Semiconductor IC

Data Book 1992 Discrete Semiconductor

SONY

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Discrete Semiconductor Data Book 1991

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1991

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PREFACE

The history of Sony semiconductors began over 37 years ago in 1954, with the first commercial introduction of the transistor in Japan. Since then, Sony has applied this leading-edge, innovative technology in the development of the semiconductors, currently used in most of its electronic products.

This discrete semiconductor data book has been compiled with the aim of providing the circuit designer with a reference guide describing Sony's presently available product line, together with application information for each category of discrete semiconductors.

Sony Semiconductor Data Books

The following data books are available for the respective products applications.

1. TVs
2. Videos
3. CCD Cameras & Peripherals
4. Compact Discplayers
5. Analog Audio
6. Floppy Disk/Hard Disk Drive ICs
7. Radio Communication System ICs
8. A/D, D/A Converters
9. SPECL Standard Logic
10. Microcomputers
11. Microprocessors
12. Memories
13. Discrete Semiconductors

In addition, a List of Semiconductor Products covering all manufacutured device on the market, is issued twice a year.

Data books offer information pertaining to the listed products.

Contents

1. List of Model Names

Type	Page	Type	Page	Type	Page
1T32/1T32A	31	SLD202U/V	73	SLU302XR	193
1T33/1T33A	34	SLD202U-3/V-3	76	SLU303VR	197
1T33C	37	SLD203AV	79	SLU303XR	201
1T339	335	SLD301B	102	SLU304VR	205
1T359	49	SLD301V	82	SLU304XR	209
1T360	51	SLD301WT	88	2SK125	215
1T362	40	SLD301XT	95	2SK152	224
1T363	44	SLD302B	128	2SK300	231
1T364	47	SLD302V	108	2SK613	237
PHD003	337	SLD302WT	114	2SK676H5	273
SGH5002F	287	SLD302XT	121	2SK677H5	280
SGH5003F	291	SLD303B	155	3SK165	265
SGH5612F	295	SLD303V	134	3SK166	269
SGM2004M	253	SLD303WT	141	CXD7500M	245
SGM2006M/P	257	SLD303XT	148	DM-106B	301
SGM5102F	261	SLD304B	175	DM-111	305
SLD104AU	55	SLD304V	161	DM-211	311
SLD111V	58	SLD304XT	168	DM-230	316
SLD151U/V	63	SLU301VR	181	DM-231	320
SLD201U/V	67	SLU301XR	185	DM-232	324
SLD201U-3/V-3	70	SLU302VR	189	DM-233	328

2. Index by Usage

1) Variable Capacitance Diodes

Type	Package	Application	Remark	Voltage (V)	Page
1T32 1T32A	2P Mini mold	UHF/VHF tuning	Smaller package ΔC: 3% (1T32A: 2%)	2~25	31
1T33 1T33A	2P Mini mold	CATV tuning	Smaller package ΔC: 3% (1T33A: 2%)	2~25	34
1T33C	2P Mini mold	CATV tuning	Advanced type of 1T33, ΔC: 2%	1~28	37
1T362	2P Super Mini mold	UHF/VHF tuning	Super mini mold package of 1T32, ΔC: 3%	2~25	40
1T363	2P Super Mini mold	CATV tuning	Super mini mold package of 1T33C, ΔC: 3%	1~28	44
1T364	2P Super Mini mold	CATV tuning	Super mini mold package of 1T360	~30	47
1T359	2P Mini mold	UHF/VHF tuning	C_2/C_{25}: 6.5, rs: ~0.4Ω, ΔC: 3%	~30	49
1T360	2P Mini mold	CATV tuning	Advanced type of 1T33C, Large capacitance ratio	~30	51

ΔC: Maximum capacitance deviation for same rank.

2) Laser Diodes

Type	Package	Applications	Features	Wavelength (nm)	Output Power (mW) max	Page
SLD104AU	3P ϕ5.6mm	Light source of CD/VD pickups	Low power consumption	780	5	55
SLD111V		Light source of CD pick up	Low noise, Low power consumption			58
SLD151U SLD151V	3P ϕ9mm	Bar code Scanner Laser printer	Red light emission	670	5	63
SLD201U SLD201V		Magneto-optical disk	Low noise, high power density	780	20	67
SLD201U-3 SLD201V-3					50	70
SLD202U SLD202V				820	25	73
SLD202U-3 SLD202V-3					50	76
SLD203AV			Signgle mode, high power density	780	35	79
SLD301V	3P ϕ9mm	Medical use, Solid State laser excitation	Laser diods efficiency is higher than gas laser, solid state laser	*Wavelength select possible	100	82
SLD301WT	8P TO-3					88
SLD301XT	8P Square type					95
SLD301B	Bare block					102
SLD302V	3P ϕ9mm				200	108
SLD302WT	8P TO-3					114
SLD302XT	8P Square type					121
SLD302B	Bare block					128
SLD303V	3P ϕ9mm				500	134
SLD303WT	8P TO-3					141
SLD303XT	8P Square type					148
SLD303B	Bare block					155
SLD304V	3P ϕ9mm				1000	161
SLD304XT	8P Square type					168
SLD304B	Bare block					175
SLU301VR	Special	Medical use, Solid State laser excitation	For fiber, coupling with lens, FC type connector		70/80	181
SLU301XR						185
SLU302VR					140/160	189
SLU302XR						193
SLU303VR					350/400	197
SLU303XR						201
SLU304VR					700/800	205
SLU304XR						209

Note) WT, XT package with a TE (Thermo Electric) cooler

VR: V package with a lens, a FC type connector and Frange and Fiber

XR: XT package with a lens, a FC type connector and Fiber

※Wavelength category (SLD300 series SLU300 series only)

: Wavelength selection (Primary classification)

Rank	Wavelength (nm)
1	785±15
2	810±10
3	830±10

: Wavelength selection (Sub-classification)

Rank	Wavelength (nm)
21	798±3
24	807±3
25	810±3

3) Si FETs

Type	Package	Structure	Applications	Voltage (V)	Page
2SK125	3P TO-92	N-channel J. FET	UHF amplifier, mixer, oscillator	10	215
2SK152	3P TO-92	N-channel J. FET	Audio frequency amplifier, high frequency amplifier	5	224
2SK300	3P Mini mold	N-channel J. FET	Audio frequency amplifier, high frequency amplifier	5	231
2SK613	3P Mini mold	N-channel J. FET	Audio frequency amplifier, high frequency amplifier	5	237
CXD7500M	8P SOP	P-channel MOS FET	Voltage control type variable resistor	10	245

4) GaAs FETs

Type	Package	Applications	Features	Drain to source Voltage (V)	Page
SGM2004M	4P Mini mold	UHF RF, amplifier	Low crossmodulation Built-in gate protection diode.	5	253
SGM2006M SGM2006P	4P Mini mold	UHF, RF, amplipier, mixer, oscillator	Low noise, Built-in gate protection diode.	5	257
SGM5102F	4P Ceramic	Microwave amplifier	Low noise NF: 2.1dB max	5	261
3SK165	4P Mini mold	UHF, RF amplifier, mixer, oscillator	Low noise, low input capacity	5	265
3SK166	4P Mini mold	UHF, RF, amplifier, oscillator	Low noise, high gm 40ms (Typ)	5	269
2SK676H5	Chip	Microwave low noise amplifier. For high speed logic	Low noise	2	273
2SK677H5	Chip	Microwave low noise amplifier. For high speed logic	Low noise	2	280
SGH5002F	4P Ceramic	Microwave low noise amplifier, DBS, FSS	Low noise NF: 1.3~1.7dB max	2	287
SGH5003F	4P Ceramic	Microwave low noise amplifier, DBS, FSS	Low noise NF: 1.3~1.7dB max	2	291
SGH5612F	4P Ceramic	Microwave low noise amplifier, DBS, FSS	Low noise NF: 1.0~1.2dB max	2	295

5) SDME (Magneto resistance element)

Type	Package	Applications	Remark	Page
DM-106B	3P Mold	rpm detection, other general use	Small, standard model (2.3kΩ typ)	301
DM-111	3P Mold	rpm detection, battery operated telemeter	High resistance (650kΩ typ)	305
DM-211	4P Mold	Ditection of revolution speed	Matching with multi-pole ring magnet (λ =4.52mm)	311
DM-230	4P Special Mold	Non-contact angle of rotation detection Non-contact number of rotation detection	High sensitibity	316
DM-231	4P Special Mold	Non-contact angle of rotation detection Contactless potentiometer	Biasmagnet adhered $\theta=90^\circ$	320
DM-232	4P Special Mold	Non-contact angle of rotation detection Contactless potentiometer	Biasmagnet adhered $\theta=0^\circ$	324
DM-233	4P Special Mold	Non-contact angle of rotation detection Contactless potentiometer	Ferrite without magnetic field adhered	328

6) Photo Diodes

Type	Package	Features	Page
1T339	8P SOP	• CD pickup, Silicon PIN photodiode • High sensitivity S=0.5A/W • Pattern custom compatible (max 6 split elements)	335
PHD003	8P SOP		337

3. Description

1) Nomenclature of Sony Semiconductors

So far names of Sony FET devices have been based on the semiconductor nomenclature method of the Japan industrial Standards (JIS C7012). For other semiconductors (GaAs discrete devices, diodes, laser diodes and magnetoresistance elements), Sony's own nomenclature is used. The following is an explanation of how each device is named.

(1) Nomenclature of diodes

1T □□⬚ □

- □ — Changes in alphabet order.
- □□⬚ — Indicates the product No. for each individual device.
- 1T — Indicates Sony diode.

(2) Nomenclature of field effect transistors

No.1	No.2	No.3	No.4	No.5
(Figure)	(Letter)	(Letter)	(Figure)	(Letter)

The No.1 figure denotes the type of semiconductor device.

The device's number of effective electrical connections minus one is used for this number (n-1).

The No.2 letter shows the symbol "**S**" representing semiconductor devices registered with the Electronic Industries Association of Japan (EIAJ).

The No.3 letter shows the polarity and application of the semiconductor device. For example, "**K**" indicates an N-Channel FET.

The No.4 figure represents a sequential number registered with the Electronic Industries Association of Japan for each of the preceding types (No.1 figure, No.2 and No.3 letters).

The No.5 letters changes in A, B, C, ... alphabet order every time the device specifications are modified for improvement.

(3) Nomenclature of magnetoresistance elements

DM-□□□ □

- □ — Letter indicating improvement.
- □□□ — Indicates the product No. for each individual device.
- DM- — Indicates Sony Magnetoresistance Elements.

(4) Nomenclature of laser diodes

SL □ □□□ ⬚ □⬚ - □⬚ ⬚⬚

- Fiber (Application products only)
- Wavelength classification (However for the actual 201 and 202, indicates output classification)

  cf. SLD 300 series

General classification	Minute classification
−1	−21
−2	−24
−3	−25

- Package type
  - U : ϕ5.6mm Oblique cap package
    ϕ9mm Oblique cap package
  - V : ϕ9mm Flat cap package
  - WT : TO-3 Equivalent 8 pins Built-in TE cooler
  - XT : Special square type 8 pins Built-in TE cooler
  - VR : V package + flange + coupling lens + FC connector + fiber
  - XR : XT package + coupling lens + FC connector + fiber
- Modification symbol (alphabetical order)
- Product number
- D : Basic product
  U : Application product
- Indicates Sony laser diode

(5) Nomenclature of GaAs discrete devices

SG □ □□□□ ⬚ □ - □□

- NF
- Package type
  - M, P : 4pin mini mold
  - C : chip
  - E : ceramic disk cross
- Modification symbol (Alphabetical order)
- Symbol indicating product number
- H : HEMT
  M : MES FET
- Indicates Sony GaAs device

2) Ratings and Characteristics

(1) Absolute maximum ratings

The reliability of semiconductors chiefly depends on two factors. One, needless to say, is the manufacturing quality. The other can be defined as the "operating conditions" which are selected by the user. That is, selection of the circuit, and environmental conditions, among other factors, play an important role.

Thus, to ensure the highest degree of reliability in the usage of semiconductors, proper selection is a key point. To this effect the absolute maximum ratings should be carefully taken into consideration.

What are Absolute maximum ratings

The maximum ratings are usually given with the semiconductor specifications. The values should not be exceeded, even momentarily.

Exceeding these values, even for a moment, will adversely affect the device, inducing premature aging or breakdown. Breakdown may not occur immediately, but still, service life would be drastically shortened. Also, any **Two** items from those ratings **SHOULD NOT** reach their maximum value at **THE SAME TIME**. When designing a circuit, the following items, at their worst condition, should be taken into account to avoid overrunning the absolute maximum ratings.

- Fluctuation of the supply voltage
- Irregularity in the electrical characteristics of the electric parts, such as FETs, resistors or capacitors
- Power loss during circuit adjustment
- Ambient temperature
- Fluctuation of input signals
- Input of abnormal pulses

For pulse application usage, be careful with the Area of Safe Operation (ASO), operation amplitude, peak voltage and current.

(2) Diodes maximum ratings (Variable capacitance diodes, Photo diodes)

Item	Symbol	Definition
Peak reverse voltage	V_{RM}	The maximum allowable value of AC voltage applied in reverse where the average voltage is kept below V_R
Reverse voltage	V_R	Maximum allowable value of DC voltage applied in reverse
Forward current	I_F	Maximum allowable value of average rectifying current or DC current that can be applied
Operating temperature	T_{opr}	The maximum allowable value of ambient temperature where operation is possible under normal heat dissipating conditions
Junction temperature	T_j	Maximum allowable value of the junction temperature. This temperature is the sum of the ambient temperature during operation and the rise in temperature due to internal power dissipation (PD) of the diode itself
Storage temperature	T_{stg}	The lower and upper limit of the ambient temperature that should not be exceeded when the diode is stored in a state of non operation

2-1) Electrical Characteristics of Variable Capacitance Diodes

Item	Symbol	Definition
Reverse breakdown voltage	V_{RM}	Applied reverse voltage when normal reverse current flows
Reverse current	I_R	The current that flows in reverse when normal voltage is applied
Pin interval capacitance	C_2	Pin interval capacitance when a 2V reverse voltage is applied
Capacitance ratio	C_2/C_{25}	Ratio of the pin interval capacitance when a 2V reverse voltage is applied
Series resistance	r_s	High frequency series resistance under specified conditions
Performance exponent	Q	Ratio between dissipated and stored energy
Maximum capacitance deviation in the same rank	ΔC	Indicates the amount of capacitance deviation and is defined through the following formula $\Delta C = \frac{C_{max} - C_{min}}{C_{min}} \times 100\ (\%)$
Capacitance variation rate	n	The capacitance variation rate is expressed through the following formula $n = -\frac{V}{C}\frac{dC}{dV}$
High frequency distortion	P	High frequency distortion is expressed through the following formula $P = \frac{1}{8}\left\{\frac{1}{C} \cdot \frac{d^2C}{dV^2} - \frac{4}{3}\left(\frac{1}{C} \cdot \frac{dC}{dV}\right)^2\right\} \times 100\ (\%)$

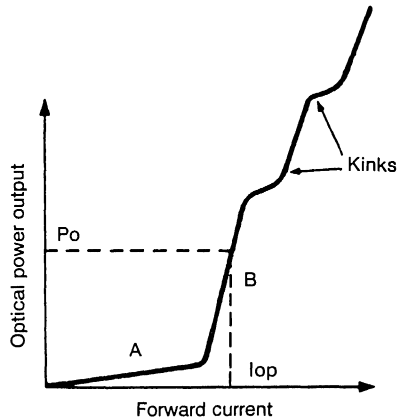
2-2) Electrical Characteristics of Photo Diodes

Item	Symbol	Definition
Forward voltage	V_F	Voltage between pins when normal current flows forward
Dark current	I_D	The current when normal voltage is applied with the photo-diode kept in the dark
Pin interval capacitance	C_1	Capacitance between focus diode and cathode
Pin interval capacitance	C_2	Capacitance between tracking diode and cathode
Sensitivity	S	The amount of photocurrent per unit incident light at a standard wavelength

3) Absolute Maximum Ratings of Laser Diodes

Item	Symbol	Definition
Optical power output	Po	Maximum allowable instantaneous optical power output under continuous (CW) operation. Up to this output level, there are no kinks in the current vs power output curve.
Reverse voltage	V_R	Maximum allowable voltage when reverse bias is applied to either the laser diode or photodiode.
Operating temperature	Topr	Range of case temperatures within which the device may be safely operated.
Storage temperature	Tstg	Range of case temperatures within which the device may be safely stored.
Case temperature	Tc	Device temperature measured at the base of the package.

Optical Power Output vs. Forward Current.



3-1) Electro-Optical Characteristics

Item	Symbol	Definition
Forward Current	I_F	Current through the laser diode under forward bias.
Threshold Current	Ith	The boundary between spontaneous emission (region A) and stimulated emission (region B) on the optical power output vs. forward current curve.
Operating Current	Iop	The forward current through the laser diode necessary to produce its specified optical power output.
Operating Voltage	Vop	The forward voltage across the laser diode when the device produces its specified optical power output.

Item		Symbol	Definition
Wavelength		λ	The wavelength of the light emitted by the laser diode. For a single mode device, this is the wavelength of the single spectral line of the laser output. For a multi-mode device, this is the wavelength of the spectral line with the greatest intensity.
Monitor Current		Im	The current through the photodiode, at a specified reverse bias voltage, when the laser diode is producing its specified power output.
Beam Divergence		$\theta /\!/$, $\theta \perp$	The laser beam's full width, half-maximum intensity points (FWHM), measured both parallel and perpendicular to the junction plane.
Positional accuracy	Angles	$\Delta\phi /\!/$, $\Delta\phi \perp$	The deviation of the optical axis of the beam from the mechanical axis of the package, measured both parallel and perpendicular to the junction plane.
	Position	$\Delta x, \Delta y, \Delta z$	Displacement of the laser diode chip with respect to the device package. Δx and Δy are measured as the planer displacement of the chip from the physical axis of the package. Δz is measured perpendicular to the reference plane.
Slope Efficiency		η_D	The mean value of the incremental change in laser power output for an incremental change in forward current. $\eta = \frac{\Delta Po}{\Delta I_F}$
Thermal Resistance			The incremental change in the laser diode junction temperature for an incremental change in the power dissipation of the laser chip.
Signal to Noise Ratio		S/N	Noise is defined as the fluctuation over time of the intensity of the laser diode output, when driven by a DC input. The signal to noise ratio is expressed in terms of the mean output power, P. and the fluctuation δP, as: S/N = 10 log ($P/\delta P$) decibels. Noise includes; 1) mode hopping noise caused by temperature changes at the laser diode junction, and 2) optical feedback noise caused by the formation of a complex resonator when part of the laser beam is reflected back into the laser diode.

Item	Symbol	Definition
Astigmatism	As	The laser beam appears to have different source points for the directions perpendicular and parallel to the junction plane. The astigmatic distance is defined as the distance between the two apparent sources. A large astigmatism must be corrected if the laser beam is to be accurately focused.
Polarization Ratio		The light from a laser diode emitting in an ideal single mode is linearly polarized parallel to the junction plane. Spontaneous emission adds unpolarized light which has a component of polarization perpendicular to the junction plane. The polarization ratio is defined as the ratio of the component of polarization parallel to the junction plane to the component perpendicular to the junction plane.

(4) Maximum ratings of FET

Item	Symbol	Definition
Drain to Gate Voltage	V_{DGO}	Maximum voltage applicable across drain and gate when the source is open.
Source to Gate Voltage	V_{SGO}	Maximum voltage applicable across source and gate, when the drain is open.
Drain Current	I_D	Maximum DC current applicable to the drain continuously, within the allowable channel dissipation.
Gate Current	I_G	Maximum DC current applicable to the gate continuously, within the allowable channel dissipation.
Allowable Power Dissipation	P_D	Maximum channel dissipation that can be continuously consumed by the FET, under specified heat dissipating conditions.
Channel Temperature	T_{ch}	Maximum value of the channel temperature which must not exceed the sum of: the ambient temperature while in operation (Ta), and the temperature rise due to the device's inner power dissipation.
Storage Temperature	T_{stg}	The lower and upper limits of the ambient temperature that should not be exceeded when the device is stored.

4-1) FET Electrical Characteristics

Item	Symbol	Definition
Drain to Gate voltage	V_{DGO}	Drain to Gate voltage with Source open
Source to Gate voltage	V_{SGO}	Source to Gate voltage with Drain open
Gate to Source voltage	V_{GSS}	Gate to Source voltage with Drain-Source Short
Drain to Source voltage	V_{DSX}	Drain to Source voltage under normal conditions
Gate to Source cutoff voltage	$V_{GS(OFF)}$ $V_{G1S(OFF)}$ $V_{G2S(OFF)}$	Gate to Source cutoff voltage under normal conditions
Drain current	I_{DSS}	Drain current with Gate-Source Short
Gate cutoff current	I_{GSS} I_{G1SS} I_{G2SS}	Gate leakage current with Drain-Source Short
Drain OFF current	$I_{D(OFF)}$	Drain current when voltage is applied at Gate-Source to bias the FET off.
Gate 2 to Drain leak current	I_{G2DO}	Gate 2-Drain Leakage current with normal voltage applied at Gate 2-Drain
OFF resistance	R_{OFF}	Drain-Source resistance with normal voltage applied at Gate-Source and cut OFF condition
ON resistance	R_{ON}	Drain-Source Resistance with FET ON
Input resistance Input capacitance	r_{ip} C_{ip}	Input admittance: $Y_I = \frac{1}{r_{ip}} + j\omega C_{ip}$

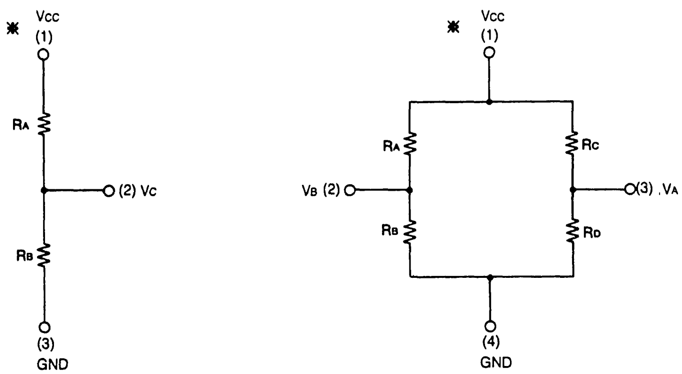
Item	Symbol	Definition
Output resistance, Output capacitance	r_{op} C_{op}	Output admittance: $Y_O = \frac{1}{r_{op}} + j\omega C_{op}$
Feedback capacitance	C_{rss} C_{dg}	Drain-Gate capacitance with Common Source Drain-Gate capacitance under normal conditions
Gate to Drain capacitance	C_{gd}	Gate-Drain capacitance with Gate-Source Short
Gate to Source capacitance	C_{gs}	Gate-Drain capacitance with Gate-Source Short
Input capacitance	C_{ISS}	Input capacitance with Common Source
Forward transfer admittance	$\lvert Y_{fs} \rvert$	Ratio of input voltage ΔV_{GS} and output current ΔI_D under normal conditions $\lvert Y_{fs} \rvert = \frac{\Delta I_D}{\Delta V_{GS}}$
Reverse transfer coefficient	S_{12}	Reverse transfer coefficient with input and output terminated by characteristic impedance.
Input equivalent noise voltage	$\bar{e}_n$	$\bar{e}_n = \sqrt{4kTR_N}$ K: Boltzmann's constant T: Absolute temperature (°K) 1/f noise added to Johnson Noise generated at equivalent Noise resistance R_N
Power gain noise	PG	Maximum power gain under normal conditions
Noise figure	NF	$NF = \frac{\text{Input signal vs. Noise ratio}}{\text{Output signal vs. Noise ratio}}$
Gain (NF minimum)	G_a	Power gain under matching conditions leading to NF minimum
Inter modulation	IMD	Third distortion component level (dB) at 0dB signal level

(5) Maximum ratings of Magnetoresistance Elements

Item	Symbol	Definition
Supply voltage	V_{cc}	Maximum voltage applicable between Supply-Ground pins
Operating temperature	T_{opr}	Ambient temperature that ensures full performance of the Magnetoresistance functions during operation.
Storage temperature	T_{stg}	Allowable ambient temperature for storage without operation.

(5-1) Electrical characteristics

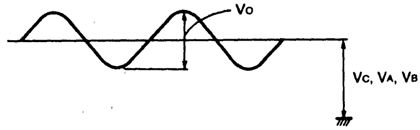
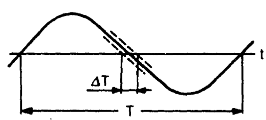
Equivalent circuit of the Magnetoresistance Element



3-pins 4-pins

※ Refer to the Equivalent circuit.

Item	Symbol	※Definition	Unit
Total resistance	R_T	3-pins Magnetoresistance Element $R_T = R_A + R_B$ 4-pins Magnetoresistance Element $R_T = (R_A + R_B) /\!/ (R_C + R_D)$	kΩ
Output voltage	V_O	Output voltage amplitude for pins (2) and (3). Measure Magnetoresistance Element at rotary magnetic field for pin 3, and at AC magnetic field for pin 4.	mVp-p

Item	Symbol	Definition	Unit
Midpoint voltage	V_C V_A V_B	V_C, V_A and V_B voltages (DC voltage)  Measure Magnetoresistance Element at rotary magnetic field for pin 3, and at AC magnetic field for pin 4.	V
Midpoint Potential	$\|V_A - V_B\|$	Difference between center Potentials V_A and V_B of pin 4 Magnetoresistance Element.	mV
Resistance change ratio	$\frac{\Delta\rho}{\rho}$	$R\perp$: Resistance value when current crosses with the magnetic direction, orthogonally. $R//$: Resistance value when current is parallel to magnetic direction. Then, the resistance change ratio is $\frac{R_{//} - R_{\perp}}{R_T} \times 100$	%
FG Fluctuation		Fluctuation of the output waveform on the time axis. FG fluctuation $= \frac{\Delta T}{T} \times 100$ 	%

3) Quality Assurance and Reliability Test Standards

1) Quality assurance in shipping

Establishing quality in the design and in fabrication is essential to keep the quality and reliability levels of the semiconductor devices at a high level. This is done by the "Zero-defect" (ZD) movement. Further sampling checks, in units of shipping lot, is done on products that have been "totally-inspected" at the final fabrication stage, thus ensuring no detective items. This sampling inspection is done in accordance with MIL-STD-105D.

2) Reliability

The reliability test is done, periodically, to confirm reliability level.

Periodic Reliability Test

Item		Testing time	LTPD
Electrical Characteristics Test		In order to know the initial quality level, some types are selected and tested again.	
Life Test	high temperature operation	up to 1000 h	10%
	high temperature and high humidity with bias	up to 1000 h	10%
	pressure cooker	up to 200 h	10%
Environmental Test	soldering heat resistance	10s	15%
	heat cycle	100 cycles	15%
Mechanical Test	solderability	Japan Industrial Standard (JIS)	15%
	length strength		15%
Other Tests	If necessary, tests are selected according to JIS C7021 C7022 and EIAJ SD121 IC121.		

*These tests are selected by sampling standard.
LTPD: Lot-Tolerance Percent Defective

These tests and inspection data are useful not only to improve design and wafer processes, but also serve to forecast reliability at the consumer level.

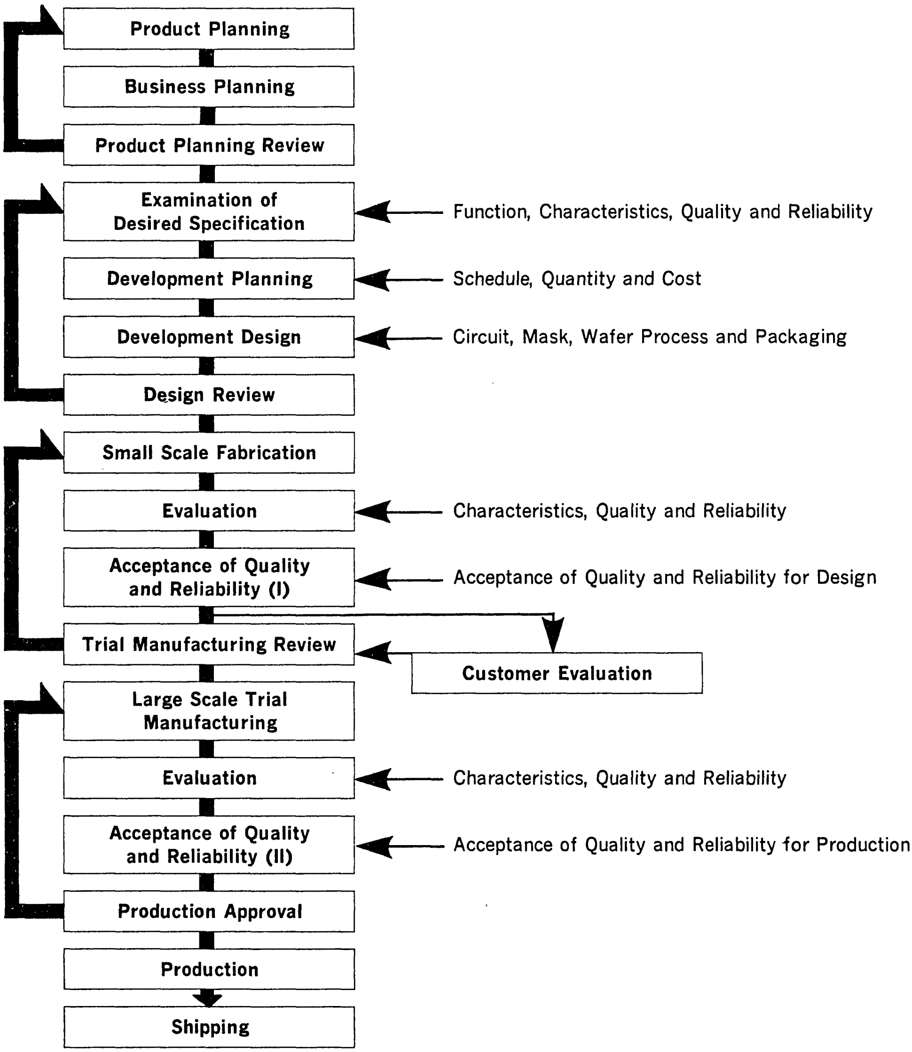
Reliability Test Standards

Types of test	Condition	Supply voltages	Testing time	LTPD
High temperature operation	Ta=125°C, 150°C	Typical	1000h	5%
High temperature with bias	Ta=125°C, 150°C	Typical	1000h	5%
High temperature storage	Ta=150°C		1000h	5%
Low temperature storage	Ta=−65°C		1000h	5%
High temperature and high humidity storage	Ta=85°C 85%RH		1000h	5%
High temperature and high humidity with bias	Ta=85°C 85%RH	Typical	1000h	5%
Pressure cooker	Ta=121°C 100%RH 30 pounds per square inch		200h	5%
Temperature cycle	Ta=−65°C to+150°C		100c	10%
Heat shock	Ta=−65°C to+150°C		100c	10%
Soldering heat resistance	T solder=260°C		10s	10%
Solderability	T solder=230°C (rosin type flux)		5s	10%
Mechanical shock	X, Y, Z 1500G Half part of sinusoidal wave of 0.5ms		3times for each direction	10%
Vibration	X, Y, G 20G 10Hz to 2000Hz to 10Hz (4min) Sinusoidal wave vibration		16minutes for each direction	10%
Constant acceleration	X, Y, Z 20,000G Centrifugal acceleration		1minute for each direction	10%
Free fall	Free fall from the height of 75cm to maple plate		3times	10%
Lead strength (bend) (pull)	based on JIS			10%
Electrostatic strength	Device must be designed again, when electrostatic strength below standard supplying surge voltage to each pin under the condition of C=200pF and Rs=0Ω.			

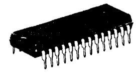
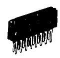
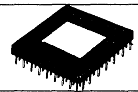
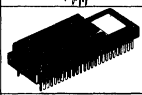
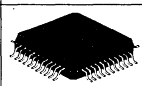
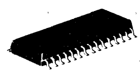
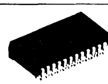
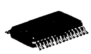
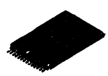
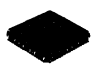
LTPD: Lot Tolerance Percent Defective

Flow Chart from Development to Manufacturing

Sony attains high quality and high reliability of semiconductor products by designing devices with quality and reliability from the initial steps of development and evaluating them sufficiently in each step of the development.



Package Name

Type		Package name: Symbol	Package name: Description	Package	Features: Material*	Features: Lead pitch	Features: Lead shape	Features: Lead pull out direction
Inserted	Standard	D I P	DUAL IN-LINE PACKAGE		P C	2.54mm (100MIL)	Through Hole Lead	2-direction
		S I P	SINGLE IN-LINE PACKAGE		P	2.54mm (100MIL)	Through Hole Lead	1-direction
		Z I P	ZIG-ZAG IN-LINE PACKAGE		P	2.54mm (100MIL) Zig-Zag in-line	Through Hole Lead	1-direction
		P G A	PIN GRID ARRAY		C	2.54mm (100MIL)	Through Hole Lead	Package under side
		PIGGY BACK	PIGGY BACK		C	2.54mm (100MIL)	Through Hole Lead	2-direction
	Shrink	SDIP	SHRINK DUAL IN-LINE PACKAGE		P	1.778mm (70MIL)	Through Hole Lead	2-direction
		SZIP	SHRINK ZIG-ZAG IN-LINE PACKAGE		P	1.778mm (70MIL) Zig-Zag in-line	Through Hole Lead	1-direction
Surface mounted	Standard flat package	Q F P	QUAD FLAT L-LEADED PACKAGE		P C	1.0mm 0.8mm 0.65mm	Gull-Wing	4-direction
		S O P	SMALL OUTLINE L-LEADED PACKAGE		P	1.27mm (50MIL)	Gull-Wing	2-direction
	Standard 2-direction chip carrier	S O J	SMALL OUTLINE J-LEADED PACKAGE		P	1.27mm (50MIL)	J-Lead	2-direction
	Shrink flat package	VQFP	VERY SMALL QUAD FLAT PACKAGE		P	0.5mm	Gull-Wing	4-direction
		VSOP	VERY SMALL OUTLINE PACKAGE		P	0.65mm	Gull-Wing	2-direction
		TSOP	THIN SMALL OUTLINE PACKAGE		P	0.5mm (0.55mm)	Gull-Wing	2-direction
	Standard chip carrier	Q F J	QUAD FLAT J-LEADED PACKAGE		P	1.27mm (50MIL)	J-Lead	4-direction
		Q F N	QUAD FLAT NON-LEADED PACKAGE		C	1.27mm (50MIL)	Leadless	Package under side

* P……Plastic, C……Ceramic

Variable Capacitance Diodes

1) Variable Capacitance Diodes

Type	Package	Application	Remark	Voltage (V)	Page
1T32 1T32A	2P Mini mold	UHF/VHF tuning	Smaller package ΔC: 3% (1T32A: 2%)	2~25	31
1T33 1T33A		CATV tuning	Smaller package ΔC: 3% (1T33A: 2%)		34
1T33C			Advanced type of 1T33, ΔC: 2%	1~28	37
1T362	2P Super Mini mold	UHF/VHF tuning	Super mini mold package of 1T32, ΔC: 3%	2~25	40
1T363		CATV tuning	Super mini mold package of 1T33C, ΔC: 3%	1~28	44
1T364			Super mini mold package of 1T360	~30	47
1T359	2P Mini mold	UHF/VHF tuning	C_2/C_{25}: 6.5, rs: ~0.4Ω, ΔC: 3%	~30	49
1T360		CATV tuning	Advanced type of 1T33C, Large capacitance ratio	~30	51

ΔC: Maximum capacitance deviation for same rank.

SONY® **1T32/1T32A**

Silicon Variable Capacitance Diode

Description

The 1T32/1T32A is a variable capacitance diode designed for use in electric tuning for UHF, VHF and TV tuner, and AFT which make their packages more compact so as to match tuner miniaturization easily, keeping excellent characteristics of former 1T25 type.

Features

- Compact package
- Low serial resistance 0.52 Ω Typ. (f = 470 MHz)
- Large capacitance ratio 6.5 Typ. (C_2/C_{25})
- Small leakage current 10 nA Max. (V_R = 28V)
- 1T32(A)-T7, 1T32(A)-T8 is for taping.

Structure

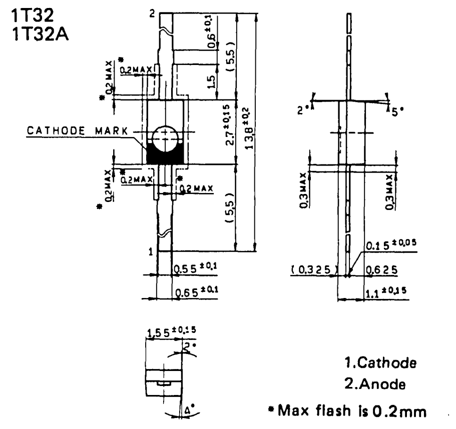
Silicon epitaxial planar type diode

Applications

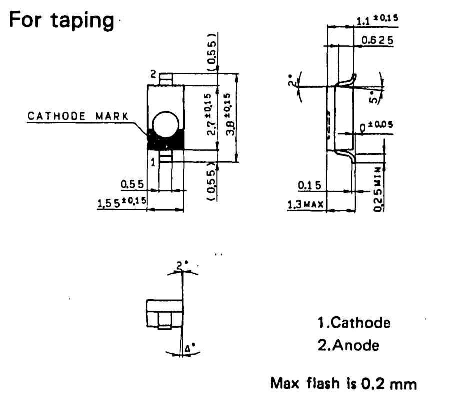
Electric tuning for UHF, VHF or TV tuner, or AFT

Package Outline

Unit: mm



M-204



M-205

Absolute Maximum Ratings (Ta = 25°C)

• Reverse voltage	V_R	30	V	
• Peak reverse voltage	V_{RM}	35	V	($R_L \geqq 10$ kΩ)
• Operating temperature	Topr	85	°C	
• Storage temperature	Tstg	−30 to +120	°C	

71020-TO

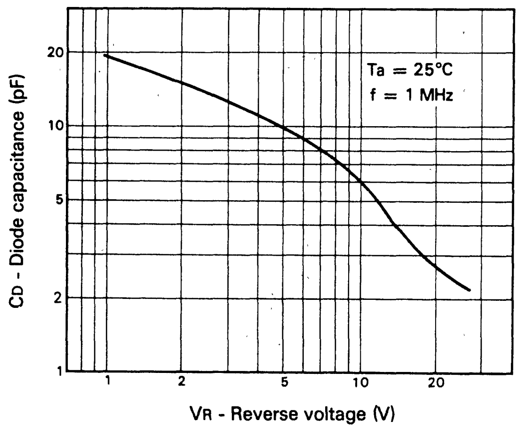
Electrical Characteristics

Ta = 25°C

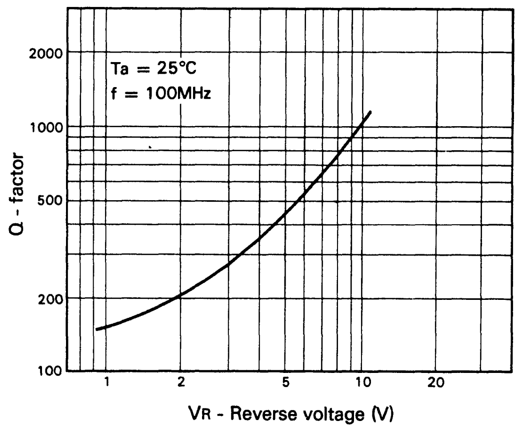
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse current	I_R	V_R = 28V			10	nA
Diode capacitance	C_2	V_R = 2V, f = 1 MHz	14.01	15.00	16.33	pF
	C_{25}	V_R = 25V, f = 1 MHz	2.10	2.27	2.39	pF
Serial resistance	r_s	C_D = 14 pF, f = 470 MHz		0.52	0.6	Ω
Maximum-capacitance deviation in the Same ranking*	ΔC	V_R = 2 to 25V			3 (1T32) 2 (1T32A)	%

***Note)** Applied only to tuning.

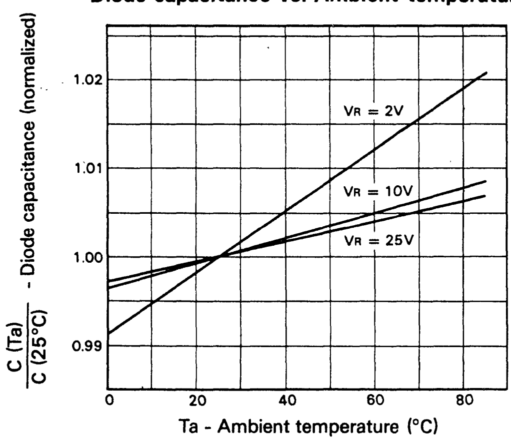
Diode capacitance vs. Reverse voltage



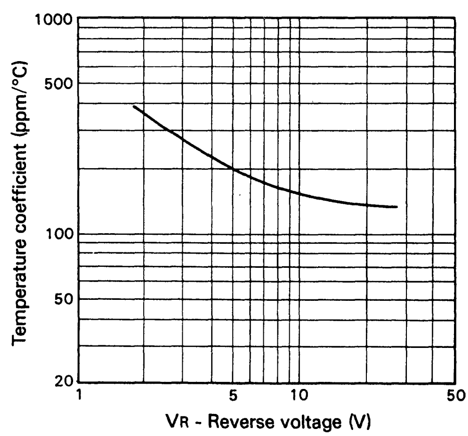
Q - factor vs. Reverse voltage



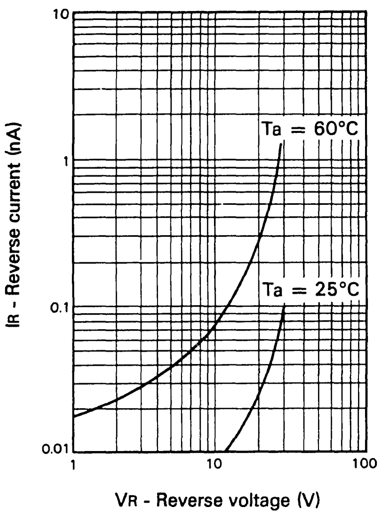
Diode capacitance vs. Ambient temperature



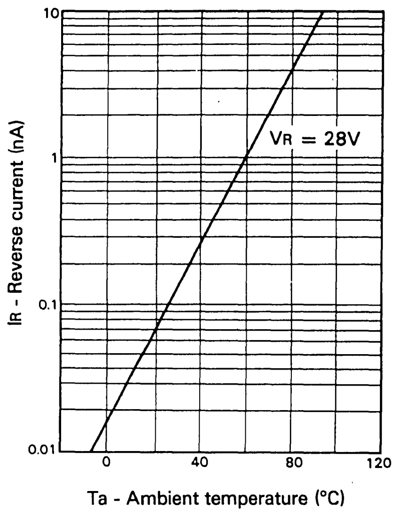
Temperature coefficient of the diode capacitance



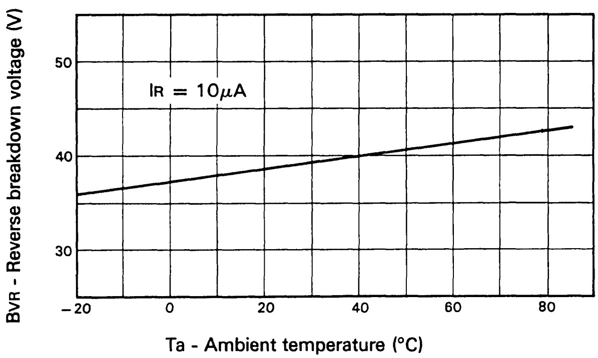
Reverse current vs. Reverse voltage



Reverse current vs. Ambient temperature



Reverse breakdown voltage vs. Ambient temperature



SONY® # 1T33/1T33A

Silicon Variable Capacitance Diode

Description

The 1T33/1T33A is a variable capacitance diode designed for use in electric tuning for CATV tuner which make their packages more compact so as to match tuner minituarization easily, keeping excellent characteristics of former 1T31 type.

Features

- Compact package
- Low serial resistance 0.8 Ω Typ. (f = 470 MHz)
- Large capacitance ratio 10 Min. (C_2/C_{25})
- Small leakage current 10 nA Max. (V_R = 28V)
- 1T33(A)-T7, 1T33(A)-T8 is for taping.

Structure

Silicon epitaxial planar type diode

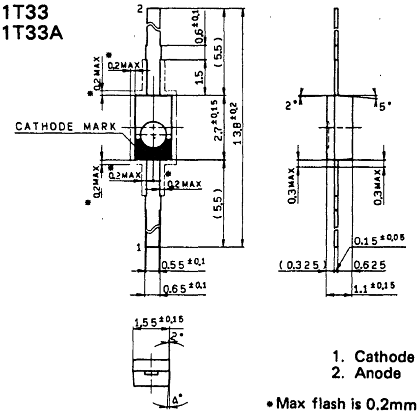
Application

Electric tuning for TV or CATV

Package Outline

Unit: mm

1T33
1T33A

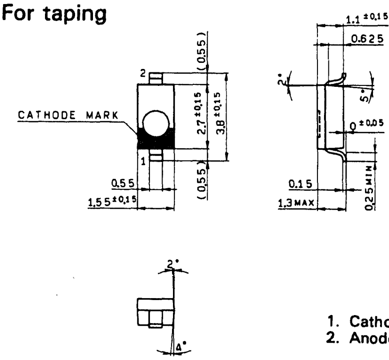


1. Cathode
2. Anode

*Max flash is 0.2mm

M-204

For taping



1. Cathode
2. Anode

Max flash is 0.2mm

M-205

Absolute Maximum Ratings (Ta = 25°C)

• Reverse voltage	V_R	30	V	
• Peak reverse voltage	V_{RM}	35	V	($R_L \geqq 10$ kΩ)
• Operating temperature	Topr	85	°C	
• Storage temperature	Tstg	−30 to +120	°C	

71019-TO

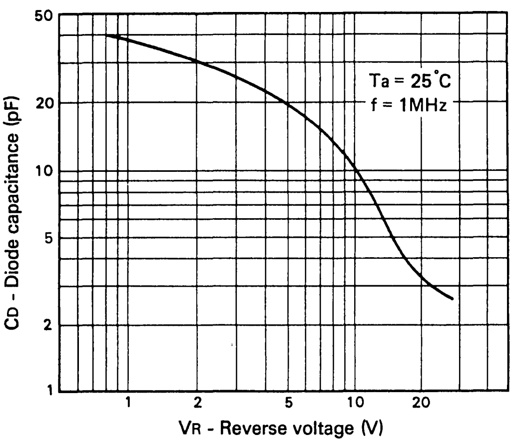
Electrical Characteristics

Ta = 25°C

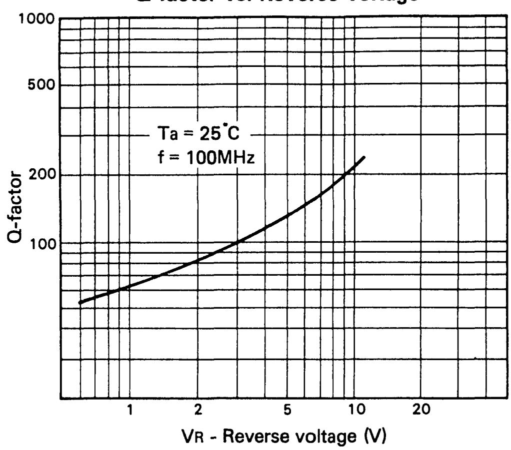
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse current	I_R	V_R = 28V			10	nA
Diode capacitance	C_2	V_R = 2V, f = 1 MHz	27.19		32.03	pF
	C_{25}	V_R = 25V, f = 1 MHz	2.71		3.04	pF
Serial resistance	rs	C_D = 14pF, f = 470 MHz		0.7	0.8	Ω
Maximum-capacitance deviation in the same ranking*	ΔC	V_R = 2 to 25V, f = 1 MHz			3 (1T33) 2 (1T33A)	%

***Note)** Applied only to tuning.

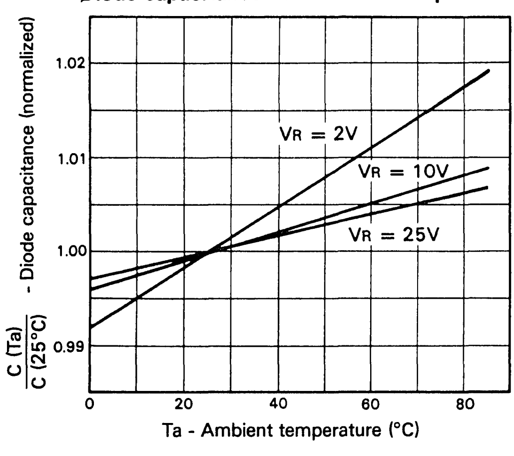
Diode capacitance vs. Reverse voltage



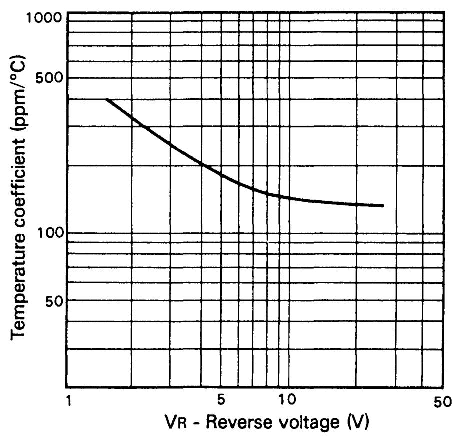
Q-factor vs. Reverse voltage



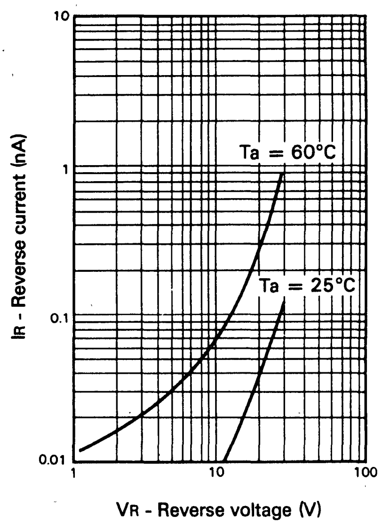
Diode capacitance vs. Ambient temperature



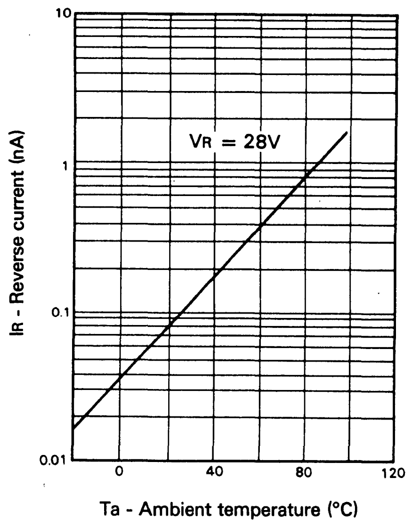
Temperature coefficient of the diode capacitance



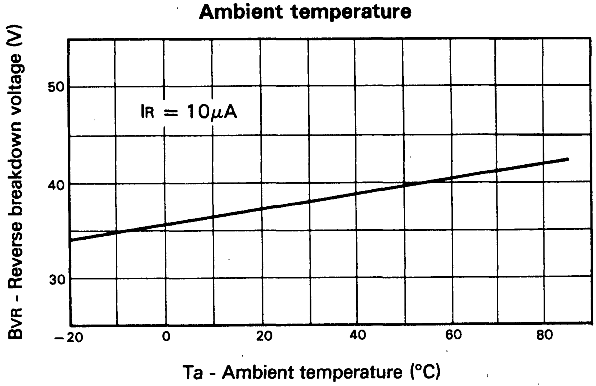
Reverse current vs. Reverse voltage



Reverse current vs. Ambient temperature



Reverse breakdown voltage vs. Ambient temperature



SONY®	**1T33C**

Silicon Variable Capacitance Diode

Description

The 1T33C is designed for CATV tuner, these diodes easily cope with the trend for miniaturization. They combine low serial resist with large capacitance variation ratio and small capacitance variation rate n*.

$$* \left[n = -\frac{V\,dC}{C\,dV} \right]$$

Features

- Compact package
- Low serial resistance 0.65 Ω Typ. (f = 470 MHz)
- Large capacitance ratio 15 Typ. (C_1/C_{28})
- Small leakage current 10 nA Max. (V_R = 28 V)
- 1T33C-T7, 1T33C-T8 is for taping.

Structure

Silicon epitaxial planar type diode

Application

Electronic tuning for TV or CATV tuner

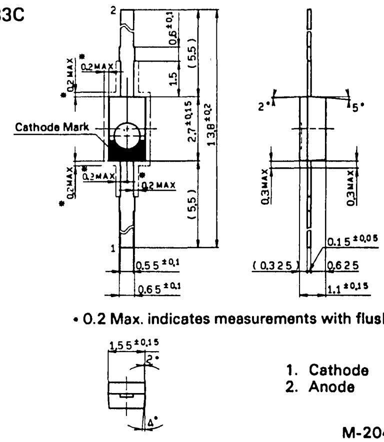
Absolute Maximum Ratings (Ta = 25°C)

• Reverse voltage	V_R	30	V
• Peak reverse voltage	V_{RM}	35 ($R_L \geqq 10\,k\Omega$)	V
• Operating temperature	Topr	85	°C
• Storage temperature	Tstg	−55 to +150	°C

Package Outline

Unit: mm

1T33C

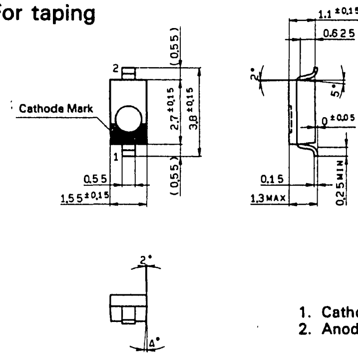


• 0.2 Max. indicates measurements with flush.

1. Cathode
2. Anode

M-204

For taping



1. Cathode
2. Anode

Measurements with resin flush: 0.2 max.

M-205

Electrical Characteristics

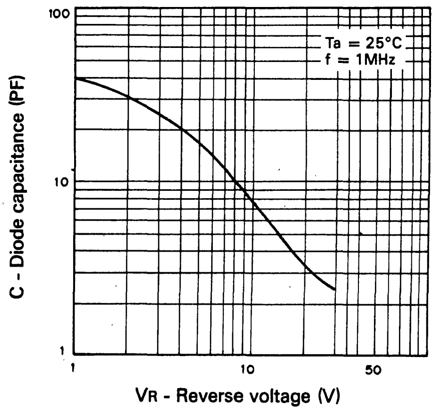
Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse current	I_R	V_R = 28V			10	nA
Diode capacitance	C_1	V_R = 1V, f = 1 MHz	34.65	38.0	42.35	pF
	C_{28}	V_R = 28V, f = 1 MHz	2.361	2.515	2.754	pF
Capacitance ratio	C_1/C_{28}	f = 1 MHz	13.5	15		
Serial resistance	rs	C_D = 14 pF, f = 470 MHz		0.65	0.8	Ω
Maximum-capacitance deviation in the Same ranking *	ΔC	V_R = 1V to 28V, f = 1 MHz			2	%

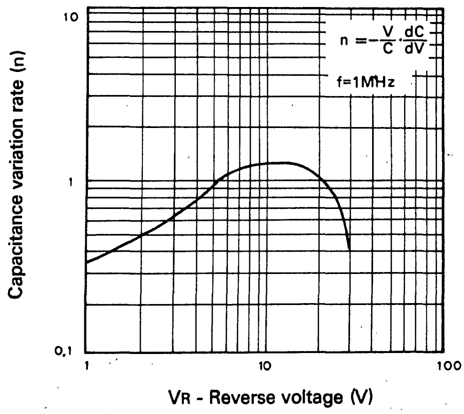
***Note)** Applied only for tuning.

71018-TO

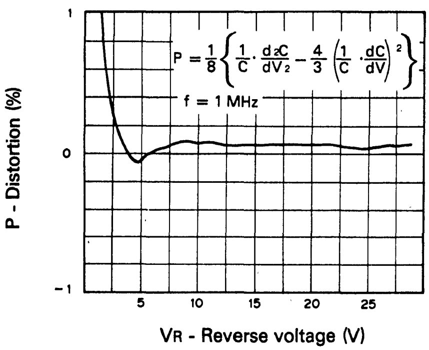
Diode capacitance vs. Reverse voltage



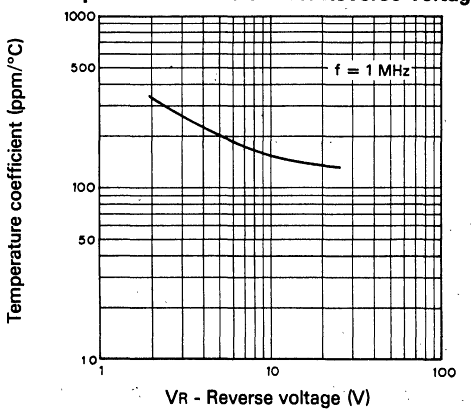
Capacitance variation rate vs. Reverse voltage



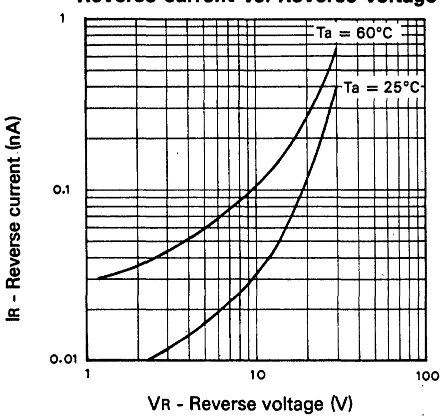
Distortion vs. Reverse voltage



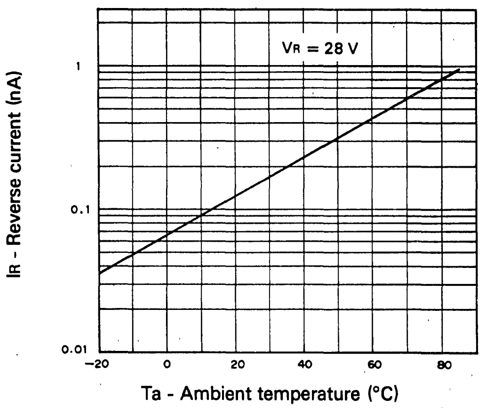
Temperature coefficient vs. Reverse voltage



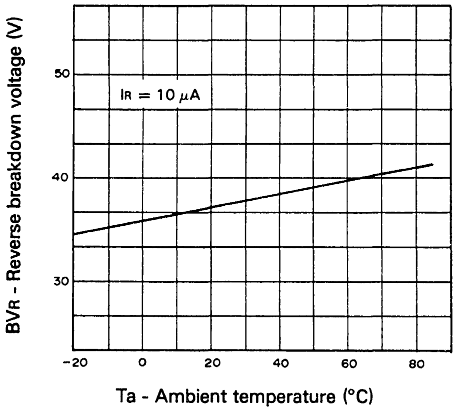
Reverse current vs. Reverse voltage



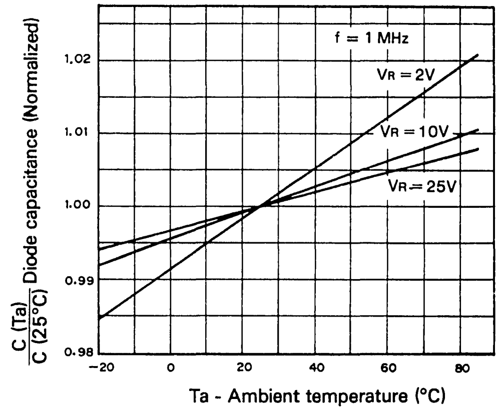
Reverse current vs. Ambient temperature



Reverse breakdown voltage vs. Ambient temperature



Diode capacitance vs. Ambient temperature

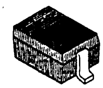


SONY® **1T362**

Silicon Variable Capacitance Diode

Description

1T362 is a variable capacitance diode designed for electronic tuning UHF, VHF TV tuners and AFT circuits. A miniature package has been adopted to allow tuner miniaturization, while maintaining the same superior features of 1T32.



Features

- Super miniature package
- Low series resistance 0.65Ω Max. (f = 470 MHz)
- Large capacitance ratio 6.5 Typ. (C_2/C_{25})
- Small leakage current 10 nA Max. (V_R = 28V)
- Maximum capacitance deviation 3% Max.

Structure

Silicon epitaxial planar type diode

Application

Electronic tuning for UHF, VHF or TV tuner, or AFT

Absolute Maximum Ratings (Ta = 25°C)

• Reverse voltage	V_R	30	V	
• Peak reverse voltage	V_{RM}	35	V	($R_L \geqq 10$ kΩ)
• Operating temperature	Topr	85	°C	
• Storage temperature	Tstg	−55 to +150	°C	

Electrical Characteristics

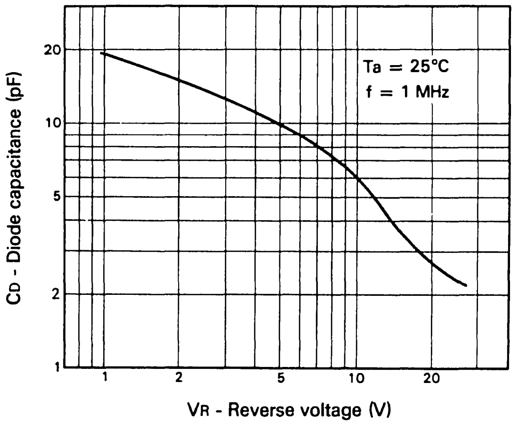
Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse current	I_R	V_R = 28V			10	nA
Diode capacitance	C_2	V_R = 2V, f = 1 MHz	14.01	15.00	16.33	pF
	C_{25}	V_R = 25V, f = 1 MHz	2.10	2.27	2.39	pF
Series resistance	rs	C_D = 14pF, f = 470 MHz		0.57	0.65	Ω
Maximum-capacitance deviation in the same ranking*	ΔC	V_R = 1 to 28V, f = 1 MHz			3	%

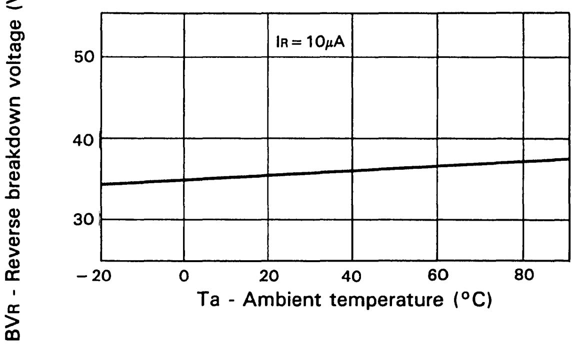
***Note)** Applied only to tuning.

E89144-HP

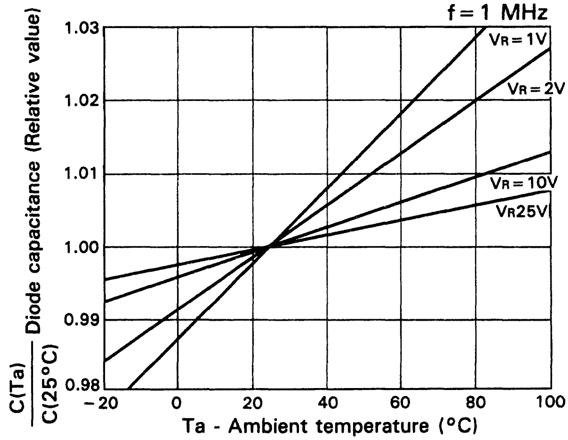
Diode capacitance vs. Reverse voltage



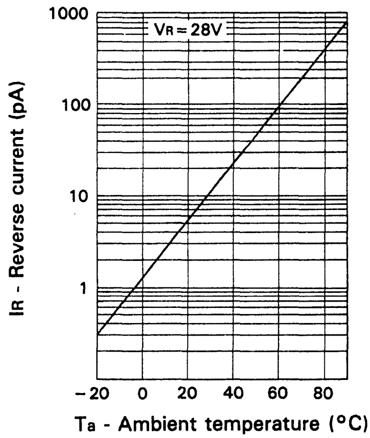
Reverse breakdown voltage vs. Ambient temperature



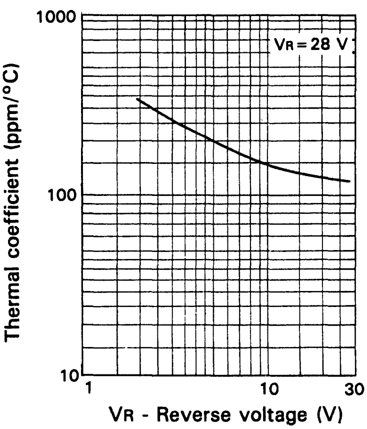
Diode capcitance vs. Ambient temperature



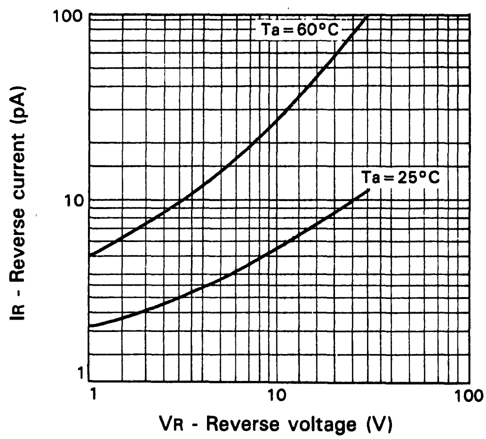
Reverse current vs. Ambient temperature



Thermal coefficient of diode capacitance

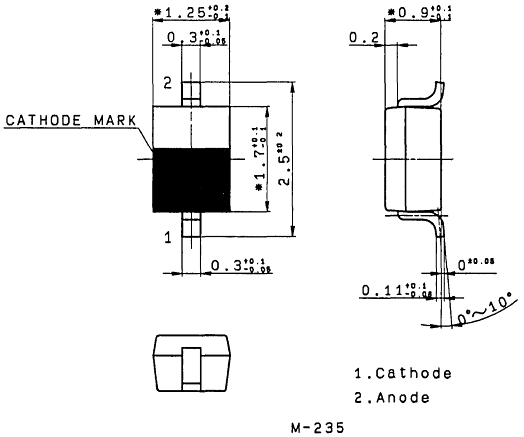


Reverse current vs. Reverse voltage



Package Outline Unit: mm

0.04g



Note) *Dimension does not include resin

SONY® **1T363**

Silicon Variable Capacitance Diode

Description

The 1T363 is a variable capacitance diode designed for electronic tuning of CATV tuner. A miniature package has been adopted to allow tuner miniaturization, while maintaining the same superior features of 1T33C.

Features

- Super miniature package
- Low series resistance 0.80 Ω Max. (f = 470 MHz)
- Large capacitance ratio 15 Typ. (C_1/C_{28})
- Small leakage current 10 nA Max. (V_R = 28V)
- Maximum capacitance deviation 3% Max.

Structure

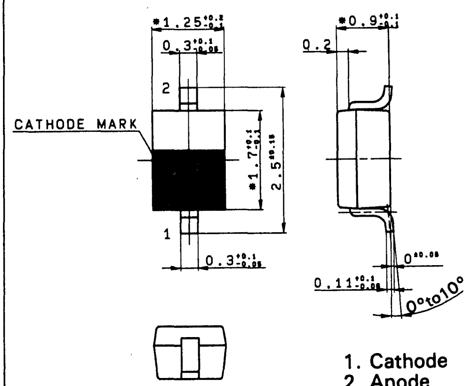
Silicon epitaxial planar type diode

Application

Electronic tuning for TV, CATV

Package Outline

Unit: mm



Note) *Dimension does not include resin

Absolute Maximum Ratings (Ta = 25°C)

• Reverse voltage	V_R	30	V	
• Peak reverse voltage	V_{RM}	35	V	(R_L ≧ 10 kΩ)
• Operating temperature	Topr	85	°C	
• Storage temperature	Tstg	−55 to +150	°C	

70412A-TO

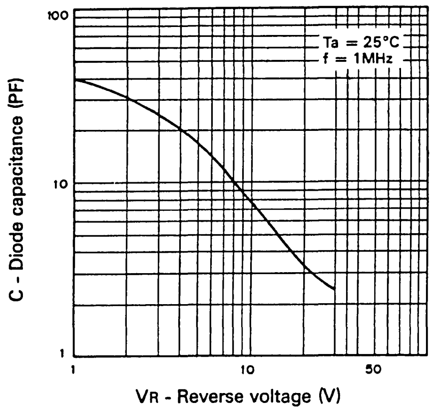
Electrical Characteristics

Ta = 25°C

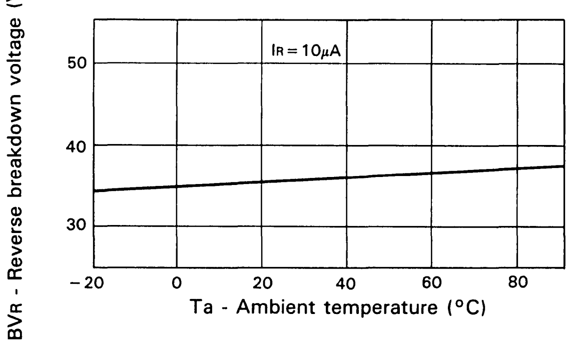
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse current	I_R	V_R = 28V			10	nA
Diode capacitance	C_1	V_R = 1V, f = 1 MHz	34.65	38.00	42.35	pF
	C_{28}	V_R = 28V, f = 1 MHz	2.361	2.515	2.754	pF
Series resistance	r_s	C_D = 14pF, f = 470 MHz		0.75	0.80	Ω
Maximum-capacitance deviation in the same ranking*	ΔC	V_R = 1 to 28V, f = 1 MHz			3	%

***Note)** Applied only to tuning.

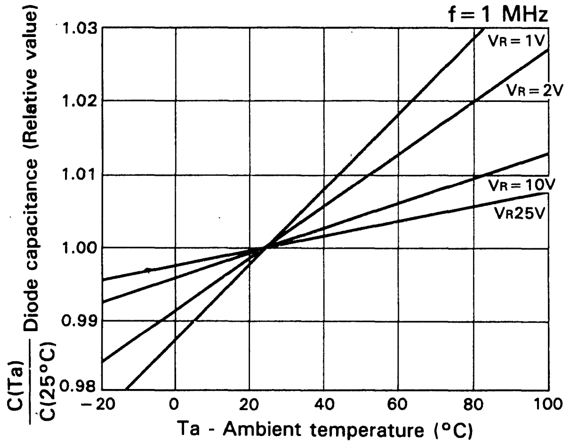
Diode capacitance vs. Reverse voltage



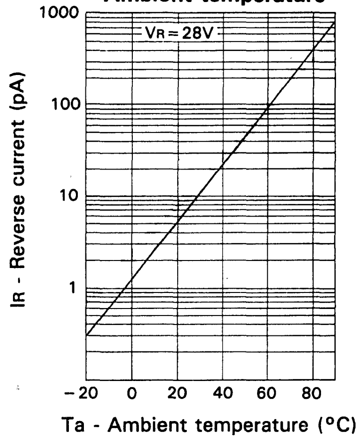
Reverse breakdown voltage vs. Ambient temperature



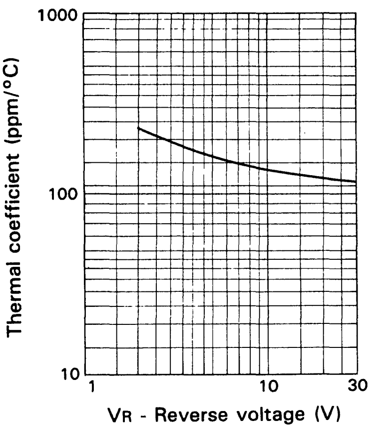
Diode capcitance vs. Ambient temperature



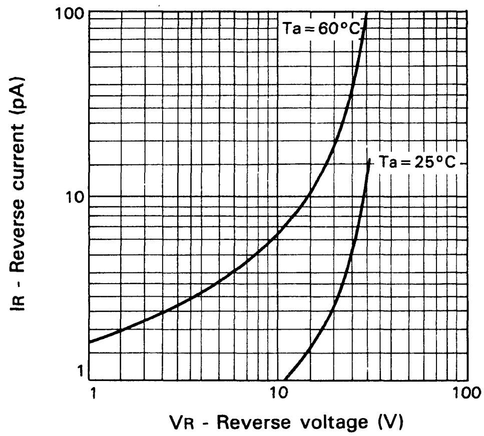
Reverse current vs. Ambient temperature



Thermal coefficient of diode capacitance



Reverse current vs. Reverse voltage



SONY® **1T364**

Silicon Variable Capacitance Diode

Description

1T364 is a variable capacitance diode designed for the tuning of wide band multichannel CATV tuners.

Features

- Miniature package
- Low series resistance 0.85Ω Typ.(f=470MHz)
- Capacitance ratio 12.5 Typ. (C_2/C_{25})
- Small leakage current 10nA Max.(V_R=28V)
- Capacitance deviation within 3%
- 1T364-T7 and 1T364-T8 are for taping.

Structure

Silicon epitaxial planer type diode

Application

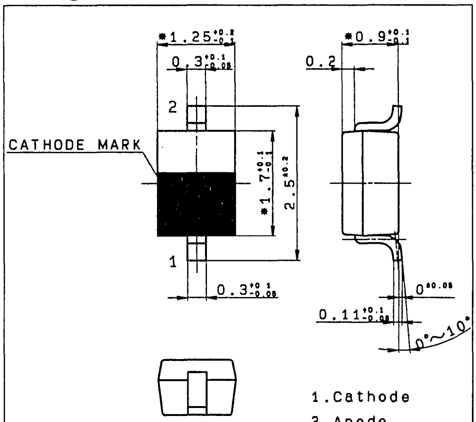
- Electronic tuning of wide band CATV tuners.

Absolute Maximum Ratings (Ta=25°C)

- Reverce voltage V_R 30 V
- Peak reverse voltage V_{RM} 35 V (R_L≧10kΩ)
- Storage temperature Tstg −55 to +150 °C
- Operating temperature Topr 85 °C

Package Outline

Unit: mm



*Max. flash is 0.2mm M-235

Recommended Operating Conditions

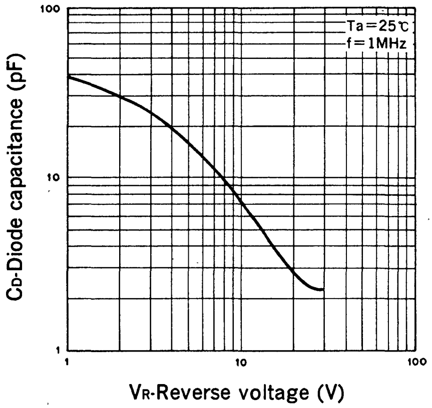
- Operating temperature Topr −20 to +75 °C

Electrical Characteristics (Ta=25°C)

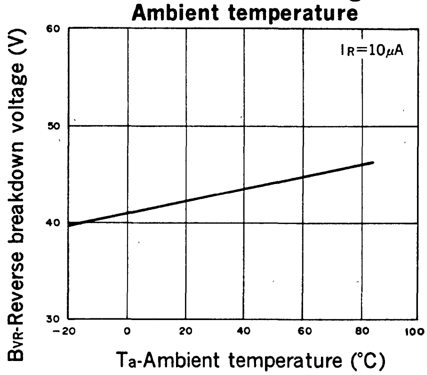
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse current	I_R	V_R=28V			10	nA
Serial resistance	rs	C_D=14pF, f=470MHz		0.85	1.00	Ω
Diode capacitance	C_2	V_R=2V, f=1MHz	28.0	31.25	34.0	pF
	C_{25}	V_R=25V, f=1MHz	2.30	2.50	2.65	pF
Capacitance deviation in a matching group	ΔC	V_R=2 to 25V f=1MHz			3	%
Capacitance ratio	C_2/C_{25}	f=1MHz	11.5	12.5		

E89621-HP

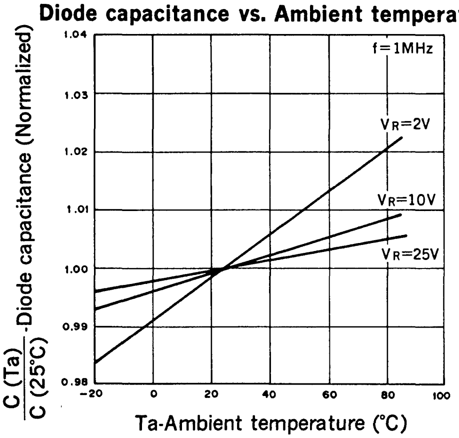
Diode capacitance vs. Reverse voltage



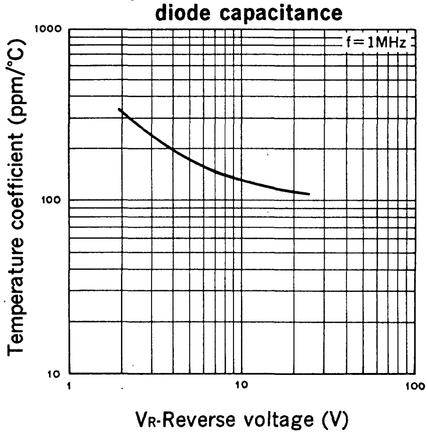
Reverse breakdown voltage vs. Ambient temperature



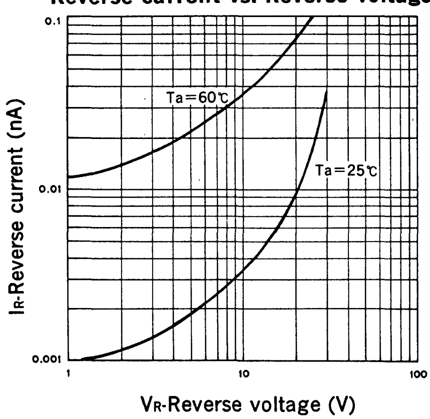
Diode capacitance vs. Ambient temperature



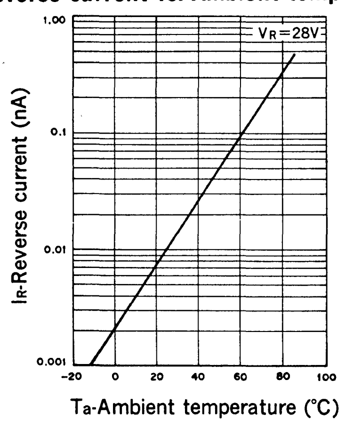
Temperature coefficient of the diode capacitance



Reverse current vs. Reverse voltage



Reverse current vs. Ambient temperature



SONY | **1T359**

Silicon Variable Capacitance Diode

Description

The 1T359 is a variable capacitance diode for electronic tuning, designed for radio or TV tuners.

Features

- Compact package
- Low serial resistance 0.40Ω Max. (f=470 MHz)
- Large capacitance ratio 6.5 Typ. (C_2/C_{25})
- Capacitance deviation in the same ranking within 3%

Structure

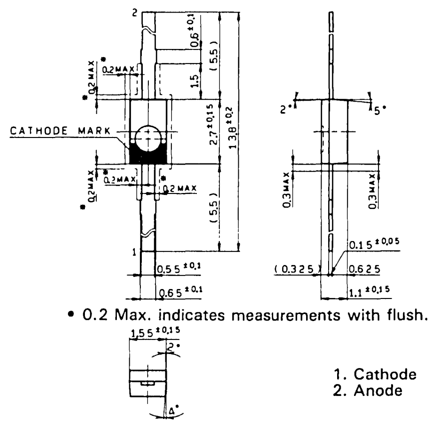
Silicon epitaxial planar type diode

Application

Electoronic tuning for Radio or TV tuner

Package Outline

Unit: mm



• 0.2 Max. indicates measurements with flush.

1. Cathode
2. Anode

M-204

Absolute Maximum Ratings (T_a=25°C)

- Reverse voltage — V_R — 30 V
- Peak reverse voltage — V_{RM} — 35 (R_L≧10KΩ) V
- Operating temperature — T_{opr} — 85 °C
- Storage temperature — T_{stg} — −55 to +150 °C

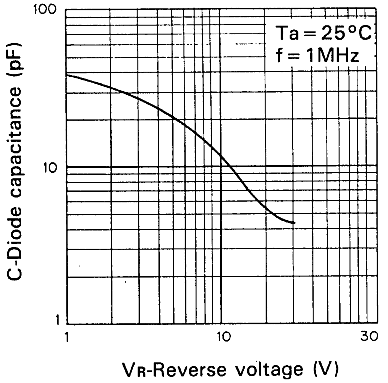
Electrical Characteristics

T_a=25°C

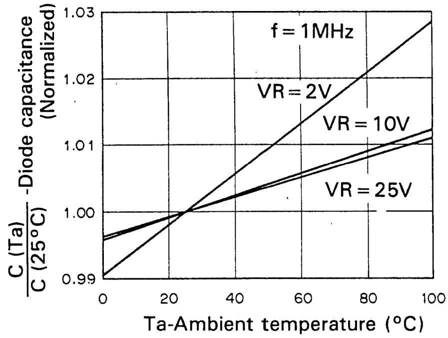
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse current	I_R	V_R=28 V			20	nA
Diode capacitance	C_2	V_R=2V, f=1 MHz	26.37	29.50	33.05	pF
	C_{25}	V_R=25 V, f=1 MHz	4.030	4.400	4.807	pF
Capacitance ratio	C_2/C_{25}	f=1 MHz		6.5		
Serial resistance	rs	C_D=14 pF, f=470 MHz		0.35	0.4	Ω
Capacitance deviation in the same ranking	ΔC	V_R=2 to 25 V, f=1 MHz			3	%

70946-YA

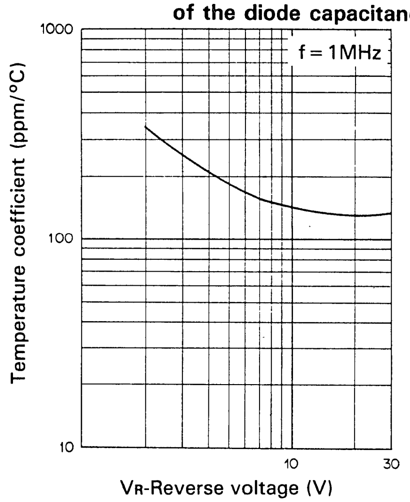
Diode capacitance vs. Reverse voltage



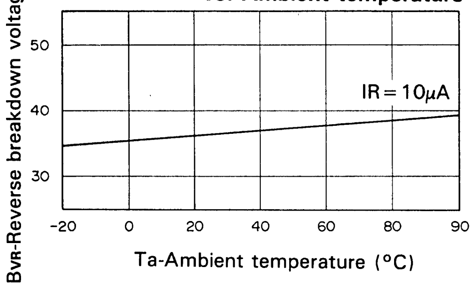
Diode capacitance vs. Ambient temperature



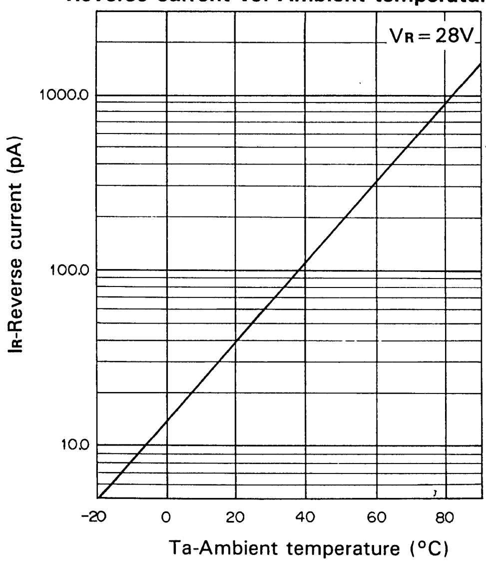
Temperature coefficient of the diode capacitance



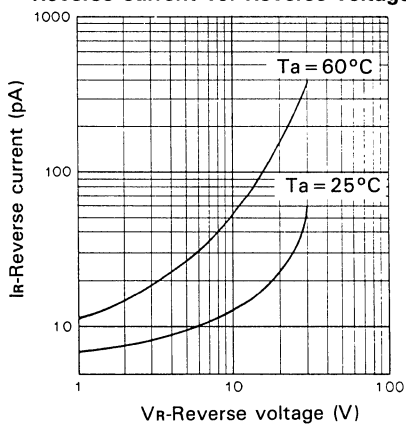
Reverse breakdown voltage vs. Ambient temperature



Reverse current vs. Ambient temperature



Reverse current vs. Reverse voltage



SONY® **1T360**

Silicon Variable Capacitance Diode

Description

1T360 is a variable capacitance diode designed for the tuning of wide band multichannel CATV tuners.

Features

- Miniature package
- Low series resistance 0.80Ω Typ.(f=470MHz)
- Capacitance ratio 12.5 Typ. (C_2/C_{25})
- Small leakage current 10nA Max.(V_R=28V)
- Capacitance deviation within 2%
- 1T360-T7 and 1T360-T8 are for taping.

Structure

Silicon epitaxial planer type diode

Application

- Electronic tuning of wide band CATV tuners.

Absolute Maximum Ratings (Ta=25°C)

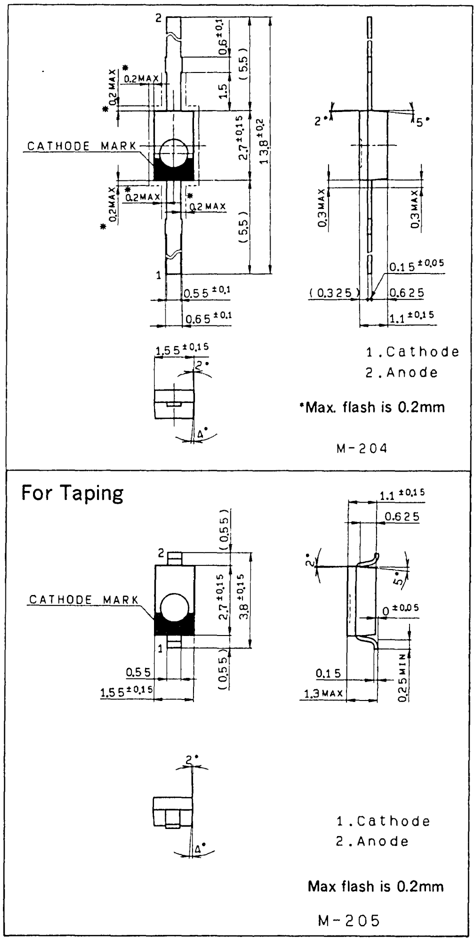
• Reverce voltage	V_R	30	V
• Peak reverse voltage	V_{RM}	35	V
		(R_L≧10kΩ)	
• Storage temperature	Tstg	−55 to +150	°C
• Operating temperature	Topr	85	°C

Recommended Operating Conditions

• Operating temperature	Topr	−20 to +75	°C

Package Outline

Unit: mm

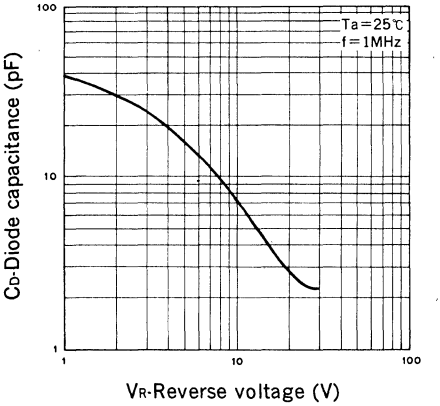


Electrical Characteristics (Ta=25°C)

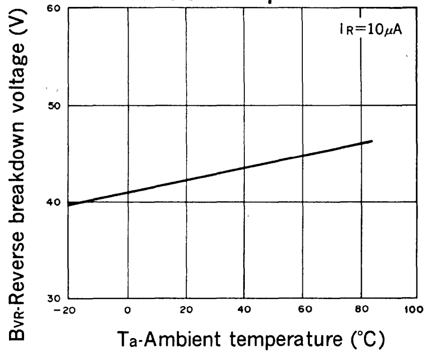
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse current	I_R	V_R=28V			10	nA
Diode capacitance	C_2	V_R=2V, f=1MHz	28.0	31.25	34.0	pF
	C_{25}	V_R=25V, f=1MHz	2.30	2.5	2.65	pF
Capacitance ratio	C_2/C_{25}	f=1MHz	11.5	12.5		
Serial resistance	rs	C_D=14pF, f=470MHz		0.80	1.00	Ω
Capacitance deviation in a matching group	ΔC	V_R=2 to 25V f=1MHz			2	%

80427A-HP

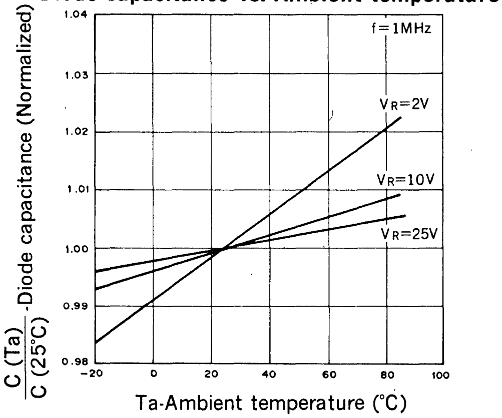
Diode capacitance vs. Reverse voltage



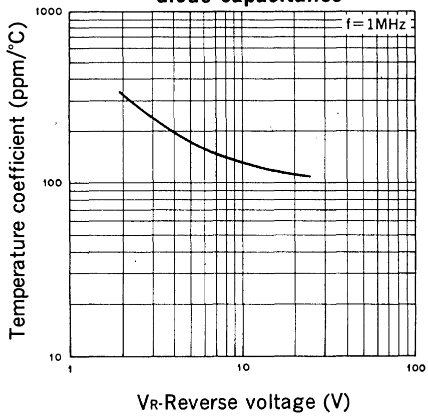
Reverse breakdown voltage vs. Ambient temperature



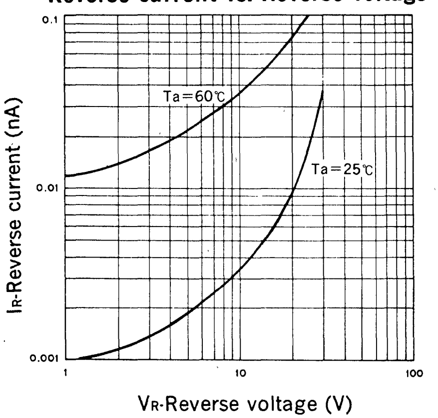
Diode capacitance vs. Ambient temperature



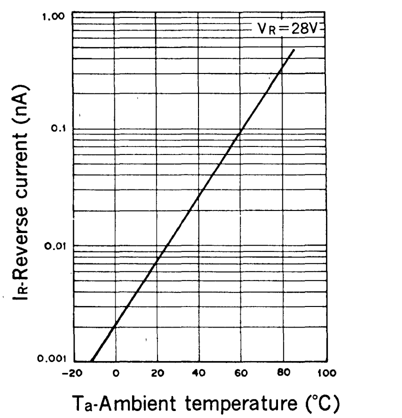
Temperature coefficient of the diode capacitance



Reverse current vs. Reverse voltage



Reverse current vs. Ambient temperature



Laser Diodes

2) Laser Diodes

Type	Package	Applications	Features	Wavelength (nm)	Output Power (mW) max	Page
SLD104AU	3P ϕ5.6mm	Light source of CD/VD pickups	Low power consumption	780	5	55
SLD111V	3P ϕ5.6mm	Light source of CD pick up	Low noise, Low power consumption	780	5	58
SLD151U SLD151V	3P ϕ9mm	Bar code Scanner Laser printer	Red light emission	670	5	63
SLD201U SLD201V	3P ϕ9mm	Magneto-optical disk	Low noise, high power density	780	20	67
SLD201U-3 SLD201V-3	3P ϕ9mm	Magneto-optical disk	Low noise, high power density	780	50	70
SLD202U SLD202V	3P ϕ9mm	Magneto-optical disk	Low noise, high power density	820	25	73
SLD202U-3 SLD202V-3	3P ϕ9mm	Magneto-optical disk	Low noise, high power density	820	50	76
SLD203AV	3P ϕ9mm	Magneto-optical disk	Signgle mode, high power density	780	35	79
SLD301V	3P ϕ9mm 8P TO-3	Medical use, Solid laser excitation	Laser diods efficiency is higher than gas laser, solid state laser	*Wavelength select possible	100	82
SLD301WT	8P TO-3				100	88
SLD301XT	8P Square type				100	95
SLD301B	Bare block				100	102
SLD302V	3P ϕ9mm 8P TO-3				200	108
SLD302WT	8P TO-3				200	114
SLD302XT	8P Square type				200	121
SLD302B	Bare block				200	128
SLD303V	3P ϕ9mm 8P TO-3				500	134
SLD303WT	8P TO-3				500	141
SLD303XT	8P Square type				500	148
SLD303B	Bare block				500	155
SLD304V	3P ϕ9mm 8P TO-3				1000	161
SLD304XT	8P Square type				1000	168
SLD304B	Bare block				1000	175
SLU301VR	Special	Medical use, Solid laser excitation	For fiber, coupling with lens, FC type connector		70/80	181
SLU301XR					70/80	185
SLU302VR					140/160	189
SLU302XR					140/160	193
SLU303VR					350/400	197
SLU303XR					350/400	201
SLU304VR					700/800	205
SLU304XR					700/800	209

Note) WT, XT package with a TE (Thermo Electric) cooler
VR: V package with a lens, a FC type connector and Frange and Fiber
XR: XT package with a lens, a FC type connector and Fiber
※Wavelength category (SLD300 series SLU300 series only)

: Wavelength selection (Primary classification)

Rank	Wavelength (nm)
1	785±15
2	810±10
3	830±10

: Wavelength selection (Sub-classification)

Rank	Wavelength (nm)
21	798±3
24	807±3
25	810±3

SONY® **SLD104AU**

GaAlAs Laser Diode

Description

SLD104AU is a low-noise visible laser diode developed for positive power supplies. In comparison with SLD104U this device attains even lower consumption levels.

Features

- Low power consumption
- Single power supply
- Low noise
- Microminiaturized package (ϕ5.6 mm)

Structure

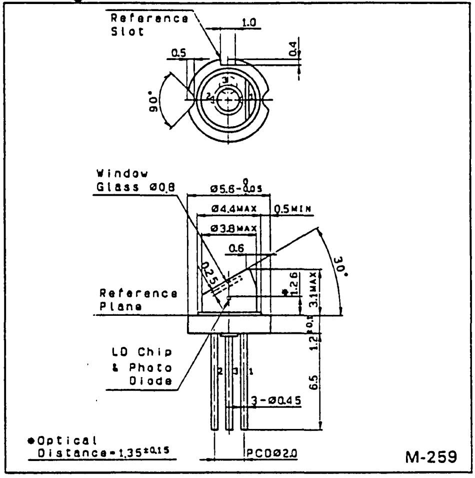
With built-in visible laser diode of GaAlAs double hetero-type and a PIN Photodiode to monitor the laser beam output

Absolute Maximum Ratings (Tc = 25°C)

• Radiant power output	Po	5	mW
• Reverse voltage	VR LD	2	V
	PD	15	V
• Operating temperature	Topr	−10 to +60	°C
• Storage temperature	Tstg	−40 to +85	°C

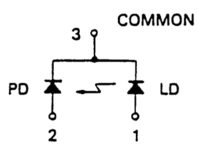
Package Outline

Unit: mm

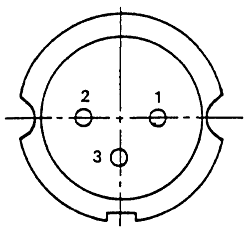


M-259

Connection Diagram



Pin Configuration



Bottom View

1. LD anode
2. PD anode
3. COMMON

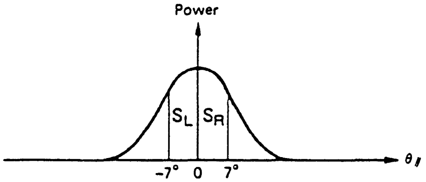
E89418A99-HP

Electrical and Optical Characteristics (Tc = 25°C)

Tc: Case temperature

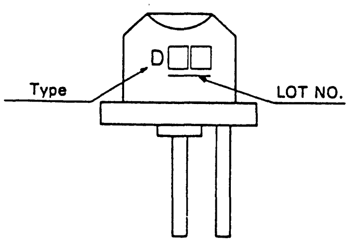
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			45	60	mA
Operating current		Iop	Po = 3 mW		52	70	mA
Operating voltage		Vop	Po = 3 mW	1.7	1.9	2.5	V
Wavelength		λ	Po = 3 mW	760	780	800	nm
Monitor current		Im	Po = 3 mW, Vr = 5 V	0.08	0.15	0.4	mA
F.W.H.M	Perpendicular	$\theta\perp$	Po = 3 mW	20	32	45	degree
	Parallel	$\theta /\!/$		9	17	25	degree
	Asymmetry	ΔS_R *1				20	%
Positional accuracy	Position	ΔX, ΔY, ΔZ	Po = 3 mW			±150	μm
	Angle	$\Delta\phi\perp$				±3	degree
Slope efficiency		ηD	Po = 3 mW	0.2	0.45	0.7	mW/mA
Astigmatism		As	Po = 3 mW $\lvert Z/\!/ - Z\perp \rvert$			15	μm
Signal to noise ratio		S/N	fc = 7.5 MHz Δf = 30 kHz Po = 4 mW		88		dB
Dark current of PD		I_D	V_R = 5 V			150	nA
Capacitance of PD		Ct	V_R = 5 V, f = 1 MHz			30	pF

Note) *1.

