
A,B	2000	20000
C,D,E	1000	10000
F,G	500	3000

TS type (Snap-in type)

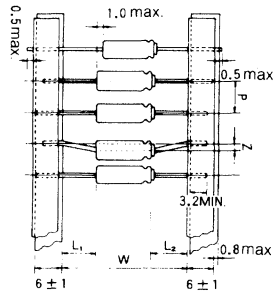
Case dia. [mm]	Box
ø20	300
ø22 ~ ø25	200
ø30 ~ ø35	100

TS type (Snap-in type)

Case dia. [mm]	Box
ø35	100
ø40	50

Please consult us regarding lug terminal types (M type), screw terminal types (G type), and capacitors for photo flash.
 The above tables are as of 1990 and are subject to change without notice.

Axial Lead Type Taping & Packaging



Ammunition pack

Case size	Suffix	W	P ± 0.5	Z	L ₁ -L ₂
3.5 x 7	B	26 ± 0.5	5.0	1.0	0.5
	BZ	52 ± 2	5.0	1.0	0.5
4.5 x 10.5	BZ	52 ± 2	5.0	1.0	1.5

Reel pack

Case size	Suffix	W	P ± 0.5	Z	L ₁ -L ₂
3.5 x 7	AZ	52 ± 2	5.0	1.0	0.5
	A	63 ± 2	5.0	1.0	0.5
4.5 x 10.5	AZ	52 ± 2	5.0	1.0	1.5
	A	63 ± 2	5.0	1.0	1.5
5 x 10.5 ~ 12.5	AZ	52 ± 2	10.0	1.0	1.5
	A	63 ± 2	10.0	1.0	1.5
6.3 x 10.5 ~ 16	AZ	52 ± 2	10.0	1.0	1.5
	A	63 ± 2	10.0	1.0	1.5
8 x 16	A	63 ± 2	10.0	1.0	1.5
8 x 20	A	73 ± 2	10.0	1.0	1.5
10 x 20 ~ 31	A	73 ± 2	15.0	1.5	1.5
12.5 x 25 ~ 31	A	73 ± 2	15.0	1.5	1.5

Reel packing			Ammunition packing			
W	W ₁	2 ₂	W	A	B	C
52 ± 2	70 ± 2	81 max.	26	51 max.	80 max.	260 max.
63 ± 2	82 ± 2	93 max.	52	75 max.	110 max.	330 max.
73 ± 2	92 ± 2	103 max.				

Packaging quantity	Style	W	ø3.5	ø4.5	ø5	ø6.3	ø8	ø10	ø12.5
	Reel		52/63/73	4,000 pcs.	3,000 pcs.	1,500 pcs.	1,000 pcs.	1,000 pcs.	500 pcs.	400 pcs.
Ammunition		52	2,000 pcs.	1,500 pcs.					
		26	1,000 pcs.						

Explanation of Part Numbers

E C E	B				
Common code	Shape	W.V code	Series code	Capacitance code	Suffix

Notes

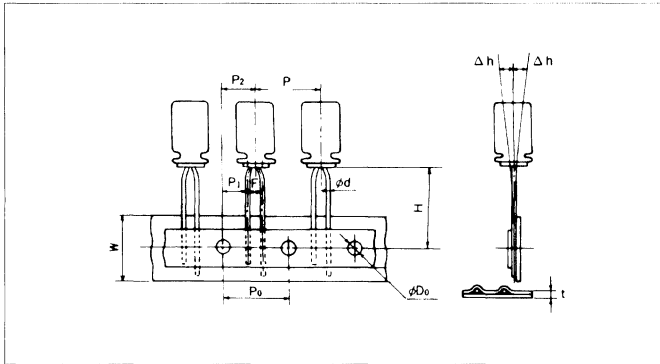
- The anode has colored tape.
- Product polarity is aligned in one direction.
- No missed products when taping.
- Please order in package units
- Marking on the outside of each box indicate the following.
 - Part number
 - Quantity
 - Date of production and lot number
 - Country of production.

Suffix code	Configurations	
B	Ammo-pack	W = 26mm for ø3.5 x 7
BZ	Ammo-pack	W = 52mm for ø3.5, ø4.5
AZ	Reel-pack	W = 52mm for ø3.5 ~ ø6.3
A	Reel-pack	W = 63mm for ø3.5 ~ ø8 x 16
		W = 73mm for ø8 x 16~ø12.5

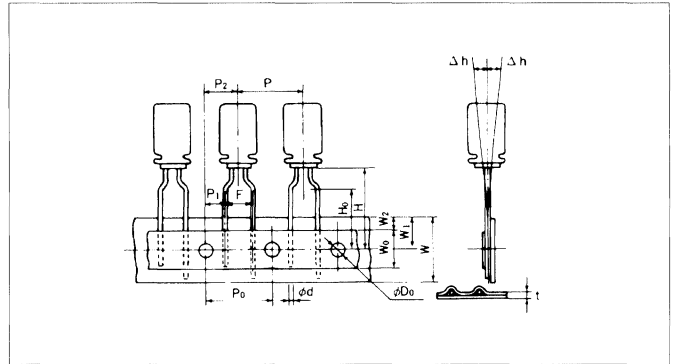
Taping Specifications (Radial Lead Type)

[mm]

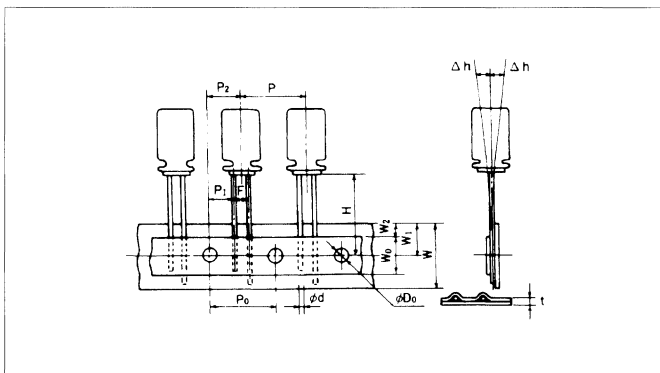
F = 2.5 (ø3, ø4, ø5)



F = 5.0 (ø3 ~ ø8)



F = 2.5 (ø6.3, ø8 x 5, ø8 x 7)



Code	F = 5.0	"F = 2.5	Tolerance
ød	0.40 ~ 0.60		±0.05
P ₀	12.7		±0.2
F	5.0 ^{+0.8} _{-0.2}	2.5 ± 0.5	
W	18.0		±0.5
H ₀	16.0	—	±0.5
H	² 17.5 ^{+0.75} _{-0.2}	18.5 ^{+0.75} _{-0.2}	
	³ 18.5 ^{+0.75} _{-0.5}		
	⁴ 20.0 ^{+0.75} _{-0.5}		
øD ₀	4.0		±0.2
P	12.7		±1.0
P ₁	3.85	5.10	±0.50
P ₂	6.35		±1.00
Δh	≤ 1.0		—
t	0.6		±0.3

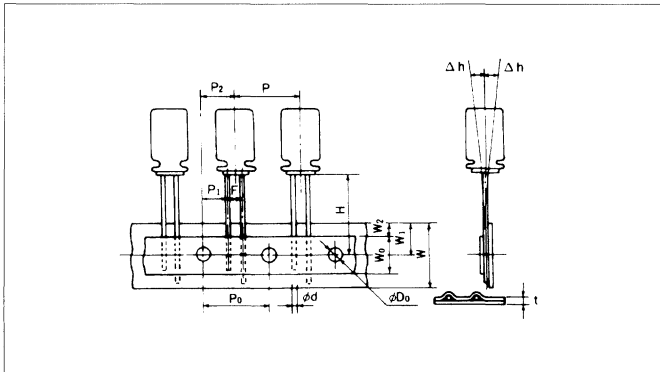
*1 for dia ø3 ~ ø6.3 & ø8 x 5 products

*2 for 4 x 5, 5 x 5, 6.3 x 5, 4 x 7, 5 x 7, 6.3 x 7 products

*3 for 5 x 11, 5 x 15, 6.3 x 11.2, 6 x 15 products also ø8 products available (suffix "BQ")

*4 for ø8 x 7, 8 x 9, 8 x 11.5, 8 x 12.5, 8 x 16, 8 x 20 products

F = 5.0 (ø10, ø12.5 (height ≤ 25))

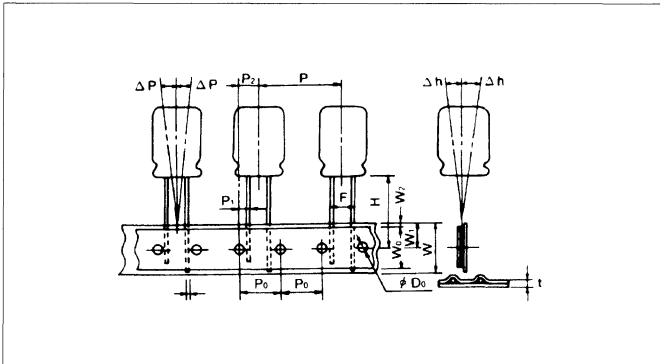


Code	ø10	ø12.5	Tolerance
ød	0.60	15.0	±0.05
P ₀	12.7	15.0	±0.2
F	5.0		+0.8, -0.2
W	18.0		±0.5
W ₀	≥ 12.0	≥ 15.0	—
W ₁	9.0		±0.5
W ₂	0 ~ 1.5		—
H	¹ 16.0		+0.75, -0
	² 18.50		+0.75, -0.5
øD ₀	4.0		±0.2
P	12.7	15.0	±1.0
P ₁	3.85	5.0	±0.50
P ₂	6.35	7.50	±1.00
Δh	≤ 1.0		—
t	0.6		±0.3

*1 Suffix "B"

*2 Suffix "BQ"

F = 7.5 (ø16, ø18 (height ≤ 25))



Code	Standard	Tolerance
ød	0.80	±0.05
P	30.0	±1.0
P ₀	15.0	±0.2
P ₁	3.75	±0.50
P ₂	7.5	±1.0
F	7.5	±0.5
W	18.0	±0.5
W ₀	≥ 15.0	—
W ₁	9.0	±0.5
W ₂	0 ~ 1.5	—
H	18.50	+0.75, -0.50
øD ₀	4.0	±0.2
ΔP	≤ 1.3	—
Δh	≤ 2.0	—
t	0.6	±0.3

Packaging for Radial Lead Taped Products

Packaging	Ammunition pack		Reel pack (available on request)	
Dimensions (Unit: mm)	WP	65 max.	ø	ø4 ~ ø8
	HP	330 max.	A	30 ± 2
	LP	340 max.	B	90 ± 2
			W ₁	44 ± 2
			W ₂	52 max.
Packing quantity per box/reel	ø3, ø4	2000 pcs.	ø10	500 pcs.
	ø5, ø6.3	2000 pcs.	ø12.5	500 pcs.
	ø8	1,000 pcs.	ø16, ø18	250 pcs.
			ø4	2,000 pcs.
			ø5	1,500 pcs.
			ø6.3	1,000 pcs.
			ø8	750 pcs.

Container

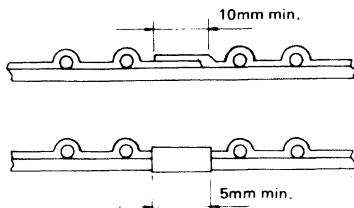
No more than 3 consecutive missing components are permitted.
 Container quantity shall be actual number as indicated
 Components shall be capable of sustaining a 500 gram steady pull
 for 10 seconds in the direction of lead egress.
 All polarized components shall be oriented in one direction.

Order quantity shall be a multiple of packing quantity of one box.

Each box shall be marked with following:

- Part name
- Manufacturer's part number
- Quantity
- Manufacturer's name or symbol
- Date code or lot number
- Country of origin

Tape splicing



Ammunition packing is recommended.

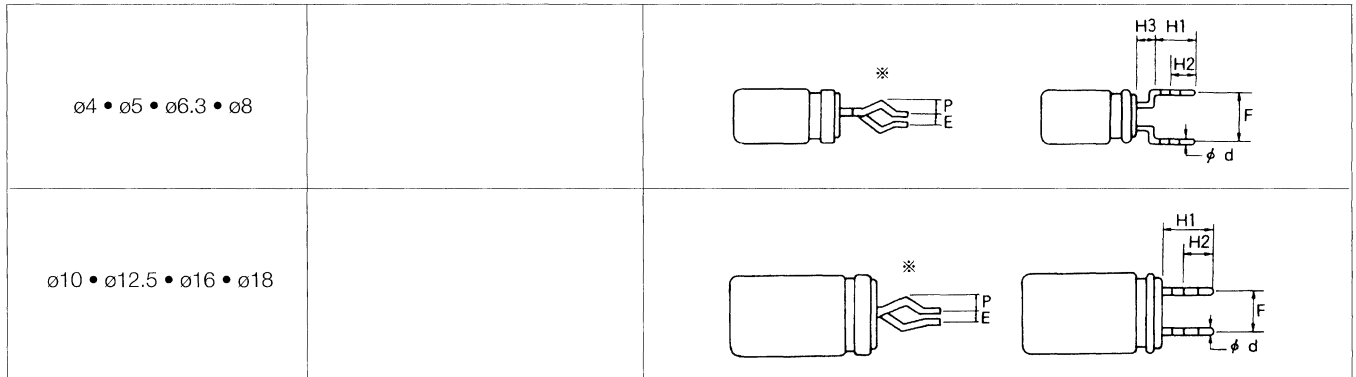
Both are available to supply components with polarity by + plus first or - minus first.

Explanation of Part Numbers

E C □	A □ □	□ □	□	□ □ □	□																		
Common code	Shape	W.V code	Series code	Capacitance code	Suffix																		
		<table border="1"> <thead> <tr> <th>Suffix code</th> <th colspan="2">Configurations</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>Ammo-pack</td> <td>5mm pitch for ø4 ~ ø12.5 7.5mm pitch for ø16 ~ ø18</td> </tr> <tr> <td>BQ</td> <td>Ammo-pack</td> <td>H = 18.5mm height for ø8 ~ ø12.5</td> </tr> <tr> <td>i</td> <td>Ammo-pack</td> <td>2.5mm pitch for ø3 ~ ø6.5 & ø8x5</td> </tr> <tr> <td>AX</td> <td>Reel-pack</td> <td>5mm pitch for ø4 ~ ø8 + lead first</td> </tr> <tr> <td>AZ</td> <td>Reel-pack</td> <td>5mm pitch for ø4 ~ ø8 - lead first</td> </tr> </tbody> </table>				Suffix code	Configurations		B	Ammo-pack	5mm pitch for ø4 ~ ø12.5 7.5mm pitch for ø16 ~ ø18	BQ	Ammo-pack	H = 18.5mm height for ø8 ~ ø12.5	i	Ammo-pack	2.5mm pitch for ø3 ~ ø6.5 & ø8x5	AX	Reel-pack	5mm pitch for ø4 ~ ø8 + lead first	AZ	Reel-pack	5mm pitch for ø4 ~ ø8 - lead first
Suffix code	Configurations																						
B	Ammo-pack	5mm pitch for ø4 ~ ø12.5 7.5mm pitch for ø16 ~ ø18																					
BQ	Ammo-pack	H = 18.5mm height for ø8 ~ ø12.5																					
i	Ammo-pack	2.5mm pitch for ø3 ~ ø6.5 & ø8x5																					
AX	Reel-pack	5mm pitch for ø4 ~ ø8 + lead first																					
AZ	Reel-pack	5mm pitch for ø4 ~ ø8 - lead first																					

Lead forming

Self mounting type



*Direction of bending shape is random.

Dimensions

[mm]

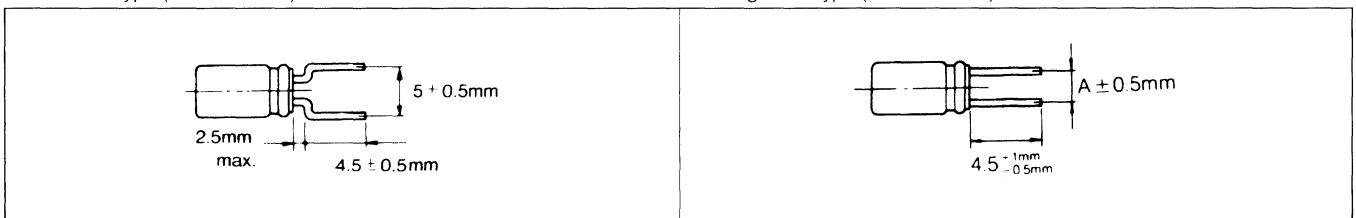
Case dia.	H1 ±0.5	H2	H3	F ±0.5	P	E max.	ød	for P.C.B	
								dia. ø	thickness
5	4.5	2.7	2.5	5.0	0.85	1.0	0.5	0.8	1.6
6.3	4.5	2.7	2.5	5.0	1.00	1.0	0.5/0.6	1.0	1.6
8	4.5	2.7	2.5	5.0	1.00	1.0	0.6	1.0	1.6
10/12.5	4.5	2.7	—	5.0	1.30	1.3	0.6	1.0	1.6
16/18	4.5	2.7	—	7.5	1.30	1.3	0.8	1.0	1.6
*4/5/6.3	4.5	2.8	1.5	5.0	0.95	1.3	0.45	0.9	1.6

*5mm & 7m height products (ex. KA/KS series)

Straight & formed lead cut

Form & cut type (non-standard)

Straight cut type (non-standard)



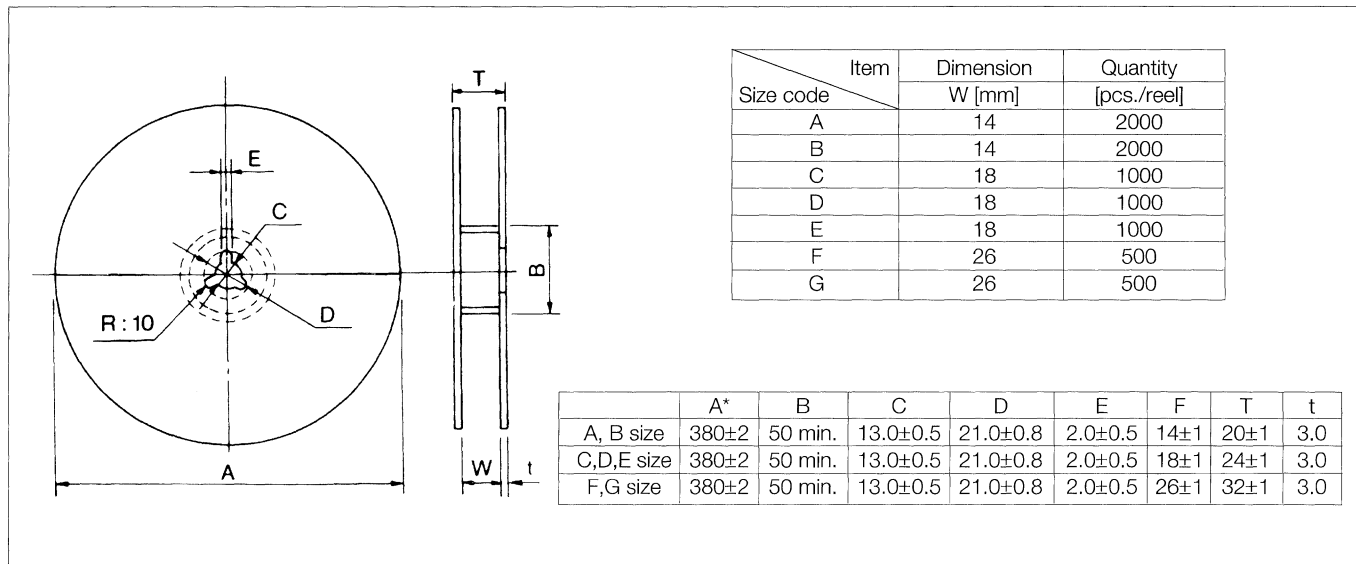
(Self mounting type is recommended as standard products)

Explanation of Part Numbers

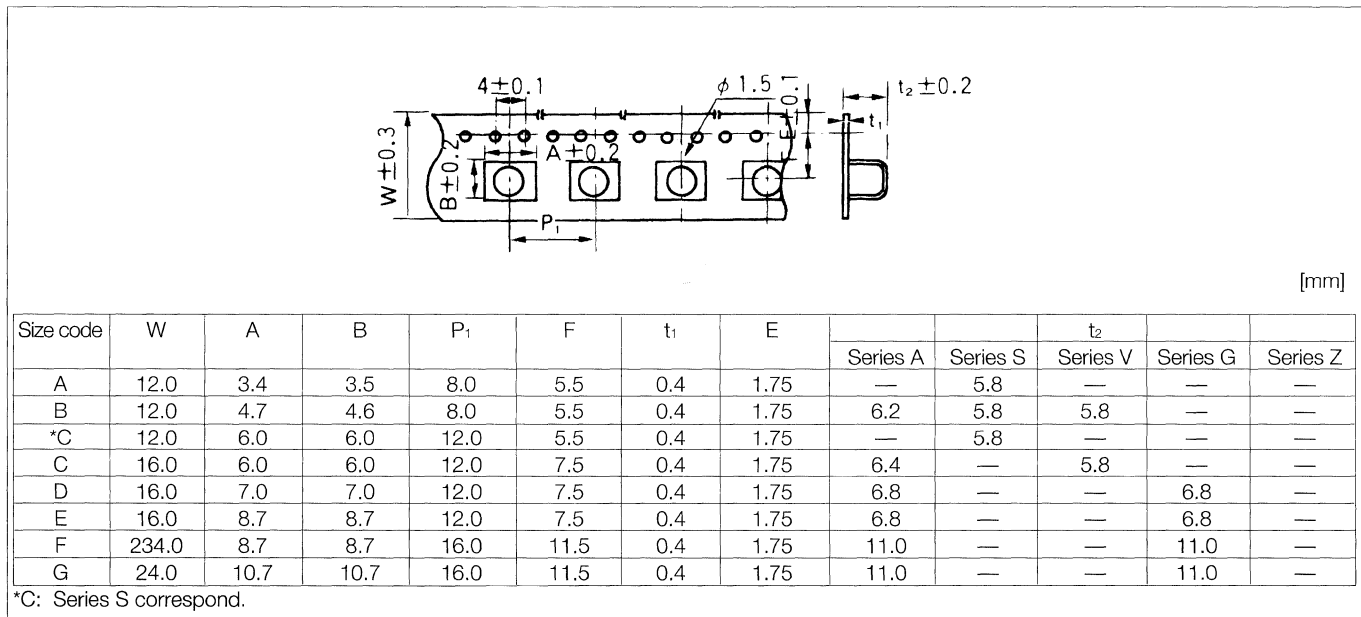
E C □	A	□ □	□	□ □ □	E
Common code	Shape	W.V code	Series code	Capacitance code	Suffix
Suffix code		Configurations			
E	Self mounting type	5mm pitch for ø4 ~ ø12.5 7.5mm pitch for ø16 ~ ø18			
(C)	Straight lead cut	1.5 ~ 7.5mm pitch for ø4 ~ ø18			
(F)	Formed & cut	5mm pitch for ø4 ~ ø18			

Packaging Specifications

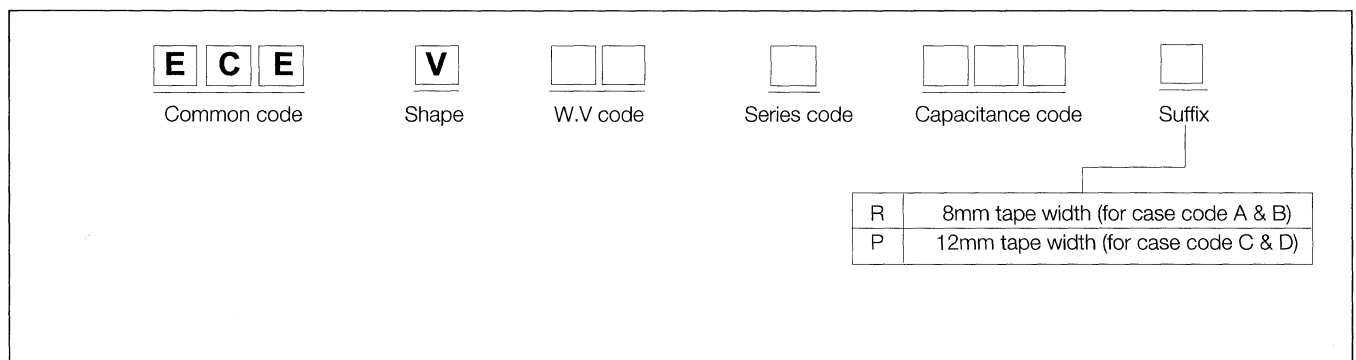
Reel Dimensions in mm (not to scale)



Taping Dimensions in mm (not to scale)

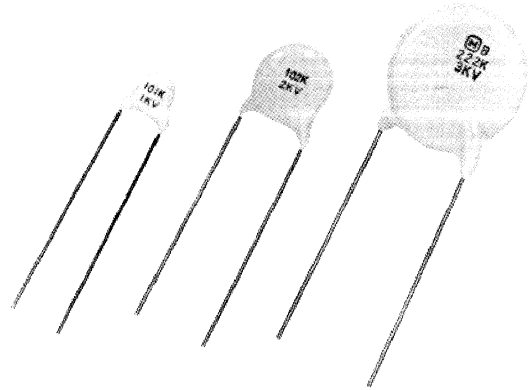


Explanation of Part Numbers



Features

- Wide operating temperature range: -25 to 125 °C
- Improved "Voltage vs. Temperature Rise" through low loss ceramic dielectric materials
- Temperature stable type (Char. B/Y5P)
- Flame-retardant insulating coating applied



Applications

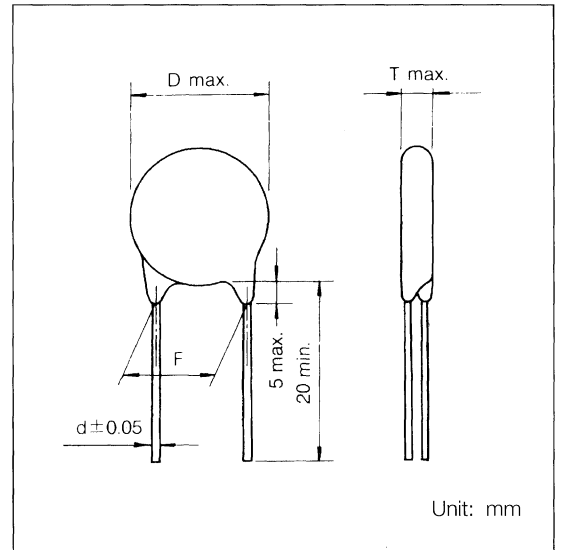
- Snubber circuit of switching power supply
- Horizontal resonance circuit of TV and CRT display
- Inverter lighting apparatus
- High voltage and pulse circuit

Specifications

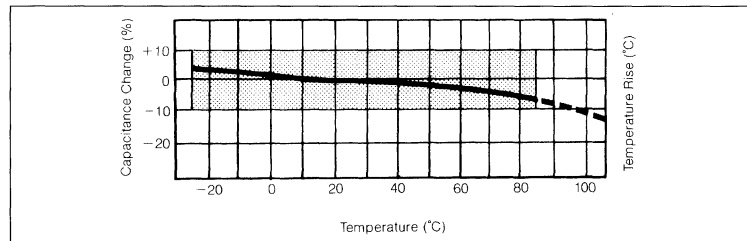
Characteristics	Specifications
Operating Temperature Range	-25 to 125 °C
Rated Voltage	1kVDC, 2 kVDC and 3 kVDC
Dielectric Withstanding Voltage	200% of the rated voltage for 1 to 5 seconds
Capacitance	Within the specified tolerance, when measured at 1 kHz ±10 %, 1 to 5 Vrms and 20 °C
Dissipation Factor	0.025 max. at 1 kHz ±10 %, 1 to 5 Vrms and 20 °C
Insulation Resistance	10000 MΩ min. at 500 VDC and 1 minute electrification
Temperature Characteristics	Capacitance Change: ±10 % max. over the temperature range of -20 to 85 °C

*Including maximum temperature rise of +20 °C

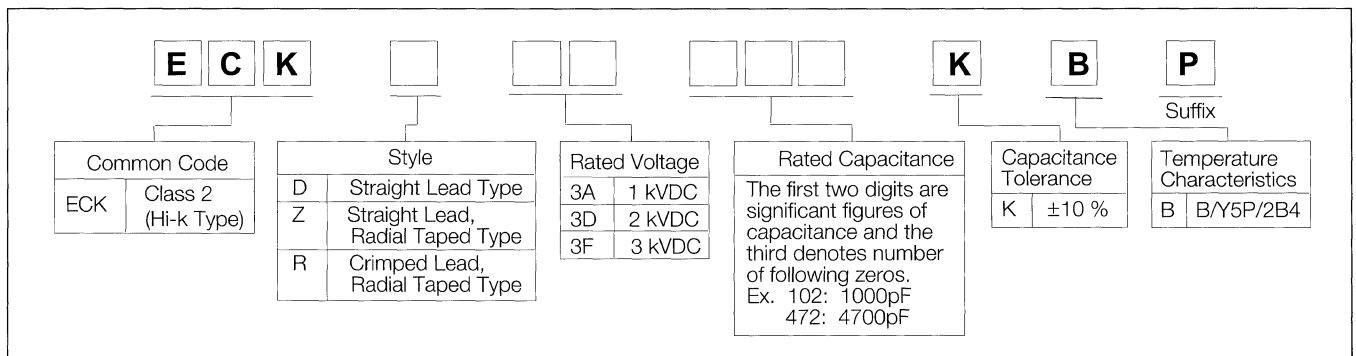
Dimensions



[Temperature Characteristic B/Y5P/2B4]



Explanation of Part Numbers



Standard Product (For DC and Pulse Circuit, Rated Voltage 1kV~3kVDC, B/Y5P/2B4)

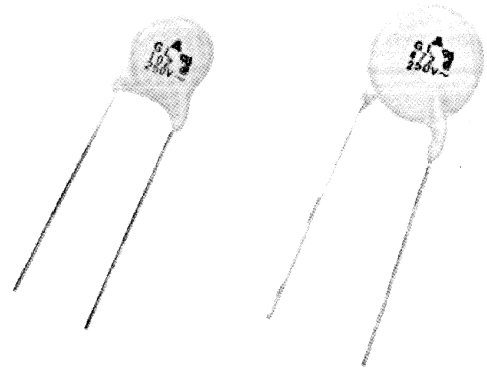
Rated Voltage	Part Number	Capacitance		Dimensions (mm)			
		Cap. (pF)	Tol. (%)	D max.	T max.	F	ød
1kVDC	ECKD3A101KBP	100	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A121KBP	120	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A151KBP	150	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A181KBP	180	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A221KBP	220	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A271KBP	270	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A331KBP	330	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A391KBP	390	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A471KBP	470	±10	6.0	4.5	5.0±1.5	0.6
	ECKD3A561KBP	560	±10	7.0	4.5	5.0±1.5	0.6
	ECKD3A681KBP	680	±10	7.0	4.5	5.0±1.5	0.6
	ECKD3A821KBP	820	±10	7.5	4.5	5.0±1.5	0.6
	ECKD3A102KBP	1000	±10	9.0	4.5	5.0±1.5	0.6
	ECKD3A122KBP	1200	±10	9.0	4.5	5.0±1.5	0.6
	ECKD3A152KBP	1500	±10	9.5	4.5	5.0±1.5	0.6
	ECKD3A182KBP	1800	±10	10.0	4.5	5.0±1.5	0.6
	ECKD3A222KBP	2200	±10	12.0	4.5	5.0±1.5	0.6
	ECKD3A272KBP	2700	±10	12.0	4.5	5.0±1.5	0.6
ECKD3A332KBP	3300	±10	13.5	4.5	10.0±2.0	0.6	
ECKD3A392KBP	3900	±10	13.5	4.5	10.0±2.0	0.6	
ECKD3A472KBP	4700	±10	15.5	4.5	10.0±2.0	0.6	
ECKD3A562KBP	5600	±10	17.0	4.5	10.0±2.0	0.6	
2kVDC	ECKD3D101KBP	100	±10	7.0	5.0	7.5±2.0	0.6
	ECKD3D121KBP	120	±10	7.0	5.0	7.5±2.0	0.6
	ECKD3D151KBP	150	±10	7.0	5.0	7.5±2.0	0.6
	ECKD3D181KBP	180	±10	7.0	5.0	7.5±2.0	0.6
	ECKD3D221KBP	220	±10	7.0	5.0	7.5±2.0	0.6
	ECKD3D271KBP	270	±10	7.0	5.0	7.5±2.0	0.6
	ECKD3D331KBP	330	±10	7.0	5.0	7.5±2.0	0.6
	ECKD3D391KBP	390	±10	7.0	5.0	7.5±2.0	0.6
	ECKD3D471KBP	470	±10	7.5	5.0	7.5±2.0	0.6
	ECKD3D561KBP	560	±10	8.0	5.0	7.5±2.0	0.6
	ECKD3D681KBP	680	±10	9.0	5.0	7.5±2.0	0.6
	ECKD3D821KBP	820	±10	9.0	5.0	7.5±2.0	0.6
	ECKD3D102KBP	1000	±10	10.0	5.0	7.5±2.0	0.6
	ECKD3D122KBP	1200	±10	10.5	5.0	7.5±2.0	0.6
	ECKD3D152KBP	1500	±10	12.0	5.0	7.5±2.0	0.6
	ECKD3D182KBP	1800	±10	12.5	5.0	7.5±2.0	0.6
	ECKD3D222KBP	2200	±10	14.0	5.0	10.0±2.0	0.6
	ECKD3D272KBP	2700	±10	16.0	5.0	10.0±2.0	0.6
ECKD3D332KBP	3300	±10	17.0	5.0	10.0±2.0	0.6	
ECKD3D392KBP	3900	±10	18.0	5.0	10.0±2.0	0.6	
ECKD3D472KBP	4700	±10	25.0	5.0	10.0±2.0	0.8	
ECKD3D562KBP	5600	±10	25.0	5.0	10.0±2.0	0.8	
3kVDC	ECKD3F101KBP	100	±10	7.5	6.0	7.5±2.0	0.65
	ECKD3F121KBP	120	±10	7.5	6.0	7.5±2.0	0.65
	ECKD3F151KBP	150	±10	7.5	6.0	7.5±2.0	0.65
	ECKD3F181KBP	180	±10	7.5	6.0	7.5±2.0	0.65
	ECKD3F221KBP	220	±10	7.5	6.0	7.5±2.0	0.65
	ECKD3F271KBP	270	±10	7.5	6.0	7.5±2.0	0.65
	ECKD3F331KBP	330	±10	8.0	6.0	7.5±2.0	0.65
	ECKD3F391KBP	390	±10	9.0	6.0	7.5±2.0	0.65
	ECKD3F471KBP	470	±10	9.5	6.0	7.5±2.0	0.65
	ECKD3F561KBP	560	±10	10.0	6.0	7.5±2.0	0.65
	ECKD3F681KBP	680	±10	11.0	6.0	7.5±2.0	0.65
	ECKD3F821KBP	820	±10	11.0	6.0	7.5±2.0	0.65
	ECKD3F102KBP	1000	±10	12.5	6.0	7.5±2.0	0.65
	ECKD3F122KBP	1200	±10	14.5	6.0	10.0±2.0	0.65
	ECKD3F152KBP	1500	±10	14.5	6.0	10.0±2.0	0.65
	ECKD3F182KBP	1800	±10	16.0	6.0	10.0±2.0	0.65
	ECKD3F222KBP	2200	±10	17.0	6.0	10.0±2.0	0.65
	ECKD3F272KBP	2700	±10	18.5	6.0	10.0±2.0	0.65

Features

- Ceramic Disc Capacitors, "Type GL", rated 250 VAC, are recognized by UL

Related Standards and Certificate Number

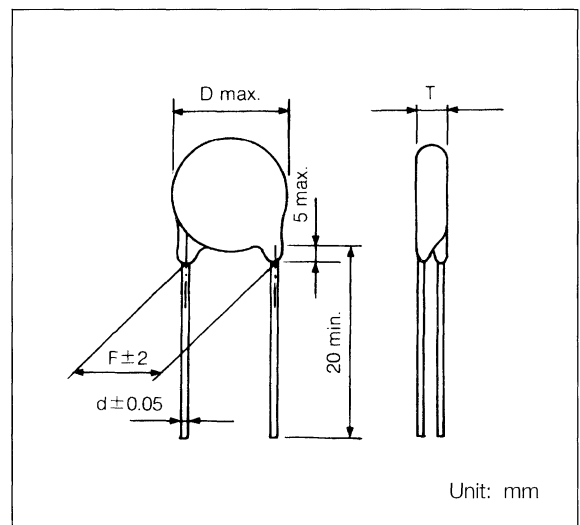
Related Standards	Certificate Number/File No.
UL1414	E62674 (Rated 250 VAC)
CSA C22.2	LR58064-7 (Rated 125 VAC)



Specifications (Type GL)

Characteristics	Specifications		
Operating Temperature Range	-25 to 85 °C		
Rated Voltage	Applicable Standards		
	Rated Voltage		
Dielectric Withstanding Voltage	1500 VAC for 1 minute		
	Capacitance	Within the specified tolerance, when measured at 1 kHz, 1 to 5 Vrms and 20 °C	
Dissipation Factor	B/Y5P/2B4: 0.025 max.		
	E/Y5U/2E4: 0.025 max.		
Insulation Resistance	V: 0.05 max.		
	10000 MΩ min. at 500 VDC, 1 minute		
Temperature Characteristics (see page 68)	T.C.	Cap. Change	Temp. Range
	B/Y5P/2B4	±10 % max.	-25 to 85 °C
	E/Y5U/2E4	\pm_{-30}^{+20} % max.	-25 to 85 °C
	V	\pm_{-30}^{+30} % max.	0 to 70 °C
The reference temperature: 20 °C			

Dimensions

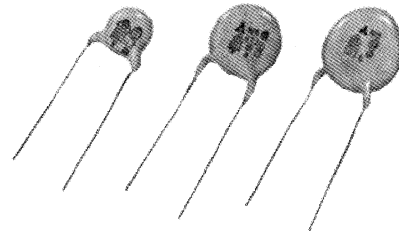


Ratings and Characteristics

Part Number	Capacitance (pF)	Tolerance (%)	Temperature Characteristics	Dimensions in mm			
				D max.	T max.	F	d
ECKDGL101MB	100	±20	B/Y5P/2B4	8.0	5.5	7.5	0.65
ECKDGL151MB	150	±20	B/Y5P/2B4	8.0	5.5	7.5	0.65
ECKDGL221MB	220	±20	B/Y5P/2B4	8.0	5.5	7.5	0.65
ECKDGL331MB	330	±20	B/Y5P/2B4	8.0	5.5	7.5	0.65
ECKDGL471MB	470	±20	B/Y5P/2B4	9.0	5.5	7.5	0.65
ECKDGL681MB	680	±20	B/Y5P/2B4	9.0	5.5	7.5	0.65
ECKDGL102ME	1000	±20	E/Y5U/2E4	9.0	5.5	7.5	0.65
ECKDGL152ME	1500	±20	E/Y5U/2E4	11.0	5.5	7.5	0.65
ECKDGL222ME	2200	±20	E/Y5U/2E4	12.0	5.5	7.5	0.65
ECKDGL332ME	3300	±20	E/Y5U/2E4	15.0	5.5	10.0	0.65
ECKDGL472ME	4700	±20	E/Y5U/2E4	17.0	5.5	10.0	0.65
ECKDGL472ZV	4700	+80, -20	V	12.0	5.5	7.5	0.65
ECKDGL103ZV	10000	+80, -20	V	17.0	5.5	10.0	0.65

Features

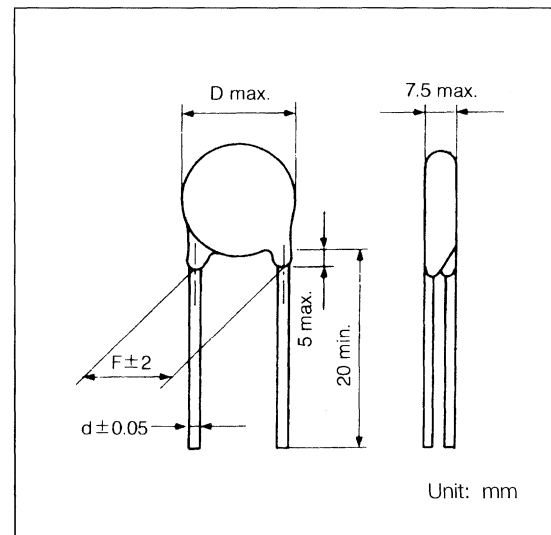
- Ceramic Disc Capacitors, Type NS, are recognized by UL, CSA, BSI, SEMKO, SEV and VDE
- The NS (Suffix: X) capacitors are applicable to "Class II" equipment in European safety regulations



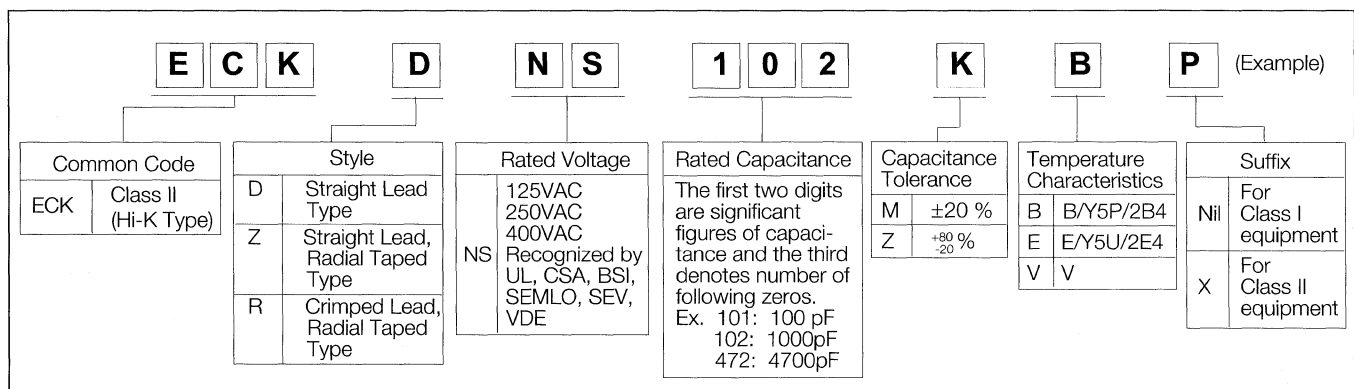
Specifications (Type NS)

Characteristics	Specifications		
Operating Temperature Range	-25 to 85 °C		
Rated Voltage	Applicable Standards		
	UL, CSA	125 VAC	
	VDE (565-1)	250 VAC	
	VDE (560-2), SEV, BS, SEMKO	400 VAC	
Dielectric Withstanding Voltage	[For Class II equipment] 4000 VAC, 1 min.		
	[For Class I equipment] 2600 VAC, 1 min.		
Notes: [T.C. E, 10000 pF] 2000 VAC, 1 min. [T.C. V] 2500 VAC, 1 min.			
Capacitance	Within the specified tolerance, when measured at 1 kHz, 1 to 5 Vrms and 20 °C		
Dissipation Factor	B/Y5P/2B4, E/Y5U/2E4: 2.5% max. V: 5.0% max.		
	When measured at 1 kHz, 5Vrms max. and 20 °C		
Insulation Resistance	10000 MΩ min. at 500 VDC, 1 minute		
Temperature Characteristics (see page 68)	T.C.	Cap. Change	Temp. Range
	B/Y5P/2B4	±10 % max.	-25 to 85 °C
	E/Y5U/2E4	+20 -55 % max.	-25 to 85 °C
	V	+80 -80 % max.	0 to 70 °C
•The reference temperature: 20 °C			

Dimensions



Explanation of Part Numbers



Related Standards and Certificate Numbers

Related Standard			Certificate Number	T.C.	Cap. Range (Applicable)
UL	(USA)	UL1414	E62674	B/E/V	100~22000 pF
CSA	(Canada)	CSA C22.2	LR31605	B/E/V	100~22000 pF
VDE	(Germany)	VDE 560-2*	32543	B	100~1000 pF
			35912	E	1500~4700 pF
			32543	V	4700~22000 pF
		VDE 565-1*	32544	B	100~1000 pF
			35912	E	1500~4700 pF
SEV	(Switzerland)	SEV 1016**	90,102655,11	B/E	100~4700 pF
		SEV1055 X**	90,102655,12	E	10000pF
BSI	(UK)	BS 415	415226319	B/E/V	100~22000pF
SEMKO	(Sweden)	SEMKO 101	8372418	B/E/V	100~22000 pF

Notes: *VDE 560-2: For coupling use

**SEV 1016: For protection from electric shock

VDE 565-1: For radio interference suppressor

SEV 1055: For radio interference suppressor

Standard Products (Type NS)

Part Number	Capacitance		T.C.	Dimensions (mm)			Applicable standards						
	Rated Cap. (pF)	Tol. (%)		D max.	F	d	UL	CSA	VDE		SEV	BS	SEMKO
									560-2	565-1			
ECKDNS101MBX	100	±20	B	11.0	10.0	0.65	○	○	●	●	●	●	●
ECKDNS221MBX	220	±20	B	11.0	10.0	0.65	○	○	●	●	●	●	●
ECKDNS471MBX	470	±20	B	11.0	10.0	0.65	○	○	●	●	●	●	●
ECKDNS102MBX	1000	±20	B	11.0	10.0	0.65	○	○	●	●	●	●	●
ECKDNS152MEX	1500	±20	E	11.0	10.0	0.65	○	○	●	●	●	●	●
ECKDNS222MEX	2200	±20	E	11.0	10.0	0.65	○	○	●	●	●	●	●
ECKDNS332MEX	3300	±20	E	13.0	10.0	0.65	○	○	●	●	●	●	●
ECKDNS472MEX	4700	±20	E	16.0	10.0	0.65	○	○	●	●	●	●	●
ECKDNS101MB	100	±20	B	10.5	7.5	0.65	○	○	○	○	○	○	○
ECKDNS221MB	221	±20	B	10.5	7.5	0.65	○	○	○	○	○	○	○
ECKDNS471MB	470	±20	B	10.5	7.5	0.65	○	○	○	○	○	○	○
ECKDNS102MB	1000	±20	B	10.5	7.5	0.65	○	○	○	○	○	○	○
ECKDNS152ME	1500	±20	E	10.5	7.5	0.65	○	○	○	○	○	○	○
ECKDNS222ME	2200	±20	E	10.5	7.5	0.65	○	○	○	○	○	○	○
ECKDNS332ME	3300	±20	E	13.0	10.0	0.65	○	○	○	○	○	○	○
ECKDNS472ME	4700	±20	E	16.0	10.0	0.65	○	○	○	○	○	○	○
ECKDNS103ME	10000	±20	E	22.0	10.0	0.80	○	○	—	—	—	○	○
ECKDNS472ZV	4700	+80, -20	V	12.0	7.5	0.65	○	○	○	—	—	○	○
ECKDNS103ZV	10000	+80, -20	V	17.5	10.0	0.65	○	○	○	—	—	○	○
ECKDNS223ZV	22000	+80, -20	V	24.0	10.0	0.80	○	○	○	—	—	○	○

Notes: ○ for Class I equipment

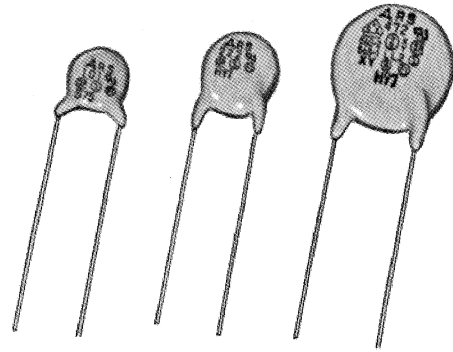
● for Class II equipment

Ceramic Disc Capacitors For Safety Regulations (Class I)

ECK-DRS Series

Ceramic disc capacitors, Type RS, are recognized by the following safety regulations:

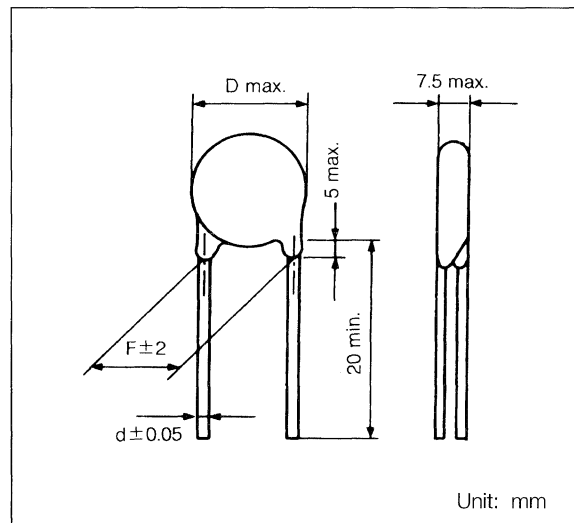
- UL1414 (125 VAC) and CSA (125 VAC)
- European safety regulations for "Class I" equipment:
VDE, SEV, BSI, SEMKO, FIMKO, NEMKO
and DEMKO



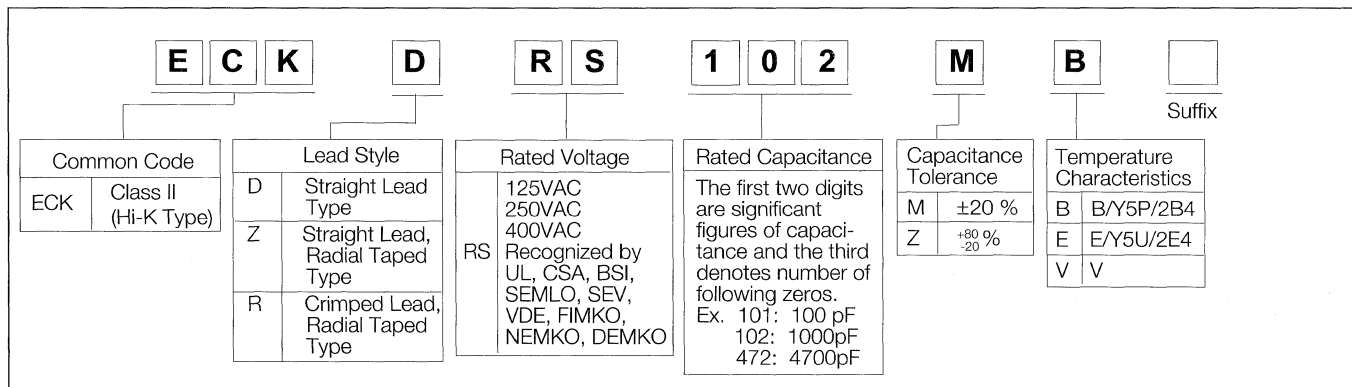
Specifications (Type RS)

Characteristics	Specifications		
Operating Temperature Range	-25 to 85 °C		
Rated Working Voltage	Applicable Standards	Rated Voltage	
	UL, CSA	125 VAC	
	VDE (565-1)	250 VAC	
	VDE (560-2), FIMKO NEMKO, DEMKO SEV, BS, SEMKO	400 VAC	
Dielectric Withstanding Voltage	T.C.	Voltage	
	B/Y5P/2B4, E/Y5U/2E4 V	2600VAC for 1 min. 2500VAC for 1 min.	
Capacitance	Within the tolerance, when measured at 1 kHz, 5 Vrms. max. and 20 °C		
Dissipation Factor	B/Y5P/2B4, E/Y5U/2E4: 2.5% max.		
	V: 5.0% max.		
Insulation Resistance	When measured at 1kHz, 5Vrms. max. and 20 °C		
	10000 MΩ min. at 500 V DC. 1 minute		
Temperature Characteristics (see page 68)	T.C.	Cap. Change	Temp. Range
	B/Y5P/2B4	±10 % max.	-25 to 85 °C
	E/Y5U/2E4	\pm_{-5}^{+20} % max.	-25 to 85 °C
	V	\pm_{-30}^{+30} % max.	0 to 70 °C
● The reference temperature: 20 °C			

Dimensions



Explanation of Part Numbers



Related Standards and Certificate Numbers

Related Standard			Certificate Number	T.C.	Cap. Range (Applicable)
UL	(USA)	UL1414	E62674	B/E/V	100~10000 pF
CSA	(Canada)	CSA C22.2	LR58064-7	B/E/V	100~10000 pF
VDE	(Germany)	VDE 560-2	51437	B	100~1000 pF
			51438	E	1500~4700 pF
			51436	V	4700~10000 pF
		VDE 565-1	51454	B	100~1000 pF
			51455	E	1500~4700 pF
SEV	(Switzerland)	SEV 1016	ⓑ 87, 1 02636, 04	B/E	100~3300 pF
			ⓐ 87, 1 02636, 05	B/E	100~4700 pF
		SEV1055	X 87, 1 02636, 08	B/E	100~4700 pF
			Y 87, 1 02636, 06	B/E	100~4700 pF
BSI	(UK)	BS 415	226843	B/E/V	100~10000 pF
SEMKO	(Sweden)	SEMKO 101	8731033	B/E/V	100~10000 pF
FIMKO	(Finland)	E101-82	121318-01	B/E/V	100~10000 pF
		E384-14/82	124364-01	B/E/V	100~10000 pF
NEMKO	(Norway)	IEC 65	E44177	B/E/V	100~10000 pF
		132/85	E 44178, E 44179	B/E/V	100~10000 pF
DEMKO	(Denmark)	SECTION 21	98270 EC	B/E/V	100~10000 pF
		SECTION 101	98270 EC	B/E/V	100~10000 pF

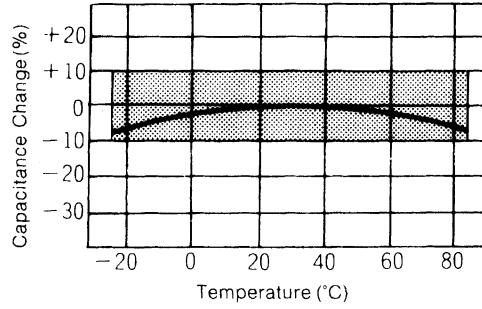
Standard Products (Type NS)

Part Number	Capacitance		T.C.	Dimensions (mm)			Applicable standards									
	Rated Cap. (pF)	Tol. (%)		D max.	F	d	UL	CSA	VDE		SEV		BS	SEMKO NEMKO	FIMKO DEMKO	
									560-2	565-1	1016	1055				
ECKDRS101MB	100	±20	B	9.5	7.5	0.65	○	○	○	○	○	○	○	○	○	○
ECKDRS151MB	150	±20	B	9.5	7.5	0.65	○	○	○	○	○	○	○	○	○	○
ECKDRS221MB	220	±20	B	9.5	7.5	0.65	○	○	○	○	○	○	○	○	○	○
ECKDRS471MB	470	±20	B	9.5	7.5	0.65	○	○	○	○	○	○	○	○	○	○
ECKDRS102MB	1000	±20	B	10.0	7.5	0.65	○	○	○	○	○	○	○	○	○	○
ECKDRS152ME	1500	±20	E	10.0	7.5	0.65	○	○	○	○	○	○	○	○	○	○
ECKDRS222ME	2200	±20	E	10.5	7.5	0.65	○	○	○	○	○	○	○	○	○	○
ECKDRS332ME	3300	±20	E	12.5	7.5	0.65	○	○	○	○	○	○	○	○	○	○
ECKDRS472ME	4700	±20	E	16.0	10.0	0.65	○	○	○	○	△	○	○	○	○	○
ECKDRS472ZV	4700	+80/-20	V	11.0	7.5	0.65	○	○	○	—	—	—	○	○	○	○
ECKDRS103ZV	10000	+80/-20	V	17.0	10.0	0.65	○	○	○	—	—	—	○	○	○	○

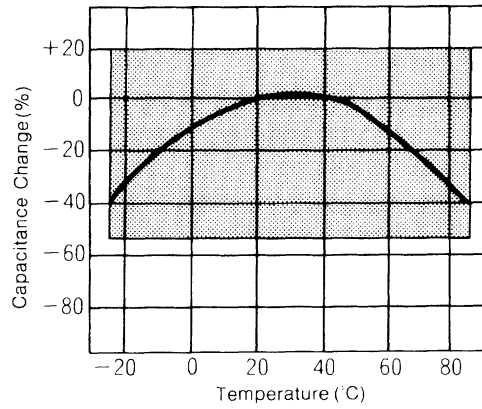
Notes: ○: Indicates recognized components by the related standards on the table.

△: ECKDRS472ME; Applicable only for SEV1016 ⓐ, not applicable for SEV1016 ⓑ.

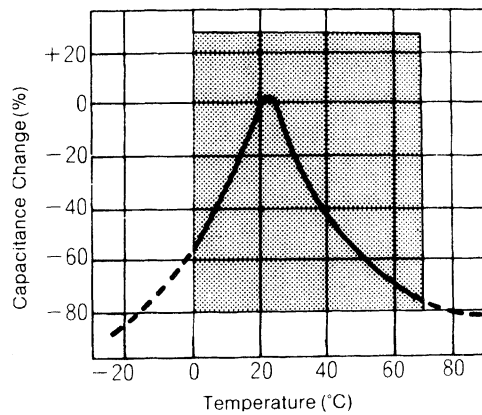
Temperature Characteristics B/Y5P/2B4



Temperature Characteristics E/Y5U/2E4



Temperature Characteristics V



Standard Products and Individual Taping Specifications

For DC and Pulse Circuit, Rated Voltage 500V DC to 3kV DC B/Y5P/2B4, SL/GP

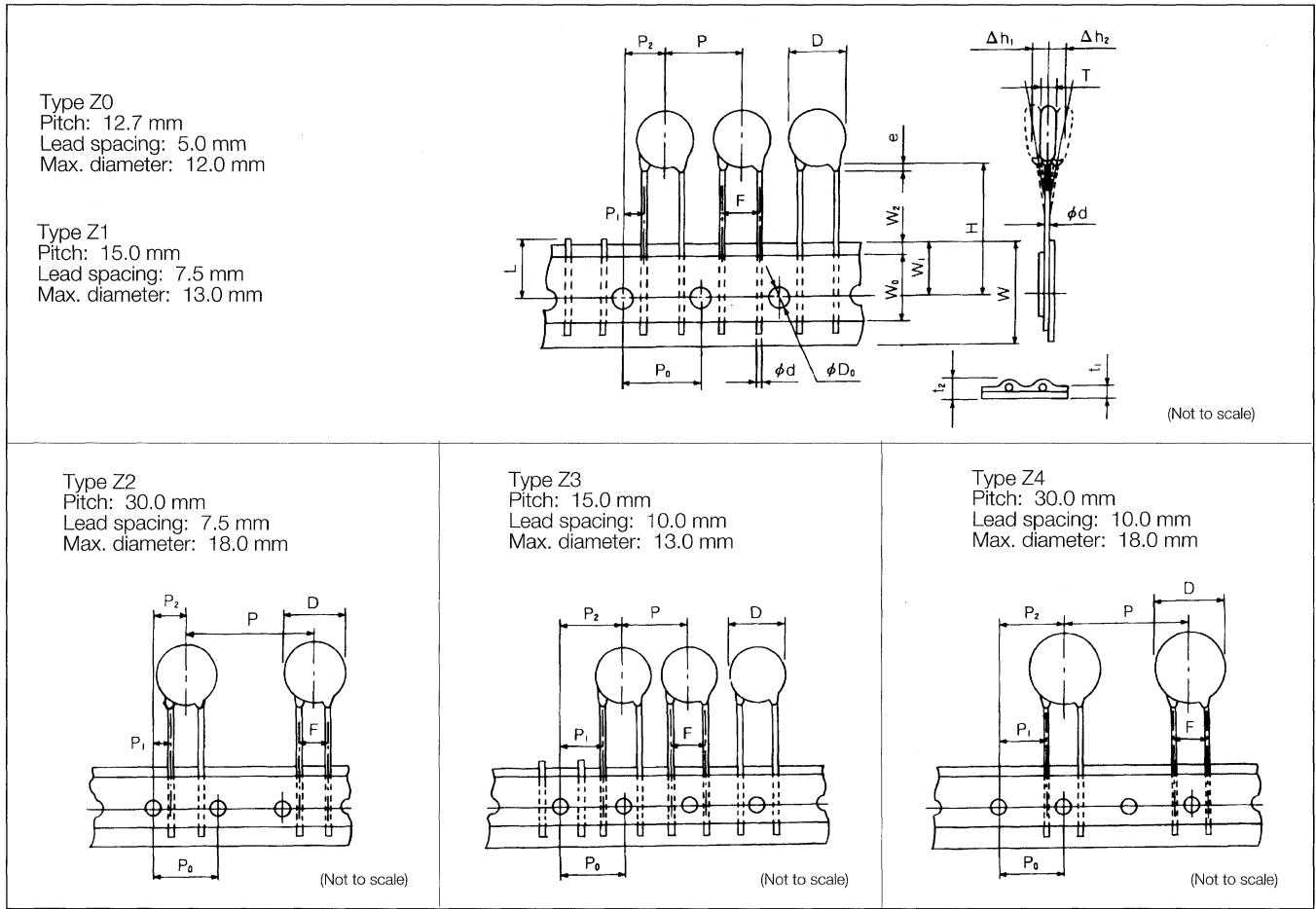
Rated Voltage	Temp. Char.	Part Number	Capacitance Range (pF)	Taping Dimensions in mm			
				Taping Type	F	P ₀	P
1kV DC	B	ECKZ3A□□□□KBP	100~2700	Z0, R0	5.0±0.8	12.7±0.3	12.7±1.0
		ECKR3A□□□□KBP	3300~5600	Z2, R2	7.5±1.0	15.0±0.3	30.0±2.0
2kV DC	B	ECKZ3D□□□□KBP	100~1800	Z1, R1	7.5±1.0	15.0±0.3	15.0±2.0
		ECKR3D□□□□KBP	2200~3900	Z2, R2	7.5±1.0	15.0±0.3	30.0±1.0
3kV DC	B	ECKZ3F□□□□KBP	100~1200	Z1, R1	7.5±1.0	15.0±0.3	15.0±2.0
		ECKR3F□□□□KBP	1500~2700	Z2, R2	7.5±1.0	15.0±0.3	30.0±2.0

Safety Regulations Recognized Type RS, NS, and GL

Type	Temp. Char.	Part Number	Capacitance Range (pF)	Taping Dimensions in mm			
				Taping Type	F	P ₀	P
RS (For Class I equipment)	B	ECKZRS□□□□B	100 - 1000	Z1, R1	7.5±1.0	15.0±0.3	15.0±2.0
		ECKRRS□□□□B					
	E	ECKZRS□□□□ME	1500 - 3300	Z1, R1	7.5±1.0	15.0±0.3	15.0±2.0
		ECKRRS□□□□ME						4700	Z2, R2	7.5±1.0	15.0±0.3	30.0±2.0
V	E	ECKZRS□□□□ZV	4700	Z1, R1	7.5±1.0	15.0±0.3	15.0±2.0
		ECKRRS□□□□ZV						10000	Z2, R2	7.5±1.0	15.0±0.3	30.0±2.0
NS (For Class II equipment)	B	ECKZNS□□□□BX	100 - 1000	Z3	10.0±1.2	15.0±0.3	15.0±2.0
		E	ECKZNS□□□□MEX	1500 - 3300	Z3	10.0±1.2	15.0±0.3	15.0±2.0
				4700	Z4	10.0±1.2	15.0±0.3	30.0±2.0
GL	B	ECKZGL□□□□MB	100 - 680	Z1, R1	7.5±1.0	15.0±0.3	15.0±2.0
	E	ECKRGL□□□□ME	3300 - 4700	Z2, R2	7.5±1.0	15.0±0.3	30.0±2.0
	V	ECKRGL□□□□ZV	10000	Z2, R2	7.5±1.0	15.0±0.3	30.0±2.0

*See next page for taping type detail

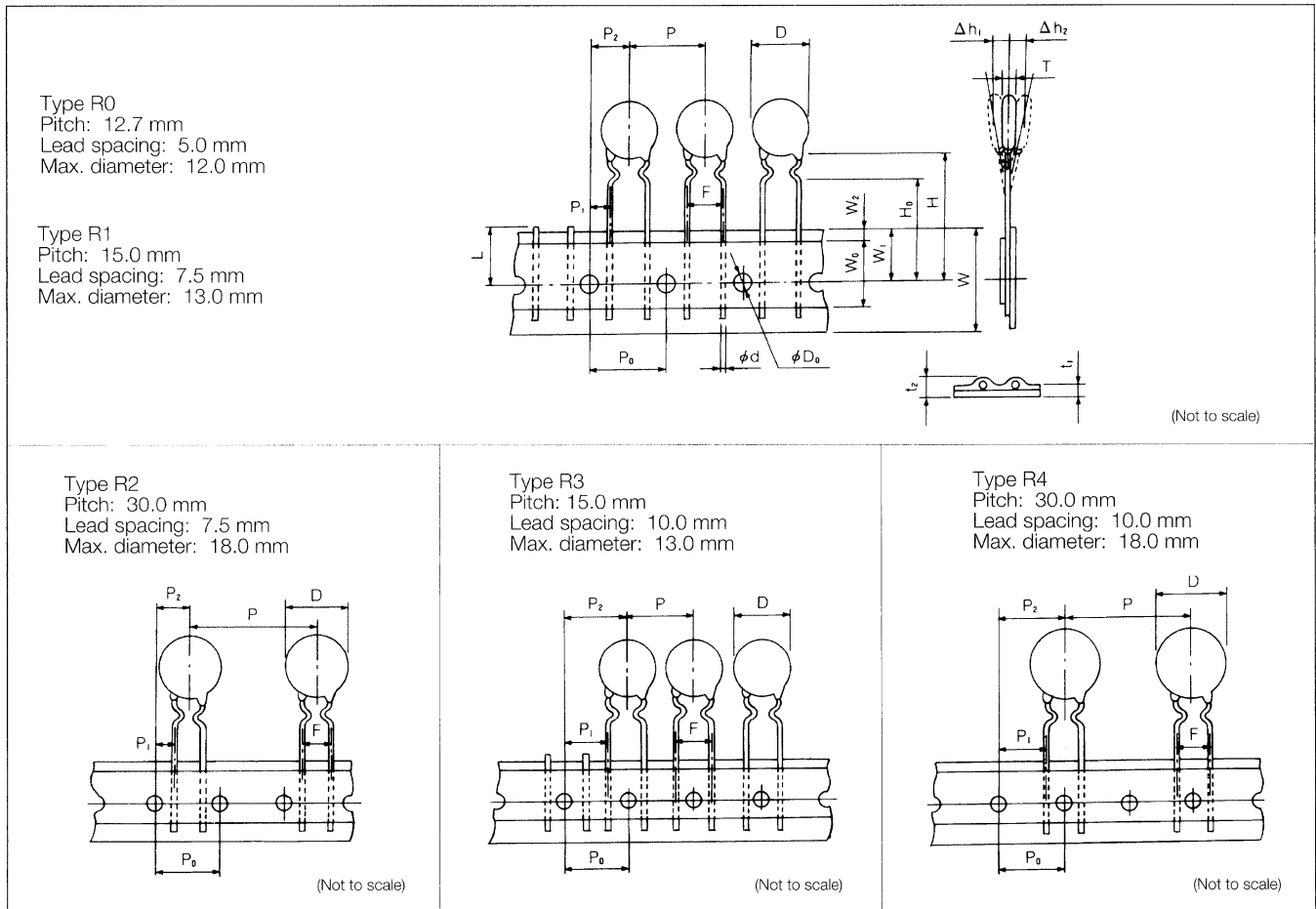
Specifications for Straight Lead, Radial Taped Type



Taping Dimensions in mm

Taping Type	Z0	Z1	Z2	Z3	Z4
Symbol					
P	12.7±1.0	15.0±2.0	30.0±2.0	15.0±2.0	30.0±2.0
P ₀	12.7±0.3	15.0±0.3	15.0±0.3	15.0±0.3	15.0±0.3
F	5.0±0.8	7.5±1.0	7.5±1.0	10.0±1.2	10.0±1.2
P ₁	3.85±0.70	3.75±0.80	3.75±0.80	10.0±0.8	10.0±0.8
P ₂	6.35±1.30	7.5±1.5	7.5±1.5	15.0±1.5	15.0±1.5
D	(To comply with each individual specification)				
W	18.0 ^{+0.0} _{-0.3}				
W ₀	10.0 min.				
W ₁	9.0±0.5				
W ₂	3.0 max.				
H	18.0 ^{+2.0} ₀				
e	3.0 max.				
øD ₀	4.0±0.2				
ød	0.60±0.05 or 0.65±0.05				
t ₁	0.6±0.3				
t ₂	1.5 max.				
T	(To comply with each individual specification)				
Δh ₁ , Δh ₂	2.0 max.				
L	11.0 max.				

Specifications for Crimped Lead, Radial Taped Type



Taping Dimensions in mm

Taping Type Symbol	R0	R1	R2	R3	R4
P	12.7±1.0	15.0±2.0	30.0±2.0	15.0±2.0	30.0±2.0
P ₀	12.7±0.3	15.0±0.3	15.0±0.3	15.0±0.3	15.0±0.3
F	5.0±0.8	7.5±1.0	7.5±1.0	10.0±1.2	10.0±1.2
P ₁	3.85±0.70	3.75±0.80	3.75±0.80	10.0±0.8	10.0±0.8
P ₂	6.35±1.30	7.5±1.5	7.5±1.5	15.0±1.5	15.0±1.5
D	(To comply with each individual specification)				
W	18.0 ^{+1.0} _{-0.5}				
W ₀	10.0 min.				
W ₁	9.0±0.5				
W ₂	3.0 max.				
H	20.0				
H ₀	16.0 ^{+1.0} _{-0.5}				
øD ₀	4.0±0.2				
ød	0.60±0.05 or 0.65±0.05				
t ₁	0.6±0.3				
t ₂	1.5 max.				
T	(To comply with each individual specification)				
Δh ₁ , Δh ₂	2.0 max.				
L	11.0 max.				

Packing Specifications

Packing Quantity

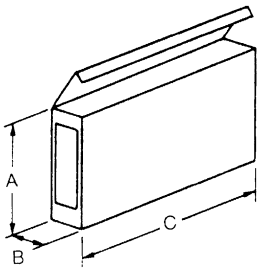
High Voltage Capacitors (1 to 3kV DC)

Temperature Characteristics	Rated Voltage	Capacitance Range (pF)	Packing Quantity (pcs)
B	1kV DC	100 to 2700	2000
		3000	1000
		4700 to 5600	500
	2kV DC	100 to 1800	1000
		2200 to 3900	500
	3kV DC	100 to 1200	1000
1500 to 2700		500	
E	1kV DC	680 to 4700	2000
		6800	1000
		10000	500
	2kV DC	1000 to 3300	1000
		4700 to 6800	500
	3kV DC	1000 to 2200	1000
3300 to 4700		500	

Safety Regulations Recognized Type

Type	Temperature Characteristics	Capacitance Range (pF)	Packing Quantity (pcs.)
RS	B,E,V	100 - 10000	500
NS	B,E	100 - 4700	500
GL	B,E,V	100 - 10000	500

Packing Case



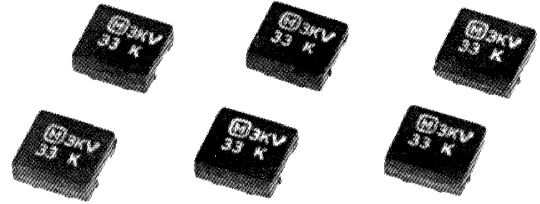
Unit: mm

Symbol	Dimensions*
A	150 or 175 or 190 or 215
B	47 or 55
C	335

Note: *Tolerance; ±3 mm

Features

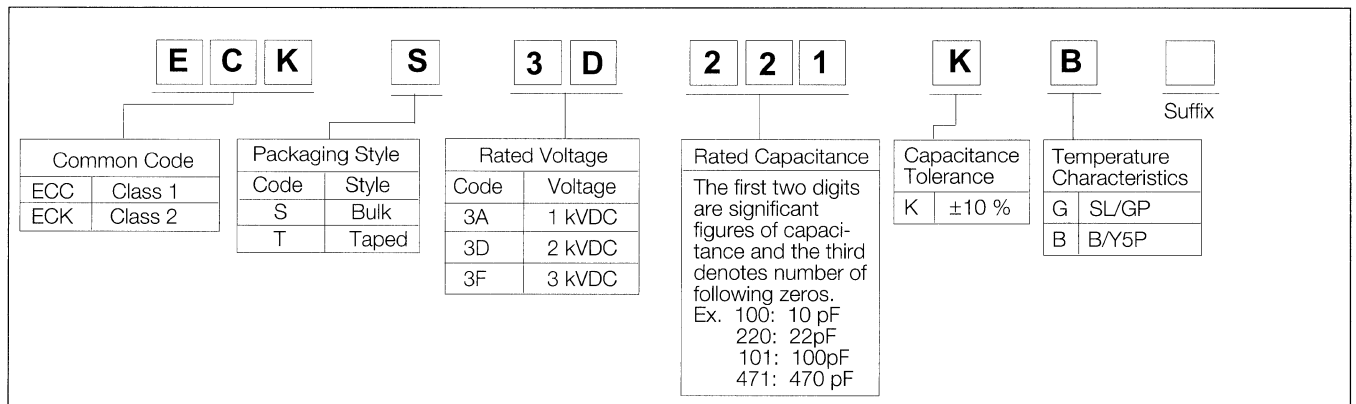
- Resin molded type for reflow soldering with a high voltage rating of 1 to 3 kVDC
- High reliability through disc capacitor element molded construction
- Excellent "Voltage vs. Temperature Rise" through low loss ceramic dielectric materials
- Temperature stable type
(Characteristics: SL/GP and B/Y5P)



Performance Characteristics

Characteristics	Characteristics SL/GP	Characteristics B/Y5P
Operating Temperature Range	-25 to 105 °C	
Rated Voltage	3 kVDC	1 to 2 kVDC
Capacitance Range	10 to 47 pF	1 kVDC - 390 to 470 pF 2 kVDC - 100 to 330 pF
Dielectric Withstanding Voltage	200% of the Rated Voltage for 1 to 5 seconds	
Capacitance	Within the specified tolerance at 1 MHz, 1 to 5 Vrms and 20 °C	Within the specified tolerance at 1 kHz, 1 to 5 Vrms and 20 °C
Q or Dissipation Factor (tan δ)	C<30 pF: Q≥400 + 20 C (C: Cap. pF) C≥30 pF: Q≥1000 at 1 MHz, 1 to 5 Vrms and 20 °C	D.F. (tan δ)≤0.025 at 1 kHz, 1 to 5 Vrms and 20 °C
Insulation Resistance	10000 MΩ min. at 500 VDC and 1 minute electrification	
Temperature Characteristics	Temperature Coefficient: +350 to -1000 ppm/°C	Max. Capacitance Change: ΔC/C±10% (Temperature Range: -25 to 85 °C)

Explanation of Part Numbers

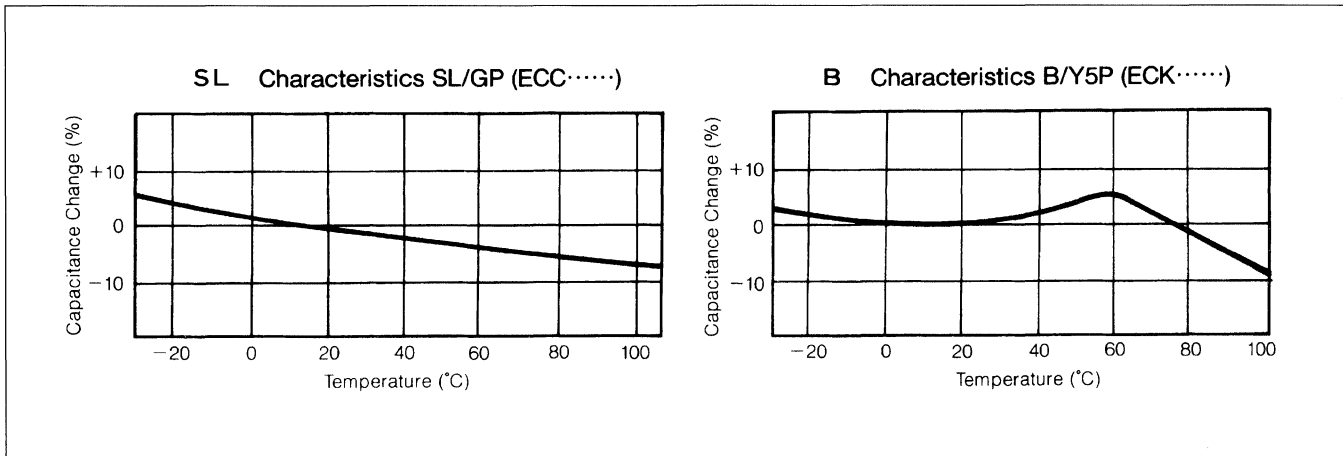


Standard Products

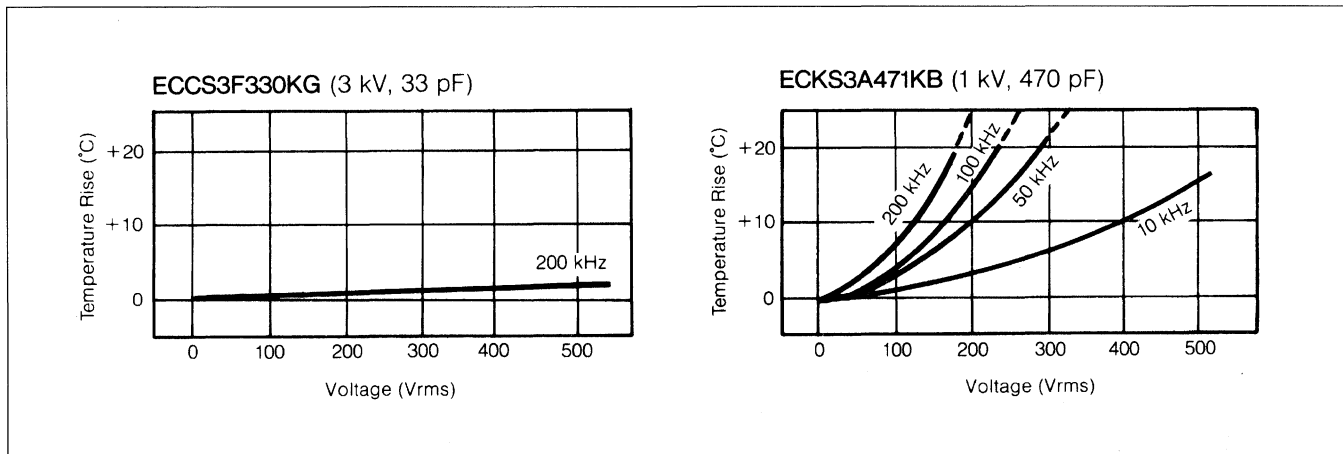
Rated Voltage	Part Number	Rated Capacitance (pF)	Capacitance Tolerance (%)	Temperature Characteristics
3 kVDC	ECC□3F100KG	10	±10	SL/GP
	ECC□3F120KG	12	±10	SL/GP
	ECC□3F150KG	15	±10	SL/GP
	ECC□3F180KG	18	±10	SL/GP
	ECC□3F220KG	22	±10	SL/GP
	ECC□3F270KG	27	±10	SL/GP
	ECC□3F330KG	33	±10	SL/GP
	ECC□3F390KG	39	±10	SL/GP
	ECC□3F470KG	47	±10	SL/GP
2 kVDC	ECK□3D101KB	100	±10	B/Y5P
	ECK□3D121KB	120	±10	B/Y5P
	ECK□3D151KB	150	±10	B/Y5P
	ECK□3D181KB	180	±10	B/Y5P
	ECK□3D221KB	220	±10	B/Y5P
	ECK□3D271KB	270	±10	B/Y5P
	ECK□3D331KB	330	±10	B/Y5P
1 kVDC	ECK□3A391KB	390	±10	B/Y5P
	ECK□3A471KB	470	±10	B/Y5P

□: Packaging Styles Code: S; Bulk, T; Embossed Taping

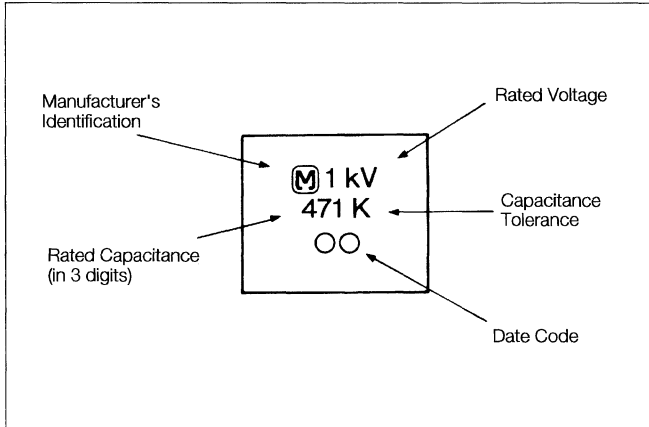
Temperature Characteristics



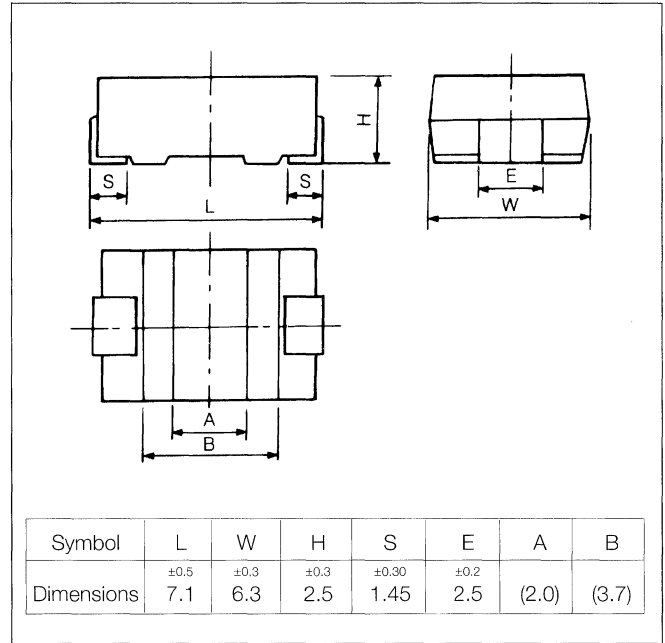
Applied Voltage vs. Temperature Rise



Markings (Example)



Dimensions in mm (not to scale)



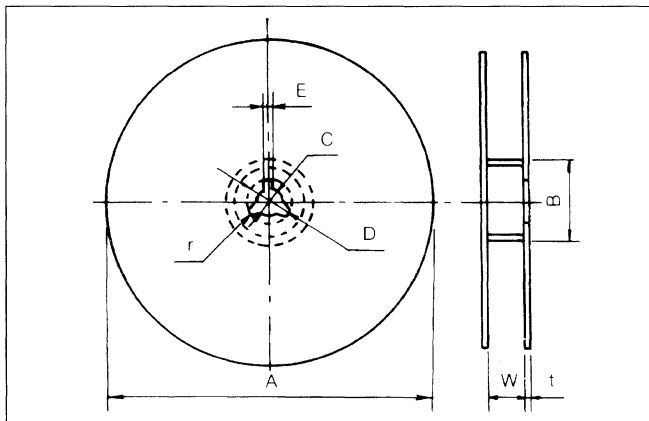
Packaging Specifications

Standard Packing Quantity

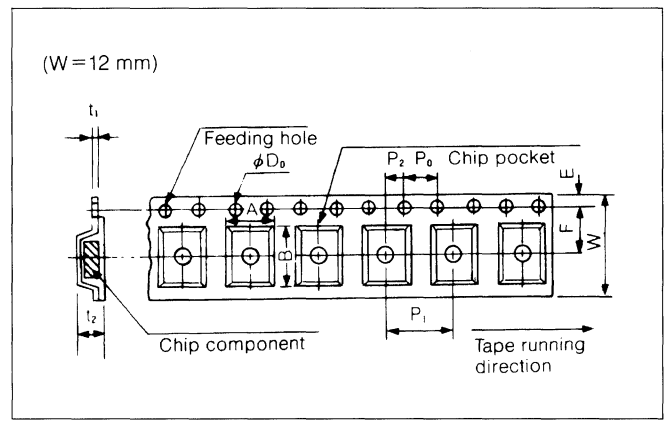
Bulk: 1000 pcs./bag

Embossed taping: 2000 pcs./reel

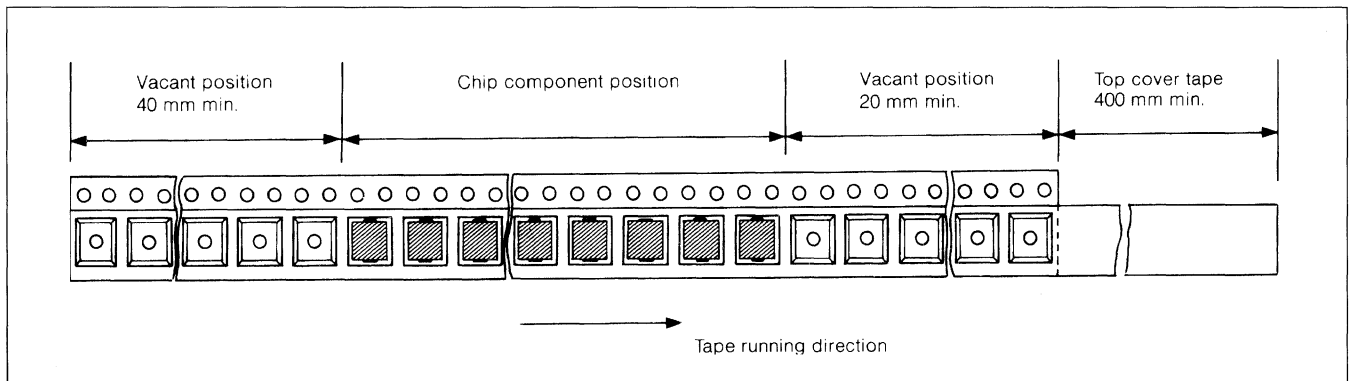
Reel



Embossed taping



Leader Part and Taped End



Features

- Small size/wide capacitance range
- Superior humidity characteristic and long life
- Excellent solderability and resistance to soldering due to three layer terminals
- Low inductance and excellent frequency characteristics



Applications

- Class I (T.C. Type) •Temperature compensation
•Tuned Circuit and Filters
- Class II (Hi-K Type) •By-pass and Coupling

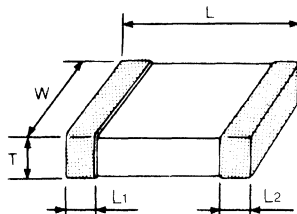
Specifications

(For "Z5U" Characteristics, see Standard Product Tables)

Item	Requirement			Test Method													
	Class I (T.C. Type)	Class II (Hi-K Type)															
	CΔ~UΔ and SL/GP	B/X7R	F/Y5V														
Operating Temperature Range	-55 to 125 °C		-25 to 85 °C	—													
Rated Voltage	50V DC	50V DC, 25V DC	50V DC, 25V DC, 16V DC	—													
Dielectric Withstanding Voltage	No break down			Class I: Rated Voltage x 3, 1 to 5s Class II: Rated Voltage x 2.5, 1 to 5s Limit surge current: 50 mA max.													
Insulation Resistance (IR)	IR≥10000 mΩ or 500/C MΩ whichever is less [C...Rated capacitance in μF]			Rated voltage at 1 minute electrification													
Capacitance	Within the specified tolerance																
Q Factor or Dissipation Factor (tanδ) (cf. Minimum Q at 1 MHz on page 78)	Capacitance < 30 pF Q≥400+20C* 30 pF ≤ Cap. ≤ 1000 pF Q≥1000 Capacitance>1000 pF D.F. (tan δ)≤0.2%	D.F. (tan δ)≤2.5%	D.F. (tan δ)≤5%	<table border="1"> <thead> <tr> <th>Class</th> <th>Frequency</th> <th>Voltage</th> <th>Temp.</th> </tr> </thead> <tbody> <tr> <td rowspan="2">I</td> <td>≤1000pF 1MHz ±10%</td> <td rowspan="2">0.5-5 Vrms</td> <td rowspan="2">20 °C</td> </tr> <tr> <td>>1000pF 1 kHz ±10%</td> </tr> <tr> <td>II</td> <td>1 kHz ±10%</td> <td>1±0.2 Vrms</td> <td></td> </tr> </tbody> </table>	Class	Frequency	Voltage	Temp.	I	≤1000pF 1MHz ±10%	0.5-5 Vrms	20 °C	>1000pF 1 kHz ±10%	II	1 kHz ±10%	1±0.2 Vrms	
Class	Frequency	Voltage	Temp.														
I	≤1000pF 1MHz ±10%	0.5-5 Vrms	20 °C														
	>1000pF 1 kHz ±10%																
II	1 kHz ±10%	1±0.2 Vrms															
Temperature Characteristics	Without voltage application	See page 79	Cap. change: ±10% max.	Measurement temperature range Class I: 20 °C and 85 °C Class II: -25 to 85 °C													
	Within 1/2 rated voltage application	—	Cap. change: +10 -30 % max.														

