Information and Industry
Laser Diodes
Application Note

HITACHI

ADE-508-011E
Hitachi
5/14/01

Safety Considerations

Be sure to avoid direct exposure of human eyes to high power laser beams emitted from laser diodes. Even though barely visible and/or invisible to the human eye, they can be quite harmful. In particular, avoid looking directly into a laser diode or collimated beam along its optical axis when the diode is activated. One simple way to determine the optical path is to use a phosphor plate or infrared sensitive camera.

Hitachi certifies compliance with US Safety Regulations (21 CFR Subchapter J) on laser products, as stipulated by the U.S. Department of Health and Human Services.



"VISIBLE AND/OR INVISIBLE LASER RADIATION - AVOID DIRECT EXPOSURE TO BEAM"

PEAK POWER 60 mW
WAVELENGTH 625 ~ 1600 nm

"CLASS IIIb LASER PRODUCT"

This product conforms to FDA regulations 21 CRF Chapter 1, Subchapter J.

AVOID EXPOSURE : Visible and/or invisible laser radiation is emitted from glass window, fiber pigtail end or laser chip mounted on top of header. Before use, consult appropriate catalogs or manuals.

LASER SAFETY

This laser device in operation produces visible and/or invisible laser radiation which may be harmful to the human eye. Avoid directly looking into the device or the collimated beam along its optical axis when the device is in operation.

MANUFACTURED:

Hitachi, Ltd.
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Chiyoda-ku, Tokyo 100-0004, JAPAN
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USER INSTRUCTIONS:

Be sure to avoid direct exposure of human eyes to high power laser beams emitted from laser diodes. Even though barely visible and/or invisible to the human eye, they can be quite harmful. In particular, avoid looking directly into a laser diode or collimated beam along its optical axis when the diode is activated. One simple way to determine the optical pate is to use a phosphor plate or infrared sensitive camera.

These devices are components to be used in producing complete laser systems. They do not emit radiation unless combined by the end user with other components. Please consult the Opto Data Book for some of the possible uses of these devices.

Because of the small size of the device, the required labels and these instructions are provided in this insert rather than printed on the device.

Cautions

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1. The laser light is harmful to human body especially to eye no matter what directly or indirectly. The laser beam shall be observed or adjusted through infrared camera or equivalent.

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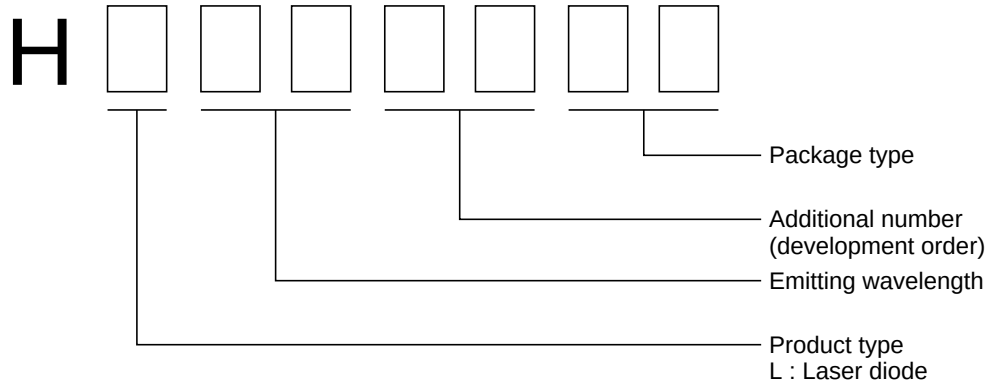
Section 1 Introduction

More than thirty years have passed since the first semiconductor laser diode was introduced. Since then, the number of applications using laser diode has been increasing. The style of our life is changing to enjoying our life itself with variety of our interests, from just living without fun. We want beauties for things, ease of use for tools and pleasures of acting.

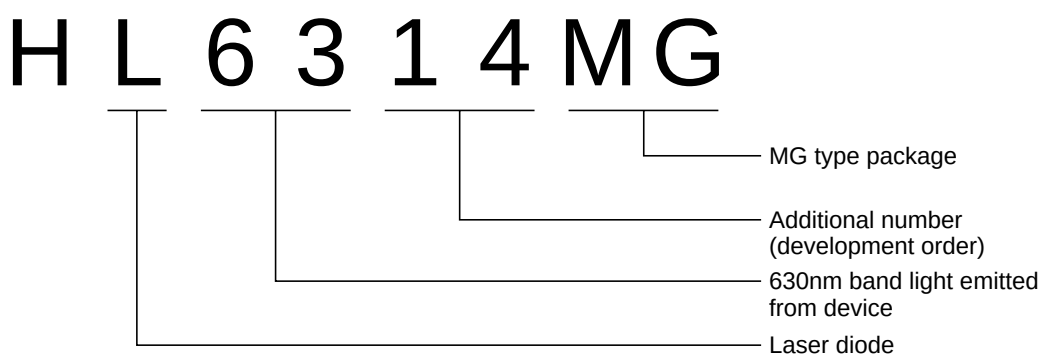
We, Hitachi, would like to help by providing you with our visible and infrared laser diodes.

Section 2 Part Numbers

Hitachi laser diode part numbers indicate the following.



An example is given below.



Visible and Infrared Laser Diodes

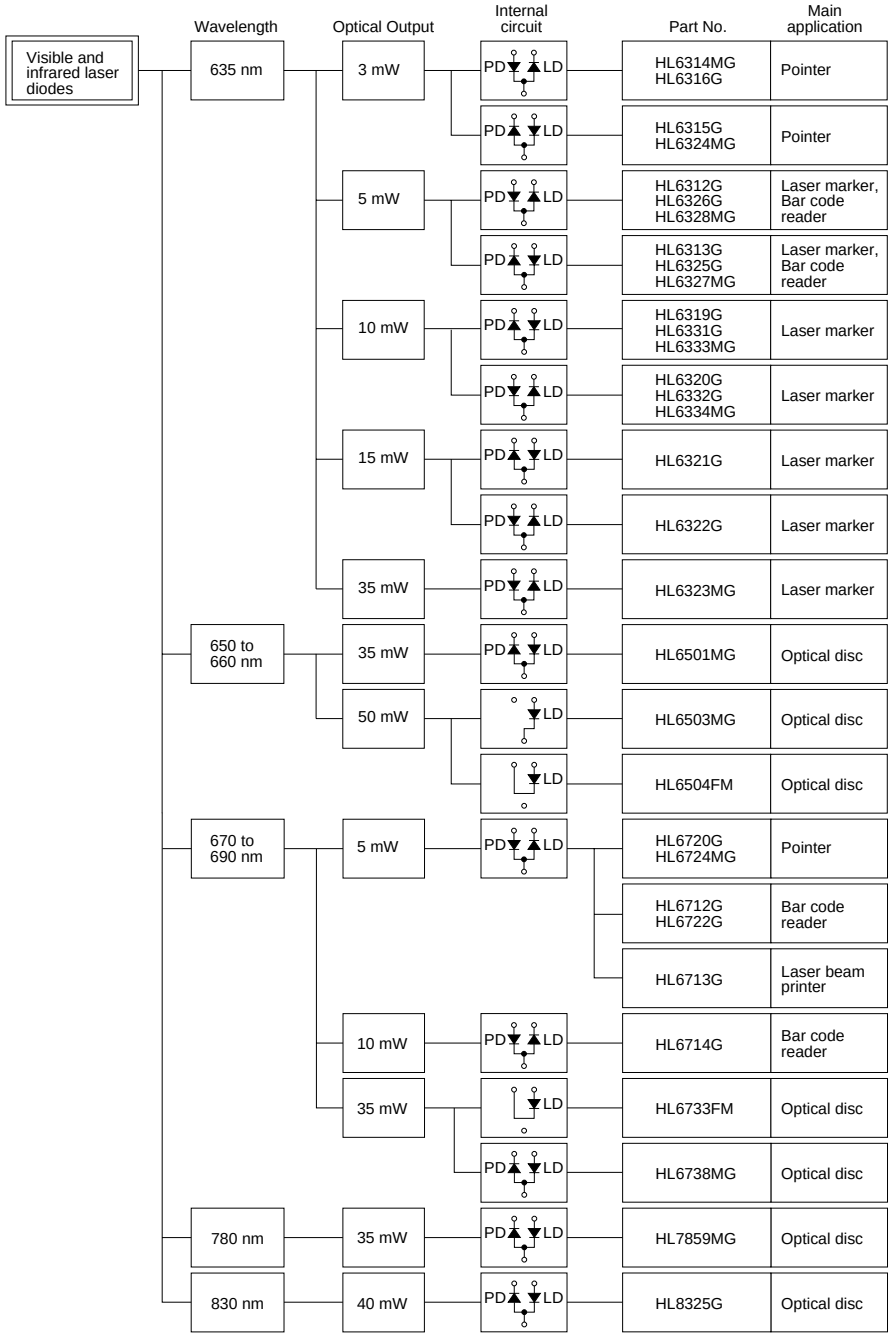
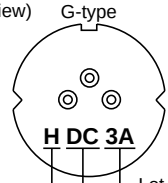


Table Optical and Electrical Characteristics for Red & Infrared Lds

Application	Type No.	Mark	Out line	Inter nal	Maximum Ratings (Tc = 25°C) Po (mW)	Tc (°C)	Optical and Electrical Characteristics (Typ) (Tc = 25°C) Po (mW)	Ith (mA)	Iop (mA)	θ// (deg)	θ⊥ (deg)	λp (nm)	Is (mA)	Status
Pointer	HL6314MG	B	MG	AC	3	–10 to 50	3	25	30	8	30	635	0.15	MP
Education	HL6315G	DN	G	CC	3	–10 to 50	3	25	30	8	30	635	0.3	MP
Toy	HL6316G	DP	G	AC	3	–10 to 50	3	25	30	8	30	635	0.3	MP
Amusement	HL6324MG	M	MG	CC	3	–10 to 50	3	25	30	8	30	635	0.15	MP
	HL6720G	DG	G	AC	5	–10 to 50	5	30	35	9	30	670	0.1	MP
	HL6724MG	A	MG	AC	5	–10 to 50	5	25	35	8	30	670	0.9	MP
Bar code	HL6312G	DF	G	AC	5	–10 to 50	5	45	55	8	31	635	0.4	MP
reader	HL6313G	DM	G	CC	5	–10 to 50	5	45	55	8	31	635	0.4	MP
Industrial	HL6319G	DT	G	CC	10	–10 to 50	10	50	70	8	31	635	0.17	MP
	HL6320G	DU	G	AC	10	–10 to 50	10	50	70	8	31	635	0.17	MP
	HL6321G	HV	G	CC	15	–10 to 50	15	55	85	8	30	635	0.2	MP
	HL6322G	HW	G	AC	15	–10 to 50	15	55	85	8	30	635	0.2	MP
	HL6323MG	AU	MG	AC	35	–10 to 50	30	45	95	8.5	30	639	0.15	MP
	HL6325G	DX	G	CC	5	–10 to 60	5	30	40	8	31	635	0.1	MP
	HL6326G	DY	G	AC	5	–10 to 60	5	30	40	8	31	635	0.1	MP
	HL6327MG	AL	MG	CC	5	–10 to 50	5	30	40	8	31	635	0.07	MP
	HL6328MG	AM	MG	AC	5	–10 to 50	5	30	40	8	31	635	0.07	MP
	HL6331G	DZ	G	CC	10	–10 to 60	10	40	55	8	31	635	0.18	MP
	HL6332G	EA	G	AC	10	–10 to 60	10	40	55	8	31	635	0.18	MP
	HL6333MG	AS	MG	CC	10	–10 to 50	10	40	55	8	31	635	0.09	MP
	HL6334MG	AT	MG	AC	10	–10 to 50	10	40	55	8	31	635	0.09	MP
	HL6712G	DB	G	AC	5	–10 to 50	5	40	50	8	27	670	0.6	MP
	HL6714G	DD	G	AC	10	–10 to 50	10	35	50	8	22	670	0.8	MP
	HL6722G	DJ	G	AC	5	–10 to 50	5	32	42	8	30	670	2.0	MP
LBP/PPC	HL6713G	DC	G	AC	5	–10 to 50	5	40	53	9	30	670	2.0	MP
Optical	HL6501MG	W	MG	CC	35	–10 to 60	30	45	85	8.5	22	658	0.3	MP
disc drive	HL6503MG	AJ	MG	CC	50	–10 to 60	50	45	115	8.5	21	664	—	MP
	HL6504FM	AK	FM	—	50	–10 to 60	50	45	115	8.5	21	664	—	MP
	HL6733FM	U	FM	—	35	–10 to 70	30	45	90	8.5	19	690	—	MP
	HL6738MG	Q	MG	CC	35	–10 to 70	30	45	90	8.5	19	690	0.1	MP
	HL7859MG	V	MG	CC	35	–10 to 60	35	35	95	9	23	785	0.4	MP
	HL8325G	GE	G	CC	40	–10 to 60	40	40	120	10	22	830	0.4	MP