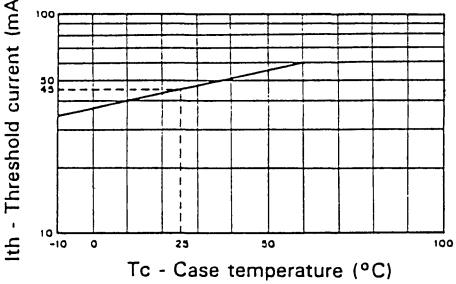


$$\Delta S_R = \frac{|S_L - S_R|}{S_L + S_R}$$

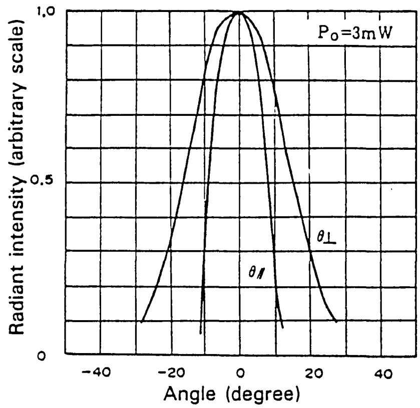
Mark



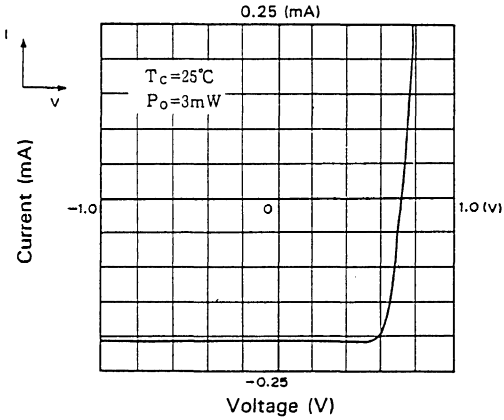
Temperature characteristic of threshold current



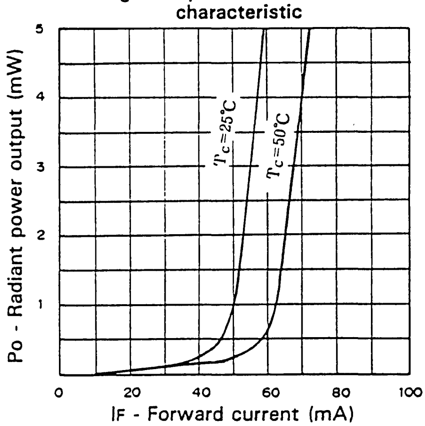
Far field pattern (FFP)



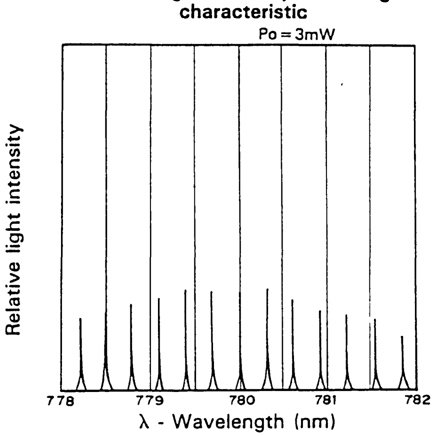
Pin diode current-voltage characteristic



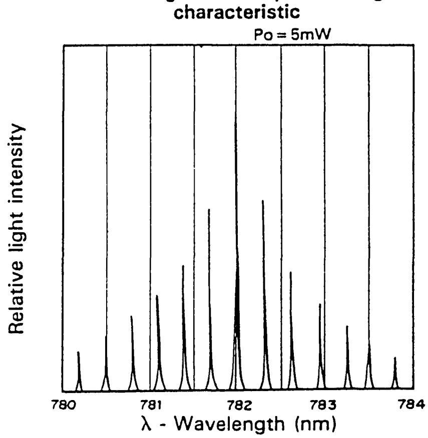
Light output forward current characteristic



Relative light intensity wavelength characteristic



Relative light intensity wavelength characteristic



SONY

SLD111V

GaAlAs Laser Diode

Description

The SLD111V is a low-noise index guided laser diode developed for optical disk applications.

Features

- Low power consumption
- Small astigmatism
- Low noise
- Microminiaturized flat-top package (ϕ 5.6mm)
- Single power supply

Structure

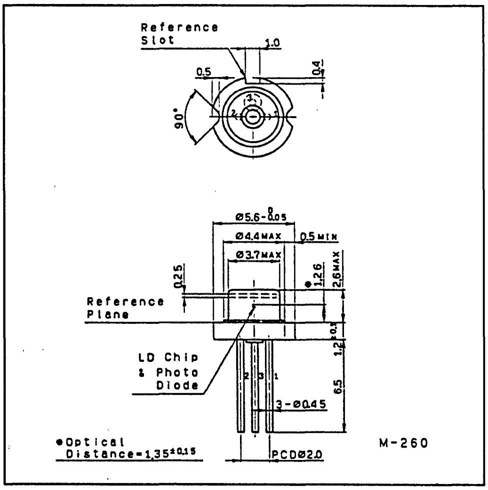
- GaAlAs double hetero structure
- Laser diode chip is mounted on a Si submount which operates as a photodetector.

Absolute Maximum Ratings (Tc=25℃)

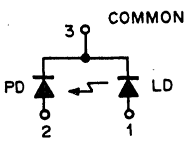
• Radiant power output	Po		5	mW
• Reverse voltage	V_R	LD	2	V
		PD	15	V
• Operating temperature	Topr		– 10 to +60	℃
• Storage temperature	Tstg		– 40 to +85	℃

Package Outline

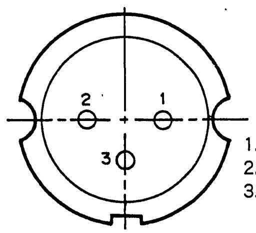
Unit : mm



Connection Diagram



Pin Configuration



1. LD anode
2. PD anode
3. COMMON

Bottom View

E90769 – ST

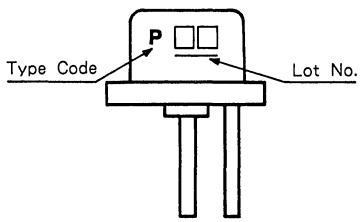
Electrical and Optical Characteristics (Tc=25℃)

Tc: Case temperature

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			35	50	mA
Operating current		Iop	Po=3mW		45	60	mA
Operating voltage		Vop	Po=3mW	1.7	1.9	2.5	V
Wavelength		λ	Po=3mW	760	780	800	nm
Monitor current		Im	Po=3mW V_R=5V	0.08	0.15	0.4	mA
Radiation angle (F.W.H.M*)	Perpendicular	$\theta\perp$	Po=3mW	20	38	45	deg
	Parallel	$\theta/\!/$		8	10	15	deg
Positional accuracy	Position	ΔX, ΔY, ΔZ	Po=3mW			±150	μm
	Angle	$\Delta\phi\perp$				±3	deg
		$\Delta\phi/\!/$				±2	deg
Slope efficiency		η_D	Po=3mW	0.2	0.3	1.0	mW/mA
Astigmatism		As	Po=3mW $\lvert Z/\!/ - Z\perp \rvert$		10		μm
Signal to noise ratio		S/N	fc=720kHz Δf=10kHz Po=3mW		90		dB

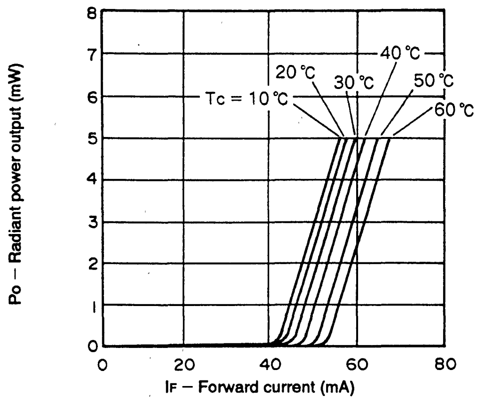
* Full Width at Half Maximum

Mark

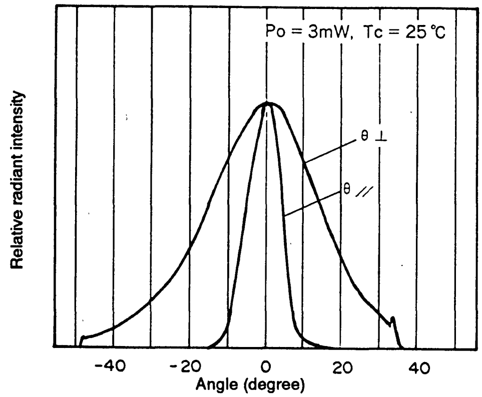


Example of Representative Characteristics

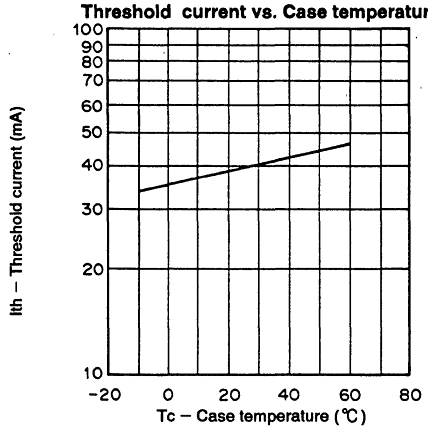
Radiant power output vs. Forward current



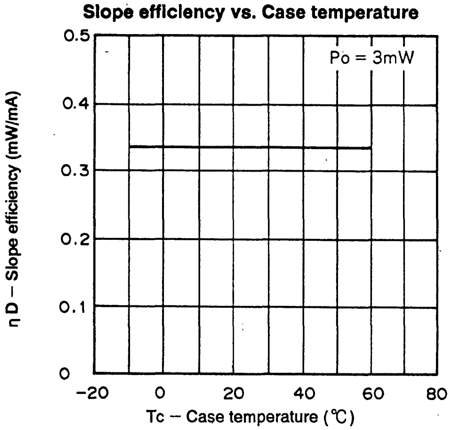
Far field pattern (FFP)



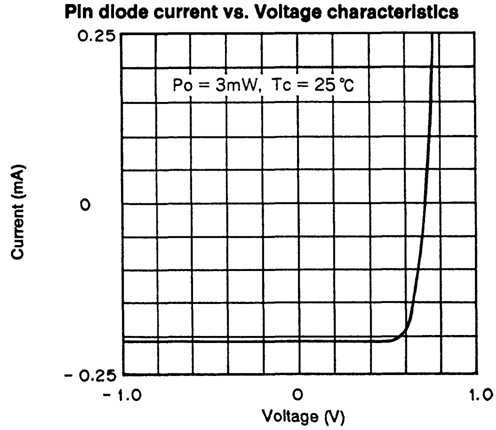
Threshold current vs. Case temperature



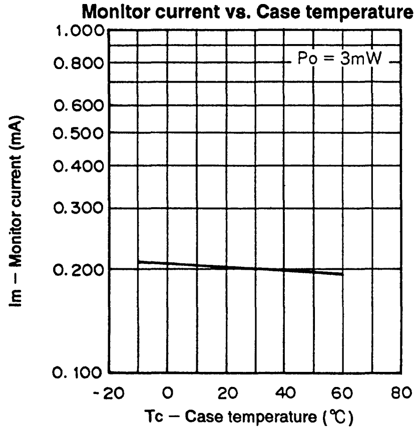
Slope efficiency vs. Case temperature



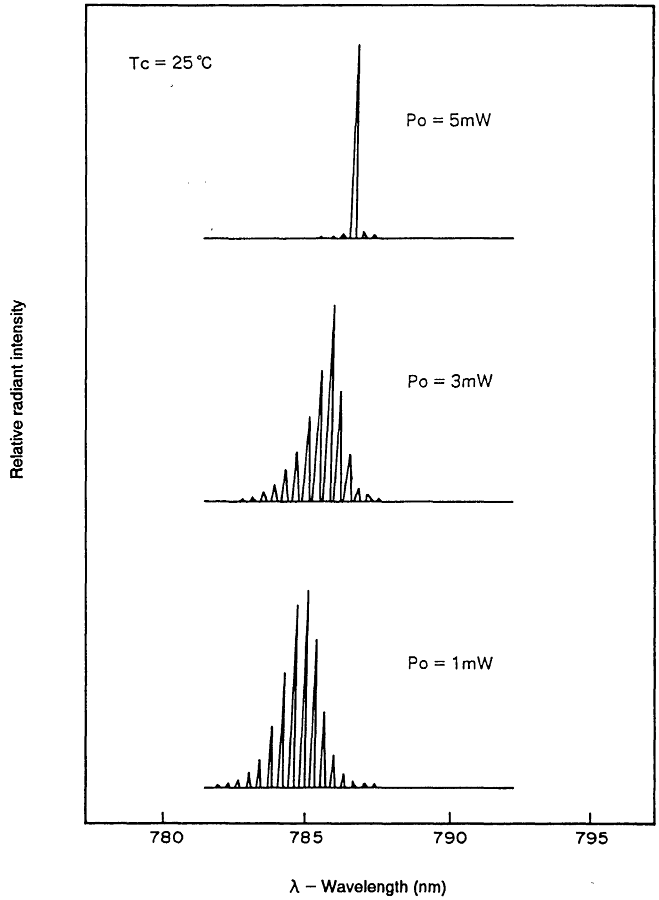
Pin diode current vs. Voltage characteristics



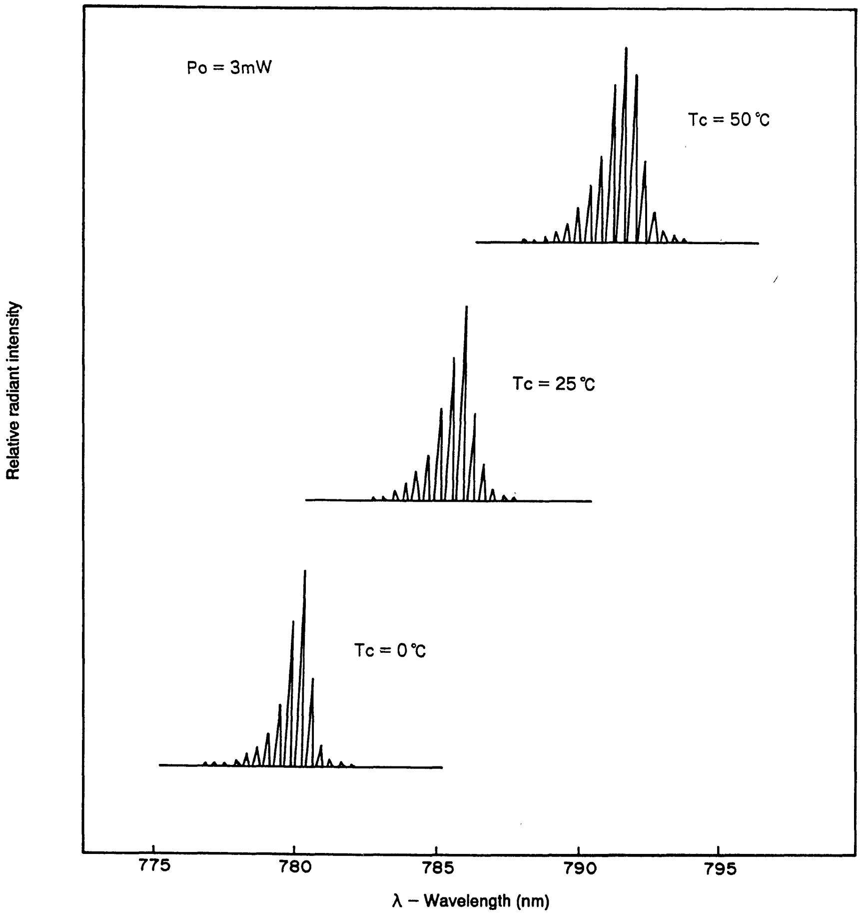
Monitor current vs. Case temperature



Radiant power dependence of emission spectrum



Temperature dependence of emission spectrum



SONY

SLD151U/V

Visible Laser Diode

Description
SLD151U/V are AlGaInP visible laser diodes designed for optical disc, bar code reader and laser printer applications.

Features
- Visible radiation (λ =670nm).
- Fundamental transverse mode.
- Correction of astigmatism using slanted glass cap (SLD151U).

Applications
- Bar code reader
- Laser printer
- Laser pointer

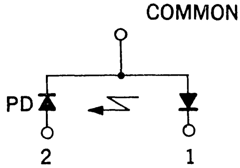
Structure
AlGaInP double-hetero laser diode

Absolute Maximum Ratings (Tc=25°C)

• Radiant power output	Po		5	mW
• Recommended radiant power output	Po		3	mW
• Reverse voltage	V_R	LD	2	V
		PD	30	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +60	°C

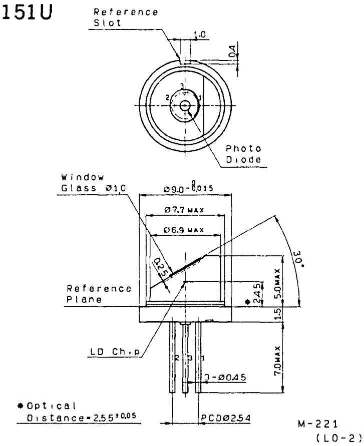
Pin Configuration

No	Function
1	LD Cathode
2	PD Anode
3	Common

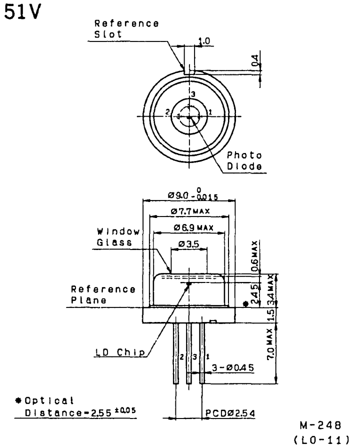


Package Outline
Unit: mm

SLD151U



SLD151V



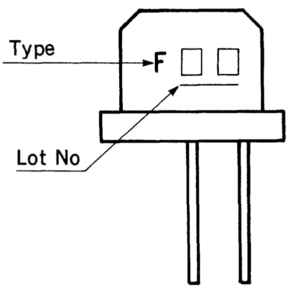
Optical and Electrical Characteristics

Tc: Case temperature, Tc=25°C

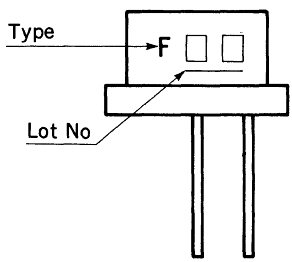
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		I_{th}			75	90	mA
Operating current		I_{op}	Po=3mW		85	100	mA
Operating voltage		V_{op}	Po=3mW		2.6	3.0	V
Wavelength		λp	Po=3mW		670	680	nm
Radiation angle (F. W. H. M)	Perpendicular	$\theta \perp$	Po=3mW		30	35	degree
	parallel	$\theta_{//}$		7	11	15	
Positional accuracy	position	$\Delta x, \Delta y, \Delta z$	Po=3mW			±50	μm
	Angle	$\Delta\phi \perp$				±3	degree
Astigmatism	SLD151U	As	Po=3mW			15	μm
	SLD151V				35		μm
Monitor current		I_{mon}	Po=3mW V_R=15V	0.15	0.4	0.7	mA

Marking

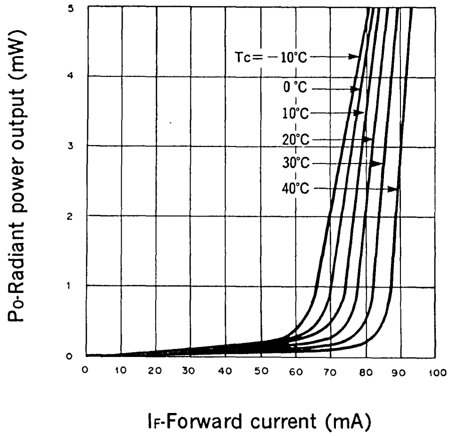
SLD151U



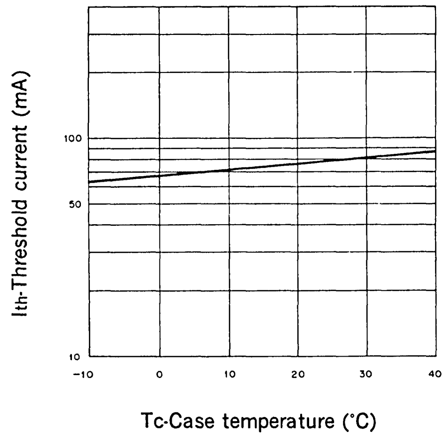
SLD151V



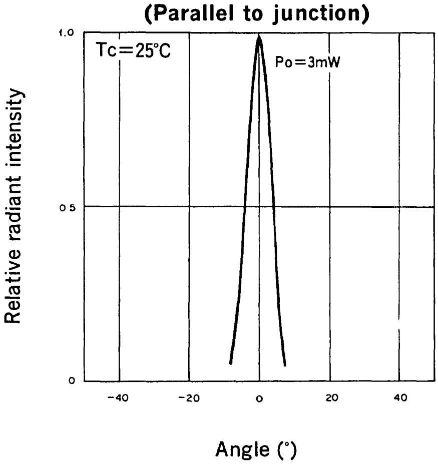
Radiant power output vs. Forward current characteristics



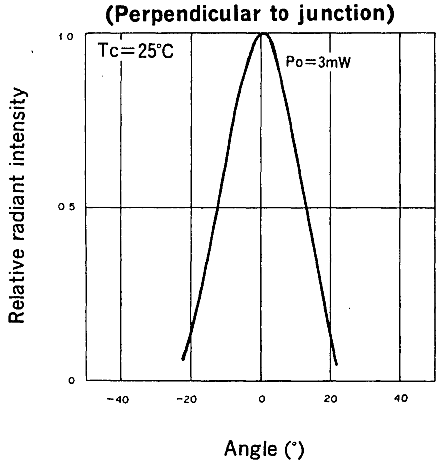
Threshold current vs. Temperature characteristics



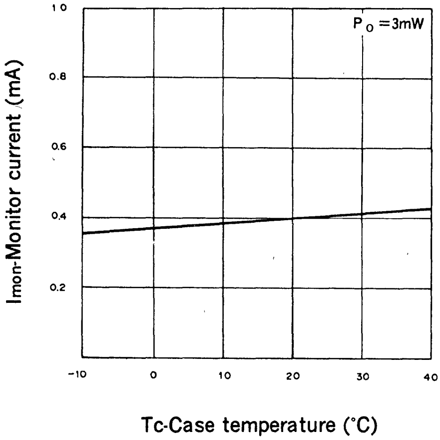
Farfield pattern (Parallel to junction)



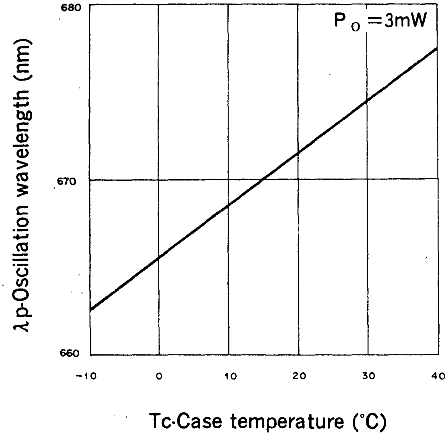
Farfield pattern (Perpendicular to junction)



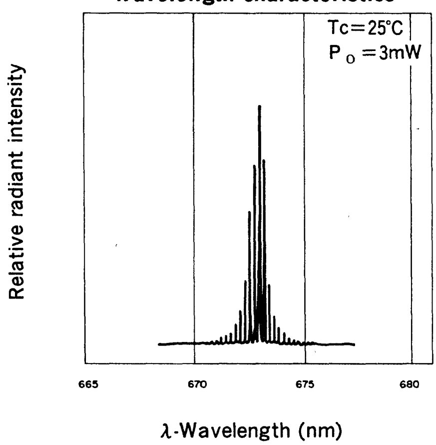
Monitor current vs. Temperature characteristics



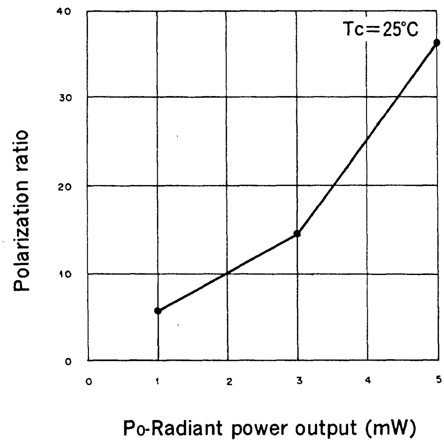
Emission wavelength vs. Temperature characteristics



Relative radiant intensity vs. Wavelength characteristics



Power dependence of polarization ratio



SONY®

SLD201U/V

20mW High Power Laser Diode

Description

SLD201U/V is a gain-guided high-power laser diode fabricated by MOCVD.

Features

- Low noise S/N=80 dB (Typ.) at 5 mW.

Structure

GaAlAs double-hetero laser diode.
PIN photo diode included for monitoring the laser radiant power output.

Application

Optical disc, Laser printer.

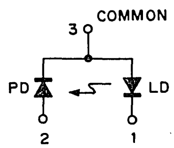
Recommended Radiant Power Output

15 mW

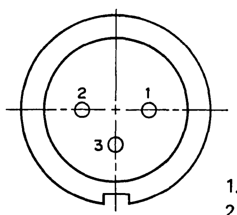
Absolute Maximum Ratings (T_c=25°C)

• Radiant power output	Po	20	mW
• Reverse voltage	VR LD	2	V
	PD	30	V
• Operating temperature	Topr	−10 to +50	°C
• Storage temperature	Tstg	−40 to +85	°C

Connection Diagram



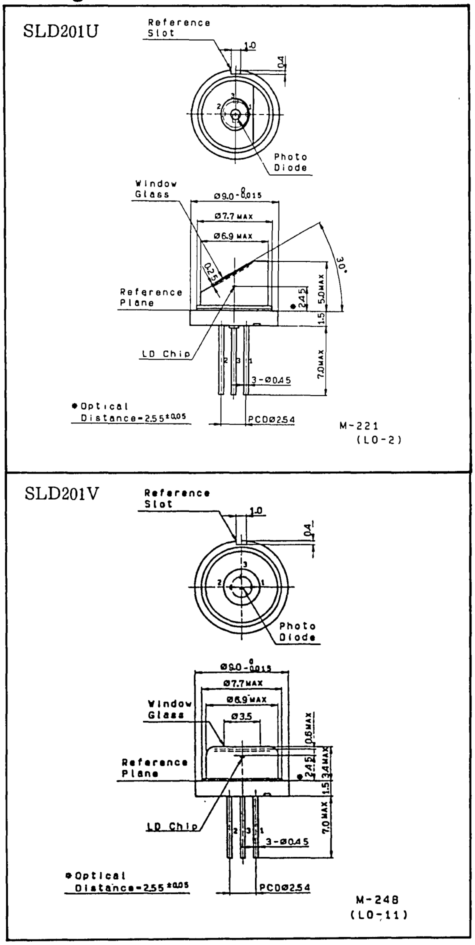
Pin Configuration (Bottom View)



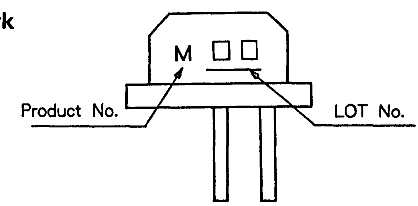
1. LD Cathode
2. PD Anode
3. COMMON

Package Outline

Unit: mm



Mark



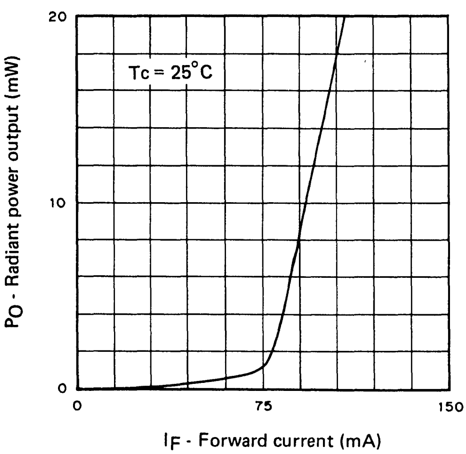
Electrical and Optical Characteristics

$T_C=25°C$

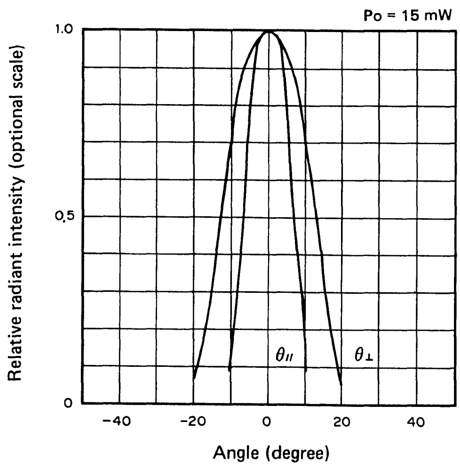
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			80	110	mA
Operating current		I_{op1}	$P_O=15mW$		95	135	mA
Operating current		I_{op2}	$P_O=15mW$, $T_C=50°C$		115	160	mA
Operating voltage		Vop	$P_O=15mW$		1.9	2.5	V
Wavelength		λ		760	780	800	nm
Monitor current		Im	$P_O=15mW$ $V_R=15V$	0.02	0.09	0.5	mA
F.W.H.M.*	Perpen-dicular	$\theta_\perp$	$P_O=15mW$		28	38	degree
	Parallel	$\theta_{//}$		7	15	22	
Positional accuracy	Position	$\Delta X, \Delta Y, \Delta Z$	$P_O=15mW$			±50	μm
	Angle	$\Delta\phi_\perp$ $\Delta\phi_{//}$				±3	degree
Slope efficiency		η_D	$P_O=15mW$	0.3	1.0		mW/mA
Astigmatism	SLD201U	As	$\lvert Z_{//}-Z_\perp \rvert$		4	10	μm
	SLD201V				40	60	
Dark current of PD		I_D	$V_R=15V$			0.15	μA
Signal to noise ratio		S/N	$f_C=720kHz$ $\Delta f=30kHz$ $P_O=5mW$	60	80		dB

* Full Width at Half Maximum

Radiant power output vs. Forward current characteristics

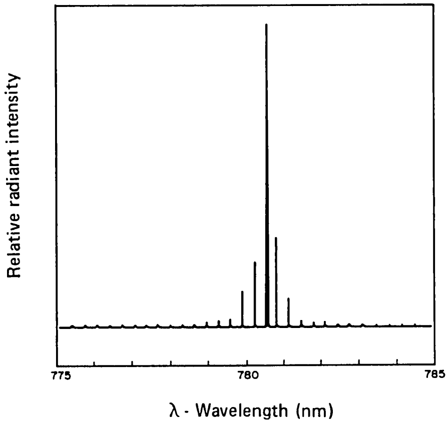


Far field pattern (FFP)



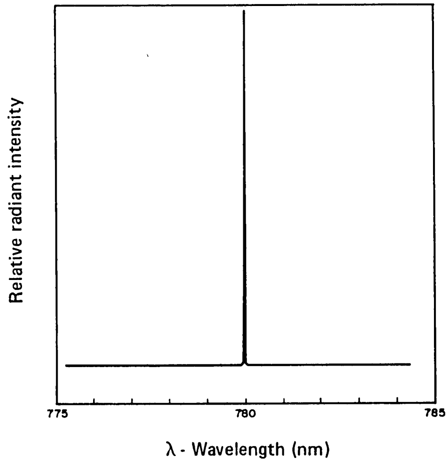
Relative radiant intensity vs. Wavelength characteristics.

Po = 5 mW



Relative radiant intensity vs. Wavelength characteristics

Po = 15 mW



SONY

SLD201U-3/V-3

50mW High Power Laser Diode

Description

SLD201U-3/V-3 is a gain-guided high-power laser diode fabricated by MOCVD.

Features

- Low noise S/N=80 dB (Typ.) at 5 mW.

Structure

GaAlAs double-hetero visible laser diode.
PIN photo diode included for monitoring the laser radiant power output.

Application

Optical disc, Laser printer.

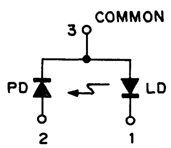
Recommended Radiant Power Output

40 mW

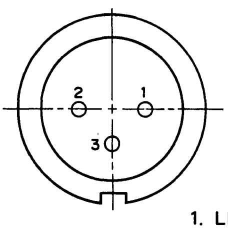
Absolute Maximum Ratings (Tc=25°C)

• Radiant power output	Po		50	mW
• Reverse voltage	V_R	LD	2	V
		PD	30	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +85	°C

Connection Diagram



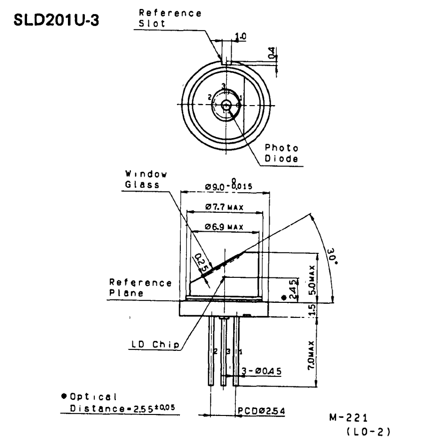
Pin Configuration (Bottom View)

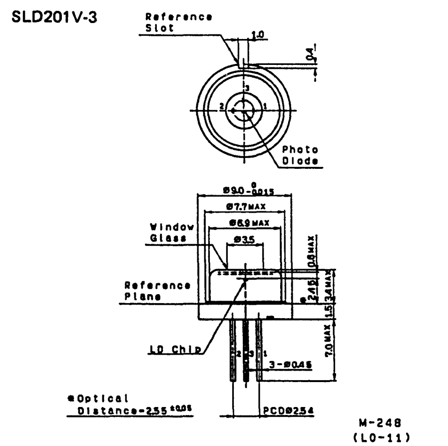


1. LD Cathode
2. PD Anode
3. COMMON

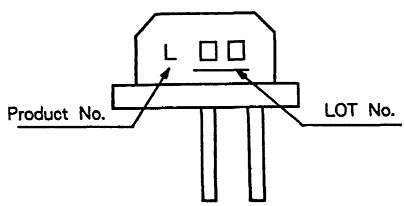
Package Outline

Unit: mm





Mark



E89315B16 – ST

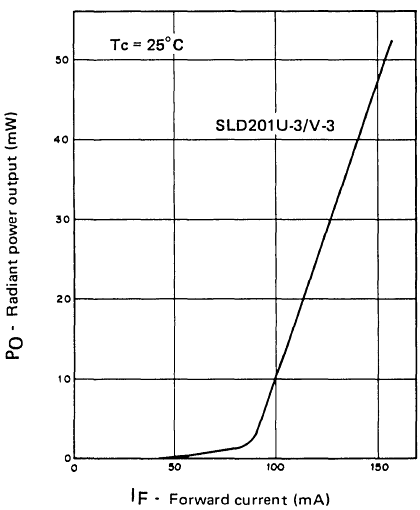
Electrical and Optical Characteristics

Tc=25°C

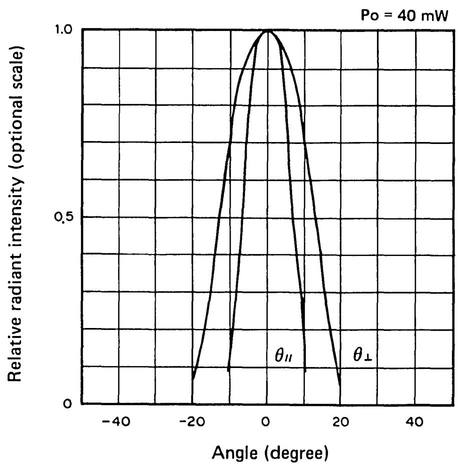
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			80	110	mA
Operating current		Iop1	Po=40mW		120	160	mA
Operating current		Iop2	Po=40mW, Tc=50°C		145	190	mA
Operating voltage		Vop	Po=40mW		2.1	2.5	V
Wavelength		λ		760	780	800	nm
Monitor current		Im	Po=40mW VR=15V	0.05	0.24	1.2	mA
F.W.H.M.*	Perpen-dicular	$\theta_\perp$	Po=40mW		28	38	degree
	Parallel	$\theta_{//}$		7	14	21	
Positional accuracy	Position	ΔX,ΔY,ΔZ	Po=40mW			±50	μm
	Angle	$\Delta\phi_\perp$ $\Delta\phi_{//}$				±3	degree
Slope efficiency		η_D	Po=40mW	0.3	1.0		mW/mA
Astigmatism	SLD201U-3	As	$\lvert Z_{//}-Z_\perp \rvert$		10		μm
	SLD201V-3				40	60	
Dark current of PD		ID	VR=15V			0.15	μA
Signal to noise ratio		S/N	fc=720kHz Δf=30kHz Po=5mW	60	80		dB

* Full Width at Half Maximum

Radiant power output vs. Forward current characteristics

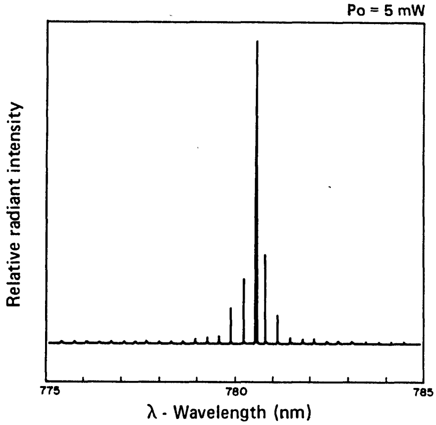


Far field pattern (FFP)



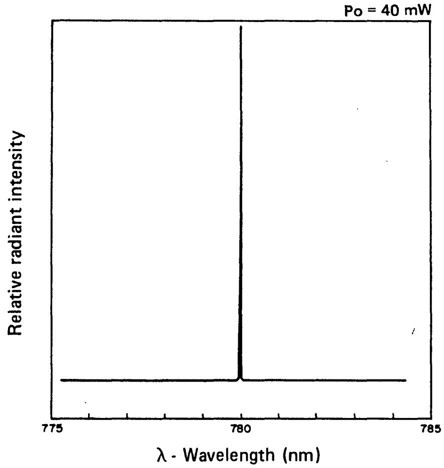
Relative radiant intensity vs. Wavelength characteristics

Po = 5 mW



Relative radiant intensity vs. Wavelength characteristics

Po = 40 mW



25mW High Power Laser Diode

Description
SLD202U/V is a gain-guided high-power laser diode fabricated by MOCVD.

Features
- Low noise S/N=80 dB (Typ.) at 5 mW.

Structure
GaAlAs double-hetero visible laser diode.
PIN photo diode included for monitoring the laser radiant power output.

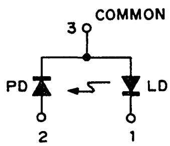
Application
Optical disc, Laser printer.

Recommended Radiant Power Output
20 mW

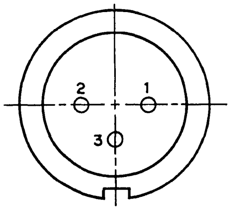
Absolute Maximum Ratings (T_c=25°C)

• Radiant power output	Po		25	mW
• Reverse voltage	VR	LD	2	V
		PD	30	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +85	°C

Connection Diagram

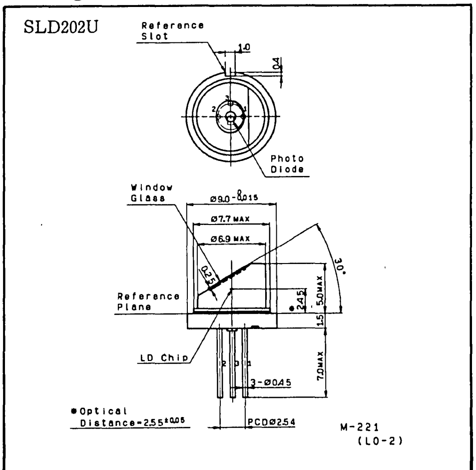


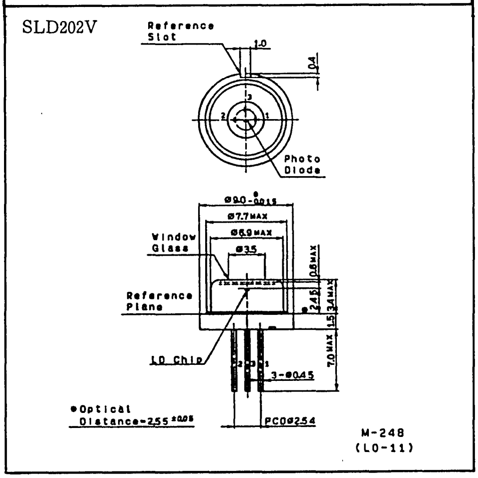
Pin Configuration (Bottom View)



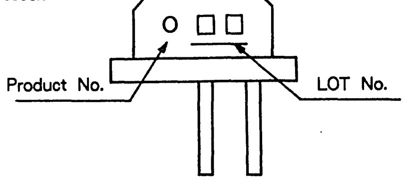
1. LD Cathode
2. PD Anode
3. COMMON

Package Outline
Unit: mm





Mark



E89316B16 – ST

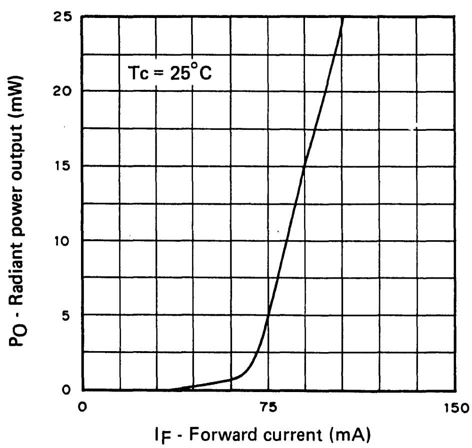
Electrical and Optical Characteristics

Tc=25°C

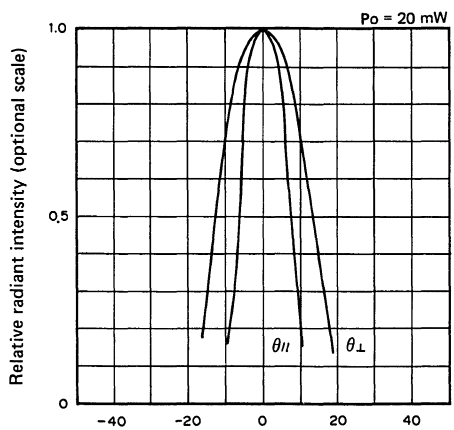
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			80	110	mA
Operating current		Iop1	Po=20mW		100	140	mA
Operating current		Iop2	Po=20mW, Tc=50°C		120	170	mA
Operating voltage		Vop	Po=20mW		1.9	2.5	V
Wavelength		λ		800	820	840	nm
Monitor current		Im	Po=20mW VR=15V	0.025	0.12	0.6	mA
F.W.H.M.*	Perpendicular	$\theta_{\perp}$	Po=20mW		28	38	degree
	Parallel	$\theta_{//}$		7	15	22	
Positional accuracy	Position	$\Delta X, \Delta Y, \Delta Z$	Po=20mW			±50	μm
	Angle	$\Delta\phi_{\perp}$ $\Delta\phi_{//}$				±3	degree
Slope efficiency		η_D	Po=20mW	0.3	1.0		mW/mA
Astigmatism	SLD202U	As	$\lvert Z_{//} - Z_{\perp} \rvert$		4	10	μm
	SLD202V				40	60	
Dark current of PD		ID	VR=15V			0.15	μA
Signal to noise ratio		S/N	fc=720kHz Δf=30kHz Po=5mW	60	80		dB

* Full Width at Half Maximum

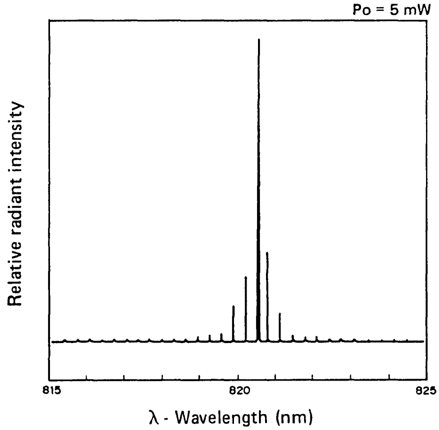
Radiant power output vs. Forward current characteristics



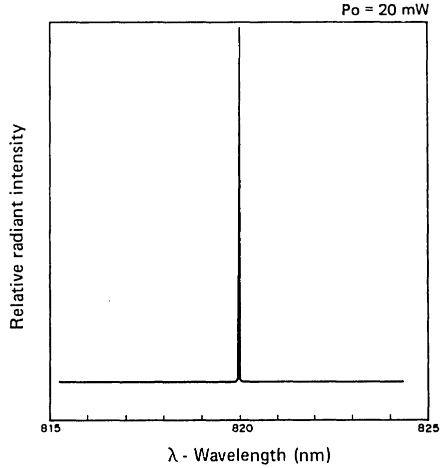
Far field pattern (FFP)



Relative radiant intensity vs. Wavelength characteristics



Relative radiant intensity vs. Wavelength characteristics



SONY® SLD202U-3/V-3

50mW High Power Laser Diode

Description

SLD202U-3/V-3 is a gain-guided high-power laser diode fabricated by MOCVD.

Features

- Low noise S/N=80 dB (Typ.) at 5 mW.

Structure

GaAlAs double-hetero laser diode.
PIN photo diode included for monitoring the laser radiant power output.

Application

Optical disc, Laser printer, Nd : YAG excitation.

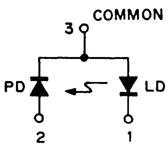
Recommended Radiant Power Output

40 mW

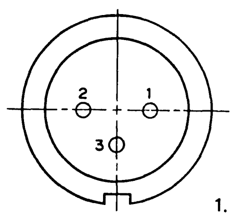
Absolute Maximum Ratings (Tc=25°C)

• Radiant power output	Po	50	mW
• Reverse voltage	VR LD	2	V
	PD	30	V
• Operating temperature	Topr	−10 to +50	°C
• Storage temperature	Tstg	−40 to +85	°C

Connection Diagram



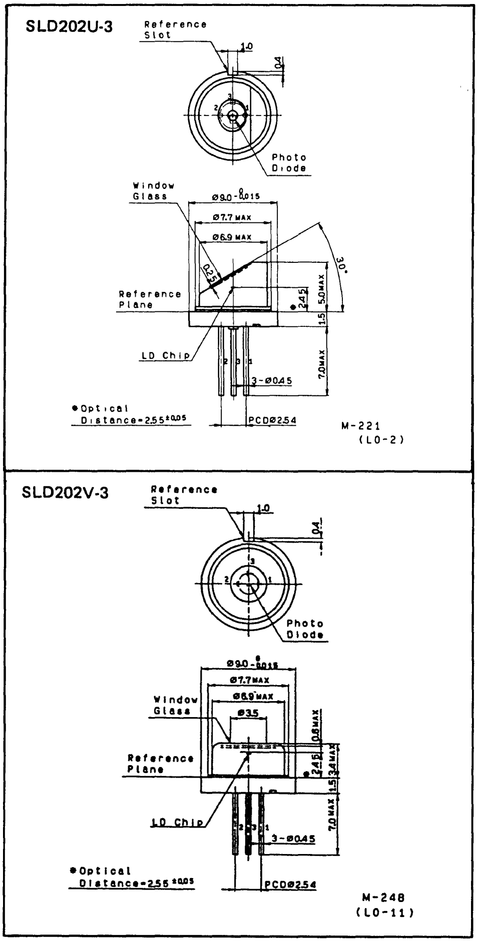
Pin Configuration (Bottom View)



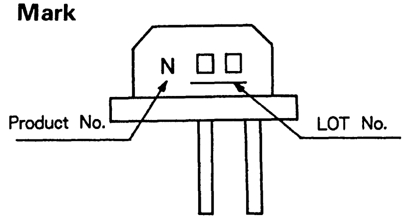
1. LD Cathode
2. PD Anode
3. COMMON

Package Outline

Unit: mm



Mark



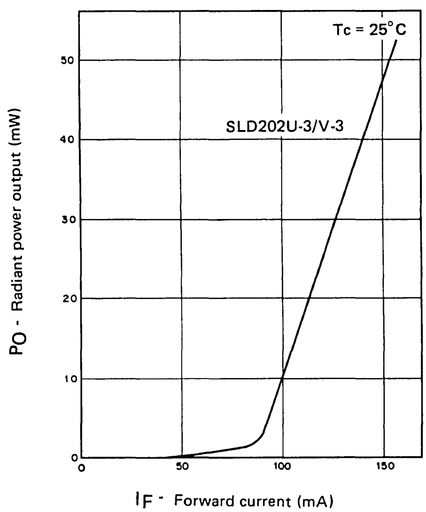
E89317B16 – ST

Electrical and Optical Characteristics Tc=25°C

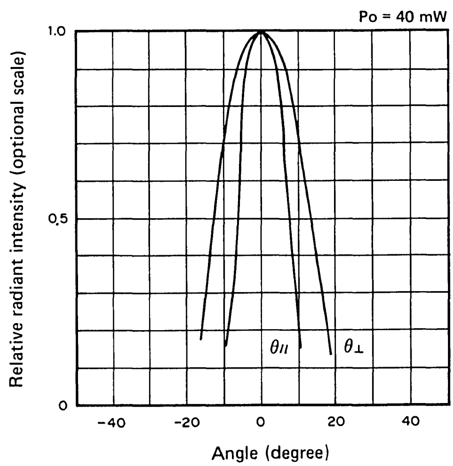
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			80	110	mA
Operating current		Iop1	Po=40mW		120	160	mA
Operating current		Iop2	Po=40mW, Tc=50°C		145	190	mA
Operating voltage		Vop	Po=40mW		2.1	2.5	V
Wavelength		λ		800	820	840	nm
Monitor current		Im	Po=40mW VR=15V	0.05	0.24	1.2	mA
F.W.H.M.*	Perpendicular	$\theta_\perp$	Po=40mW		28	38	degree
	Parallel	$\theta_{/\!/}$		7	14	21	
Positional accuracy	Position	$\Delta X, \Delta Y, \Delta Z$	Po=40mW			±50	μm
	Angle	$\Delta\phi_\perp$ $\Delta\phi_{/\!/}$				±3	degree
Slope efficiency		η_D	Po=40mW	0.3	1.0		mW/mA
Astigmatism	SLD202U-3	As	$\lvert Z_{/\!/} - Z_\perp \rvert$		10		μm
	SLD202V-3				40	60	
Dark current of PD		ID	VR=15V			0.15	μA
Signal to noise ratio		S/N	fc=720kHz Δf=30kHz Po=5mW	60	80		dB

* Full Width at Half Maximum

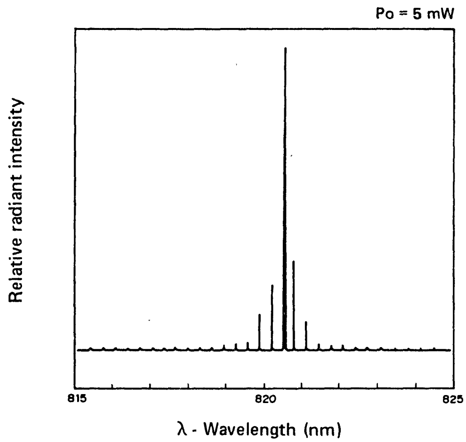
Radiant power output vs. Forward current characteristics



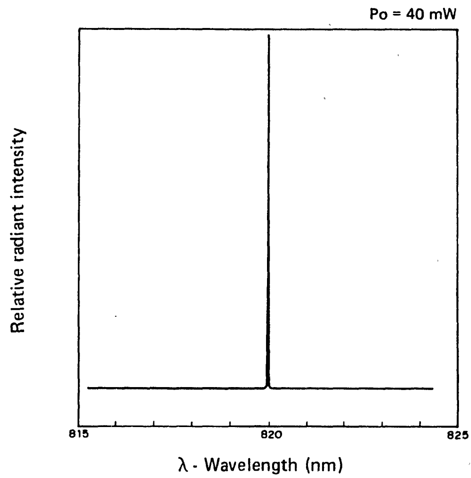
Far field pattern (FFP)



Relative radiant intensity vs. Wavelength characteristics



Relative radiant intensity vs. Wavelength characteristics



SONY | **SLD203AV**

35mW High Power Laser Diode

Description
SLD203AV is an index-guided high-power laser diode for optical disc applications.

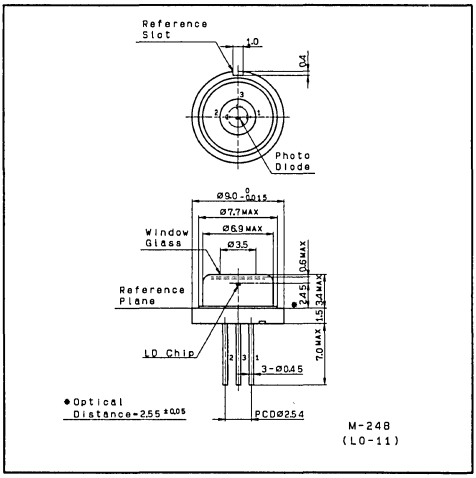
Features
- High power Po = 35mW (Max.)
- Low astigmatism (3 μm (Typ.))
- Single longitudinal mode operation
- Small aspect ratio ($\theta_{/\!/}$: $\theta_{\perp}$ = 1 : 2)

Structure
GaAlAs double-hetero laser diode.
PIN photo diode included for monitoring the laser radiant power output.

Application
- Optical disc, Laser printer.

Recommended Radiant Power Output
30mW

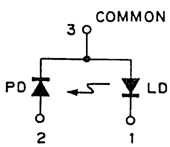
Package Outline
Unit : mm



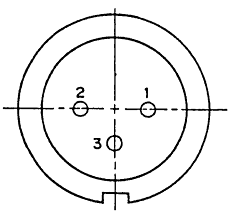
Absolute Maximum Ratings (Tc = 25°C)

• Radiant power output	Po		35	mW
• Reverse voltage	V_R	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +85	°C

Connection Diagram



Pin Configuration (Bottom View)



Bottom View

1. LD Cathode
2. PD Anode
3. Common

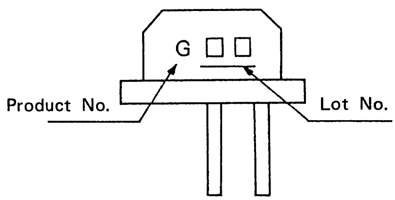
E89331A99 – ST

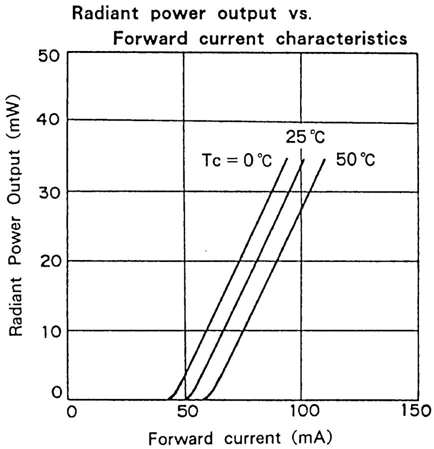
Electrical and Optical Characteristics (Ta = 25℃)

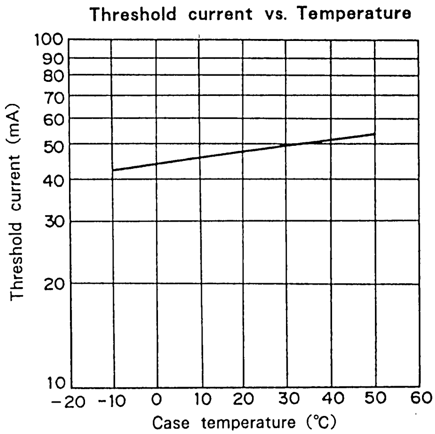
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			50	75	mA
Operating current		Iop	Po = 30mW		90	135	mA
Operating voltage		Vop	Po = 30mW		1.9	2.5	V
Wavelength		λp	Po = 30mW	760	780	800	nm
Monitor current		Im	Po = 30mW VR = 15V	0.04	0.3	1.2	mA
F.W.H.M. *	Perpendicular	$\theta_{\perp}$	Po = 30mW	14	24	34	degree
	Parallel	$\theta_{//}$		7	12	17	degree
Positional accuracy	Position	ΔX, ΔY, ΔZ	Po = 30mW			±50	μm
	Angle	$\Delta\phi_{//}$				±2	degree
		$\Delta\phi_{\perp}$				±3	degree
Slope efficiency		η_D	Po = 30mW	0.3	0.75		mW/mA
Astigmatism		As	$\lvert Z_{//} - Z_{\perp} \rvert$		3	10	μm
Dark current of PD		I_D	VR = 15V			0.15	μA

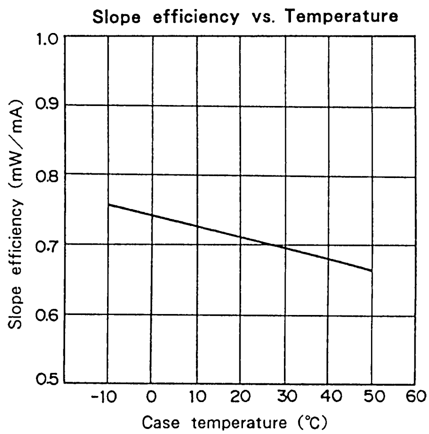
* Full Width at Half Maximum

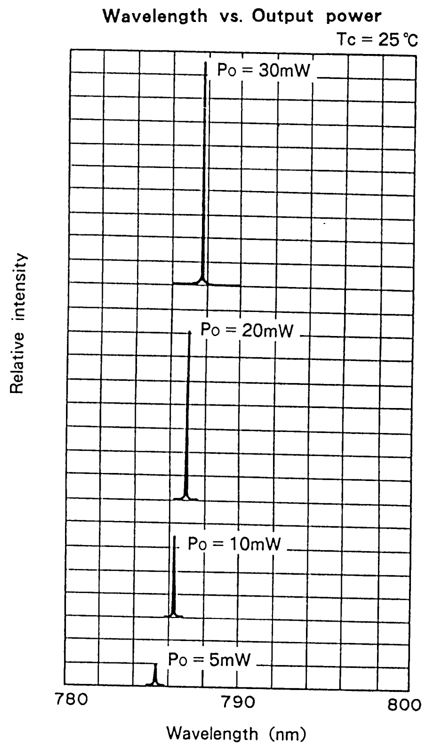
Mark

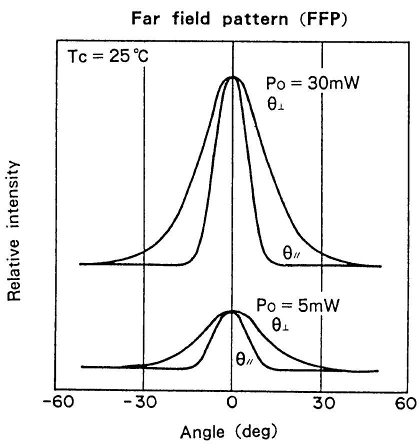



Radiant power output vs.
Forward current characteristics
Radiant Power Output (mW)
50
40
30
20
10
0
Tc = 0 °C
25 °C
50 °C
0
50
100
150
Forward current (mA)


Threshold current vs. Temperature
Threshold current (mA)
100
90
80
70
60
50
40
30
20
10
−20
−10
0
10
20
30
40
50
60
Case temperature (°C)


Slope efficiency vs. Temperature
Slope efficiency (mW/mA)
1.0
0.9
0.8
0.7
0.6
0.5
-10
0
10
20
30
40
50
60
Case temperature (°C)


Wavelength vs. Output power
Tc = 25 °C
Relative intensity
Po = 30mW
Po = 20mW
Po = 10mW
Po = 5mW
780
790
800
Wavelength (nm)


Far field pattern (FFP)
Tc = 25 °C
Po = 30mW
θ⊥
θ//
Po = 5mW
θ⊥
θ//
Relative intensity
-60
-30
0
30
60
Angle (deg)

SONY

SLD301V

100mW High Power Laser Diode

Description
SLD301V is a gain-guided, high-powered laser diode fabricated by MOCVD.
MOCVD: Metal Organic Chemical Vapor Deposition

Features
- High power
  Recommended power output Po=90mW
- Small operating current

Applications
- Solid state laser excitation
- Medical use

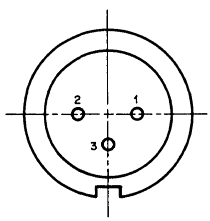
Structure
GaAlAs double-hetero laser diode

Absolute Maximum Ratings (Tc=25°C)

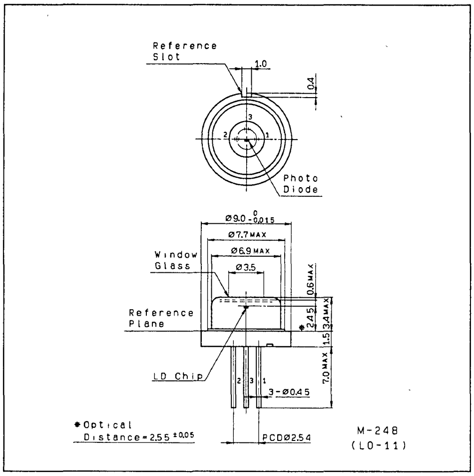
• Radiant power output	Po		100	mW
• Reverse voltage	VR	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +85	°C

Pin Configuration (Bottom View)

No.	Function
1	Laser diode cathode
2	Photodiode anode
3	Common



Package Outline
Unit: mm



Optical and Electrical Characteristics

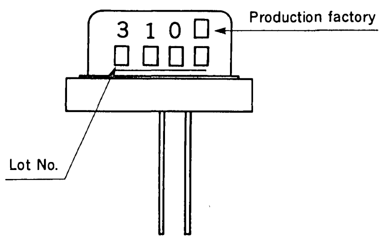
Tc=25°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			150	200	mA
Operating current		I_{OP}	Po=90mW		250	400	mA
Operating voltage		V_{OP}	Po=90mW		1.9	3.0	V
Wavelength*		λ_p	Po=90mW	770		840	nm
Monitor current		Imon	Po=90mW VR=10V		0.15		mA
F. W. H. M	Perpendicular	$\theta\perp$	Po=90mW		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=90mW			±50	μm
	Angle	$\Delta\phi\perp$				±3	degree
Slope efficiency		η_D	Po=90mW	0.65	0.9		mW/mA

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD301V-1	785±15
SLD301V-2	810±10
SLD301V-3	830±10
SLD301V-21 -24 -25	798± 3 807± 3 810± 3

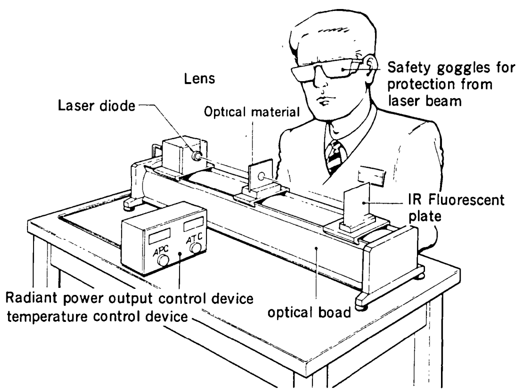
Marking



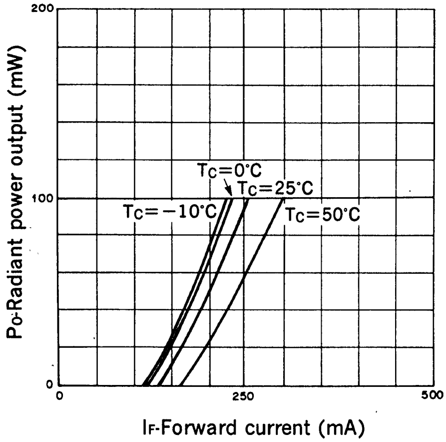
Handling Precautions

Eye protection against laser beams

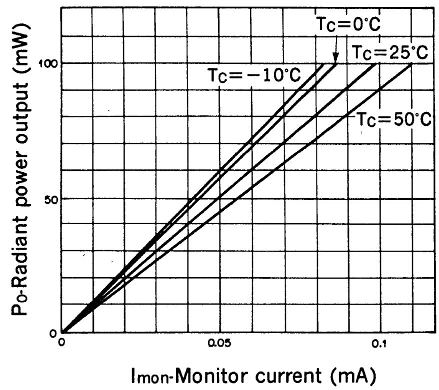
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the tip end reaches 1 megawatt per square centimeter. Unlike gas lasers, as laser diode beams are rather divergent, beam of uncollinated laser diodes are fairly safe at a disance. Generally speaking, however, it is best NOT to LOOK into laser beams, under any circumstances. For laser beams observation purposes ALWAYS use safety goggles that block infrared rays. Usage of 1R scopes, 1R cameras and fluorescent plates is also recommended for the safe monitoring of laser beams.



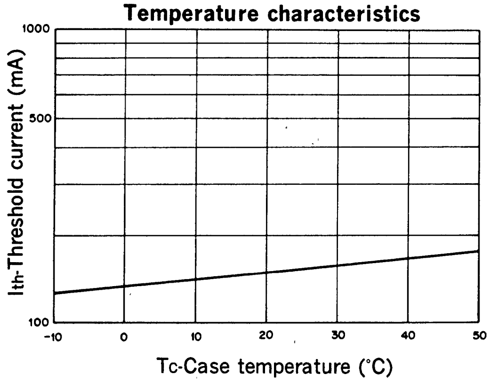
Radiant power output vs. Forward current characteristics



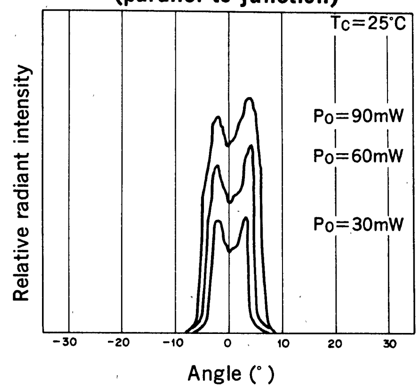
Radiant power output vs. Monitor current characteristics



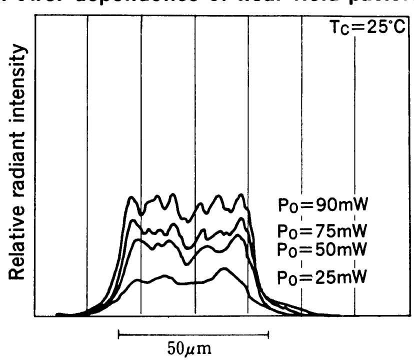
Threshold current vs. Temperature characteristics



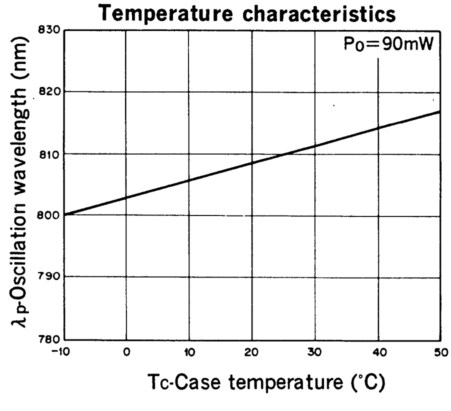
Power dependence of far field pattern (parallel to junction)

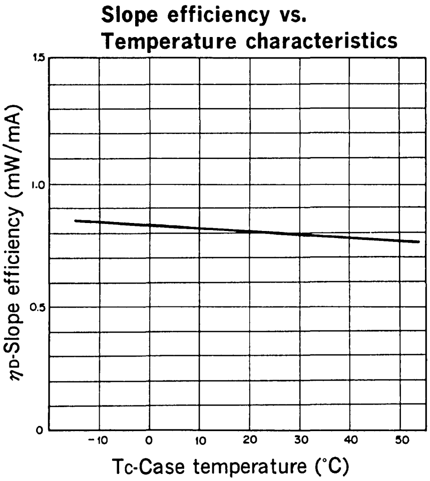


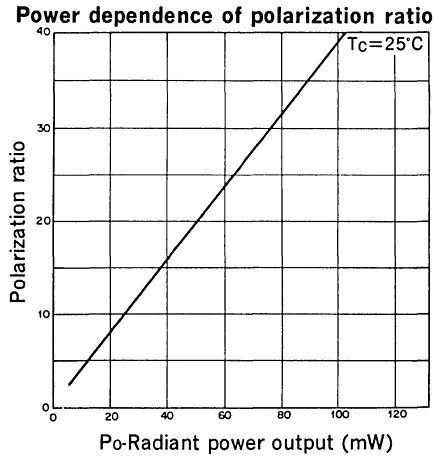
Power dependence of near field pattern



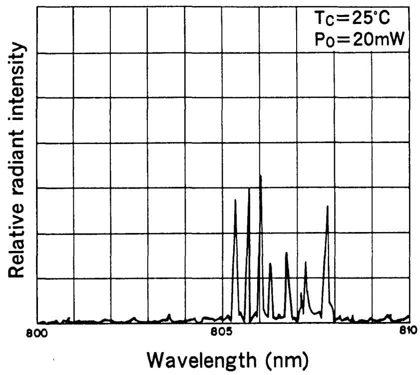
Oscillation wavelength vs. Temperature characteristics

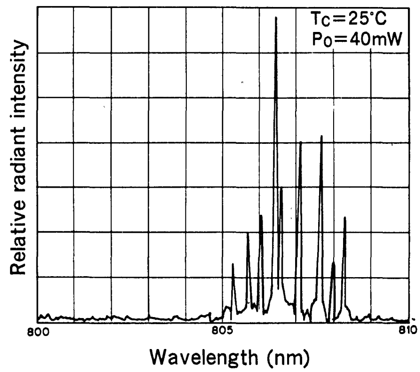


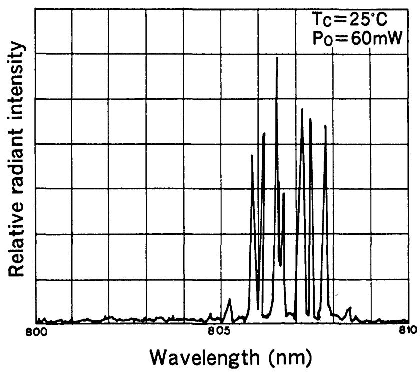

Slope efficiency vs.
Temperature characteristics
ηD-Slope efficiency (mW/mA)
Tc-Case temperature (°C)
1.5
1.0
0.5
0
-10
0
10
20
30
40
50

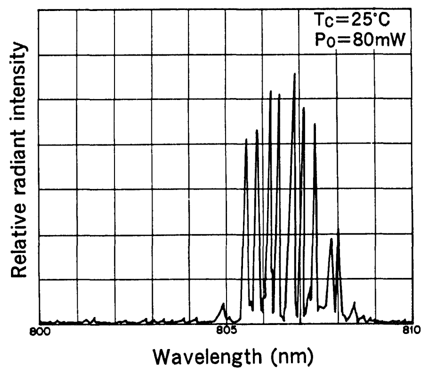

Power dependence of polarization ratio
Tc=25°C
Polarization ratio
Po-Radiant power output (mW)
40
30
20
10
0
0
20
40
60
80
100
120

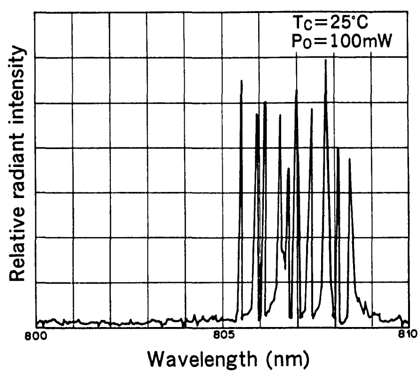
Power dependence of wavelength (Spectrum)



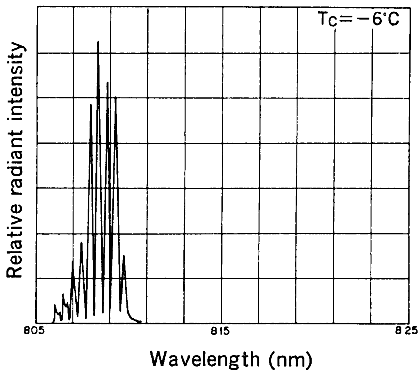


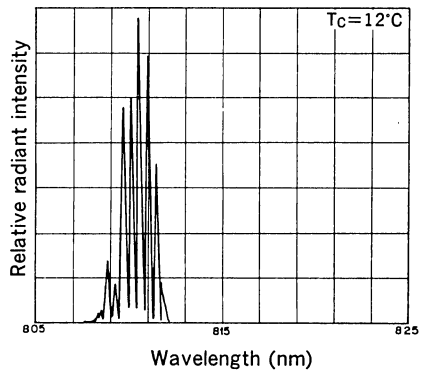


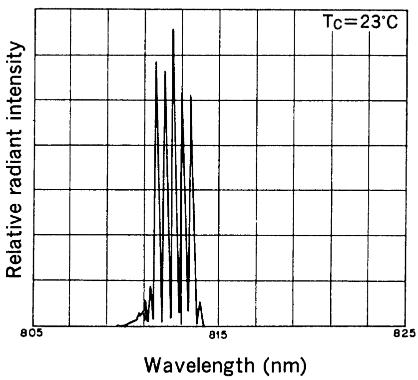


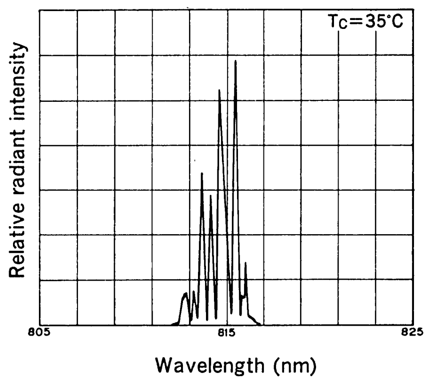


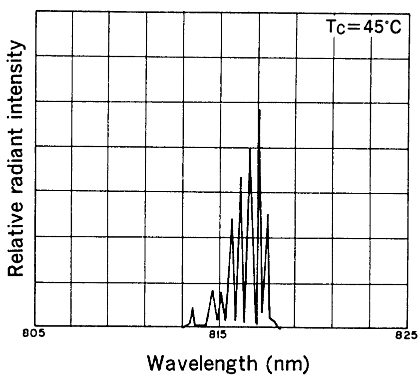
Temperature dependence of wavelength (Po=90mW)











SONY **SLD301WT**

100mW High Power Laser Diode

Description

SLD301WT is a gain-guided, high-powered laser diode with a built-in TE cooler. Fine tuning of the wavelength is possible by controlling the laser chip temperature.

Features

- High power
  Recommended power output Po=90mW
- Small operating current
- TO-3 package with built-in TE cooler, thermistor, and photodiode

Structure

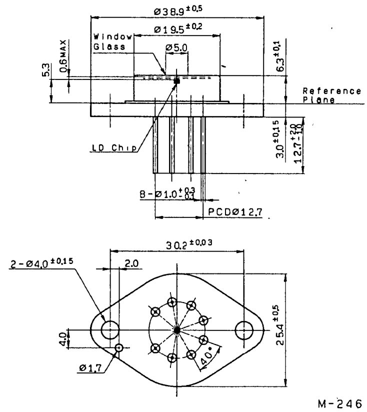
GaAlAs double-hetero laser diode

Applications

- Solid state laser excitation
- Medical use

Package Outline

Unit: mm

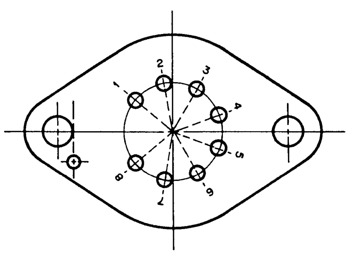


Absolute Maximum Ratings (T_{th}=25°C)

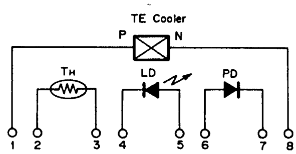
• Radiant power output	Po		100	mW
• Reverse voltage	VR	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +85	°C
• Operating current of TE cooler	IT		2.1	A

Pin Configuration (Bottom View)

No.	Function
1	TE cooler, positive
2	Thermistor lead 1
3	Thermistor lead 2
4	Laser diode cathode
5	Laser diode anode
6	Photodiode anode
7	Photodiode cathode
8	TE cooler, negative



Equivalent Circuit



E80403A13-HP

Optical and Electrical Characteristics

Tth=25°C

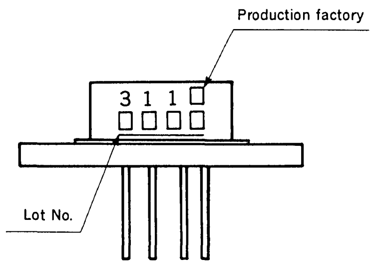
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			150	200	mA
Operating current		I_{OP}	Po=90mW		250	400	mA
Operating voltage		V_{OP}	Po=90mW		1.9	3.0	V
Wavelength*		λ_p	Po=90mW	770		840	nm
Monitor current		Imon	Po=90mW V_R=10V		0.15		mA
F. W. H. M	Perpendicular	$\theta_\perp$	Po=90mW		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=90mW			±100	μm
	Angle	$\Delta\phi\perp$				±3	degree
Slope efficiency		η_D	Po=90mW	0.65	0.9		mW/mA
Thermistor resistance		Rth	Tth=25°C		10		kΩ

Note) Tth: Thermistor temperature

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD301WT-1	785±15
SLD301WT-2	810±10
SLD301WT-3	830±10
SLD301WT-21	798± 3
-24	807± 3
-25	810± 3

Marking

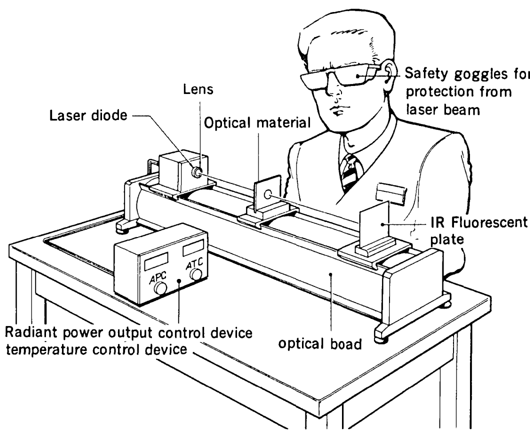


※ Categories are not specified by marking.

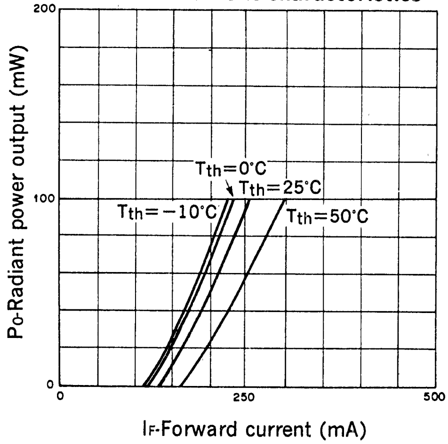
Handling Precautions

Eye protection against laser beams

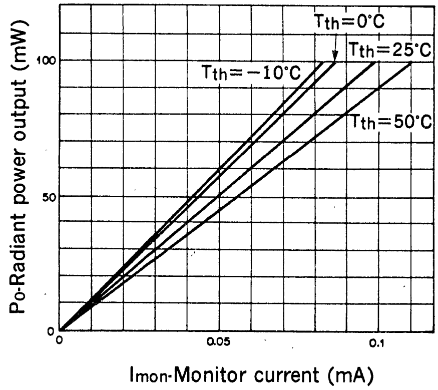
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the tip end reaches 1 megawatt per square centimeter. Unlike gas lasers, as laser diode beams are rather divergent, beam of uncollinated laser diodes are fairly safe at a disance. Generally speaking, however, it is best NOT to LOOK into laser beams, under any circumstances. For laser beams observation purposes ALWAYS use safety goggles that block infrared rays. Usage of 1R scopes, 1R cameras and fluorescent plates is also recommended for the safe monitoring of laser beams.



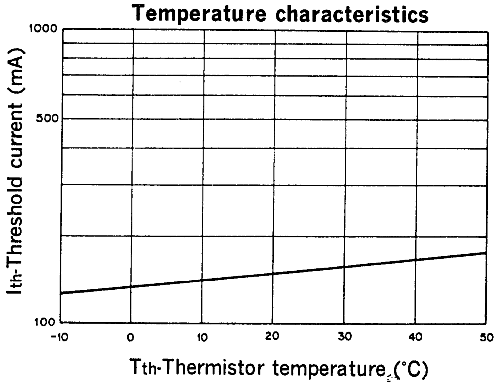
Radiant power output vs. Forward current characteristics



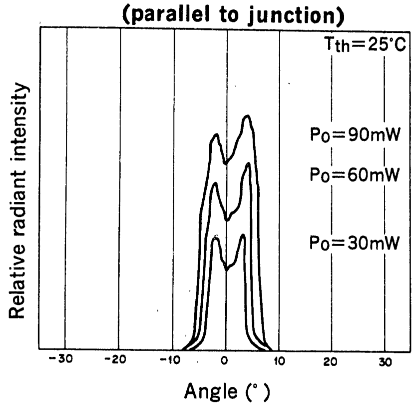
Radiant power output vs. Monitor current characteristics



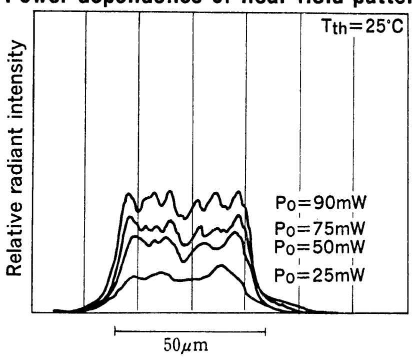
Threshold current vs. Temperature characteristics



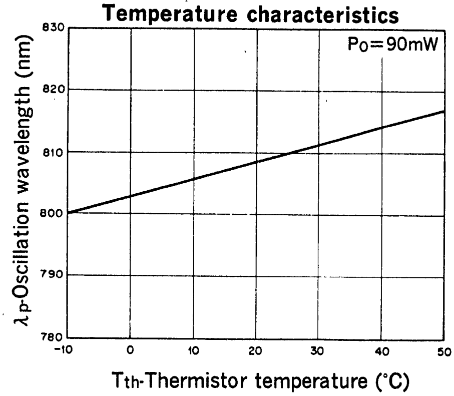
Power dependence of far field pattern (parallel to junction)



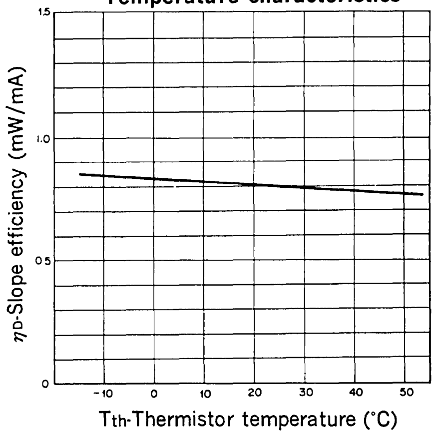
Power dependence of near field pattern



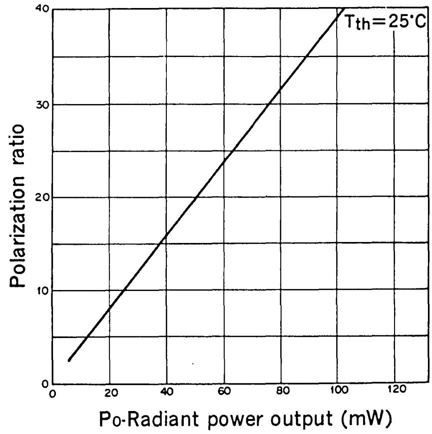
Oscillation wavelength vs. Temperature characteristics



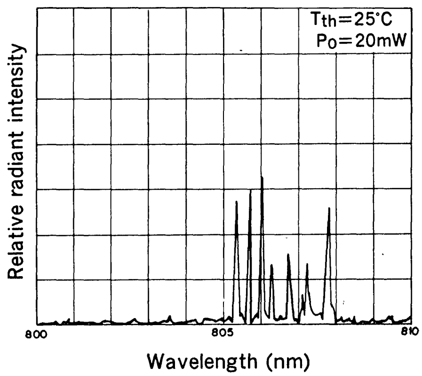
Slope efficiency vs.
Temperature characteristics

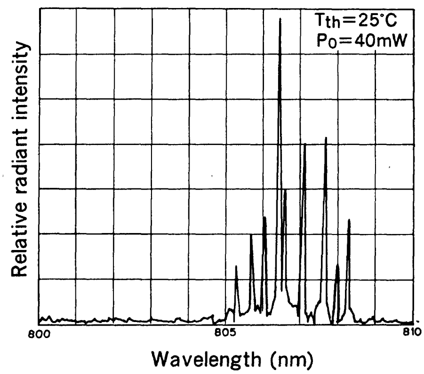


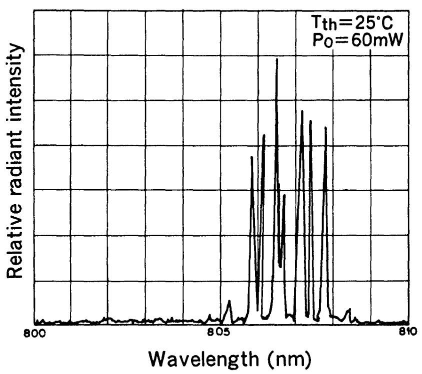
Power dependence of polarization ratio

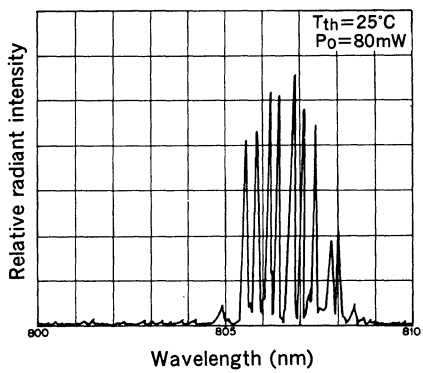


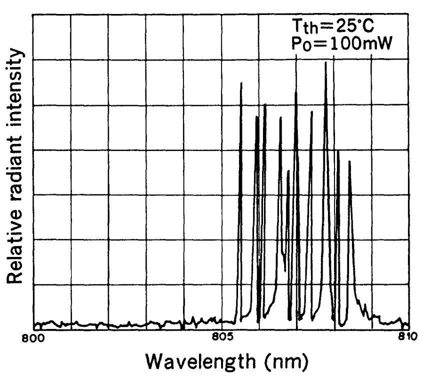
Power dependence of wavelength (spectrum)



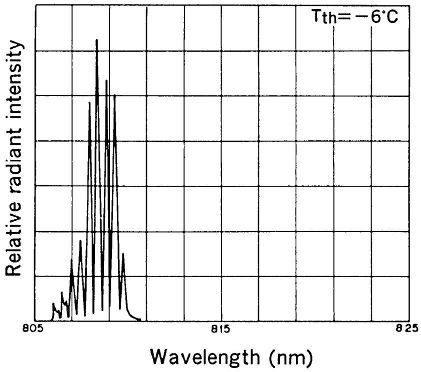


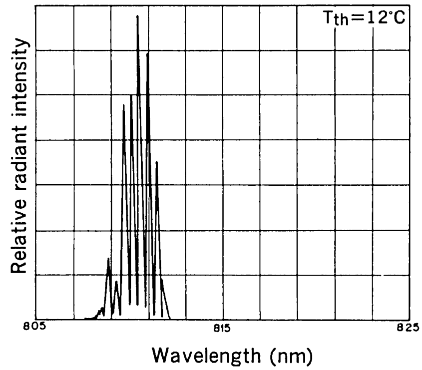


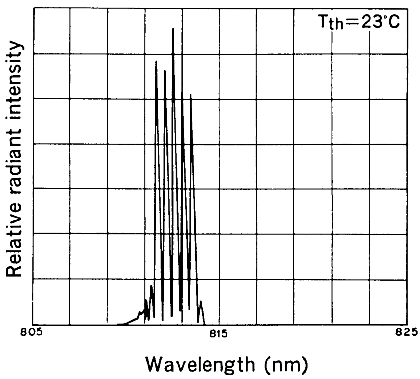


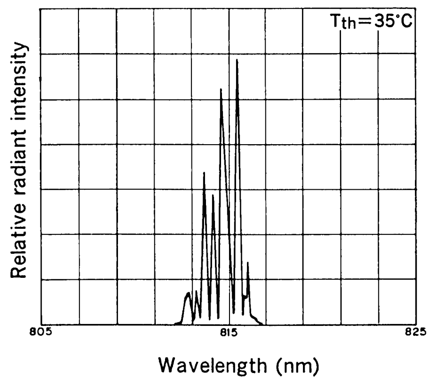


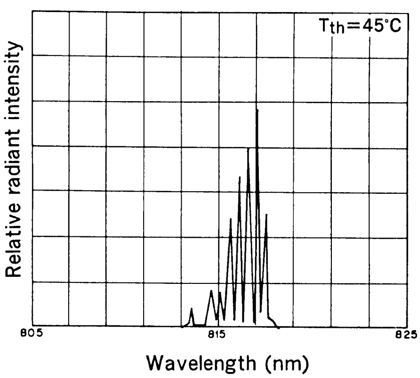
Temperature dependence of wavelength (Po=90mW)



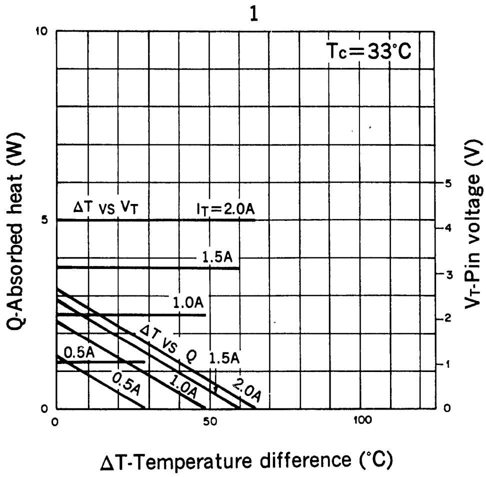


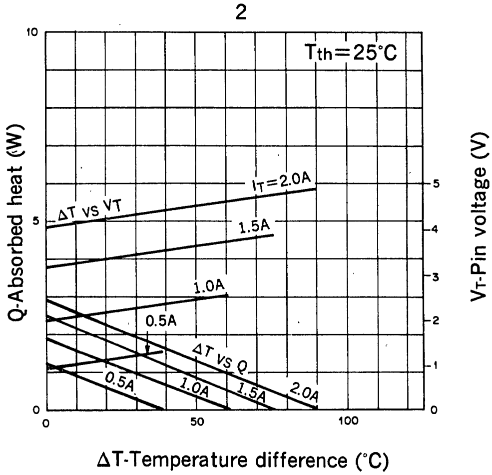






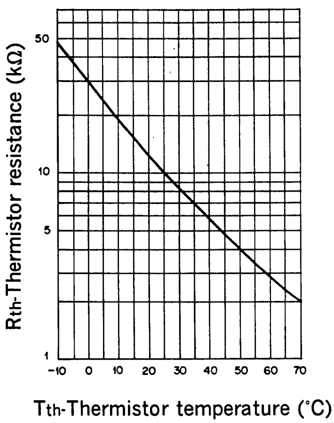
TE cooler characteristics





ΔT : Tc-Tth
Tth : Thermistor temperature
Tc : Case temperature

Thermistor characteristics



SONY

SLD301XT

100mW High Power Laser Diode

Description

SLD301XT is a gain-guided, high-power laser diode with a built-in TE cooler. A new flat, square package with a low thermal resistance and an in-line pin configuration is employed.

Fine tuning of the wavelength is possible by controlling the laser chip temperature.

Features

- High power
  Recommended power output Po=90mW
- Small operating current
- Newly developed flat package with built-in TE cooler, thermistor, and photodiode.

Structure

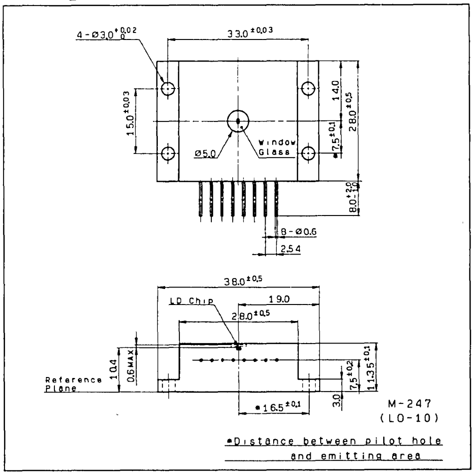
GaAlAs double-hetero laser diode

Applications

- Solid state laser excitation
- Medical use

Package Outline

Unit: mm

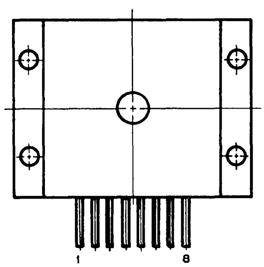


Absolute Maximum Ratings (T_{th}=25°C)

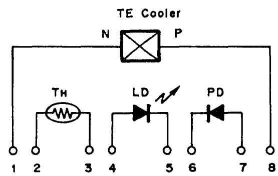
• Radiant power output	Po		100	mW
• Reverse voltage	VR	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +85	°C
• Operating current of TE cooler	IT		2.5	A

Pin Configuration (Top View)

No.	Function
1	TE cooler, negative
2	Thermistor lead 1
3	Thermistor lead 2
4	Laser diode anode
5	Laser diode cathode
6	Photodiode cathode
7	Photodiode anode
8	TE cooler, positive



Equivalent Circuit



E81119A13-HP

Optical and Electrical Characteristics

$T_{th}=25°C$

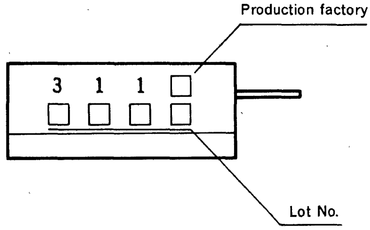
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		I_{th}			150	200	mA
Operating current		I_{OP}	$P_O=90mW$		250	400	mA
Operating voltage		V_{OP}	$P_O=90mW$		1.9	3.0	V
Wavelength*		λ_p	$P_O=90mW$	770		840	nm
Monitor current		I_{mon}	$P_O=90mW$ $V_R=10V$		0.15		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta\perp$	$P_O=90mW$		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	ΔX, ΔY	$P_O=90mW$			±100	μm
	Angle	$\Delta\phi\perp$				±3	degree
Slope efficiency		η_D	$P_O=90mW$	0.65	0.9		mW/mA
Thermistor resistance		R_{th}	$T_{th}=25°C$		10		kΩ

Note) Tth : Thermistor temperature

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD301XT-1	785±15
SLD301XT-2	810±10
SLD301XT-3	830±10
SLD301XT-21	798± 3
-24	807± 3
-25	810± 3

Marking

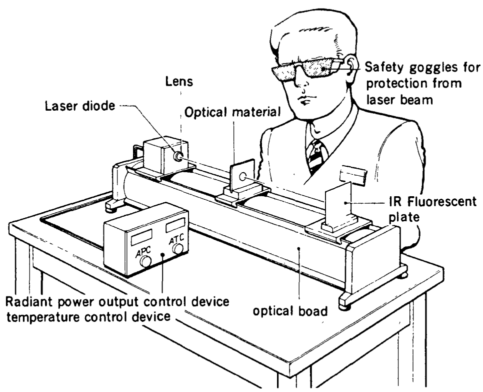


Categories are not specified by marking.

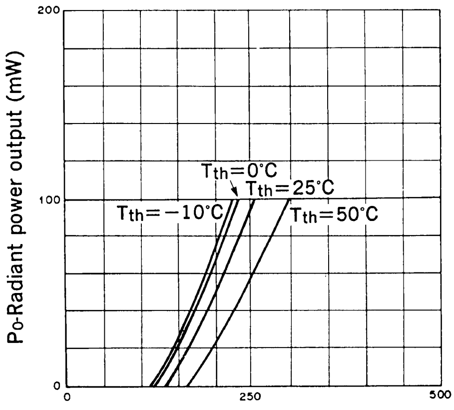
Handling Precautions

Eye protection against laser beams

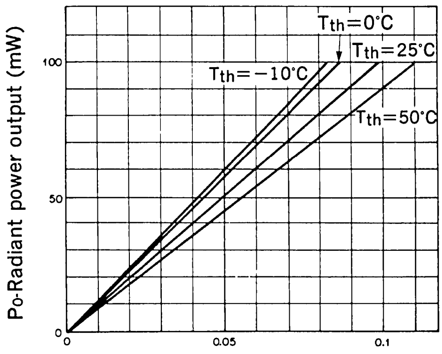
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.