* Rated Capacitance in pF ** -25 to 85°C for Type B, NPO, 5100~10000pF

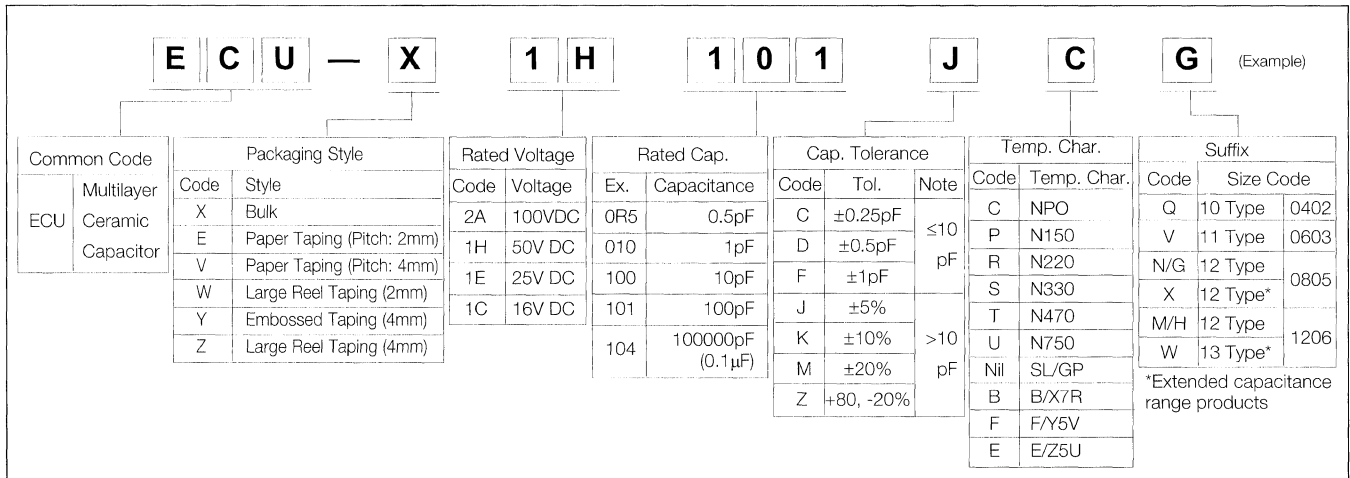
Dimensions in mm (not to scale)



Size Code (EIA)	L	W	T	L ₁ ,L ₂
"10" Type (0402)	1.00±0.05	0.50±0.05	0.50±0.05	0.2±0.1
"11" Type (0603)	1.6±0.1	0.8±0.1	0.8±0.1	0.3±0.2
"12" Type (0805)	2.0±0.2	1.25±0.20	1.45 max.*	0.50±0.25
"13" Type (1206)	3.2±0.2	1.6±0.2	1.25 max.*	0.6±0.3

*Specified by nominal capacitance

Explanation of Part Numbers



Capacitance Range in pF (For "Z5U" Characteristics, see Standard Product Tables)

Class	Size Code	Dim. "T" (mm)	Capacitance Range (pF) [50 VDC]													
			NP0 CΔ	SL/GP (SLJ)*	N150 PΔ	N220 RΔ	N330 SΔ	N470 TΔ	N750 UΔ							
										(CΔJ)*	(SLJ)*	(PΔJ)*	(RΔJ)*	(SΔJ)*	(TΔJ)*	(UΔJ)*
1 (T.C. Type)	"10"	0.50±0.05	0.5 - 220	0.5 - 220	—	—	—	—	—							
	"11" (0603)	0.8±0.1	0.5 - 1000	0.5 - 1200	0.5 - 150	0.5 - 180	0.5 - 180	0.5 - 220	0.5 - 1200							
	"12" (0805)	0.65-0.15	0.5 - 2200	0.5 - 2700	0.5 - 220	0.5 - 220	0.5 - 220	0.5 - 270	0.5 - 2700							
		1.00-0.35	2400•2700	—	240 - 330	240 - 390	240 - 470	300 - 470	—							
	"13" (1206)	1.25±0.20	—	—	360 - 470	430 - 560	510•560	510 - 680	—							
		0.65-0.15	0.5 - 4700	0.5 - 5600	0.5 - 560	0.5 - 680	0.5 - 680	0.5 - 820	0.5 - 5600							
	1.00-0.35	5100 - 6800	—	620 - 1200	750 - 1200	750 - 1500	910 - 1500	—								
	1.25-0.25	7500 - 10000	—	1300•1500	1300•1500	1600•1800	1600 - 2200	—								

Class	Size Code	Dim. "T" (mm)	Capacitance Range (pF)					
			B/(RB)*X7R			F/(FJ)*Y5V		
			50 VDC	25 VDC	16 VDC	50 VDC	25 VDC	16 VDC
2 (Hi-K Type)	"10"	0.50±0.50	—	100 - 4700	5600 - 10000	—	1000 - 10000	15000 - 33000
	"11" (0603)	0.8±0.1	220 - 15000	18000 - 22000	—	1000 - 47000	68000	100000
	"12" (0805)	0.65-0.15	220 - 22000	18000 - 33000	—	1000 - 100000	68000 - 220000	—
		1.00-0.35	27000 - 39000	39000 - 56000	—	—	—	—
	"13" (1206)	0.65-0.15	220 - 56000	33000 - 82000	—	1000 - 220000	100000 - 470000	—
		1.00-0.35	68000 - 100000	100000 - 150000	—	—	—	680000
	1.25-0.25	—	—	—	—	—	1000000	

*Temperature characteristics codes conform to JIS C6429

Temperature coefficient of Class 1 Capacitors/T.C. Tolerance (ppm/°C)

T.C. Cap.	Temp. Coeff. Code	CΔ (NP0)	PΔ (N150)	RΔ (N220)	SΔ (N330)	TΔ (N470)	UΔ (N750)	SL/GP
	T.C. Tol.	≤2 pF	CK(±250)	PK(±250)	RL(±250)	SK(±250)	TK(±250)	UK(±250)
3 pF		CJ(±120)	PJ(±120)	RJ(±120)	SJ(±120)	TJ(±120)	UJ(±120)	+350 to -1000
≥4 pF		CH(±60)	PH(±60)	RH(±60)	SH(±60)	TH(±60)	UJ(±120)	+350 to -1000

Temperature Characteristics of Class 2 Capacitors

Temp. Char.	Capacitance Change		Measurement Temperature Range	Reference Temperature
	No DC Voltage Applied	1/2 Rated Voltage applied		
B* (RB)	±10 % max.	+10, -30 % max.	-25 to 85 °C	20 °C
F** (FJ)	+30, -80 % max.	+30, -95 % max.	-25 to 85 °C	20 °C

*Temperature Characteristics "B" (JIS) covers "X7R" (EIA)

**Temperature Characteristics "F" (JIS) covers "Y5V" (EIA)

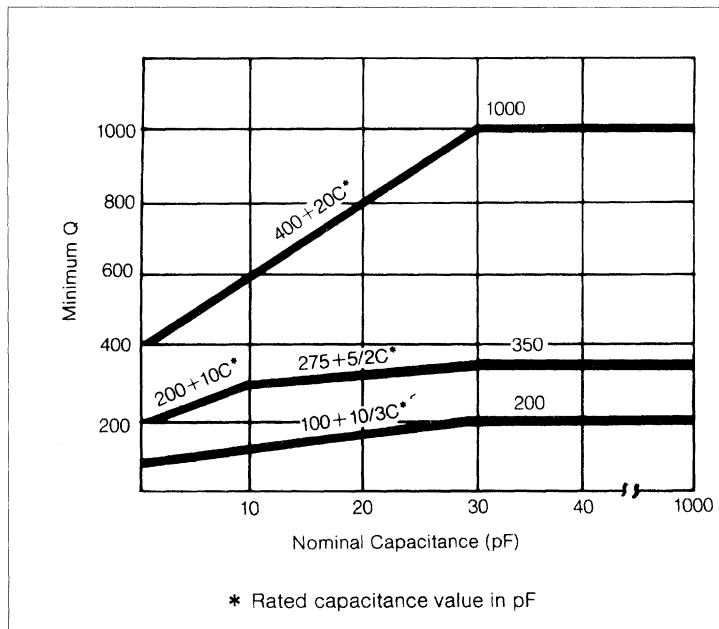
Nominal Capacitance vs. Capacitance Tolerance

Tol. Code	Capacitance Tolerance	Nominal Capacitance Available (pF)		Temp. Char.	Class
C	≤10pF	±0.25pF	0.5, 1, 1.5, 2, 3, 4, 5	CΔ-UΔ (NP0)(N750) and SL/GP	I (T.C. Type)
D		±0.5pF	1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10		
F		±1pF	10		
J	>10pF	±5%	E 24	B (X7R)	II (Hi-K Type)
K		±10%	E 12		
K	±10%	E 12	Within Capacitance Range, E-Series Numbers x 10 ⁿ	F (Y5V)	
M	±20%	E 6			
Z	+80, -20%	E 6			

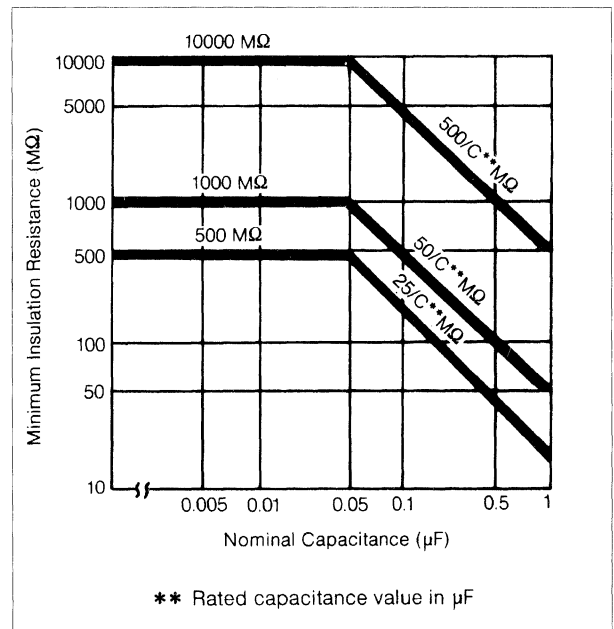
E-Series Numbers

E6	1		1.5		2.2		3.3		4.7		6.8													
E12	1	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2												
E24	1	1.1	1.2	1.3	1.5	1.6	1.8	2	2.2	2.4	2.7	3	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1

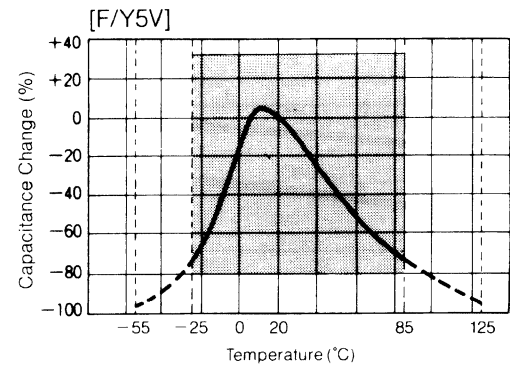
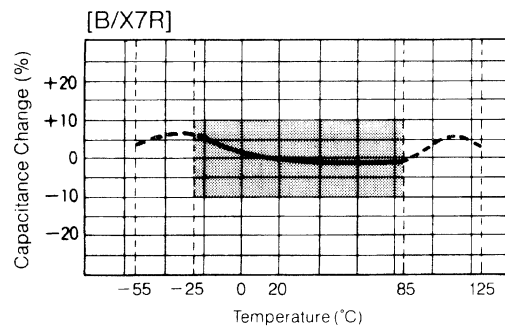
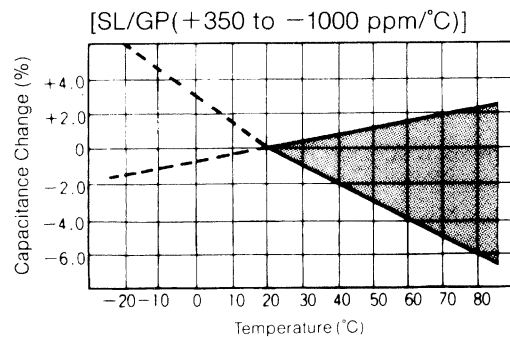
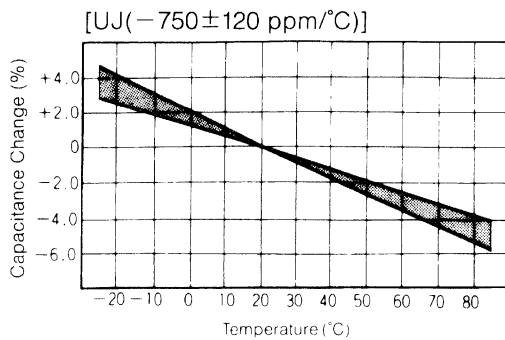
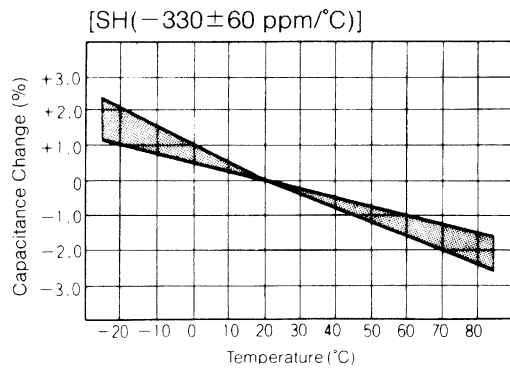
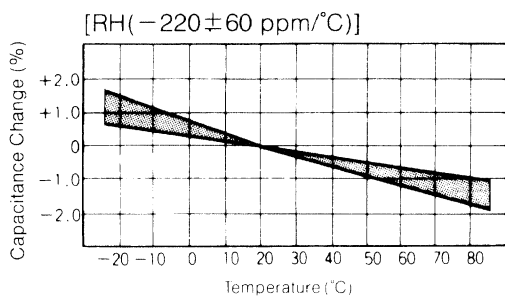
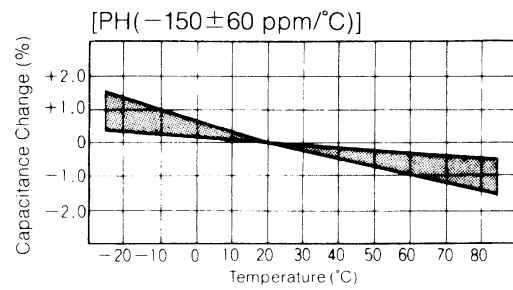
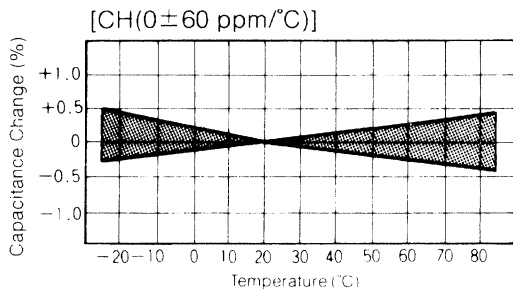
Minimum Q at 1MHz



Minimum Insulation Resistance



Typical Temperature Characteristics



Standard Products for "10" Type (EIA "0402" Type), Taped Version

Capacitance (pF)	Capacitance Tolerance	CΔ(NP0)		SL/GP	
		50 VDC		50 VDC	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
0.5	±0.25 pF (C)	ECUE1H0R5CCQ	0.5	ECUE1H0R5CQ	0.5
1	±0.25 pF (C)	ECUE1H010□CQ	0.5	ECUE1H010□Q	0.5
1.5		ECUE1H1R5□CQ	0.5	ECUE1H1R5□Q	0.5
2	or	ECUE1H020□CQ	0.5	ECUE1H020□Q	0.5
3	±0.5 pF (D)	ECUE1H030□CQ	0.5	ECUE1H030□Q	0.5
4		ECUE1H040□CQ	0.5	ECUE1H040□Q	0.5
5	±0.5 pF (D)	ECUE1H050□CQ	0.5	ECUE1H050□Q	0.5
6		ECUE1H060DCQ	0.5	ECUE1H060DQ	0.5
7		ECUE1H070DCQ	0.5	ECUE1H070DQ	0.5
8		ECUE1H080DCQ	0.5	ECUE1H080DQ	0.5
9	±0.5pF(D), ±1pF(F)	ECUE1H090DCQ	0.5	ECUE1H090DQ	0.5
10		ECUE1H100□CQ	0.5	ECUE1H100□Q	0.5
11	±5%** (J) or ±10% (K)	ECUE1H110JCCQ	0.5	ECUE1H110JQ	0.5
12		ECUE1H120□CQ	0.5	ECUE1H120□Q	0.5
13		ECUE1H130JCCQ	0.5	ECUE1H130JQ	0.5
15		ECUE1H150□CQ	0.5	ECUE1H150□Q	0.5
16		ECUE1H160JCCQ	0.5	ECUE1H160JQ	0.5
18		ECUE1H180□CQ	0.5	ECUE1H180□Q	0.5
20		ECUE1H200JCCQ	0.5	ECUE1H200JQ	0.5
22		ECUE1H220□CQ	0.5	ECUE1H220□Q	0.5
24		ECUE1H240JCCQ	0.5	ECUE1H240JQ	0.5
27		ECUE1H270□CQ	0.5	ECUE1H270□Q	0.5
30		ECUE1H300JCCQ	0.5	ECUE1H300JQ	0.5
33		ECUE1H330□CQ	0.5	ECUE1H330□Q	0.5
36		ECUE1H360JCCQ	0.5	ECUE1H360JQ	0.5
39		ECUE1H390□CQ	0.5	ECUE1H390□Q	0.5
43		ECUE1H430JCCQ	0.5	ECUE1H430JQ	0.5
47		ECUE1H470□CQ	0.5	ECUE1H470□Q	0.5
51		ECUE1H510JCCQ	0.5	ECUE1H510JQ	0.5
56		ECUE1H560□CQ	0.5	ECUE1H560□Q	0.5
62		ECUE1H620JCCQ	0.5	ECUE1H620JQ	0.5
68		ECUE1H680□CQ	0.5	ECUE1H680□Q	0.5
75	ECUE1H750JCCQ	0.5	ECUE1H750JQ	0.5	
82	ECUE1H820□CQ	0.5	ECUE1H820□Q	0.5	
91	ECUE1H910JCCQ	0.5	ECUE1H910JQ	0.5	
100	ECUE1H101□CQ	0.5	ECUE1H101□Q	0.5	
110	ECUE1H111JCCQ	0.5	ECUE1H111JQ	0.5	
120	ECUE1H121□CQ	0.5	ECUE1H121□Q	0.5	
130	ECUE1H131JCCQ	0.5	ECUE1H131JQ	0.5	
150	ECUE1H151□CQ	0.5	ECUE1H151□Q	0.5	
160	ECUE1H161JCCQ	0.5	ECUE1H161JQ	0.5	
180	ECUE1H181□CQ	0.5	ECUE1H181□Q	0.5	
200	ECUE1H201JCCQ	0.5	ECUE1H201JQ	0.5	
220	ECUE1H221□CQ	0.5	ECUE1H221□Q	0.5	

(Packaging Style Code)***

(Cap. Tol/ Code)

**Capacitance values of "E24" series and capacitance tolerance of ±5% are available on special order.

***Packaging Styles Code: "E" for Taped Version (Taping pitch: 2 mm) and "X" for Bulk Type.

Standard Products for “10” Type, (EIA “0402” Type), Taped Version

Capacitance (pF)	Capacitance Tolerance	B/X7R				Capacitance Tolerance	F/Y5V			
		25VDC		16VDC			25VDC		16VDC	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
100		ECUE1E101	IBQ	0.5						
120		ECUE1E121	KBQ	0.5						
150		ECUE1E151	IBQ	0.5						
180		ECUE1E181	KBQ	0.5						
220		ECUE1E221	IBQ	0.5						
270		ECUE1E271	KBQ	0.5						
330		ECUE1E331	IBQ	0.5						
390		ECUE1E391	KBQ	0.5						
470		ECUE1E471	IBQ	0.5						
560		ECUE1E561	KBQ	0.5						
680		ECUE1E681	IBQ	0.5						
820		ECUE1E821	KBQ	0.5						
1000		ECUE1E102	IBQ	0.5			ECUE1E102	ZFQ	0.5	
1200	±10%	ECUE1E122	KBQ	0.5			ECUE1E152	ZFQ	0.5	
1500	(K)	ECUE1E152	IBQ	0.5			ECUE1E222	ZFQ	0.5	
1800	or	ECUE1E182	KBQ	0.5			ECUE1E332	ZFQ	0.5	
2200	±20%	ECUE1E222	IBQ	0.5			ECUE1E472	ZFQ	0.5	
2700	(M)	ECUE1E272	KBQ	0.5			ECUE1E682	ZFQ	0.5	
3300		ECUE1E332	IBQ	0.5			ECUE1E103	ZFQ	0.5	
3900		ECUE1E392	KBQ	0.5						
4700		ECUE1E472	IBQ	0.5						
5600		(Packaging Style Code)**		ECUE1C562	KBQ	0.5				
6800				ECUE1C682	IBQ	0.5				
8200				ECUE1C822	KBQ	0.5				
10000				ECUE1C103	IBQ	0.5				
12000				(Cap. Tol. Code)*						
15000								ECUE1C153	ZFQ	0.5
18000										
22000								ECUE1C223	ZFQ	0.5
27000										
33000								ECUE1C333	ZFQ	0.5

* □: Capacitance Tolerance Code.

** Packaging Styles Code: “E” for Taped Version (Taping pitch: 2 mm) and “X” for Bulk Type.

Standard Products for "11" Type (EIA "0603" Type), Taped Version [Rated Voltage 50 VDC]

Capacitance (pF)	Capacitance Tolerance	CΔ(NP0)		SL/GP		PΔ(N150)		RΔ(N220)		SΔ(N330)		TΔ(N470)		UΔ(N750)		
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	
0.5	±0.25pF(C)	ECUV1H0R5CCV	0.8	ECUV1H0R5CV	0.8	ECUV1H0R5CPV	0.8	ECUV1H0R5CRV	0.8	ECUV1H0R5CSV	0.8	ECUV1H0R5CTV	0.8	ECUV1H0R5CUV	0.8	
1	±0.25 pF (C)	ECUV1H010 CV	0.8	ECUV1H010 V	0.8	ECUV1H010 PV	0.8	ECUV1H010 RV	0.8	ECUV1H010 SV	0.8	ECUV1H010 TV	0.8	ECUV1H010 UV	0.8	
1.5		ECUV1H1R5 CV	0.8	ECUV1H1R5 V	0.8	ECUV1H1R5 PV	0.8	ECUV1H1R5 RV	0.8	ECUV1H1R5 SV	0.8	ECUV1H1R5 TV	0.8	ECUV1H1R5 UV	0.8	
2	or	ECUV1H020 CV	0.8	ECUV1H020 V	0.8	ECUV1H020 PV	0.8	ECUV1H020 RV	0.8	ECUV1H020 SV	0.8	ECUV1H020 TV	0.8	ECUV1H020 UV	0.8	
3		ECUV1H030 CV	0.8	ECUV1H030 V	0.8	ECUV1H030 PV	0.8	ECUV1H030 RV	0.8	ECUV1H030 SV	0.8	ECUV1H030 TV	0.8	ECUV1H030 UV	0.8	
4	±0.5 pF (D)	ECUV1H040 CV	0.8	ECUV1H040 V	0.8	ECUV1H040 PV	0.8	ECUV1H040 RV	0.8	ECUV1H040 SV	0.8	ECUV1H040 TV	0.8	ECUV1H040 UV	0.8	
5		ECUV1H050 CV	0.8	ECUV1H050 V	0.8	ECUV1H050 PV	0.8	ECUV1H050 RV	0.8	ECUV1H050 SV	0.8	ECUV1H050 TV	0.8	ECUV1H050 UV	0.8	
6	±0.5 pF (D)	ECUV1H060DCV	0.8	ECUV1H060DV	0.8	ECUV1H060DPV	0.8	ECUV1H060DRV	0.8	ECUV1H060DSV	0.8	ECUV1H060DTV	0.8	ECUV1H060DUV	0.8	
7		ECUV1H070DCV	0.8	ECUV1H070DV	0.8	ECUV1H070DPV	0.8	ECUV1H070DRV	0.8	ECUV1H070DSV	0.8	ECUV1H070DTV	0.8	ECUV1H070DUV	0.8	
8		ECUV1H080DCV	0.8	ECUV1H080DV	0.8	ECUV1H080DPV	0.8	ECUV1H080DRV	0.8	ECUV1H080DSV	0.8	ECUV1H080DTV	0.8	ECUV1H080DUV	0.8	
9		ECUV1H090DCV	0.8	ECUV1H090DV	0.8	ECUV1H090DPV	0.8	ECUV1H090DRV	0.8	ECUV1H090DSV	0.8	ECUV1H090DTV	0.8	ECUV1H090DUV	0.8	
10	±0.5 pF(D) or ±1 pF(F)	ECUV1H100 CV	0.8	ECUV1H100 V	0.8	ECUV1H100 PV	0.8	ECUV1H100 RV	0.8	ECUV1H100 SV	0.8	ECUV1H100 TV	0.8	ECUV1H100 UV	0.8	
12		ECUV1H120 CV	0.8	ECUV1H120 V	0.8	ECUV1H120 PV	0.8	ECUV1H120 RV	0.8	ECUV1H120 SV	0.8	ECUV1H120 TV	0.8	ECUV1H120 UV	0.8	
15		ECUV1H150 CV	0.8	ECUV1H150 V	0.8	ECUV1H150 PV	0.8	ECUV1H150 RV	0.8	ECUV1H150 SV	0.8	ECUV1H150 TV	0.8	ECUV1H150 UV	0.8	
18		ECUV1H180 CV	0.8	ECUV1H180 V	0.8	ECUV1H180 PV	0.8	ECUV1H180 RV	0.8	ECUV1H180 SV	0.8	ECUV1H180 TV	0.8	ECUV1H180 UV	0.8	
22		ECUV1H220 CV	0.8	ECUV1H220 V	0.8	ECUV1H220 PV	0.8	ECUV1H220 RV	0.8	ECUV1H220 SV	0.8	ECUV1H220 TV	0.8	ECUV1H220 UV	0.8	
27		ECUV1H270 CV	0.8	ECUV1H270 V	0.8	ECUV1H270 PV	0.8	ECUV1H270 RV	0.8	ECUV1H270 SV	0.8	ECUV1H270 TV	0.8	ECUV1H270 UV	0.8	
33		ECUV1H330 CV	0.8	ECUV1H330 V	0.8	ECUV1H330 PV	0.8	ECUV1H330 RV	0.8	ECUV1H330 SV	0.8	ECUV1H330 TV	0.8	ECUV1H330 UV	0.8	
39		ECUV1H390 CV	0.8	ECUV1H390 V	0.8	ECUV1H390 PV	0.8	ECUV1H390 RV	0.8	ECUV1H390 SV	0.8	ECUV1H390 TV	0.8	ECUV1H390 UV	0.8	
47		ECUV1H470 CV	0.8	ECUV1H470 V	0.8	ECUV1H470 PV	0.8	ECUV1H470 RV	0.8	ECUV1H470 SV	0.8	ECUV1H470 TV	0.8	ECUV1H470 UV	0.8	
56		ECUV1H560 CV	0.8	ECUV1H560 V	0.8	ECUV1H560 PV	0.8	ECUV1H560 RV	0.8	ECUV1H560 SV	0.8	ECUV1H560 TV	0.8	ECUV1H560 UV	0.8	
68		ECUV1H680 CV	0.8	ECUV1H680 V	0.8	ECUV1H680 PV	0.8	ECUV1H680 RV	0.8	ECUV1H680 SV	0.8	ECUV1H680 TV	0.8	ECUV1H680 UV	0.8	
82		±5%***	ECUV1H820 CV	0.8	ECUV1H820 V	0.8	ECUV1H820 PV	0.8	ECUV1H820 RV	0.8	ECUV1H820 SV	0.8	ECUV1H820 TV	0.8	ECUV1H820 UV	0.8
100			ECUV1H101 CV	0.8	ECUV1H101 V	0.8	ECUV1H101 PV	0.8	ECUV1H101 RV	0.8	ECUV1H101 SV	0.8	ECUV1H101 TV	0.8	ECUV1H101 UV	0.8
120		or	ECUV1H121 CV	0.8	ECUV1H121 V	0.8	ECUV1H121 PV	0.8	ECUV1H121 RV	0.8	ECUV1H121 SV	0.8	ECUV1H121 TV	0.8	ECUV1H121 UV	0.8
150			ECUV1H151 CV	0.8	ECUV1H151 V	0.8	ECUV1H151 PV	0.8	ECUV1H151 RV	0.8	ECUV1H151 SV	0.8	ECUV1H151 TV	0.8	ECUV1H151 UV	0.8
180		±10% (K)	ECUV1H181 CV	0.8	ECUV1H181 V	0.8			ECUV1H181 RV	0.8	ECUV1H181 SV	0.8	ECUV1H181 TV	0.8	ECUV1H181 UV	0.8
220			ECUV1H221 CV	0.8	ECUV1H221 V	0.8			(Packaging Style Code)*				ECUV1H221 TV	0.8	ECUV1H221 UV	0.8
270	ECUV1H271 CV		0.8	ECUV1H271 V	0.8									ECUV1H271 UV	0.8	
330	ECUV1H331 CV		0.8	ECUV1H331 V	0.8									ECUV1H331 UV	0.8	
390	ECUV1H391 CV		0.8	ECUV1H391 V	0.8									ECUV1H391 UV	0.8	
470	ECUV1H471 CV		0.8	ECUV1H471 V	0.8									ECUV1H471 UV	0.8	
560	ECUV1H561 CV		0.8	ECUV1H561 V	0.8									ECUV1H561 UV	0.8	
680	ECUV1H681 CV		0.8	ECUV1H681 V	0.8									ECUV1H681 UV	0.8	
820	ECUV1H821 CV		0.8	ECUV1H821 V	0.8									ECUV1H821 UV	0.8	
1000	ECUV1H1021 CV		0.8	ECUV1H1021 V	0.8									ECUV1H1021 UV	0.8	
1200	(Cap. Tol. Code)**		ECUV1H1221 V	0.8									ECUV1H1221 UV	0.8		

* Packaging Style Code: "V" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.

** Capacitance Tolerance Codes.

*** Capacitance values of "E24" series and capacitance tolerance of ±5% are available on special order.

Standard Products for "11" Type, (EIA "0603" Type), Taped Version

Capacitance (pF)	Capacitance Tolerance	B/X7R				Capacitance Tolerance	F/Y5V						
		50VDC		25VDC			50VDC		25VDC		16VDC		
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	
220		ECUV1H221 BV	0.8										
270		ECUV1H271KBV	0.8										
330		ECUV1H331 BV	0.8										
390		ECUV1H391KBV	0.8										
470		ECUV1H471 BV	0.8										
560		ECUV1H561KBV	0.8										
680		ECUV1H681 BV	0.8										
820		ECUV1H821KBV	0.8										
1000		ECUV1H102 BV	0.8				ECUV1H102ZFV	0.8					
1200		ECUV1H122KBV	0.8										
1500		ECUV1H152 BV	0.8				ECUV1H152ZFV	0.8					
1800		ECUV1H182KBV	0.8										
2200	±10%	ECUV1H222 BV	0.8				ECUV1H222ZFV	0.8					
2700	(K)	ECUV1H272KBV	0.8										
3300	or	ECUV1H332 BV	0.8				ECUV1H332ZFV	0.8					
3900	±2%	ECUV1H392KBV	0.8										
4700	(M)	ECUV1H472 BV	0.8				ECUV1H472ZFV	0.8					
5600		ECUV1H562KBV	0.8										
6800		ECUV1H682 BV	0.8				ECUV1H682ZFV	0.8					
8200		ECUV1H822KBV	0.8										
10000		ECUV1H103 BV	0.8				ECUV1H103ZFV	0.8					
12000		ECUV1H123KBV	0.8										
15000		ECUV1H153 BV	0.8				ECUV1H153ZFV	0.8					
18000		(Cap. Tol. Code)**		ECUV1E183KBV	0.8								
22000				ECUE1E223 BV	0.8		ECUV1H223ZFV	0.8					
33000							ECUV1H333ZFV	0.8					
47000							ECUV1H473ZFV	0.8					
68000							(Packaging Styles Code)*	ECUV1E683ZFV	0.8				
100000												ECUV1C104ZFV	0.8

* Packaging Styles Code: "V" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.

Standard Products for "12" Type (EIA "0805" Type), Taped Version [Rated Voltage 50 VDC]

Capacitance (pF)	Capacitance Tolerance	CΔ(NP0)		SL/GP		PΔ(N150)		RΔ(N220)		SΔ(N330)		TΔ(N470)		UΔ(N750)	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
0.5	±0.25pF(C)	ECUV1H0R5CCN	0.65	ECUV1H0R5CN	0.65	ECUV1H0R5CPN	0.65	ECUV1H0R5CRN	0.65	ECUV1H0R5CSN	0.65	ECUV1H0R5CTN	0.65	ECUV1H0R5CUN	0.65
1	±0.25 pF (C)	ECUV1H010□CN	0.65	ECUV1H010□N	0.65	ECUV1H010□PN	0.65	ECUV1H010□RN	0.65	ECUV1H010□SN	0.65	ECUV1H010□TN	0.65	ECUV1H010□UN	0.65
1.5		ECUV1H1R5□CN	0.65	ECUV1H1R5□N	0.65	ECUV1H1R5□PN	0.65	ECUV1H1R5□RN	0.65	ECUV1H1R5□SN	0.65	ECUV1H1R5□TN	0.65	ECUV1H1R5□UN	0.65
2	or	ECUV1H020□CN	0.65	ECUV1H020□N	0.65	ECUV1H020□PN	0.65	ECUV1H020□RN	0.65	ECUV1H020□SN	0.65	ECUV1H020□TN	0.65	ECUV1H020□UN	0.65
3		ECUV1H030□CN	0.65	ECUV1H030□N	0.65	ECUV1H030□PN	0.65	ECUV1H030□RN	0.65	ECUV1H030□SN	0.65	ECUV1H030□TN	0.65	ECUV1H030□UN	0.65
4	±0.5 pF (D)	ECUV1H040□CN	0.65	ECUV1H040□N	0.65	ECUV1H040□PN	0.65	ECUV1H040□RN	0.65	ECUV1H040□SN	0.65	ECUV1H040□TN	0.65	ECUV1H040□UN	0.65
5		ECUV1H050□CN	0.65	ECUV1H050□N	0.65	ECUV1H050□PN	0.65	ECUV1H050□RN	0.65	ECUV1H050□SN	0.65	ECUV1H050□TN	0.65	ECUV1H050□UN	0.65
6	±0.5 pF (D)	ECUV1H060DCN	0.65	ECUV1H060DN	0.65	ECUV1H060DPN	0.65	ECUV1H060DRN	0.65	ECUV1H060DSN	0.65	ECUV1H060DTN	0.65	ECUV1H060DUN	0.65
7		ECUV1H070DCN	0.65	ECUV1H070DN	0.65	ECUV1H070DPN	0.65	ECUV1H070DRN	0.65	ECUV1H070DSN	0.65	ECUV1H070DTN	0.65	ECUV1H070DUN	0.65
8	±0.5 pF (D)	ECUV1H080DCN	0.65	ECUV1H080DN	0.65	ECUV1H080DPN	0.65	ECUV1H080DRN	0.65	ECUV1H080DSN	0.65	ECUV1H080DTN	0.65	ECUV1H080DUN	0.65
9		ECUV1H090DCN	0.65	ECUV1H090DN	0.65	ECUV1H090DPN	0.65	ECUV1H090DRN	0.65	ECUV1H090DSN	0.65	ECUV1H090DTN	0.65	ECUV1H090DUN	0.65
10	±0.5 pF(D) or ±1 pF(F)	ECUV1H100□CN	0.65	ECUV1H100□N	0.65	ECUV1H100□PN	0.65	ECUV1H100□RN	0.65	ECUV1H100□SN	0.65	ECUV1H100□TN	0.65	ECUV1H100□UN	0.65
12		ECUV1H120□CN	0.65	ECUV1H120□N	0.65	ECUV1H120□PN	0.65	ECUV1H120□RN	0.65	ECUV1H120□SN	0.65	ECUV1H120□TN	0.65	ECUV1H120□UN	0.65
15	±5%***	ECUV1H150□CN	0.65	ECUV1H150□N	0.65	ECUV1H150□PN	0.65	ECUV1H150□RN	0.65	ECUV1H150□SN	0.65	ECUV1H150□TN	0.65	ECUV1H150□UN	0.65
18		ECUV1H180□CN	0.65	ECUV1H180□N	0.65	ECUV1H180□PN	0.65	ECUV1H180□RN	0.65	ECUV1H180□SN	0.65	ECUV1H180□TN	0.65	ECUV1H180□UN	0.65
22	(J)	ECUV1H220□CN	0.65	ECUV1H220□N	0.65	ECUV1H220□PN	0.65	ECUV1H220□RN	0.65	ECUV1H220□SN	0.65	ECUV1H220□TN	0.65	ECUV1H220□UN	0.65
27		ECUV1H270□CG	0.65	ECUV1H270□G	0.65	ECUV1H270□PN	0.65	ECUV1H270□RN	0.65	ECUV1H270□SN	0.65	ECUV1H270□TN	0.65	ECUV1H270□UN	0.65
33	or	ECUV1H330□CG	0.65	ECUV1H330□G	0.65	ECUV1H330□PN	0.65	ECUV1H330□RN	0.65	ECUV1H330□SN	0.65	ECUV1H330□TN	0.65	ECUV1H330□UN	0.65
39		ECUV1H390□CG	0.65	ECUV1H390□G	0.65	ECUV1H390□PN	0.65	ECUV1H390□RN	0.65	ECUV1H390□SN	0.65	ECUV1H390□TN	0.65	ECUV1H390□UN	0.65
47	±10%	ECUV1H470□CG	0.65	ECUV1H470□G	0.65	ECUV1H470□PN	0.65	ECUV1H470□RN	0.65	ECUV1H470□SN	0.65	ECUV1H470□TN	0.65	ECUV1H470□UN	0.65
56		ECUV1H560□CG	0.65	ECUV1H560□G	0.65	ECUV1H560□PN	0.65	ECUV1H560□RN	0.65	ECUV1H560□SN	0.65	ECUV1H560□TN	0.65	ECUV1H560□UN	0.65
68	(K)	ECUV1H680□CG	0.65	ECUV1H680□G	0.65	ECUV1H680□PN	0.65	ECUV1H680□RN	0.65	ECUV1H680□SN	0.65	ECUV1H680□TN	0.65	ECUV1H680□UN	0.65
82		ECUV1H820□CG	0.65	ECUV1H820□G	0.65	ECUV1H820□PN	0.65	ECUV1H820□RN	0.65	ECUV1H820□SN	0.65	ECUV1H820□TN	0.65	ECUV1H820□UN	0.65
100	±10%	ECUV1H101□CG	0.65	ECUV1H101□G	0.65	ECUV1H101□PN	0.65	ECUV1H101□RN	0.65	ECUV1H101□SN	0.65	ECUV1H101□TN	0.65	ECUV1H101□UN	0.65
120		ECUV1H121□CG	0.65	ECUV1H121□G	0.65	ECUV1H121□PN	0.65	ECUV1H121□RN	0.65	ECUV1H121□SN	0.65	ECUV1H121□TN	0.65	ECUV1H121□UN	0.65
150	or	ECUV1H151□CG	0.65	ECUV1H151□G	0.65	ECUV1H151□PN	0.65	ECUV1H151□RN	0.65	ECUV1H151□SN	0.65	ECUV1H151□TN	0.65	ECUV1H151□UN	0.65
180		ECUV1H181□CG	0.65	ECUV1H181□G	0.65	ECUV1H181□PN	0.65	ECUV1H181□RN	0.65	ECUV1H181□SN	0.65	ECUV1H181□TN	0.65	ECUV1H181□UN	0.65
220	(K)	ECUV1H221□CG	0.65	ECUV1H221□G	0.65	ECUV1H221□PN	0.65	ECUV1H221□RN	0.65	ECUV1H221□SN	0.65	ECUV1H221□TN	0.65	ECUV1H221□UN	0.65
270		ECUV1H271□CG	0.65	ECUV1H271□G	0.65	ECUV1H271□PN	1.0	ECUV1H271□RN	1.0	ECUV1H271□SN	1.0	ECUV1H271□TN	1.0	ECUV1H271□UN	0.65
330	±10%	ECUV1H331□CG	0.65	ECUV1H331□G	0.65	ECUV1H331□PN	1.0	ECUV1H331□RN	1.0	ECUV1H331□SN	1.0	ECUV1H331□TN	1.0	ECUV1H331□UN	0.65
390		ECUV1H391□CG	0.65	ECUV1H391□G	0.65			ECUV1H391□RN	1.0	ECUV1H391□SN	1.0	ECUV1H391□TN	1.0	ECUV1H391□UX	0.65
470	±10%	ECUV1H471□CX	0.65	ECUV1H471□G	0.65					ECUV1H471□SN	1.0	ECUV1H471□TN	1.0	ECUV1H471□UX	0.65
560		ECUV1H561□CX	0.65	ECUV1H561□G	0.65					(Packaging Style Code)*				ECUV1H561□UX	0.65
680	±10%	ECUV1H681□CX	0.65	ECUV1H681□G	0.65									ECUV1H681□UX	0.65
820		ECUV1H821□CX	0.65	ECUV1H821□G	0.65									ECUV1H821□UX	0.65
1000	±10%	ECUV1H102□CX	0.65	ECUV1H102□X	0.65									ECUV1H102□UX	0.65
1200		ECUV1H122□CX	0.65	ECUV1H122□X	0.65									ECUV1H122□UX	0.65
1500	±10%	ECUV1H152□CX	0.65	ECUV1H152□X	0.65									ECUV1H152□UX	0.65
1800		ECUV1H182□CX	0.65	ECUV1H182□X	0.65									ECUV1H182□UX	0.65
2200	±10%	ECUV1H222□CX	0.65	ECUV1H222□X	0.65									ECUV1H222□UX	0.65
2700		ECUV1H272□CX	1.0	ECUV1H272□X	0.65									ECUV1H272□UX	0.65

(Cap. Tol. Code)**

* Packaging Style Code: "V" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.

** Capacitance Tolerance Codes.

*** Capacitance values of "E24" series and capacitance tolerance of ±5% are available on special order.

Standard Products for “12” Type, (EIA “0805” Type), Taped Version

Capacitance (pF)	Capacitance Tolerance	B/X7R				Capacitance Tolerance	F/Y5V				E/Z5U	
		50VDC		25VDC			50VDC		25VDC		50VDC	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
220		ECUV1H221 BN	0.65									
270		ECUV1H271KBN	0.65									
330		ECUV1H331 BN	0.65									
390		ECUV1H391KBN	0.65									
470		ECUV1H471 BN	0.65									
560		ECUV1H561KBN	0.65									
680		ECUV1H681 BN	0.65									
820		ECUV1H821KBN	0.65									
1000		ECUV1H102 BN	0.65				ECUV1H102ZFN	0.65				
1200		ECUV1H122KBN	0.65									
1500		ECUV1H152 BN	0.65				ECUV1H152ZFN	0.65				
1800		ECUV1H182KBN	0.65									
2200		ECUV1H222 BN	0.65				ECUV1H222ZFN	0.65				
2700		ECUV1H272KBN	0.65									
3300	±10%	ECUV1H332 BN	0.65				ECUV1H332ZFN	0.65				
3900	(K)	ECUV1H392KBN	0.65									
4700	or	ECUV1H472 BG	0.65				ECUV1H472ZFN	0.65				
5600	±20%	ECUV1H562KBG	0.65									
6800	(M)	ECUV1H682 BG	0.65				ECUV1H682ZFN	0.65				
8200		ECUV1H822KBG	0.65									
10000		ECUV1H103 BG	0.65				ECUV1H103ZFG	0.65			ECUV1H103MEN	1.0
12000		ECUV1H123KBX	0.65									
15000		ECUV1H153 BX	0.65				ECUV1H153ZFG	0.65			ECUV1H153MEN	1.0
18000		ECUV1H183KBX	0.65	ECUV1E183KBX	0.65							
22000		ECUV1H223 BX	0.65	ECUE1E223 BX	0.65		ECUV1H223ZFG	0.65			ECUV1H223MEN	1.0
27000		ECUV1H273KBX	1.0	ECUV1E273KBX	0.65							
33000		ECUV1H333 BX	1.0	ECUV1E333 BX	0.65		ECUV1H333ZFX	0.65			ECUV1H333MEN	1.0
39000		ECUV1H393KBX	1.0	ECUV1E393KBX	1.0							
47000		(Cap. Tol. Code)**		ECUV1E473 BX	1.0		ECUV1H473ZFX	0.65			ECUV1H473MEN	1.0
56000				ECUV1E563KBX	1.0							
68000				(Packaging Style Code)*			ECUV1H683ZFX	0.65	ECUV1E683ZFX	0.65		
100000							ECUV1H104ZFX	0.65	ECUV1E104ZFX	0.65		
150000									ECUV1E154ZFX	0.65		
220000									ECUV1E224ZFX	0.65		

* Packaging Style Code: “V” for Taped Version (Taping pitch: 4 mm) and “X” for Bulk Type.

** □: Capacitance Tolerance Codes.

Standard Products for "13" Type (EIA "1206" Type), Taped Version [Rated Voltage 50 VDC]

Capacitance (pF)	Capacitance Tolerance	C(NP0)		SL/GP		P(N150)		R(N220)		S(N330)		T(N470)		U(N750)	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
0.5	±0.25pF(C)	ECUV1H0R5CCM	0.65	ECUV1H0R5CCM	0.65	ECUV1H0R5CPM	0.65	ECUV1H0R5CRM	0.65	ECUV1H0R5CSM	0.65	ECUV1H0R5CTM	0.65	ECUV1H0R5CUM	0.65
1	±0.25 pF (C)	ECUV1H010 CM	0.65	ECUV1H010 M	0.65	ECUV1H010 PM	0.65	ECUV1H010 RM	0.65	ECUV1H010 SM	0.65	ECUV1H010 TM	0.65	ECUV1H010 UM	0.65
1.5		ECUV1H1R5 CM	0.65	ECUV1H1R5 M	0.65	ECUV1H1R5 PM	0.65	ECUV1H1R5 RM	0.65	ECUV1H1R5 SM	0.65	ECUV1H1R5 TM	0.65	ECUV1H1R5 UM	0.65
2	or	ECUV1H020 CM	0.65	ECUV1H020 M	0.65	ECUV1H020 PM	0.65	ECUV1H020 RM	0.65	ECUV1H020 SM	0.65	ECUV1H020 TM	0.65	ECUV1H020 UM	0.65
3		ECUV1H030 CM	0.65	ECUV1H030 M	0.65	ECUV1H030 PM	0.65	ECUV1H030 RM	0.65	ECUV1H030 SM	0.65	ECUV1H030 TM	0.65	ECUV1H030 UM	0.65
4	±0.5 pF (D)	ECUV1H040 CM	0.65	ECUV1H040 M	0.65	ECUV1H040 PM	0.65	ECUV1H040 RM	0.65	ECUV1H040 SM	0.65	ECUV1H040 TM	0.65	ECUV1H040 UM	0.65
5		ECUV1H050 CM	0.65	ECUV1H050 M	0.65	ECUV1H050 PM	0.65	ECUV1H050 RM	0.65	ECUV1H050 SM	0.65	ECUV1H050 TM	0.65	ECUV1H050 UM	0.65
6	±0.5 pF (D)	ECUV1H060DCM	0.65	ECUV1H060DM	0.65	ECUV1H060DPM	0.65	ECUV1H060DRM	0.65	ECUV1H060DSM	0.65	ECUV1H060DTM	0.65	ECUV1H060DUM	0.65
7		ECUV1H070DCM	0.65	ECUV1H070DM	0.65	ECUV1H070DPM	0.65	ECUV1H070DRM	0.65	ECUV1H070DSM	0.65	ECUV1H070DTM	0.65	ECUV1H070DUM	0.65
8	±0.5 pF (D)	ECUV1H080DCM	0.65	ECUV1H080DM	0.65	ECUV1H080DPM	0.65	ECUV1H080DRM	0.65	ECUV1H080DSM	0.65	ECUV1H080DTM	0.65	ECUV1H080DUM	0.65
9		ECUV1H090DCM	0.65	ECUV1H090DM	0.65	ECUV1H090DPM	0.65	ECUV1H090DRM	0.65	ECUV1H090DSM	0.65	ECUV1H090DTM	0.65	ECUV1H090DUM	0.65
10	±0.5 pF(D) or ±1 pF(F)	ECUV1H100 CM	0.65	ECUV1H100 M	0.65	ECUV1H100 PM	0.65	ECUV1H100 RM	0.65	ECUV1H100 SM	0.65	ECUV1H100 TM	0.65	ECUV1H100 UM	0.65
12	±5%*** (J) or ±10% (K)	ECUV1H120 CM	0.65	ECUV1H120 M	0.65	ECUV1H120 PM	0.65	ECUV1H120 RM	0.65	ECUV1H120 SM	0.65	ECUV1H120 TM	0.65	ECUV1H120 UM	0.65
15		ECUV1H150 CM	0.65	ECUV1H150 M	0.65	ECUV1H150 PM	0.65	ECUV1H150 RM	0.65	ECUV1H150 SM	0.65	ECUV1H150 TM	0.65	ECUV1H150 UM	0.65
18		ECUV1H180 CM	0.65	ECUV1H180 M	0.65	ECUV1H180 PM	0.65	ECUV1H180 RM	0.65	ECUV1H180 SM	0.65	ECUV1H180 TM	0.65	ECUV1H180 UM	0.65
22		ECUV1H220 CM	0.65	ECUV1H220 M	0.65	ECUV1H220 PM	0.65	ECUV1H220 RM	0.65	ECUV1H220 SM	0.65	ECUV1H220 TM	0.65	ECUV1H220 UM	0.65
27		ECUV1H270 CM	0.65	ECUV1H270 M	0.65	ECUV1H270 PM	0.65	ECUV1H270 RM	0.65	ECUV1H270 SM	0.65	ECUV1H270 TM	0.65	ECUV1H270 UM	0.65
33		ECUV1H330 CM	0.65	ECUV1H330 M	0.65	ECUV1H330 PM	0.65	ECUV1H330 RM	0.65	ECUV1H330 SM	0.65	ECUV1H330 TM	0.65	ECUV1H330 UM	0.65
39		ECUV1H390 CM	0.65	ECUV1H390 M	0.65	ECUV1H390 PM	0.65	ECUV1H390 RM	0.65	ECUV1H390 SM	0.65	ECUV1H390 TM	0.65	ECUV1H390 UM	0.65
47		ECUV1H470 CM	0.65	ECUV1H470 M	0.65	ECUV1H470 PM	0.65	ECUV1H470 RM	0.65	ECUV1H470 SM	0.65	ECUV1H470 TM	0.65	ECUV1H470 UM	0.65
56		ECUV1H560 CM	0.65	ECUV1H560 M	0.65	ECUV1H560 PM	0.65	ECUV1H560 RM	0.65	ECUV1H560 SM	0.65	ECUV1H560 TM	0.65	ECUV1H560 UM	0.65
68		ECUV1H680 CM	0.65	ECUV1H680 M	0.65	ECUV1H680 PM	0.65	ECUV1H680 RM	0.65	ECUV1H680 SM	0.65	ECUV1H680 TM	0.65	ECUV1H680 UM	0.65
82		ECUV1H820 CM	0.65	ECUV1H820 M	0.65	ECUV1H820 PM	0.65	ECUV1H820 RM	0.65	ECUV1H820 SM	0.65	ECUV1H820 TM	0.65	ECUV1H820 UM	0.65
100		ECUV1H101 CH	0.65	ECUV1H101 H	0.65	ECUV1H101 PM	0.65	ECUV1H101 RM	0.65	ECUV1H101 SM	0.65	ECUV1H101 TM	0.65	ECUV1H101 UM	0.65
120		ECUV1H121 CH	0.65	ECUV1H121 H	0.65	ECUV1H121 PM	0.65	ECUV1H121 RM	0.65	ECUV1H121 SM	0.65	ECUV1H121 TM	0.65	ECUV1H121 UM	0.65
150		ECUV1H151 CH	0.65	ECUV1H151 H	0.65	ECUV1H151 PM	0.65	ECUV1H151 RM	0.65	ECUV1H151 SM	0.65	ECUV1H151 TM	0.65	ECUV1H151 UM	0.65
180		ECUV1H181 CH	0.65	ECUV1H181 H	0.65	ECUV1H181 PM	0.65	ECUV1H181 RM	0.65	ECUV1H181 SM	0.65	ECUV1H181 TM	0.65	ECUV1H181 UM	0.65
220		ECUV1H221 CH	0.65	ECUV1H221 H	0.65	ECUV1H221 PM	0.65	ECUV1H221 RM	0.65	ECUV1H221 SM	0.65	ECUV1H221 TM	0.65	ECUV1H221 UM	0.65
270		ECUV1H271 CH	0.65	ECUV1H271 H	0.65	ECUV1H271 PM	0.65	ECUV1H271 RM	0.65	ECUV1H271 SM	0.65	ECUV1H271 TM	0.65	ECUV1H271 UM	0.65
330		ECUV1H331 CH	0.65	ECUV1H331 H	0.65	ECUV1H331 PM	0.65	ECUV1H331 RM	0.65	ECUV1H331 SM	0.65	ECUV1H331 TM	0.65	ECUV1H331 UM	0.65
390		ECUV1H391 CH	0.65	ECUV1H391 H	0.65	ECUV1H391 PM	0.65	ECUV1H391 RM	0.65	ECUV1H391 SM	0.65	ECUV1H391 TM	0.65	ECUV1H391 UM	0.65
470		ECUV1H471 CH	0.65	ECUV1H471 H	0.65	ECUV1H471 PM	0.65	ECUV1H471 RM	0.65	ECUV1H471 SM	0.65	ECUV1H471 TM	0.65	ECUV1H471 UM	0.65
560	ECUV1H561 CH	0.65	ECUV1H561 H	0.65	ECUV1H561 PM	0.65	ECUV1H561 RM	0.65	ECUV1H561 SM	0.65	ECUV1H561 TM	0.65	ECUV1H561 UM	0.65	
680	ECUV1H681 CH	0.65	ECUV1H681 H	0.65	ECUV1H681 PM	1.0	ECUV1H681 RM	0.65	ECUV1H681 SM	0.65	ECUV1H681 TM	0.65	ECUV1H681 UM	0.65	
820	ECUV1H821 CH	0.65	ECUV1H821 H	0.65	ECUV1H821 PM	1.0	ECUV1H821 RM	1.0	ECUV1H821 SM	1.0	ECUV1H821 TM	0.65	ECUV1H821 UM	0.65	
1000	ECUV1H102 CW	0.65	ECUV1H102 H	0.65	ECUV1H102 PM	1.0	ECUV1H102 RM	1.0	ECUV1H201 SM	1.0	ECUV1H102 TM	1.0	ECUV1H102 UM	0.65	
1200	ECUV1H122 CW	0.65	ECUV1H122 H	0.65	ECUV1H122 PM	1.0	ECUV1H122 RM	1.0	ECUV1H122 SM	1.0	ECUV1H122 TM	1.0	ECUV1H122 UM	0.65	
1500	ECUV1H152 CW	0.65	ECUV1H152 H	0.65	ECUV1H152 PM	1.25	ECUV1H152 RM	1.25	ECUV1H152 SM	1.0	ECUV1H152 TM	1.0	ECUV1H152 UM	0.65	
1800	ECUV1H182 CW	0.65	ECUV1H182 H	0.65	(Packaging Styles Code)*				ECUV1H182 SM	1.25	ECUV1H182 TM	1.25	ECUV1H182 UM	0.65	
2200	ECUV1H222 CW	0.65	ECUV1H222 H	0.65						ECUV1H222 TM	1.25	ECUV1H222 UM	0.65		
2700	ECUV1H272 CW	0.65	ECUV1H272 H	0.65								ECUV1H272 UM	0.65		
3300	ECUV1H332 CW	0.65	ECUV1H332 H	0.65								ECUV1H332 UM	0.65		
3900	ECUV1H392 CW	0.65	ECUV1H392 H	0.65								ECUV1H392 UM	0.65		
4700	ECUV1H472 CW	0.65	ECUV1H472 H	0.65								ECUV1H472 UM	0.65		
5600	ECUV1H562 CW	1.0	ECUV1H562 H	0.65								ECUV1H562 UM	0.65		
6800	ECUV1H682 CW	1.0													
8200	ECUV1H822 CW	1.25													
10000	ECUV1H103 CW	1.23													

(Cap. Tol. Code)**

* Packaging Style Code: "V" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.

** □: Capacitance Tolerance Codes.

*** Capacitance values of "E24" series and capacitance tolerance of ±5% are available on special order.

Standard Products for “13” Type, (EIA “1206” Type), Taped Version

Capacitance (pF)	Capacitance Tolerance	B/X7R						E/Z5U		
		100VDC		50VDC		25 VDC		50VDC		
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	
220				ECUV1H221	IBM	0.65				
270				ECUV1H271	KBM	0.65				
330				ECUV1H331	IBM	0.65				
390				ECUV1H391	KBM	0.65				
470				ECUV1H471	IBM	0.65				
560				ECUV1H561	KBM	0.65				
680				ECUV1H681	IBM	0.65				
820				ECUV1H821	KBM	0.65				
1000		ECUV2A102	KBM 1.0	ECUV1H102	IBM	0.65				
1200		ECUV2A122	KBM 1.0	ECUV1H122	KBM	0.65				
1500		ECUV2A152	KBM 1.0	ECUV1H152	IBM	0.65				
1800		ECUV2A182	KBM 1.0	ECUV1H182	KBM	0.65				
2200		ECUV2A222	KBM 1.0	ECUV1H222	IBM	0.65				
2700		ECUV2A272	KBM 1.0	ECUV1H272	KBM	0.65				
3300		ECUV2A332	KBM 1.0	ECUV1H332	IBM	0.65				
3900		ECUV2A392	KBM 1.0	ECUV1H392	KBM	0.65				
4700		ECUV2A472	KBM 1.0	ECUV1H472	IBM	0.65				
5600	±10%	ECUV2A562	KBM 1.0	ECUV1H562	KBM	0.65				
6800	(K)	ECUV2A682	KBM 1.0	ECUV1H682	IBM	0.65				
8200	or	ECUV2A822	KBM 1.0	ECUV1H822	KBM	0.65				
10000	±20%	ECUV2A103	KBM 1.0	ECUV1H103	IBM	0.65		ECUV1H103	MEM 1.0	
12000	(M)	ECUV2A123	KBM 1.0	ECUV1H123	KBM	0.65				
15000		ECUV2A153	KBM 1.0	ECUV1H153	IBM	0.65		ECUV1H153	MEM 1.0	
18000		ECUV2A183	KBM 1.0	ECUV1H183	KBM	0.65				
22000		ECUV2A223	KBM 1.0	ECUV1H223	IBM	0.65		ECUV1H223	MEM 1.0	
27000		ECUV2A273	IBM 1.0	ECUV1H273	KBM	0.65				
33000		ECUV2A333	IBM 1.0	ECUV1H333	IBM	0.65	ECUV1E333	IBW 0.65	ECUV1H333	MEM 1.0
39000				ECUV1H393	KBM	0.65	ECUV1E393	KBW 0.65		
47000				ECUV1H473	IBM	0.65	ECUV1E473	IBW 0.65	ECUV1H473	MEM 1.0
56000				ECUV1H563	KBM	0.65	ECUV1E563	KBW 0.65		
68000				ECUV1H683	IBM	1.0	ECUV1E683	IBW 0.65	ECUV1H683	MEM 1.0
82000				ECUV1H683	KBM	1.0	ECUV1E823	KBW 0.65		
100000				ECUV1H104	IBM	1.0	ECUV1E104	IBW 1.0	ECUV1H104	MEM 1.0
120000				(Packaging Styles Code)**			ECUV1E124	KBW 1.0		
150000							ECUV1E154	IBW 1.0		
220000							(Cap. Tol. Code)*			
330000										
470000										
680000										
1000000										

* □: Capacitance Tolerance Code.

** Packaging Styles Code: “E” for Taped Version (Taping pitch: 2 mm) and “X” for Bulk Type.

Standard Products for "13" Type, (EIA "1206" Type), Taped Version

Capacitance (pF)	Capacitance Tolerance	NPO/COG			
		50VDC		100VDC	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
1.0	±.25 pF	ECUV1H010CCM	1.0	ECUV2A010CCM	1.0
1.2		ECUV1H1R2CCM	1.0	ECUV2A1R2CCM	1.0
1.5		ECUV1H1R5CCM	1.0	ECUV2A1R5CCM	1.0
1.8		ECUV1H1R8CCM	1.0	ECUV2A1R8CCM	1.0
2.2		ECUV1H2R2CCM	1.0	ECUV2A2R2CCM	1.0
2.7		ECUV1H2R7CCM	1.0	ECUV2A2R7CCM	1.0
3.3		ECUV1H3R3CCM	1.0	ECUV2A3R3CCM	1.0
3.9		ECUV1H3R9CCM	1.0	ECUV2A3R9CCM	1.0
4.7		ECUV1H4R7CCM	1.0	ECUV2A4R7CCM	1.0
5.6	±.5 pF	ECUV1H5R6DCM	1.0	ECUV2A5R6DCM	1.0
6.8		ECUV1H6R8DCM	1.0	ECUV2A6R8DCM	1.0
8.2		ECUV1H8R2DCM	1.0	ECUV2A8R2DCM	1.0
10	J=±5% K=±10%	ECUV1H100JCM	1.0	ECUV2A100JCM	1.0
12		ECUV1H120JCM	1.0	ECUV2A120JCM	1.0
15		ECUV1H150JCM	1.0	ECUV2A150JCM	1.0
18		ECUV1H180JCM	1.0	ECUV2A180JCM	1.0
22		ECUV1H220JCM	1.0	ECUV2A220JCM	1.0
27		ECUV1H270JCM	1.0	ECUV2A270JCM	1.0
33		ECUV1H330JCM	1.0	ECUV2A330JCM	1.0
39		ECUV1H390JCM	1.0	ECUV2A390JCM	1.0
47		ECUV1H470JCM	1.0	ECUV2A470JCM	1.0
56		ECUV1H560JCM	1.0	ECUV2A560JCM	1.0
82		ECUV1H820JCM	1.0	ECUV2A820JCM	1.0
100		ECUV1H101JCM	1.0	ECUV2A101JCM	1.0
120		ECUV1H121JCM	1.0	ECUV2A121JCM	1.0
150		ECUV1H151JCM	1.0	ECUV2A151JCM	1.0
180		ECUV1H181JCM	1.0	ECUV2A181JCM	1.0
220		ECUV1H221JCM	1.0	ECUV2A221JCM	1.0
330		ECUV1H331JCM	1.0	ECUV2A331JCM	1.0
390		ECUV1H391JCM	1.0	ECUV2A391JCM	1.0
470		ECUV1H471JCM	1.0	ECUV2A471JCM	1.0
560		ECUV1H561JCM	1.0	ECUV2A561JCM	1.0
680		ECUV1H681JCM	1.0	ECUV2A681JCM	1.0
820		ECUV1H821JCM	1.0	ECUV2A821JCM	1.0
1000		ECUV1H122JCM	1.0	ECUV2A122JCM	1.0
1200		ECUV1H122JCM	1.0	(Packaging Code**)	
1500		ECUV1H152JCM	1.0		
1800		ECUV1H182JCM	1.0		
2200		ECUV1H222JCM	1.0		

Capacitance Tolerance Code. _____ ↑

** Packaging Styles Code: "V", "Y" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk Type.

Standard Products for "13" Type, (EIA "1206" Type), Taped Version

Capacitance (pF)	Capacitance Tolerance	F/Y5V					
		50VDC		25VDC		16VDC	
		Part No.	Dim. T (mm)	Part No.	Dim. T (mm)	Part No.	Dim. T (mm)
220							
270							
330							
390							
470							
560							
680							
820							
1000		ECUV1H102ZFM	0.65				
1200							
1500		ECUV1H152ZFM	0.65				
1800							
2200		ECUV1H222ZFM	0.65				
2700							
3300		ECUV1H332ZFM	0.65				
3900							
4700		ECUV1H472ZFM	0.65				
5600							
6800		ECUV1H682ZFM	0.65				
8200							
10000		ECUV1H103ZFM	0.65				
12000							
15000		ECUV1H153ZFM	0.65				
18000							
22000		ECUV1H223ZFM	0.65				
27000							
33000		ECUV1H333ZFM	0.65				
39000							
47000		ECUV1H473ZFM	0.65				
56000							
68000		ECUV1H683ZFW	0.65				
82000							
100000		ECUV1H104ZFW	0.65	ECUV1E104ZFW	0.65		
120000							
150000		ECUV1H154ZFW	0.65	ECUV1E154ZFW	0.65		
220000		ECUV1H224ZFW	0.65	ECUV1E224ZFW	0.65		
330000		(Packaging Styles Code)**		ECUV1E334ZFW	0.65		
470000				ECUV1E474ZFW	0.65		
680000				(Cap. Tol. Code)*		ECUV1C684ZFW	1.0
1000000						ECUY1C105ZFW	1.25

* □: Capacitance Tolerance Code.

** Packaging Styles Code: "V", "Y" for Taped Version (Taping pitch: 4 mm) and "X" for Bulk.Type.

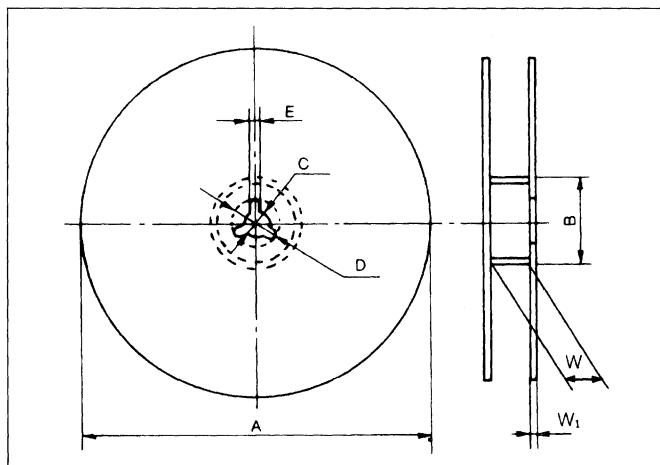
Packaging Specifications

Standard Packing Quantity

Size Code	Thickness	Style	Paper Taping	Embossed Taping	Bulk
10 (0402)	0.5 mm		Pitch 2 mm: 10000 (50000) pcs./reel	—	1000 pcs./ bag
11 (0603)	0.8 mm		Pitch 2 mm: 8000 (20000) pcs./reel	—	1000 pcs./bag
			Pitch 4 mm: 4000 (10000) pcs./reel		
12 (0805)	0.65 mm		Pitch 2 mm: 10000 (40000) pcs./reel	—	1000 pcs./bag
			Pitch 4 mm: 5000 (20000) pcs./reel		
	1.0 mm	Pitch 4 mm: 8000 (20000) pcs./reel Pitch 4 mm: 4000 (10000) pcs./reel			
13 (1206)	1.25 mm		—	—	1000 pcs./bag
	0.65 mm		Pitch 4 mm: 5000 (20000) pcs./reel	—	1000 pcs./bag
	1.0 mm		Pitch 4 mm: 4000 (10000) pcs./reel	—	1000 pcs./bag
	1.25 mm		—	Pitch 4 mm: 2000 (10000) pcs./reel	1000 pcs./bag

() for large size reel

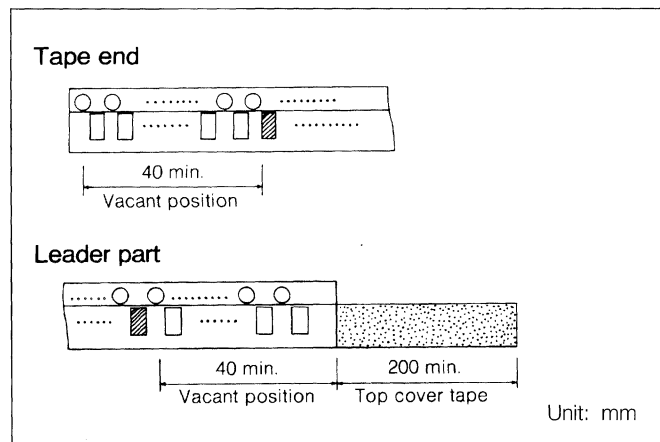
Reel for Taping



Symbol	A	B	C	D	E	W	W ₁
Dim. (mm)	ø180 ⁰ ₋₁ (330±5)	ø60.0±0.5 (50 min.)	13.0 ±0.5 (20 min.)	21.0±0.8 (20 min.)	2.0±0.5	9.0±0.3 (9.5±1.0)	1.3±0.2 (2.0±0.5)

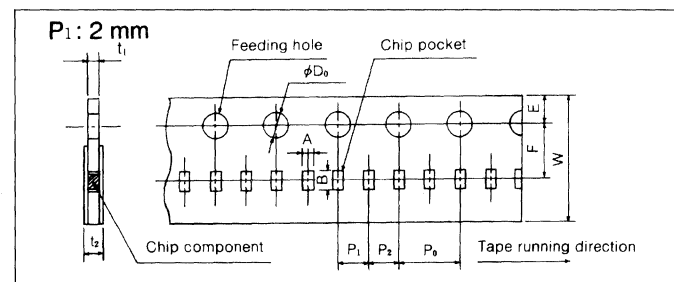
(): Large size reel

Leader Part and Taped End

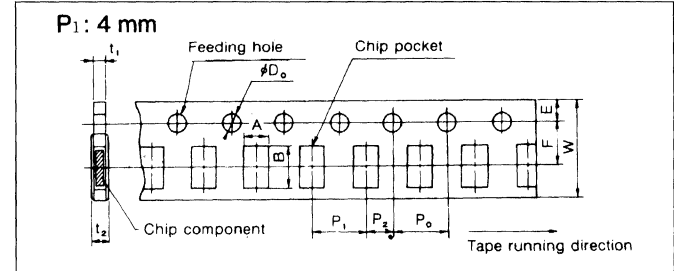


Size Code	Symbol	A	B	W	F	E	P ₁	P ₂	P ₀	øD ₀	t ₁	t ₂
Dim. (mm)	13 (1206)	1.95 ±0.20	3.6 ±0.2	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1	0.6 max.	1.5 max.

Paper Taping

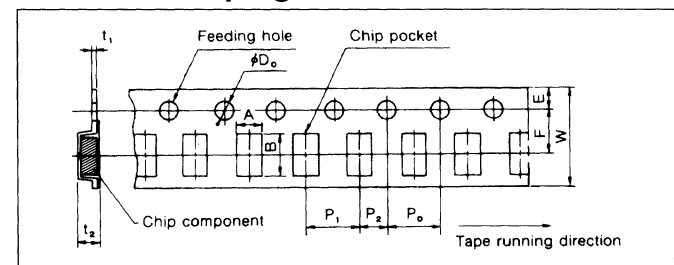


Size Code	Symbol	A	B	W	F	E	P ₁	P ₂	P ₀	øD ₀	t ₁	t ₂
10		0.65 ±0.05	1.15 ±0.05								0.7 max.	1.0 max.
11 (0603)		1.10 ±0.10	1.90 ±0.10	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	1.1 max.	1.4 max.
12 (0805)		1.65 ±0.2	2.4 ±0.2									



Size Code	Symbol	A	B	W	F	E	P ₁	P ₂	P ₀	øD ₀	t ₁	t ₂
11 (0603)		1.10 ±0.10	1.70 ±0.10									
12 (0805)		1.65 ±0.20	2.4 ±0.2	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	1.1 max.	1.4 max.
13 (1206)		2.0 ±0.2	3.6 ±0.2									

Embossed Taping



Features

- High Volumetric Efficiency
- Packaged for Automatic Insertion
- Excellent Stability
- Excellent Solderability
- Excellent Moisture Resistance

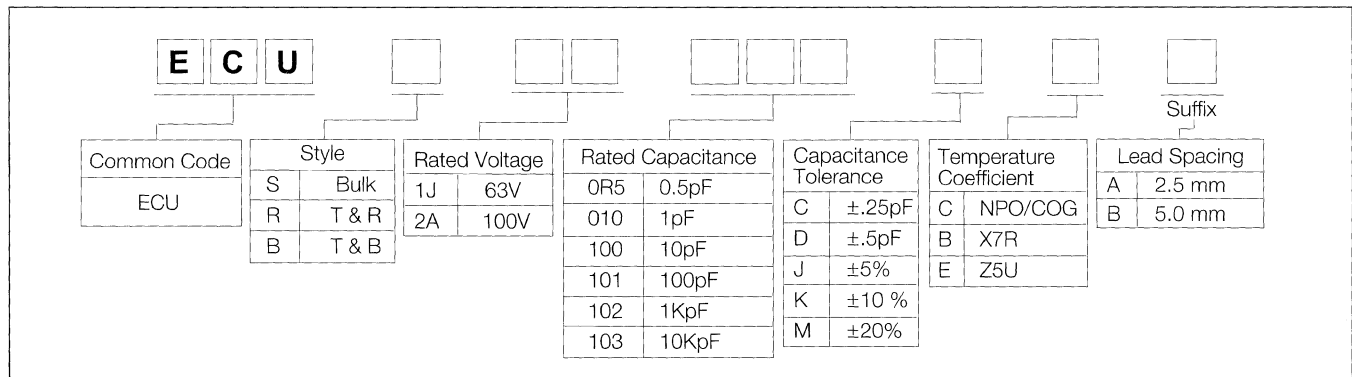
PHOTO
NOT
AVAILABLE

Specifications

Item	NPO/COG		X7R		Z5U
Operating Temperature Range	-55 °C to 125 °C		-55 °C to 125 °C		+10 °C to 85 °C
Rated Voltage	63 VDC	100 VDC	63 VDC	100 VDC	63 VDC
Capacitance Range*	100-47000 pF	4.7-22000 pF	3300-100,000 pF	220-33000 pF	.01 μf-2.2μF
Capacitance Tolerance	±.5pF, ±5%, ±10%		±10%, ±20%		±20%
Dielectric Strength	200% rated VDC for 10 s		200% rated VDC for 10 s		150% rated VDC for 10 s
Q Factor/Dissipation Factor	≤.15%		≤2.5%		≤4.0%
Insulation Resistance	100,000 MΩ or (1000MΩ x μF), whichever is less		50,000 MΩ or (500 mΩ x μF), whichever is less		10,000 MΩ or (100 μΩ x μF), whichever is less
Endurance Test (1000 hrs)	150% rated VDC at 125 °C		150% rated VDC at 125 °C		125% rated VDC at 85 °C
Temperature Coefficient	0 ±30ppm/°C		±15%		+22% / -56%

*NPO/COG, X7R - measured at 1.0 VRMS max at 1KHz (1.0 MHz for >100 pF); Z5U - measured at 0.5 VRMS max at 1KHz.

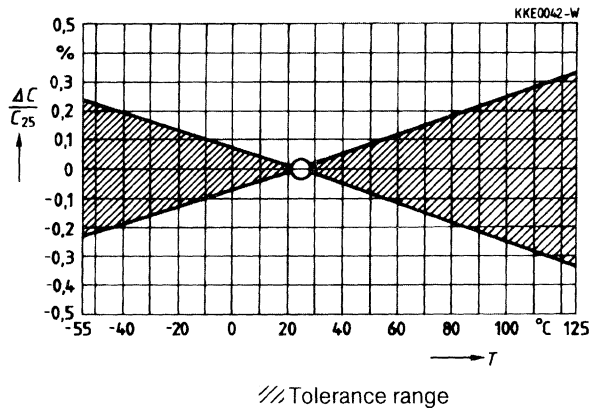
Explanation of Part Numbers



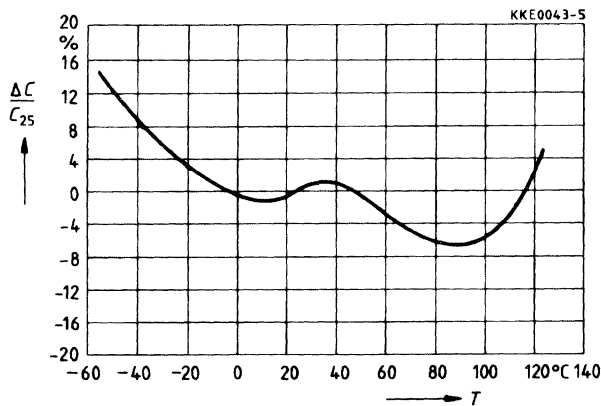
Characteristic Curves

Capacitance change versus temperature

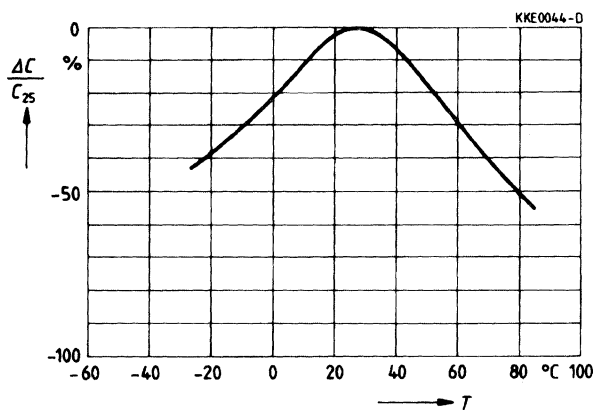
C0G ceramics



X7R ceramics (typical values)

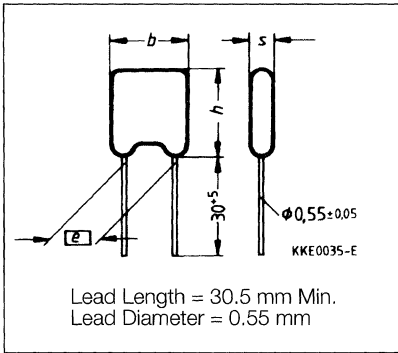


Z5U ceramics (typical values)



Case Configuration by Case Code

<p>Case Code A</p> <p>L max. = 5.0 mm</p> <p>H max. = 5.5 mm</p> <p>T max. = 2.5 mm</p> <p>S = 2.5 mm</p>	
<p>Case Code B</p> <p>L max. = 5.0 mm</p> <p>H max. = 6.5 mm</p> <p>T max. = 3.1 mm</p> <p>S = 2.5 mm</p>	
<p>Case Code C</p> <p>L max. = 5.0 mm</p> <p>H max. = 5.5 mm</p> <p>T max. = 2.5 mm</p> <p>S = 5.0 mm</p>	
<p>Case Code D</p> <p>L max. = 5.0 mm</p> <p>H max. = 6.5 mm</p> <p>T max. = 3.1 mm</p> <p>S = 5.0 mm</p>	
<p>Case Code E</p> <p>L max. = 7.5 mm</p> <p>H max. = 9.0 mm</p> <p>T max. = 3.8 mm</p> <p>S = 5.0 mm</p>	
<p>Case Code F</p> <p>L max. = 10.0 mm</p> <p>H max. = 11.5 mm</p> <p>T max. = 5.0 mm</p> <p>S = 5.0 mm</p>	



Part Number Selection Guide

Capacitance pF	Part Number Case A	Part Number Case B	Part Number Case C	Part Number Case D	Part Number Case E	Part Number Case F
NPO/COG 50-63 VDC						
100	ECUS1J101JCA		ECUS1J101JCB			
120	ECUS1J121JCA		ECUS1J121JCB			
150	ECUS1J151JCA		ECUS1J151JCB			
180	ECUS1J181JCA		ECUS1J181JCB			
220	ECUS1J221JCA		ECUS1J221JCB			
270	ECUS1J271JCA		ECUS1J272JCB			
330	ECUS1J331JCA		ECUS1J331JCB			
390	ECUS1J391JCA		ECUS1J391JCB			
470	ECUS1J471JCA		ECUS1J471JCB			
560	ECUS1J561JCA		ECUS1J561JCB			
680		ECUS1J681JCA		ECUS1J681JCB		
820		ECUS1J821JCA		ECUS1J821JCB		
1000		ECUS1J102JCA		ECUS1J102JCB		
1200		ECUS1J122JCA		ECUS1J122JCB		
1500		ECUS1J152JCA		ECUS1J152JCB		
1800		ECUS1J182JCA		ECUS1J182JCB		
2200		ECUS1J222JCA		ECUS1J222JCB		
2700		ECUS1J272JCA		ECUS1J272JCB		
3300		ECUS1J332JCA		ECUS1J332JCB		
3900		ECUS1J392JCA		ECUS1J393JCB		
4700		ECUS1J472JCA		ECUS1J472JCB		
5600					ECUS1J562JCB	
6800					EW S1J682JCB	
8200					ECUS1J822JCB	
10000					ECUS1J103JCB	
12000					ECUS1J123JCB	
18000					ECUS1J183JCB	
22000					ECUS1J223JCB	
27000					ECUS1J273JCB	
33000						ECUS1J333JC
39000						ECUS1J393JC
47000						ECUS1J473JC
NPO/COG 100VDC						
4.7	ECUS2A4R7DCA		ECUS2A4R7DCB			
5.6	ECUS2A5R6DCA		ECUS2A5R6DCB			
6.8	ECUS2A6R8DCA		ECUS2A6R8DCB			
8.2	ECUS2A8R2DCA		ECUS2A8R2DCB			
10	ECUS2A100JCA		ECUS2A100JCB			
12	ECUS2A120JCA		ECUS2A120JCB			
15	ECUS2A150JCA		ECUS2A150JCB			
18	ECUS2A180JCA		ECUS2A180JCB			
22	ECUS2A220JCA		ECUS2A220JCB			
27	ECUS2A270JCA		ECUS2A270JCB			
33	ECUS2A330JCA		ECUS2A330JCB			
39	ECUS2A390JCA		ECUS2A390JCB			
47	EGUS2A470JCA		ECUS2A470JCB			
56	ECUS2A560JCA		ECUS2A560JCB			
68	ECUS2A680JCA		ECUS2A680JCB			
82	ECUS2A820JCA		ECUS2A820JCB			
100	ECUS2A101JCA		ECUS2A101JCB			
120	ECUS2A121JCA		ECUS2A121JCB			
150	ECUS2A151JCA		ECUS2A151JCB			
180	ECUS2A181JCA		ECUS2A181JCB			
220		ECUS2A221JCA		ECUS2A221JCB		

Capacitance pF	Part Number Case A	Part Number Case B	Part Number Case C	Part Number Case D	Part Number Case E	Part Number Case F
270		ECUS2A272JCA		ECUS2A271JCB		
330		ECUS2A331JCA		ECUS2A331JCB		
390		ECUS2A391JCA		ECUS2A391JCB		
470		ECUS2A471JCA		ECUS2A471JCB		
560		ECUS2A561JCA		ECUS2A561JCB		
680		ECUS2A681JCA		ECUS2A681JCB		
820		ECUS2A821JCA		ECUS2A821JCB		
1000		ECUS2A102JCA		ECUS2A102JCB		
1200		ECUS2A122JCA		ECUS2A122JCB		
1500		ECUS2A152JCA		ECUS2A152JCB		
1800					ECUS2A182JCB	
2200					ECUS2A222JCB	
2700					ECUS2A272JCB	
3300					ECUS2A332JCB	
3900					ECUS2A392JCB	
4700					ECUS2A472JCB	
5600					ECUS2A562JCB	
6800					ECUS2A682JCB	
8200					ECUS2A822JCB	
10000					ECUS2A103JCB	
12000						ECUS2A123JCB
15000						ECUS2A153JCB
18000						ECUS2A183JCB
22000						ECUS2A223JCB
X7R 50-63VDC						
3300	ECUS1J332KBA		ECUS1J332KBB			
3900	ECUS1J392KBA		ECUS1J332KBB			
4700	ECUS1J472KBA		ECUS1J472KBB			
5600	ECUS1J562KBA		ECUS1J562KBB			
6800	ECUS1J682KBA		ECUS1J682KBB			
8200	ECUS1J822KBA		ECUS1J822KBB			
10000	ECUS1J103KBA		ECUS1J103KBB			
12000	E W S1J123KBA		ECUS1J123KBB			
15000	ECUS1J153KBA		ECUS1J153KBB			
18000	ECUS1J183KBA		ECUS1J183KBB			
22000	ECUS1J223KBA		ECUS1J223KBB			
27000		ECUS1J273KBA		ECUS1J273KBB		
33000		ECUS1J333KBA		ECUS1J333KBB		
39000		ECUS1J393KBA		ECUS1J393KBB		
47000		ECUS1J473KBA		ECUS1J473KBB		
56000		ECUS1J563KBA		ECUS1J563KBB		
68000		ECUS1J683KBA		ECUS1J683KBB		
82000		ECUS1J823KBA		ECUS1J823KBB		
100000		ECUS1J104KBA		ECUS1J104KBB		
120000		ECUS1J124KBA		ECUS1J124KBB		
150000		ECUS1J154RBA		ECUS1J154KBB		
180000					ECUS1J184KBB	
220000					ECUS1J224KBB	
270000					ECUS1J274KBB	
330000					ECUS1J334KBB	
470000					ECUS1J474RBB	
560000					ECUS1J564KBB	
680000					ECUS1J684KBB	
820000						ECUS1J824KBB
1000000						ECUS1J105KBB

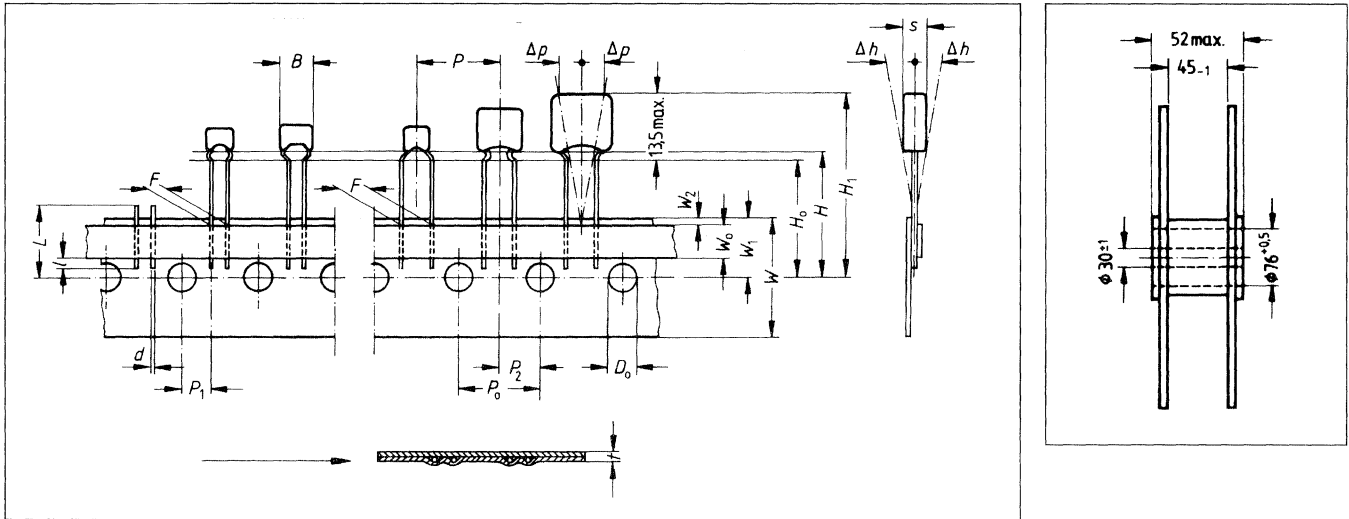
Ceramic Multilayer Radial Leaded Capacitor

ECU Series (Leaded)

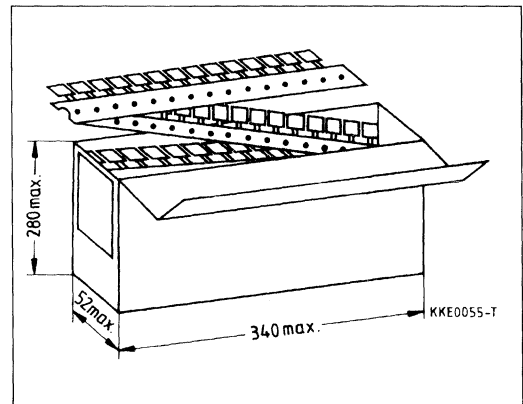
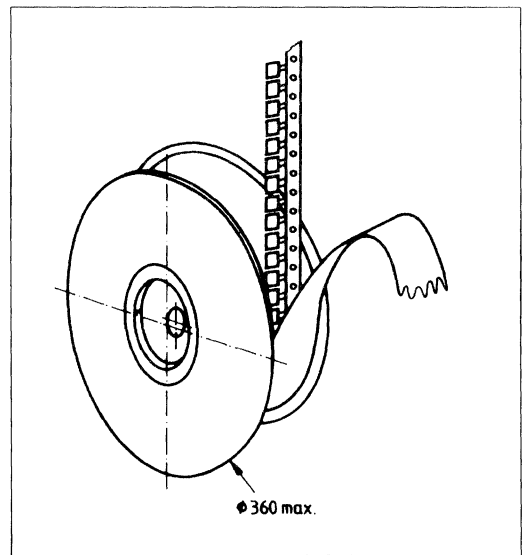
Capacitance pF	Part Number Case A	Part Number Case B	Part Number Case C	Part Number Case D	Part Number Case E	Part Number Case F
X7R 100VDC						
220	ECUS2A221KBA		ECUS2A221KBB			
270	ECUS2A271KBA		ECUS2A271KBB			
330	ECUS2A331KBA		ECUS2A331KBB			
390	ECUS2A391KBA		ECUS2A391KBB			
470	ECUS2A471KBA		ECUS2A471KBB			
560	ECUS2A561KBA		ECUS2A561KBB			
680	ECUS2A681KBA		ECUS2A681KBB			
820	ECUS2A821KBA		ECUS2A821KBB			
1000	ECUS2A102KBA		ECUS2A102KBB			
1200	ECUS2A122KBA		ECUS2A122KBB			
1500	ECUS2A152KBA		ECUS2A152KBB			
1800	ECUS2A182KBA		ECUS2A182KBB			
2200	ECUS2A222KBA		ECUS2A222KBB			
2700	ECUS2A272KBA		ECUS2A272KBB			
3300	ECUS2A332KBA		ECUS2A332KBB			
3900	ECUS2A392KBA		ECUS2A392KBB			
4700	ECUS2A472KBA		ECUS2A472KBB			
5600		ECUS2A562KBA		ECUS2A562KBB		
6800		ECUS2A682KBA		ECUS2A682KBB		
8200		ECUS2A822KBA		ECUS2A822KBB		
10000		ECUS2A103KBA		ECUS2A103KBB		
12000		ECUS2A123KBA		ECUS2A123KBB		
15000		ECUS2A153KBA		ECUS2A153KBB		
18000		ECUS2A183KBA		ECUS2A183KBB		
22000		ECUS2A223KBA		ECUS2A223KBB		
27000		ECUS2A273KBA		ECUS2A273KBB		
33000		ECUS2A333KBA		ECUS2A333KBB		
39000		ECUS2A393KBA		ECUS2A393KBB		
47000		ECUS2A473KBA		ECUS2A473KBB		
56000		ECUS2A563KBA		ECUS2A453KBB		
68000		ECUS2A683KBA		ECUS2A683KBB		
82000		ECUS2A823KBA		ECUS2A823KBB		
100000		ECUS2A104KBA		ECUS2A104KBB		
120000					ECUS2A124KBB	
150000					ECUS2A154KBB	
180000					ECUS2A184KBB	
220000						ECUS2A224KBB
270000						ECUS2A274KBB
330000						ECUS2A334KBB
Z5U 50-63VDC						
.010 μ F	ECUS1J103MEA		ECUS1J103MEB			
.015 μ F	ECUS1J153MEA		ECUS1J153MEB			
.022 μ F	ECUS1J223MEA		ECUS1J223MEB			
.033 μ F	ECUS1J333MEA		ECUS1J333MEB			
.047 μ F	ECUS1J473MEA		ECUS1J473MEB			
.068 μ F		ECUS1J683MEA		ECUS1J683MEB		
.100 μ F		ECUS1J104MEA		ECUS1J104MEB		
.150 μ F		ECUS1J154MEA		ECUS1J154MEB		
.220 μ F		ECUS1J224MEA		ECUS1J224MEB		
.330 μ F		ECUS1J334MEA		ECUS1J334MEB		
.470 μ F					ECUS1J474MEB	
.680 μ F					ECUS1J684MEB	
1.000 μ F					ECUS1J105MEB	
1.500 μ F					ECUS1J155MEB	
2.200 μ F						ECUS1J225MEB

Tape Packaging of Radial-Lead Capacitors (Taping in accordance with IEC 286-2)

Dimensions and Tolerances

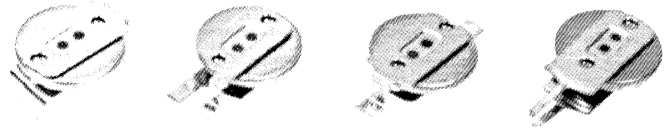


Dimension (mm)	Lead spacing		Tolerance	Remarks
	2.54 mm	5.08 mm		
B	11.0	11.0	max.	
s	3.1	5.0	max.	
d	0.55	0.55	±0.05	
P	12.7	12.7	±1.0	
P ₀	12.7	12.7	±0.2	±1 mm/20 hole pitches
P ₁	5.1	3.85	±0.7	
P ₂	6.35	6.35	±1.3	
F	2.54	5.08	+0.6/-0.1	
Δh	0	0	±2.0	measured at top of component body
Δp	0	0	±1.3	
W	18.0	18.0	±0.5	
W ₀	5.5	5.5	min.	Peel force ≥ 5N
W ₁	9.0	9.0	±0.5	
W ₂	1.0	1.0	-0.5	
H	18.0	18.0	+2.0/-0	
H ₀	16.0	16.0	±0.5	
H ₁	32.2	32.2	max.	
D ₀	4.0	4.0	±0.2	
t	0.7	0.7	+0.2	
L	11.0	11.0	max.	
l	1.0	1.0	max.	



Features

- IC memory back-up device (mA range load)
- Coin type with various terminal style
- Suitable for application in limited space



Specifications

Item	Performance Characteristics
Operating Temperature Range	-25 to +70°C
Rated Working Voltage	2.5V DC
Nominal Capacitance Range	0.1F to 2.0F
Capacitance Tolerance	-20% to +80% (+20 °C)
Internal Resistance	Refer to “Standard products table” for each value
Characteristics at High and Low Temperature	-25°C & +70°C Capacitance change ±30% of the measured value at +20°C
	-25°C Internal resistance ≤ 5 times of the measured value at +20°C
High Temperature Loading	The capacitor shall meet the following limits after 1,000 hours application of 2.5V DC a +70°C Capacitance change : ±30% of the initial measured value Internal resistance : ≤ 4 times of the initial specified value
Shelf Life	The capacitor shall meet the limits for “High Temperature Loading” after 1,000 hours exposure at +70°C with no voltage applied.
Loading with Moisture	The capacitor shall meet the limits specified for “High Temperature Loading” after 500 hours exposure at +55°C/90 to 95% RH with 2.5V DC applied.

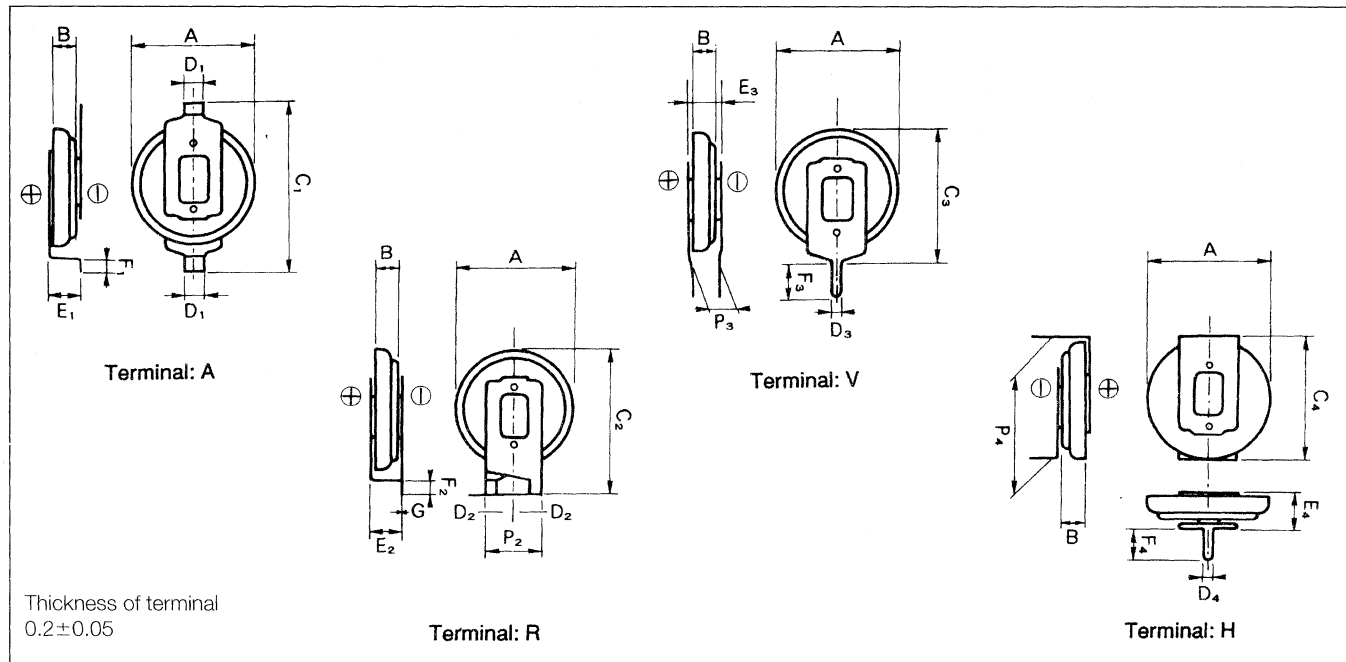
Standard Products Table

Rated working voltage [V.DC]	Normal capacitance [F]	Part number	Internal resistance [Ω] at 1 kHz
2.5	0.10	EECEOEL104 □	40
	0.33	EECEOEL334 □	40
	0.47	EECEOEL474 □	40
	0.68	EECEOEL684 □	10
	2.0	EECEOEL205 □	15

* □ Terminal configurations A/R VIH

Dimensions

[mm]



Terminal: A

Part No.	A ⁺⁰ _{-0.3}	B ⁺⁰ _{-0.2}	C ₁ ±0.5	D ₁ ±0.1	E ₁ max.	F ₁ ±0.2
EECEOEL104A	6.8	1.4	12.4	0.5	1.9	1.8
EECEOEL334A	9.5	2.1	15.5	2.0	2.9	2.0
EECEOEL474A	11.0	2.0	17.0	2.0	2.8	2.0
EECEOEL684A	20.0	1.6	26.0	2.0	2.5	2.0
EECEOEL205A	18.5	2.2	24.5	2.0	3.0	2.0

Terminal: R

Part No.	A ⁺⁰ _{-0.3}	B ⁺⁰ _{-0.2}	C ₂ max.	D ₂ ±0.1	E ₂ max.	F ₂ +0.2	P ₂ ±0.5
EECEOEL104R	6.8	1.4	9.5	0.5	1.9	1.8	2.0
EECEOEL334R	9.5	2.1	13.5	1.5	2.9	2.0	4.5
EECEOEL474R	11.0	2.0	15.0	1.5	2.8	2.0	5.5
EECEOEL684R	20.0	1.6	24.0	1.5	2.5	2.0	5.5
EECEOEL205R	18.5	2.2	22.5	1.5	3.0	2.0	5.5

Terminal: V

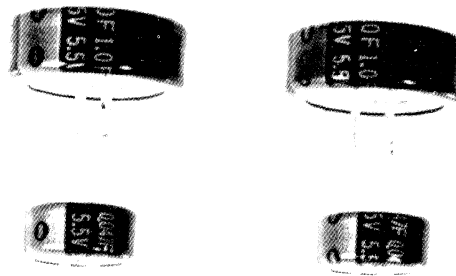
Part No.	A ⁺⁰ _{-0.3}	B ⁺⁰ _{-0.2}	C ₃ max.	D ₃ +0.1	E ₃ max.	F ₃ (+)±0.3	F ₃ (-)±0.3	P ₃ +0.5
EECEOEL334V	9.5	2.1	12.0	0.8	2.9	5.0	4.0	3.0
EECEOEL474V	11.0	2.0	13.0	0.8	2.8	5.0	4.0	3.0
EECEOEL684V	20.0	1.6	22.0	0.8	2.5	5.0	4.0	3.0
EECEOEL205V	18.5	2.2	20.5	0.8	3.0	5.0	4.0	3.0

Terminal: H

Part No.	A ⁺⁰ _{-0.2}	B ⁺⁰ _{-0.2}	C ₄ ±0.5	D ₄ ±0.1	E ₄ max.	F ₄ ±0.3	P ₄ ±0.5
EECEOEL334H	9.5	2.1	10.5	0.8	4.0	5.0	10.0
EECEOEL474H	11.0	2.0	12.0	0.8	3.9	5.0	10.0
EECEOEL684H	20.0	1.6	21.0	0.8	3.5	5.0	20.0
EECEOEL205H	18.5	2.2	19.5	0.8	4.1	5.0	20.0

Features

- IC memory back-up device (μA range load)
- Large capacitance for long time back-up
- General purpose
- 5mm terminal spacing

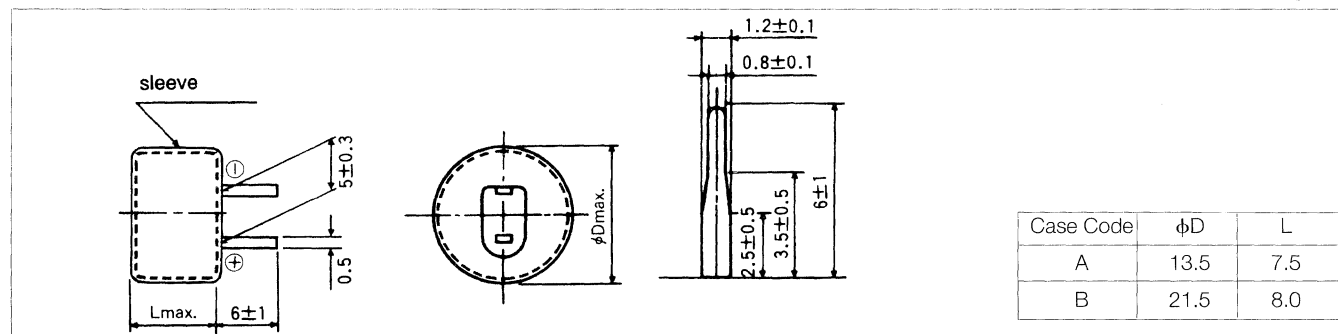


Specifications

Item	Performance Characteristics		
Operating Temperature Range	-25 to +70°C		
Rated Working Voltage	5.5V DC		
Nominal Capacitance Range	0.022F to 1.0F		
Capacitance Tolerance	-20% to +80% (+20 °C)		
Internal Resistance	Refer to "Standard products table" for each value		
Characteristics at High and Low Temperature	-25°C & +70°C	Capacitance change	$\pm 30\%$ of the measured value at +20°C
	-25°C	Internal resistance	≤ 5 times of the measured value at +20°C
High Temperature Loading	The capacitor shall meet the following limits after 1,000 hours application of 5.5V DC at +70°C Capacitance change : $\pm 30\%$ of the initial measured value Internal resistance : ≤ 4 times of the initial specified value		
Shelf Life	The capacitor shall meet the limits for "High Temperature Loading" after 1,000 hours exposure at +70°C with no voltage applied.		
Loading with Moisture	The capacitor shall meet the limits specified for "High Temperature Loading" after 500 hours exposure at +55°C/90 to 95% RH with 5.5V DC applied.		