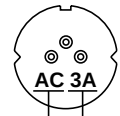
(Mark layout)
(Bottom view)

G-type



Lot No.
Abbreviation of type No.
Abbreviation of Hitachi

MG/FM-type



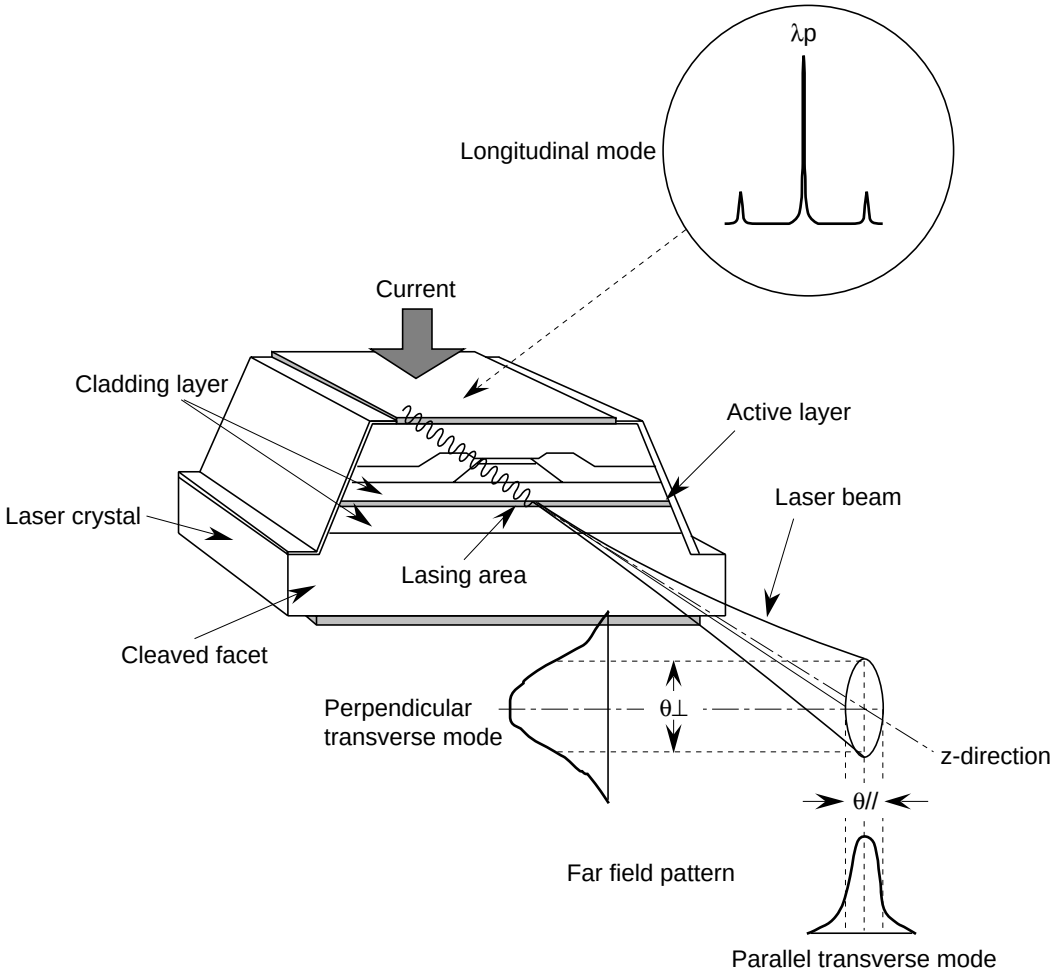
Lot No.
Abbreviation of type No.
(Some products have one character.)

Products status
MP : Mass production
WS : Working sample (preliminary spec.)
UD : Under development (Target spec.)

Symbols	Items
Ith	Threshold current
Iop	Operating current
θ//	Beam divergence(parallel)
θ⊥	Beam divergence(perpendicular)
λp	Lasing wavelength
Is	Monitor current

Section 5 Lasing Modes of Laser Diode

Under laser oscillation, a light standing wave is created with its wave front parallel to the mirror facets while light is traveling back and forth within the laser cavity. This standing wave consists of a longitudinal mode and two transverse modes (see below). The longitudinal mode expresses the condition of the standing wave in the direction of cavity length (z-direction). The transverse modes express the conditions of the axes perpendicular to the cavity length direction. The transverse modes are divided into a perpendicular transverse mode which is perpendicular to the active layer, and a parallel transverse mode which is parallel to the layer.



Section6 Composition of Parts

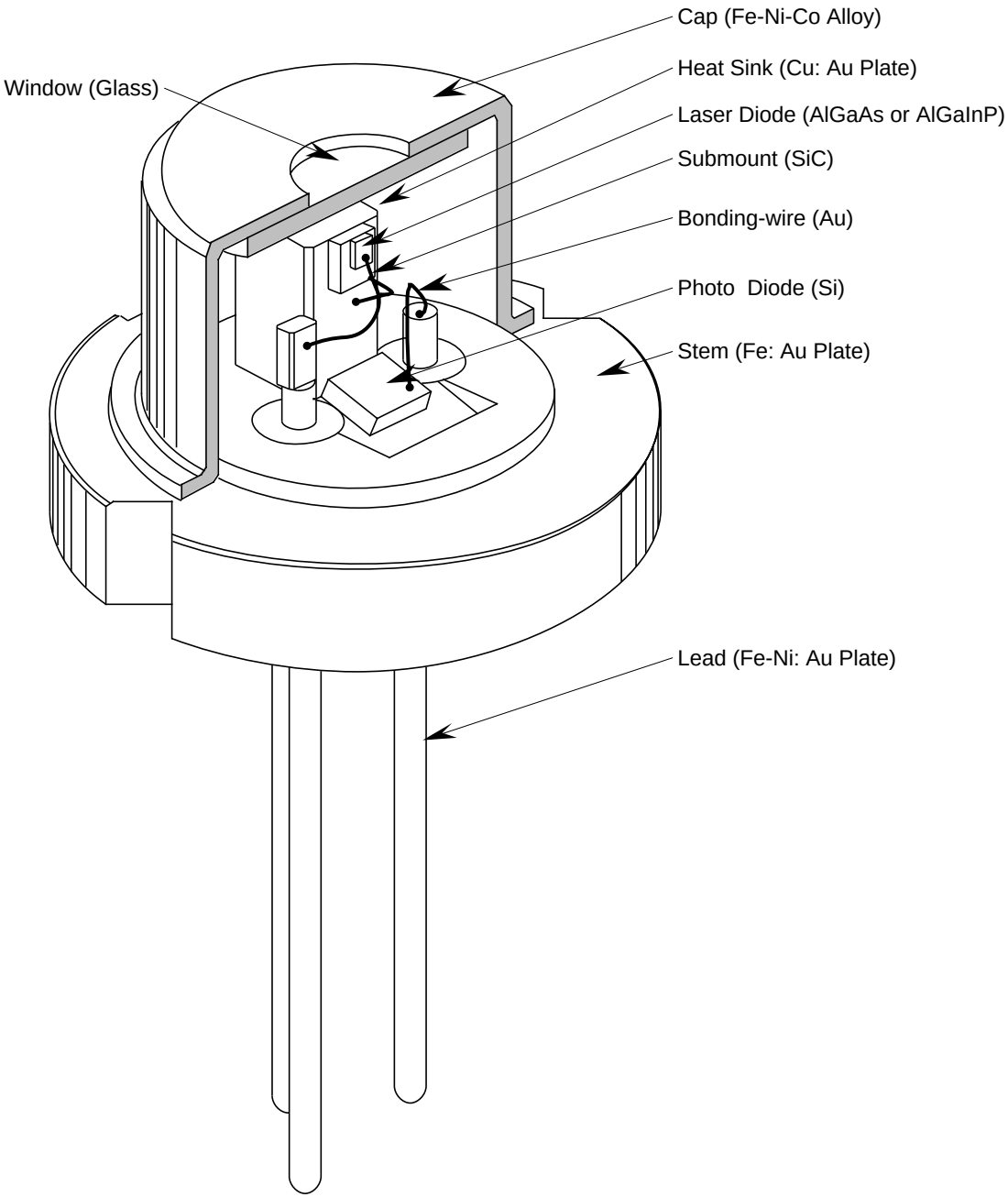
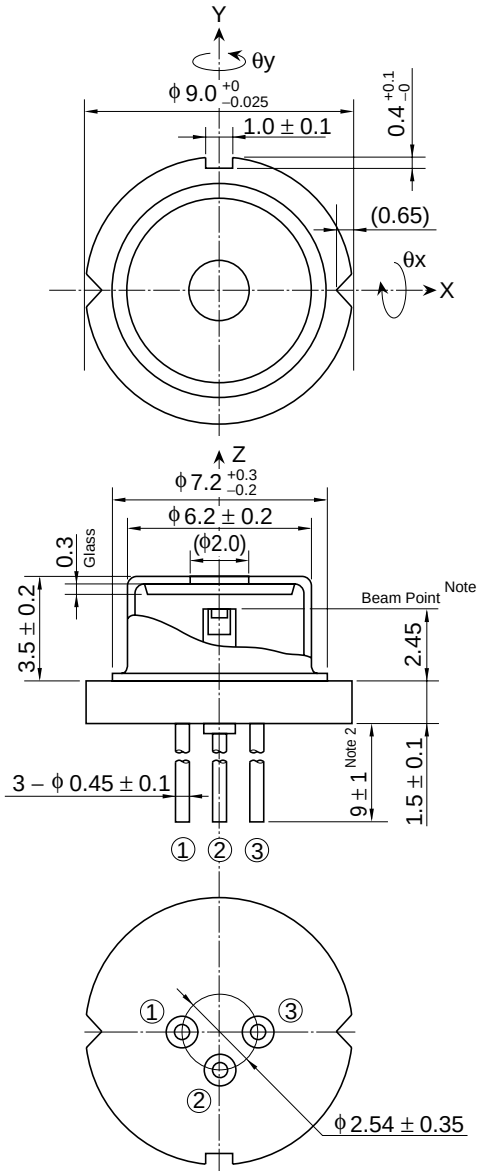


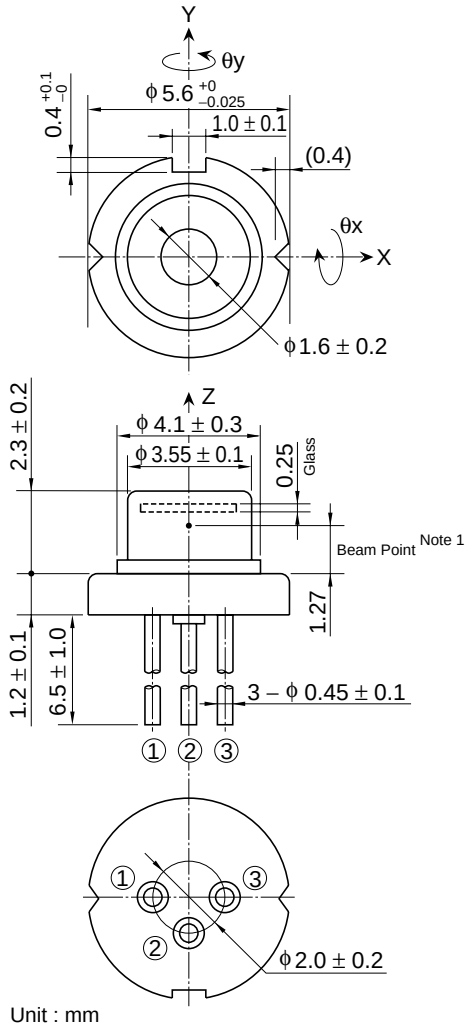
Fig. Example of Composition of Parts in G-Package

Section 7 Package Outlines

G-outline

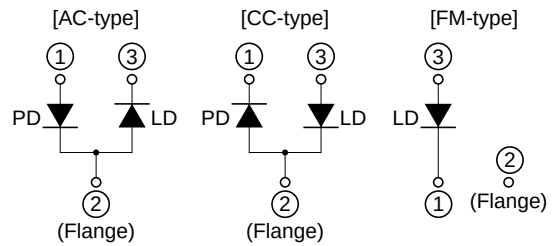


MG/FM-outline



Unit : mm

[Internal circuit]



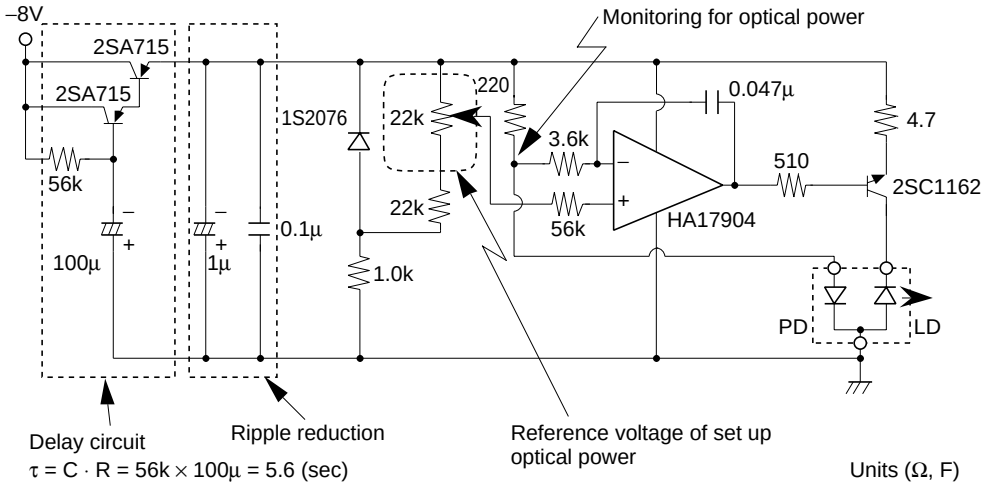
Notes: 1. Beam point is mechanical dimensions from reference of stem.
2. Lead length of HL6712G and HL6713G are applied to 14mm ± 1mm.