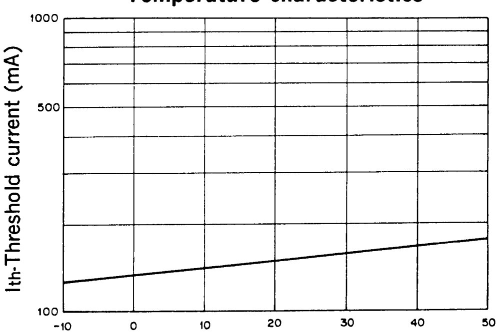
Radiant power output vs. Forward current characteristics



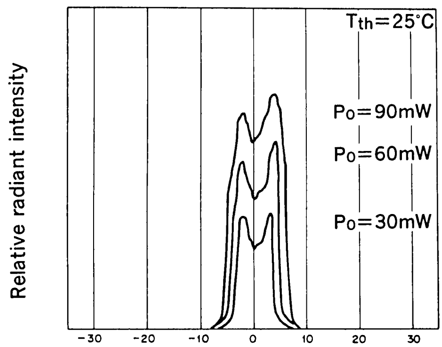
Radiant power output vs. Monitor current characteristics



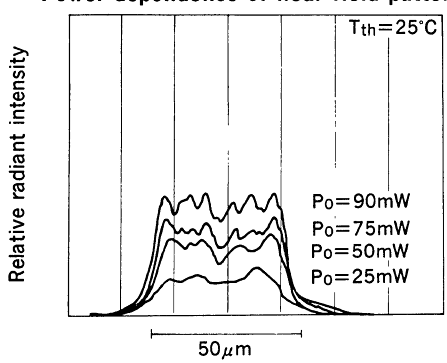
Threshold current vs. Temperature characteristics



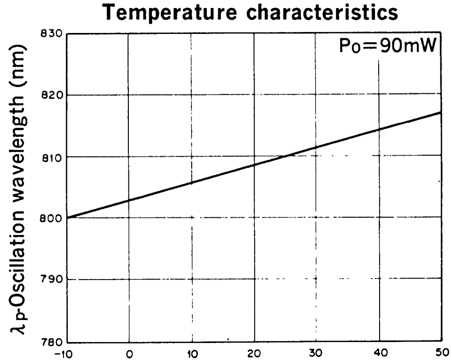
Power dependence of far field pattern (parallel to junction)



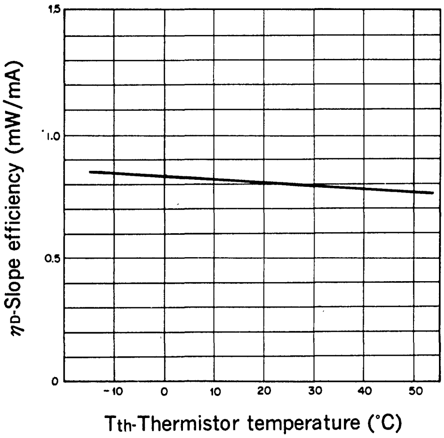
Power dependence of near field pattern



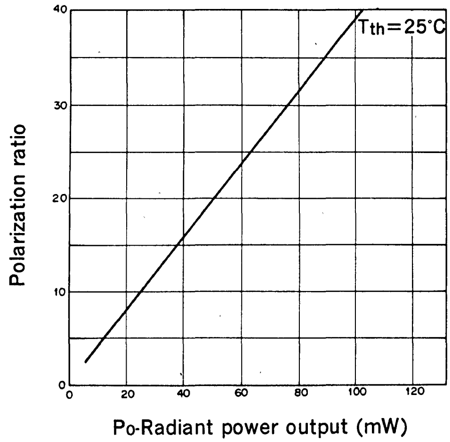
Oscillation wavelength vs. Temperature characteristics



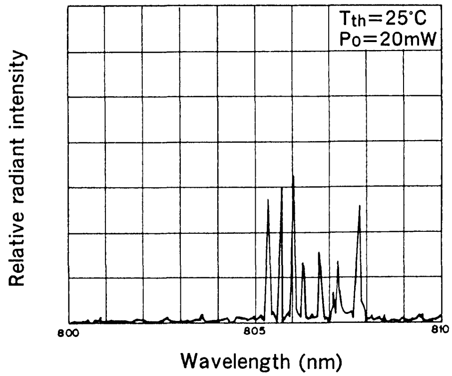
Slope efficiency vs. Temperature characteristics

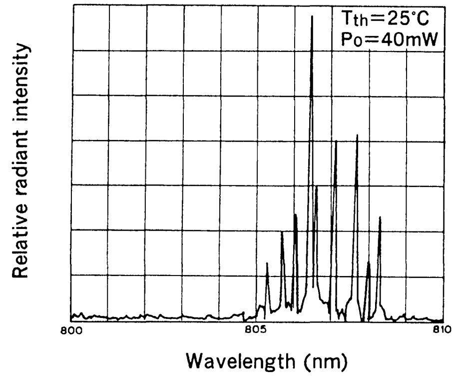


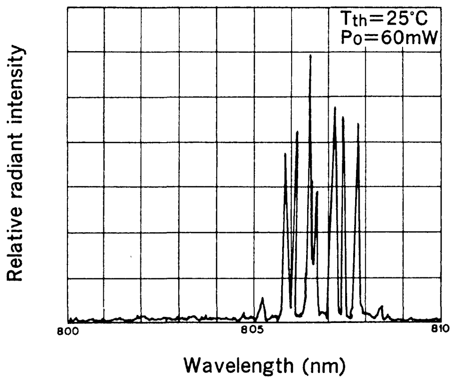
Power dependence of polarization ratio

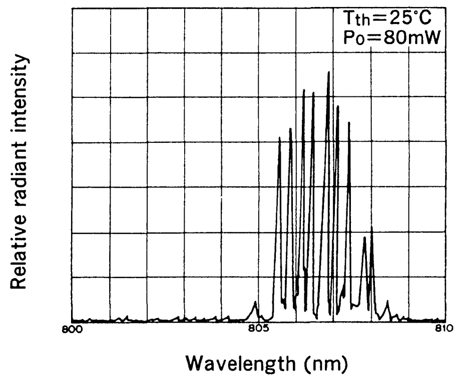


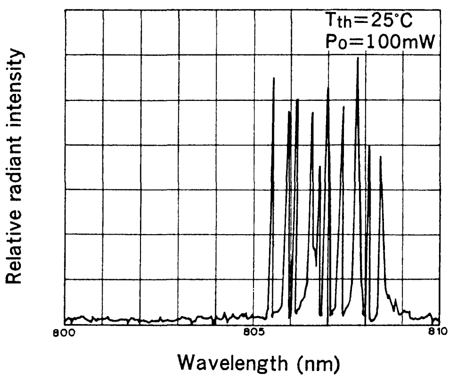
Power dependence of wavelength



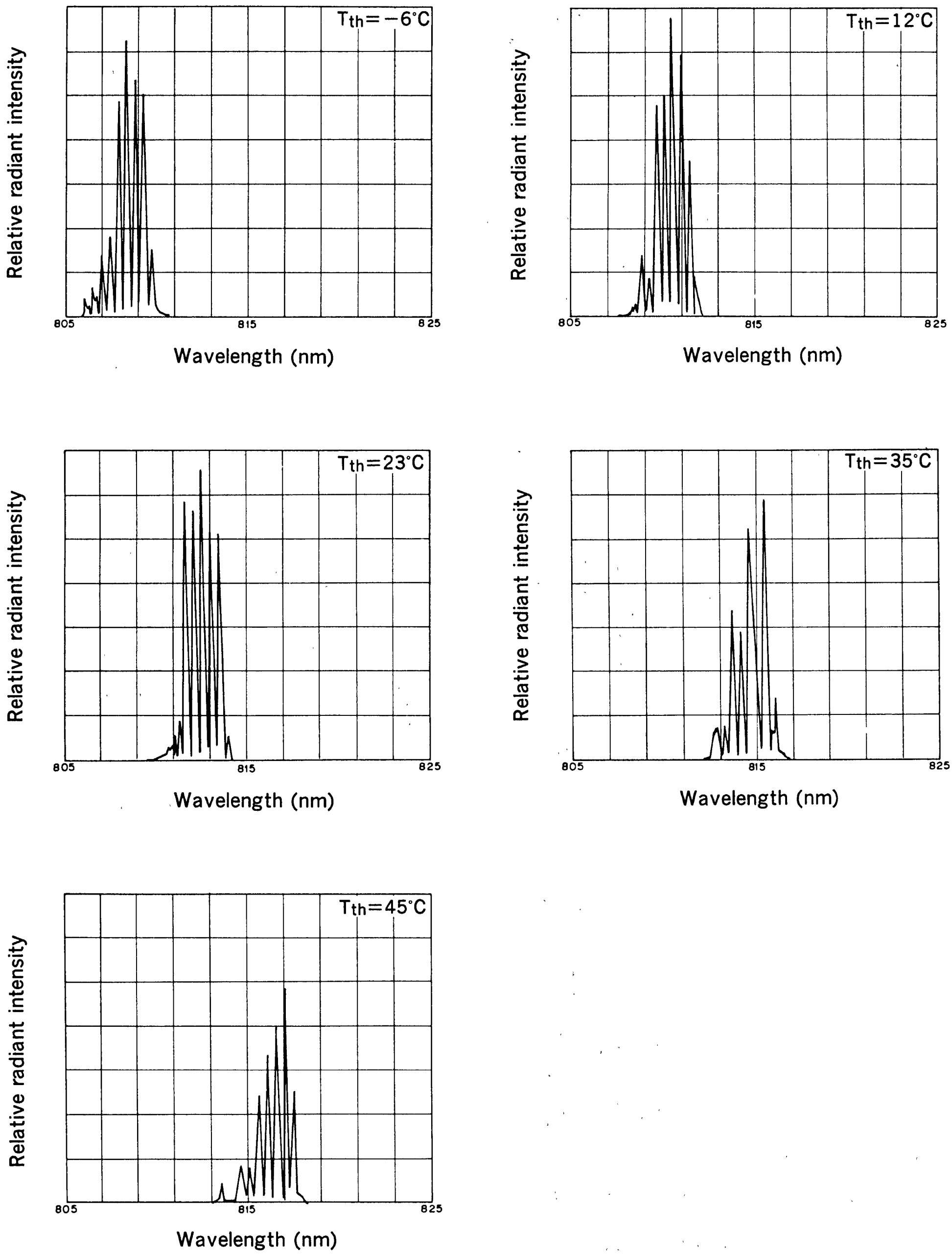




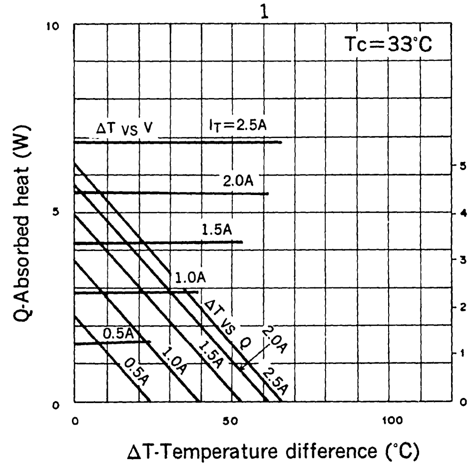


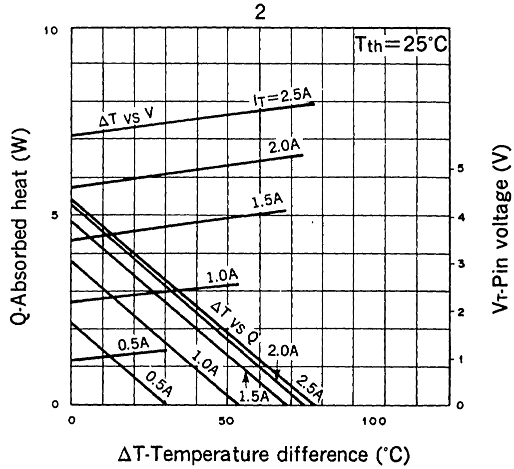


Temperature dependence of wavelength (Po=90mW)



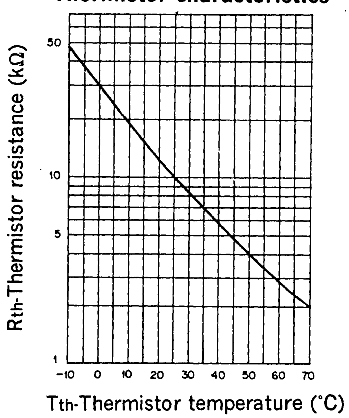
TE cooler characteristics





ΔT : Tc-Tth
Tth : Thermistor temperature
Tc : Case temperature

Thermistor characteristics



SONY® **SLD301B**

Block-type 100mW High Power Laser Diode

Description

SLD301B is a high power laser diode mounted on a 3×3×5mm Copper block.
It is ideal for applications which require a minimal distance between the laser facet and external optical parts.

Features

- Compact size 3×3×5mm block
- High power output Po = 100mW
- Hole for thermistor

Application

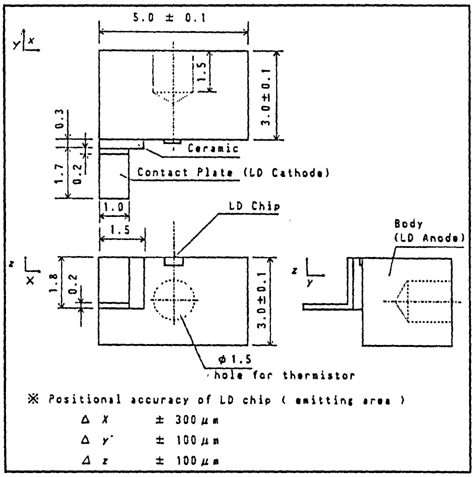
- Solid state laser excitation
- Medical use

Structure

GaAlAs double hetero-type laser diode

Package Outline

Unit : mm

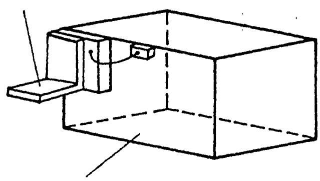


Absolute Maximum Ratings (Tc = 25°C)

• Radiant power output	Po		100	mW
• Recommended radiant power output	Po		90	mW
• Reverse voltage	V_R	LD	2	V
• Operating temperature	Topr		−10 to +50	℃
• Storage temperature	Tstg		−40 to +85	℃

Pin Configuration

No.	Function
1	LD cathode
2	LD anode



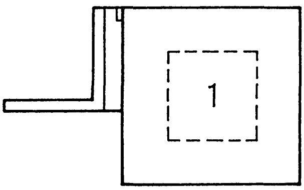
E89103 – ST

Electrical Characteristics (Tc = 25℃)

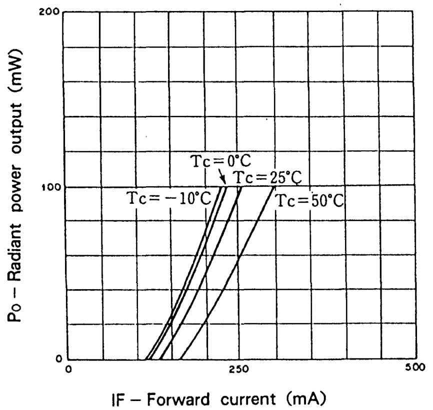
Item		Symbol	Conditions	Min.	Typ.	Max.	Unit
Threshold current		Ith			150	200	mA
Operating current		Iop	Po = 90mW		300	400	mA
Operating voltage		Vop	Po = 90mW		1.9	3.0	V
Wavelength		λ p	Po = 90mW	770		840	nm
Radiation angle (FWHM*)	Perpendicular to junction	$\theta_{\perp}$	Po = 90mW		28	40	Degree
	Parallel to junction	$\theta_{//}$			12	17	
Positional accuracy	Position	Δ X	Po = 90mW			± 300	μm
		Δ Y, Δ Z				± 100	
	Angle	$\Delta \phi_{\perp}$				± 3	Degree
Slope efficiency		η_D	Po = 90mW	0.5	0.7		mW/mA

*FWHM : Full Width at Half Maximum

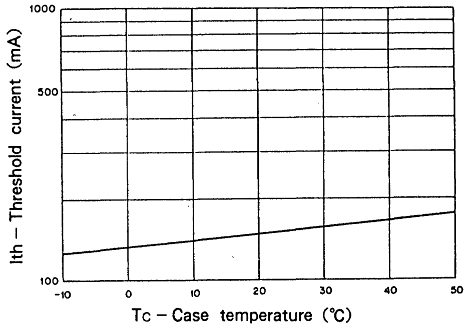
Mark



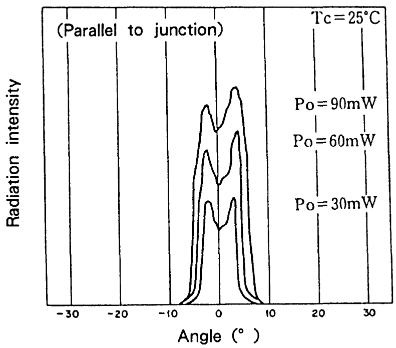
Radiant power output vs. Forward current



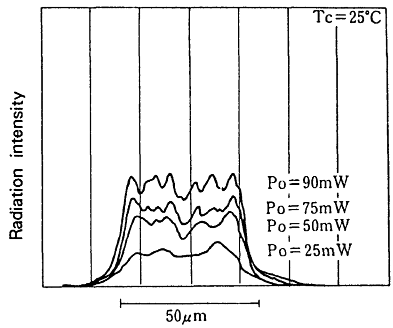
Threshold current vs. Temperature characteristics



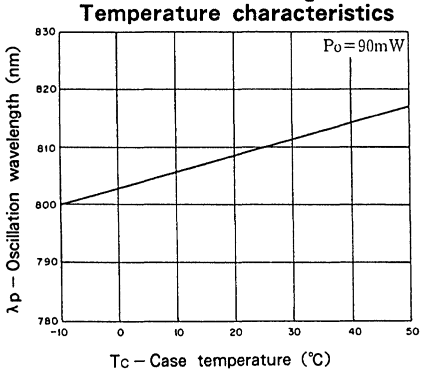
Power dependence of far field pattern



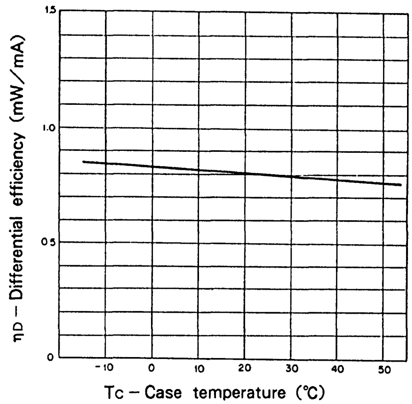
Power dependence of near field pattern



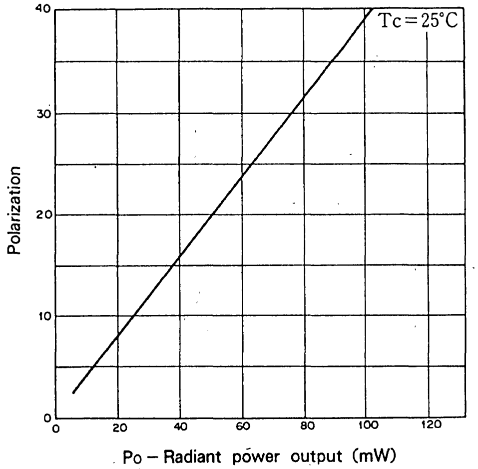
Oscillation wavelength vs. Temperature characteristics



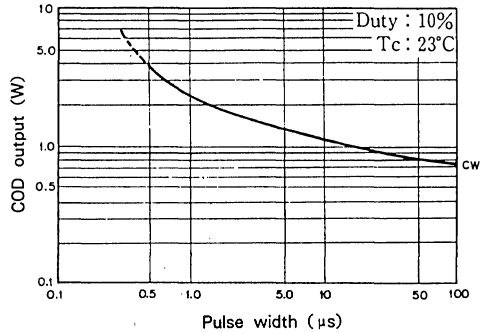
Slope efficiency vs. Temperature characteristics



Power dependence of polarization ratio

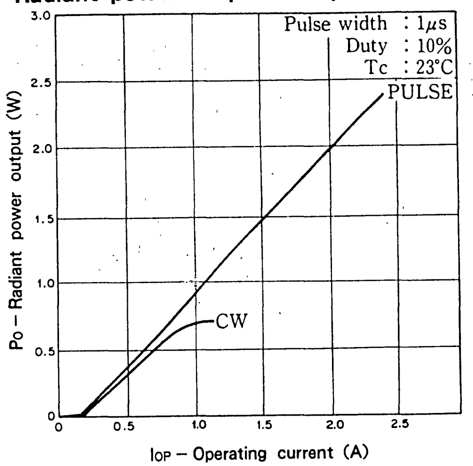


Pulse width dependence of COD* power

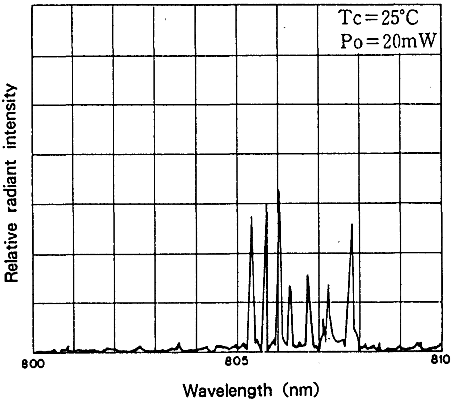


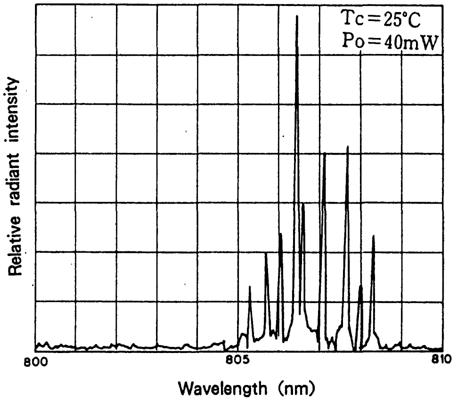
*COD (Catastrophic Optical Damage)

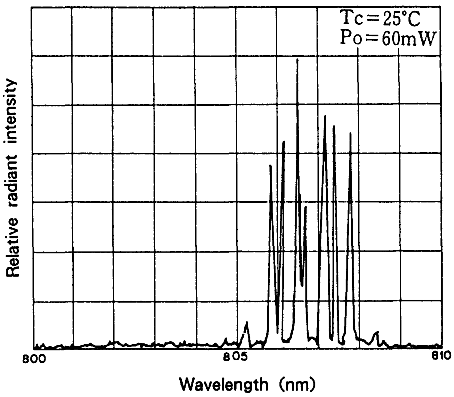
Radiant power output vs. Operating current

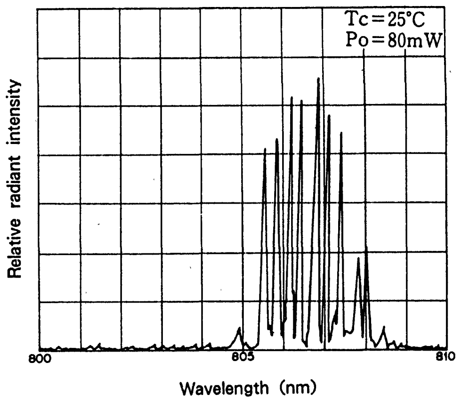


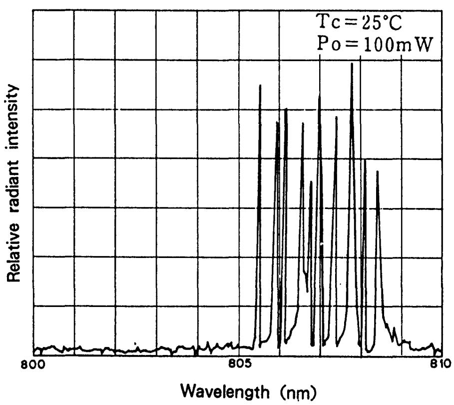
Power Dependence of Wavelength



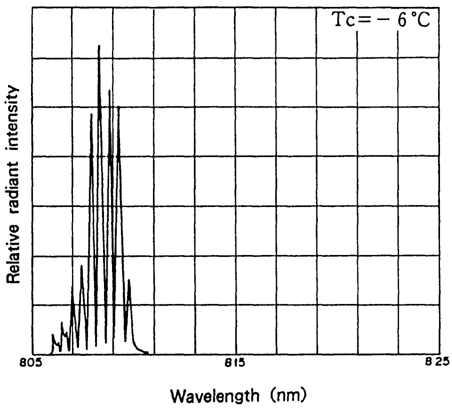


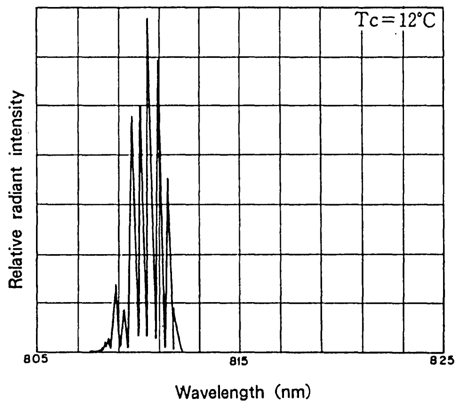


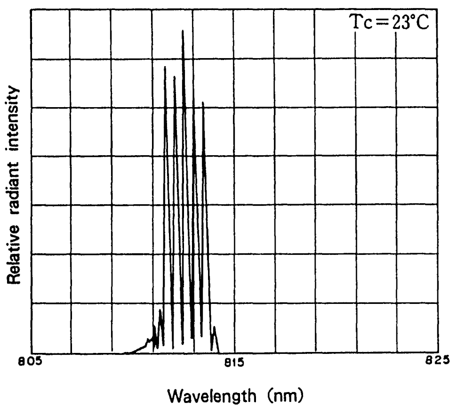


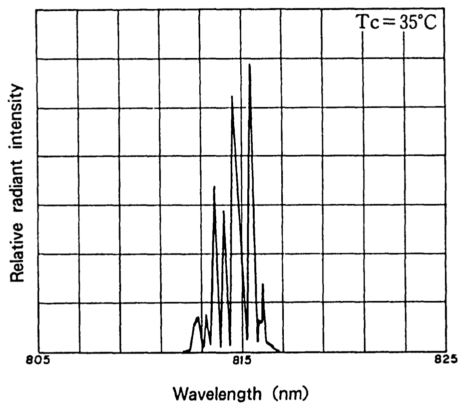


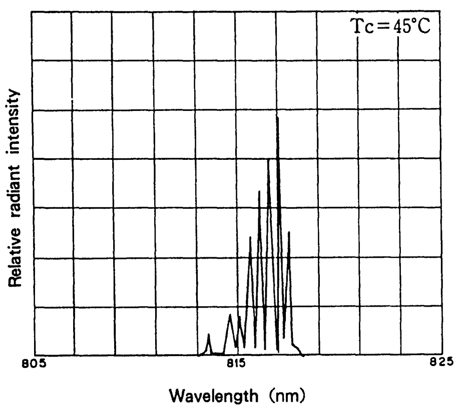
Temperature Dependence of Wavelength ($P_o = 90mW$)











SONY® **SLD302V**

200mW High Power Laser Diode

Description

SLD302V are gain-guided, high-power laser diodes fabricated by MOCVD.
MOCVD: Metal Organic Chemical Vapor Deposition

Features

- High power
  Recommended power output P_O=180mW
- Small operating current

Applications

- Solid state laser excitation
- Medical use

Structure

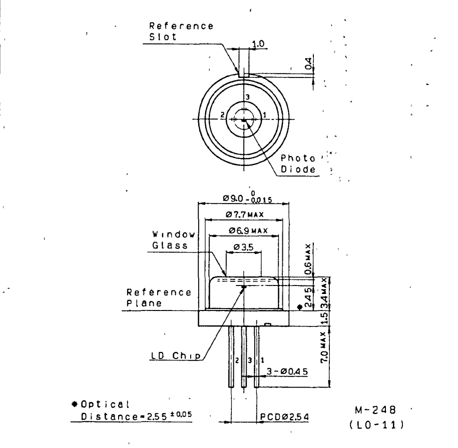
GaAlAs double-hetero laser diode

Absolute Maximum Ratings (Tc=25°C)

• Radiant power output	P_O		200	mW
• Reverse voltage	V_R	LD	2	V
		PD	15	V
• Operating temperature	T_{opr}		−10 to +50	°C
• Storage temperature	T_{stg}		−40 to +85	°C

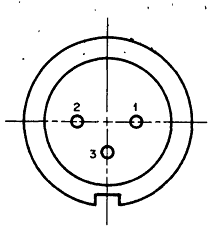
Package Outline

Unit: mm



Pin Configuration (Bottom View)

No.	Function
1	Laser diode cathode
2	Photodiode anode
3	Common



E70776D13-HP

Optical and Electrical Characteristics

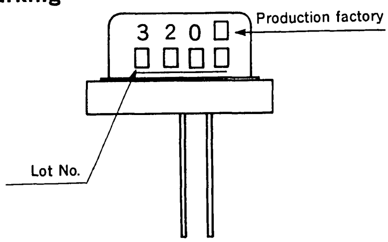
Tc=25°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			150	200	mA
Operating current		I_{OP}	Po=180mW		350	500	mA
Operating voltage		V_{OP}	Po=180mW		1.9	3.0	V
Wavelength*		λ_p	Po=180mW	770		840	nm
Monitor current		Imon	Po=180mW VR=10V		0.3		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta_\perp$	Po=180mW		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=180mW			±50	μm
	Angle	$\Delta\phi_\perp$				±3	degree
Slope efficiency		η_D	Po=180mW	0.65	0.9		mW/mA

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD302V-1	785±15
SLD302V-2	810±10
SLD302V-3	830±10
SLD302V-21 -24 -25	798± 3 807± 3 810± 3

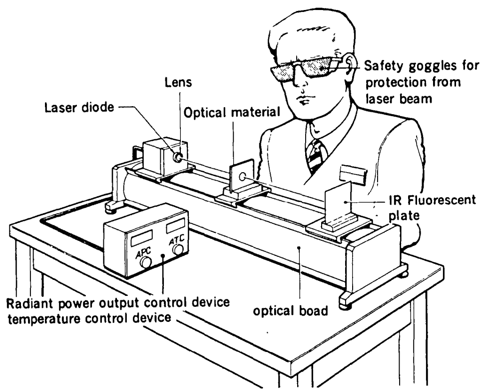
Marking



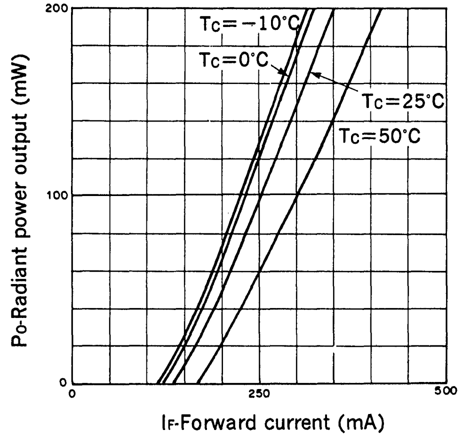
Precautions

Eye protection against laser beams

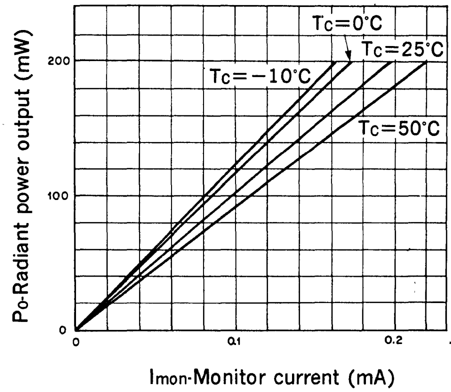
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.



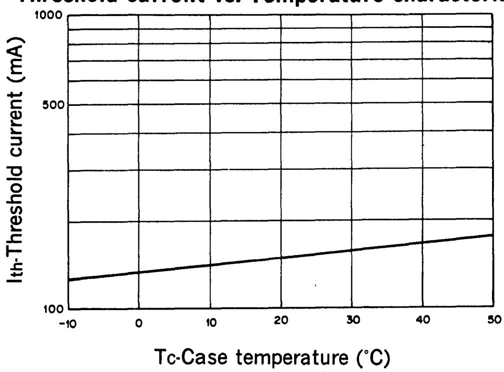
Radiant power output vs. Forward current characteristics



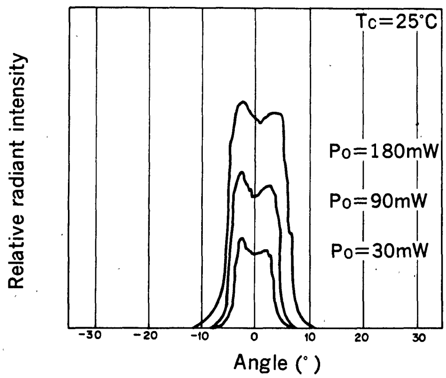
Radiant power output vs. Monitor current characteristics



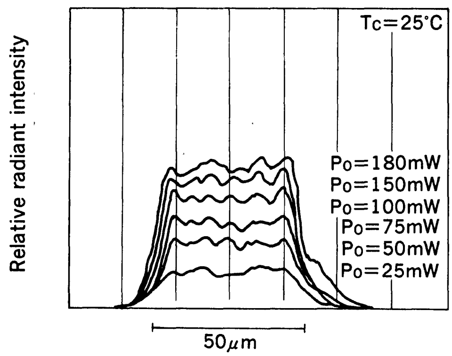
Threshold current vs. Temperature characteristics



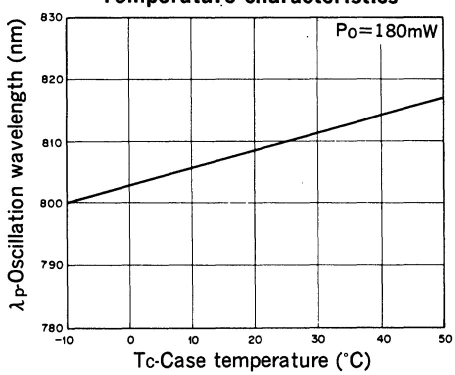
Power dependence of far field pattern (parallel to junction)



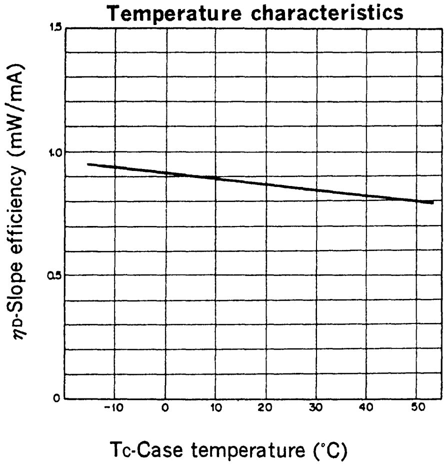
Power dependence of near field pattern



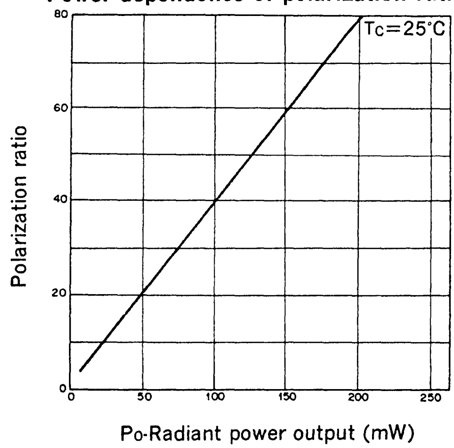
Oscillation wavelength vs. Temperature characteristics



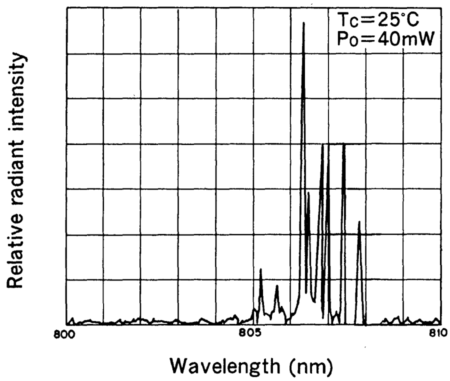
Slope efficiency vs. Temperature characteristics

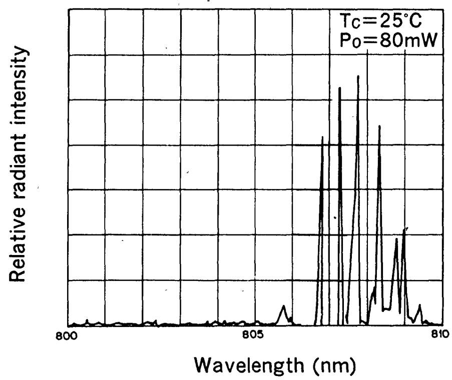


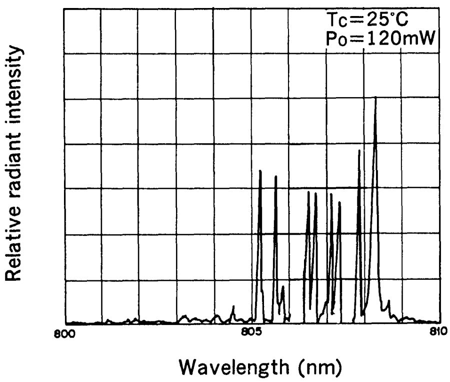
Power dependence of polarization ratio

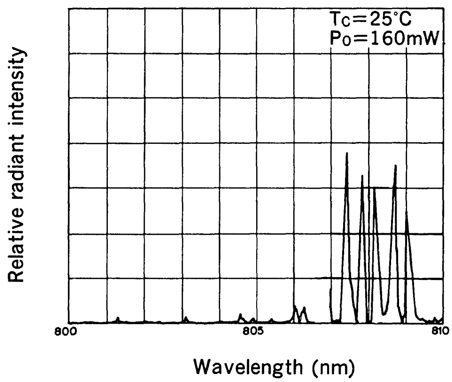


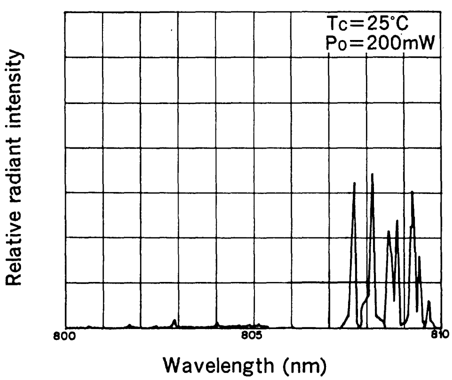
Power dependence of wavelength



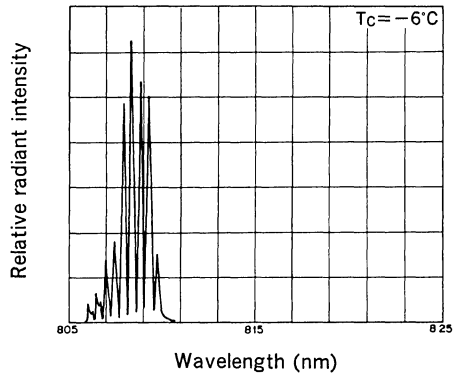


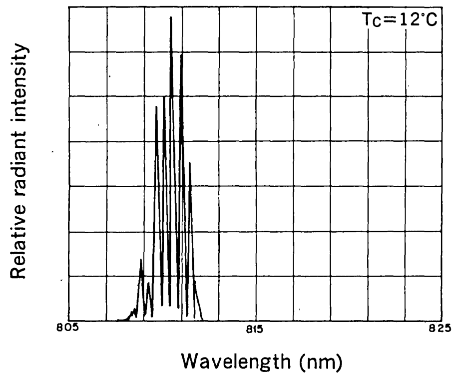


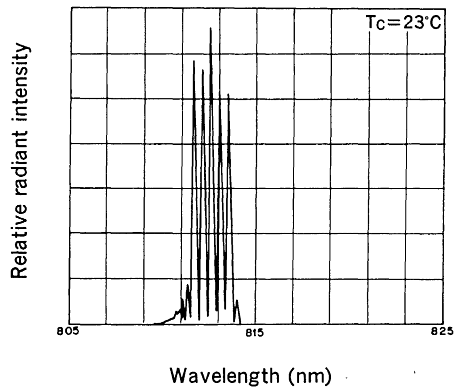


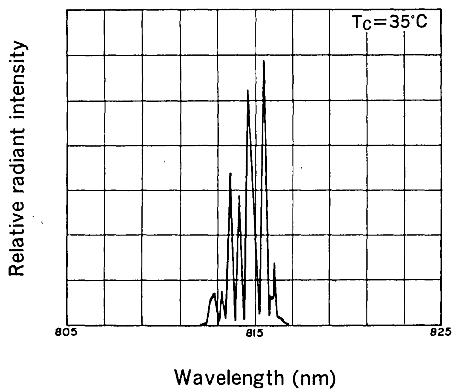


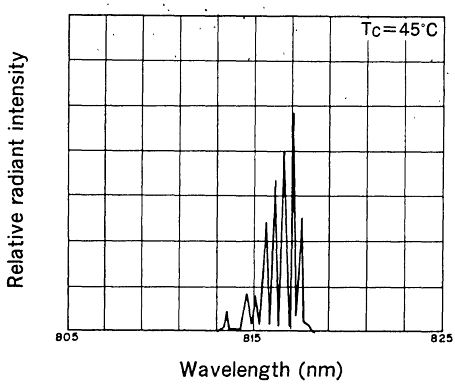
Temperature dependence of wavelength (Po=180mW)











SONY # SLD302WT

200mW High Power Laser Diode

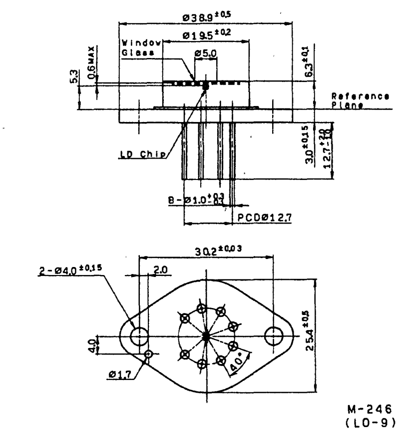
Description
SLD302WT is a gain-guided, high-power laser diode with a built-in TE cooler. Fine tuning of the wavelength is possible by controlling the laser chip temperature.

Features
- High power
  Recommended power output Po=180mW
- Small operating current
- TO-3 package with built-in TE cooler, thermistor and photodiode

Structure
GaAlAs double-hetero laser diode

Applications
- Solid state laser excitation
- Medical use

Package Outline
Unit: mm

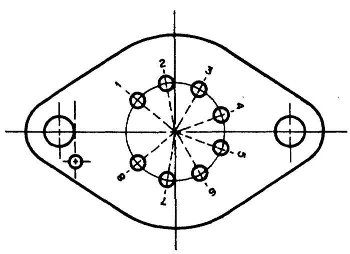


Absolute Maximum Ratings (Tth=25°C)

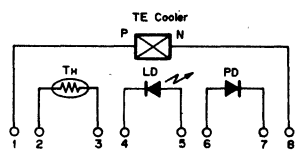
• Radiant power output	Po		200	mW
• Reverse voltage	VR	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +85	°C
• Operating current of TE cooler	IT		2.1	A

Pin Configuration (Bottom View)

No.	Function
1	TE cooler, positive
2	Thermistor lead 1
3	Thermistor lead 2
4	Laser diode cathode
5	Laser diode anode
6	Photodiode anode
7	Photodiode cathode
8	TE cooler, negative



Equivalent Circuit



E80405A13-HP

Optical and Electrical Characteristics

Tth=25°C

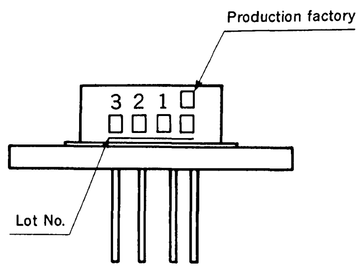
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			150	200	mA
Operating current		I_{OP}	Po=180mW		350	500	mA
Operating voltage		V_{OP}	Po=180mW		1.9	3.0	V
Wavelength*		λp	Po=180mW	770		840	nm
Monitor current		Imon	Po=180mW VR=10V		0.3		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta \perp$	Po=180mW		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=180mW			±100	μm
	Angle	$\Delta\phi \perp$				±3	degree
Slope efficiency		η_D	Po=180mW	0.65	0.9		mW/mA
Thermistor resistance		Rth	Tth=25°C		10		kΩ

Note) Tth: Thermistor temperature

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD302WT-1	785±15
SLD302WT-2	810±10
SLD302WT-3	830±10
SLD302WT-21	798± 3
-24	807± 3
-25	810± 3

Marking

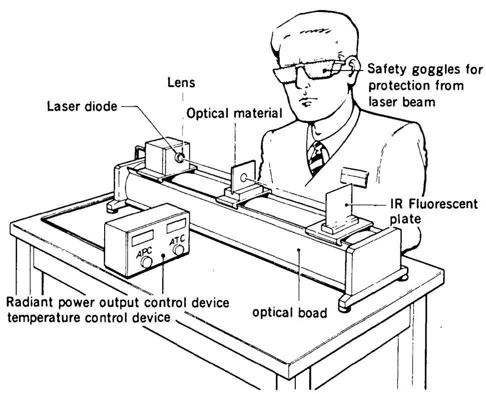


Categories are not specified by marking.

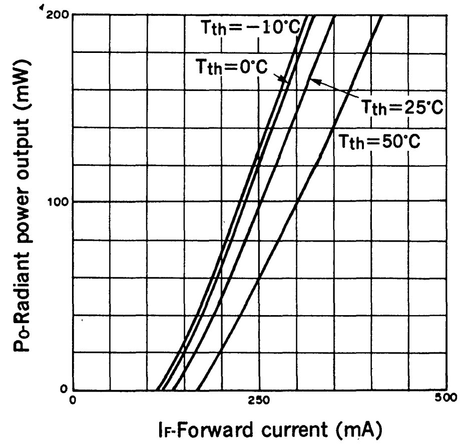
Precautions

Eye protection against laser beams

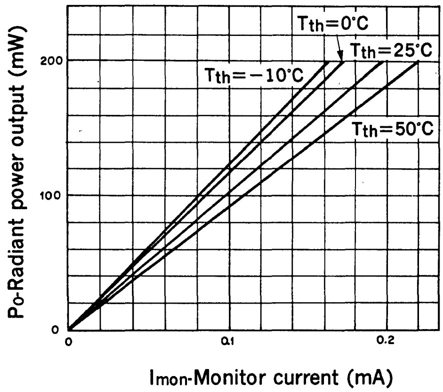
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.



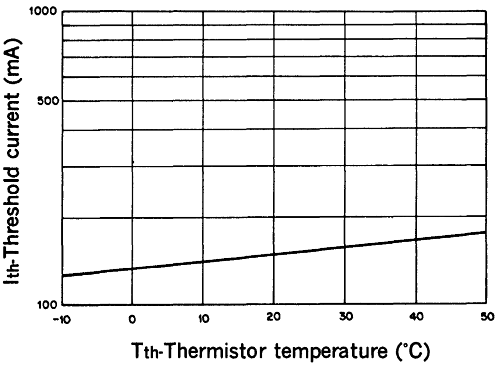
Radiant power output vs. Forward current characteristics



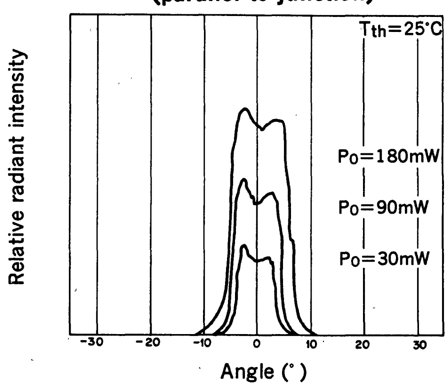
Radiant power output vs. Monitor current characteristics



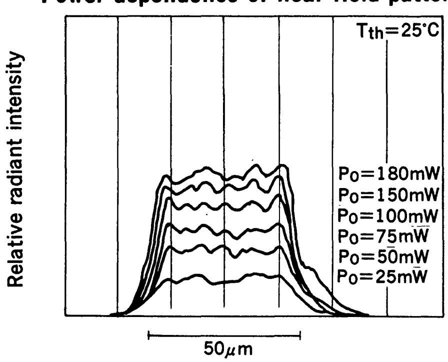
Threshold current vs. Temperature characteristics



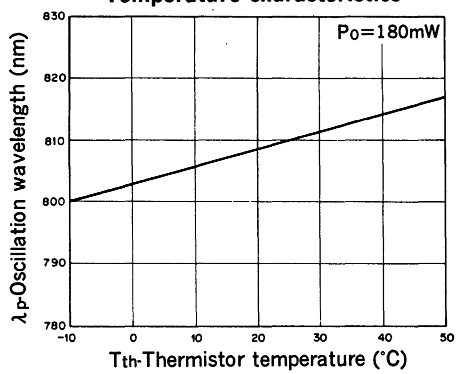
Power dependence of far field pattern (parallel to junction)

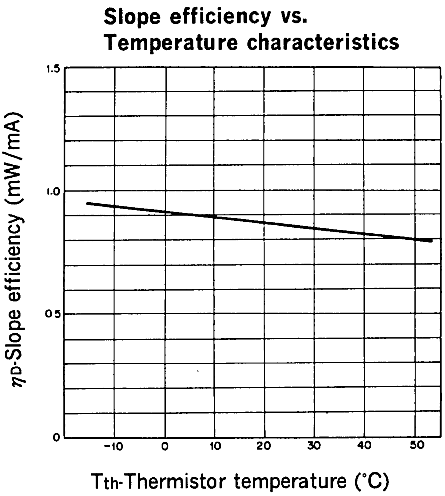


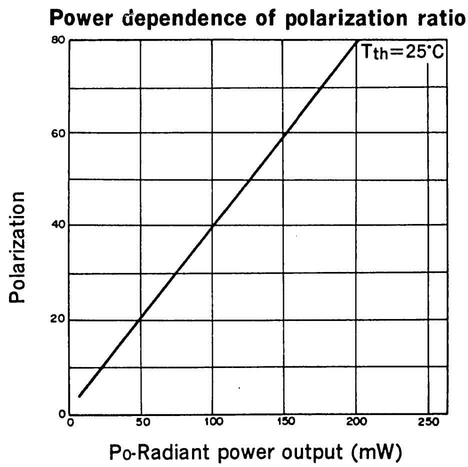
Power dependence of near field pattern



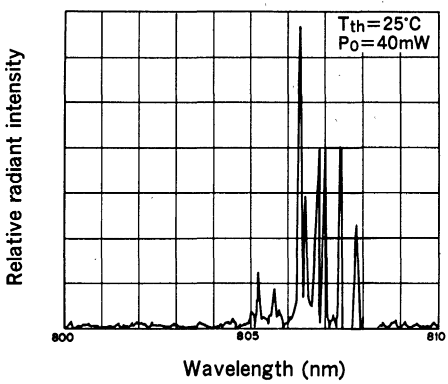
Oscillation wavelength vs. Temperature characteristics

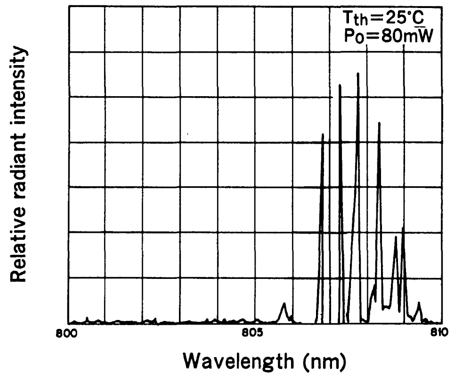


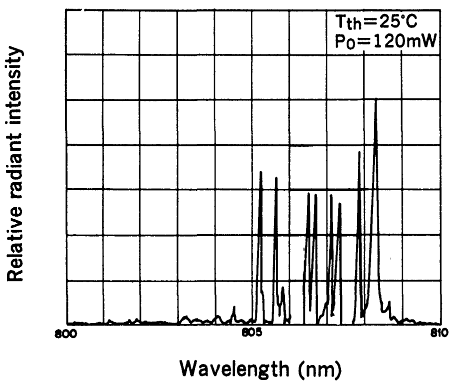

Slope efficiency vs.
Temperature characteristics
ηD-Slope efficiency (mW/mA)
1.5
1.0
0.5
0
-10
0
10
20
30
40
50
Tth-Thermistor temperature (°C)

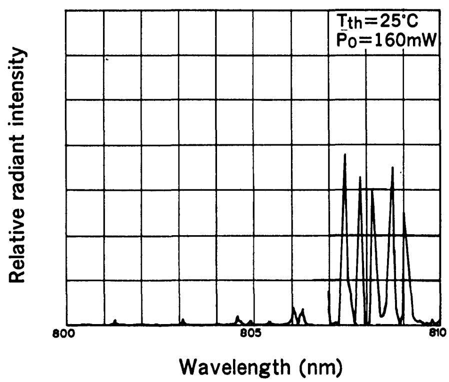

Power dependence of polarization ratio
Tth=25°C
Polarization
80
60
40
20
0
0
50
100
150
200
250
Po-Radiant power output (mW)

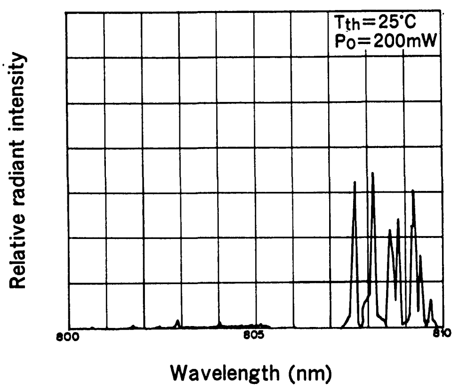
Power dependence of wavelength



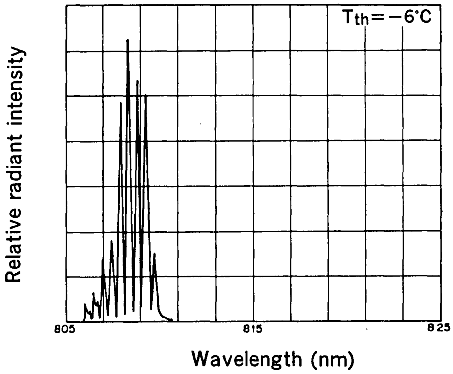


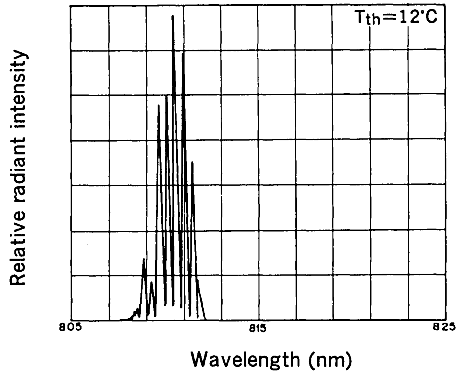


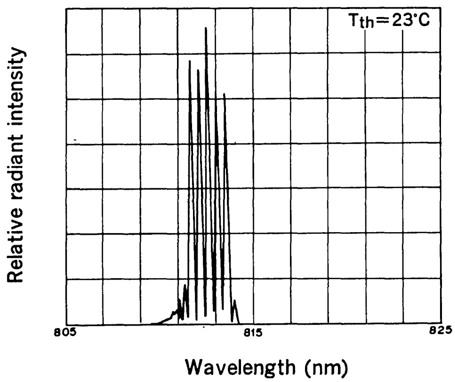


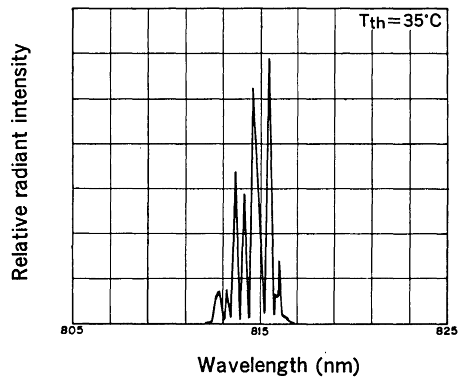


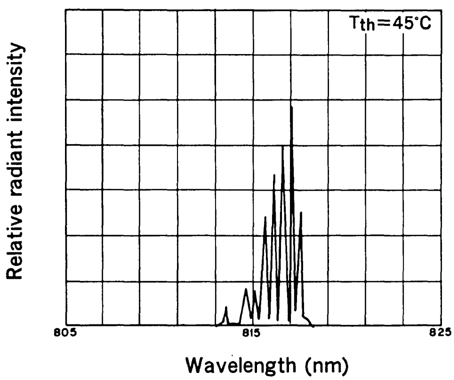
Temperature dependence of wavelength (Po=180mW)



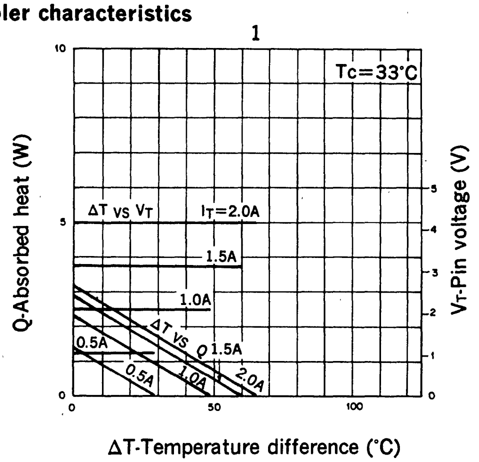


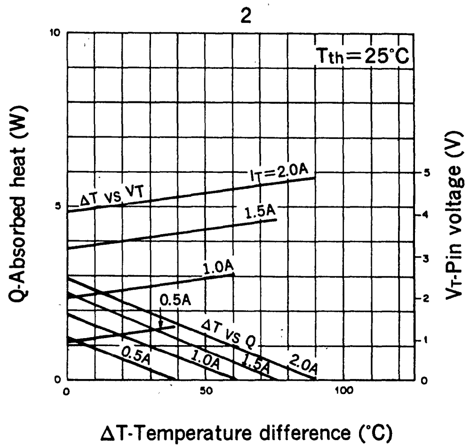






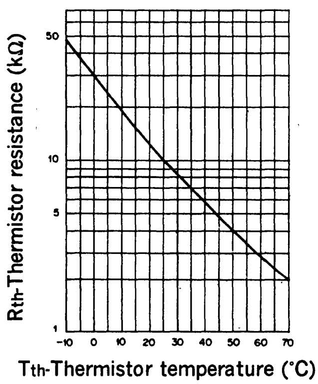
TE cooler characteristics





ΔT : Tc-Tth
Tth : Thermistor temperature
Tc : Case temperature

Thermistor characteristics



SONY® SLD302XT

200mW High Power Laser Diode

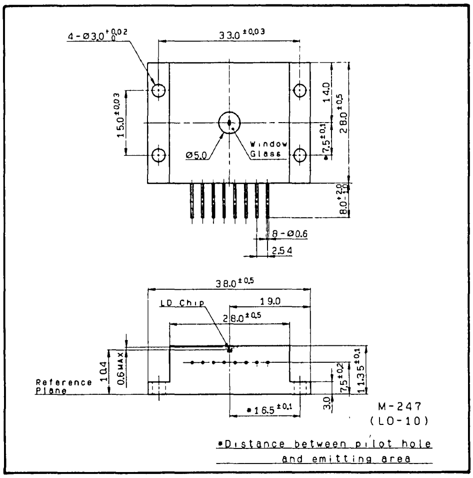
Description

SLD302XT is a gain-guided, high-power laser diode with a built-in TE cooler. A new flat, square package with a low thermal resistance and an in-line pin configuration is employed.

Fine tuning of the wavelength is possible by controlling the laser chip temperature.

Package Outline

Unit: mm



Features

- High power
  Recommended power output Po=180mW
- Small operating current
- Newly developed flat package with built-in TE cooler, thermistor and photodiode.

Structure

GaAlAs double-hetero laser diode

Applications

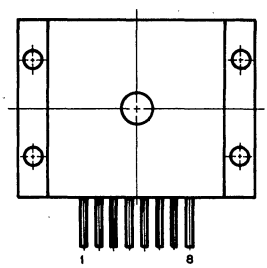
- Solid state laser excitation
- Medical use

Absolute Maximum Ratings (T_{th}=25°C)

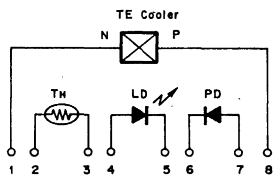
• Radiant power output	P_O		200	mW
• Reverse voltage	V_R	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +50	°C
• Storage temperature	Tstg		−40 to +85	°C
• Operating current of TE cooler	I_T		2.5	A

Pin Configuration (Top View)

No.	Function
1	TE cooler, negative
2	Thermistor lead 1
3	Thermistor lead 2
4	Laser diode anode
5	Laser diode cathode
6	Photodiode cathode
7	Photodiode anode
8	TE cooler, positive



Equivalent Circuit



E88Z28A13-HP

Optical and Electrical Characteristics

T_{th}=25°C

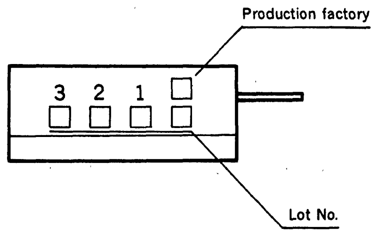
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			150	200	mA
Operating current		I_{OP}	P_O=180mW		350	500	mA
Operating voltage		V_{OP}	P_O=180mW		1.9	3.0	V
Wavelength*		λ_p	P_O=180mW	770		840	nm
Monitor current		Imon	P_O=180mW V_R=10V		0.3		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta\perp$	P_O=180mW		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	$\Delta X, \Delta Y$	P_O=180mW			±100	μm
	Angle	$\Delta\phi\perp$				±3	degree
Slope efficiency		η_D	P_O=180mW	0.65	0.9		mW/mA
Thermistor resistance		Rth	T_{th}=25°C		10		kΩ

Note) Tth : Thermistor temperature

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD302XT-1	785±15
SLD302XT-2	810±10
SLD302XT-3	830±10
SLD302XT-21	798± 3
-24	807± 3
-25	810± 3

Marking

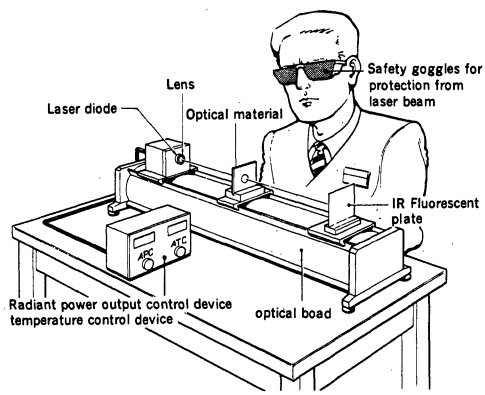


Categories are not specified by marking.

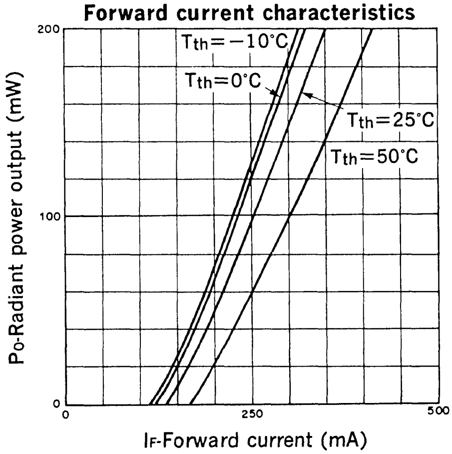
Handling Precautions

Eye protection against laser beams

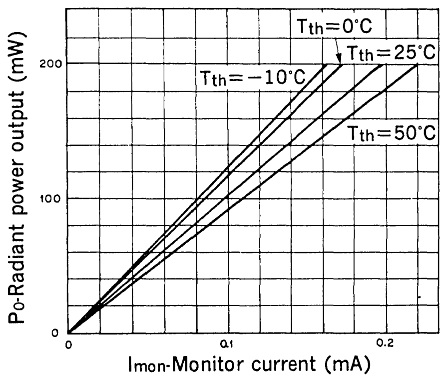
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.



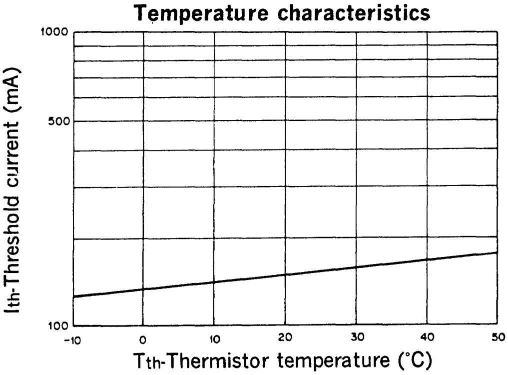
Radiant power output vs.
Forward current characteristics



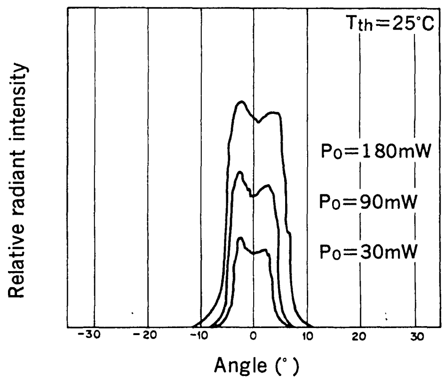
Radiant power output vs.
Monitor current characteristics



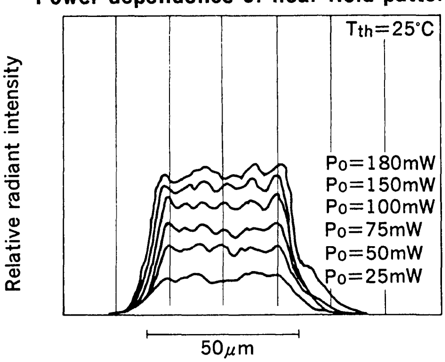
Threshold current vs.
Temperature characteristics



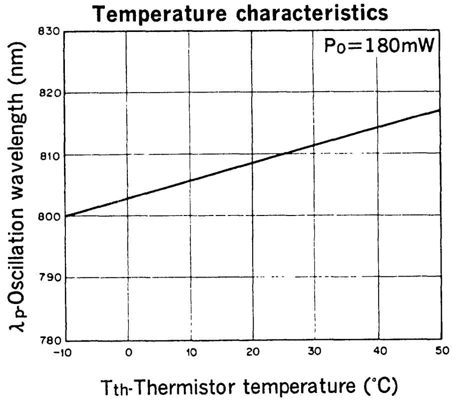
Power dependence of far field pattern
(parallel to junction)



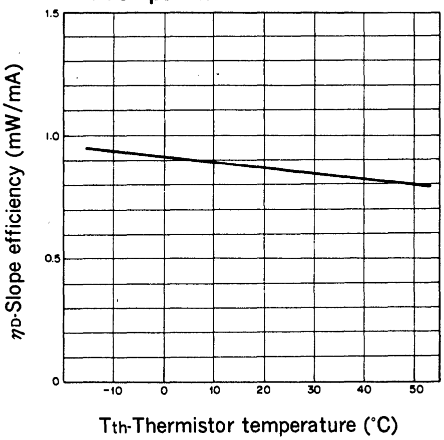
Power dependence of near field pattern



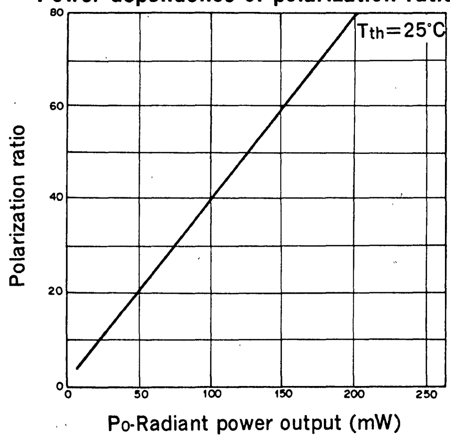
Oscillation wavelength vs.
Temperature characteristics



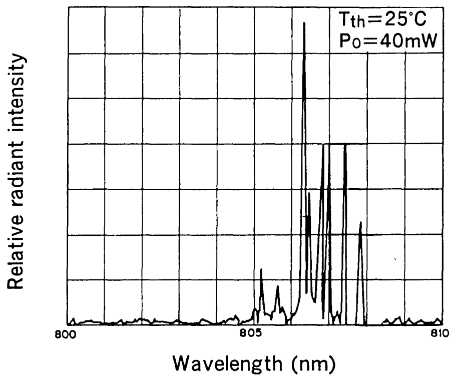
Slope efficiency vs. Temperature characteristics

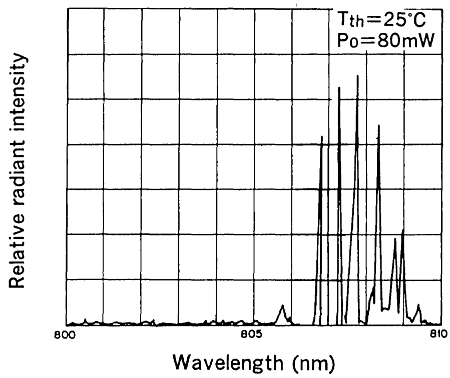


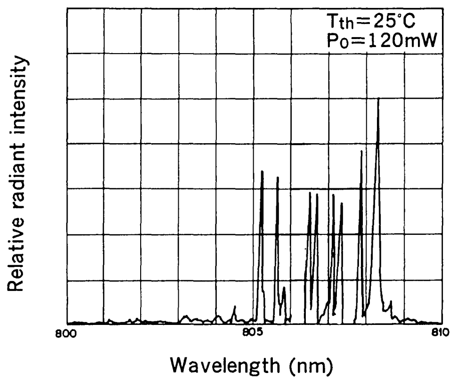
Power dependence of polarization ratio

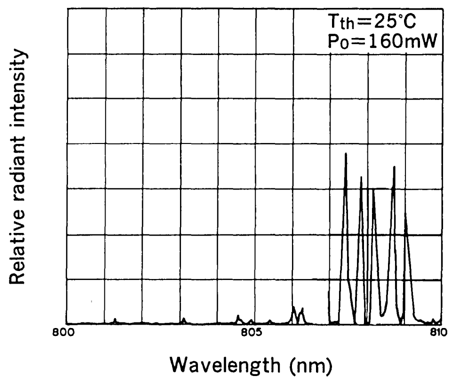


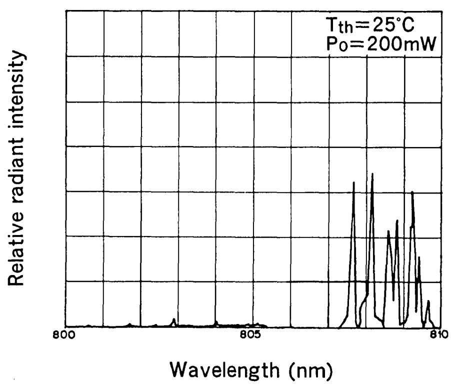
Power dependence of wavelength



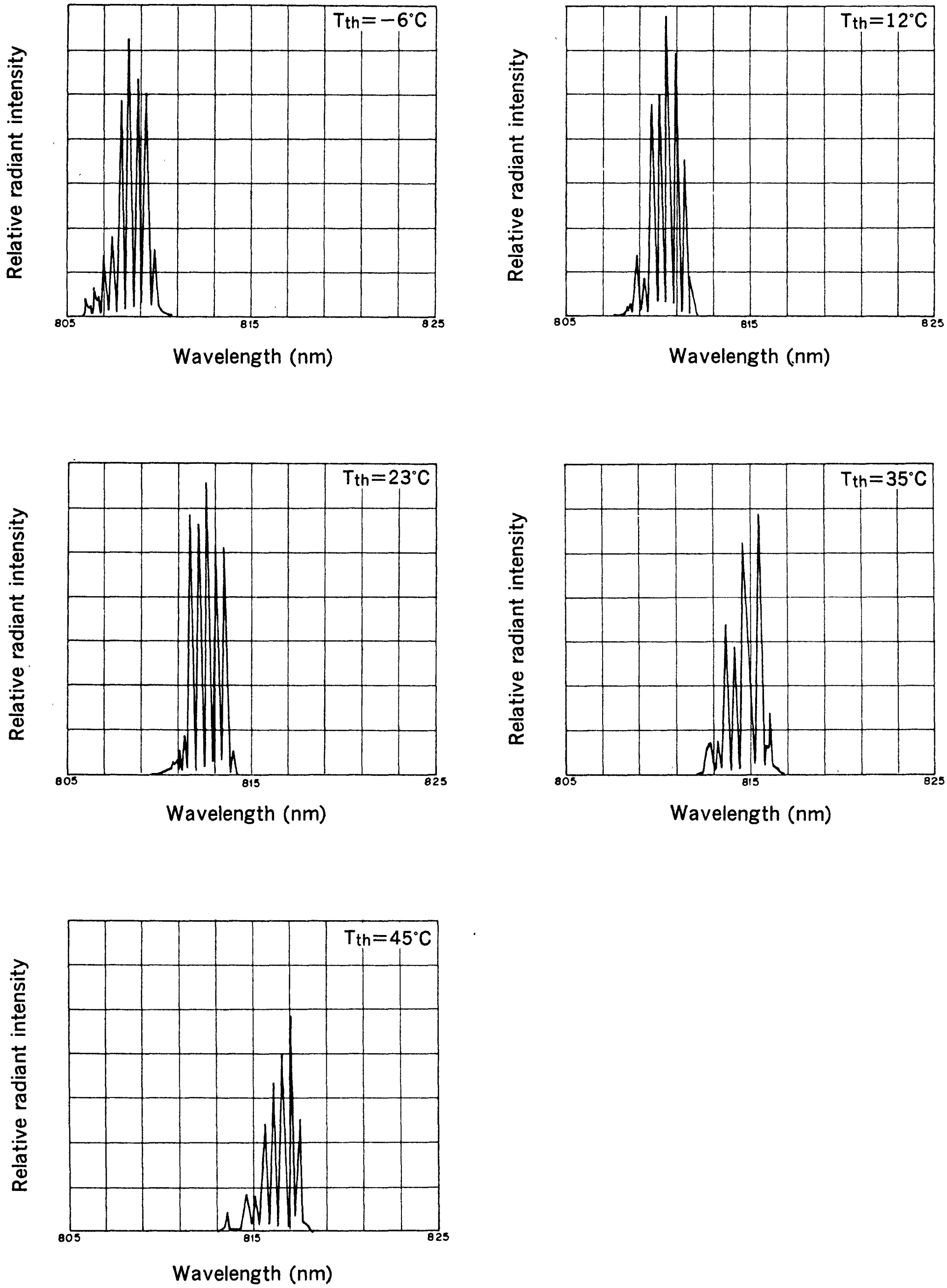






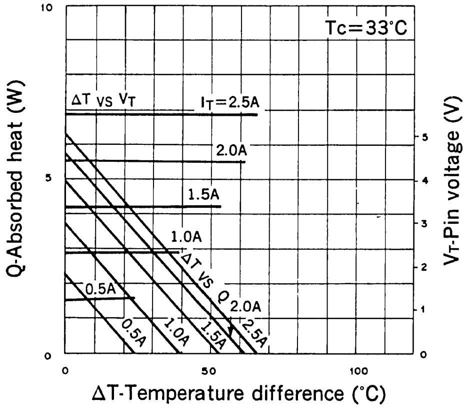


Temperature dependence of wavelength (P_o=180mW)

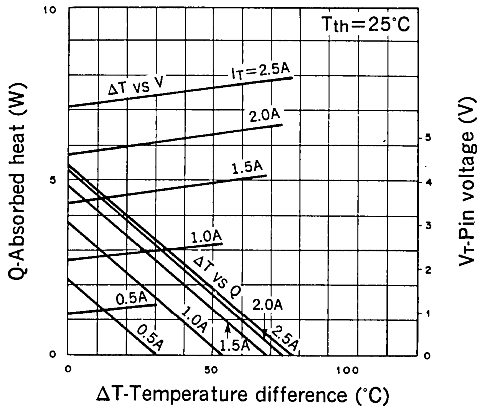


TE cooler characteristics

1

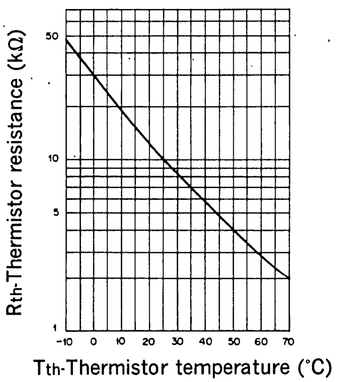


2



ΔT : Tc-Tth
Tth : Thermistor temperature
Tc : Case temperature

Thermistor characteristics



SONY®

SLD302B

Block-type 200mW High Power Laser Diode

Description
SLD302B is a high power laser diode mounted on a 3×3×5mm Copper block.
It is ideal for applications which require a minimal distance between the laser facet and external optical parts.

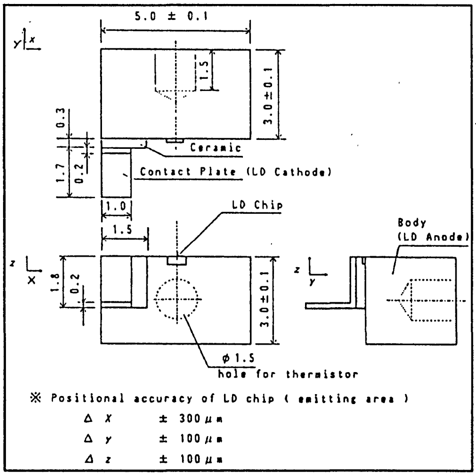
Features
- Compact size 3×3×5mm block
- High power output Po = 200mW
- Hole for thermistor

Application
- Solid state laser excitation
- Medical use

Structure
GaAlAs double hetero-type laser diode

Package Outline

Unit : mm

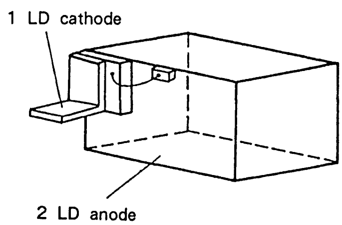


Absolute Maximum Ratings (Tc = 25°C)

• Radiant power output	Po		200	mW
• Recommended radiant power output	Po		180	mW
• Reverse voltage	VR	LD	2	V
• Operating temperature	Topr		−10 to +50	℃
• Storage temperature	Tstg		−40 to +85	℃

Pin Configuration

No.	Function
1	LD cathode
2	LD anode



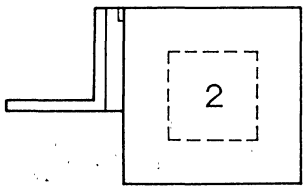
E89104 – ST

Electrical Characteristics (Tc = 25℃)

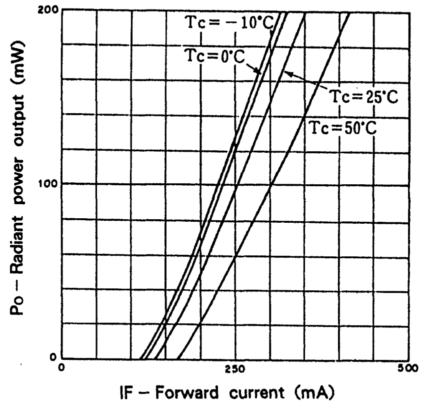
Item		Symbol	Conditions	Min.	Typ.	Max.	Unit
Threshold current		Ith			150	200	mA
Operating current		Iop	Po = 180mW		400	500	mA
Operating voltage		Vop	Po = 180mW		1.9	3.0	V
Wavelength		λ p	Po = 180mW	770		840	nm
Radiation angle (FWHM*)	Perpendicular to junction	θ⊥	Po = 180mW		28	40	Degree
	Parallel to junction	θ//			12	17	
Positional accuracy	Position	Δ X	Po = 180mW			± 300	µm
		Δ Y, Δ Z				± 100	
	Angle	Δ φ⊥				± 3	Degree
Slope efficiency		η D	Po = 180mW	0.5	0.8		mW/mA

*FWHM : Full Width at Half Maximum

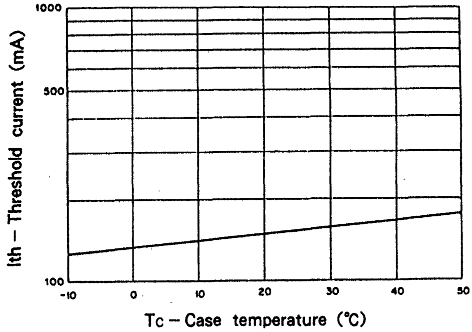
Mark



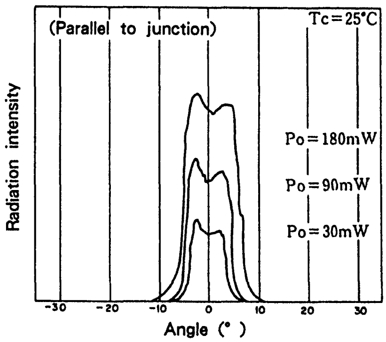
Radiant power output vs. Forward current



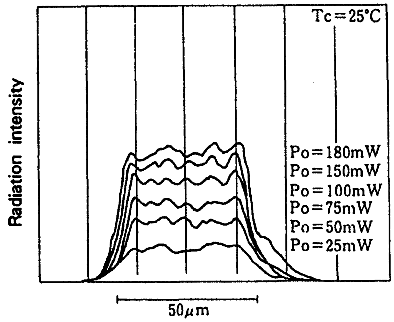
Threshold current vs. Temperature characteristics



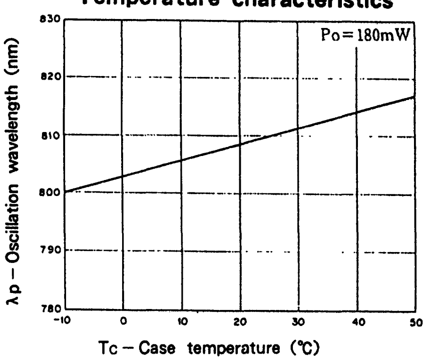
Power dependence of far field pattern



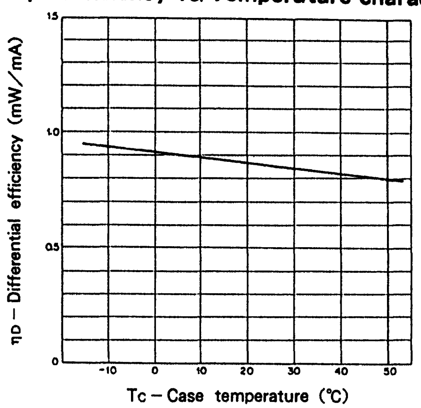
Power dependence of near field pattern



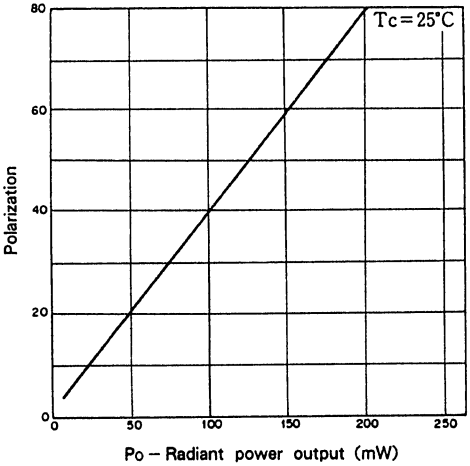
Oscillation wavelength vs. Temperature characteristics



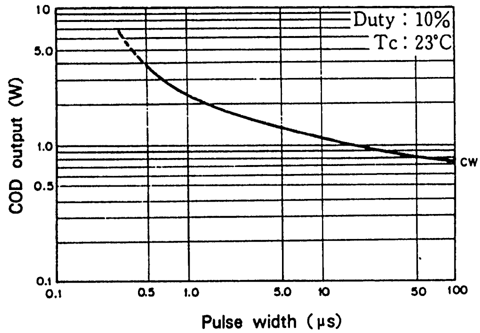
Slope efficiency vs. Temperature characteristics



Power dependence of polarization ratio

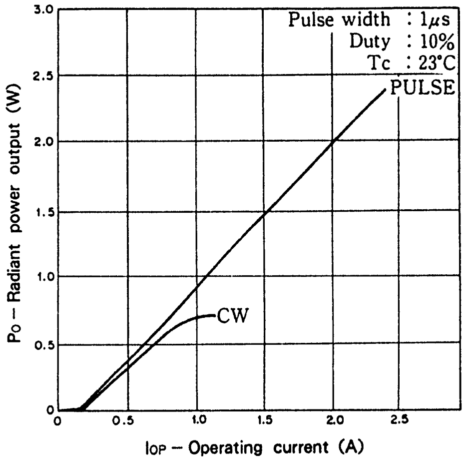


Pulse width dependence of COD* power

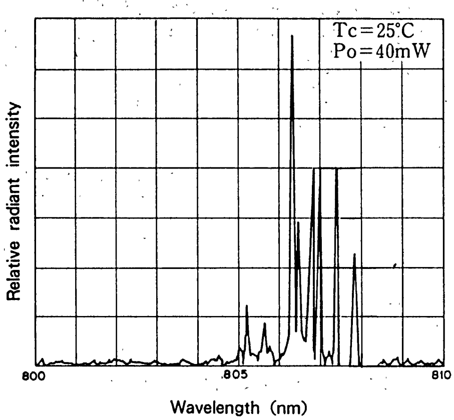


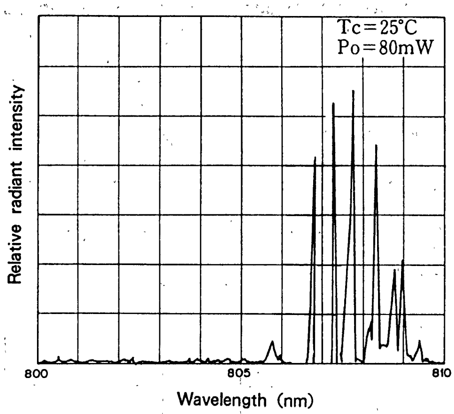
*COD (Catastrophic Optical Damage)

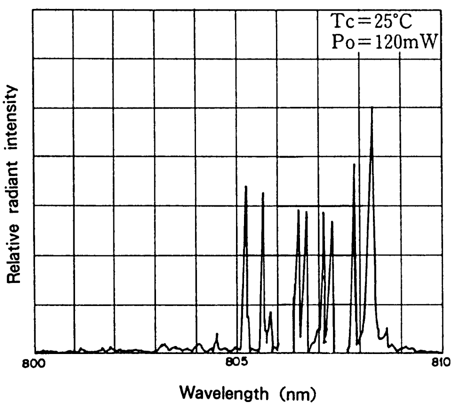
Radiant power output vs. Operating current

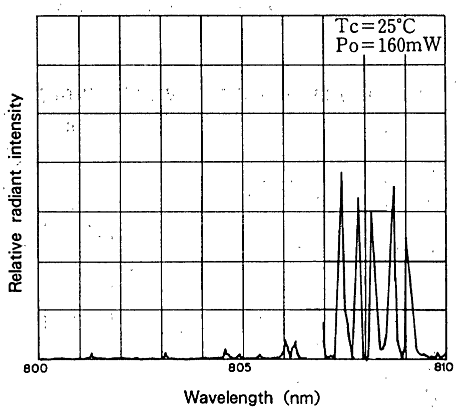


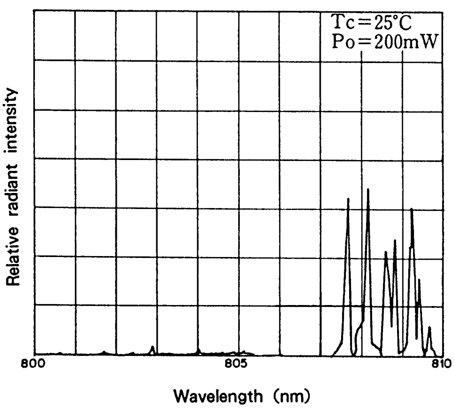
Power Dependence of Wavelength



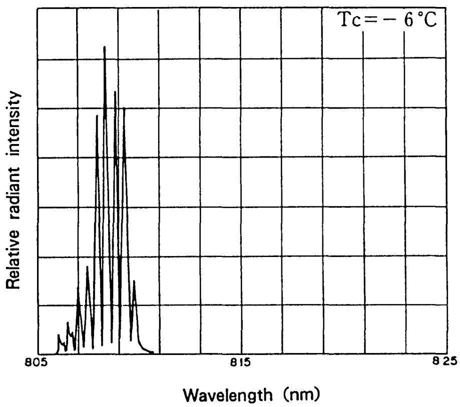


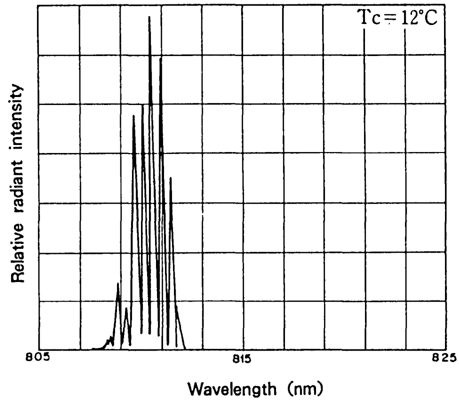


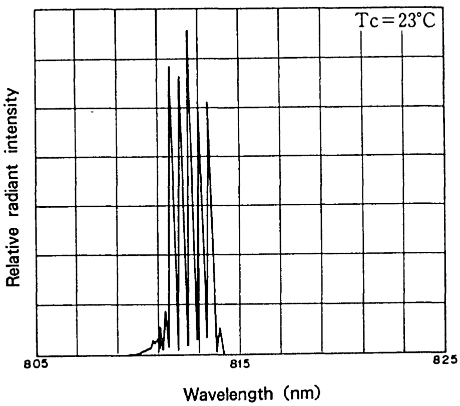


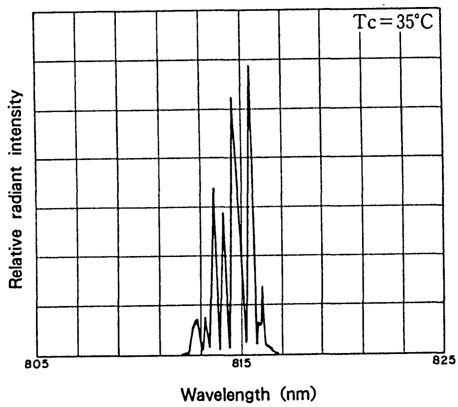


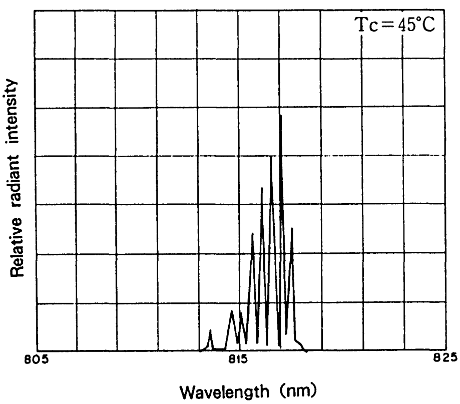
Temperature Dependence of Wavelength (Po = 90mW)











SONY® SLD303V

500mW High Power Laser Diode

Description
SLD303V are gain-guided, high-power laser diodes fabricated by MOCVD.
MOCVD: Metal Organic Chemical Vapor Deposition

Features
- High power
  Recommended power output Po=450mW
- Small operating current

Applications
- Solid state laser excitation
- Medical use

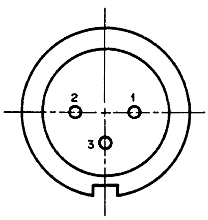
Structure
GaAlAs double-hetero laser diode

Absolute Maximum Ratings (Tc=25°C)

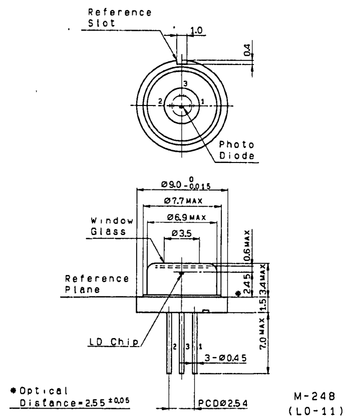
• Radiant power output	Po		500	mW
• Reverse voltage	V_R	LD	2	V
		PD	15	V
• Operating temperature	T_{opr}		−10 to +30	°C
• Storage temperature	T_{stg}		−40 to +85	°C

Pin Configuration (Bottom View)

No.	Function
1	Laser diode cathode
2	Photodiode anode
3	Common



Package Outline
Unit: mm



Optical and Electrical Characteristics

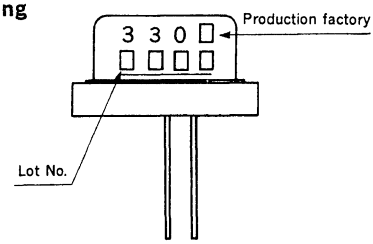
Tc=25°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			450	600	mA
Operating current		I_{OP}	Po=450mW		950	1500	mA
Operating voltage		V_{OP}	Po=450mW		1.9	3.0	V
Wavelength*		λp	Po=450mW	770		840	nm
Monitor current		Imon	Po=450mW V_R=10V		0.8		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta \perp$	Po=450mW		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=450mW			±50	μm
	Angle	$\Delta\phi \perp$				±3	degree
Slope efficiency		ηD	Po=450mW	0.65	0.9		mW/mA

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD303V-1	785±15
SLD303V-2	810±10
SLD303V-3	830±10
SLD303V-21	798± 3
-24	807± 3
-25	810± 3

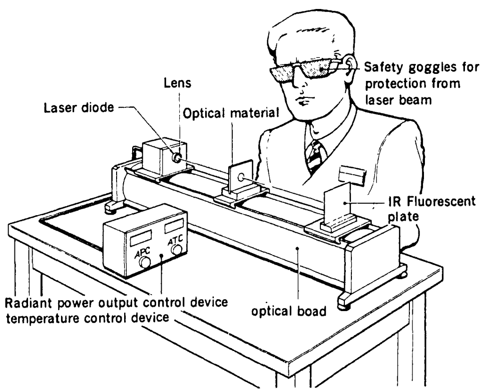
Marking



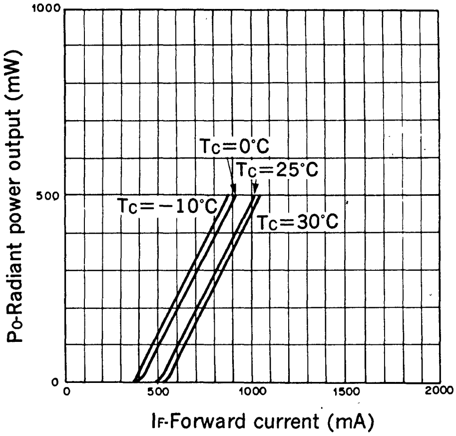
Precautions

Eye protection against laser beams

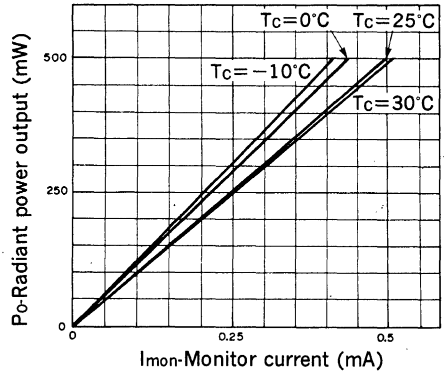
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.