Dimensions

[mm]

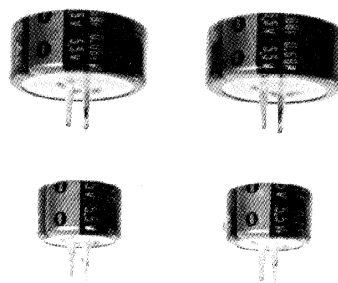


Standard Products Table

Rated working voltage [V.DC]	Nominal capacitance [F]	Case code	Part number	Internal resistance [Ω] at 1kHz
5.5	.022	A	EECF5R5U223	150
	0.033	A	EECF5R5U333	150
	0.047	A	EECF5R5U473	120
	0.1	A	EECF5R5U104	75
	0.22	A	EECF5R5U224	75
	0.33	B	EECF5R5U334	40
	0.47	B	EECF5R5U474	30
	1.0	B	EECF5R5U105	30

Features

- IC memory back-up device (μA range load)
- Industrial grade (max. temperature: $+85^\circ\text{C}$)



Specifications

Item	Performance Characteristics		
Operating Temperature Range	-25 to $+85^\circ\text{C}$		
Rated Working Voltage	5.5V DC		
Nominal Capacitance Range	0.033F to 0.68F		
Capacitance Tolerance	-20% to +80% ($+20^\circ\text{C}$)		
Internal Resistance	Refer to "Standard products table" for each value		
Characteristics at High and Low Temperature	-25 $^\circ\text{C}$ & $+85^\circ\text{C}$	Capacitance change	$\pm 30\%$ of the measured value at $+20^\circ\text{C}$
	-25 $^\circ\text{C}$	Internal resistance	≤ 5 times of the measured value at $+20^\circ\text{C}$
High Temperature Loading	The capacitor shall meet the following limits after 1,000 hours application of 5.5V DC at $+85^\circ\text{C}$ Capacitance change : $\pm 30\%$ of the initial measured value Internal resistance : ≤ 4 times of the initial specified value		
Shelf Life	The capacitor shall meet the limits for "High Temperature Loading" after 1,000 hours exposure at $+85^\circ\text{C}$ with no voltage applied.		
Loading with Moisture	The capacitor shall meet the limits specified for "High Temperature Loading" after 500 hours exposure at $+55^\circ\text{C}/90$ to 95% RH with 5.5V DC applied.		

Dimensions

[mm]

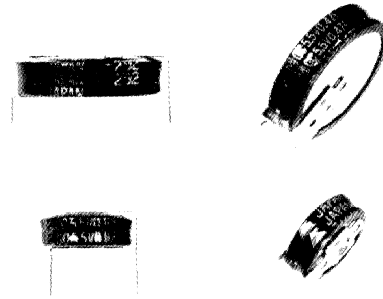
Case Code	ϕD	L
A	13.5	9.5
B	21.5	9.5

Standard Products Table

Rated working voltage [V.DC]	Nominal capacitance [F]	Case code	Part number	Internal resistance [Ω] at 1kHz
5.5	0.033	A	EECF5R5H333	150
	0.047	A	EECF5R5H473	120
	0.1	A	EECF5R5H104	100
	0.47	B	EECF5R5H474	75
	0.68	B	EECF5R5H684	50

Features

- IC memory back-up device (mA range load)
- Volumetric efficiency (50% smaller than NF series)
- Light weight (1.2g)
- General purpose

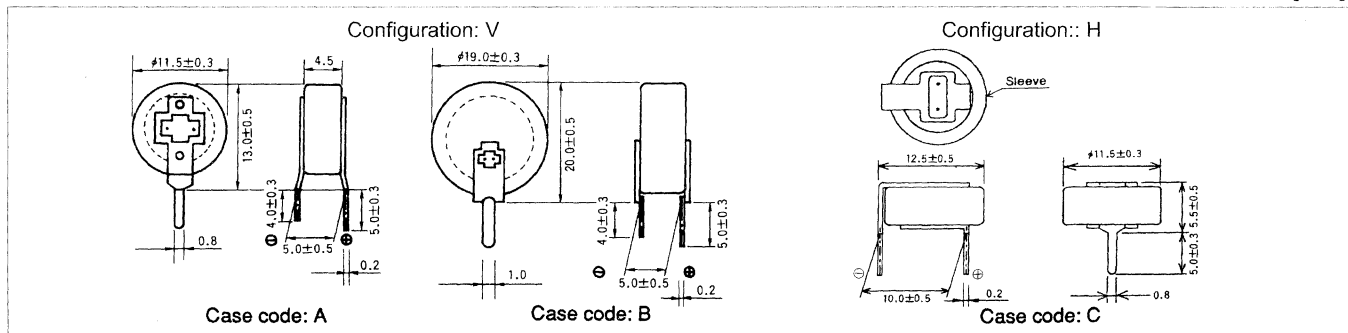


Specifications

Item	Performance Characteristics		
Operating Temperature Range	-25 to +70°C		
Rated Working Voltage	5.5V DC		
Nominal Capacitance Range	0.022F to 1.0F		
Capacitance Tolerance	-20% to +80% (+20 °C)		
Internal Resistance	Refer to “Standard products table” for each value		
Characteristics at High and Low Temperature	-25°C & +70°C	Capacitance change	± 30% of the measured value at +20°C
	-25°C	Internal resistance	≦ 5 times of the measured value at +20°C
High Temperature Loading	The capacitor shall meet the following limits after 1,000 hours application of 5.5V DC at +70°C Capacitance change : ± 30% of the initial measured value Internal resistance : ≦ 4 times of the initial specified value		
Shelf Life	The capacitor shall meet the limits for “High Temperature Loading” after 1,000 hours exposure at +70°C with no voltage applied.		
Loading with Moisture	The capacitor shall meet the limits specified for “High Temperature Loading” after 500 hours exposure at +55°C/90 to 95% RH with 5.5V DC applied.		

Dimensions

[mm]



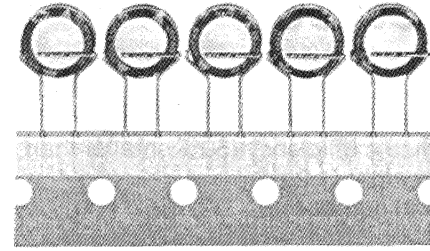
Standard Products Table

Rated working voltage [V.DC]	Nominal capacitance [F]	Part number	Internal resistance [Ω] at 1kHz	Case code	
				V	H
5.5	0.022	EECS5R5 □ 223	150	A	C
	0.047	EECS5R5 □ 473	120	A	C
	0.10	EECS5R5 □ 104	75	A	C
	0.22	EECS5R5 □ 224	75	A	C
	0.47	EECS5R5 □ 474	30	B	D
	1.0	EECS5R5 □ 105	30	B	D

* □ = V (Configuration: V) or H (Configuration H)

Features

- Lead taping type of SG series
- IC memory back-up device (mA range load)
- Volumetric efficiency (50% smaller than NF series)
- General purpose



Specifications

Item	Performance Characteristics		
Operating Temperature Range	-25 to +70°C		
Rated Working Voltage	5.5V DC		
Nominal Capacitance Range	0.022F to 0.22F		
Capacitance Tolerance	-20% to +80% (+20 °C)		
Internal Resistance	Refer to "Standard products table" for each value		
Characteristics at High and Low Temperature	-25°C & +70°C	Capacitance change	±30% of the measured value at +20°C
	-25°C	Internal resistance	≦ 5 times of the measured value at +20°C
High Temperature Loading	The capacitor shall meet the following limits after 1,000 hours application of 5.5V DC at +70°C Capacitance change : ±30% of the initial measured value Internal resistance : ≦ 4 times of the initial specified value		
Shelf Life	The capacitor shall meet the limits for "High Temperature Loading" after 1,000 hours exposure at +70°C with no voltage applied.		
Loading with Moisture	The capacitor shall meet the limits specified for "High Temperature Loading" after 500 hours exposure at +55°C/90 to 95% RH with 5.5V DC applied.		

Dimensions

[mm]

Code	Dimensions	Tolerance
φd	0.55	±0.05
P ₀	12.7	±0.2
F	5.0	+0.8/-0.2
W	18.0	±0.5
W ₀	≍5.5	—
W ₁	9.0	±0.5
W ₂	0~3.0	—
H ₀	18.0	±0.5
φD ₀	4.0	±0.2
P	12.7	±1.0
P ₁	3.85	±0.50
P ₂	6.35	±1.00
Δh, Δh ₁	0	±1.0
H ₁	29.5	±0.5

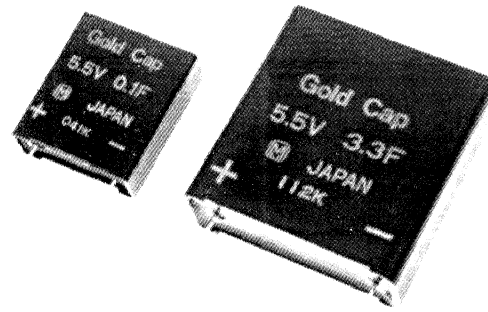
Packing quantity: 1500 pcs

Standard Products Table

Rated working voltage [V DC]	Nominal capacitance [F]	Part number	Internal resistance [Ω] at 1kHz
5.5	0.022	EECS5R5T223	150
	0.047	EECS5R5T473	120
	0.10	EECS5R5T104	75
	0.22	EECS5R5T224	75

Features

- Back-up for mA range load
- Large capacitance (3.3F)
- Molded case



Specifications

Item	Performance Characteristics		
Operating Temperature Range	-25 to +70°C		
Rated Working Voltage	5.5V DC		
Nominal Capacitance Range	1.0F to 3.3F		
Capacitance Tolerance	-20% to +80% (0.1F, 0.33F), -20% to +40% (1F, 3.3F) (+20 °C)		
Internal Resistance	Refer to "Standard products table" for each value		
Characteristics at High and Low Temperature	-25°C & +70°C	Capacitance change	±30% of the measured value at +20°C
	-25°C	Internal resistance	≤ 3 times of the measured value at +20°C
High Temperature Loading	The capacitor shall meet the following limits after 1,000 hours application of 5.5V DC at +70°C Capacitance change : ±30% of the initial measured value Internal resistance : ≤ 2 times of the initial specified value		
Shelf Life	The capacitor shall meet the limits for "High Temperature Loading" after 1,000 hours exposure at +70°C with no voltage applied.		
Loading with Moisture	The capacitor shall meet the limits specified for "High Temperature Loading" after 500 hours exposure at +55°C/90 to 95% RH with 5.5V DC applied.		

Dimensions

[mm]

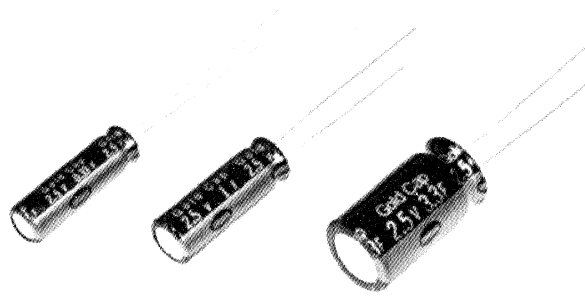
Case code	Dimensions				
	W	T	H	P	φd
A	25.0	9	28.0	17.5	0.7
B	29.0	10	31.5	22.5	0.7
C	42.5	15	32.5	32.5	0.8
D	42.5	15	42.5	32.5	0.8

Standard Products Table

Rated working voltage [V.DC]	Nominal capacitance [F]	Case code	Part number	Internal resistance [Ω] at 1kHz
5.5	0.1	A	EECW5R5D104	9.0
	0.33	B	EECW5R5D334	5.0
	1	C	EECW5R5D105	5.0
	3.3	D	EECW5R5D335	2.5

Features

- Low internal resistance, 1/10 of NA series.
- For back-up on ampere order

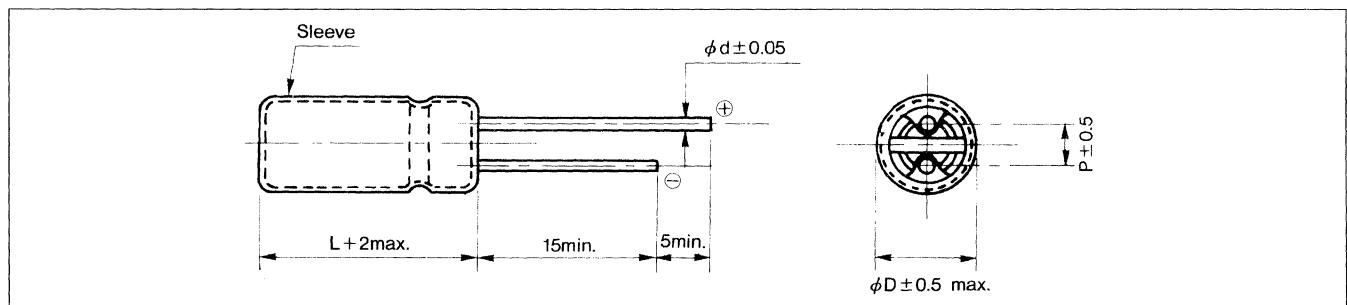


Specifications

Item	Performance Characteristics	
Operating Temperature Range	-40 to +70°C	
Rated Working Voltage	2.5V DC	
Nominal Capacitance Range	0.22 to 10F	
Capacitance Tolerance	-20% to +80% (20 °C)	
Characteristics at Low Temperature	Capacitance change	±30% of the measured value at +20°C
	Internal resistance	≦ 4 times of the measured value at +20°C
Endurance	The capacitor shall meet the following limits after 1,000 hours application of 2.5V DC at +70°C	
	Capacitance change	±30% of measured value
	Internal resistance	≦ 2 times of initial specified value
Shelf Life	The capacitor shall meet the limits for "Endurance" after 1,000 hours at +70°C with no voltage applied.	
Moisture Resistance	The capacitor shall meet the limits specified for "Endurance" after 500 hours exposure at +55°C/90 to 95% RH with 2.5V DC applied.	

Dimensions

[mm]



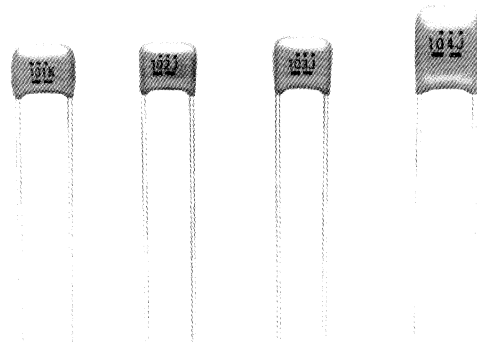
Standard Products Table

Nominal capacitance [F]	Part number	Internal Resistance [Ω] at 1kHz	Size (mm)			
			φD	L	φd	P
0.22	EECAOEL224	2.60	6.8	21.0	0.7	2.5
0.33	EECAOEL334	1.60	6.8	21.0	0.7	2.5
0.47	EECAOEL474	1.30	8.0	22.0	0.7	3.5
1.0	EECAOEL105	1.00	8.0	22.0	0.7	3.5
1.5	EECAOEL155	0.60	12.5	23.0	0.8	5.0
2.2	EECAOEL225	0.40	12.5	23.0	0.8	5.0
3.3	EECAOEL335	0.30	12.5	23.0	0.8	5.0
4.7	EECAOEL475	0.20	12.5	35.0	0.8	5.0
10.0	EECAOEL106	0.10	18.0	35.0	0.8	7.5

This series is especially designed for application where high density insertion of components is required.

Features

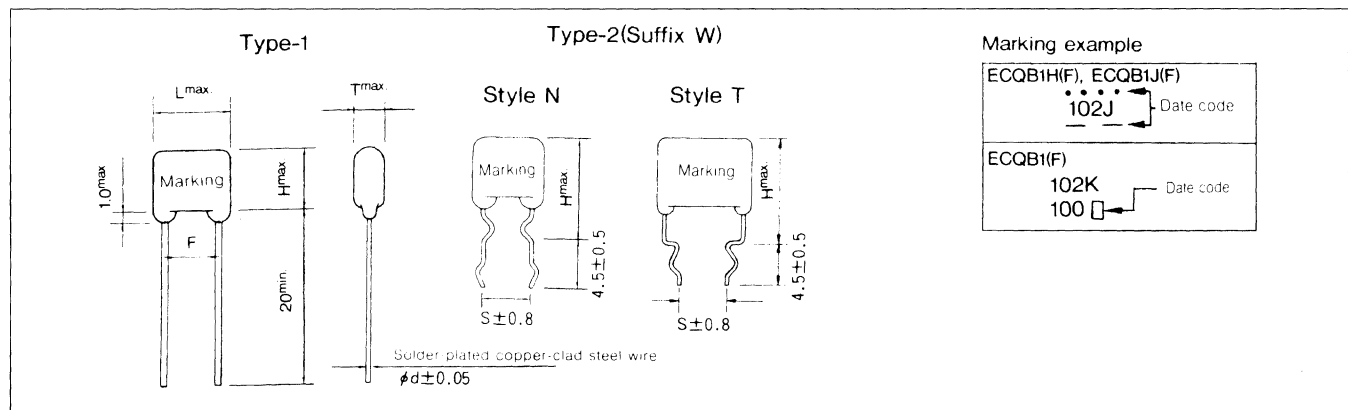
- High volumetric efficiency
- Non-inductive construction
- Low-loss, high stability
- Epoxy resin coating
- Taped product available (see p. 141)



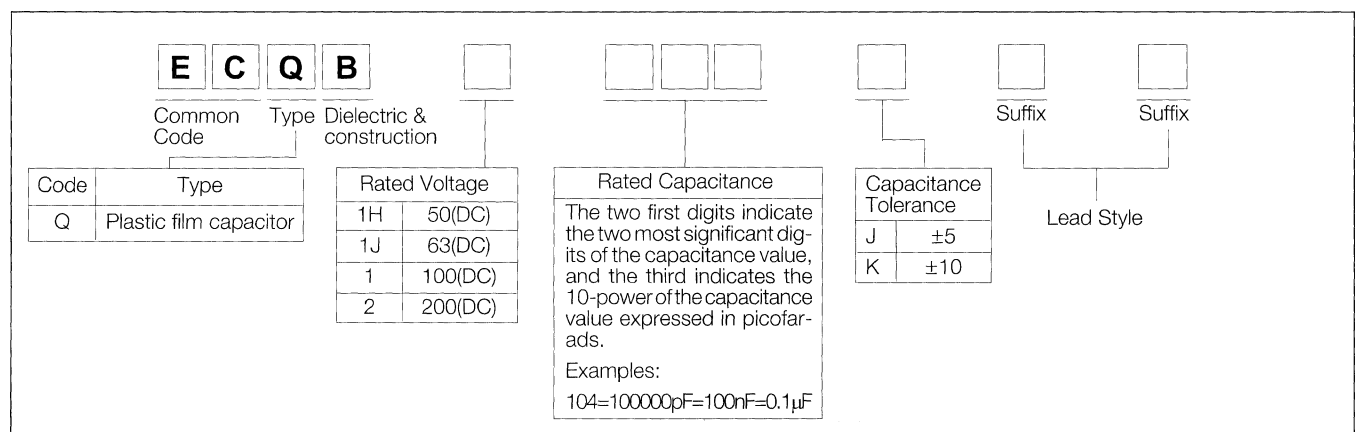
Specifications

Operating Temperature Range	-40 to +85 °C
Rated Voltage	50V, 63V, 100V, 200VDC
Capacitance Range	0.0001 to 0.47μF
Capacitance Tolerance	±5%(J), ±10%(K) (0.0001 to 0.00039μF/50V, 63VDC: ±10% only)
Dissipation Factor	0.8% max. (20 °C, 1kHz)
Withstanding Voltage	Between terminals: Rated voltage (VDC) x 250% 1 to 5s
Insulation Resistance	C≤0.33mF: 30000MΩmin. (20 °C, 50VDC, 60s: ECQB1H(F), ECQB1J(F)) C>0.33μF: 10000MΩ•μFmin. (20 °C, 100VDC, 60s: ECQB1(F), ECQB(X)(F))
Construction	Polyester film, non-inductive, epoxy resin coating

Dimensions



Explanation of Part Numbers



Rating & Dimensions

50VDC

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style Type-2	
		L max.	T max.	H max.		F ^{+0.75} _{-0.25}	S \pm 0.8			ϕ d \pm 0.05
				Type-1	Type-2		Type-1	Type-2		
ECQ B1H101KF ()	.0001	6.5	3.0	5.5	10.5	5.0	5.0	0.5	N	
" 1H121KF ()	.00012	"	"	"	"	"	"	"	"	
" 1H151KF ()	.00015	"	"	"	"	"	"	"	"	
" 1H181KF ()	.00018	"	"	"	"	"	"	"	"	
" 1H221KF ()	.00022	"	"	"	"	"	"	"	"	
" 1H271KF ()	.00027	"	"	"	"	"	"	"	"	
" 1H331KF ()	.00033	"	"	"	"	"	"	"	"	
" 1H391KF ()	.00039	"	"	"	"	"	"	"	"	
" 1H471KF ()	.00047	"	"	"	"	"	"	"	"	
" 1H561KF ()	.00056	"	"	"	"	"	"	"	"	
" 1H681KF ()	.00068	"	"	"	"	"	"	"	"	
" 1H821KF ()	.00082	"	"	"	"	"	"	"	"	
" 1H102KF ()	.001	"	"	"	"	"	"	"	"	
" 1H122KF ()	.0012	"	"	"	"	"	"	"	"	
" 1H152KF ()	.0015	"	"	"	"	"	"	"	"	
" 1H182KF ()	.0018	"	"	"	"	"	"	"	"	
" 1H222KF ()	.0022	"	"	"	"	"	"	"	"	
" 1H272KF ()	.0027	"	"	"	"	"	"	"	"	
" 1H332KF ()	.0033	"	"	"	"	"	"	"	"	
" 1H392KF ()	.0039	"	"	"	"	"	"	"	"	
" 1H472KF ()	.0047	"	"	"	"	"	"	"	"	
" 1H562KF ()	.0056	"	"	"	"	"	"	"	"	
" 1H682KF ()	.0068	"	"	"	"	"	"	"	"	
" 1H822KF ()	.0082	"	"	"	"	"	"	"	"	
" 1H103KF ()	.01	"	"	"	"	"	"	"	"	
" 1H123KF ()	.012	7.0	"	6.0	11.0	"	"	"	"	
" 1H153KF ()	.015	"	"	"	"	"	"	"	"	
" 1H183KF ()	.018	"	"	"	"	"	"	"	"	
" 1H223KF ()	.022	"	"	"	"	"	"	"	"	
" 1H273KF ()	.027	"	3.5	6.5	11.5	"	"	"	"	
" 1H333KF ()	.033	7.5	"	"	"	"	"	"	"	
" 1H393KF ()	.039	"	"	"	"	"	"	"	"	
" 1H473KF ()	.047	"	4.0	"	"	"	"	"	"	
" 1H563KF ()	.056	8.0	"	7.5	12.5	"	"	"	"	
" 1H683KF ()	.068	"	"	8.5	13.5	"	"	"	"	
" 1H823KF ()	.082	"	4.5	"	"	"	"	"	"	
" 1H104KF ()	.1	"	"	9.5	14.5	"	"	"	"	
" 1H124KF ()	.12	11.0	"	"	"	7.5	"	0.6	T	
" 1H154KF ()	.15	"	5.0	"	"	"	"	"	"	
" 1H184KF ()	.18	"	5.5	11.0	15.0	"	"	"	"	
" 1H224KF ()	.22	"	6.0	11.0	16.0	"	"	"	"	
" 1H274KF ()	.27	13.0	"	12.0	17.0	10.0	"	"	"	
" 1H334KF ()	.33	"	"	13.0	18.0	"	"	"	"	
" 1H394KF ()	.39	"	6.5	14.0	19.0	"	"	"	"	
" 1H474KF ()	.47	"	7.0	14.5	19.5	"	"	"	"	

Suffix for lead crimped or taped type (W: Self mounting crimped; 3: Crimped lead taping; 4: Straight lead taping)

Cap. tol. code J: \pm 5% K: \pm 10% (0.0001 to 0.00039 is only for \pm 10% (K))

Rating & Dimensions

63VDC

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style Type-2	
		L max.	T max.	H max.		F ^{+0.75} -0.25	S \pm 0.8			ϕ d \pm 0.05
				Type-1	Type-2		Type-1	Type-2		
ECQ B1J101KF ()	.0001	6.5	3.0	5.5	10.5	5.0	5.0	0.5	N	
" 1J121KF ()	.00012	"	"	"	"	"	"	"	"	
" 1J151KF ()	.00015	"	"	"	"	"	"	"	"	
" 1J181KF ()	.00018	"	"	"	"	"	"	"	"	
" 1J221KF ()	.00022	"	"	"	"	"	"	"	"	
" 1J271KF ()	.00027	"	"	"	"	"	"	"	"	
" 1J331KF ()	.00033	"	"	"	"	"	"	"	"	
" 1J391KF ()	.00039	"	"	"	"	"	"	"	"	
" 1J471 F ()	.00047	"	"	"	"	"	"	"	"	
" 1J561 F ()	.00056	"	"	"	"	"	"	"	"	
" 1J681 F ()	.00068	"	"	"	"	"	"	"	"	
" 1J821 F ()	.00082	"	"	"	"	"	"	"	"	
" 1J102 F ()	.001	"	"	"	"	"	"	"	"	
" 1J122 F ()	.0012	"	"	"	"	"	"	"	"	
" 1J152 F ()	.0015	"	"	"	"	"	"	"	"	
" 1J182 F ()	.0018	"	"	"	"	"	"	"	"	
" 1J222 F ()	.0022	"	"	"	"	"	"	"	"	
" 1J272 F ()	.0027	"	"	"	"	"	"	"	"	
" 1J332 F ()	.0033	"	"	"	"	"	"	"	"	
" 1J392 F ()	.0039	"	"	"	"	"	"	"	"	
" 1J472 F ()	.0047	"	"	"	"	"	"	"	"	
" 1J562 F ()	.0056	"	"	"	"	"	"	"	"	
" 1J682 F ()	.0068	"	"	"	"	"	"	"	"	
" 1J822 F ()	.0082	"	"	"	"	"	"	"	"	
" 1J103 F ()	.01	"	"	"	"	"	"	"	"	
" 1J123 F ()	.012	7.0	"	6.0	11.0	"	"	"	"	
" 1J153 F ()	.015	"	"	"	"	"	"	"	"	
" 1J183 F ()	.018	"	"	"	"	"	"	"	"	
" 1J223 F ()	.022	"	"	"	"	"	"	"	"	
" 1J273 F ()	.027	"	3.5	6.5	11.5	"	"	"	"	
" 1J333 F ()	.033	7.5	"	"	"	"	"	"	"	

Suffix for lead crimped or taped type (W: Self mounting crimped; 3: Crimped lead taping; 4: Straight lead taping)

Cap. tol. code J: \pm 5% K: \pm 10% (0.0001 to 0.00039 is only for \pm 10% (K))

Rating & Dimensions

100VDC

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style Type-2	
		L max.	T max.	H max.		F ^{+0.75} F _{-0.25}	S \pm 0.8			ϕ d \pm 0.05
				Type-1	Type-2		Type-1	Type-2		
ECQ B1101KF ()	.0001	7.0	3.0	5.5	10.5	5.0	5.0	0.5	N	
" 1121KF ()	.00012	"	"	"	"	"	"	"	"	
" 1151KF ()	.00015	"	"	"	"	"	"	"	"	
" 1181KF ()	.00018	"	"	"	"	"	"	"	"	
" 1221KF ()	.00022	"	"	"	"	"	"	"	"	
" 1271KF ()	.00027	"	"	"	"	"	"	"	"	
" 1331KF ()	.00033	"	"	"	"	"	"	"	"	
" 1391KF ()	.00039	"	"	"	"	"	"	"	"	
" 1471 \square F ()	.00047	"	"	"	"	"	"	"	"	
" 1561 \square F ()	.00056	"	"	"	"	"	"	"	"	
" 1681 \square F ()	.00068	"	"	"	"	"	"	"	"	
" 1821 \square F ()	.00082	"	"	"	"	"	"	"	"	
" 1102 \square F ()	.001	"	"	"	"	"	"	"	"	
" 1122 \square F ()	.0012	"	"	"	"	"	"	"	"	
" 1152 \square F ()	.0015	"	"	"	"	"	"	"	"	
" 1182 \square F ()	.0018	"	"	6.5	11.5	"	"	"	"	
" 1222 \square F ()	.0022	"	"	"	"	"	"	"	"	
" 1272 \square F ()	.0027	"	"	"	"	"	"	"	"	
" 1332 \square F ()	.0033	"	"	"	"	"	"	"	"	
" 1392 \square F ()	.0039	"	"	"	"	"	"	"	"	
" 1472 \square F ()	.0047	"	"	"	"	"	"	"	"	
" 1562 \square F ()	.0056	"	"	"	"	"	"	"	"	
" 1682 \square F ()	.0068	"	"	"	"	"	"	"	"	
" 1822 \square F ()	.0082	"	3.2	7.0	12.0	"	"	"	"	
" 1103 \square F ()	.01	7.0	"	"	"	"	"	"	"	
" 1123 \square F ()	.012	7.2	3.5	"	"	"	"	"	"	
" 1153 \square F ()	.015	"	4.0	7.5	12.5	"	"	"	"	
" 1183 \square F ()	.018	"	4.5	8.0	13.0	"	"	"	"	
" 1223 \square F ()	.022	"	"	9.0	14.0	"	"	"	"	
" 1273 \square F ()	.027	7.5	5.0	9.5	14.5	"	"	"	"	
" 1333 \square F ()	.033	"	5.5	10.0	15.0	"	"	"	"	
" 1393 \square F ()	.039	"	6.0	10.5	15.5	"	"	"	"	
" 1473 \square F ()	.047	"	6.5	11.5	16.5	"	"	"	"	
" 1563 \square F ()	.056	10.0	5.0	9.5	14.5	7.5	"	0.6	T	
" 1683 \square F ()	.068	"	5.5	10.0	15.0	"	"	"	"	
" 1823 \square F ()	.082	"	"	12.0	17.0	"	"	"	"	
" 1104 \square F ()	.1	10.5	6.0	12.5	17.5	"	"	"	"	
" 1124 \square F ()	.12	"	7.0	13.5	18.5	"	"	"	"	
" 1154 \square F ()	.15	13.0	"	12.0	17.0	10.0	"	"	"	
" 1184 \square F ()	.18	"	7.5	12.5	17.5	"	"	"	"	
" 1224 \square F ()	.22	"	8.0	13.0	18.0	"	"	"	"	
" 1274 \square F ()	.27	"	8.5	15.0	20.0	"	"	"	"	
" 1334 \square F ()	.33	"	9.0	16.0	21.0	"	"	"	"	
" 1394 \square F ()	.39	"	10.5	17.0	22.0	"	"	"	"	
" 1474 \square F ()	.47	"	11.5	17.5	22.5	"	"	"	"	

taping)

Suffix for lead crimped or taped type (W: Self mounting crimped; 3/9: Crimped lead taping; 4/5: Straight lead

Cap. tol. code

Rating & Dimensions

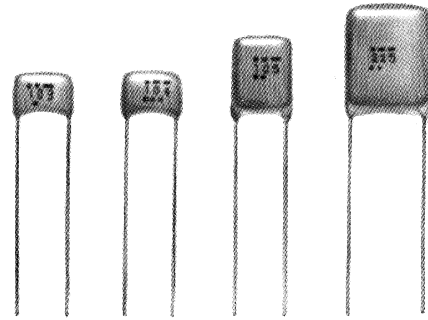
200VDC

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style Type-2
		L max.	T max.	H max.		F \pm 1.0	S \pm 0.8	ϕ d \pm 0.05	
				Type-1	Type-2	Type-1	Type-2		
ECQB 2102 F()	.001	8.5	4.0	7.0	12.0	5.0	5.0	0.5	N
" 2122 F()	.0012	"	"	7.5	12.5	"	"	"	"
" 2152 F()	.0015	"	"	"	"	"	"	"	"
" 2182 F()	.0018	"	4.5	"	"	"	"	"	"
" 2222 F()	.0022	"	"	"	"	"	"	"	"
" 2272 F()	.0027	"	"	8.0	13.0	"	"	"	"
" 2332 F()	.0033	11.0	"	7.5	12.5	7.5	"	0.6	T
" 2392 F()	.0039	"	"	"	"	"	"	"	"
" 2472 F()	.0047	"	"	8.5	13.5	"	"	"	"
" 2562 F()	.0056	"	"	"	"	"	"	"	"
" 2682 F()	.0068	"	"	9.0	14.0	"	"	"	"
" 2822 F()	.0082	"	"	"	"	"	"	"	"
" 2103 F()	.01	"	"	10.0	15.0	"	"	"	"
" 2123 F()	.012	"	5.0	10.5	15.5	"	"	"	"
" 2153 F()	.015	"	5.5	"	"	"	"	"	"
" 2183 F()	.018	"	"	10.0	15.0	"	"	"	"
" 2223 F()	.022	"	6.0	10.5	15.5	"	"	"	"
" 2273 F()	.027	"	6.5	11.5	16.5	"	"	"	"
" 2333 F()	.033	"	7.0	12.0	17.0	"	"	"	"
" 2393 F()	.039	13.5	5.0	12.5	17.5	10.0	7.5	"	"
" 2473 F()	.047	"	5.5	13.0	18.0	"	"	"	"
" 2563 F()	.056	"	6.0	13.5	18.5	"	"	"	"
" 2683 F()	.068	16.0	5.5	13.0	18.0	12.5	10.0	"	"
" 2823 F()	.082	"	6.0	13.5	18.5	"	"	"	"
" 2104 F()	.1	"	7.0	14.5	19.5	"	"	"	"
" 2124 F()	.12	19.0	6.5	16.0	21.0	15.0	12.5	"	"
" 2154 F()	.15	"	7.5	17.0	22.0	"	"	"	"
" 2184 F()	.18	"	8.0	17.5	22.5	"	"	"	"
" 2224 F()	.22	"	9.0	18.5	23.0	"	"	"	"
" 2274 F()	.27	24.0	8.0	17.5	22.5	20.0	15.0	0.8	"
" 2334 F()	.33	"	9.0	18.5	23.5	"	"	"	"
" 2394 F()	.39	"	10.0	19.5	24.5	"	"	"	"
" 2474 F()	.47	"	11.5	20.5	25.5	"	"	"	"

Suffix for lead crimped or taped type (W: Self mounting crimped; 3: Crimped lead taping)

Cap. tol. code

This capacitor is constructed by stacking double metallized film with a film dielectric coating. Because of the compound dielectric layers and advanced manufacturing techniques, the performance is excellent and the size is greatly reduced.



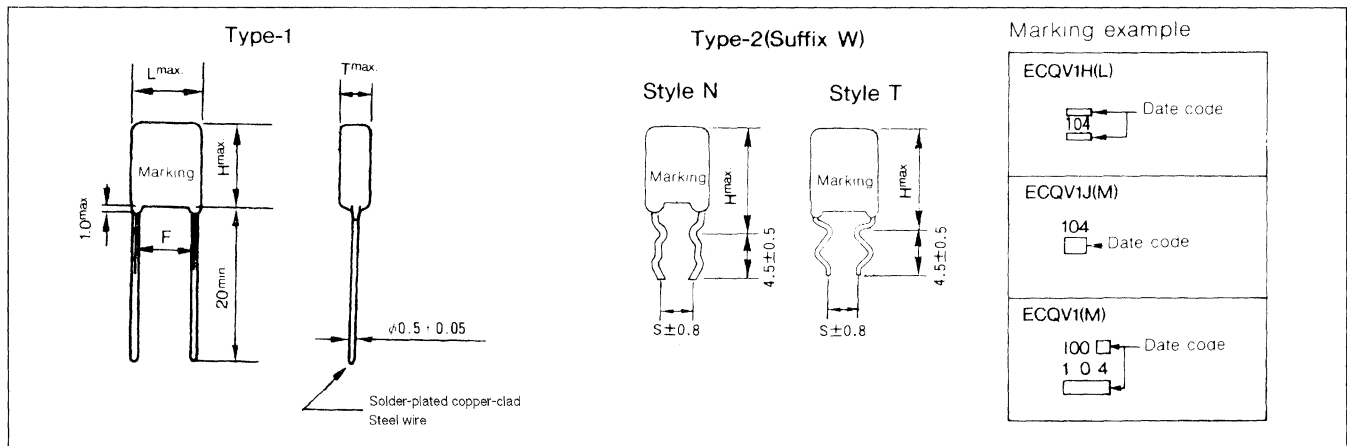
Features

- High volumetric efficiency
- Tight capacitance tolerance, $\pm 5\%$ (J)
- High stability
- Low dissipation factor
- Stacked and non-inductive construction
- Taped product available (see p. 141)

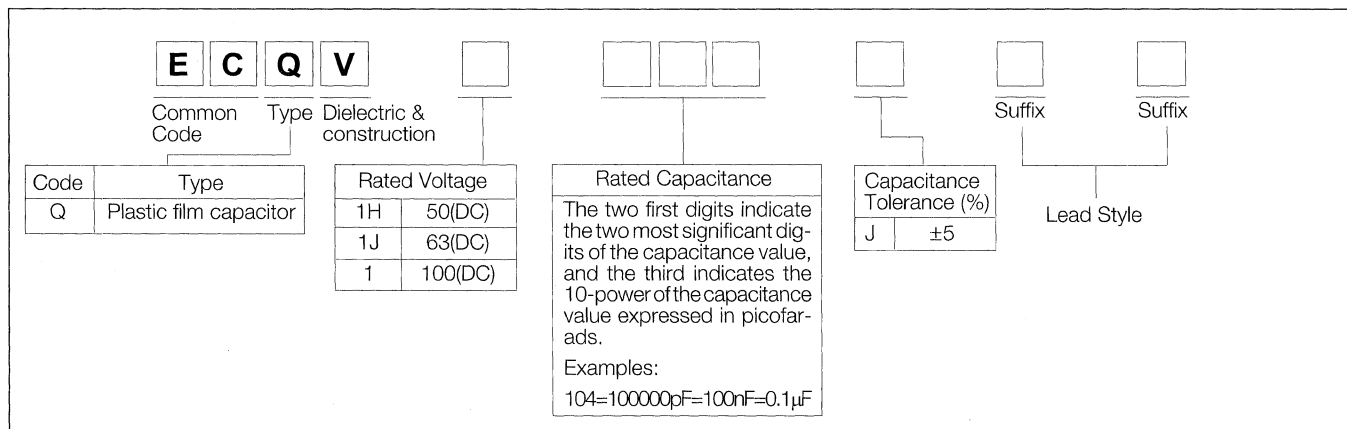
Specifications

Operating Temperature Range	-40 to +85 °C
Rated Voltage	50V, 63V, 100VDC
Capacitance Range	0.01 to 2.2 μ F
Capacitance Tolerance	$\pm 5\%$ (J)
Dissipation Factor	1.0% max. (20 °C, 1kHz)
Withstanding Voltage	Between terminals: Rated voltage (VDC) x 150% 60s
Insulation Resistance	C \leq 0.33 μ F: 3000M Ω min. (20 °C, 50VDC, 60s: ECQV1H, ECQV1J) C $>$ 0.33 μ F: 1000M Ω • μ Fmin. (20 °C, 100VDC, 60s: ECQV1)
Construction	Metallized film with dielectric coating, stacked construction, epoxy resin coating

Dimensions



Explanation of Part Numbers



Rating & Dimensions

50VDC

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style
		L max.	T max.	H max.		F \pm 0.8	S \pm 0.8	ϕ d	
				Type-1	Type-2	Type-1	Type-2	\pm 0.05	Type-2
ECQ V1H103JL()	.01	7.3	3.2	5.0	9.0	5.0	5.0	0.5	N
" 1H123JL()	.012	"	"	"	"	"	"	"	"
" 1H153JL()	.015	"	"	"	"	"	"	"	"
" 1H183JL()	.018	"	"	"	"	"	"	"	"
" 1H223JL()	.022	"	"	"	"	"	"	"	"
" 1H273JL()	.027	"	"	"	"	"	"	"	"
" 1H333JL()	.033	"	"	"	"	"	"	"	"
" 1H393JL()	.039	"	"	"	"	"	"	"	"
" 1H473JL()	.047	"	"	"	"	"	"	"	"
" 1H563JL()	.056	"	"	"	"	"	"	"	"
" 1H683JL()	.068	"	"	"	"	"	"	"	"
" 1H823JL()	.082	"	3.6	"	"	"	"	"	"
" 1H104JL()	.1	"	4.0	"	"	"	"	"	"
" 1H124JL()	.12	"	"	"	"	"	"	"	"
" 1H154JL()	.15	"	4.4	5.5	9.5	"	"	"	"
" 1H184JL()	.18	"	4.5	"	"	"	"	"	"
" 1H224JL()	.22	"	4.8	"	"	"	"	"	"
" 1H274JL()	.27	"	4.6	7.0	11.0	"	"	"	"
" 1H334JL()	.33	"	5.2	"	"	"	"	"	"
" 1H394JL()	.39	"	5.7	7.3	11.3	"	"	"	"
" 1H474JL()	.47	"	6.0	"	"	"	"	"	"
" 1H564JL()	.56	"	5.8	10.0	14.0	"	"	"	"
" 1H684JL()	.68	"	6.5	"	"	"	"	"	"
" 1H824JL()	.82	"	6.8	"	"	"	"	"	"
" 1H105JL()	1.0	"	8.0	11.0	15.0	"	"	"	"
" 1H125JL()	1.2	10.2	6.5	10.0	14.0	7.5	"	"	T
" 1H155JL()	1.5	"	7.2	"	"	"	"	"	"
" 1H185JL()	1.8	"	"	12.0	16.5	"	"	"	"
" 1H225JL()	2.2	"	7.9	"	"	"	"	"	"

Suffix for lead crimped or taped type (W: Self mounting crimped; 3: Crimped lead taping; 2: Straight lead taping)

Rating & Dimensions

63VDC

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style
		L max.	T max.	H max.		F \pm 0.8	S \pm 0.8	ϕ d \pm 0.05	
				Type-1	Type-2	Type-1	Type-2		Type-2
ECQ V1J103JM()	.01	7.5	3.2	6.8	10.8	5.0	5.0	0.5	N
" 1J123JM()	.012	"	"	"	"	"	"	"	"
" 1J153JM()	.015	"	"	"	"	"	"	"	"
" 1J183JM()	.018	"	"	"	"	"	"	"	"
" 1J223JM()	.022	"	"	"	"	"	"	"	"
" 1J273JM()	.027	"	"	"	"	"	"	"	"
" 1J333JM()	.033	"	"	"	"	"	"	"	"
" 1J393JM()	.039	"	"	"	"	"	"	"	"
" 1J473JM()	.047	"	"	"	"	"	"	"	"
" 1J563JM()	.056	"	"	"	"	"	"	"	"
" 1J683JM()	.068	"	"	"	"	"	"	"	"
" 1J823JM()	.082	"	"	"	"	"	"	"	"
" 1J104JM()	.1	"	"	7.0	11.0	"	"	"	"
" 1J124JM()	.12	"	3.8	"	"	"	"	"	"
" 1J154JM()	.15	"	4.1	"	"	"	"	"	"
" 1J184JM()	.18	10.2	3.5	9.0	14.0	7.5	"	"	T
" 1J224JM()	.22	"	"	"	"	"	"	"	"
" 1J274JM()	.27	"	"	"	"	"	"	"	"
" 1J334JM()	.33	"	3.8	"	"	"	"	"	"
" 1J394JM()	.39	"	4.0	"	"	"	"	"	"
" 1J474JM()	.47	"	4.5	"	"	"	"	"	"
" 1J564JM()	.56	"	4.9	"	"	"	"	"	"
" 1J684JM()	.68	"	5.5	10.0	15.0	"	"	"	"
" 1J824JM()	.82	"	6.1	"	"	"	"	"	"
" 1J105JM()	1.0	"	6.9	"	"	"	"	"	"

100VDC

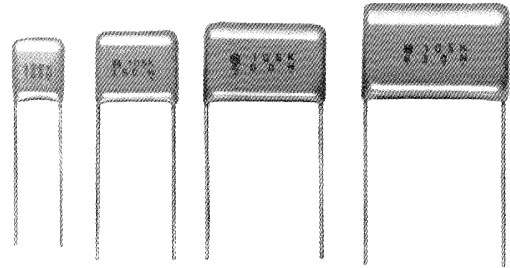
ECQ V1103JM()	.01	7.5	3.2	7.0	12.0	5.0	5.0	0.5	N
" 1123JM()	.012	"	"	"	"	"	"	"	"
" 1153JM()	.015	"	"	"	"	"	"	"	"
" 1183JM()	.018	"	"	"	"	"	"	"	"
" 1223JM()	.022	"	"	"	"	"	"	"	"
" 1273JM()	.027	"	"	"	"	"	"	"	"
" 1333JM()	.033	"	"	"	"	"	"	"	"
" 1393JM()	.039	"	"	"	"	"	"	"	"
" 1473JM()	.047	"	"	"	"	"	"	"	"
" 1563JM()	.056	"	"	"	"	"	"	"	"
" 1683JM()	.068	"	4.0	"	"	"	"	"	"
" 1823JM()	.082	"	4.1	"	"	"	"	"	"
" 1104JM()	.1	"	4.5	"	"	"	"	"	"
" 1124JM()	.12	10.2	3.3	9.0	14.0	7.5	"	"	T
" 1154JM()	.15	"	"	"	"	"	"	"	"
" 1184JM()	.18	"	3.6	"	"	"	"	"	"
" 1224JM()	.22	"	4.0	"	"	"	"	"	"
" 1274JM()	.27	"	4.2	"	"	"	"	"	"
" 1334JM()	.33	"	4.8	10.0	15.0	"	"	"	"
" 1394JM()	.39	"	5.5	"	"	"	"	"	"
" 1474JM()	.47	"	6.8	10.5	15.5	"	"	"	"

Suffix for lead crimped or taped type (W: Self mounting crimped; 3: Crimped lead taping; 2: Straight lead taping)

Film Capacitors Metallized Polyester Type

ECQ-E(F) Series

The type ECQE(F) series uses a double side metallized polyester film with high dielectric constant(ϵ) which makes it possible to produce large C-values in small dimensions, and is an economical capacitor meeting high requirements for professional circuit design.



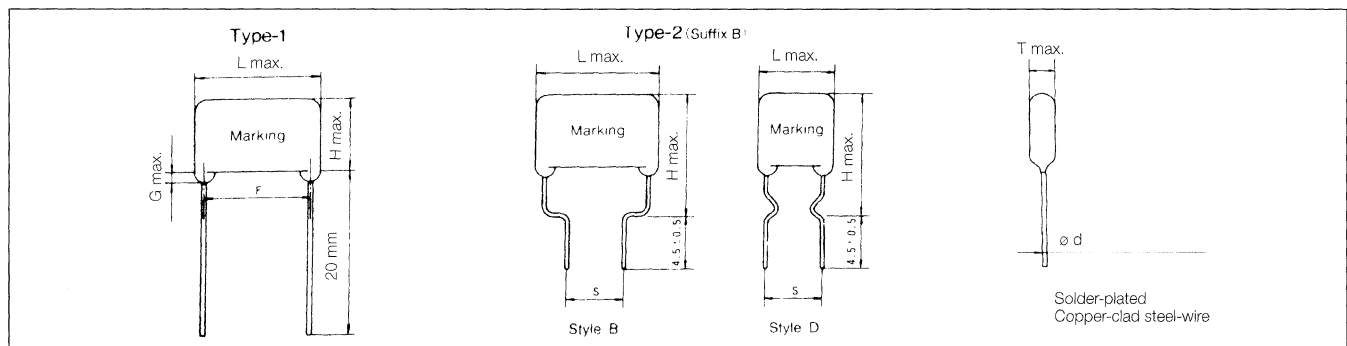
Features

- Self-healing property
- Flame retardant epoxy resin coating
- Taped product available (see pp. 141)

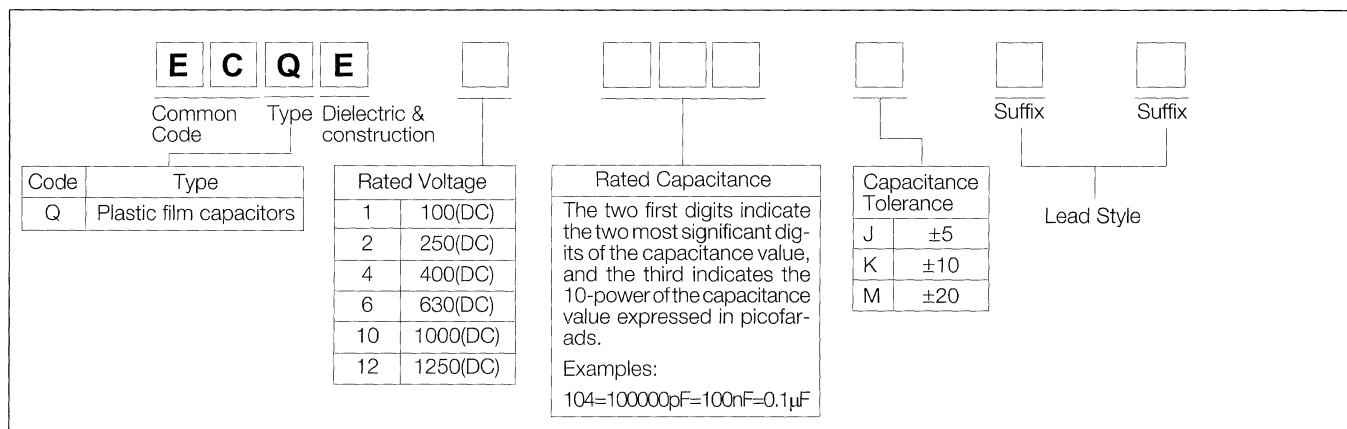
Specifications

Operating Temperature Range	-40 to +85 °C (+105 °C.....75% of Rated Voltage)
Rated Voltage	100V, 250V, 400V, 630V, 1000V, 1250VDC
Capacitance Range	0.001 to 10 μ F
Capacitance Tolerance	\pm 5%(J), \pm 10%(K), \pm 20% (M)
Dissipation Factor	1.0% max. (20 °C, 1kHz)
Withstanding Voltage	<ul style="list-style-type: none"> •Rated voltage 100V to 630VDC rating Between terminals: Rated voltage(VDC)x150% 60s •Rated voltage 1000VDC ~1250VDC rating Between terminals: Rated voltage(VDC)x175% 2 to 5s or 1000VAC 60c Between terminals and enclosure: 1500VAC 60s
Insulation Resistance	100V to 630VDC: $C \leq 0.33\mu\text{F}$ 9000M Ω min. (20 °C, 100VDC 60s) $C > 0.33\mu\text{F}$ 3000M $\Omega \cdot \mu\text{F}$ min. 1000VDC to 1250VDC: 10000M Ω min. (20 °C, 100VDC 60s) 2000M Ω min. (20 °C, 500VDC 60s)
Construction	Metallized polyester film, flame retardant epoxy resin coating

Dimensions



Explanation of Part Numbers



Marking (Example)

Rated voltage 100VDC		Rated voltage 250VDC	Rated voltage 400VDC	Rated voltage 630VDC	Rated voltage	
					1000VDC	1000VDC 125VAC
(0.01~0.1 μF)	(0.12~1.0 μF)	(0.01~0.33 μF)	(0.01~0.1 μF)	(0.01~0.047 μF)	(0.001~0.47 μF)	Cap. range E6 series
103K 100 Date code	124K 109 Date code	393K 250 Date code	103K 400 Date code	163K 630 Date code	823M Q-E 1000V Date code	2B102M A2 GFS QEF Date code
(1.2~10.0 μF)		(0.39~10.0 μF)	(0.12~2.2 μF)	(0.056~2.2 μF)		Cap. range w/o E6 series
125K 100 Date code		105K 250 Date code	105K 400 Date code	105K 630 Date code		823M Q-E 1000V 125V~ Date code

Rating & Dimensions

100VDC

Part No.	Cap. (μF)	Dimensions (mm)								Crimped style
		L max.	T max.	H max.		F±1.0	S±0.8	G max.	ød ±0.05	
				Type-1	Type-2	Type-1	Type-2	Type-1		
ECQ E1103□F()	.01	7.8	4.6	7.7	12.7	5.0	5.0	1.0	0.5	D
" 1123□F()	.012	"	4.5	7.6	12.6	"	"	"	"	"
" 1153□F()	.015	"	"	"	"	"	"	"	"	"
" 1183□F()	.018	"	4.6	7.7	12.7	"	"	"	"	"
" 1223□F()	.022	"	4.9	8.0	13.0	"	"	"	"	"
" 1273□F()	.027	"	4.7	7.8	12.8	"	"	"	"	"
" 1333□F()	.033	"	4.6	7.7	12.7	"	"	"	"	"
" 1393□F()	.039	"	4.9	8.0	13.0	"	"	"	"	"
" 1473□F()	.047	"	4.5	7.5	12.5	"	"	"	"	"
" 1563□F()	.056	"	4.8	7.9	12.9	"	"	"	"	"
" 1683□F()	.068	"	"	"	"	"	"	"	"	"
" 1823□F()	.082	"	4.7	9.9	14.9	"	"	"	"	"
" 1104□F()	.1	"	5.0	10.0	15.0	"	"	"	"	"
" 1124□F()	.12	10.3	4.5	7.5	12.5	7.5	7.5	"	0.6	"
" 1154□F()	.15	"	"	"	"	"	"	"	"	"
" 1184□F()	.18	"	4.8	7.9	12.9	"	"	"	"	"
" 1224□F()	.22	"	5.0	8.0	13.0	"	"	"	"	"
" 1274□F()	.27	"	4.5	12.0	17.0	"	"	"	"	"
" 1334□F()	.33	"	6.0	10.7	15.7	"	"	"	"	"
" 1394□F()	.39	"	6.3	11.0	16.0	"	"	"	"	"
" 1474□F()	.47	"	6.0	12.0	17.0	"	"	"	"	"
" 1564□F()	.56	12.0	5.5	10.9	15.9	10.0	10.0	"	"	"
" 1684□F()	.68	"	6.0	11.9	16.9	"	"	"	"	"
" 1824□F()	.82	"	"	13.5	18.5	"	"	"	"	"
" 1105□F()	1.0	"	6.7	14.0	19.0	"	"	"	"	"
" 1125□F()	1.2	18.5	5.5	12.8	17.8	15.0	"	"	"	B
" 1155□F()	1.5	"	6.0	13.4	18.4	"	"	"	0.8	"
" 1185□F()	1.8	"	6.5	14.4	19.4	"	"	"	"	"
" 1225□F()	2.2	"	7.0	15.0	20.0	"	"	"	"	"
" 1275□F()	2.7	"	8.0	15.8	20.8	"	"	"	"	"
" 1335□F()	3.3	"	8.5	16.5	21.5	"	"	"	"	"
" 1395□F()	3.9	26.0	7.0	16.4	21.4	22.5	15.0	"	"	"
" 1475□F()	4.7	"	7.5	17.0	22.0	"	"	"	"	"
" 1565□F()	5.6	"	8.3	17.5	22.5	"	"	"	"	"
" 1685□F()	6.8	"	9.0	18.5	23.5	"	"	"	"	"
" 1825□F()	8.2	"	10.0	20.0	25.0	"	"	1.5	"	"
" 1106□F()	10.0	"	11.5	21.0	26.0	"	"	"	"	"

Suffix for lead crimped or taped type (B: Crimped; 3: Crimped lead taping; 2: Straight lead taping)

Cap. tol. code J: ±5% K: ±10%

Rating & Dimensions
250VDC

Part No.	Cap. (μ F)	Dimensions (mm)								Crimped style Type-2
		L max.	T max.	H max.		F \pm 1.0	S \pm 0.8	G max.	ϕ d \pm 0.05	
				Type-1	Type-2	Type-1	Type-2	Type-1		
ECQ E2103□F()	.01	10.3	4.3	7.4	12.4	7.5	7.5	1.0	0.6	D
" 2123□F()	.012	"	4.4	7.5	12.5	"	"	"	"	"
" 2153□F()	.015	"	"	"	"	"	"	"	"	"
" 2183□F()	.018	"	"	"	"	"	"	"	"	"
" 2223□F()	.022	"	"	"	"	"	"	"	"	"
" 2273□F()	.027	"	"	"	"	"	"	"	"	"
" 2333□F()	.033	"	4.5	"	"	"	"	"	"	"
" 2393□F()	.039	"	"	"	"	"	"	"	"	"
" 2473□F()	.047	"	"	"	"	"	"	"	"	"
" 2563□F()	.056	"	4.8	7.9	12.9	"	"	"	"	"
" 2683□F()	.068	"	4.5	7.5	12.5	"	"	"	"	"
" 2823□F()	.082	"	4.9	8.0	13.0	"	"	"	"	"
" 2104□F()	.1	"	5.8	8.4	13.4	"	"	"	"	"
" 2124□F()	.12	"	6.0	9.0	14.0	"	"	"	"	"
" 2154□F()	.15	"	"	10.8	15.8	"	"	"	"	"
" 2184□F()	.18	12.0	5.0	10.3	15.3	10.0	10.0	"	"	"
" 2224□F()	.22	"	5.5	10.5	15.5	"	"	"	"	"
" 2274□F()	.27	"	6.0	11.5	16.5	"	"	"	"	"
" 2334□F()	.33	"	6.5	12.0	17.0	"	"	"	"	"
" 2394□F()	.39	18.5	4.9	"	"	15.0	"	"	"	B
" 2474□F()	.47	"	5.3	12.5	17.5	"	"	"	"	"
" 2564□F()	.56	"	5.5	13.0	18.0	"	"	"	"	"
" 2684□F()	.68	"	6.0	13.5	18.5	"	"	"	0.8	"
" 2824□F()	.82	"	6.5	14.5	19.5	"	"	"	"	"
" 2105□F()	1.0	"	7.4	15.0	20.0	"	"	"	"	"
" 2125□F()	1.2	"	8.0	15.9	20.9	"	"	"	"	"
" 2155□F()	1.5	"	9.0	16.8	21.8	"	"	"	"	"
" 2185□F()	1.8	26.0	7.5	15.5	20.5	22.5	15.0	"	"	"
" 2225□F()	2.2	"	8.5	16.3	21.3	"	"	"	"	"
" 2275□F()	2.7	"	9.4	17.0	22.0	"	"	"	"	"
" 2335□F()	3.3	"	10.3	18.0	23.0	"	"	1.5	"	"
" 2395□F()	3.9	"	11.0	20.5	25.5	"	"	"	"	"
" 2475□F()	4.7	"	12.0	21.5	26.5	"	"	"	"	"
" 2565□F()	5.6	31.0	11.8	17.5	21.0	26.0	27.5	22.5	"	"
" 2685□F()	6.8	"	13.0	22.4	27.4	"	"	"	"	"
" 2825□F()	8.2	"	14.3	23.5	28.5	"	"	"	"	"
" 2106□F()	10.0	"	15.9	25.8	30.8	"	"	"	"	"

Suffix for lead crimped or taped type, (B: Crimped; 3: Crimped lead taping)
Cap. tol. code J: \pm 5% K: \pm 10%

Rating & Dimensions

400VDC

Part No.	Cap. (μ F)	Dimensions (mm)								Crimped style Type-2
		L max.	T max.	H max.		F \pm 1.0	S \pm 0.8	G max.	ϕ d \pm 0.05	
				Type-1	Type-2	Type-1	Type-2	Type-1		
ECQ E4103□F()	.01	10.3	4.3	7.4	12.4	7.5	7.5	1.0	0.6	D
" 4123□F()	.012	"	4.4	7.5	12.5	"	"	"	"	"
" 4153□F()	.015	"	"	"	"	"	"	"	"	"
" 4183□F()	.018	"	"	"	"	"	"	"	"	"
" 4223□F()	.022	"	4.8	7.9	12.9	"	"	"	"	"
" 4273□F()	.027	"	5.5	8.0	13.0	"	"	"	"	"
" 4333□F()	.033	"	6.0	9.0	14.0	"	"	"	"	"
" 4393□F()	.039	12.0	4.9	8.0	13.0	10.0	10.0	"	"	"
" 4473□F()	.047	"	5.0	8.3	13.3	"	"	"	"	"
" 4563□F()	.056	"	"	10.0	15.0	"	"	"	"	"
" 4683□F()	.068	"	5.4	10.5	15.5	"	"	"	"	"
" 4823□F()	.082	"	5.8	11.0	16.0	"	"	"	"	"
" 4104□F()	.1	"	6.3	12.0	17.0	"	"	"	"	"
" 4124□F()	.12	18.5	5.0	10.0	15.0	15.0	"	"	"	B
" 4154□F()	.15	"	"	12.4	17.4	"	"	"	"	"
" 4184□F()	.18	"	5.4	12.5	17.5	"	"	"	"	"
" 4224□F()	.22	"	5.9	13.0	18.0	"	"	"	"	"
" 4274□F()	.27	"	6.5	14.3	19.3	"	"	"	0.8	"
" 4334□F()	.33	"	7.0	14.9	19.9	"	"	"	"	"
" 4394□F()	.39	"	7.5	15.4	20.4	"	"	"	"	"
" 4474□F()	.47	"	7.8	17.0	22.0	"	"	"	"	"
" 4564□F()	.56	26.0	6.5	16.0	21.0	22.5	15.0	"	"	"
" 4684□F()	.68	"	7.0	16.5	21.5	"	"	"	"	"
" 4824□F()	.82	"	7.9	17.3	22.3	"	"	"	"	"
" 4105□F()	1.0	"	8.5	18.0	23.0	"	"	"	"	"
" 4125□F()	1.2	"	9.5	18.9	23.9	"	"	"	"	"
" 4155□F()	1.5	31.0	"	19.0	24.0	27.5	22.5	"	"	"
" 4185□F()	1.8	"	11.0	20.5	25.5	"	"	1.5	"	"
" 4225□F()	2.2	"	"	22.0	27.0	"	"	"	"	"

630VDC

ECQ E6103□F()	.01	12.0	4.5	7.5	12.5	10.0	10.0	1.0	0.6	D
" 6123□F()	.012	"	"	7.8	12.8	"	"	"	"	"
" 6153□F()	.015	"	5.0	8.2	13.2	"	"	"	"	"
" 6183□F()	.018	"	4.9	10.0	15.0	"	"	"	"	"
" 6223□F()	.022	"	5.3	10.5	15.5	"	"	"	"	"
" 6273□F()	.027	"	5.5	10.9	15.9	"	"	"	"	"
" 6333□F()	.033	"	6.0	11.9	16.9	"	"	"	"	"
" 6393□F()	.039	"	"	13.4	18.4	"	"	"	"	"
" 6473□F()	.047	"	6.5	13.5	18.5	"	"	"	"	"
" 6563□F()	.056	18.5	5.4	10.5	15.5	15.0	"	"	"	B
" 6683□F()	.068	"	5.8	11.0	16.0	"	"	"	"	"
" 6823□F()	.082	"	6.5	12.0	17.0	"	"	"	"	"
" 6104□F()	.1	"	6.3	14.0	19.0	"	"	"	"	"
" 6124□F()	.12	"	"	14.5	19.5	"	"	"	0.8	"
" 6154□F()	.15	"	7.5	15.4	20.4	"	"	"	"	"
" 6184□F()	.18	"	8.0	16.0	21.0	"	"	"	"	"
" 6224□F()	.22	"	9.0	16.5	21.5	"	"	"	"	"
" 6274□F()	.27	26.0	7.0	"	"	22.5	15.0	"	"	"
" 6334□F()	.33	"	7.8	17.0	22.0	"	"	"	"	"
" 6394□F()	.39	"	8.5	17.9	22.9	"	"	"	"	"
" 6474□F()	.47	"	9.3	18.5	23.5	"	"	"	"	"
" 6564□F()	.56	"	10.0	20.0	25.0	"	"	1.5	"	"
" 6684□F()	.68	"	11.5	21.0	26.0	"	"	"	"	"
" 6824□F()	.82	31.0	11.3	20.5	25.5	27.5	22.5	"	"	"
" 6105□F()	1.0	"	12.5	21.9	26.9	"	"	"	"	"
" 6125□F()	1.2	"	13.5	23.0	28.0	"	"	"	"	"
" 6155□F()	1.5	"	15.3	24.7	29.7	"	"	"	"	"
" 6185□F()	1.8	"	16.8	27.0	32.0	"	"	"	"	"
" 6225□F()	2.2	"	19.5	29.0	34.0	"	"	"	"	"

Suffix (B: Crimped)

Cap. tol. code J: \pm 5% K: \pm 10%

Rating & Dimensions

1000VDC

Part No.	Cap. (μ F)	Dimensions (mm)								Crimped style
		L max.	T max.	H max.		F \pm 1.0	S \pm 0.8	G max.	ϕ d	
				Type-1	Type-2	Type-1	Type-2	Type-1	\pm 0.05	Type-2
ECQ E10102 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.001	15.5	6.0	11.0	16.0	12.5	10.0	1.0	0.6	D
" 10122 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0012	"	"	"	"	"	"	"	"	"
" 10152 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0015	"	"	"	"	"	"	"	"	"
" 10182 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0018	"	"	"	"	"	"	"	"	"
" 10222 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0022	"	"	11.5	16.5	"	"	"	"	"
" 10272 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0027	"	6.5	12.0	17.0	"	"	"	"	"
" 10332 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0033	"	6.0	11.5	16.5	"	"	"	"	"
" 10392 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0039	"	6.5	12.0	17.0	"	"	"	"	"
" 10472 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0047	"	7.0	12.5	17.5	"	"	"	"	"
" 10562 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0056	"	7.5	13.0	18.0	"	"	"	"	"
" 10682 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0068	"	7.0	12.5	17.5	"	"	"	"	"
" 10822 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.0082	"	6.5	12.0	17.0	"	12.5	"	"	"
" 10103 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.01	"	6.0	11.0	16.0	"	"	"	"	"
" 10123 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.012	"	"	12.0	17.0	"	"	"	"	"
" 10153 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.015	"	7.0	12.5	17.5	"	"	"	"	"
" 10183 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.018	"	7.5	13.0	18.0	"	"	"	0.8	"
" 10223 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.022	"	"	15.5	20.5	"	"	"	"	"
" 10273 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.027	21.0	6.0	13.0	18.0	17.5	"	"	"	B
" 10333 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.033	"	6.5	14.0	19.0	"	"	"	"	"
" 10393 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.039	"	7.0	14.5	19.5	"	"	"	"	"
" 10473 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.047	"	7.5	15.5	20.5	"	"	"	"	"
" 10563 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.056	"	"	17.0	22.0	"	"	"	"	"
" 10683 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.068	"	8.5	18.0	23.0	"	"	"	"	"
" 10823 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.082	"	9.0	18.5	23.5	"	"	"	"	"
" 10104 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.1	"	10.0	20.0	25.0	"	"	"	"	"
" 10124 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.12	26.0	9.0	18.5	23.5	22.5	17.5	"	"	"
" 10154 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.15	"	10.0	20.0	25.0	"	"	1.5	"	"
" 10184 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.18	"	10.5	22.0	27.0	"	"	"	"	"
" 10224 $\left\{ \begin{array}{l} E \\ F \end{array} \right\}$	.22	"	12.0	23.0	28.0	"	"	"	"	"

Suffix (B: Crimped)

Cap. tol. code J: \pm 5% K: \pm 10%

Note:

Marking for rated voltage

Type E: 「1000V」

Type F: 「1000V, 125V」 or 「2B」

Rating & Dimensions

1250VDC

Part No.	Cap. (μ F)	Dimensions (mm)								Crimped style Type-2
		L max.	T max.	H max.		F \pm 1.0	S \pm 0.8	G max.	ϕ d \pm 0.05	
				Type-1	Type-2	Type-1	Type-2	Type-1		
ECQ E12102□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.001	15.5	6.0	11.0	16.0	12.5	10.0	1.0	0.6	D
" 12122□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0012	"	"	"	"	"	"	"	"	"
" 12152□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0015	"	"	"	"	"	"	"	"	"
" 12182□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0018	"	"	"	"	"	"	"	"	"
" 12222□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0022	"	"	11.5	16.5	"	"	"	"	"
" 12272□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0027	"	6.5	12.0	17.0	"	"	"	"	"
" 12332□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0033	"	6.0	11.5	16.5	"	"	"	"	"
" 12392□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0039	"	6.5	12.0	17.0	"	"	"	"	"
" 12472□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0047	"	7.0	12.5	17.5	"	"	"	"	"
" 12562□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0056	"	7.5	13.0	18.0	"	"	"	"	"
" 12682□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0068	"	"	15.0	20.0	"	"	"	"	"
" 12822□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.0082	21.0	5.0	12.0	17.0	17.5	12.5	"	"	B
" 12103□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.01	"	"	12.5	17.5	"	"	"	"	"
" 12123□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.012	"	5.5	13.0	18.0	"	"	"	"	"
" 12153□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.015	"	6.0	13.5	18.5	"	"	"	"	"
" 12183□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.018	"	6.5	14.5	19.5	"	"	"	0.8	"
" 12223□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.022	"	7.0	15.0	20.0	"	"	"	"	"
" 12273□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.027	26.0	6.0	15.5	20.5	22.5	17.5	"	"	"
" 12333□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.033	"	6.5	16.0	21.0	"	"	"	"	"
" 12393□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.039	"	7.0	16.5	21.5	"	"	"	"	"
" 12473□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.047	"	8.0	17.0	22.0	"	"	"	"	"
" 12563□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.056	31.0	7.5	"	"	27.5	22.5	"	"	"
" 12683□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.068	"	8.0	17.5	22.5	"	"	"	"	"
" 12823□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.082	"	9.0	18.5	23.5	"	"	"	"	"
" 12104□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.1	"	10.0	19.5	24.5	"	"	"	"	"
" 12124□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.12	"	11.5	20.5	25.5	"	"	1.5	"	"
" 12154□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.15	"	12.0	23.0	28.0	"	"	"	"	"
" 12184□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.18	"	13.0	24.5	29.5	"	"	"	"	"
" 12224□ $\left\{ \begin{matrix} E \\ R \end{matrix} \right\}$	.22	"	14.5	26.5	31.5	"	"	"	"	"

Suffix (B: Crimped; Suffix for taped lead: see page 141)

Cap. tol. code J: \pm 5% K: \pm 10% M: \pm 20%

Note:

Marking for rated voltage

Type E: $\left[\begin{matrix} 1250V \\ \end{matrix} \right]$

Type F: $\left[\begin{matrix} 1250V, 125V \\ \end{matrix} \right]$ or $\left[\begin{matrix} 2B \\ \end{matrix} \right]$

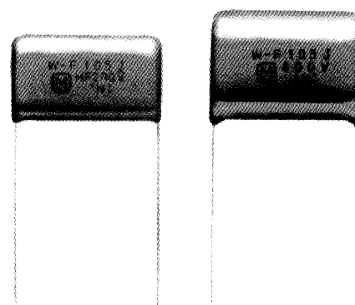
Film Capacitors Metallized Polypropylene Type

ECW-F Series

This series is designed for applications where high frequency and high current are required.

Features

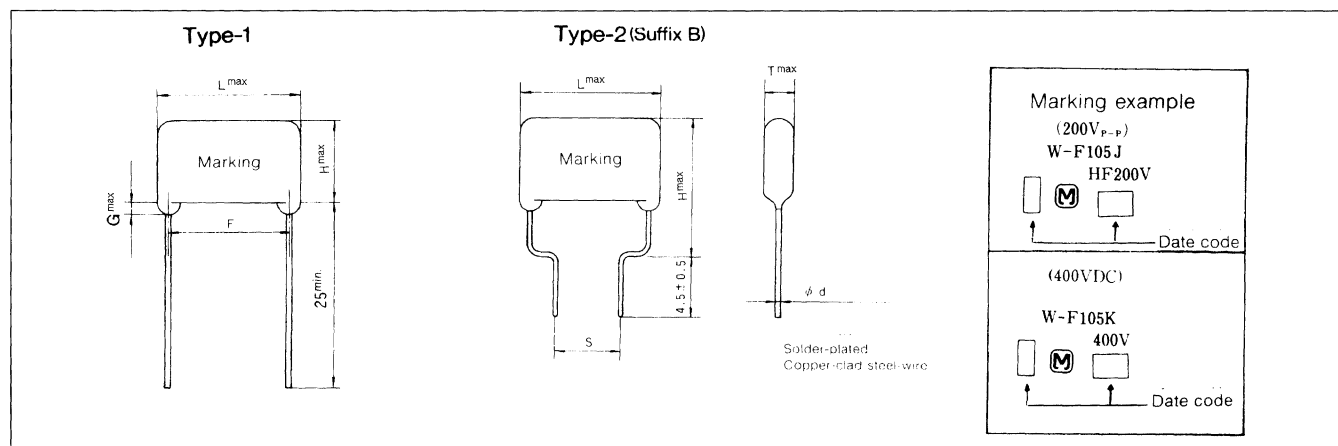
- Very low loss at high frequency
- Very small inherent temperature rise
- Flame retardant Epoxy resin coating
- Bulk packaging only



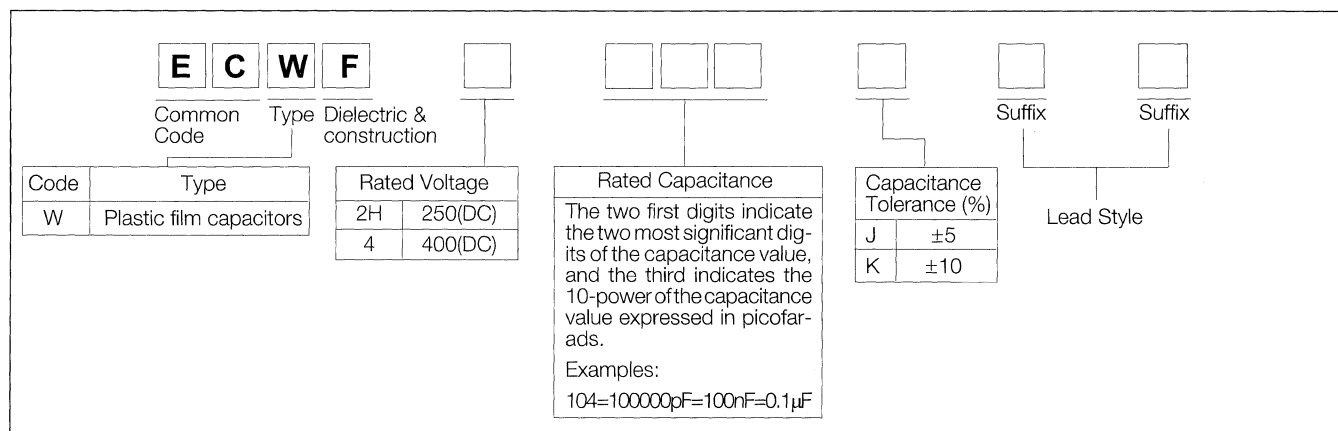
Specifications

Operating Temperature Range	-25~ +85 °C
Rated Voltage	200V _{P-P} at 15.75kHz (250VDC) 400VDC
Capacitance Range	0.15μF~3.3μF(E-24)
Capacitance Tolerance	±5%(J), ±10%(K)
Dissipation Factor	0.1% max. (20 °C, 1kHz)
Withstanding Voltage	Between terminals: Rated voltage (VDC) x 150% 60s
Insulation Resistance	C≤0.33μF: 9000MΩmin. (20 °C, 100VDC, 60s) C>0.33μF: 3000MΩ•μFmin.
Construction	Metallized polypropylene film, flame retardant epoxy resin coating

Dimensions



Explanation of Part Numbers



Rating & Dimensions

250VDC (200V_{p-p})Cap. tol. ±5%(J), ±10%(K)

Part No.	Cap. (μF)	Dimensions (mm)							
		L max.	T max.	H max.		F±1.5	S±0.8	G max.	ød ±0.05
				Type-1	Type-2	Type-1	Type-2	Type-1	
ECW F2H154□N()	.15	19.0	7.0	15.5	20.5	16.0	7.5	1.5	0.6
" 2H184□N()	.18	"	7.5	16.0	21.0	"	"	"	"
" 2H224□N()	.22	"	8.0	16.5	21.5	"	10.0	"	"
" 2H274□N()	.27	"	7.5	16.0	21.0	"	"	"	"
" 2H334□N()	.33	"	"	17.5	22.5	"	"	"	"
" 2H394□N()	.39	25.0	"	15.5	20.5	22.0	17.5	"	0.8
" 2H474□N()	.47	"	"	17.5	22.5	"	"	"	"
" 2H564□N()	.56	"	8.0	18.0	23.0	"	"	"	"
" 2H684□N()	.68	"	8.5	19.0	24.0	"	"	"	"
" 2H824□N()	.82	"	9.5	20.0	25.0	"	"	"	"
" 2H105□N()	1.0	30.0	9.0	19.5	24.5	27.0	22.5	"	"
" 2H125□N()	1.2	"	10.0	20.0	25.0	"	"	"	"
" 2H155□N()	1.5	"	11.0	21.5	26.5	"	"	"	"
" 2H185□N()	1.8	"	12.0	22.5	27.5	"	"	"	"
" 2H225□N()	2.2	35.5	"	22.0	27.0	32.0	25.0	"	"
" 2H275□N()	2.7	"	13.0	23.5	28.5	"	"	"	"
" 2H335□N()	3.3	"	15.0	25.5	30.5	"	"	"	"

400VDC Cap. tol. +5%(J), ±10%(K)

ECW F 4154□Z()	.15	18.0	9.5	16.5	21.5	15.0	10.0	3	0.8
" 4184□Z()	.18	19.0	9.5	16.5	21.5	15.5	"	"	"
" 4224□Z()	.22	"	10.5	17.0	22.0	"	"	"	"
" 4274□Z()	.27	25.0	9.5	16.0	21.0	22.0	17.5	"	"
" 4334□Z()	.33	"	10.0	17.0	22.0	"	"	"	"
" 4394□Z()	.39	"	11.0	17.5	22.5	"	"	"	"
" 4474□Z()	.47	30.0	10.5	17.0	22.0	26.5	22.5	"	"
" 4564□Z()	.56	"	"	19.5	24.5	"	"	"	"
" 4684□Z()	.68	"	11.5	20.5	25.5	"	"	"	"
" 4824□Z()	.82	"	12.5	21.5	26.5	"	"	"	"
" 4105□Z()	1.0	"	14.5	23.0	28.0	"	"	"	"
" 4125□Z()	1.2	"	16.0	25.0	30.0	"	"	"	"
" 4155□Z()	1.5	46.0	13.0	22.0	27.0	42.0	25.0	"	"
" 4185□Z()	1.8	"	14.5	23.0	28.0	"	"	"	"
" 4225□Z()	2.2	"	16.0	25.0	30.0	"	"	"	"

Suffix B for lead crimped type.

Cap. tol. code.

*Other C-values upon request.

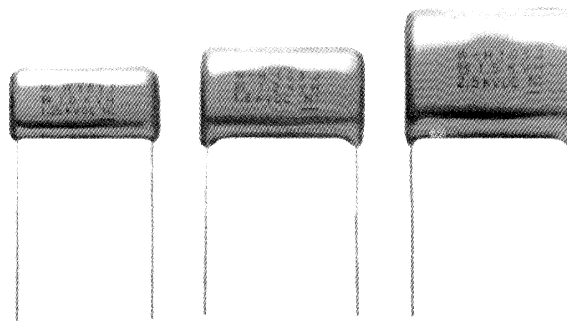
Film Capacitors High-Voltage Metallized Polypropylene

ECW-H Series

This series is designed for applications where high frequency, high pulse voltage and high current are required.

Features

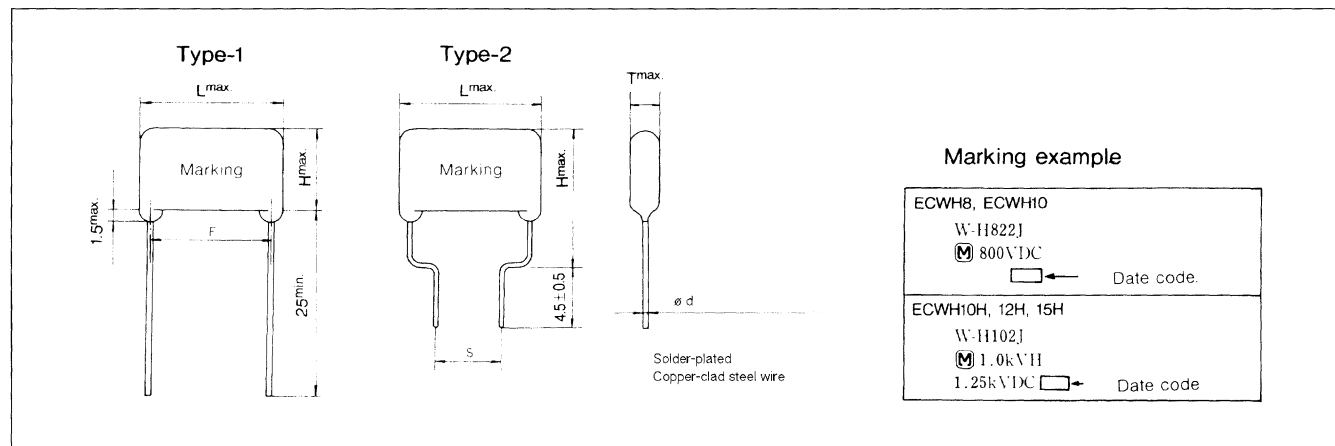
- Very low loss at high frequency
- Very small inherent temperature rise
- Flame retardant epoxy resin coating
- Taped product available (see p. 141)



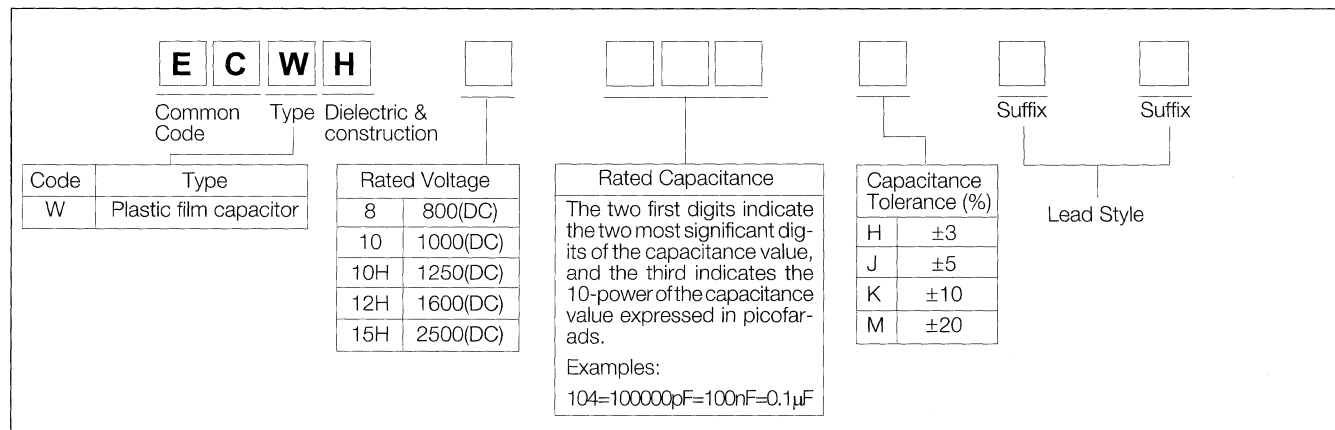
Specifications

Operating Temperature Range	-25~ +85 °C
Rated Voltage	1000V _{p-p} at 15.75kHz (1250VDC), 1200V _{p-p} at 15.75kHz (1600VDC) 1500V _{p-p} at 15.75kHz (2500VDC), 800VDC, 1000VDC
Capacitance Range	0.001μF~0.068μF (E-24)
Capacitance Tolerance	±3%(H), ±5%(J), ±10%(K), ±20%(M)
Dissipation Factor	0.1% max. (20 °C, 1kHz) 0.2% max. (20 °C, 10kHz)
Withstanding Voltage	Between terminals: Rated voltage (VDC) x 175% 1 ~ 5s Between terminals and enclosure: 1500VAC 60s
Insulation Resistance	30,000MΩmin. (20°C, 500VDC, 60s)
Construction	Metallized polypropylene film, flame retardant epoxy resin coating

Dimensions



Explanation of Part Numbers



Rating & Dimensions

1250VDC (1000V_{p-p} at 15.75kHz) Cap. tol. ±3%(H), ±5%(J), ±10%(K), ±20%(M)

Part No.	Cap. (μF)	Dimensions (mm)						
		L max.	T max.	H max.		F±1.25	S±0.8	ød ±0.05
				Type-1	Type-2	Type-1	Type-2	
ECW H10H102 R S	.001	22.0	8.0	13.0	18.0	16.5	10.0	0.8
" 10H112 R S	.0011	"	"	13.5	18.5	"	"	"
" 10H122 R S	.0012	"	8.5	"	"	"	"	"
" 10H132 R S	.0013	"	"	14.0	19.0	"	"	"
" 10H152 R S	.0015	"	8.0	13.5	18.5	"	"	"
" 10H162 R S	.0016	"	"	"	"	"	"	"
" 10H182 R S	.0018	"	8.5	"	"	"	"	"
" 10H202 R S	.002	"	9.0	14.0	19.0	"	"	"
" 10H222 R S	.0022	"	8.0	13.0	18.0	"	"	"
" 10H242 R S	.0024	"	"	13.5	18.5	"	"	"
" 10H272 R S	.0027	"	8.5	"	"	"	"	"
" 10H302 R S	.003	"	"	14.0	19.0	"	"	"
" 10H332 R S	.0033	"	9.0	"	"	"	"	"
" 10H362 R S	.0036	"	9.5	14.5	19.5	"	"	"
" 10H392 R S	.0039	"	9.0	15.5	20.5	"	"	"
" 10H432 R S	.0043	"	9.5	16.0	21.0	"	"	"
" 10H472 R S	.0047	"	10.0	16.5	21.5	"	"	"
" 10H512 R S	.0051	"	"	"	"	"	"	"
" 10H562 R S	.0056	"	10.5	17.0	22.0	"	"	"
" 10H622 R S	.0062	"	11.0	17.5	22.5	"	"	"
" 10H682 R S	.0068	"	11.5	"	"	"	"	"
" 10H752 R S	.0075	"	"	18.5	23.5	"	"	"
" 10H822 R S	.0082	28.0	8.5	15.5	20.5	22.5	15.0	"
" 10H912 R S	.0091	"	9.0	"	"	"	"	"
" 10H103 R S	.01	"	9.5	16.0	21.0	"	"	"
" 10H113 R S	.011	"	10.0	16.5	21.5	"	"	"
" 10H123 R S	.012	"	"	18.0	23.0	"	"	"
" 10H133 R S	.013	"	"	18.5	23.5	"	"	"
" 10H153 R S	.015	"	10.5	19.0	24.0	"	"	"
" 10H163 R S	.016	"	11.0	"	"	"	"	"
" 10H183 R S	.018	"	"	20.5	25.5	"	"	"
" 10H203 R S	.02	30.5	"	19.5	24.5	25.0	17.5	"
" 10H223 R S	.022	"	11.5	20.0	25.0	"	"	"
" 10H243 R S	.024	"	12.0	"	"	"	"	"
" 10H273 R S	.027	"	12.5	20.5	25.5	"	"	"
" 10H303 R S	.03	"	13.5	22.0	27.0	"	"	"
" 10H333 R S	.033	"	13.0	23.0	28.0	"	"	"
" 10H363 R S	.036	32.5	12.5	22.5	27.5	"	"	"
" 10H393 R S	.039	"	13.0	23.0	28.0	"	"	"
" 10H433 R S	.043	"	14.0	23.5	28.5	"	"	"
" 10H473 R S	.047	"	14.5	24.0	29.0	"	"	"
" 10H513 R S	.051	"	"	24.5	29.5	"	"	"
" 10H563 R S	.056	"	15.5	25.0	30.0	"	"	"
" 10H623 R S	.062	"	16.0	26.5	31.5	"	"	"
" 10H683 R S	.068	"	"	28.0	33.0	"	"	"

Cap. tol. code (H, J, K, M)

*Last suffix "R"=straight leads (Type-1)
Last suffix "S"=crimped leads (Type-2)

Rating & Dimensions

1600VDC (1200V_{p-p} at 15.75kHz) Cap. tol. ±3%(H), ±5%(J), ±10%(K), ±20%(M)

Part No.	Cap. (μF)	Dimensions (mm)						
		L max.	T max.	H max.		F±1.25	S±0.8	ød ±0.05
				Type-1	Type-2	Type-1	Type-2	
ECW H12H102□RS	.001	22.0	8.0	13.0	18.0	16.5	10.0	0.8
" 12H112□RS	.0011	"	"	13.5	18.5	"	"	"
" 12H122□RS	.0012	"	8.5	"	"	"	"	"
" 12H132□RS	.0013	"	"	14.0	19.0	"	"	"
" 12H152□RS	.0015	"	9.0	"	"	"	"	"
" 12H162□RS	.0016	"	9.5	14.5	19.5	"	"	"
" 12H182□RS	.0018	"	9.0	16.0	21.0	"	"	"
" 12H202□RS	.002	"	10.0	"	"	"	"	"
" 12H222□RS	.0022	"	"	16.5	21.5	"	"	"
" 12H242□RS	.0024	"	10.5	"	"	"	"	"
" 12H272□RS	.0027	"	11.0	17.0	22.0	"	"	"
" 12H302□RS	.003	"	"	17.5	22.5	"	"	"
" 12H332□RS	.0033	"	11.5	18.5	23.5	"	"	"
" 12H362□RS	.0036	28.0	8.5	15.5	20.5	22.5	15.0	"
" 12H392□RS	.0039	"	9.0	"	"	"	"	"
" 12H432□RS	.0043	"	9.5	16.0	21.0	"	"	"
" 12H472□RS	.0047	"	10.0	"	"	"	"	"
" 12H512□RS	.0051	"	"	16.5	21.5	"	"	"
" 12H562□RS	.0056	"	"	18.5	23.5	"	"	"
" 12H622□RS	.0062	"	"	"	"	"	"	"
" 12H682□RS	.0068	"	10.5	19.0	24.0	"	"	"
" 12H752□RS	.0075	"	11.0	19.5	24.5	"	"	"
" 12H822□RS	.0082	"	11.5	"	"	"	"	"
" 12H912□RS	.0091	"	"	20.0	25.0	"	"	"
" 12H103□RS	.01	30.5	"	"	"	25.0	17.5	"
" 12H113□RS	.011	"	12.0	"	"	"	"	"
" 12H123□RS	.012	"	"	20.5	25.5	"	"	"
" 12H133□RS	.013	"	13.0	21.0	26.0	"	"	"
" 12H153□RS	.015	"	"	23.0	28.0	"	"	"
" 12H163□RS	.016	"	13.5	23.5	28.5	"	"	"
" 12H183□RS	.018	"	14.0	24.0	29.0	"	"	"
" 12H203□RS	.02	"	15.0	25.0	30.0	"	"	"
" 12H223□RS	.022	"	"	25.5	30.5	"	"	"
" 12H243□RS	.024	"	16.0	26.5	31.5	"	"	"
" 12H273□RS	.027	32.5	15.5	25.5	30.5	27.0	20.0	"
" 12H303□RS	.03	"	16.5	26.5	31.5	"	"	"
" 12H333□RS	.033	"	"	28.5	33.5	"	"	"
" 12H363□RS	.036	"	17.5	28.0	33.0	"	"	"
" 12H393□RS	.039	37.5	16.5	27.0	32.0	31.0	25.0	1.0

□—Cap. tol. code (H, J, K, M)

*Last suffix "R"=straight leads (Type-1)
 Last suffix "S"=crimped leads (Type-2)

Rating & Dimensions

2500VDC (1500V_{p-p} at 15.75kHz) Cap. tol. ±3%(H), ±5%(J), ±10%(K), ±20%(M)

Part No.	Cap. (μF)	Dimensions (mm)						
		L max.	T max.	H max.		F±1.25	S±0.8	ød ±0.05
				Type-1	Type-2	Type-1	Type-2	
ECW H15H102 □ $\frac{D}{N}$	.001	28.0	9.0	15.5	20.5	22.5	15.0	0.8
" 15H112 □ $\frac{D}{N}$	.0011	"	"	16.0	21.0	"	"	"
" 15H122 □ $\frac{D}{N}$	.0012	"	9.5	"	"	"	"	"
" 15H132 □ $\frac{D}{N}$	.0013	"	10.0	16.5	21.5	"	"	"
" 15H152 □ $\frac{D}{N}$	.0015	"	10.5	"	"	"	"	"
" 15H162 □ $\frac{D}{N}$	.0016	"	"	17.0	22.0	"	"	"
" 15H182 □ $\frac{D}{N}$	.0018	"	"	19.0	24.0	"	"	"
" 15H202 □ $\frac{D}{N}$	.002	"	11.0	"	"	"	"	"
" 15H222 □ $\frac{D}{N}$	.0022	"	"	19.5	24.5	"	"	"
" 15H242 □ $\frac{D}{N}$	.0024	30.5	10.5	19.0	24.0	25.0	17.5	"
" 15H272 □ $\frac{D}{N}$	.0027	"	11.0	19.5	24.5	"	"	"
" 15H302 □ $\frac{D}{N}$	.003	"	11.5	20.0	25.0	"	"	"
" 15H332 □ $\frac{D}{N}$	.0033	"	12.0	20.5	25.5	"	"	"
" 15H362 □ $\frac{D}{N}$	.0036	"	12.5	"	"	"	"	"
" 15H392 □ $\frac{D}{N}$	.0039	"	13.0	21.0	26.0	"	"	"
" 15H432 □ $\frac{D}{N}$	.0043	"	"	23.0	28.0	"	"	"
" 15H472 □ $\frac{D}{N}$	.0047	"	13.5	23.5	28.5	"	"	"
" 15H512 □ $\frac{D}{N}$	.0051	"	14.0	24.0	29.0	"	"	"
" 15H562 □ $\frac{D}{N}$	.0056	"	14.5	24.5	29.5	"	"	"
" 15H622 □ $\frac{D}{N}$	.0062	"	15.0	25.0	30.0	"	"	"
" 15H682 □ $\frac{D}{N}$	.0068	"	15.5	26.0	31.0	"	"	"
" 15H752 □ $\frac{D}{N}$	.0075	"	"	27.5	32.5	"	"	"
" 15H822 □ $\frac{D}{N}$	.0082	"	16.0	28.0	33.0	"	"	"
" 15H912 □ $\frac{D}{N}$	.0091	"	17.0	29.0	34.0	"	"	"
" 15H103 □ $\frac{D}{N}$	.01	32.5	16.0	28.0	33.0	27.0	20.0	"
" 15H113 □ $\frac{D}{N}$	.011	"	17.0	29.0	34.0	"	"	1.0
" 15H123 □ $\frac{D}{N}$	.012	"	17.5	29.5	34.5	"	"	"
" 15H133 □ $\frac{D}{N}$	.013	37.5	16.0	28.0	33.0	31.0	25.0	"
" 15H153 □ $\frac{D}{N}$	.015	"	17.0	29.0	34.0	"	"	"

□ Cap. tol. code (H, J, K, M)

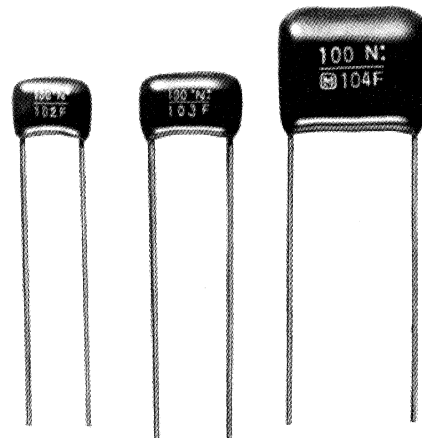
*Last suffix "D"=straight Leads (Type-1)
 Last suffix "N"=crimped Leads (Type-2)

Suitable for circuits requiring high heat resistance and tight tolerance.