Section 8 Examples of LD Operating Circuit (APC)

8.1 Anode Common Type Use

Type No.

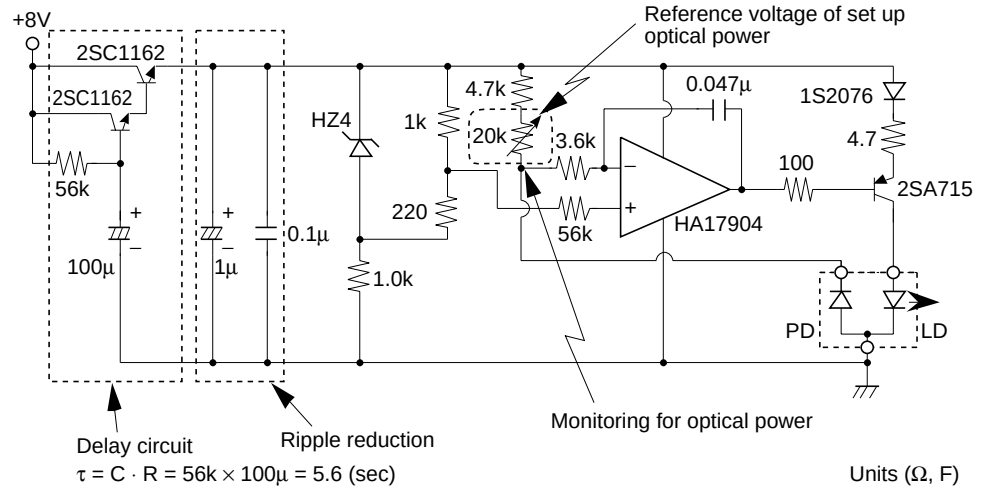
HL6312G, HL6320G, HL6322G, HL6326G, HL6328MG, HL6332G, HL6334MG, HL6712G, HL6713G, HL6714G, HL6722G



8.2 Cathode Common Type Use

Type No.

HL6313G, HL6319G, HL6321G, HL6325G, HL6327MG, HL6331G, HL6333MG, HL6738MG, HL7859MG, HL8325G



Section 9 Symbols and Definitions

9.1 The Absolute Maximum Ratings

The absolute maximum ratings specified in this document are the values which should not be exceeded under any condition. They are defined at the case temperature, Tc, of 25°C unless otherwise specified. The absolute maximum ratings of laser diodes are defined individually as follows.

Items	Symbols	Definitions
Optical output power	Po	Maximum tolerable output power under continuous wave(CW) operation. The value with no kink phenomena in a light vs. current characteristics.
Pulse optical output power	Po(pulse)	Maximum tolerable output power under pulse conditions specified respectively.
Reverse voltage V_R	$V_{R(LD)}$ $V_{R(PD)}$	Maximum tolerable reverse bias applied to a device. For the LDs with a built-in photodiode, the reverse voltages of the photodiode, $V_{R(PD)}$, and of the LD, $V_{R(LD)}$, are specified respectively.
Operating temperature	Topr	Case temperature range under which a device can safely operate.
Storage temperature	Tstg	Ambient temperature range under which a device can be safely stored.

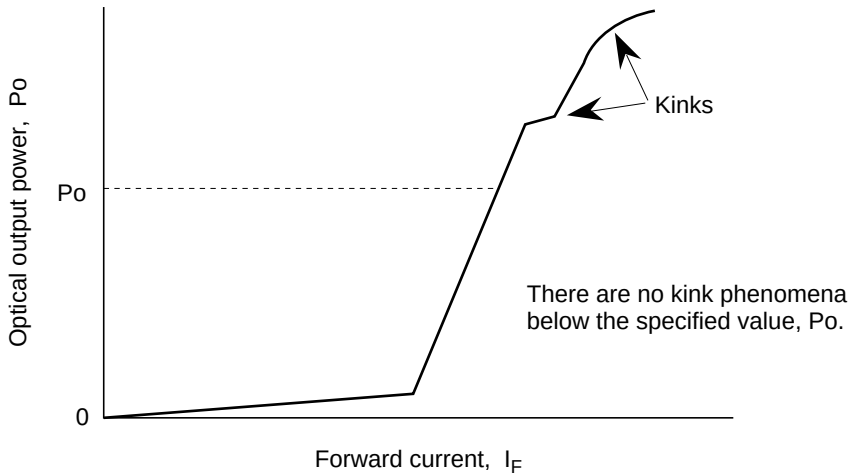


Fig. Light vs. Current Characteristics

9.2 Optical and Electrical Characteristics 1 —Po, Ith, Iop, Vop, λp, θ//, θ⊥, η, Is—

The limit values and the typical values of optical and electrical characteristics are described in this document as much as possible for users' convenience for application to electrical circuits and optics.

The definitions of optical and electrical characteristics are listed below.

Items	Symbols	Definitions
Optical output power	Po	Optical output power under the specified forward current, I_F or the value of the kink-free region.
Threshold current	Ith	Forward current at which a diode starts to lase (see the figure drawn below). Practically, this value is specified as the cross point of X axis and the extension of line B, where "A" is the spontaneous emission region and "B" is the lasing region.
Operating current, Operating voltage	Iop Vop	Current and voltage of a laser diode operated at the specified optical output power, Po.
Lasing Wavelength	λp*	Maximum intensity wavelength in a spectral distribution.
Beam divergence parallel to the junction Beam divergence perpendicular to the junction	θ//* θ⊥*	Divergence of a light beam emitted from a laser diode is described in the figure of lasing modes of the laser diode. θ// is the full angle at a half of the peak intensity in the parallel profile. θ⊥ is the full angle at a half of the peak intensity in the perpendicular profile.
Slope effciency	η	Optical output power increment per unit drive current in the lasing region ("B" region) in the figure drawn below.
Monitor current	Is	Current of a photodiode operated at the specified optical output power, Po.

Note: * See figure in lasing modes of a laser diode (Section 5).

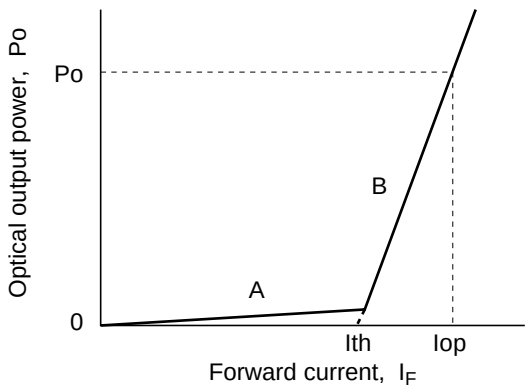


Fig. Light vs. Current Characteristics

9.3 Optical and Electrical Characteristics 2 —As, –Rth, Δθ//(axis), Δθ⊥(axis)—

Items	Symbols	Definitions
Astigmatism	As	Difference of the radiation points between parallel and perpendicular in a transverse mode of a laser diode operated at the specified optical output power, Po.
Droop	–Rth	Decreasing rate of optical output power under the specified pulse operation of a laser diode.
Radiation direction	Δθ//(axis) Δθ⊥(axis)	Difference between the peak intensity of the calculated Gaussian curve and mechanical center line of the measurement setup.

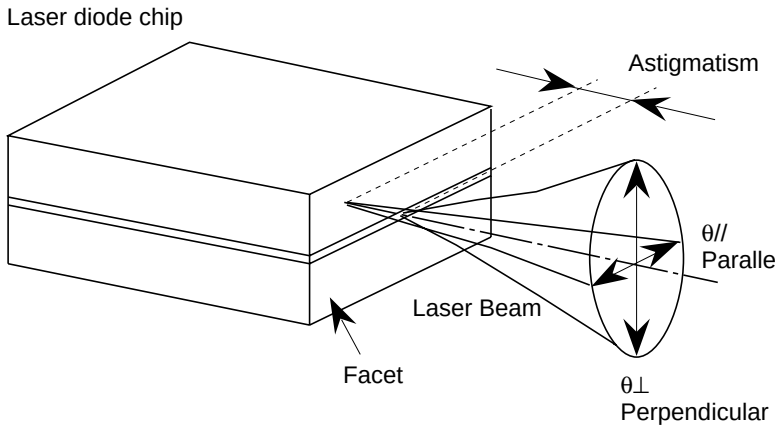
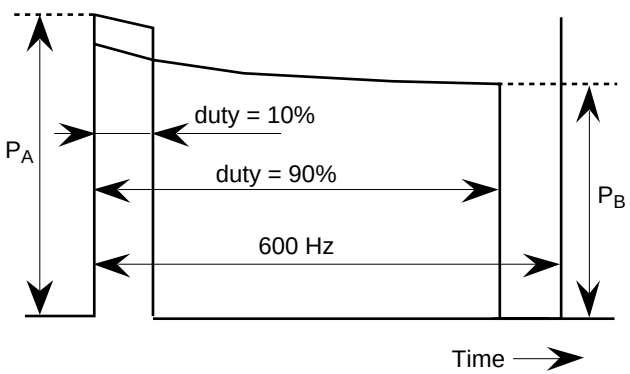


Fig. Definition of Astigmatism



$$\text{Droop}(-Rth) = \frac{(P_B - P_A)}{P_B} \times 100\ (\%)$$

Fig. Definition of Droop (–Rth)

9.4 Optical and Electrical Characteristics 3 —Polarization Direction—

There are two types of polarization direction of LDs, which are illustrated by Fig.A and Fig.B.

The angles of electric field and magnetic field to the active layer are different from each LD.

Hitachi's 0.63 mm band LDs are TM mode oscillation (See Fig.A), and 0.65/0.67/0.78/0.83 mm band LDs are TE mode oscillation (See Fig.B).

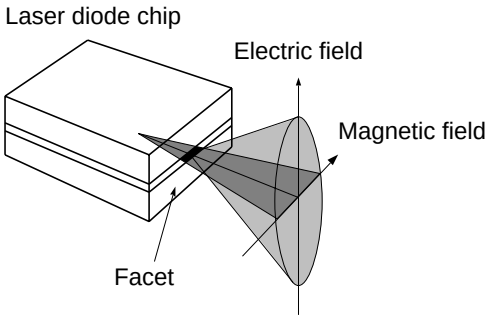


Fig.A TM mode oscillation LDs

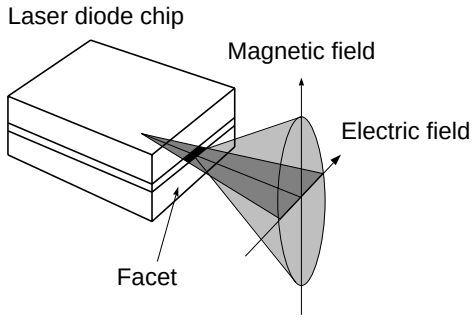


Fig.B TE mode oscillation LDs

9.5 Chip Position Accuracy —Angle, Position—

The limit values and the typical values of mechanical positions of a laser diode chip are described in this document as much as possible for users' convenience for application to assembly.