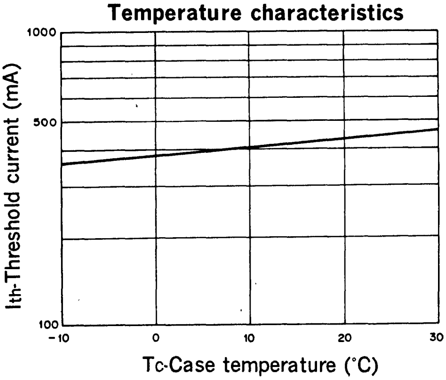
Radiant power output vs. Forward current characteristics



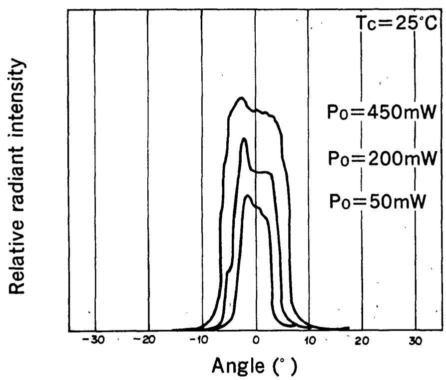
Radiant power output vs. Monitor current characteristics



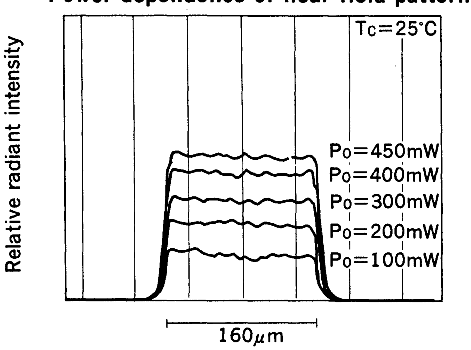
Threshold current vs. Temperature characteristics



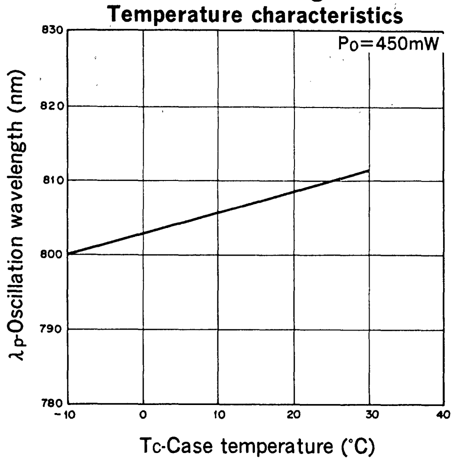
Power dependence of far field pattern (parallel to junction)



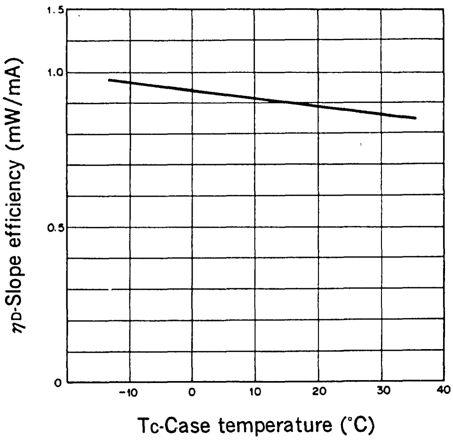
Power dependence of near field pattern



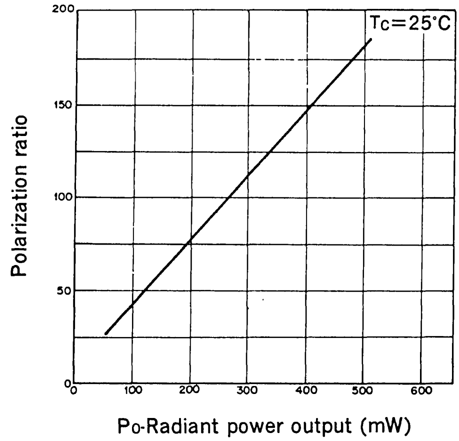
Oscillation wavelength vs. Temperature characteristics



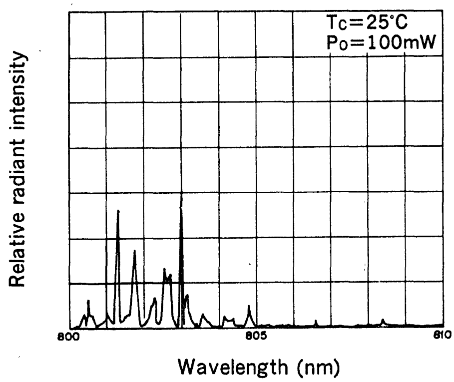
Slope efficiency vs. Temperature characteristics

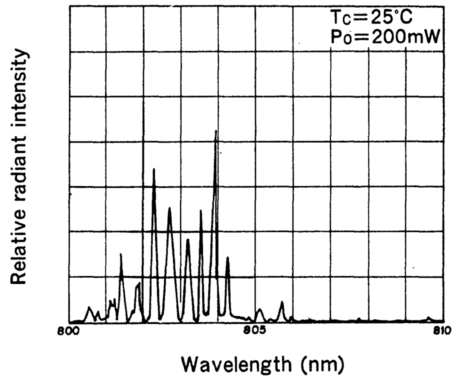


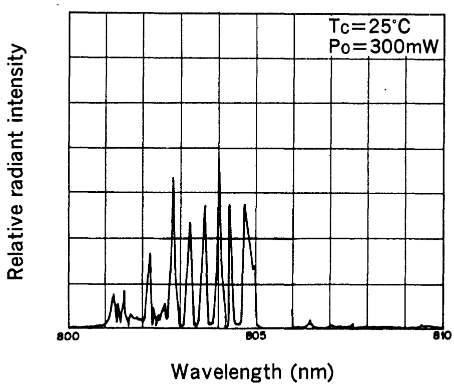
Power dependence of polarization ratio

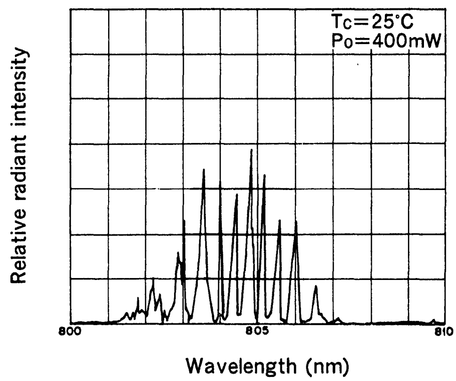


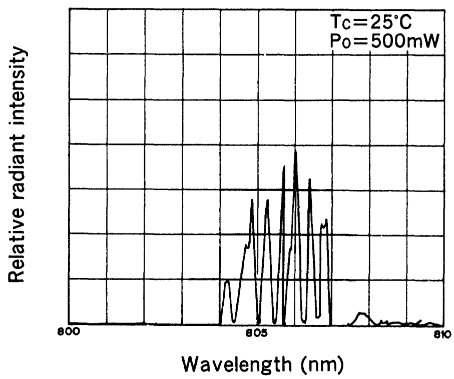
Power dependence of wavelength



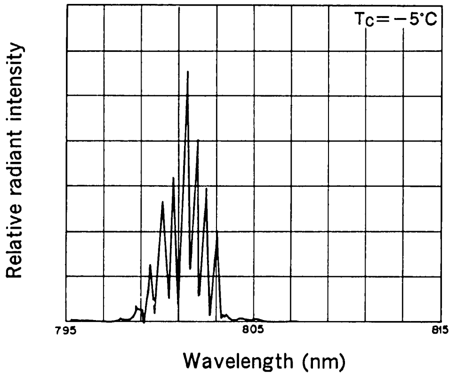


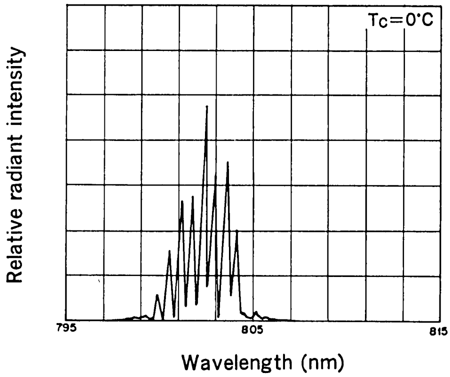


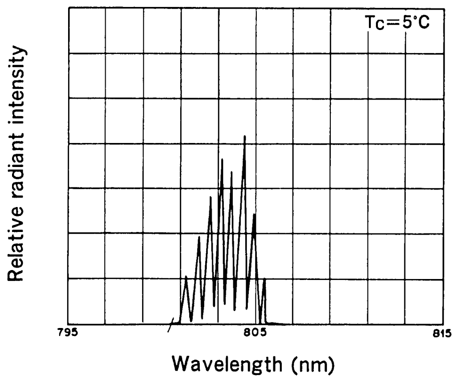


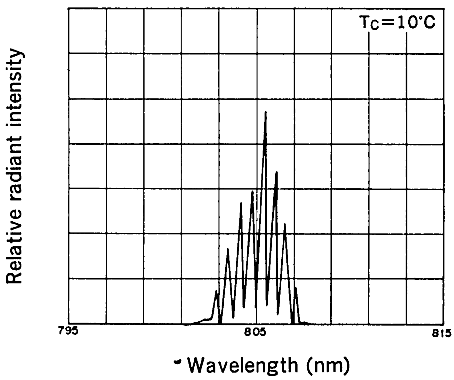


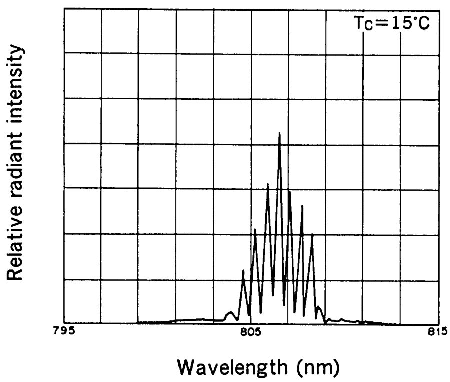
Temperature dependence of wavelength (Po=450mW)

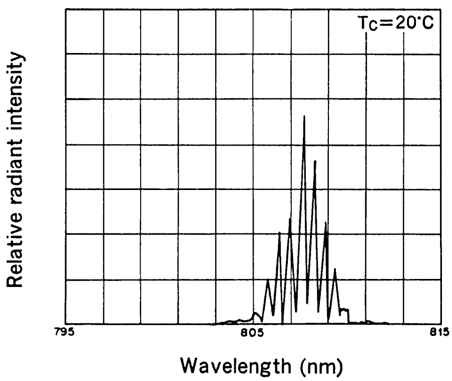


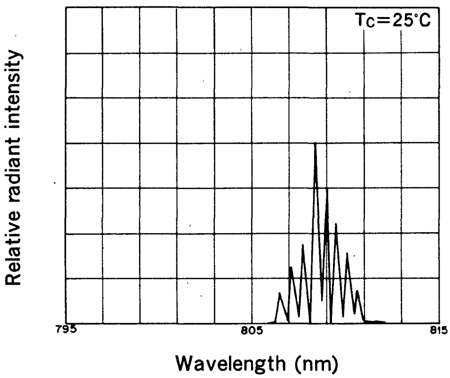


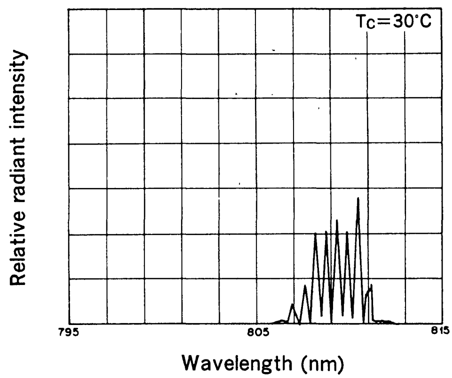









Tc=25°C
Relative radiant intensity
795
805
815
Wavelength (nm)


Tc=30°C
Relative radiant intensity
795
805
815
Wavelength (nm)

SONY® **SLD303WT**

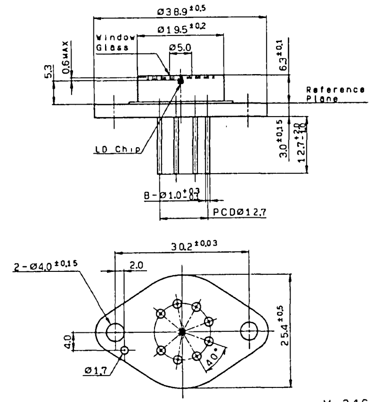
500mW High Power Laser Diode

Description

SLD303WT is a gain-guided, high-power laser diode with a built-in TE cooler. Fine tuning of the wavelength is possible by controlling the laser chip temperature.

Package Outline

Unit: mm



M-246
(LO-9)

Features

- High power
  Recommended power output Po=450mW
- Small operating current
- TO-3 package with built-in TE cooler, thermistor and photodiode

Structure

GaAlAs double-hetero laser diode

Applications

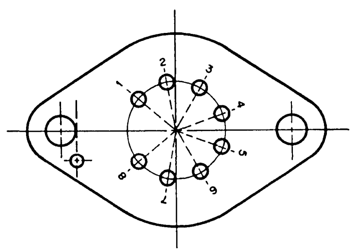
- Solid state laser excitation
- Medical use

Absolute Maximum Ratings (Tth=25°C)

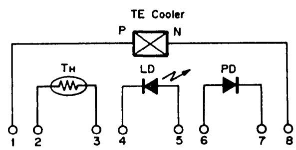
• Radiant power output	Po		500	mW
• Reverse voltage	VR	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +30	°C
• Storage temperature	Tstg		−40 to +85	°C
• Operating current of TE cooler	IT		2.1	A

Pin Configuration (Bottom View)

No.	Function
1	TE cooler, positive
2	Thermistor lead 1
3	Thermistor lead 2
4	Laser diode cathode
5	Laser diode anode
6	Photodiode anode
7	Photodiode cathode
8	TE cooler, negative



Equivalent Circuit



E80407A13-HP

Optical and Electrical Characteristics

Tth=25°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			450	600	mA
Operating current		I_{OP}	Po=450mW		950	1500	mA
Operating voltage		V_{OP}	Po=450mW		1.9	3.0	V
Wavelength*		λp	Po=450mW	770		840	nm
Monitor current		Imon	Po=450mW V_R=10V		0.8		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta \perp$	Po=450mW		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=450mW			±100	μm
	Angle	$\Delta\phi \perp$				±3	degree
Slope efficiency		ηD	Po=450mW	0.65	0.9		mW/mA
Thermistor resistance		Rth	Tth=25°C		10		kΩ

Note) Tth: Thermistor temperature

*Wavelength Selection Classification

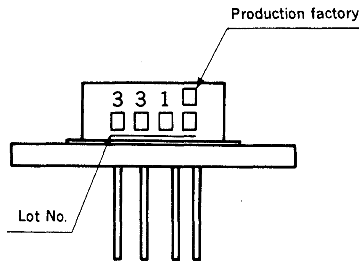
Type	Wavelength (nm)
SLD303WT-1	785±15
SLD303WT-2	810±10
SLD303WT-3	830±10
SLD303WT-21	798± 3
-24	807± 3
-25	810± 3

Precautions

Eye protection against laser beams

The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.

Marking



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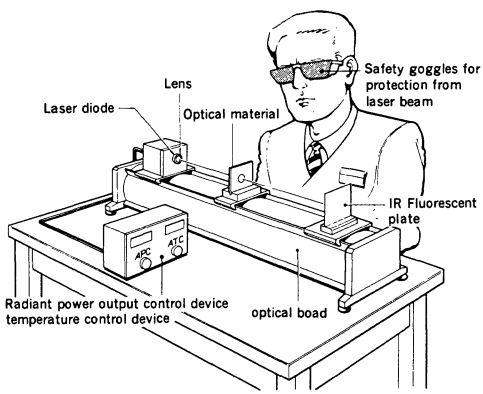
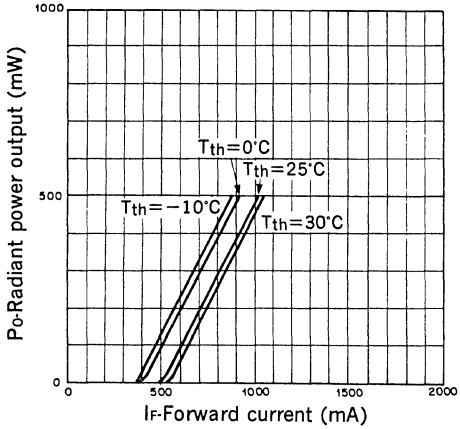
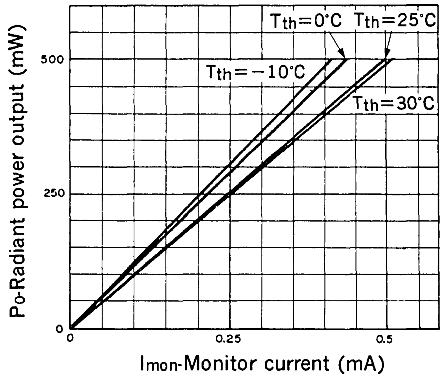


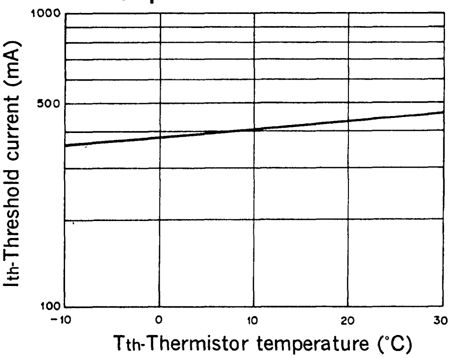
Radiant power output vs. Forward current characteristics



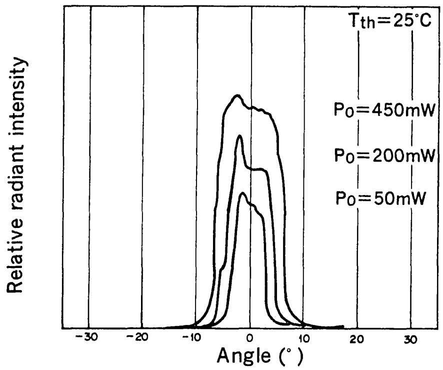
Radiant power output vs. Monitor current characteristics



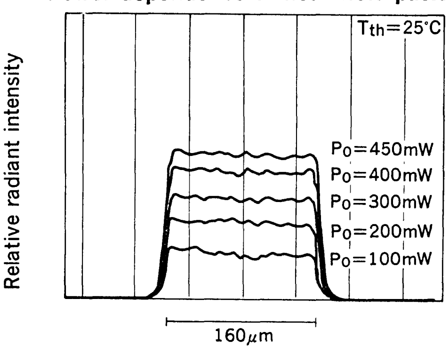
Threshold current vs. Temperature characteristics



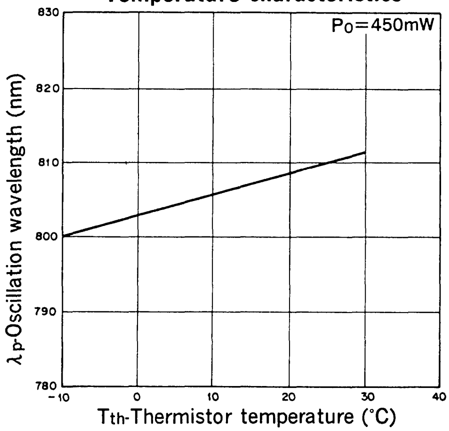
Power dependence of far field pattern (parallel to junction)



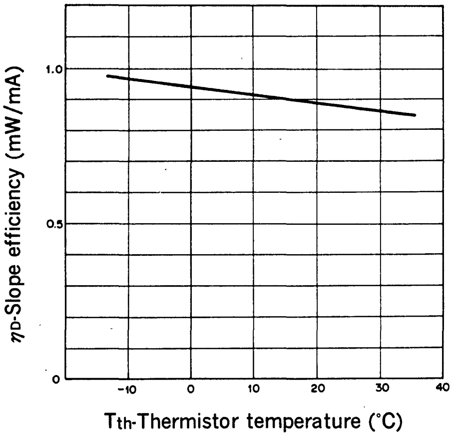
Power dependence of near field pattern



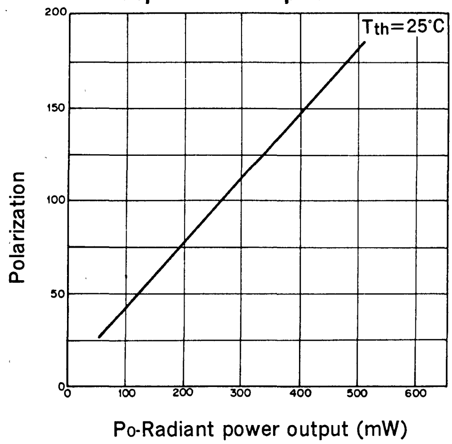
Oscillation wavelength vs. Temperature characteristics



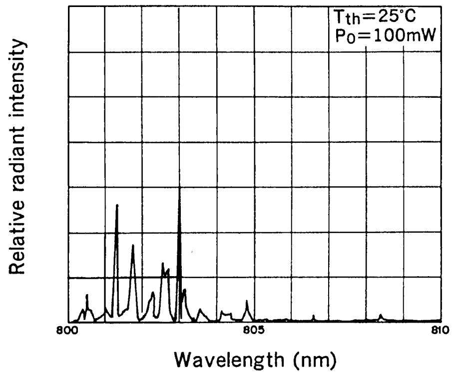
Slope efficiency vs. Temperature characteristics

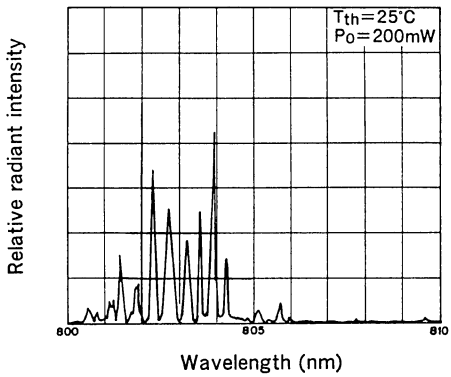


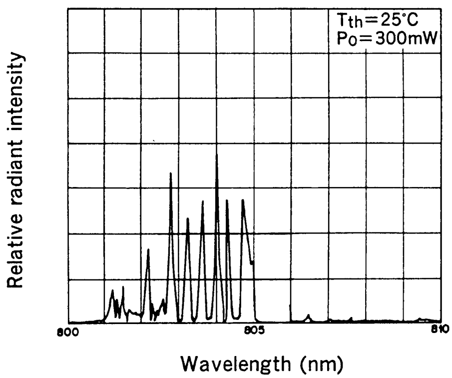
Power dependence of polarization ratio

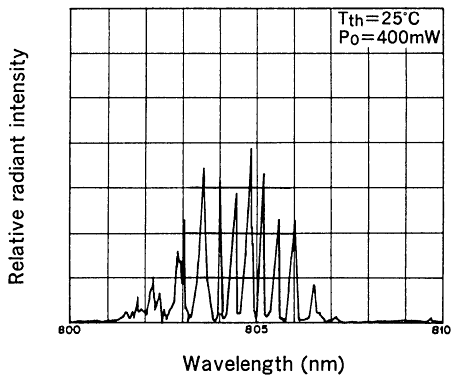


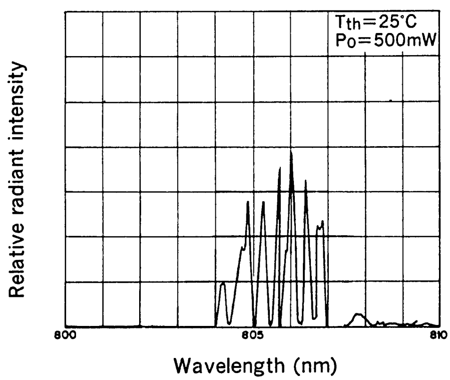
Power dependence of wavelength



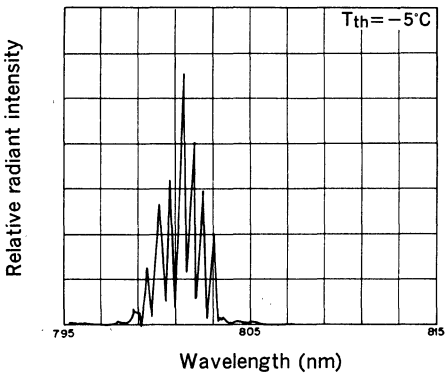


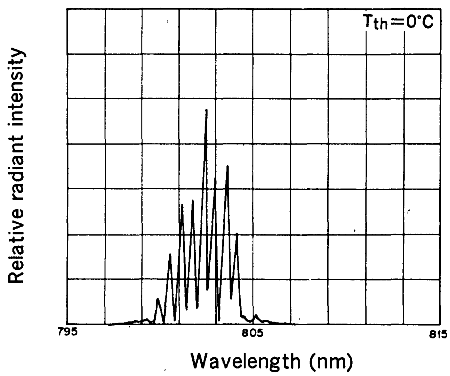


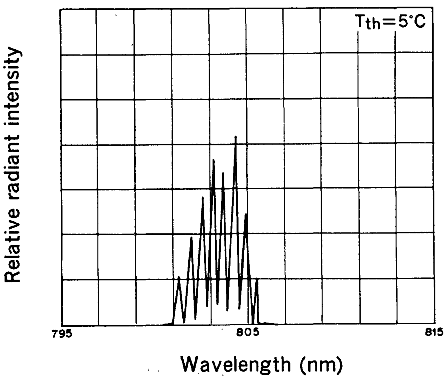


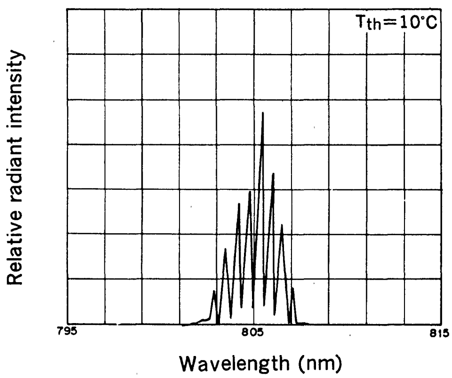


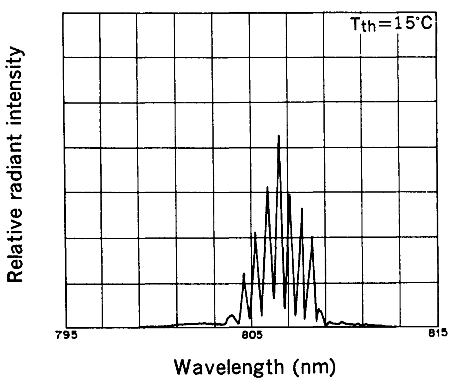
Temperature dependence of wavelength (Po=450mW)

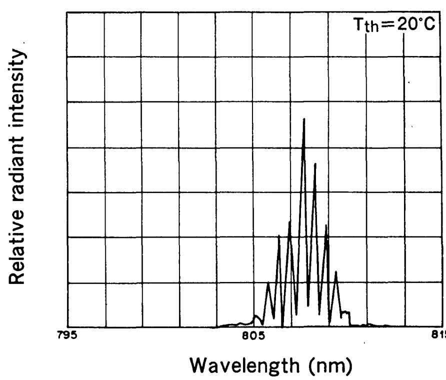


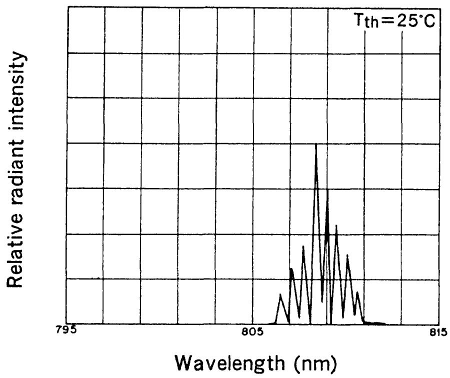


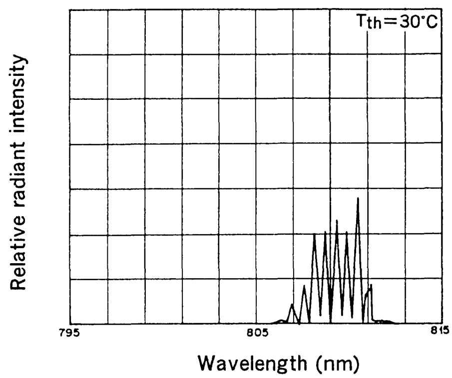






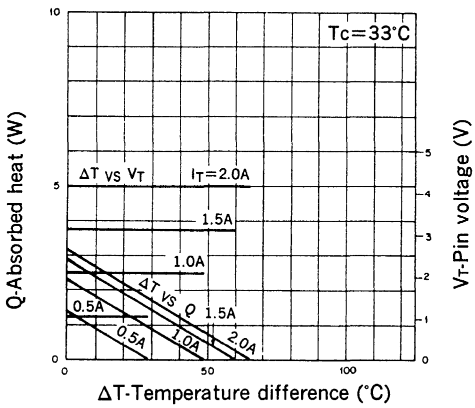






TE cooler characteristics

1



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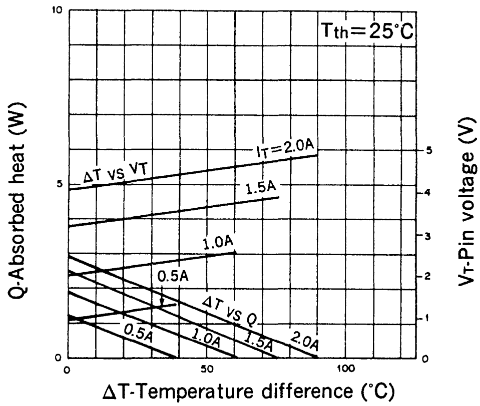
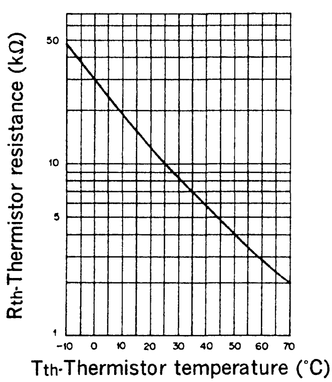


ΔT : Tc-Tth
Tth : Thermistor temperature
Tc : Case temperature

Thermistor characteristics



SONY® SLD303XT

500mW High Power Laser Diode

Description
SLD303XT is a gain-guided, high-power laser diode with a built-in TE cooler. A new flat, square package with a low thermal resistance and an in-line pin configuration is employed.

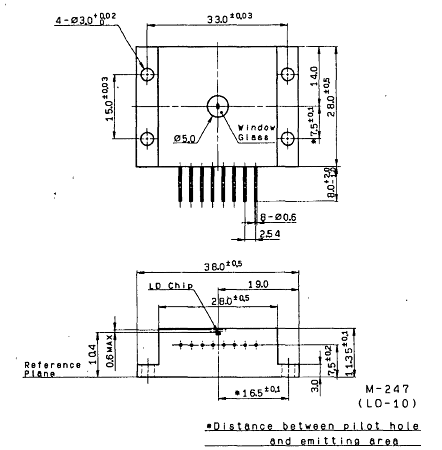
Fine tuning of the wavelength is possible by controlling the laser chip temperature.

Features
- High power
  Recommended power output Po=450mW
- Small operating current
- Newly developed flat package with built-in TE cooler, thermistor and photodiode.

Structure
GaAlAs double-hetero laser diode

Applications
- Solid state laser excitation
- Medical use

Package Outline Unit: mm

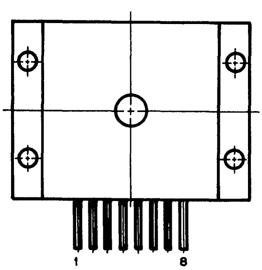


Absolute Maximum Ratings (Tth=25°C)

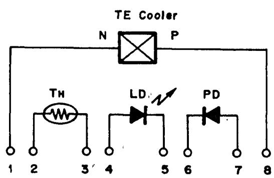
• Radiant power output	Po		500	mW
• Reverse voltage	VR	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +30	°C
• Storage temperature	Tstg		−40 to +85	°C
• Operating current of TE cooler	IT		2.5	A

Pin Configuration (Top View)

No.	Function
1	TE cooler, negative
2	Thermistor lead 1
3	Thermistor lead 2
4	Laser diode anode
5	Laser diode cathode
6	Photodiode cathode
7	Photodiode anode
8	TE cooler, positive



Equivalent Circuit



E88Z29A13-HP

Optical and Electrical Characteristics

Tth=25°C

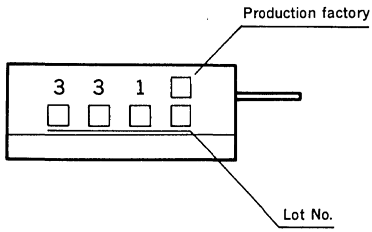
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			450	600	mA
Operating current		I_{OP}	Po=450mW		950	1500	mA
Operating voltage		V_{OP}	Po=450mW		1.9	3.0	V
Wavelength*		λ_p	Po=450mW	770		840	nm
Monitor current		Imon	Po=450mW V_R=10V		0.8		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta_\perp$	Po=450mW		28	40	degree
	Parallel	$\theta_{//}$			12	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=450mW			±100	μm
	Angle	$\Delta\phi\perp$				±3	degree
Slope efficiency		η_D	Po=450mW	0.65	0.9		mW/mA
Thermistor resistance		Rth	Tth=25°C		10		kΩ

Note) Tth: Thermistor temperature

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD303XT-1	785±15
SLD303XT-2	810±10
SLD303XT-3	830±10
SLD303XT-21	798± 3
-24	807± 3
-25	810± 3

Marking

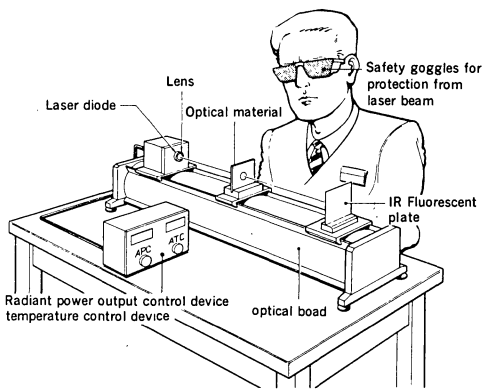


Categories are not specified by marking.

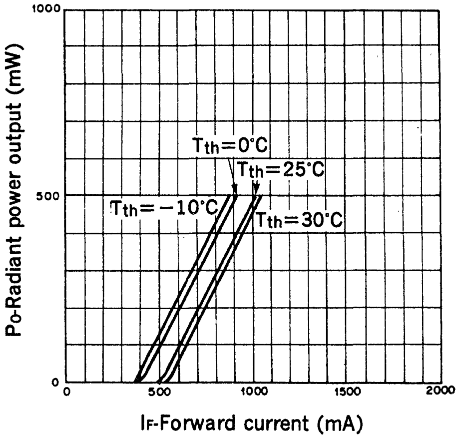
Handling Precautions

Eye protection against laser beams

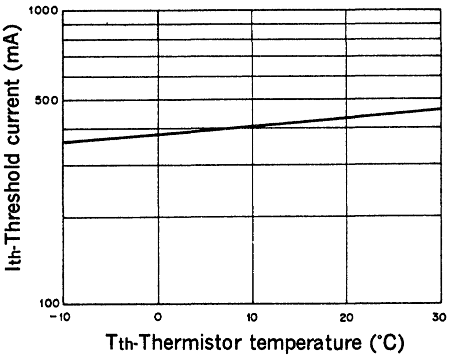
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.



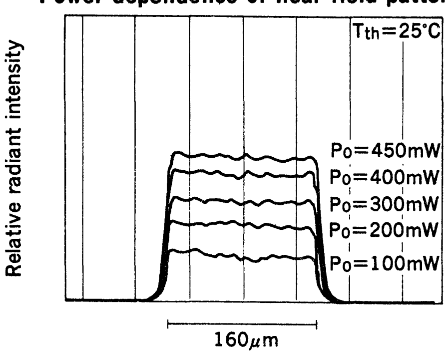
Radiant power output vs. Forward current characteristics



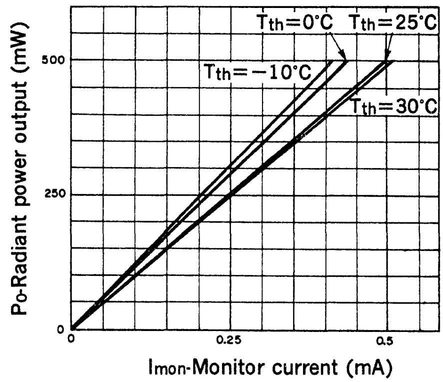
Threshold current vs. Temperature characteristics



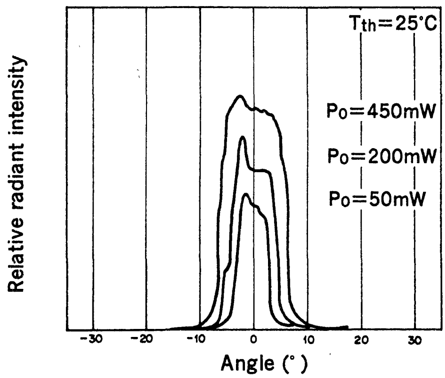
Power dependence of near field pattern



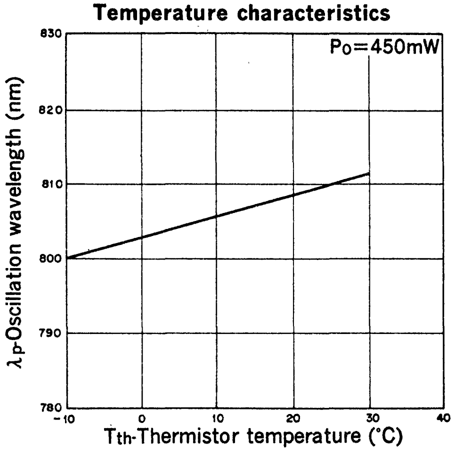
Radiant power output vs. Monitor current characteristics



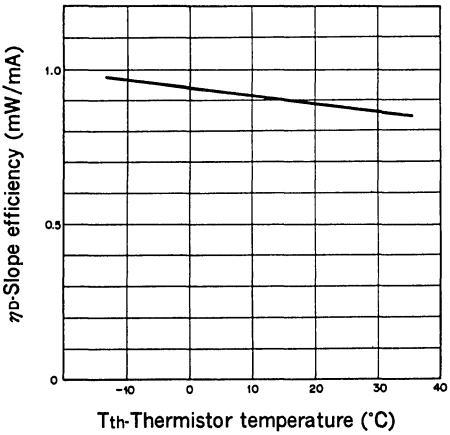
Power dependence of far field pattern (parallel to junction)



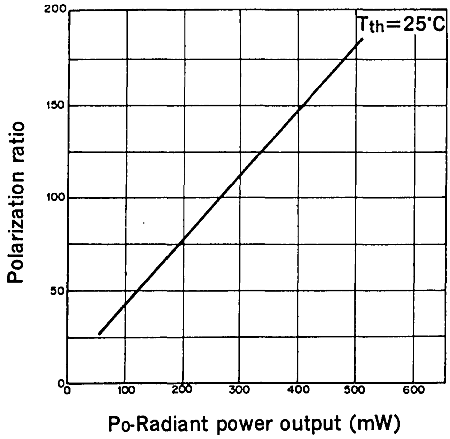
Oscillation wavelength vs. Temperature characteristics



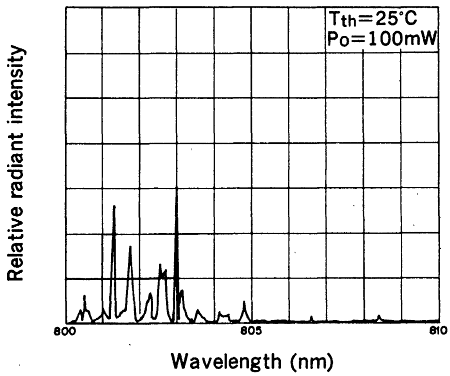
Slope efficiency vs. Temperature characteristics

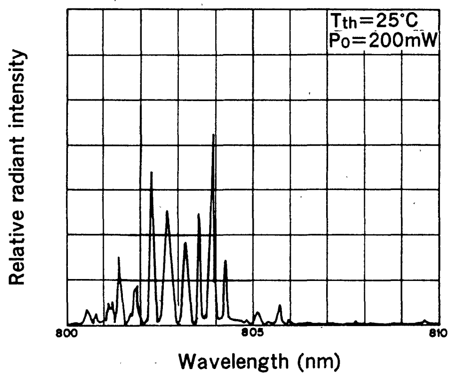


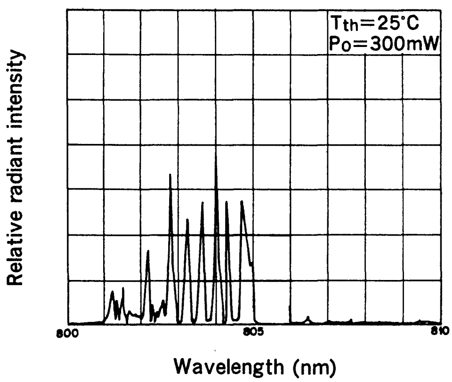
Power dependence of polarization ratio

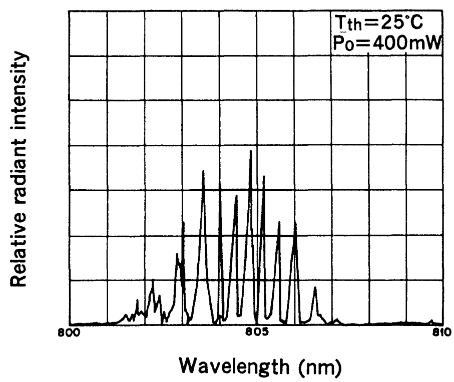


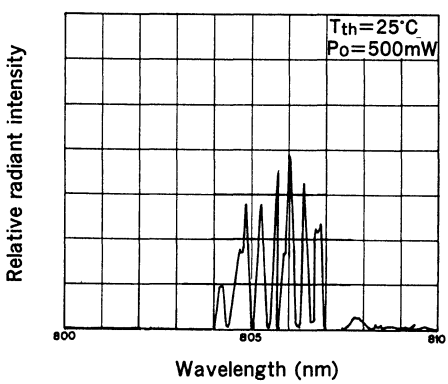
Power dependence of wavelength



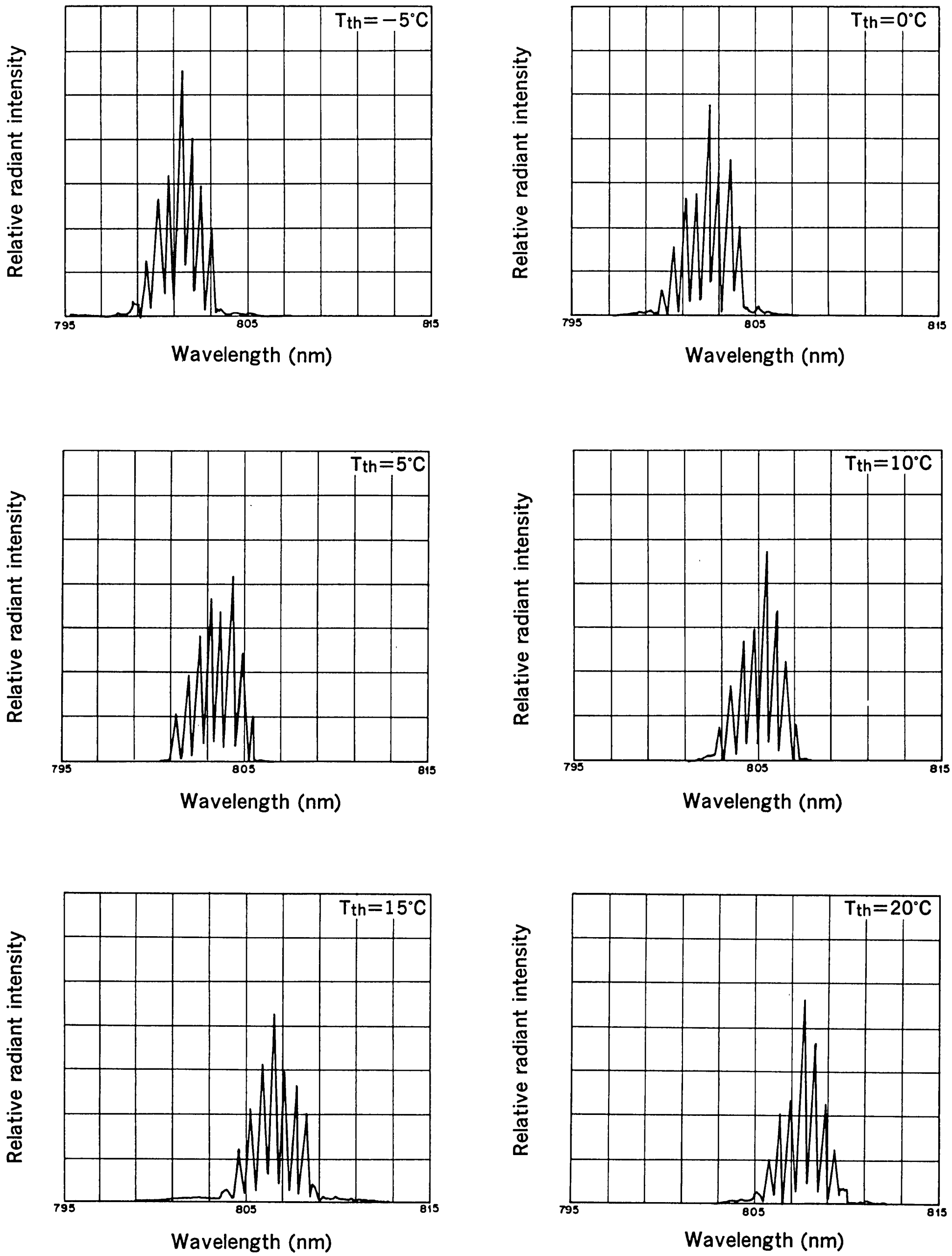


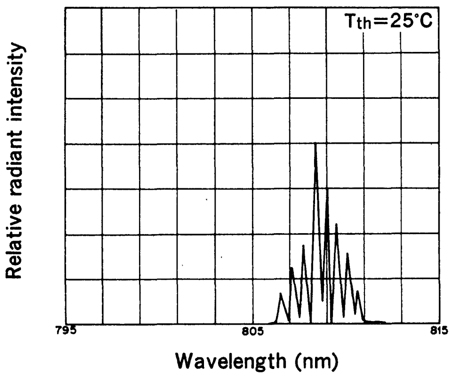


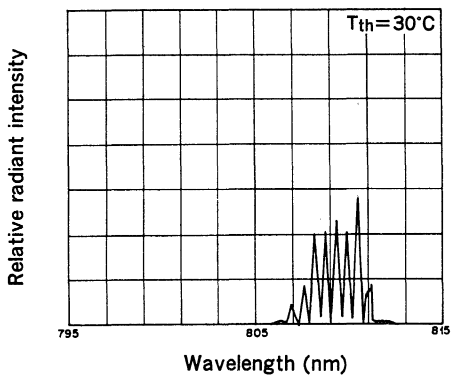




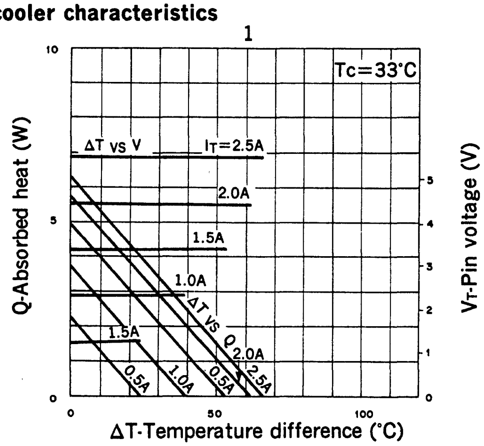
Temperature dependence of wavelength (P_o=450mW)

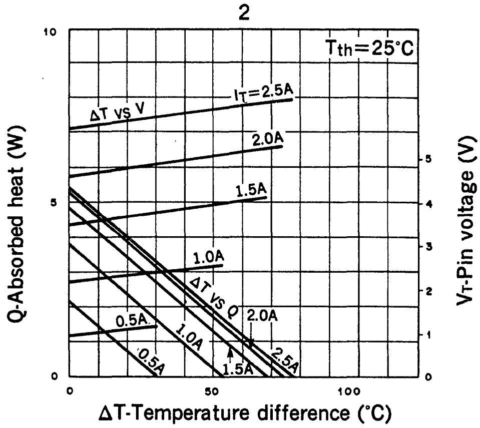






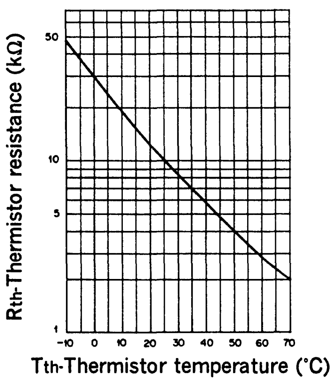
TE cooler characteristics





ΔT : Tc-Tth
Tth : Thermistor temperature
Tc : Case temperature

Thermistor characteristics



SONY®

SLD303B

Block-type 500mW High Power Laser Diode

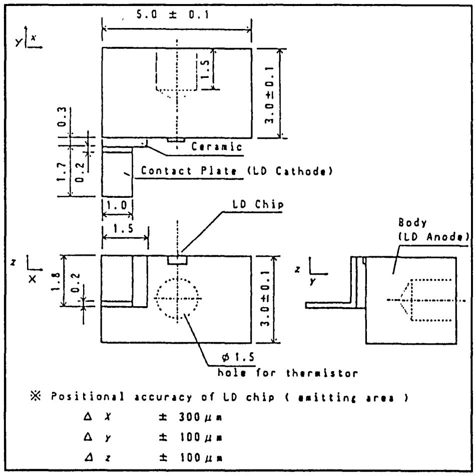
Description
SLD303B is a high power laser diode mounted on a 3×3×5mm Copper block.
It is ideal for applications which require a minimal distance between the laser facet and external optical parts.

Features
- Compact size 3×3×5mm block
- High power output Po = 500mW
- Hole for thermistor

Application
- Solid state laser excitation
- Medical use

Structure
GaAlAs double hetero-type laser diode

Package Outline
Unit : mm

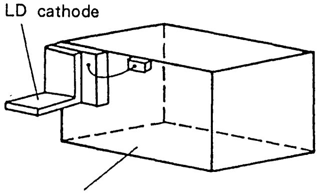


Absolute Maximum Ratings (Tc = 25°C)

• Radiant power output	Po		500	mW
• Recommended radiant power output	Po		450	mW
• Reverse voltage	V_R	LD	2	V
• Operating temperature	Topr		−10 to +30	°C
• Storage temperature	Tstg		−40 to +85	°C

Pin Configuration

No.	Function
1	LD cathode
2	LD anode



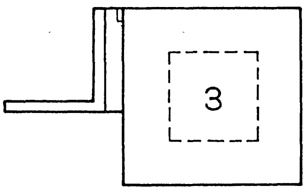
E89105 – ST

Electrical Characteristics (Tc = 25℃)

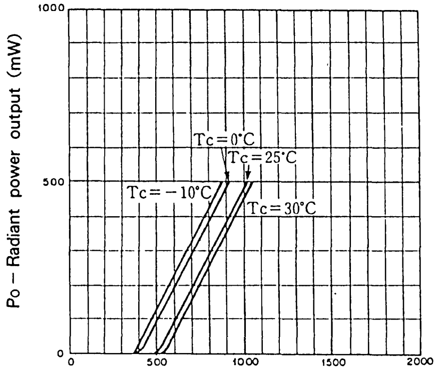
Item		Symbol	Conditions	Min.	Typ.	Max.	Unit
Threshold current		Ith			450	600	mA
Operating current		Iop	Po = 450mW		1100	1500	mA
Operating voltage		Vop	Po = 450mW		1.9	3.0	V
Wavelength		λ p	Po = 450mW	770		840	nm
Radiation angle (FWHM *)	Perpendicular to junction	$\theta_{\perp}$	Po = 450mW		28	40	Degree
	Parallel to junction	$\theta_{//}$			12	17	
Positional accuracy	Position	Δ X	Po = 450mW			± 300	µm
		Δ Y, Δ Z				± 100	
	Angle	$\Delta \phi_{\perp}$				± 3	Degree
Slope efficiency		η_D	Po = 450mW	0.5	0.8		mW/mA

* FWHM : Full Width at Half Maximum

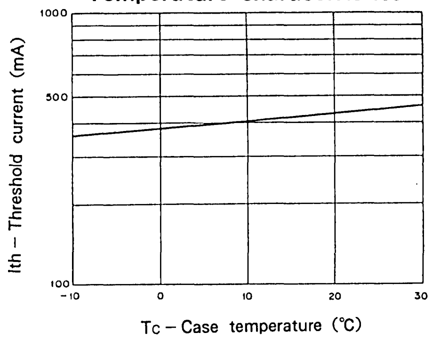
Mark



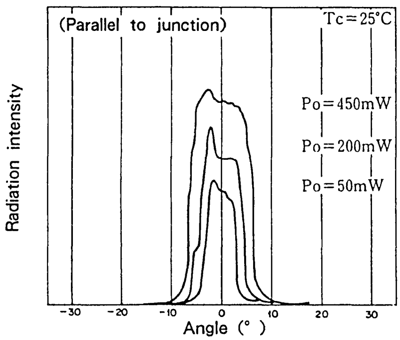
Radiant power output vs. Forward current



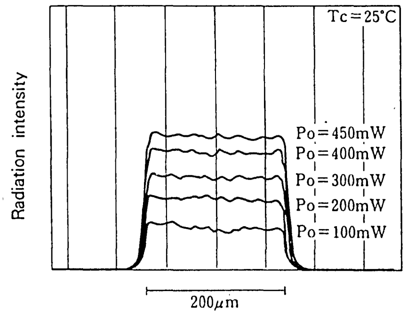
Threshold current vs. Temperature characteristics



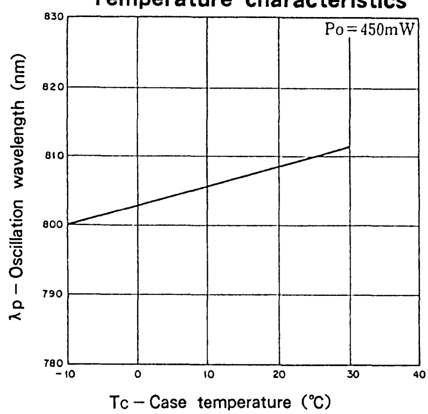
Power dependence of far field pattern



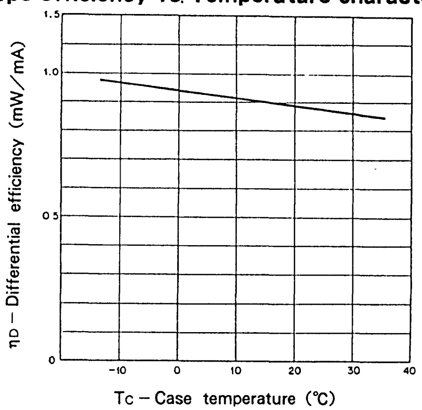
Power dependence of near field pattern



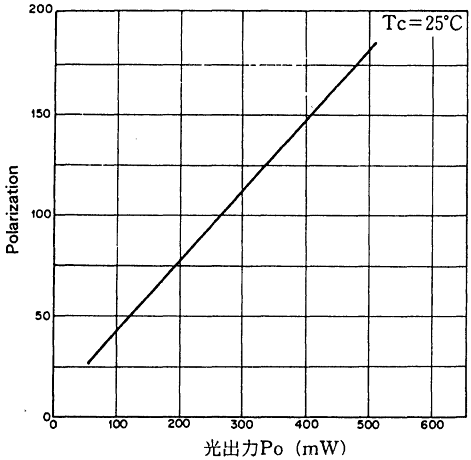
Oscillation wavelength vs. Temperature characteristics



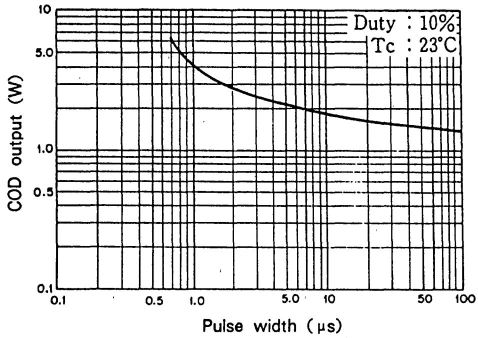
Slope efficiency vs. Temperature characteristics



Power dependence of polarization ratio

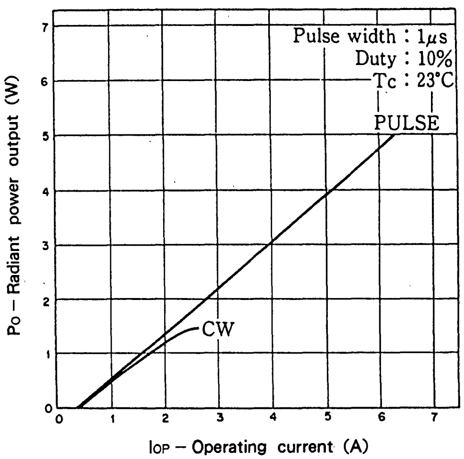


Pulse width dependence of COD* power

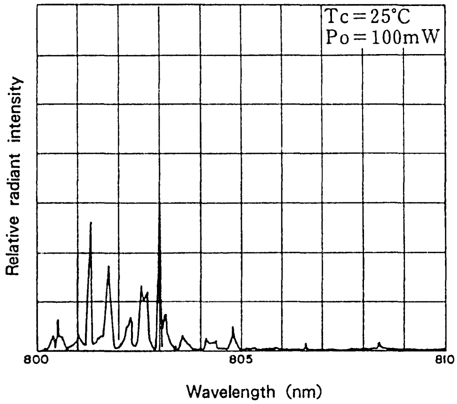


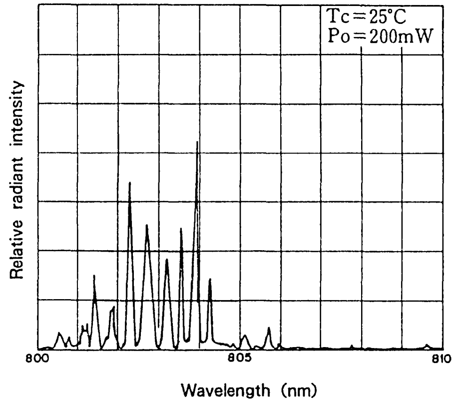
*COD (Catastrophic Optical Damage)

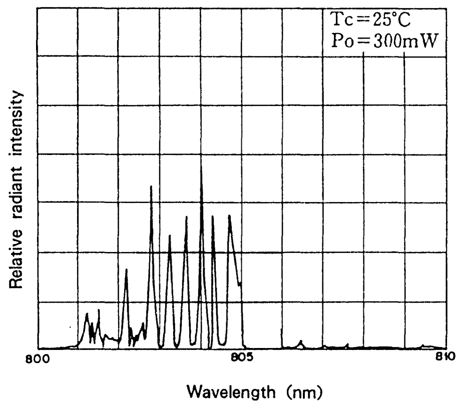
Radiant power output vs. Operating current

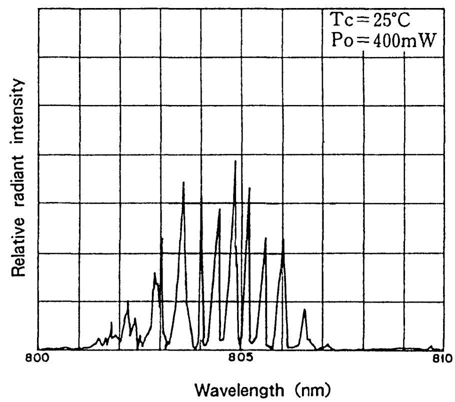


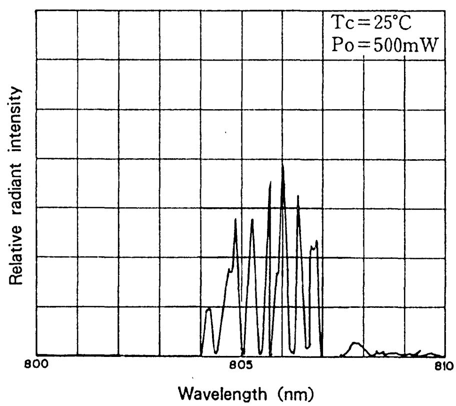
Power Dependence of Wavelength



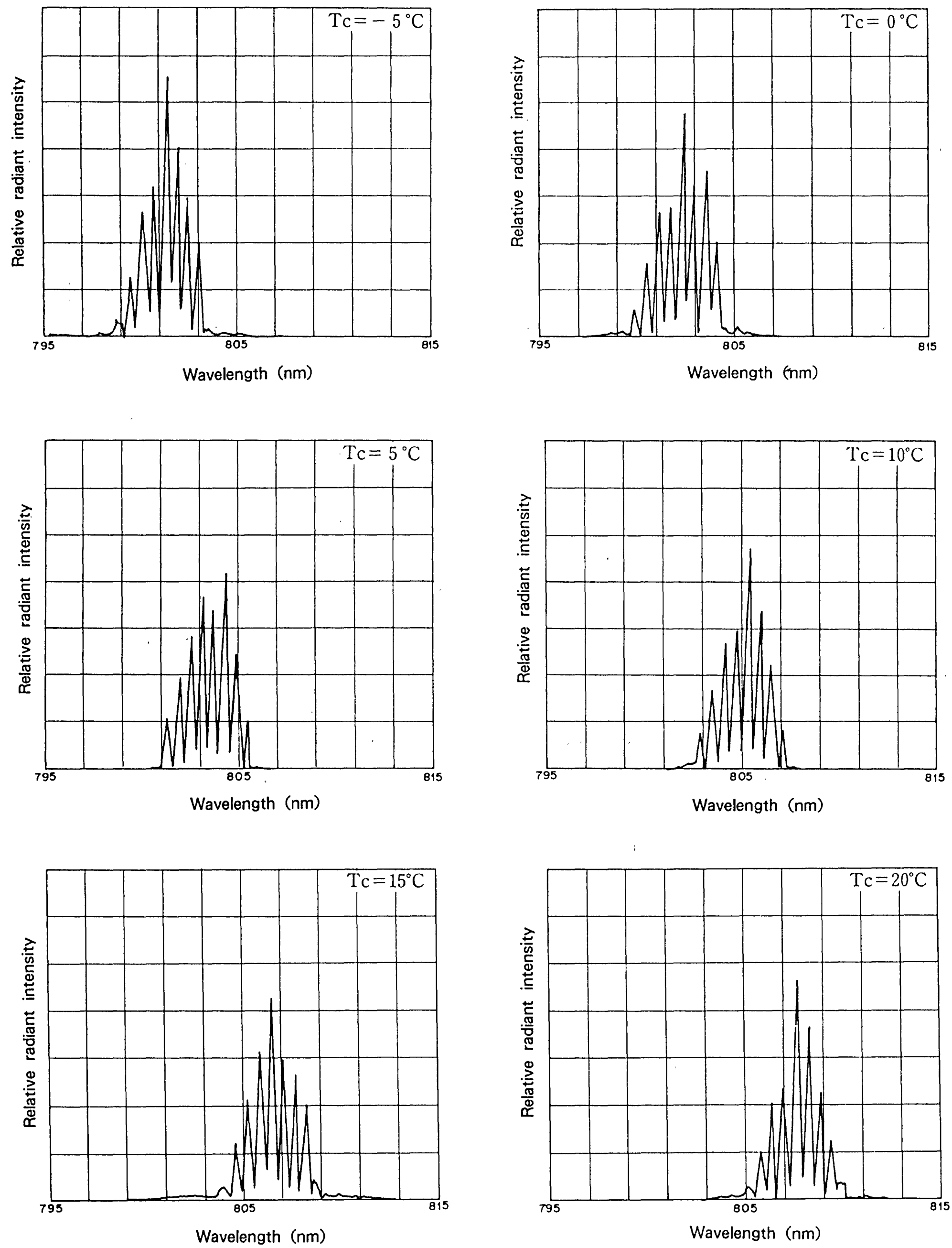








Temperature Dependence of Wavelength (Po = 90mW)



SONY | **SLD304V**

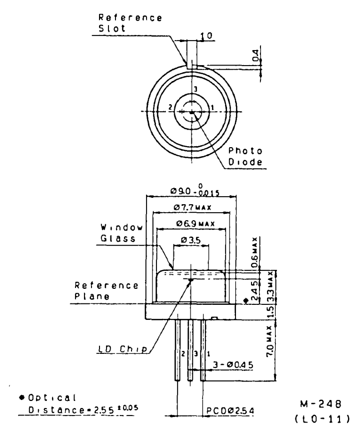
1000mW High Power Laser Diode

Description

SLD304V are gain-guided, high-power laser diodes fabricated by MOCVD.
MOCVD: Metal Organic Chemical Vapor Deposition

Package Outline

Unit: mm



Features

- High power
  Recommended power output Po=900mW
- Small operating current

Applications

- Solid state laser excitation
- Medical use

Structure

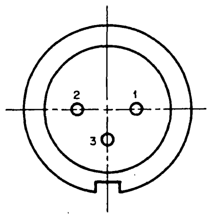
GaAlAs double-hetero laser diode

Absolute Maximum Ratings (Tc=15°C)

• Radiant power output	Po		1000	mW
• Reverse voltage	VR	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +30	°C
• Storage temperature	Tstg		−40 to +85	°C

Pin Configuration (Bottom View)

No.	Function
1	Laser diode cathode
2	Photodiode anode
3	Common



E70778C13-HP

Optical and Electrical Characteristics

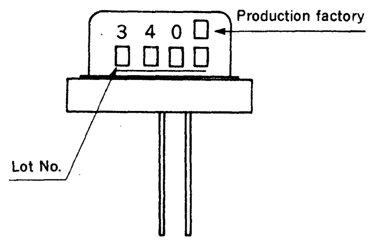
Tc=15°C

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			500	700	mA
Operating current		I_{OP}	Po=900mW		1550	2000	mA
Operating voltage		V_{OP}	Po=900mW		2.1	3.0	V
Wavelength*		λ_p	Po=900mW	770		840	nm
Monitor current		Imon	Po=900mW V_R=10V		1.5		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta\perp$	Po=900mW		28	40	degree
	Parallel	$\theta_{//}$			13	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=900mW			±50	μm
	Angle	$\Delta\phi\perp$				±3	degree
Slope efficiency		η_D	Po=900mW	0.65	0.85		mW/mA

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD304V-1	785±15
SLD304V-2	810±10
SLD304V-3	830±10
SLD304V-21	798± 3
-24	807± 3
-25	810± 3

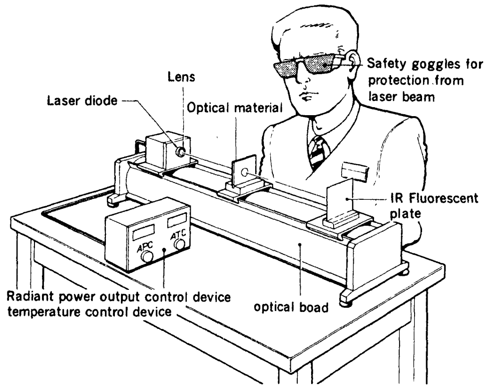
Marking



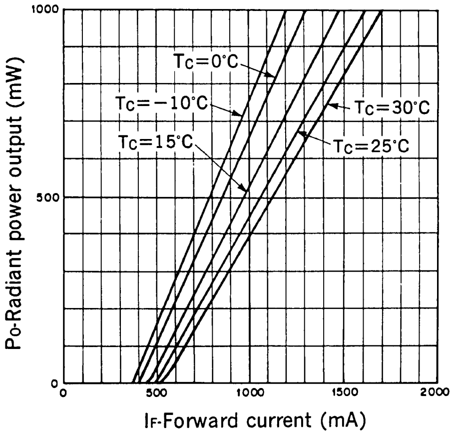
Precautions

Eye protection against laser beams

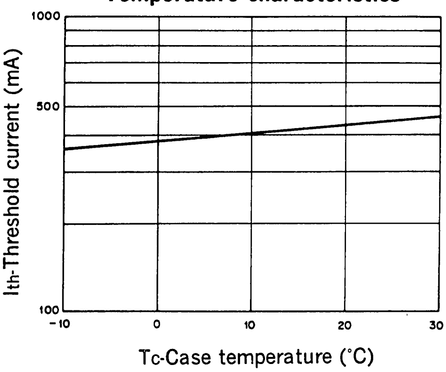
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.



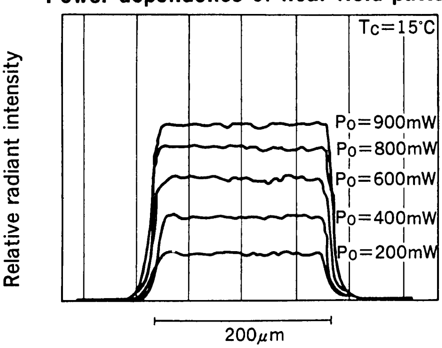
Radiant power output vs. Forward current characteristics



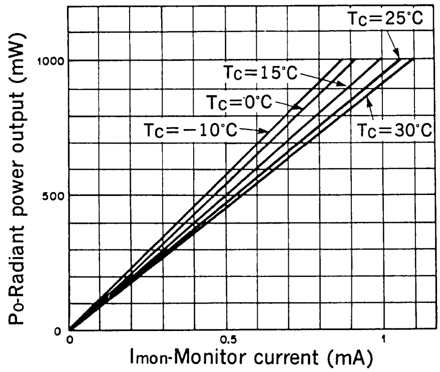
Threshold current vs. Temperature characteristics



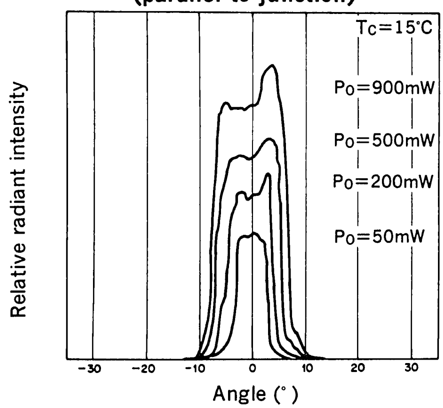
Power dependence of near field pattern



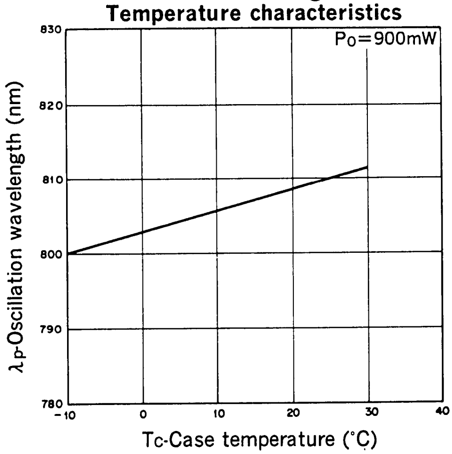
Radiant power output vs. Monitor current characteristics



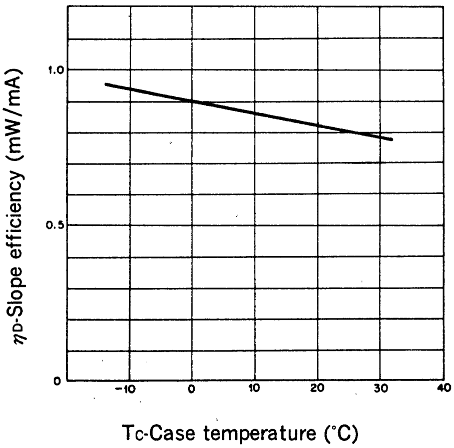
Power dependence of far field pattern (parallel to junction)



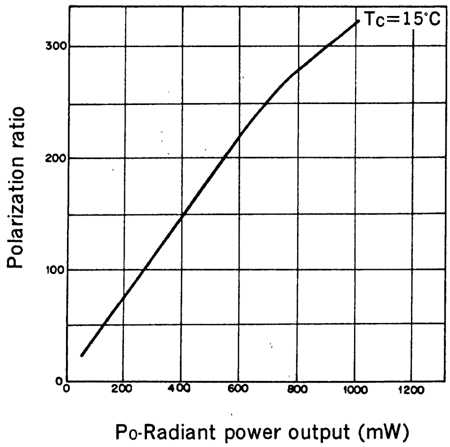
Oscillation wavelength vs. Temperature characteristics



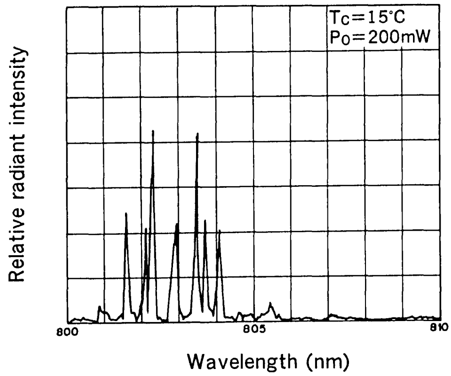
Slope efficiency vs. Temperature characteristics

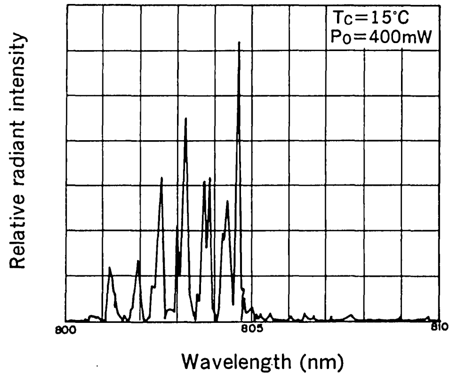


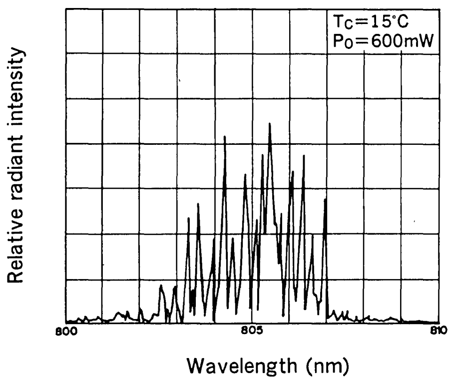
Power dependence of polarization ratio

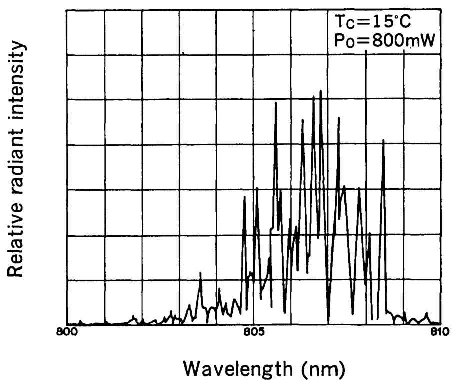


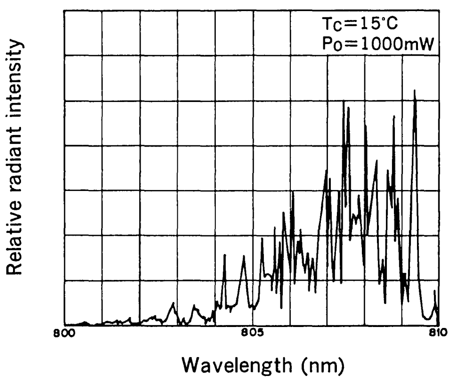
Power dependence of wavelength



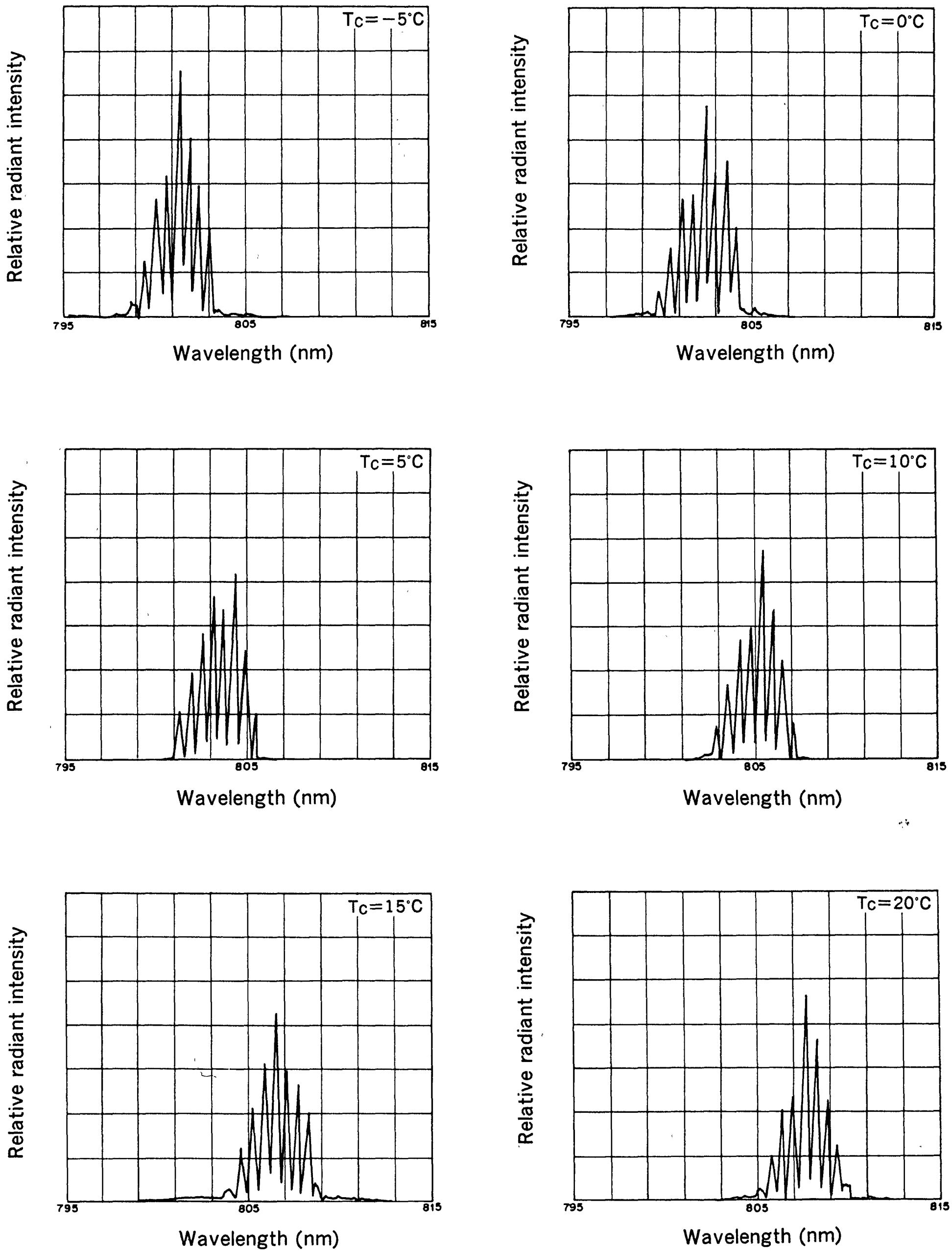


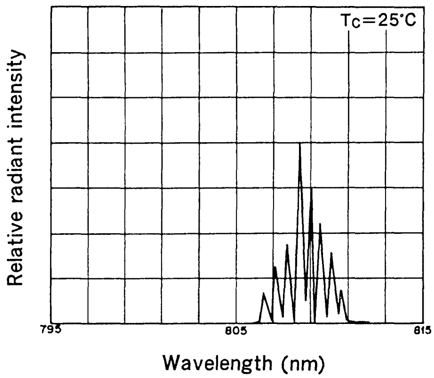


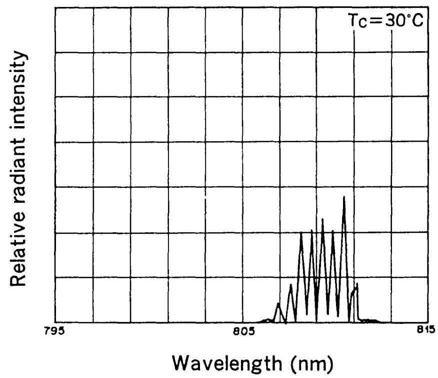




Temperature dependence of wavelength (Po=900mW)




Tc=25°C
Relative radiant intensity
795
805
815
Wavelength (nm)


Tc=30°C
Relative radiant intensity
795
805
815
Wavelength (nm)

1000mW High Power Laser Diode

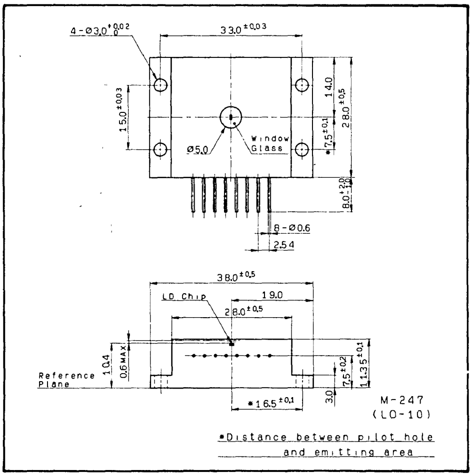
Description

SLD304XT is a gain-guided, high-power laser diode with a built-in TE cooler. A new flat, square package with a low thermal resistance and an in-line pin configuration is employed.

Fine tuning of the wavelength is possible by controlling the laser chip temperature.

Package Outline

Unit: mm



Features

- High power
  Recommended power output Po=900mW
- Small operating current
- Newly developed flat package with built-in TE cooler, thermistor and photodiode.

Structure

GaAlAs double-hetero laser diode

Applications

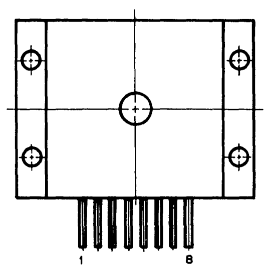
- Solid state laser excitation
- Medical use

Absolute Maximum Ratings (T_{th}=25°C)

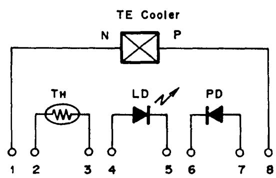
• Radiant power output	Po		1000	mW
• Reverse voltage	VR	LD	2	V
		PD	15	V
• Operating temperature	Topr		−10 to +30	°C
• Storage temperature	Tstg		−40 to +85	°C
• Operating current of TE cooler	IT		2.5	A

Pin Configuration (Top View)

No.	Function
1	TE cooler, negative
2	Thermistor lead 1
3	Thermistor lead 2
4	Laser diode anode
5	Laser diode cathode
6	Photodiode cathode
7	Photodiode anode
8	TE cooler, positive



Equivalent Circuit



E88Z30A13-HP

Optical and Electrical Characteristics

Tth=25°C

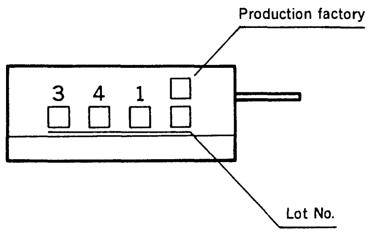
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Threshold current		Ith			550	750	mA
Operating current		I_{OP}	Po=900mW		1600	2000	mA
Operating voltage		V_{OP}	Po=900mW		2.2	3.0	V
Wavelength*		λ_p	Po=900mW	770		840	nm
Monitor current		Imon	Po=900mW V_R=10V		1.5		mA
Radiation angle (F. W. H. M)	Perpendicular	$\theta\perp$	Po=900mW		28	40	degree
	Parallel	$\theta_{//}$			13	17	degree
Positional accuracy	Position	ΔX, ΔY	Po=900mW			±100	μm
	Angle	$\Delta\phi\perp$				±3	degree
Slope efficiency		η_D	Po=900mW	0.65	0.85		mW/mA
Thermistor resistance		Rth	Tth=25°C		10		kΩ

Note) Tth: Thermistor temperature

*Wavelength Selection Classification

Type	Wavelength (nm)
SLD304XT-1	785±15
SLD304XT-2	810±10
SLD304XT-3	830±10
SLD304XT-21	798± 3
-24	807± 3
-25	810± 3

Marking

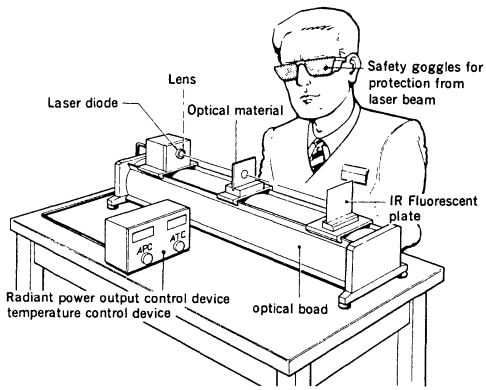


Categories are not specified by marking.

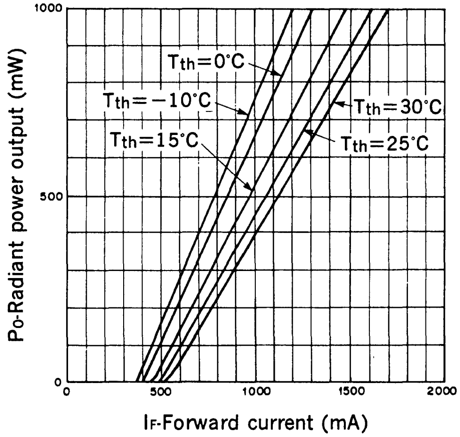
Handling Precautions

Eye protection against laser beams

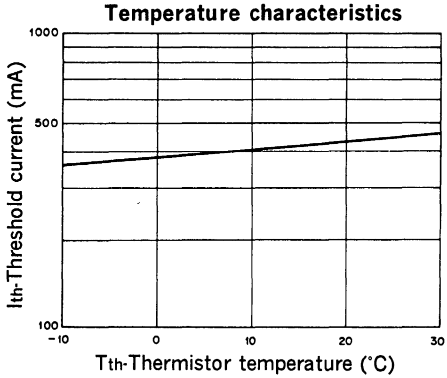
The optical output of laser diodes ranges from several milliwatts to one watt. However the optical density of the laser beam at the diode chip reaches 1 megawatt per square centimeter. Unlike gas lasers, since laser diode beams are divergent, uncollimated laser diode beams are fairly safe at a laser diode. For observing laser beams, ALWAYS use safety goggles that block infrared rays. Usage of IR scopes, IR cameras and fluorescent plates is also recommended for monitoring laser beams safely.



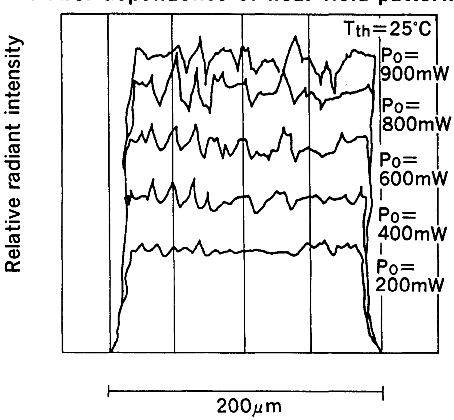
Radiant power output vs. Forward current characteristics



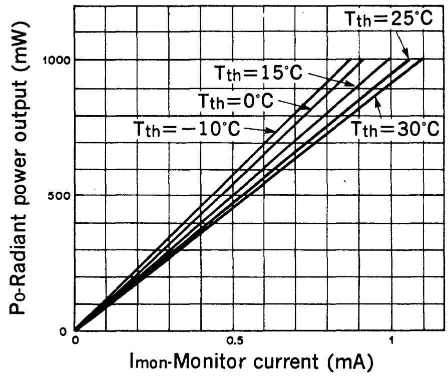
Threshold current vs. Temperature characteristics



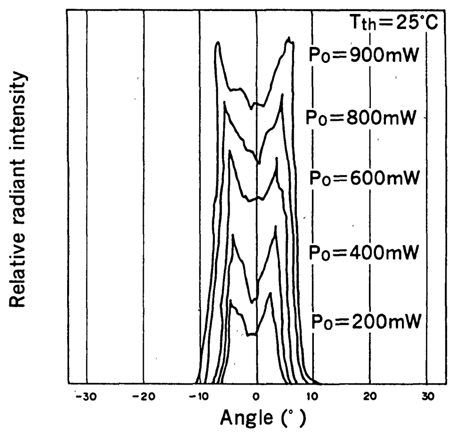
Power dependence of near field pattern



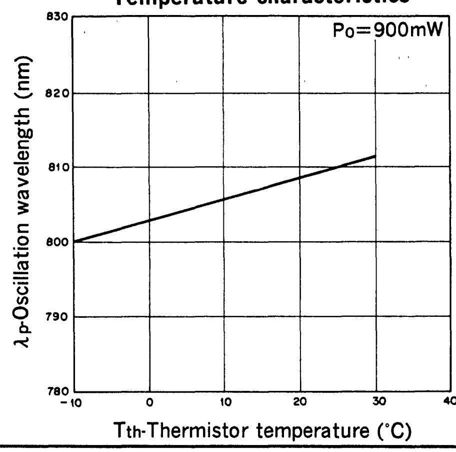
Radiant power output vs. Monitor current characteristics

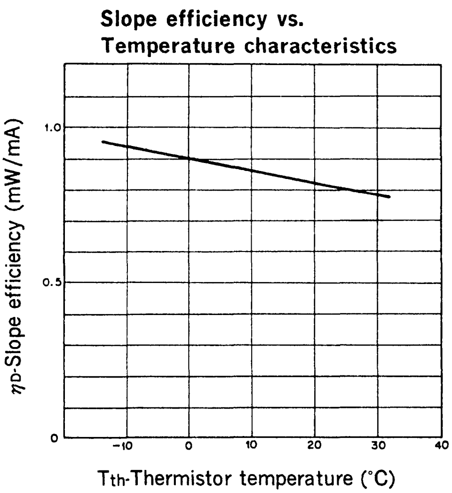


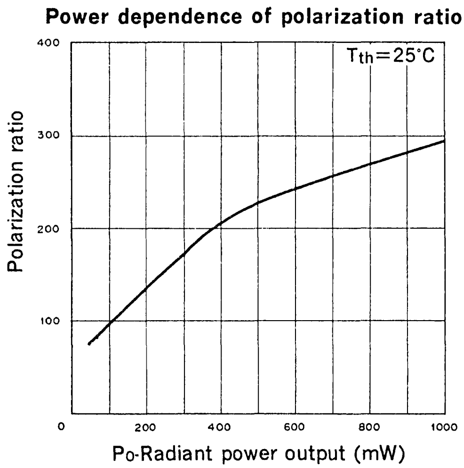
Power dependence of far field pattern (parallel to junction)



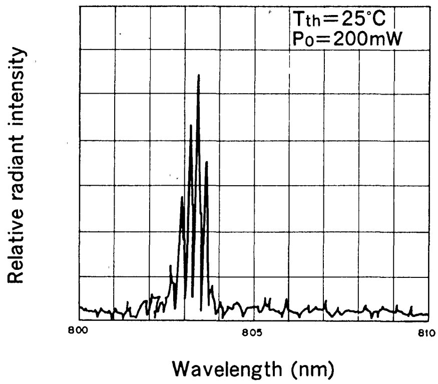
Oscillation wavelength vs. Temperature characteristics

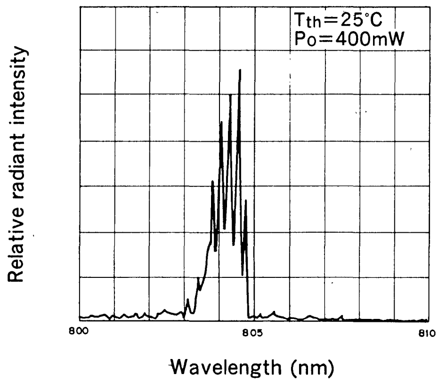


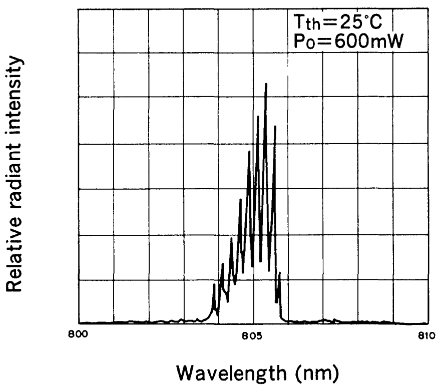

Slope efficiency vs.
Temperature characteristics
ηD-Slope efficiency (mW/mA)
1.0
0.5
0
−10
0
10
20
30
40
Tth-Thermistor temperature (°C)

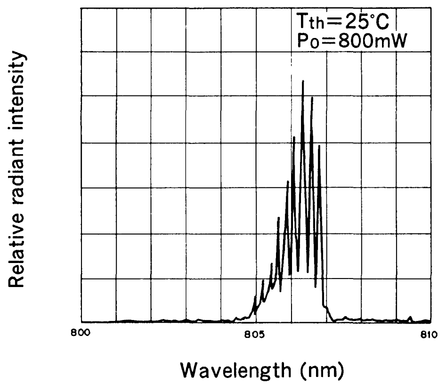

Power dependence of polarization ratio
Tth=25°C
Polarization ratio
400
300
200
100
0
200
400
600
800
1000
Po-Radiant power output (mW)

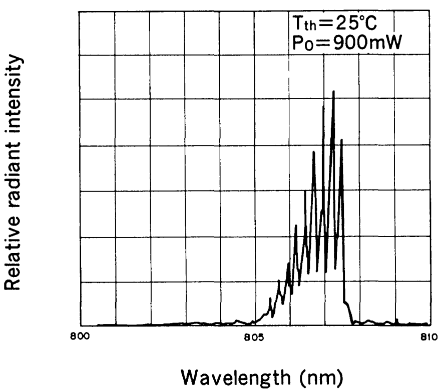
Power dependence of wavelength



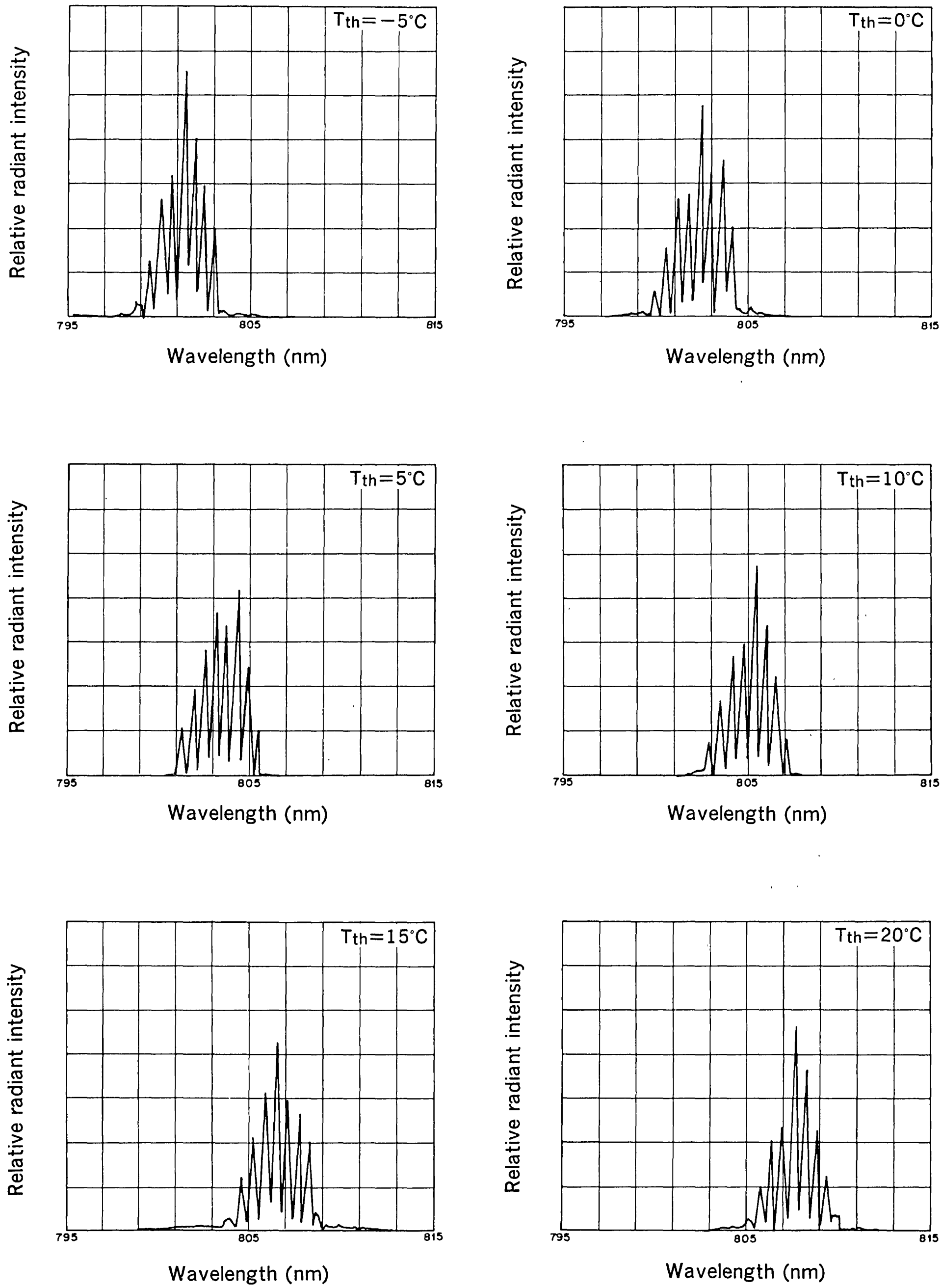


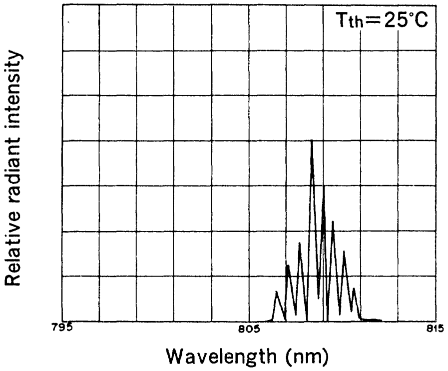


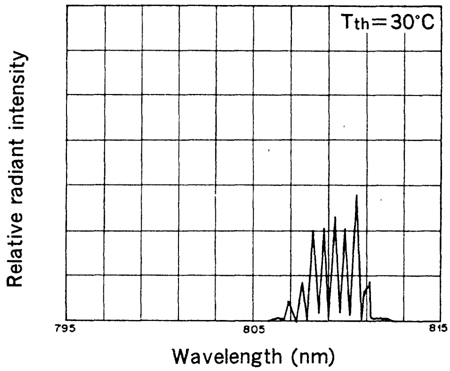




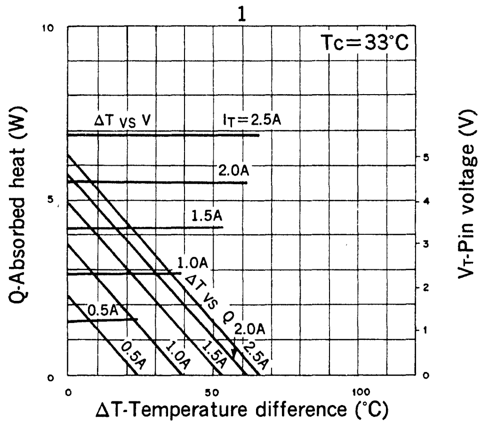
Temperature dependence of wavelength (Po=900mW)

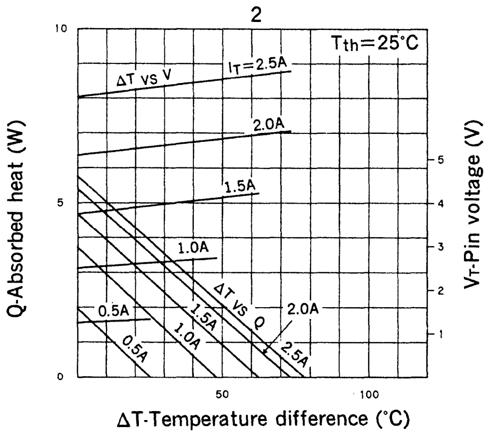






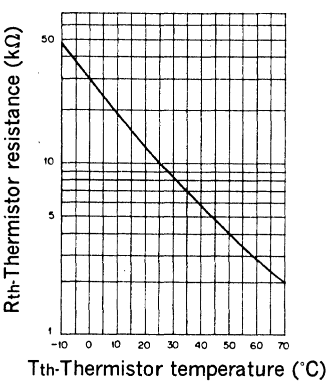
TE cooler characteristics





ΔT : Tc-Tth
Tth : Thermistor temperature
Tc : Case temperature

Thermistor characteristics



SONY | **SLD304B**

Block-type 1000mW High Power Laser Diode

Description

SLD304B is a high power laser diode mounted on a 3 × 3 × 5mm Copper block.
It is ideal for applications which require a minimal distance between the laser facet and external optical parts.