Non-inductive wound using polyphenylene sulfide film which has high heat resistance and excellent electrical characteristics.

Features

- Very low loss at high frequency
- Wide operating temperature range -40~ +125 °C
- Excellent temperature coefficient -100PPM/°C
- Low dissipation factor (tanδ), and excellent frequency characteristics
- Oxygen-free copper lead wire which provides good quality sound
- Taped product available (see pp. 141)



Specifications

Operating Temperature Range	-40~ +125 °C
Rated Voltage	50V, 100VDC
Capacitance Range	0.0001~0.47μF
Capacitance Tolerance	±1%(F), ±2%(G), ±5%(J)
Dissipation Factor	0.3% max. (20 °C, 1kHz)
Withstanding Voltage	Between terminals: Rated voltage (VDC) x 250% 1~5s
Insulation Resistance	C≤0.33μF: 45000MΩmin. (20 °C, 100VDC, 60s) C>0.33μF: 15000MΩ•μFmin.
Construction	Polyphenylene sulfide film, non-inductive, epoxy resin coating

Dimensions

Type-1

Type-2(Suffix W)

Style N

Style T

Solder-plated oxygen free copper (O.F.C.) wire

Marking example

50VDC	100VDC
(0.001~0.056μF)	(0.0001~0.027μF)
50 □ 102 J	100 □ 102 J
Date code	Date code
(0.068~0.47μF)	(0.033~0.47μF)
50 □ 104 J	100 □ 104 J
Date code	Date code

Explanation of Part Numbers

E	C	H	S									
Common Code		Type	Dielectric & construction		Rated Voltage		Rated Capacitance		Suffix		Suffix	
Code		Type			1H 50(DC)		The two first digits indicate the two most significant digits of the capacitance value, and the third indicates the 10-power of the capacitance value expressed in picofarads. Examples: 104=100000pF=100nF=0.1μF		Capacitance Tolerance (%)		Lead Style	
H		Plastic film capacitor			1 100(DC)				F ±1 G ±2 J ±5			

Rating & Dimensions

50VDC Cap. tol. $\pm 1\%$ (F), $\pm 2\%$ (G), $\pm 5\%$ (J)

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style
		L max.	T max.	H max.		F ± 1.25	S ± 0.8	ϕ d	
				Type-1	Type-2	Type-1	Type-2	± 0.05	Type-2
ECH S1H102 □Z()	.001	8.5	4.0	6.5	11.5	5.0	5.0	0.6	N
" 1H122 □Z()	.0012	"	"	7.0	12.0	"	"	"	"
" 1H152 □Z()	.0015	"	"	"	"	"	"	"	"
" 1H182 □Z()	.0018	"	"	"	"	"	"	"	"
" 1H222 □Z()	.0022	"	"	"	"	"	"	"	"
" 1H272 □Z()	.0027	"	"	"	"	"	"	"	"
" 1H332 □Z()	.0033	"	"	"	"	"	"	"	"
" 1H392 □Z()	.0039	"	"	"	"	"	"	"	"
" 1H472 □Z()	.0047	"	"	"	"	"	"	"	"
" 1H562 □Z()	.0056	"	"	"	"	"	"	"	"
" 1H682 □Z()	.0068	"	"	"	"	"	"	"	"
" 1H822 □Z()	.0082	"	"	6.5	11.5	"	"	"	"
" 1H103 □Z()	.01	"	"	7.0	12.0	"	"	"	"
" 1H123 □Z()	.012	"	"	"	"	"	"	"	"
" 1H153 □Z()	.015	12.0	4.5	"	"	7.5	"	"	T
" 1H183 □Z()	.018	"	"	"	"	"	"	"	"
" 1H223 □Z()	.022	"	"	"	"	"	"	"	"
" 1H273 □Z()	.027	"	"	8.5	13.5	"	"	"	"
" 1H333 □Z()	.033	"	"	9.0	14.0	"	"	"	"
" 1H393 □Z()	.039	"	5.0	9.5	14.5	"	"	"	"
" 1H473 □Z()	.047	"	"	"	"	"	"	"	"
" 1H563 □Z()	.056	"	5.5	10.0	15.0	"	"	"	"
" 1H683 □Z()	.068	14.5	5.0	9.5	14.5	10.0	"	"	"
" 1H823 □Z()	.082	"	5.5	10.0	15.0	"	"	"	"
" 1H104 □Z()	.1	"	6.0	10.5	15.5	"	"	"	"
" 1H124 □Z()	.12	"	6.5	11.0	16.0	"	"	"	"
" 1H154 □Z()	.15	17.0	"	"	"	12.5	"	"	"
" 1H184 □Z()	.18	"	"	12.5	17.5	"	"	"	"
" 1H224 □Z()	.22	"	7.0	13.5	18.5	"	"	"	"
" 1H274 □Z()	.27	"	7.5	14.5	19.5	"	"	0.8	"
" 1H334 □Z()	.33	"	8.5	15.5	20.5	"	"	"	"
" 1H394 □Z()	.39	"	9.0	16.0	21.0	"	"	"	"
" 1H474 □Z()	.47	"	10.0	16.5	21.5	"	"	"	"

Suffix for lead crimped or taped type (W: Self mounting crimped; 3/9: Taped type for automatic insertion; 2/5: Straight lead taping)
See page 141 for detailed taping specification

Cap. tol. code

Rating & Dimensions

100VDC Cap. tol. $\pm 1\%(F)$, $\pm 2\%(G)$, $\pm 5\%(J)$

Part No.	Cap. (μF)	Dimensions (mm)							Crimped style
		L max.	T max.	H max.		F ± 1.25	S ± 0.8	ϕd ± 0.05	
				Type-1	Type-2	Type-1	Type-2		Type-2
ECH S1101□Z()	.0001	8.5	4.0	6.5	11.5	5.0	5.0	0.6	N
" 1121□Z()	.00012	"	"	"	"	"	"	"	"
" 1151□Z()	.00015	"	"	"	"	"	"	"	"
" 1181□Z()	.00018	"	"	"	"	"	"	"	"
" 1221□Z()	.00022	"	"	"	"	"	"	"	"
" 1271□Z()	.00027	"	"	"	"	"	"	"	"
" 1331□Z()	.00033	"	"	"	"	"	"	"	"
" 1391□Z()	.00039	"	"	"	"	"	"	"	"
" 1471□Z()	.00047	"	"	"	"	"	"	"	"
" 1561□Z()	.00056	"	"	"	"	"	"	"	"
" 1681□Z()	.00068	"	"	"	"	"	"	"	"
" 1821□Z()	.00082	"	"	"	"	"	"	"	"
" 1102□Z()	.001	10.0	4.5	7.0	12.0	"	"	"	"
" 1122□Z()	.0012	"	"	"	"	"	"	"	"
" 1152□Z()	.0015	"	"	"	"	"	"	"	"
" 1182□Z()	.0018	"	"	"	"	"	"	"	"
" 1222□Z()	.0022	"	"	7.5	12.5	"	"	"	"
" 1272□Z()	.0027	"	"	7.0	12.0	"	"	"	"
" 1332□Z()	.0033	"	"	7.5	12.5	"	"	"	"
" 1392□Z()	.0039	"	"	7.0	12.0	"	"	"	"
" 1472□Z()	.0047	"	5.0	7.5	12.5	"	"	"	"
" 1562□Z()	.0056	12.0	4.5	"	"	7.5	"	"	T
" 1682□Z()	.0068	"	"	7.0	12.0	"	"	"	"
" 1822□Z()	.0082	"	"	7.5	12.5	"	"	"	"
" 1103□Z()	.01	"	"	7.0	12.0	"	"	"	"
" 1123□Z()	.012	"	5.0	7.5	12.5	"	"	"	"
" 1153□Z()	.015	"	"	"	"	"	"	"	"
" 1183□Z()	.018	"	5.5	8.0	13.0	"	"	"	"
" 1223□Z()	.022	"	5.0	10.0	15.0	"	"	"	"
" 1273□Z()	.027	"	5.5	10.5	15.5	"	"	"	"
" 1333□Z()	.033	14.5	"	10.0	15.0	10.0	"	"	"
" 1393□Z()	.039	"	6.0	"	"	"	"	"	"
" 1473□Z()	.047	"	"	10.5	15.5	"	"	"	"
" 1563□Z()	.056	"	6.5	11.0	16.0	"	"	"	"
" 1683□Z()	.068	17.0	"	10.5	15.5	12.5	"	"	"
" 1823□Z()	.082	"	"	12.0	17.0	"	"	"	"
" 1104□Z()	.1	"	7.0	13.5	18.5	"	"	"	"
" 1124□Z()	.12	"	7.5	14.0	19.0	"	"	"	"
" 1154□Z()	.15	20.5	"	"	"	15.0	"	0.8	"
" 1184□Z()	.18	"	"	14.5	19.5	"	"	"	"
" 1224□Z()	.22	"	8.5	15.5	20.5	"	"	"	"
" 1274□Z()	.27	"	9.0	16.5	21.5	"	"	"	"
" 1334□Z()	.33	"	10.0	17.0	22.0	"	"	"	"
" 1394□Z()	.39	"	10.5	18.0	23.0	"	"	"	"
" 1474□Z()	.47	"	11.5	19.5	24.5	"	"	"	"

Suffix for lead crimped or taped type (W: Self mounting crimped; 3/9: Taped type for automatic insertion; 2/5: Straight lead taping) See page 141 for detailed taping specification

Cap. tol. code

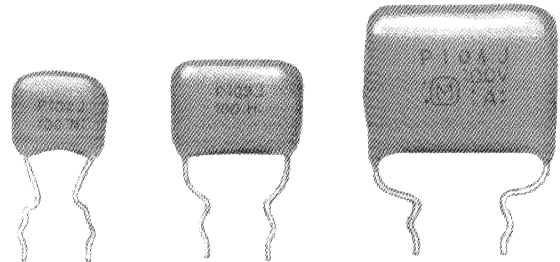
Film Capacitors Polypropylene Type

ECQ-P Series

This series is designed for applications where tight capacitance tolerance is required, and is an ideal replacement for polystyrene capacitor because of linear negative temperature coefficient, excellent frequency characteristics and low dissipation factor.

Features

- Wide capacitance range
- Tight capacitance tolerance
- High insulation resistance
- Low dissipation factor
- Non-inductive construction
- Epoxy resin coating
- Available for automatic insertion



Specifications

Operating Temperature Range	-40~ +85 °C (Derating required above 70°C. See page 145)
Rated Voltage	50V, 100VDC (Derating required according to cap. value. See page 145)
Capacitance Range	0.0001~0.47μF
Capacitance Tolerance	±1%(F), ±2%(G), ±5%(J) (For cap. value 0.0001~0.00091μF, ±5%(J) only.)
Dissipation Factor	0.1% max. (20 °C, 1kHz)
Withstanding Voltage	Between terminals: Rated voltage (VDC) x 250% 1~5s
Insulation Resistance	C≤0.33μF: 45000MΩmin. (20 °C Rated volt. (VDC) 60s) C>0.33μF: 15000MΩ•μFmin.
Construction	Polypropylene film, non-inductive, epoxy resin coating

Dimensions

Marking example

50VDC (0.0001~0.068μF)	100VDC (0.0001~0.018μF)
102 F P □ Date code	P 102F 100 □ Date code
(0.075~0.47μF)	(0.022~0.47μF)
P 753F 50V M □ Date code	P 104F 100V M □ Date code

Explanation of Part Numbers

E	C	Q	P						
Common Code		Type		Dielectric & construction		Suffix		Suffix	
Code	Type	Rated Voltage		Rated Capacitance			Capacitance Tolerance (%)		
Q	Plastic film capacitor	1H	50(DC)	The two first digits indicate the two most significant digits of the capacitance value, and the third indicates the 10-power of the capacitance value expressed in picofarads. Examples: 104=100000pF=100nF=0.1μF			F	±1	
		1	100(DC)				G	±2	J	±5
								Lead Style	

Rating & Dimensions

50VDC Cap. tol. $\pm 1\%$ (F), $\pm 2\%$ (G), $\pm 5\%$ (J)

Part No.	Cap. (μ F)	Dimensions (mm)					Crimped style
		L max.	T max.	H max.	S ± 0.8	$\phi \pm 0.05$	
ECQ P1H101JZ()	.0001	8.5	4.5	12.5	5.0	0.5	N
" 1H111JZ()	.00011	"	"	"	"	"	"
" 1H121JZ()	.00012	"	"	"	"	"	"
" 1H131JZ()	.00013	"	"	"	"	"	"
" 1H151JZ()	.00015	"	"	"	"	"	"
" 1H161JZ()	.00016	"	"	"	"	"	"
" 1H181JZ()	.00018	"	"	"	"	"	"
" 1H201JZ()	.0002	"	"	"	"	"	"
" 1H221JZ()	.00022	"	"	"	"	"	"
" 1H241JZ()	.00024	"	"	"	"	"	"
" 1H271JZ()	.00027	"	"	"	"	"	"
" 1H301JZ()	.0003	"	"	"	"	"	"
" 1H331JZ()	.00033	"	"	"	"	"	"
" 1H361JZ()	.00036	"	"	"	"	"	"
" 1H391JZ()	.00039	"	"	"	"	"	"
" 1H431JZ()	.00043	"	"	"	"	"	"
" 1H471JZ()	.00047	"	"	"	"	"	"
" 1H511JZ()	.00051	"	"	"	"	"	"
" 1H561JZ()	.00056	"	"	"	"	"	"
" 1H621JZ()	.00062	"	"	"	"	"	"
" 1H681JZ()	.00068	"	"	"	"	"	"
" 1H751JZ()	.00075	"	"	"	"	"	"
" 1H821JZ()	.00082	"	"	"	"	"	"
" 1H911JZ()	.00091	"	"	"	"	"	"
" 1H102□Z()	.001	"	"	"	"	"	"
" 1H112□Z()	.0011	"	"	"	"	"	"
" 1H122□Z()	.0012	"	"	"	"	"	"
" 1H132□Z()	.0013	"	"	"	"	"	"
" 1H152□Z()	.0015	"	"	"	"	"	"
" 1H162□Z()	.0016	"	"	"	"	"	"
" 1H182□Z()	.0018	"	"	"	"	"	"
" 1H202□Z()	.002	"	"	"	"	"	"
" 1H222□Z()	.0022	"	"	"	"	"	"
" 1H242□Z()	.0024	"	"	"	"	"	"
" 1H272□Z()	.0027	"	"	"	"	"	"
" 1H302□Z()	.003	"	"	"	"	"	"
" 1H332□Z()	.0033	"	"	"	"	"	"
" 1H362□Z()	.0036	"	"	"	"	"	"
" 1H392□Z()	.0039	"	"	"	"	"	"
" 1H432□Z()	.0043	"	"	"	"	"	"
" 1H472□Z()	.0047	* "	"	"	"	"	"
" 1H512□Z()	.0051	"	"	13.0	"	"	"
" 1H562□Z()	.0056	"	"	"	"	"	"
" 1H622□Z()	.0062	"	5.0	"	"	"	"
" 1H682□Z()	.0068	"	"	"	"	"	"

Suffix for lead crimped or taped type (W: Self mounting crimped; 3/9: Crimped lead taping)

Cap. tol. code

Rating & Dimensions

50VDC Cap. tol. $\pm 1\%$ (F), $\pm 2\%$ (G), $\pm 5\%$ (J)

Part No.	Cap. (μ F)	Dimensions (mm)					Crimped style
		L max.	T max.	H max.	S \pm 0.8	ϕ d \pm 0.05	
ECQ P1H752 Z()	.0075	12.0	5.0	14.0	5.0	0.6	T
" 1H822 Z()	.0082	"	5.5	"	"	"	"
" 1H912 Z()	.0091	"	5.0	13.5	"	"	"
" 1H103 Z()	.01	"	"	"	"	"	"
" 1H113 Z()	.011	"	"	14.0	"	"	"
" 1H123 Z()	.012	"	5.5	"	"	"	"
" 1H133 Z()	.013	"	5.0	"	"	"	"
" 1H153 Z()	.015	"	"	"	"	"	"
" 1H163 Z()	.016	"	5.5	"	"	"	"
" 1H183 Z()	.018	"	"	14.5	"	"	"
" 1H203 Z()	.02	"	"	"	"	"	"
" 1H223 Z()	.022	"	"	15.5	"	"	"
" 1H243 Z()	.024	"	6.0	"	"	"	"
" 1H273 Z()	.027	"	"	16.0	"	"	"
" 1H303 Z()	.03	"	6.5	"	"	"	"
" 1H333 Z()	.033	"	"	16.5	"	"	"
" 1H363 Z()	.036	14.5	5.5	17.0	"	"	"
" 1H393 Z()	.039	"	"	"	"	"	"
" 1H433 Z()	.043	"	6.0	"	"	"	"
" 1H473 Z()	.047	"	"	17.5	"	"	"
" 1H513 Z()	.051	"	6.5	18.5	"	"	"
" 1H563 Z()	.056	"	"	"	"	"	"
" 1H623 Z()	.062	"	7.0	19.0	"	"	"
" 1H683 Z()	.068	"	"	"	"	"	"
" 1H753 Z()	.075	17.0	6.5	18.5	7.5	"	"
" 1H823 Z()	.082	"	7.0	19.0	"	"	"
" 1H913 Z()	.091	"	"	"	"	"	"
" 1H104 Z()	.1	"	7.5	19.5	"	"	"
" 1H114 Z()	.11	"	8.0	20.5	"	"	"
" 1H124 Z()	.12	"	8.5	"	"	"	"
" 1H134 Z()	.13	"	"	21.0	"	"	"
" 1H154 Z()	.15	20.0	8.0	20.5	10.0	"	"
" 1H164 Z()	.16	"	8.5	"	"	"	"
" 1H184 Z()	.18	"	9.0	21.0	"	"	"
" 1H204 Z()	.20	"	9.5	21.5	"	"	"
" 1H224 Z()	.22	"	"	22.0	"	"	"
" 1H244 Z()	.24	"	10.0	22.5	"	"	"
" 1H274 Z()	.27	"	10.5	23.0	"	"	"
" 1H304 Z()	.30	22.5	9.5	24.0	12.5	0.8	"
" 1H334 Z()	.33	"	10.0	24.5	"	"	"
" 1H364 Z()	.36	"	10.5	25.0	"	"	"
" 1H394 Z()	.39	"	11.0	"	"	"	"
" 1H434 Z()	.43	"	11.5	25.5	"	"	"
" 1H474 Z()	.47	"	12.0	26.0	"	"	"

— Suffix for lead crimped or taped type (W: Self mounting crimped; 3/9: Crimped lead taping)

— Cap. tol. code

Rating & Dimensions

100VDC Cap. tol. ±1%(F), ±2%(G), ±5%(J) (±5% only for 0.0001~0.00091μF)

Part No.	Cap. (μF)	Dimensions (mm)					Crimped style
		L max.	T max.	H max.	S±0.8	ød±0.05	
ECQ P1101JZ()	.0001	10.0	5.0	13.0	5.0	0.6	N
" 1111JZ()	.00011	"	"	"	"	"	"
" 1121JZ()	.00012	"	"	"	"	"	"
" 1131JZ()	.00013	"	"	"	"	"	"
" 1151JZ()	.00015	"	"	"	"	"	"
" 1161JZ()	.00016	"	"	"	"	"	"
" 1181JZ()	.00018	"	"	"	"	"	"
" 1201JZ()	.0002	"	"	"	"	"	"
" 1221JZ()	.00022	"	"	"	"	"	"
" 1241JZ()	.00024	"	"	"	"	"	"
" 1271JZ()	.00027	"	"	"	"	"	"
" 1301JZ()	.0003	"	"	"	"	"	"
" 1331JZ()	.00033	"	"	"	"	"	"
" 1361JZ()	.00036	"	"	"	"	"	"
" 1391JZ()	.00039	"	"	"	"	"	"
" 1431JZ()	.00043	"	"	"	"	"	"
" 1471JZ()	.00047	"	"	"	"	"	"
" 1511JZ()	.00051	"	"	"	"	"	"
" 1561JZ()	.00056	"	"	"	"	"	"
" 1621JZ()	.00062	"	"	"	"	"	"
" 1681JZ()	.00068	"	"	"	"	"	"
" 1751JZ()	.00075	"	"	"	"	"	"
" 1821JZ()	.00082	"	"	"	"	"	"
" 1911JZ()	.00091	"	"	"	"	"	"
" 1102□Z()	.001	"	"	"	"	"	"
" 1112□Z()	.0011	"	"	"	"	"	"
" 1122□Z()	.0012	"	"	"	"	"	"
" 1132□Z()	.0013	"	"	"	"	"	"
" 1152□Z()	.0015	"	"	"	"	"	"
" 1162□Z()	.0016	"	"	"	"	"	"
" 1182□Z()	.0018	"	"	"	"	"	"
" 1202□Z()	.002	"	"	"	"	"	"
" 1222□Z()	.0022	"	"	"	"	"	"
" 1242□Z()	.0024	"	"	"	"	"	"
" 1272□Z()	.0027	"	"	"	"	"	"
" 1302□Z()	.003	"	"	"	"	"	"
" 1332□Z()	.0033	"	"	"	"	"	"
" 1362□Z()	.0036	"	"	"	"	"	"
" 1392□Z()	.0039	"	"	"	"	"	"
" 1432□Z()	.0043	"	"	"	"	"	"
" 1472□Z()	.0047	"	"	"	"	"	"
" 1512□Z()	.0051	"	"	"	"	"	"
" 1562□Z()	.0056	"	"	"	"	"	"
" 1622□Z()	.0062	"	5.5	"	"	"	"
" 1682□Z()	.0068	"	"	"	"	"	"

Suffix for lead crimped or taped type (W: Self mounting crimped; 3/9: Crimped lead taping)

Cap. tol. code

Rating & Dimensions

100VDC Cap. tol. ±1%(F), ±2%(G), ±5%(J)

Part No.	Cap. (μF)	Dimensions (mm)					Crimped style
		L max.	T max.	H max.	S±0.8	ød±0.05	
ECQ P1752 Z()	.0075	13.0 (12.0)	5.5	14.0	5.0	0.6	T
" 1822 Z()	.0082	(*)	"	"	"	"	"
" 1912 Z()	.0091	(*)	5.0	13.0	"	"	"
" 1103 Z()	.01	(*)	"	13.5	"	"	"
" 1113 Z()	.011	(*)	"	"	"	"	"
" 1123 Z()	.012	(*)	"	"	"	"	"
" 1133 Z()	.013	(*)	"	"	"	"	"
" 1153 Z()	.015	(*)	5.5	14.0	"	"	"
" 1163 Z()	.016	(*)	"	"	"	"	"
" 1183 Z()	.018	(*)	6.0	15.0	"	"	"
" 1203 Z()	.02	16.0	5.5	"	"	"	"
" 1223 Z()	.022	"	"	"	"	"	"
" 1243 Z()	.024	"	"	"	"	"	"
" 1273 Z()	.027	"	6.0	"	"	"	"
" 1303 Z()	.03	"	"	15.5	"	"	"
" 1333 Z()	.033	"	6.5	"	"	"	"
" 1363 Z()	.036	"	"	"	"	"	"
" 1393 Z()	.039	"	7.0	16.0	"	"	"
" 1433 Z()	.043	"	7.5	"	"	"	"
" 1473 Z()	.047	"	"	16.5	"	"	"
" 1513 Z()	.051	18.0	6.5	17.0	7.5	"	"
" 1563 Z()	.056	"	"	"	"	"	"
" 1623 Z()	.062	"	7.0	17.5	"	"	"
" 1683 Z()	.068	"	"	"	"	"	"
" 1753 Z()	.075	"	"	18.0	"	"	"
" 1823 Z()	.082	"	"	18.5	"	"	"
" 1913 Z()	.091	"	7.5	"	"	"	"
" 1104 Z()	.1	18.5	"	19.0	"	"	"
" 1114 Z()	.11	"	"	"	10.0	"	"
" 1124 Z()	.12	"	8.5	19.5	"	"	"
" 1134 Z()	.13	"	9.0	20.0	"	"	"
" 1154 Z()	.15	"	9.5	20.5	"	"	"
" 1164 Z()	.16	"	"	"	12.5	"	N
" 1184 Z()	.18	19.0	10.0	21.0	"	"	"
" 1204 Z()	.20	"	10.5	21.5	"	"	"
" 1224 Z()	.22	"	11.0	22.0	"	"	"
" 1244 Z()	.24	25.0	9.0	21.5	"	0.8	T
" 1274 Z()	.27	"	9.5	22.0	"	"	"
" 1304 Z()	.30	"	10.0	22.5	"	"	"
" 1334 Z()	.33	"	"	23.0	"	"	"
" 1364 Z()	.36	"	10.5	23.5	"	"	"
" 1394 Z()	.39	"	11.0	24.0	"	"	"
" 1434 Z()	.43	"	11.5	24.5	"	"	"
" 1474 Z()	.47	"	12.0	25.0	"	"	"

Suffix for lead crimped or taped type (W: Self mounting crimped lead 3,9: Crimped lead taping)

Cap. tol. code

* Dimensions in () are for taped product

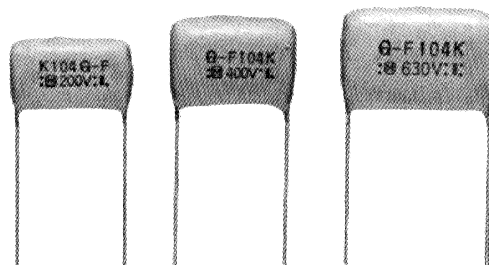
Film Capacitors Polypropylene Type

ECQ-F Series

This series is recommended for applications where high frequency and high current are required.

Features

- Excellent frequency characteristics
- Excellent temperature characteristics
- Low dissipation factor
- High insulation resistance
- Excellent moisture resistance due to wax impregnation



Specifications

Operating Temperature Range	-25~ +85 °C (For a higher temperature than 70 °C, derating is required. See page 145)
Rated Voltage	200V, 400V, 630VDC, 125VAC (Derating is required according to cap. value. See page 145)
Capacitance Range	0.001μF~0.47μF
Capacitance Tolerance	±5%(J), ±10%(K), ±20%(M)
Dissipation Factor	0.1% max. (20 °C, 1kHz)
Withstanding Voltage	Between terminals: Rated voltage (VDC) x 250% 1 ~ 5s, 125VAC x 230% 60s (For type 1A only) Between terminals and enclosure: 1000VAC 60s (For type 1A only)
Insulation Resistance	C≤0.33μF: 45000MΩmin. (20°C, 100VDC 60s) C>0.33μF: 15000MΩ•μFmin. 2000MΩmin. (20 °C, 500VDC 60s) (For type 1A only)
Construction	Polypropylene film, non-inductive, phenolic epoxy resin coating, wax impregnation

Dimensions

Solder-plated
Copper-clad steel wire

Marking example

(200VDC) J104 Q-F 200V Date code	(125VAC 0.001~0.0015μF) 102M AC125V
(400VDC) (630VDC 0.0047~0.22μF) Q-F104K 630V Date code	(125VAC 0.0022~0.22μF) 222M AC125V Date code
(630VDC 0.001~0.0039μF) F102K 630 Date code	

Explanation of Part Numbers

E	C	Q	F																
Common Code		Type		Dielectric & construction		Rated Voltage		Rated Capacitance		Capacitance Tolerance (%)		Suffix		Suffix					
Code	Type							The two first digits indicate the two most significant digits of the capacitance value, and the third indicates the 10-power of the capacitance value expressed in picofarads. Examples: 104=100000pF=100nF=0.1μF		<table border="1" style="font-size: small;"> <tr><td>J</td><td>±5</td></tr> <tr><td>K</td><td>±10</td></tr> <tr><td>M</td><td>±20</td></tr> </table>		J	±5	K	±10	M	±20	Lead Style	
J	±5																		
K	±10																		
M	±20																		
Q	Plastic film capacitor																		
		1A		125(AC)															
		2		200(DC)															
		4		400(DC)															
		6		630(DC)															

Rating & Dimensions

200VDC Cap. tol. $\pm 5\%$ (J), $\pm 10\%$ (K), $\pm 20\%$ (M)

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style Type-2
		L max.	T max.	H max.		F ± 1.25	S ± 0.8	ϕd ± 0.05	
				Type-1	Type-2	Type-1	Type-2		
ECQ F2223 IS(SH)	.022	18.5	6.0	12.0	17.0	13.5	10.0	0.6	B
" 2273 IS(SH)	.027	"	"	12.5	17.5	"	"	"	"
" 2333 IS(SH)	.033	"	"	13.0	18.0	"	"	"	"
" 2393 IS(SH)	.039	"	"	14.5	19.5	"	"	"	"
" 2473 IS(SH)	.047	"	6.5	15.0	20.0	"	"	"	"
" 2563 IS(SH)	.056	"	7.0	15.5	20.5	"	15.0	"	D
" 2683 IS(SH)	.068	"	7.5	16.0	21.0	"	"	"	"
" 2823 IS(SH)	.082	24.5	7.0	15.5	20.5	19.5	"	0.7	B
" 2104 IS(SH)	.1	"	8.0	"	"	"	"	"	"
" 2124 IS(SH)	.12	"	7.5	16.0	21.0	"	"	"	"
" 2154 IS(SH)	.15	25.0	8.5	17.0	23.0	"	20.0	"	D
" 2184 IS(SH)	.18	"	9.5	18.0	24.0	"	"	"	"
" 2224 IS(SH)	.22	25.5	10.0	18.5	24.5	"	"	"	"
" 2274 IS(SH)	.27	"	11.0	20.0	26.0	"	"	"	"
" 2334 IS(SH)	.33	26.0	12.0	21.0	27.0	"	"	"	"
" 2394 IS(SH)	.39	"	13.5	22.0	29.0	"	"	0.8	"
" 2474 IS(SH)	.47	26.5	14.5	23.5	31.5	"	"	"	"

400VDC Cap. tol. $\pm 5\%$ (J), $\pm 10\%$ (K), $\pm 20\%$ (M)

ECQ F4822 Z(ZH)	.0082	18.5	7.0	13.0	18.0	13.5	10.0	0.6	B
" 4103 Z(ZH)	.01	"	"	14.5	19.5	"	"	"	"
" 4123 Z(ZH)	.012	"	"	"	"	"	"	"	"
" 4153 Z(ZH)	.015	"	"	"	"	"	"	"	"
" 4183 Z(ZH)	.018	"	"	"	"	"	"	"	"
" 4223 Z(ZH)	.022	"	7.5	15.0	20.0	"	"	"	"
" 4273 Z(ZH)	.027	"	8.0	17.0	22.0	"	"	"	"
" 4333 Z(ZH)	.033	"	8.5	17.5	22.5	"	15.0	"	D
" 4393 Z(ZH)	.039	"	9.0	18.0	23.0	"	"	"	"
" 4473 Z(ZH)	.047	"	10.0	18.5	23.5	"	"	"	"
" 4563 Z(ZH)	.056	24.5	8.0	17.0	22.0	19.5	"	0.7	B
" 4683 Z(ZH)	.068	"	9.0	18.0	23.0	"	"	"	"
" 4823 Z(ZH)	.082	"	10.0	18.5	23.5	"	"	"	"
" 4104 Z(ZH)	.1	25.0	10.5	19.5	26.5	"	20.0	"	D
" 4124 Z(ZH)	.12	"	11.5	20.5	27.5	"	"	"	"
" 4154 Z(ZH)	.15	25.5	12.5	21.5	28.5	"	"	"	"
" 4184 Z(ZH)	.18	32.0	"	"	27.5	25.5	"	0.8	B
" 4224 Z(ZH)	.22	"	13.0	"	"	"	"	"	"
" 4274 Z(ZH)	.27	"	15.5	24.5	30.5	"	"	"	"
" 4334 Z(ZH)	.33	"	16.0	25.0	31.0	"	"	"	"
" 4394 Z(ZH)	.39	39.0	16.5	"	"	31.0	"	"	"
" 4474 Z(ZH)	.47	"	17.0	25.5	31.5	"	"	"	"

Cap. tol. code

* "H" suffix for crimped lead

Rating & Dimensions

630VDC Cap. tol. $\pm 5\%$ (J), $\pm 10\%$ (K), $\pm 20\%$ (M)

Part No.	Cap. (μ F)	Dimensions (mm)							Crimped style
		L max.	T max.	H max.		F ± 1.25	S ± 0.8	ϕd	
				Type-1	Type-2	Type-1	Type-2	± 0.05	Type-2
ECQ F6102□Z(□ZH)	.001	12.5	6.0	12.0	17.0	8.5	10.0	0.6	D
" 6122□Z(□ZH)	.0012	"	"	"	"	"	"	"	"
" 6152□Z(□ZH)	.0015	"	"	"	"	"	"	"	"
" 6182□Z(□ZH)	.0018	"	"	"	"	"	"	"	"
" 6222□Z(□ZH)	.0022	"	"	13.5	18.5	"	"	"	"
" 6272□Z(□ZH)	.0027	"	6.5	14.0	19.0	"	"	"	"
" 6332□Z(□ZH)	.0033	"	7.0	14.5	19.5	"	"	"	"
" 6392□Z(□ZH)	.0039	"	7.5	15.0	20.0	"	"	"	"
" 6472□Z(□ZH)	.0047	18.5	7.0	12.5	17.5	13.5	"	"	B
" 6562□Z(□ZH)	.0056	"	7.5	13.0	18.0	"	"	"	"
" 6682□Z(□ZH)	.0068	"	7.0	12.5	17.5	"	"	"	"
" 6822□Z(□ZH)	.0082	"	"	14.5	19.5	"	"	"	"
" 6103□Z(□ZH)	.01	"	7.5	15.0	20.0	"	"	"	"
" 6123□Z(□ZH)	.012	"	"	16.5	21.5	"	"	"	"
" 6153□Z(□ZH)	.015	"	8.0	17.0	22.0	"	15.0	"	D
" 6183□Z(□ZH)	.018	"	8.5	18.0	23.0	"	"	"	"
" 6223□Z(□ZH)	.022	"	9.5	18.5	23.5	"	"	"	"
" 6273□Z(□ZH)	.027	24.5	8.0	17.0	22.0	19.5	"	0.7	B
" 6333□Z(□ZH)	.033	"	9.0	17.5	22.5	"	"	"	"
" 6393□Z(□ZH)	.039	"	10.0	18.5	23.5	"	"	"	"
" 6473□Z(□ZH)	.047	25.0	10.5	19.5	24.5	"	"	"	"
" 6563□Z(□ZH)	.056	"	11.5	20.0	27.0	"	20.0	"	D
" 6683□Z(□ZH)	.068	25.5	12.5	21.0	28.0	"	"	"	"
" 6823□Z(□ZH)	.082	32.0	12.0	20.5	26.5	25.5	"	0.8	B
" 6104□Z(□ZH)	.1	"	12.5	21.0	27.0	"	"	"	"
" 6124□Z(□ZH)	.12	"	14.5	23.5	29.5	"	"	"	"
" 6154□Z(□ZH)	.15	"	15.0	24.0	30.0	"	"	"	"
" 6184□Z(□ZH)	.18	39.0	16.0	24.5	30.5	31.0	"	"	"
" 6224□Z(□ZH)	.22	"	"	"	"	"	"	"	"

125VAC Cap. tol. $\pm 10\%$ (K), $\pm 20\%$ (M)

ECQ F1A102□D(□DH)	.001	15.0	7.5	13.5	18.5	8.5	10.0	0.6	D
" 1A152□D(□DH)	.0015	"	8.0	14.0	19.0	"	"	"	"
" 1A222□D(□DH)	.0022	"	"	15.5	20.5	"	"	"	"
" 1A332□D(□DH)	.0033	"	9.0	16.5	21.5	"	"	"	"
" 1A472□D(□DH)	.0047	21.0	"	14.5	19.5	13.5	"	"	B
" 1A682□D(□DH)	.0068	"	"	15.0	20.0	"	"	"	"
" 1A103□D(□DH)	.01	"	9.5	17.0	22.0	"	"	"	"
" 1A153□D(□DH)	.015	"	10.0	19.0	24.0	"	15.0	"	D
" 1A223□D(□DH)	.022	"	11.5	20.5	25.5	"	"	"	"
" 1A333□D(□DH)	.033	26.5	10.5	20.0	25.0	19.5	"	0.7	B
" 1A473□D(□DH)	.047	"	12.5	21.5	26.5	"	"	"	"
" 1A683□D(□DH)	.068	27.0	14.0	23.0	30.0	"	20.0	"	D
" 1A104□D(□DH)	.1	33.0	"	23.5	28.5	24.5	"	0.8	B
" 1A154□D(□DH)	.15	"	17.0	26.0	31.0	"	"	"	"
" 1A224□D(□DH)	.22	40.0	18.0	26.5	31.5	31.0	"	"	"

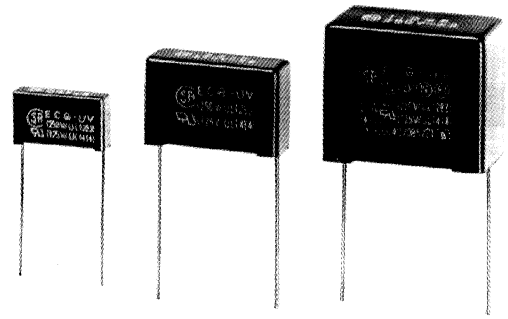
□□□□ Cap. tol. code

* "H" suffix for crimped lead

Film Capacitors Interference Suppression Type-Class X2

ECQ-UV Series

This series is especially designed for radio interference suppressors in accordance with UL/CSA and European safety regulations class X. Self-healing metallized polyester and flame resistant preformed case-with epoxy endfill.



Features

- Excellent active and passive flame-resistant properties
- Overvoltage stress withstanding
- Wide capacitance range (0.001 μ F to 1.0 μ F)

Specifications

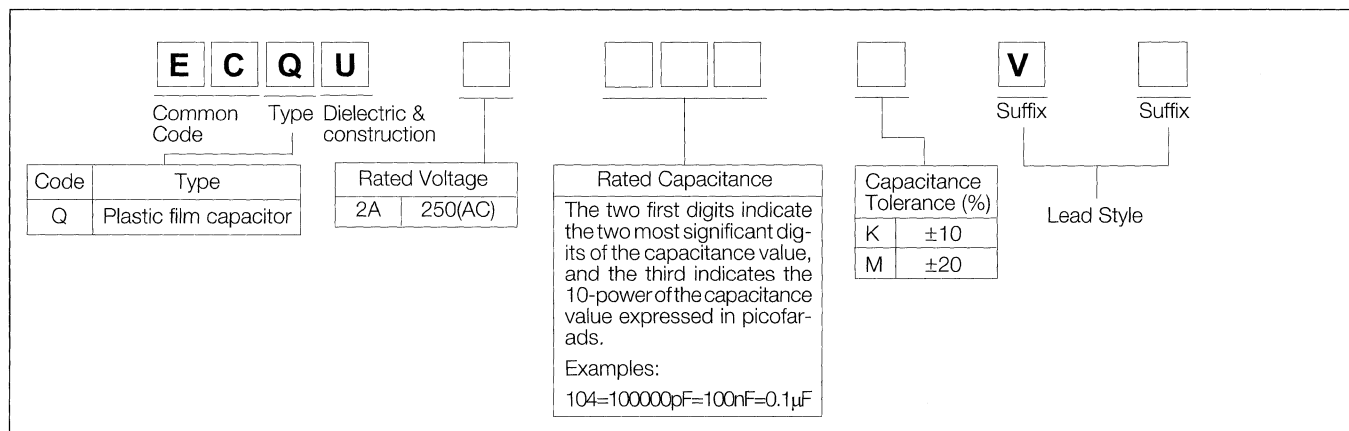
Reference Standard	UL, CSA, SEMKO, DEMKO, NEMKO, EI, VDE, SEV
Operating Temperature Range	-40 to +85 °C
Rated Voltage	200V AC (UL1414: 125VAC)
Capacitance Range	0.001 μ F to 1.0 μ F
Capacitance Tolerance	\pm 10%(K), \pm 20%(M)
Dissipation Factor	1.0% max. (20 °C, 1kHz)
Withstanding Voltage	Between terminals C \leq 0.0068 μ F: 1500VAC, 2121VDC 60s C $>$ 0.0068 μ F: 1000VAC, 1768VDC 60s Between terminals and enclosure: 2000VAC 60s
Insulation Resistance	C \leq 0.33 μ F: 15000M Ω min. (20°C, 100VDC 60s) C $>$ 0.33 μ F: 5000M Ω • μ Fmin. 2000M Ω min. (20 °C, 500VDC 60s)
Construction	Metallized polyester film, flame retardant plastic case, flame retardant resin endfill

Applicable Standard & Approval Number

UL	UL1414	Across-the-Line Capacitors Antenna-Coupling and Line-By-Pass Components	File No. E62674
	UL 1283	Electromagnetic Interference Filters.	File No. E79502
CSA	CSA C22.2 No. 0-M1982, No. 1-M1981	Across-The Line, Antenna-Isolation and Line-by-Pass Capacitor	File No. LR35752

		Class X		Class Y (0.001~0.0068 μ F)
SEMKO	SS 443 04 14	Class X2 Reg No. 8804123	0.001-1.0 μ F	Reg. No. 8804123
DEMKO	Afsnit 21	Class X2 Ref No. 93236EC	0.001-1.0 μ F	Ref No. 93236EC
NEMKO	NEMKO 132	Class X2 Ref No. 37892	0.001-1.0 μ F	Ref No. 37894
EI	IEC384/14	Class X2 Reg.No. 110918-01-02	0.001-1.0 μ F	Reg No. 110918-01-02
VDE	VDE 0565-1	Class X2 File No. 4811. 6-4670-1070	0.0082-1.0 μ F	File No. 4811. 6-4670-1070
SEV	SEV 1055	Class X Ref No. 88, 1 00318, 01	0.1-1.0 μ F	—

Explanation of Part Numbers



Dimensions & Marking

(Type 1) (Type 2)

CASE : Either type 1 or type 2.

Solder-plated copper-clad steel wire

(Tolerance of the lead exit point)

(Marking Example)

A SIDE	B SIDE	C SIDE
001 μFK	ECQ-UV (250V/UL1283) (125V/UL1414)	250V-YX2 GPF 565-1A MKT 40/085/21
01 μFK	ECQ-UV (250V/UL1283) (125V/UL1414)	250V-X2 GPF 565-1A MKT 40/085/21
056 μFK 250-X2	ECQ-UV (250V/UL1283) (125V/UL1414)	GPF MKT 565-1A 40/085/21
1 μFK 250-X2	ECQ-UV (250V/UL1283) (125V/UL1414)	GPF MKT 565-1A 40/085/21
27 μFK 250-X2	ECQ-UV (250V/UL1283) (125V/UL1414)	GPF MKT 565-1A 40/085/21

(Note) Only ±10% as cap tol. to be marked as "K"

□ Date code

Rating & Dimensions

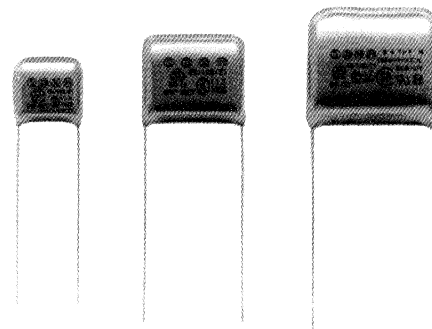
Part No.	Cap. (μF)	Dimensions (mm)						
		L±0.5	T±0.5	H±0.5	F±0.4	ød±0.05	P	Q ^{+1.4} / _{-0.6}
ECQ U2A102	.001	17.5	4.0	10.5	15.0	0.6	0±0.5	1.3
" 2A122	.0012	"	"	"	"	"	"	"
" 2A152	.0015	"	"	"	"	"	"	"
" 2A182	.0018	"	"	"	"	"	"	"
" 2A222	.0022	"	"	"	"	"	"	"
" 2A272	.0027	"	"	"	"	"	"	"
" 2A332	.0033	"	"	"	"	"	"	"
" 2A392	.0039	"	"	"	"	"	"	"
" 2A472	.0047	"	"	"	"	"	"	"
" 2A562	.0056	"	"	"	"	"	"	"
" 2A682	.0068	"	"	"	"	"	"	"
" 2A822	.0082	"	"	"	"	"	"	"
" 2A103	.01	"	"	"	"	"	"	"
" 2A123	.012	"	"	"	"	"	"	"
" 2A153	.015	"	"	"	"	"	"	"
" 2A183	.018	"	4.5	"	"	"	"	"
" 2A223	.022	"	"	"	"	"	"	"
" 2A273	.027	"	"	13.0	"	"	"	"
" 2A333	.033	"	"	"	"	"	"	"
" 2A393	.039	"	5.5	12.5	"	"	"	"
" 2A473	.047	"	"	"	"	"	"	"
" 2A563	.056	"	7.0	14.0	"	"	"	"
" 2A683	.068	"	"	"	"	"	"	"
" 2A823	.082	"	8.0	15.0	"	"	"	"
" 2A104	.1	"	"	"	"	0.8	"	"
" 2A124	.12	25.5	6.5	16.5	22.5	"	"	1.5
" 2A154	.15	"	"	"	"	"	"	"
" 2A184	.18	"	8.5	17.0	"	"	"	"
" 2A224	.22	"	"	"	"	"	"	"
" 2A274	.27	30.5	10.0	18.0	27.5	"	0±0.75	"
" 2A334	.33	"	"	"	"	"	"	"
" 2A394	.39	"	12.0	20.0	"	"	"	"
" 2A474	.47	"	"	"	"	"	"	"
" 2A564	.56	"	13.5	23.5	"	"	"	"
" 2A684	.68	"	"	"	"	"	"	"
" 2A824	.82	"	16.5	26.5	"	"	"	"
" 2A105	1.0	"	"	"	"	"	"	"

Cap. tol. code K: ±10% M: ±20%

Film Capacitors Interference Suppression Type-Class Y

ECQ-UY Series

European Safety standard approved as class Y and UL/CSA approved for across-the line & antenna-coupling and line-by-pass applications. Metallized polyester film and flame retardant epoxy resin is used for the enclosure.



Features

- Self-healing property
- Overvoltage stress withstanding
- Excellent active and passive flame-resistant properties

Specifications

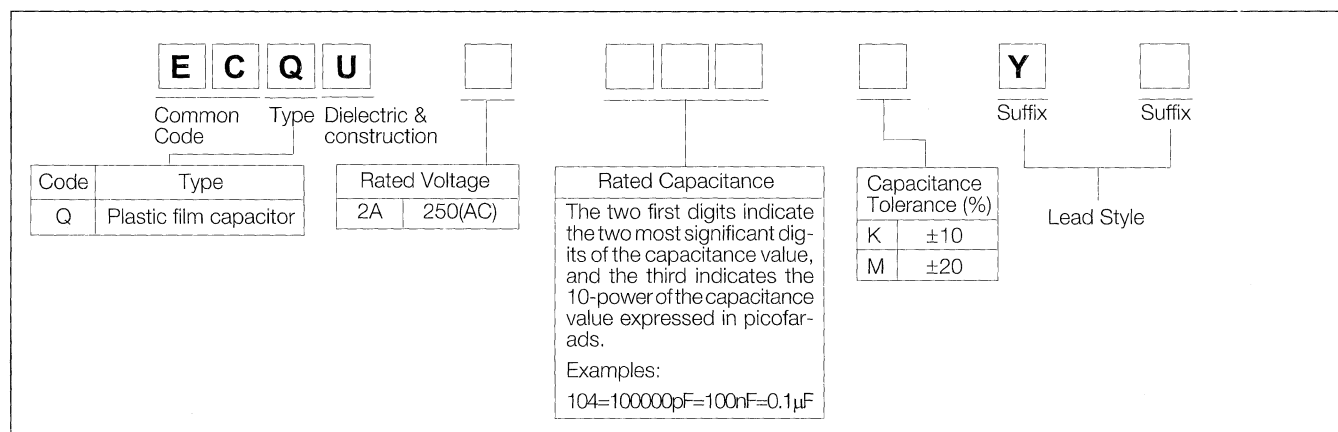
Reference Standard	UL, CSA, SEMKO, DEMKO, NEMKO, EI, VDE, SEV, BS
Operating Temperature Range	-40~ +100°C
Rated Voltage	250VAC
Capacitance Range	0.001~0.047μF
Capacitance Tolerance	±10%(K), ±20%(M)
Dissipation Factor	1.0% max. (20 °C, 1kHz)
Withstanding Voltage	Between terminals: 2000VAC 60s Between terminals and enclosure: 2000VAC 60s
Insulation Resistance	15000MΩmin. (20 °C 100VDC 60s), 2000MΩmin. (20 °C 500VDC 60s)
Construction	Metallized polyester film, flame retardant epoxy resin coating

Applicable Standard & Approval Number

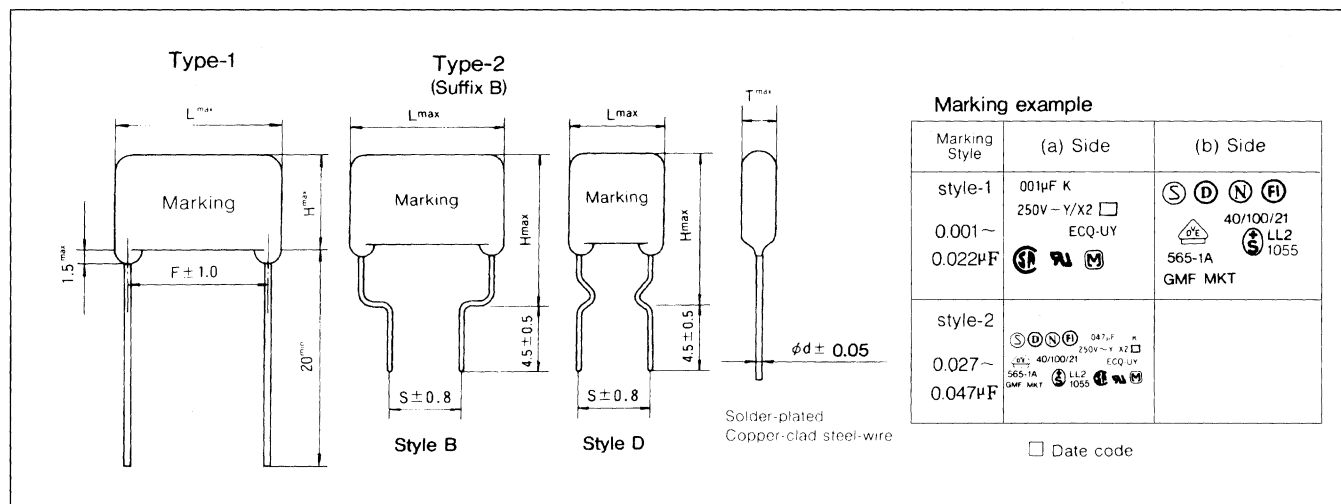
Type ECQ-UY

	Applicable Standard	Approval Number
UL	UL1414	File No. 62674
CSA	C22.2 No. 0-M1982, No. 1M1981	File No. LR35752
SEMKO	SS 443 04 14 Class Y/X 2	Reg No. 9017269
DEMKO	Afsnit 21 Class Y/X 2	Ref No. 98495 EC
NEMKO	NEMKO 132 Class Y/X 2	Ref No. E44180
EI	E384/14 Class Y/X 2	Reg No. 133865-01
VDE	VDE 0565-1 Class Y/X 2	Ref No. 4811. 6-4670-1080
SEV	SEV 1055 Class Y	Ref No. 90. 1 01068, 02
BSI	BS 415	Certificate No. 7171

Explanation of Part Numbers



Dimensions & Marking



Rating & Dimensions

250VDC Cap. tol. $\pm 10\%$ (K), $\pm 20\%$ (M)

Part No.	Cap. (μ F)	Dimensions (mm)						Crimped style	
		L max.	T max.	H max.		F ± 1.0	S ± 0.8		ϕd
				Type-1	Type-2				
ECQ U 2A102□Y()	.001	12.0	6.0	11.5	16.5	10.0	7.5	0.6	D
" 2A122□Y()	.0012	"	"	"	"	"	"	"	"
" 2A152□Y()	.0015	"	6.5	"	"	"	"	"	"
" 2A182□Y()	.0018	"	"	"	"	"	"	"	"
" 2A222□Y()	.0022	"	"	"	"	"	"	"	"
" 2A272□Y()	.0027	"	"	"	"	"	"	"	"
" 2A332□Y()	.0033	"	7.0	12.0	17.0	"	"	"	"
" 2A392□Y()	.0039	"	"	12.5	17.5	"	"	"	"
" 2A472□Y()	.0047	"	7.5	13.5	18.5	"	"	"	"
" 2A562□Y()	.0056	"	8.5	14.0	19.0	"	"	"	"
" 2A682□Y()	.0068	18.5	7.5	13.0	18.0	15.0	"	0.8	B
" 2A822□Y()	.0082	"	"	13.5	18.5	"	"	"	"
" 2A103□Y()	.01	"	"	15.0	20.0	"	"	"	"
" 2A123□Y()	.012	"	8.5	15.5	20.5	"	"	"	"
" 2A153□Y()	.015	"	9.0	16.5	21.5	"	"	"	"
" 2A183□Y()	.018	"	10.0	17.5	22.5	"	"	"	"
" 2A223□Y()	.022	"	11.0	18.0	23.0	"	"	"	"
" 2A273□Y()	.027	23.5	9.5	16.5	21.5	20.0	15.0	"	"
" 2A333□Y()	.033	"	10.0	17.5	22.5	"	"	"	"
" 2A393□Y()	.039	"	11.0	18.5	23.5	"	"	"	"
" 2A473□Y()	.047	"	12.0	20.0	25.0	"	"	"	"

— Suffix B: Crimped lead

— Cap. tol. code (K,M)

Product Specification & Packaging

Quantities for radial lead taping

Type	Rated volt.	Cap. range (μF)	Cap. rank (μF)	Style	Packing	Qty./pack	Type	Suffix				
ECQB(F)	50VDC	0.0001~0.22	0.0001~0.01	A (D)	Ammo	2000	No. 2	□□3				
			0.012~0.039	A (D)		2000	No. 3					
			0.047~0.15	A (D)		1000	No. 2					
			0.18~0.22	A (D)		500	No. 1					
		0.0001~0.1	0.0001~0.01	A (S)	Ammo	2000	No. 2	□□4				
			0.012~0.039	A (S)		2000	No. 3					
			0.047~0.1	A (S)		1000	No. 2					
			0.0001~0.22	A (D)		Reel	2000		No. 45			
	0.056~0.22	A (D)	1000	No. 45								
	0.0001~0.1	0.0001~0.047	A (S)	Reel	2000	No.45	□□5					
		0.056~0.1	A (S)		1000	No. 45						
		63VDC	0.0001~0.033		0.0001~0.01	A (D)		Ammo	2000	No. 2	□□3	
					0.012~0.033	A (D)			2000	No. 3		
	0.0001~0.033		0.0001~0.01	A (S)	Ammo	2000	No. 2	□□4				
			0.120~0.033	A (S)		2000	No. 3					
	100VDC	0.0001~0.1	0.0001~0.033	A (D)	Ammo	2000	No. 2	□□3				
A (D)				2000		No. 3						
A (D)				1000		No. 2						
A (D)				500		No. 1						
0.0001~0.047		0.0001~0.033	0.0001~0.01	A (S)	Ammo	2000	No. 2	□□4				
			0.012~0.015	A (S)		2000	No. 3					
			0.018~0.027	A (S)		1000	No. 2					
			0.033~0.1	A (S)		500	No. 1					
0.0001~0.1	0.0001~0.047	0.0001~0.01	A (S)	Ammo	2000	No. 2	□□4					
		0.012~0.015	A (S)		2000	No. 3						
		0.018~0.027	A (S)		1000	No. 2						
		0.033~0.047	A (S)		500	No. 1						
0.0001~0.1	0.0001~0.047	0.0001~0.015	A (D)	Reel	2000	No. 45	□□9					
		0.018~0.1	A (D)		1000	No. 45						
		0.0001~0.047	0.0001~0.015		A (S)	Reel		2000	No. 45	□□5		
					A (S)			1000	No. 45			
ECQV	50VDC			0.01~2.2	0.01~0.12		A (D)	Ammo	2000		No. 3	□□3
					0.15~2.2		A (D)		1000		No. 3	
		0.01~1.0	0.01~0.12	A (S)	Ammo	2000	No. 3	□□2				
			0.15~1.0	A (S)		1000	No. 3					
0.01~2.2		0.01~0.12	0.15~0.68	A (D)	Reel	2000	No. 41	□□9				
				0.82~2.2		A (D)	1000		No. 43			
			0.01~1.0	0.01~0.12		A (S)	Reel		2000	No. 41	□□5	
				0.15~0.68		A (S)			1000	No. 41		
63 VDC	0.01~1.0	0.01~0.39	A (D)	Ammo	2000	No. 3	□□3					
			0.47~1.0		A (D)	1000		No. 3				
		0.01~0.15	0.01~0.39		A (S)	Ammo		2000	No. 3	□□2		
					0.47~0.68			A (D)	2000		No. 41	
	0.01~1.0	0.01~0.39	0.47~0.68	A (D)	Reel	1000	No. 41	□□9				
				0.82~1.0		A (D)	1000		No. 43			
		0.01~0.15	0.01~0.39	0.82~1.0		A (D)	Reel		2000	No. 41	□□5	
						A (S)			2000	No. 41		

Product Specification & Packaging

Quantities for radial lead taping

Type	Rated volt.	Cap. range (μF)	Cap. rank (μF)	Style	Packing	Qty./pack	Type	Suffix		
ECQV	100VDC	0.01~0.47	0.01~0.068	A (D)	Ammo	2000	No. 3	□□3		
			0.082~0.1	A (D)		1000	No. 3			
			0.12~0.22	A (D)		2000	No. 3			
			0.27~0.57	A (D)		1000	No. 3			
		0.01~0.1	0.01~0.068	A (S)	Ammo	2000	No. 3	□□2		
			0.082~0.1	A (S)		1000	No. 3			
		0.01~0.47	0.01~0.068	0.082~0.1	0.12~0.22	A (D)	Reel	2000	No. 41	□□9
								1000	No. 41	
								2000	No. 41	
								1000	No. 41	
		0.01~0.1	0.01~0.068	0.082~0.1	A (S)	Reel	2000	No. 41	□□5	
							1000	No. 41		
ECQE(F)	100VDC	0.01~0.68	0.01~0.33	A (D)	Ammo	1000	No. 1	□□3		
			0.39~0.68	A (D)		500	No. 1			
		0.01~0.1			A (S)	Ammo	1000	No. 1	□□2	
		0.01~0.68			A (D)	Reel	1000	No. 45	□□9	
		0.82~1.0			B	Ammo	100	No. 4	□□3	
		1.2~3.3			1.2~2.2	C	Ammo	500	No. 4	□□3
					2.7	C		500	No. 5	
	3.3				C	400		No. 5		
	250VDC	0.01~0.27	0.01~0.082	0.1~0.27	A (D)	Ammo	1000	No. 1	□□3	
					A (D)		500	No. 1		
		0.01~0.33			A (D)	Reel	1000	No. 45	□□9	
		0.01~0.15			B**	Ammo	1000	No. 4	S□□	
		0.39~1.5	0.39~1.2	1.5	C	Ammo	500	No. 4	□□3	
					C		400	No. 5		
		0.01~0.33			D	Ammo	1000	No. 4	R□□	
	0.39~1.5	0.39~0.82	1.0~1.2	E	Ammo	500	No. 4	R□□		
				E		400	No. 5			
E				300		No. 5				
400VDC	0.01~0.1	0.01~0.027	0.033~0.1	A (D)	Ammo	1000	No. 1	□□3		
				A (D)		500	No. 1			
	0.01~0.1			A (D)	Reel	1000	No. 45	□□9		
	0.01~0.1			D	Ammo	1000	No. 4	R□□		
	0.12~0.47	0.12~0.33	0.39~0.47	E	Ammo	500	No. 4	R□□		
				E		400	No. 5			
630VDC	0.01~0.033	0.01~0.027	0.033	A (D)	Ammo	1000	No. 1	□□3		
				A (D)		500	No. 1			
	0.01~0.033			A (D)	Reel	1000	No. 45	□□9		
	0.047			B	Ammo	1000	No. 4	□□3		
	0.056~0.22	0.056~0.12	0.15~0.18	C	Ammo	500	No. 4	□□3		
				C		500	No. 5			
	0.01~0.047			D	Ammo	1000	No. 4	R□□		
0.056~0.22	0.056~0.12	0.15~0.18	E	Ammo	500	No. 4	R□□			
			E		400	No. 5				
			E		300	No. 5				
1000VDC	0.001~0.1		0.001~0.0047	E	Ammo	500	No. 4	R□□		
			0.0056	E		400	No. 4			
			0.0068~0.015	E		500	No. 4			
			0.018~0.022	E		400	No. 4			
			0.027~0.039	E		500	No. 4			
			0.047~0.068	E		400	No. 5			
			0.082~0.1	E		400	No. 5			
						300	No. 5			

** F = 7.5mm straight lead taping

Product Specification & Packaging

Quantities for radial lead taping

Type	Rated volt.	Cap. range (μF)	Cap. rank (μF)	Style	Packing	Qty./pack	Type	Suffix	
ECQE(F)	1250VDC	0.001~0.022	0.001~0.0047	E	Ammo	500	No. 4	R□□	
			0.0056	E		400	No. 4		
			0.0068	E		400	No. 5		
			0.0082~0.018	E		500	No. 4		
			0.022	E		500	No. 5		
ECWH	800VDC	0.0082~0.027	0.0082~0.012	E	Ammo	400	No. 4	R□□	
			0.013	E		300	No. 4		
			0.015~0.027	E		300	No. 5		
	1000VDC	0.0056~0.018	0.0056~0.0082	E	Ammo	400	No. 4	R□□	
			0.0091	E		400	No. 5		
			0.01~0.018	E		300	No. 5		
	1000V _{p-p} 1250VDC	0.001~0.0075	0.001~0.0043	E	Ammo	400	No. 4	R□	
			0.0047~0.0075	E		300	No. 4		
1200V _{p-p} 1600VDC	0.001~0.033	0.001~0.002	E	Ammo	400	No. 4	R□		
		0.0022~0.033	E		300	No. 4			
ECHS	50VDC	0.001~0.056	0.001~0.047	A (D)	Ammo	1000	No. 1	□□3	
			0.056	A (D)		500	No. 1		
		0.001~0.012	0.068~0.27	0.33~0.47	A (S)	Ammo	1000	No. 1	□□2
					C		500	No. 4	□□3
		0.068~0.47	0.068~0.12	0.15~0.22	C	Ammo	400	No. 5	
					D		500	No. 1	R□□
		0.15~0.47	0.15~0.47	0.27	E	Ammo	500	No. 4	R□□
					E		400	No. 4	
					E		400	No. 5	
	0.39~0.47	0.39~0.47	0.33	E	Ammo	400	No. 5		
				E		300	No. 5		
				E		300	No. 5		
	0.001~0.056	0.001~0.012	0.001~0.012	A (D)	Reel	1000	No. 45	□□9	
				A (S)		1000	No. 45	□□5	
	100VDC	0.0001~0.027	0.0001~0.015	0.018~0.027	A (D)	Ammo	1000	No. 1	□□3
					A (D)		500	No. 1	
					A (S)		100	No. 1		□□2
		0.033~0.12	0.068~0.1	0.12~0.18	C	Ammo	5000	No. 4	□□3
E					500		No. 4		
E					400		No. 4		
0.068~0.47		0.068~0.47	0.22	E	Ammo	400	No. 5	R□□	
				E		400	No. 5		
				E		300	No. 5		
0.0001~0.027	0.0001~0.027	0.0001~0.027	A (D)	Reel	1000	No. 45	□□9		
0.0001~0.0047	0.0001~0.0047	0.0001~0.0047	A (S)	Reel	1000	No. 45	□□5		
ECQP	50VDC	0.0001~0.033	0.0001~0.022	A (D)	Ammo	1000	No. 1	□□3	
			0.024~0.033	A (D)		500	No. 1		
		0.036~0.13	0.036~0.1	C	Ammo	500	No. 4	□□3	
	0.11~0.13	0.11~0.13	C	400		No. 5			
	100VDC	0.0001~0.018	0.02~0.13	0.15~0.16	A (D)	Ammo	1000	No. 1	□□3
					C		500	No. 4	
C					500		No. 5		

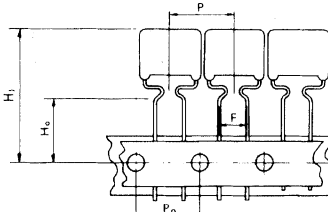
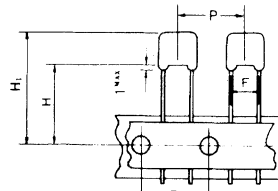
Taping Specifications - All Taped Products

Taping Type

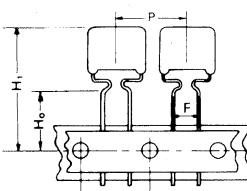
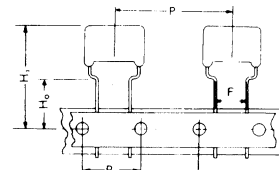
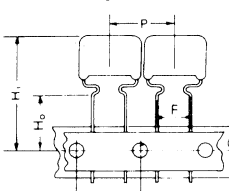
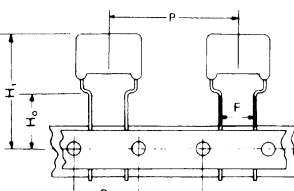
Shape	Name	Specification	Taping Style
Radial type	Standard Taping	5mm lead spacing with 12.7mm body width	A (D), A(S)
	Odd size taping (I)	5/7.5mm lead spacing with 15mm & up body width	B,C, D, E
	Odd size taping (II)	Other than above (Robotic Insertion)	Please contact factory

Radial taping dimensions

Standard taping (mm)

Style A(D)		Style A(S)	
			
P	12.7	P	12.7
P ₀	12.7	P ₀	12.7
F	5.0	F	5.0
H ₀	16.0	H ₀	(H)18.0-20.0
H ₁	32.2 max.	H ₁	32.2 max.

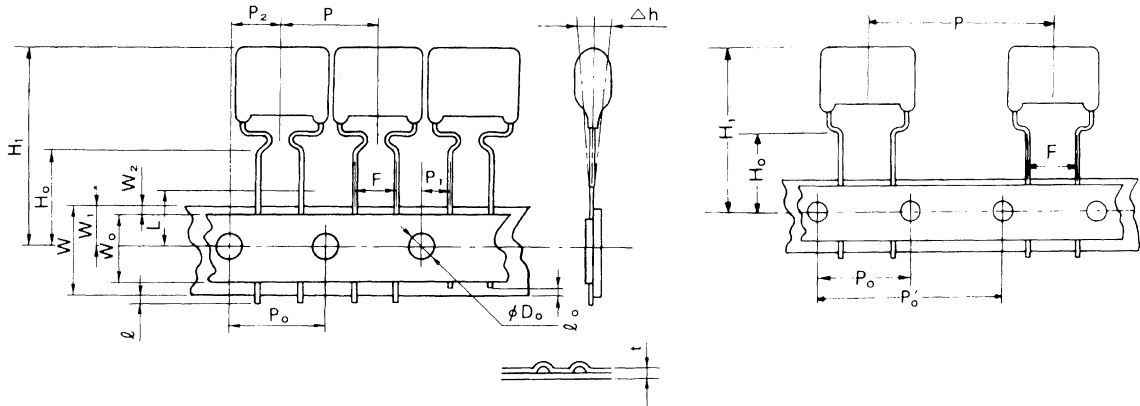
Odd size taping (I) (mm)

Style B		Style C		Style D		Style E	
							
P	15.0	P	25.4	P	15.0	P	30.0
P ₀	15.0	P ₀	12.7	P ₀	15.0	P ₀	15.0
F	5.0	F	5.0	F	7.5	F	7.5
H ₀	16.0	H ₀	16.0	H ₀	16.0	H ₀	16.0
H ₁	37.0 max.	H ₁	37.0 max.	H ₁	42.0 max.	H ₁	42.0 max.

Odd size taping (II)

As the specification of taping changes with various conditions such as dimensions, lead spacing and insertion machine, please contact the nearest sales office for further information.

Dimensions (continued)



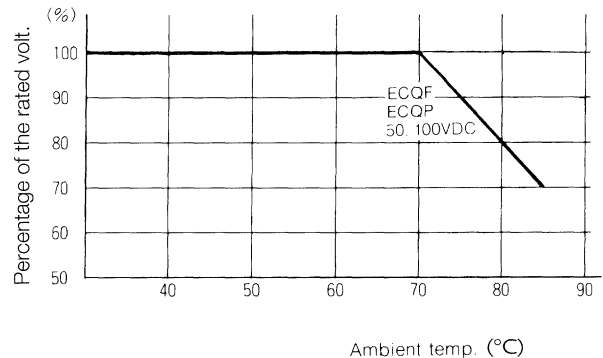
(Unit: mm)

Code	Style A ()	Style B	Style C	Style D	Style E
P	12.7±1.0	15.0±1.0	25.4±1.0	15.0±1.0	30.0±1.0
P ₀	12.7±0.2	15.0±0.2	12.7±0.2	15.0±0.2	15.0±0.2
P' ₀	—	—	25.4±0.2	—	30.0±0.2
P ₁	3.85±0.5	5.0±0.5	3.85±0.5	3.75±0.5	3.75±0.5
P ₂	6.35±1.3	7.5±1.3	6.35±1.3	7.5±1.3	7.5±1.3
F	5.0 ^{+0.8} _{-0.2}	5.0 ^{+0.8} _{-0.2}	5.0 ^{+0.8} _{-0.2}	7.5 ^{+0.8} _{-0.2}	7.5 ^{+0.8} _{-0.2}
Δh	0±2.0				
W	18.0±0.5				
W ₀	9.5 min.				
W ₁	9.0±0.5				
W ₂	0-3.0				
H ₀	16.0±0.5	16.0±0.5	16.0±0.5	16.0 ^{+1.0} ₀	16.0 ^{+1.0} ₀
H ₁	32.2 max.	37.0 max.	37.0 max.	42.0 max.	42.0 max.
l	2.0 max.	0			
l ₀	7.0 max.				
øD ₀	4.0±0.2				
t	0.7±0.2				
L	11.0 max.				

Derating of rated voltage to capacitance value, ECQF and ECQP

Cap. value(μF)	Rated Voltage				
	50VDC	100VDC	200VDC	400VDC	630VDC
0.11-0.12	49V	98V	195V	390V	615V
0.13-0.15	47V	95V	190V	380V	600V
0.16-0.18	46V	93V	185V	370V	585V
0.20-0.22	45V	90V	180V	360V	570V
0.24-0.27	44V	88V	175V	350V	
0.30-0.33	42V	85V	170V	340V	
0.35-0.39	41V	83V	165V	320V	
0.43-0.47	40V	80V	160V	300V	

Derating of rated voltage to operating Temperature, ECQF and ECQP



Explanation of Part Numbers

Standard taping

	Ammo	Reel
Crimped	3	9
Straight	2	5
Straight (ECQB)	4	5

Odd size taping

R	7.5mm Crimped lead
S	7.5mm Straight lead

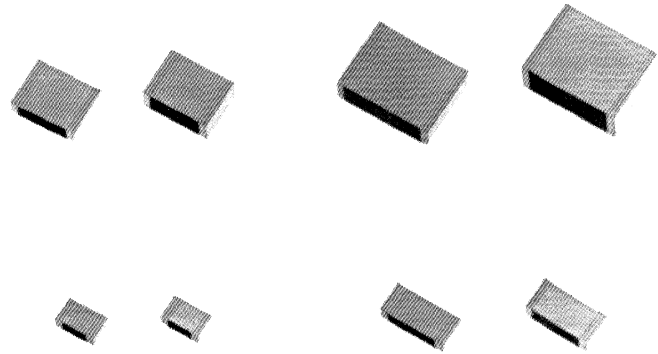
Packing

Ammo packing				Reel packing																																																	
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No. 5	340	65	360																																																		
Type	Dimensions (mm)																																																				
	W ⁺⁵ ₋₂	D max.	d max.																																																		
No. 41	41	360	30																																																		
No. 43	43	360	30																																																		
No. 45	45	360	30																																																		

Film Capacitors Chip Type

ECH-U(B)/ECW-U(B) Series

Uses simple moldless construction and advanced manufacturing techniques, as well as well-established stacking technology.



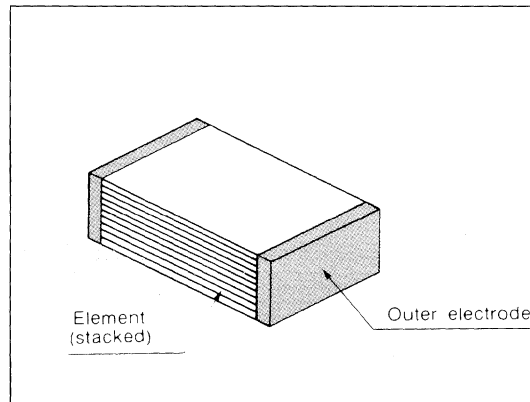
Features

- Small size (minimum size 2.0 x 1.25 mm)
- High moisture resistance (85 °C, 86 %RH, W. V x 1.0 for 500 hours)

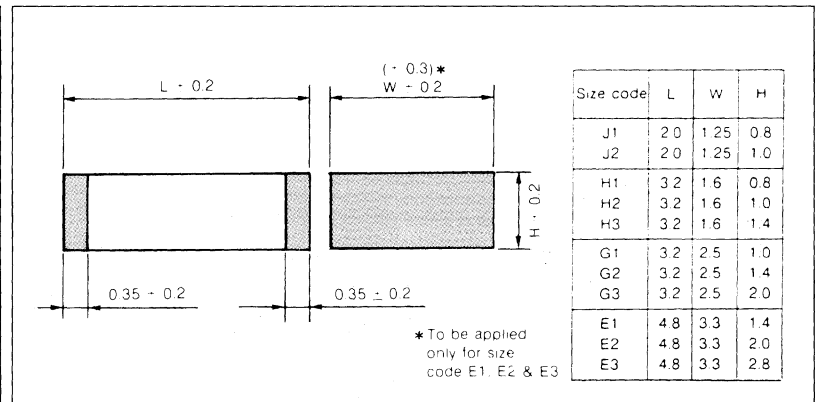
Specifications

Items	Type ECHU (B)	Type ECWU (B)
Operating Temperature Range	-55 to +125 °C	-55 to +105 °C
Rated Voltage	16 VDC, 50 VDC	16 VDC, 50 VDC, 100 VDC
Capacitance Range	0.0001 to 0.1 μF	0.001 to 0.22 μF
Capacitance Tolerance	±2% (G), ±5%(J)	±5% (J)
Withstand voltage	Between terminals: Rated volt. (VDC) x 175% 1-5s	Between terminals: Rated volt. (VDC) x 175% 1-5s
Dissipation Factor	≤0.6% max. at 1 kHz 20 °C	≤1.0% max. at 1 kHz 20 °C
Insulation Resistance	16 VDC: ≥3000MΩ at 20 °C 10 VDC 60s 50 VDC: ≥3000MΩ at 20 °C 50 VDC 60s	16 VDC: ≥3000MΩ at 20 °C 10 VDC 60s 50 VDC: ≥3000MΩ at 20 °C 50 VDC 60s 100 VDC: ≥3000MΩ at 20 °C 100 VDC 60s
Soldering conditions	Flow soldering: 260 °C max., 5 s max. Reflow soldering: 260 °C max. and 30 sec max. at more than 230 °C (Temp. at cap. surface)	Reflow soldering: 240 °C max. and 30 s max. at more than 210 °C (Temp. at cap. surface)
Construction	Metallized Polyphenylene-sulfide Film	Metallized Polyethylene-naphthalate Film

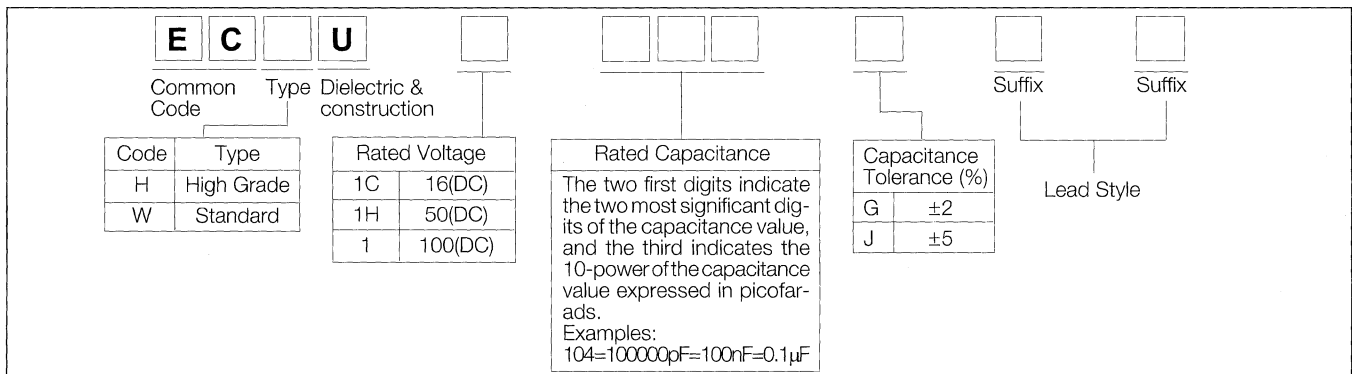
Construction



Dimensions in mm.



Explanation of Part Numbers



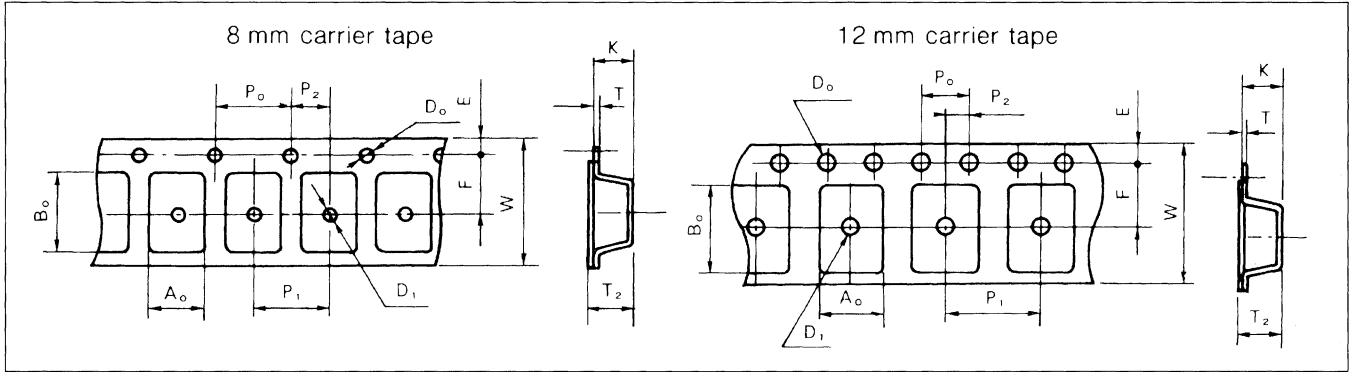
Rating & Dimensions

Cap. (μF)	ECHU (B)				ECWU (B)											
	16 VDC		50 VDC		16 VDC		50 VDC		100 VDC							
	Part No.	Size Code	Part No.	Size Code	Part No.	Size Code	Part No.	Size Code	Part No.	Size Code						
0.0001	Please use 50 VDC rating of ECHU (B)		ECHU1H101()B5	J1	Please use 16 VDC or 50 VDC rating of ECHU (B)		Please use 50 VDC rating of ECHU (B)									
0.00012			" 1H121()B5	"												
0.00015			" 1H151()B5	"												
0.00018			" 1H181()B5	"												
0.00022			" 1H221()B5	"												
0.00027			" 1H271()B5	"												
0.00033			" 1H331()B5	"												
0.00039			" 1H391()B5	"												
0.00047			" 1H471()B5	"												
0.00056			" 1H561()B5	"												
0.00068			" 1H681()B5	"												
0.00082			" 1H821()B5	"												
0.001			" 1H102()B5	"												
0.0012			" 1H122()B5	"												
0.0015			" 1H152()B5	"												
0.0018	" 1H182()B5	"														
0.0022	" 1H222()B5	"														
0.0027	" 1H272()B5	"														
0.0033	ECHU1C332()B5	J1	" 1H332()B5	H1	Please use 16 VDC or 50 VDC rating of ECHU (B)		Please use 50 VDC rating of ECHU (B)									
0.0039	" 1C392()B5	"	" 1H392()B5	"												
0.0047	" 1C472()B5	"	" 1H472()B5	"												
0.0056	" 1C562()B5	"	" 1H562()B5	"												
0.0068	" 1C682()B5	"	" 1H682()B5	"												
0.0082	" 1C822()B5	J2	" 1H822()B5	H2												
0.01	" 1C103()B5	"	" 1H103()B5	"												
0.012	" 1C123()B5	H1	" 1H123()B5	G1							ECWU1C123JB5	H2	" 1H123JB5	G1	" 1123JB9	E1
0.015	" 1C153()B5	"	" 1H153()B5	"							" 1C153JB5	"	" 1H153JB5	"	" 1153JB9	"
0.018	" 1C183()B5	"	" 1H183()B5	G2							" 1C183JB5	"	" 1H183JB5	G2	" 1183JB9	"
0.022	" 1C223()B5	"	" 1H223()B5	"							" 1C223JB5	"	" 1H223JB5	"	" 1223JB9	E2
0.027	" 1C273()B5	H2	" 1H273()B5	"							" 1C273JB5	"	" 1H273JB5	"	" 1273JB9	"
0.033	" 1C333()B5	"	" 1H333()B5	G3							" 1C333JB5	H3	" 1H333JB5	G3	" 1333JB9	E3
0.039	" 1C393()B5	H3	" 1H393()B5	"							" 1C393JB5	"	" 1H393JB5	"	" 1393JB9	"
0.047	" 1C473()B5	"	" 1H473()B9	E1							" 1C473JB5	"	" 1H473JB5	"	" 1473JB9	"
0.056	" 1C563()B5	G2	" 1H563()B9	"	" 1C563JB5	G2	" 1H563JB9	E1								
0.068	" 1C683()B5	"	" 1H683()B9	"	" 1C683JB5	"	" 1H683JB9	"								
0.082	" 1C823()B5	G3	" 1H823()B9	E2	" 1C823JB5	G3	" 1H823JB9	E2								
0.1	" 1C104()B5	"	" 1H104()B9	"	" 1C104JB5	"	" 1H104JB9	"								
0.12					" 1C124JB9	E1										
0.15					" 1C154JB9	"										
0.18					" 1C184JB9	"										
0.22					" 1C224JB9	E2										

Capacitance tolerance code (G: ±2%. J: ±5%)

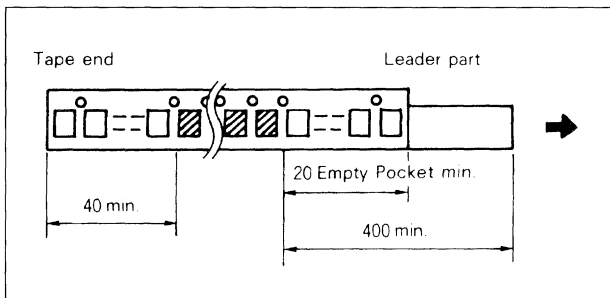
Packaging

Embossed carrier taping



Size code	Dimensions (mm)												
	$A_0 \pm 0.1$	$B_0 \pm 0.1$	$W \pm 0.3$	$F \pm 0.05$	$E \pm 0.1$	$P_1 \pm 0.1$	$P_2 \pm 0.05$	$P_0 \pm 0.1$	$\phi D_0 \pm 0.1$	$\phi D_1 \pm 0.2$	$T \pm 0.05$	$T_2 \pm 0.2$	$K \pm 0.1$
J1	1.55	2.3	8.0	3.5	1.75	4.0	2.0	4.0	$\phi 1.5$	$\phi 1.0$	0.25	1.3	1.2
J2	1.55	2.3										1.5	1.4
H1, H2	1.9	3.5										1.5	1.4
H3	1.9	3.5	12.0	5.5	1.75	8.0	2.0	4.0	$\phi 1.5$	$\phi 1.5$	0.30	1.9	1.8
G1, G2	2.8	3.5										1.9	1.8
G3	2.8	3.5										2.5	2.4
E1	3.8	5.1	12.0	5.5	1.75	8.0	2.0	4.0	$\phi 1.5$	$\phi 1.5$	0.30	2.0	1.9
E2	3.8	5.1										2.6	2.5
E3	3.8	5.1										3.4	3.3

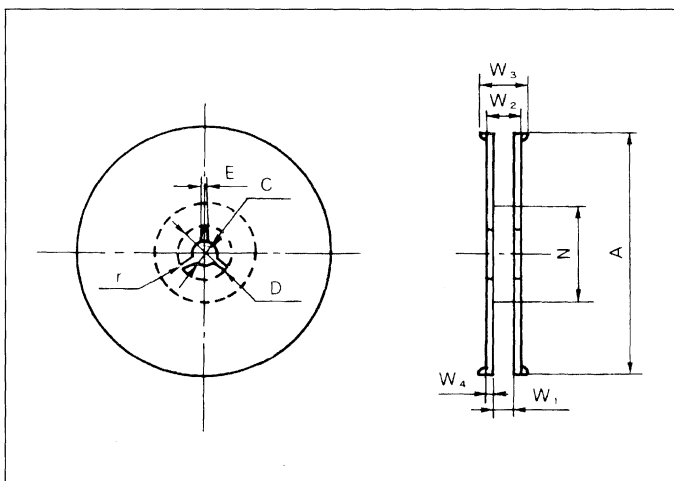
Leader part and tape end



Standard packaging quantities

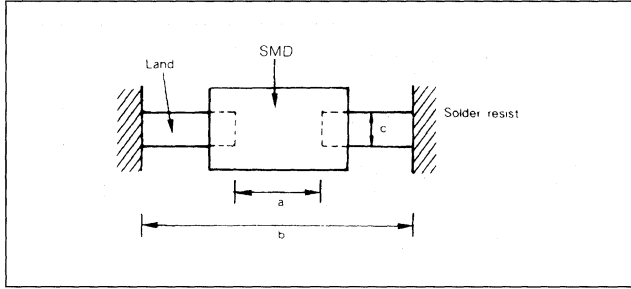
Size code	Reel	quantities
J1, J2, H1, H2	$\phi 178$	3000 pcs/reel
H3, G1, G2, G3	$\phi 178$	2000 pcs/reel
E1, E2	$\phi 330$	3000 pcs/reel
E3	$\phi 330$	2000 pcs/reel

Reel dimensions



Code	Dimensions (mm)	
	Reel size $\phi 178$	Reel size $\phi 330$
A	178.0 ± 2.0	330.0 ± 2.0
C	13.0 ± 0.5	13.0 ± 0.5
D	23.5 ± 0.5	21.0 ± 0.8
E	2.0 ± 0.5	2.0 ± 0.5
N	60.0 ± 2.0	80.0 ± 2.0
W1	9.5 ± 0.5	14.0 ± 1.5
W2	11.9 ± 1.5	18.0 ± 2.5
W3	13.3 ± 1.5	—
W4	1.2 ± 0.5	2.0 ± 0.5
r	1.0 ± 0.5	1.0 ± 0.25

Recommended Land Dimensions



(Unit: mm)

Type	Size Code	Dimensions			Land dimensions					
		L	W(D)	T(H)	Flow soldering			Reflow soldering		
					a	b	c	a	b	c
ECHU(B) ECWU(B)	J1	2.0	1.25	0.8	1.0	2.7	1.1	1.0	2.7	1.1
	J2	2.0	1.25	1.0	1.0	2.7	1.1	1.0	2.7	1.1
	H1	3.2	1.6	0.8	2.2	3.8	1.4	2.2	3.8	1.4
	H2	3.2	1.6	1.0	2.2	3.8	1.4	2.2	3.8	1.4
	H3	3.2	1.6	1.4	2.2	3.8	1.4	2.2	3.8	1.4
	G1	3.2	2.5	1.0	2.2	3.8	2.3	2.2	3.8	2.3
	G2	3.2	2.5	1.4	2.2	3.8	2.3	2.2	3.8	2.3
	G3	3.2	2.5	2.0	2.2	3.8	2.3	2.2	3.8	2.3
	E1	4.8	3.3	1.4	2.6	6.6	3.0	2.6	6.6	3.0
	E2	4.8	3.3	2.0	2.6	6.6	3.0	2.6	6.6	3.0
E3	4.8	3.3	2.8	—	—	—	2.6	6.6	3.0	

Cleaning

1. Applicable solvent
 - Trichloro ethane
 - Isopropyl alcohol

(For more technical information consult our sales engineer)
2. Cleaning methods
 - Dip cleaning
(Room temp.) Less than 5 minutes
 - Vaporized cleaning
(Less than 50 °C) Less than 5 minutes
 - Ultrasonic cleaning
(Less than 50 °C) Less than 5 minutes

Note:

 1. Please avoid using the following cleaning solvents. Toluene, Xylene, MEK or Organochlorine solvent such as Dichloro Ethane and Trichloro Ethylene.)
 2. It is necessary to remove cleaning solvent from P.W.B. by drying sufficiently
 3. Consult with our sales engineer in advance when further information on cleaning solvents and conditions is required.