The definitions of the laser diode chip positions are listed below.

Items	Symbols	Definitions
Chip position	ΔX, ΔY,	Differences of positions between the radiation point and the center of package.
	ΔZ	Difference of the specified laser diode front facet position from the surface of package.
Chip angle	Δθx Δθy	Mechanical angles of the laser diode front facet from the reference surface.

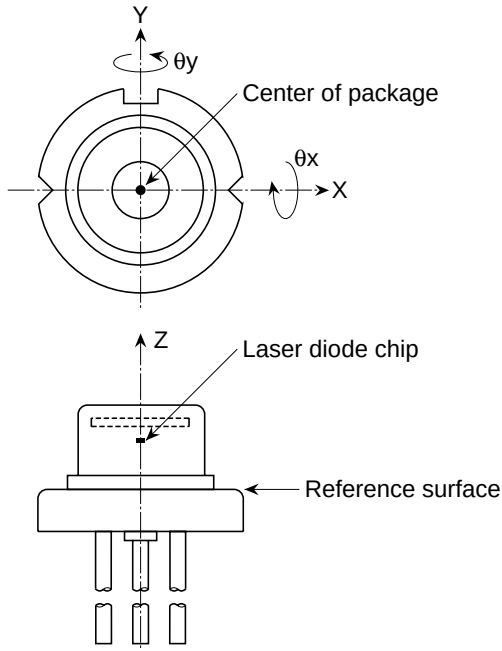


Fig. Position of Lase Diode Chip

Section 10 Applications

10.1 Pointer, Education, Experiment and Amusement

Introduction

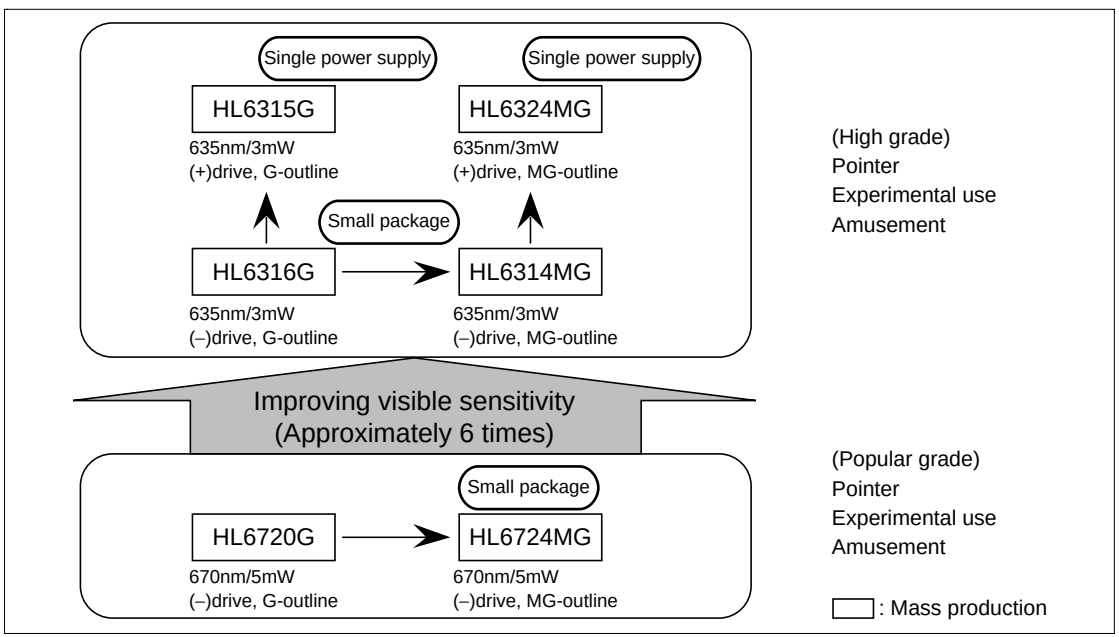
Visible light is suitable for uses in pointer, educational and experimental equipment and amusement. Shorter wavelength light and lower power consumption are required for these applications. Hitachi offers a variety of products for these applications.

Features

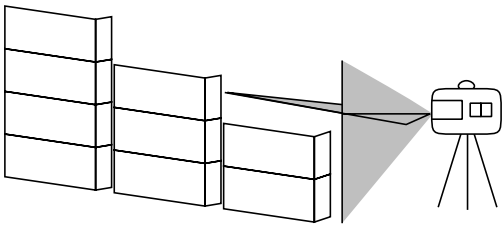
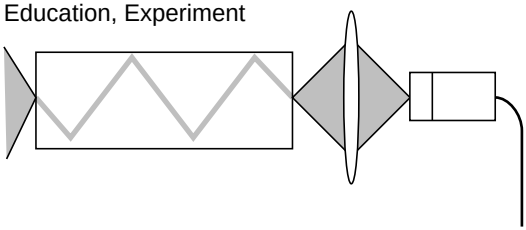
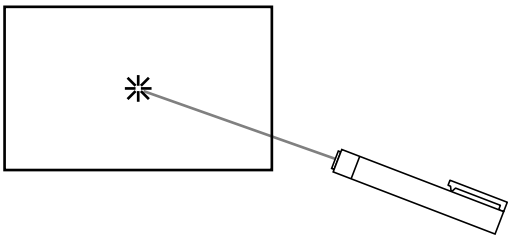
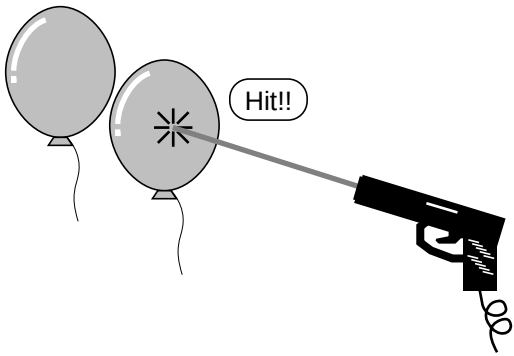
A wide variety of products specially designed for these applications

- 635 and 670 nm wavelength bands
- Operating temperature range up to 50°C
- Small package (ϕ5.6 mm)
  (HL6314MG, HL6324MG, HL6724MG)
- Pin arrangement for single polarity power supply
  (+) : cathode common (HL6315G, HL6324MG)
  (–) : anode common (HL6314MG, HL6316G, HL6720G, HL6724MG)
- Built-in monitor photodiode

Development Trend of Visible Laser Diodes for Pointer, Education, Experiment and Amusement



Application and Products

Example of Applied System	Applications	Products
Laser level (low end) 	Referense position for sunday carpenter (for making block wall, cutting line for board etc.)	HL6314MG HL6315G HL6316G HL6324MG
Education, Experiment 	Optical experiment	HL6314MG HL6316G HL6720G HL6724MG
Pointer 	Point of guide (Meeting, Sightseeing, Exhibition etc.)	HL6314MG HL6315G HL6316G HL6324MG
Amusement 	Shooting game Toys	HL6314MG HL6316G HL6720G HL6724MG

10.2 Bar Code Reader and Measuring Equipment

Introduction

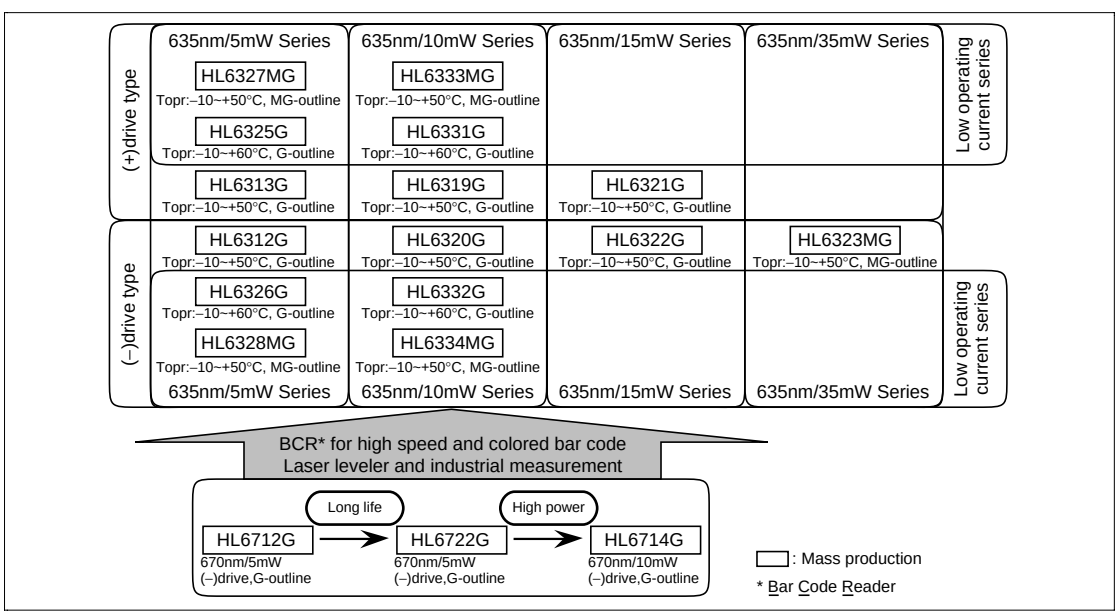
Getting shorter wavelength light from laser diode enables us to make the size of equipment smaller. It also eliminates use of gas lasers. We can get high resolution and precision industrial equipment more easily with laser diodes. Hitachi offers highly reliable laser diodes for these applications.

Features

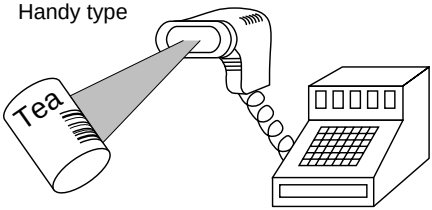
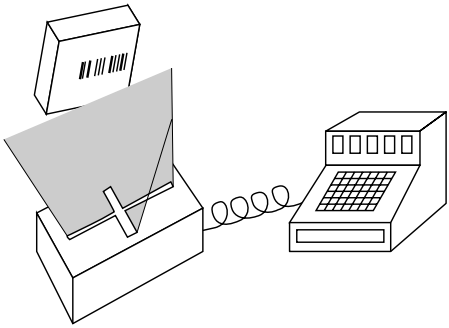
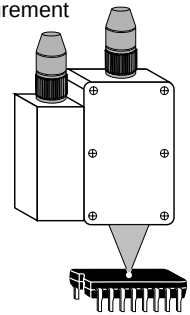
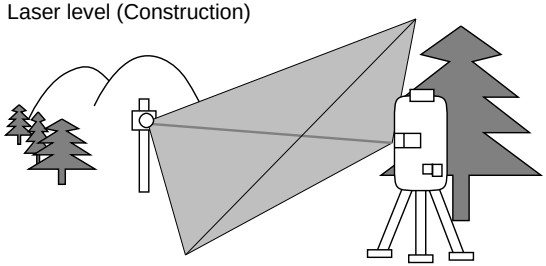
High reliability products

- 635 and 670 nm wavelength bands
- High optical power operation (10 mW : HL6319G, HL6320G, HL6714G)
  (15 mW : HL6321G, HL6322G)
  (35 mW : HL6323MG)
- Operating temperature range up to 60°C and 50°C
- Pin arrangement for single polarity power supply
  (+) : Cathode common (HL6313G, HL6319G, HL6321G, HL6325G, HL6327MG, HL6331G, HL6333MG)
  (–) : Anode common (HL6312G, HL6320G, HL6322G, HL6323MG, HL6326G, HL6328MG, HL6332G, HL6334MG, HL6712G, HL6722G, HL6714G)
- Built-in monitor photodiode

Development Trend of Visible Laser Diodes for Bar Code Reader and Measuring Equipment



Application and Products

Example of Applied System	Applications	Products
Bar code reader Handy type  Fixed type 	Merchandise control Process control Security	HL6312G HL6313G HL6325G HL6326G HL6327MG HL6328MG HL6722G HL6714G
Measurement 	Displacement meter Auto collimator Positioning system	HL6321G HL6322G HL6323MG
Laser level (Construction) 	Reference for construction (for parallel line, for measurement distance)	HL6321G HL6322G HL6323MG HL6325G HL6326G HL6327MG HL6328MG HL6331G HL6332G HL6333MG HL6334MG

10.3 Laser Beam Printer (LBP) and Plain Paper Copier (PPC)

Introduction

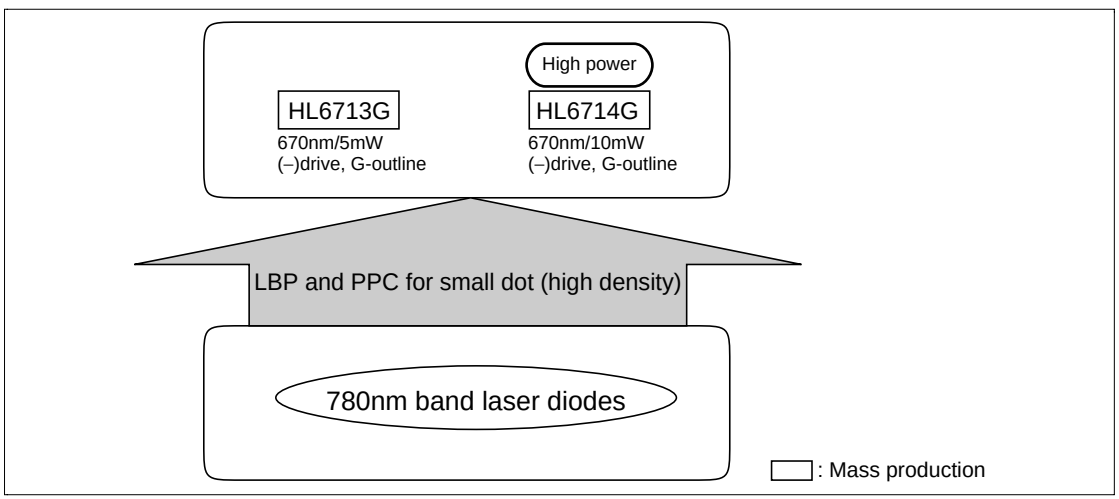
High resolution output devices are required for printing documents with text, drawing and photos. Making dots smaller is very important to get high resolution output. Hitachi offers high performance visible laser diodes for this purpose.