Features

- Compact size 3 × 3 × 5mm block
- High power output Po = 1000mW
- Hole for thermistor

Application

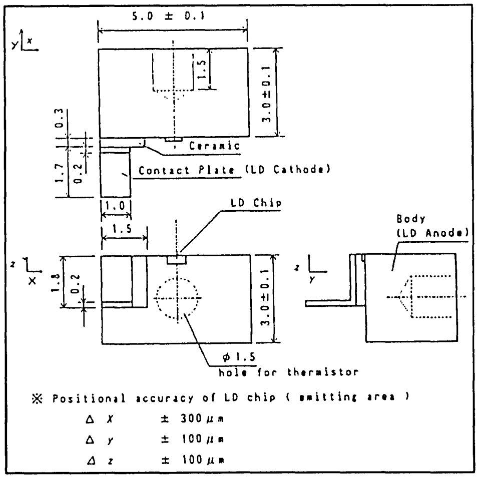
- Solid state laser excitation
- Medical use

Structure

GaAlAs double hetero-type laser diode

Package Outline

Unit : mm

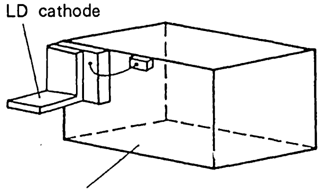


Absolute Maximum Ratings (Tc = 15°C)

• Radiant power output	Po		1000	mW
• Recommended radiant power output	Po		900	mW
• Reverse voltage	V_R	LD	2	V
• Operating temperature	Topr		−10 to +30	°C
• Storage temperature	Tstg		−40 to +85	°C

Pin Configuration

No.	Function
1	LD cathode
2	LD anode



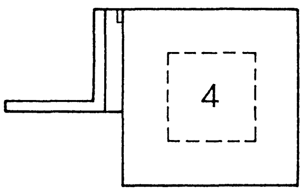
E89106 – ST

Electrical Characteristics (Tc = 25℃)

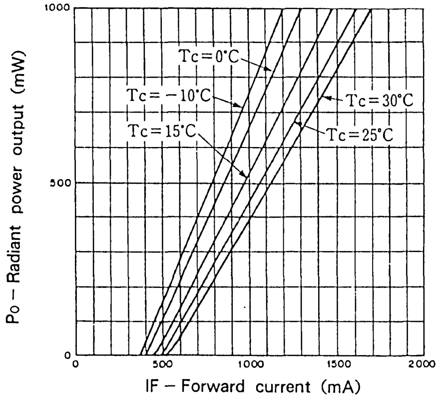
Item		Symbol	Conditions	Min.	Typ.	Max.	Unit
Threshold current		Ith			450	700	mA
Operating current		Iop	Po = 900mW		1400	2000	mA
Operating voltage		Vop	Po = 900mW		2.1	3.0	V
Wavelength		λp	Po = 900mW	770		840	nm
Radiation angle (FWHM*)	Perpendicular to junction	$\theta_{\perp}$	Po = 900mW		28	40	Degree
	Parallel to junction	$\theta_{//}$			13	17	
Positional accuracy	Position	ΔX	Po = 900mW			± 300	μm
		ΔY, ΔZ				± 100	
	Angle	$\Delta \phi_{\perp}$				± 3	Degree
Slope efficiency		η_D	Po = 900mW	0.5	0.8		mW/mA

*FWHM : Full Width at Half Maximum

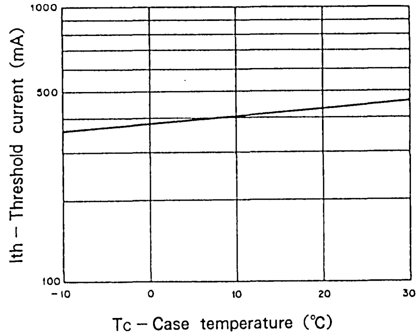
Mark



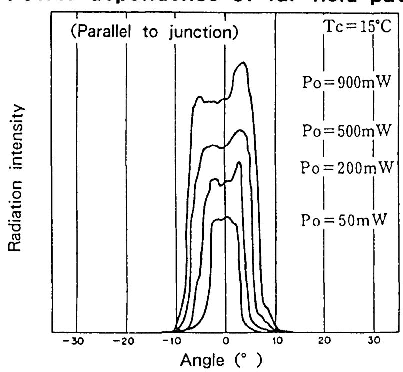
Radiant power output vs. Forward current



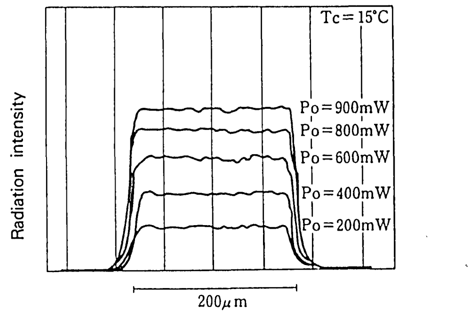
Threshold current vs. Temperature characteristics



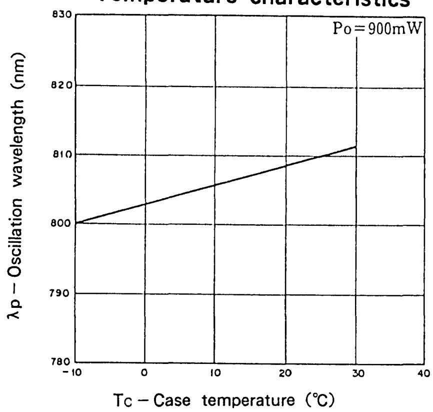
Power dependence of far field pattern



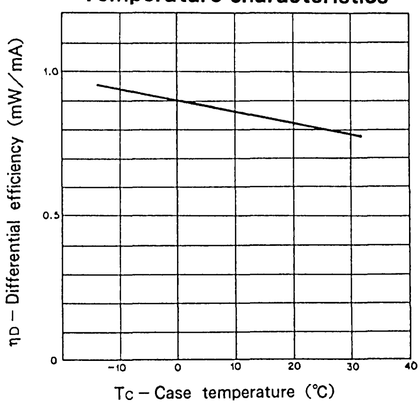
Power dependence of near field pattern



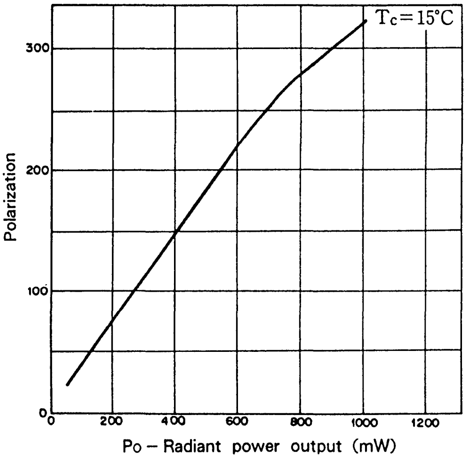
Oscillation wavelength vs. Temperature characteristics



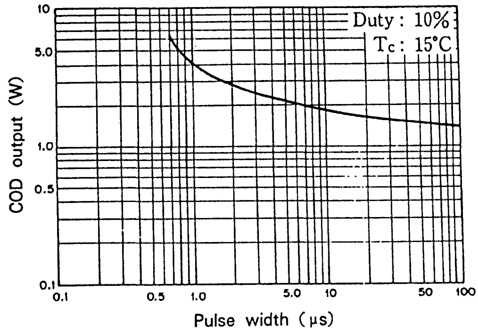
Slope efficiency vs. Temperature characteristics



Power dependence of polarization ratio

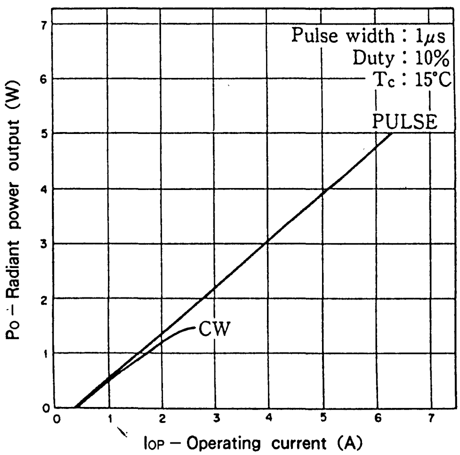


Pulse width dependence of COD* power

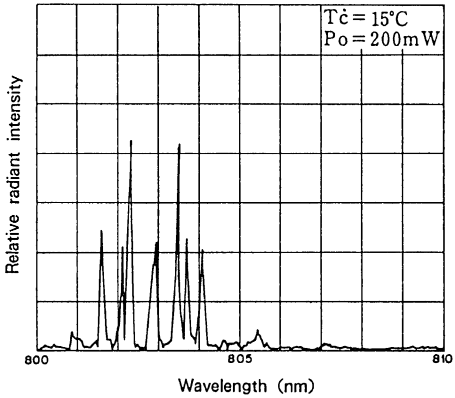


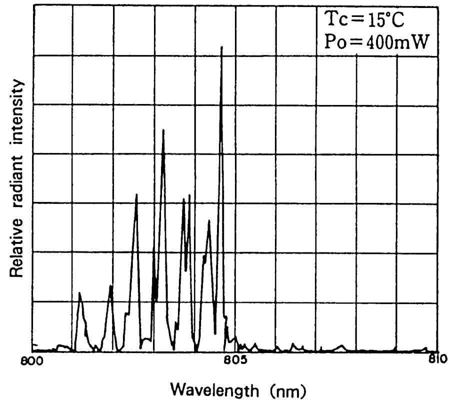
*COD (Catastrophic Optical Damage)

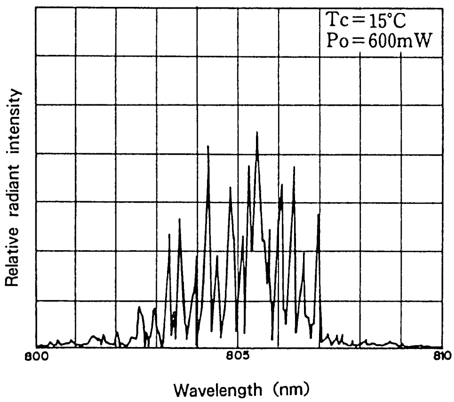
Radiant power output vs. Operating current

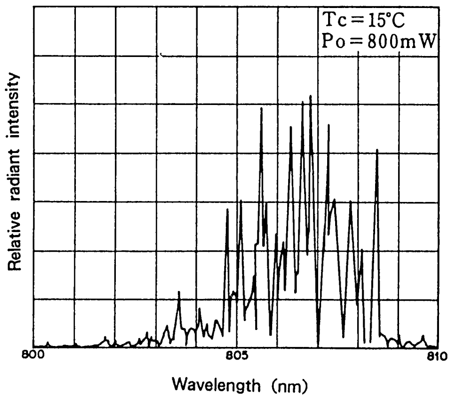


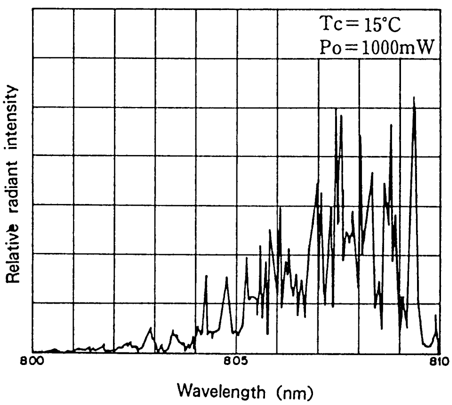
Power Dependence of Wavelength



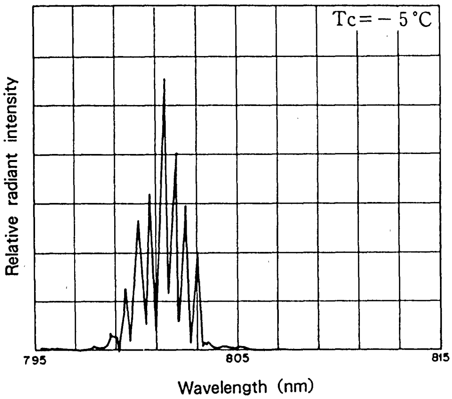


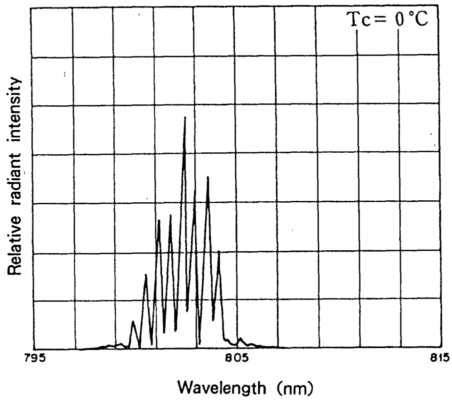


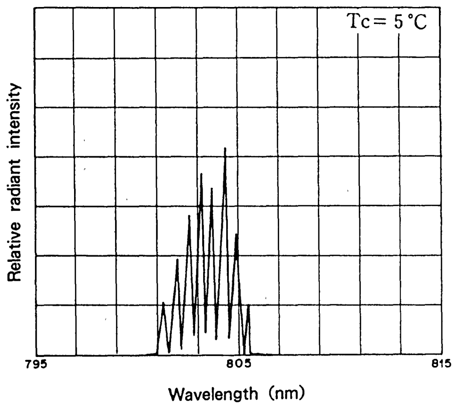


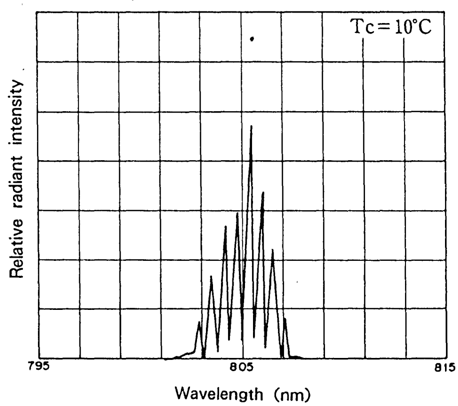


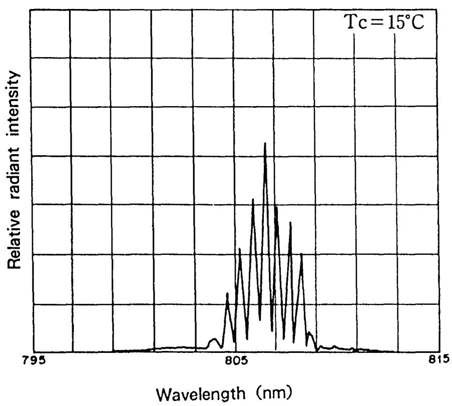
Temperature Dependence of Wavelength (Po = 900mW)

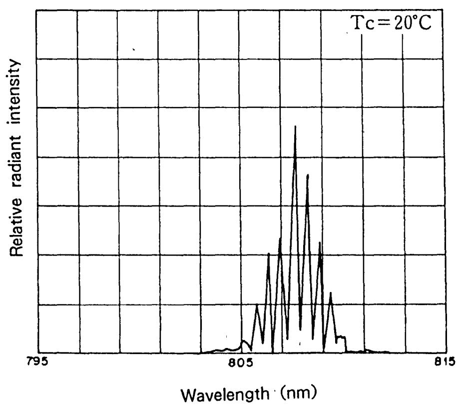












SONY® **SLU301VR**

80/70mW High Power Laser Diode with a Detachable Fiber

Description

SLU301VR is a high power laser diode based on the SLD301V with a detachable fiber.

Direct coupling to a fiber having an FC connector is possible without any optical adjustment.

Features

- Detachable fiber
- Built-in photo diode

Application

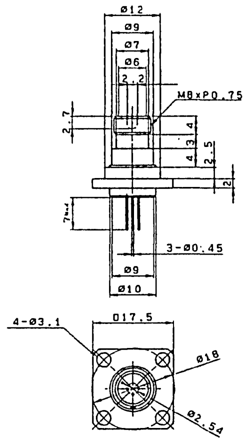
- Solid state laser pumping
- Medical uses

Structure

GaAlAs double hetero-type laser diode

Package Outline

Unit : mm



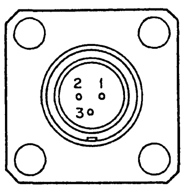
Absolute Maximum Ratings (Tc = 25°C)

		(Typ.) GI fiber Core dia. 200 μm NA = 0.2 L = 2m		(Option) GI fiber Core dia. 100 μm NA = 0.2 L = 2m	
• Radiant power output	Po	80	mW	70	mW
• Recommended radiant power output	Po	72	mW	63	mW
• Reverse voltage	V_R LD	2	V	2	V
	PD	15	V	15	V
• Operating temperature	Topr	−10 to +50	℃	−10 to +50	℃
• Storage temperature	Tstg	−40 to +85	℃	−40 to +85	℃

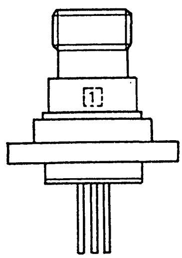
Pin Configuration

No.	Function
1	LD cathode
2	LD anode
3	COMMON

Bottom View



Mark



E89111A13 – ST

Electrical • Optical Characteristics (Tc = 25℃)

Item	Symbol	Condition*1	Min.	Typ.	Max.	Unit
Threshold current	Ith			150		mA
Operating current	Iop	a, b		300		mA
Operating voltage	Vop	a, b		1.9		V
Wavelength*2	λ p	a, b	770		840	nm
Radiation angle*3 (F.W.H.M)	X	a		10		degree
		b		10		degree
	Y	a		15		degree
		b		15		degree
Monitor current	Imon	a, b $V_R = 10V$		0.15		mA

Note)

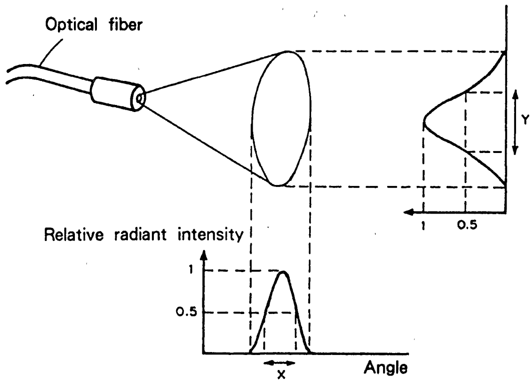
*1 a : Po = 72mW (Using standard fiber)
b : Po = 63mW (Using optional fiber)

*2 Classification of wavelength

Type	Wavelength (nm)
SLU301VR-1	785 ± 15
SLU301VR-2	810 ± 10
SLU301VR-3	830 ± 10

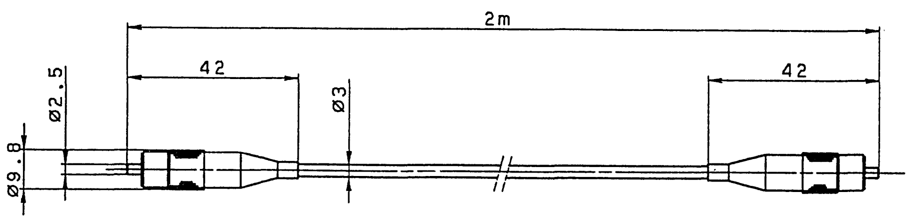
Type	Wavelength (nm)
SLU301VR-21	798 ± 3
24	807 ± 3
25	810 ± 3

*3 Radiation angle



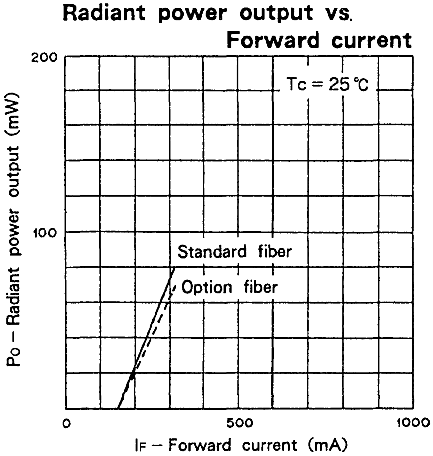
X : F.W.H.M of radiation beam in the narrow direction.
Y : F.W.H.M of radiation beam in the wide direction.

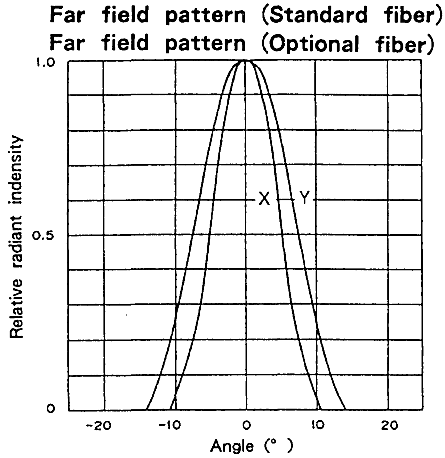
Fiber Package Outline



Unit : mm

Typical Characteristics (Tc = 25℃)





How to order the SLU300 series

When ordering please be sure to specify the required wavelength and type of optical fiber according to the below specifications.

SLU □□□ □□－□□－□□
(1) (2) (3) (4)

(1) LD chip 301 to 304
(2) Package VR, XR
(3) Wavelength category 1 to 3, 21, 24, 25
(4) Optical fiber 01 to 04

Combination of LD and Optical fiber

LD chip \ Optical fiber	01	02	03	04
301	O	O	×	×
302	O	O	×	×
303	×	×	O	O
304	×	×	O	O

O : Applicable
× : Not applicable

01, 03 : Standard fiber
02, 04 : Option fiber

Optical fiber specification

Code \ Item	Core dia. (μm)	NA	Length (m)
01	200	0.2	2
02	100	0.2	2
03	400	0.2	2
04	230	0.3	2

Example
For the purchase of SLU304XR (rank 25) with optical fiber of 400 μm core diameter

- SLU304XR – 25 – 03

SONY® SLU301XR

80/70mW High Power Laser Diode with a Detachable Fiber

Description

SLU301XR is a high power laser diode based on the SLD301XT with a detachable fiber.

Direct coupling to a fiber having an FC connector is possible without any optical adjustment.

Features

- Detachable fiber
- Built-in photo diode

Application

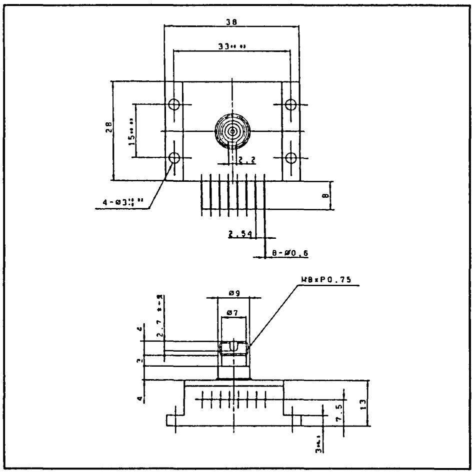
- Solid state laser pumping
- Medical uses

Structure

GaAlAs double hetero-type laser diode

Package Outline

Unit : mm



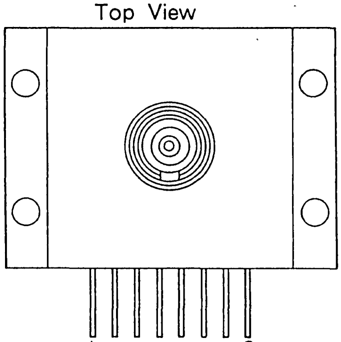
Absolute Maximum Ratings (Tth = 25°C)

		(Typ.) GI fiber Core dia. 200 µm NA = 0.2 L = 2m		(Option) GI fiber Core dia. 100 µm NA = 0.2 L = 2m	
• Radiant power output	Po	80	mW	70	mW
• Recommended radiant power output	Po	72	mW	63	mW
• Reverse voltage	V_R LD	2	V	2	V
	PD	15	V	15	V
• Operating temperature	Topr	−10 to +50	°C	−10 to +50	°C
• Storage temperature	Tstg	−40 to +85	°C	−40 to +85	°C
• TE cooler operating current	I_T	2.5	A	2.5	A

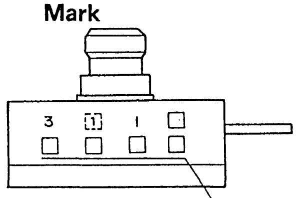
Pin Configuration

No.	Function
1	TE cooler (−)
2	Thermistor
3	Thermistor
4	LD anode
5	LD cathode
6	PD cathode
7	PD anode
8	TE cooler (+)

Top View



Mark



E89107A13 − ST

Electrical • Optical Characteristics (Tth = 25℃)

Item	Symbol	Condition*1	Min.	Typ.	Max.	Unit
Threshold current	Ith			150		mA
Operating current	Iop	a, b		300		mA
Operating voltage	Vop	a, b		1.9		V
Wavelength*2	λp	a, b	770		840	nm
Radiation angle*3 (F.W.H.M)	X	a		10		degree
		b		10		
	Y	a		15		
		b		15		
Monitor current	Imon	a, b $V_R = 10V$		0.15		mA
Thermistor resister	Rth	Tth = 25℃		10		kΩ

Note)

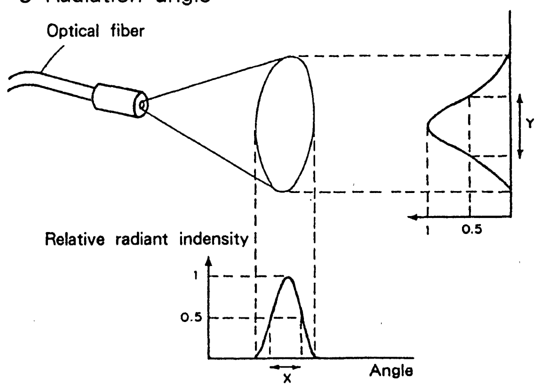
*1 a : Po = 72mW (Using standard fiber)
b : Po = 63mW (Using optional fiber)

*2 Classification of wavelength

Type	Wavelength (nm)
SLU301XR-1	785 ± 15
SLU301XR-2	810 ± 10
SLU301XR-3	830 ± 10

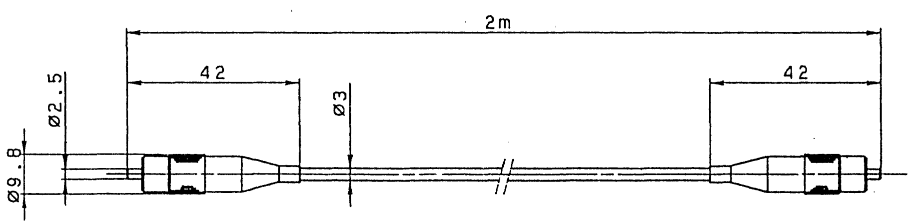
Type	Wavelength (nm)
SLU301XR-21	798 ± 3
24	807 ± 3
25	810 ± 3

*3 Radiation angle



X : F.W.H.M of radiation beam in the narrow direction.
Y : F.W.H.M of radiation beam in the wide direction.

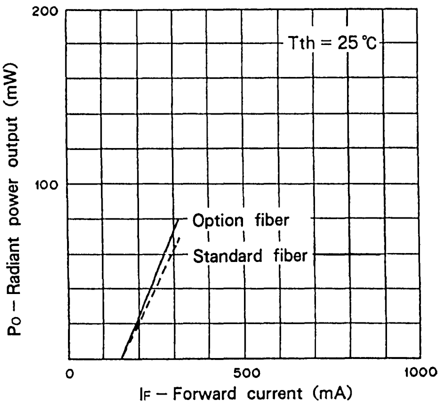
Fiber Package Outline



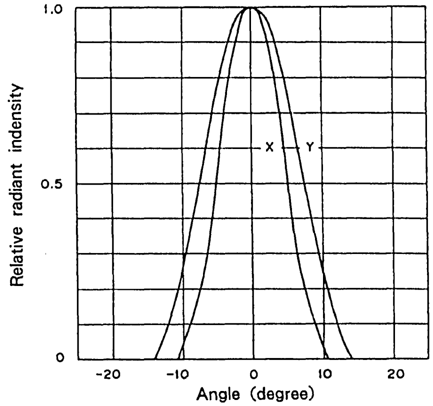
Unit : mm

Typical Characteristics (Tth = 25℃)

Radiant power output vs. Forward current

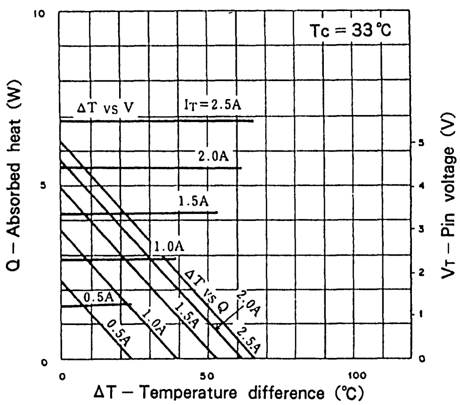


Far field pattern (Standard fiber) (Optional fiber)

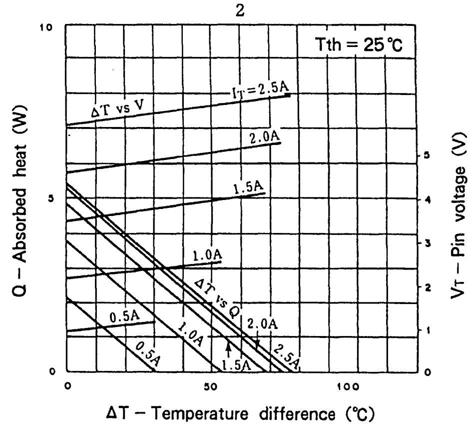


TE cooler characteristics

1

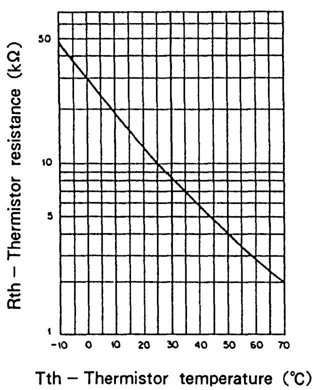


2



ΔT : Tc – Tth
Tth : Termistor temperature
Tc : Case temperature

Thermistor characteristics



How to order the SLU300 series

When ordering please be sure to specify the required wavelength and type of optical fiber according to the below specifications.

SLU □□□ □□−□□−□□
(1) (2) (3) (4)

(1) LD chip	301 to 304
(2) Package	VR, XR
(3) Wavelength category	1 to 3, 21, 24, 25
(4) Optical fiber	01 to 04

Combination of LD and Optical fiber

LD chip \ Optical fiber	01	02	03	04
301	○	○	×	×
302	○	○	×	×
303	×	×	○	○
304	×	×	○	○

○ : Applicable
× : Not applicable

01, 03 : Standard fiber
02, 04 : Option fiber

Optical fiber specification

Code \ Item	Core dia. (μm)	NA	Length (m)
01	200	0.2	2
02	100	0.2	2
03	400	0.2	2
04	230	0.3	2

Example
For the purchase of SLU304XR (rank 25) with optical fiber of 400 μm core diameter

- SLU304XR − 25 − 03

SONY®

SLU302VR

160/140mW High Power Laser Diode with a Detachable Fiber

Description

SLU302VR is a high power laser diode based on the SLD302V with a detachable fiber.

Direct coupling to a fiber having an FC connector is possible without any optical adjustment.

Features

- Detachable fiber
- Built-in photo diode

Application

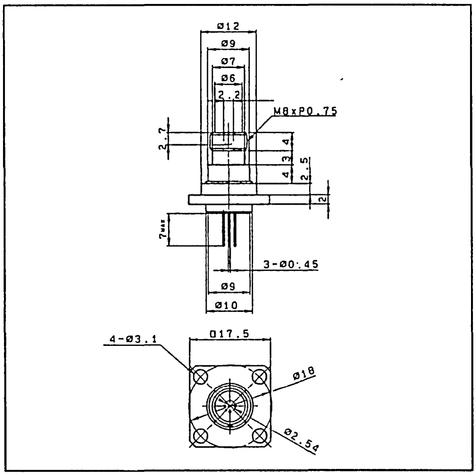
- Solid state laser pumping
- Medical uses

Structure

GaAlAs double hetero-type laser diode

Package Outline

Unit : mm



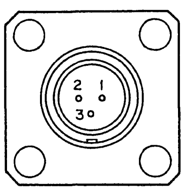
Absolute Maximum Ratings (Tc = 25 °C)

		(Typ.) GI fiber Core dia. 200 μm NA = 0.2 L = 2m		(Option) GI fiber Core dia. 100 μm NA = 0.2 L = 2m	
• Radiant power output	Po	160	mW	140	mW
• Recommended radiant power output	Po	144	mW	126	mW
• Reverse voltage	V_R LD	2	V	2	V
	PD	15	V	15	V
• Operating temperature	Topr	−10 to +50	°C	−10 to +50	°C
• Storage temperature	Tstg	−40 to +85	°C	−40 to +85	°C

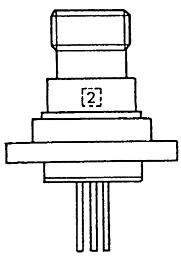
Pin Configuration

No.	Function
1	LD cathode
2	LD anode
3	COMMON

Bottom View



Mark



E89112A13 – ST

Electrical • Optical Characteristics (Tc = 25℃)

Item	Symbol	Condition*1	Min.	Typ.	Max.	Unit
Threshold current	Ith			150		mA
Operating current	Iop	a, b		400		mA
Operating voltage	Vop	a, b		1.9		V
Wavelength*2	λ p	a, b	770		840	nm
Radiation angle*3 (F.W.H.M)	X	a		10		degree
		b		10		
	Y	a		15		
		b		15		
Monitor current	Imon	a, b $V_R = 10V$		0.3		mA

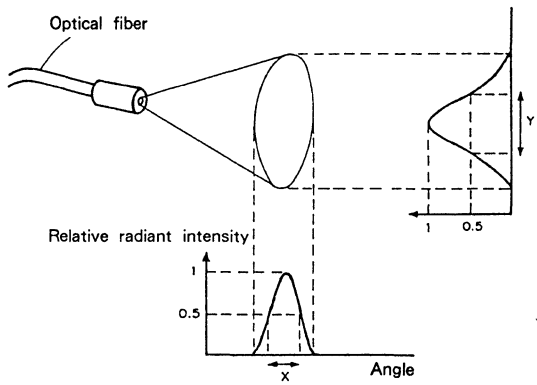
Note)
*1 a : Po = 144mW (Using standard fiber)
b : Po = 126mW (Using optional fiber)

*2 Classification of wavelength

Type	Wavelength (nm)
SLU302VR-1	785 ± 15
SLU302VR-2	810 ± 10
SLU302VR-3	830 ± 10

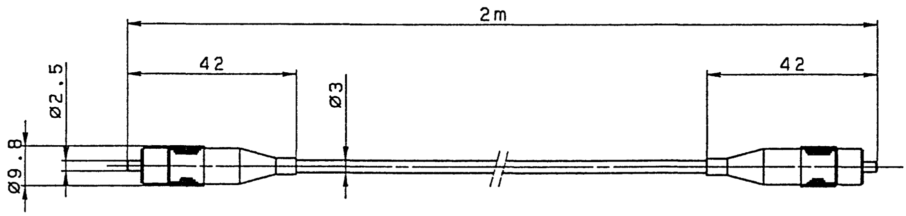
Type	Wavelength (nm)
SLU302VR-21	798 ± 3
24	807 ± 3
25	810 ± 3

*3 Radiation angle



X : F.W.H.M of radiation beam in the narrow direction.
Y : F.W.H.M of radiation beam in the wide direction.

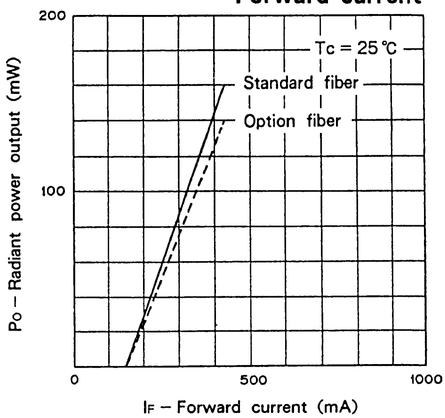
Fiber Package Outline



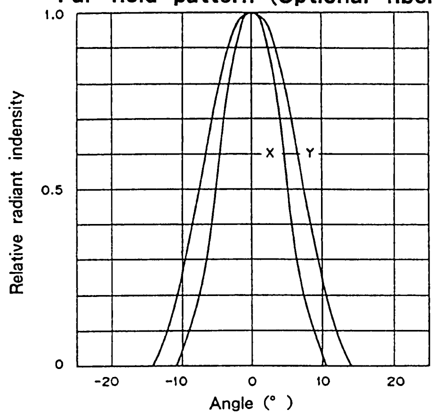
Unit : mm

Typical Characteristics (Tc = 25℃)

Radiant power output vs. Forward current



Far field pattern (Standard fiber)
Far field pattern (Optional fiber)



How to order the SLU300 series

When ordering please be sure to specify the required wavelength and type of optical fiber according to the below specifications.

SLU □□□ □□−□□−□□
(1) (2) (3) (4)

(1) LD chip — 301 to 304
(2) Package — VR, XR
(3) Wavelength category — 1 to 3, 21, 24, 25
(4) Optical fiber — 01 to 04

Combination of LD and Optical fiber

LD chip \ Optical fiber	01	02	03	04
301	○	○	×	×
302	○	○	×	×
303	×	×	○	○
304	×	×	○	○

○ : Applicable
× : Not applicable

01, 03 : Standard fiber
02, 04 : Option fiber

Optical fiber specification

Code \ Item	Core dia. (μm)	NA	Length (m)
01	200	0.2	2
02	100	0.2	2
03	400	0.2	2
04	230	0.3	2

Example
For the purchase of SLU304XR (rank 25) with optical fiber of 400 μm core diameter

- SLU304XR − 25 − 03

SONY	**SLU302XR**

160/140mW High Power Laser Diode with a Detachable Fiber

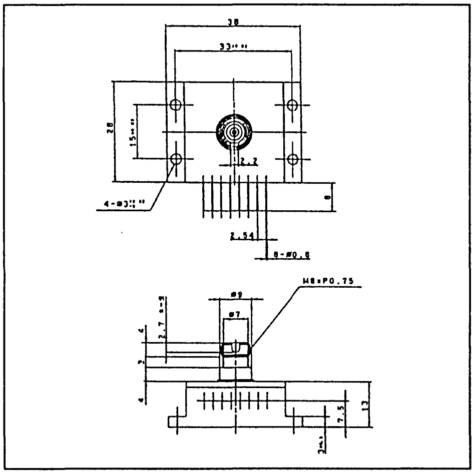
Description
SLU302XR is a high power laser diode based on the SLD302XT with a detachable fiber.
Direct coupling to a fiber having an FC connector is possible without any optical adjustment.

Features
- Detachable fiber
- Built-in photo diode

Application
- Solid state laser pumping
- Medical uses

Structure
GaAlAs double hetero-type laser diode

Package Outline
Unit : mm



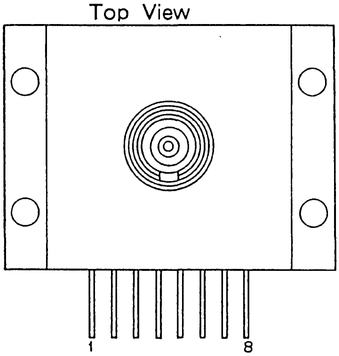
Absolute Maximum Ratings (Tth = 25°C)

		(Typ.) GI fiber Core dia. 200 µm NA = 0.2 L = 2m		(Option) GI fiber Core dia. 100 µm NA = 0.2 L = 2m	
• Radiant power output	Po	160	mW	140	mW
• Recommended radiant power output	Po	144	mW	126	mW
• Reverse voltage	VR LD	2	V	2	V
	PD	15	V	15	V
• Operating temperature	Topr	−10 to +50	°C	−10 to +50	°C
• Storage temperature	Tstg	−40 to +85	°C	−40 to +85	°C
• TE cooler operating current	IT	2.5	A	2.5	A

Pin Configuration

No.	Function
1	TE cooler (−)
2	Thermistor
3	Thermistor
4	LD anode
5	LD cathode
6	PD cathode
7	PD anode
8	TE cooler (+)

Top View



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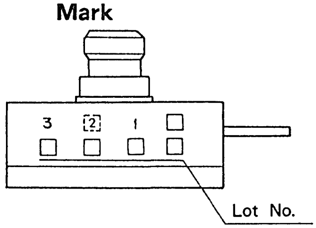


E89108A13 – ST

Electrical • Optical Characteristics (Tth = 25℃)

Item	Symbol	Condition*1	Min.	Typ.	Max.	Unit
Threshold current	Ith			150		mA
Operating current	Iop	a, b		400		mA
Operating voltage	Vop	a, b		1.9		V
Wavelength*2	λ p	a, b	770		840	nm
Radiation angle*3 (F.W.H.M)	X	a		10		degree
		b		10		
	Y	a		15		
		b		15		
Monitor current	Imon	a, b V_R = 10V		0.3		mA
Thermistor resister	Rth	Tth = 25℃		10		kΩ

Note)

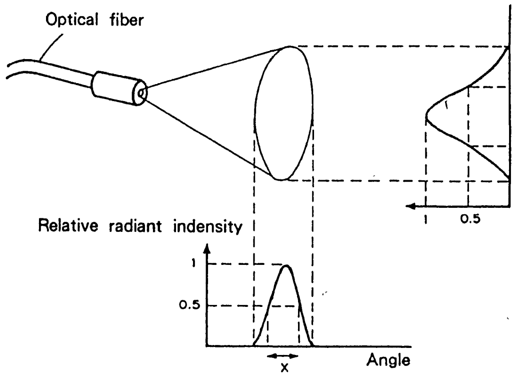
*1 a : Po = 144mW (Using standard fiber)
b : Po = 126mW (Using optional fiber)

*2 Classification of wavelength

Type	Wavelength (nm)
SLU302XR-1	785 ± 15
SLU302XR-2	810 ± 10
SLU302XR-3	830 ± 10

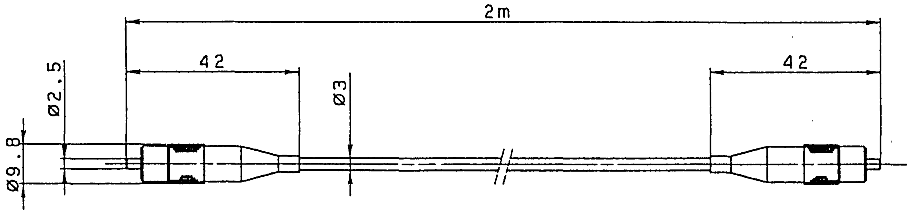
Type	Wavelength (nm)
SLU302XR-21	798 ± 3
24	807 ± 3
25	810 ± 3

*3 Radiation angle



X : F.W.H.M of radiation beam in the narrow direction.
Y : F.W.H.M of radiation beam in the wide direction.

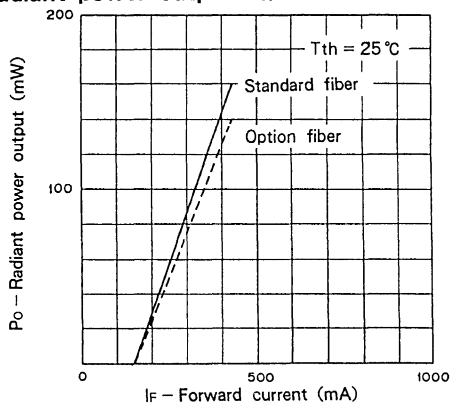
Fiber Package Outline



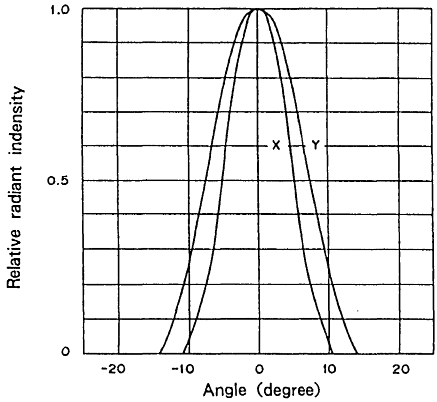
Unit : mm

Typical Characteristics (Tth = 25℃)

Radiant power output vs. Forward current

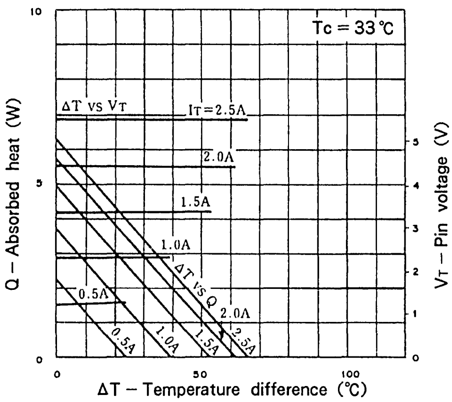


Far field pattern
(Standard fiber) (Optional fiber)



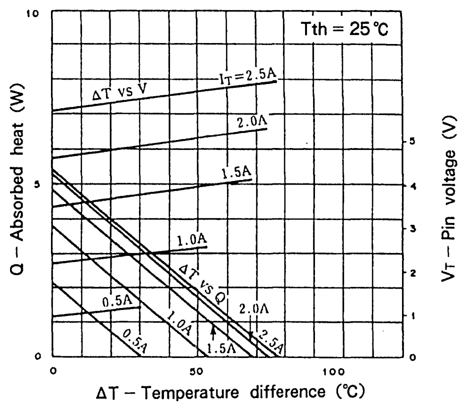
TE cooler characteristics

1

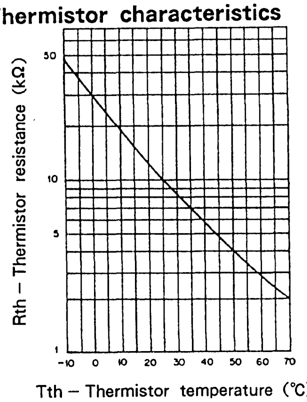


ΔT : Tc – Tth
Tth : Termistor temperature
Tc : Case temperature

2



Thermistor characteristics



How to order the SLU300 series

When ordering please be sure to specify the required wavelength and type of optical fiber according to the below specifications.

SLU □□□ □□−□□−□□
(1) (2) (3) (4)

(1) LD chip 301 to 304
(2) Package VR, XR
(3) Wavelength category 1 to 3, 21, 24, 25
(4) Optical fiber 01 to 04

Combination of LD and Optical fiber

LD chip \ Optical fiber	01	02	03	04
301	O	O	×	×
302	O	O	×	×
303	×	×	O	O
304	×	×	O	O

O : Applicable
× : Not applicable

01, 03 : Standard fiber
02, 04 : Option fiber

Optical fiber specification

Code \ Item	Core dia. (μm)	NA	Length (m)
01	200	0.2	2
02	100	0.2	2
03	400	0.2	2
04	230	0.3	2

Example
For the purchase of SLU304XR (rank 25) with optical fiber of 400 μm core diameter

- SLU304XR − 25 − 03

SONY **SLU303VR**

400/350mW High Power Laser Diode with a Detachable Fiber

Description

SLU303VR is a high power laser diode based on the SLD303V with a detachable fiber.

Direct coupling to a fiber having an FC connector is possible without any optical adjustment.

Features

- Detachable fiber
- Built-in photo diode

Application

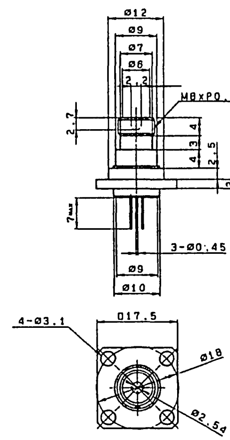
- Solid state laser pumping
- Medical uses

Structure

GaAlAs double hetero-type laser diode

Package Outline

Unit : mm



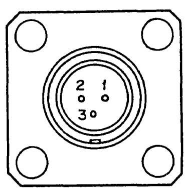
Absolute Maximum Ratings (Tc = 25°C)

		(Typ.) GI fiber Core dia. 400 μm NA = 0.2 L = 2m		(Option) GI fiber Core dia. 230 μm NA = 0.3 L = 2m	
Radiant power output	Po	400	mW	350	mW
Recommended radiant power output	Po	360	mW	315	mW
Reverse voltage	VR LD	2	V	2	V
	PD	15	V	15	V
Operating temperature	Topr	−10 to +30	°C	−10 to +30	°C
Storage temperature	Tstg	−40 to +85	°C	−40 to +85	°C

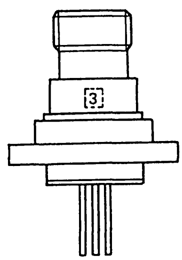
Pin Configuration

No.	Function
1	LD cathode
2	LD anode
3	COMMON

Bottom View



Mark



E89113A13–ST

Electrical • Optical Characteristics (Tc = 25℃)

Item	Symbol	Condition*1	Min.	Typ.	Max.	Unit
Threshold current	Ith			450		mA
Operating current	Iop	a, b		1100		mA
Operating voltage	Vop	a, b		1.9		V
Wavelength*2	λ p	a, b	770		840	nm
Radiation angle*3 (F.W.H.M)	X	a		10		degree
		b		12		
	Y	a		15		
		b		28		
Monitor current	Imon	a, b V_R = 10V		0.8		mA

Note)

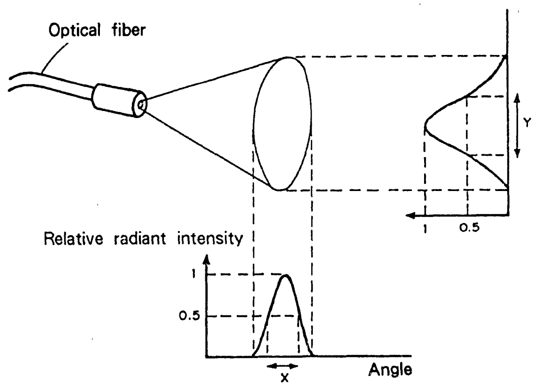
*1 a : Po = 360mW (Using standard fiber)
b : Po = 315mW (Using optional fiber)

*2 Classification of wavelength

Type	Wavelength (nm)
SLU303VR-1	785 ± 15
SLU303VR-2	810 ± 10
SLU303VR-3	830 ± 10

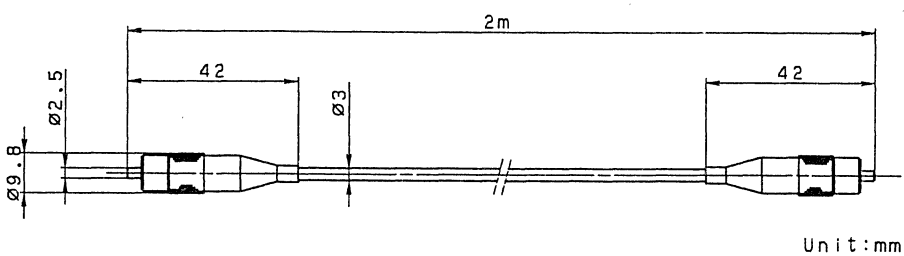
Type	Wavelength (nm)
SLU303VR-21	798 ± 3
24	807 ± 3
25	810 ± 3

*3 Radiation angle



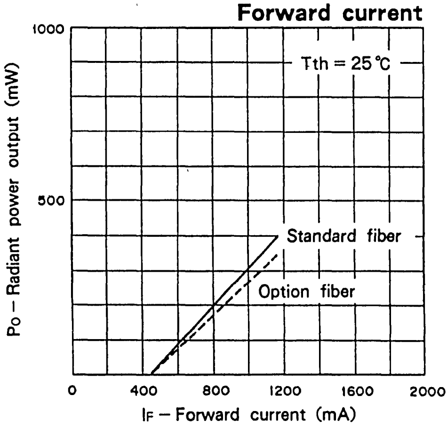
X : F.W.H.M of radiation beam in the narrow direction.
Y : F.W.H.M of radiation beam in the wide direction.

Fiber Package Outline

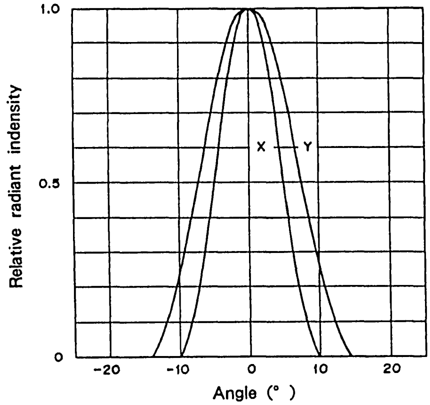


Typical Characteristics (Tc = 25℃)

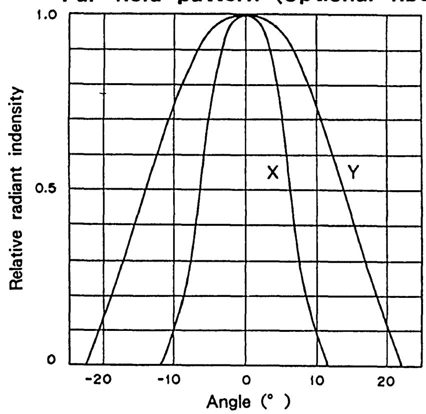
Radiant power output vs. Forward current



Far field pattern (Standard fiber)



Far field pattern (Optional fiber)



How to order the SLU300 series

When ordering please be sure to specify the required wavelength and type of optical fiber according to the below specifications.

SLU □□□ □□–□□–□□
(1) (2) (3) (4)

(1) LD chip 301 to 304
(2) Package VR, XR
(3) Wavelength category 1 to 3, 21, 24, 25
(4) Optical fiber 01 to 04

Combination of LD and Optical fiber

LD chip \ Optical fiber	01	02	03	04
301	O	O	×	×
302	O	O	×	×
303	×	×	O	O
304	×	×	O	O

O : Applicable
× : Not applicable

01, 03 : Standard fiber
02, 04 : Option fiber

Optical fiber specification

Code \ Item	Core dia. (μm)	NA	Length (m)
01	200	0.2	2
02	100	0.2	2
03	400	0.2	2
04	230	0.3	2

Example
For the purchase of SLU304XR (rank 25) with optical fiber of 400 μm core diameter

- SLU304XR – 25 – 03

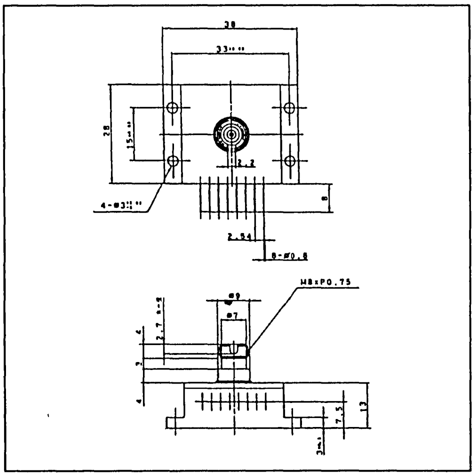
SONY®	SLU303XR

SLU303XR

400/350mW High Power Laser Diode with a Detachable Fiber

Description
SLU303XR is a high power laser diode based on the SLD303XT with a detachable fiber.
Direct coupling to a fiber having an FC connector is possible without any optical adjustment.

Package Outline
Unit : mm



Features
- Detachable fiber
- Built-in photo diode

Application
- Solid state laser pumping
- Medical uses

Structure
GaAlAs double hetero-type laser diode

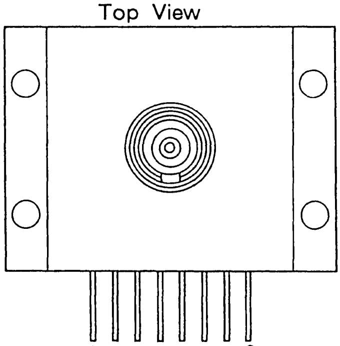
Absolute Maximum Ratings (Tth = 25°C)

			(Typ.) GI fiber Core dia. 400 μm NA = 0.2 L = 2m		(Option) GI fiber Core dia. 230 μm NA = 0.3 L = 2m	
• Radiant power output	Po		400	mW	350	mW
• Recommended radiant power output	Po		360	mW	315	mW
• Reverse voltage	VR	LD	2	V	2	V
		PD	15	V	15	V
• Operating temperature	Topr		−10 to +30	°C	−10 to +30	°C
• Storage temperature	Tstg		−40 to +85	°C	−40 to +85	°C
• TE cooler operating current	IT		2.5	A	2.5	A

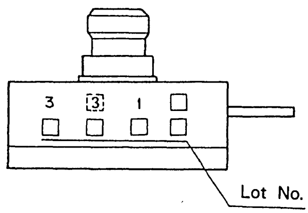
Pin Configuration

No.	Function
1	TE cooler (−)
2	Thermistor
3	Thermistor
4	LD anode
5	LD cathode
6	PD cathode
7	PD anode
8	TE cooler (+)

Top View



Mark



E89109A13 – ST

Electrical • Optical Characteristics (Tth = 25℃)

Item	Symbol	Condition*1	Min.	Typ.	Max.	Unit
Threshold current	Ith			450		mA
Operating current	Iop	a, b		1100		mA
Operating voltage	Vop	a, b		1.9		V
Wavelength*2	λ p	a, b	770		840	nm
Radiation angle*3 (F.W.H.M)	X	a		10		degree
		b		12		
	Y	a		15		
		b		28		
Monitor current	Imon	a, b V_R = 10V		0.8		mA
Thermistor resister	Rth	Tth = 25℃		10		kΩ

Note)

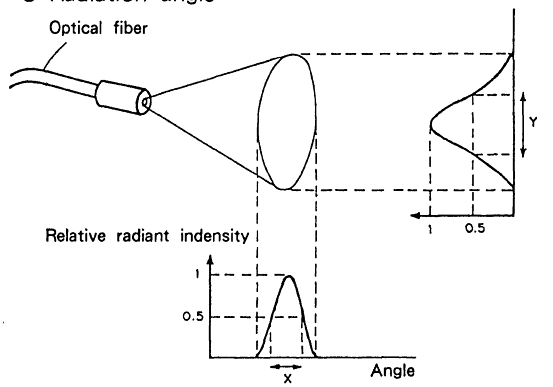
*1 a : Po = 360mW (Using standard fiber)
b : Po = 315mW (Using optional fiber)

*2 Classification of wavelength

Type	Wavelength (nm)
SLU303XR-1	785 ± 15
SLU303XR-2	810 ± 10
SLU303XR-3	830 ± 10

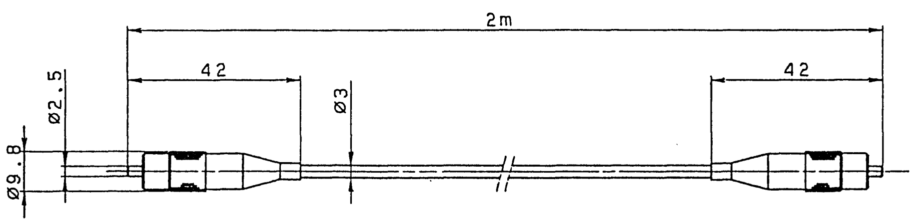
Type	Wavelength (nm)
SLU303XR-21	798 ± 3
24	807 ± 3
25	810 ± 3

*3 Radiation angle



X : F.W.H.M of radiation beam in the narrow direction.
Y : F.W.H.M of radiation beam in the wide direction.

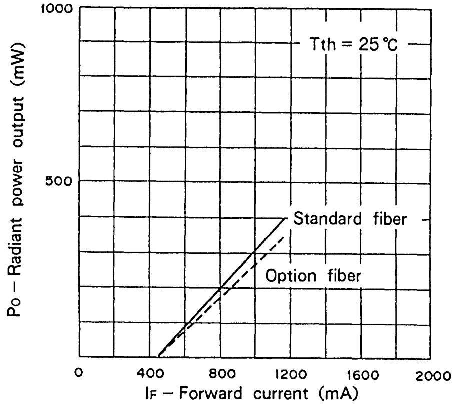
Fiber Package Outline



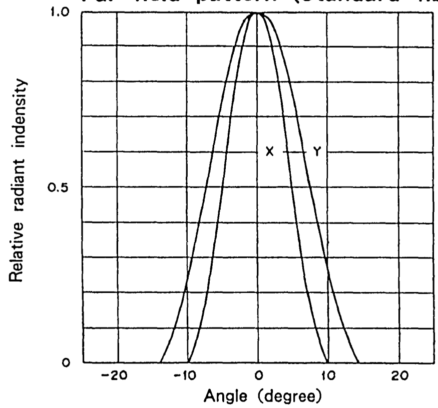
Unit : mm

Typical Characteristics (Tth = 25℃)

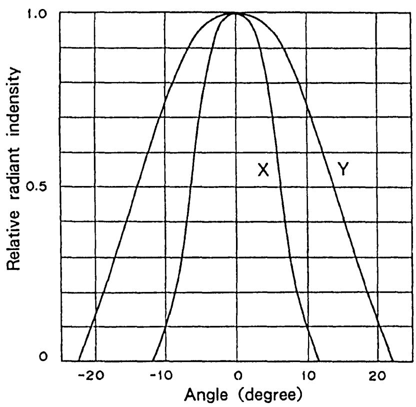
Radiant power output vs. Forward current



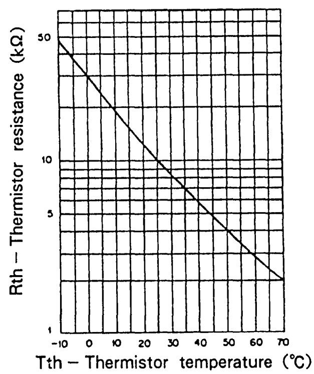
Far field pattern (Standard fiber)



Far field pattern (Optional fiber)

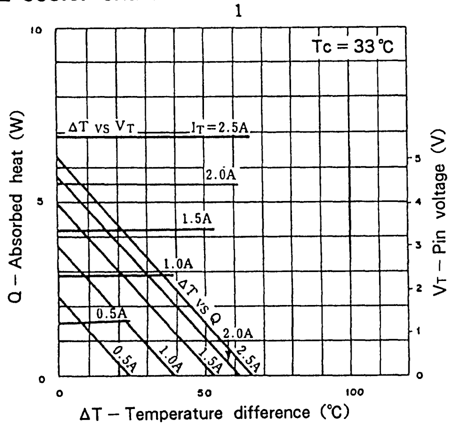


Thermistor characteristics

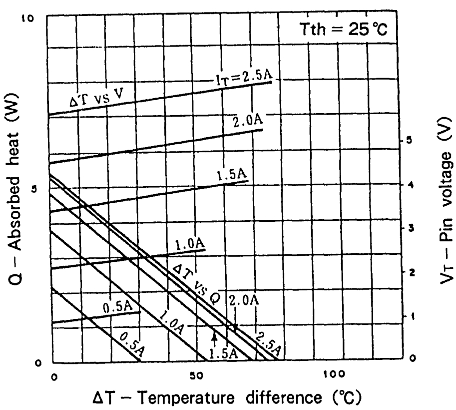


TE cooler characteristics

1



2



ΔT : Tc – Tth
Tth : Termistor temperature
Tc : Case temperature

How to order the SLU300 series

When ordering please be sure to specify the required wavelength and type of optical fiber according to the below specifications.

SLU □□□ □□-□□-□□
(1) (2) (3) (4)

(1) LD chip 301 to 304
(2) Package VR, XR
(3) Wavelength category 1 to 3, 21, 24, 25
(4) Optical fiber 01 to 04

Combination of LD and Optical fiber

LD chip \ Optical fiber	01	02	03	04
301	O	O	×	×
302	O	O	×	×
303	×	×	O	O
304	×	×	O	O

O : Applicable
× : Not applicable

01, 03 : Standard fiber
02, 04 : Option fiber

Optical fiber specification

Code \ Item	Core dia. (μm)	NA	Length (m)
01	200	0.2	2
02	100	0.2	2
03	400	0.2	2
04	230	0.3	2

Example
For the purchase of SLU304XR (rank 25) with optical fiber of 400 μm core diameter

- SLU304XR – 25 – 03

SONY | # SLU304VR

800/700mW High Power Laser Diode with a Detachable Fiber

Description
SLU304VR is a high power laser diode based on the SLD304V with a detachable fiber.
Direct coupling to a fiber having an FC connector is possible without any optical adjustment.

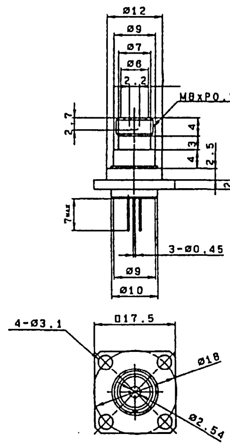
Features
- Detachable fiber
- Built-in photo diode

Application
- Solid state laser pumping
- Medical uses

Structure
GaAlAs double hetero-type laser diode

Package Outline

Unit : mm



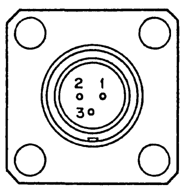
Absolute Maximum Ratings (Tc = 15°C)

			(Typ.) GI fiber Core dia. 400 μm NA = 0.2 L = 2m		(Option) GI fiber Core dia. 230 μm NA = 0.3 L = 2m	
• Radiant power output	Po		800	mW	700	mW
• Recommended radiant power output	Po		720	mW	630	mW
• Reverse voltage	V_R	LD	2	V	2	V
		PD	15	V	15	V
• Operating temperature	Topr		−10 to +30	°C	−10 to +30	°C
• Storage temperature	Tstg		−40 to +85	°C	−40 to +85	°C

Pin Configuration

No.	Function
1	LD cathode
2	LD anode
3	COMMON

Bottom View



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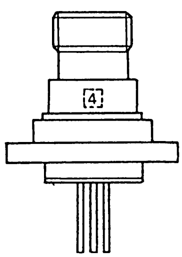


E89114A13 – ST

Electrical • Optical Characteristics (Tc = 15℃)

Item	Symbol	Condition*1	Min.	Typ.	Max.	Unit
Threshold current	Ith			450		mA
Operating current	Iop	a, b		1400		mA
Operating voltage	Vop	a, b		2.1		V
Wavelength*2	λ p	a, b	770		840	nm
Radiation angle*3 (F.W.H.M)	X	a		10		degree
		b		13		degree
	Y	a		15		degree
		b		28		degree
Monitor current	Imon	a, b V_R = 10V		1.5		mA

Note)

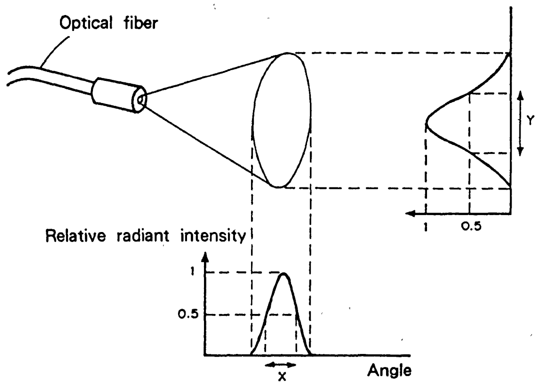
*1 a : Po = 720mW (Using standard fiber)
b : Po = 630mW (Using optional fiber)

*2 Classification of wavelength

Type	Wavelength (nm)
SLU304VR-1	785 ± 15
SLU304VR-2	810 ± 10
SLU304VR-3	830 ± 10

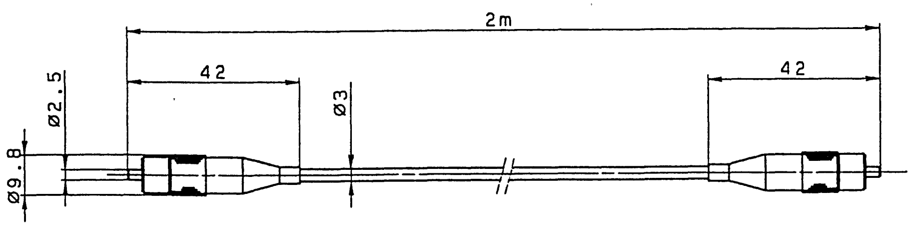
Type	Wavelength (nm)
SLU304VR-21	798 ± 3
24	807 ± 3
25	810 ± 3

*3 Radiation angle



X : F.W.H.M of radiation beam in the narrow direction.
Y : F.W.H.M of radiation beam in the wide direction.

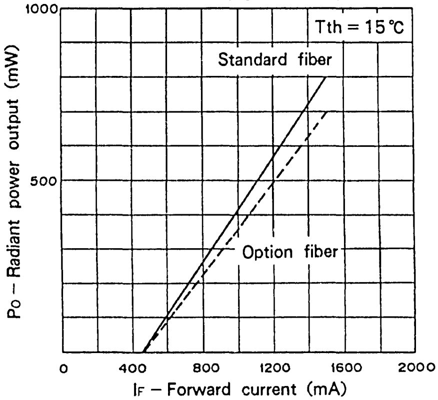
Fiber Package Outline



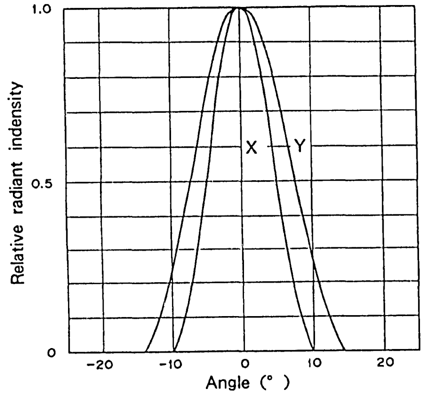
Unit : mm

Typical Characteristics (Tc = 15℃)

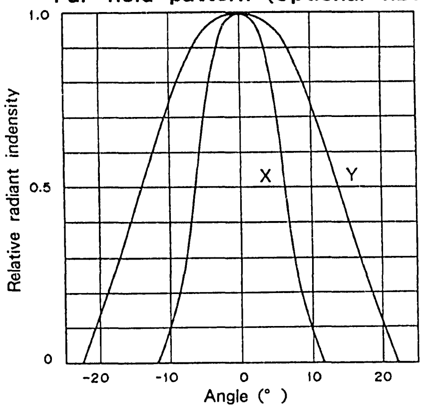
Radiant power output vs. Forward current



Far field pattern (Standard fiber)



Far field pattern (Optional fiber)



How to order, the SLU300 series

When ordering please be sure to specify the required wavelength and type of optical fiber according to the below specifications.

SLU □□□ □□−□□−□□
(1) (2) (3) (4)

(1) LD chip	301 to 304
(2) Package	VR, XR
(3) Wavelength category	1 to 3, 21, 24, 25
(4) Optical fiber	01 to 04

Combination of LD and Optical fiber

LD chip \ Optical fiber	01	02	03	04
301	O	O	×	×
302	O	O	×	×
303	×	×	O	O
304	×	×	O	O

O : Applicable
× : Not applicable

01, 03 : Standard fiber
02, 04 : Option fiber

Optical fiber specification

Code \ Item	Core dia. (μm)	NA	Length (m)
01	200	0.2	2
02	100	0.2	2
03	400	0.2	2
04	230	0.3	2

Example
For the purchase of SLU304XR (rank 25) with optical fiber of 400 μm core diameter

- SLU304XR − 25 − 03

SONY® **SLU304XR**

800/700mW High Power Laser Diode with a Detachable Fiber

Description

SLU304XR is a high power laser diode based on the SLD304XT with a detachable fiber.

Direct coupling to a fiber having an FC connector is possible without any optical adjustment.

Features

- Detachable fiber
- Built-in photo diode

Application

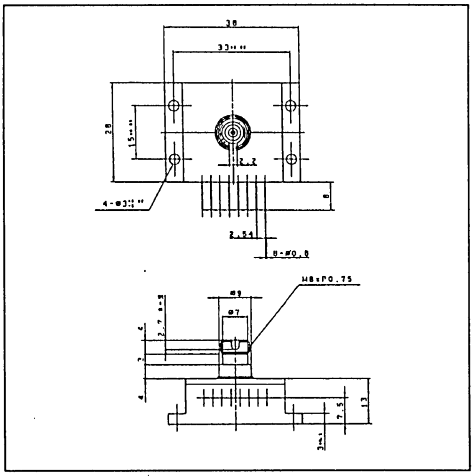
- Solid state laser pumping
- Medical uses

Structure

GaAlAs double hetero-type laser diode

Package Outline

Unit : mm



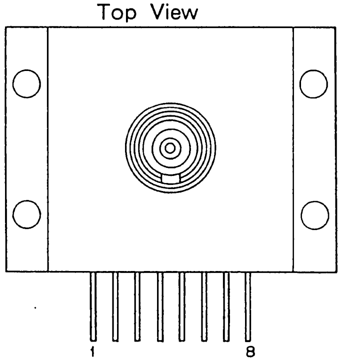
Absolute Maximum Ratings (Tth = 25℃)

			(Typ.) GI fiber Core dia. 400 μm NA = 0.2 L = 2m		(Option) GI fiber Core dia. 230 μm NA = 0.3 L = 2m	
• Radiant power output	Po		800	mW	700	mW
• Recommended radiant power output	Po		720	mW	630	mW
• Reverse voltage	V_R	LD	2	V	2	V
		PD	15	V	15	V
• Operating temperature	Topr		−10 to +30	℃	−10 to +30	℃
• Storage temperature	Tstg		−40 to +85	℃	−40 to +85	℃
• TE cooler operating current	I_T		2.5	A	2.5	A

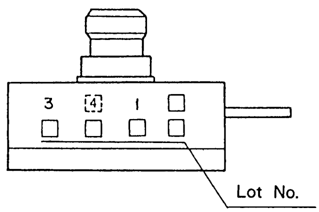
Pin Configuration

No.	Function
1	TE cooler (−)
2	Thermistor
3	Thermistor
4	LD anode
5	LD cathode
6	PD cathode
7	PD anode
8	TE cooler (+)

Top View



Mark



E89110A13 – ST

Electrical • Optical Characteristics (Tth = 25℃)

Item	Symbol	Condition*1	Min.	Typ.	Max.	Unit
Threshold current	Ith			550		mA
Operating current	Iop	a, b		1600		mA
Operating voltage	Vop	a, b		2.1		V
Wavelength*2	λ p	a, b	770		840	nm
Radiation angle*3 (F.W.H.M)	X	a		10		degree
		b		13		degree
	Y	a		15		degree
		b		28		degree
Monitor current	Imon	a, b V_R = 10V		1.5		mA
Thermistor resister	Rth	Tth = 25℃		10		kΩ

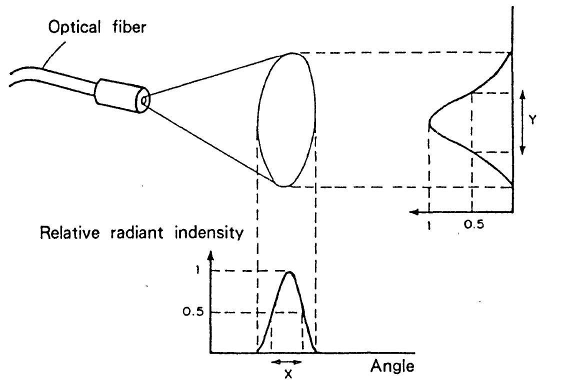
Note)
*1 a : Po = 720mW (Using standard fiber)
b : Po = 630mW (Using optional fiber)

*2 Classification of wavelength

Type	Wavelength (nm)
SLU304XR-1	785 ± 15
SLU304XR-2	810 ± 10
SLU304XR-3	830 ± 10

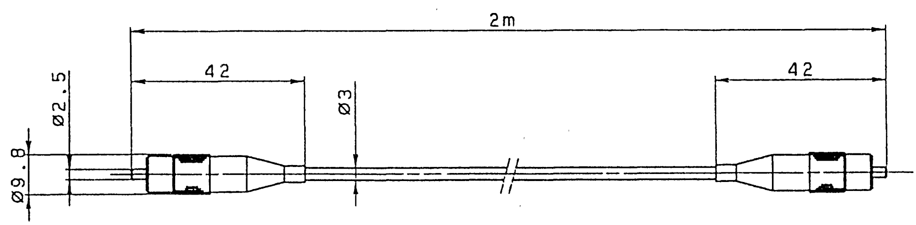
Type	Wavelength (nm)
SLU304XR-21	798 ± 3
24	807 ± 3
25	810 ± 3

*3 Radiation angle



X : F.W.H.M of radiation beam in the narrow direction.
Y : F.W.H.M of radiation beam in the wide direction.

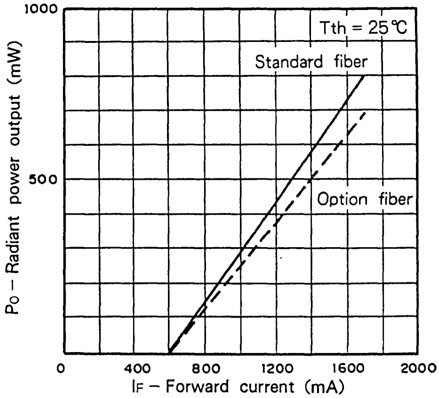
Fiber Package Outline



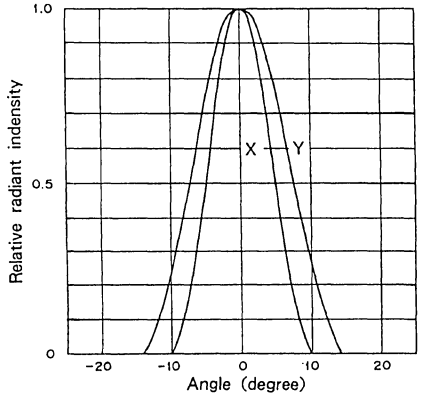
Unit : mm

Typical Characteristics (Tth = 25°C)

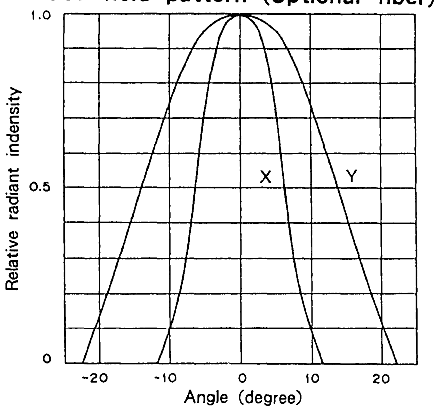
Radiant power output vs. Forward current



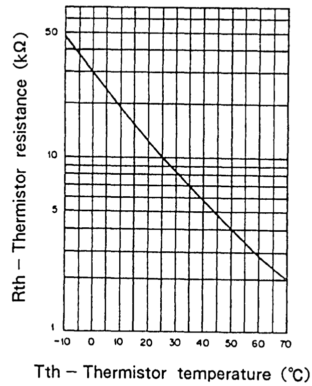
Far field pattern (Standard fiber)



Far field pattern (Optional fiber)

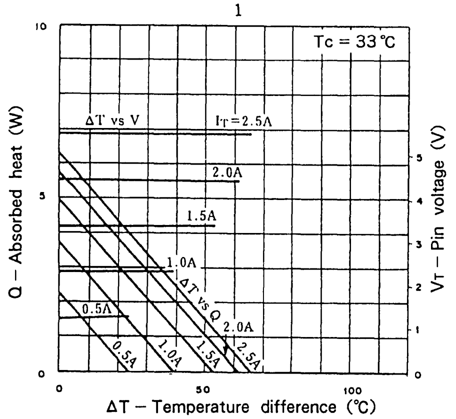


Thermistor characteristics



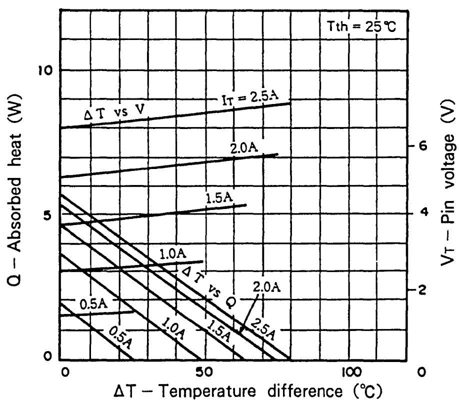
TE cooler characteristics

1



ΔT : Tc – Tth
Tth : Termistor temperature
Tc : Case temperature

2



How to order the SLU300 series

When ordering please be sure to specify the required wavelength and type of optical fiber according to the below specifications.

SLU □□□ □□–□□–□□
(1) (2) (3) (4)

(1) LD chip	301 to 304
(2) Package	VR, XR
(3) Wavelength category	1 to 3, 21, 24, 25
(4) Optical fiber	01 to 04

Combination of LD and Optical fiber

LD chip \ Optical fiber	01	02	03	04
301	○	○	×	×
302	○	○	×	×
303	×	×	○	○
304	×	×	○	○

○ : Applicable
× : Not applicable

01, 03 : Standard fiber
02, 04 : Option fiber

Optical fiber specification

Code \ Item	Core dia. (μm)	NA	Length (m)
01	200	0.2	2
02	100	0.2	2
03	400	0.2	2
04	230	0.3	2

Example
For the purchase of SLU304XR (rank 25) with optical fiber of 400 μm core diameter

- SLU304XR – 25 – 03

Si FETs

3) Si FETs

Type	Package	Structure	Applications	Voltage (V)	Page
2SK125	3P TO-92	N-channel J. FET	UHF amplifier, mixer, oscillator	10	215
2SK152	3P TO-92	N-channel J. FET	Audio frequency amplifier, high frequency amplifier	5	224
2SK300	3P Mini mold	N-channel J. FET	Audio frequency amplifier, high frequency amplifier	5	231
2SK613	3P Mini mold	N-channel J. FET	Audio frequency amplifier, high frequency amplifier	5	237
CXD7500M	8P SOP	P-channel MOS FET	Voltage control type variable resistor	10	245

SONY® **2SK125**

Silicon N-Channel Junction FET

Description

The 2SK125 is an N-Channel silicon junction type field effect transistor developed for low-noise amplification at frequencies up to UHF. It is especially suitable for when a wide dynamic range is required.

Features

- High power gain
  12.5 dB (Typ.)
  (f = 100 MHz Gate grounded)
- Low noise figure
  1.5 dB (Typ.)
  (f = 100 MHz Gate grounded)
- Wide dynamic range
  3rd intermodulation distortion
  −52 dB (Typ.)
  (f = 100 MHz at 100 dBμ input)
- Small inverse transfer coefficient
  $|S_{12}|$ = 0.035 (Typ.)
  (f = 500 MHz Gate grounded)

Structure

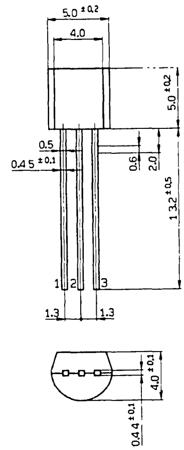
Silicon N-Channel junction FET.

Application

UHF band amplification, mixing, oscillation, analog switches.

Package Outline

Unit: mm



1. Source
2. Gate
3. Drain

M-230

Absolute Maximum Ratings (Ta = 25°C)

• Drain to gate voltage	V_{DGO}	35	V
• Source to gate voltage	V_{SGO}	35	V
• Drain current	I_D	100	mA
• Gate current	I_G	10	mA
• Channel temperature	Tj	120	°C
• Storage temperature	Tstg	−50 to +120	°C
• Allowable power dissipation	P_D	300	mW

51044A-TO

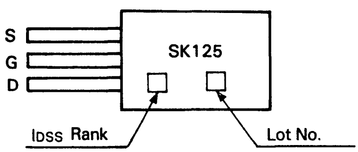
Electrical Characteristics

Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Gate cutoff current	I_{GSS}	V_{GS} = −15V, V_{DS} = 0			−10	nA
Gate to source voltage	V_{GSS}	I_G = 10μA, V_{DS} = 0	−35			V
Drain current	I_{DSS}	V_{DS} = 10V, V_{GS} = 0 P.W = 300μs	40		75	mA
Gate to source cutoff voltage	$V_{GS(OFF)}$	V_{DS} = 10V, I_D = 100μA	−2		−6	V
Forward transfer conductance	$\|Y_{fs}\|$	V_{DS} = 10V, I_D = 10mA f = 1 kHz	10	14		mS
Reverse transfer capacitance	Crss	V_{DG} = 10V, I_S = 0mA f = 1 MHz, source grounded		2.6	3	pF
Power gain	PG	V_{DG} = 10V, I_D = 10mA *1 f = 100 MHz, BW = 2.8 MHz	10	12.5		dB
Noise figure	NF	V_{DG} = 10V, I_D = 10mA *1 f = 100 MHz, BW = 2.8 MHz At the NF of the amplifier in the next stage is 4.2 dB		1.8	2.5	dB
Intermodulation distortion	IMD	V_{DG} = 10V, I_D = 10mA, *2 f_1 = 100 MHz, f_2 = 100.1 MHz, at 100 dBμ input	−45	−52		dB
Junction to ambient thermal resistance	θj-a				190	°C/W

Note) *1. See the 100 MHz, PG, NF, test circuit.
*2. See the 100 MHz IMD test circuit.

Mark



Classification

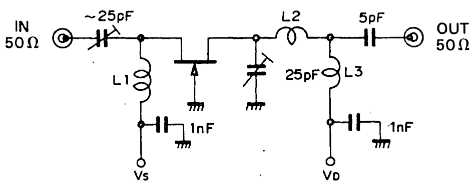
Rank	I_{DSS} (mA) V_{DS} = 10V V_{GS} = 0V
2	40 to 75
3	40 to 52
4	48 to 63
5	57 to 75

Standard Circuit Design Data

Ta = 25°C

Item	Symbol	Condition	Typ.	Unit
Input resistance	r_{ig}	VDG = 10V, ID = 10 mA f = 100 MHz	70	Ω
Input capacitance	C_{ig}		3.0	pF
Output resistance	r_{og}		5	kΩ
Output capacitance	C_{og}		3.0	pF
Power gain	PG	VDG = 10V, ID = 10 mA f = 500 MHz, BW = 12 MHz	7.0	dB
Noise figure	NF		4.0	dB
Reverse transfer coefficient	$\lvert S_{12} \rvert$	VDG = 10V, ID = 10 mA f = 500 MHz	0.035	
Equivalent input noise voltage	$\overline{e}_n$	VDS = 10V, ID = 10 mA f = 1 kHz	3	$nV/\sqrt{Hz}$
Drain source ON resistance	$R_{(ON)}$	ID = 10 mA, VGS = 0V	35	Ω
Drain cutoff current	$I_{D(OFF)}$	VDS = 10V, VGS = −10V	0.1	nA

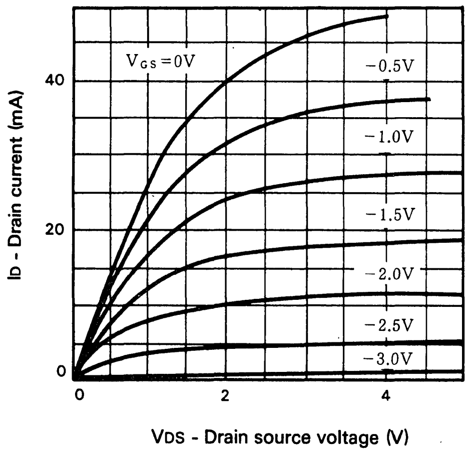
100 MHz PG, NF Test Circuit



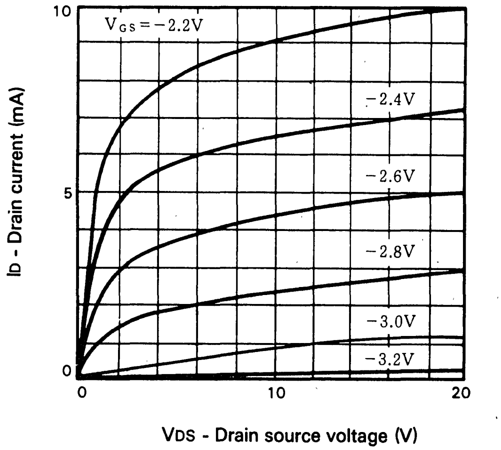
L1 : 0.45 ϕmm polyurethane wire ϕ3 mm 10.5 t
L2, L3 : 0.45 ϕmm polyurethane wire ϕ3 mm 5.5 t

Output Characteristics

Drain current vs. Drain source voltage

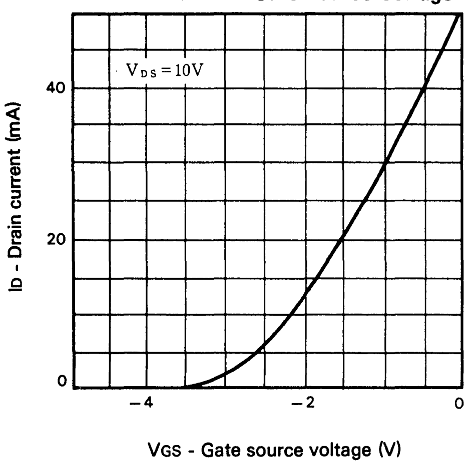


Drain current vs. Drain source voltage

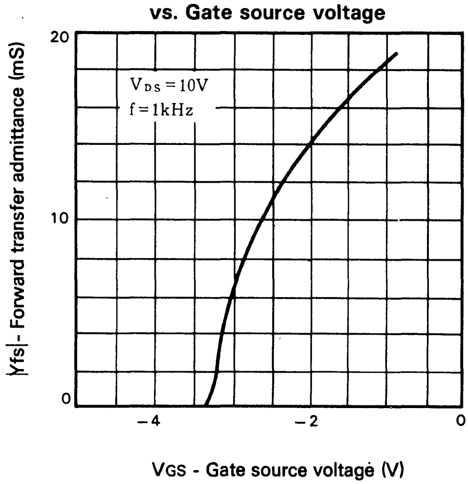


Transfer Characteristics

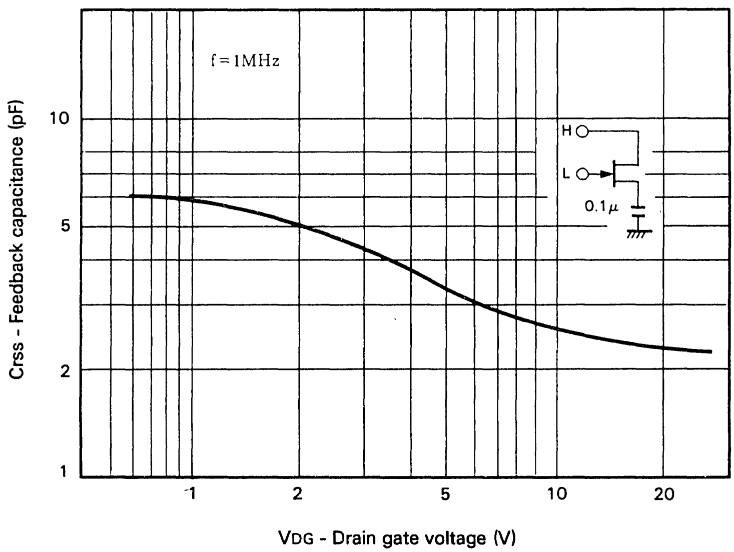
Drain current vs. Gate source voltage



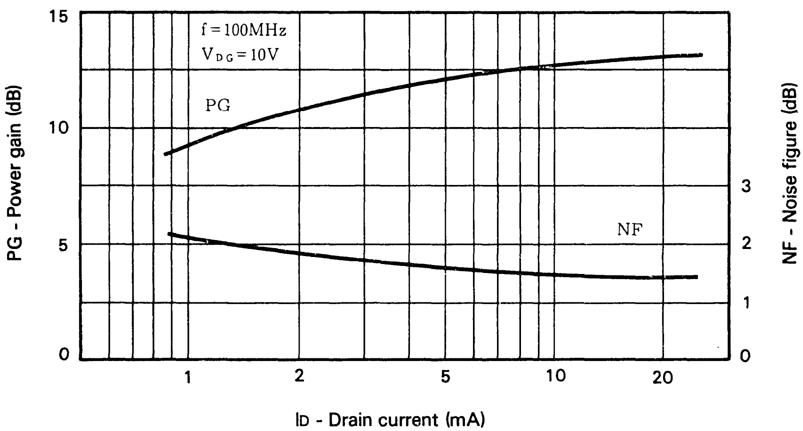
Forward transfer admittance vs. Gate source voltage



Feedback capacitance vs. Drain gate voltage



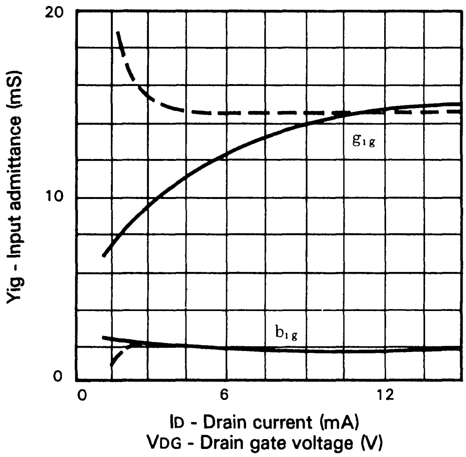
Common-gate power gain noise figure vs. Drain current



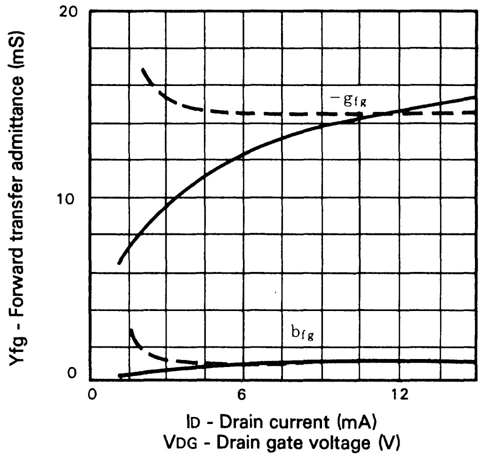
Common Gate Y-Parameter

——— Drain current characteristics (V_{DG} = 10V, f = 100 MHz)
– – – Drain gate voltage characteristics (I_D = 10mA, f = 100 MHz)

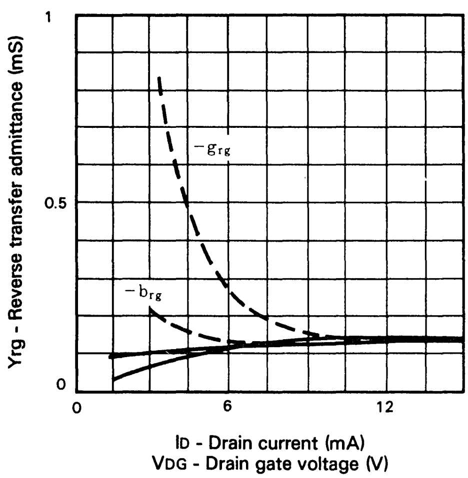
Input admittance



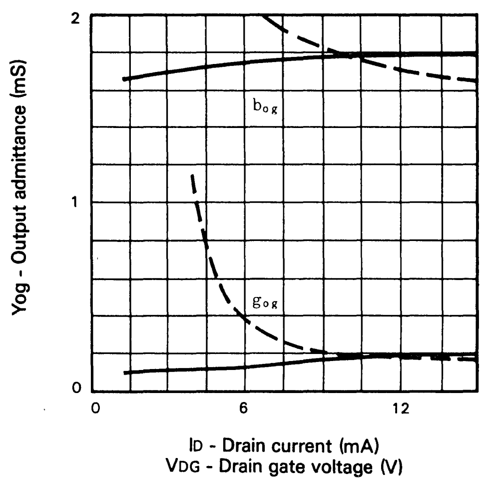
Forward transfer admittance



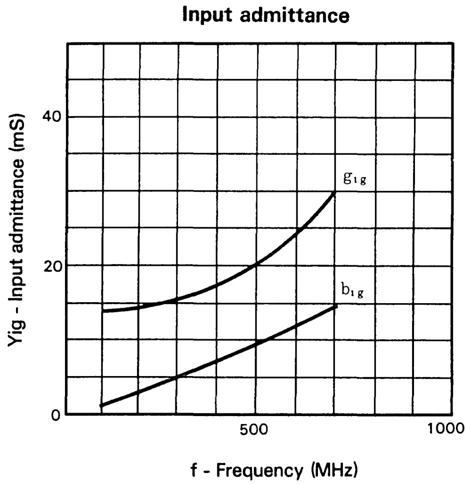
Reverse transfer admittance

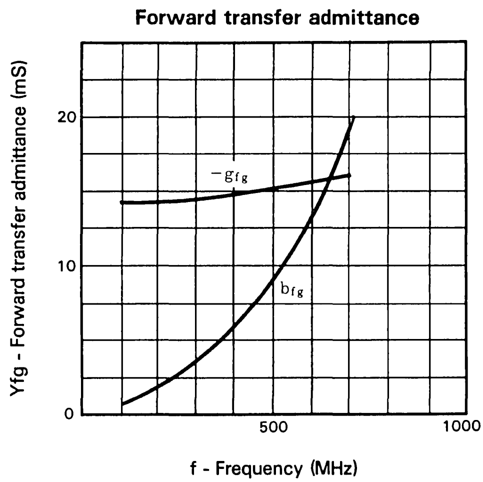


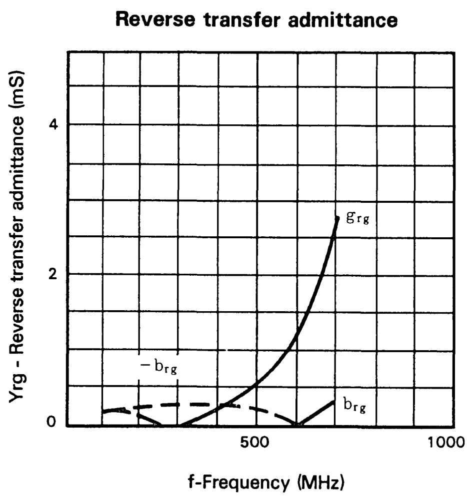
Output admittance

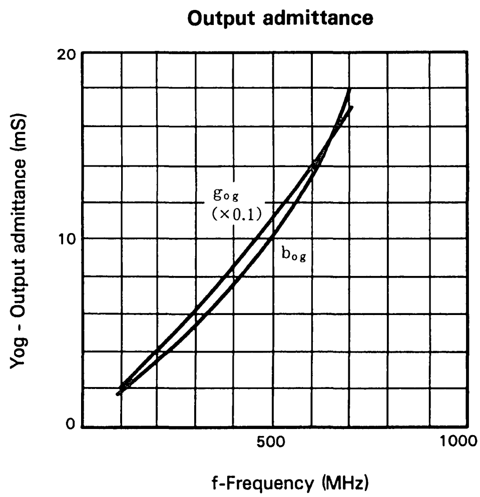


Common Gate Y-Parameter vs. Frequency (V_{DG} = 10V, I_D = 10mA)

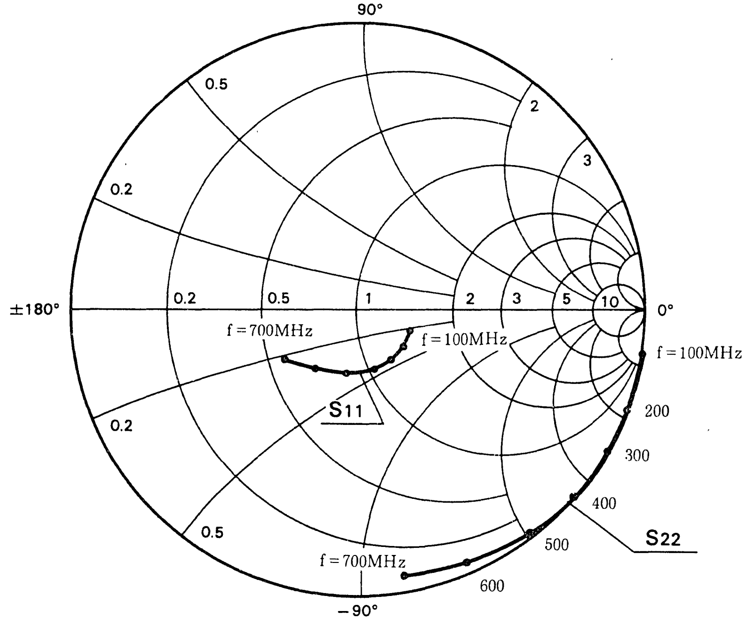


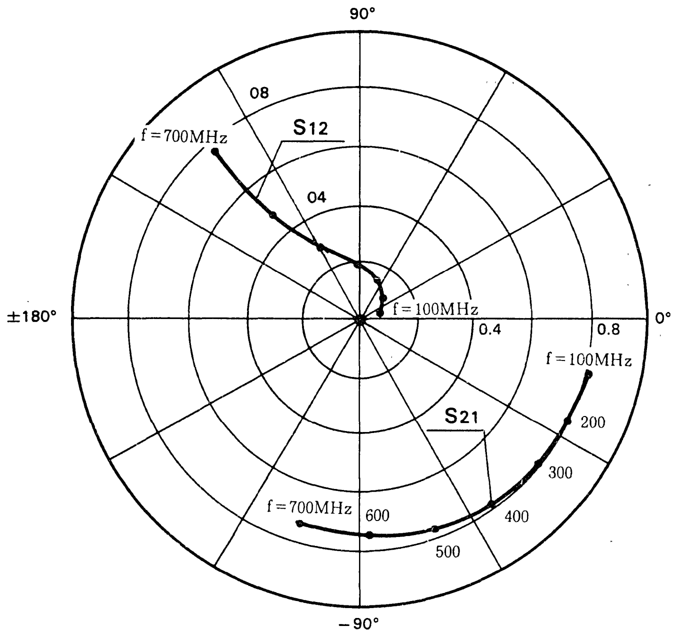




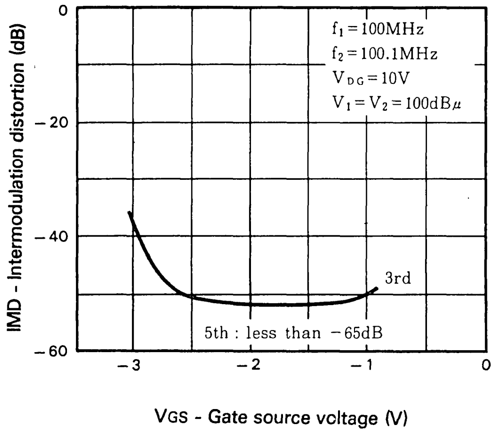


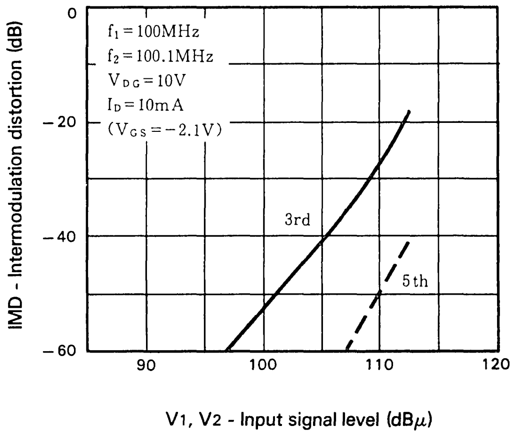
Common Gate S-Parameter vs. Frequency (VDG = 10V, ID = 10 mA)



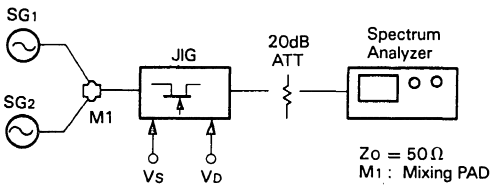


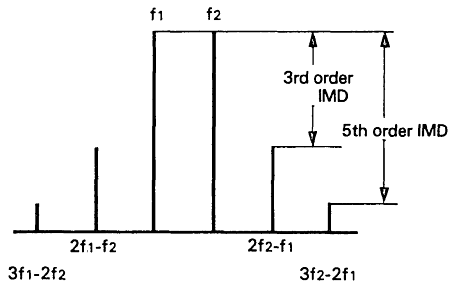
Intermodulation distortion characteristics



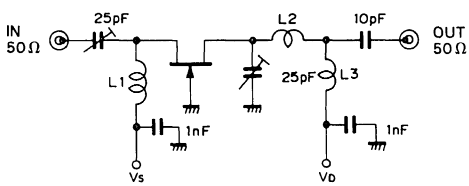


Block Diagram for IMD Measurement



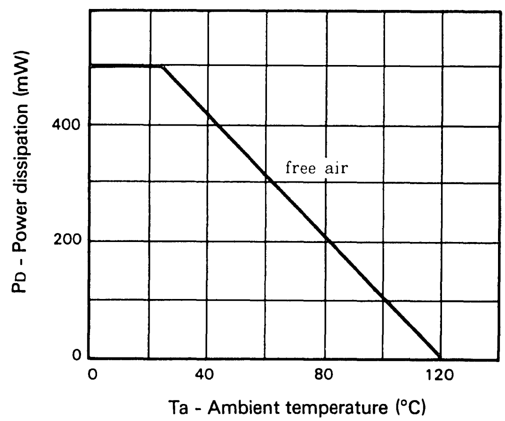


100 MHz IMD Test Circuit



L1 : 0.45 φmm polyurethane wire 3φ mm 10.5 t
L2, L3 : 0.45 φmm polyurethane wire 3φ mm 5.5 t

Derating curve



SONY

2SK152

Silicon N-Channel Junction FET

Description

The 2SK152 is the first device to reach such a high "Figure of merit" level. Because it uses the latest Epitaxy and Pattern technology.