Features

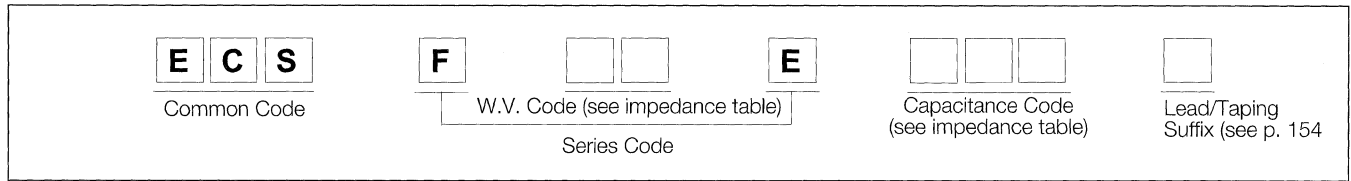
- Highly reliable resin dipped type
- Excellent frequency & temperature characteristics
- Non-flammable epoxy resin



Specifications

Item	Performance Characteristics					
Operating Temperature Range	-55 to +105 °C (-55 to +85 °C for 4 & 6.3V)					
Rated Working Voltage Range	4 to 50V DC					
Nominal Capacitance Range	0.047 to 470μF					
Capacitance Tolerance	±20% (±10% is available) (120Hz, +20 °C)					
Leakage Current	I ≤ 0.008CV or 0.05 [μA] whichever is greater measured after 2 minutes application of rated working voltage at +20 °C					
tan δ (120 Hz, +20 °C)	Working voltage	6.3-50V		4V		
	Capacitance	≤ 1μF	1.5-68μF	≥ 100μF		
	tan δ max.	0.04	0.06	0.08		
				0.10		
Characteristics at High and Low Temperature	-55 °C	Capacitance change	±12% of initial measured value at +20 °C			
	+85 °C	Leakage current	≤ 10 times initial specified value			
		Capacitance change	±12% of initial measured value at +20 °C			
Moisture Resistance	Test conditions					
	Relative humidity	: 90 to 95% without load				
	Ambient temperature	: +40 °C				
	Duration	: 500 hours				
	Post test requirements at +20 °C					
	Leakage current	: ≤ 0.012CV or 0.75 [μA] whichever is greater				
	Capacitance change	: ±10% of initial measured value				
	tan δ	: ≤ 150% of initial specified value				
High Temperature Loading	Test conditions					
	Item	Conditions	Derating (for 10~50V only)	Rating		
		Duration	1000 hours	2000 hours		
	Ambient temperature	+105 °C	+85 °C			
	Applied voltage	Derated working voltage	Rated working voltage			
	Source impedance	1Ω/V	1Ω/V			
	Derating voltage at +105 °C for 10~50V working					
	Working voltage [V DC]	10	16	25	35	50
	Derating voltage [V DC]	8.1	13	21	29	41
	Post test requirements at +20 °C					
Leakage current	: ≤ 0.01CV or 0.625 [μA] whichever is greater					
Capacitance change	: ±10% of initial measured value					
tan δ	: ≤ Initial specified value					
Shelf Life	Test conditions		Post test requirements at +20 °C			
	Duration	: 2000 hours	Same limits for high temperature loading.			
	Ambient temperature	: +85 °C				
	Applied voltage	: (None)				

Explanation of Part Numbers

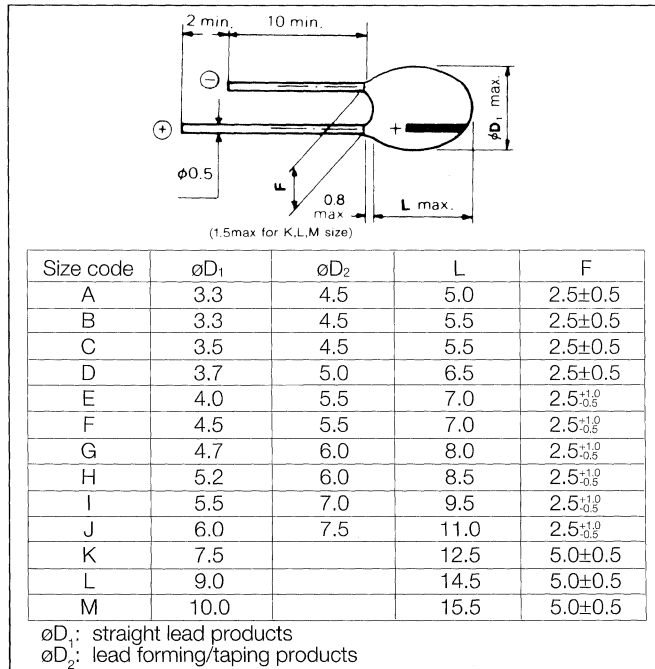


Impedance

Typical/maximum value at 10kHz, +20 °C [Ω]

W.V. [V.DC] Code Cap. [μF] (Code)	4 (0G)	6.3 (0J)	10 (1A)	16 (1C)	25 (1E)	35 (1V)	50 (1H)
0.047 (473)						350 / 490	
0.068 (683)						240 / 350	
0.10 (104)						165 / 270	170 / 270
0.15 (154)						110 / 160	105 / 160
0.22 (224)						75 / 130	80 / 130
0.33 (334)						51 / 85	50 / 85
0.47 (474)						37 / 58	32 / 55
0.68 (684)						27 / 40	25 / 38
1.0 (105)				18 / 28	18 / 28	18 / 28	16 / 26
1.5 (155)				12 / 25	12 / 25	13 / 20	13 / 18
2.2 (225)			10 / 22	10 / 25	9.0 / 15	9.0 / 13	8.0 / 12
3.3 (335)			8.0 / 22	6.5 / 13.5	6.5 / 14.5	6.0 / 10	6.2 / 9.0
4.7 (475)		5.6 / 19	5.0 / 12	5.0 / 12	4.5 / 7.5	4.0 / 7.0	3.5 / 6.5
6.8 (685)	5.5 / 17	4.0 / 10	3.0 / 9.5	3.5 / 7.5	3.0 / 5.5	3.0 / 4.5	2.2 / 4.2
10 (106)	4.5 / 15.5	3.0 / 9.5	2.4 / 7.0	2.5 / 5.0	2.0 / 4.2	2.5 / 3.2	1.8 / 3.0
15 (156)	2.0 / 8.5	2.0 / 6.8	1.8 / 4.5	1.5 / 4.0	1.7 / 2.8	1.2 / 2.5	1.2 / 2.5
22 (226)	1.8 / 7.5	1.5 / 4.0	1.0 / 3.5	1.0 / 2.5	1.2 / 2.5	1.0 / 2.0	
33 (336)	1.2 / 7.0	0.8 / 3.5	0.8 / 2.2	0.7 / 2.2	0.8 / 1.8	0.8 / 1.6	
47 (476)	0.9 / 4.2	0.6 / 2.0	0.6 / 2.0	0.6 / 1.5	0.7 / 1.4	0.6 / 1.2	
68 (686)	0.7 / 2.8	0.5 / 2.0	0.5 / 1.8	0.5 / 1.1	0.6 / 1.0		
100 (107)	0.5 / 2.0	0.5 / 1.5	0.4 / 1.0	0.4 / 0.9			
150 (157)	0.5 / 1.8	0.4 / 0.9	0.4 / 0.9	0.3 / 0.8			
220 (227)	0.4 / 1.1	0.4 / 0.9	0.3 / 0.7				
330 (337)	0.4 / 0.9	0.3 / 0.7					
470 (477)	0.3 / 0.8						

Dimensions[mm]



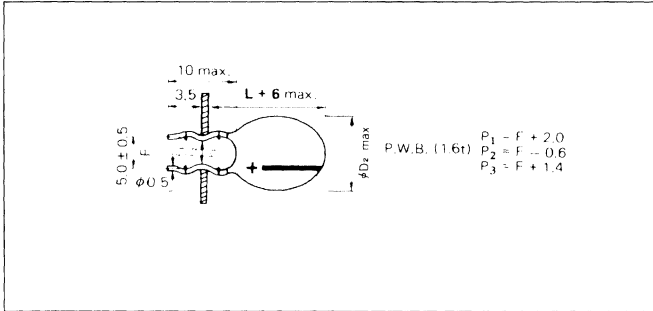
Case Size Table

W.V. [V.DC] Cap. [μF]	4	6.3	10	16	25	35	50
0.047						*A	
0.068						*A	
0.1						*A	*A
0.15						*A	*A
0.22						*A	*B
0.33						*A	*C
0.47						*B	D
0.68						*B	D
1.0				*A		C	E
1.5				*B	C	C	F
2.2			*B	*C	C	D	G
3.3			*C	C	D	E	H
4.7		*C	C	D	E	F	I
6.8	*C	C	D	E	F	H	K
10	C	D	E	F	H	I	L
15	D	E	F	G	I	J	M
22	E	F	G	H	J	K	
33	F	G	H	I	K	L	
47	G	H	I	J	L	M	
68	H	I	J	K	M		
100	I	J	K	L			
150	J	K	L	M			
220	K	L	M				
330	L	M					
470	M						

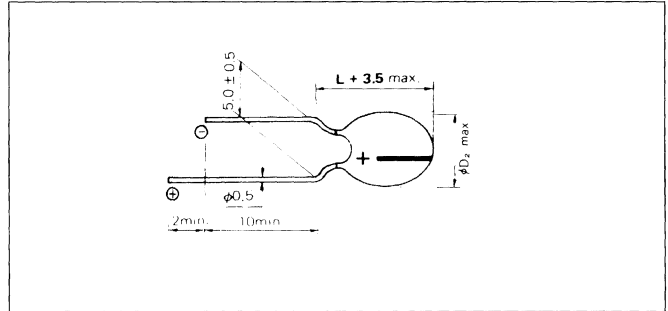
* Shows items with special marking

Lead Forming

5.0mm pitch, A-J size only (suffix "E") [mm]

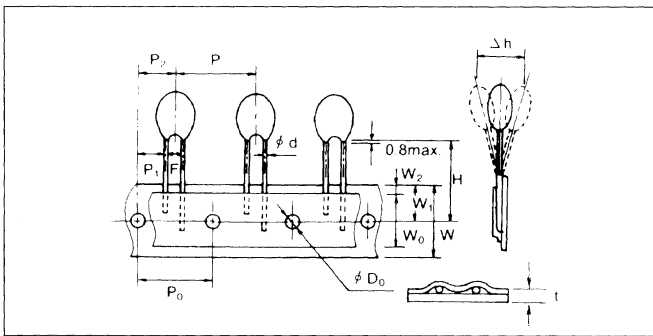


5.0mm pitch, A-J size only (suffix "H") [mm]

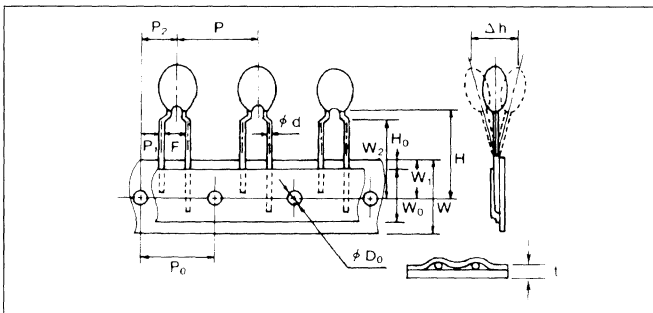


Lead Taping

2.5mm pitch, A-I size only (suffix "B1")



5.0mm pitch, A-I size only
[suffix "B" (H = 21.5)/"BB" (H = 18.5)]

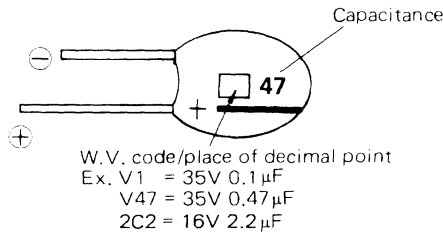
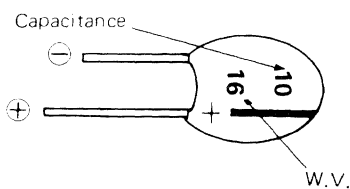


Code	F = 5.0	F = 2.5	Tolerance
ød	0.5	0.5	±0.05
P ₀	12.7	12.7	±0.2
F	5.0	2.5	±0.8
W	18.0	18.0	±0.5
W ₀	≥12.5	≥12.5	—
W ₁	9.0	9.0	±0.5
W ₂	0 ~ 3	0 ~ 3	—
H ₀	16.0	—	±0.5
H	18.5±1.0 21.5±1.0	20.0±0.5	—
øD ₀	4.0	4.0	±0.2
P	12.7	12.7	±1.0
P ₁	3.85	5.1	±0.5
P ₂	6.35	6.35	±1.0
Δh	0	0	±1.0
t	0.7	0.7	±0.2

Marking

"C" ~ "M" size products

"A" ~ *C size products

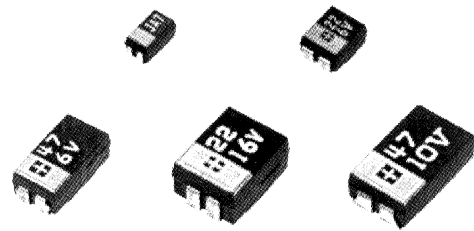


W.V. code for marking on A ~ C* size products.

Code	W.V.
G	4
J	6.3
A	10
C	16
E	25
V	35
H	50

Features

- For general purpose surface mount type
- Compact size & wide CV range
- High solderability & stable characteristics for soldering



Specifications

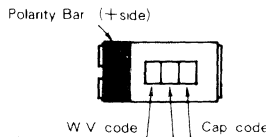
Item	Performance Characteristics							
Operating Temperature Range	-55 to +125 °C							
Rated Working Voltage Range	2.5 to 35V DC							
Nominal Capacitance Range	0.047 to 150µF							
Capacitance Tolerance	±20% (±10% is available) (120Hz, +20 °C)							
Leakage Current	$I \leq 0.01CV$ or 0.5 [µA] whichever is greater measured after 2 minutes application of rated working voltage at +20 °C							
tan δ (120 Hz, +20 °C)	0.04 max. for ≤3.3µF 0.06 max. for 4.7 to 68µF 0.08 max. for 100 to 150µF and 2.5W.V.							
Characteristics at High and Low Temperature	-55 °C	Capacitance change	±12% of initial measured value at +20 °C					
	+125 °C	Leakage current	≤ 12.5 times of initial specified value					
		Capacitance change	±15% of initial measured value at +20 °C					
Moisture Resistance	Test conditions Relative humidity : 90 to 95% without load Ambient temperature : +40 °C Duration : 500 hours							
	Post test requirements at +20 °C Leakage current : ≤ Initial specified value Capacitance change : ±10% of initial measured value tan δ : ≤ Initial specified value							
High Temperature Loading	Test conditions							
	Item \ Conditions	Derating	Rating					
	Duration	2000 hours	2000 hours					
	Ambient temperature	+125 °C	+85 °C					
	Applied voltage	Derated working voltage	Rated working voltage					
Source impedance	1Ω/V	1Ω/V						
Derating voltage at +125 °C								
Working voltage [V DC]	2.5	4	6.3	10	16	20	25	35
Derating voltage [V DC]	1.6	2.5	4	6.3	10	13	16	22
Post test requirements at +20 °C Leakage current : ≤ 125% of initial specified value Capacitance change : ±10% of initial measured value tan δ : ≤ Initial specified value								
Shelf Life	Test conditions		Post test requirements at +20 °C Same limits for "Endurance".					
	Duration	2000 hours						
	Ambient temperature	+125 °C						
Applied voltage	(None)							
Solder Heat Resistance	The capacitor shall withstand dipping into solder bath for 5 ± 1 seconds at 260 ± 5 °C							

Explanation of Part Numbers

E C S	T	□ □	□	□ □ □	□ □
Common Code	Series Code	W.V. Code	Size Code	Capacitance Code	Suffix

Marking

Size Y



Working voltage code

W.V. [V.DC]	2.5	4	6.3	10	16	20	25	35
Code	e	G	J	A	C	D	E	V

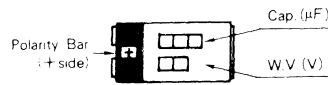
Capacitance code

Capacitance (pF)	1	1.5	2.2	3.3	4.7	6.8
1st code	A	E	J	N	S	W

Multiplier	10 ⁵	10 ⁶	10 ⁷
2nd code	5	6	7

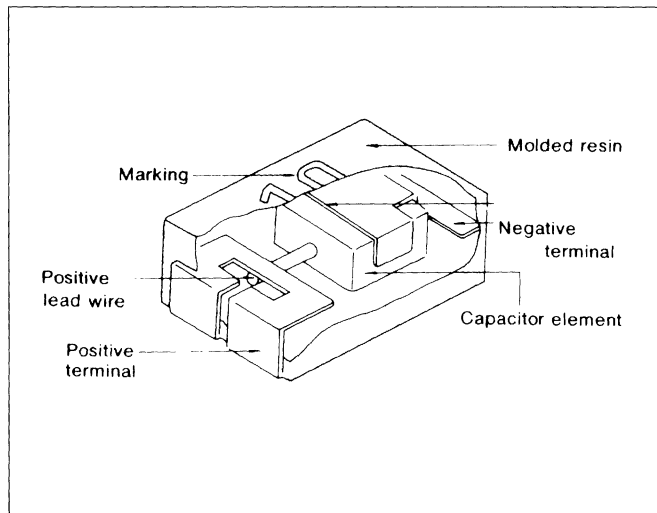
Ex.) A6: 1.0 x 10⁶pF (1.0μF)
J5: 2.2 x 10⁵pF (0.22μF)

Size X, C, V, D



* For 6.3W.V. abbreviated to 6V
* For 2.5W.V. abbreviated to 2V

Construction



Dimensions

Size code	L±0.2	W1±0.2	W2±0.1	H±0.2	P±0.3
Y	3.2	1.6	1.20	1.6	0.8
X	3.5	2.8	2.20	1.9	0.8
C	6.0	3.2	2.20	2.5	1.3
V	5.8	4.6	2.40	3.2	1.3
D	7.3	4.3	3.65	2.8	1.3

Case Size Table

Cap. [μF]	W.V. [V.DC]								
	2.5 (OE)	4 (OG)	6.3 (OJ)	10 (1A)	16 (1C)	20 (1D)	25 (1E)	35 (1V)	
0.047 (473)									Y
0.068 (683)									Y
0.10 (104)									Y
0.15 (154)									Y
0.22 (224)									Y
0.33 (334)									Y
0.47 (474)							Y		Y
0.68 (684)					Y	Y			Y
1.0 (105)					Y		Y	X	Y
1.5 (155)					Y	Y	X	Y	X
2.2 (225)				Y	Y	X	Y	X	X
3.3 (335)			Y	Y	Y	X	Y	X	C
4.7 (475)		Y	Y	Y	X	Y	X	C	X
6.8 (685)		Y	Y	X	Y	C	X	D	V
10 (106)		X	X	Y	X	Y	C	D	V
15 (156)		X	Y	X	Y	C	X	D	V
22 (226)		X	Y	C	X	C		D	V
33 (336)	Y	C	X	C	X	D	V	C	
47 (476)		C	X	D	V	C		D	V
68 (686)	X	D	V	C	D	V		D	V
100 (107)		D	V	C	D	V		D	V
150 (157)			D	V	C	D		D	V

□ Parts newly added as smaller size and recommended for new design
() shows W.V. and Cap. code

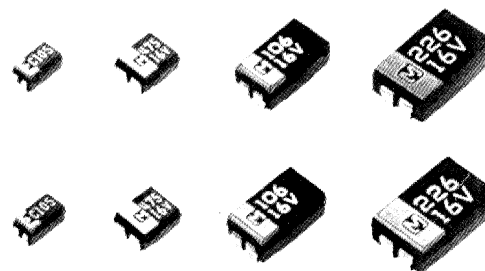
Standard Products

W.V. [V.DC]	Cap. [μF]	Part No.	Size code	D.C.L. (+20°C/ 2 min.) [μA] max.	tan δ (120Hz/ +20°C) max.
2.5	33	ECST0EY336R	Y	0.9	0.08
	68	ECST0EX686R	X	1.7	0.08
4	4.7	ECST0GY475R	Y	0.5	0.06
	6.8	ECST0GY685R	Y	0.5	0.06
	10	ECST0GY106R	Y	0.5	0.06
	15	ECST0GY156R	Y	0.6	0.06
		ECST0GX156P	X		
	22	ECST0GY226R	Y	0.9	0.06
		ECST0GX226R	X		
	33	ECST0GX336R	X	1.4	0.06
		ECST0GC336R	C		
	47	ECST0GX476R	X	1.9	0.06
		ECST0GC476R	C		
	68	ECST0GC686R	C	2.8	0.06
		ECST0GV686R	V		
		ECST0GD686R	D		
	100	ECST0GC107R	C	4.0	0.08
ECST0GV107R		V			
ECST0GD107R		D			
150	ECST0GD157R	D	6.0	0.08	
6.3	3.3	ECST0JY335R	Y	0.5	0.04
	4.7	ECST0JY475R	Y	0.5	0.06
	6.8	ECST0JY685R	Y	0.5	0.06
	10	ECST0JY106R	Y	0.7	0.06
		ECST0JX106R	X		
	15	ECST0JY156R	Y	1.0	0.06
		ECST0JX	X		
	22	ECST0JX226R	X	1.4	0.06
		ECST0JC226R	C		
	33	ECST0JX336R	X	2.1	0.06
		ECST0JC336R	C		
	47	ECST0JC476R	C	3.0	0.06
		ECST0JV476R	V		
		ECST0JD476R	D		
	68	ECST0JV686R	V	4.3	0.06
ECST0JD686R		D			
100	ECST0JD107R	D	6.3	0.08	
10	2.2	ECST1AY225R	Y	0.5	0.04
	3.3	ECST1AY335R	Y	0.5	0.04
	4.7	ECST1AY475R	Y	0.5	0.06
	6.8	ECST1AY685R	Y	0.7	0.06
		ECST1AX685R	X		
	10	ECST1AY106R	Y	1.0	0.06
		ECST1AX106R	X		
	15	ECST1AX156R	X	1.5	0.06
ECST1AC156R		C			

W.V. [V.DC]	Cap. [μF]	Part No.	Size code	D.C.L. (+20°C/ 2 min.) [μA] max.	tan δ (120Hz/ +20°C) max.
10	22	ECSTAX226R	X	2.2	0.06
		ECST1AC226R	C		
	33	ECST1AC336R	C	3.3	0.06
		ECST1AV336R	V		
		ECST1A336R	D		
	47	ECST1AV476R	V	4.7	0.06
ECST1AD476R		D			
68	ECST1AD686R	D	6.8	0.06	
16	0.68	ECST1CY684R	Y	0.5	0.04
	1.0	ECST1CY105R	Y	0.5	0.04
	1.5	ECST1CY155R	Y	0.5	0.04
	2.2	ECST1CY225R	Y	0.5	0.04
	3.3	ECST1CY335R	Y	0.6	0.04
	4.7	ECST1CY475R	Y	0.8	0.06
		ECST1CX475R	X		
	6.8	ECST1CX685	X	1.1	0.06
	10	ECST1CX106	X	1.6	0.06
		ECST1CC106R	C		
	15	ECST1CC156R	C	2.4	0.06
	22	ECST1CC226R	C	3.6	0.06
ECST1CV226R		V			
ECST1CD226R		D			
33	ECST1CV336R	V	5.3	0.08	
	ECST1CD336R	D			
47	ECST1CD476R	D	7.6	0.06	
20	0.68	ECST1DY684R	Y	0.5	0.04
	1.5	ECST1DY155R	Y	0.5	0.04
	2.2	ECST1DY225R	Y	0.5	0.04
		ECST1DX225R	X		
	3.3	ECST1DY335R	Y	0.7	0.04
		ECST1DX335R	X		
	4.7	ECST1DX475	X	1.0	0.06
	6.8	ECST1DX685R	X	1.4	0.06
		ECST1DC685R	C		
	10	ECST1DC106R	C	2.0	0.06
	15	ECST1DC156R	C	3.0	0.06
		ECST1DV156R	V		
22	ECST1DD156R	D	4.4	0.06	
	ECST1DV226R	V			
33	ECST1DD226R	D	6.6	0.06	
	ECST1DD336R	D			

Features

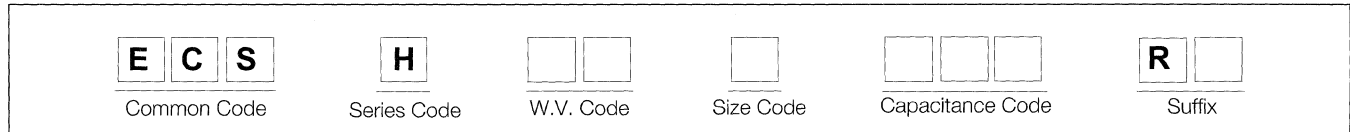
- Highly reliable surface mount type
- Moisture resistance: 1000 hours at 90~95%RH, +60 °C
- Excellent frequency & temperature characteristics
- High solderability: new solder coverage $\geq 95\%$



Specifications

Item	Performance Characteristics						
Operating Temperature Range	-55 to +125 °C						
Rated Working Voltage Range	4 to 35V DC						
Nominal Capacitance Range	0.047 to 100µF						
Capacitance Tolerance	$\pm 20\%$ ($\pm 10\%$ is available) (120Hz, +20 °C)						
Leakage Current	$I \leq 0.01CV$ or $0.5 [\mu A]$ whichever is greater measured after 2 minutes application of rated working voltage at +20 °C						
tan δ (120 Hz, +20 °C)	0.04 max. for $\leq 3.3\mu F$ 0.06 max. for 4.7 ~ 68µF 0.08 max. for 100µF						
Impedance	Refer to standard products table (100kHz/+20 °C)						
Characteristics at High and Low Temperature	-55 °C	Capacitance change	$\pm 12\%$ of initial measured value at +20 °C				
	+125 °C	Leakage current	≤ 12.5 times of initial specified value				
Moisture Resistance	Test conditions						
	Relative humidity : 90 to 95% without load Ambient temperature : +60 °C Duration : 1000 hours Post test requirements at +20 °C Leakage current : $\leq 200\%$ of initial specified value Capacitance change : $\pm 10\%$ of initial measured value tan δ : \leq Initial specified value						
High Temperature Loading	Test conditions						
	Conditions	Derating	Rating				
	Duration	2000 hours	2000 hours				
	Ambient temperature	+125 °C	+85 °C				
	Applied voltage	Derated working voltage	Rated working voltage				
Source impedance	1Ω/V	1Ω/V					
Derating voltage at +125 °C							
Working voltage [V DC]	4	6.3	10	16	20	25	35
Derating voltage [V DC]	2.5	4	6.3	10	13	16	22
Post test requirements at +20 °C							
Leakage current : $\leq 125\%$ of initial specified value							
Capacitance change : $\pm 10\%$ of initial measured value							
tan δ : \leq Initial specified value							
Shelf Life	Test conditions		Post test requirements at +20 °C Same limits for high temperature loading				
	Duration	2000 hours					
Ambient temperature	+125 °C						
Applied voltage	(None)						
Thermal Shock	Test conditions						
	Duration	100 cycles					
	Ambient temperature	-55/+125 °C (30 min. each)					
	Post test requirements at +20 °C						
Leakage current : $\leq 125\%$ of initial specified value							
Capacitance change : $\pm 5\%$ of initial measured value							
tan δ : \leq Initial specified value							
Solder Heat Resistance	The capacitor shall withstand dipping into solder bath for 10 ± 1 sec at 260 ± 5 °C						

Explanation of Part Numbers



Marking

Size Y
Polarity Bar (+Side) Manufacture's Identification

W.V. Code Cap. Code

① Working voltage code

W.V. [V.DC]	4	6.3	10	16	20	25	35
Code	G	J	A	C	D	E	V

② Cap. code
Capacitances in μF are designated by three numerals. The first two numerals are the significant digits and the last numeral designates the number of zeroes that follow the significant digits.

Cap. code	Capacitance
474	$470000\text{pF} = 0.47\mu\text{F}$
475	$4700000\text{pF} = 4.7\mu\text{F}$

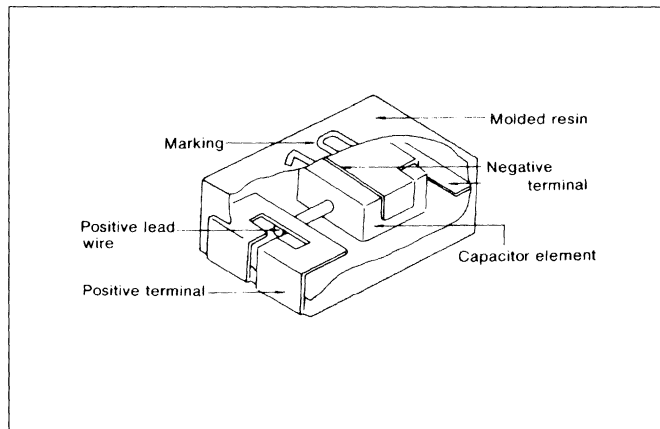
Size X, C, D

Polarity Bar (+Side) Manufacture's Identification

Cap. (μF)
W.V. (V)

* 6.3W.V. abbreviated to 6V

Construction



Dimensions

[mm]

Size code	L ± 0.2	W1 ± 0.2	W2 ± 0.1	H ± 0.2	P ± 0.3
Y	3.2	1.6	1.2	1.6	0.8
X	3.5	2.8	2.2	1.9	0.8
C	6.0	3.2	2.2	2.5	1.3
D	7.3	4.3	2.4	2.8	1.3

Case Size Table

Cap. [μF]	W.V. [V.DC]	4V (0G)	6.3V (0J)	10V (1A)	16V (1C)	20V (1D)	25V (1E)	35V (1V)
0.047 (473)								Y
0.068 (683)								Y
0.10 (104)								Y
0.15 (154)								Y
0.22 (224)								Y
0.33 (334)								Y
0.47 (474)							Y	X (Y)
0.68 (684)					Y	Y		X (Y)
1.0 (105)					Y		Y	X
1.5 (155)				Y	Y	Y	X	C (X)
2.2 (225)			Y	Y	X (Y)	X	X	C (X)
3.3 (335)		Y		Y	X (Y)	X	C (X)	D (C)
4.7 (475)	Y		Y	X (Y)	X (X)	C (X)	C (C)	D
6.8 (685)		Y	X (Y)	X (X)	C (X)	C		D
10 (106)	X	Y	X (X)	C (X)	C	C (C)	D	D (D)
15 (156)		X	C (X)	C	C (C)	D	D (D)	
22 (226)		X	C	C (C)	D	D (D)		
33 (336)	C		C (C)	D	D			
47 (476)		C (C)	D	D				
68 (686)	D		D					
100 (107)	D							

() shows W.V. and Cap. code
□ Parts newly added as smaller size

Standard Products

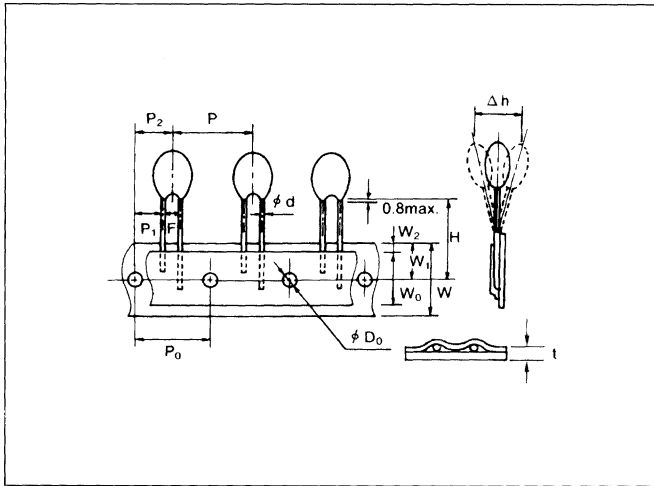
W.V [V.DC]	Cap. [μA]	Part No.	Size code	D.C.L. (+20°C/ 2 min.) [μA]max.	tan δ (120Hz/ +20°C max.	Impe- dance (100kHz/ +20°C) [Ω] max.
4	4.7	ECHS0GY475R	Y	0.5	0.06	8
	6.8	ECHS0GY685R	Y	0.5	0.06	8
	10	ECHS0GY106R	Y	0.5	0.06	3
		ECHS0GX106R	X			
	15	ECHS0GX156R	X	0.6	0.06	3
	22	ECHS0GX226R	X	0.9	0.06	3
	33	ECHS0GC336R	C	1.4	0.06	3
	47	ECHS0GC476R	C	1.9	0.06	1
	68	ECHS0GD686R	D	2.8	0.06	1
100	ECHS0GD107R	D	4.0	0.08	1	
6.3	3.3	ECSH0JY335R	Y	0.5	0.04	8
	4.7	ECSH0JY475R	Y	0.5	0.06	8
	6.8	ECSH0JY685R	Y	0.05	0.06	8
		ECSH0JX685R	X			
	10	ECSH0JX106R	X	0.7	0.06	3
	15	ECSH0JX156R	X	1.0	0.06	3
		ECSH0JC156R	C			
	22	ECSH0JC226R	C	1.4	0.06	3
	33	ECSH0JC336R	C	2.1	0.06	1
47	ECSH0JD476R	D	3.0	0.06	1	
68	ECSH0JD686R	D	4.3	0.06	1	
10	2.2	ECSH1AY225R	Y	0.5	0.04	8
	3.3	ECSH1AY335R	Y	0.5	0.04	8
	4.7	ECSH1AY475R	Y	0.5	0.06	8
		ECSH1AX475R	X			
	6.8	ECSH1AX685R	X	0.7	0.06	8
	10	ECSH1AX106R	X	1.0	0.06	3
		ECSH1AC106R	C			
	15	ECSH1AC156R	C	1.5	0.06	3
	22	ECSH1AC226R	C	2.2	0.06	3
33	ECSH1AD336R	D	3.3	0.06	3	
47	ECSH1AD476R	D	4.7	0.06	1	
16	0.68	ECSH1CY684R	Y	0.5	0.04	15
	1.0	ECSH1CY105R	Y	0.5	0.04	8
	1.5	ECSH1CY155R	Y	0.5	0.04	8
	2.2	ECSH1CY225R	Y	0.5	0.04	8
		ECSH1CX225R	X			
	3.3	ECSH1CY335R	Y	0.6	0.04	8
		ECSH1CX335R	X			
	4.7	ECSH1CX475R	X	0.8	0.06	8
		ECSH1CX685R	X			
	6.8	ECSH1CC685R	C	1.1	0.06	8
	10	ECSH1CC106R	C	1.6	0.06	3
	15	ECSH1CC156R	C	2.4	0.06	3
	22	ECSH1CD226R	D	3.6	0.06	3
33	ECSH1CD336R	D	5.3	0.06	3	

W.V [V.DC]	Cap. [μA]	Part No.	Size code	D.C.L. (+20°C/ 2 min.) [μA]max.	tan δ (120Hz/ +20°C max.	Impe- dance (100kHz/ +20°C) [Ω] max.	
20	0.68	ECSH1DY684R	Y	0.5	0.04	15	
	1.5	ECSH1DY155R	Y	0.5	0.04	8	
	2.2	ECSH1DX225R	X	0.5	0.04	8	
	3.3	ECSH1DX335R	X	0.7	0.04	8	
	4.7	ECSH1DX475R	X	1.0	0.06	8	
		ECSH1DC475R	C				
	6.8	ECSH1DC685R	C	1.4	0.06	8	
	10	ECSH1DC106R	C	2.0	0.06	3	
	15	ECSH1DD156R	D	3.0	0.06	3	
	22	ECSH1DD226R	D	4.4	0.06	3	
	25	0.47	ECSH1EY474	Y	0.5	0.04	15
		1.0	ECSH1EY105R	Y	0.5	0.04	8
1.5		ECSH1EX155R	X	0.5	0.04	8	
2.2		ECSH1EX225R	X	0.6	0.04	8	
3.3		ECSH1EX335R	X	0.9	0.04	8	
		ECSH1EC335R	C				
4.7		ECSH1EC475R	C	1.2	0.06	8	
10		ECSH1ED106R	D	2.5	0.06	3	
15		ECSH1ED156R	D	3.8	0.06	3	
35	0.047	ECSH1VY473R	Y	0.05	0.04	60	
	0.068	ECSH1VY683R	Y	0.5	0.04	60	
	0.10	ECSH1VY104R	Y	0.5	0.04	60	
	0.15	ECSH1VY154R	Y	0.5	0.04	60	
	0.22	ECSH1VY224R	Y	0.5	0.04	60	
	0.33	ECSH1VY334R	Y	0.5	0.04	15	
	0.47	ECSH1VY474R	Y	0.5	0.04	15	
		ECSH1VX474R	X				
	0.68	ECSH1VY684R	Y	0.5	0.04	15	
		ECSH1VX684R	X				
	1.0	ECSH1VX105R	X	0.5	0.04	8	
	1.5	ECSH1VX155R	X	0.6	0.04	8	
		ECSH1VC155R	C				
	2.2	ECSH1VX225R	X	0.8	0.04	8	
		ECSH1VC225R	C				
3.3	ECSH1VC335R	C	1.2	0.04	8		
	ECSH1VD335R	D					
4.7	ECSH1VD475R	D	1.7	0.06	8		
6.8	ECSH1VD685R	D	2.4	0.06	8		
10	ECSH1VD106R	D	3.5	0.06	3		

Resin dipped type: EF

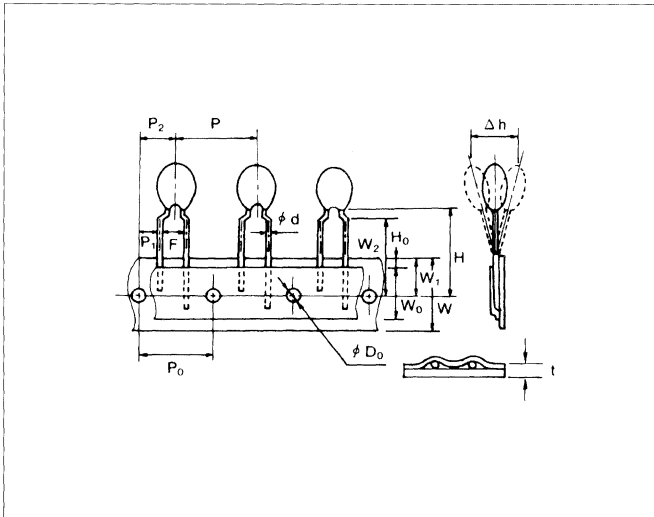
2.5mm pitch straight lead taping (suffix "B1" EF)

[mm]



Code	Dimensions	Tolerance
ød	0.5	±0.05
P ₀	12.7	±0.2
F	2.5	±0.8
W	18.0	±0.5
W ₀	5.0≤	—
W ₁	9.0	±0.5
W ₂	0 to 3	—
H	20.0	±0.5
øD ₀	4.0	±0.2
P	12.7	±1.0
P ₁	5.1	±0.5 /
P ₂	6.35	±1.0
Δh	0	±1.0
t	0.7	±0.2

5mm pitch lead taping (H=18.5) (suffix "BB" EF)



Code	Dimensions	Tolerance
ød	0.5	±0.05
P ₀	12.7	±0.2
F	5.0	±0.8
W	18.0	±0.5
W ₀	5.0≤	—
W ₁	9.0	±0.5
W ₂	0 to 3	—
H ₀	16.0	±0.5
H	18.5	±1.0
øD ₀	4.0	±0.2
P	12.7	±1.0
P ₁	3.85	±0.5
P ₂	6.35	±1.0
Δh	0	±1.0
t	0.7	±0.2

Bulk Packaging (pcs.)

Capacitance (μF)	Working voltage (V.DC)							Inner bag
	4	6.3	10	16	25	35	50	
to 2.2								200
3.3								
4.7								
6.8								100
10								
15								50
22								
33								
47								
68								
100								
150								
220								
330								
470								

Capacitance (μF)	Working voltage (V.DC)							Per carton box
	4	6.3	10	16	25	35	50	
to 2.2								10000
3.3								
4.7								
6.8								5000
10								
15								2500
22								
33								
47								
68								
100								
150								
220								
330								
470								

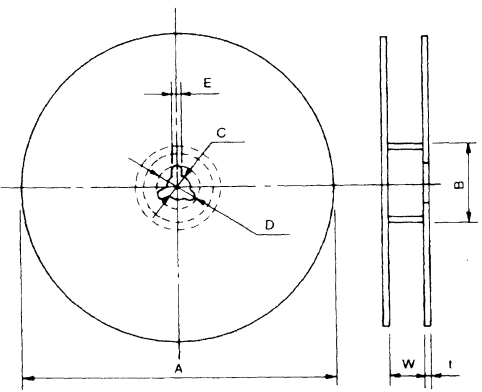
Taped Packaging (pcs.)

Case size	Inner box	Outer box
A ~ I	2000	10000

Surface Mount Type

Reel

[mm]

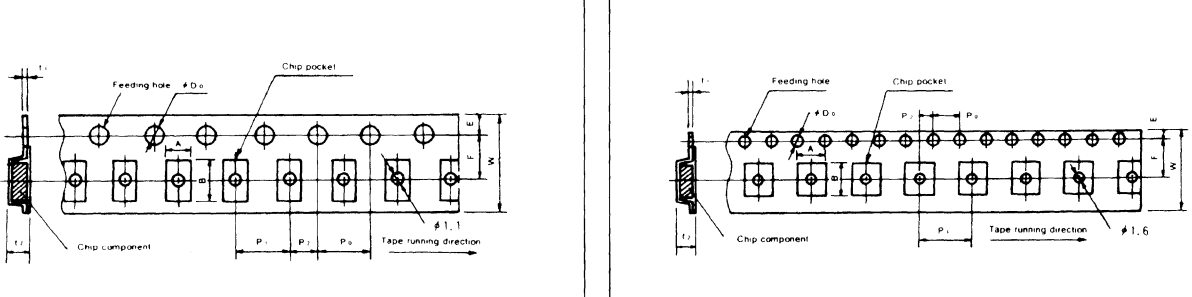


Packaging Quantities (unit: pcs)
Taped

Tape width	Case size	Per reel	Per box
8	Z, P	3000	15000
	Y, X	2000	10000
12	C, D	750	3000
	V	500	2000

Dimension	A±2	≥ B	C±0.5	D±0.8	E±0.5	W±1.5	t±0.5
W: 12mm	178	50	13.0	21.0	2.0	14.0	2.0
W: 8mm	178	50	13.0	21.0	2.0	10.0	2.0

Carrier Tape



Code	A±0.2	B±0.2	W±0.3	F±0.1	E±0.10	P ₁ ±0.1	P ₂ ±0.05	P ₀ ±0.1	øD ₀ ^{+0.1} ₋₀	t ₁	t ₂ ±0.2
Z	1.35	2.2	8.0	3.5	1.75	4.0	2.00	4.0	1.5	0.2	1.3
P	1.9	3.5				4.0					1.3
Y	1.9	3.5				4.0					1.9
X	3.3	3.8				4.0					2.1
C	3.7	6.4	12.0	5.5		8.0				0.3	3.0
V	5.0	6.2				8.0					3.7
D	4.7	7.7				8.0					3.3

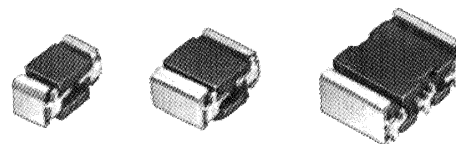
Explanation of Part Numbers

E C S					
Common Code	Series Code	W.V. Code	Size Code	Capacitance Code	Suffix

Packing style, Polarity and Capacitance tolerance (%)			
Packing	Polarity	Capacitance tolerance (%)	
		±20	±10
Reel taping		R	KR
		L	KL

Features

- Rated current is 2 A max.
- High impedance
- No need for ground pattern
- Suitable for flow soldering and reflow soldering
- Three kinds of characteristics depending on strength of noise.



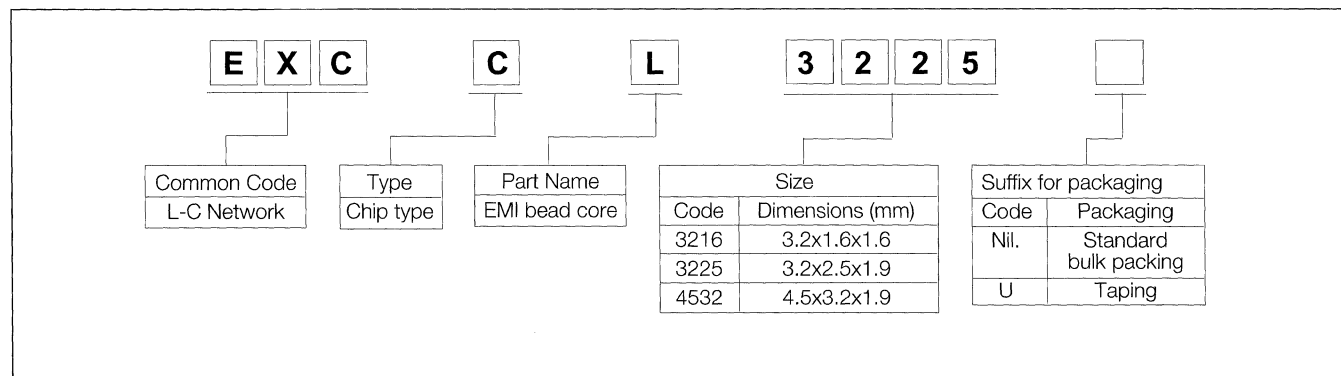
General Specifications

Type	Impedance		Rated Current (A DC)
	(Ω) at 1 MHz	(Ω) at 100 MHz	
4532	30 max.	115 \pm 25%	2 max.
3225	15 max.	45 \pm 25%	
3216	10 max.	25 \pm 25%	

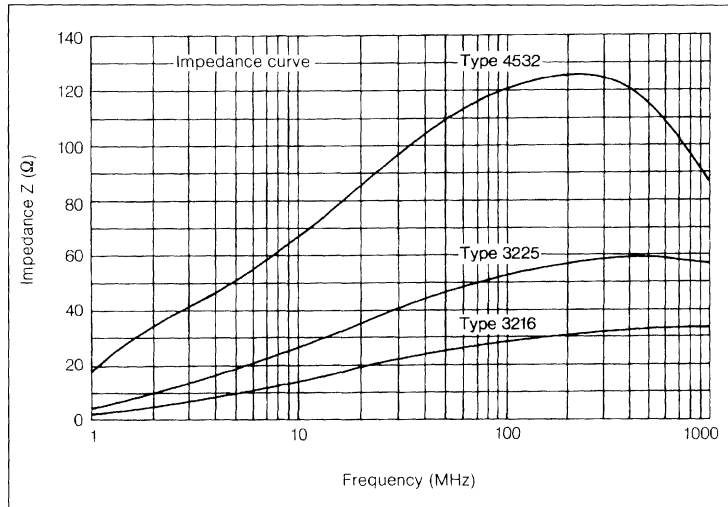
Performance Specifications

Characteristics	Specifications	Test Methods
Resistance to Soldering Heat	No cracking	260 °C, 5 s
Solderability	90 % coverage minimum	230 °C, 3 s
Bending Strength	20 N (2 kgf) min.	20 N (2 kgf) min.
Temperature Cycling	Impedance $\Delta Z/Z \pm 20\%$	-25 to + 85 °C 30 min. 50 cycles
Load Life in Humidity	Impedance $\Delta Z/Z \pm 20\%$	2 A DC 60 °C, 90 to 95 % RH, 1000 h

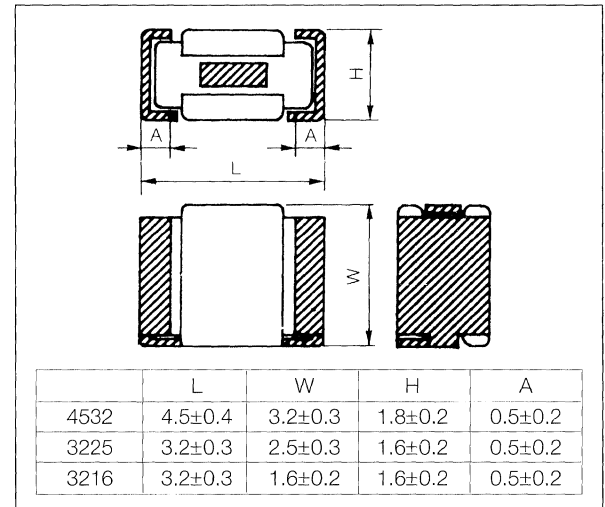
Explanation of Part Numbers



Impedance



Dimensions in mm (not to scale)

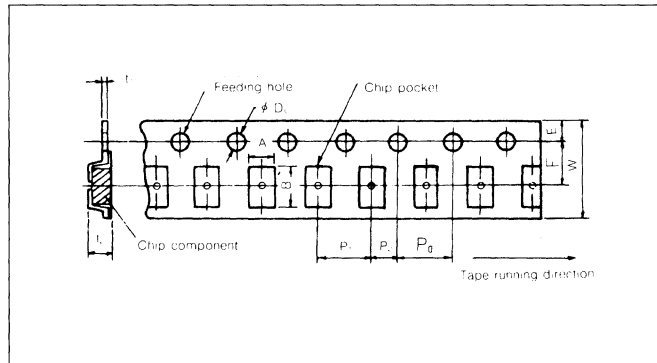


Packaging

Standard Packing Quantity

Appearance	Packing style	Embossed taping	Bulk
EXLCL3216U		2000 pcs./reel	2000 pcs./pack
EXLCL3225U		2000 pcs./reel	2000 pcs./pack
EXLCL4532U		1000 pcs./reel	2000 pcs./pack

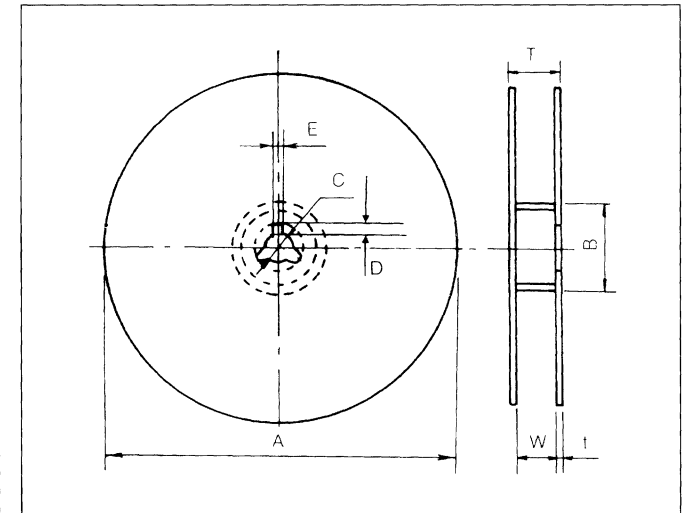
Embossed Taping



Code	A	B	W	F	E	P ₁	
(mm) Dimensions	3216	±0.1 1.9	±0.1 3.4	±0.2 8.0	±0.05 3.5	±0.1 1.75	±0.1 4.0
	3225	±0.1 2.8	±0.1 3.4	±0.2 8.0	±0.05 3.5	±0.1 1.75	±0.1 4.0
	4532	±0.1 3.6	±0.1 4.9	±0.2 12.0	±0.05 5.5	±0.01 1.75	±0.1 8.0

Code	P ₂	P ₀	øD ₀	t ₁	t ₂	
(mm) Dimensions	3216	±0.05 2.00	±0.1 4.0	±0.1 1.5-0	±0.05 0.20	max. 1.7
	3225	±0.05 2.00	±0.1 4.0	±0.1 1.5-0	±0.05 0.20	max. 2.2
	4532	±0.05 4.00	±0.1 8.0	±0.1 1.5-0	±0.05 0.30	max. 2.1

Reel

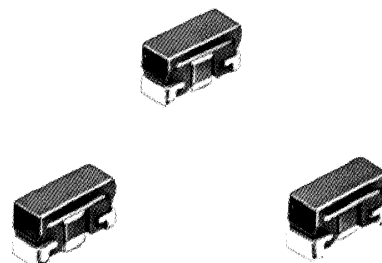


Code	A	B	C	D	
(mm) Dimensions	3216	178±2	60±1	13.0±0.5	5.0±0.5
	3225	178±2	60±1	13.0±0.5	5.0±0.5
	4532	178±2	60±1	13.0±0.5	5.0±0.5

Code	E	W	T	t	
(mm) Dimensions	3216	2.0±0.5	9.5 ^{+0.5} _{-1.0}	15.5 max.	1.2±0.5
	3225	2.0±0.5	9.5 ^{+0.5} _{-1.0}	15.5 max.	1.2±0.5
	4532	2.0±0.5	13.0 ^{+0.5} _{-1.0}	20.5 max.	1.2±0.5

Features

- Rated current is 2 A max.
- Eight kinds of capacitance range depending on noise frequency
- Suitable for reflow soldering
- Suitable for narrow pitch insertion



General Specifications

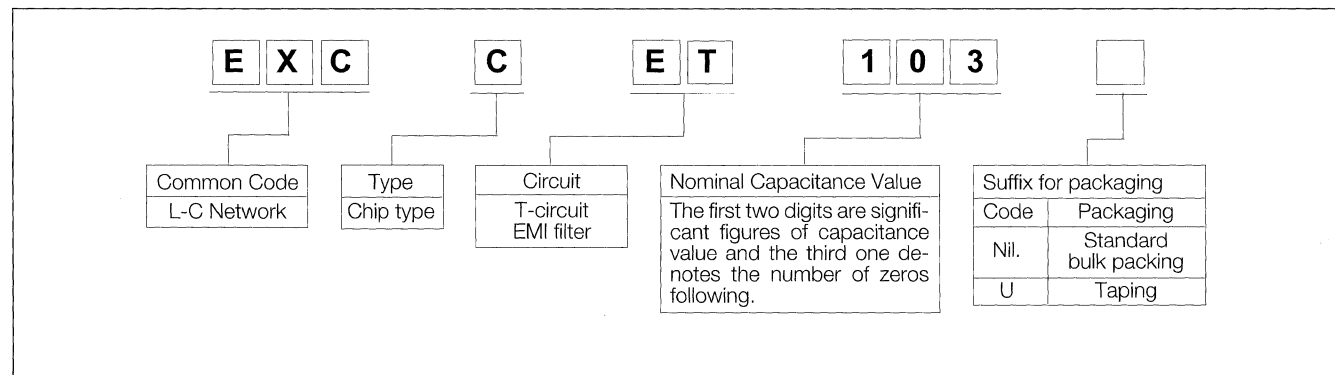
Part No.	Capacitance (pF)	Rated Voltage (V DC)	Tolerance (%)	Temperature Characteristics	Rated Current (A DC)	25dB Attenuate Frequency (MHz)	15 dB Attenuate Frequency (MHz)
EXCCET220B□	22	50	±20	YB	2	800 to 1000	600 to 1000
EXCCET470B□	47	50	±20	YB	2	450 to 550	350 to 1000
EXCCET101B□	100	50	±20	YB	2	300 to 450	200 to 900
EXCCET271B□	270	50	±20	YB	2	200 to 300	80 to 700
EXCCET471B□	470	50	±20	YB	2	100 to 220	50 to 700
EXCCET102B□	1000	50	±20	YB	2	65 to 200	35 to 700
EXCCET222B□	2200	50	±20	YB	2	35 to 180	15 to 700
EXCCET103B□	10000	50	±20	YB	2	15 to 120	15 to 700

* YB Characteristic: Max. Capacitance change is ±10% over temperature range of -25 to +85 °C

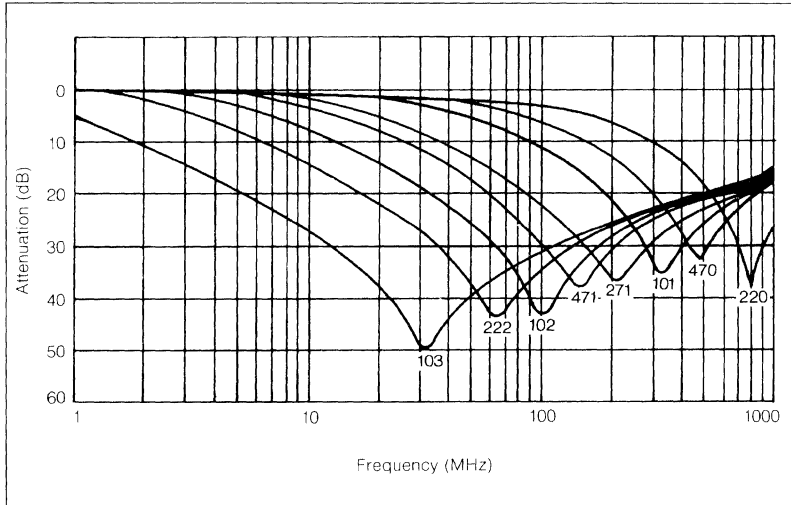
Performance Specifications

Characteristics	Specifications		Test Methods
Resistance to Soldering Heat	No cracking		250 °C, 30 s
Solderability	90 % coverage minimum		230 °C, 10 s
Bending Strength	20 N (2 kgf) min.		20 N (2 kgf) min.
Temperature Cycling	Attenuation 25 dB min.	Insulation resistance 500 MΩ max.	-40 to + 85 °C 30 min. 100 cycles
Load Life in Humidity	Attenuation 25 dB min.	Insulation resistance 100 MΩ max.	50 V DC, 2 A DC 60 °C, 90 to 95 % RH, 1000 h

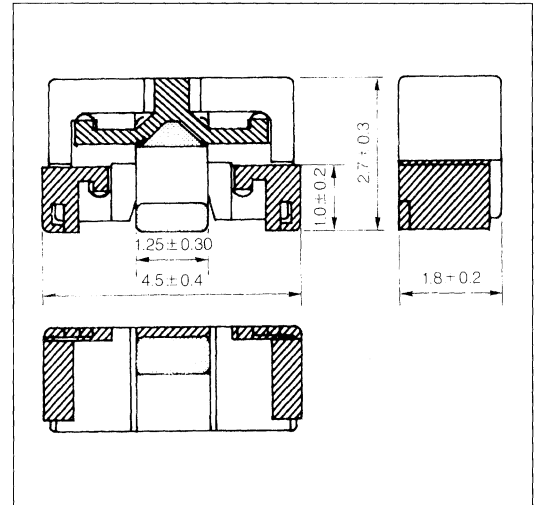
Explanation of Part Numbers



Frequency Characteristics



Dimensions in mm (not to scale)

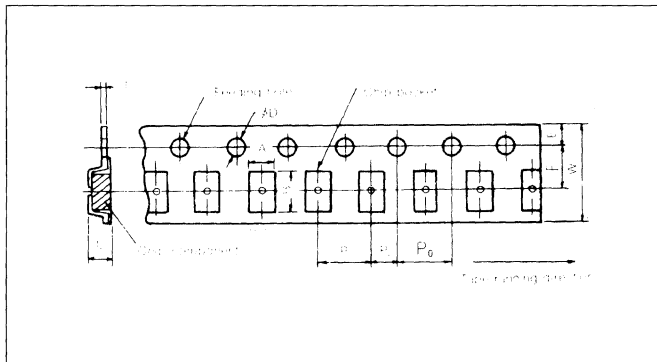


Packaging

Standard Packing Quantity

Appearance	Packing style	Embossed taping	Bulk
EXCCET		1000 pcs./reel	2000 pcs./pack

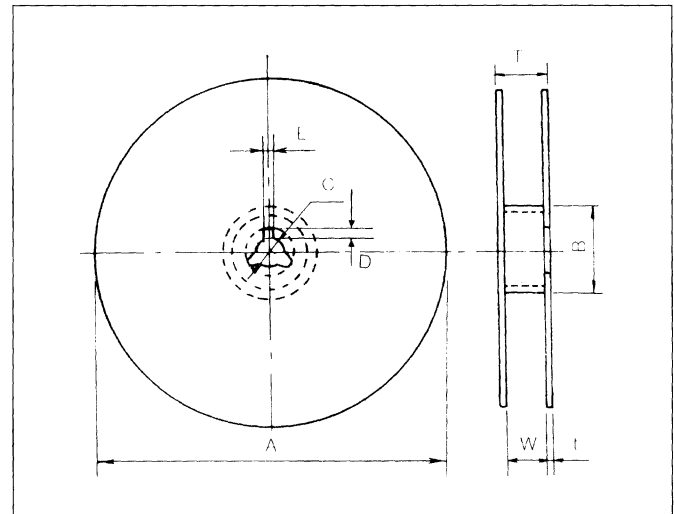
Embossed Taping



Code	A	B	W	F	E	P ₁
(mm) Dimensions	2.2 ^{±0.1}	4.9 ^{±0.1}	12.0 ^{±0.2}	5.50 ^{±0.05}	1.75 ^{±0.1}	4.0 ^{±0.1}

Code	P ₂	P ₀	øD ₀	t ₁	t ₂
(mm) Dimensions	2.00 ^{±0.05}	4.0 ^{±0.1}	1.50 ^{+0.1}	0.30 ^{±0.05}	3.3 max.

Reel



Code	A	B	C	D
(mm) Dimensions	178 ^{±2}	60 ^{±1}	13.0 ^{±0.5}	5.0 ^{±0.5}

Code	E	W	T	t
(mm) Dimensions	2.0 ^{±0.5}	13.0 ^{+0.5 -1.0}	20.5 max.	1.2 ^{±0.5}

Application Notes

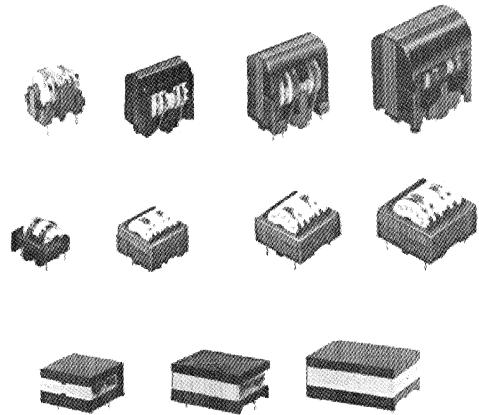
- Flow soldering method shall not be applied

Features

- These line filters are excellent in high frequency characteristics due to low stray capacitance realized by section windings
- Comply with all safety standards

(V/ H Series)

- By using an unseparated closed magnetic circuit core, high inductance is obtained and distribution of inductance is reduced
- Leakage flux is greatly decreased



Classification

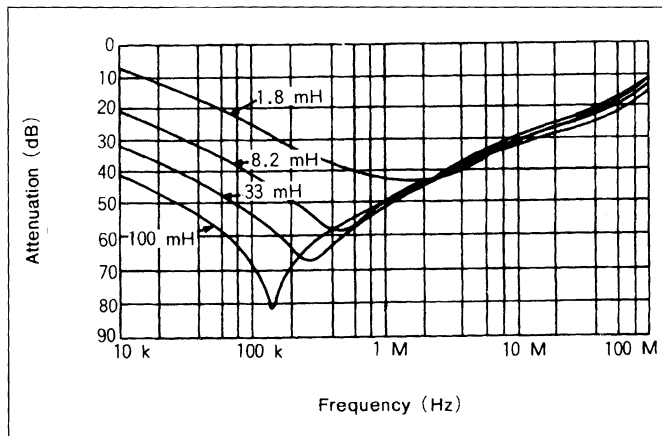
Series	Type	Features
V	290, 450, 650, 850	Upright construction results in small mounting space
H	200, 270, 400, 600	Thin equipment design possible due to horizontal construction

Performance Characteristics

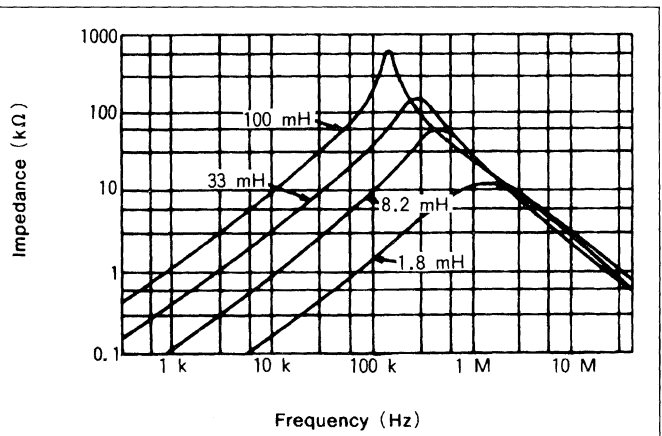
Item	Series	Series V				Series H				Note
	Type	290	450	650	850	270	200	400	600	
Operating Temperature		-20 to 105 °C (Class E: 115 °C)								
Rated Voltage		Less than AC250 Vrms								
Rated Current		Less than AC5 Arms								
Inductance		Greater than $3 \frac{1}{2}$ mH	Greater than $10 \frac{1}{2}$ mH	Greater than $20 \frac{1}{2}$ mH	Greater than $48 \frac{1}{2}$ mH	Greater than $3 \frac{1}{2}$ mH	Greater than $5 \frac{1}{2}$ mH	Greater than $10 \frac{1}{2}$ mH	Greater than $20 \frac{1}{2}$ mH	I: Prescribed Rated Current
Dielectric Strength		AC2 kV 1 min.								
Temperature Rise		Less than 45 °C								Resistance Method
Safety Standard		Electric Appliance Control Act (Japan)•UL•CSA•IEC								

Attenuation Characteristics

(Terminal impedance: 50Ω)



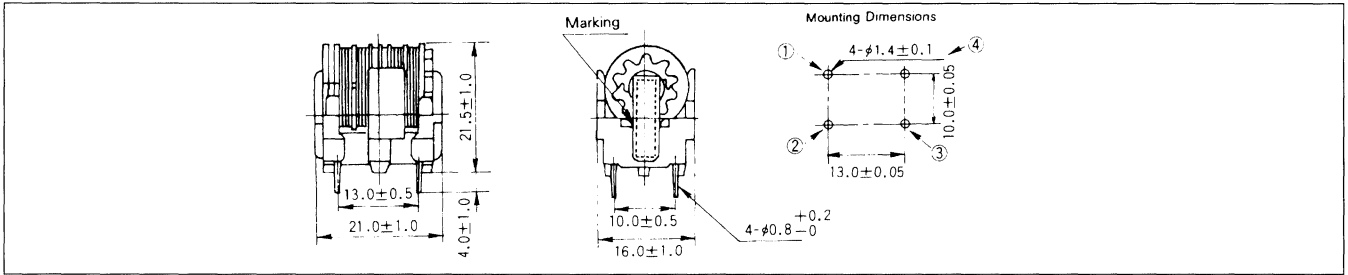
Impedance Characteristics



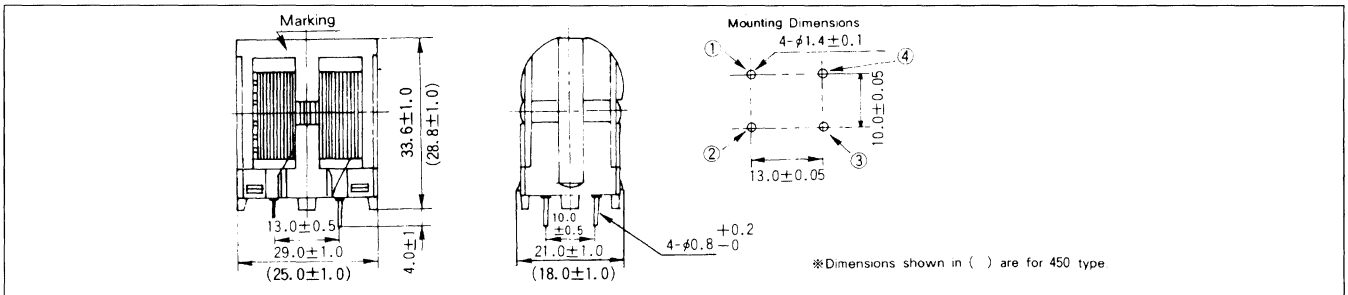
Dimensions in mm (not to scale)

V Series

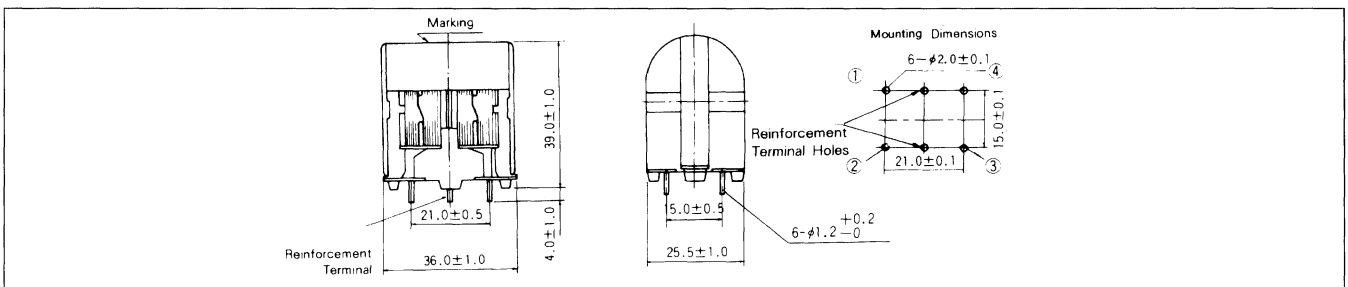
Type 290



Type 450, 650

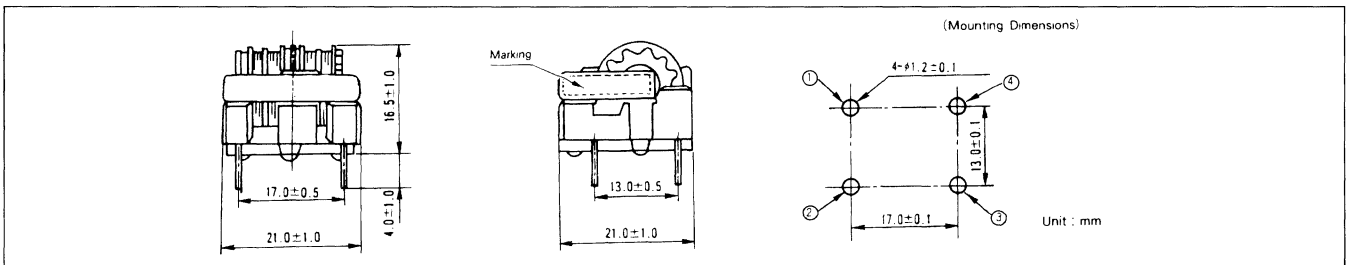


Type 850

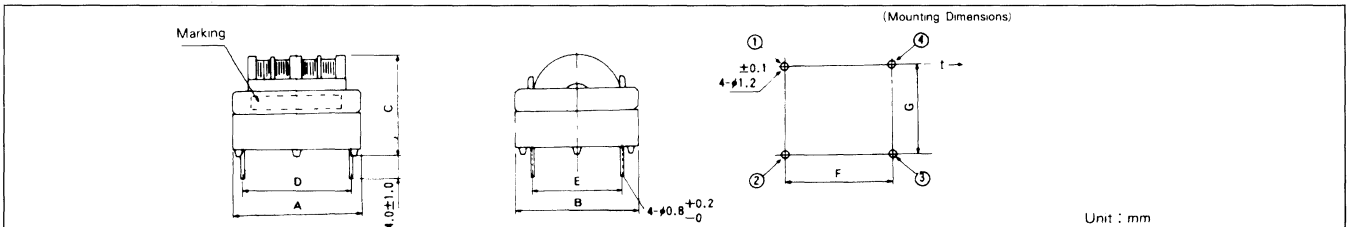


H Series

Type 270



Types 200, 400, 600



	A	B	C	D	E	F	G
Type 200	20±1	21±1	20 max.	13±0.5	10±0.5	13±0.1	10±0.1
Type 400	24±1	25±1	19.5±1	21±0.5	15±0.5	21±0.1	15±0.1
Type 600	28.5±1	29±1	22.5±1	24±0.5	20±0.5	24±0.1	20±0.1

Examples

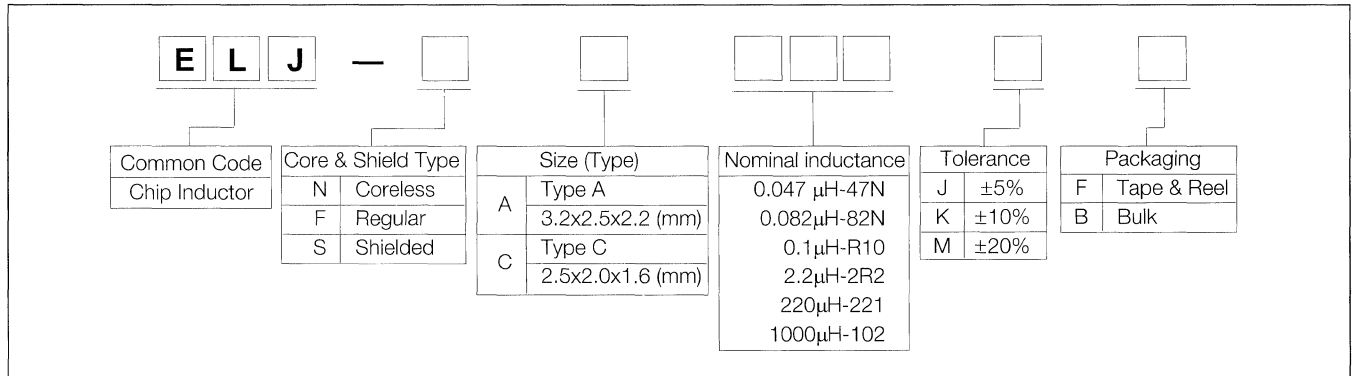
V Series				H Series			
Type	Part No.	Inductance mH min.	Rated Current A rms	Type	Part No.	Inductance mH min.	Rated Current A rms
290	ELF18D290B	0.82	2.0	200	ELF18D217	1.5	1.6
	ELF18D290D	1.2	1.6		ELF18D219	2.7	1.3
	ELF18D290V	1.8	1.5		ELF18D216	3.9	1.0
	ELF18D290T	2.2	1.3		ELF18D225	6.8	0.8
	ELF18D290E	2.7	1.1		ELF18D214	8.2	0.7
	ELF18D290S	3.3	1.1		ELF18D210	18.0	0.5
	ELF18D290R	3.9	1.0		ELF18D218	22.0	0.4
	ELF18D290M	5.6	0.8		ELF18D212F	1.0	2.1
	ELF18D290P	6.8	0.7		ELF18D230F	1.2	2.0
	ELF18D290L	8.2	0.6		ELF18D228F	2.2	1.5
	ELF18D290G	10.0	0.6		ELF18D227F	4.7	1.0
	ELF18D290A	18.0	0.5		ELF18D221F	33.0	0.4
450	ELF18D290C	22.0	0.4	ELF18D235F	47.0	0.3	
	ELF18D290H	33.0	0.3	ELF18D222F	68.0	0.25	
	ELF18D450C	2.2	2.2	ELF18D270C	1.8	1.5	
	ELF18D450A	2.7	2.0	ELF18D270D	2.7	1.1	
	ELF18D450D	5.6	1.4	ELF18D270A	6.8	0.7	
	ELF18D450G	8.2	1.1	ELF18D270G	10.0	0.6	
650	ELF18D450B	18.0	0.8	ELF18D270H	18.0	0.5	
	ELF18D450H	39.0	0.5	ELF18D270B	22.0	0.4	
	ELF18D650M	1.5	3.1	400	ELF18D419	1.5	2.4
	ELF18D650G	1.8	2.8		ELF18D416	2.2	2.0
	ELF18D650B	3.3	2.4		ELF18D414	3.3	1.5
	ELF18D650A	3.9	2.3		ELF18D433	3.9	1.5
	ELF18D650Y	4.7	2.0		ELF18D424	5.6	1.3
	ELF18D650K	6.8	1.8		ELF18D412	6.8	1.2
	ELF18D650C	8.2	1.7		ELF18D415	8.2	1.0
	ELF18D650W	10.0	1.4		ELF18D430	12.0	0.9
	ELF18D650J	12.0	1.3		ELF18D417	18.0	0.7
	ELF18D650D	15.0	1.1		ELF18D423	27.0	0.6
	ELF18D650I	18.0	1.0		ELF18D428	33.0	0.5
	ELF18D650L	22.0	1.0		ELF18D441F	0.56	3.4
	ELF18D650H	33.0	0.8		ELF18D420F	1.2	3.0
	ELF18D650P	39.0	0.7		ELF18D435F	2.2	2.2
	ELF18D650U	47.0	0.7		ELF18D434F	2.7	2.0
	ELF18D666A	2.2	2.8		ELF13D424F	5.6	1.4
	ELF18D656Z	2.7	2.7		ELF18D431F	10.0	1.0
	ELF18D656Y	4.7	2.5		ELF18D417F	18.0	0.8
ELF18D656X	5.6	2.2	ELF18D427F		39.0	0.5	
ELF18D656K	6.8	2.0	ELF18D437F		68.0	0.4	
ELF18D656J	12.0	1.6	ELF18D608	1.0	3.4		
ELF18D656V	27.0	1.0	ELF18D610	1.5	3.1		
ELF18D656E	190.0	0.35	ELF18D614	1.8	2.8		
850	ELF18D850M	1.5	5.0	ELF18D611	2.7	2.6	
	ELF18D860B	2.2	4.5	ELF18D605	3.3	2.5	
	ELF18D850B	3.3	4.2	ELF18D613	3.9	2.2	
	ELF18D850P	3.9	3.7	ELF18D604	4.7	2.0	
	ELF18D850Y	4.7	3.5	ELF18D603	5.6	1.8	
	ELF18D850X	5.6	3.4	ELF18D602	8.2	1.7	
	ELF18D850C	8.2	3.0	ELF18D616	10.0	1.4	
	ELF18D850W	10.0	2.5	ELF18D609	12.0	1.3	
	ELF18D850D	15.0	2.0	ELF18D606	18.0	1.0	
	ELF18D850I	18.0	1.9	ELF18D612	22.0	1.0	
	ELF18D860C	22.0	1.8	ELF18D618	27.0	0.8	
	ELF18D850Z	27.0	1.5	ELF18D615	39.0	0.7	
	ELF18D850H	33.0	1.4	ELF18D607	68.0	0.5	
	ELF18850U	47.0	1.2	ELF18D617F	2.2	2.8	
	ELF18D850T	56.0	1.1	ELF18D604F	4.7	2.5	
	ELF18D850R	82.0	0.9	ELF18D603F	5.6	2.1	
				ELF18D601F	10.0	1.6	
				ELF18D609F	12.0	1.6	
			ELF18D606F	18.0	1.2		
			ELF18D624F	33.0	0.8		

Features

- Very thin wires are wound on a high magnetic effect drum core, resulting in high Q and excellent frequency characteristics
- High reliability because the coil is molded by heat-resistant epoxy resin
- Flow and reflow solderings possible due to adoption of metal terminals

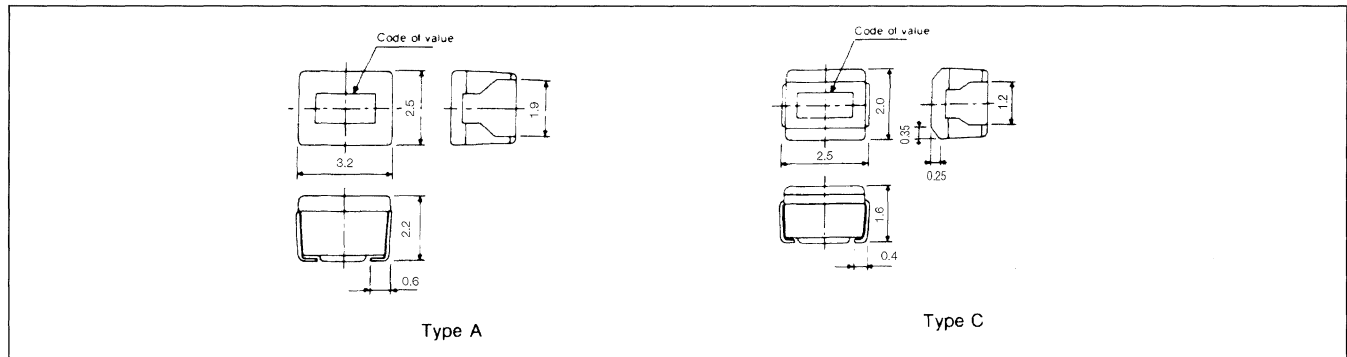


Explanation of Part Numbers



Type	Size	Features	Inductance Range (μH)
NA	3.2x2.5x2.2 (LxWxH)	<ul style="list-style-type: none"> •Coreless type. L is stable with respect to temperature and humidity •Suitable for high-frequency circuits 	0.047 — 8.2
FA	3.2x2.5x2.2	<ul style="list-style-type: none"> •Chip inductor for general use •Compact size, with a wide inductance range 	0.22 — 220
SA	3.2x2.5x2.2	<ul style="list-style-type: none"> •Use of ferrite resin giving it an additional function of magnetic shield •Compact size, with high inductance 	10 — 270
PA	3.2x2.5x2.2	<ul style="list-style-type: none"> •Low DC resistance and large rated DC current •Suitable for power circuits •Use of ferrite resin giving it the additional function of a magnetic shield 	10 — 330
FC/SC	2.5x2.0x1.6	<ul style="list-style-type: none"> •Smallest of the coil type inductors; Suitable for a variety of small processing circuits •SC type is equipped with a magnetic shield function 	0.22 — 22 — 100 Type FC Type SC
NC	2.5x2.0x1.6	<ul style="list-style-type: none"> •Low inductance, tight tolerance and small size. •Suitable for high-frequency circuits •Coreless type. L is stable with respect to temperature and humidity 	0.01 — 0.47

Dimensions in mm (not to scale)



Examples (Type FA)

Part No.	Inductance			Q		SRF* MHz min.	DCR** Ω max.	Rated DC Current mA max.
	μH	Freq. MHz	Tolerance	min.	Freq. MHz			
ELJ FA R22M	0.22	1.0	±20%	25	25.2	230	0.29	360
R27M	0.27			25		210	0.32	345
R33M	0.33			25		190	0.35	330
R39M	0.39			25		175	0.39	305
R47M	0.47			25		160	0.44	290
R56M	0.56			25		150	0.49	275
R68M	0.68			25		135	0.55	260
R82M	0.82			25		125	0.61	245
1R0M/K	1.0			25		115	0.69	230
1R2M/K	1.2			25		100	0.75	215
1R5M/K	1.5		35	90	0.75	210		
1R8M/K	1.8		35	85	0.82	200		
2R2M/K	2.2		±20%	35	7.96	80	0.95	190
2R7M/K	2.7		35	75		1.1	180	
3R3M/K	3.3		±10%	35		65	1.2	180
3R9M/K	3.9			35		60	1.3	175
4R7M/K	4.7		35	55		1.5	165	
5R6M/K	5.6		35	50		1.6	160	
6R8M/K	6.8		35	45		1.8	150	
8R2M/K	8.2		35	40		2.0	140	
100K/J	10	±10%	30	5.0		35	2.1	140
120K/J	12		30			32	2.5	125
150K/J	15		30		30	2.8	120	
180K/J	18		30		27	3.3	110	
220K/J	22		30		25	3.7	105	
270K/J	27		30		22	5.0	90	
330K/J	33		30		20	5.6	85	
390K/J	39		30		20	6.4	80	
470K/J	47		±5%		30	15	7.0	75
560K/J	56				30	15	8.0	70
680K/J	68	30	15	9.0	65			
820K/J	82	0.796	25	2.52	10	10	60	
101K/J	100		25		10	10	60	
121K/J	120		25		10	11	55	
151K/J	150		20		8	15	50	
181K/J	180		20		7	17	50	
221K/J	220		20		7	21	45	

* Self-resonant Frequency ** DC Resistance

Examples (Type NA)

Part No.	Inductance			Q		SRF MHz min.	DCR Ω max.	Rated DC Current mA max.
	μH	Freq. MHz	Tolerance	min.	Freq. MHz			
ELJNA47NM	0.047	100	±20%	10	100	680	0.20	450
56NM	0.056					600	0.22	420
68NM	0.068					540	0.25	400
82NM	0.082					500	0.27	380
R10M	0.1					450	0.30	360
R12M	0.12	25.2	±10%	10	25.2	400	0.67	240
R15M	0.15					350	0.72	230
R18M	0.18	1.0	±10%	13	7.96	320	0.81	220
R22K	0.22					280	0.90	210
R27K	0.27					250	1.0	200
R33K	0.33					220	1.1	190
R39K	0.39					200	1.2	180
R47K	0.47					180	1.4	175
R56K	0.56					160	1.5	170
R68K	0.68					150	1.7	155
R82M	0.82					135	1.9	145
1R0J	1.0					120	2.1	125
1R2J	1.2	110	2.3	120				
1R5J	1.5	95	2.7	115				
1R8J	1.8	85	3.0	110				
2R2J	2.2	80	3.2	110				
2R7J	2.7	70	3.6	105				
3R3J	3.3	62	4.2	100				
3R9J	3.9	57	4.4	95				
4R7J	4.7	52	7.7	70				
5R6J	5.6	46	8.7	65				
6R8J	6.8	42	10	60				
8R2J	8.2	38	11	60				

Examples (Type SA)

Part No.	Inductance			Q		SRF MHz min.	DCR Ω max.	Rated DC Current mA max.
	μH	Freq. MHz	Tolerance	min.	Freq. MHz			
ELJ SA100K	10	1.0	±10%	40	5.0	30	1.8	18
120K	12			40		28	2.0	17
150K	15			40		25	2.2	15
180K	18			40		23	2.5	13
220K	22			40		20	2.8	12
270K	27			40		18	3.2	10
330K	33			40		17	3.5	10
390K	39			40		15	3.8	9
470K	47			40		14	4.0	8
560K	56			40		13	4.5	7
680K	68			40	12	5.0	6	
820K	82			40	11	6.0	6	
101K	100			40	10	7.0	5	
121K	120			40	9	8.0	5	
151K	150			40	5	9.0	5	
181K	180	0.1	40	5	11.0	5		
221K	220		40	4	12.0	5		
271K	270		40	4	14.0	5		

Examples (Type PA)

Part No.	Inductance		Q min.	L, Q Test Freq. MHz	SRF* MHz min.	DCR** Ω max.	Rated DC Current mA max.
	μH	Tolerance					
ELJ PA100K	10	±10%	15	2.52	23	0.50	240
120K	12		15		21	0.60	230
150K	15		15		18	0.74	220
180K	18		15		17	0.90	205
220K	22		15		15	1.15	185
270K	27		15		13	1.45	165
330K	33		15		12	1.65	155
390K	39		15		11	1.90	145
470K	47		15		9.5	2.25	135
560K	56		15		8.5	3.30	110
680K	68		15	7.5	3.70	105	
820K	82		15	7.0	4.20	100	
101K	100		20	6.5	5.00	90	
121K	120		20	6.0	7.00	75	
151K	150		20	5.5	8.00	70	
181K	180		20	5.0	9.50	65	
221K	220		20	4.0	11.00	60	
271K	270		20	3.5	14.50	55	
331K	330		20	3.0	16.00	50	

* Self-resonant Frequency ** DC Resistance

Examples (Type FC/SC)

Part No.	Inductance		Q min.	L, Q Test Freq. MHz	SRF MHz min.	DCR Ω max.	Rated DC Current mA max.			
	μH	Tolerance								
ELJ FCR22M	0.22	±20%	25	25.2	230	0.7	190			
FCR27M	0.27		25		210	0.75	180			
FCR33M	0.33		25		190	0.85	170			
FCR39M	0.39		25		175	0.95	160			
FCR47M	0.47		25		160	1.0	155			
FCR56M	0.56		25		150	1.1	150			
FCR68M	0.68		25		135	1.25	140			
FCR82M	0.82		25		125	1.4	130			
FC1R0M/K	1.0		25		115	0.65	195			
FC1R2M/K	1.2		25		100	0.75	180			
FC1R5M/K	1.5	25	90	0.85	170					
FC1R8M/K	1.8	25	85	0.95	160					
FC2R2M/K	2.2	±20%	25	7.96	80	1.05	155			
FC2R7M/K	2.7		25		75	1.2	145			
FC3R3M/K	3.3		±10%		25	65	1.3	135		
FC3R9M/K	3.9				25	60	1.4	130		
FC4R7M/K	4.7				25	55	1.55	125		
FC5R6M/K	5.6				25	50	1.75	120		
FC6R8M/K	6.8				25	45	1.95	115		
FC8R2M/K	8.2				25	40	2.2	105		
FC100K/J	10				±10%	25	2.52	32	3.7	80
FC120K/J	12					25		30	4.1	75
FC150K/J	15	±5%		25		28		5.0	70	
FC180K/J	18			25		25		5.4	65	
FC220K/J	22		25	22		6.0		60		
ELJ SC270K	27	±10%	40	0.796	20	4.5	18			
SC330K	33		40		18	5.2	14			
SC390K	39		40		15	5.7	13			
SC470K	47		40		14	6.6	12			
SC560K	56		40		13	6.5	17			
SC680K	68		25		13	6.5	17			
SC820K	82		25		13	7.4	14			
SC101K	100		25		12	8.4	10			

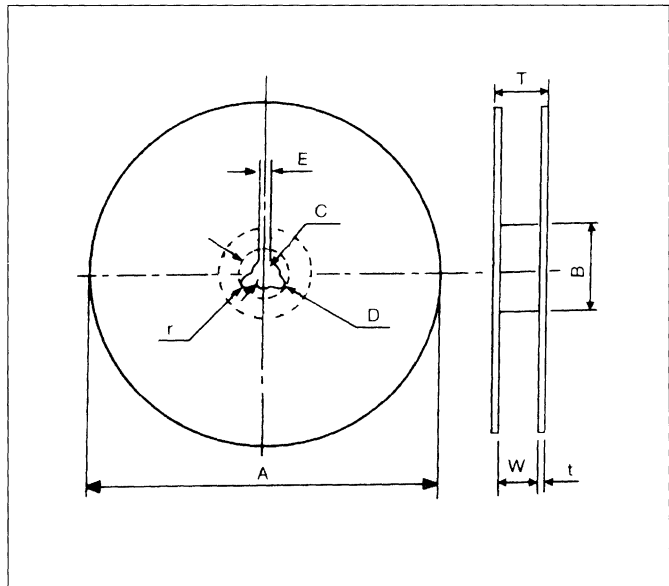
Examples (Type NC)

Part No.	Inductance		Q min.	L, Q Test Freq. MHz	SRF* MHz min.	DCR** Ω max.	Rated DC Current mA max.
	μH	Tolerance					
ELJ NC10NK/M	0.01	±10% ±20%	10	100	2500	0.32	280
NC12NK/M	0.012		10		2200	0.34	270
NC15NK/M	0.015		10		1800	0.38	255
NC18NK/M	0.018		10		1550	0.40	250
NC22NK/M	0.022		15		1350	0.43	240
NC27NK/M	0.027		15		1150	0.47	230
NC22NK/M	0.033		15		1000	0.51	220
NC39NK/M	0.039		15		890	0.55	215
NC47NK/M	0.047		15		770	0.59	205
NC56NK/M	0.056		15		670	0.63	200
NC68NK/M	0.068		15		590	0.68	190
NC82NK/M	0.082		15		520	0.73	185
NCR10K/M	0.1		10		460	0.80	175
NCR12K/M	0.12		10		400	0.87	170
NCR15K/M	0.15	10	340	0.98	160		
NCR18K/M	0.18	10	300	1.05	155		
NCR22K	0.22	±10%	10	25.2	260	1.15	145
NCR27K	0.27		10		230	1.25	140
NCR33K	0.33		10		200	1.37	135
NCR39K	0.39		10		180	1.47	130
NCR47K	0.47		10		160	1.58	125

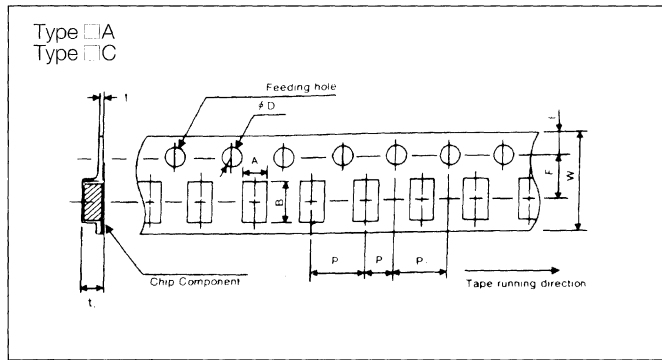
Packaging Specifications
Standard Packing Quantity

	Tape & Reel	Bulk
ELJ-□A	2,000 pcs/reel (ø178)	5,000 pcs/pack
ELJ-□C	2,000 pcs/reel (ø178)	5,000 pcs/pack

Reel Dimensions



Tape Dimensions



Tape

Type \ Code	A	B	W	F	E	P ₁	P ₂	P ₃	øD ₀	øD ₁	t ₁	t ₂
□A	2.8	3.6	8	3.5	1.75	4.0	2.0	4.0	1.5	—	(0.3)	2.3
□C	2.4	2.9	8	3.5	1.75	4.0	2.0	4.0	1.5	1.1	(0.3)	1.85

Reel

Type \ Code	A	B	C	D	E	W	T	t	r
□A	178	50 min.	13	21	2.0	10	—	—	1.0
□C	178	50 min.	13	21	2.0	10	—	—	1.0

Features

- Triangular terminal layout for better sitting



Specifications

Item	Standard
Nominal Total Resistance & Tolerance	100Ω to 1 MΩ ±30%
Power Rating & Maximum Operating Voltage	R ≤ 500kΩ: 0.1 W 50V (50 °C) R > 500kΩ: 0.1 W 25V (50 °C)
Rotation Angle	210 ±20 °C
Rotation Torque	2.0 to 25.0 mN·m (20~250 gf·cm)
Stopper Strength	surface: 75.0 mN·m (750 gf·cm) reverse: 35.0 mN·m (350 gf·cm)
Taper	B
Residual Resistance	R ≤ 1kΩ: 30Ω max. 1kΩ < R ≤ 2kΩ: 60Ω max. 2kΩ < R ≤ 1MΩ: 3% max. or 200Ω max., whichever is smaller
Rotation Life	100 turns
Soldering Heat	240 to 280 °C: 5s max. 280 to 300 °C: 3s max.
Humidity 40±2°C (90 to 95 % RH)	After 350 hrs { R ≤ 100kΩ: +15%, -0% 100kΩ < R ≤ 1MΩ: +20% -0%
Humidity Load Life	After 350 hrs R ≤ 100kΩ: ±15% (1.5h ON, .5h OFF) 100kΩ < R ≤ 1MΩ: ±20%
High Temperature	After 250 hrs, 70±3 °C, +5% -15%

Explanation of Part Numbers

E	V	N
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Common code

D	
---	--

Construction

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Material / special

A	O	
---	---	--

Packing style

--	--	--

Resistance & Taper

Code	Item
A	Standard
Letters or numbers except A	Construction, taper or material special
(Example) B U	Special tolerance Flame retardant

Example:

Resistance	11th	12th
500Ω	5	2
47 kΩ	Q	4
1 MΩ	1	6

10th
Taper: B(standard)

11th
Significant number of resistance

12th
Number of zeros

Note: When significant number is odd, letters are assigned as shown below:
Example:

Symbol	Significant number	Symbol	Significant number
A	1.2	F	2.5
C	1.5	J	7.5
E	.2	Q	4.7

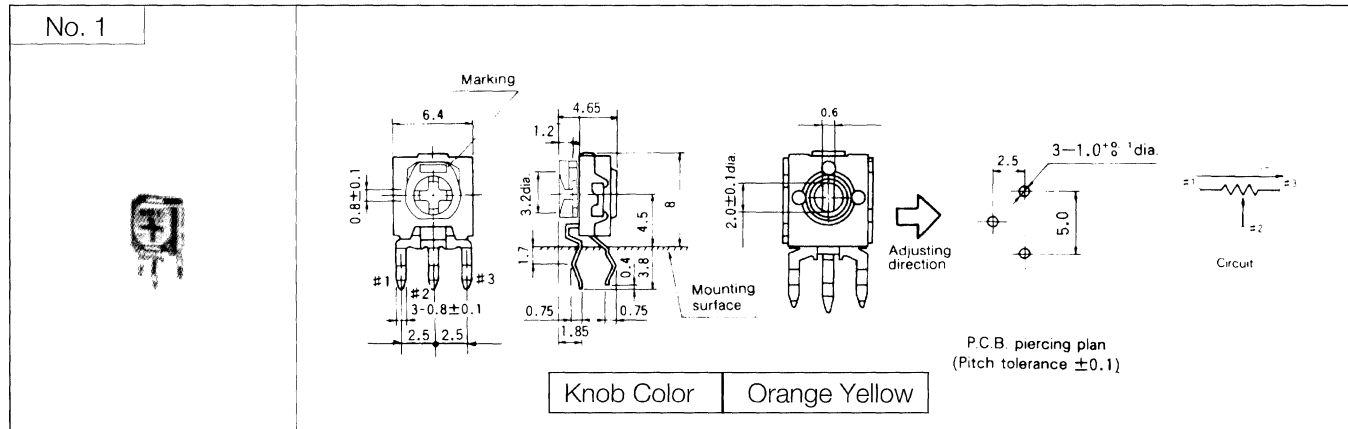
Packaging

Product Item (Type, Series)	Part Numbers	Min. Packaging & Ordering Qty (pcs)
6mm Square Carbon, Dustproof (6FE Type) (Bulk)	EVND2A, EVND8A, EVND8M	5000
6mm Square Carbon, Dustproof (6FE Type) (Radial taping)	EVNDJA, EVNDXA, EVNDCA	10000

Dimensions in mm (not to scale)

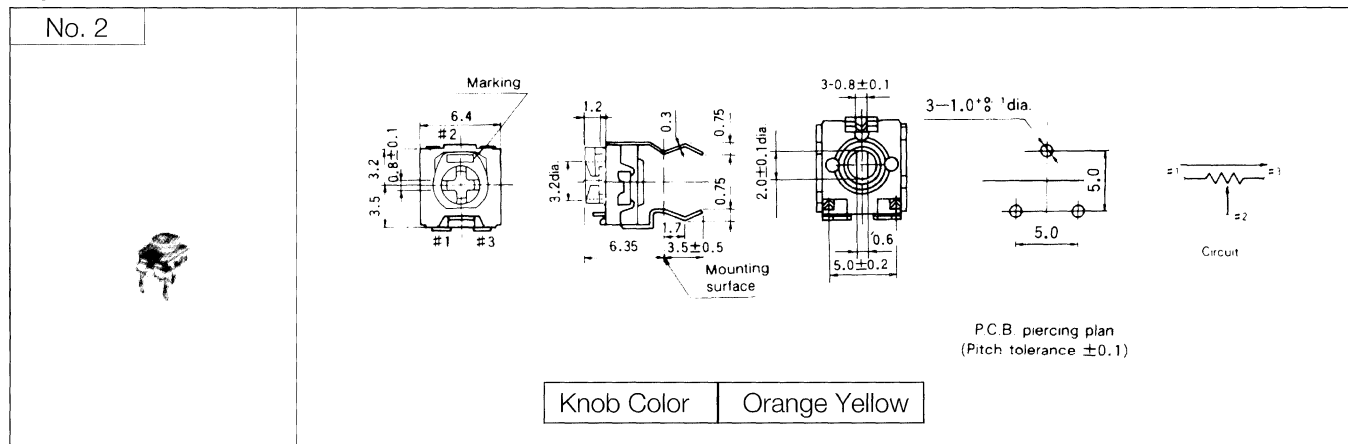
Stand-up

EVN D2A



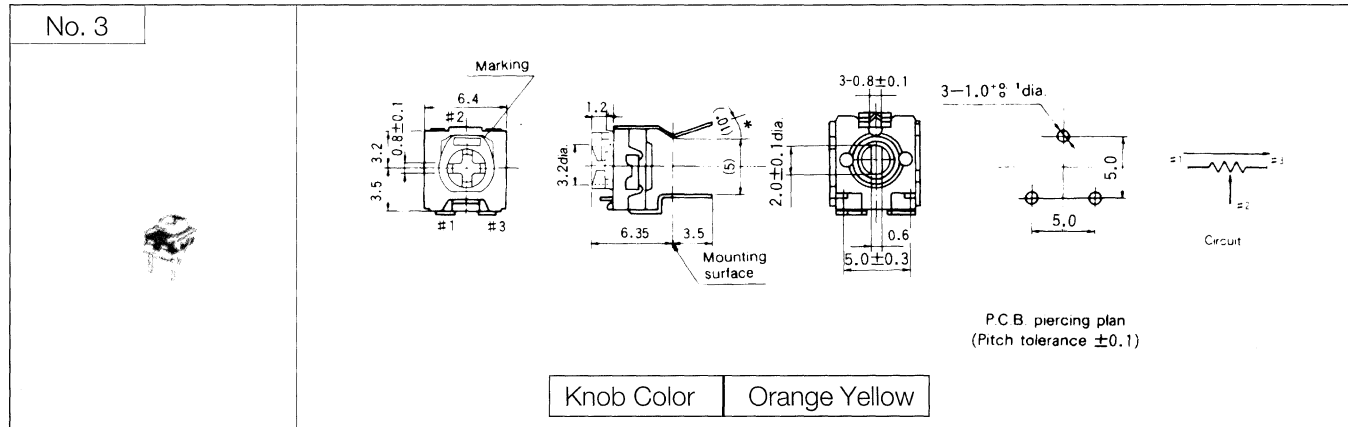
Laydown

EVN D8A



For automatic insertion

EVN D8M



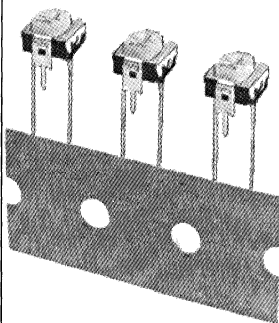
Trimmer Potentiometers 6mm Square Carbon Trimmer, Dustproof

Type 6FE

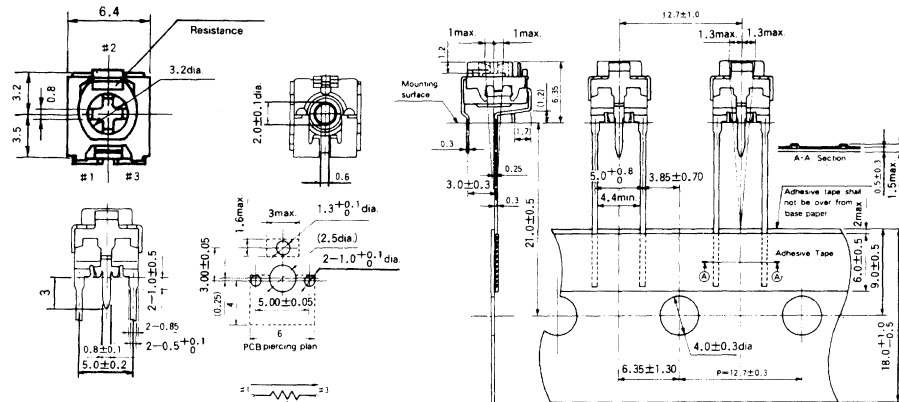
Lay-down

EVN DJA

No. 4



Inner Carton	1,000 pcs
Outer Carton	10,000 pcs



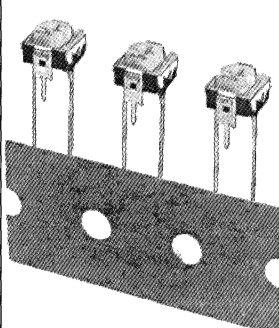
The pattern foil of PCB shall not be in this dotted square area

Knob Color	Orange Yellow
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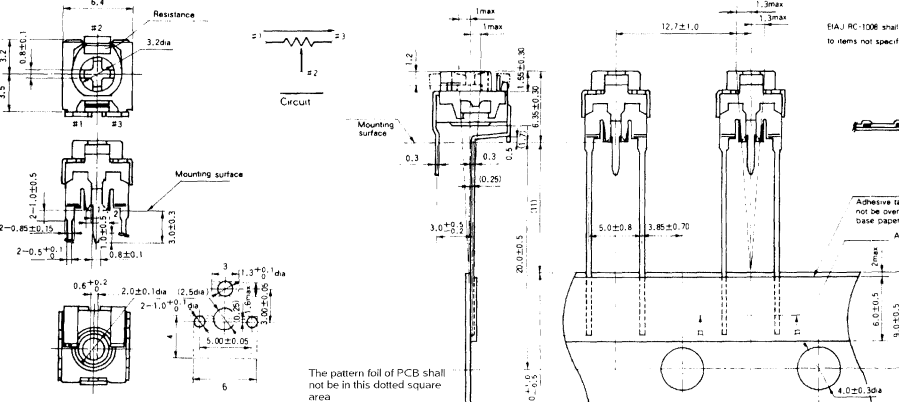
Lay-down

EVN DXA

No. 5



Inner Carton	1,000 pcs
Outer Carton	10,000 pcs



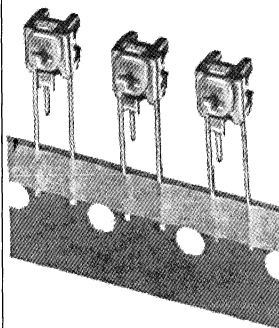
The pattern foil of PCB shall not be in this dotted square area

Knob Color	Orange Yellow
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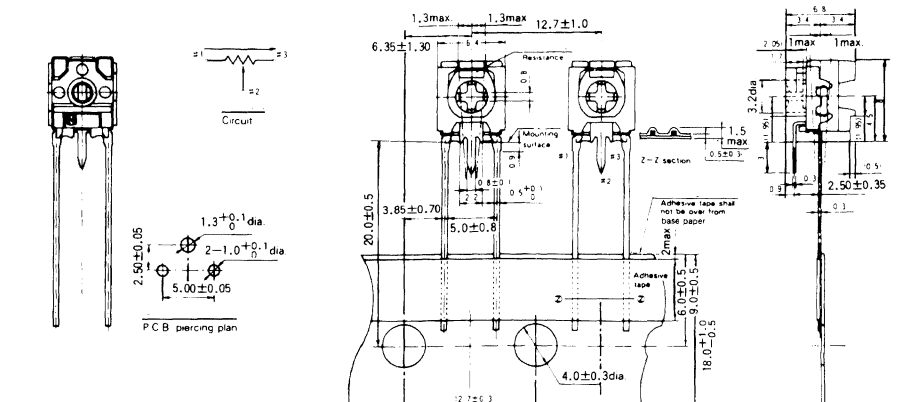
Stand-up

EVN DCA

No. 6



Inner Carton	1,000 pcs
Outer Carton	10,000 pcs



The pattern foil of PCB shall not be in this dotted square area

Knob Color	Orange Yellow
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Product Chart & Specifications

Item	Size	4mm High Grade	6mm General Grade	6mm High Grade
Part Numbers		EVM-LxG	EVN-3xC EVN-4xC	EVM-3xG EVM-4xG
Nominal Total Resistance & Tolerance		100Ω to 2 MΩ ±25%		
Power Rating & Maximum Operating Voltage		0.2 W, 50V (70 °C)	0.3 W, 100V (70 °C)	
Rotation Angle		200 ±20 °		
Rotation Torque		1.9 to 24.5 mN·m (20~250 gf·cm)		
Stopper Strength		39 mN·m min. (400 gf·cm min.)	29 mN·m min. (300 of·cm min.)	
Taper		B		
Residual Resistance		2% max. or 10kΩ max., whichever is smaller R ≤ 1kΩ: 30Ω max.		
Soldering Heat		280 °C, 3s	300 °C, 3s	
Rotation Life		20 turns	100 turns	
Humidity/Humidity Load Life (40 ±2 °C, 90~95% RH, 1000hrs)		±5%		R ≥ 500: ±3%
High Temperature/Load Life (70 ±2 °C, 1000 hrs)		±5%		100 ≤ R < 500
Temperature Coefficient -30 to 100°C		±300 ppm / °C		±200 ppm / °C

Packaging

Product Item	Min. Packaging & Ordering Quantity
4mm Diameter	5000
6mm Diameter General Grade	10000
6mm Diameter High Grade	10000

Explanation of Part Numbers

E V M

Common code Shape & type

□ □

Construction

□

Material special

A O O

Common Code

□ □ □

Resistance & Taper

Code	Resistive element	Type
M	Cermet (high grade)	4mm 6mm

Code	Item
K, C	Carbon composition
G	Standard (cermet)
Letters or numbers except C,G	Construction, taper or material special
(Example) A U	Semi-standard (cermet) Flame retardant

On special specifications, we will assign 6th digit in accordance with you requirements.