Features

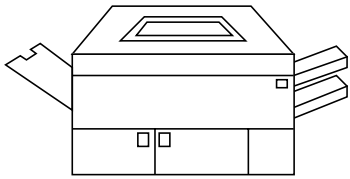
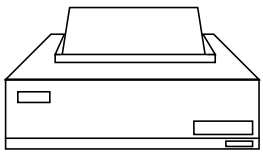
Products for high density of applied systems

- 670 nm wavelength bands
- High quality print by low droop
  High optical power operation (10 mW : HL6714G)
- Low astigmatism
- Pin arrangement : (–) Anode common (HL6713G, HL6714G)
- Built-in monitor photodiode

Development Trend of Visible Laser Diodes for Laser Beam Printer and Plain Paper Copier

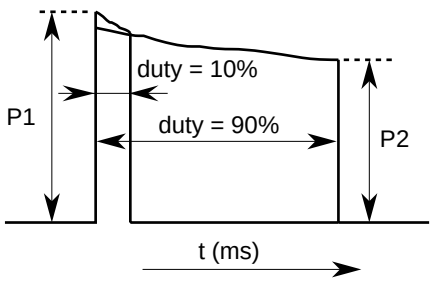


Application and Products

Example of Applied System	Applications	Products
Plain paper copier 	Image printing Word printing	HL6713G HL6714G
Laser beam printer 		

Droop

The ratio of variation in optical pulse output power between the power at the beginning of 10% duty pulse and the power at the end of 90% duty pulse. Smaller droop improves uniformity of printed output.



$$\text{Droop}(-\text{Rth}) = \frac{(P2 - P1)}{P2} \times 100\ (\%)$$

10.4 Optical Disc Drive (ODD) and Measurement

Introduction

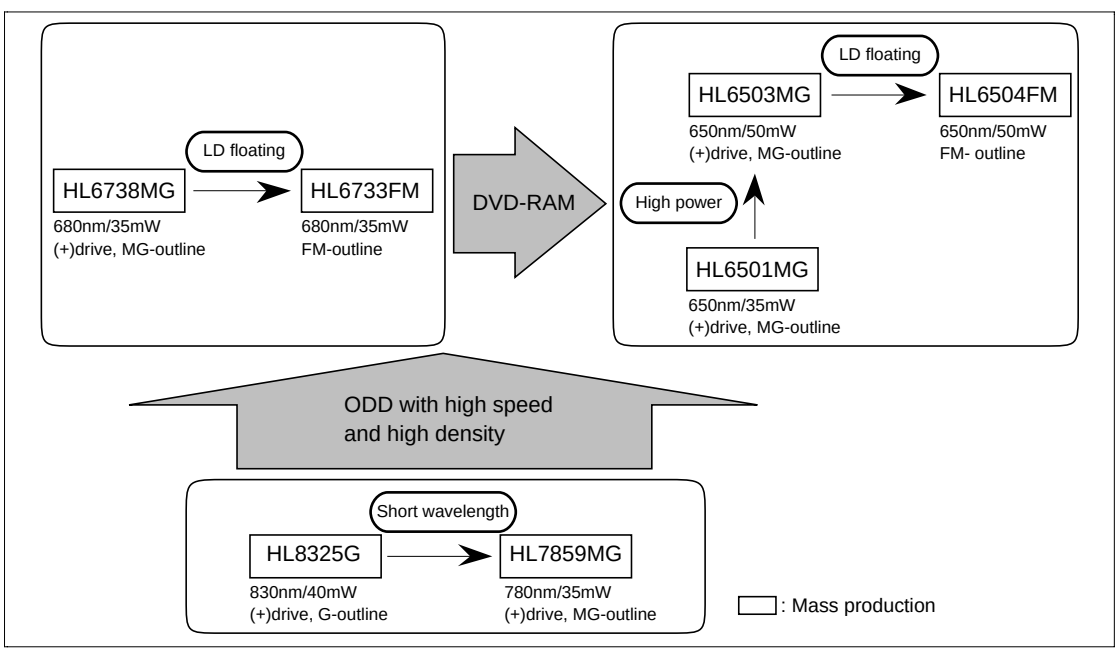
Optical disc drive is suitable for data mass storage. High output power and reliability are required for use in optical disc drive. Hitachi offers 830, 780, 680, and 650 nm bands laser diodes with high output power and reliability.

Features

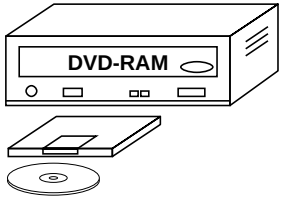
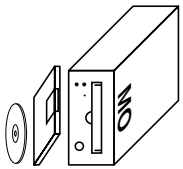
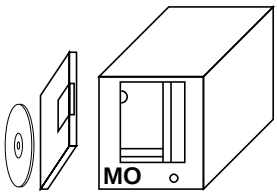
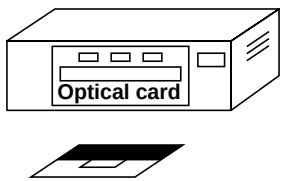
High reliability and high optical power line-up for ODD

- High optical power (more than 30 mW) for high speed access of ODD
- Short wavelength (650/680 nm) for high density ODD
- Low astigmatism
- Small package (ϕ5.6 mm) : HL6501MG, HL6503MG, HL6504FM, HL6733FM, HL6738MG, HL7859MG
- Positive and Negative power supply applicable
  (+) : Cathode common (HL6501MG, HL6503MG, HL6738MG, HL7859MG, HL8325G)
- Built-in monitor photodiode (except HL6504FM, HL6733FM)

Development Trend of Visible Laser Diodes for Optical Disc Drive and Measurement



Application and Products

Example of Applied System	Applications	Products
	Digital Versatile Disc (DVD)-RAM Drive	HL6501MG HL6503MG HL6504FM
	Magneto Optical (MO) Drive (3.5”)	HL6733FM HL6738MG HL7859MG
	Magneto Optical (MO) Drive (5.25”)	HL6501MG HL6503MG HL6504FM HL7859MG
	Optical Card Reader-Writer	HL7859MG HL8325G

Section 11 Handling Instructions

11.1 Handling Instructions

Suitable handling precautions during device measurement and system design must be taken as described below for high performance of a device with high reliability.

The Absolute Maximum Ratings

Be careful never to exceed, even momentarily, the absolute maximum ratings specified in the data sheets herein.

Pay particular attention to the following points.

1. It is possible for diodes to be damaged by spike current, generated when switching the power ON or OFF or when adjusting its output voltage. Before activating diodes, check the transient state of the power supply to assure that it does not exceed the maximum voltage rating.
2. Operate the diodes below the maximum optical output power rating in order to prevent mirror facet damage and resultant loss in reliability.

Surge Energy

Electrostatic discharge and electric spike input which may damage the diodes should be prevented. The main causes of undesirable surge energy are static electricity on the human body, shipping containers made of unsuitable materials, abnormal pulses generated from test equipment, and voltage leakage from soldering irons.

Storage

1. Store diodes in temperature of between 5 and 30 degree and relative humidity of below 40%. Lower values of both are preferable. Avoid sharp drops in temperature in order to prevent condensation. It is recommended to store diodes in an atmosphere of dry nitrogen with a dew point of –40 degree.
2. Assure that the storage atmosphere is void of dust and gases harmful to diodes.
3. Use a storage case which can not easily be charged with static elecricity.

Safty Considerations

Be sure to avoid direct exposure of human eyes to high power laser beams emitted from laser diodes. Even though barely visible and/or invisible to the human eye, they can be quite harmful. In particular, avoid looking directly into a laser diode or collimated beam along its optical axis when the diode is activated. One simple way to determine the optical path is to use a phosphor plate or infrared camera.

11.2 LD Pckage Handling -G, -MG Types

1. Take care not to touch the window glass directly. Contamination and scratches on the window surface will result in deceased optical power output and distorted far field patterns. Contamination can usually be wiped off using a cotton swab with ethanol.
2. Do not squeeze the cap tightly, as it will cause the window glass to crack and package hermeticity to deteriorate.
3. Do not bend the bottom of the lead wire, as it will cause the glass area to crack and the hermeticity to deteriorate.
4. Do not cut or process package.
5. Mounting a diode on a thermal radiator

   Laser diodes must be mounted on thermal radiators. For higher reliability, it is necessary to minimize mechanical stress to the packages and achieve sufficient heat sinking. Attention should be paid to the following items when mounting diodes on thermal radiators.

   a. Use a copper or aluminum plate for the thermal radiator. The plate should be larger than $30 \times 40 \times 2$ mm^3.
   b. To provide good thermal conductivity, polish the thermal radiator surface so that it will lie flat with the diode heat sink. Finish the radiator surface to keep bumps, twists, or bends below 0.05 mm.
   c. Do not solder packages to thermal radiators, as this may result in excessive temperature to the assemblies inside the packages or loss of package hermeticity.
   d. When mounting the diodes, do not touch or hit them against the caps, to prevent the window glass from becoming contaminated or cracked.
   e. Do not use heat sink grease, as it may contaminate the window glass.

Section 12 Prevention of Surge and ESD* for Laser Diodes

* Electric Static Damage

It compares LD to other electronic device and is very sensitive to static electricity and it being picked up often for in a manufacturing process or market delinquent become much. Accordingly, it understands that the cause investigation and measures are necessary. It introduces example for the ways to prevent surge destruction of LDs to table-1.

For basis model of electro static damage evaluation, two of human body model, machine model is thought about and the former is prescribed in MIL-STD-883C, and the latter is prescribed in EIAJ.

ESD strength level is different from by LD.

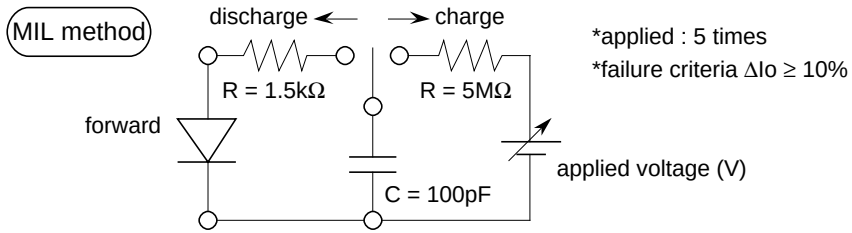
If you have any requirements on questions, please contact our product marketing dept.