Head amplifiers Video Cameras VTRs etc. perform very efficiently.

Features

- High figure of merit

$V_{DS}=5V$, $I_D=10mA$	$\mid Y_{fs}\mid/C_{iss}$	3.5	(Typ.)

- High $\mid Y_{fs}\mid$

$V_{DS}=5V$, $V_{GS}=0V$	$\mid Y_{fs}\mid$	30mS	(Typ.)

- Low input capacitance

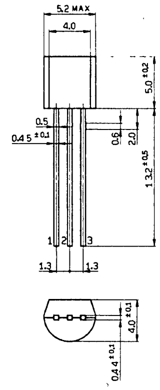
	C_{iss}	8pF	(Typ.)

Structure

Silicon N-Channel junction FET.

Package Outline

Unit: mm



1: Drain
2: Source
3: Gate

M-230

Absolute Maximum Ratings (Ta = 25°C)

• Drain to gate voltage	V_{DGO}	15	V
• Source to gate voltage	V_{SGO}	15	V
• Drain current	I_D	50	mA
• Gate current	I_G	5	mA
• Junction temperature	T_j	100	°C
• Storage temperature	T_{stg}	−50 to +120	°C
• Allowable power dissipation	P_D	300	mW

50573B-TO

Electrical Characteristics

Ta = 25°C

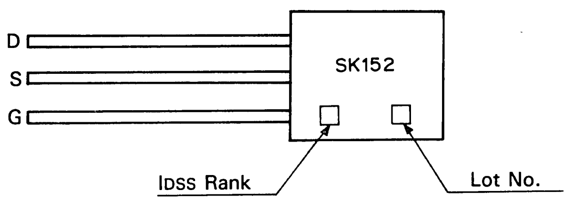
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to gate voltage	V_{DGO}	$I_G = 10\mu A$	15			V
Source to gate voltage	V_{SGO}	$I_G = 10\mu A$	15			V
Gate cutoff current	I_{GSS}	$V_{GS} = -7V$, $V_{DS} = 0V$			−2	nA
Drain current	I_{DSS}	$V_{DS} = 5V$, $V_{GS} = 0V$	9.5		42	mA*
Gate to source cutoff voltage	$V_{GS(OFF)}$	$V_{DS} = 5V$, $I_D = 100\mu A$	−0.55		−2.0	V
Forward transfer admittance	$\lvert Y_{fs} \rvert$	$V_{DS} = 5V$, $V_{GS} = 0V$, f = 1kHz	21	30		mS
Input capacitance	C_{iss}	$V_{DS} = 5V$, $V_{GS} = 0V$, f = 1MHz		8	9	pF

*Note) Drain current detail specification as follows.

Classification

Rank	I_{DSS}(mA) $V_{DS} = 5V$ $V_{GS} = 0V$
1	9.5 to 14.8
2	13.4 to 21.0
3	19.0 to 30.2
4	27.4 to 42.0

Mark

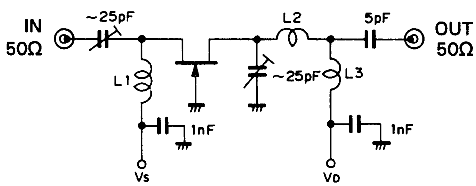


Standard Circuit Design Data

Ta = 25°C

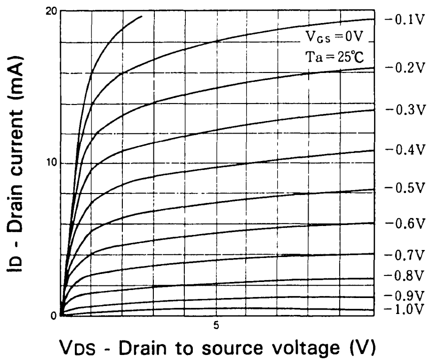
Item	Symbol	Condition	Typ.	Unit
Forward transfer admittance	$\lvert Y_{fs} \rvert$	$V_{DS}=5V$, $I_D=10mA$, $f=1kHz$	25	mS
Input capacitance	C_{iss}	$V_{DS}=5V$, $I_D=10mA$, $f=1MHz$	7.2	pF
Gate cutoff current	I_G	$V_{DG}=5V$, $I_D=10mA$	40	pA
Input resistance	r_{is}	$V_{DS}=5V$, $I_D=10mA$, $f=100MHz$	3.5	kΩ
Input capacitance	C_{is}		7.2	pF
Output resistance	r_{os}		3	kΩ
Output capacitance	C_{os}		2.5	pF
Power gain	PG	$V_{DS}=5V$, $I_D=10mA$, $f=100MHz$	15	dB
Noise figure	NF		1.8	dB
Equivalent input noise voltage	$\bar{e}_n$	$V_{DS}=5V$, $I_D=10mA$ $f=1kHz$, $R_g=0\Omega$	1.2	$nV/\sqrt{Hz}$
Reverse transfer capacitance	C_{rss}	$V_{DS}=5V$, $V_{GS}=0V$, $f=1MHz$	2.0	pF

100 MHz PG, NF Test Circuit

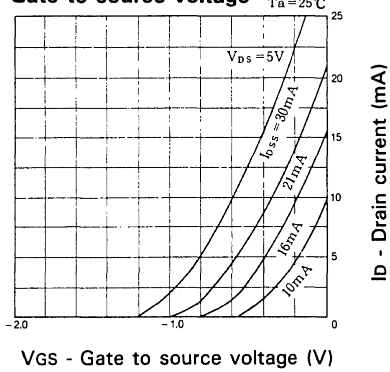


L1 φ0.45mm Polyurethane Wireφ3mm 10.5t
L2, L3 } φ0.45mm Polyurethane Wireφ3mm 5.5t

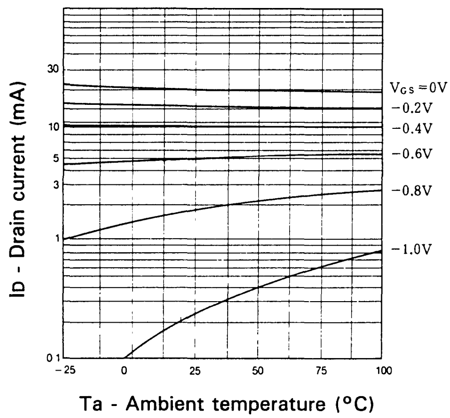
Drain current vs. Drain to source voltage



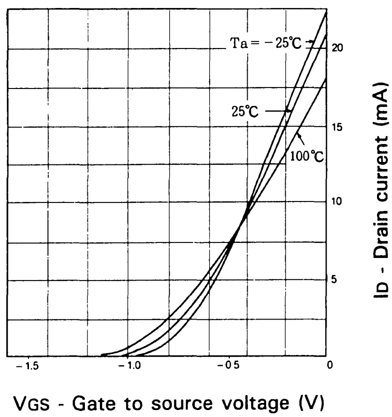
Drain current vs. Gate to source voltage



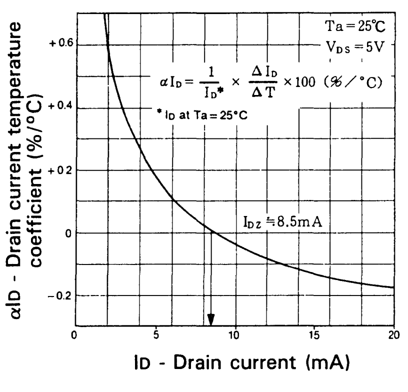
Drain current vs. Ambient temperature



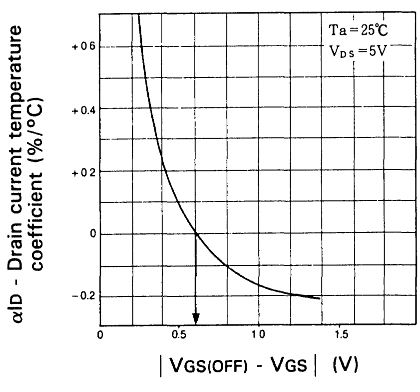
Transfer characteristics vs. Ambient temperature



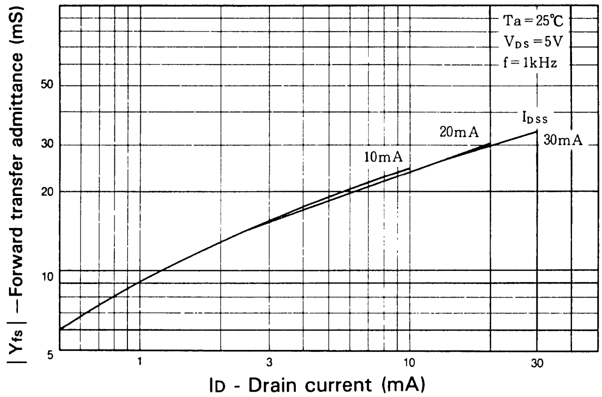
Drain current temperature coefficient vs. Drain current



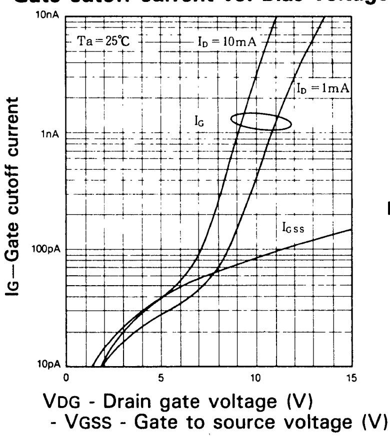
Drain current temperature coefficient vs. Gate cutoff voltage



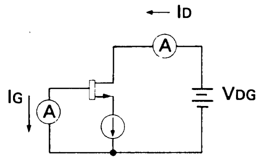
Forward transfer admittance vs. Drain current



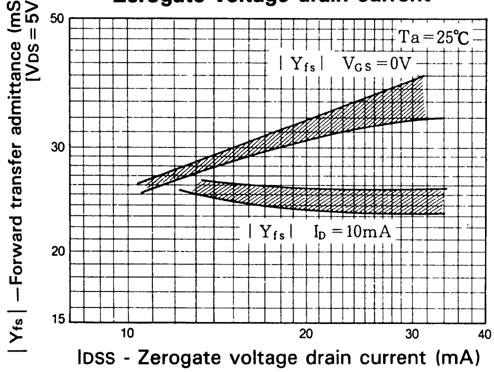
Gate cutoff current vs. Bias voltage



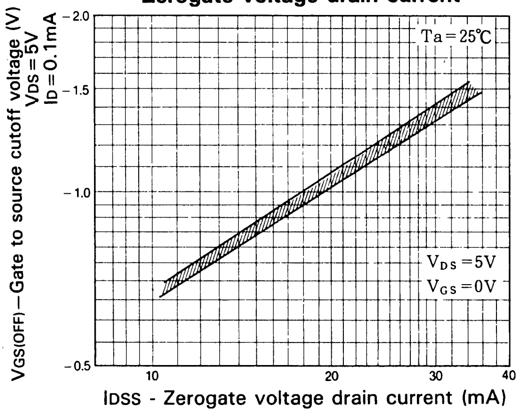
IG Test Circuit



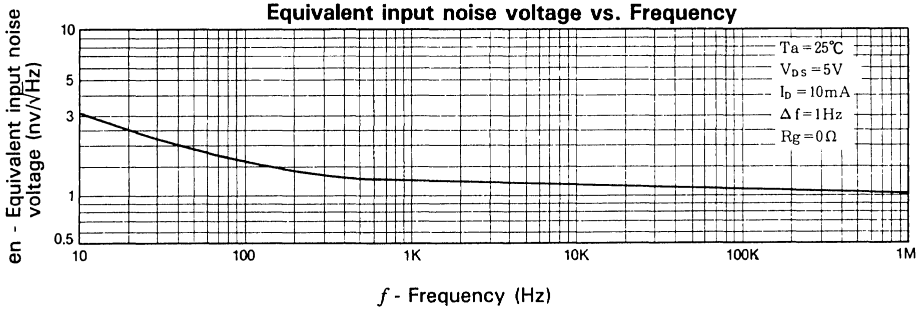
Forward transfer admittance vs. Zerogate voltage drain current



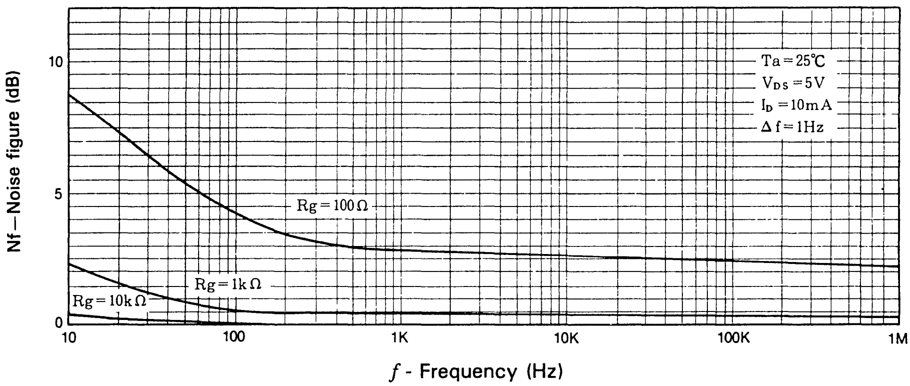
Gate to source cutoff voltage vs. Zerogate voltage drain current



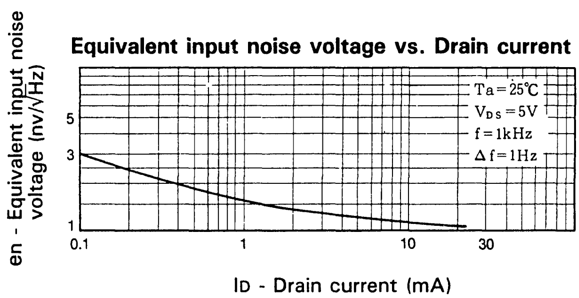
Equivalent input noise voltage vs. Frequency



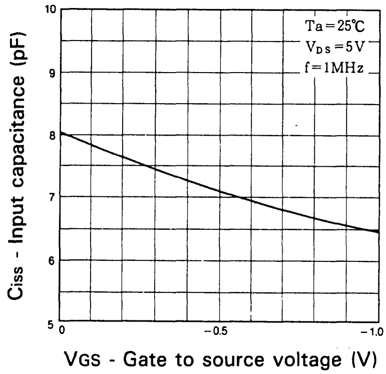
Noise figure vs. Frequency



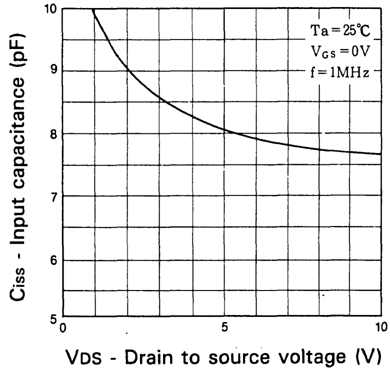
Equivalent input noise voltage vs. Drain current



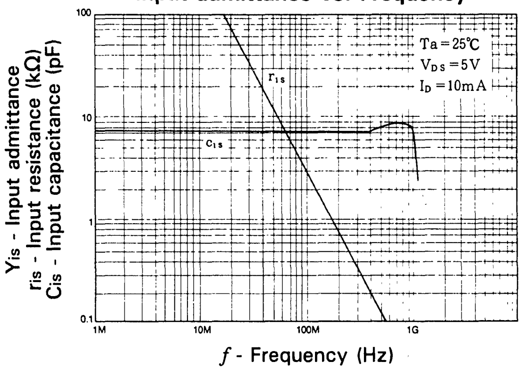
Input capacitance vs. Gate to source voltage



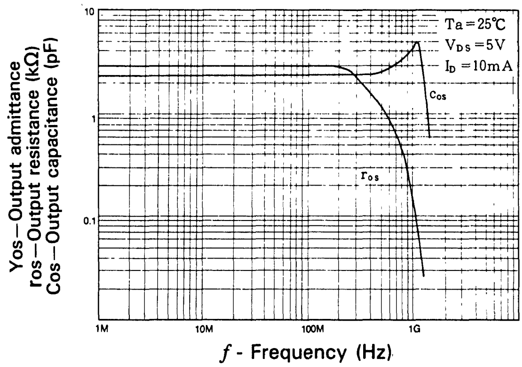
Input capacitance vs. Drain to source voltage



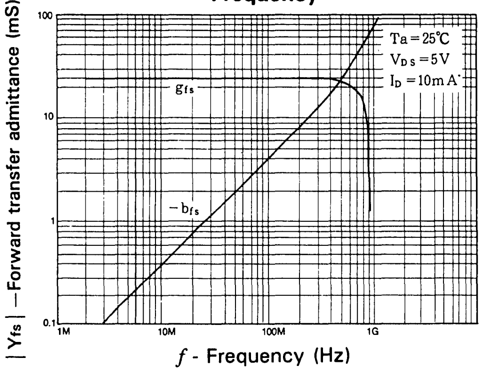
Input admittance vs. Frequency



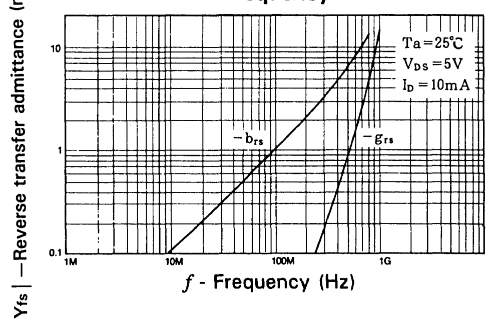
Output admittance vs. Frequency



Forward transfer admittance vs. Frequency



Reverse transfer admittance vs. Frequency



SONY® **2SK300**

Silicon N-Channel Junction FET

Description

Making the best of Epitaxy and Pattern latest technology, 2SK300 accomplishes so far unattainable levels of performance.

Usage with head amplifiers for video cameras and the like, ensures the highest efficiency.

Features

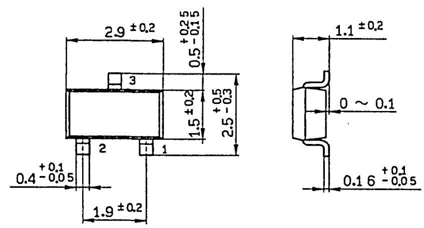
- High figure of merit
  V_{DS}=5V |Yfs| /Ciss 3.5 (Typ.)
  I_D=10mA
- High |Yfs|
  V_{DS}=5V |Yfs| 30mS (Typ.)
  V_{GS}=0V
- Low input capacitance
  Ciss 8pF (Typ.)

Absolute Maximum Ratings (Ta=25°C)

Drain to gate voltage	V_{DGO}	15	V
Source to gate voltage	V_{SGO}	15	V
Drain current	I_D	50	mA
Gate current	I_G	5	mA
Junction temperature	Tj	150	°C
Storage temperature	Tstg	–55 to +150	°C
Allowable power dissipation	P_D	150	mW

Package Outline

Unit : mm



Structure

Silicon N-Channel junction FET

Electrical Characteristics

(Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to gate voltage	V_{DGO}	I_G=10 µA	15			V
Source to gate voltage	V_{SGO}	I_G=10 µA	15			V
Gate cutoff current	I_{GSS}	V_{GS}=–7V, V_{DS}=0V			–2	nA
Drain current	I_{DSS}	V_{DS}=5V, V_{GS}=0V	9.5		42	mA *
Gate to source cutoff voltage	$V_{GS(OFF)}$	V_{DS}=5V, I_D=100 µA	–0.55		–2.0	V
Forward transfer admittance	|Yfs|	V_{DS}=5V, V_{GS}=0V, f=1kHz	21	30		mS
Input capacitance	Ciss	V_{DS}=5V, V_{GS}=0V, f=1MHz		8	9	pF

* Drain current detail specification as follows.

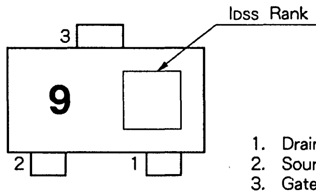
E90910 – ST

Classification (VDS=5V, VGS=0V)

Rank	IDSS (mA)
1	9.5 to 14.8
2	13.4 to 21.0
3	19.0 to 30.2
4	27.4 to 42.0
3/4 *	19.0 to 42.0

* Rank 3 or 4 is indicated on IDSS rank of Rank 3/4.

Mark



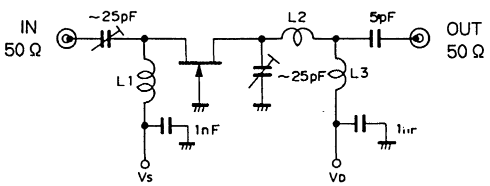
1. Drain
2. Source
3. Gate

Standard Circuit Design Data

(Ta=25°C)

Item	Symbol	Condition	Typ.	Unit
Forward transfer admittance	|Yfs|	VDS=5V, ID=10mA, f=1kHz	25	mS
Input capacitance	Ciss	VDS=5V, ID=10mA, f=1MHz	7.2	pF
Gate cutoff current	IG	VDS=5V, ID=10mA	40	pA
Input resistance	ris	VDS=5V, ID=10mA, f=100MHz	3.5	kΩ
Input capacitance	Cis		7.2	pF
Output resistance	ros		3	kΩ
Output capacitance	Cos		2.5	pF
Power gain	PG	VDS=5V, ID=10mA, f=100MHz	15	dB
Noise figure	NF		1.8	dB
Equivalent input noise voltage	$\overline{en}$	VDS=5V, ID=10mA, f=1kHz, Rg=0Ω	1.2	$nV/\sqrt{Hz}$
Reverse transfer capacitance	Crss	VDS=5V, VGS=0V, f=1MHz	2.0	pF

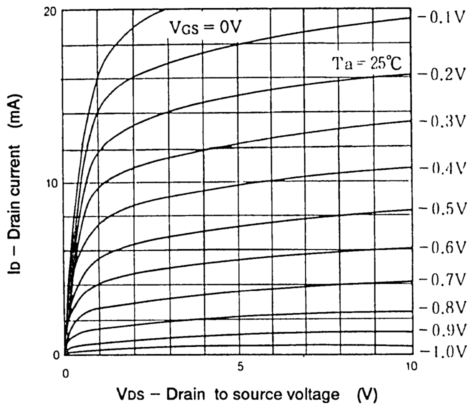
100MHz PG, NF Test Circuit



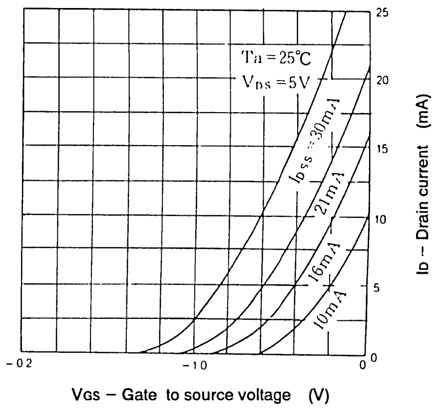
L1	ϕ 0.45mm Polyurethane Wire ϕ 3mm	10.5t
L2, L3	ϕ 0.45mm Polyurethane Wire ϕ 3mm	5.5t

Example of Representative Characteristics

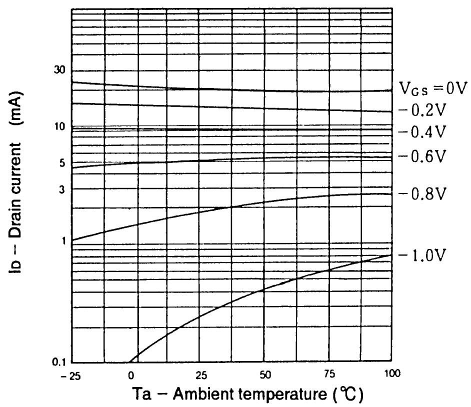
Drain current vs. Drain to source voltage



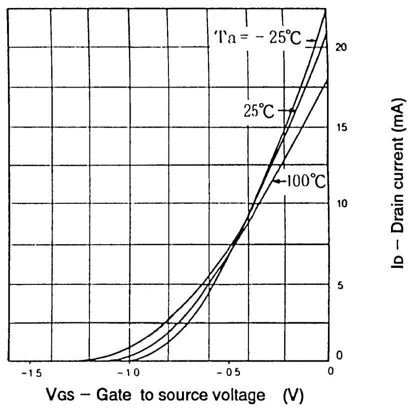
Drain current vs. Gate to source voltage



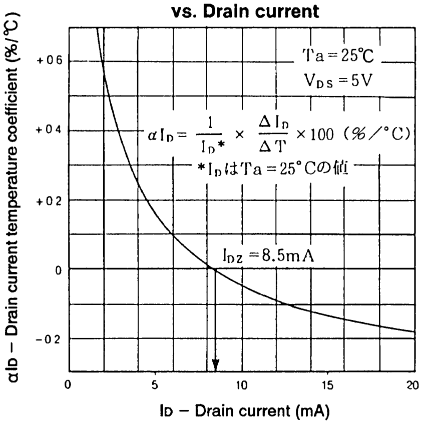
Drain current vs. Ambient temperature



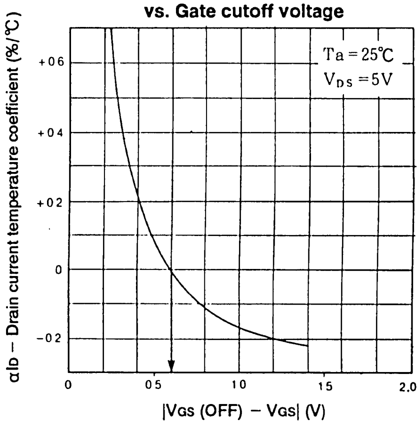
Transfer characteristics vs. Ambient temperature



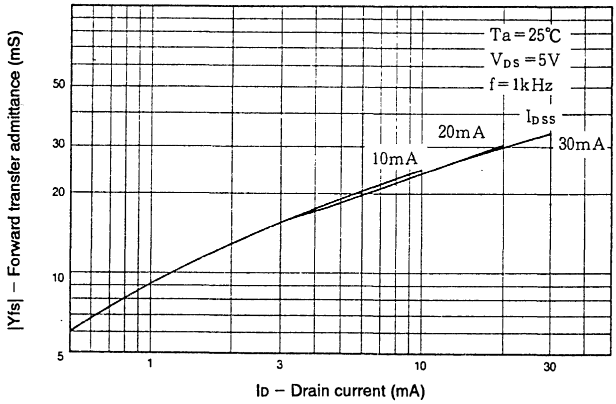
Drain current temperature coefficient vs. Drain current



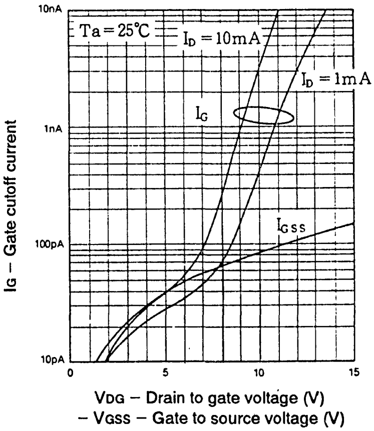
Drain current temperature coefficient vs. Gate cutoff voltage



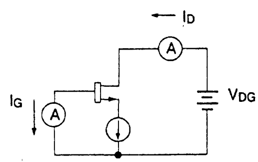
Forward transfer admittance vs. Drain current



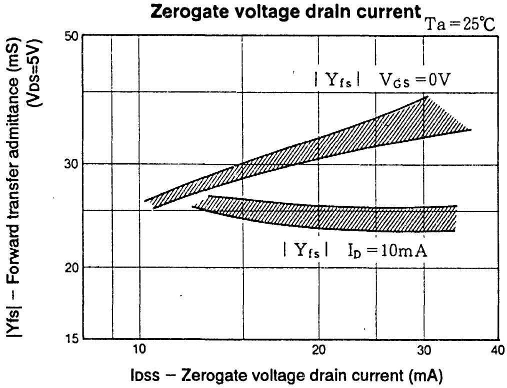
Gate cutoff vs. Supply voltage



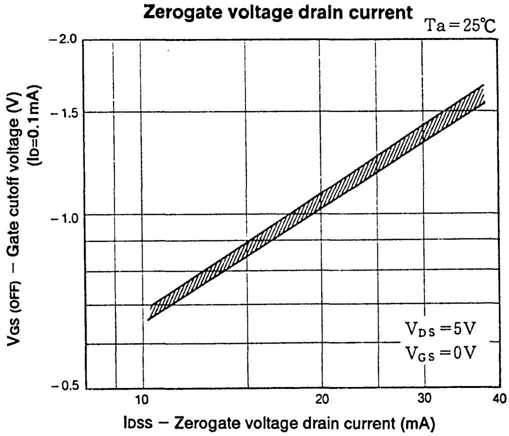
IG Test Circuit



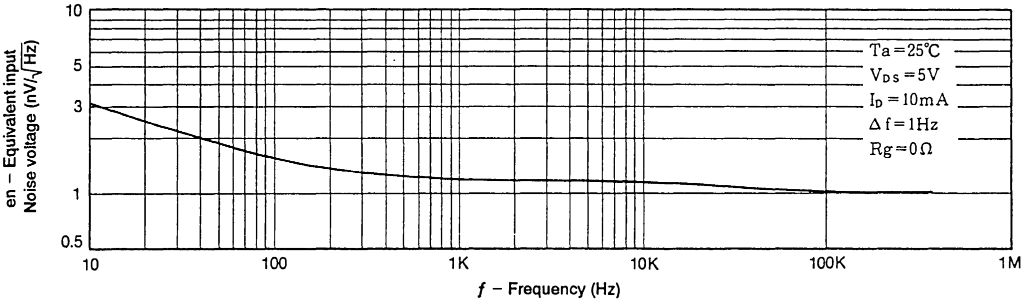
Forward transfer admittance vs. Zerogate voltage drain current



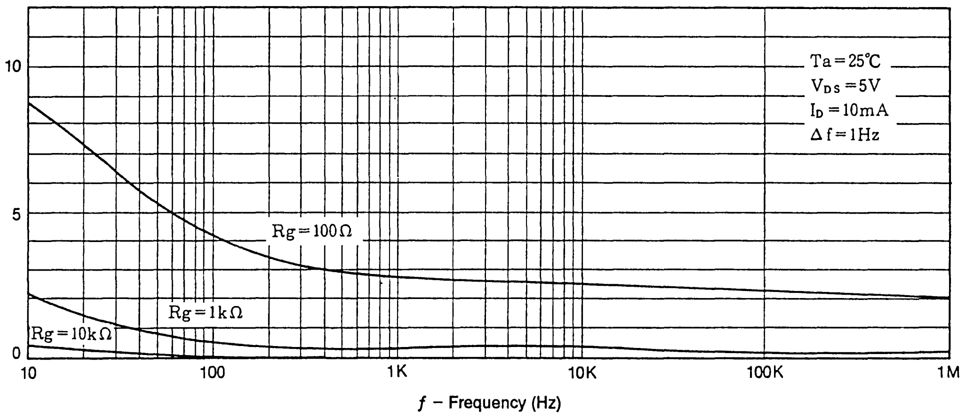
Gate cutoff voltage vs. Zerogate voltage drain current



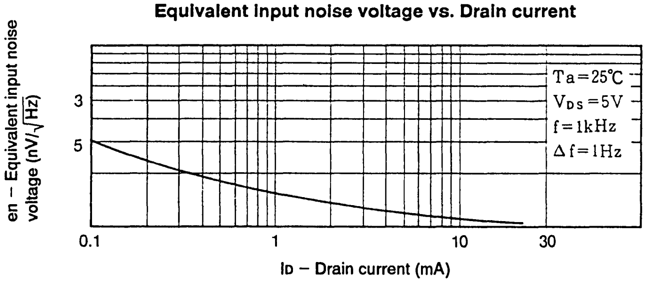
Equivalent input noise voltage vs. Frequency



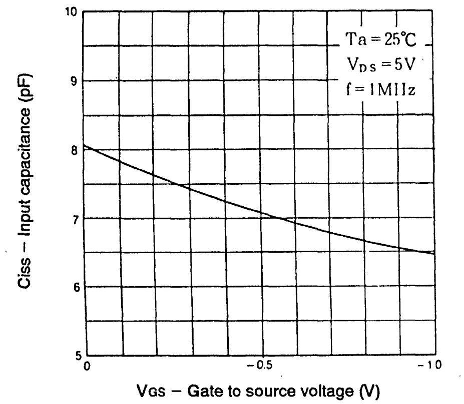
Noise figure vs. Frequency



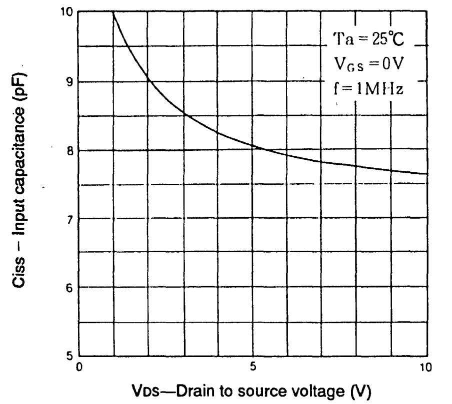
Equivalent input noise voltage vs. Drain current



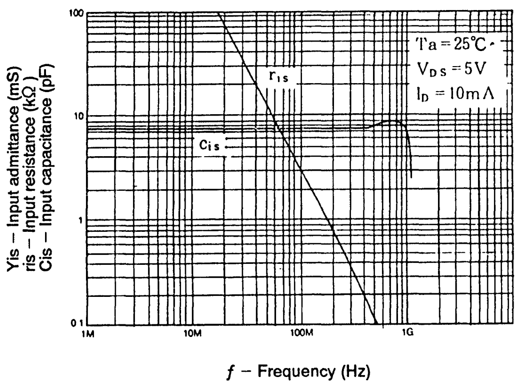
Input capacitance vs. Gate to source voltage



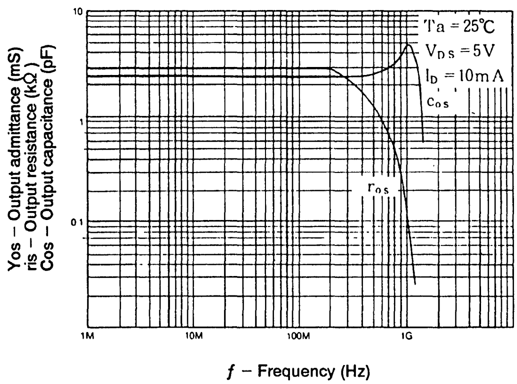
Input capacitance vs. Drain to source voltage



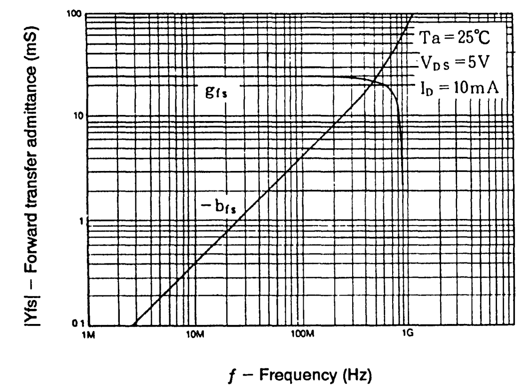
Input admittance vs. Frequency



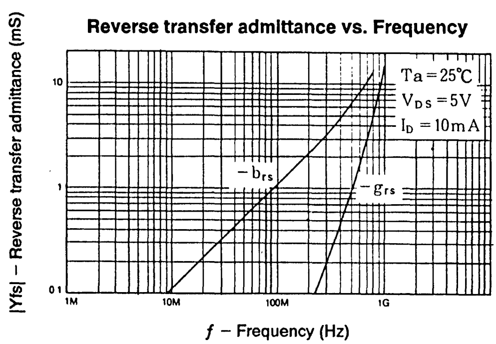
Transfer characteristics vs. Ambient temperature



Forward transfer admittance vs. Frequency



Reverse transfer admittance vs. Frequency



SONY

2SK613

Silicon N-Channel Junction FET

Description

Making the best of Epitaxy and Pattern latest technology, 2SK613 accomplishes so far unattainable levels of performance.

Usage with head amplifiers for video cameras and the like, ensures the highest efficiency.

Features

- High figure of merit
  ($V_{DS} = 5$ V, $I_D = 10$ mA) $|Y_{fs}|$/Ciss 4.5
- High forward transfer admittance
  ($V_{DS} = 5$ V, $V_{GS} = 0$ V) $|Y_{fs}|$ 30 mS (Typ.)
- Low input capacitance
  Ciss 6.6 pF (Typ.)

Structure

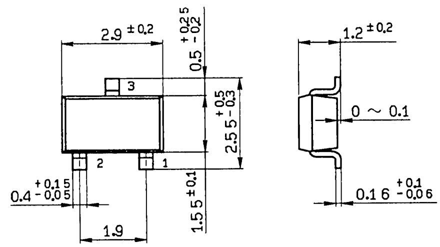
- Silicon N-Channel junction FET

Absolute Maximum Ratings (Ta=25℃)

Drain to gate voltage	V_{DGO}	15	V
Source to gate voltage	V_{SGO}	15	V
Drain current	I_D	50	mA
Gate current	I_G	5	mA
Allowable power dissipation	P_D	150	mW
Junction temperature	Tj	150	°C
Storage temperature	Tstg	−55 to +150	°C

Package Outline

Unit: mm



M-232

1 : Drain
2 : Source
3 : Gate

60199A-HP

Electrical Characteristics

Unless otherwise specified ($Ta = 25°C$)

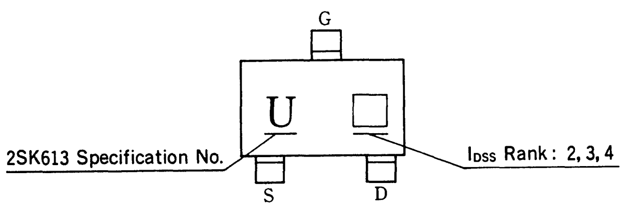
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to Gate Voltage	V_{DGO}	$I_G = 10\ \mu A$	15			V
Source to Gate Voltage	V_{SGO}	$I_G = 10\ \mu A$	15			V
Drain to Source Voltage	V_{DSX}	$I_D = 10\ \mu A$, $V_{GS} = -3\ V$	15			V
Gate Cutoff Current	I_{GSS}	$V_{GS} = -7\ V$, $V_{DS} = 0\ V$			−2	nA
Drain Current	I_{DSS} *	$V_{GS} = 5\ V$, $V_{GS} = 0\ V$	13.4		42.0	mA
Gate to Source Cutoff Voltage	$V_{GS(OFF)}$*	$V_{DS} = 5\ V$, $I_D = 100\ \mu A$,	−0.65		−2.0	V
Forward Transfer Admittance	$\lvert Y_{fs} \rvert$ *	$V_{DS} = 5\ V$, $V_{GS} = 0\ V$, $f = 1\ kHz$	23	30		mS
Input Capacitance	C_{iss}	$V_{DS} = 5\ V$, $V_{GS} = 0\ V$, $f = 1\ MHz$		6.6	7.5	pF
Equivalent Input Noise Voltage	$\bar{e}_n$	$V_{DS} = 5\ V$, $I_D = 10\ mA$, $Rg = 0\ \Omega$, $f = 1\ kHz$		4.0	7.0	$nV/\sqrt{Hz}$

(*Drain current detail specification as follows.)

Classification

	I_{DSS}(mA) ($V_{DS} = 5\ V$, $V_{GS} = 0\ V$)	$V_{GS(OFF)}$(V) ($V_{DS} = 5\ V$, $I_D = 100\ \mu A$)	$\lvert Y_{fs} \rvert$ (mS) ($V_{DS} = 5\ V$, $V_{GS} = 0\ V$, $f = 1\ kHz$)	Mark
2SK613-2	13.4 to 21.0	−0.65 to −1.26	23	2
2SK613-3	19.0 to 30.2	−0.85 to −1.6	25	3
2SK613-4	27.4 to 42.0	−1.05 to −2.0	29	4

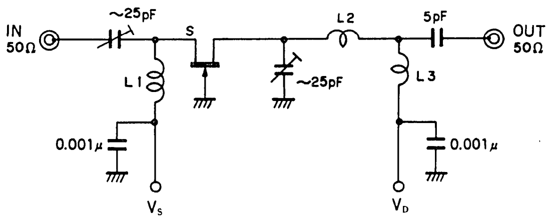
Mark



Standard Circuit Design Data

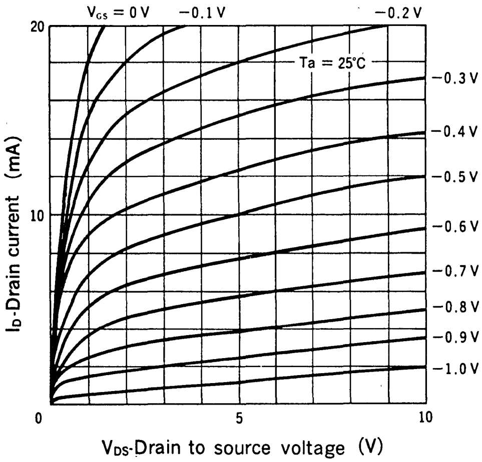
Item	Symbol	Condition	Typ.	Unit
Forward Transfer Admittance	$\lvert Y_{fs} \rvert$	V_{DS} = 5 V, I_D = 10 mA, f = 1 kHz	25	mS
Input Capacitance	C_{iss}	V_{DS} = 5 V, I_D = 10 mA, f = 1 MHz	5.5	pF
Gate Cutoff Current	I_G	V_{DG} = 5 V, I_D = 10 mA	10	pA
Input Resistance	r_{is}	V_{DS} = 5 V, I_D = 10 mA, f = 100 MHz	3.5	kΩ
Input Capacitance	C_{is}		5.5	pF
Output Resistance	r_{os}		2.0	kΩ
Output Capacitance	C_{os}		1.5	pF
Power Gain	PG	V_{DS} = 5 V, I_D = 10 mA, f = 100 MHz	14	dB
Noise Figure	NF		1.8	dB
Equivalent Input Noise Voltage	$\overline{e}_n$	V_{DS} = 5 V, I_D = 10 mA, f = 1 kHz, Rg = 0 Ω	4.0	nV/√Hz
Reverse Transfer	C_{rss}	V_{DS} = 5 V, V_S = 0 V, f = 1 MHz	1.6	pF

100 MHz PG, NF Test Circuit

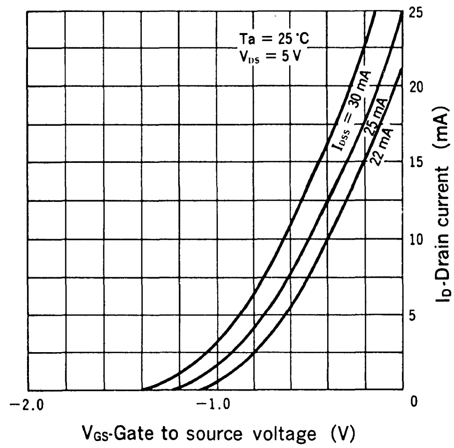


L1: ϕ 0.45 mm Polyurethan wire ϕ 3 mm 10.5 t
L2: ϕ 0.45 mm Polyurethan wire ϕ 3 mm 5.5 t
L3: ϕ 0.45 mm Polyurethan wire ϕ 3 mm 5.5 t

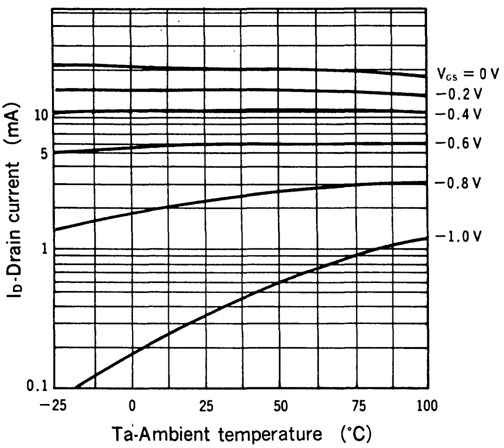
Drain current vs. Gate to source voltage



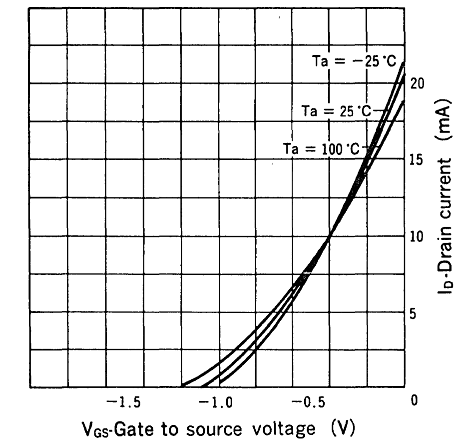
Drain current vs. Gate to source voltage

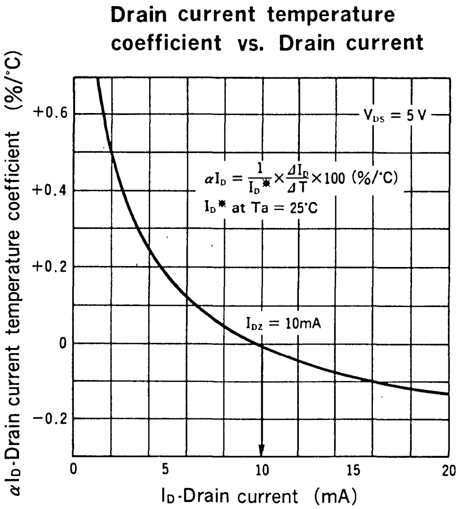


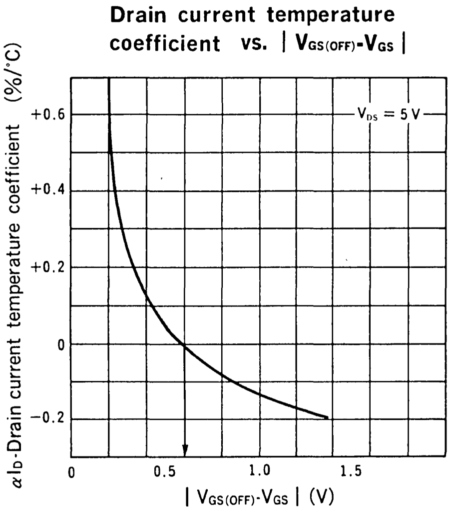
Drain current vs. Ambient temperature

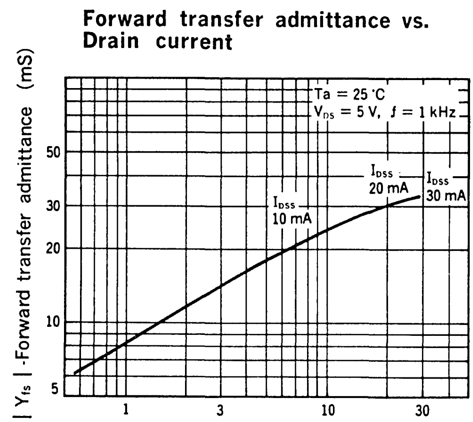


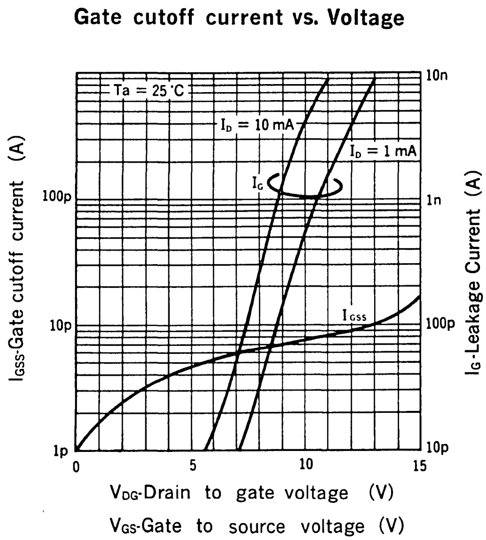
Drain current vs. Gate to source voltage

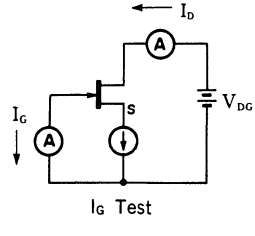



Drain current temperature coefficient vs. Drain current
αID-Drain current temperature coefficient (%/°C)
+0.6
+0.4
+0.2
0
−0.2
VDS = 5 V
αID = 1/ID* × ΔID/ΔT × 100 (%/°C)
ID* at Ta = 25°C
IDZ = 10mA
0 5 10 15 20
ID-Drain current (mA)

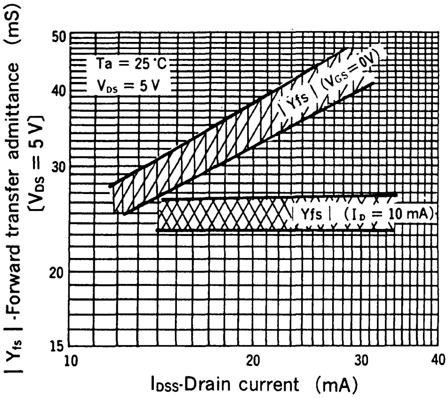

Drain current temperature coefficient vs. | VGS(OFF)-VGS |
αID-Drain current temperature coefficient (%/°C)
+0.6
+0.4
+0.2
0
−0.2
VDS = 5 V
0 0.5 1.0 1.5
| VGS(OFF)-VGS | (V)


Forward transfer admittance vs. Drain current
| Yfs | -Forward transfer admittance (mS)
50
30
20
10
5
Ta = 25 °C
VDS = 5 V, f = 1 kHz
IDSS 10 mA
IDSS 20 mA
IDSS 30 mA
1 3 10 30
ID-Drain current (mA)

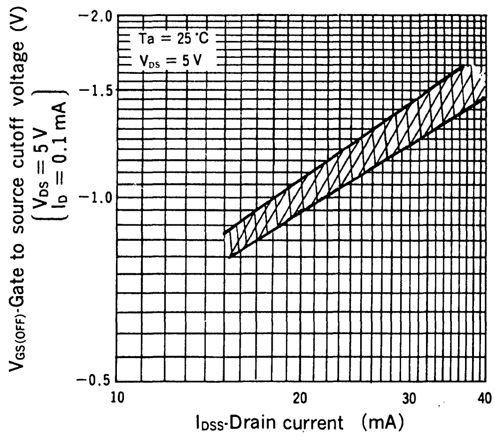

Gate cutoff current vs. Voltage
IGSS-Gate cutoff current (A)
IG-Leakage Current (A)
100p
10p
1p
10n
1n
100p
10p
Ta = 25 °C
ID = 10 mA
ID = 1 mA
IG
IGSS
0 5 10 15
VDG-Drain to gate voltage (V)
VGS-Gate to source voltage (V)


ID
A
VDG
IG
A
S
IG Test

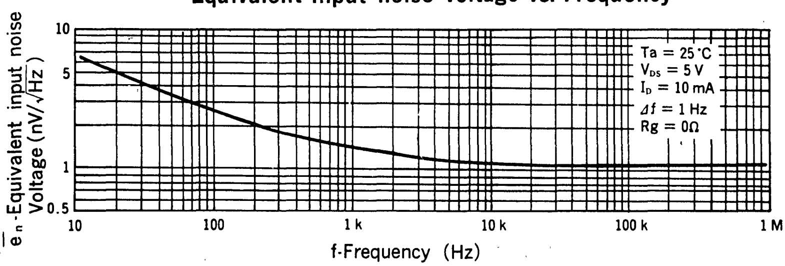
Forward transfer admittance vs. Drain current



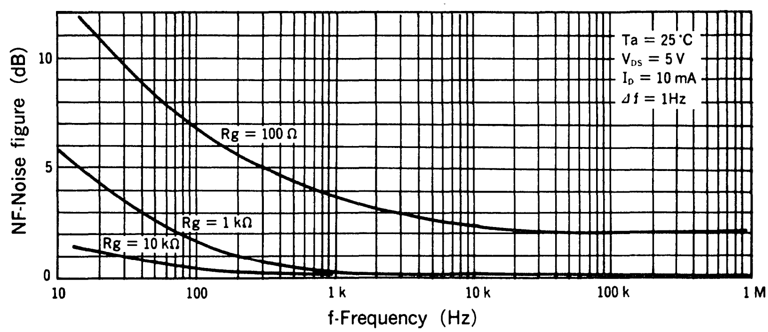
Gate to source cutoff voltage vs. Drain current



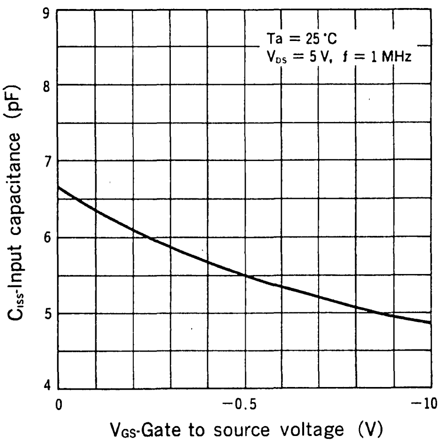
Equivalent input noise voltage vs. Frequency



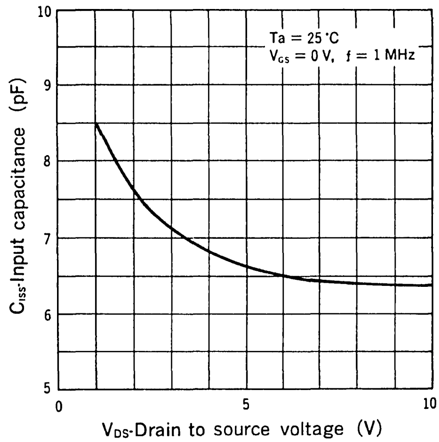
Noise figure vs. Frequency



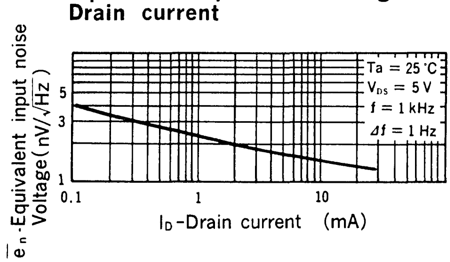
Input capacitance vs. Gate to source voltage



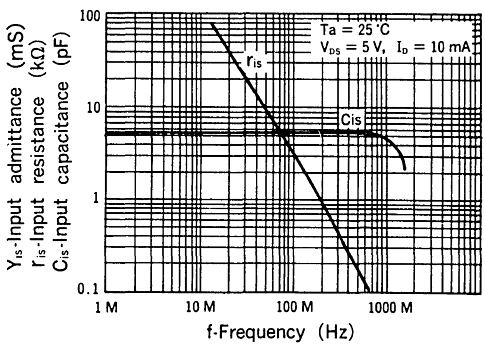
Input capacitance vs. Drain to source voltage



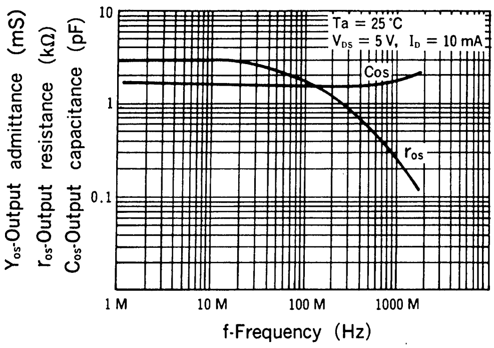
Equivalent input noise voltage vs. Drain current



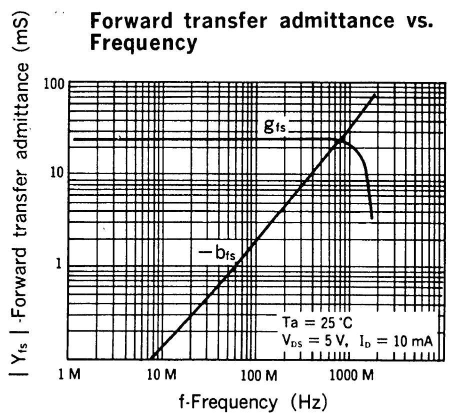
Input admittance vs. Frequency



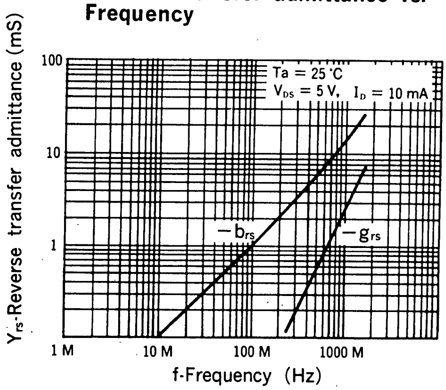
Output admittance vs. Frequency



Forward transfer admittance vs. Frequency



Reverse transfer admittance vs. Frequency



SONY® **CXD7500M**

Voltage Control Type Variable Resistor

Description

CXD7500M is a resistive gate type MOS FET featuring linear current vs voltage characteristics over a wide range of drain voltage low distortion and good linearity make this device suitable for use as a voltage controlled variable resistor.

Features

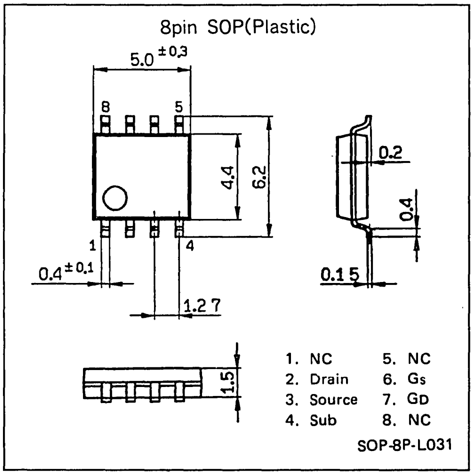
- Voltage controlled variable resistor
- Good linearity, low distortion variable resistor.
- As V_{DS}-I_{DS} characteristics are linear through a number of ±V, the dynamic range is wide.
- Signals up to VHF band can be handled.

Structure

Silicon P channel MOS FET

Package Outline

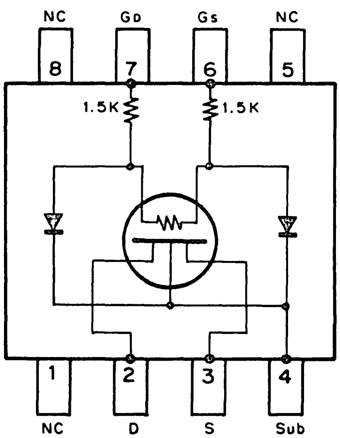
Unit: mm



Absolute Maximum Ratings (Ta=25°C)

◦ Drain to source voltage	V_{DS}	−20(V_{GB}=0V)	V
◦ Gate to substrate voltage	V_{GB}	−25	V
◦ Drain to substrate voltage	V_{DB}	−25	V
◦ Drain current	I_D	±15	mA
◦ Channel temperature	T_{ch}	80	°C
◦ Storage temperature	T_{stg}	−55 to +150	°C
◦ Allowable power dissipation	P_D	150	mW

Equivalent Circuit and Pin Configuration (Top View)



80961-HP

Electrical Characteristics

(Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to source voltage	V_{DSS}	$I_{DS}=-10\mu A$	−20			V
Drain current	I_{DS}	* $V_{GS}-V_{THE}=-10V$ $V_{DS}=-2V$, * $V_{BS}=10V$	−6	−10		mA
Threshold voltage	V_{THO}	* $V_{BS}=0V$, $I_{DS}=-1\mu A$, $V_{DS}=-1V$,	−0.4	−1.0	−2.5	V
Effective threshold voltage	V_{THE}	* $V_{BS}=10V$, $I_{DS}=-1\mu A$, $V_{DS}=-1V$,	−0.4	−1.2	−3.0	V
Min. channel resistance	R_{cho}	* $V_{GS}-V_{THE}=-10V$, * $V_{BS}=10V$, $V_{DS}=-1V$,	150	200	300	Ω
Low frequency distortion	L_{THD}	V_{in}=0dBm V_{out}=−6dBm f_{in}=20Hz, * $V_{BS}=10V$,		0.6		%
Standard distortion	S_{THD}	V_{in}=0dBm V_{out}=−6dBm f_{in}=1kHz, * $V_{BS}=10V$,		0.4		%
Gete resistance	$R_{(GS\cdot GD)}$	$V_{(GS\cdot GD)}=-10V$	50		1000	MΩ
Gete cutoff current	I_{GSS}	* $V_{GS}=-5V$, $V_{DS}=0V$, $V_{BS}=0V$, * $V_{BS}=0V$			−0.2	μA

* V_{BS}: Substrate (Base) -to Source Supply Voltage
* G_D, G_S Shorted and tested.

Electrical Characteristics Test Circuit
Distortion
Channel Resistance

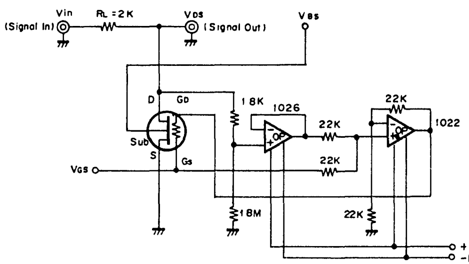


Fig. 1

Parallel Equivalent Capacitance
Parallel Equivalent Resistance

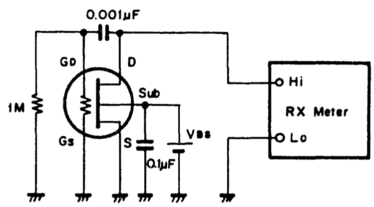
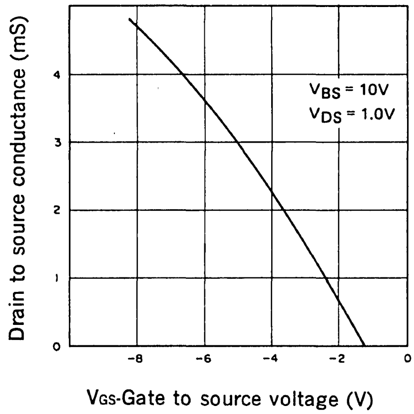
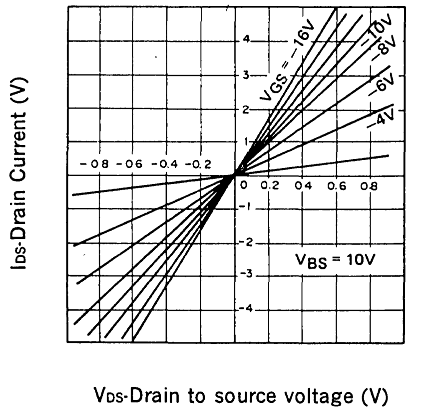


Fig. 2

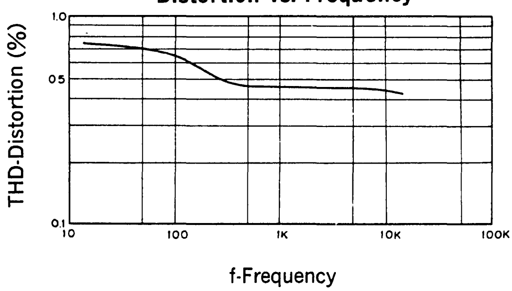
Drain to source conductance vs. Gate to source voltage



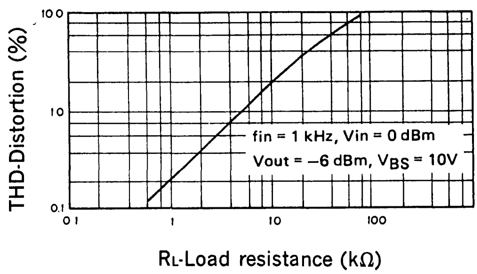
Drain current vs. Drain to source voltage



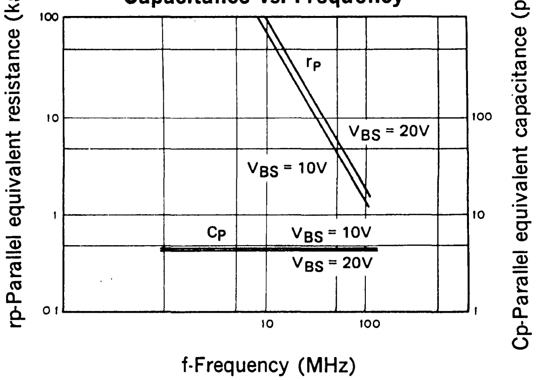
Distortion vs. Frequency



Distortion vs. Load resistance

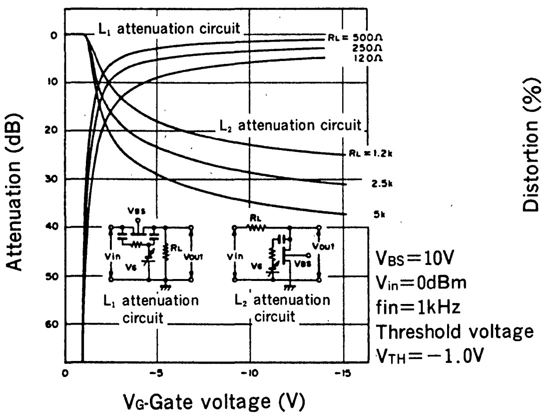


Parallel equivalent resistance, Capacitance vs. Frequency

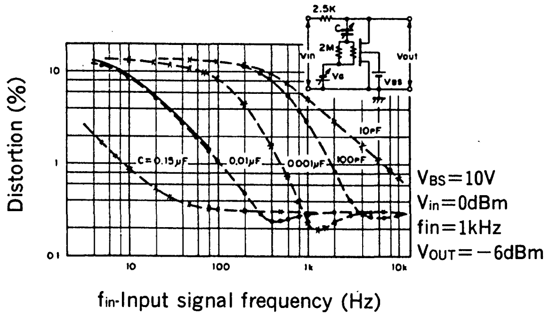


- **Example of characteristics at L attenuator circuit**

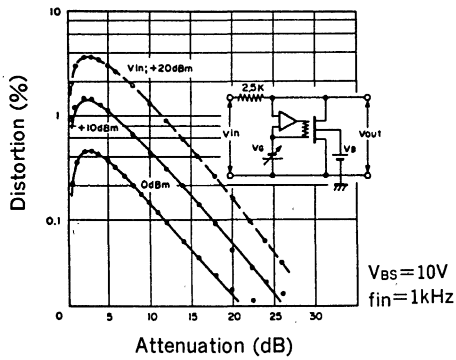
Attenuation vs. Gate voltage



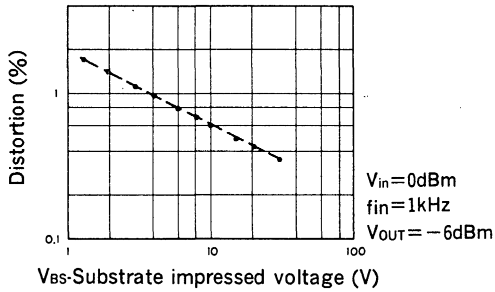
Distortion vs. Input signal frequency



Distortion vs. Attenuation



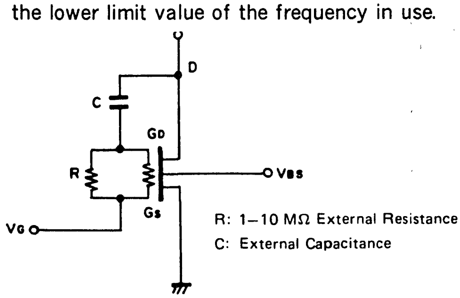
Distortion vs. Substrate impressed voltage

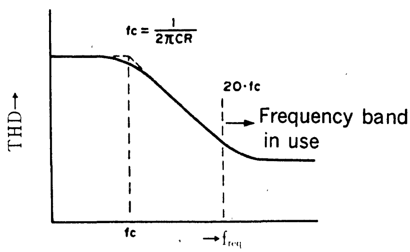


- **Circuit for Practical Use**

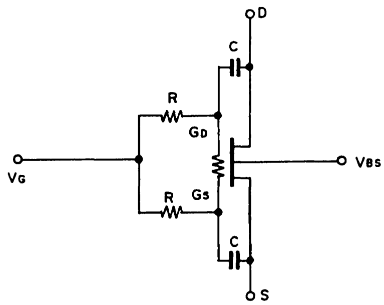
1) When used with source grounded

As the gate resistor is extremely high at several hundred MΩ and the resistance values uneven, it is advisable to attach a 1 to 10 MΩ external resistor. Moreover, the value of the coupled capacitance C is determined according to frequency band in use. As a guideline, use a cut off frequency less than 1/20 the lower limit value of the frequency in use.



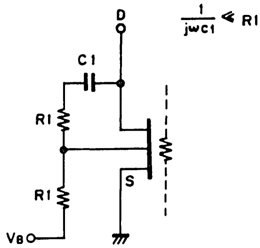


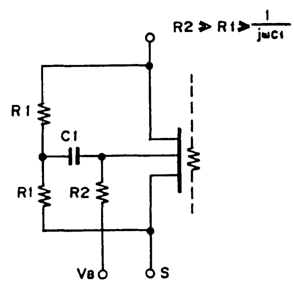
2) For source to drain floating usage
Should the frequency of the control voltage be comparatively high and the transient distortion grow problematically worse, source to drain is used floating.



3) Attenuation of the spacecharge effect
To attenuate non-linearity caused by the effects of Sub spacecharge effect, feedback 1/2 the drain to source voltage. This should improve the distortion ratio.

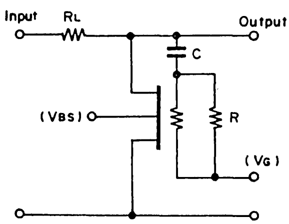
a)



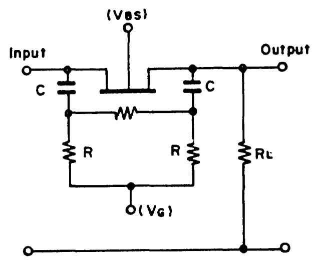


4) Attenuator circuit examples

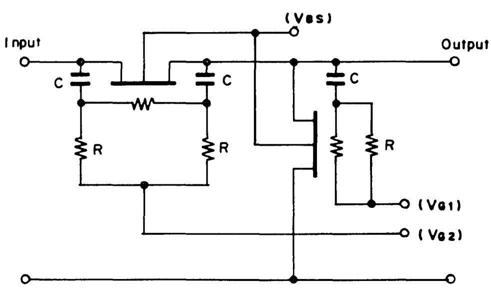
a)

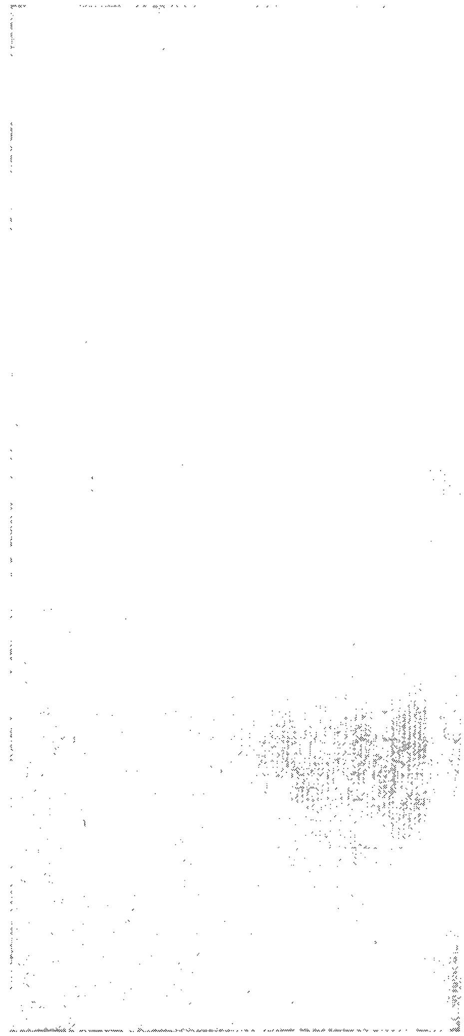


b)

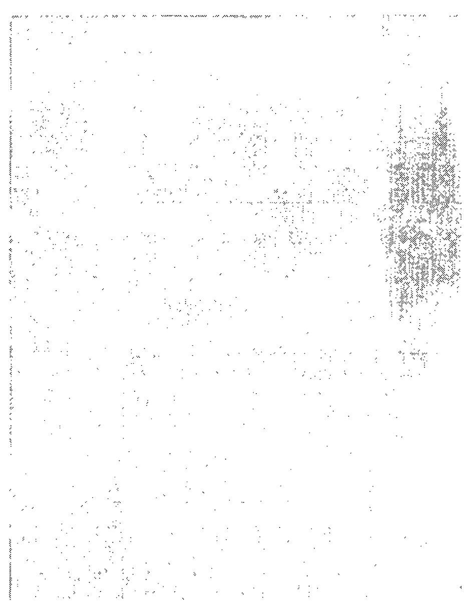


c)





GaAs FETs



4) GaAs FETs

Type	Package	Applications	Features	Drain to source Voltage (V)	Page
SGM2004M	4P Mini mold	UHF RF, amplifier	Low crossmodulation Built-in gate protection diode.	5	253
SGM2006M SGM2006P	4P Mini mold	UHF, RF, amplipier, mixer, oscillator	Low noise, Built-in gate protection diode.	5	257
SGM5102F	4P Ceramic	Microwave amplifier	Low noise NF : 2.1dB max	5	261
3SK165	4P Mini mold	UHF, RF amplifier, mixer, oscillator	Low noise, low input capacity	5	265
3SK166	4P Mini mold	UHF, RF, amplifier, oscillator	Low noise, high gm 40ms (Typ)	5	269
2SK676H5	Chip	Microwave low noise amplifier. For high speed logic	Low noise	2	273
2SK677H5	Chip	Microwave low noise amplifier. For high speed logic	Low noise	2	280
SGH5002F	4P Ceramic	Microwave low noise amplifier, DBS, FSS	Low noise NF : 1.3～1.7dB max	2	287
SGH5003F	4P Ceramic	Microwave low noise amplifier, DBS, FSS	Low noise NF : 1.3～1.7dB max	2	291
SGH5612F	4P Ceramic	Microwave low noise amplifier, DBS, FSS	Low noise NF : 1.0～1.2dB max	2	295

SONY **SGM2004M**

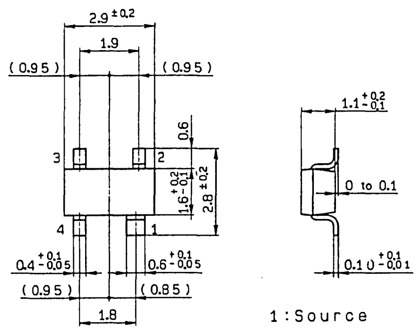
GaAs N-channel Dual Gate MES FET

Description

SGM2004M is an N-channel dual gate GaAs MES FET for UHF band low-noise amplification. This FET is suitable for a wide range of applications including TV tuners, cellular radios and DBS IF amplifiers.

Package Outline

Unit : mm



1 : Source
2 : Gate 1
3 : Gate 2
4 : Drain

M-254

Features

- Low voltage operation
- Low noise : NF = 1.6 dB (Typ.) at 800 MHz
- High gain : Ga = 18 dB (Typ.) at 800 MHz
- Low cross-modulation
- High stability
- Built-in gate-protection diode
- Standard SOT-143 package

Application

UHF band amplifier, mixer and oscillator

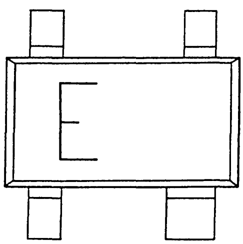
Structure

GaAs N-channel dual gate metal semiconductor field effect transistor

Absolute Maximum Ratings (Ta = 25°C)

• Drain to source voltage	V_{DSX}	12	V
• Gate 1 to source voltage	V_{G1S}	−5	V
• Gate 2 to source voltage	V_{G2S}	−5	V
• Drain current	I_D	55	mA
• Allowable power dissipation	P_D	150	mW
• Channel temperature	Tch	150	°C
• Storage temperature	Tstg	−55 to +150	°C

Mark

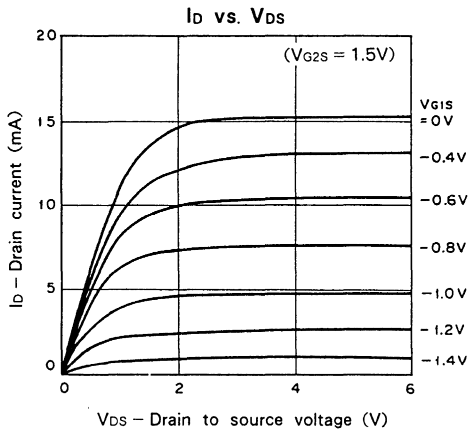


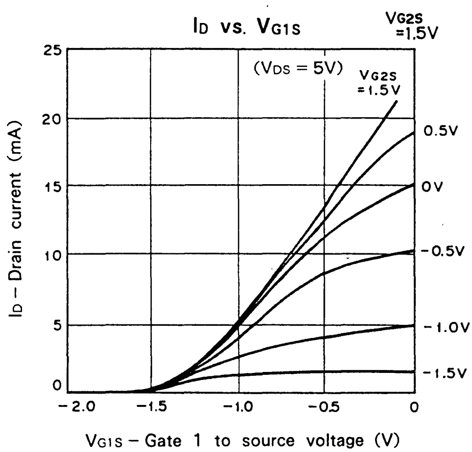
E88Z09-ST

Electrical Characteristics (Ta = 25℃)

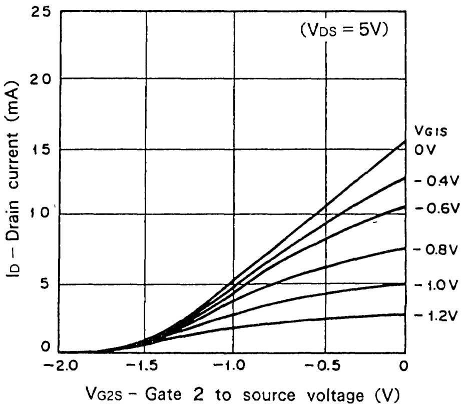
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to source voltage	V_{DSX}	I_D = 20 μA V_{G1S} = 0V V_{G2S} = − 4.0V	11			V
Gate 1 cutoff current	I_{G1SS}	V_{G1S} = − 4.5V V_{G2S} = 0V V_{DS} = 0V			− 8	μA
Gate 2 cutoff current	I_{G2SS}	V_{G2S} = − 4.5V V_{G1S} = 0V V_{DS} = 0V			− 8	μA
Gate 2 to drain cutoff current	I_{G2DO}	V_{G2D} = − 12V			− 10	μA
Drain saturation current	I_{DSS}	V_{DS} = 5V V_{G1S} = 0V V_{G2S} = 0V	8		28	mA
Gate 1 cutoff voltage	V_{G1S} (OFF)	V_{DS} = 5V I_D = 100 μA V_{G2S} = 0V			− 2.5	V
Gate 2 cutoff voltage	V_{G2S} (OFF)	V_{DS} = 5V I_D = 100 μA V_{G1S} = 0V			− 2.5	V
Forward transfer admittance	gm	V_{DS} = 5V I_D = 8mA V_{G2S} = 1.5V f = 1KHz	11	15		mS
Input capacitance	Ciss	V_{DS} = 5V I_D = 8mA V_{G2S} = 1.5V f = 1MHz		0.9	2	pF
Reverse transfer capacitance	Crss			25	40	fF
Noise figure	NF	V_{DS} = 5V I_D = 8mA V_{G2S} = 1.5V f = 800MHz		1.6	2.5	dB
Associated gain	Ga		15	18		dB

Typical Characteristics (Ta = 25℃)

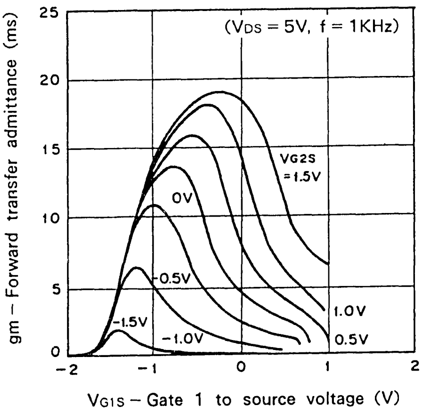




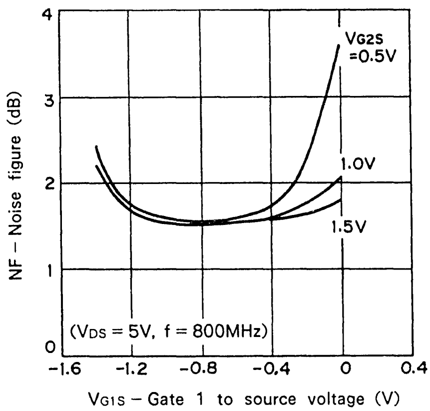
I_D vs. V_{G2S}



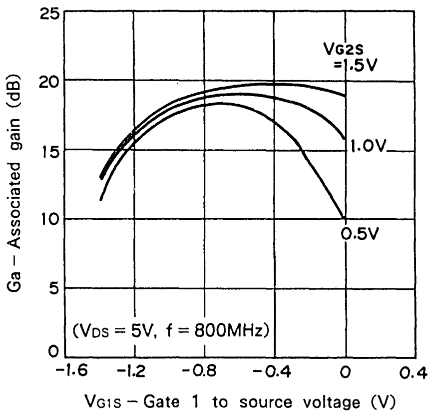
gm vs. V_{G1S}



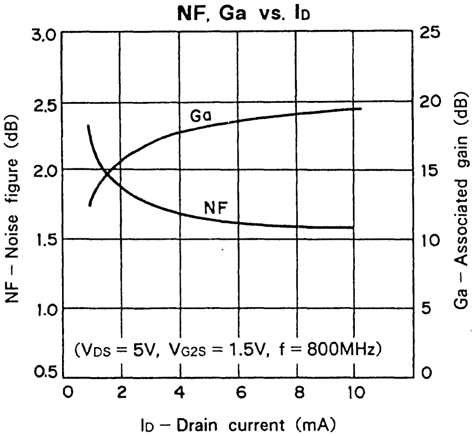
NF vs. V_{G1S}



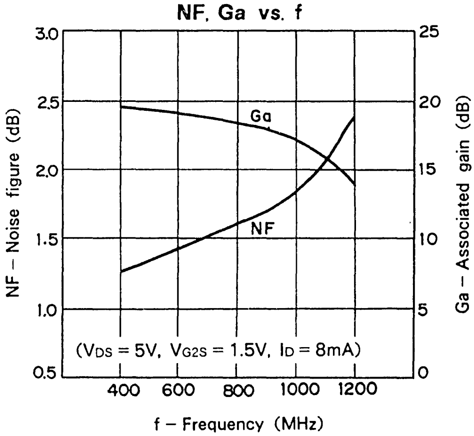
Ga vs. V_{G1S}



NF, Ga vs. I_D

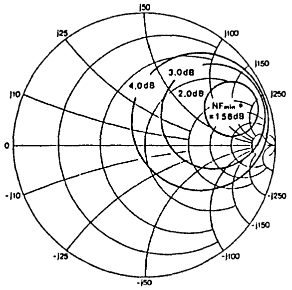


NF, Ga vs. f



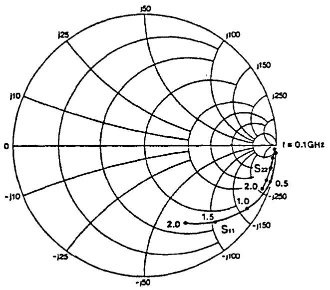
Noise Figure Characteristics (V_{DS} = 5V, V_{G2S} = 1.5V, I_D = 8 mA)

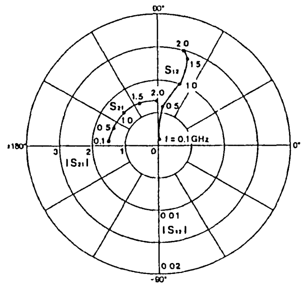
at 800 MHz



f (MHz)	Ga (dB)	NFmin (dB)	NF50 (dB)	Rn (Ω)	Γ (S) MAG	Γ (S) ANG	Γ (L) MAG	Γ (L) ANG
600	19.3	1.45	3.61	53.4	.830	17.3°	.862	1.3°
800	18.5	1.56	3.69	55.8	.793	22.2°	.895	5.8°
1000	16.4	1.77	3.73	60.3	.714	26.0°	.832	5.2°

S-parameters vs. Frequency Characteristics (V_{DS} = 5V, V_{G2S} = 1.5V, I_D = 8 mA)





f	S11		S21		S12		S22	
(MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	1.00	− 3.2°	1.50	175°	.001	78.2°	.978	− 1.4°
200	.999	− 6.3°	1.49	171°	.003	89.2°	.979	− 2.3°
300	.992	− 9.7°	1.49	166°	.004	92.7°	.975	− 3.3°
400	.981	− 12.7°	1.48	162°	.004	80.4°	.970	− 4.4°
500	.974	− 15.8°	1.47	157°	.006	82.4°	.968	− 5.3°
600	.967	− 18.8°	1.47	153°	.006	60.0°	.966	− 6.0°
700	.950	− 22.1°	1.47	149°	.008	78.7°	.968	− 7.2°
800	.939	− 25.3°	1.46	144°	.009	76.4°	.965	− 8.2°
900	.926	− 28.5°	1.46	140°	.010	78.1°	.966	− 9.4°
1000	.911	− 31.5°	1.46	135°	.010	70.9°	.965	− 10.2°
1100	.894	− 34.3°	1.46	131°	.011	74.7°	.976	− 11.1°
1200	.863	− 37.3°	1.45	126°	.011	60.9°	.953	− 12.7°
1300	.843	− 40.6°	1.44	122°	.012	74.5°	.956	− 13.7°
1400	.818	− 43.7°	1.43	117°	.013	77.1°	.952	− 14.6°
1500	.792	− 47.1°	1.41	113°	.014	70.7°	.950	− 15.7°
1600	.769	− 50.3°	1.40	108°	.014	70.1°	.944	− 16.4°
1700	.746	− 53.4°	1.39	104°	.014	76.3°	.946	− 17.2°
1800	.725	− 56.5°	1.39	100°	.014	79.2°	.947	− 18.2°
1900	.696	− 59.2°	1.38	95.8°	.015	76.2°	.949	− 19.4°
2000	.665	− 61.8°	1.37	91.2°	.015	74.6°	.948	− 20.4°

SONY® SGM2006M/P

GaAs N-channel Dual Gate MES FET

Description

SGM2006M/P is an N-channel dual gate GaAs MES FET for UHF band low-noise amplification. This FET is suitable for a wide range of applications including TV tuners, cellular radios and DBS IF amplifiers.