Example:

Resistance	11th	12th
500Ω	5	2
47 kΩ	Q	4
1 MΩ	1	6

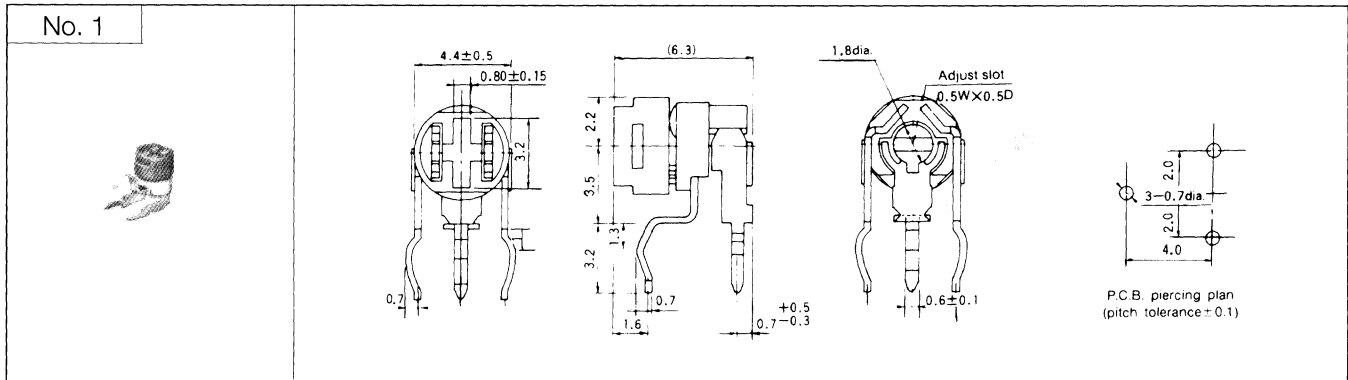
Note: When significant number is odd, letters are assigned as shown below:
 Example:

Symbol	Significant number	Symbol	Significant number
E	2.2	Q	4.7
Y	3.3	S	6.8

4 mm Dia. Cermet Trimmer Potentiometers (Dustproof)

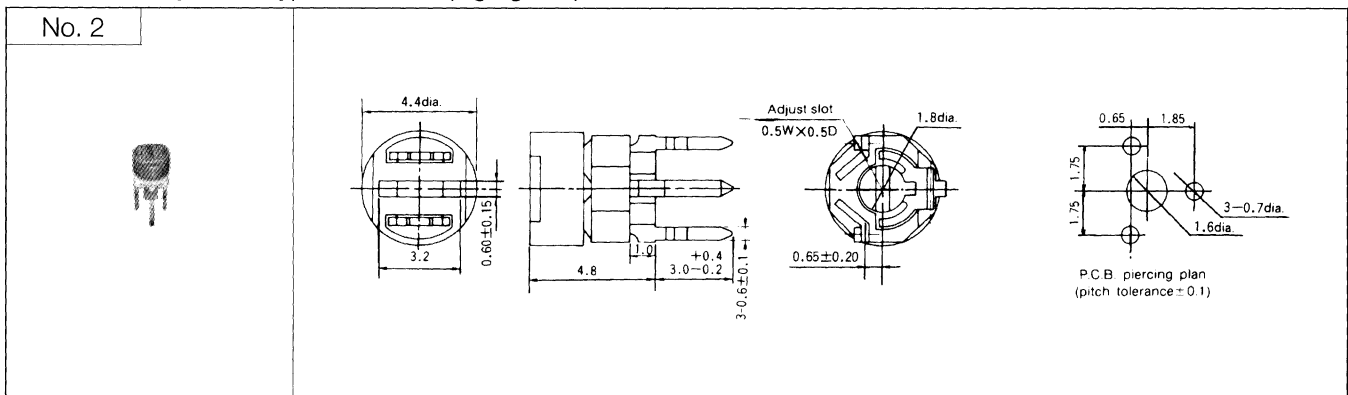
3 terminals, Stand-up, for automatic adjustment (high grade)

EVM L1G



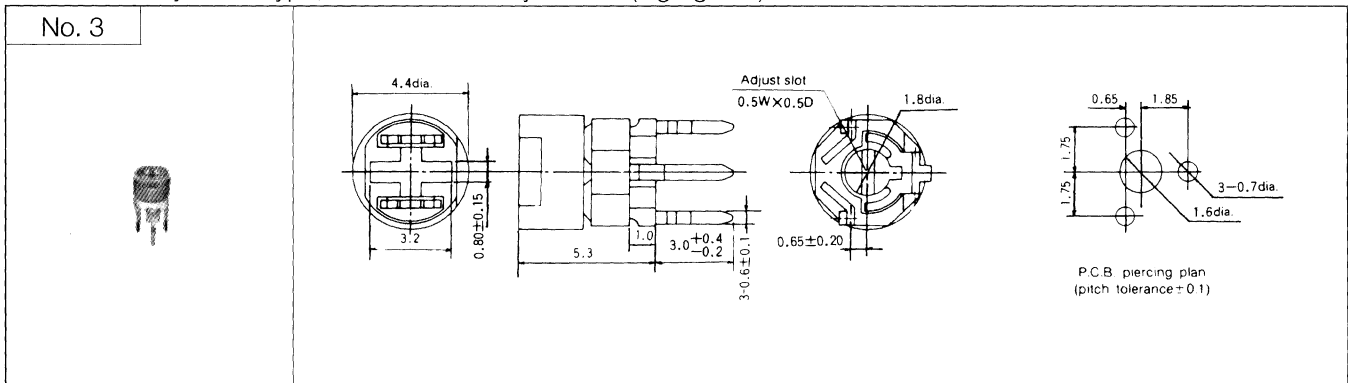
3 terminals, Lay-down type, Standard (high grade)

EVM L3G



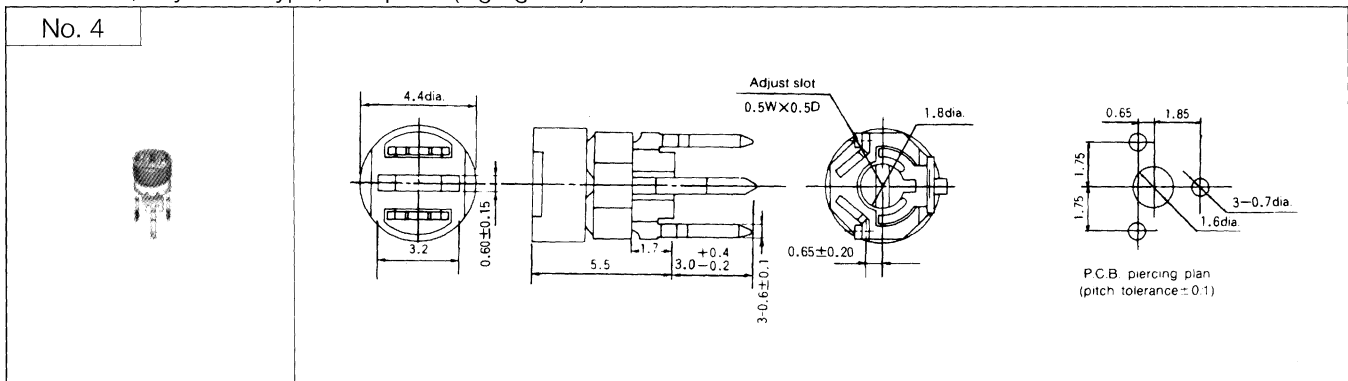
3 terminals, Lay-down type, For automatic adjustment (high grade)

EVM L4G



3 terminals, Lay-down type, Flux proof (high grade)


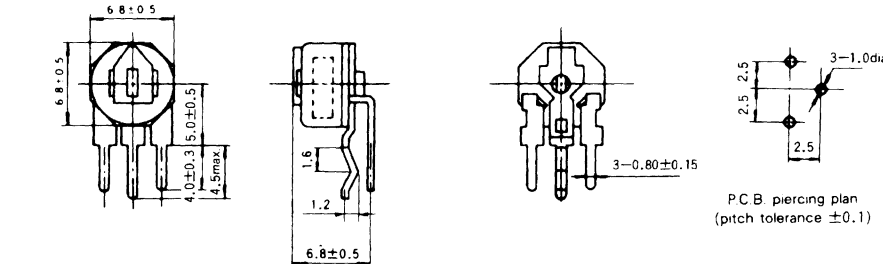
EVM LGG



6mm Size Cermet Trimmer Potentiometers
(Dustproof, GeneralGrade/High Grade)

3 terminals, Stand-up type, Both sides adjust

No. 1


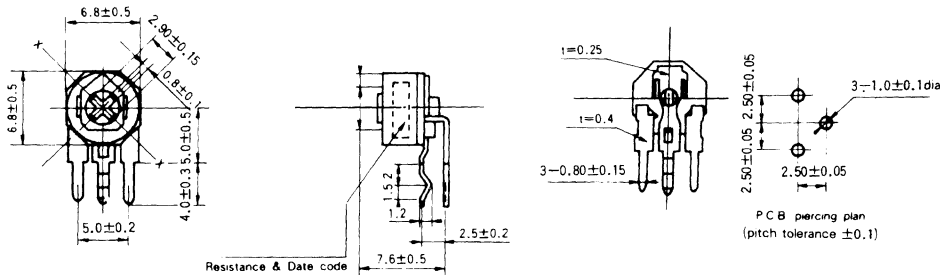



P.C.B. piercing plan
(pitch tolerance ±0.1)

General Grade	High Grade
EVN 32C (White knob)	EVM 31G (Blue knob)

3 terminals, Stand-up type, Both sides adjust, Cross slot

No. 2


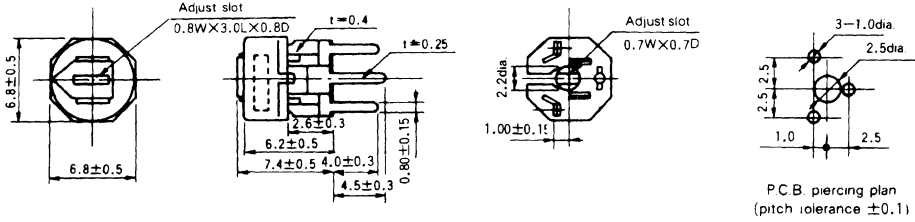
Resistance & Date code

P.C.B. piercing plan
(pitch tolerance ±0.1)

General Grade	High Grade
EVN 49C (White knob)	EVM 49G (Blue knob)

3 terminals, Lay-down type, Both sides adjust

No. 3

P.C.B. piercing plan
(pitch tolerance ±0.1)

General Grade	High Grade
EVN 38C (White knob)	EVM 38G (Blue knob)

6mm Size Cermet Trimmer Potentiometers
(Dustproof, GeneralGrade/High Grade)

3 terminals, Lay-down type

No. 4

General Grade	High Grade
EVN 36C (White knob)	EVM 36G (Blue knob)

3 terminals, Lay-down type, Both sides adjust, Cross slot

No. 5

General Grade	High Grade
EVN 4LC (White knob)	EVM 4LG (Blue knob)

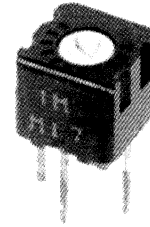
3 terminals, Lay-down type, Both sides adjust, Cross slot

No. 6

General Grade	High Grade
EVN 39C (White knob)	EVM 3G (Blue knob)

Features

- Resistance range: 50 Ω to 2 MΩ, Wattage rating: 0.5 W
 Temperature range: -55 to +125 °C
- Infinitesimal resolution for fine adjustment
- Very stable contact resistance variation due to multi-finger contacts...1% max.
- Excellent setting stability against shock and high temperature
- Low temperature coefficient: 100ppm/°C max.



Environmental Specifications

Type	5mm Square	
	ΔR	Ess
Temperature Range	-55 to +125 °C	
Resistance Temperature Coefficient (-55 to + 125 °C)	±100 ppm/°C [100 Ω to 2 MΩ (5 mm; 200 Ω to 1 MΩ)] ±250 ppm/°C [Others]	
Load Life (70 °C 0.5W 1000 h)	±3	±2
High Temperature Test (125 °C 250 h)	±3	±2
Thermal Shock (25→65→25→125→25 °C)	±2	±2
Vibration Test (20 G, 10 to 2000 Hz)	±1	±1
Shock 980 m/s ² (100G)	±1	±1
Rotation Life	±5	
Soldering Heat (350 °C 3 s)	±1	

Note: ΔR=Total resistance change (%), Ess = Setting stability (%)

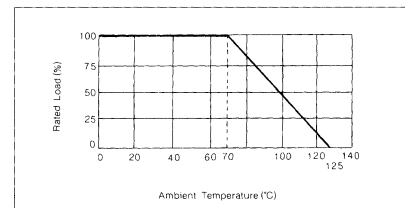
Mechanical Specifications

5 mm Square	
Adjust Method	Top & Side
Rotation Angle	230 °
Rotation Torque	9.8 mN·m (100 gf·cm) max.
Stopper Strength	29.4 mN·m (300 gf·cm) min.
Terminal Strength	49.0 mN·m (500 gf·cm) min.

Electrical Specifications

Type	5 mm Square
Resistance Range	50 to 2 MΩ
Tolerance	±20% (±10% available)
Taper	B(linear)
Power Rating	0.5 W (70 °C), over 70 °C, see derating curve at right
Max. Operating Voltage	200 VDC or Voltage Rating, whichever is smaller
Residual Resistance	1% max. against nominal total resistance or 2 Ω max., whichever is larger
Resolution	Infinitesimal
Contact Resistance Variation	3% max. against nominal total resistance
Dielectric Withstanding Voltage	600 VAC for 1 minute
Insulation Resistance	500 VDC 1000 MΩ min.

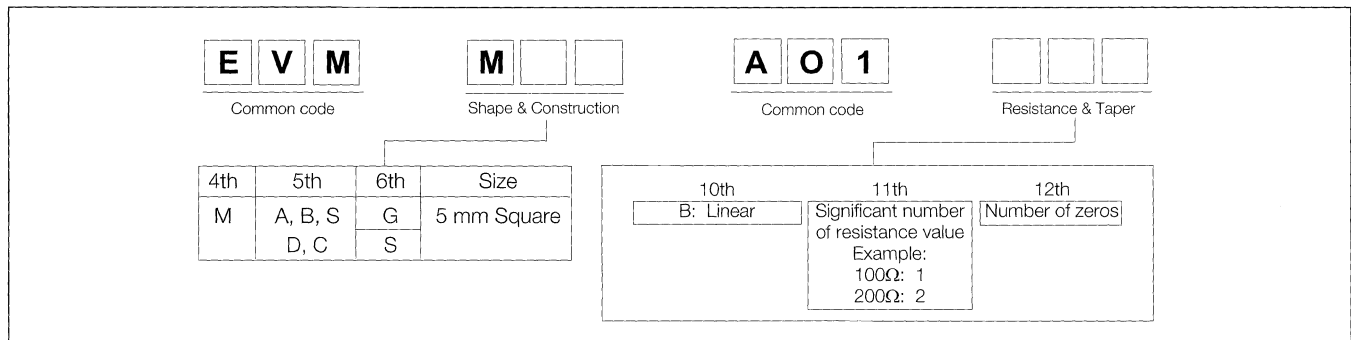
Power Derating Curve



Voltage Rating

E = Voltage Rating
 P = Power Rating
 R = Nominal Total Resistance $E = \sqrt{P \cdot R}$

Explanation of Part Numbers



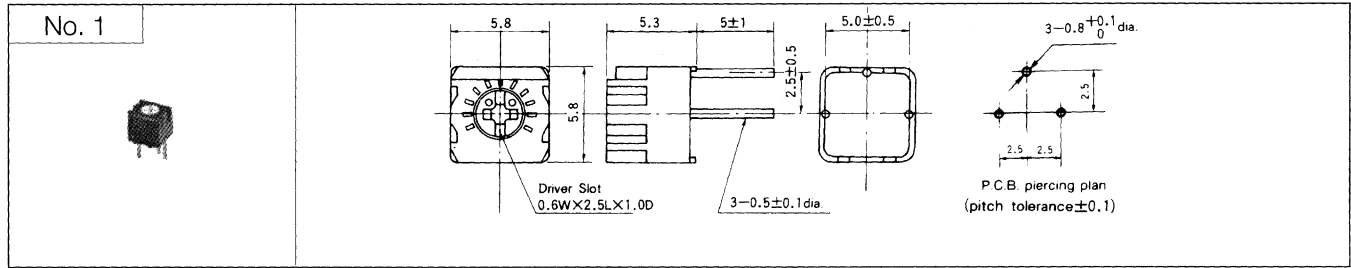
Packaging

Bulk: 2000 pcs./package min.	Tape: 10000 pcs./package min.
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Dimensions in mm (not to scale)

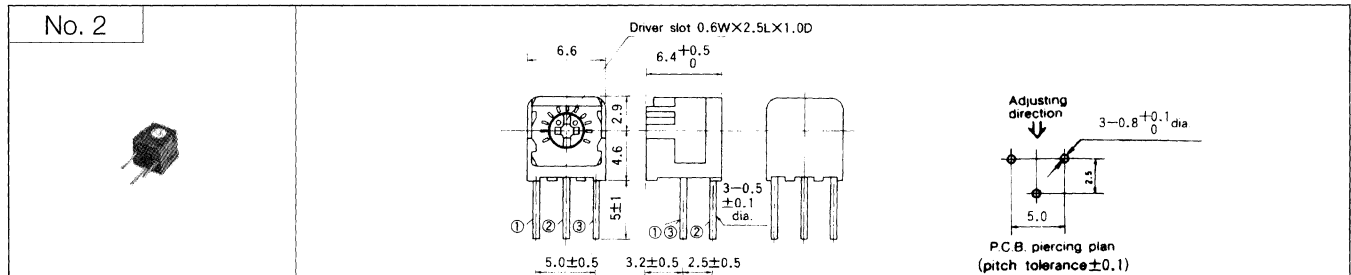
Type P (top adjust)

EVM MAG



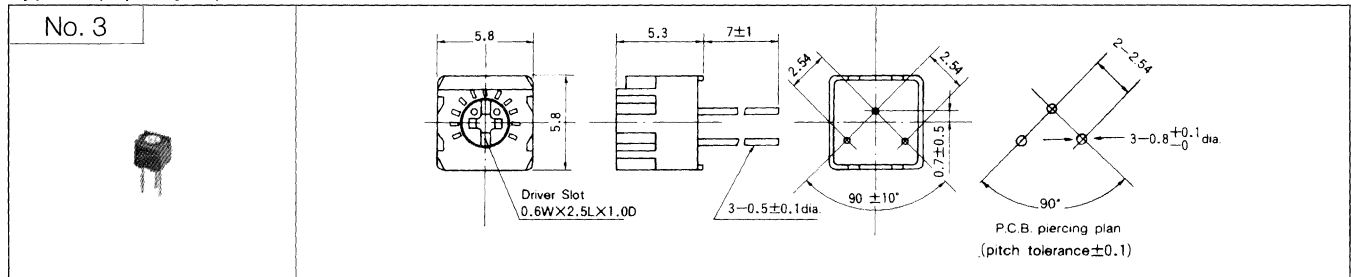
Type S (side adjust)

EVM MBG



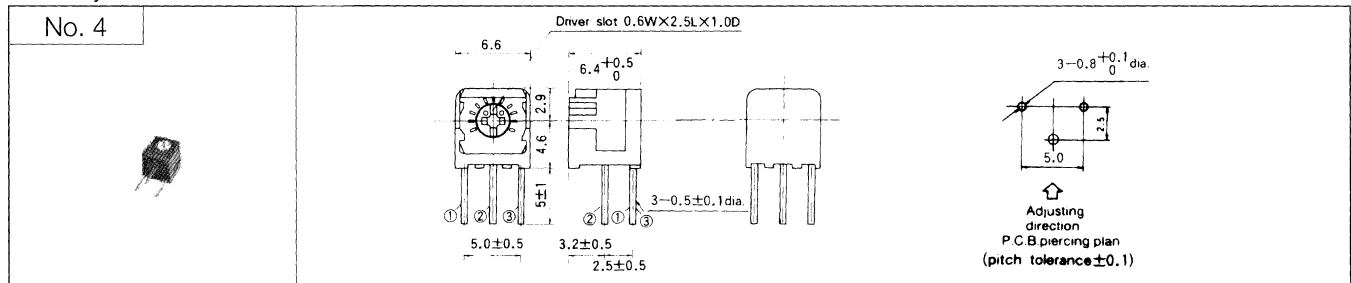
Type P (top adjust)

EVM MSG



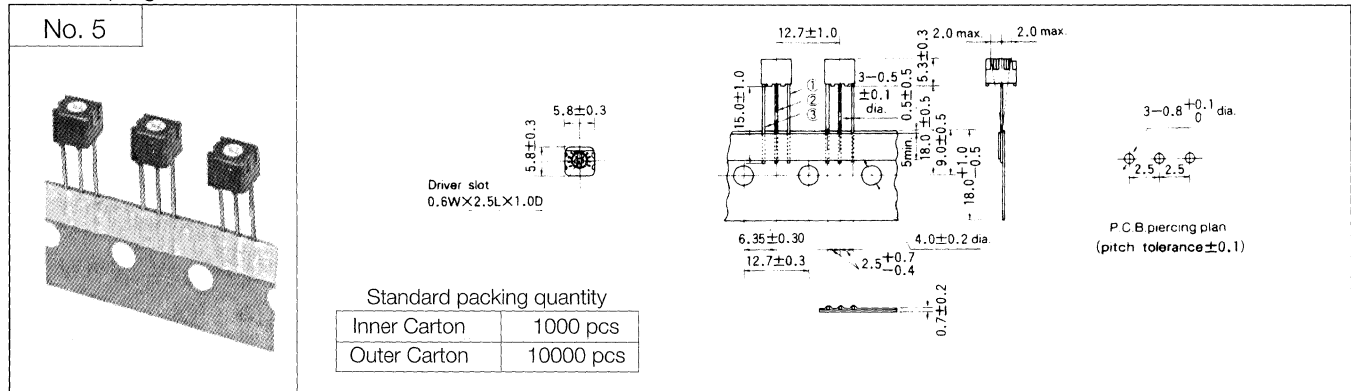
Side adjust

EVM MDG



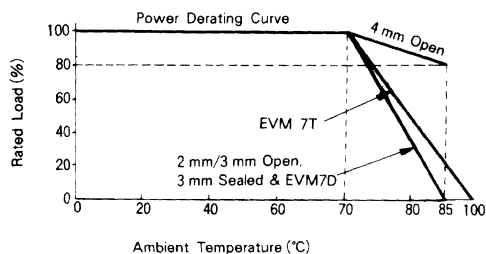
Radial taping

EVM MCS



Specifications

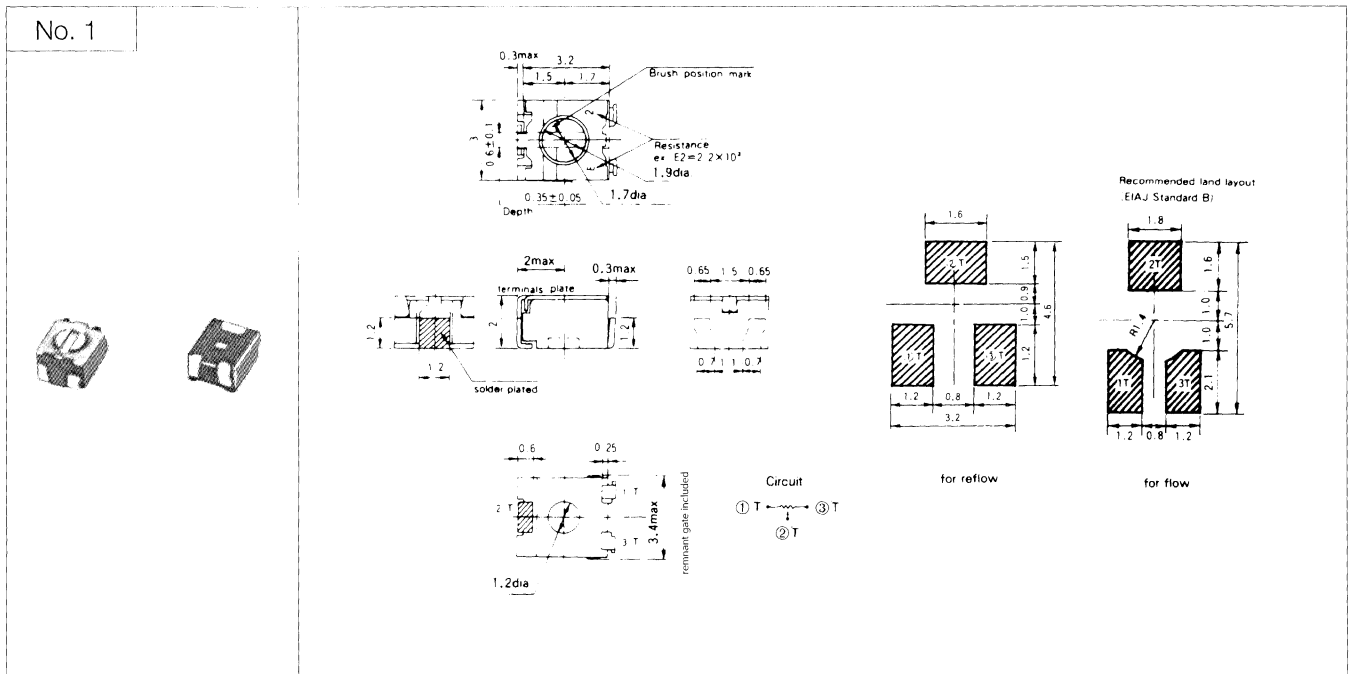
Type	3mm Sealed		2mm Open	3mm Open	4mm Open	
Applicable Part Numbers	EVM 7J		EVM 7L	EVM 1X, 2X	EVM 1S, 1Y 3S	
	0.05 W		0.15 W		0.2 W	
Electrical	Power Rating	For potentiometers operated in ambient temperatures above 70° C, Power Rating shall be derated in accordance with the figure at right.				
	Max. Operating Temperature	50 V (Voltage Rating 15 VDC)		50 V (Voltage Rating 15 VDC)		
	Voltage Rating	15VDC		15VDC		
	Resistance Range	220 Ω to 1 MΩ		200Ω to 1 MΩ	100 Ω to 1 MΩ	
	Tolerance	±25%				
	Taper	B (Linear)				
Mechanical	Effective Rotation Angle	260±20°				
	Rotation Torque	1.9 to 14.7 mN•m (20 to 150 gf•cm)	1.5 to 16.7 mN•m (15 to 170 gf•cm)	1.0 to 14.7 mN•m (10 to 150 gf•cm)	1.9 to 19.6 mN•m (20 to 200 gf•cm)	
	Soldering Strength	Horizontal: 9.8 N (1 kgf) Vertical: 4.9 N (500 gf)		Horizontal: 4.9 N (500 gf) Vertical: 2.5 N (250 gf)		
	Applicable Soldering	Flow and Reflow		Reflow		
Durability	Temperature Range	-40 to +100°C				
	Soldering Heat	250°C, 10s/260°C, 5s		260°C, 10s		
	Humidity (40±2°C 90 to 95% RH)	After 1000 hours, Total resistance change: ±5%				
	Humidity Load Life (40±2°C 90 to 95% RH)	After 1000 hours, (1.5h ON, .5h OFF) Total resistance change: ±5%				
	High Temperature (70±2°C)	After 1000 hours, Total resistance change: ±5%				
	Load Life (70±2°C)	After 1000 hours, (1.5h ON, .5h OFF) Total resistance change: ±5%				
	Temperature Coefficient	-20 to +80°C ±250 ppm/°C				
Rotation Life	After 10 turns, Total Resistance: ±15%		After 20 turns, Total Resistance: ±15%			



3 mm Square, Sealed
Dimensions in mm (not to scale)

3 terminals

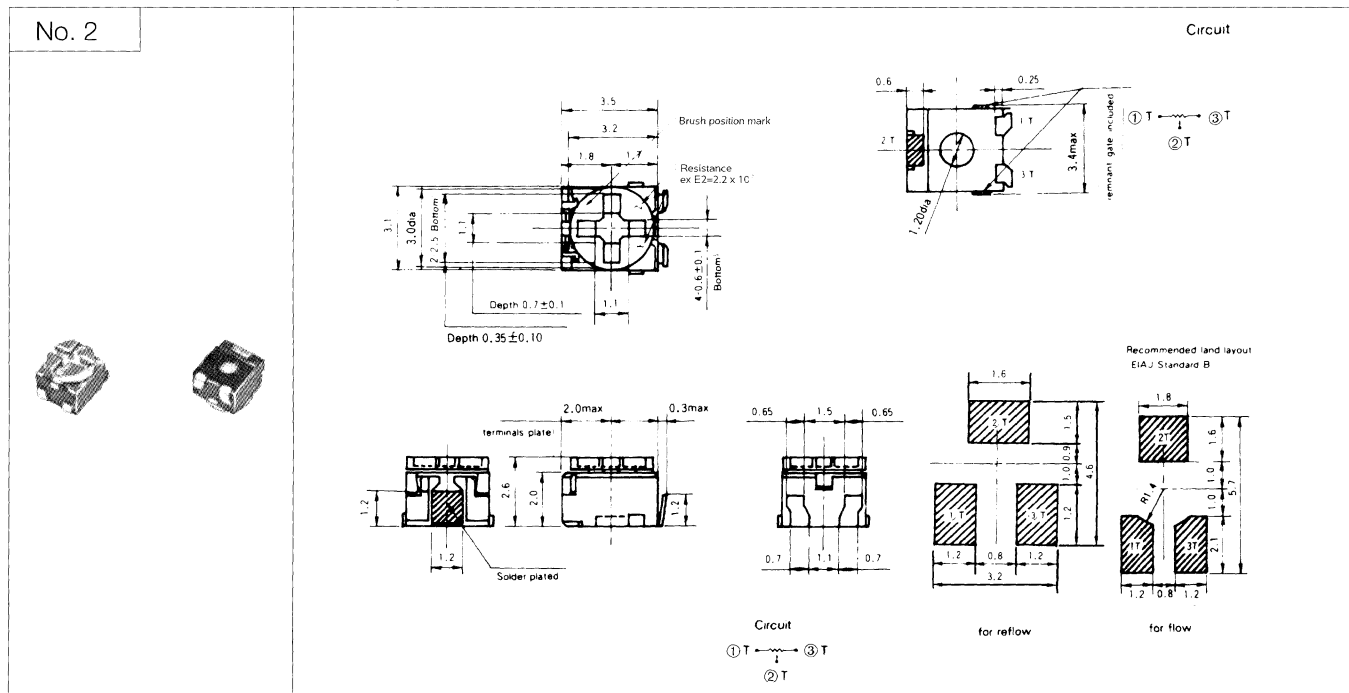
EVM 7 J



Note: PCB mounting not possible after trimming knob has been rotated

3 terminals (for automatic trimming adjustment)

EVM 7 L

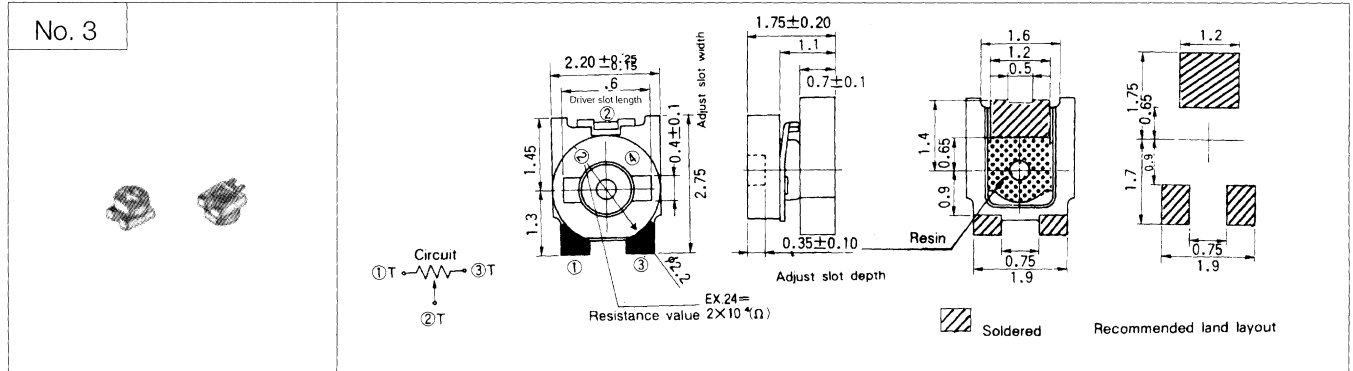


Note: PCB mounting not possible after trimming knob has been rotated

2 mm Square, Open Frame

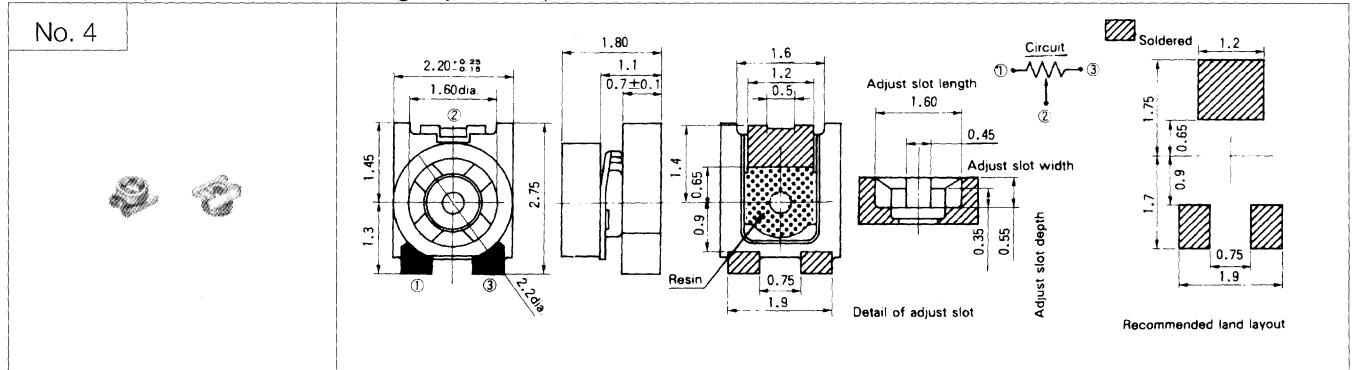
3 terminals

EVM 1X



3 terminals (for auto matic trimming adjustment)

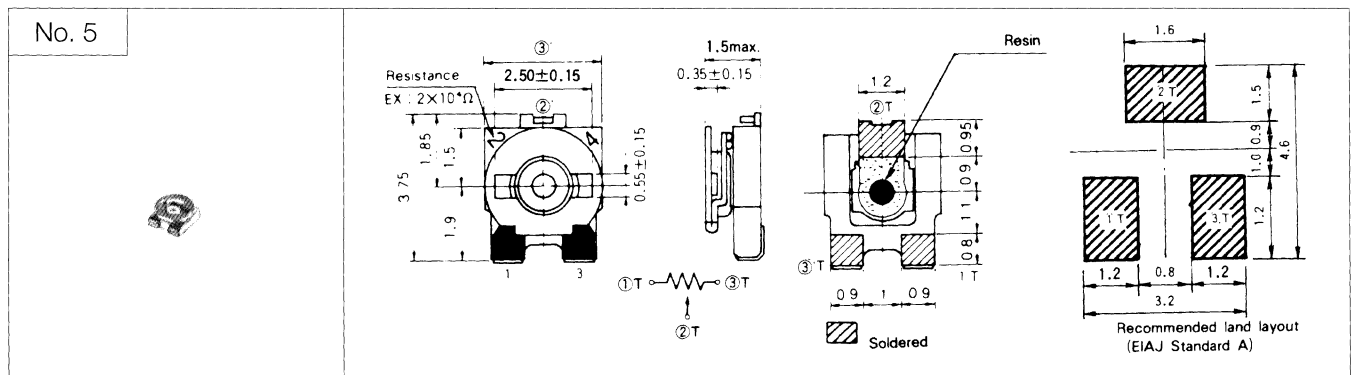
EVM 2X



3 mm Square, Open Frame

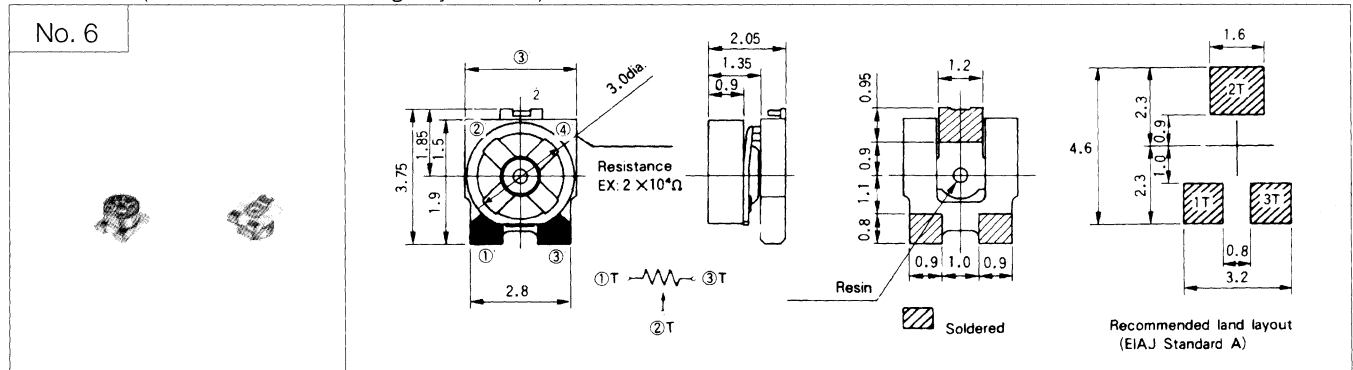
3 terminals

EVM 1S



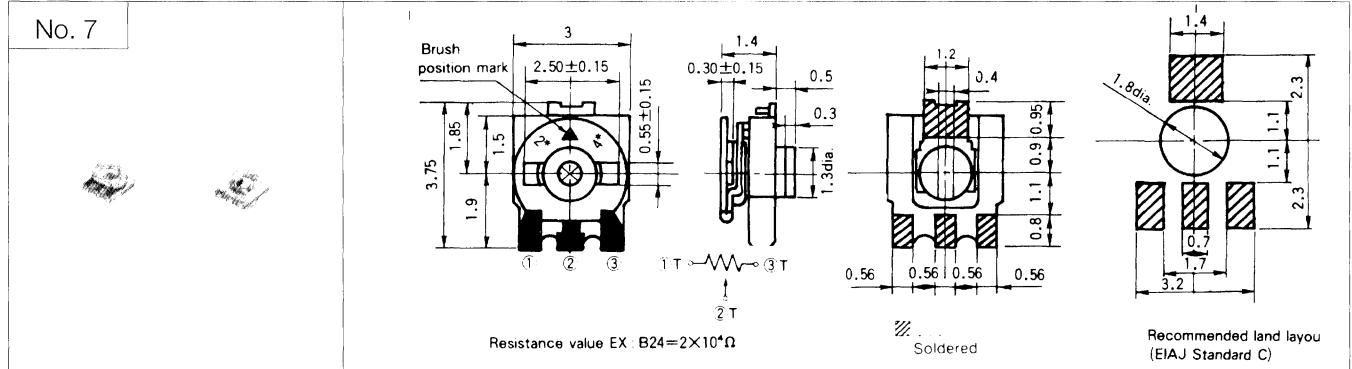
3 terminals (for automatic trimming adjustment)

EVM 1Y



2 terminals, Both sides adjust

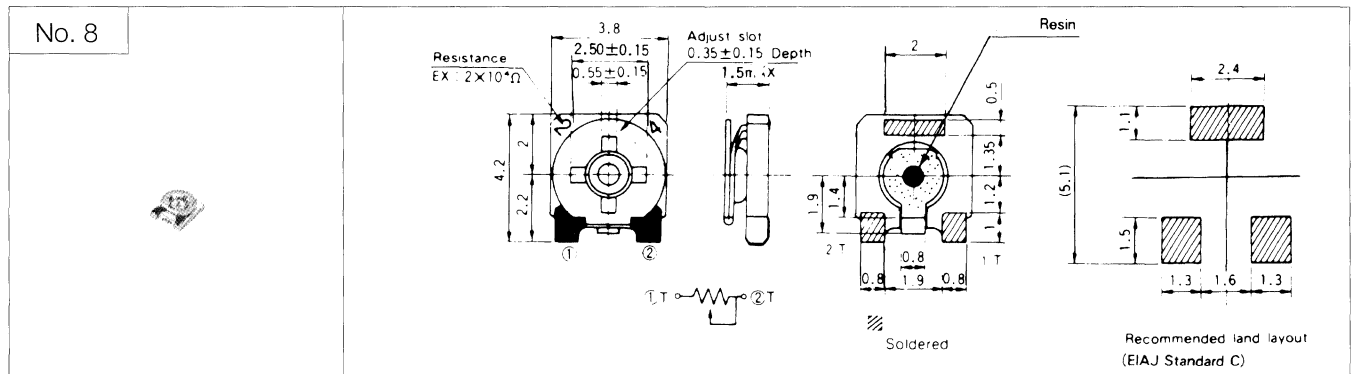
EVM 3S



4 mm Square, Open Frame

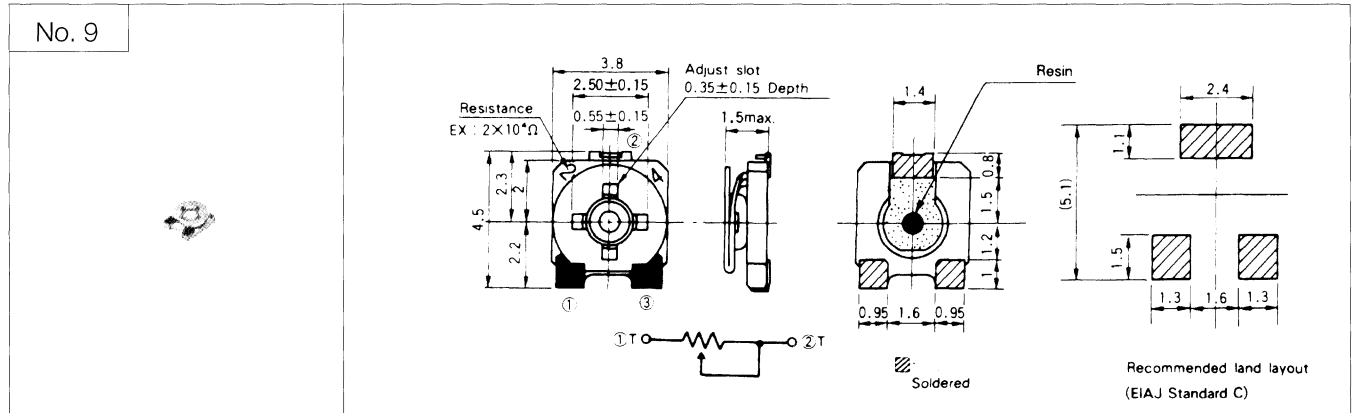
2 terminals, Cross slot

EVM 1G



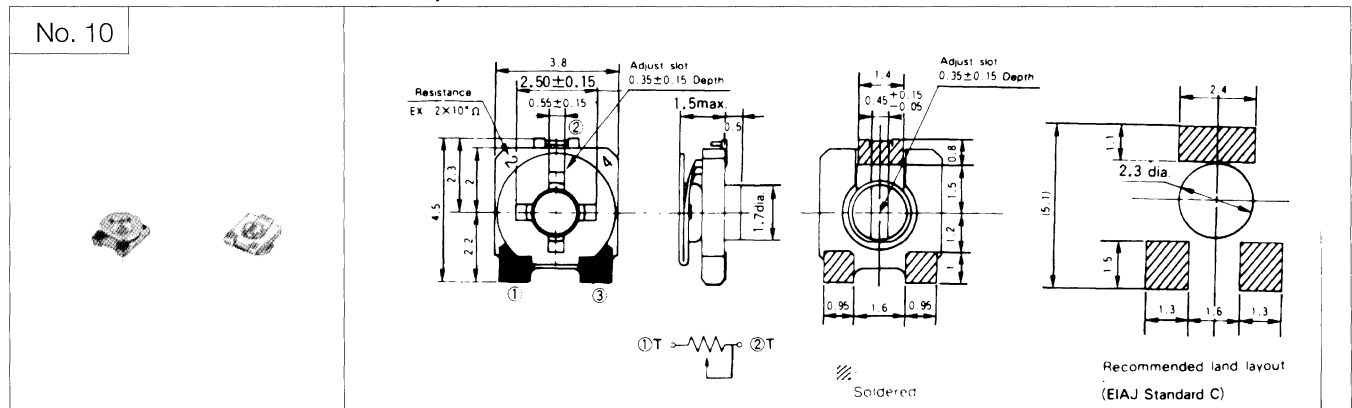
2 terminals, Cross slot

EVM 1L



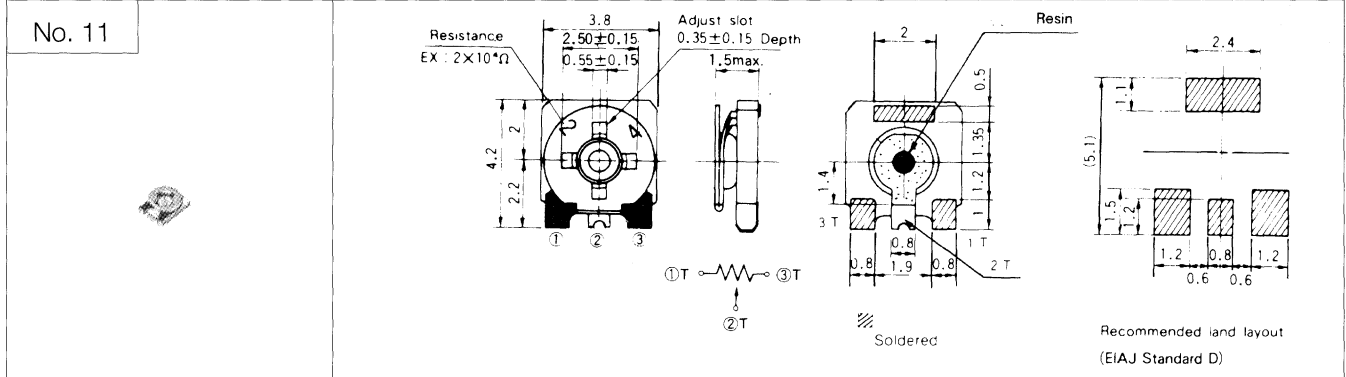
2 terminals, Cross slot, Both sides adjust

EVM 1K



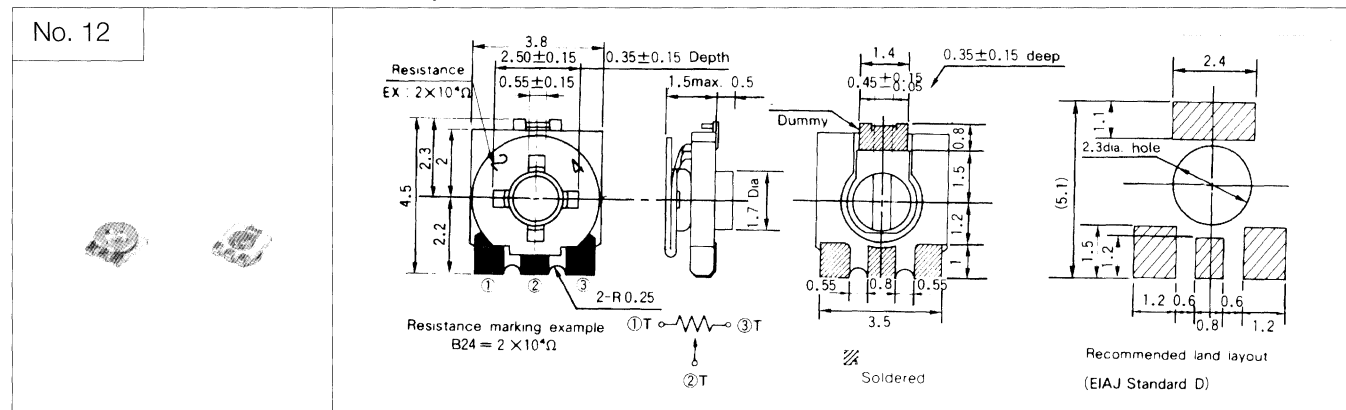
3 terminals, Cross slot

EVM 1E



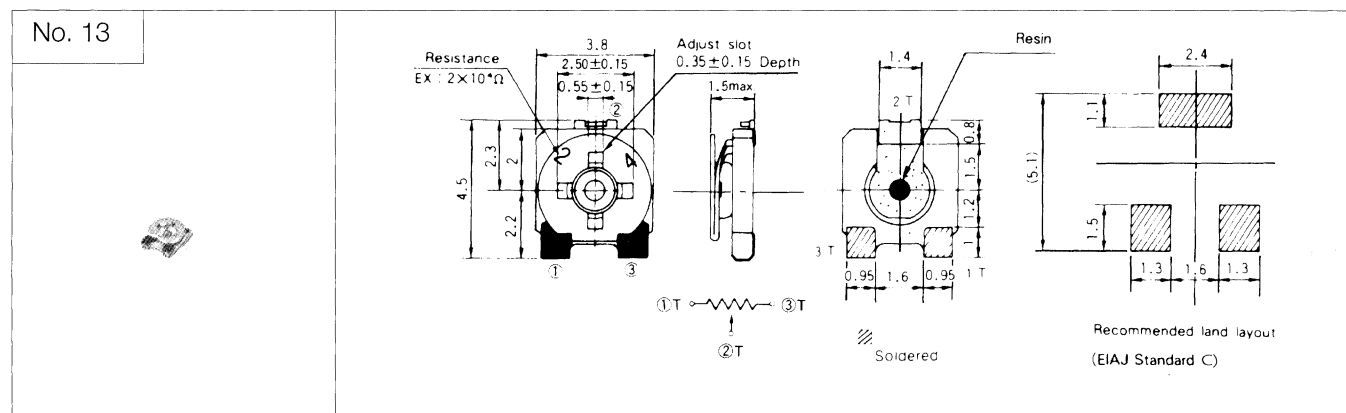
3 terminals, Cross slot, Both sides adjust

EVM 1U



3 terminals, Cross slot

EVM 1D

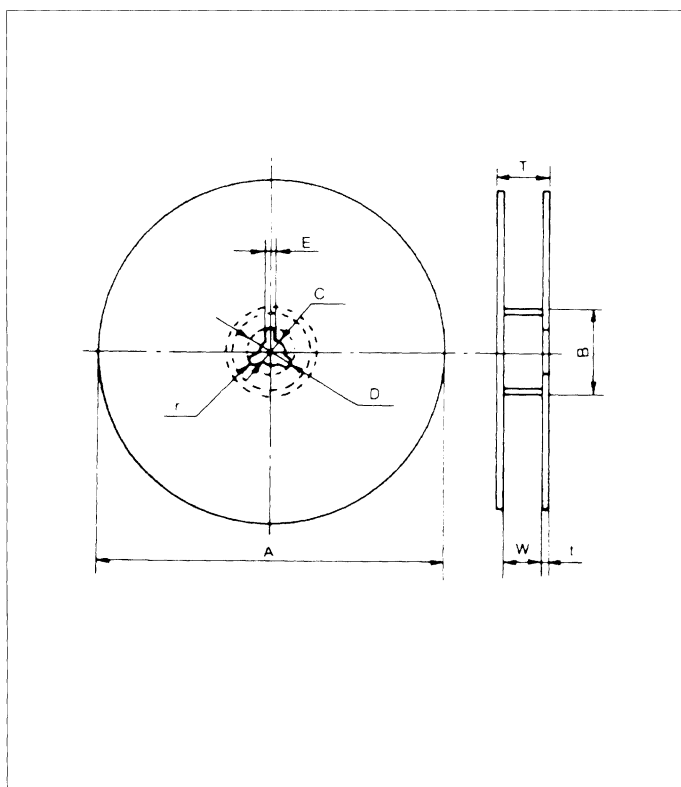
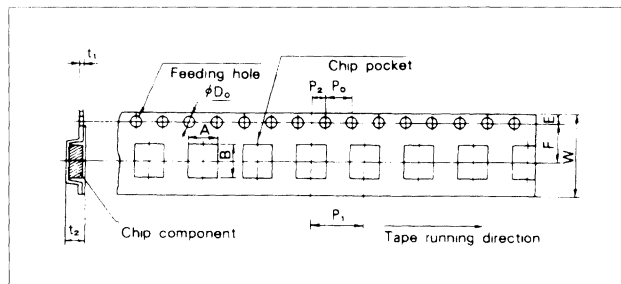


Taping/Packaging Specifications

Standard Packing Quantity

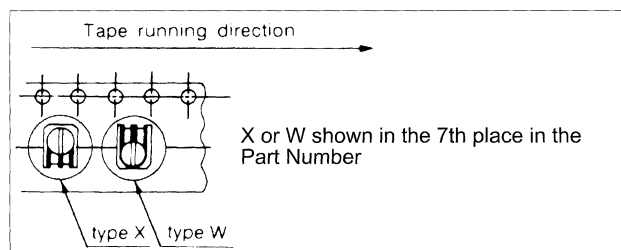
Appearance	Style		Embossed Taping	Bulk
	Thickness			
EVM 7J	2.0 mm		1000/5000 pcs/reel	500 pcs/pack
EVM 7L	2.6 mm		750/4000 pcs/reel	500 pcs/pack
EVM 1□, 2mm	1.5 to 2.0 mm		2000 pcs/reel	1000 pcs/pack
EVM1□, 3mm	1.5 mm		1000/2000 pcs/reel	500 pcs/pack
EVM 1□, 4mm	1.5 mm		1000/5000 pcs/reel	500 pcs/pack

Embossed Taping



Part No.	Dim. Code	A	B	W	F	E	P ₁
EVM 7J		3.5	4.3	12	5.5	1.75	8
EVM 7L		3.5	4.3	12	5.5	1.75	8
EVM 1□, 2mm		2.45	2.9	8	3.5	1.75	4
EVM 1□, 3mm		3.3	4.0	8/12	3.5	1.75	4/8
EVM 1□, 4mm		4.3	5	12	5.5	1.75	8

Part No.	Dim. Code	P ₂	P ₀	∅D ₀	t ₁	t ₂
EVM 7J		2	4	1.5	0.3	2.4
EVM 7L		2	4	1.5	0.3	3.1
EVM 1□, 2mm		2	4	1.5	0.3	2.3
EVM 1□, 3mm		2	4	1.5	0.3	2.0 to 2.4
EVM 1□, 4mm		2	4	1.5	0.3	2.2



Embossed Taping

(Unit: mm)

Type No.	Dim. Code	A	B	C	D	E	W	t	Packaging Quantity
	Tolerance	±2.0	min.	±0.5	±0.8	±0.5	±1.5	±0.5	t ₂ =2.0 to 2.4
	1	178 dia.	50/80 dia.	13.0 dia.	21.0 dia.	2.0	14.0/10.0*	1.0 to 2.0	1000 pcs (P ₁ =8) 2000 pcs (P ₁ =4)
	3	370 dia.	80 dia.	13.0 dia.	21.0 dia.	2.0	14.0/10.0	1.0 to 2.0	5000 pcs (P ₁ =8)

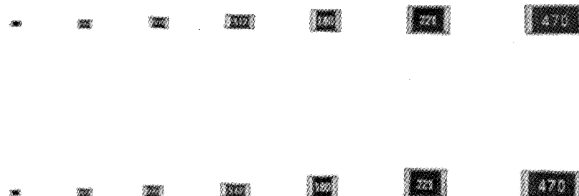
Application Notes

- After automatic assembly, please wash completely with Freon substitute or other appropriate solvent
- For sealed type, use Freon TF substitute.
- Soldering reworking shall be done only once under the following conditions:

Time: 3s max.
Temperature: 280°C max.
Soldering iron: 20 W max.

Features

- **Small size and light weight**
For PCB size reduction and lightweight products
- **High reliability**
Metal glaze thick film resistive element and 3 layered electrode results in high reliability
- **Matching with placement machines**
Bulk, Taping and magazine packagings for automatic placement machines
- **Solderability**
Suitable for both reflow soldering and flow soldering



Conforming to:
EIA-RS-481A

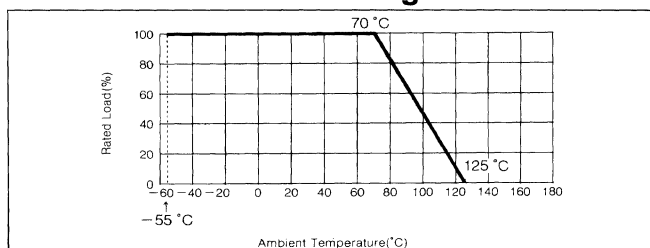
Specifications

Part No.	Power Rating at 70°C	Maximum RCWW*	Maximum Overload Voltage	Resistance Tolerance	Resistance Range (Ω)		Standard Res. Values
					Min	Max	
ERJ2G	1/16 W	50 V	100 V	±2 ±5	10 10	1.0 M 1.0 M	E-24 E-24
ERJ3EK	1/16 W (1/10 W)**	50 V	100 V	±1	10	1 M	E-24, 96
ERJ3G	1/16 W (1/10 W)**	50 V	100 V	±1	10	1.0 M	E-24
				±2	10	1.0 M	E-24
				±5	10	1.0 M	E-24
				±10	1.0	10.0 M	E-12
ERJ6EN	1/10 W (1/8 W)**	150 V	200 V	±1	10	1 M	E-24, 96
ERJ6G	1/10 W (1/8 W)**	150 V	200 V	±1	10	1.0 M	E-24
				±2	10	1.0 M	E-24
				±5	10	1.0 M	E-24
				±10	0.47	10.0 M	E-12
ERJ8EN	1/8 W (1/4 W)**	200 V	400 V	±1	10	1 M	E-24, 96
ERJ8G	1/8 W (1/4 W)**	200 V	400 V	±1	10	1.0 M	E-24
				±2	10	1.0 M	E-24
				±5	10	1.0 M	E-24
				±10	0.39	10.0 M	E-12
ERJ14N	1/4 W	200 V	400 V	±1	10	1 M	E-24, 96
ERJ14	1/4 W	200 V	400 V	±2	10	1.0 M	E-24
				±5	10	1.0 M	E-24
				±10	0.39	1.0 M	E-12
ERJ12N	1/2 W	200 V	400 V	±1	10	1 M	E-24, 96
ERJ12	1/2 W	200 V	400 V	±2	10	1.0 M	E-24
				±5	10	1.0 M	E-24
				±10	1.0	1.0 M	E-12
ERJ1W	1 W	250 V	500 V	±2	10	1.0 M	E-24
				±5	10	1.0 M	E-24
				±10	1.0	1.0 M	E-12

* Rated continuous working voltage (RCWW) shall be determined from $RCWW = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$, or max RCWW listed above, whichever less.

** Available for reduction of load of pulse characteristic (RCWW x 2.5 → RCWW x 2.0)

Power Derating Curve



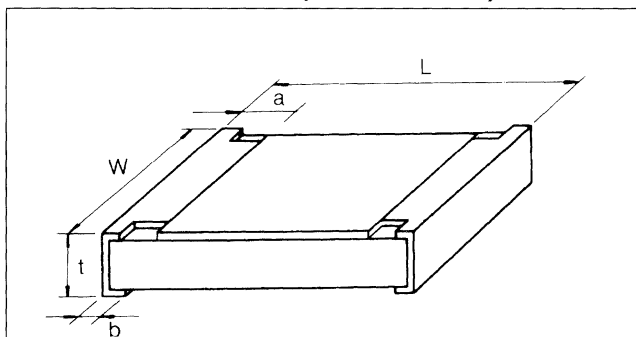
Standard Precision

E R J		8 G E		Y	J	1 0 2	S
Common Code	Power Rating		Marking		Resistance Tolerance		Nominal Resistance Value
Thick Film Chip Resistors	Code	Power R.	Code	Marking	Code	Tol.	The first two digits are significant figures of resistance and the third one denotes number of zeros following. Jumper is expressed by R00.
	2GE	1/16 W	Y	Value marking on black side	F	±1%	
	3GS	1/16 W	Nil	No marking	G	±2%	
	6GE	1/10 W			J	±5%	
	8GE	1/8 W			K	±10%	
	14	1/4 W			0	Jumper	
	12	1/2 W					
	1W	1 W					
							Suffix for Packaging
							Code
							Nil
							S
							H
							B
							Z
							A
							X

High Precision

E R J		8 E		N	F	1 0 0 2	S
Common Code	Power Rating		Marking		Resistance Tolerance		Nominal Resistance Value
Thick Film Chip Resistors	Code	Power R.	Code	Marking	Code	Tol.	The first three digits are significant figures of resistance and the 4th one denotes number of zeros following.
	3E	1/16 W	N	Value marking on black side (4 digit)	F	±1%	
	6E	1/10 W	K	No marking			
	8E	1/8 W					
	14	1/4 W					
	12	1/2 W					
							Suffix for Packaging
							Code
							Nil
							S
							H
							B
							Z
							A

Dimensions in mm (not to scale)



Type No.	Dimensions (mm)					Net Weight (1000 pcs.)
	L	W	a	b	t	
ERJ3EK	+0.15 1.60	+0.15 0.80	±0.20 0.30	±0.20 0.30	+0.10 0.45	2 g
ERJ6EN	±0.20 2.00	±0.10 1.25	±0.25 0.40	±0.25 0.40	+0.10 0.60	4 g
ERJ8EN	+0.05 -0.20 3.20	+0.05 0.15 1.60	±0.25 0.50	±0.25 0.50	+0.10 0.60	10 g
ERJ14N	±0.20 3.20	±0.20 2.50	±0.25 0.50	±0.25 0.50	+0.10 0.60	16 g
ERJ12N	±0.20 4.50	±0.20 3.20	±0.25 0.50	±0.25 0.50	+0.10 0.60	27 g

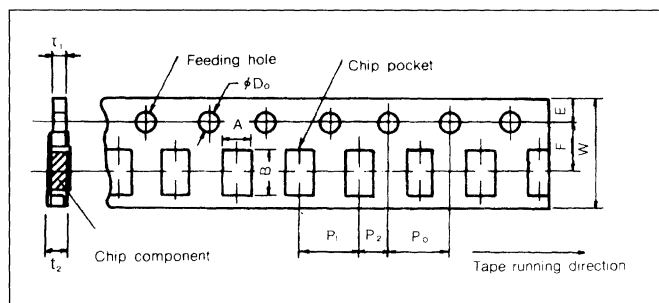
Part No.	Dimensions (mm)					Net Weight (1000 pcs.)
	L	W	a	b	t	
ERJ2GE	±0.05 1.00	±0.05 0.50	±0.10 0.20	±0.05 0.25	±0.05 0.35	0.8 g
ERJ3GS	±0.15 1.60	+0.15 -0.05 0.80	±0.20 0.30	±0.15 0.30	±0.10 0.45	
ERJ6GM ER6GE	±0.20 2.00	±0.10 1.25	±0.25 0.40	max. 0.30 ±0.25 0.40	±0.10 0.60	4 g
ERJ6GM ER6GE	±0.05 -0.20 3.20	±0.05 -0.15 1.60	±0.25 0.50	max. 0.30 ±0.25 0.50	±0.10 0.60	10g
ERJ14	±0.20 3.20	±0.20 2.50	±0.25 0.50	±0.25 0.50	±0.10 0.60	16 g
ERJ12	±0.20 4.50	±0.20 3.20	±0.25 0.50	±0.25 0.50	±0.10 0.60	27 g
ERJ1W	±0.20 6.40	±0.20 3.20	±0.25 0.65	±0.25 1.30	±0.20 1.10	79 g

Packaging Specifications
Standard Packing Quantity

Chip Resistor Type	Style Thickness	Paper Taping (4mm pitch)	Embossed Taping	Bulk Case	Bulk
		ERJ2G	0.35	10000 (2 mm pitch)			1000 pcs./pack
ERJ3G	0.45	5000,10000*, 20000*		25000 pcs./case	1000 pcs./pack
ERJ6G	0.60	5000,10000*,20000*		10000 pcs./case	1000 pcs./pack
ERJ8G	0.60	5000,10000*,20000*	4000 pcs./reel	5000 pcs./case	1000 pcs./pack
ERJ14	0.60		4000 pcs./reel		500 pcs./pack
ERJ12	0.60		2000 pcs./reel		500 pcs./pack
ERJ1W	1.10		1000 pcs./reel		100 pcs./pack
ERJ3EK	0.45	5000		25000 pcs./case	1000 pcs./pack
ERJ6EN	0.60	5000		10000 pcs./case	1000 pcs./pack
ERJ8EN	0.60	5000	4000 pcs./reel	5000 pcs./case	1000 pcs./pack
ERJ14N	0.60		4000 pcs./reel		500 pcs./pack
ERJ12N	0.60		2000 pcs./reel		500 pcs./pack

* Special

Paper Taping



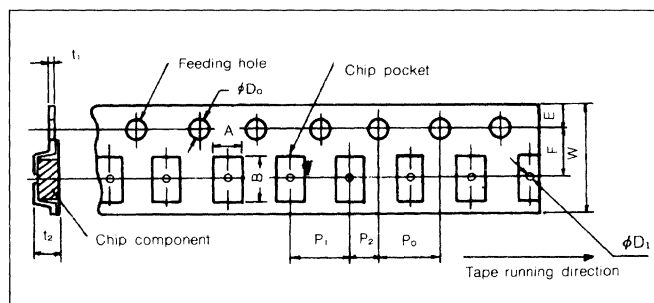
		A	B	W	F	E	P ₁
Dimensions (mm)	2G	±0.05 0.70	±0.05 1.20	±0.20 8.00	±0.05 3.50	±0.10 1.75	±0.10 2.00
	3G	±0.10 1.10	±0.10 1.90				±0.10 4.00
	6G	±0.15 1.60	±0.20 2.50				±0.10 8.00
	8G	±0.15 1.90	±0.20 3.60				±0.10 4.00

		P ₂	P ₀	øD ₀	t ₁	t ₂
Dimensions (mm)	2G	±0.05 2.00	-0.10 4.00	+0.10 0 ø1.50	±0.05 0.40	±0.05 0.45
	3G				±0.05 0.60	±0.05 0.64
	6G				±0.05 0.80	±0.05 0.84
	8G				±0.05 0.80	±0.05 0.84

		A	B	W	F	E	P ₁
Dimensions (mm)	3EK	±0.10 1.10	±0.10 1.90	±0.20 8.00	±0.05 3.50	±0.10 1.75	±0.10 4.00
	6EN	±0.15 1.60	±0.20 2.40				
	8EN	±0.15 1.90	±0.20 3.50				

		P ₂	P ₀	øD ₀	t ₁	t ₂
Dimensions (mm)	3EK	±0.05 2.00	-0.10 4.00	+0.10 0 ø1.50	±0.05 0.64	±0.05 0.84
	6EN				±0.05 0.80	±0.05 0.84
	8EN				±0.05 0.80	±0.05 0.84

Embossed Taping



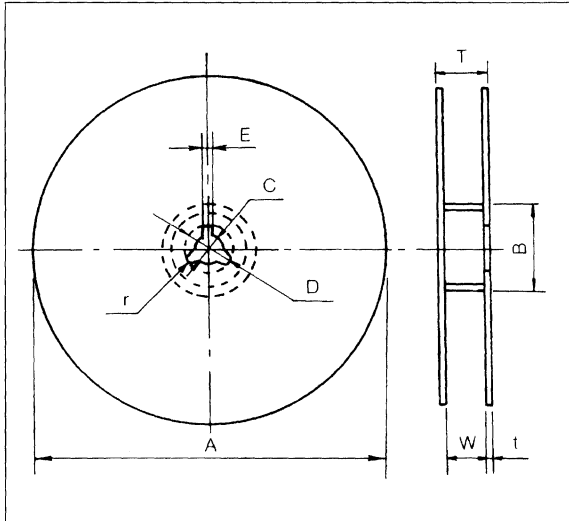
		A	B	W	F	E	P ₁		
Dimensions (mm)	8G	±0.20 1.90	±0.20 3.50	±0.30 8.00	±0.05 3.50	±0.10 1.75	±0.10 4.00		
	14	±0.20 2.80	±0.20 3.50				±0.10 8.00		
	12	±0.20 3.50	±0.20 4.80				±0.30 12.0	±0.05 5.50	±0.10 8.00
	1W	±0.20 3.60	±0.20 6.90				±0.30 12.0	±0.05 5.50	±0.10 8.00

		P ₂	P ₀	øD ₀	t ₁	t ₂	øD ₁
Dimensions (mm)	8G	±0.05 2.00	±0.10 4.00	+0.10 0 ø1.50	max. 0.40	±0.10 1.00	±0.10 ø1.00
	14						±0.10 1.00
	12						±0.10 1.60
	1W						±0.10 1.60

		A	B	W	F	E	P ₁
Dimensions (mm)	8EN	±0.20 1.90	±0.20 3.50	±0.30 8.00	±0.05 3.50	±0.20 1.75	±0.10 4.00
	14N	±0.20 2.80	±0.20 3.50				±0.10 8.00
	12N	±0.20 3.50	±0.20 4.80				±0.30 12.00	±0.05 5.50	±0.10 8.00

		P ₂	P ₀	øD ₀	t ₁	t ₂	øD ₁
Dimensions (mm)	8EN	±0.05 2.00	±0.10 4.00	+0.10 0 ø1.50	max. 0.40	±0.20 1.00	min. ø1.00
	14N						min. ø1.50
	12N						min. ø1.50

Reel



		øA	øB	øC	øD	øE
Dimensions (mm)	3EK, 6EN, 8EN, 14N	±2.0	min.	±0.5	±1.0	±1.5
	12N	178.0	60	13.0	21.0	3.0

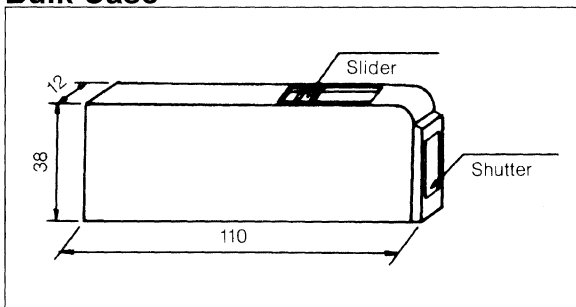
		W	T	t	r
Dimensions (mm)	3EK, 6EN, 8EN, 14N	10.0±1.0	12.0±2.0	±0.5	±0.5
	12N	14.0±1.0	16.0±2.0	1.0	1.5

		øA	øB	øC	øD	øE
Dimensions (mm)	2G, 3G, 6G, 8G, 14	±2.0	min.	±0.5	±1.0	±1.5
	12, 1W	178.0	60	13.0	21.0	3.0

		W	T	t	r
Dimensions (mm)	2G, 3G, 6G, 8G, 14	10.0±1.0	12.0±2.0	±0.5	±0.5
	12, 1W	10.0±1.0	16.0±2.0	1.0	1.5

Note øA; 10000 pcs./reel=255
20000 pcs./reel=330

Bulk Case



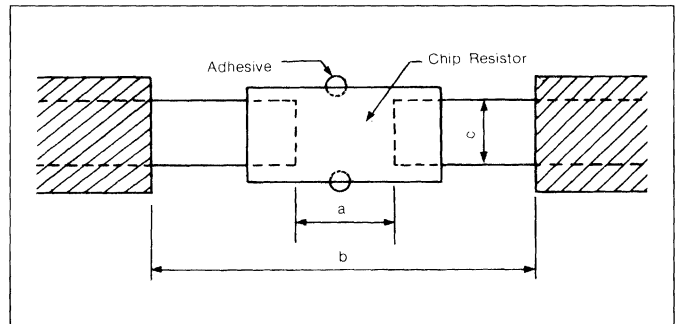
Application Notes

In the case of flow soldering, the land width must be smaller than the Chip Resistor width to properly control the solder amount properly. Generally, the land width should be 0.7 to 0.8 times the width of chip resistor (W). In the case of reflow soldering, solder amount can be adjusted, and the land width should be set to 1.0 to 1.3 times chip resistor width (W).

Type	Dimensions (mm)		
	a	b	c
ERJ3EK	0.7 to 0.9	2.0 to 2.2	0.8 to 1.0
ERJ6EN	1.0 to 1.4	3.2 to 3.8	0.9 to 1.4
ERJ8EN	2.0 to 2.4	4.4 to 5.0	1.2 to 1.8
ERJ14N	2.0 to 2.4	4.4 to 5.0	1.8 to 2.8
ERJ12N	3.3 to 3.7	5.7 to 6.5	2.3 to 3.5

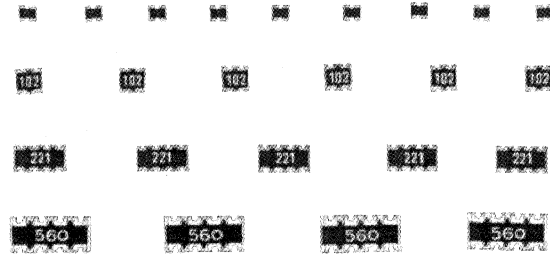
ERJ2G	0.5 to 0.6	1.4 to 1.6	0.4 to 0.6
ERJ3G	0.7 to 0.9	2.0 to 2.2	0.8 to 1.0
ERJ6G	1.0 to 1.4	3.2 to 3.8	0.9 to 1.4
ERJ8G	2.0 to 2.4	4.4 to 5.0	1.2 to 1.8
ERJ14	2.0 to 2.4	4.4 to 5.0	1.8 to 2.8
ERJ12	3.3 to 3.7	5.7 to 6.5	2.3 to 3.5
ERJ1W	3.6 to 4.0	7.6 to 8.6	2.3 to 3.5

Example



Features

- **High density**
2 resistors in 1.6 mm x 1.6 mm size (V4V)
4 resistors in 3.2 mm x 1.6 mm size (V8V),
4 resistors in 5.08 mm x 2.2 mm size (S8V),
- **Improvement of placement efficiency**
Placement efficiency of Chip Resistor Array is two or four times that of discrete chip resistors.
- **Automatic placement**
Taped and reeled packaging (EIA RS-481) is suitable for automatic placement machine.



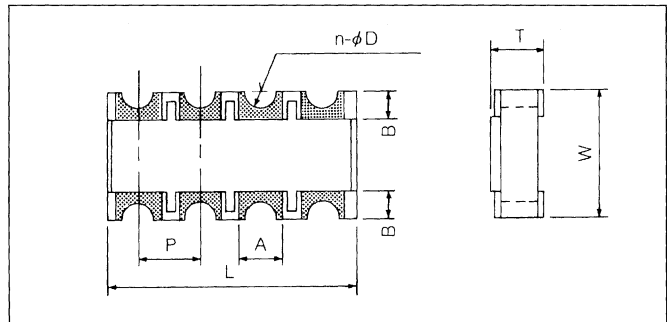
Series EXBV, S

Specifications

Item	Specifications	
Resistance Range	10 Ω to 1 MΩ: E24 series	
Resistance Tolerance	V	G: ±2 %, J: ±5 %
	S	G: ±2 %, J: ±5 %
Number of Pins	4V	4 terminal
	8V	8 terminal
Number of Resistors	4V	2 resistors
	8V	4 resistors
Power Rating at 70 °C	V	1/16 W/element
	S	1/10 W/element
Max. Rated Continuous Working Voltage *	V	50 V
	S	100 V
Max. Over-load Voltage	V	100V
	S	200 V
Temperature Characteristic Range	±200 ppm/ °C	
Operating Temperature Range	-55 °C to 125 °C	
Storage Temperature Range	-55 °C to 125 °C	

* Rated continuous working voltage (RCWV) shall be determined from $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Value}}$, or max. RCWV listed above, whichever is less.

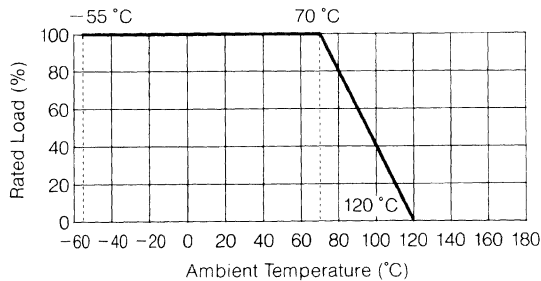
Dimensions in mm (not to scale)



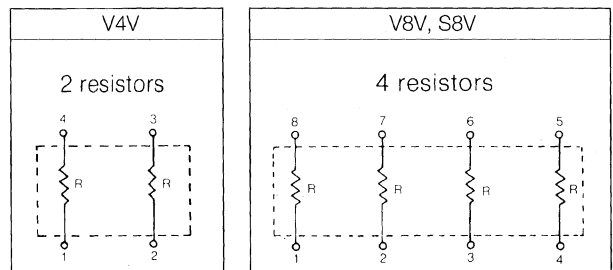
Code	n	L	W	T	
Dimensions (mm)	V4V	4	1.60 ^{+0.20} _{-0.10}	1.60 ^{+0.20} _{-0.10}	0.60±0.20
	V8V	8	3.20 ^{+0.30} _{-0.10}	1.60 ^{+0.30} _{-0.10}	0.60±0.20
	S8V	8	5.08 ^{+0.30} _{-0.10}	2.20 ^{+0.30} _{-0.10}	0.70±0.20

Code	A	B	φD	P
Dimensions (mm)	V4V	0.60±0.15	0.30±0.15	(0.3)
	V8V			
	S8V	0.80±0.15	0.50±0.15	(0.5)	1.27±0.20

Power Derating Curve



Isolated type



**Series EXB 2
Specifications**

Item	Specifications
Resistance Range	10 Ω to 1 MΩ, E24 Series
Resistance Tolerance	J: +5 %
Power Rating at 70 °C	1/16 W/element
Maximum RCWV	50V
Maximum Overload Voltage	100V

Dimensions in mm (not to scale)

Code	L	W	T	A
Dimensions (mm)	1.00±0.05	1.00±0.05	0.35±0.05	0.33±0.05

Code	B	C	D	P
Dimensions (mm)	0.15±0.10	0.25±0.05	0.34±0.05	0.65±0.10

Explanation of Part Number (EXB-2/S/V)

E	X	B	V	8	V	4	7	2	J	
Thick Film Resistor Networks			Chip Resistor Array	No. of terminals	Schematics	Resistance Value			Resistance tolerance	Suffix for Packaging
			2 2 Series V V Series S S Series	4 4 pins 8 8 pins	V Isolated type	The first two digits are significant figures of resistance value and the third one denotes the number of zeros following. Example 330 kΩ: 334			G ±2% J ±5%	Code Packaging
										Nil Embossed taping P Bulk V Paper taping

Performance Characteristics

Characteristics	Specifications	Test Methods
Thermal Shock	Resistance change shall be within ±(1%+0.05Ω).	5 cycles between -65 °C and +125 °C
Short-Time Overload	Resistance change shall be within ±(2.5%+0.05Ω)	5 seconds at 2.5 x rated working voltage
Resistance to Soldering Heat	Resistance change shall be within ±(1% + 0.05Ω) .	10.0±0.5 seconds, dipping in 270±5°C solder

Fixed Resistors Chip Resistor Array

Performance Characteristics (Continued)

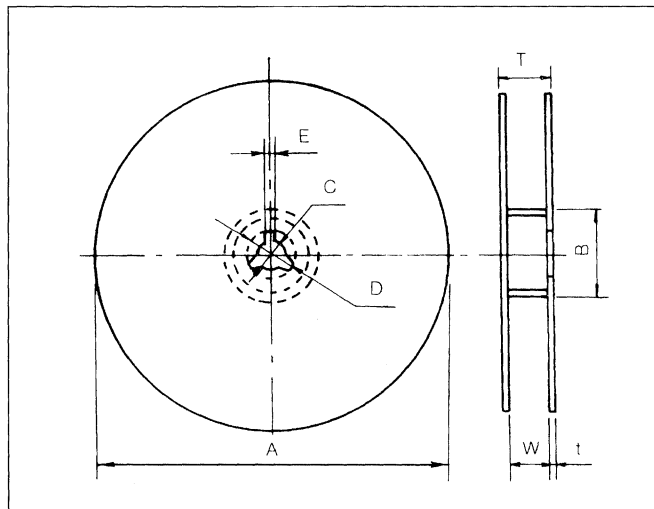
Load Life in Humidity	Resistance change shall be within $\pm(3\% + 0.05\ \Omega)$	1000 hours at 1/10 rated power, $65\pm 2\ ^\circ\text{C}$ and 90 to 95 % RH (1.5 hours ON, 0.5 hour OFF)
Load Life	Resistance change shall be within $\pm(3\%+0.05\ \Omega)$	1000 hours at rated power, $70\pm 2\ ^\circ\text{C}$ (1.5 hours ON, 0.5 hour OFF)
Solderability	95% coverage min.	Test temperature at solder: $230\pm 5\ ^\circ\text{C}$, Dwell time in solder: 3 ± 0.5 seconds

Packaging Specifications

Standard Packing Quantity

Type	Thickness	Paper Taping	Embossed Taping
EXB2	$0.35\pm 0.05\ \text{mm}$	10000 pcs./reel	—
EXBV	$0.6\pm 0.2\ \text{mm}$	5000 pcs./reel	—
EXBS	$0.7\pm 0.2\ \text{mm}$	—	2500 pcs./reel

Reel



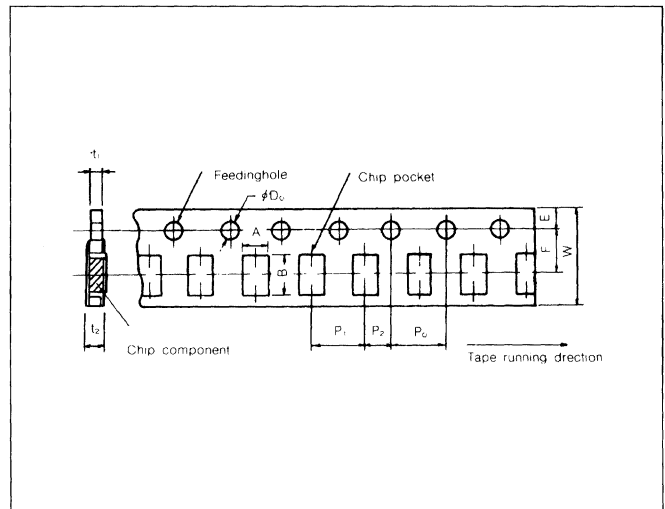
Code	ϕA	ϕB	ϕC	
Dimensions (mm)	2	178.0 ± 2.0	50 min.	13.0 ± 0.5

Code	W	T	t	
Dimensions (mm)	V	10.0 ± 1.0	12.0 ± 2.0	1.0 ± 0.5

Code	ϕA	ϕB	ϕC	
Dimensions (mm)	S	178 ± 2	50 min.	13.0 ± 0.5

Code	E	W	T	t	
Dimensions (mm)	S	2.0 ± 0.5	14 ± 1.5	20.5 max.	2.0

Taping



Paper Taping

Code	A	B	W	F	E	
Dimensions (mm)	24V	1.20 ± 0.05	1.20 ± 0.05	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10
	V4V	2.00 ± 0.15	2.00 ± 0.15			
	V8V	2.00 ± 0.15	3.60 ± 0.20			

Code	P_1	P_2	P_0	ϕD_0	t_1	t_2
Dimensions (mm)	24V	2.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	0.75 ± 0.05	0.79 ± 0.05
	V4V	2.00 ± 0.10	2.00	4.00 ± 0.10	0.75	0.79
	V8V	4.00		1.50 ± 0.10		

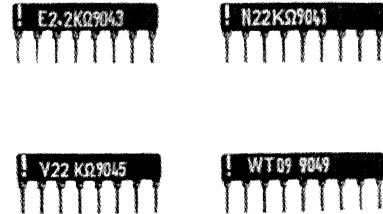
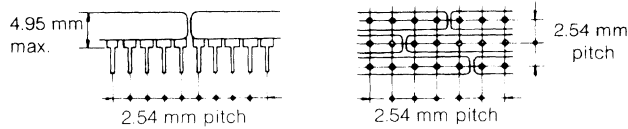
Embossed Taping

Code	A	B	W	F	E	P_0	
Dimensions (mm)	S8V	2.80 ± 0.20	5.70 ± 0.20	12.00 ± 0.30	5.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10

Code	P_1	P_2	ϕD_0	t_1	t_2	ϕD_1
Dimensions (mm)	S8V	4.00 ± 0.10	2.00 ± 0.05	1.50 ± 0.10	0.35 ± 0.05	max. 1.60 ± 0.10

Features

- **Highly stable thick film**
Equivalent to MIL-R-83401
- **Compact package**
A short body length which can be inserted onto PC board at 2.54 mm pitch sequentially.



- **Automatic SIP insertion capability**
Available for automatic insertion machine, packaged in either stick magazine or taped and box.
- **Low profile**
4.95 mm max. seated height.
- **Low TC.R.**
6200 ppm/°C (Standard), 6100 ppm/°C (Special)
TC. Tracking 50 ppm/°C typical.