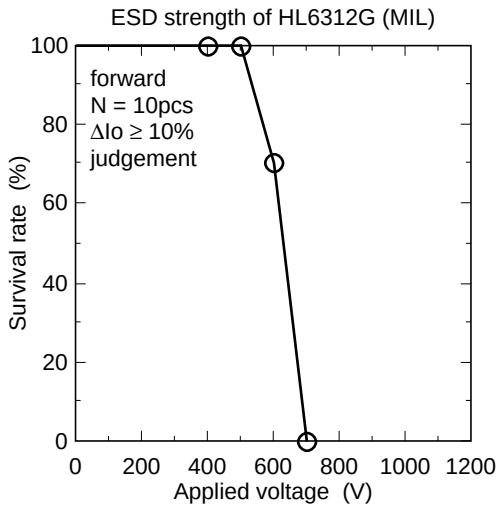
Table 1 Ways to Prevent Surge Destruction of LDs (Example)

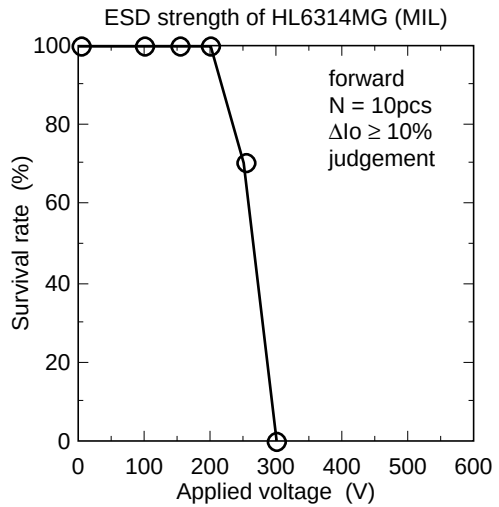
No.	Items	Check Point	Specification Examples
1	Human body	Ground operator's body.	Place a non-metallic, carbon band with a resistance of 500 Ω to 1 MΩ on his wrist.
		Commonly ground the measuring and inspecting equipment and the work bench.	Should be carried out in sheilded rooms as well.
		Control the ground level.	Under 10 Ω.
2	Power supply	Distribute power from main power supply through noise filter to each measuring and testing unit.	
		Insert noise filter in each power supply unit.	Organize with capacitors and resistors
		Eliminate relay chattering.	
		To prevent chattering, avoid turning on and off switch in APC circuit or relay.	
3	Working conditions	Temporarily stop work when the power supply for lights or other equipment connected to the same power line is turned on or off.	
		Conduct diode packing and measuring while performing ion blowing or in a weak minus ion atmosphere.	
		Select the right soldering iron.	Battery operated soldering iron.
4	Jigs and other considerations	Make carrier jigs and packing cases conductive.	Particulary the cases.
		Place conductive mats on the working floor.	Under 100 Ω.
		Control room temperature and humidity.	Humidity should be 50 ± 10%.
		Eliminate ripples from power supply.	Battery operated power supply.

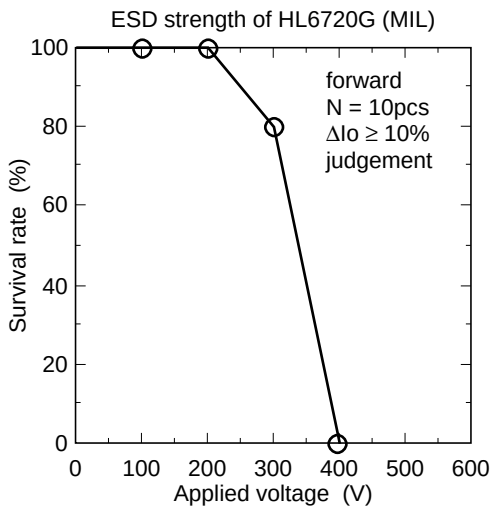
Section 13 ESD Strength Data of Laser Diodes

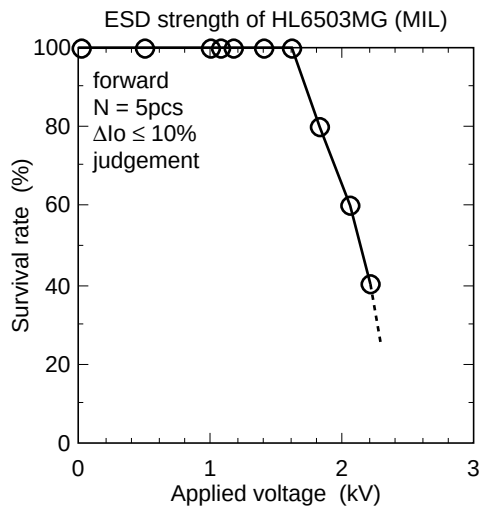
Some testing results of electrostatic discharge based on the method described in the MIL standard are shown below. Please make sure that these data are from limited number of samples and only for your reference. Hitachi does not guarantee the level of electrostatic discharge.







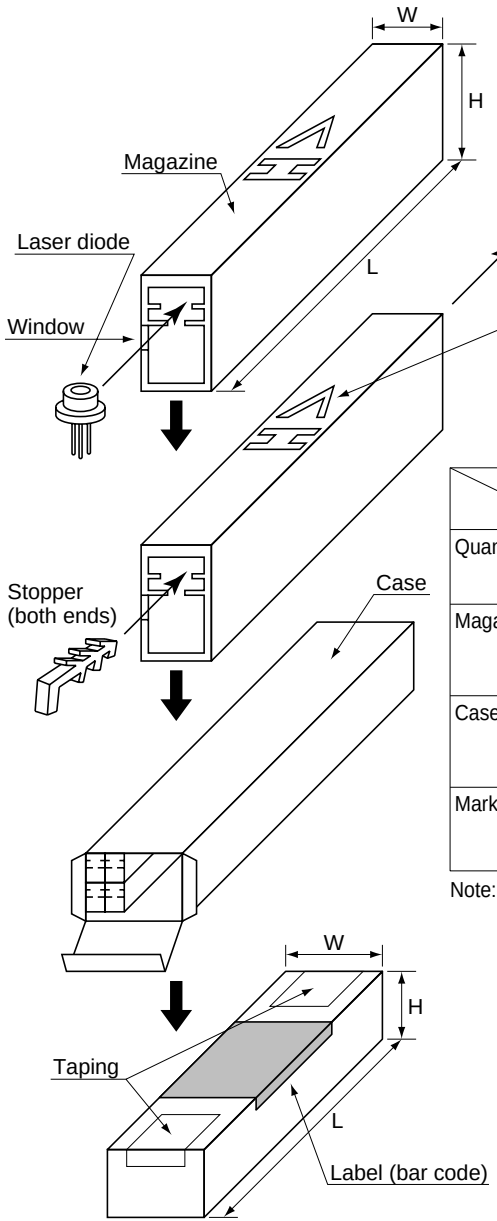




Section 14 The Way of Packing

Hitachi's standard packing way for visible and infrared LDs is "magazine packing", which is free from the lead bending potential during its transportation since the leads contact to nothing.

Just slope the magazine to get LDs from it. They will slide from it easily. The magazine is made of the conductive material to prevent ESD problem.



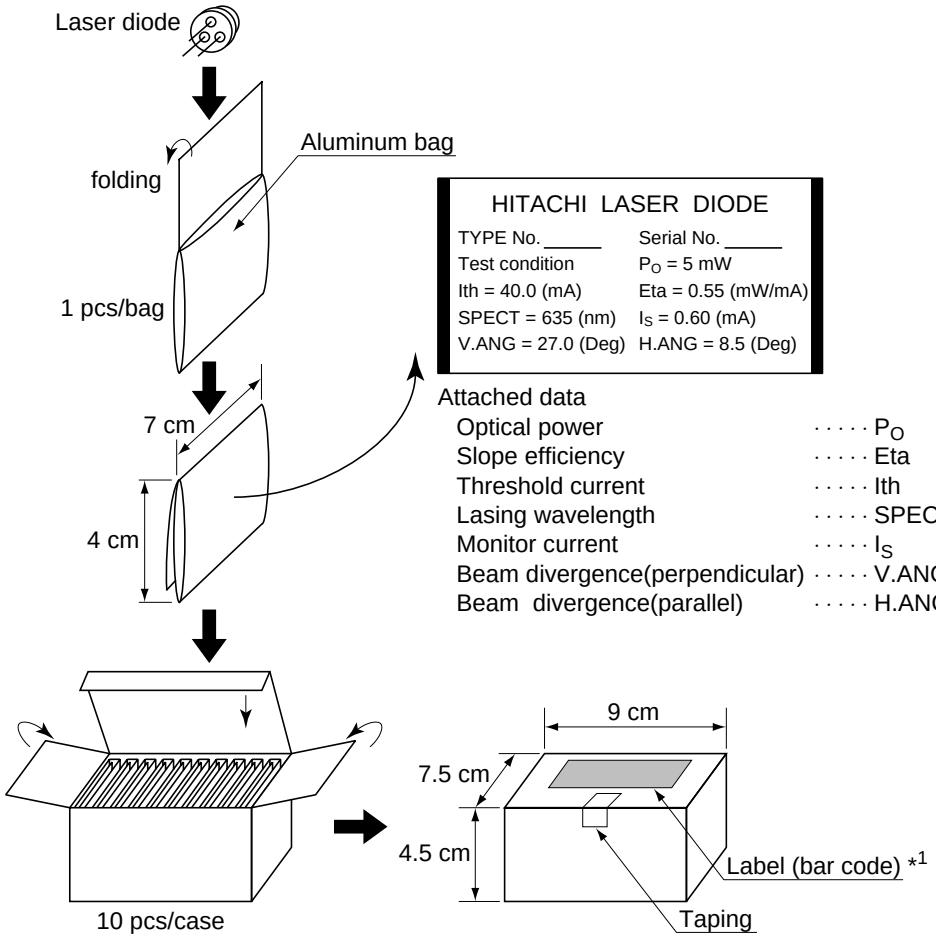
(Unit: mm)

		MG Type *1		G Type
		A	B	
Quantity		500 pcs (25 pcs/magazine × 20 magazines)	250 pcs (25 pcs/magazine × 10 magazines)	250 pcs (25 pcs/magazine × 10 magazines)
Magazine	W	8		12
	L	160		250
	H	14		25
Case	W	82	41	62
	L	162	162	252
	H	30	30	52
Marking *2		HITACHI part number, quantity, and mark are indicated by bar code on a label. The mark number is applied only to marked products.		

Note: 1. Either A or B is applied by delivery quantity.
2. The position and format of the label are subject to change.

Section 15 Testing Data

Testing data are available on request with additional charge. Please specify that it is necessary to attach the testing data.



Note: 1. HITACHI part number, quantity, and mark are indicated by bar code on a label.
The mark number is applied only to marked products.
The position and format of the label are subject to change.

Section 16 Data Sheets

HL6312G 31
HL6313G 31
HL6314MG 36
HL6315G 41
HL6316G 41
HL6319G 46
HL6320G 46
HL6321G 51
HL6322G 51
HL6323MG 56
HL6324MG 36
HL6325G 61
HL6326G 61
HL6327MG 66
HL6328MG 66
HL6331G 71
HL6332G 71
HL6333MG 76
HL6334MG 76
HL6501MG 81
HL6503MG 86
HL6504FM 91
HL6712G 96
HL6713G 101
HL6714G 106
HL6720G 111
HL6722G 116
HL6724MG 121
HL6733FM 126
HL6738MG 131
HL7859MG 136
HL8325G 141

HL6312G/13G

AlGaInP Laser Diodes

HITACHI

ADE-208-190G (Z)
8th Edition
Dec. 2000

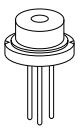
Description

The HL6312G/13G are 0.63 μm band AlGaInP laser diodes with a multi-quantum well (MQW) structure. Wavelength is equal to He-Ne Gas laser. They are suitable as light sources in bar code readers, laser levelers and various other types of optical equipment. Hermetic sealing of the package achieves high reliability.