Features

- Low voltage operation
- Low noise : NF = 1.2 dB (Typ.) at 800 MHz
- High gain : Ga = 22 dB (Typ.) at 800 MHz
- High stability
- Built-in gate-protection diode
- Standard SOT-143 package

Application

UHF band amplifier, mixer and oscillator

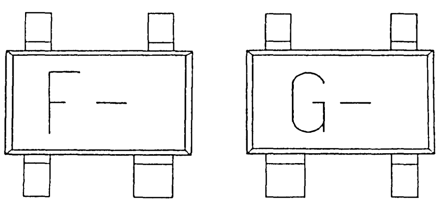
Structure

GaAs N-channel dual gate metal semiconductor field effect transistor

Absolute Maximum Ratings (Ta = 25°C)

• Drain to source voltage	V_{DSX}	12	V
• Gate 1 to source voltage	V_{G1S}	−5	V
• Gate 2 to source voltage	V_{G2S}	−5	V
• Drain current	I_D	55	mA
• Allowable power dissipation	P_D	150	mW
• Channel temperature	Tch	150	℃
• Storage temperature	Tstg	−55 to +150	℃

Mark

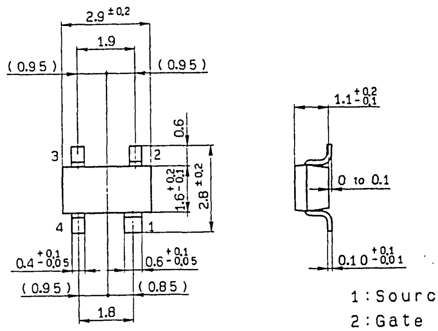


SGM2006M SGM2006P

Package Outline

Unit : mm

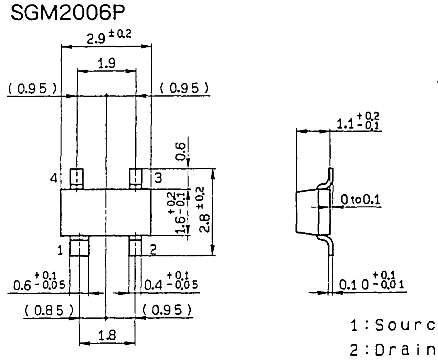
SGM2006M



1 : Source
2 : Gate 1
3 : Gate 2
4 : Drain

M-254

SGM2006P



1 : Source
2 : Drain
3 : Gate 2
4 : Gate 1

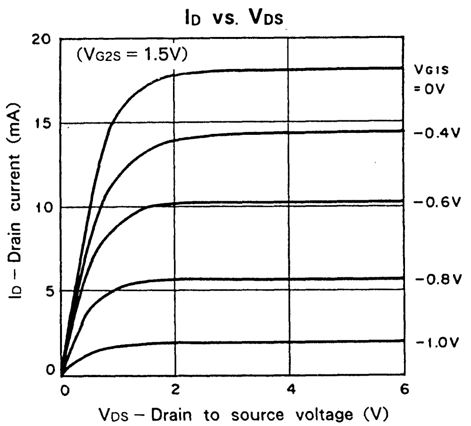
M-255

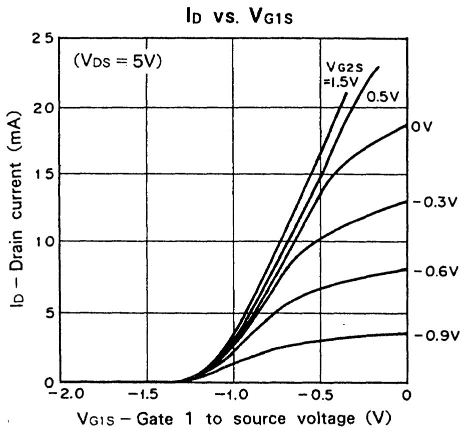
E88Z10-ST

Electrical Characteristics (Ta = 25℃)

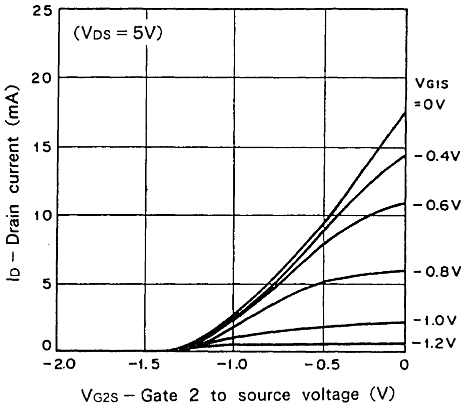
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to source voltage	V_{DSX}	I_D = 20 μA V_{G1S} = 0V V_{G2S} = − 4.0V	11			V
Gate 1 cutoff current	I_{G1SS}	V_{G1S} = − 4.5V V_{G2S} = 0V V_{DS} = 0V			− 8	μA
Gate 2 cutoff current	I_{G2SS}	V_{G2S} = − 4.5V V_{G1S} = 0V V_{DS} = 0V			− 8	μA
Gate 2 to drain cutoff current	I_{G2DO}	V_{G2D} = − 12V			− 10	μA
Drain saturation current	I_{DSS}	V_{DS} = 5V V_{G1S} = 0V V_{G2S} = 0V	10		35	mA
Gate 1 cutoff voltage	V_{G1S} (OFF)	V_{DS} = 5V I_D = 100 μA V_{G2S} = 0V			− 2.5	V
Gate 2 cutoff voltage	V_{G2S} (OFF)	V_{DS} = 5V I_D = 100 μA V_{G1S} = 0V			− 2.5	V
Forward transfer admittance	gm	V_{DS} = 5V I_D = 10mA V_{G2S} = 1.5V f = 1KHz	20	26		mS
Input capacitance	Ciss	V_{DS} = 5V I_D = 10mA V_{G2S} = 1.5V f = 1MHz		1.1	3	pF
Reverse transfer capacitance	Crss			28	40	fF
Noise figure	NF	V_{DS} = 5V I_D = 10mA V_{G2S} = 1.5V f = 800MHz		1.2	2.0	dB
Associated gain	Ga		18	22		dB

Typical Characteristics (Ta = 25℃)

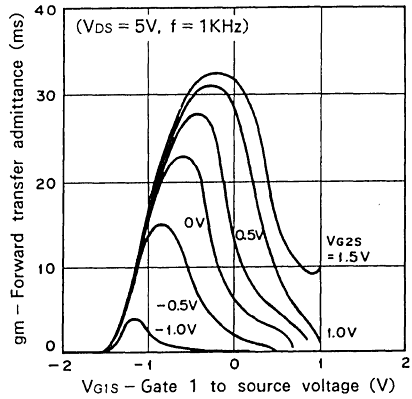




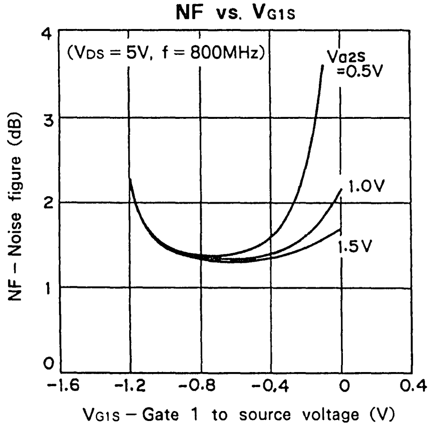
ID vs. VG2S



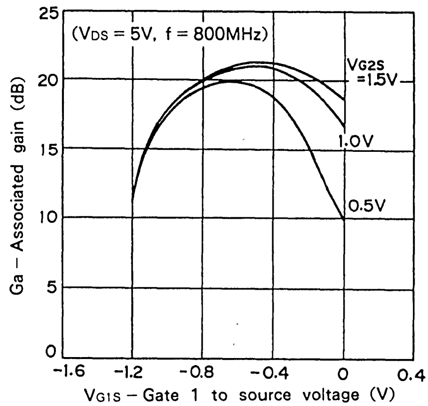
gm vs. VG1S



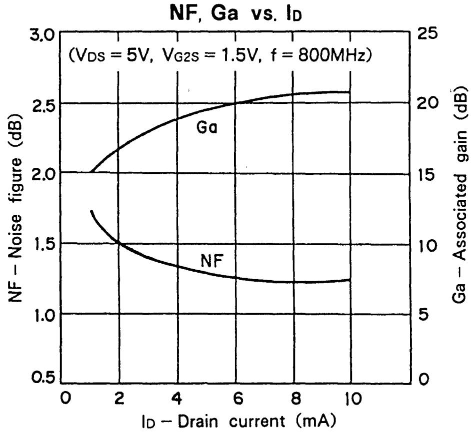
NF vs. VG1S



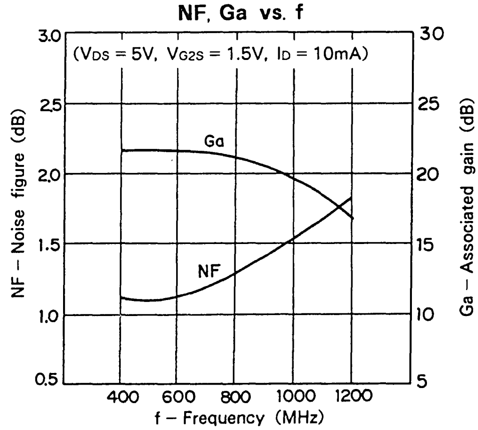
Ga vs. VG1S



NF, Ga vs. ID

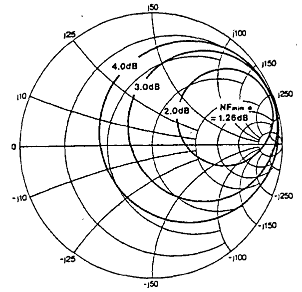


NF, Ga vs. f



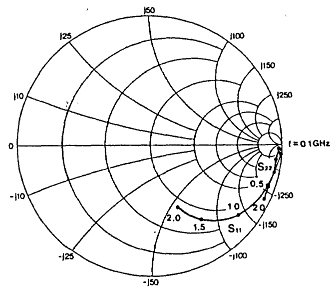
Noise Figure Characteristics (V_{DS} = 5V, V_{G2S} = 1.5V, I_D = 10 mA)

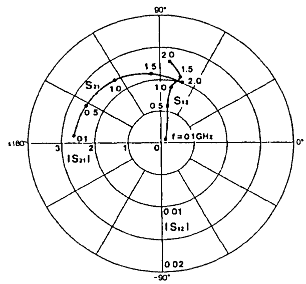
at 800 MHz



f (MHz)	Ga (dB)	NFmin (dB)	NF50 (dB)	Rn (Ω)	Γ (S) MAG	Γ (S) ANG	Γ (L) MAG	Γ (L) ANG
600	21.2	1.23	2.59	29.1	.823	18.9°	.824	3.1°
800	20.8	1.26	2.59	29.2	.804	20.4°	.896	5.8°
1000	19.5	1.57	2.78	37.7	.750	24.2°	.865	3.9°

S-parameters vs. Frequency Characteristics (V_{DS} = 5V, V_{G2S} = 1.5V, I_D = 10 mA)





f (MHz)	S11 MAG	S11 ANG	S21 MAG	S21 ANG	S12 MAG	S12 ANG	S22 MAG	S22 ANG
100	1.00	− 4.0°	2.63	174°	.001	50.9°	.976	− 1.6°
200	.996	− 8.0°	2.62	168°	.002	84.7°	.975	− 2.8°
300	.985	− 12.3°	2.61	163°	.004	85.8°	.971	− 4.0°
400	.968	− 16.0°	2.57	157°	.004	77.0°	.968	− 5.2°
500	.953	− 19.9°	2.55	152°	.006	80.2°	.965	− 6.4°
600	.933	− 24.1°	2.53	146°	.006	84.4°	.966	− 7.8°
700	.916	− 27.6°	2.51	141°	.007	75.3°	.964	− 8.7°
800	.895	− 31.5°	2.49	135°	.008	77.9°	.963	− 9.9°
900	.872	− 35.1°	2.47	130°	.009	77.1°	.962	− 11.3°
1000	.844	− 38.8°	2.45	125°	.009	79.8°	.961	− 12.3°
1100	.819	− 42.1°	2.42	119°	.010	72.3°	.959	− 13.6°
1200	.778	− 44.8°	2.36	114°	.010	75.4°	.955	− 15.0°
1300	.747	− 48.9°	2.33	108°	.010	76.0°	.953	− 16.5°
1400	.713	− 52.4°	2.29	103°	.011	80.0°	.950	− 17.7°
1500	.679	− 55.7°	2.24	97.1°	.011	74.2°	.945	− 19.1°
1600	.646	− 58.6°	2.18	92.1°	.011	70.0°	.939	− 19.7°
1700	.616	− 61.5°	2.14	87.4°	.012	76.5°	.946	− 20.9°
1800	.589	− 63.8°	2.12	82.0°	.012	83.6°	.949	− 22.1°
1900	.552	− 65.7°	2.09	76.8°	.012	81.7°	.953	− 23.7°
2000	.517	− 66.8°	2.06	71.3°	.013	83.4°	.956	− 25.4°

GaAs N-channel Microwave MES FET

Description

The SGM5102F is an N-channel GaAs MES FET designed for low noise amplifiers from C to Ku bands.
SGM5102F-T6 is for taping.
MES: Metal Semiconductor

Structure

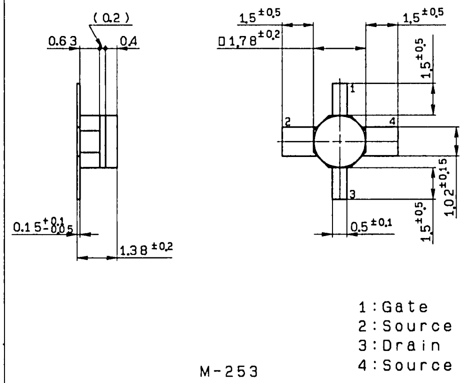
GaAs N-channel MES field effect transistor

Absolute Maximum Ratings (Ta=25°C)

• Drain to gate voltage	V_{DGO}	5	V
• Gate to source voltage	V_{GSO}	−3.5	V
• Drain current	I_D	70	mA
• Allowable power dissipation	P_D	340	mW
• Channel temperature	T_{ch}	150	°C
• Storage temperature	T_{stg}	−55 to +150	°C

Package Outline

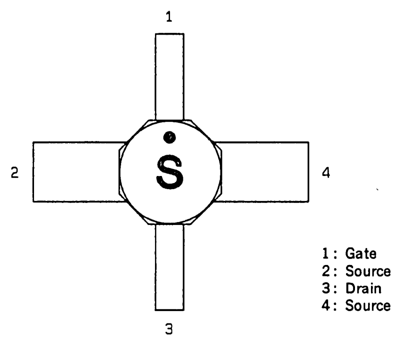
Unit: mm



Electrical Characteristics

Ta=25°C

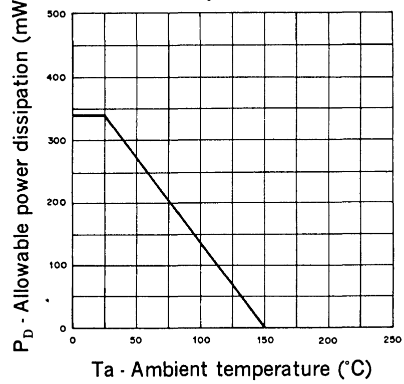
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to source cutoff current	I_{GSS}	V_{DS}=0V, V_{GS}=−3V			−10	μA
Drain current	I_{DSS}	V_{DS}=2V, V_{GS}=0V	10	30	70	mA
Gate to source cutoff voltage	$V_{GS(OFF)}$	V_{DS}=2V, I_D=100μA	−0.2	−1.5	−3.0	V
Transconductance	g_m	V_{DS}=2V, I_D=10mA	15	25		mS
Noise Figure	NF	V_{DS}=2V, I_D=10mA f=12GHz		1.8	2.1	dB
NF associated gain	Ga	V_{DS}=2V, I_D=10mA f=12GHz	8.0	8.5		dB



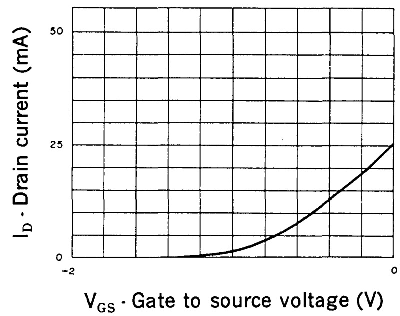
E90248A0X-HP

Representative Characteristics

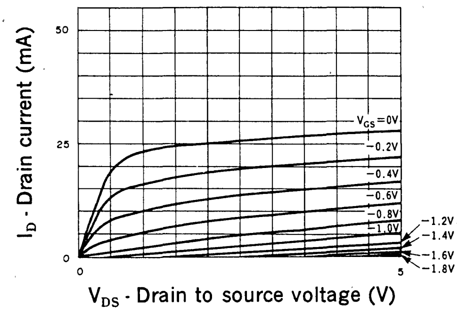
Allowable power dissipation vs. Ambient temperature



Drain current vs. Gate to source voltage



Drain current vs. Drain to source voltage

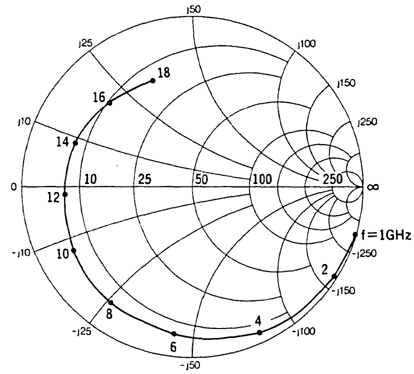


S Parameter Frequency Characteristics

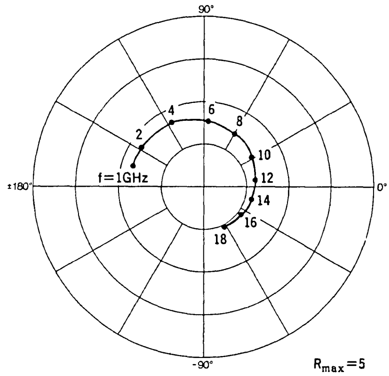
V_{DS}=2V, I_D=10mA

Frequency (GHz)	S_{11}		S_{21}		S_{12}		S_{22}	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1	1.00	−16.4	2.17	163.8	.02	77.3	.72	−11.5
2	.98	−32.4	2.15	148.3	.03	67.6	.72	−22.6
3	.96	−48.6	2.13	132.7	.05	54.7	.71	−34.2
4	.94	−65.0	2.08	117.0	.06	42.5	.69	−45.9
5	.90	−81.2	2.01	101.6	.07	32.5	.67	−57.7
6	.87	−96.6	1.93	86.8	.08	22.3	.65	−69.6
7	.84	−111.2	1.86	73.0	.08	13.4	.63	−81.5
8	.83	−125.0	1.79	59.4	.08	5.4	.62	−93.3
9	.81	−138.5	1.73	45.9	.08	−2.9	.62	−104.6
10	.79	−152.0	1.66	32.4	.08	−8.3	.62	−115.8
11	.77	−164.5	1.57	20.0	.07	−14.1	.62	−127.0
12	.75	−176.3	1.50	8.1	.07	−18.4	.62	−137.8
13	.74	172.4	1.45	−3.1	.07	−19.7	.62	−148.2
14	.74	160.3	1.43	−15.3	.07	−22.6	.63	−158.2
15	.72	148.2	1.40	−27.5	.07	−24.1	.65	−168.5
16	.70	135.4	1.35	−39.5	.07	−29.0	.65	−179.4
17	.68	123.2	1.32	−51.1	.08	−32.0	.66	170.4
18	.67	110.8	1.31	−62.9	.08	−38.0	.68	160.6

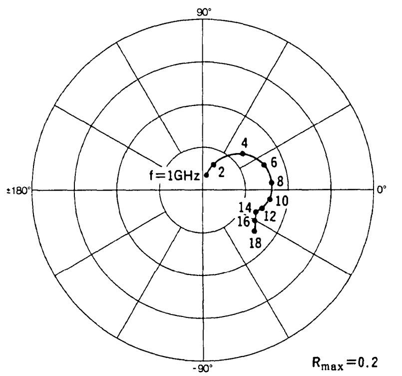
S11



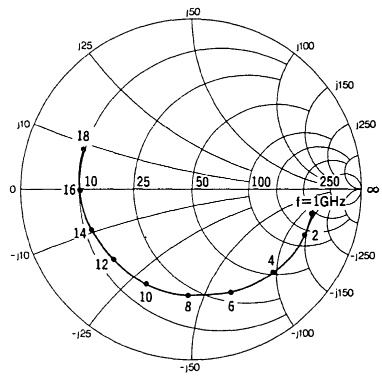
S21



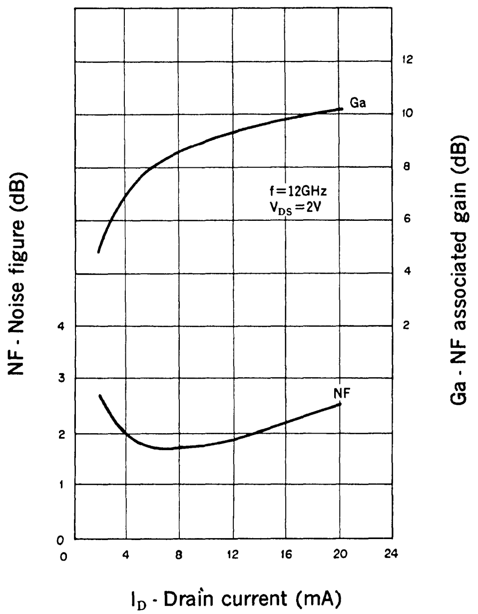
S12



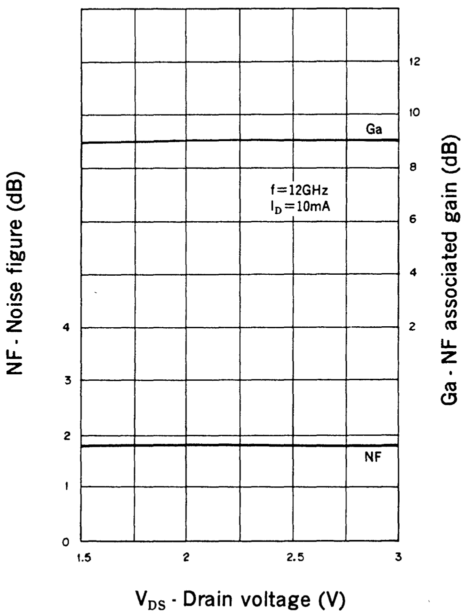
S22



Minimum noise figure, gain vs. Drain current



Minimum noise figure, gain vs. Drain voltage



SONY **3SK165**

GaAs N-Channel Dual-Gate MES FET

Description

The 3SK165 is a GaAs N-channel Dual-Gate MES FET for low noise UHF amplifiers and mixers. Low noise and high gain characteristics are accomplished by optimum mask pattern design. Easier high frequency circuits adjustments are made possible by the miniaturized plastic molded package which contributes to reduce parasitic elements of the device.

Features

- Low NF NF = 1.2 dB (Typ.) at 800MHz
- High PG PG = 20 dB (Typ.) at 800MHz
- High stability

Applications

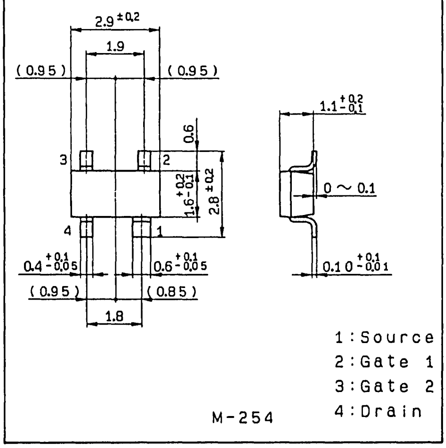
- UHF Amplifier, mixer, oscillator

Absolute Maximum Ratings (Ta = 25°C)

• Drain to source voltage	V_{DSX}	8	V
• Gate 1 to source voltage	V_{G1S}	−6	V
• Gate 2 to source voltage	V_{G2S}	−6	V
• Drain current	I_D	80	mA
• Channel temperature	Tch	150	°C
• Storage temperature	Tstg	− 55 to + 150	°C
• Allowable power dissipation	P_D	150	mW

Package Outline

Unit: mm



Electrical Characteristics

Ta = 25°C

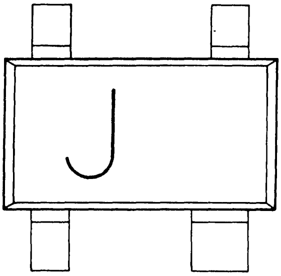
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to source voltage	V_{DSX}	I_D = 200μA, V_{G1S} = 0V, V_{G2S} = −5V	8			V
Gate 1 cutoff current	I_{G1SS}	V_{G1S} = −4V, V_{G2S} = 0V, V_{DS} = 0V			−20	μA
Gate 2 cutoff current	I_{G2SS}	V_{G2S} = −4V, V_{G1S} = 0V, V_{DS} = 0V			−20	μA
Drain saturation current*	I_{DSS}*	V_{DS} = 5V, V_{G1S} = 0V, V_{G2S} = 0V	20		55	mA
Gate 1 cutoff voltage	V_{G1S} (OFF)	V_{DS} = 5V, I_D = 100μA, V_{G2S} = 0V	-1		-4	V
Gate 2 cutoff voltage	V_{G2S} (OFF)	V_{DS} = 5V, I_D = 100μA, V_{G1S} = 0V	-1		-4	V
Forward transfer admittance	gm	V_{DS} = 5V, I_D = 10mA, V_{G2S} = 1.5V, f = 1KHz	15	22		mS
Input capacitance	Ciss	V_{DS} = 5V, I_D = 10mA, V_{G2S} = 1.5V, f = 1MHz		0.5	1.0	pF
Reverse transfer capacitance	Crss			7.5	25	fF
Power gain	PG	V_{DS} = 5V, I_D = 10mA, V_{G2S} = 1.5V, f = 800MHz	16	20		dB
Noise figure	NF			1.2	2.5	dB

* Classification

Rank	I_{DSS}	Unit
3SK165-0	20−55	mA
3SK165-1	20−35	mA
3SK165-2	30−55	mA

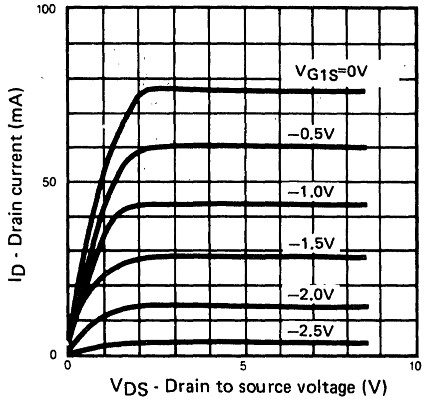
E89332-ST

Mark



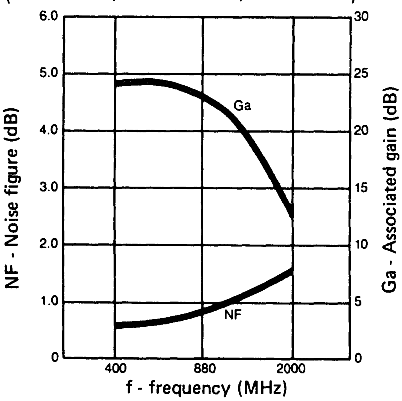
Output characteristics

(Ta=25°C, V_{G2S}=1.5V, V_{G1S}=−0.5V/step)



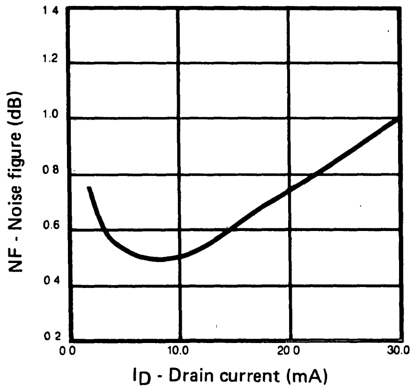
NF, Ga frequency dependence

(V_{DS}=5.0V, V_{G2S}=1.5V, I_D=10mA)

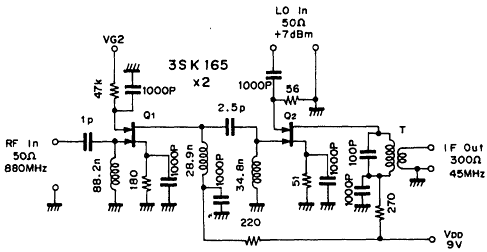


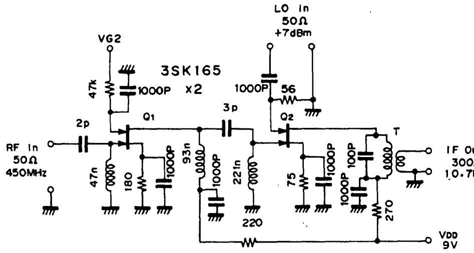
NF-I_D characteristics

(V_{DS}=5.0V, V_{G2S}=1.5V, Frequency at 450MHz)



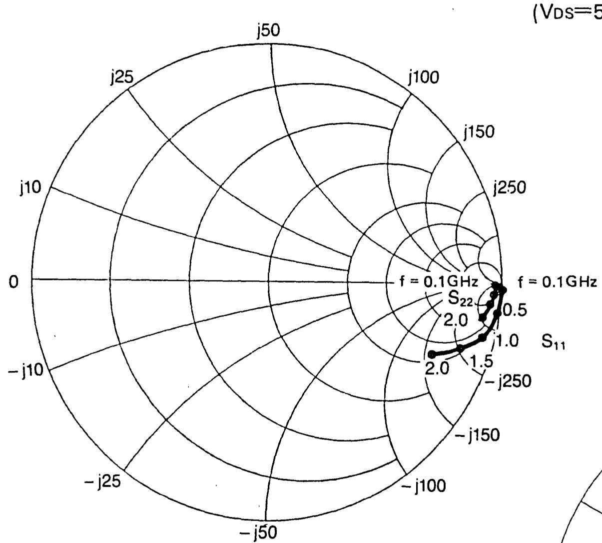
Application Circuit (Front-end amplifier)

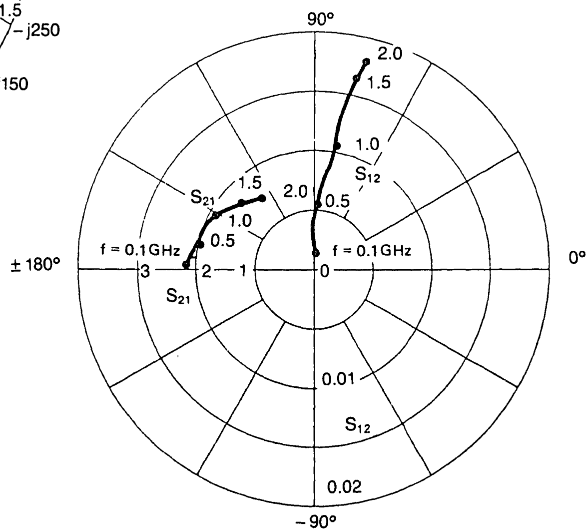




S-Parameters vs. Frequency characteristics

(VDS=5.0V, VG2S=1.5V, ID=10mA)





S-Parameter Data of FET 3SK165

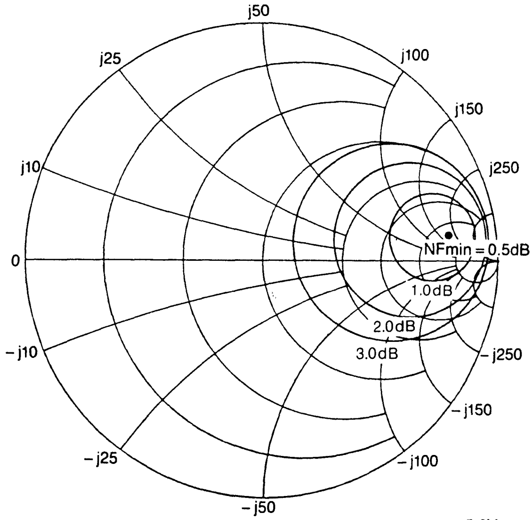
Zo=50Ω

Frequency MHz	S11 MAG	S11 ANG	S21 MAG	S21 ANG	S12 MAG	S12 ANG	S22 MAG	S22 ANG
100	.999	-1.60	2.065	177.40	0.0011	88.48	.961	-.77
200	.998	-2.97	2.044	172.69	0.0021	93.67	.961	-1.85
300	.999	-4.28	2.180	169.86	0.0023	105.04	.971	-2.98
400	.993	-5.70	2.077	170.12	0.0049	89.67	.958	-3.51
500	.989	-6.98	1.981	167.14	0.0054	83.41	.958	-4.17
600	.979	-8.16	1.999	161.04	0.0068	83.94	.960	-5.09
700	.969	-9.57	2.004	160.63	0.0082	83.47	.955	-5.68
800	.958	-10.84	1.957	159.23	0.0084	82.97	.955	-6.83
900	.948	-12.16	1.856	153.88	0.0091	79.56	.948	-7.22
1000	.938	-13.23	1.938	150.58	0.0106	78.17	.949	-8.58
1200	.912	-15.27	1.789	147.43	0.0131	79.92	.941	-10.37
1400	.877	-17.11	1.823	139.04	0.0151	74.26	.936	-12.06
1600	.841	-19.12	1.700	137.04	0.0156	78.12	.935	-13.26
1800	.805	-21.04	1.704	132.09	0.0171	77.47	.928	-13.91
2000	.756	-22.32	1.448	126.14	0.0176	76.07	.922	-14.46

Noise figure characteristics

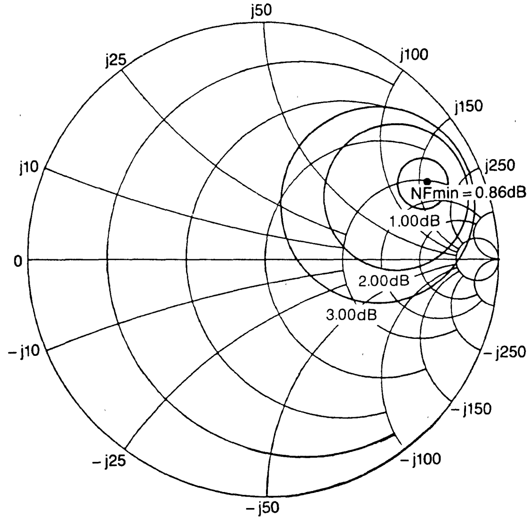
(VDS=5.0V, VG2S=1.5V, ID=10mA)

at 450MHz



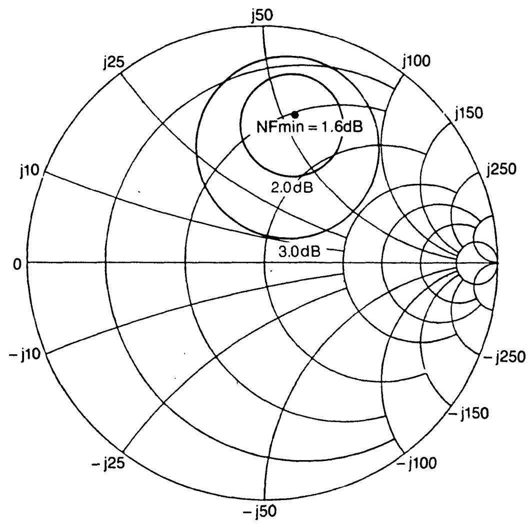
VDS = 5.0V
VG2S = 1.5V
ID = 10mA
Frequency 450 MHz
NF min 0.50 dB
Ga 23.83 dB
Gamma (S); MAG 0.799 ANG 7.78°
Gamma (L); MAG 0.887 ANG 7.31°

at 880MHz



VDS = 5.0V
VG2S = 1.5V
ID = 10mA
Frequency 880 MHz
NF min 0.86 dB
Ga 23.70 dB
Gamma (S); MAG 0.771, ANG 25.07°
Gamma (L); MAG 0.830, ANG 21.84°

at 2000MHz



Frequency (MHz)	Ga (dB)	NF (dB)	Gamma- S		Gamma- L	
			MAG	ANG	MAG	ANG
400	23.54	0.59	0.824	3.16°	0.910	8.75°
450	23.83	0.50	0.799	7.78°	0.887	7.31°
500	22.79	0.47	0.792	12.03°	0.848	14.56°
880	23.70	0.86	0.771	25.07°	0.830	21.84°
2000	12.92	1.60	0.643	78,48°	0.559	46.00°

VDS = 5.0V
VG2S = 1.5V
ID = 10mA
Frequency 2000 MHz
NF min 1.60 dB
Ga 12.91 dB
Gamma (S); MAG 0.643, ANG 78.48°
Gamma (L); MAG 0.559, ANG 46.00°

SONY® | **3SK166**

GaAs N-channel Dual-Gate MES FET

Description

3SK166 is a GaAs N-channel Dual-Gate MES FET for low noise UHF amplifiers. Low noise and high gain characteristics are accomplished by optimum mask pattern design. Easier high frequency circuits adjustments are made possible by the miniaturized plastic molded package which contributes to reduce parasitic elements of the device.

Features

- Low NF   NF = 1.2 dB (Typ.) at 800 MHz
- High PG   PG = 20 dB (Typ.) at 800 MHz
- High Stability

Structure

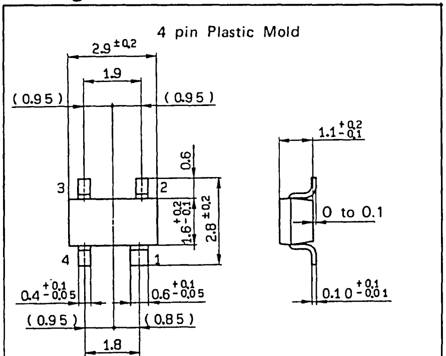
GaAs N-channel Dual-Gate MES (Metal Semiconductor) type FET.

Applications

- UHF Amplifier, oscillator.

Package Outline

Unit: mm



1 : Source
2 : Gate 1
3 : Gate 2
4 : Drain

M-254

Absolute Maximum Ratings (Ta=25°C)

• Drain to source voltage	V_{DSX}	8	V
• Gate 1 to source voltage	V_{G1S}	−6	V
• Gate 2 to source voltage	V_{G2S}	−6	V
• Drain current	I_D	80	mA
• Channel temperature	Tch	150	°C
• Storage temperature	Tstg	−55 to +150	°C
• Allowable power dissipation	P_D	150	mW

Electrical Characteristics

Ta=25°C

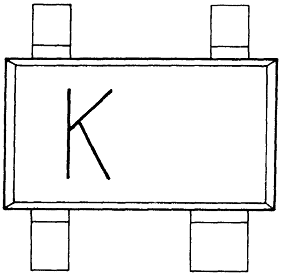
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain to source voltage	V_{DSX}	I_D = 200μA, V_{G1S} = 0V, V_{G2S} = −5V	8			V
Gate 1 cutoff current	I_{G1SS}	V_{G1S} = −5V, V_{G2S} = 0V, V_{DS} = 0V			−20	μA
Gate 2 cutoff current	I_{G2SS}	V_{G2S} = −5V, V_{G1S} = 0V, V_{DS} = 0V			−20	μA
Drain saturation current	I_{DSS}*	V_{DS} = 5V, V_{G1S} = 0V, V_{G2S} = 0V	20		80	mA
Gate 1 cutoff voltage	V_{G1S} (OFF)	V_{DS} = 5V, I_D = 100μA, V_{G2S} = 0V	-1		-4	V
Gate 2 cutoff voltage	V_{G2S} (OFF)	V_{DS} = 5V, I_D = 100μA, V_{G1S} = 0V	-1		-4	V
Forward transfer admittance	gm	V_{DS} = 5V, I_D = 10mA, V_{G2S} = 1.5V, f = 1KHz	25	40		mS
Input capacitance	Ciss	V_{DS} = 5V, I_D = 10mA, V_{G2S} = 1.5V, f = 1MHz		1.3	2.0	pF
Reverse transfer capacitance	Crss			25	40	fF
Power gain	PG	V_{DS} = 5V, I_D = 10mA, V_{G2S} = 1.5V, f = 800MHz	18	20		dB
Noise figure	NF			1.2	2.5	dB

* Classification

Rank	I_{DSS}	Unit
3SK166-0	20—80	mA
3SK166-1	30—55	mA
3SK166-2	45—80	mA

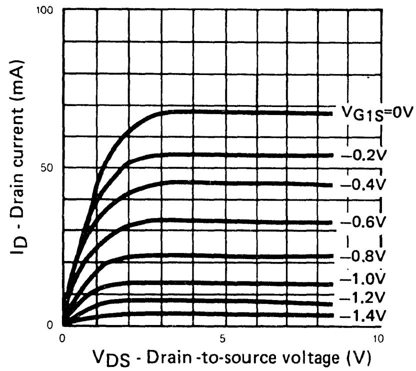
E89333-ST

Mark



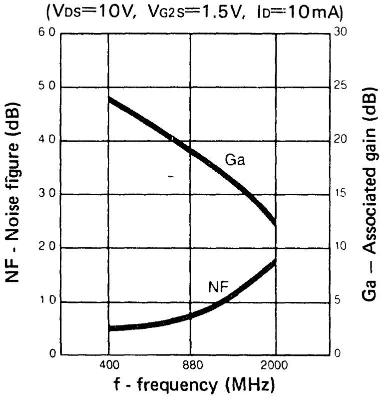
Output characteristics

(Ta=25°C, V_{G2S}=1.5V, V_{G1S}=−0.2V/step)



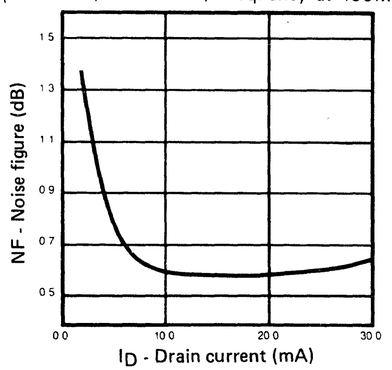
NF, Ga frequency dependence

(V_{DS}=10V, V_{G2S}=1.5V, I_D=10mA)

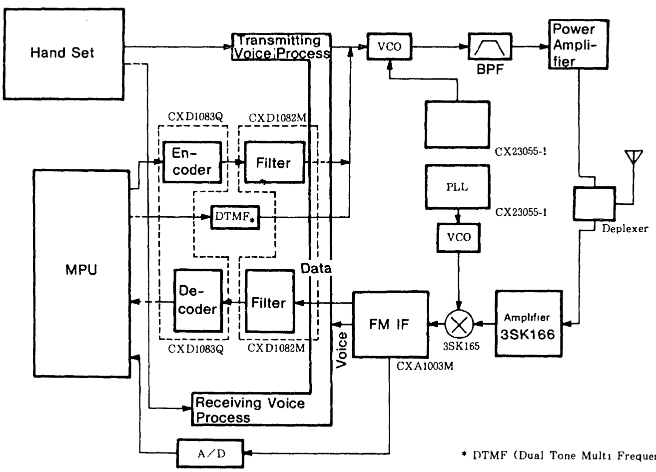


NF-I_D characteristics

(V_{DS}=5.0V, V_{G2S}=1.5V, Frequency at 450MHz)



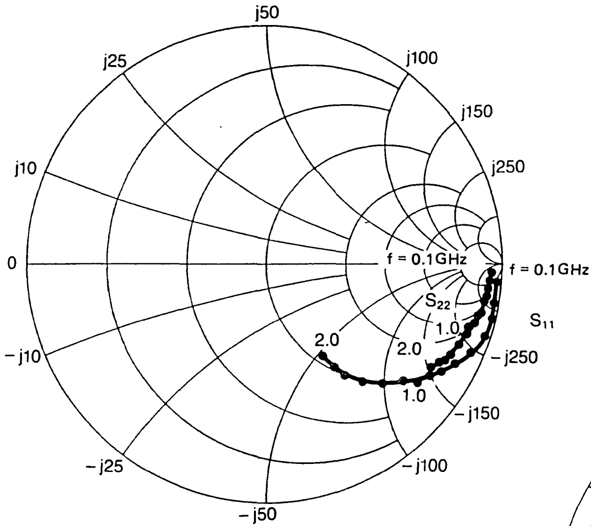
Application Example for Cellular System

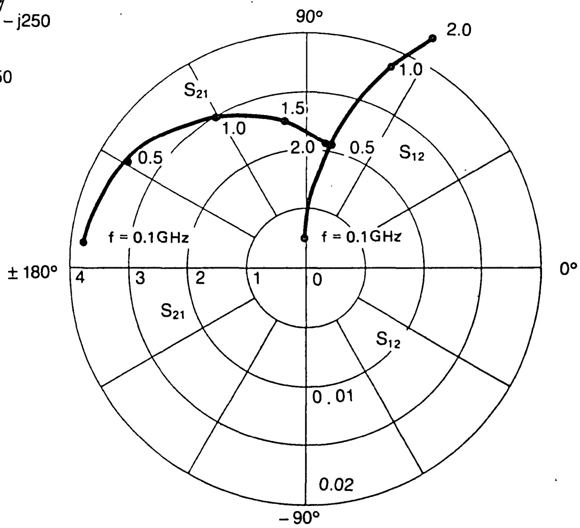


* DTMF (Dual Tone Multi Frequency)

S-Parameter vs. Frequency characteristics

(VDS=5.0V, VG2S=1.5V, ID=10mA)





S-Parameter Data of FET 3SK166

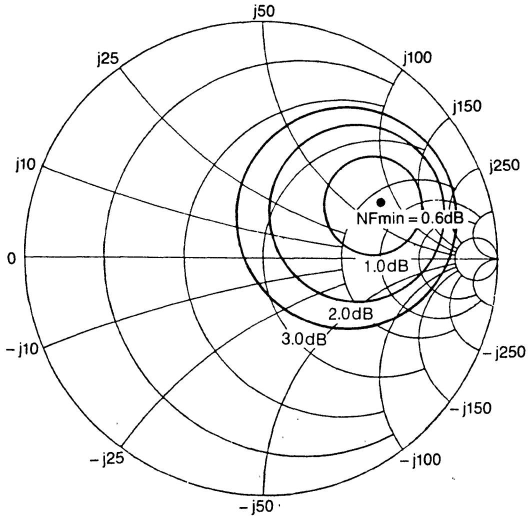
Zo=50Ω

Frequency MHz	S11 MAG	S11 ANG	S21 MAG	S21 ANG	S12 MAG	S12 ANG	S22 MAG	S22 ANG
100	.997	−4.90	3.815	173.47	0.0025	90.83	.941	−1.80
200	.991	−9.59	3.745	165.74	0.0041	86.98	.939	−4.18
300	.998	−13.04	3.672	161.43	0.0095	84.23	.979	−9.40
400	.959	−18.65	3.647	155.81	0.0105	82.44	.928	−8.23
500	.933	−22.47	3.471	149.90	0.0110	76.78	.925	−9.44
600	.904	−26.50	3.400	141.51	0.0134	76.78	.926	−11.85
700	.873	−30.25	3.311	137.92	0.0153	72.93	.913	−12.87
800	.844	−33.71	3.173	132.54	0.0160	73.56	.912	−15.33
900	.814	−36.72	3.002	125.45	0.0172	69.08	.896	−16.30
1000	.780	−39.35	3.058	120.39	0.0189	66.18	.897	−18.80
1200	.707	−44.48	2.741	112.87	0.0217	65.07	.882	−22.55
1400	.641	−49.20	2.636	103.06	0.0246	60.53	.868	−25.75
1600	.587	−52.59	2.412	95.81	0.0236	61.71	.863	−28.06
1800	.520	−54.29	2.357	88.93	0.0245	62.06	.855	−29.88
2000	.452	−57.35	2.145	80.33	0.0239	60.92	.834	−31.69

Noise figure characteristics

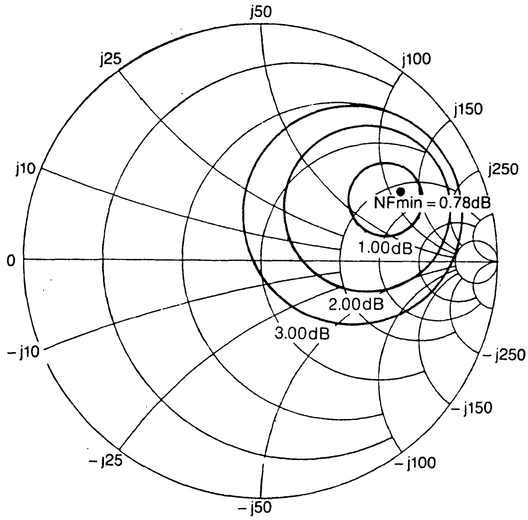
(VDS=5.0V, VG2S=1.5V, ID=10mA)

at 450MHz



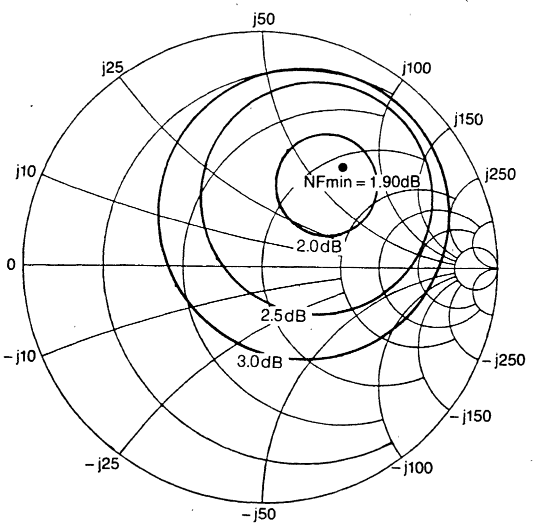
VDS = 5.0V
VG2S = 1.5V
ID = 10mA
Frequency 450 MHz
NF min 0.60 dB
Ga 23.02 dB
Gamma (S); MAG 0.559 ANG 26.73°

at 880MHz



VDS = 5.0V
VG2S = 1.5V
ID = 10mA
Frequency 880 MHz
NF min 0.78 dB
Ga 19.25 dB
Gamma (S); MAG 0.616, ANG 26.89°

at 2000MHz



Frequency (MHz)	Ga (dB)	NF (dB)	Gamma- S		Gamma- L	
			MAG	ANG	MAG	ANG
400	24.31	0.51	0.689	21.39°	0.902	14.07°
450	23.02	0.60	0.559	26.73°	0.894	16.93°
500	22.43	0.66	0.690	19.49°	0.894	17.93°
880	19.25	0.78	0.616	26.87°		
2000	12.90	1.90	0.542	51.14°		

VDS = 5.0V
VG2S = 1.5V
ID = 10mA
Frequency 2000 MHz
NF min 1.90 dB
Ga 12.90 dB
Gamma (S); MAG 0.542, ANG 51.14°

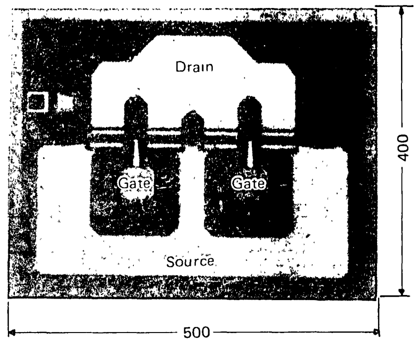
SONY® **2SK676H5**

AlGaAs/GaAs Low Noise Microwave HEMT CHIP

Description

The 2SK676H5 is an AlGaAs/GaAs HEMT chip fabricated by MOCVD (Metal Organic Chemical Vapor Deposition). This 0.5 micron gate FET features very low noise figure and high gain, and is suitable for a wide range of front-end amplifier applications including satellite reception and other communications systems up to K-band.

Chip outline **Unit: μm**



Features

- Low noise figure
- Excellent device uniformity
- High gain
- Wide band

Structure

AlGaAs/GaAs N-channel HEMT chip
Twin gate-pad π geometry

Absolute Maximum Ratings (Ta=25°C)

• Drain to source voltage	V_{DS}	5	V
• Gate to source voltage	V_{GSO}	−3.5	V
• Drain current	I_D	70	mA

Electrical Characteristics

Ta=25°C

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Gate to source cutoff current	I_{GSS}	V_{DS}=0V, V_{GS}=−3V				−100	μA
Drain current	I_{DSS}	V_{DS}=2V, V_{GS}=0V		10	40	70	mA
Gate to source cutoff voltage	$V_{GS(OFF)}$	V_{DS}=2V, I_D=500μA		−0.2	−1.5	−3.0	V
Forward transfer admittance	Y_{fs}	V_{DS}=2V, I_D=10mA		25	40		ms
Noise figure	NF	V_{DS}=2V, I_D=10mA	f=12GHz			1.4	dB
Associated gain at NF min.	Ga	V_{DS}=2V I_D=10mA	f=12GHz	9	11		dB

Noise figure ranks determined on a sampling basis by measuring ceramic-mounted devices.

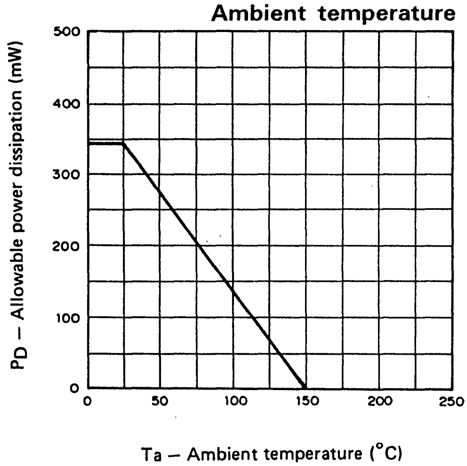
Noise Figure Classification (f=12 GHz)

	Min.	Typ.	Max.	
2SK676H5-1	—	—	1.0	dB
2SK676H5-2	—	—	1.2	dB
2SK676H5-3	—	—	1.4	dB

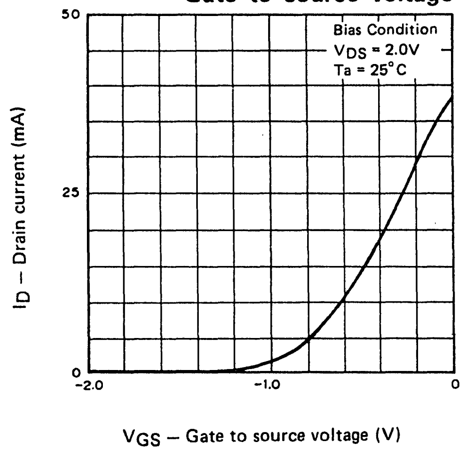
V_{DS}=2V
I_D=10mA

E90180 – ST

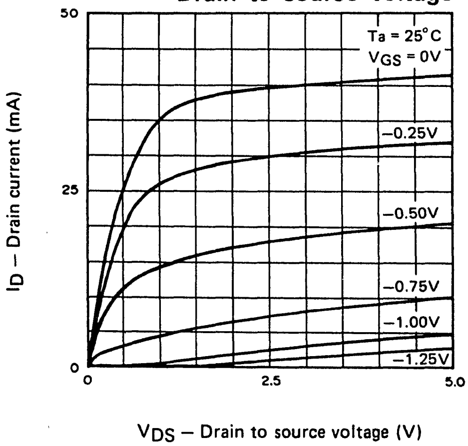
Allowable power dissipation vs. Ambient temperature



Drain current vs. Gate to source voltage



Drain current vs. Drain to source voltage

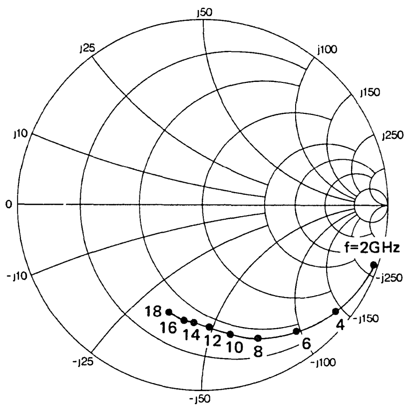


S-Parameters vs. Frequency Characteristics

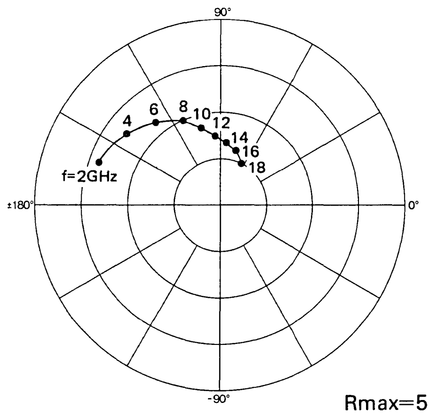
V_{DS}=2V, I_D=10 mA

f (GHz)	S11 MAG	S11 ANG	S21 MAG	S21 ANG	S12 MAG	S12 ANG	S22 MAG	S22 ANG
2	0.976	−20.0	3.415	161.1	0.030	79.2	0.744	−10.1
4	0.916	−38.6	3.164	143.8	0.057	69.8	0.723	−19.0
6	0.852	−54.2	2.819	129.4	0.076	62.2	0.700	−27.2
8	0.775	−67.7	2.482	115.3	0.089	55.9	0.671	−32.6
10	0.717	−78.3	2.154	105.0	0.096	52.8	0.657	−37.2
12	0.667	−87.2	1.897	94.4	0.103	52.6	0.644	−41.4
14	0.631	−93.7	1.666	85.4	0.103	55.0	0.648	−45.1
16	0.625	−99.4	1.542	75.4	0.105	58.8	0.627	−47.8
18	0.605	−106.8	1.237	63.6	0.123	62.6	0.645	−46.7

S11

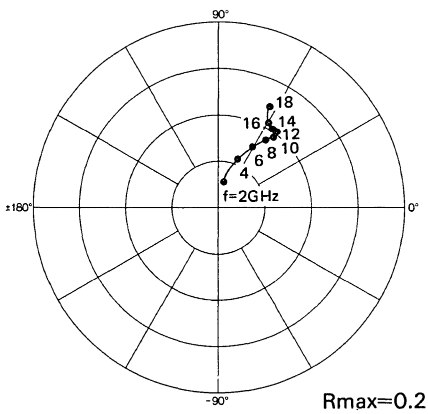


S21



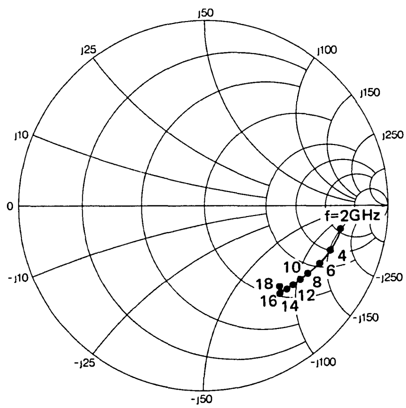
Rmax=5

S12

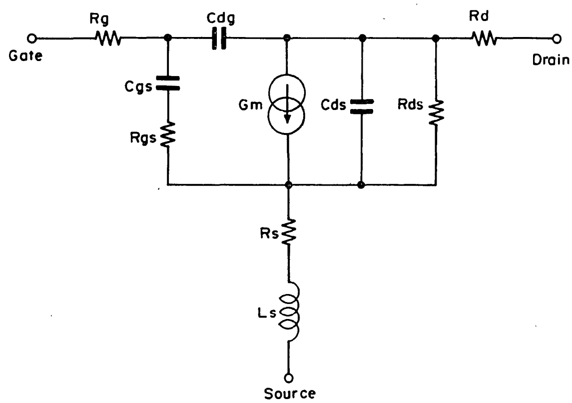


Rmax=0.2

S22



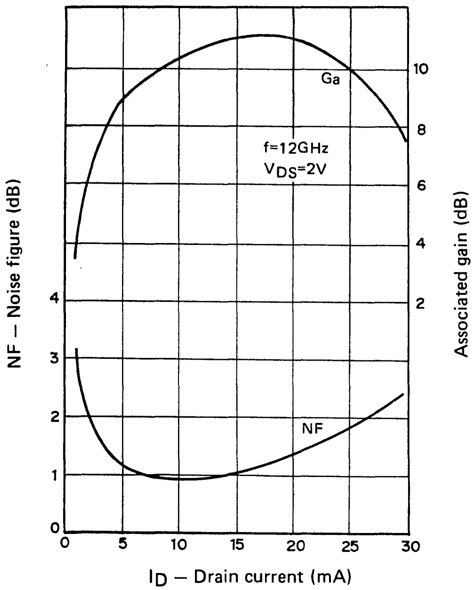
Equivalent Circuit



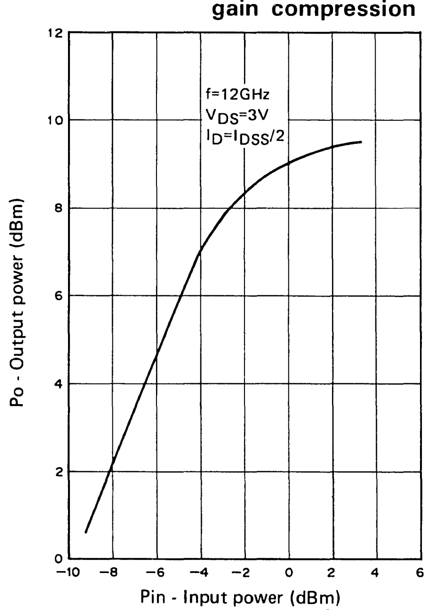
V_{DS}=2V, I_D=10 mA

Parameter	Value
Rg	1Ω
Cgs	0.23 pF
Rgs	3.5Ω
Gm	50 mS
Cds	0.06 pF
Rds	300Ω
Rd	1Ω
Rs	3.5Ω
Ls	0.08 nH
Cdg	28 fF

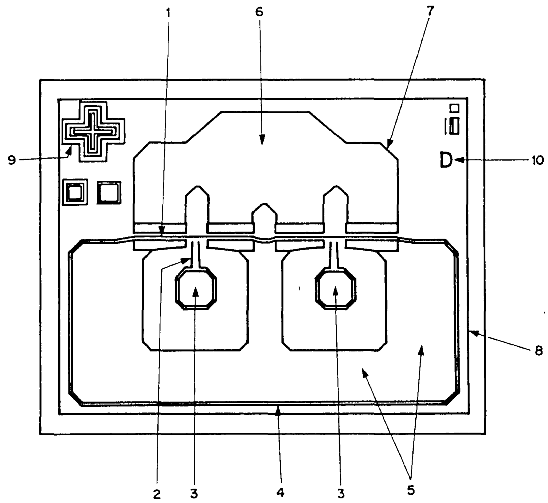
Minimum noise figure vs. Drain current



Output power at 1 dB gain compression

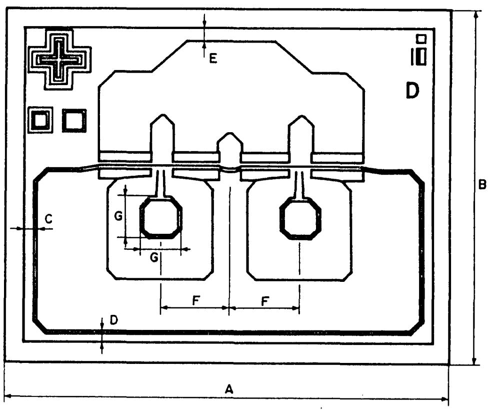


Chip Outline



1. Gate area
2. Gate metal
3. Gate bonding pad
4. Source metal
5. Source bonding pad
6. Drain bonding pad
7. Drain metal
8. Scribe line
9. Alignment mark
10. D: 2SK676H5

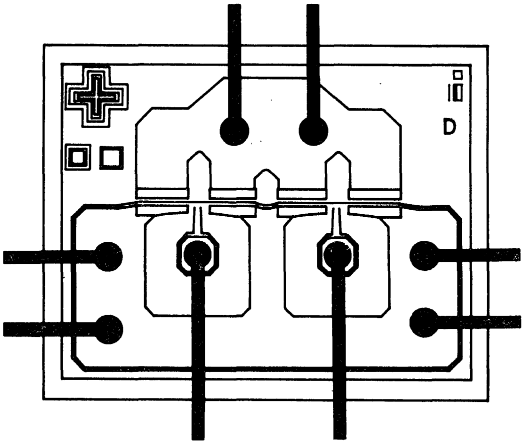
Chip Pattern Dimension



Symbol	Dimension (μm)
A	500 ±50
B	400 ±50
C	15 ± 3
D	10 ± 3
E	15 ± 3
F	75 ± 5
G	44 ± 5

Chip thickness 150 ± 30 μm
Pad metal Au 1 ± 0.15 μm
Back metal Ti/Au 0.45 ± 0.05 μm

Recommended Bonding Position



HEMT Chip Handling Precautions

1) All handling and assembly operations should be done in a clean and dry environment.

2) Chips should be stored in a dry nitnogen environment at room temperature.

3) Care must be exercised when handling GaAs chips, since they break easily under pressure.

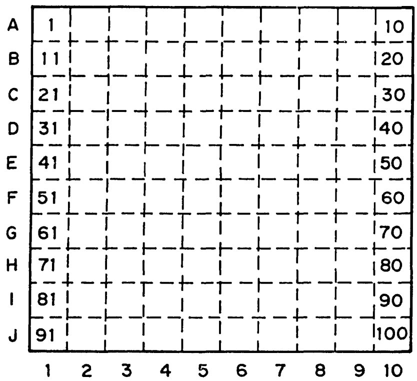
4) All equipment used for handling, die attachment, and wire bonding must be properly grounded to avoid electrostatic damage to the chips.

5) Die attachment: Use AuSn alloy in nitrogen atmosphere. The temperature should be 280 to 300°C, and the operation time should be kept as short as possible. When using Ag paste, cure for one hour at 160°C in a nitrogen atmosphere.

6) Wire bonding: Thermal compression wedge bonding is recommended.
The temperature should be under 290°C, and the operation time should be kept under a minute. Bonding wire diameter should be 0.7 to 1.0 mils (18 to 25 microns) diameter gold. Wire lengths should, in general, be kept as short as possible.

Packaging

The chip is placed on the film carrier and numbered as shown in the figure, starting in the top left corner.



SONY® **2SK677H5**

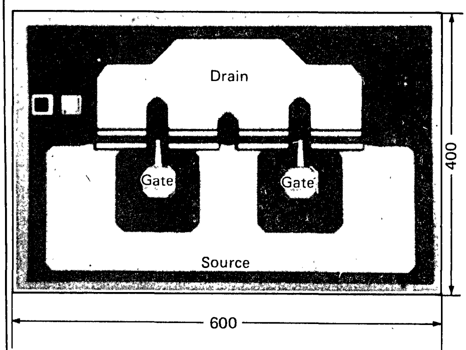
AlGaAs/GaAs Low Noise Microwave HEMT CHIP

Description

The 2SK677H5 is an AlGaAs/GaAs HEMT chip fabricated by MOCVD (Metal Organic Chemical Vapor Deposition). This 0.5 micron gate FET features very low noise figure and high gain, and is suitable for a wide range of front-end amplifier applications including satellite reception and other communications systems up to K-band.

Chip outline

Unit: μm



Features

- Low noise figure
- Excellent device uniformity
- High gain
- Wide band

Structure

AlGaAs/GaAs N-channel HEMT chip
Twin gate-pad π geometry

Absolute Maximum Ratings (Ta=25°C)

• Drain to source voltage	V_{DS}	5	V
• Gate to source voltage	V_{GSO}	−3.5	V
• Drain current	I_D	100	mA

Electrical Characteristics

Ta=25°C

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Gate to source cutoff current	I_{GSS}	V_{DS}=0V, V_{GS}=−3V				−150	μA
Drain current	I_{DSS}	V_{DS}=2V, V_{GS}=0V		15	60	100	mA
Gate to source cutoff voltage	$V_{GS(OFF)}$	V_{DS}=2V, I_D=500μA		−0.2	−1.5	−3.0	V
Forward transfer admittance	Y_{fs}	V_{DS}=2V, I_D=15mA		37	60		ms
Noise figure	NF	V_{DS}=2V, I_D=15mA	f=12GHz			1.4	dB
Associated gain at NF min.	Ga	V_{DS}=2V I_D=15mA	f=12GHz	9	11		dB

Noise figure ranks determined on a sampling basis by measuring ceramic-mounted devices.

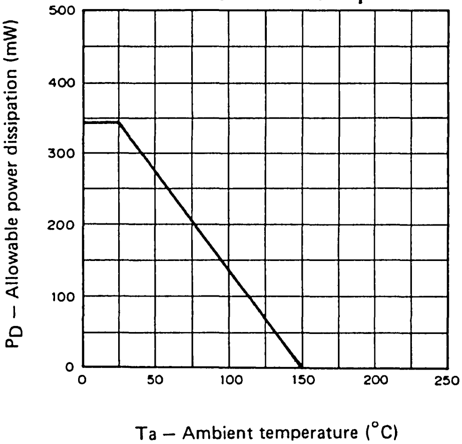
Noise Figure Classification (f=12 GHz)

	Min.	Typ.	Max.	
2SK677H5-1	–	–	1.0	
2SK677H5-2	–	–	1.2	dB
2SK677H5-3	–	–	1.4	

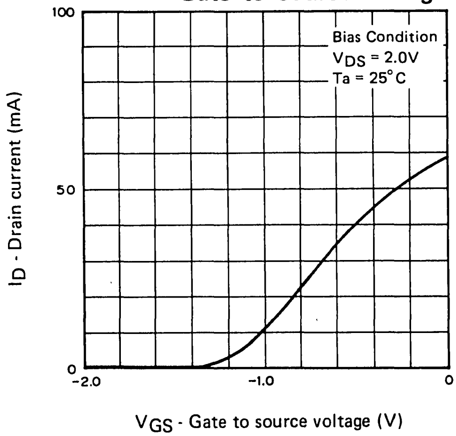
V_{DS}=2V
I_D=15mA

E90181 – ST

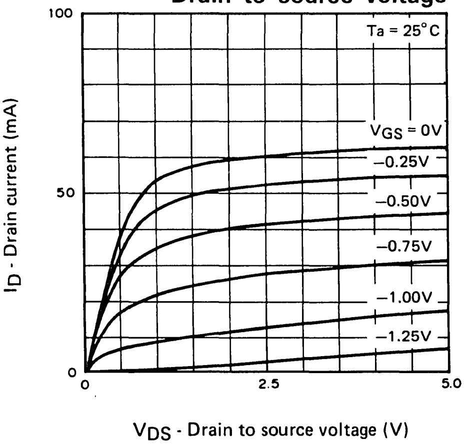
Allowable power dissipation vs. Ambient temperature



Drain current vs. Gate to source voltage



Drain current vs. Drain to source voltage

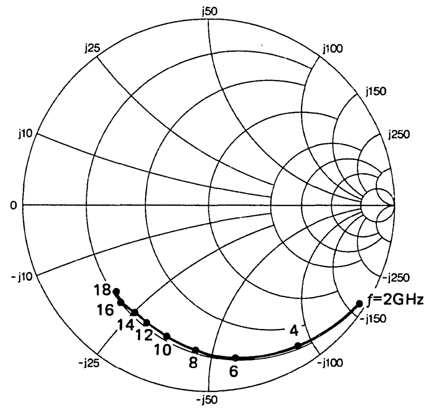


S-Parameter vs. Frequency Characteristics

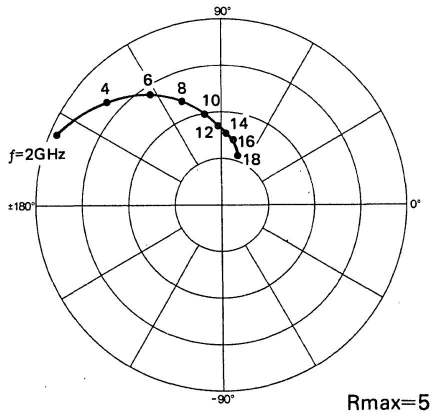
V_{DS}=2V, I_D=15 mA

f	S11		S21		S12		S22	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2	0.972	−33.1	4.808	157.4	0.037	72.5	0.675	−15.6
4	0.888	−58.3	4.133	137.5	0.065	59.2	0.642	−28.8
6	0.838	−80.2	3.535	122.5	0.086	48.2	0.606	−40.5
8	0.781	−95.1	2.948	111.1	0.098	41.4	0.581	−48.3
10	0.741	−107.6	2.487	101.4	0.106	35.2	0.568	−54.9
12	0.711	−118.4	2.132	93.1	0.110	29.3	0.557	−59.5
14	0.701	−124.5	1.884	86.8	0.109	28.9	0.586	−63.5
16	0.724	−133.2	1.796	80.2	0.125	22.4	0.587	−76.0
18	0.682	−137.2	1.403	74.0	0.105	10.4	0.496	−73.4

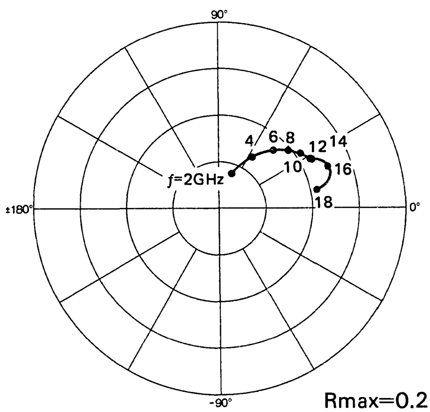
S11



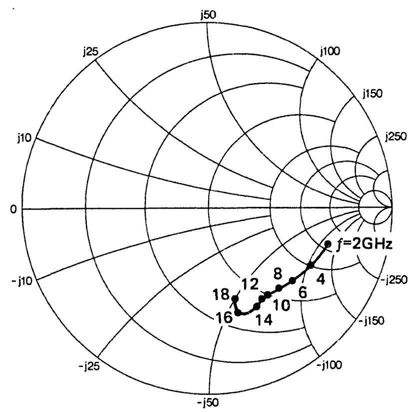
S21



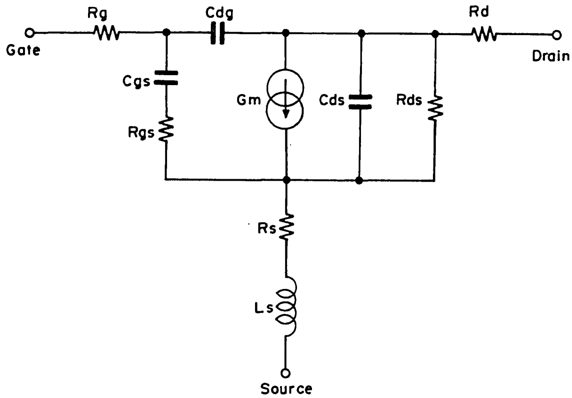
S12



S22



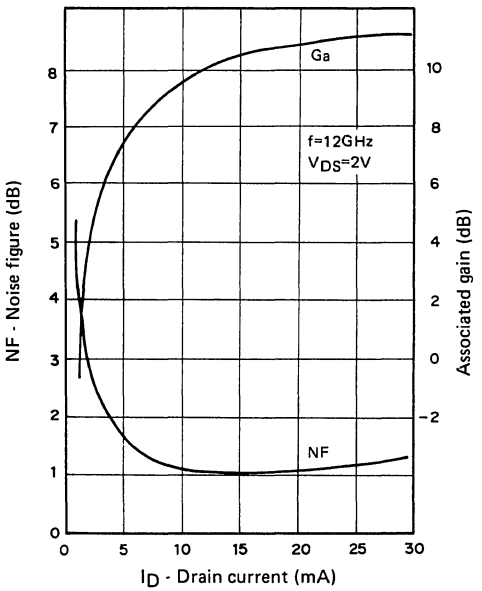
Equivalent Circuit



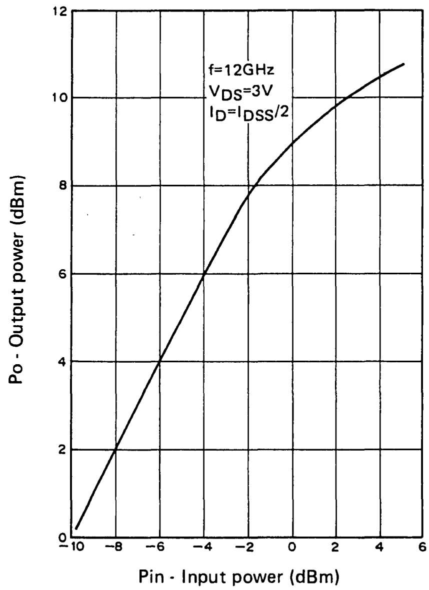
V_{DS}=2V, I_D=15 mA

Parameter	Value
Rg	1.5Ω
Cgs	0.36 pF
Rgs	3Ω
Gm	64 mS
Cds	0.08 pF
Rds	200Ω
Rd	1Ω
Rs	2.3Ω
Ls	0.01 nH
Cdg	40 fF

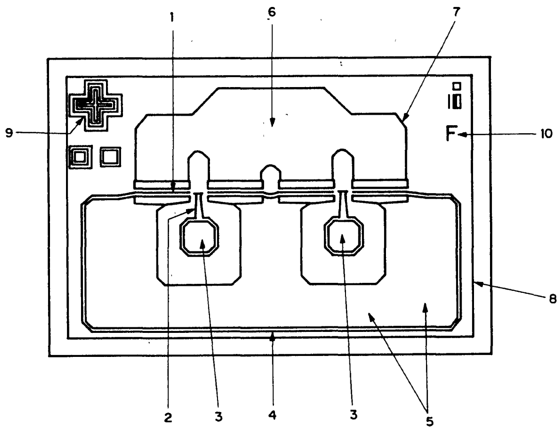
Minimum noise figure vs. Drain current



Output Power at 1 dB gain compression

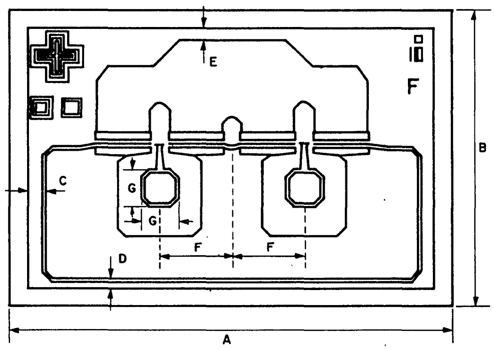


Chip Outline



1. Gate Area
2. Gate Metal
3. Gate Bonding Pad
4. Source Metal
5. Source Bonding Pad
6. Drain Bonding Pad
7. Drain Metal
8. Scribe Line
9. Alignment Mark
10. F : 2SK677H5

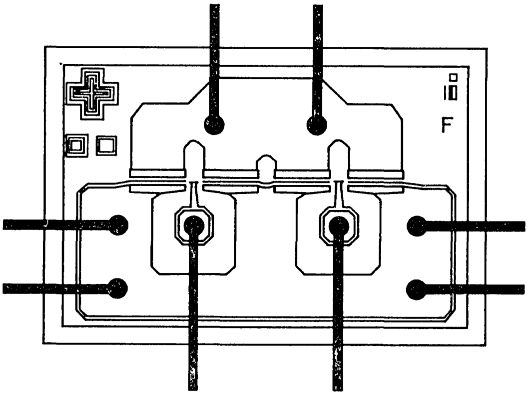
Chip Pattern Dimension



Symbol	Dimension (μm)
A	600 ±50
B	400 ±50
C	15 ± 3
D	10 ± 3
E	15 ± 3
F	100 ± 5
G	44 ± 5

Chip thickness	150 ± 30 μm
Pad metal	Au 1 ± 0.15 μm
Back metal	Ti/Au 0.45 ± 0.05 μm

Recommended Bonding Position



HEMT Chip Handling Precautions

1) All handling and assembly operations should be done in a clean and dry environment.

2) Chips should be stored in a dry nitnogen environment at room temperature.

3) Care must be exercised when handling GaAs chips, since they break easily under pressure.

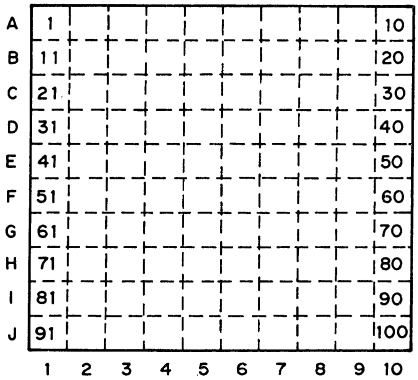
4) All equipment used for handling, die attachment, and wire bonding must be properly grounded to avoid electrostatic damage to the chips.

5) Die attachment: Use AuSn alloy in nitrogen atmosphere. The temperature should be 280 to 300°C, and the operation time should be kept as short as possible. When using Ag paste, cure for one hour at 160°C in a nitrogen atmosphere.

6) Wire bonding: Thermal compression wedge bonding is recommended.
The temperature should be under 290°C, and the operation time should be kept under a minute. Bonding wire diameter should be 0.7 to 1.0 mils (18 to 25 microns) diameter gold. Wire lengths should, in general, be kept as short as possible.

Packaging

The chip is placed on the film carrier and numbered as shown in the figure, starting in the top left corner.



SONY® SGH5002F

AlGaAs/GaAs Low Noise Microwave HEMT *Preliminary*

Description

SGH5002F is an AlGaAs/GaAs HEMT fabricated by MOCVD (Metal Organic Chemical Vapor Deposition). This 0.5 micron gate FET features very low noise figure and high gain, and is suitable for a wide range of front-end amplifier applications including satellite reception (DBS, FSS, TVRO) and other communications systems.

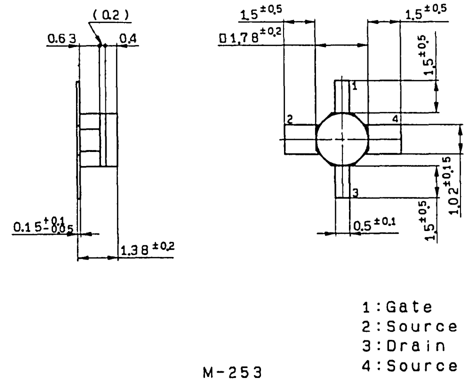
SGH5002F-T6 is for taping.

Structure

AlGaAs/GaAs N-Channel HEMT

Package Outline

Unit : mm



Absolute Maximum Ratings (Ta=25°C)

• Drain to source voltage	V_{DS}	5	V
• Gate to source voltage	V_{GSO}	−3.5	V
• Drain current	I_D	70	mA
• Channel temperature	Tch	150	°C
• Storage temperature	Tstg	−55 to +150	°C
• Allowable power dissipation	P_D	340	mW

Electrical Characteristics

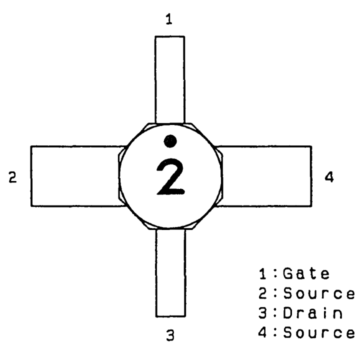
(Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Gate to source cutoff current	I_{GSS}	V_{DS}=0V, V_{GS}=−3V			−100	μA
Drain current	I_{DSS}	V_{DS}=2V, V_{GS}=0V	10	40	70	mA
Gate to source cutoff voltage	$V_{GS(OFF)}$	V_{DS}=2V, I_D=500μA	−0.2	−1.5	−3.0	V
Transconductance	gm	V_{DS}=2V, I_D=10mA	25	40		mS

Noise Figure Classification

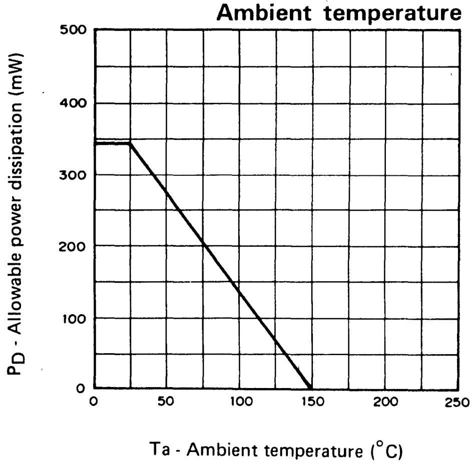
(f=12 GHz, V_{DS}=2V, I_D=10 mA)

Rank	NF (dB) Max.	Ga (dB) Min.	Ga (dB) Typ.
SGH5002F-01	1.7	8.5	9.5
SGH5002F-02	1.6	9.0	10.0
SGH5002F-03	1.5	9.5	10.5
SGH5002F-04	1.4	10.0	11.0
SGH5002F-05	1.3	10.0	11.0

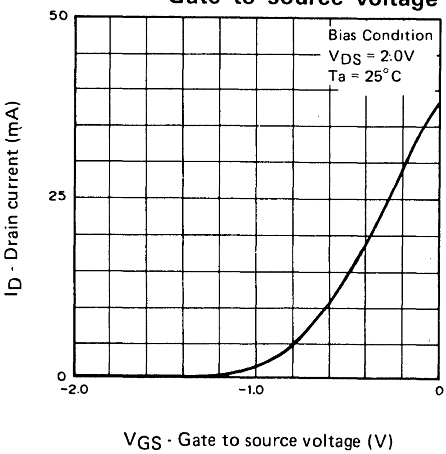


PE90246 – ST

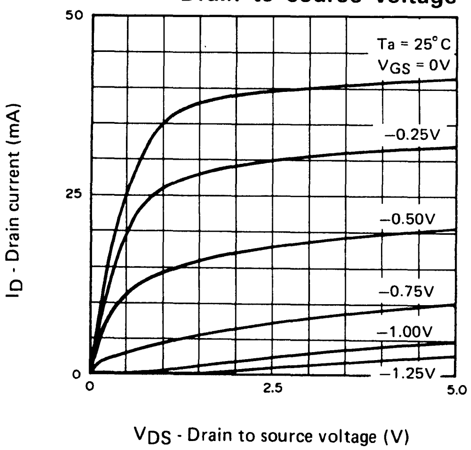
Allowable power dissipation vs. Ambient temperature



Drain current vs. Gate to source voltage



Drain current vs. Drain to source voltage

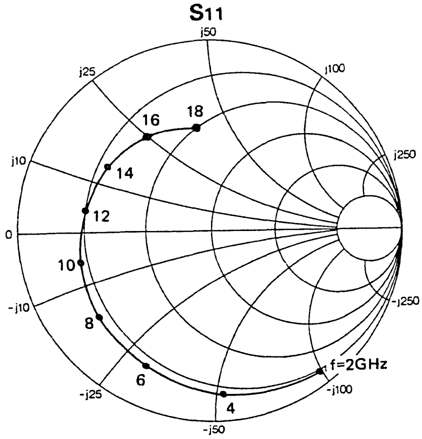


S-Parameter vs. Frequency Characteristics

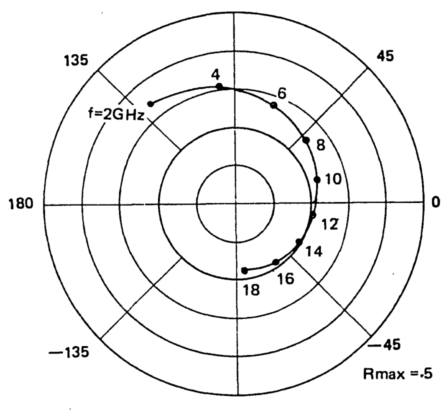
(VDS=2V, ID=10 mA)

f	S11		S21		S12		S22	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2.0	.968	−35.4	3.490	145.5	.032	64.5	.777	−25.4
3.0	.939	−52.7	3.388	129.2	.045	51.8	.753	−37.9
4.0	.901	−69.6	3.255	113.0	.055	39.8	.726	−50.3
5.0	.859	−86.2	3.105	97.3	.063	29.3	.701	−62.2
6.0	.820	−101.8	2.940	82.2	.066	19.1	.680	−74.4
7.0	.787	−116.6	2.777	67.9	.068	10.3	.661	−87.1
8.0	.763	−130.1	2.627	54.2	.066	2.1	.650	−99.4
9.0	.739	−143.0	2.486	41.1	.064	−3.0	.637	−110.8
10.0	.717	−155.4	2.371	28.5	.063	−5.9	.635	−121.3
11.0	.696	−167.3	2.249	15.8	.062	−10.0	.640	−132.5
12.0	.674	−178.9	2.152	4.0	.060	−12.8	.644	−143.9
13.0	.660	169.7	2.059	−8.4	.059	−14.7	.647	−156.2
14.0	.646	158.2	2.001	−19.8	.060	−15.2	.654	−166.0
15.0	.632	146.6	1.939	−31.9	.060	−15.9	.670	−176.0
16.0	.611	134.7	1.886	−43.8	.067	−18.3	.682	174.8
17.0	.594	122.5	1.861	−55.8	.071	−22.6	.696	164.4
18.0	.574	109.2	1.821	−68.4	.080	−32.1	.702	153.7

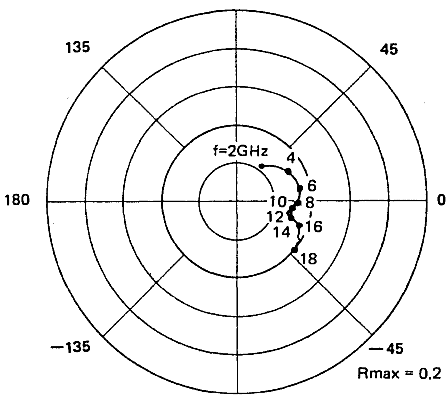
S11



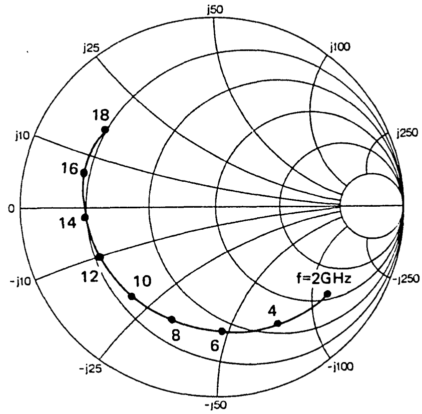
S21



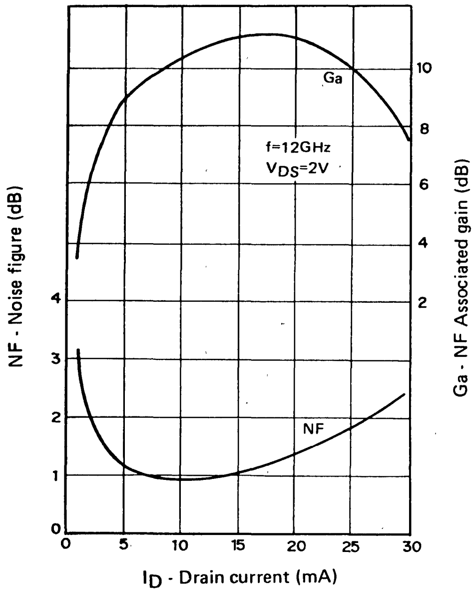
S12



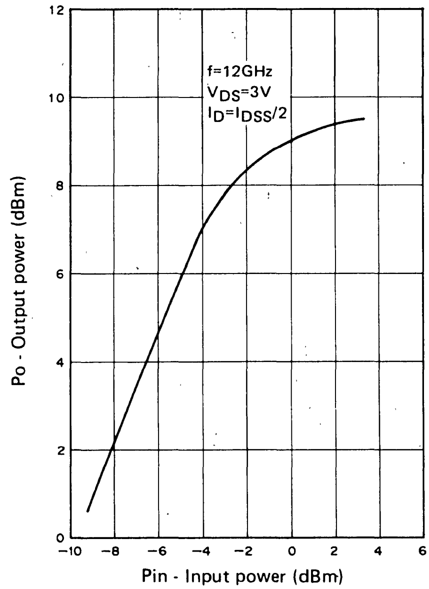
S22



Minimum noise figure vs. Drain current



Output power at 1 dB gain compression



Noise Parameter Frequency Characteristics

MODEL : SGH5002F-05 V_{DS}=2V, I_D=10mA

FREQUENCY (GHz)	NF [min] (dB)	Gamma Optimum MAG.	ANG.	Ga (dB)	Rn (ohm)
4	0.48	0.61	59.8	14.9	11.2
6	0.65	0.55	92.5	13.7	8.3
8	0.88	0.52	122.4	12.6	6.7
10	1.06	0.51	151.6	11.7	4.1
12	1.25	0.50	−178.5	10.9	2.8
14	1.44	0.49	−151.2	10.1	3.4
16	1.61	0.48	−126.3	9.5	5.6
18	1.78	0.47	−99.6	8.3	9.7

SONY®

SGH5003F

AlGaAs/GaAs Low Noise Microwave HEMT *Preliminary*

Description

SGH5003F is an AlGaAs/GaAs HEMT fabricated by MOCVD (Metal Organic Chemical Vapor Deposition). This 0.5 micron gate FET features very low noise figure and high gain, and is suitable for a wide range of front-end amplifier applications including satellite reception (DBS, FSS, TVRO) and other communications systems.

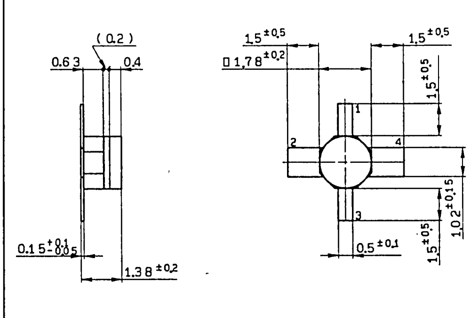
SGH5003F-T6 is for taping.

Structure

AlGaAs/GaAs N-Channel HEMT

Package Outline

Unit : mm



Absolute Maximum Ratings ($Ta=25°C$)

- Drain to source voltage V_{DS} 5 V
- Gate to source voltage V_{GSO} −3.5 V
- Drain current I_D 100 mA
- Channel temperature Tch 150 °C
- Storage temperature Tstg −55 to +150 °C
- Allowable power dissipation P_D 340 mW

Electrical Characteristics

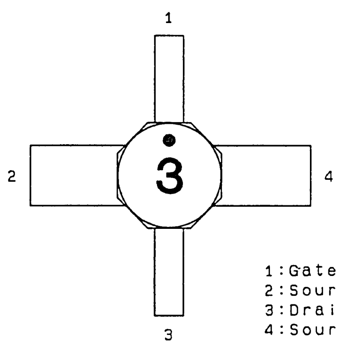
($Ta=25°C$)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Gate to source cutoff current	I_{GSS}	$V_{DS}=0V$, $V_{GS}=-3V$			−150	μA
Drain current	I_{DSS}	$V_{DS}=2V$, $V_{GS}=0V$	15	60	100	mA
Gate to source cutoff voltage	$V_{GS(OFF)}$	$V_{DS}=2V$, $I_D=500\mu A$	−0.2	−1.5	−3.0	V
Transconductance	gm	$V_{DS}=2V$, $I_D=15mA$	37	60		mS

Noise Figure Classification

($f=12$ GHz, $V_{DS}=2V$, $I_D=15$ mA)

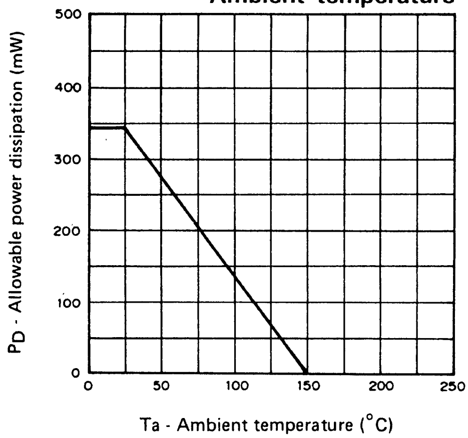
Rank	NF (dB)	Ga (dB)	
	Max.	Min.	Typ.
SGH5003F-01	1.7	8.5	9.5
SGH5003F-02	1.6	9.0	10.0
SGH5003F-03	1.5	9.5	10.5
SGH5003F-04	1.4	10.0	11.0
SGH5003F-05	1.3	10.0	11.0



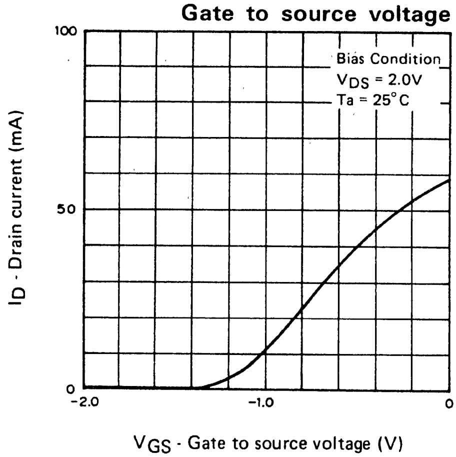
1 : Gate
2 : Source
3 : Drain
4 : Source

PE90247 – ST

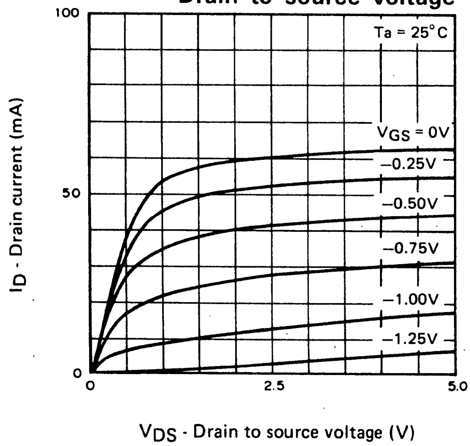
Allowable power dissipation vs. Ambient temperature



Drain current vs. Gate to source voltage



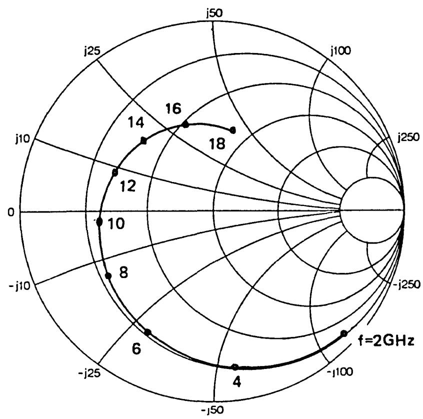
Drain current vs. Drain to source voltage



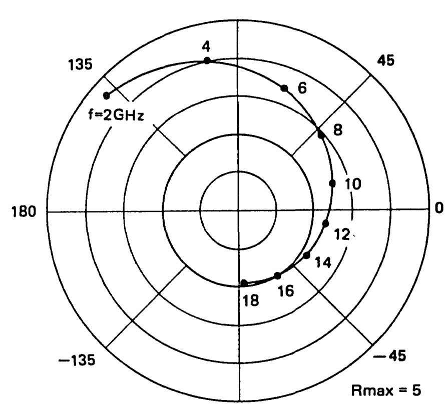
S-Parameter vs. Frequency Characteristics (VDS=2V, ID=15 mA)

f (GHz)	S11 MAG	S11 ANG	S21 MAG	S21 ANG	S12 MAG	S12 ANG	S22 MAG	S22 ANG
2.0	.940	−43.4	4.622	138.9	.038	60.7	657	−30.3
3.0	.886	−63.7	4.350	120.1	.054	49.4	.625	−44.4
4.0	.826	−83.3	4.032	102.1	.063	37.0	591	−58.0
5.0	766	−101.4	3.708	85.4	.071	28.1	564	−71.0
6.0	.714	−118.5	3.408	69.8	.074	19.9	.537	−83.7
7.0	.675	−134.2	3.141	55.3	.077	12.3	.522	−95.8
8.0	.645	−148.5	2.908	41.5	.078	7.0	.516	−107.5
9.0	.622	−161.9	2.725	28.2	.079	1.9	.518	−118.4
10.0	.595	−175.0	2.556	15.3	.083	−.6	.520	−129.6
11.0	574	172.3	2.420	2.9	.084	−3.6	.521	−140.7
12.0	.553	159.4	2.297	−9.4	.088	−8.1	.526	−151.7
13.0	538	147.1	2.200	−21.9	.095	−12.1	.537	−163.1
14.0	.518	134.8	2.121	−34.3	.100	−17.9	.548	−173.4
15.0	.497	121.7	2.052	−46.9	.108	−24.2	.566	176.6
16.0	.477	107.8	1.994	−59.5	.116	−31.8	.575	166.3
17.0	.462	93.2	1.954	−72.6	.123	−41.1	.575	154.8
18.0	.439	77.6	1.916	−86.8	.134	−51.5	.574	143.1

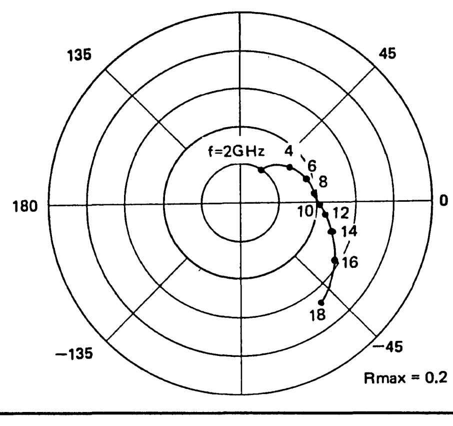
S11



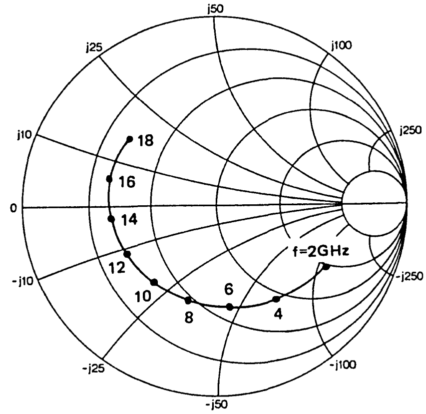
S21



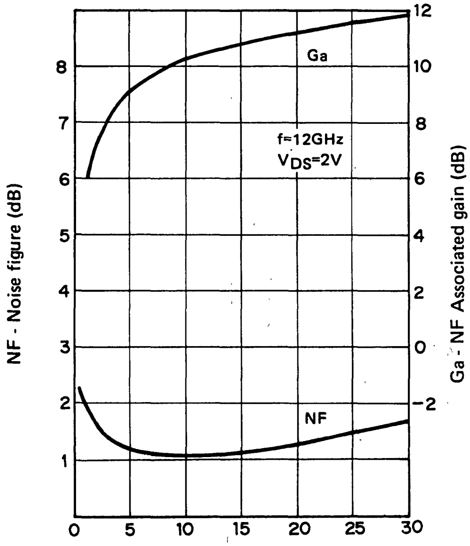
S12



S22

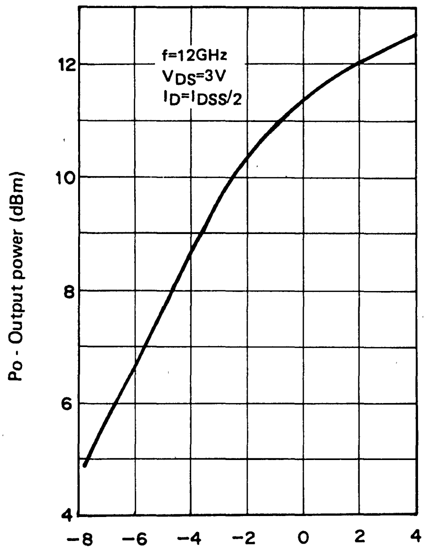


Minimum noise figure vs. Drain current



ID - Drain current (mA)

Output Power at 1 dB gain compression



Pin - Input power (dBm)

Noise Parameter Frequency Characteristics

MODEL : SGH5003F-05　　$V_{DS}=2V$, $I_D=15mA$

FREQUENCY (GHz)	NF [min] (dB)	Gamma Optimum MAG.	ANG.	Ga (dB)	Rn (ohm)
4	0.47	0.57	71.2	15.1	10.9
6	0.64	0.53	106.5	13.9	7.6
8	0.84	0.50	141.1	12.7	5.9
10	1.05	0.49	170.6	11.8	3.4
12	1.25	0.48	−167.1	10.8	2.6
14	1.45	0.47	−136.7	9.9	3.1
16	1.63	0.46	−109.8	9.2	5.2
18	1.81	0.55	−77.1	8.1	8.7

SONY® SGH5612F

AlGaAs/GaAs Low Noise Microwave HEMT

Description

SGH5612F is an AlGaAs/GaAs HEMT fabricated by MOCVD (Metal Organic Chemical Vapor Deposition). This HEMT features very low noise figure and high gain, and is suitable for a wide range of front-end amplifier applications including satellite reception (DBS, FSS, TVRO) and other communications systems.