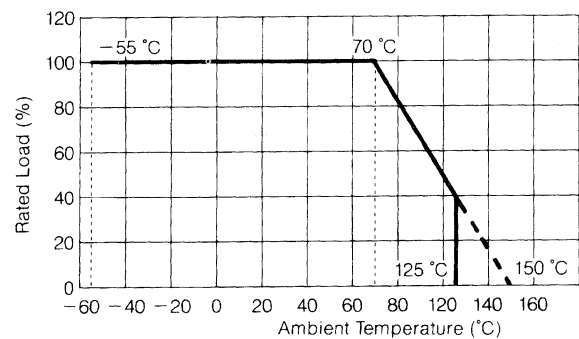
Specifications

		Common Terminal Circuit EXBF□E	Isolated Circuit EXBF□V	Series Circuit EXBF□N	Line Terminator EXBF□W
Number of Resistors		3 to 13	2 to 7	3 to 13	4 to 12
Power Rating at 70°C	Single Resistors	125 mW	200 mW	125 mW	125 mW
	Total Package	125 mW x (pins-1)			
Resistance Range		Standard: 22 Ω to 1 MΩ (Special: 10 Ω to 5.6 MΩ)			
Resistance Tolerance		F: ±1 %, G: ±2 %, J: ±5 % (±1 Ω min, for values 100 Ω and lower)			
Temperature Coefficient		±200 ppm/ °C (Special: ±100 ppm/ °C)			
TC Tracking		50 ppm/°C (Same resistance)			
Maximum Rated Continuous Working Voltage**		100 V			
Maximum Overload Voltage**		150 V			
Operating Temperature Range		-55 °C to +125 °C			

* Rated Continuous Working Voltage (RCWV) shall be determined from $RCWV = \sqrt{\text{Power rating} \times 3 \times \text{Resistance value}}$, or maximum RCWV listed above, whichever less.

** Maximum Overload Voltage shall be the same as the maximum test voltage short time overload test.

Power Derating Curve



Standard Circuits

□ : Number of Pins

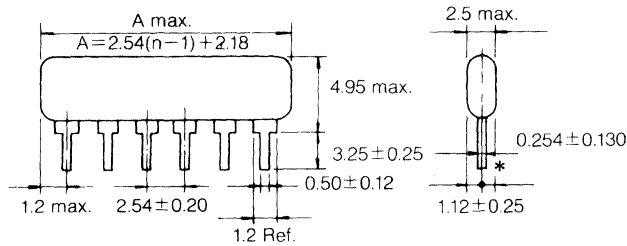
Circuits	Common Terminal Circuits			Isolated Circuit	Series Circuit
Part Numbers	EXBF□E	EXBF□C	EXBF□T	EXBF□V	EXBF□N
Circuit Configurations					
No. of Resistors	n-1	n-1	n-2	n/2	n-1

Explanation of Part Numbers

E
X
B
F
8
E
4
7
2
G
□

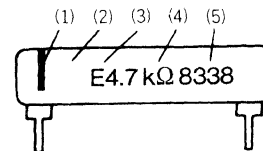
Common Code	Number of Pins	Circuit Configuration	Resistance Value	Resistance Tolerance	Suffix for Special Requirements
Low Profile	Code Pins	Code Type of Circuit	The first two digits are significant figures of resistance value and the third one denotes the number of zeros following.	Code Tol.	Example TCR 100 ppm: K Special marking : D Taped & boxed: Y Stick magazine: 5 to 8
F Series	4 4 pins 5 5 pins 6 6 pins 7 7 pins 9 9 pins 10 10 pins 11 11 pins 12 12 pins 13 13 pins 14 14 pins	E Common terminal V Isolated N Series W Line terminator C Center common T Both ends common		Example 330 Ω: 331 4.7 kΩ: 472 22kΩ: 223 100 kΩ: 104		F ±1% G ±2% J ±5%

Dimensions in mm (not to scale)



Part No.	Pins	Dimension A max.
EXBF4	4	9.80
EXBF5	5	12.34
EXBF6	6	14.88
EXBF7	7	17.42
EXBF8	8	19.96
EXBF9	9	22.50
EXBF10	10	25.04
EXBF11	11	27.58
EXBF12	12	30.12
EXBF13	13	32.66
EXBF14	14	35.20

Marking

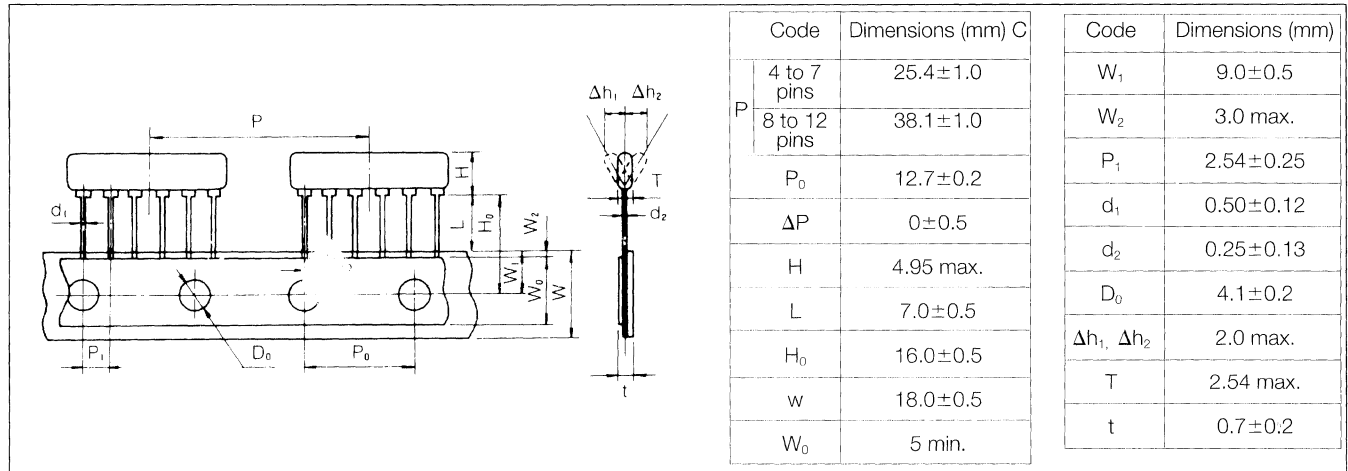


- (1) Bar identifying pin number 1, marking the difference below Operating Temperature Range
 - : ±1% (F) type
 - : ±2 % (G) type
 - : ±5 % (J) type
- (2) Manufacturers identification (Feasible 7-pin and longer)
- (3) The type of circuits

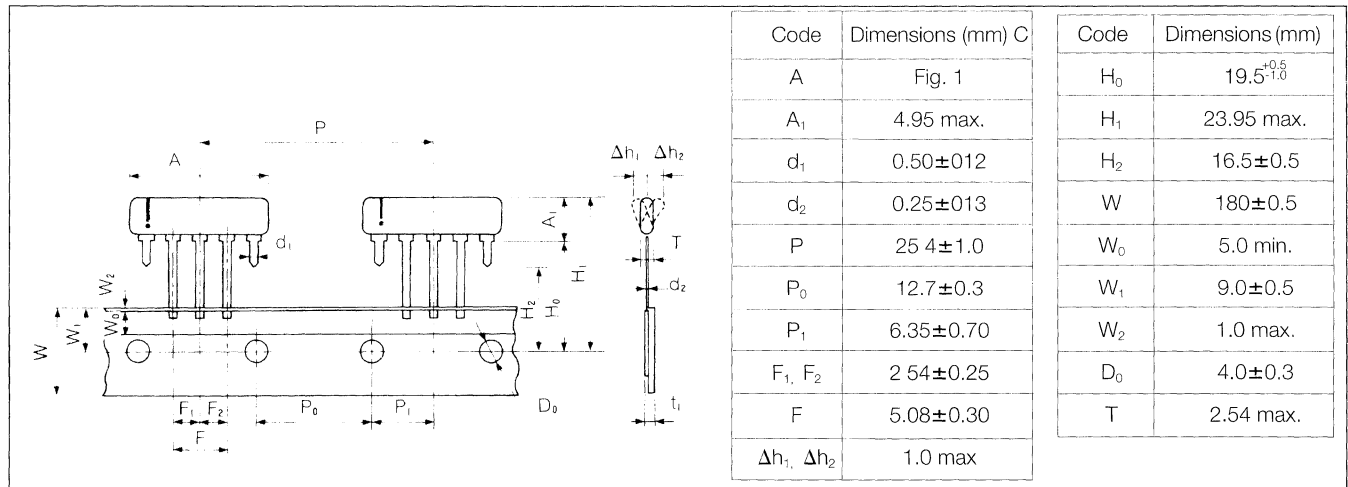
Code	Circuits
E	Common terminal
V	Isolated
N	Series
W	Line terminator
C	Center common
T	Both end common
- (4) Resistance value or custom designed number with three digits, or terminator code number
- (5) Lot number

Package Specifications

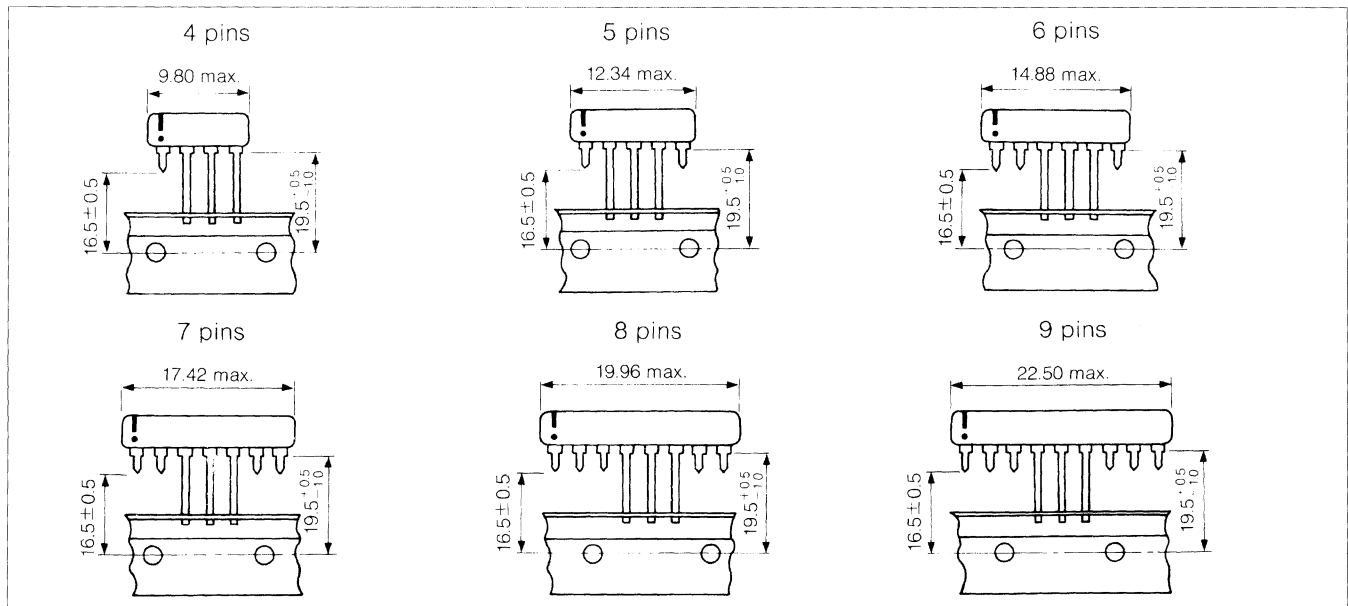
Taped & Box Type (Standard) (1000 pcs./box)



Taped & Box Type for Panasert RH (1000 pcs./box)

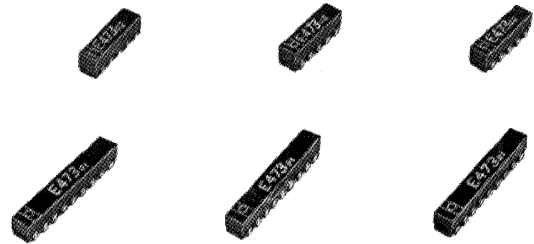


Pin Dimensions in mm (not to scale)



Features

- **Jumper function**
Possible to place two pass lines beneath body
- **High heat resistance**
Heat resistant to 270 °C for 1 minute or 350 °C for 3 seconds
- **High power**
Power rating is 1/16 W and 1/10 per resistor
- **Flexible lead terminals**
High reliability against bending, vibration and thermal shock to PC board
- **Space Saving**
70% vs. conventional SO package.
50% vs. discrete chip resistors.
- **Automatic mounting**
Uses existing chip mounters at a high mounting speed.

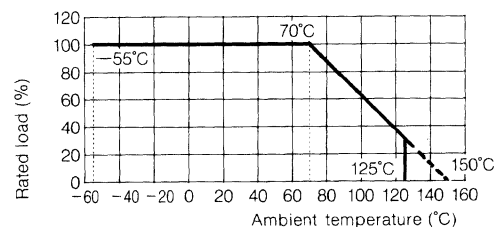


Specifications

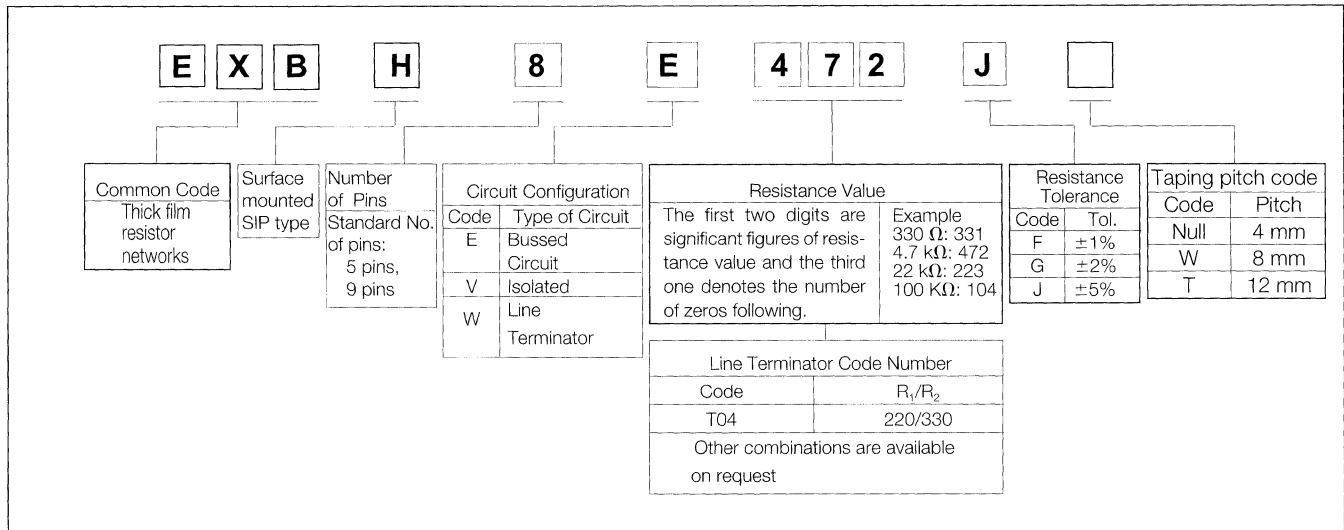
Specifications		Bussed Circuits EXBHTE	Isolated Circuit EXBHIV	Line Terminator EXBHIV
Number of Resistors		4 to 9 resistors	3 to 5 resistors	4, 6, 8 pairs of R ₁ /R ₂
Circuit Configuration				
Power Rating at 70 °C	/Resistors	1/16 W*	1/10 W	1/16 W
	/Package	1/16 W x (n-1) n: No. of pins		
Resistance Range		Standard: 22Ω to 1 MΩ (Non-standard resistance value is available on request.)		
Resistance Tolerance Temperature Coefficient		Standard J: ±5% ±200 ppm/°C Special F: ±1% ±100 ppm/°C		
TC Tracking		50 ppm/°C Same resistors in a package		
Maximum Rated Continuous Working Voltage**		25 V		
Maximum Overload Voltage***		50 V		
Operating Temperature Range		-55 °C to 125 °C		
Storage Temperature Range		-55 °C to 125 °C		

*Higher power type 1/10 W is available on request.
 **Rated Continuous Working Voltage (RCWV) shall be determined from RCWV=√Rated power x Resistance value, or max. RCWV listed above, whichever is less.
 ***Maximum pulse voltage means the peak of pulse voltage (duty ratio: less than 1/4), and shall be the same as the maximum test voltage of short-time overload test.

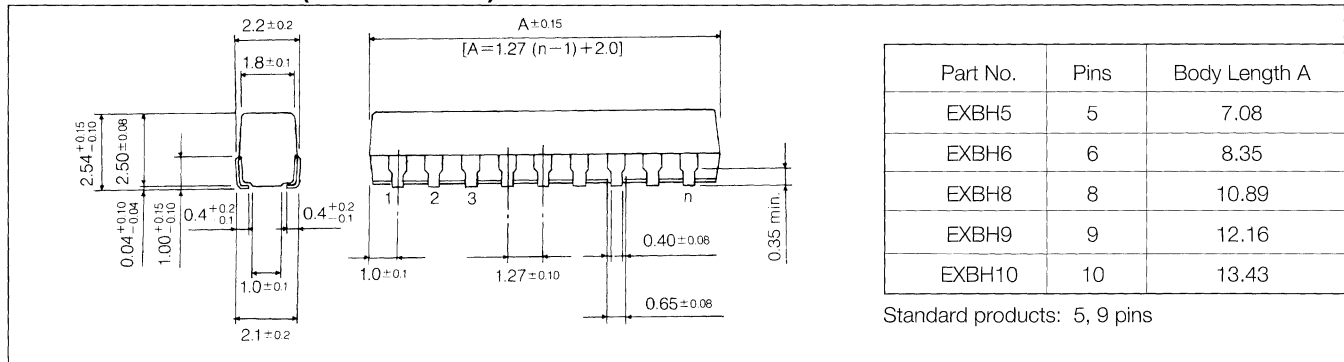
Power Derating Curve



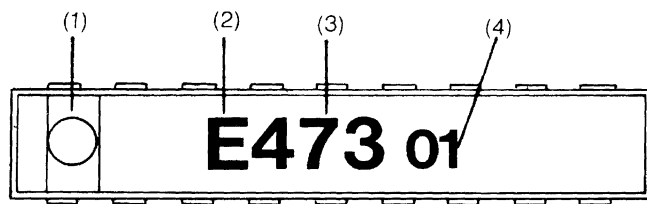
Explanation of Part Number



Dimensions in mm (not to scale)

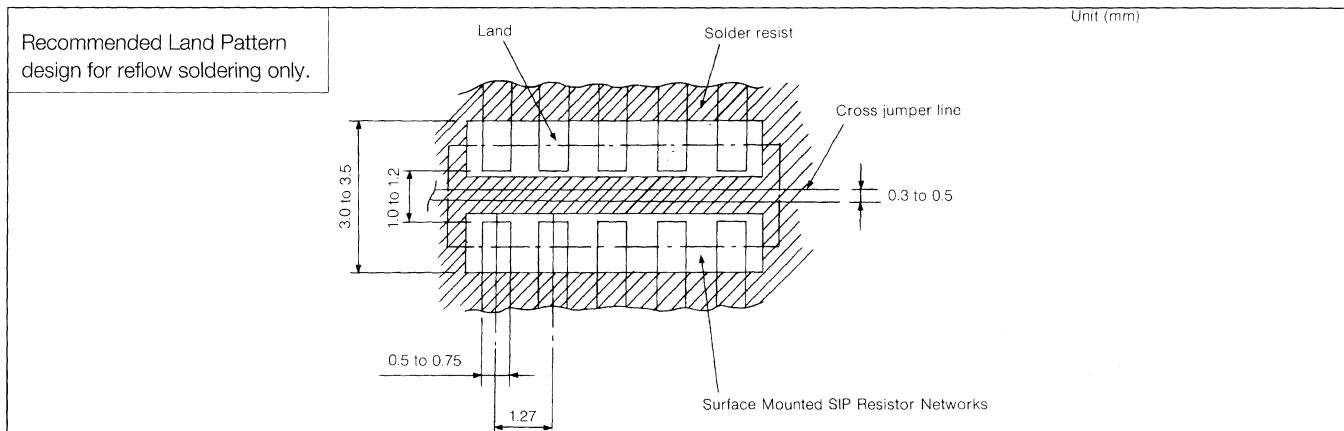


Marking



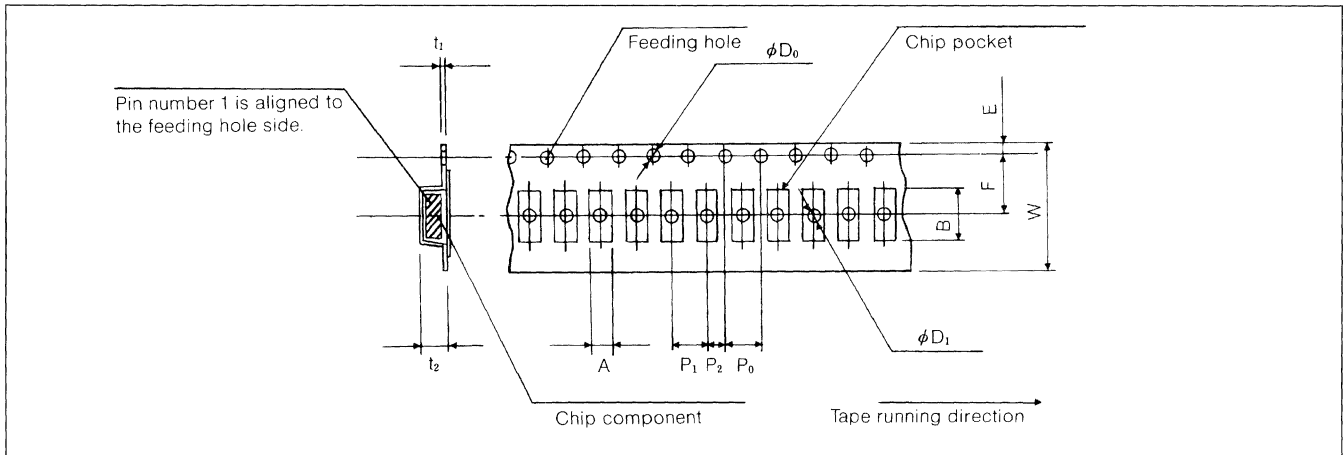
- (1) Bar mark with a dot for pin number 1
- (2) Type of circuits
- (3) Resistance value
The first two digits are significant figures of resistance value and the third one denotes the number of zeros.
- (4) Date code
Year-month

Code	Circuit configuration
E	Bussed circuit
V	Isolated circuit
W	Line terminator



Packaging Specifications

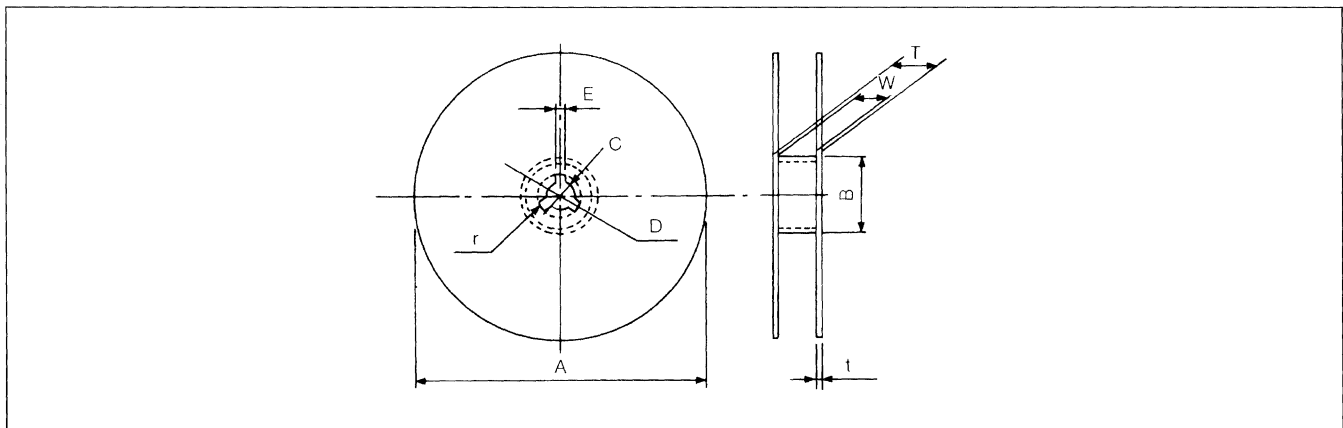
Embossed Taping (Standard packing quantity: 3000 pcs./reel)



Unit (mm)

Dimensions		B	A	W	F	E	P ₁	P ₂	P ₀	øD ₀	t ₁	t ₂	øD ₁
16 mm tape	EXBH5	7.48±0.20	2.4±0.2	16.0±0.3	7.5±0.1	1.75±0.1	4.0±0.1	2.0±0.1	4.0±0.1	1.5 ^{+0.1} ₀	0.3±0.1	3.2 ^{max.}	1.5 ^{min.}
	EXBH6	8.75±0.20											
24 mm tape	EXBH8	11.29±0.20	2.4±0.2	24.0±0.3	11.5±0.1	1.75±0.1	4.0±0.1	2.0±0.1	4.0±0.1	1.5 ^{+0.1} ₀	0.3±0.1	3.2 ^{max.}	1.5 ^{min.}
	EXBH9	12.56±0.20											
	EXBH10	13.83±0.20											

Reel



Unit (mm)

Tape width	øA	øB	C	D	E	W	T	t
16 mm	330.0±3.0	100.0±2.0	13.0±0.5	25.0±1.0	2.2±0.5	16.5±2.0	21.5±2.0	2.0±1.0
24 mm	330.0±3.0	100.0±2.0	13.0±0.5	25.0±1.0	2.2±0.5	24.5±2.0	29.5±2.0	2.0±1.0

Features

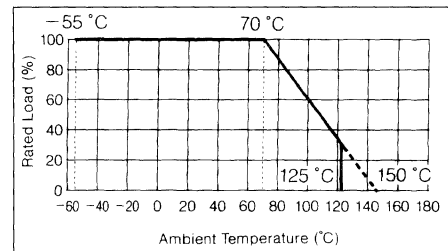
- **High density**
Maximum 28 resistors in one SOIC package
- **Low profile**
Maximum height: 2.2 mm
- **High reliability**
- **Solderable by flow Soldering**
Solderable in 270 °C flow soldering
- **Automatic placement**
Placement by same machine as for SOICs



Specifications

Characteristics	Specifications
Resistance Range	Standard 10Ω~1MΩ: E12 series
Resistance Tolerance	F: ±1%, G: ±2%, J: ±5%(±1Ω Min., Less than 99 Ω)
Number of Pins	16 pins (14 pins on request)
Number of Resistors	4~28 resistors/package
Power Rating	16 pins 500 mW/package (14 pins 430 mW/package)
Maximum Rated Continuous Working Voltage*	50 V
Maximum Overload Voltage	100 V
T. C. R.	Standard: ±200 ppm/°C (Special: ±100 ppm/°C)
Operating Temperature Range	-55°C~+125°C

Power Derating Curve

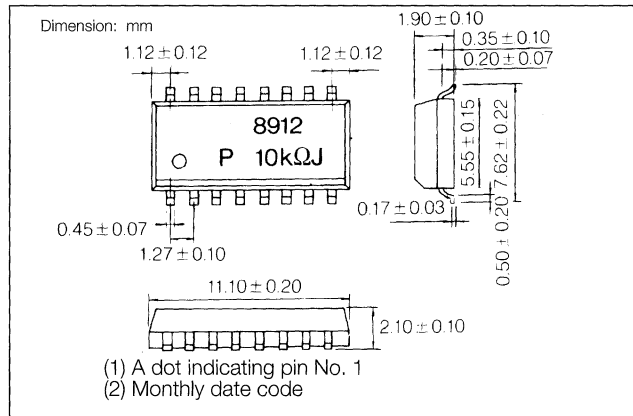


*Rated Continuous Working Voltage (RCWV) shall be RCWV=√ Power Rating Resistance Value, or max. RCWV listed, whichever is less.

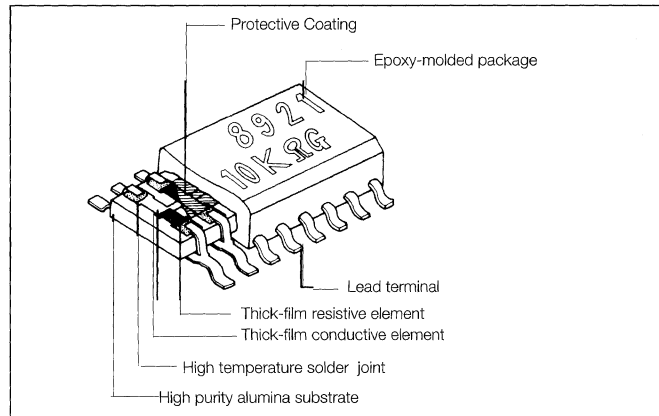
Standard Circuits

<p>Isolated Circuits...EXB M16V •1/16 w/resistor</p>	<p>Common Terminal Circuits...EXB M16P •1/32 W/resistor</p>	<p>Line Terminator (28 Res.)...EXB M16Y •1/32 W/resistor</p> <table border="1" style="float: right;"> <thead> <tr> <th>Code</th> <th>R₁/R₂</th> </tr> </thead> <tbody> <tr><td>T01</td><td>160/240</td></tr> <tr><td>T02</td><td>180/390</td></tr> <tr><td>T03</td><td>220/270</td></tr> <tr><td>T04</td><td>220/330</td></tr> <tr><td>T05</td><td>330/390</td></tr> <tr><td>T06</td><td>330/470</td></tr> <tr><td>T07</td><td>330/680</td></tr> <tr><td>T08</td><td>1.3k/3.3k</td></tr> <tr><td>T09</td><td>3k/6.2k</td></tr> </tbody> </table>	Code	R ₁ /R ₂	T01	160/240	T02	180/390	T03	220/270	T04	220/330	T05	330/390	T06	330/470	T07	330/680	T08	1.3k/3.3k	T09	3k/6.2k
Code	R ₁ /R ₂																					
T01	160/240																					
T02	180/390																					
T03	220/270																					
T04	220/330																					
T05	330/390																					
T06	330/470																					
T07	330/680																					
T08	1.3k/3.3k																					
T09	3k/6.2k																					

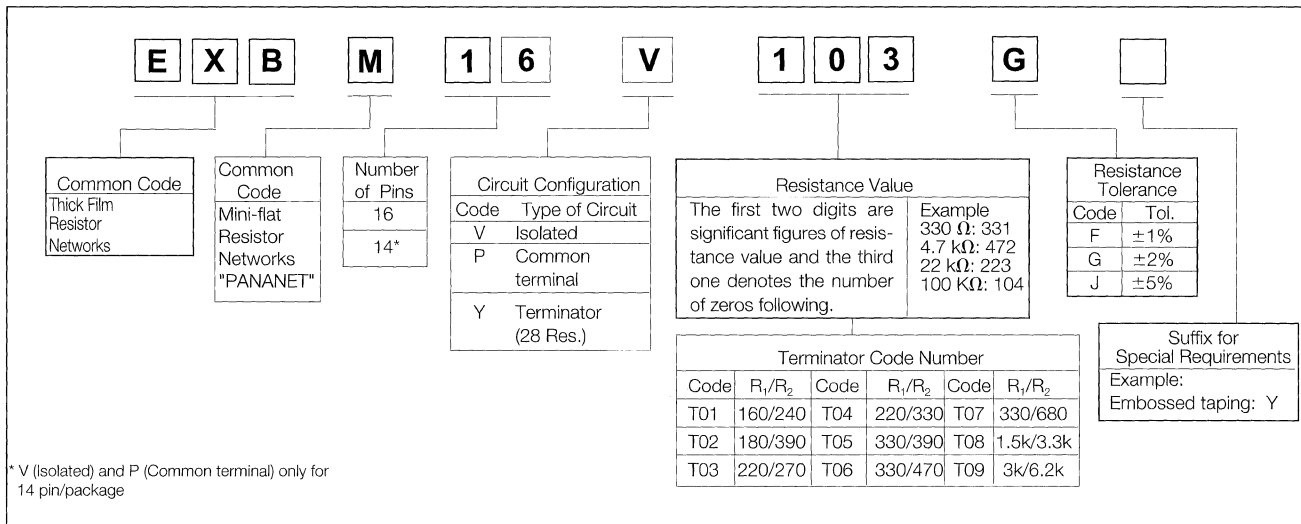
Dimensions in mm (not to scale)



Construction



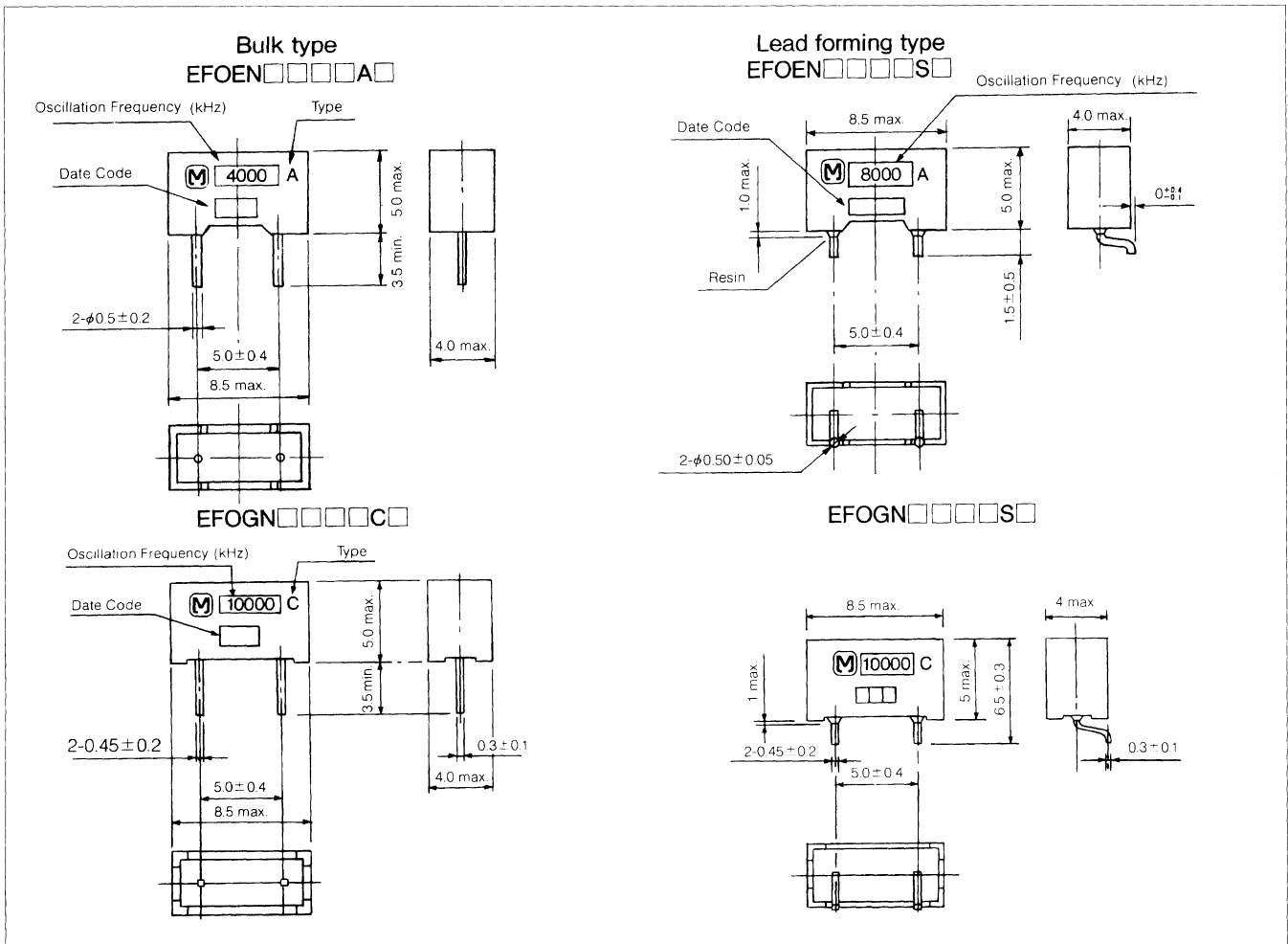
Explanation of Part Numbers



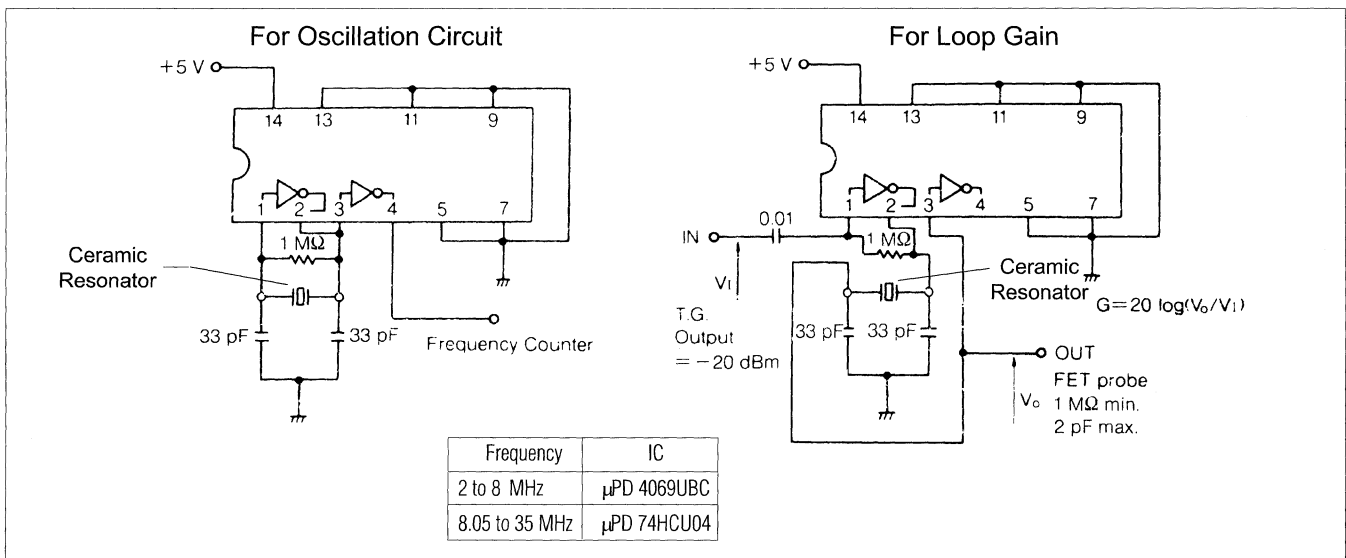
Performance Characteristics

Characteristics	Specifications	Test Methods
Thermal Shock	±(0.5% + 0.05 Ω) max.	5 cycles between -65 ⁰ °C and +125 ⁺³ °C
Short Time Overload	±(0.25% + 0.05 Ω) max.	5 seconds at 2.5 x rated working voltage (Do not exceed max. overload voltage)
Resistance to Soldering Heat	±(0.25% + 0.05 Ω) max.	10.0±0.5 seconds, dipping in 270±5 °C solder
Load Life in Humidity	±(0.5% + 0.05 Ω) max.	500 hours at 1/10 power rating, 65±2 °C and 90 to 95% relative humidity (1.5 hours ON, 0.5 hour OFF)
Load Life	±(1.0% + 0.05 Ω) max.	1000 hours at rated voltage, 70±2 °C (1.5 hours ON, 0.5 hour OFF)
Insulation Resistance	10000 MΩ min.	Measured at 100 V DC. between all pins and package
Dielectric Withstanding Voltage	No evidence of arcing or damage.	1 minute at 500 V DC between all pins and package (500 V/s)
Solderability	95% coverage	Test temperature of solder: 230±5 °C. Dwell time in solder: 3±0.5 s.
Vibration	±(0.25% + 0.05 Ω) max.	A single vibration having an amplitude of 1.52 mm for 2 hours in each X, Y, Z directions 20 minutes between 10 and 2000 Hz
Terminal Strength	±(0.25% + 0.05 Ω) max.	9.8 N (1.0 kgf) for 30±5 minutes

Dimensions in mm (not to scale)

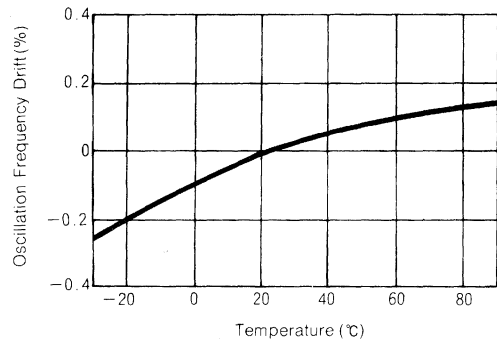


Test Circuit Diagram



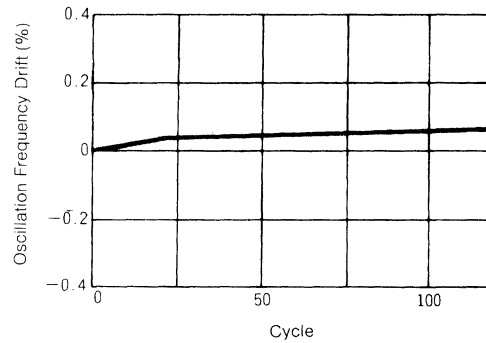
Typical Characteristics (EFOGN4004A4)

Temperature Characteristics

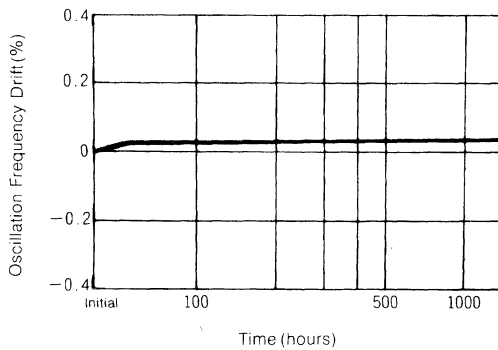


Temperature Cycle

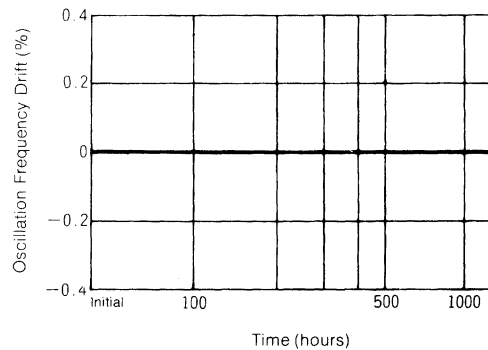
(-40°C: 30 minutes, room temp.: 5 minutes)
(+80°C: 30 minutes, room temp.: 5 minutes)



Dry Heat (80 °C)



Cold (-40 °C)



Dimensions for taping in mm (not to scale)

EFOEN□□□□T□
EFOGN□□□□T□

Symbol	Dimensions
P	12.7±1.0
P ₀	12.7±0.3
W	18.0±1.0
W ₀	6.0 min.
H ₀	18.5±0.5
φD ₀	φ4.0±0.2
F	5.0±0.4
t ₀	1.5 max.
Δh ₁ , Δh ₂	2.0 max.

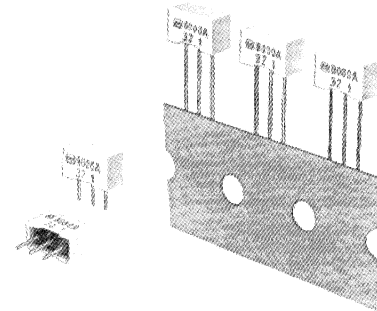
Symbol	Dimensions*
A	170
B	40
C	330

* Tolerance ±3 mm

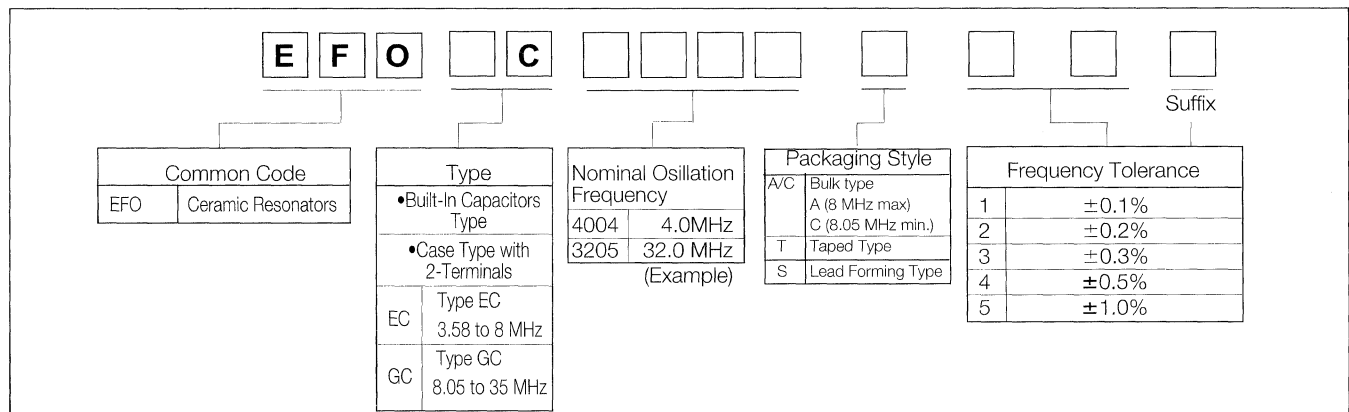
• Packing Quantity: 1000 pcs./box

Features

- Wide range of oscillation frequency: 3.58 to 35 MHz.
- No need of capacitors in oscillation circuit
- High accuracy, high stability
Initial frequency tolerance: 60.5 %
- Excellent temperature characteristics
frequency drift: 60.1% max. -10 to 60 °C
- Saves height on P.C.-board (Height: 5 mm max.)
- Taped version is available for automatic insertion.



Explanation of Part Numbers



Ratings and Characteristics

• Type EC

Part Number		Oscillation Frequency	Loop Gain (G)	Temperature Characteristics
Bulk Type	Taped Type			
EFOEC3584A4	EFOEC3584T4	3.58 MHz±0.5 %	10 dB min.	Maximum frequency drift: ±0.1% (-10 to 60°C)
EFOEC4004A4	EFOEC4004T4	4.00 MHz±0.5 %		
EFOEC4194A4	EFOEC4194T4	4.19 MHz±0.5 %		
EFOEC5004A4	EFOEC5004T4	5.00 MHz±0.5 %		
EFOEC6004A4	EFOEC6004T4	6.00 MHz±0.5 %		
EFOEC8004A4	EFOEC8004T4	8.00 MHz±0.5 %		

- Operating Temperature Range: -20 to 60°C
- Frequency Drift: 0.3 % max. / 10 years

Also other frequency tolerances are available; ±0.1, ±0.2, ±0.3 and ±1.0%.

• Type GC

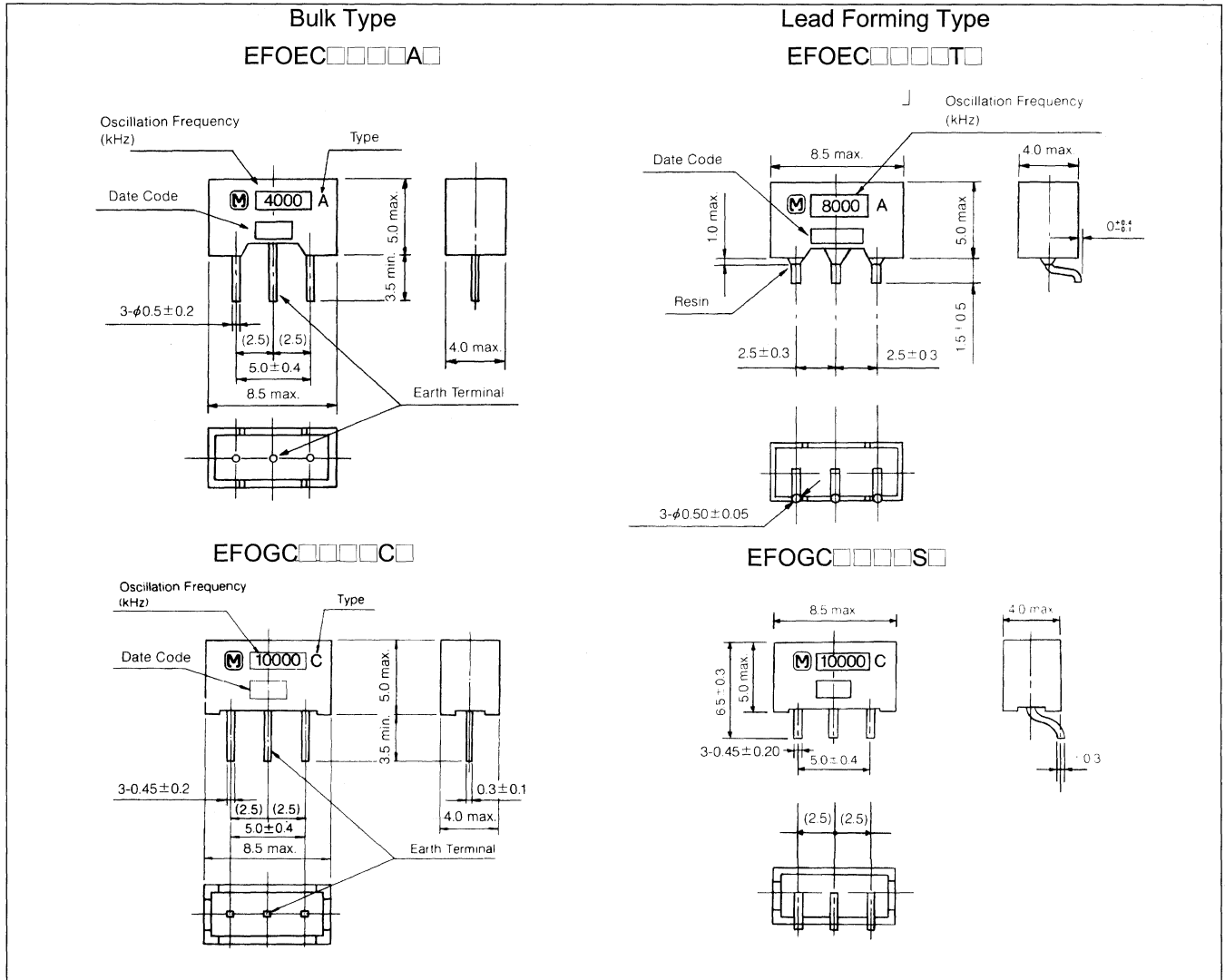
Part Number		Oscillation Frequency	Loop Gain (G)	Temperature Characteristics
Bulk Type	Taped Type			
EFOGC1005C4	EFOGC1005T4	10.0 MHz±0.5 %	6 dB min.	Maximum frequency drift: ±0.3% (-10 to 60°C)
EFOGC1205C4	EFOGC1205T4	12.0 MHz±0.5 %		
EFOGC1805C4	EFOGC1805T4	18.0 MHz±0.5 %		
EFOGC2505C4	EFOGC2505T4	25.0 MHz±0.5 %		
EFOGC3205C4	EFOGC3205T4	32.0 MHz±0.5 %		

- Operating Temperature Range: -20 to 60°C
- Frequency Drift: 0.3 % max. / 10 years

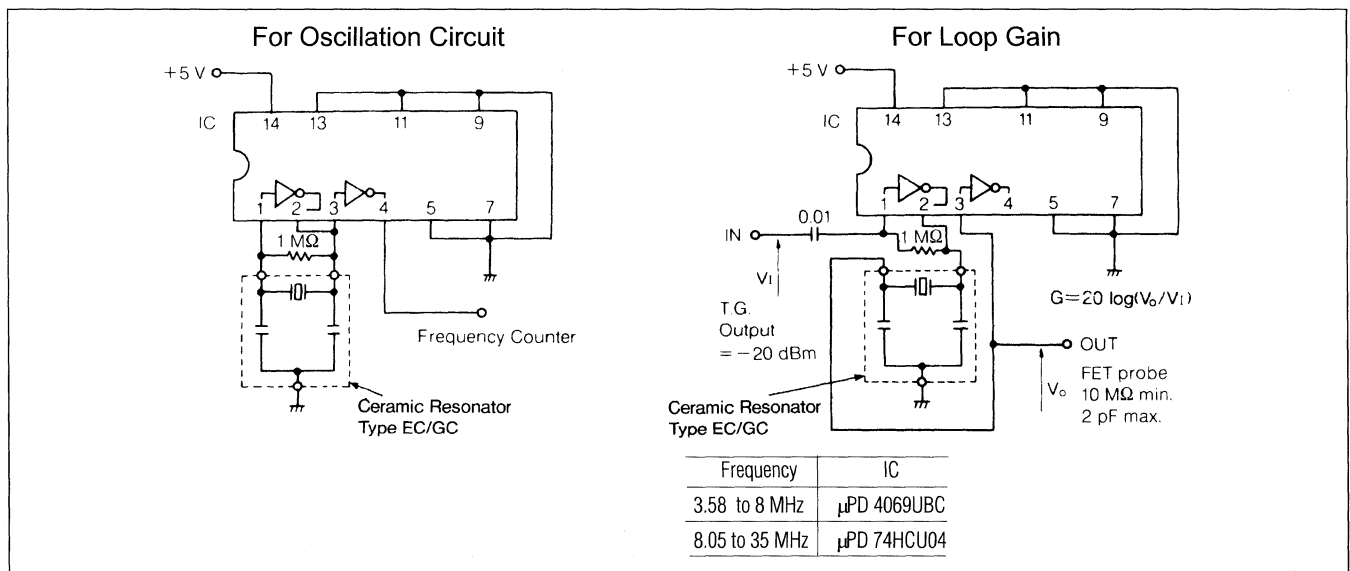
Also other frequency tolerances are available; ±0.1, ±0.2, ±0.3 and ±1.0%.

Dimensions in mm (not to scale)

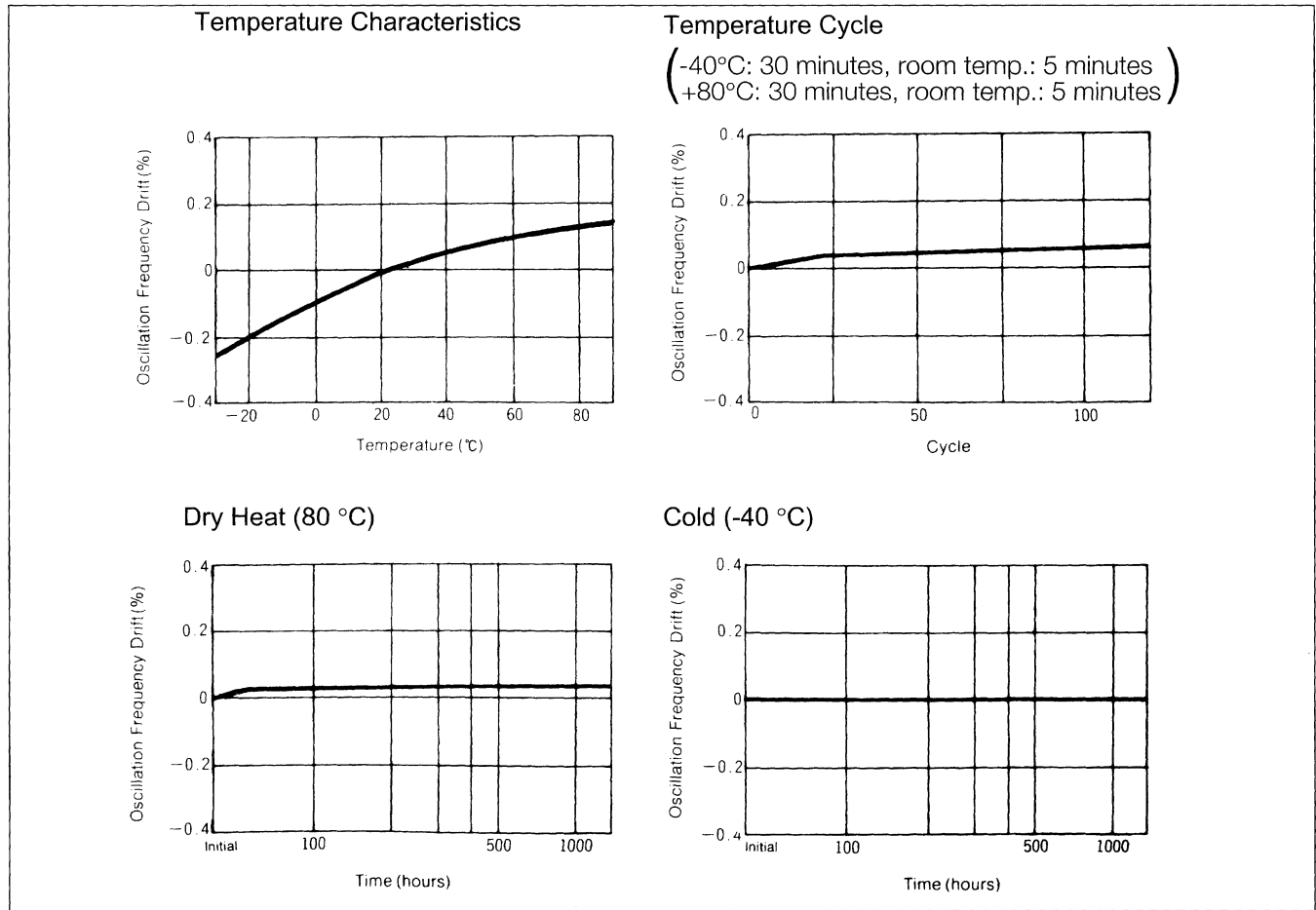
• Packing quantity: 4000 pcs./bag



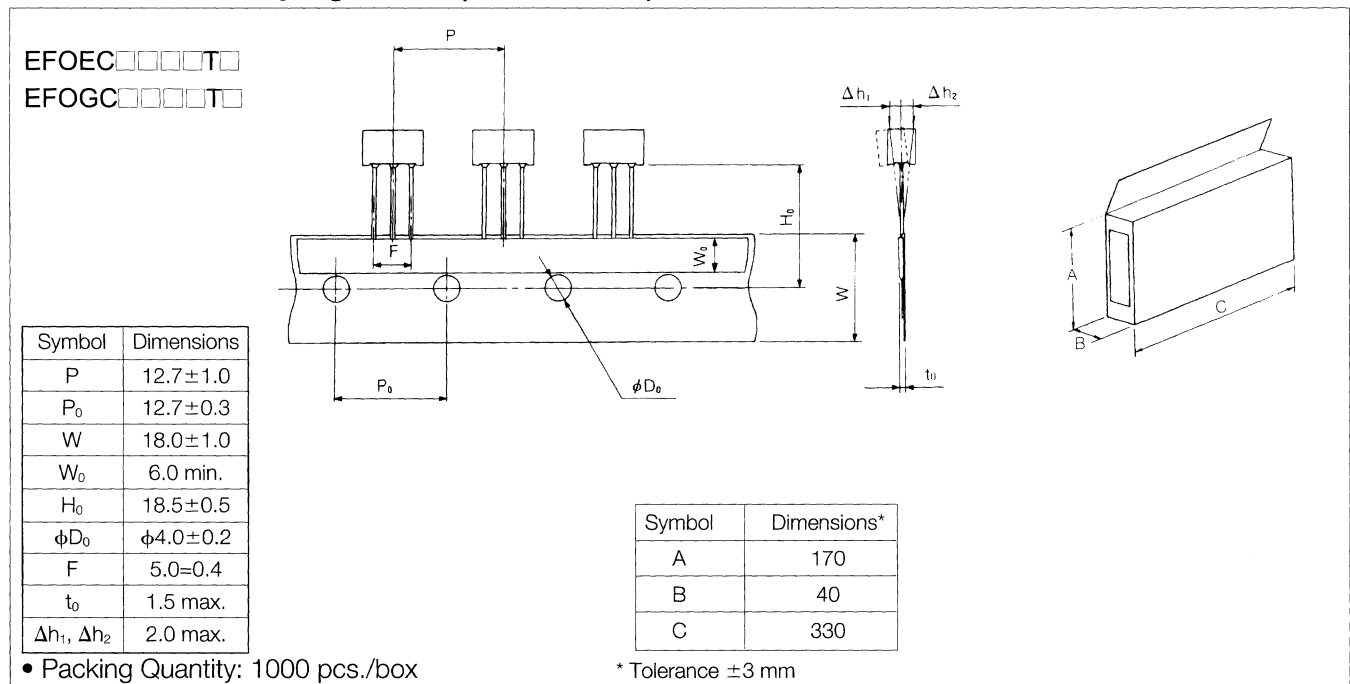
Test Circuit Diagram



Typical Characteristics (EFOGC4004A4)

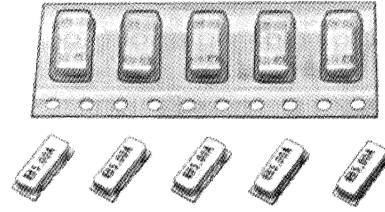


Dimensions for taping in mm (not to scale)

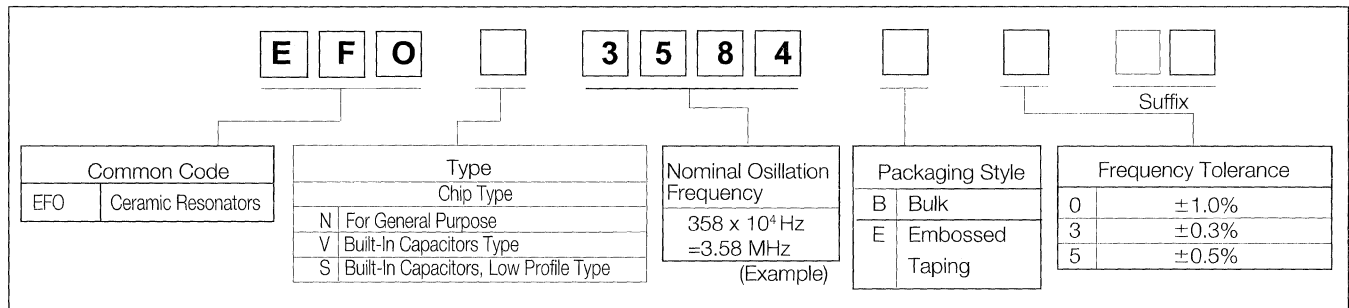


Features

- Constructed with ceramic package
- High reliability against soldering heat and mechanical stress
- Moisture-proof sealing
- Stable against solvent cleaning
- Designed for reflow soldering
- Flat-bottom plate for better mountings
- **[Type V and S] ("Built In Capacitors" Type)**
Contributes simplification of oscillation circuits and reduces the numbers of circuit parts
- **[Type S]**
Low Profile Type (1.8 mm maximum in thickness)



Explanation of Part Numbers



Ratings and Characteristics

Type N Ceramic Resonators, Chip Type (For General Purpose)

Part Number		Oscillation Frequency	Loop Gain (G)	Temperature Characteristics
Bulk Type	Embossed Taping Type			
EFON3584B5	EFON3584E5	3.58 MHz±0.5%	10 dB min.	Maximum frequency drift: ±0.3% (-20 to 80 °C)
EFON4004B5	EFON4004E5	4.00 MHz±0.5%		
EFON4194B5	EFON4194E5	4.19 MHz±0.5%		
EFON5004B5	EFON5004E5	5.00 MHz±0.5%		
EFON6004B5	EFON6004E5	6.00 MHz±0.5%		
EFON8004B5	EFON8004E5	8.00 MHz±0.5%		

Type V ("Built-In Capacitors" Type)

Part Number		Oscillation Frequency	Loop Gain (G)	Temperature Characteristics
Bulk Type	Embossed Taping Type			
EFOV3584B5	EFOV3854E5	3.58 MHz±0.5%	10 dB min.	Maximum frequency drift: ±0.1% (-10 to 60 °C)
EFOV4004B5	EFOV4004E5	4.00 MHz±0.5%		
EFOV4194B5	EFOV4194E5	4.19 MHz±0.5%		
EFOV5004B5	EFOV5004E5	5.00 MHz±0.5%		
EFOV8004B5	EFOV8004E5	8.00 MHz±0.5%		

Type S (Built-In Capacitors, Low Profile Type)

Part Number		Oscillation Frequency	Loop Gain (G)	Temperature Characteristics
Bulk Type	Embossed Taping Type			
EFOS3584B5	EFOS3584E5	3.58 MHz±0.5%	10 dB min.	Maximum frequency drift: ±0.1% (-10 to 60 °C)
EFOS4004B5	EFOS4004E5	4.00 MHz±0.5%		
EFOS4194B5	EFOS4194E5	4.19 MHz±0.5%		
EFOS5004B5	EFOS5004E5	5.00 MHz±0.5%		
EFOS8004B5	EFOS8004E5	8.00 MHz±0.5%		

• Operating Temperature Range: -20 to 80 °C
 Note: Also available are types other than above standard products in the frequency range of 3.58 to 8 MHz..
 Please contact us for more information.

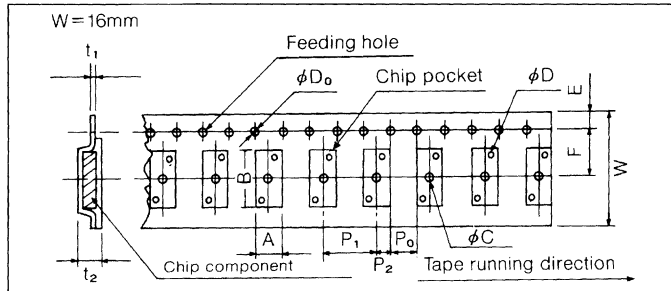
Packaging Specifications

Supplied in bulk or taped & reel packing style

Standard Packing Quantity

Style	Embossed Taping	Bulk
Quantity	2500 pcs./reel	500 pcs./bag

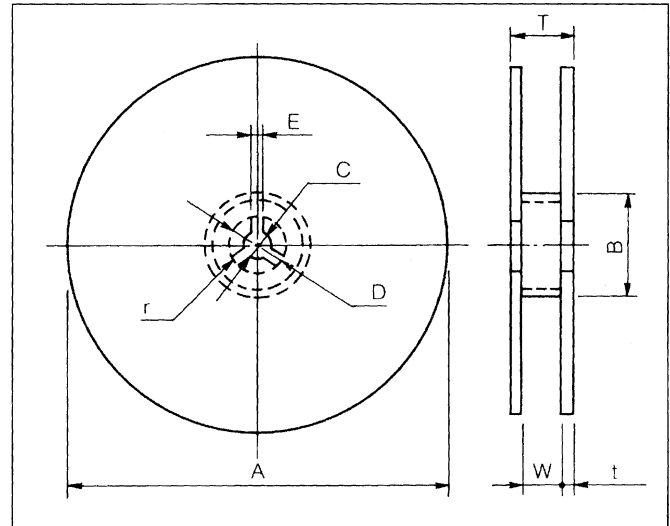
Embossed Taping



Symbol	A	B	W	F	E	P ₁
Dim. (mm)	3.7	8.2	16.0±0.3	7.5±0.1	1.75±0.10	8.0±0.1

Symbol	P ₂	P ₀	øD ₀	t ₁	t ₂	øC	øD
Dim. (mm)	2.0±0.1	4.0±0.1	1.5 ^{+0.1} ₀	0.3	3.5 max.	1.55	1.0

Reel



Symbol	øA	øB	C	D	E
Dim. (mm)	330	50 min.	13.0±0.5	21.0±0.8	2.0±0.2

Symbol	W	T	t	r
Dim. (mm)	16.4°	22.4 max.	3 max.	1.0

Application Notes

•Oscillation Frequency

Please note that the oscillation frequency may drift depending on the IC used, the type of microprocessor and the manufacturer. Please contact us in the event of difficulties.

•Shock Resistance

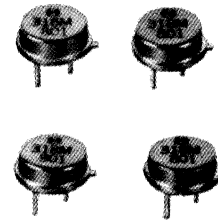
This ceramic resonator is so designed as to endure shocks applied when it is dropped onto a wooden plate from a height of 1 m. However, please note that the ceramic element, etc. may be damaged, if the ceramic resonator is dealt more severe shocks. Special care shall, therefore, be taken in handling it.

•Soldering Conditions

Reflow soldering shall be done at 220 °C for less than 10 seconds, and peak temperature of 240 °C. (Remark) flow soldering method and dip soldering method shall not be applied.



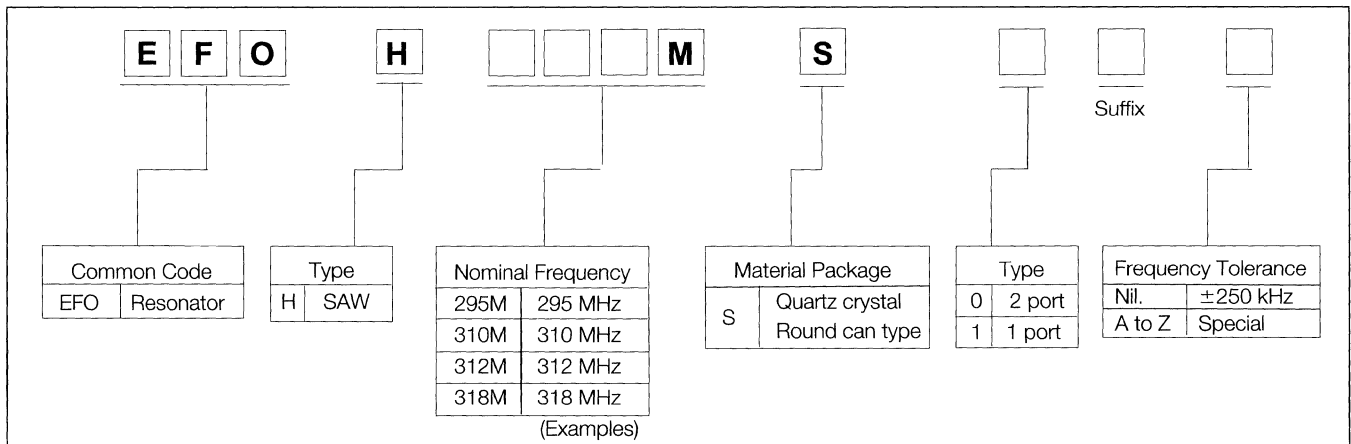
UHF SAW Resonator is capable of fundamental wave oscillation, and it is particularly suited for simplification, size reduction and stabilization of the circuit, compared with conventional LC oscillation and quartz crystal oscillation.



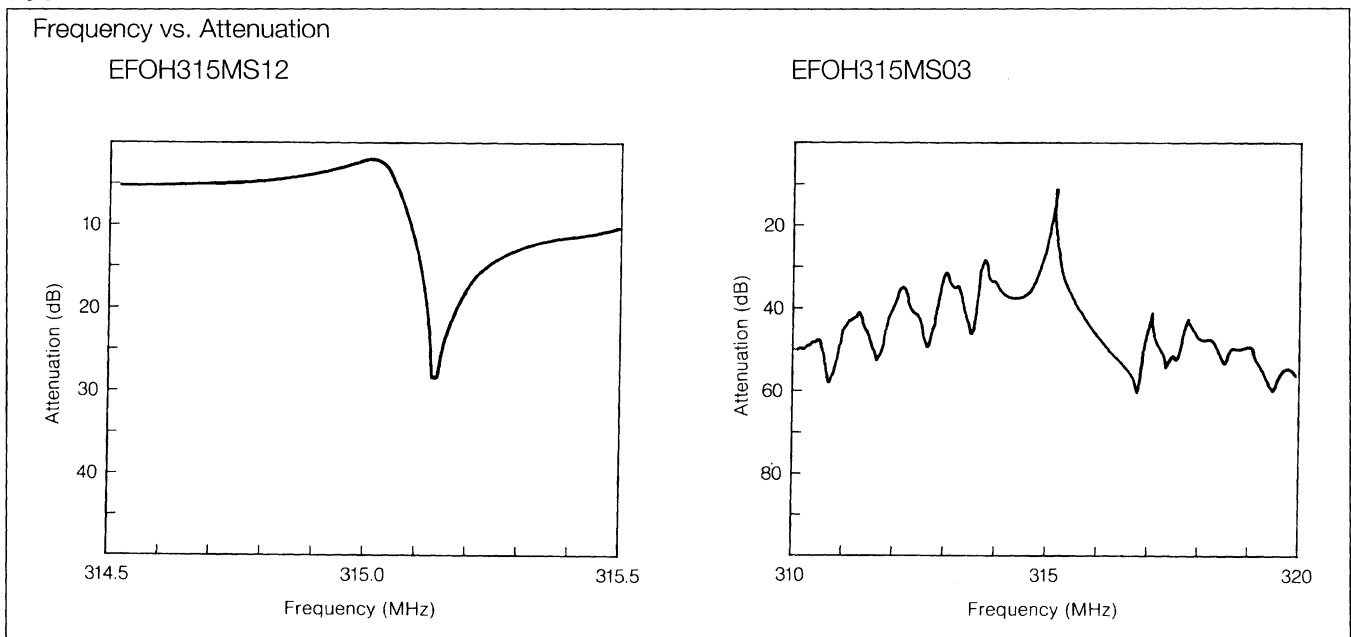
Features

- Capable of fundamental oscillation.
- Superior temperature characteristics.
- Suited for circuit simplification, size reduction and stabilization.
- Wide frequency range: 200 to 700MHz (Available for requested frequency)

Explanation of Part Numbers



Typical Characteristics



**Ratings and Characteristics
(2 port type)**

Item Part No.	Center Frequency (MHz)	Insertion Loss (dB)	Loaded Q	Capacitance (pF)	Temperature Characteristics
EFOH224MS03	224.50±0.25	15 max.	7000 min.	1.3±0.3	Maximum Frequency Drift: -150 to 50 ppm/°C (-20 to 80°C)
EFOH295MS03	295.50±0.25				
EFOH304MS03	303.875±0.250				
EFOH310MS03	310.00±0.25				
EFOH312MS03	312.00±0.25				
EFOH315MS03	315.00±0.25		5000 min.		
EFOH318MS03	318.00±0.25				
EFOH407MS03	407.00±0.25				
EFOH418MS03	418.00±0.25				
EFOH434MS03	433.92±0.25				
EFOH458MS03	458.00±0.25				

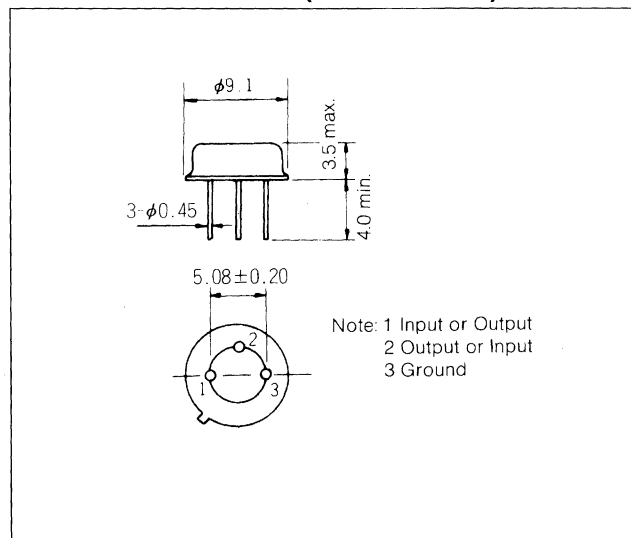
- Operating Temperature Range: - 20 to 80°C
- Phase shift: 180°

(1 port type)

Item Part No.	Resonant Frequency (MHz)	Resonant Resistance (Ω)	Capacitance (pF)	Temperature Characteristics
EFOH224MS12	224.50±0.25	30 max.	2.0+0.5	Maximum Frequency Drift: -150 to 50 ppm (-20 to 80°C)
EFOH304MS12	303.875±0.250			
EFOH312MS12	312.00±0.25			
EFOH315MS12	315.00±0.25			
EFOH318MS12	318.00±0.25			
EFOH418MS12	418.00±0.25			
EFOH434MS12	433.92±0.25			

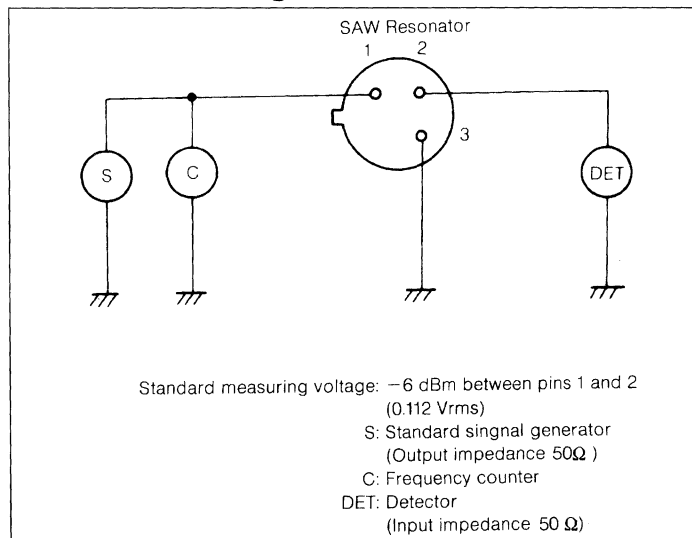
- Operating Temperature Range: -20 to 80°C

Dimensions in mm (not to scale)



Notes •Also available are types other than above standard products in the frequency range of 200 to 700 MHz.

Test Circuit Diagram



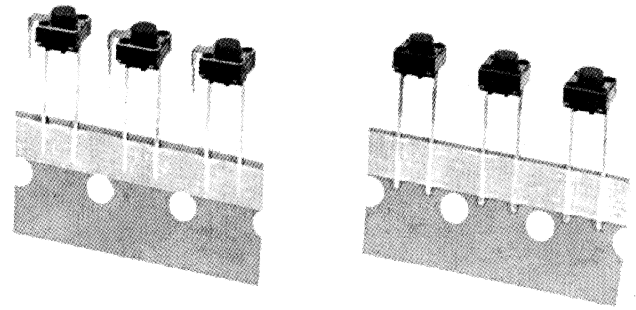
•Other frequency tolerances are available.
Please contact us.

Performance Characteristics (UHF SAW Resonators)

Characteristics		Test Methods	Specifications													
Mechanical	Shock	Specimen shall be dropped 10 times onto a wooden board from height of 1 m.	(Change after the test shall be within the following range) [2 port type] [1 port type] •Center Frequency: •Resonant Frequency: ±100 ppm max. ±100 ppm max. • Insertion Loss: •Resonant Resistance: ±2 dB max. ±5Ω max.													
	Vibration	The specified single harmonic vibration shall be applied to the specimen to each of three perpendicular direction for 1 hour (for totals of 3 hours). •Amplitude:0.75 mm/single, (1.5 mm/double) •Sweep frequency and its interval: 10 Hz-55 Hz-10 Hz with duration of 1 minute														
	Resistance to Soldering Heat	Lead wires of the specimen shall be immersed up to 3 mm from its neck for 5 seconds in a solder bath of 350±5°C														
	Robustness of Terminations (Tensile)	Specimen shall be secured by the body, and the specified force of 10 N(1.02 kgf) shall be applied for 10 seconds in the axial direction of lead wires.														
Environmental	Damp Heat (Steady State)	Specimen shall be subjected to in an ambient of 60±2°C and 90 to 95 %RH for 500 hours and be stored at room temperature for 1 hour before the specified measurements.	(Change after the test shall be within the following range) [2 port type] [1 port type] •Center Frequency: •Resonant Frequency: ±100 ppm max. ±100 ppm max. •Insertion Loss: •Resonant Resistance: ±2 dB max. ±5 Ω max.													
	Dry Heat	Specimen shall be subjected to in an ambient of 85±2C for 500 hours and be stored at room temperature for 1 hour before the specified measurements.														
	Cold	Specimen shall be subjected to in an ambient of -40±3C for 500 hours and be stored at room temperature for 1 hour before the specified measurements.														
	Temperature Cycle	The specified temperature cycles following shall be repeated 100 times, and be stored at room temperature for 1 hour before the specified measurements. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Period</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-20±3°C</td> <td>30 minutes</td> </tr> <tr> <td>2</td> <td>Room Temp.</td> <td>2 to 3 minutes</td> </tr> <tr> <td>3</td> <td>80±2°C</td> <td>30 minutes</td> </tr> <tr> <td>4</td> <td>Room Temp.</td> <td>2 to 3 minutes</td> </tr> </tbody> </table>		Step	Temperature	Period	1	-20±3°C	30 minutes	2	Room Temp.	2 to 3 minutes	3	80±2°C	30 minutes	4
Step	Temperature	Period														
1	-20±3°C	30 minutes														
2	Room Temp.	2 to 3 minutes														
3	80±2°C	30 minutes														
4	Room Temp.	2 to 3 minutes														

Features

- 6x6 mm, body thickness 3.2 mm
- Push stroke 0.25 mm, clear click feeling
- Wide selection with or without ground terminal, lay-down or stand-up type with snap-in terminals
- Wave soldering applicable



Specifications

		Snap action/Push-ON type SPST	
Switch Part	Circuit Diagram		
	Power Rating	20 mA 15 VDC	
Electrical	Contact Resistance	100 mΩ max.	
	Insulation Resistance	50 MΩ min. (100 VDC)	
	Dielectric Withstanding Voltage	250 VAC for 1 minute	
	Bouncing	3ms max. (ON), 10 ms max. (OFF)	
Mechanical	Operating Force	1.0±0.4 N (100±40 gf) 1.3±0.4 N (130±40 gf) 1.6±0.5 N (160±50 gf) 2.6±0.6 N (260±60 gf) (available)	
	Push Stroke	0.25±0.1 mm	
Endurance	Operating Life	100000 min.	
	Operating Temperature	-20 to + 70 °C	

Explanation of Part Numbers

<table border="1"> <tr> <td style="padding: 5px;">E</td> <td style="padding: 5px;">V</td> <td style="padding: 5px;">Q</td> </tr> </table>	E	V	Q	<table border="1"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>				<table border="1"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>			<table border="1"> <tr> <td style="width: 20px; height: 20px;"></td> </tr> </table>																			
E	V	Q																												
<table border="1"> <tr> <th>4th•5th</th> <th>Type</th> </tr> <tr> <td>P□</td> <td>5N Type</td> </tr> <tr> <td>Numeral</td> <td>5N Radial Taping</td> </tr> </table>	4th•5th	Type	P□	5N Type	Numeral	5N Radial Taping	<table border="1"> <tr> <th>7th•8th</th> <th>Height</th> </tr> <tr> <td>04</td> <td>4.3 mm (5 mm Type: 4.0 mm)</td> </tr> <tr> <td>05</td> <td>5.0 mm</td> </tr> <tr> <td>07</td> <td>7.0 mm</td> </tr> <tr> <td>09</td> <td>9.5 mm</td> </tr> </table>	7th•8th	Height	04	4.3 mm (5 mm Type: 4.0 mm)	05	5.0 mm	07	7.0 mm	09	9.5 mm	<table border="1"> <tr> <th>9th</th> <th>Knob color</th> </tr> <tr> <td>B</td> <td>Blue</td> </tr> <tr> <td>M, W</td> <td>White</td> </tr> <tr> <td>K</td> <td>Black</td> </tr> <tr> <td>R</td> <td>Red</td> </tr> <tr> <td>Q</td> <td>Gray</td> </tr> </table>	9th	Knob color	B	Blue	M, W	White	K	Black	R	Red	Q	Gray
4th•5th	Type																													
P□	5N Type																													
Numeral	5N Radial Taping																													
7th•8th	Height																													
04	4.3 mm (5 mm Type: 4.0 mm)																													
05	5.0 mm																													
07	7.0 mm																													
09	9.5 mm																													
9th	Knob color																													
B	Blue																													
M, W	White																													
K	Black																													
R	Red																													
Q	Gray																													


Packaging Specifications

Product Item	Part Numbers	Minimum Packaging & Ordering Quantity (pcs)
5N Type Light Touch Switches (Radial Taping)	EVQ213/214/215 EVQ233/234/235	1000
5 mm/5N Type Light Touch Switches (Bulk packaging)	Lay-down H=5 mm max.	20000
	Others	10000

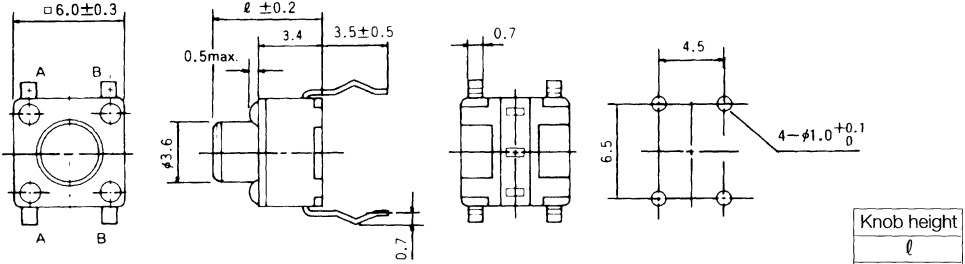
Dimensions in mm (not to scale)

No. 1

Without ground terminal



PWB piercing plan (pitch ± 0.1)




Knob height	
ℓ	
4.3	
5	
7	
9.5	

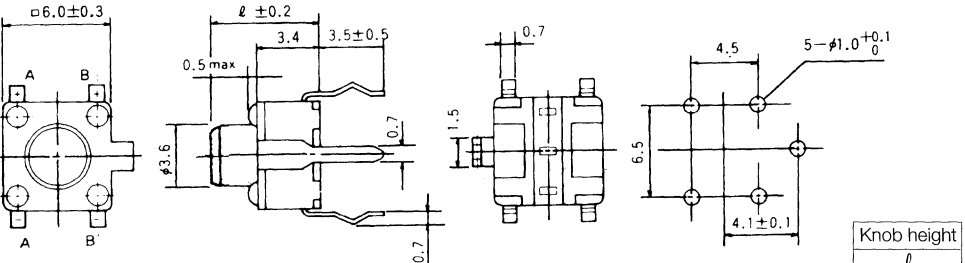
EVQ PAC

No. 2

With ground terminal



PWB piercing plan (pitch ± 0.1)




Knob height	
ℓ	
4.3	
5	
7	
9.5	

EVQ PBC

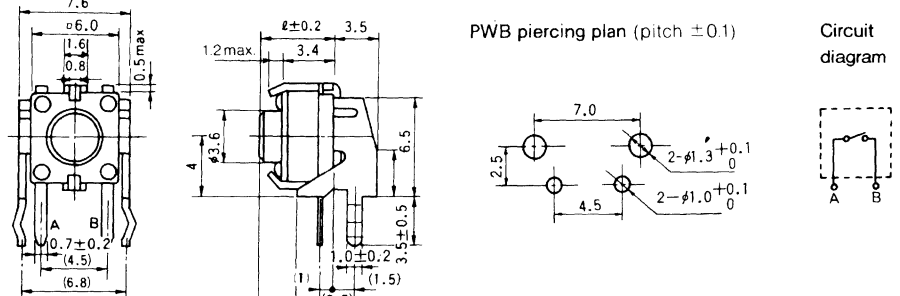
No. 3

Stand-up type



PWB piercing plan (pitch ± 0.1)

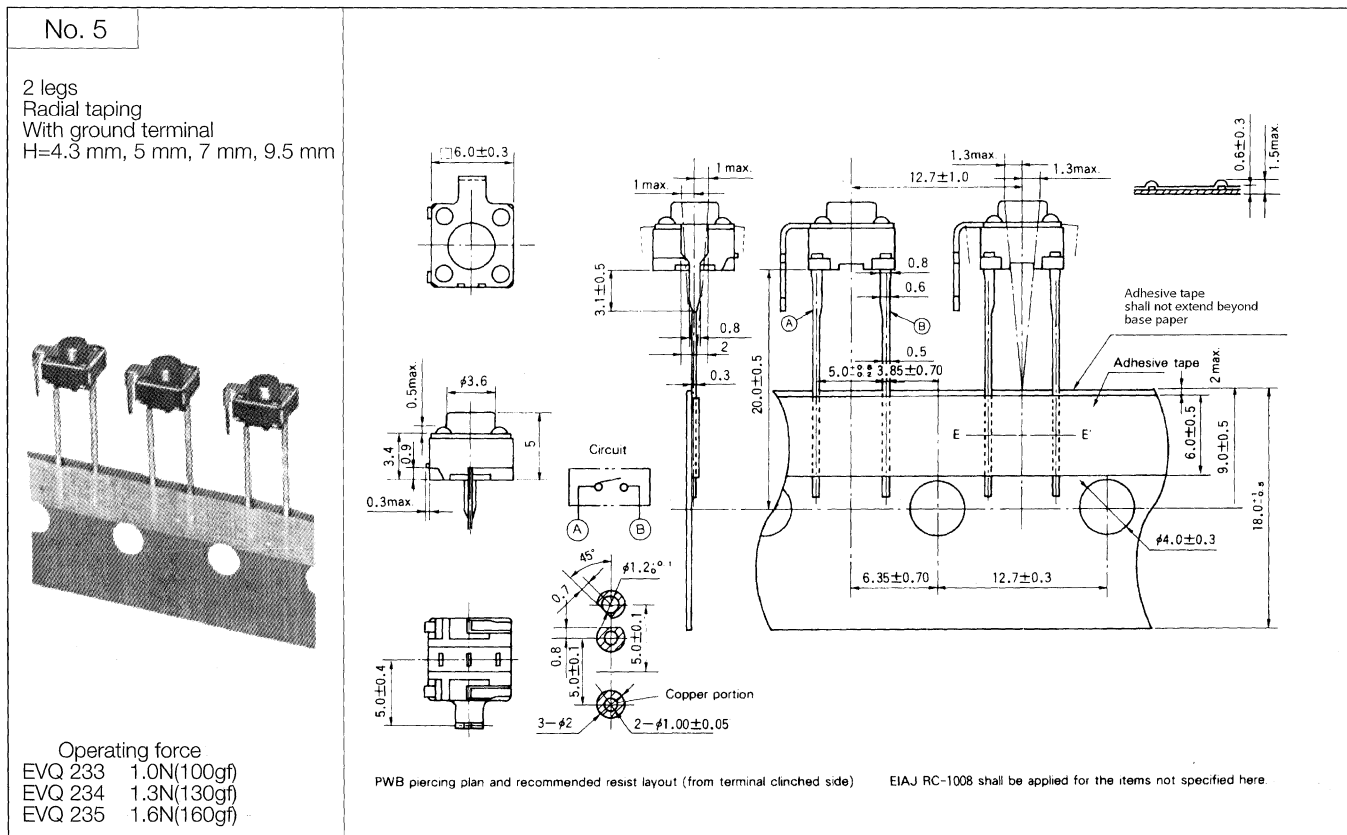
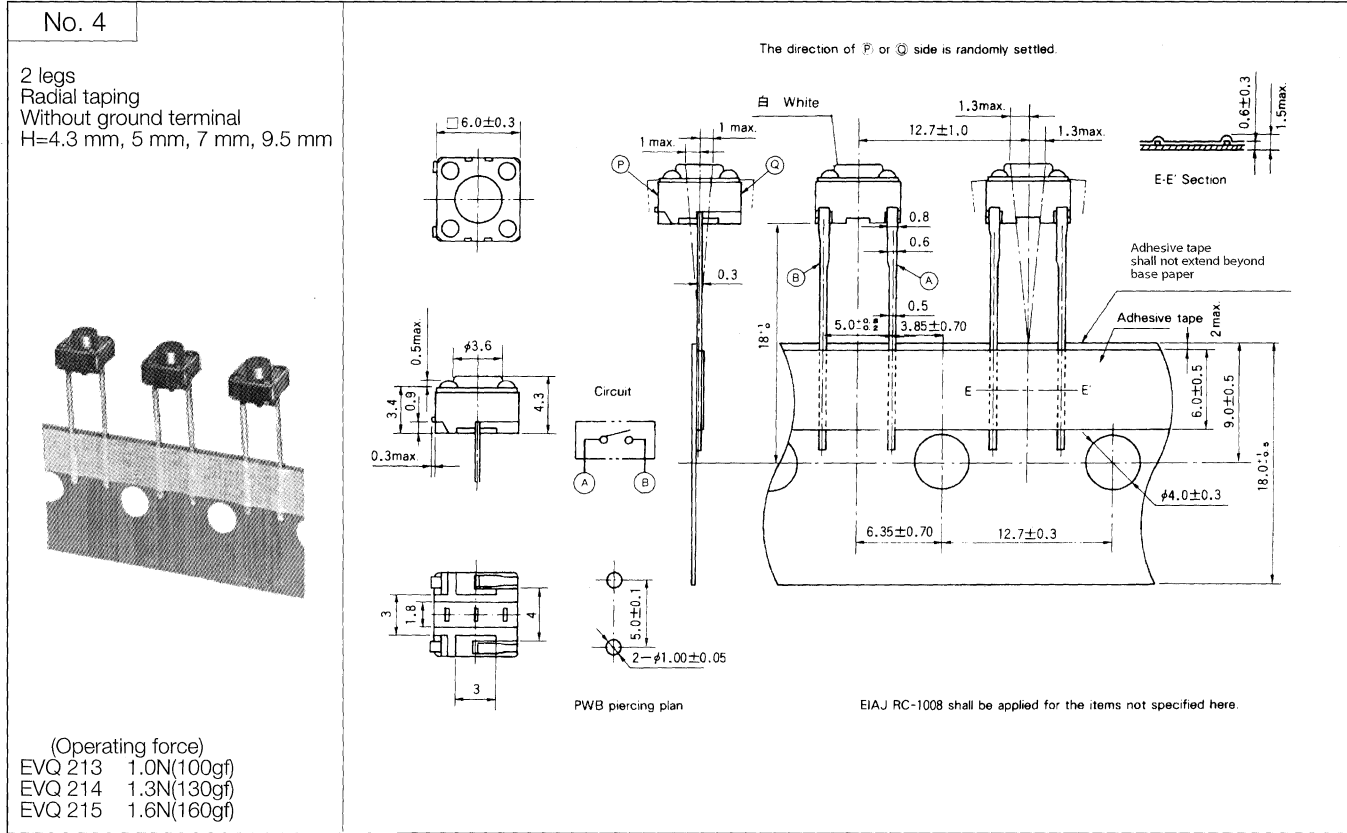
Circuit diagram



Knob height	
ℓ	L
4.3	5.8
5	6.5
7	8.5
9.5	11

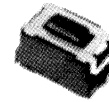
EVQ PFC (Height=4 mm)

Dimensions in mm (not to scale)



Features

- 6x3.5 mm, high density installation and space saving
- Excellent clear tactile feeling
- Auto-dipping applicable
- Excellent soldering heat endurance due to heat-resistant resin
- Excellent mounting efficiency by radial taping package



Specifications

Switch Part	Snap action/Push-ON type SPST	
	Circuit Diagram	
	Power Rating	20 mA 16 VDC (50 mA 12 VDC)
Electrical	Contact Resistance	100 mΩ max.
	Insulation Resistance	100 MΩ min. (100 VDC)
	Dielectric Withstanding Voltage	250 VAC for 1 minute
	Bouncing	10 ms max.
Mechanical	Operating Force	2.4±0.6N (240±60 gf) 1.6±0.5N (160±50 gf) (Standard) 1.0±0.5N (100±50 gf) (Low force type)
	Push Stroke	0.25 ±0.1 mm
	Push Strength	30 N (3 kgf) min. (Vertical, 1 minute)
Endurance	Soldering Heat	5 s at 260 °C (2 times max.)
	Operating Life	50000 min.
	Operating Temperature	-20 to + 70 °C