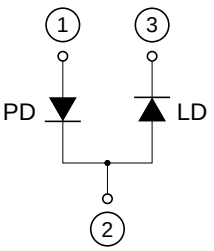
Features

- Visible light output: λp = 635 nm Typ (nearly equal to He-Ne Gas Laser)
- Optical output power: 5 mW CW
- Low Operating voltage: 2.7 V Max
- Single longitudinal mode
- Built-in photodiode for monitoring laser output
- TM mode oscillation

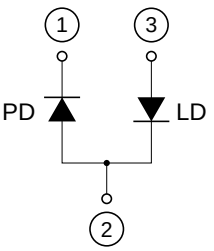
Package Type
• HL6312G/13G: G2



Internal Circuit
• HL6312G



Internal Circuit
• HL6313G



Absolute Maximum Ratings (T_C = 25°C)

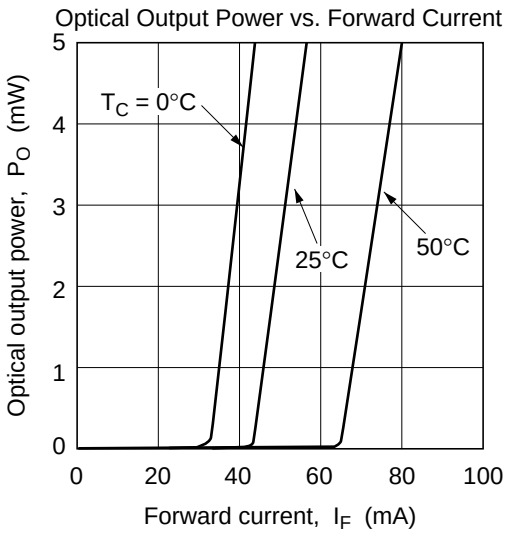
Item	Symbol	Rated Value	Unit
Optical output power	P_O	5	mW
Pulse optical output power	$P_{O(pulse)}$	6 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

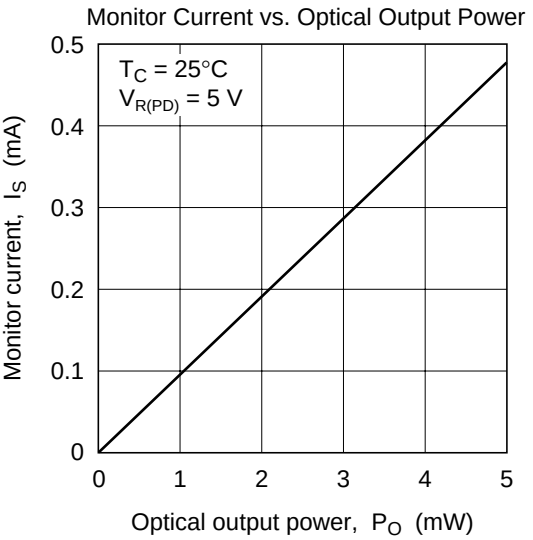
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

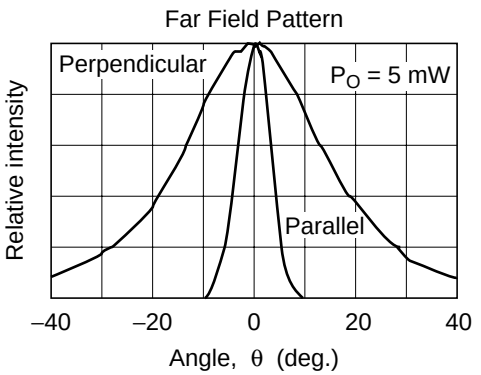
Optical and Electrical Characteristics (T_C = 25°C)

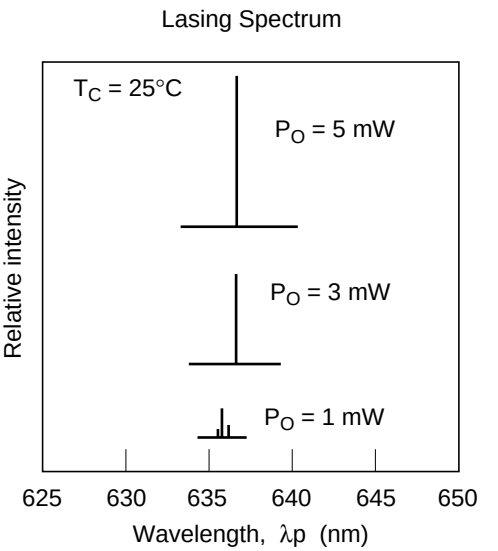
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	5	—	—	mW	Kink free
Threshold current	Ith	20	45	70	mA	
Operating current	I_{OP}	—	55	85	mA	P_O = 5 mW
Operating voltage	V_{OP}	—	—	2.7	V	P_O = 5 mW
Beam divergence parallel to the junction	θ//	5	8	11	deg.	P_O = 5 mW
Beam divergence parpendicular to the junction	θ⊥	25	31	37	deg.	P_O = 5 mW
Astigmatism	A_S	—	8	—	µm	P_O = 5 mW, NA = 0.55
Lasing wavelength	λp	625	635	640	nm	P_O = 5 mW
Monitor current	I_S	0.2	0.4	0.8	mA	P_O = 5 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves



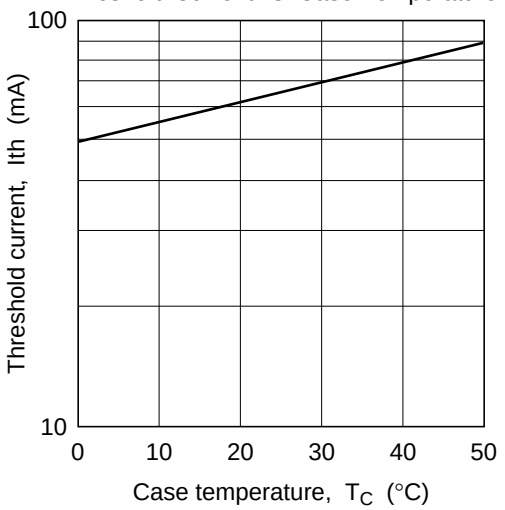




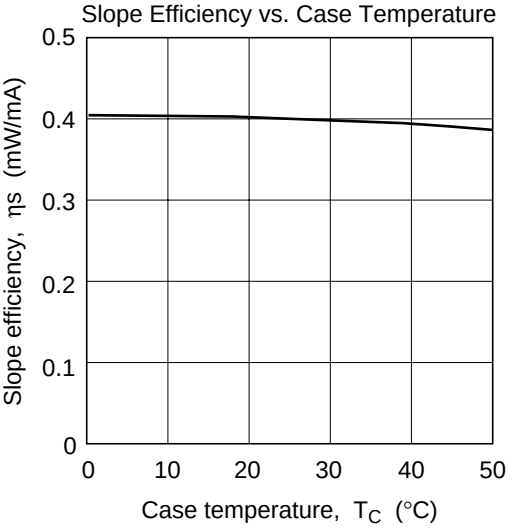


Typical Characteristic Curves (cont)

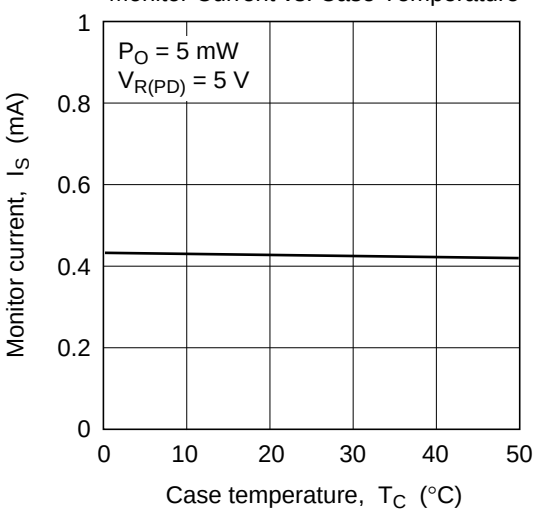
Threshold Current vs. Case Temperature



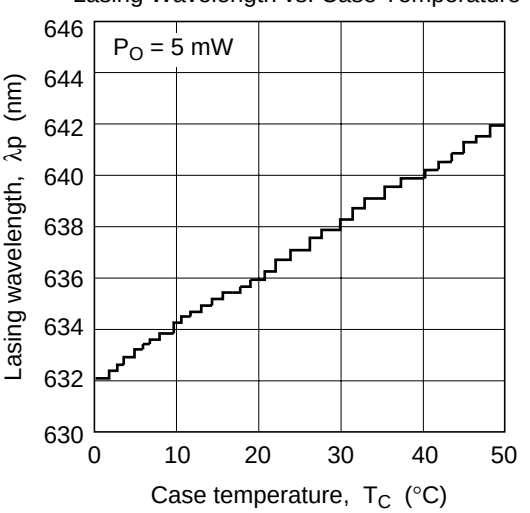
Slope Efficiency vs. Case Temperature



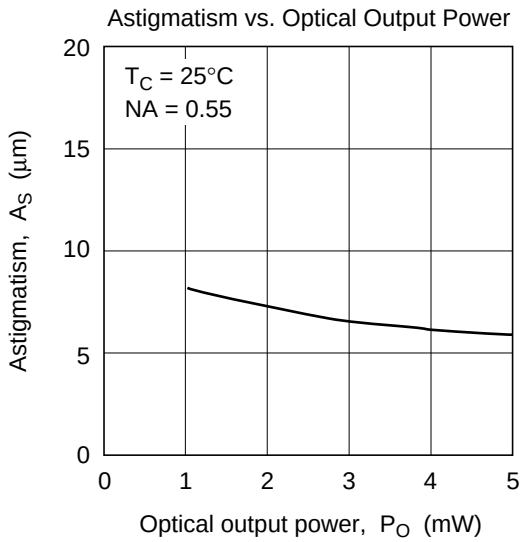
Monitor Current vs. Case Temperature

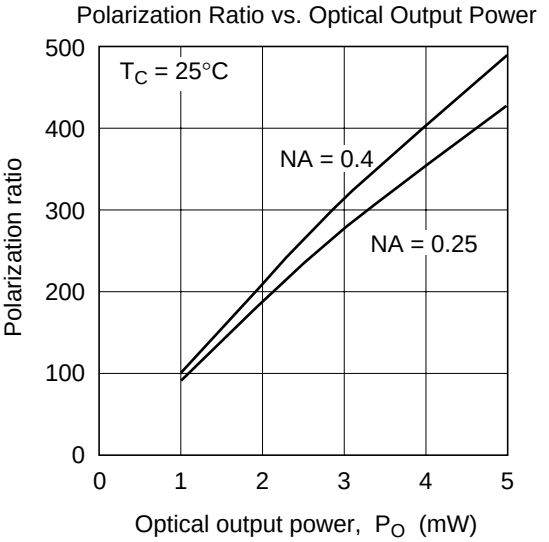


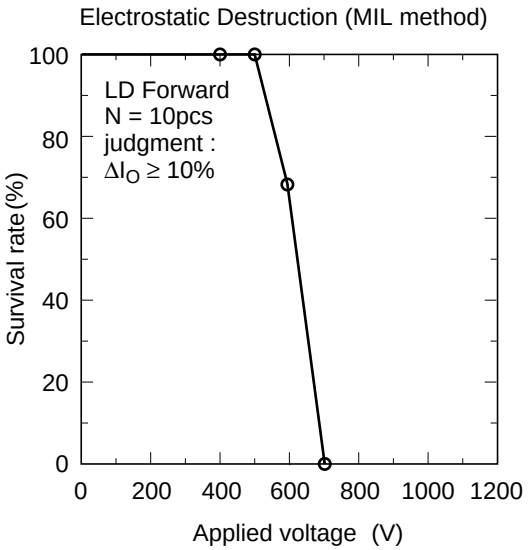
Lasing Wavelength vs. Case Temperature

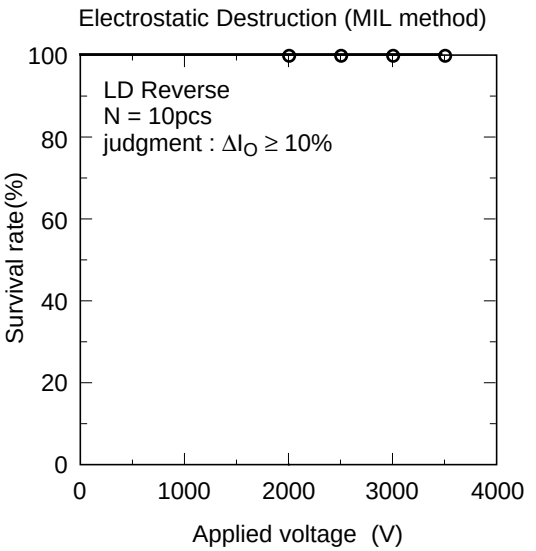


Typical Characteristic Curves (cont)









HL6314MG/24MG

AlGaInP Laser Diodes

HITACHI

ADE-208-262D (Z)
5th Edition
Dec. 2000

Description

The HL6314MG/24MG are 0.63 μm band AlGaInP laser diodes with a multi-quantum well (MQW) structure. They are suitable as light sources for laser poiters and optical equipment for amusement.