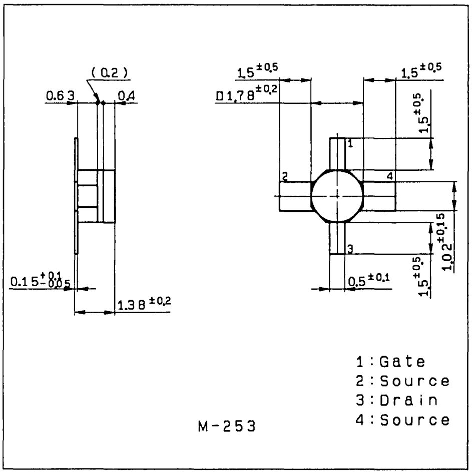
SGH5612F-T6 is for taping.

Structure

AlGaAs/GaAs N-Channel HEMT

Package Outline

Unit: mm



Absolute Maximum Ratings (Ta=25°C)

• Drain to source voltage	V_{DS}	4	V
• Gate to source voltage	V_{GSO}	+0.4 −3.0	V
• Drain current	I_D	70	mA
• Channel temperature	Tch	150	°C
• Storage temperature	Tstg	−55 to + 150	°C
• Allowable power dissipation	P_D	340	mW

Electrical Characteristics

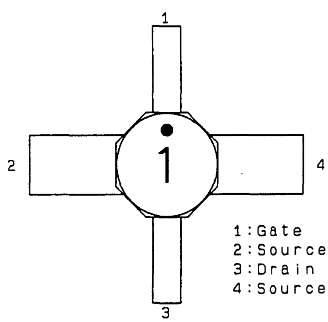
Ta=25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Gate to source cutoff current	I_{GSS}	V_{DS}=0V, V_{GS}=−3V			−100	μA
Drain current	I_{DS}	V_{DS}=2V, V_{GS}=+0.4V	12	30	70	mA
Gate to source cutoff voltage	$V_{GS(OFF)}$	V_{DS}=2V, I_D=500μA	+0.2	−0.5	−2.0	V
Transconductance	gm	V_{DS}=2V, I_D=10mA	30	50		mS

Noise Figure Classification

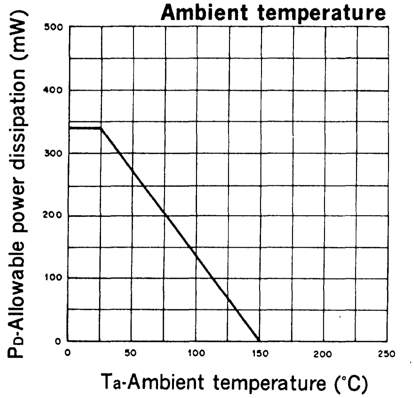
(f=12GHz, V_{DS}=2V, I_D=10mA)

Rank	NF (dB)		Ga (dB)	
	Typ.	Max.	Min.	Typ.
SGH5612F-03	1.05	1.2	9.5	10.5
SGH5612F-04	0.9	1.0	9.5	10.5

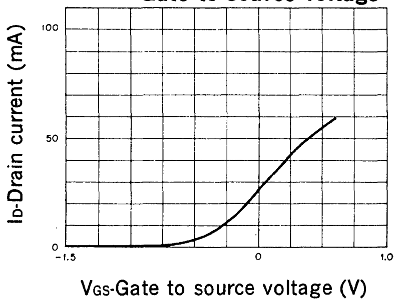


E90525A0X-HP

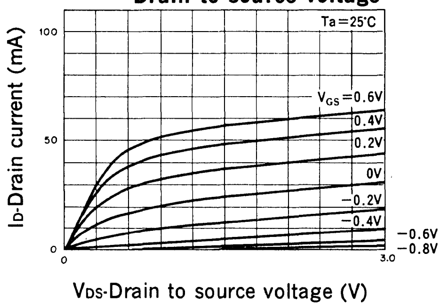
Allowable power dissipation vs. Ambient temperature



Drain current vs. Gate to source voltage



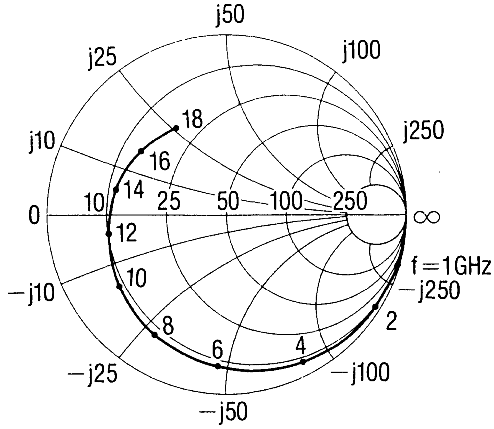
Drain current vs. Drain to source voltage



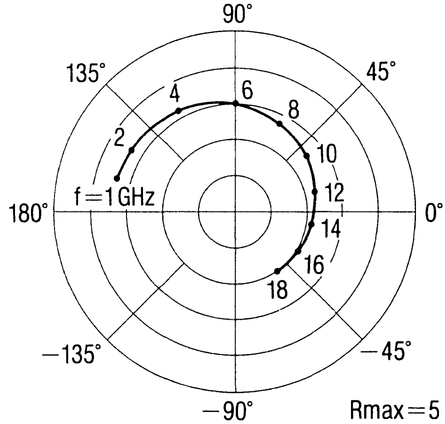
S-Parameter vs. Frequency Characteristics (V_{DS}=2V, I_D=10mA)

Frequency (GHz)	S_{11}		S_{21}		S_{12}		S_{22}	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
1	0.994	−15.8	3.394	163.9	0.018	77.8	0.548	−12.4
2	0.981	−31.1	3.344	148.9	0.036	68.8	0.538	−24.0
3	0.957	−46.4	3.305	134.1	0.053	58.8	0.521	−36.4
4	0.923	−62.0	3.214	118.8	0.069	47.6	0.498	−48.7
5	0.881	−77.5	3.105	104.1	0.080	37.2	0.473	−61.0
6	0.837	−92.4	2.976	90.0	0.091	27.9	0.448	−73.4
7	0.799	−106.7	2.844	76.5	0.098	19.4	0.427	−86.0
8	0.773	−120.2	2.723	63.4	0.103	11.9	0.414	−98.4
9	0.746	−133.1	2.618	50.7	0.107	3.4	0.411	−109.7
10	0.716	−146.1	2.509	37.7	0.110	−4.2	0.405	−121.0
11	0.687	−158.7	2.386	25.5	0.111	−11.3	0.402	−131.6
12	0.662	−170.6	2.285	14.1	0.112	−17.7	0.396	−142.3
13	0.648	178.3	2.212	3.0	0.112	−24.6	0.399	−152.4
14	0.635	167.2	2.169	−8.5	0.115	−31.4	0.407	−161.4
15	0.618	155.8	2.130	−20.4	0.116	−38.1	0.417	−171.2
16	0.594	143.8	2.066	−32.1	0.118	−46.3	0.428	179.2
17	0.575	131.8	2.025	−43.3	0.119	−54.8	0.432	169.2
18	0.563	119.8	2.004	−55.5	0.123	−63.7	0.446	160.8

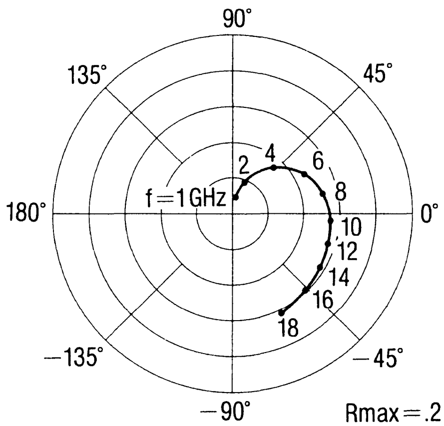
S11



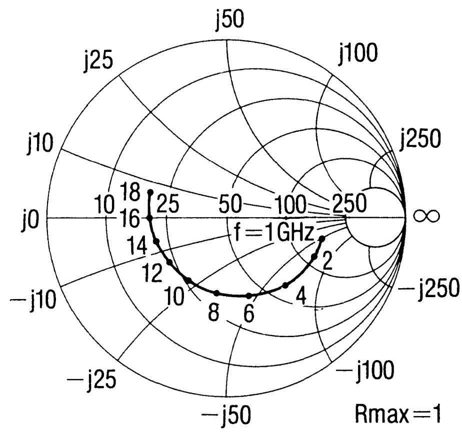
S21



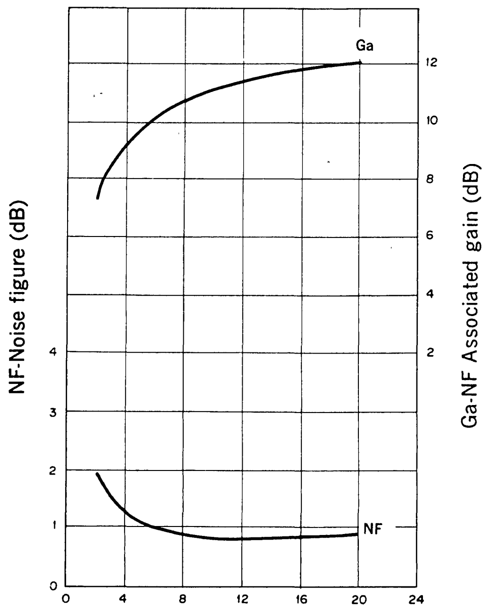
S12



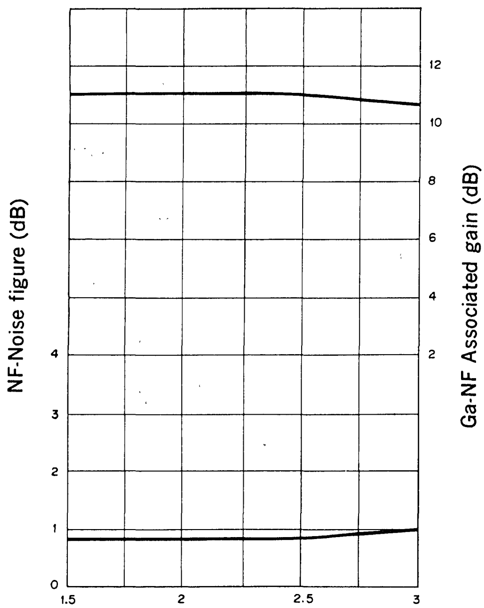
S22



Minimum noise figure vs. Drain current



Minimum noise figure vs. Drain voltage



Noise Parameter

(f=12GHz, V_{DS}=2V, I_D=10mA)

NF [min] (dB)	Gamma Optimum		Ga (dB)	Rn (Ω)
	MAG.	ANG.		
0.9	0.56	170	10.5	1.8

SDME
(Magneto resistance element)

5) SDME (Magneto resistance element)

Type	Package	Applications	Remark	Page
DM-106B	3P Mold	rpm detection, other general use	Small, standard model (2.3kΩ typ)	301
DM-111	3P Mold	rpm detection, battery operated telemeter	High resistance (650kΩ typ)	305
DM-211	4P Mold	Ditection of revolution speed	Matching with multi-pole ring magnet ($\lambda=4.52$mm)	311
DM-230	4P Special Mold	Non-contact angle of rotation detection Non-contact number of rotation detection	High sensitibity	316
DM-231	4P Special Mold	Non-contact angle of rotation detection Contactless potentiometer	Biasmagnet adhered $\theta=90°$	320
DM-232	4P Special Mold	Non-contact angle of rotation detection Contactless potentiometer	Biasmagnet adhered $\theta=0°$	324
DM-233	4P Special Mold	Non-contact angle of rotation detection Contactless potentiometer	Ferrite without magnetic field adhered	328

SONY® DM-106B

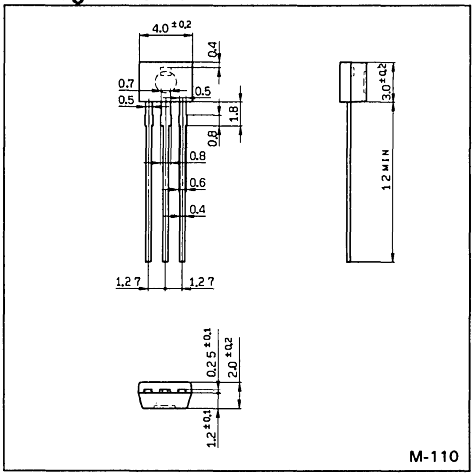
Magneto-Resistance Element

Description

The DM-106B is a highly sensitive magneto-resistance element composed of an evaporated ferromagnetic alloy on a silicon substrate. (The element can be used for automatic shut off of tape recorders, as a contactless switch, and as a general detector of rotational motion.)

Package Outline

Unit: mm



Features

- Low power consumption — 11 μW (Typ.), Vcc = 5V
- Low magnetic field and high sensitivity — 80 mVp-p (Typ.), Vcc = 5V, H = 100 Oe
- High reliability
  Ensured through silicon
  Nitride protective filming

Structure

Thin-film nickel-cobalt magnetic alloy on silicon substrate

Absolute Maximum Ratings (Ta = 25°C)

• Supply voltage	Vcc	10	V
• Operating temperature	Topr	−40 to +100	°C
• Storage temperature	Tstg	−50 to +125	°C

Recommended Operating Condition

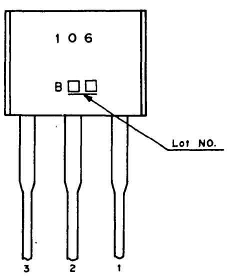
• Supply voltage	Vcc	5	V

Electrical Characteristics

Ta = 25°C

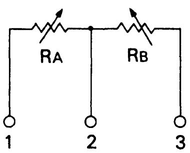
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Total resistance	R_T	Vcc = 5V, H = 100 Oe, Revolving magnetic field	1.4	2.3	3.7	kΩ
Midpoint potential	Vc	Vcc = 5V, H = 100 Oe, Revolving magnetic field	2.45	2.50	2.55	V
Output voltage	Vo	Vcc = 5V, H = 100 Oe, Revolving magnetic field	60	80		mVp-p

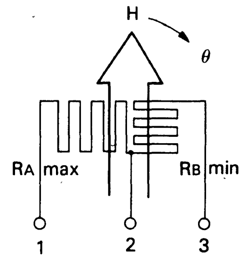
Mark



60142A-TO

Equivalent Circuit



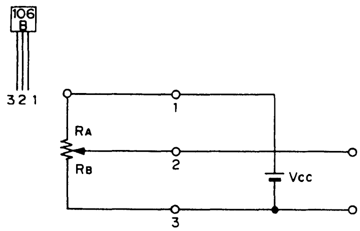


RA: Resistance reduces as the magnetic field revolves.

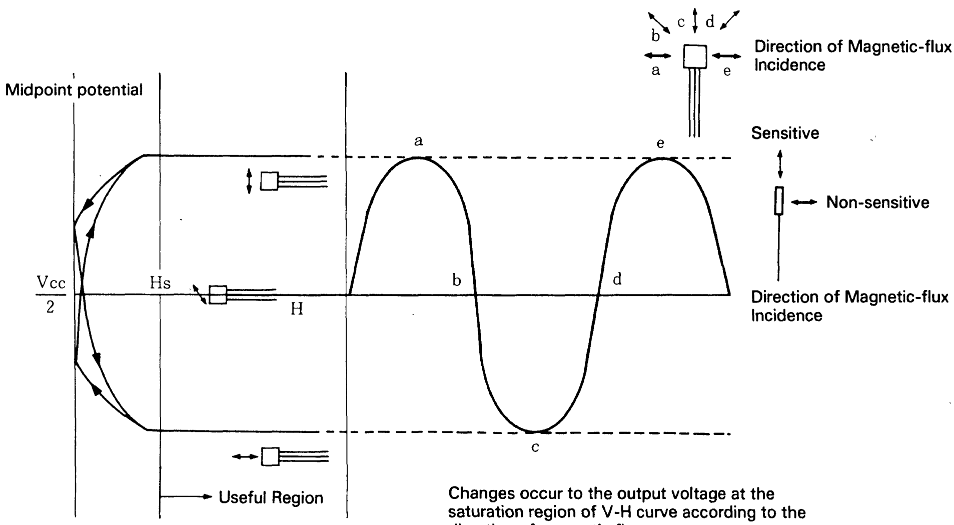
RB: Resistance increases as the magnetic field revolves.

Introduction

1. Power supply pin and Output pin



2. Sensitive direction vs. Midpoint potential

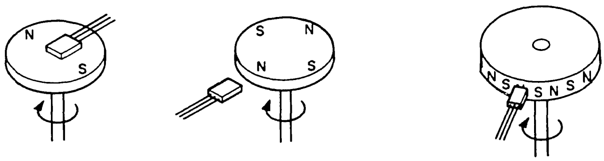


Changes occur to the output voltage at the saturation region of V-H curve according to the direction of magnetic flux.
These changes provide for the operation.

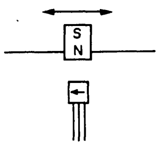
- With one rotation of magnetic flux, signals for 2 periods are obtained.

Applications

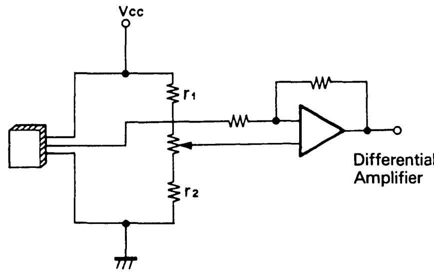
1. Detection of revolution



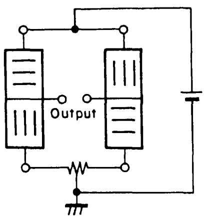
2. Position detecting

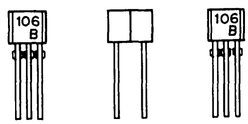


Circuits



3. Bridge Circuits



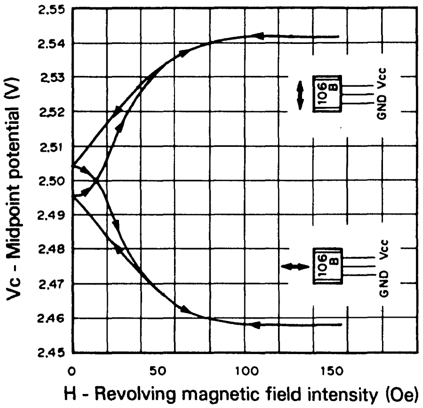


By coupling 2 pieces back to back and sticking them together in a bridge, the output voltage is doubled.

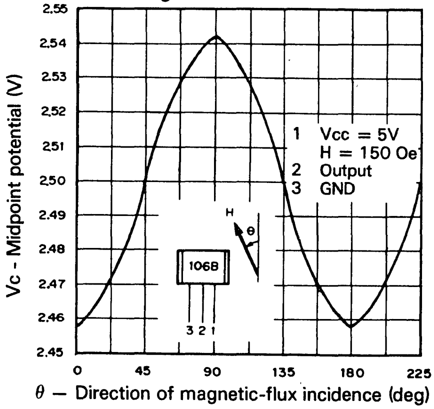
Notes on Application

- Execute the solder of the lead line within 10 seconds at a temperature below 260°C.
- To Fix the ELEMENTS: When glue is used, DO NOT apply mechanical stress to the elements.

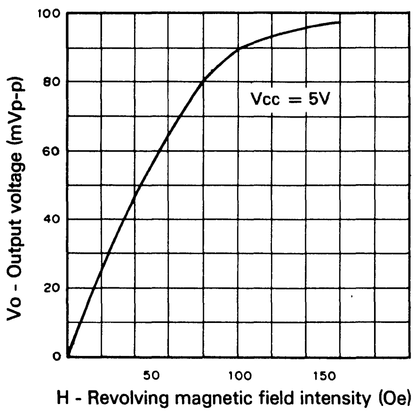
Midpoint potential vs. Magnetic field intensity



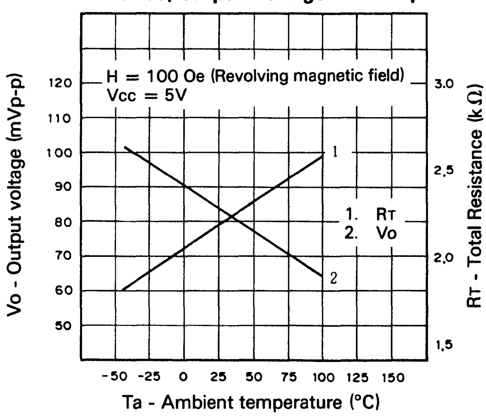
Midpoint potential vs. Direction of magnetic-flux incidence



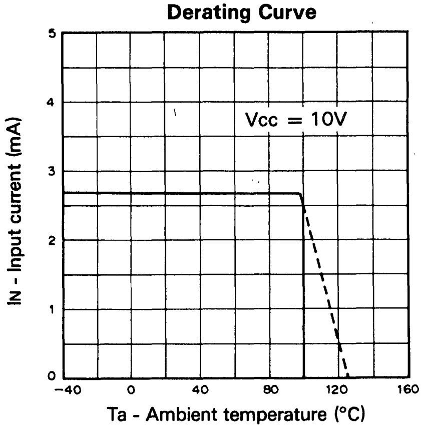
Output voltage vs. Magnetic field intensity



Total resistance, output voltage vs. Temperature



Derating Curve



SONY® DM-111

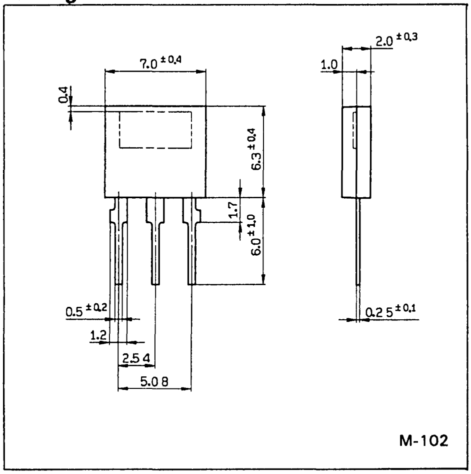
Magneto-Resistance Element

Description

The DM-111 is a highly sensitive magnetic resistance element, composed of an evaporated ferromagnetic alloy on a silicon substrate. The element can be used for detection of rotational speed and for detection of angle of rotation and as a detection of position.

Package Outline

Unit: mm



Features

- Low power consumption
  38 μW (Typ.) at Vcc = 5V
- Low magnetic field and high sensitivity
  75 mVp-p (Typ.) at Vcc = 5V and H = 50 Oe
- High reliability

Absolute Maximum Ratings (Ta = 25°C)

• Supply voltage	Vcc	10	V
• Operating temperature	Topr	−40 to +80	°C
• Storage temperature	Tstg	−50 to +100	°C

Recommended Operating Condition

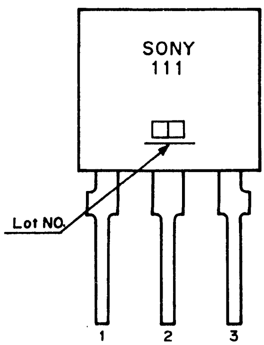
• Supply voltage	Vcc	5	V

Electrical Characteristics

Ta = 25°C

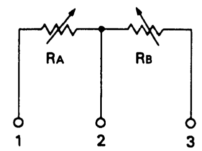
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Total resistance	R_T	H = 50 Oe, θ = 45°	500	650	800	kΩ
Midpoint potential	Vc	Vcc = 5V, H = 50 Oe Revolving magnetic field	2.47	2.50	2.53	V
Output voltage	Vo	Vcc = 5V, H = 50 Oe Revolving magnetic field	30	75		mVp-p

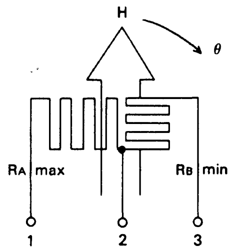
Mark



51027A-TO

Equivalent Circuit



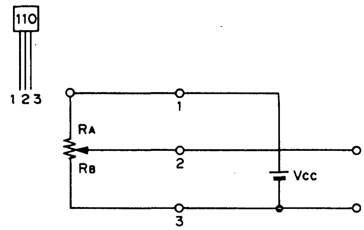


RA: Resistance reduces as the magnetic field revolves.

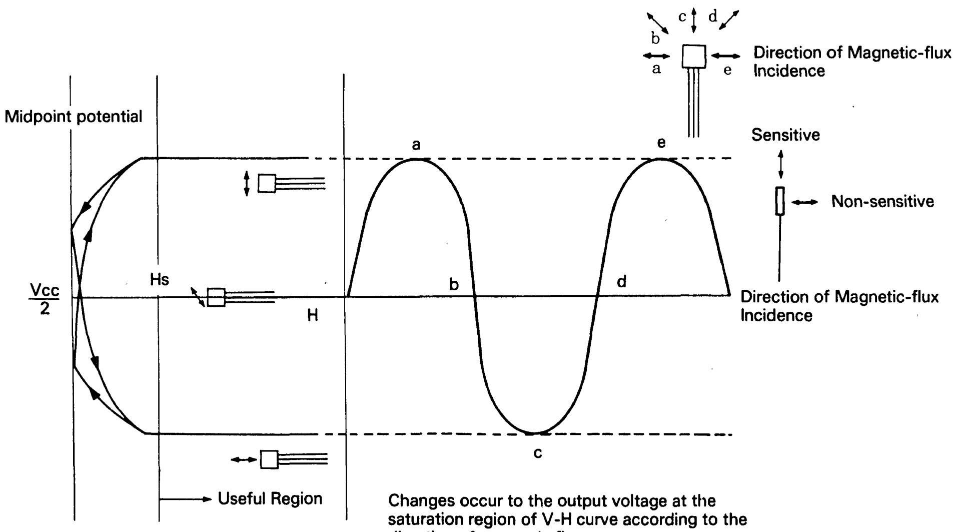
RB: Resistance increases as the magnetic field revolves.

Introduction

1. Power supplying pin and output pin

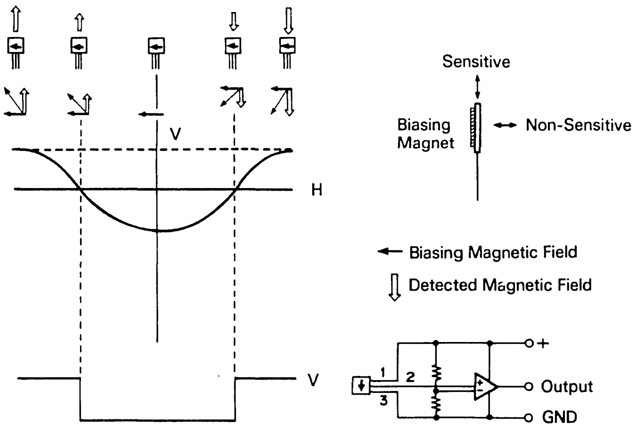


2. Sensitive direction vs. Midpoint potential

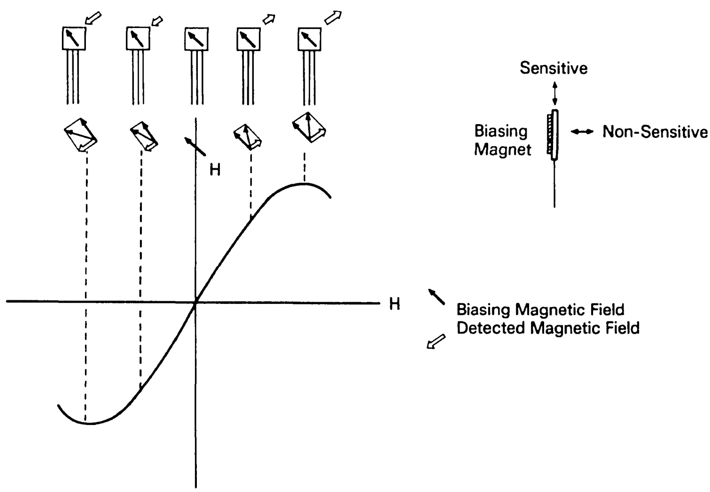


Changes occur to the output voltage at the saturation region of V-H curve according to the direction of magnetic flux.
These changes provide for the operation
- With one rotation of magnetic flux, signals for 2 periods are obtained.

3. 0° Biasing magnetic field
(Switching use)

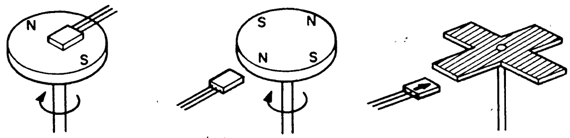


4. 45° Biasing magnetic field
(Analog use)

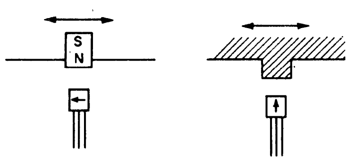


Applications

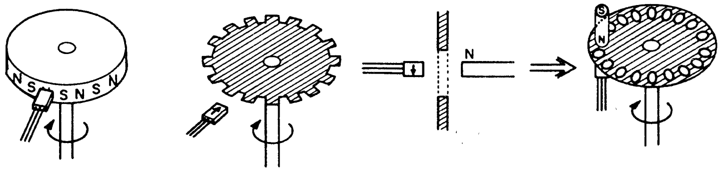
1. Detection of revolution



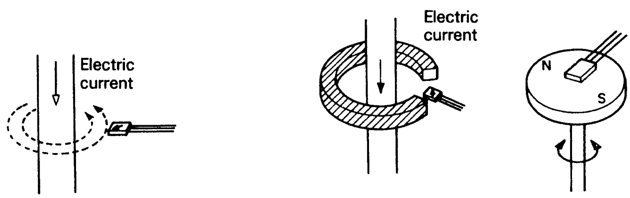
2. Position detecting



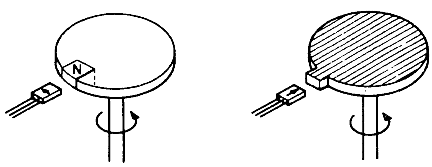
3. Angular detection of rotating wheel



4. Reading out of analog value



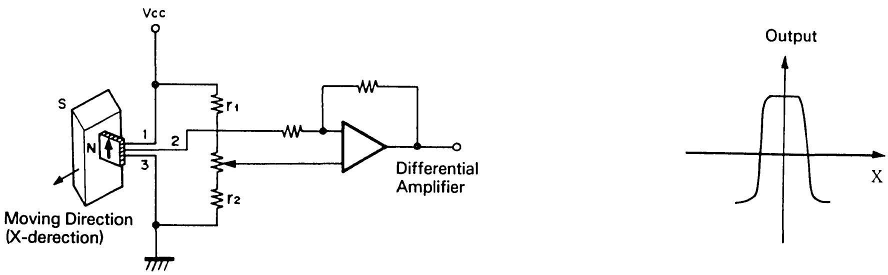
5. Position detecting of revolving element



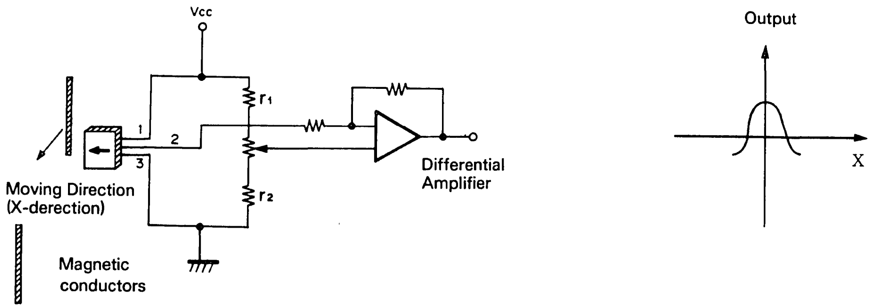
Magnetic conductors

Circuits

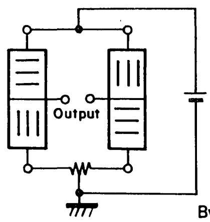
2, 3, 5

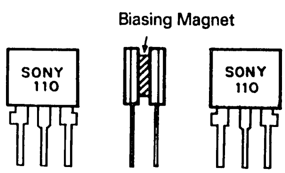


1, 2, 3, 5



Bridge Circuits





By coupling 2 pieces back to back and sticking item together in a bridge, the output voltage is doubled.

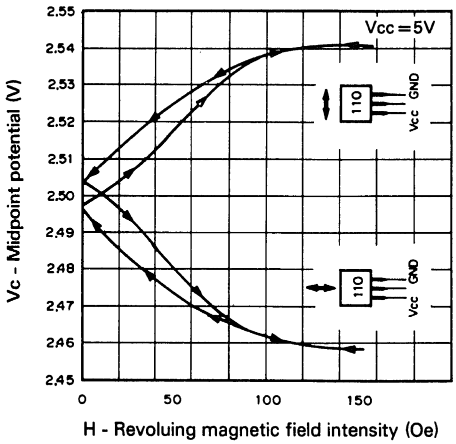
How to Make a Biasing Magnetic Field

- Stick a rubber or ferrite biasing magnet.
- Position an element between the poles of the permanent magnet.

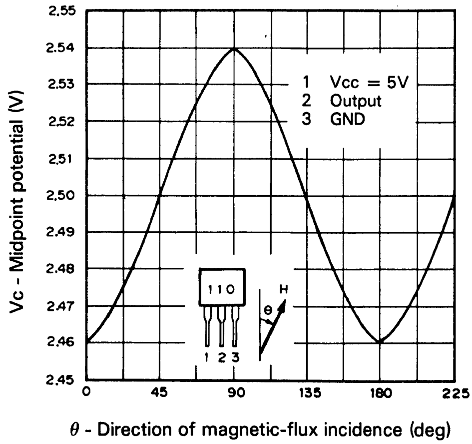
Notes on Application

- Execute the solder of the lead line within 10 seconds at a temperature below 260°C.
- To Fix the ELEMENTS: When glue is used, DO NOT apply mechanical stress to the elements.

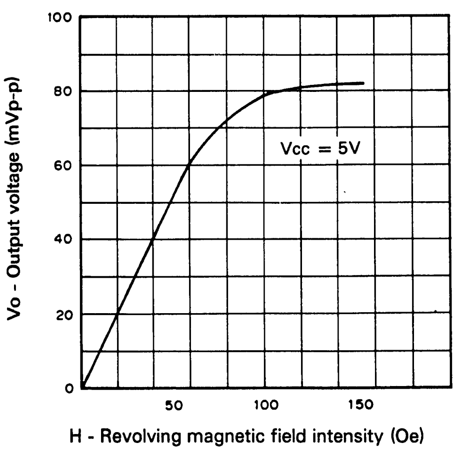
Midpoint potential vs. Magnetic field intensity



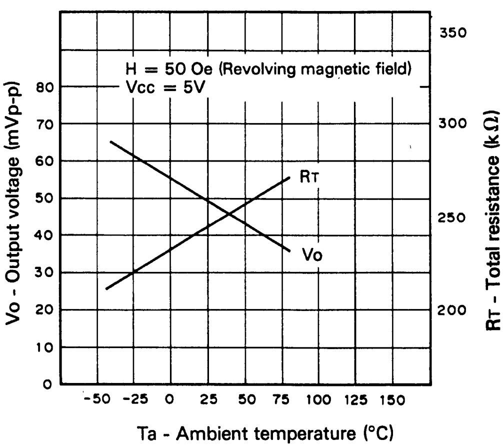
Midpoint potential vs. Magnetic-flux incidence



Output voltage vs. Magnetic field intensity



Total resistance, output voltage vs. Temperature



SONY® **DM-211**

Magnetoresistance Element

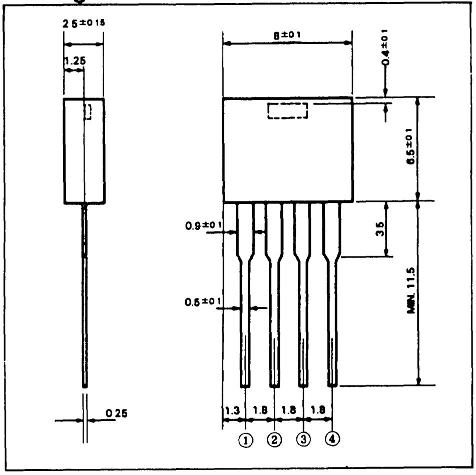
Description

The DM-211 is a highly sensitive magneto resistance element, composed of an evaporated ferromagnetic alloy on a sillicon substrate.

This element can be used for the detection of rotational speed and direction of rotation.
tion.

Package Outline

Unit: mm



Features

- Low magnetic field and high sensitivity
  75mVp-p (Typ.) at Vcc = 5V
  and H = 100 Oe

Absolute Maximum Ratings (Ta = 25°C)

• Supply voltage	Vcc	10	V
• Operating temperature	Topr	−20 to +120	°C
• Storage temperature	Tstg	−50 to +150	°C

Recommended Operating Condition

• Supply voltage	Vcc	5	V

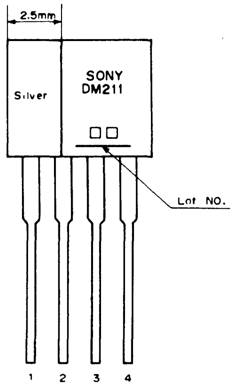
Electrical Characteristics

Ta = 25°C

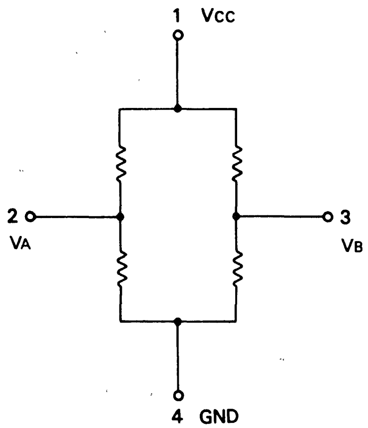
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Total resistance	RT	H = 100 Oe θ = 45° Vcc = 5V	1.6		3.0	kΩ
Midpoint potential	VA, VB	Revolving magnetic field H = 100 Oe Vcc = 5V	2.475		2.525	V
Midpoint potential difference	|VA - VB|	Revolving magnetic field H = 100 Oe Vcc = 5V	−25		25	mV
Output voltage	VOUT	Revolving magnetic field H = 100 Oe Vcc = 5V	50	75		mVp-p
FG irregular of rotation		See the Electrical Characteristic Test Circuit (Page 209)		0.03		%

51071B-TO

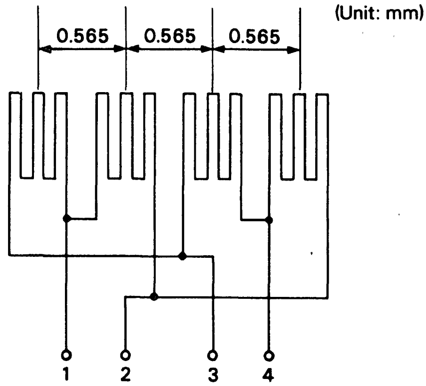
Mark



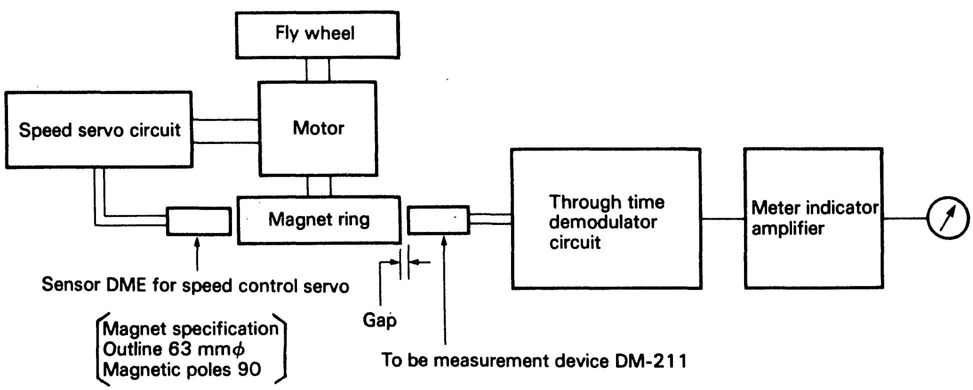
Equivalent Circuit



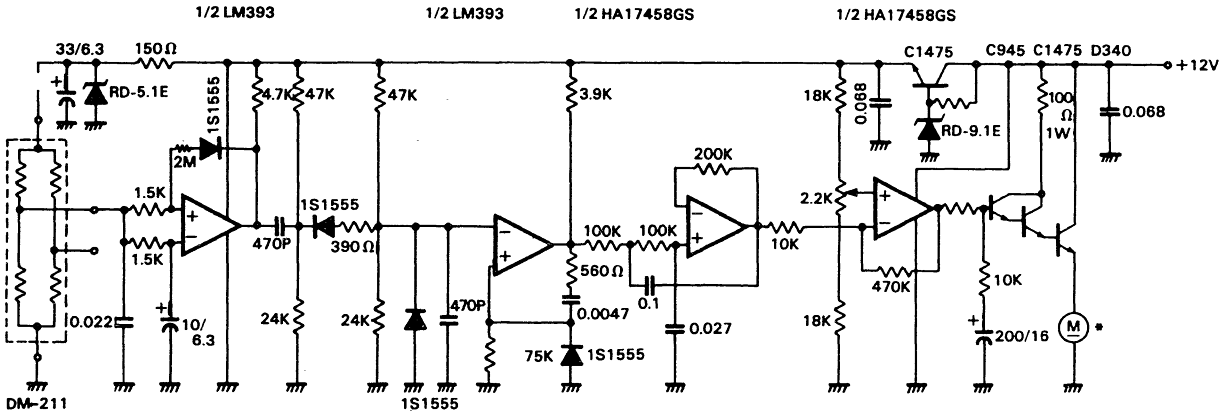
Pattern Layout



FG Irregular of Rotation Test Circuit

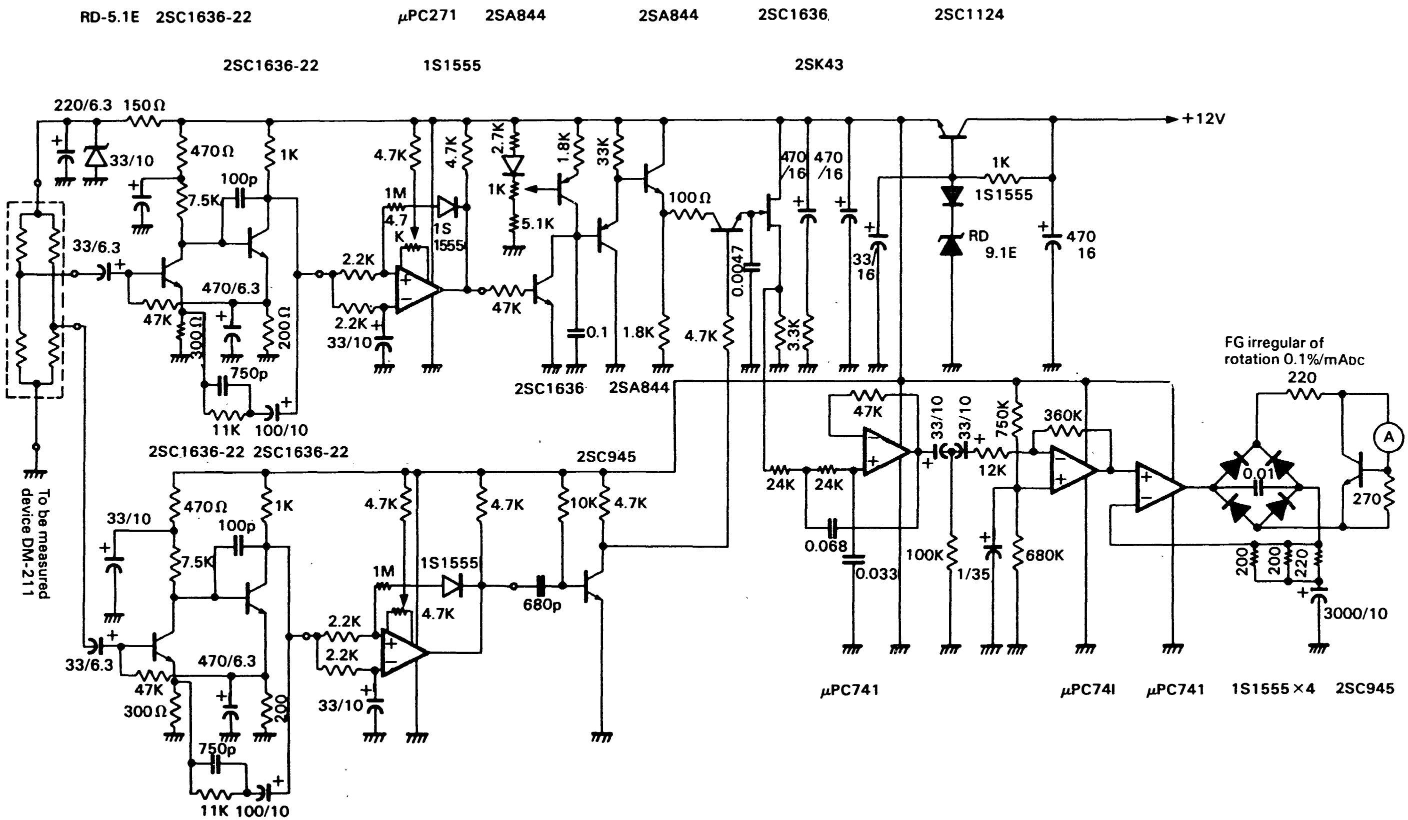


Electrical Characteristic Test Circuit
(Speed servo circuit)

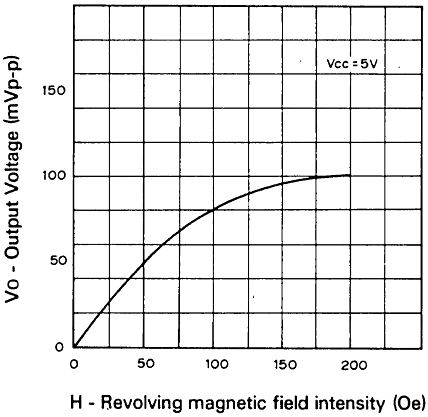


* Motor must be used with fly wheel (I = 12g·Cm·S²)

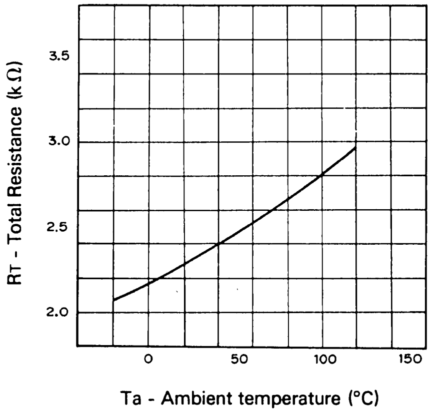
(Through the Time Demodulator Circuit and Meter Indicator Amplifier Circuit)



Output voltage vs. Magnetic field intensity



Total resistance vs. Ambient temperature



SONY® **DM-230**

Magnetoresistance Element

Description

DM-230 a magnetic sensor using magnetoresistance effect is composed of ferromagnetic material deposited by evaporation on a silicon substrate.It is suitable for angle of rotation detection and number of rotation detection.

Features

- Low magnetic field and high sensitivity: bridge type stands for large output voltage 150mVp-p (Min) at Vcc=5V. H=180 Oe.
- High reliability: Achieved through silicon nitride protective film.

Structure

Ferromagnetic thin film circuit (fitted with non magnetic ferrite)

Applications

- Non-contact angle of rotation detection.
- Non-contact number of rotation detection.
- Contactless switch and contactless potentiometer.

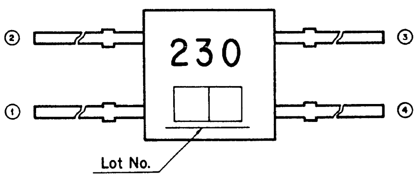
Absolute Maximum Ratings (Ta=25°C)

• Supply voltage	V_{CC}	10	V
• Storage temperature	T_{stg}	−55 to +150	°C

Recommended Operating Conditions

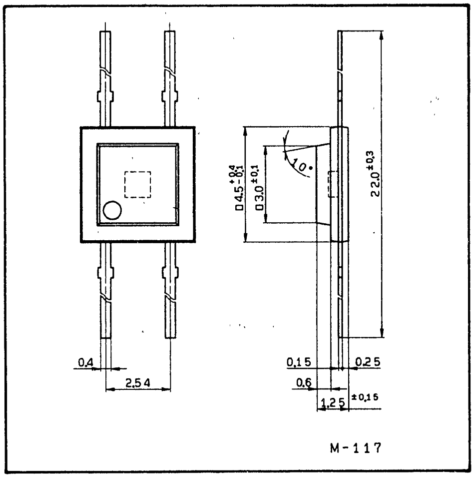
• Supply voltage	V_{CC}	5	V
• Operating temperature	T_{opr}	−40 to +100	°C

Marking



Package Outline

Unit: mm



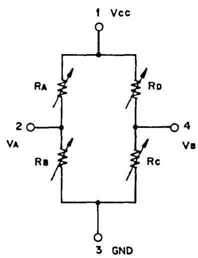
88Z11-HP

Electrical Characteristics

Ta=25°C

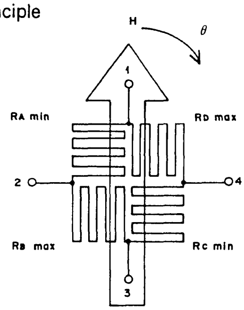
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Output voltage	Vo	Vcc=5V, H=180 Oe (Revolving magnetic field)	150			mVp-p
Midpoint potential	V_A, V_B	Vcc=5V, H=0 Oe	2.475		2.525	V
Midpoint potential difference/Output voltage	$\frac{\lvert V_A-V_B \rvert}{V_O}$	Vcc=5V, H=0 Oe			15	%
Total resistance	R_T	H=180 Oe (Revolving magnetic field)	500	650	800	Ω

Equivalent Circuit



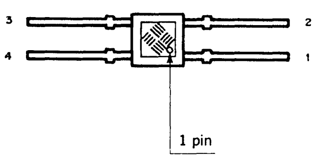
Basic Performance

1) Operation principle

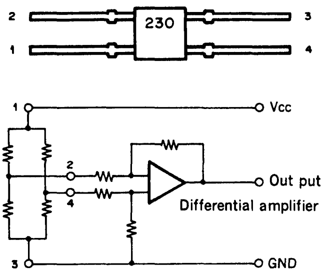


According to the rotation of the external magnetic field,
R_A, R_C : Resistance reduces
R_B, R_D : Resistance increases
When $\theta=90°$
R_A, R_C : Maximum resistance
R_B, R_D : Minimum resistance

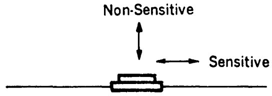
* Device internal structure
(Back of mark face)



2) Power supply pin and output pin

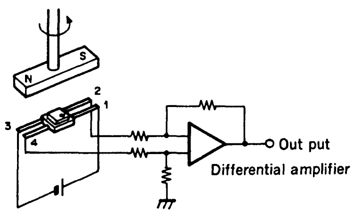


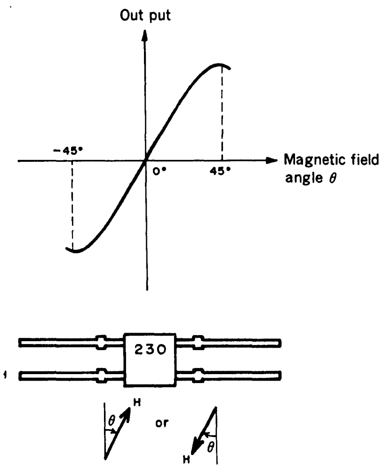
3) Sensitivity direction

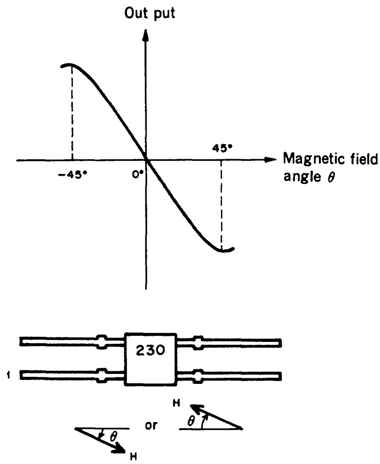


The ferromagnetic magnetoresistance element differs from the semiconductor magnetoresistance element and hole element in that it responds only to the magnetic field within the element's surface. It is not sensitive to the magnetic field perpendicular to the element.

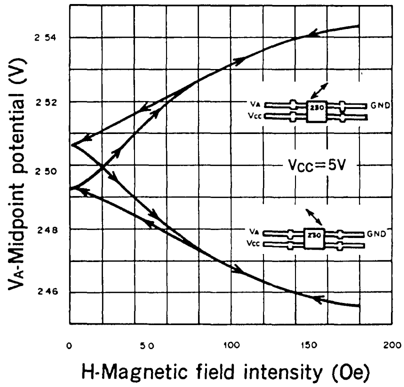
Basic Application
Rotation angular detection



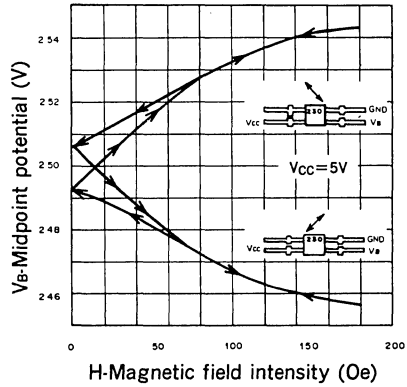




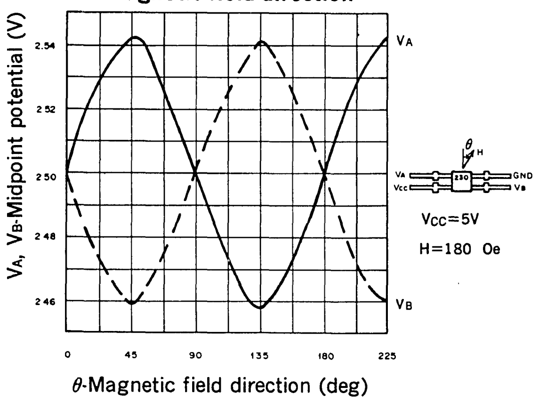
Midpoint potential vs. Magnetic field intensity (1)



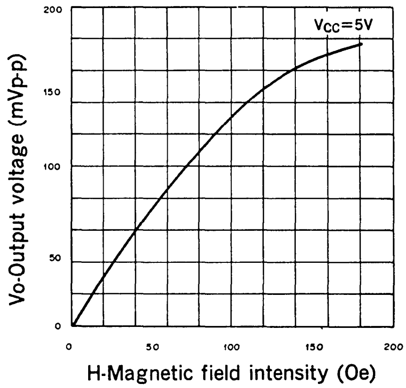
Midpoint potential vs. Magnetic field intensity (2)



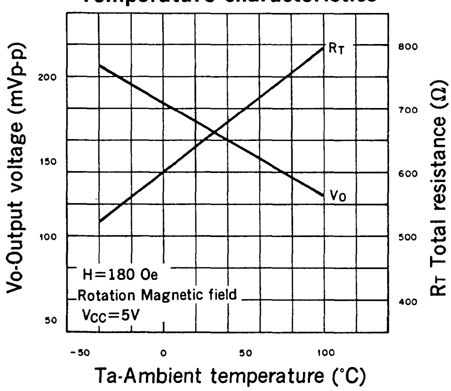
Midpoint potential vs. Magnetic field direction



Output voltage vs. Magnetic field intensity



Temperature characteristics



SONY®

DM-231

Magnetoresistance Element

Description

DM-231 a magnetic sensor using magnetoresistance effect is composed of ferromagnetic material deposited by evaporation on a silicon substrate.It is suitable for angle of rotation detection.

Features

- Low magnetic field and high sensitivity: bridge type stands for large output voltage 150mVp-p (Min) at Vcc=5V. H=180 Oe.
- Fitted with bias magnet: stable output.
- High reliability: Achieved through silicon nitride protective film.

Structure

Ferromagnetic thin film circuit (With ferrite magnet)

Applications

- Non-contact angle of rotation detection.
- Contactless potentiometer.

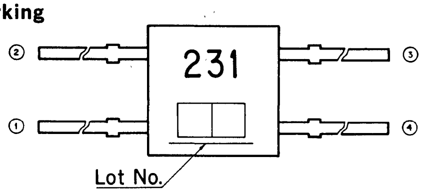
Absolute Maximum Ratings (Ta=25°C)

• Supply voltage	Vcc	10	V
• Storage temperature	Tstg	−30 to +100	°C

Recommended Operating Conditions

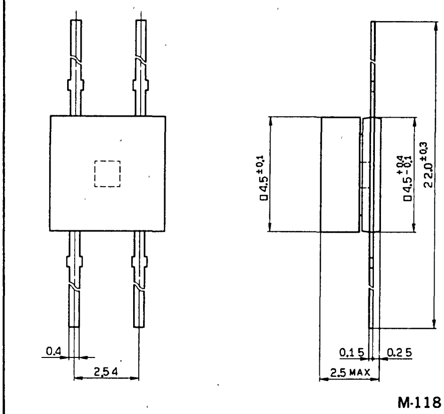
• Supply voltage	Vcc	5	V
• Operating temperature	Topr	−20 to +75	°C

Marking



Package Outline

Unit: mm



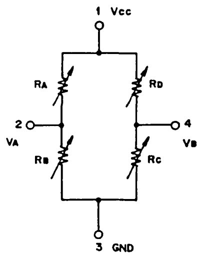
Electrical Characteristics

Ta=25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Output voltage	Vo	Vcc=5V, H=180 Oe (Peak) AC magnetic field θ=0°	150			mVp-p
Midpoint potential	V_A, V_B	Vcc=5V, H=0 Oe	2.475		2.525	V
Midpoint potential difference/Output voltage	$\frac{\lvert V_A - V_B \rvert}{V_O}$	Vcc=5V, H=0 Oe			15	%
Total resistance	R_T	H=180 Oe (Peak) AC magnetic field θ=0°	500	650	800	Ω

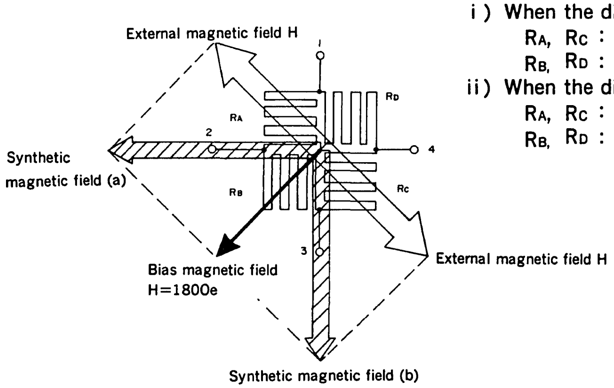
88Z12-HP

Equivalent Circuit



Basic Performance

1) Operation principle

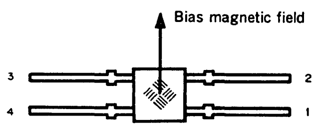


Various resistances change according to the direction of the combnied bias and external magnetic field.

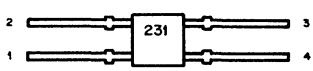
i) When the direction of the synthetic magnetic field is (a),
   R_A, R_C : Maximum resistance
   R_B, R_D : Minimum resistance

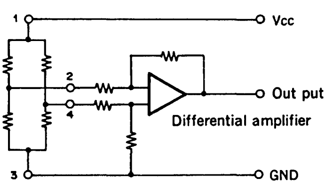
ii) When the direction of the synthetic magnetic field is (b),
   R_A, R_C : Minimum resistance
   R_B, R_D : Maximum resistance

* Device internal structure
(Back of mark face)

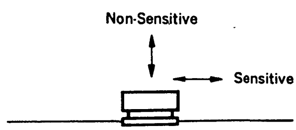


2) Power supply pin and output pin



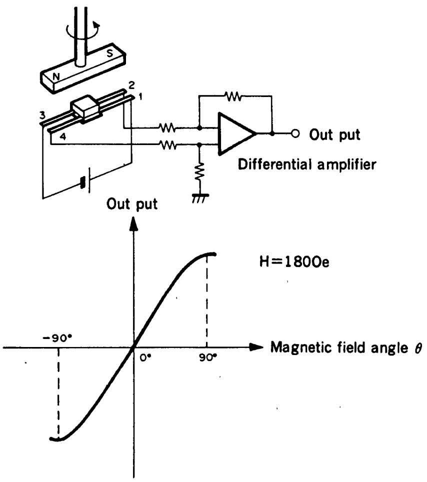


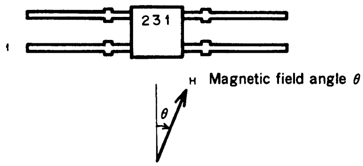
3) Sensitivity direction



The ferromagnetic magnetoresistance element differs from the semiconductor magnetoresistance element and hole element in that it responds only to the magnetic field within the element's surface. It is not sensitive to the magnetic field perpendicular to the element.

Basic Application
Rotation angular detection

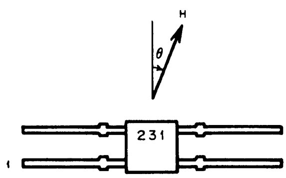


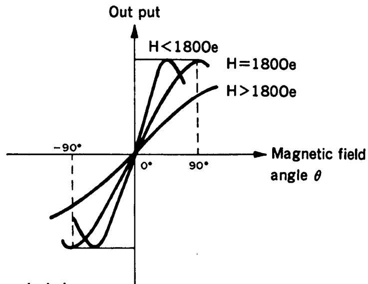


Handling precautions

1) Most suitable magnetic field intensity

When the external magnetic field is at H=180 Oe, rotation angle can be detected most effectively.





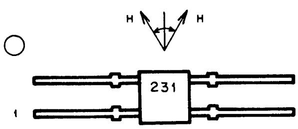
When the external magnetic field H<180 Oe, output voltage shrinks.

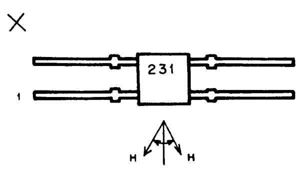
When the external magnetic field H>180 Oe, the detection angle range shrinks.

When the external magnetic field H<180 Oe, the detection angle range becomes larger. In regions other than −90° to +90°, the magnetic field combined with the bias magnetic field, shrinks down, which is not advisable. Also, when the range to be detected is smaller than −90° to +90° it is more advantageous to turn to H>180 Oe.

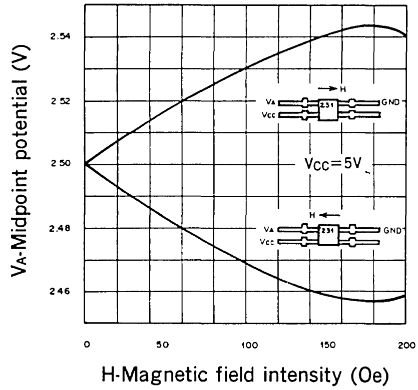
2) External magnetic field direction

With regards to the bias magnetic field, usage at other than ±90° should be avoided. That causes a decrease in the combined magnetic field intensity, that is not recommended.

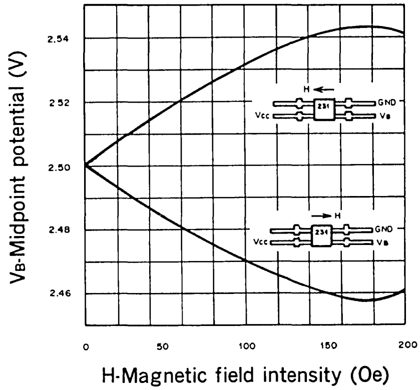




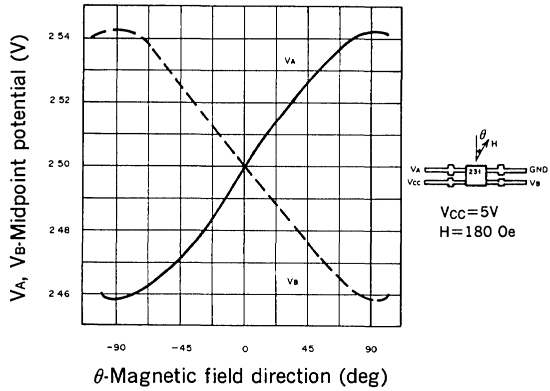
Midpoint potential vs. Magnetic field intensity (1)



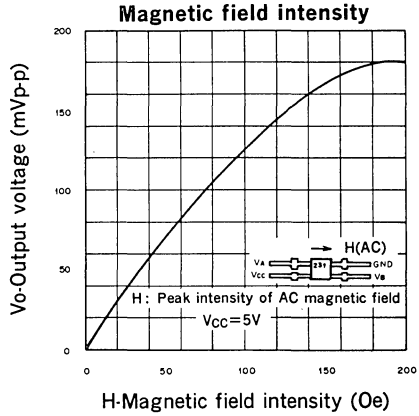
Midpoint potential vs. Magnetic field intensity (2)



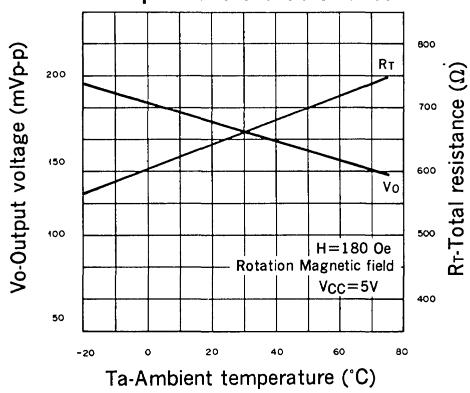
Midpoint potential vs. Magnetic field direction



Output voltage vs. Magnetic field intensity



Temperature characteristics



SONY® **DM-232**

Magnetoresistance Element

Description

DM-232 a magnetic sensor using magnetoresistance effect is composed of ferromagnetic material deposited by evaporation on a silicon substrate.It is suitable for angle of rotation detection.

Features

- Low magnetic field and high sensitivity: bridge type stands for large output voltage 150mVp-p (Min) at V_{CC}=5V. H=180 Oe.
- Fitted with bias magnet: stable output.
- High reliability: Achieved through silicon nitride protective film.

Structure

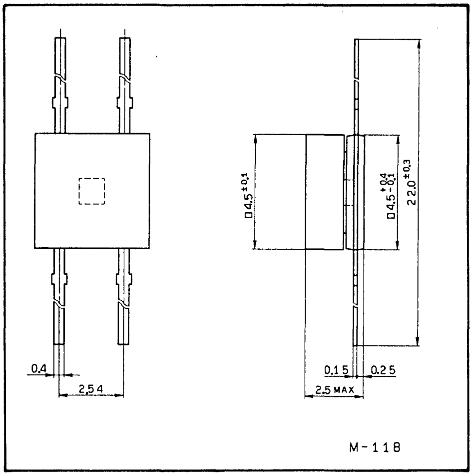
Ferromagnetic thin film circuit (With ferrite magnet)

Applications

- Non-contact angle of rotation detection.
- Contactless potentiometer.

Package Outline

Unit: mm



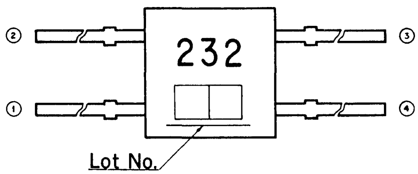
Absolute Maximum Ratings (Ta=25°C)

• Supply voltage	V_{CC}	10	V
• Storage temperature	T_{stg}	−30 to +100	°C

Recommended Operating Conditions

• Supply voltage	V_{CC}	5	V
• Operating temperature	T_{opr}	−20 to +75	°C

Marking



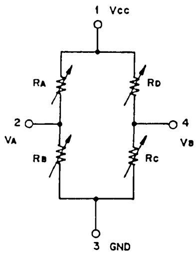
Electrical Characteristics

Ta=25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Output voltage	V_O	V_{CC}=5V, H=180 Oe (Peak) AC magnetic field θ=0°	150			mVp-p
Midpoint potential	V_A, V_B	V_{CC}=5V, H=0 Oe	2.475		2.525	V
Midpoint potential difference/Output voltage	$\frac{\lvert V_A - V_B \rvert}{V_O}$	V_{CC}=5V, H=0 Oe			15	%
Total resistance	R_T	H=180 Oe (Peak) AC magnetic field θ=0°	500	650	800	Ω

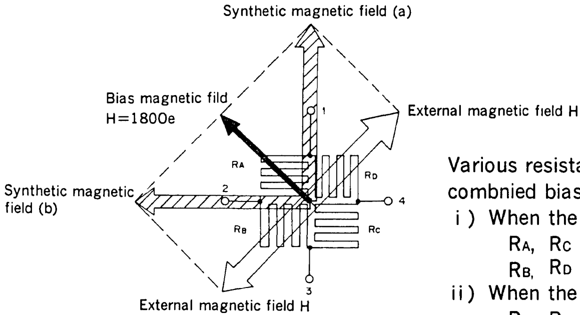
88Z13-HP

Equivalent Circuit



Basic Performance

1) Operation principle

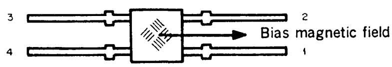


Various resistances change according to the direction of the combnied bias and external magnetic field.

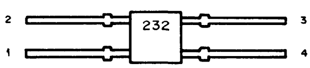
i) When the direction of the synthetic magnetic field is (a),
R_A, R_C : Minimum resistance
R_B, R_D : Maximum resistance

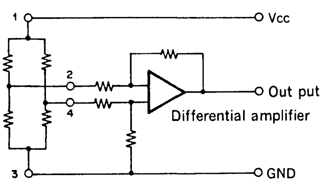
ii) When the direction of the synthetic magnetic field is (b),
R_A, R_C : Maximum resistance
R_B, R_D : Minimum resistance

* Device internal structure
(Back of mark face)

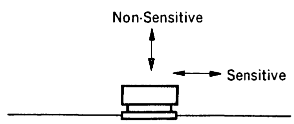


2) Power supply pin and output pin



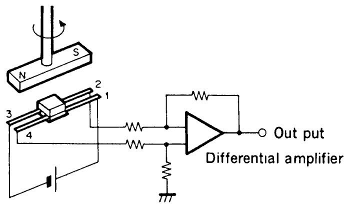


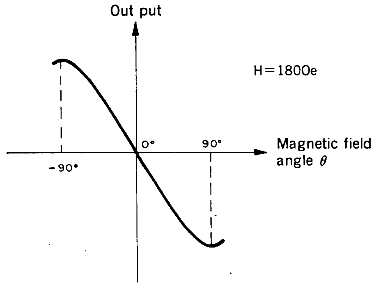
3) Sensitivity direction

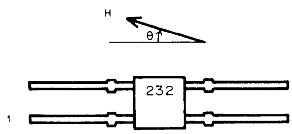


The ferromagnetic magnetoresistance element differs from the semiconductor magnetoresistance element and hole element in that it responds only to the magnetic field within the element's surface. It is not sensitive to the magnetic field perpendicular to the element.

Basic Application
Rotation angular detection



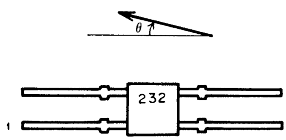


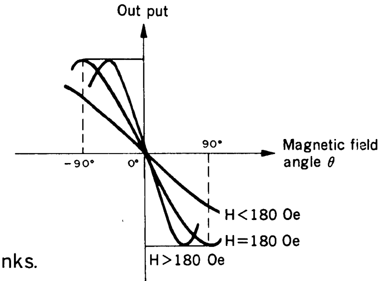


Handling precautions

1) Most suitable magnetic field intensity

When the external magnetic field is at H=180 Oe, rotation angle can be detected most effectively.



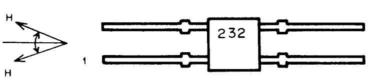


When the external magnetic field H<180 Oe, output voltage shrinks.
When the external magnetic field H>180 Oe, the detection angle range shrinks.
When the external magnetic field H<180 Oe, the detection angle range becomes larger. In regions other than −90° to +90°, the magnetic field combined with the bias magnetic field, shrinks down, which is not advisable. Also, when the range to be detected is smaller than −90° to +90° it is more advantageous to turn to H>180 Oe.

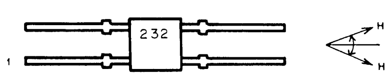
2) External magnetic field direction

With regards to the bias magnetic field, usage at other than ±90° should be avoided. That causes a decrease in the combined magnetic field intensity, that is not recommended.

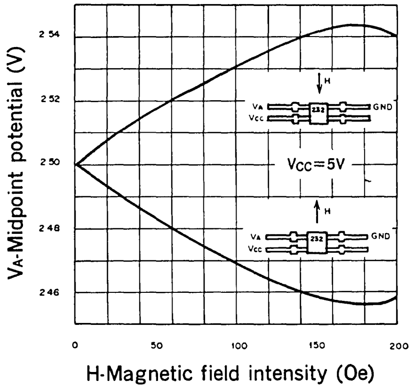
○



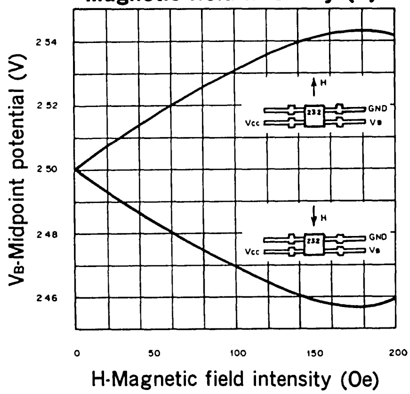
×



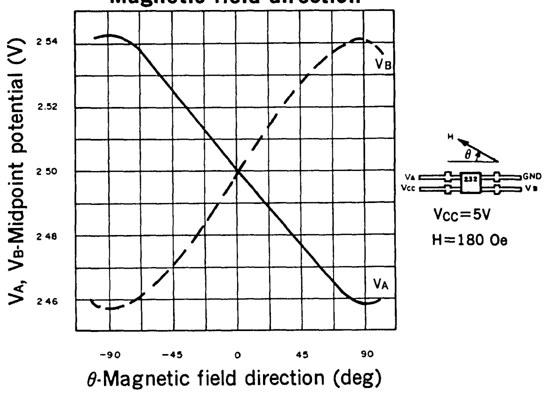
Midpoint potential vs. Magnetic field intensity (1)



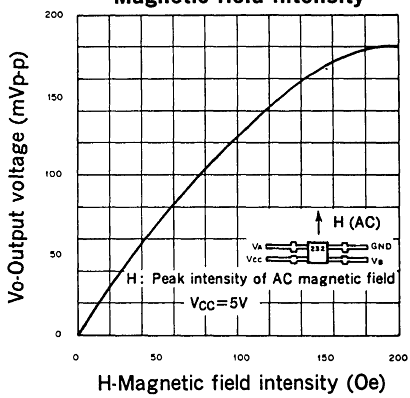
Midpoint potential vs. Magnetic field intensity (2)



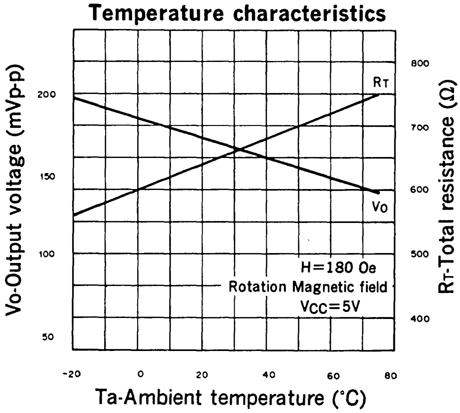
Midpoint potential vs. Magnetic field direction



Output voltage vs. Magnetic field intensity



Temperature characteristics



SONY® **DM-233**

Magnetoresistance Element

Description

DM-233 a magnetic sensor using magnetoresistance effect is composed of ferromagnetic material deposited by evaporation on a silicon substrate.It is suitable for angle of rotation detection.

Features

- Low magnetic field and high sensitivity: bridge type stands for large output voltage 150mVp-p (Min) at Vcc=5V. H=180 Oe.
- Fitted with non magnetic ferrite: Usage possible with magnetization in desired direction or intensity.
- High reliability: Achieved through silicon nitride protective film.

Structure

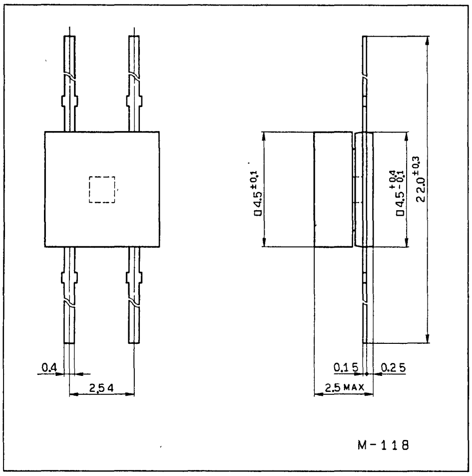
Ferromagnetic thin film circuit (fitted with non magnetic ferrite)

Applications

- Non-contact angle of rotation detection.
- Contactless potentiometer.

Package Outline

Unit: mm



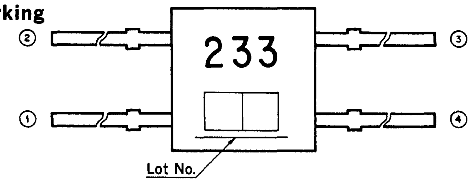
Absolute Maximum Ratings (Ta=25°C)

• Supply voltage	Vcc	10	V
• Storage temperature	Tstg	−30 to 100	°C

Recommended Operating Conditions

• Supply voltage	Vcc	5	V
• Operating temperature	Topr	−20 to 75	°C

Marking



Electrical Characteristics

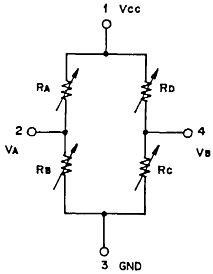
(Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Output voltage	Vo	Vcc=5V, H=180 Oe (Revolving magnetic field)	150			mVp-p
Midpoint potential	V_A, V_B	Vcc=5V, H=0 Oe	2.475		2.525	V
Midpoint potential difference/Output voltage	$\frac{\lvert V_A - V_B \rvert}{V_O}$	Vcc=5V, H=0 Oe			15	%
Total resistance	R_T	H=180 Oe (Revolving magnetic field)	500	650	800	Ω

Note) These characteristics apply to the condition before non magnetic ferrite is bound.

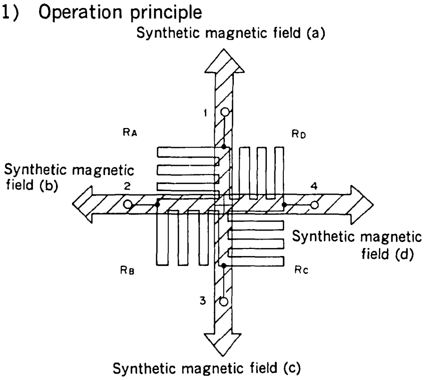
81115-HP

Equivalent Circuit



Basic Performance

1) Operation principle

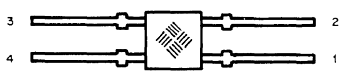


Various resistances vary according to the derection of the synthetic magnetic field formed by the external and the bias magnetic field formed by ferrite.

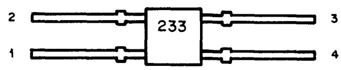
i) When the direction of the synthetic magnetic field is (a), (c)
 R_A, R_C : Minimum resistance
 R_B, R_D : Maximum resistance

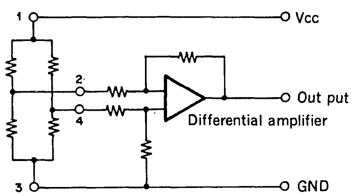
ii) When the direction of the synthetic magnetic field is (b), (d)
 R_A, R_C : Maximum resistance
 R_B, R_D : Minimum resistance

* Device internal structure
(Back of mark face)

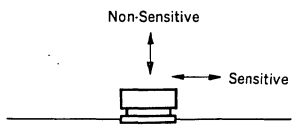


2) Power supply pin and output pin



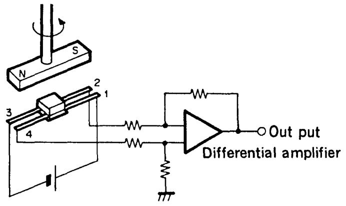


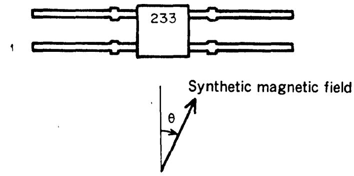
3) Sensitivity direction

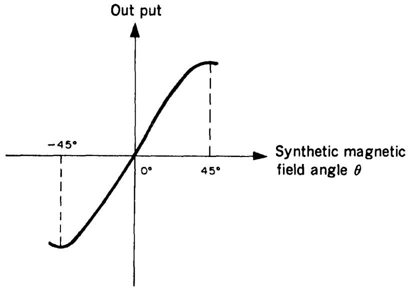


The ferromagnetic magnetoresistance element differs from the semiconductor magnetoresistance element and hole element in that it responds only to the magnetic field within the element's surface. It is not sensitive to the magnetic field perpendicular to the element.

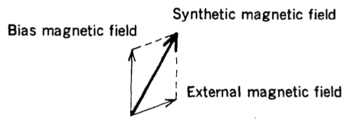
Basic Application
Rotation angular detection







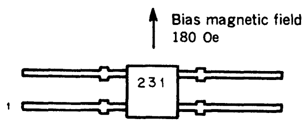
Example of synthetic magnetic field

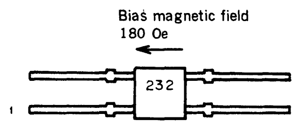


Handling precautions

1) Bias magnetic field

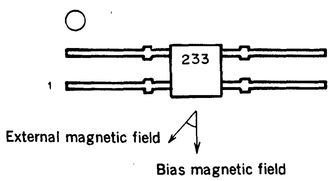
With DM-233 the bias magnetic field can be set in the desired direction and intensity. (In DM-231 and DM-232 the bias magnetic field is already applied. See Fig. below)

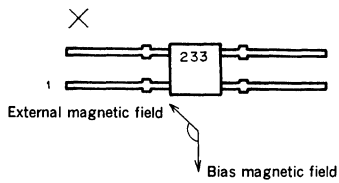




To stabilize the output set the bias magnetic field at an intensity where the element is sufficiently saturated (150 Oe and over)

2) Relation between bias magnetic field and external magnetic field





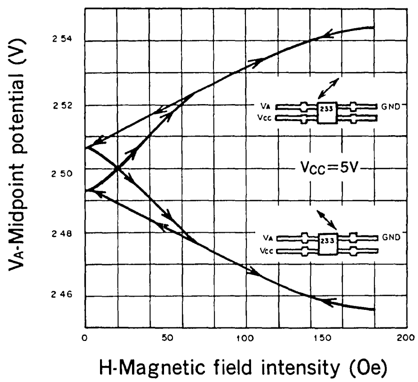
To stabilize the output keep the angle between the bias magnetic field and external magnetic field to 90° or below. (to increase the intensity of the synthetic magnetic field.)

3) When the bias magnetic field is not necessary

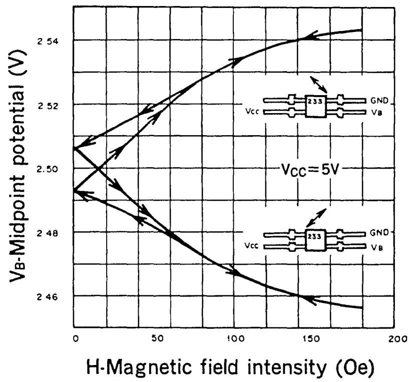
Better not use the ferrites without magnetizing. The external magnetic field (signal magnetic field) is absorbed to ferrite and cannot be applied effectively to the element. When the bias magnetic field is not necessary, use the DM-230, a type without ferrite.

Note) Indicates the characteristics in a condition before the ferrite is bonded.

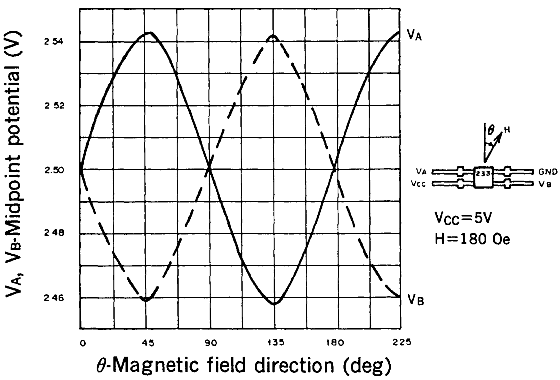
Midpoint potential vs. Magnetic field intensity (1)



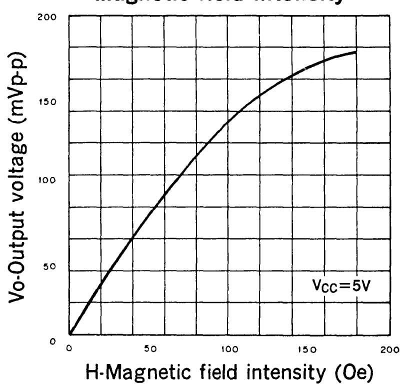
Midpoint potential vs. Magnetic field intensity (2)



Midpoint potential vs. Magnetic field direction



Output voltage vs. Magnetic field intensity



Temperature characteristics

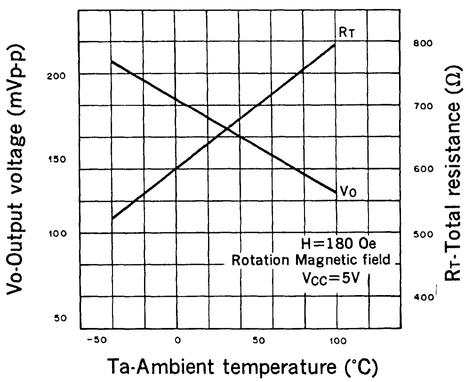


Photo Diodes

6) Photo Diodes

Type	Package	Features	Page
1T339	8P SOP	• CD pickup, Silicon PIN photodiode • High sensitivity S=0.5A/W • Pattern custom compatible (max 6 split elements)	335
PHD003	8P SOP		337

SONY® **1T339**

CD Optical Pickup Photodiode

Description

1T339 is a photodiode developed for use as a light receiving element for CD optical pickup and is adaptable for the astigmatism focus servo and 3-spot tracking servo systems.

Structure

Silicon PIN photodiode.

Applications

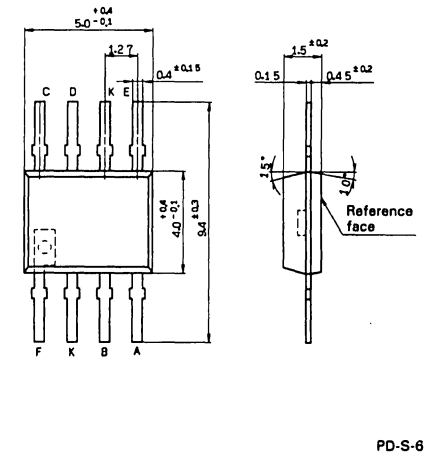
CD optical pickup.

Absolute Maximum Ratings (Ta=25°C)

- Peak reverse voltage V_R 30 V
- Junction temperature T_j 100 °C
- Storage temperature T_{stg} −40 to +100 °C

Package Outline

Unit: mm



Electrical Characteristics

Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward voltage	V_F	I_F = 10 mA			1.2	V
Dark current	I_D	V_R = 15 V			4.0	nA
Inter-pin capacitance	C_1	V_R = 15 V, f = 1 MHz Note 1	2.8	3.8	4.8	pF
	C_2	V_R = 15 V, f = 1 MHz Note 2	3.4	4.4	5.4	pF
Sensitivity	S	λ = 780 nm	0.40	0.50	0.60	A/W

Note) 1. Capacitance between each of devices A, B, C, D and cathode.
2. Capacitance between cathode and device E or F.

E89859-HP

Acceptance Pattern Diagram

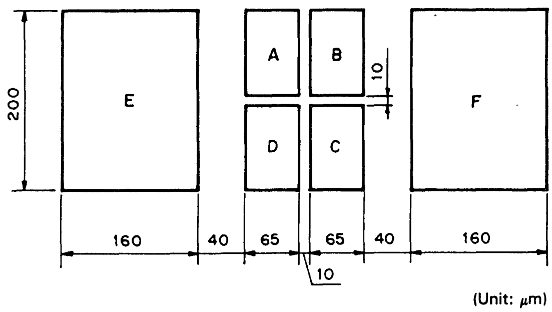
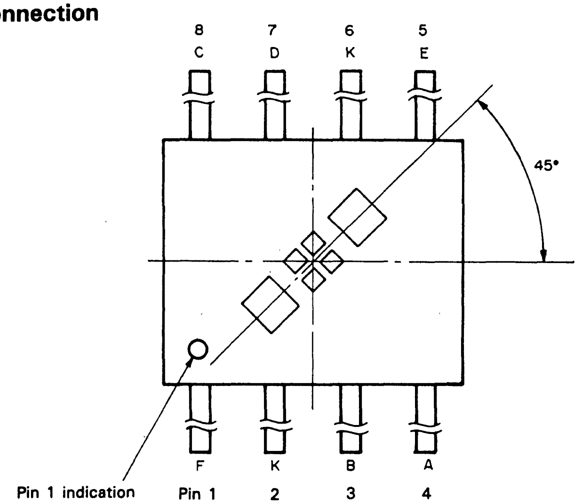


Fig. 1

Pin Wiring and Connection



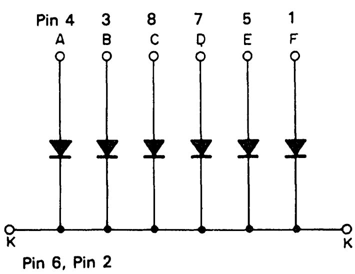


Fig. 2

SONY® **PHD003**

CD Optical Pickup Photodiode

Description

PHD003 is a photo diode developed for use as a light receiving element for CD optical pickup and is adaptable for the astigmatism focus servo and 3-spot tracking servo systems.

Features

- High sensitivity: 0.5A/W (Typ.) at λ=780nm, V_R=15V
- Allow the light receiving pattern to be tailored to the customer's specific requirements. Note that the minimum line width of insensitive band is 5μm.

Structure

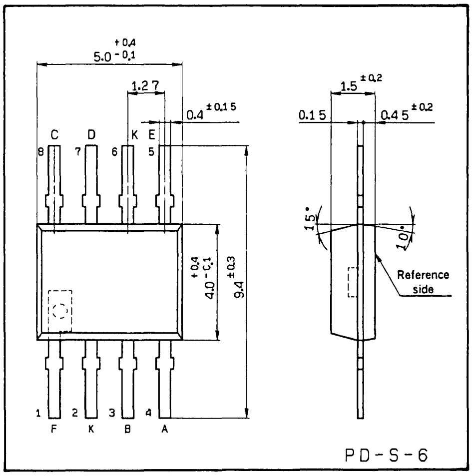
Silicon PIN photo diode

Absolute Maximum Ratings (Ta=25°C)

Peak reverse voltage	V_R	30	V
Junction temperature	T_j	100	°C
Storage temperature	T_{stg}	−40 to +100	°C

Package Outline

Unit: mm



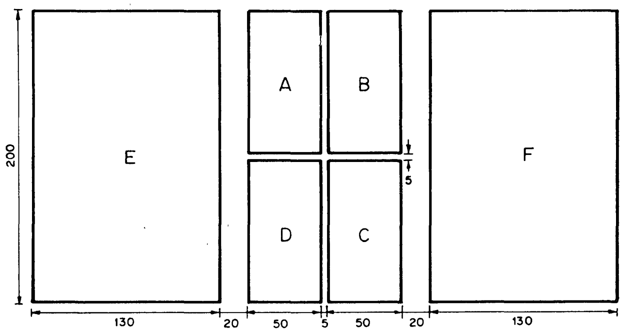
Electrical Characteristics (Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward voltage	V_F	I_F=10mA			1.2	V
Dark current	I_D	V_R=15V in the dark			4.0	nA
Inter-pin capacitance	C_1	V_R=15V, f=1MHz *1	2.8	3.8	4.8	pF
	C_2	V_R=15V, f=1MHz *2	3.4	4.4	5.4	pF
Sensitivity	S	λ=780nm, V_R=15V	0.4	0.5	0.6	A/W

Note * **1)** Capacitance between each of device A, B, C, D and cathode.
* **2)** Capacitance between cathode and device E or F.

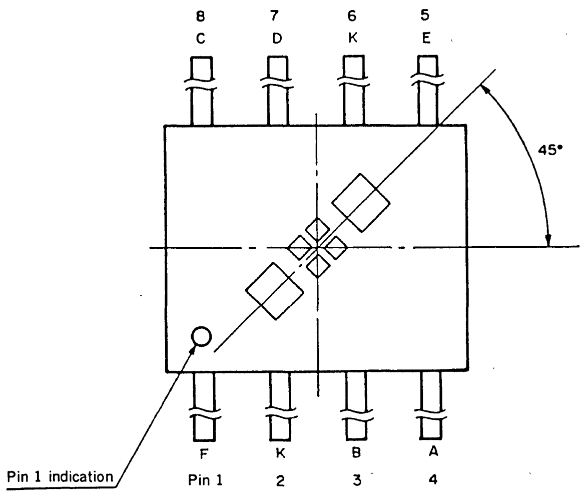
E89182-HP

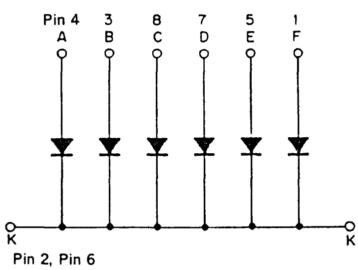
Acceptance Pattern Diagram



(Unit: μm)

Pin Wiring and Connection





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