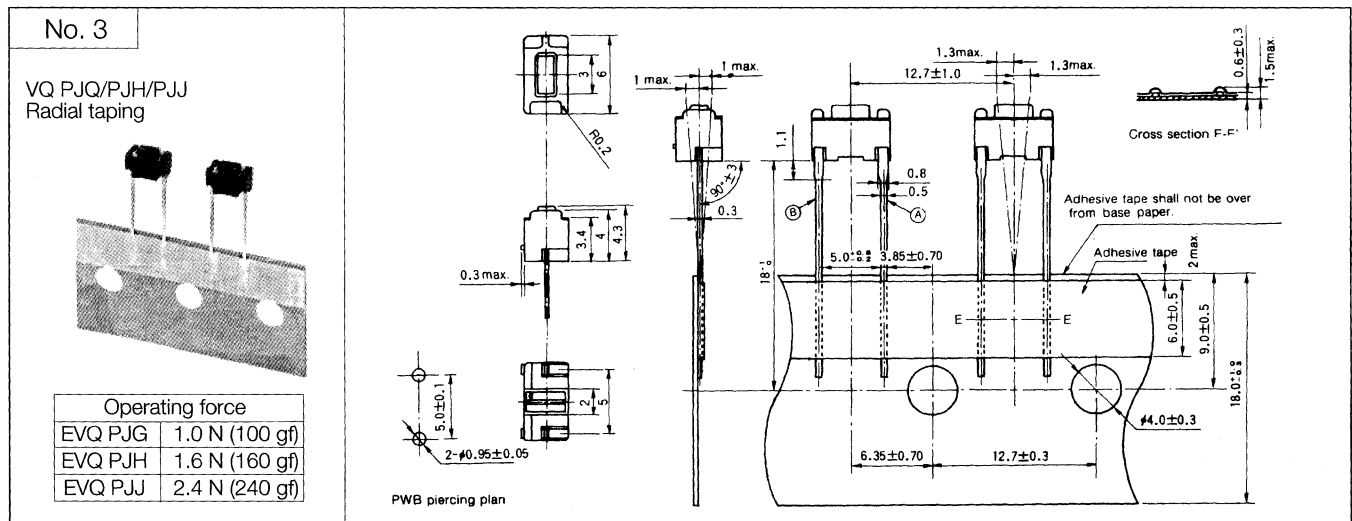
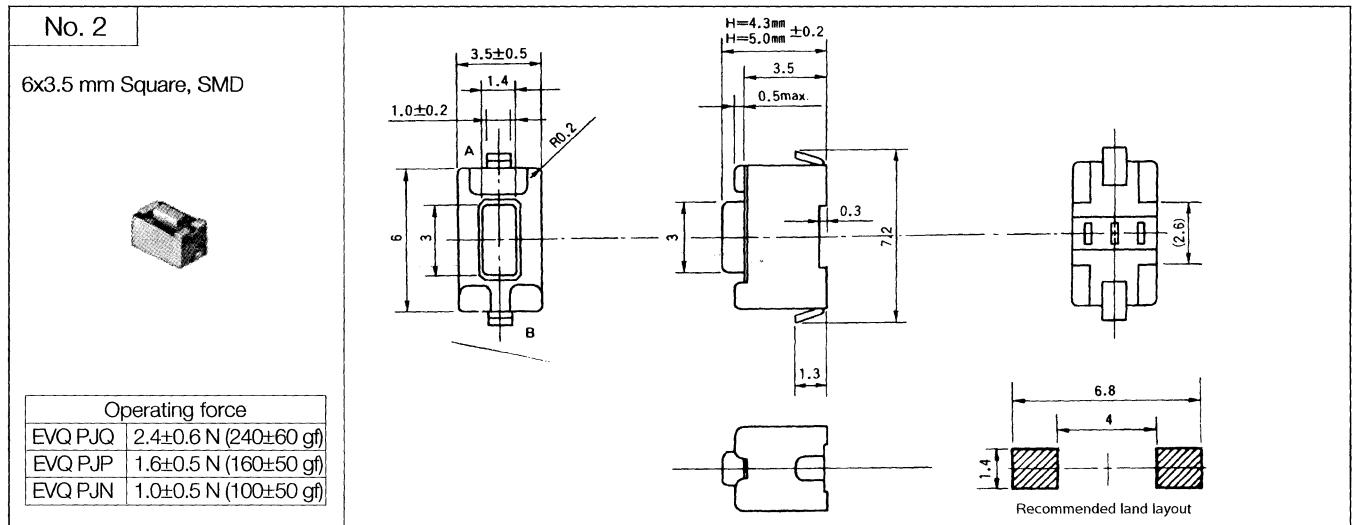
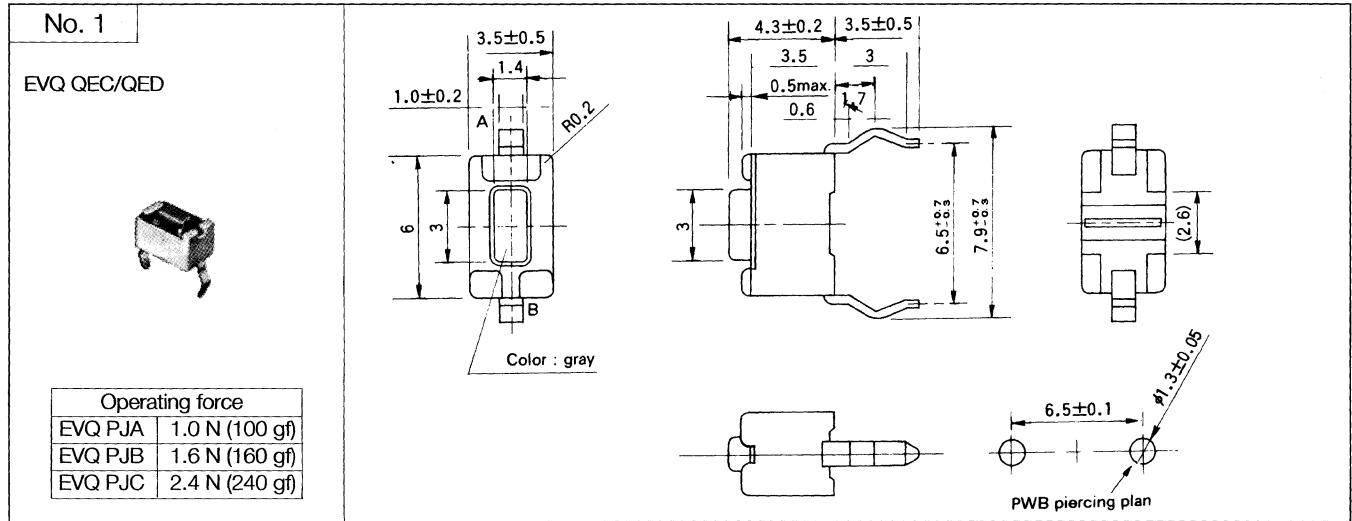
Explanation of Part Numbers

E V Q							
4th•5th		7th•8th		9th		Knob color	
Type		Height					
P J		04				B Blue	
6x3.5 mm Square		4.3 mm (5 mm Type: 4.0 mm)				M, W White	
						K Black	
						R Red	
						Q Gray	

Packaging Specifications

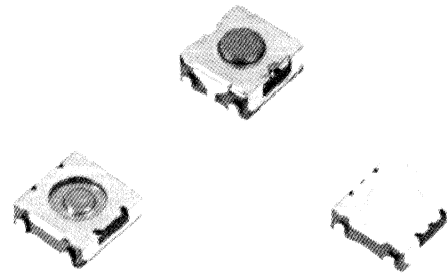
Product Item		Part Numbers	Minimum Packaging & Ordering Quantity (pcs)
6x3.5 mm Square Light Touch Switches	Bulk	EVQPJA/PJB/PJC	10000
	Embossed	EVQPJQ/PJP/PJN	7500
	Radial Taping	EVQPJG/PJH/PJJ	20000

Dimensions in mm (not to scale)



Features

- Super thin 2.0 mm height Light Touch Switch
- For flow soldering and reflow soldering and solvent washing
- Hermetically sealed
- Tactile feeling
- Supplied in bulk or tape & reel packing style
- With or without ground terminal
- Insertion types available



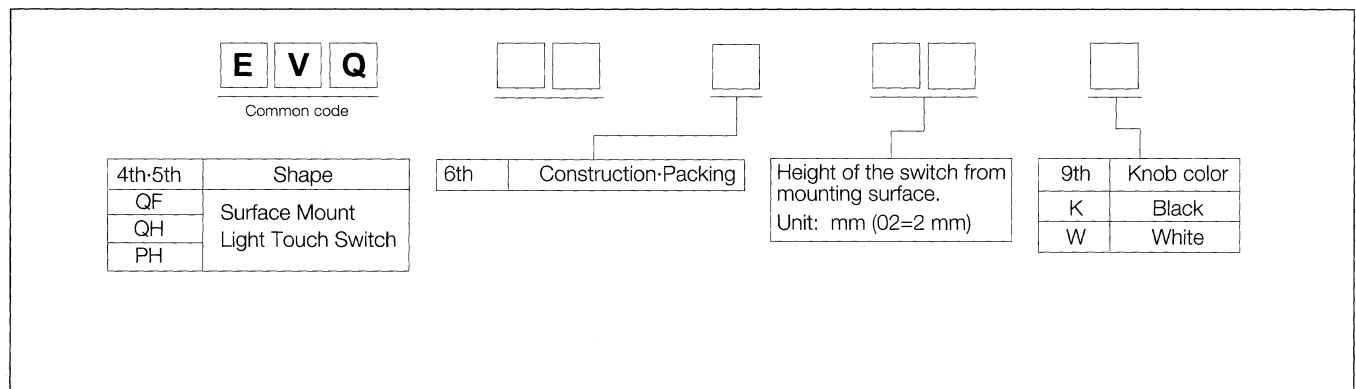
Product Chart

	Flow Soldering	Reflow soldering	Insertable	Knob	Ground Terminal Available
EVQ-QF	Yes	Yes	Yes (see #4, #5)	No	Yes (standard, see #3)
EVQ-QH	No	Yes	No	Yes	Yes (by request)
EVQ-PH	No	Yes	No	Yes	Yes (by request)

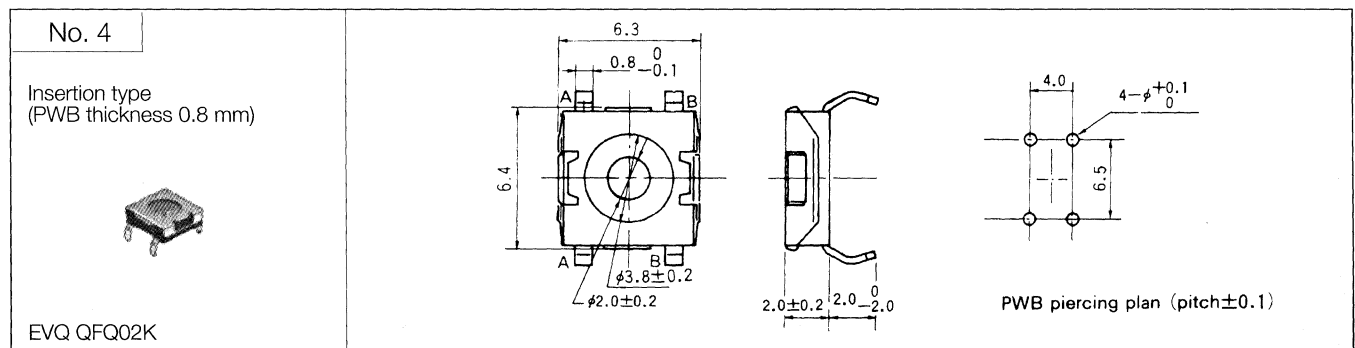
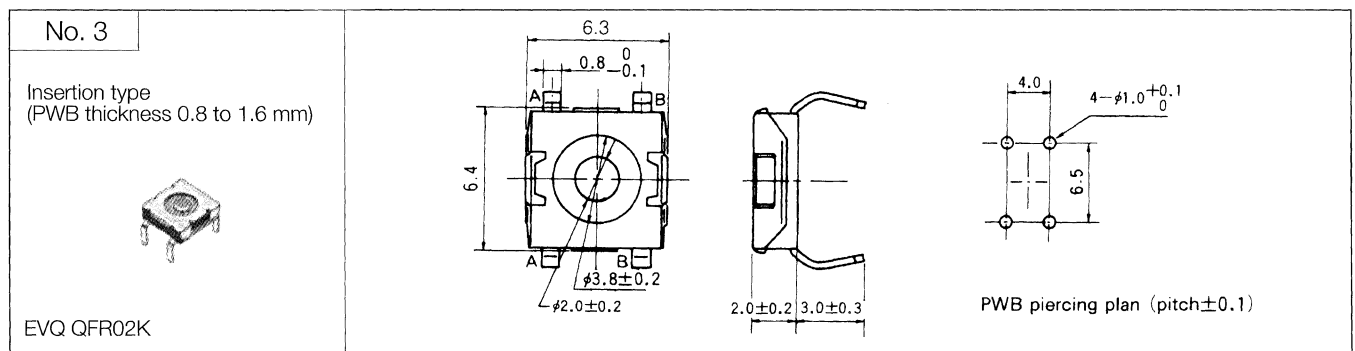
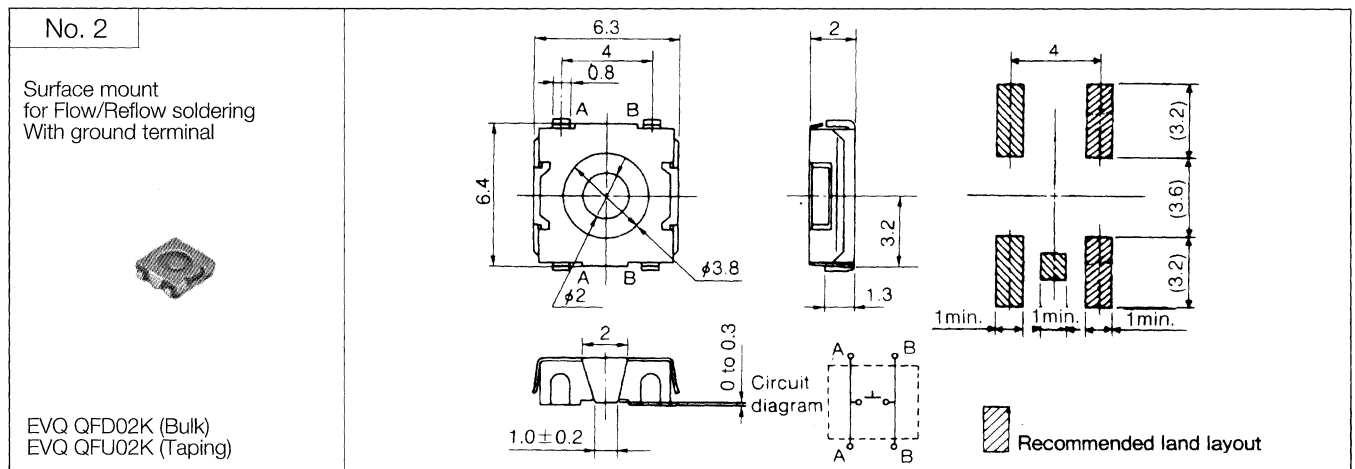
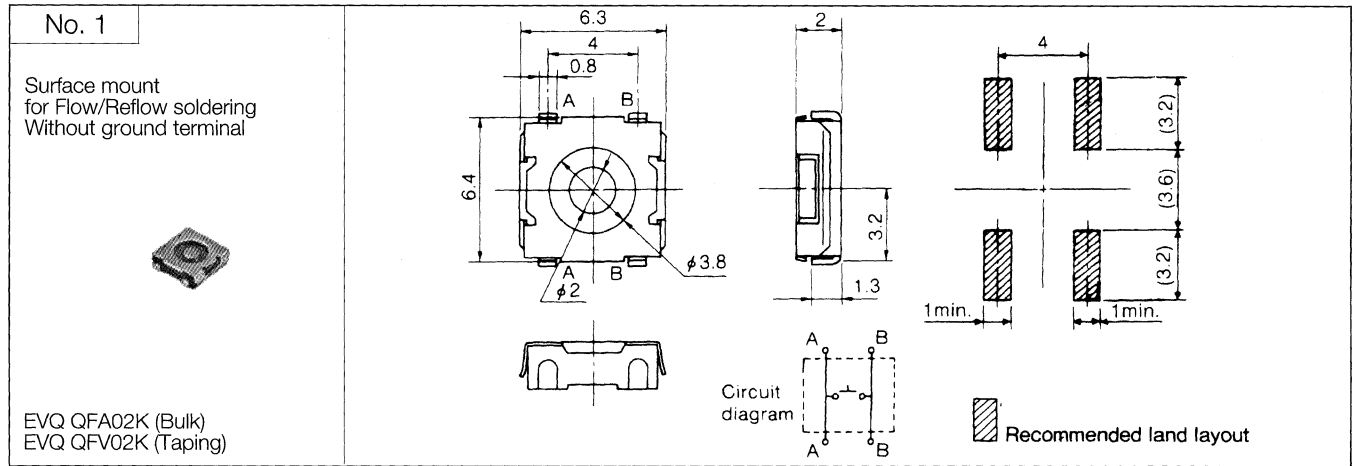
Specifications

Electrical	Power Rating	20 mA 15 VDC max. 10 μ A 2 VDC min.
	Contact Resistance	100 m Ω max.
	Insulation Resistance	50 M Ω min. (100 VDC)
	Dielectric Withstanding Voltage	250 VAC for 1 minute
	Bouncing	3 ms max. (ON) 10 ms max. (OFF)
Mechanical	Operating Force	1.3 \pm 0.4 N (130 \pm 40 gf), 1.6 \pm 0.5 N (160 \pm 50 gf), 2.6 \pm 0.6 N (260 \pm 60 gf)
	Push Stroke	0.25 \pm 0.1 mm
Endurance	Operating Life	100000 min.
	Operating Temperature	-20 to + 70 °C (45 to 85% RH)
	Storage Temperature	-40 to +85 °C

Explanation of Part Numbers


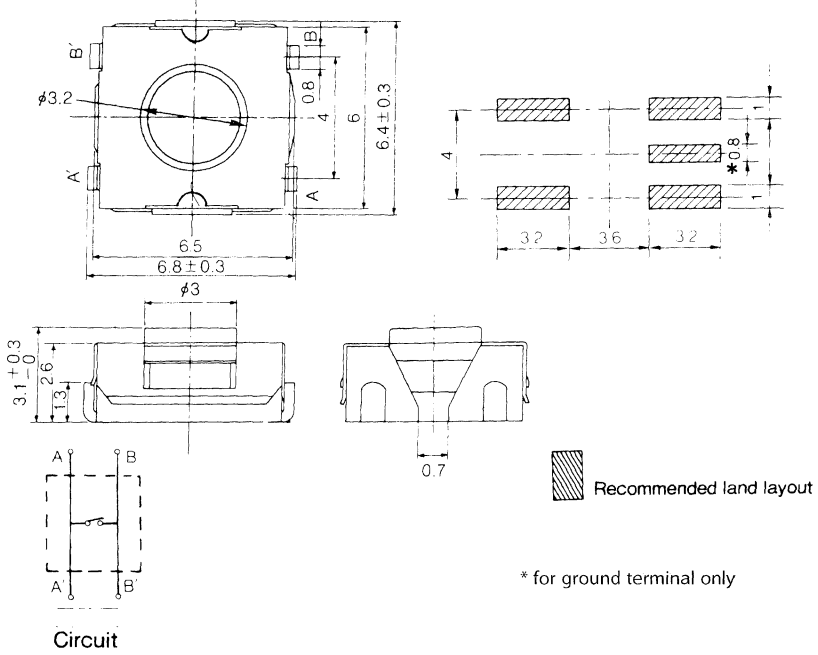



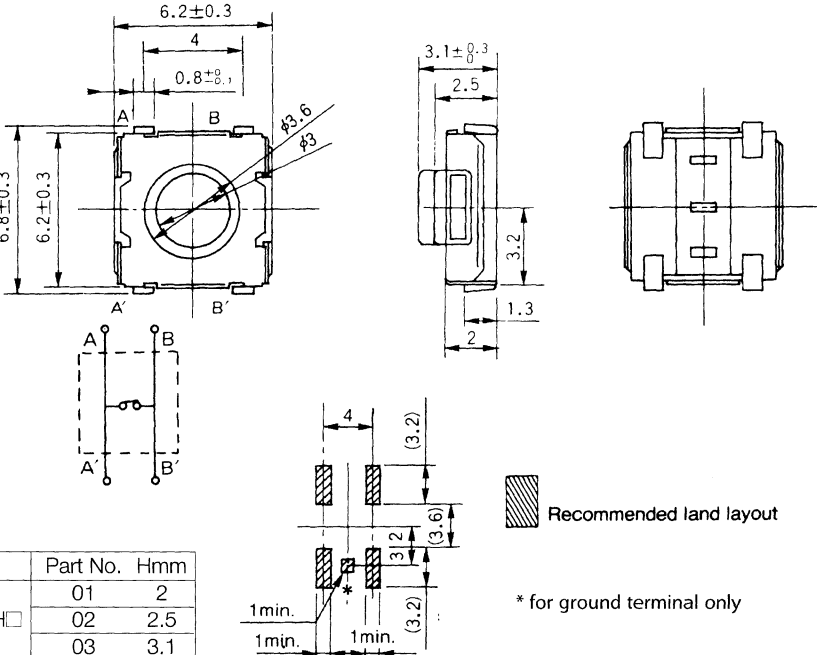
Dimensions in mm (not to scale)



Light Touch Switches
Surface Mount, 6 mm Low Profile with Knobs

EVQ-QF/QH/PH Series

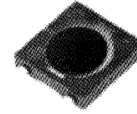
<p style="text-align: center; border: 1px solid black; display: inline-block; padding: 2px;">No. 5</p>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>With knob Surface mount for Reflow soldering without ground terminal</p> <p>Notes: 1. Washable in solvents 2. With ground terminal types available</p>  </div> <div style="width: 50%;">  <p style="text-align: center;">Circuit</p> </div> </div>
<p>EVQ PHC, PHP EVQ PHF, PHV EVQ PHQ, PHU</p>	<p style="text-align: right;">Recommended land layout</p> <p style="text-align: right;">* for ground terminal only</p>

<p style="text-align: center; border: 1px solid black; display: inline-block; padding: 2px;">No. 6</p>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>With knob Surface mount for Reflow soldering without ground terminal</p> <p>Notes: 1. Non-washable in solvents 2. With ground terminal types available</p>  </div> <div style="width: 50%;">  </div> </div>
<p>EVQ QHC, QHP EVQ QHF, QHV EVQ QHQ, QHU</p>	<p style="text-align: right;">Recommended land layout</p> <p style="text-align: right;">* for ground terminal only</p>

	Part No.	Hmm
	01	2
EVQ QH□	02	2.5
	03	3.1

Features

- Super thin switch (1 mm) with excellent click feeling
- For Reflow soldering

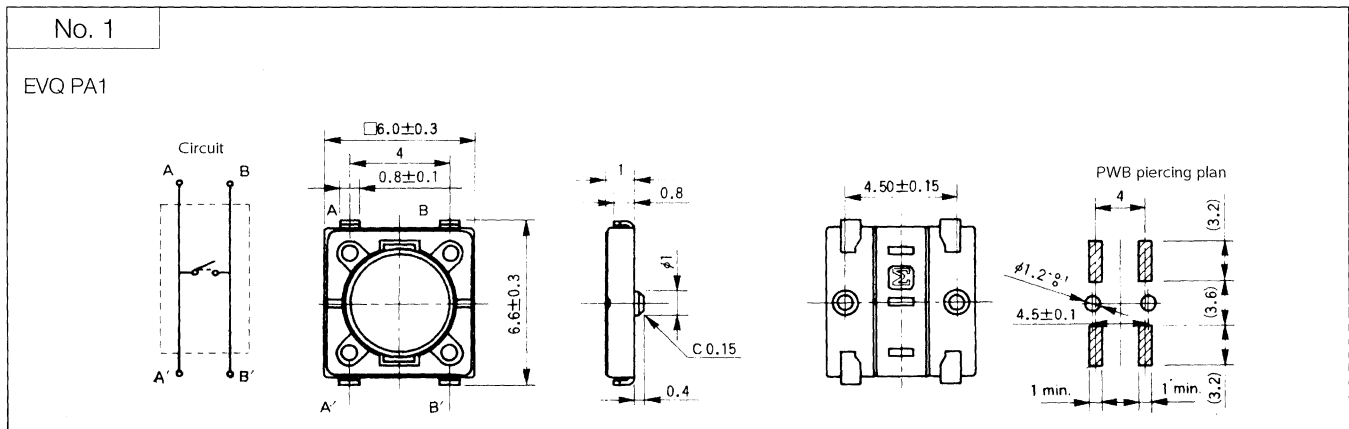


Specifications

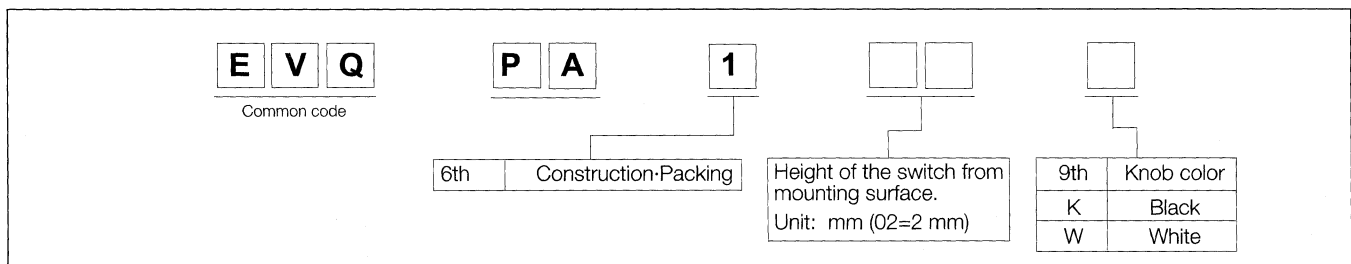
Electrical	Power Rating	20 mA 15 VDC max. 10 μ A 2 VDC min.
	Contact Resistance	100 m Ω max.
	Insulation Resistance	50 M Ω min. (100 VDC)
	Dielectric Withstanding Voltage	250 VAC for 1 minute
	Bouncing	3 ms max. (ON) 10 ms max. (OFF)
Mechanical	Operating Force	1.6 \pm 0.5 N (160 \pm 50 gf)
	Push Stroke	0.25 $^{+0.02}$ mm
Endurance	Operating Life	100000 min.
	Operating Temperature	-10 to +70 °C (45 to 85% RH)
	Storage Temperature	-40 to +60 °C (in embossed taping package)

Note: Non-washable

Dimensions in mm (not to scale)



Explanation of Part Numbers



Packaging Specifications

Standard Packing Quantity

Type	Style	Embossed Taping			Bulk
		Thickness	Inner carton	Outer carton	
EVQPA1	1.0 mm	1.0 mm	1000 pcs	20000 pcs.	4000 pcs/pack
EVQQF	2.0 mm	2.0 mm	or 4000 pcs		
EVQPH	3.1 mm		2.5 m/3.1 m	500 pcs or 2000 pcs	10000 pcs	1000 pcs/pack
EVQQH	2.0 mm				
	2.5 mm				
	3.1 mm	3.5 mm	2000 pcs	10000 pcs	1500 pcs/pack
EVQPJ	4.3 mm				

Standard soldering method

Flow soldering

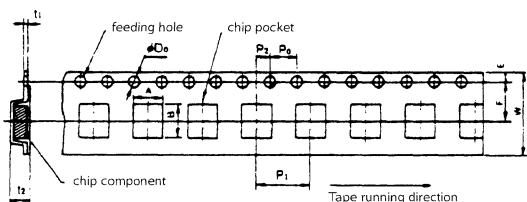
	Item	Conditions
Soldering process	Application flux	K322V (by Tamura)
		Specific gravity : 0.84
		Time : 2±0.5 s
		Temperature : normal temperature
Preheat	Flux method : Foam flux	100 to 120 °C, 60 s
	Soldering	Temperature : 250±5 °C Time : 5s max.
Cleaning process	Cleaning	Freon TES (by Mitsui)*Substitute
		Liquid temperature : 42±2 °C
		Time : 2 min max.
		Cleaning method : Only dip in a liquid

* ODC's controlled under Montreal Protocol are subject to termination earlier than the year of 2000.

Notes:

- Put the switch in to the pre-heat oven within 10 seconds after the flux process.
- Cleaning should be done after the temperature of the switch becomes normal.

Embossed Taping



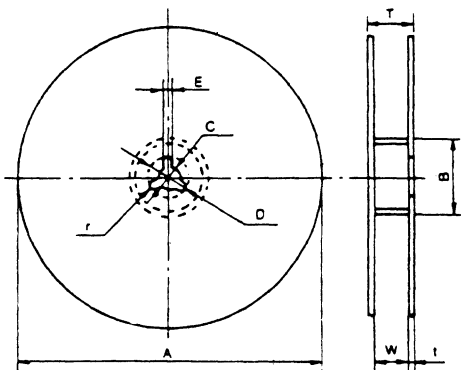
Reflow Soldering

Item	Conditions
Preheat	Set the surface of PWB at 180 °C in 2.5±0.3 minutes after it is put into the preheat or chamber oven.
Soldering	Set the surface of switches at 240 °C in 10±0.5 seconds after put into soldering oven.

Note: In case you solder in other ways, please consult with our salesman.

Part Nos.	Height	A	B	W	F	E	P ₁	P ₂	P ₀	D ₀ Dia.	t ₁	t ₂
EVQ PA	1.0	7.0±0.2	7.5±0.2	12.0±0.3	5.5±0.1	1.75±0.10	8.0±0.1	2.0±0.1	4.0±0.1	1.5 ^{+0.1}	0.30±0.05	1.8±0.2
EVQ QF	2.0											2.5±0.2
EVQ QH	2.0/2.5/3.1											3.3±0.2
EVQ PH	3.1											3.3±0.2
EVQ PJ	4.3/5.0											4.5/5.3±0.2

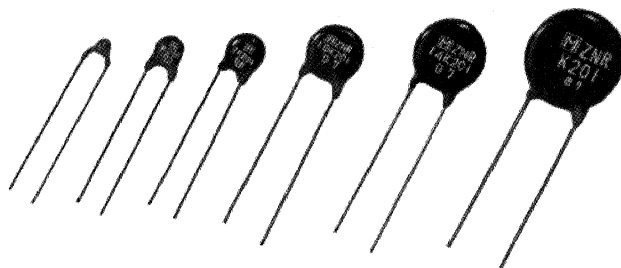
Reel



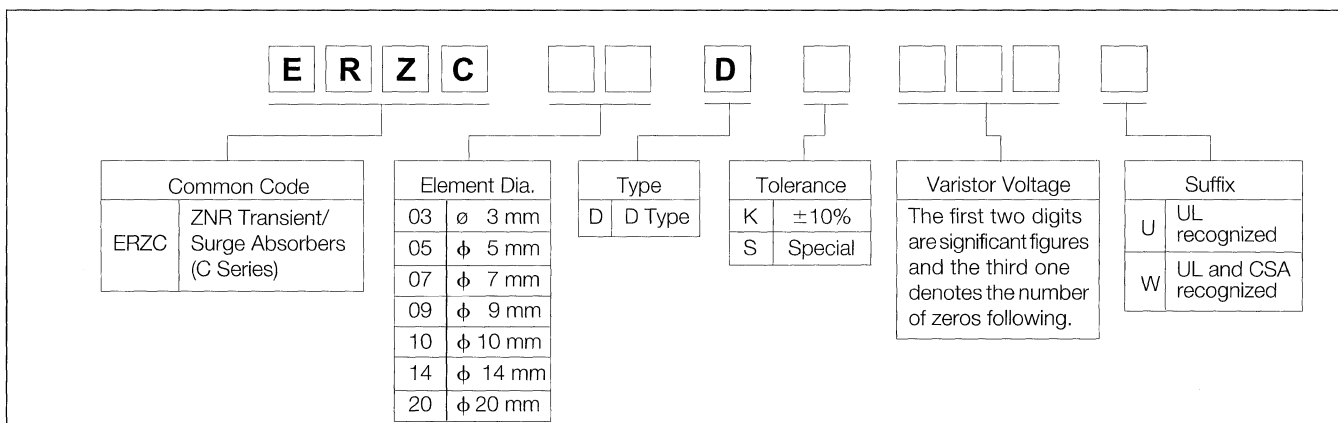
	A	B	C	D	E	W	T	t	r
(mm)	ø178.0±2.0	50 min.	13.0±0.5	ø21±1	2.0±0.5	14.0±1.5	—	1.0 to 2.0±0.5	1.0±0.5
	ø370.0±2.0	"	"	"	"	"	—	"	"

Features

- Fast response to rapidly rising surge voltage
- High performance clamping voltage characteristics
- Broad products range:
 Varistor voltage: 18V to 1.8 kV
- UL and CSA recognized models are available



Explanation of Part Numbers (Type D)



Reference Guide to Standard Products (Type D)

Part No.	Maximum Allowable Voltage		Varistor Voltage*	Clamping Voltage @ Test Current (8/20 ms)		Maximum Energy (J)		Maximum Peak Current (8/20 μs)	
	ACrms(V)	DC(V)		V _{KA} (V)	I _p (A)	10/1000μs	2 ms	1 times	
			(A)					(A)	
ERZC05DK180	11	14	18(16-20)	40	1	0.4	0.3	100	50
ERZC07DK180				36	2.5	0.9	0.8	250	125
ERZC10DK180				36	5	2.1	1.5	500	250
ERZC14DK180				36	10	4.0	3.5	1000	500
ERZC20DK180				36	20	11	10	2000	1000
ERZC03DK220	14	18	22(20-24)	48	0.5	—	0.16	50	25
ERZC05DK220				48	1	0.5	0.4	100	50
ERZC07DK220				43	2.5	1.1	0.9	250	125
ERZC10DK220				43	5	2.5	2.0	500	250
ERZC14DK220				43	10	5.0	4.0	1000	500
ERZC20DK220	43	20	14	13	2000	1000			
ERZC03DK270	17	22	27(24-30)	60	0.5	—	0.2	50	25
ERZC05DK270				60	1	0.6	0.5	100	50
ERZC07DK270				53	2.5	1.4	1.0	250	125
ERZC10DK270				53	5	3.0	2.5	500	250
ERZC14DK270				53	10	6.0	5.0	1000	500
ERZC20DK270	53	20	18	15	2000	1000			
ERZC05DK330	20	26	33(30-36)	73	1	0.8	0.6	100	50
ERZC07DK330				65	2.5	1.7	1.2	250	125
ERZC10DK330				65	5	4.0	3.0	500	250
ERZC14DK330				65	10	7.5	6.0	1000	500
ERZC20DK330				65	20	23	20	2000	1000
ERZC03DK390	25	31	39(35-43)	86	0.5	—	0.32	50	25
ERZC05DK390				86	1	0.9	0.8	100	50
ERZC07DK390				77	2.5	2.1	1.5	250	125
ERZC10DK390				77	5	4.6	3.5	500	250
ERZC14DK390				77	10	8.6	7.0	1000	500
ERZC20DK390	77	20	26	24	2000	1000			

**“ZNR” Transient/Surge Absorbers
General Purpose**

ERZ-C(D) Series

Part No.	Maximum Allowable Voltage		Varistor Voltage*	Clamping Voltage @ Test Current (8/20 μs)		Maximum Energy (J)		Maximum Peak Current (8/20 μs)	
	ACrms(V)	DC(V)		V _{XA} (V)	I _p (A)	10/1000μs	2 ms	1 times	2 times
			(A)					(A)	
ERZC05DK470 ERZC07DK470 ERZC10DK470 ERZC14DK470 ERZC20DK470	30	38	47(42-52)	104	1	1.1	1.0	100	50
93				2.5	2.5	1.8	250	125	
93				5	5.5	4.5	500	250	
93				10	10	8.5	1000	500	
93				20	33	30	2000	1000	
ERZC05DK560 ERZC07DK560 ERZC10DK560 ERZC14DK560 ERZC20DK560	35	45	56(50-62)	123	1	1.3	1.0	100	50
110				2.5	3.1	2.2	250	125	
110				5	7.0	5.5	500	250	
110				10	11	10	1000	500	
110				20	41	35	2000	1000	
ERZC05DK680 ERZC07DK680 ERZC10DK680 ERZC14DK680 ERZC20DK680	40	56	68(61-75)	150	1	1.6	1.2	100	50
135				2.5	3.6	2.5	250	125	
135				5	8.2	6.5	500	250	
135				10	14	12	1000	500	
135				20	46	40	2000	1000	
ERZC03DK820 ERZC05DK820 ERZC07DK820 ERZC10DK820 ERZC14DK820 ERZC20DK820	50	65	82(74-90)	145	2.5	—	0.68	200	100
145				5	2.5	1.7	400	200	
135				10	5.5	3.5	1200	600	
135				25	12	8.0	2500	1250	
135				50	22	14	4500	2500	
135				100	38	27	6500	4000	
ERZC05DK101 ERZC07DK101 ERZC10DK101 ERZC14DK101 ERZC20DK101	60	85	100(90-110)	175	5	3.0	2.0	400	200
165				10	6.5	4.0	1200	600	
165				25	15	10	2500	1250	
165				50	28	18	4500	2500	
165				100	45	30	6500	4000	
ERZC03DK121 ERZC05DK121 ERZC07DK121 ERZC10DK121 ERZC14DK121 ERZC20DK121	75	100	120(108-132)	210	2.5	—	1.0	200	100
210				5	4.0	2.5	400	200	
200				10	7.8	5.0	1200	600	
200				25	18	12	2500	1250	
200				50	32	20	4500	2500	
200				100	55	40	6500	4000	
ERZC05DK151 ERZC07DK151 ERZC10DK151 ERZC14DK151 ERZC20DK151	95	125	150(135-165)	260	5	4.8	3.0	400	200
250				10	9.7	6.5	1200	600	
250				25	22	16	2500	1250	
250				50	40	25	4500	2500	
250				100	70	50	6500	4000	
ERZC05DK201 ERZC07DK201 ERZC10DK201 ERZC14DK201 ERZC20DK201	130	170	200(185-225)	355	5	6.5	4.0	400	200
340				10	13	10	1200	600	
340				25	30	20	2500	1250	
340				50	57	35	4500	2500	
340				100	95	70	6500	4000	
ERZC05DK221 ERZC07DK221 ERZC10DK221 ERZC14DK221 ERZC20DK221	140	180	220(198-242)	380	5	7.0	4.5	400	200
360				10	14	10	1200	600	
360				25	32	23	2500	1250	
360				50	60	40	4500	2500	
360				100	100	75	6500	4000	
ERZC03DK241 ERZC05DK241 ERZC07DK241 ERZC10DK241 ERZC14DK241 ERZC20DK241	150	200	240(216-264)	415	2.5	—	2.0	200	100
415				5	8.0	5.0	400	200	
395				10	15	10	1200	600	
395				25	35	25	2500	1250	
395				50	63	40	4500	2500	
395				100	108	80	6500	4000	
ERZC05DK271 ERZC07DK271 ERZC10DK271 ERZC14DK271 ERZC20DK271	175	225	270(247-303)	475	5	8.5	6.0	400	200
455				10	18	12	1200	600	
455				25	40	30	2500	1250	
455				50	70	50	4500	2500	
455				100	127	90	6500	4000	
ERZC05DK361 ERZC07DK361 ERZC10DK361 ERZC14DK361 ERZC20DK361	230	300	360(324-396)	620	5	10	7.5	400	200
595				10	25	15	1200	600	
595				25	47	35	2500	1250	
595				50	93	65	4500	2500	
595				100	163	120	6500	4000	
ERZC05DK391 ERZC07DK391 ERZC10DK391 ERZC14DK391 ERZC20DK391	250	320	390(351-429)	675	5	12	8.0	400	200
650				10	25	17	1200	600	
650				25	60	40	2500	1250	
650				50	100	70	4500	2500	
650				100	180	130	6500	4000	

**“ZNR” Transient/Surge Absorbers
General Purpose**

ERZ-C(D) Series

Part No.	Maximum Allowable Voltage		Varistor Voltage*	Clamping Voltage @ Test Current 8/20 μs)		Maximum Energy (J)		Maximum Peak Current (8/20 μs)	
	ACrms(V)	DC(V)		V _{XA} (V)	I _p (A)	10/1000μs	2 ms	1 times	2 times
			(A)					(A)	
ERZC05DK431 ERZC07DK431 ERZC10DK431 ERZC14DK431 ERZC20DK431	275	350	430(387-473)	745	5	13	9.0	400	200
710				10	28	20	1200	600	
710				25	65	45	2500	1250	
710				50	115	75	4500	2500	
710				100	190	140	6500	4000	
ERZC05DK471 ERZC07DK471 ERZC10DK471 ERZC14DK471 ERZC20DK471	300	385	470(423-517)	810	5	15	10	400	200
775				10	30	20	1200	600	
775				25	70	45	2500	1250	
775				50	125	80	4500	2500	
775				100	220	150	6500	4000	
ERZC10DK621 ERZC14DK621 ERZC20DK621	385	505	620(558-682)	1025	25	70	45	2500	1250
1025				50	125	85	4500	2500	
1025				100	220	150	6500	4000	
ERZC10DK681 ERZC14DK681 ERZC20DK681	420	560	680(612-748)	1120	25	70	45	2500	1250
1120				50	130	90	4500	2500	
1120				100	230	160	6500	4000	
ERZC10DK751 ERZC14DK751 ERZC20DK751	460	615	750(675-825)	1240	25	75	50	2500	1250
1240				50	143	100	4500	2500	
1240				100	255	175	6500	4000	
ERZC10DK781 ERZC14DK781 ERZC20DK781	485	640	780(702-858)	1290	25	80	50	2500	1250
1290				50	148	105	4500	2500	
1290				100	265	180	6500	4000	
ERZC10DK821 ERZC14DK821 ERZC20DK821	510	670	820(738-902)	1355	25	85	55	2500	1250
1355				50	157	110	4500	2500	
1355				100	282	190	6500	4000	
ERZC10DK911 ERZC14DK911 ERZC20DK911	550	745	910(819-1001)	1500	25	93	60	2500	1250
1500				50	175	120	4500	2500	
1500				100	310	215	6500	4000	
ERZC10DK102 ERZC14DK102 ERZC20DK102	625	825	1000(900-1100)	1650	25	102	65	2500	1250
1650				50	190	130	4500	2500	
1650				100	342	230	6500	4000	
ERZC10DK112 ERZC14DK112 ERZC20DK112	680	895	1100(990-1210)	1815	25	115	70	2500	1250
1815				50	213	140	4500	2500	
1815				100	383	250	6500	4000	
ERZC14DK182 ERZC20DK182	1000	1465	1800(1620-1980)	2970	50	337	240	4500	2500
2970				100	625	400	6500	4000	

- Operating Temperature Range:40 to 85 °C
- Storage Temperature Range: 40 to 125 °C
- * Varistor Voltage: 3 and 5 Series -V_{0.1mA}

Rated Power

7,10,14, 20 SeriesV1 mA

Part No.	Rated Power (W)	Part No.	Rated Power (W)	Part No.	Rated Power (W)
ERZC03DK220-390	0.004	ERZC14DK180-680	0.1	ERZC07DK820-471	0.25
ERZC05DK180-680	0.01	ERZC20DK180-680	0.2	ERZC10DK820-112	0.4
ERZC07DK180-680	0.02	ERZC03DK820-241	0.04	ERZC14DK820-182	0.6
ERZC10DK180-680	0.05	ERZC05DK820-471	0.1	ERZC20DK820-182	1.0

ULand CSA Recognized

Related Standards

Standard No.	UL1414	UL1449	UL4970	CSA Class 2221 01
Title	Across-The-Line Components (Varistors)	Transient Voltage Surge Suppressors	Secondary Protectors for Communication Circuit	Accessories and Parts For Electronic Products • Varistor for Across-The-Line use as transient Protection on 120Vac nominal system
File Mo.	E62674 Vol. 5, 10	E86821 Vol. 1	E134178 Vol. 1	LR-92226

UL and CSA Recognized Components, and The AC Rated Voltage.

Part Number	Max. Allowable Voltage		Rated Voltage (Vrms)		
	ACrms (V)	DC (V)	UL1414	UL1449	CSA (class 2221 01)
ERZC05DK820U ERZC07DK820U ERZC09DK820U ERZC10DK820U ERZC14DK820U ERZC20DK820U	50	65	— (Not Applicable)	45	— (Not Applicable)
ERZC05DK101U ERZC07DK101U ERZC09DK101U ERZC10DK101U ERZC14DK101U ERZC20DK101U	60	85	— (Not Applicable)	55	— (Not Applicable)
ERZC05DK121U ERZC07DK121U ERZC09DK121U ERZC10DK121U ERZC14DK121U ERZC20DK121U	75	100	— (Not Applicable)	68	— (Not Applicable)
ERZC05DK151U ERZC07DK151U ERZC09DK151U ERZC10DK151U ERZC14DK151U ERZC20DK151U	95	125	— (Not Applicable)	86	— (Not Applicable)
ERZC05DK201□ ERZC07DK201□ ERZC09DK201□ ERZC10DK201□ ERZC14DK201□ ERZC20DK201□	130	170	125	118	118
ERZC05DK221□ ERZC07DK221□ ERZC09DK221□ ERZC10DK221□ ERZC14DK221□ ERZC20DK221□	140	180	125	127	127
ERZC05DK241□ ERZC07DK241□ ERZC09DK241□ ERZC10DK241□ ERZC14DK241□ ERZC20DK241□	150	200	125	136	136
ERZC05DK271□ ERZC07DK271□ ERZC09DK271□ ERZC10DK271□ ERZC14DK271□ ERZC20DK271□	175	225	125	159	159

□: Suffix U for UL recognized components
“W” for UL and CSA recognized components

UL and CSA Recognized Components and The AC Rated Voltage

Part Number	Max. Allowable Voltage		Rated Voltage (Vrms)		
	ACrms (V)	DC (V)	UL1414	UL1449	CSA (class 2221 01)
ERZC05DK361□ ERZC07DK361□ ERZC09DK361□ ERZC10DK361□ ERZC14DK361□ ERZC20DK361□	230	300	125	209	209
ERZC05DK391□ ERZC07DK391□ ERZC09DK391□ ERZC10DK391□ ERZC14DK391□ ERZC20DK391□	250	320	125	227	227
ERZC05DK431□ ERZC07DK431□ ERZC09DK431□ ERZC10DK431□ ERZC14DK431□ ERZC20DK431□	275	350	125	250	250
ERZC05DK471□ ERZC07DK471□ ERZC09DK471□ ERZC10DK471□ ERZC14DK471□ ERZC20DK471□	300	385	125	272	272
ERZC10DK621□ ERZC14DK621□ ERZC20DK621□	385	505	125	350	350
ERZC10DK681□ ERZC14DK681□ ERZC20DK681□	420	560	125	381	381
ERZC10DK751□ ERZC14DK751□ ERZC20DK751□	460	615	125	418	418
ERZC10DK781□ ERZC14DK781□ ERZC20DK781□	485	640	125	440	440
ERZC10DK821□ ERZC14DK821□ ERZC20DK821□	510	670	125	463	463
ERZC10DK911□ ERZC14DK911□ ERZC20DK911□	550	745	125	500	500
ERZC10DK102□ ERZC14DK102□ ERZC20DK102□	625	825	125	568	568
ERZC10DK112□ ERZC14DK112□ ERZC20DK112□	680	895	125	600	600
ERZC14DK182□ ERZC20DK182□	1000	1465	125	600	600

□ : Suffix U for UL recognized components
"W" for UL and CSA recognized components

3 Series Dimensions in mm (not to scale)

Part No.	D max.	T max.	W	H max.	L	Shape and Dimensions
ERZC03DK220	7.5	3.5	5.0±1.0	6.5	1.5±1.0	
ERZC03DK270						
ERZC03DK390						
ERZC03DK820						
ERZC03DK121						
ERZC03DK241		4.5			2.2±1.0	

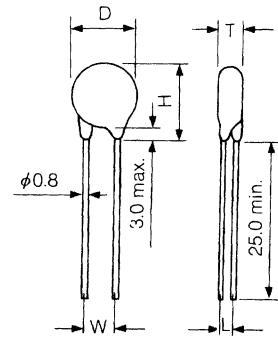
5 Series Dimensions in mm (not to scale)

Part No.	D max.	T max.	W	H max.	L	Shape and Dimensions
ERZC05DK180	7.5	4.5	5.0±1.0	10.0	1.5±1.0	
ERZC05DK220						
ERZC05DK270						
ERZC05DK330						
ERZC05DK390						
ERZC05DK470						
ERZC05DK560						
ERZC05DK680						
ERZC05DK820						
ERZC05DK101	7.0	4.7	5.0±1.0	10.0	1.6±1.0	
ERZC05DK121		4.8			1.8±1.0	
ERZC05DK151		5.0			2.0±1.0	
ERZC05DK201		5.2			2.0±1.0	
ERZC05DK221		5.3			2.1±1.0	
ERZC05DK241		5.4			2.2±1.0	
ERZC05DK271		5.6			2.4±1.0	
ERZC05DK361		6.2			3.0±1.0	
ERZC05DK391		6.4			3.2±1.0	
ERZC05DK431		6.7			3.5±1.0	
ERZC05DK471	7.0	3.8±1.0				

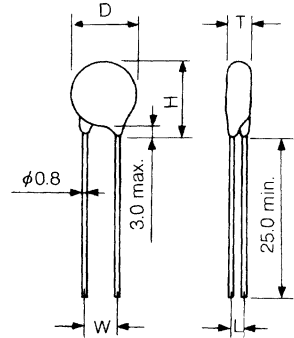
7 Series Dimensions in mm (not to scale)

Part No.	D max.	T max.	W	H max.	L	Shape and Dimensions
ERZC07DK180	9.0	4.5	5.0±1.0	12.0	1.3±1.0	
ERZC07DK220		4.6			1.4±1.0	
ERZC07DK270		4.7			1.5±1.0	
ERZC07DK330		4.9			1.7±1.0	
ERZC07DK390		4.8			1.7±1.0	
ERZC07DK470		4.9			1.8±1.0	
ERZC07DK560		5.0			1.9±1.0	
ERZC07DK680		5.2			2.1±1.0	
ERZC07DK820		4.6			1.6±1.0	
ERZC07DK101		4.7			1.6±1.0	
ERZC07DK121		4.8			1.8±1.0	
ERZC07DK151		5.0			2.0±1.0	
ERZC07DK201		5.2			2.0±1.0	
ERZC07DK221		5.3			2.1±1.0	
ERZC07DK241		5.4			2.2±1.0	
ERZC07DK271		5.6			2.4±1.0	
ERZC07DK361		6.2			3.0±1.0	
ERZC07DK391		6.4			3.2±1.0	
ERZC07DK431		6.7			3.5±1.0	
ERZC07DK471		7.0			3.8±1.0	

10 Series Dimensions in mm (not to scale)

Part No.	D max.	T max.	W	H max.	L	Shape and Dimensions		
ERZC10DK180	13.5	4.6	7.5±1.0	16.5	1.3±1.0			
ERZC10DK220		4.7			1.4±1.0			
ERZC10DK270		4.8			1.5±1.0			
ERZC10DK330		5.0			1.7±1.0			
ERZC10DK390		5.1			1.8±1.0			
ERZC10DK470		5.0			1.7±1.0			
ERZC10DK560		5.1			1.9±1.0			
ERZC10DK680		5.3			2.2±1.0			
ERZC10DK820		5.0			1.6±1.0			
ERZC10DK101		5.1			1.8±1.0			
ERZC10DK121		5.2			2.0±1.0			
ERZC10DK151		5.5			2.2±1.0			
ERZC10DK201		5.6			2.2±1.0			
ERZC10DK221		5.7			2.3±1.0			
ERZC10DK241		5.8			2.4±1.0			
ERZC10DK271		6.1			2.6±1.0			
ERZC10DK361		14.0			6.7		17.0	3.2±1.0
ERZC10DK391					6.8			3.4±1.0
ERZC10DK431	7.2		3.7±1.0					
ERZC10DK471	7.5		4.0±1.0					
ERZC10DK621	7.2		3.8±1.0					
ERZC10DK881	7.5		4.1±1.0					
ERZC10DK751	7.8		4.4±1.0					
ERZC10DK781	7.9		4.5±1.0					
ERZC10DK821	8.1		4.7±1.0					
ERZC10DK911	8.6		5.2±1.0					
ERZC10DK102	9.0		5.6±1.0					
ERZC10DK112	9.5		6.1±1.0					

14 Series Dimensions in mm (not to scale)

Part No.	D max.	T max.	W	H max.	L	Shape and Dimensions			
ERZC14DK180	17.0	4.6	7.5±1.0	20.0	1.3±1.0				
ERZC14DK220		4.7			1.4±1.0				
ERZC14DK270		4.8			1.5±1.0				
ERZC14DK330		5.0			1.7±1.0				
ERZC14DK390		5.1			1.8±1.0				
ERZC14DK470		5.0			1.7±1.0				
ERZC14DK560		5.1			1.9±1.0				
ERZC14DK660		5.3			2.2±1.0				
ERZC14DK820		5.0			1.6±1.0				
ERZC14DK101		5.1			1.8±1.0				
ERZC14DK121		5.2			2.0±1.0				
ERZC14DK151		5.5			2.2±1.0				
ERZC14DK201		5.6			2.2±1.0				
ERZC14DK221		5.7			2.3±1.0				
ERZC14DK241		5.8			2.4±1.0				
ERZC14DK271		6.1			2.6±1.0				
ERZC14DK361		17.5			6.7		15.0±1.0*	22.0	3.2±1.0
ERZC14DK391					6.8				3.4±1.0
ERZC14DK431	7.2		3.7±1.0						
ERZC14DK471	7.5		4.0±1.0						
ERZC14DK621	7.2		3.8±1.0						
ERZC14DK681	7.5		4.1±1.0						
ERZC14DK751	7.8		4.4±1.0						
ERZC14DK781	7.9		4.5±1.0						
ERZC14DK821	8.1		4.7±1.0						
ERZC14DK911	8.6		5.2±1.0						
ERZC14DK102	9.0		5.6±1.0						
ERZC14DK112	9.5		6.1±1.0						
ERZC14DK182	14.0		15.0±1.0*	22.0	9.5±2.0				

20 Series Dimensions in mm (not to scale)

Part No.	D max.	T max.	W	H max.	L	Shape and Dimensions		
ERZC20DK180	23.0	5.1	10.0±1.0	27.0	1.5±1.0			
ERZC20DK220		5.2			1.6±1.0			
ERZC20DK270		5.3			1.7±1.0			
ERZC20DK330		5.5			1.9±1.0			
ERZC20DK390		5.5			1.9±1.0			
ERZC20DK470		5.6			1.9±1.0			
ERZC20DK560		5.7			2.1±1.0			
ERZC20DK680		5.8			2.4±1.0			
ERZC20DK820		5.5			1.8±1.0			
ERZC20DK101		5.6			2.0±1.0			
ERZC20DK121		5.7			2.2±1.0			
ERZC20DK151		5.9			2.4±1.0			
ERZC20DK201		6.0			2.4±1.0			
ERZC20DK221		6.2			2.6±1.0			
ERZC20DK241	6.3	2.7±1.0						
ERZC20DK271	6.5	2.9±1.0						
ERZC20DK361	24.0	7.2	15.0±1.0*	28.0	3.5±1.0			
ERZC20DK391		7.4			3.7±1.0			
ERZC20DK431		7.7			4.0±1.0			
ERZC20DK471		8.0			4.3±1.0			
ERZC20DK621		7.6			4.1±1.0			
ERZC20DK681		7.9			4.4±1.0			
ERZC20DK751		8.3			4.8±1.0			
ERZC20DK781		8.4			4.9±1.0			
ERZC20DK821		8.6			5.1±1.0			
ERZC20DK911		9.1			5.6±1.0			
ERZC20DK102		9.5			6.0±1.0			
ERZC20DK112		10.0			6.5±1.0			
ERZC20DK182		25.0			14.0	15.0±1.0*	30.0	9.5±2.0

Performance Characteristics (Electrical)

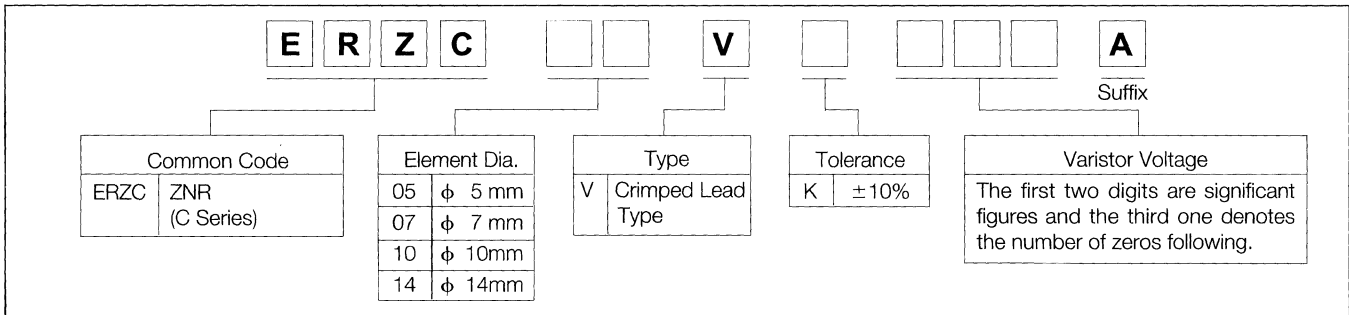
Characteristics	Test Methods/Description	Specifications
Standard Test Condition	Environmental conditions under which every measuring is done without doubt about the measuring results. Unless specially specified, temperature, relative humidity are 5 to 35 °C, 45 to 85 % RH.	—
Varistor Voltage	The voltage between two terminals with the specified measuring current CmA DC applied is called Vc or VCmA. The measurement shall be made as fast as possible to avoid heat affection.	
Maximum Allowable Voltage	The maximum sinusoidal RMS voltage or maximum DC voltage that can be applied continuously in the specified environmental temperature range.	
Clamping Voltage	<p>The maximum voltage between two terminals with the specified standard impulse current (8/20 μs) illustrated below applied.</p>	To meet the specified value.

Performance Characteristics (Electrical)

Characteristics		Test Methods/Description		Specifications						
Rated Power		The maximum power that can be applied at the specified ambient temperature.		To meet the specified value						
Maximum Energy		The maximum energy within a varistor voltage change of $\pm 10\%$ when one impulse of 2 ms or 10/1000 μs is applied.								
Maximum Peak Current (Withstanding Surge Current)	2 times	The maximum current within a varistor voltage change of $\pm 10\%$ when the standard impulse current (8/20 μs) applied two times with an interval of 5 minutes.								
	1 time	The maximum current within a varistor voltage change of $\pm 10\%$ when the standard impulse current (8/20 μs) is applied one time.								
Temperature Coefficient of Varistor Voltage		$\frac{V_c \text{ at } 85^\circ\text{C} - V_c \text{ at } 25^\circ\text{C}}{V_c \text{ at } 25^\circ\text{C}} \times \frac{1}{60} \times 100 (\%/^\circ\text{C})$		0 to -0.05 $\%/^\circ\text{C}$ max.						
Capacitance		Capacitance shall be measured at 1 kHz $\pm 10\%$, 1 Vrms max. (1 MHz $\pm 10\%$ below 100 pF), 0 V bias and $20 \pm 2^\circ\text{C}$.		To meet the specified value.						
Dissipation Factor		Dissipation Factor shall be measured at 1 kHz $\pm 10\%$, 1Vrms max. (1 MHz $\pm 10\%$ below 100 pF), 0 V bias and $20 \pm 2^\circ\text{C}$.								
Withstanding Voltage (Body Insulation)		<p>The specified voltage shall be applied to both terminals of the specimen connected together, with metal foil closely wrapped around its body for 1 minute. Electrical breakdown shall be examined.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Classification (Nominal varistor voltage)</th> <th>Test Voltage (AC)</th> </tr> </thead> <tbody> <tr> <td>V0.1 mA, V1 mA \leq 330 V</td> <td>1000 Vrms</td> </tr> <tr> <td>V0.1mA, V1mA $>$ 330 V</td> <td>1500 Vrms</td> </tr> </tbody> </table>		Classification (Nominal varistor voltage)	Test Voltage (AC)	V0.1 mA, V1 mA \leq 330 V	1000 Vrms	V0.1mA, V1mA $>$ 330 V	1500 Vrms	No breakdown
Classification (Nominal varistor voltage)	Test Voltage (AC)									
V0.1 mA, V1 mA \leq 330 V	1000 Vrms									
V0.1mA, V1mA $>$ 330 V	1500 Vrms									
Impulse Life (I)		The change of V_c shall be measured after the impulse listed below is applied 10000 times continuously with ten second intervals at room temperature.		$\Delta V_{CmA}/V_{CmA} \leq \pm 10\%$						
		3 Series	ERZC03DK220 to ERZC03DK390		0.2 A (2 ms)					
			ERZC03DK820 to ERZC03DK241		8 A (8/20 μs)					
		5 Series	ERZC05DK180 to ERZC05DK680		0.5 A (2 ms)					
			ERZC05DK820 to ERZC05DK471		20 A (8/20 μs)					
		7 Series	ERZC07DK180 to ERZC07DK680		18 A (8/20 μs)					
			ERZC07DK820 to ERZC07DK411		50 A (8/20 μs)					
		10 Series	ERZC10DK180 to ERZC10DK680		50 A (8/20 μs)					
			ERZC10DK820 to ERZC10DK112		100 A (8/20 μs)					
		14 Series	ERZC14DK180 to ERZC14DK680		75 A (8/20 μs)					
			ERZC14DK820 to ERZC14DK182		150 A (8/20 μs)					
		20 Series	ERZC20DK180 to ERZC20DK680		120 A (8/20 μs)					
			ERZC20DK820 to ERZC20DK182		200 A (8/20 μs)					
		Impulse Life (II)			The change of V_c shall be measured after the impulse listed below is applied 100000 times continuously with ten second intervals at room temperature.		$\Delta V_{CmA}/V_{CmA} \leq \pm 10\%$			
3 Series	ERZC03DK220 to ERZC03DK390			0.18 A (2 ms)						
	ERZC03DK820 to ERZC03DK241			6 A (8/20 μs)						
5 Series	ERZC05DK180 to ERZC05DK680			0.45 A (2 ms)						
	ERZC05DK820 to ERZC05DK471			14 A (8/20 μs)						
7 Series	ERZC07DK180 to ERZC07DK680			12 A (8/20 μs)						
	ERZC07DK820 to ERZC07DK471			35 A (8/20 μs)						
10 Series	ERZC10DK180 to ERZC10DK680			35 A (8/20 μs)						
	ERZC10DK820 to ERZC10DK112			70 A (8/20 μs)						
14 Series	ERZC14DK180 to ERZC14DK680			45 A (8/20 μs)						
	ERZC14DK820 to ERZC14DK182			90 A (8/20 μs)						
20 Series	ERZC20DK180 to ERZC20DK680			55 A (8/20 μs)						
	ERZC20DK820 to ERZC20DK182			100 A (8/20 μs)						

Note: Varistor Voltage change of forward direction shall be measured in the test of uni-pole surge life and DC load life.

Explanation of Part Numbers -(Crimped Leads)



Dimensions in mm (not to scale)

[Crimped Leads Type]

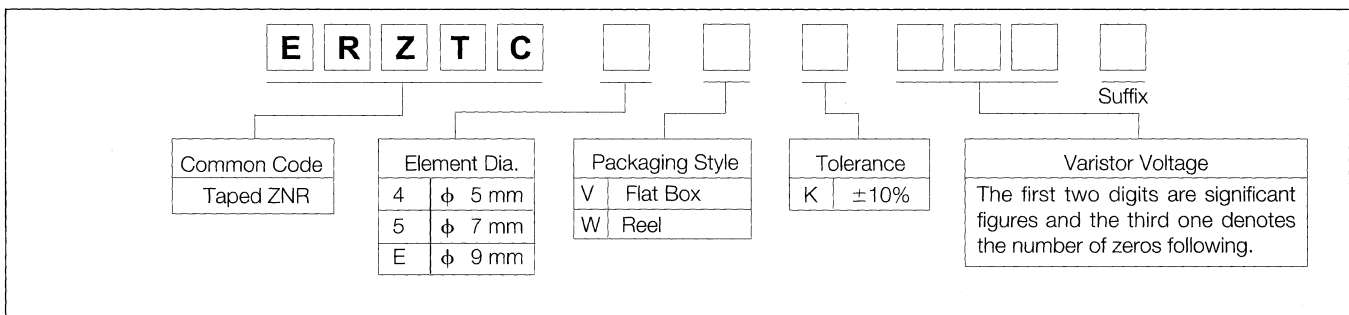
*“T” and “L” dimensions can be found in relevant ZNR Product Specifications

Crimped Leads Type

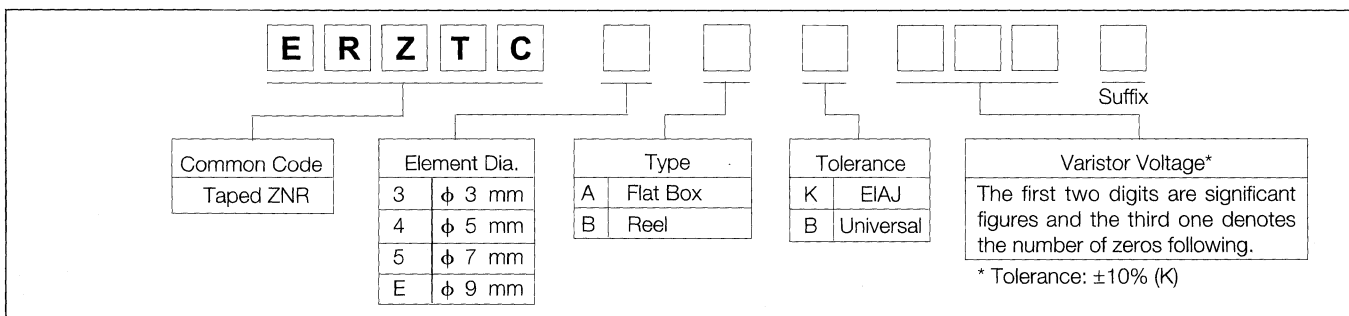
Symbol	Series	5 Series	7 Series	10 Series	14 Series	
A max.	Varistor Voltage [V _{1mA} (V)]	18 to 270	13.0	15.0	19.5	22.5
		360 to 470	13.0	15.0	20.5	23.5
	D max.		7.5	9.0	14.0	17.5
	K		1.2±0.4	1.2±0.4	1.4±0.4	1.4±0.4
	W		5.0±1.0	5.0±1.0	7.5±1.0	7.5±1.0
	φd		0.6	0.6	0.8	0.8

Taped ZNR's

Explanation of Part Numbers (Crimped Leads and Taped)

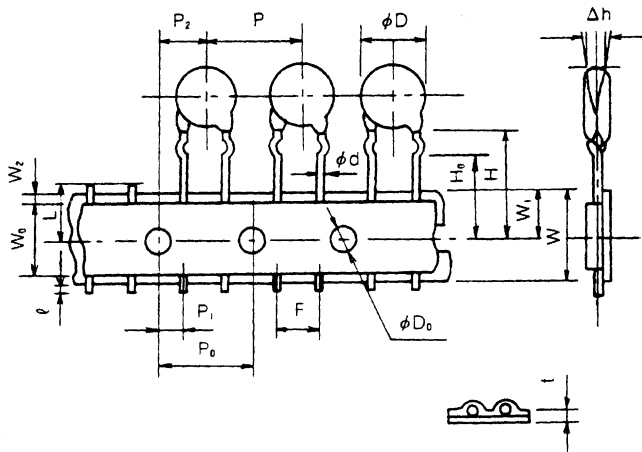


Explanation of Part Numbers (Straight Leads and Taped)



Dimensions in mm (not to scale)

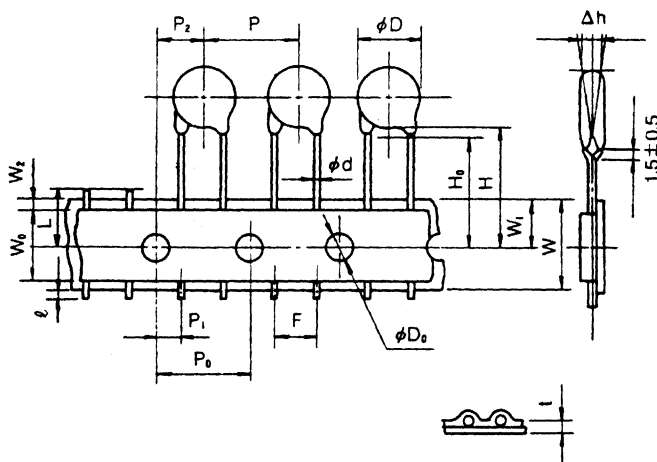
[Crimped Leads and Taped]



Symbol	Dimensions
P	12.7±1.0
P ₀	12.7±0.3
P ₁	3.85±0.70
P ₂	6.35±1.30
ød	0.60 ^{+0.06} _{-0.06}
F	5.0±0.5
Δh	0±2
W	18.0 ^{+1.0} _{-0.5}
W ₀	5.0 min.
W ₁	9.0±0.5
W ₂	3 max.
H	Approx. 22
H ₀	17.0±0.5
l	1 max.
øD ₀	ø4.0±0.2
t	0.6±0.3
L	11 max.

Dimensions in mm (not to scale)

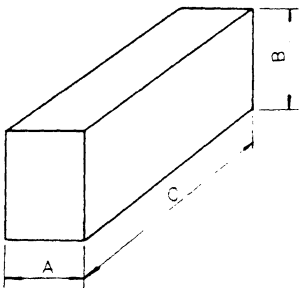
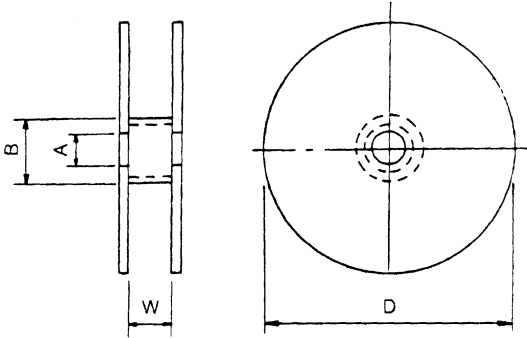
[Straight Leads and Taped]



Symbol	Dimensions
P	12.7±1.0
P ₀	12.7±0.3
P ₁	3.85±0.70
P ₂	6.35±1.30
ød	0.60 ^{+0.06} _{-0.06}
F	5.0±0.5
Δh	0±2
W	18.0 ^{+1.0} _{-0.5}
W ₀	5.0 min.
W ₁	9.0±0.5
W ₂	3 max.
H	Approx. 20
H ₀	17.0±0.5
l	1 max.
øD ₀	ø4.0±0.2
t	0.6±0.3
L	11 max.

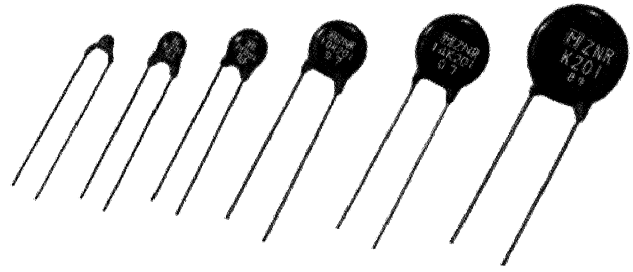
Note Relevant Specification: EIAJ

Packaging Specifications

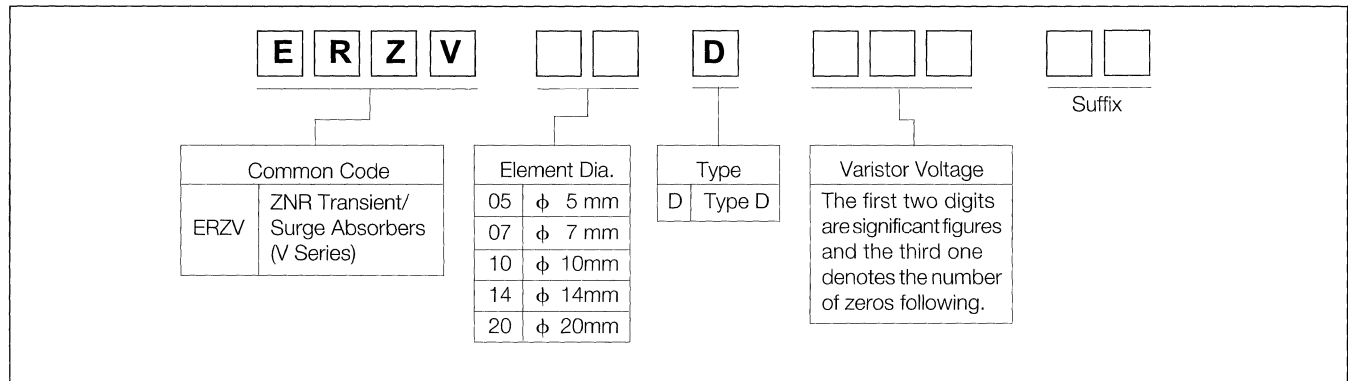
	Flat Box	Reel		
Dimensions in mm (not to scale)				
	A	55 max.	W	Approx. 44
	B	330 max. (185/220)	D	360 max.
	C	340 max.	A	Approx. ø30
		B	Approx. ø90	
Quantity	1000 pcs.	1000 pcs.		
Part No.	ERZTC□AK180 to 271 (Straight Leads and Taped)	ERZTC□BK361 to 471 (Straight Leads and Taped)		
	ERZTC□VK180 to 271 (Crimped Leads and Taped)	ERZTC□WK361 to 471 (Crimped Leads and Taped)		

Features

- Large Surge Current Ratings (approx. 5000A/cm²)
- Excellent Energy Ratings (approx. . 250J/cm³)
- All Standard Products are under UL recognition.



Explanation of Part Numbers



5 Series:

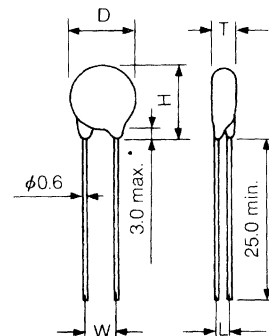
Ratings and Characteristics

Part No.	Varistor Voltage	Max. Allowable Voltage		Clamping Voltage	Power (W)	Energy (Joule)		Surge Current 8/20ms. (A)		Capacitance (1kHz)
	V _{1mA} DC(V)	ACrms (V)	DC (V)	V _{5A} max (V)		10/1000 (μs)	2 (ms.)	1 (Time)	2 (Times)	max. (pF)
ERZV05D820	82 (74-90)	50	65	145	0.1	3.5	2.5	800	600	460
ERZV05D201	200(185-225)	130	170	355	0.1	8.5	6.0	800	600	120
ERZV05D221	220(198-242)	140	180	380	0.1	9.0	6.5	800	600	110
ERZV05D241	240(216-264)	150	200	415	0.1	10.5	7.5	800	600	100
ERZV05D271	270(247-303)	175	225	475	0.1	11.0	8.0	800	600	90*
ERZV05D331	330(297-363)	210	270	570	0.1	13.0	9.5	800	600	80*
ERZV05D471	470(423-517)	300	385	810	0.1	21.0	15.0	800	600	60*

* Measured at 1MHz.

Dimensions in mm (not to scale)

Part No.	D max.	T max.	W ±1	H max.	L ±1
ERZV05D820	7.0	4.1	5	10.0	1.4
ERZV05D201	7.0	4.4	5	10.0	1.7
ERZV05D221	7.0	4.5	5	10.0	1.8
ERZV05D241	7.0	4.6	5	10.0	1.9
ERZV05D271	7.0	4.8	5	10.0	2.1
ERZV05D331	7.0	5.1	5	10.0	2.4
ERZV05D471	7.0	5.8	5	10.0	3.1



"ZNR" Transient/Surge Absorber
High Surge Current Capability

ERZ-V(D) Series

7 Series:

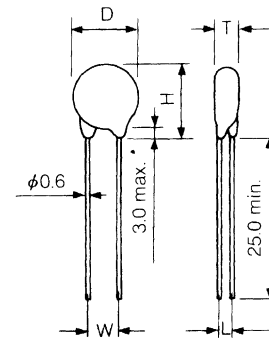
Ratings and Characteristics

Part No.	Varistor Voltage	Max. Allowable Voltage		Clamping Voltage	Power (W)	Energy (Joule)		Surge Current 8/20ms. (A)		Capacitance (1kHz)
	V _{1mA} DC(V)	ACrms (V)	DC (V)	V _{10A max} (V)		10/1000 (μs)	2 (ms)	1 (Time)	2 (Times)	max. (pF)
ERZV07D820	82(74-90)	50	65	135	0.25	7	5	1750	1250	810
ERZV07D201	200(185-225)	130	170	340	0.25	17.5	12.5	1750	1250	200
ERZV07D221	220(198-242)	140	180	360	0.25	19	13.5	1750	1250	190
ERZV07D241	240(216-264)	150	200	395	0.25	21	15	1750	1250	170
ERZV07D271	270(247-303)	175	225	455	0.25	24	17	1750	1250	150
ERZV07D331	330(297-363)	210	270	545	0.25	28	20	1750	1250	130
ERZV07D471	470(423-517)	300	385	775	0.25	42	30	1750	1250	100
ERZV07D511	510(459-561)	320	410	845	0.25	45	32	1750	1250	90*

* Measured at 1 MHz.

Dimensions in mm (not to scale)

Part No.	D max.	T max.	W ±1	H max.	L ±1
ERZV07D820	8.5	4.1	5	11.5	1.4
ERZV07D201	8.5	4.4	5	11.5	1.7
ERZV07D221	8.5	4.5	5	11.5	1.8
ERZV07D241	8.5	4.6	5	11.5	1.9
ERZV07D271	8.5	4.8	5	11.5	2.1
ERZV07D331	8.5	5.1	5	11.5	2.4
ERZV07D471	8.5	5.8	5	11.5	3.1
ERZV07D511	8.5	6.0	5	11.5	3.3



10 Series:

Ratings and Characteristics

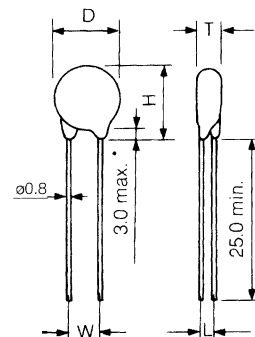
Part No.	Varistor Voltage	Max. Allowable Voltage		Clamping Voltage	Power (W)	Energy (Joule)		Surge Current 8/20ms. (A)		Capacitance (1kHz)
	V _{1mA} DC(V)	ACrms (V)	DC (V)	V _{25A max} (V)		10/1000 (μs)	2 (ms)	1 (Time)	2 (Times)	max. (pF)
ERZV10D820	82 (74-90)	50	65	135	0.4	14	10	3500	2500	2000
ERZV10D201	200 (185-225)	130	170	340	0.4	35	25	3500	2500	430
ERZV10D221	220 (198-242)	140	180	360	0.4	39	27.5	3500	2500	410
ERZV10D241	240 (216-264)	150	200	395	0.4	42	30	3500	2500	380
ERZV10D271	270 (247-303)	175	225	455	0.4	49	35	3500	2500	350
ERZV10D331	330 (297-363)	210	270	545	0.4	58	42	3500	2500	300
ERZV10D471	470 (423-517)	300	385	775	0.4	85	60	3500	2500	230
ERZV10D511	510 (459-561)	320	410	845	0.4	92	67	3500	2500	210
ERZV10D821	820 (738-902)	510	670	1355	0.4	110	80	3500	2500	140
ERZV10D911	910 (819-1001)	550	745	1500	0.4	130	90	3500	2500	120
ERZV10D112	1100 (990-1210)	680	895	1815	0.4	155	110	3500	2500	110
ERZV10D182	1800 (1700-1980)	1200	1580	2970	0.4	247	183	3000	2500	70*

* Measured at 1 MHz.

Dimensions in mm (not to scale)

Part No.	D max.	T max.	W ±1	H max.	L ±1	øD
ERZV10D820	11.5	4.5	7.5	14.5	1.6	0.8
ERZV10D201	11.5	4.8	7.5	14.5	1.9	0.8
ERZV10D221	11.5	4.9	7.5	14.5	2.0	0.8
ERZV10D241	11.5	5.0	7.5	14.5	2.1	0.8
ERZV10D271	11.5	5.2	7.5	14.5	2.3	0.8
ERZV10D331	11.5	5.5	7.5	14.5	2.6	0.8
ERZV10D471	11.5	6.2	7.5	14.5	3.3	0.8
ERZV10D511	11.5	6.4	7.5	14.5	3.5	0.8
ERZV10D821	12.5	8.1	7.5	15.5	5.2	0.8
ERZV10D911	12.5	8.6	7.5	15.5	5.7	0.8
ERZV10D112	12.5	9.7	7.5	15.5	6.8	0.8
ERZV10D182	13.5	14.4	*A11.0	15.5	*B10.5	0.8

*A: W2 *B: ±2



14 Series: Ratings and Characteristics

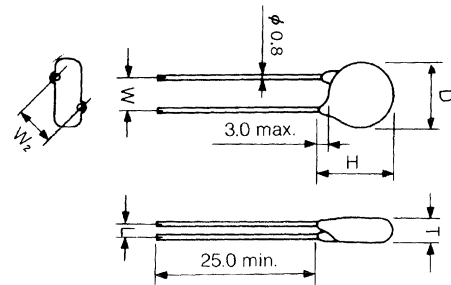
Part No.	Varistor Voltage	Max. Allowable Voltage		Clamping Voltage	Power (W)	Energy (Joule)		Surge Current 8/20ms. (A)		Capacitance (1kHz)
	V _{1mA} DC(V)	ACrms (V)	DC (V)	V _{50A max} (V)		10/1000 (μs)	2 (ms.)	1 (Time)	2 (Times)	max. (pF)
ERZV14D820	82 (74-90)	50	65	135	0.6	28	20	6000	4500	3700
ERZV14D201	200 (185-225)	130	170	340	0.6	70	50	6000	4500	770
ERZV14D221	220 (198-242)	140	180	360	0.6	78	55	6000	4500	740
ERZV14D241	240 (216-264)	150	200	395	0.6	84	60	6000	4500	700
ERZV14D271	270 (247-303)	175	225	455	0.6	99	70	6000	4500	640
ERZV14D331	330 (297-363)	210	270	545	0.6	115	80	6000	4500	580
ERZV14D471	470 (423-517)	300	385	775	0.6	175	125	6000	4500	400
ERZV14D511	510 (459-561)	320	410	845	0.6	190	136	6000	4500	350
ERZV14D821	820 (738-902)	510	670	1355	0.6	235	165	6000	4500	280
ERZV14D911	910 (819-1001)	550	745	1500	0.6	255	180	6000	4500	250
ERZV14D112	1100 (990-1210)	680	895	1815	0.6	310	220	6000	4500	210
ERZV14D182	1800 (1700-1980)	1200	1580	1970	0.6	510	360	6000	4500	120

Dimensions in mm (not to scale)

Part No.	D max.	T max.	W ±1	H max.	L ±1	φd
ERZV14D820	15.5	4.5	7.5	18.5	1.6	0.8
ERZV14D201	15.5	4.8	7.5	18.5	1.9	0.8
ERZV14D221	15.5	4.9	7.5	18.5	2.0	0.8
ERZV14D241	15.5	5.0	7.5	18.5	2.1	0.8
ERZV14D271	15.5	5.2	7.5	18.5	2.3	0.8
ERZV14D331	15.5	5.5	7.5	18.5	2.6	0.8
ERZV14D471	15.5	6.2	7.5	18.5	3.3	0.8
ERZV14D511	15.5	6.4	7.5	18.5	3.5	0.8
ERZV14D821	16.0	8.1	7.5	19.0	5.2	0.8
ERZV14D911	16.0	8.6	7.5	19.0	5.7	0.8
ERZV14D112	16.0	9.7	7.6	19.0	6.8	0.8
ERZV14D182	17.0	14.4	*A15.0	20.5	*B10.5	0.8

*A W/2

*B ±2

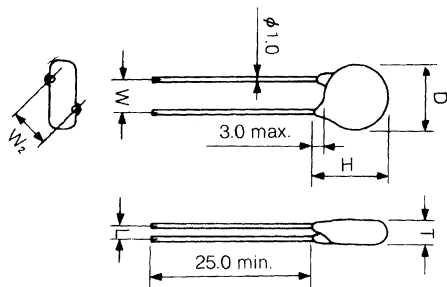


Dimensions in mm (not to scale)

Part No.	D max.	T max.	W ±1	H max.	L ±1	φd
ERZV20D820	21.5	4.9	10.0	24.5	1.8	1.0
ERZV20D201	21.5	5.2	10.0	24.5	2.1	1.0
ERZV20D221	21.5	5.3	10.0	24.5	2.2	1.0
ERZV20D241	21.5	5.4	10.0	24.5	2.3	1.0
ERZV20D271	21.5	5.6	10.0	24.5	2.5	1.0
ERZV20D331	21.5	5.9	10.0	24.5	2.8	1.0
ERZV20D471	21.5	6.6	10.0	24.5	3.5	1.0
ERZV20D511	21.5	6.8	10.0	24.5	3.7	1.0
ERZV20D821	22.5	8.5	10.0	25.5	5.4	1.0
ERZV20D911	22.5	9.0	10.0	25.5	5.9	1.0
ERZV20D112	22.5	10.1	10.0	25.5	7.0	1.0
ERZV20D182	23.5	14.8	*A15.0	28.0	*B10.7	1.0

*A W/2

*B ±2



20 Series: Ratings and Characteristics

Part No.	Varistor Voltage	Max. Allowable Voltage		Clamping Voltage	Power (W)	Energy (Joule)		Surge Current 8/20ms. (A)		Capacitance (1kHz)
	V _{1mA} DC(V)	ACrms (V)	DC (V)	V _{100A max} (V)		10/1000 (μs)	2 (ms.)	1 (Time)	2 (Times)	max. (pF)
ERZV20D820	82 (74-90)	50	65	135	1.0	56	40	10000	6500	7500
ERZV20D201	200 (185-225)	130	170	340	1.0	140	100	10000	6500	1700
ERZV20D221	220 (198-242)	140	180	360	1.0	155	110	10000	6500	1600
ERZV20D241	240 (216-264)	150	200	395	1.0	168	120	10000	6500	1500
ERZV20D271	270 (247-303)	175	225	455	1.0	190	135	10000	6500	1300
ERZV20D331	330 (297-363)	210	270	545	1.0	228	160	10000	6500	1100
ERZV20D471	470 (423-517)	300	385	775	1.0	350	250	10000	6500	900
ERZV20D511	510 (459-561)	320	410	845	1.0	382	273	10000	6500	800
ERZV20D821	820 (738-902)	510	670	1355	1.0	460	325	7000	6500	530
ERZV20D911	910 (819-1001)	550	745	1500	1.0	510	360	7000	6500	500
ERZV20D112	1100 (990-1210)	680	895	1815	1.0	620	440	7000	6500	400
ERZV20D182	1800 (1700-1980)	1200	1580	2970	1.0	1020	720	7000	6500	250

Ratings and Characteristics (Type SF)

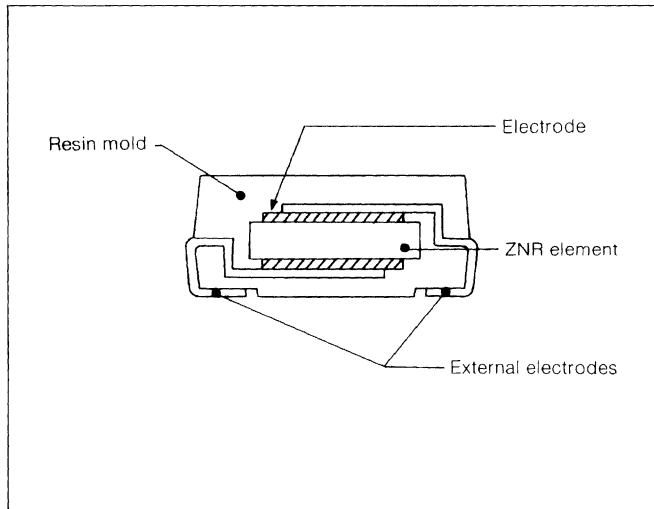
Part No.	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage*	Rated Power	Energy (ms)	Maximum Peak Current (8/20ms, 2 times)
	V ₁ mA (V)	ACrms (V)	DC (V)	V _{XA} (V)	(W)	(J)	(A)
ERZSF □ MK220	22 (20 – 25)	14	18	43	0.02	0.9	125
ERZSF □ MK270	27 (24 – 30)	17	22	53	0.02	1.0	125
ERZSF □ MK330	33 (30 – 36)	20	26	65	0.02	1.2	125
ERZSF □ MK390	39 (35 – 43)	25	31	77	0.02	1.5	125
ERZSF □ MK470	47 (42 – 52)	30	38	93	0.02	1.8	125
ERZSF □ MK560	56 (50 – 62)	35	45	110	0.02	2.2	125
ERZSF □ MK680	68 (61 – 75)	40	56	135	0.02	2.5	125
ERZSF □ MK820	82 (74 – 90)	50	65	135	0.25	3.5	600
ERZSF □ MK121	120 (108 – 132)	75	100	200	0.25	5.0	600
ERZSF □ MK221	220 (198 – 242)	140	180	360	0.25	9.0	600
ERZSF □ MK241	240 (216 – 264)	150	200	395	0.25	10.0	600
ERZSF □ MK271	270 (247 – 303)	175	225	455	0.25	12.0	600
ERZSF □ MK391	390 (351 – 429)	250	320	650	0.25	12.0	400
ERZSF □ MK471	470 (423 – 517)	300	385	775	0.25	14.0	400

Performance Characteristics

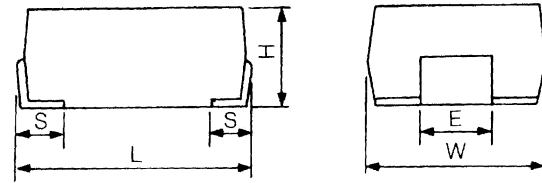
(Electrical)

Characteristics	Test Methods	Specifications
Standard Test Condition	Unless otherwise specified Temperature 5 to 35°C Relative humidity: 45 to 85% RH	—
Varistor Voltage	The voltage between two terminals with the specified measuring current C _m A DC applied is called V _C or V _{Cm} A. The measurement shall be made as fast as possible to avoid heat affection.	To meet the specified value.
Maximum Allowable Voltage	The recommended maximum sinusoidal wave voltage (rms) or the maximum DC voltage that can be applied continuously.	
Maximum Clamping Voltage	The maximum voltage between two terminals with the specified impulse current (8/20 μs).	
Rated Power	The maximum power that can be applied within the specified ambient temperature.	
Energy	Maximum energy at less than ±10 % of varistor voltage change when the standard impulse (2 ms) is applied one time.	
Maximum Peak Current	Maximum current at less than ±10 % of varistor voltage change when impulse current (8/20 μs) is applied two times continuously with the interval of 5 minutes.	
Temperature Coefficient of Varistor Voltage	$\frac{V_C \text{ at } 85^\circ\text{C} - V_C \text{ at } 25^\circ\text{C}}{V_C \text{ at } 25^\circ\text{C}} \times \frac{1}{60} \times 100 \text{ (\%/}^\circ\text{C)}$	0 to -0.05%/°C

Construction



Dimensions in mm (not to scale)

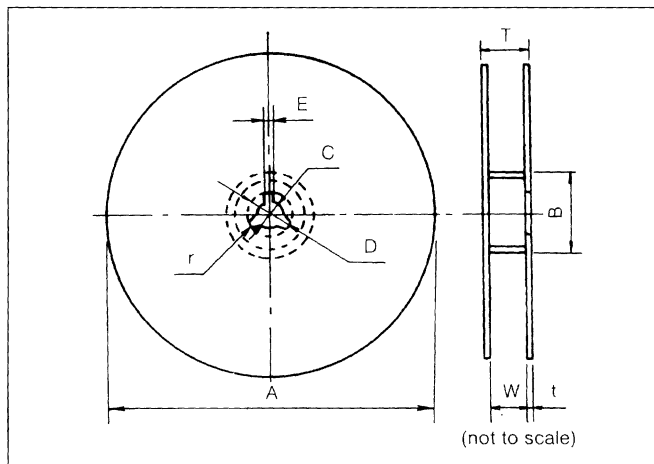


Size Code	W	L	H	S	E
CF/SF	6.0±0.4	8.0±0.5	3.2±0.3	1.3±0.3	2.5±0.2

Packaging Specifications
Standard Packing Quantity

Size Code	Thickness (mm)	Style	
		Embossed taping	Bulk
CF/SF	3.2±0.3	2000 pcs./reel	500 pcs./bag

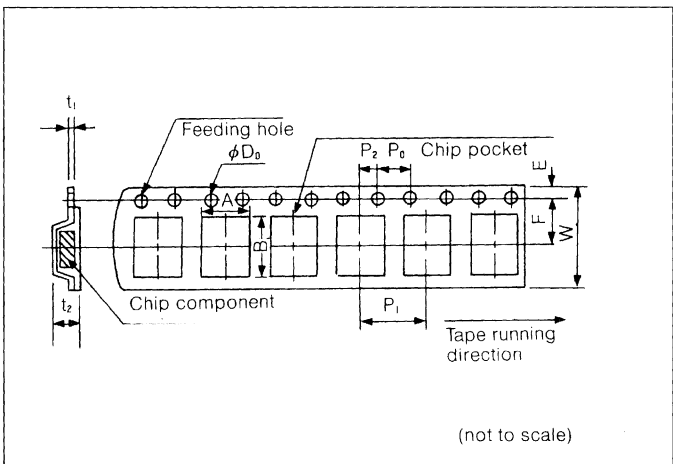
Reel



Symbol	A	B	C	D	E
Dim. (mm)	382 max.	50 min.	13±0.5	21±0.8	2.0±0.5

Symbol	W	T	t	r
Dim. (mm)	16.4 ^{+2.0} _{-0.0}	22.4 max.	2.5±0.5	1.0

Embossed taping



Symbol	A	B	W	F	E	P ₁
Dim. (mm)	6.8 max.	11.9 max.	16	7.5	1.75	8

Symbol	P ₂	P ₀	øD ₀	t ₁	t ₂
Dim. (mm)	2.0	4.0	1.5	0.6 max.	6.5 max.

1. Soldering Methods

Soldering Method	Recommended Conditions	Suggestions
Flow Soldering	260 °C within 5 seconds	Gas removal is recommended to keep good solderability at high density mounting of components.
Reflow Soldering	230 °C within 10 seconds	If land is too large in comparison with the size of terminal surface, part may be ill-situated at solder melting.



Panasonic