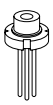
Application

- Laser pointer

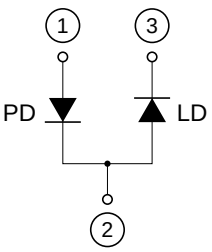
Features

- Visible light output: 635 nm Typ (nearly equal to He-Ne gas laser)
- Optical output power: 3 mW CW
- Low operating current: 30 mA Typ
- Low operating voltage: 2.7 V Max
- TM mode oscillation

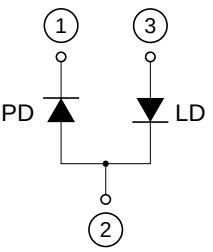
Package Type
• HL6314MG/24MG: MG



Internal Circuit
• HL6314MG



Internal Circuit
• HL6324MG



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Unit
Optical output power	P_O	3	mW
Pulse optical output power	$P_{O(pulse)}$	5 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

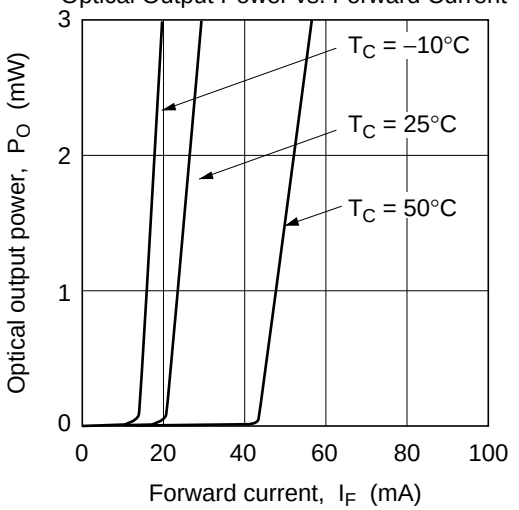
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

Optical and Electrical Characteristics (T_C = 25°C)

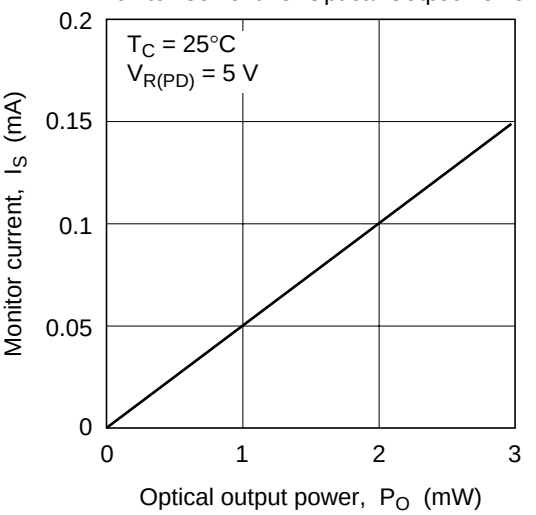
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	3	—	—	mW	Kink free
Threshold current	Ith	—	25	35	mA	
Operating current	I_{OP}	—	30	42	mA	P_O = 3 mW
Operating voltage	V_{OP}	—	—	2.7	V	P_O = 3 mW
Beam divergence parallel to the junction	θ//	6	8	10	deg.	P_O = 3 mW
Beam divergence parpendicular to the junction	θ⊥	23	30	39	deg.	P_O = 3 mW
Astigmatism	A_S	—	8	—	µm	P_O = 3 mW, NA = 0.55
Lasing wavelength	λp	630	635	640	nm	P_O = 3 mW
Monitor current	I_S	0.08	0.15	0.40	mA	P_O = 3 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

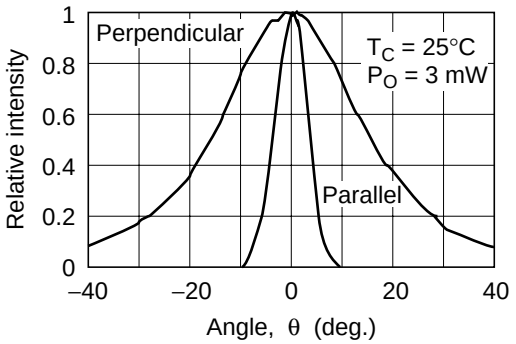
Optical Output Power vs. Forward Current



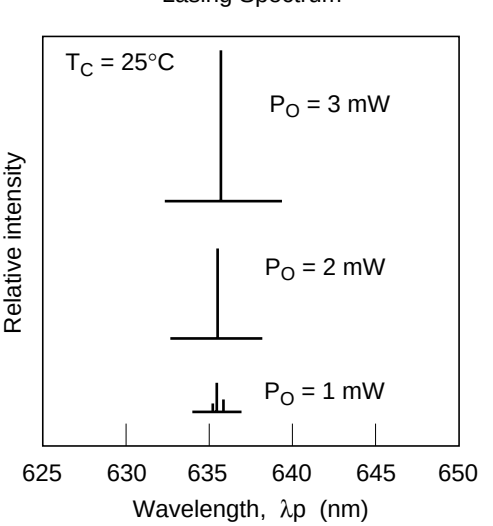
Monitor Current vs. Optical Output Power



Far Field Pattern

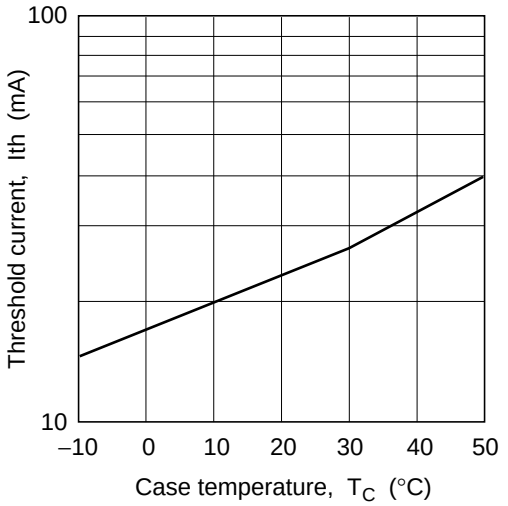


Lasing Spectrum

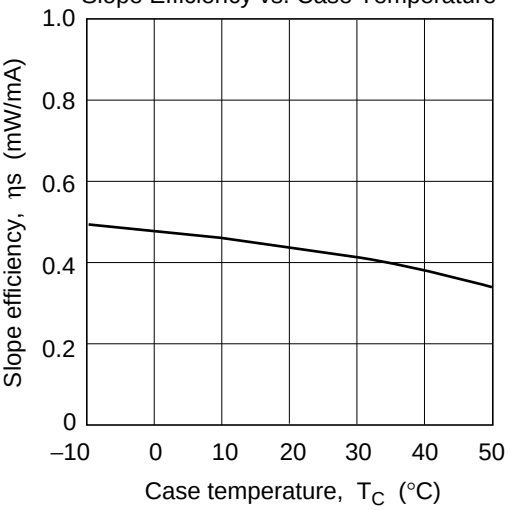


Typical Characteristic Curves (cont)

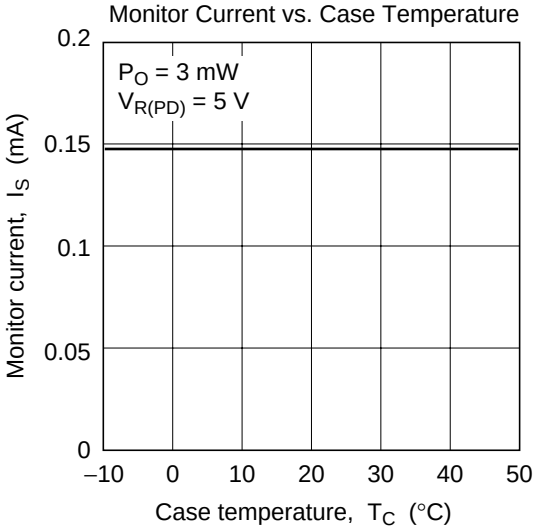
Threshold Current vs. Case Temperature



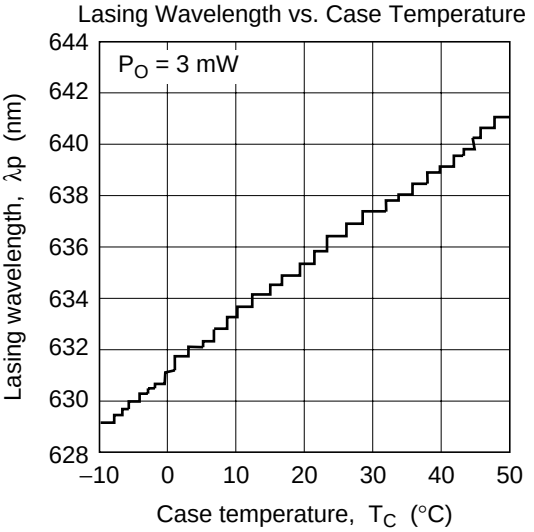
Slope Efficiency vs. Case Temperature



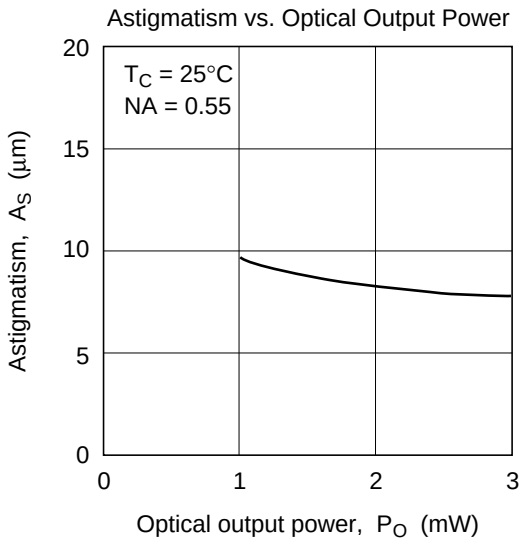
Monitor Current vs. Case Temperature

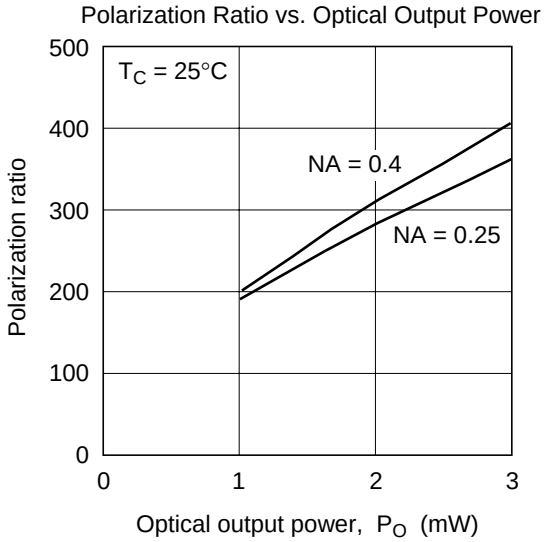


Lasing Wavelength vs. Case Temperature



Typical Characteristic Curves (cont)





HL6315G/16G

AlGaInP Laser Diodes

HITACHI

ADE-208-218D (Z)
5th Edition
Dec. 2000

Description

The HL6315G/16G are 0.63 μm band AlGaInP laser diodes with a multi-quantum well (MQW) structure. They are suitable as light sources for laser poiters and optical equipment.

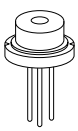
Application

- Laser pointer

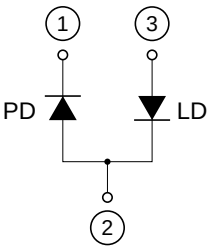
Features

- Visible light output: 635 nm Typ (nearly equal to He-Ne gas laser)
- Optical output power: 3 mW CW
- Low operating current: 30 mA Typ
- Low operating voltage: 2.7 V Max
- TM mode oscillation

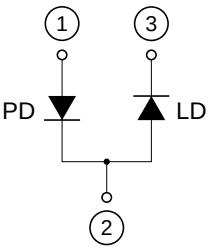
Package Type
• HL6315G/16G: G2



Internal Circuit
• HL6315G



Internal Circuit
• HL6316G



Absolute Maximum Ratings (T_C = 25°C)

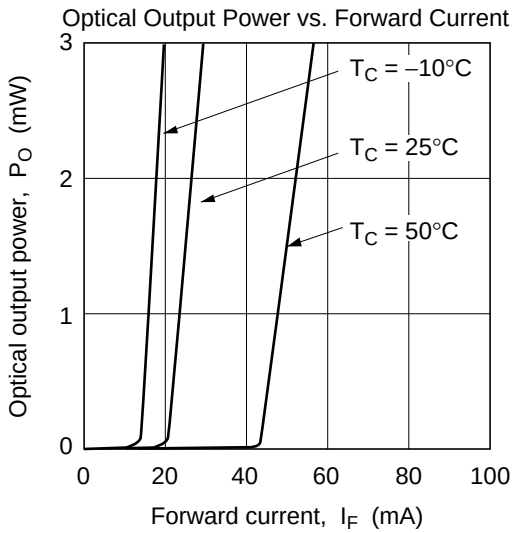
Item	Symbol	Rated Value	Unit
Optical output power	P_O	3	mW
Pulse optical output power	$P_{O(pulse)}$	5 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

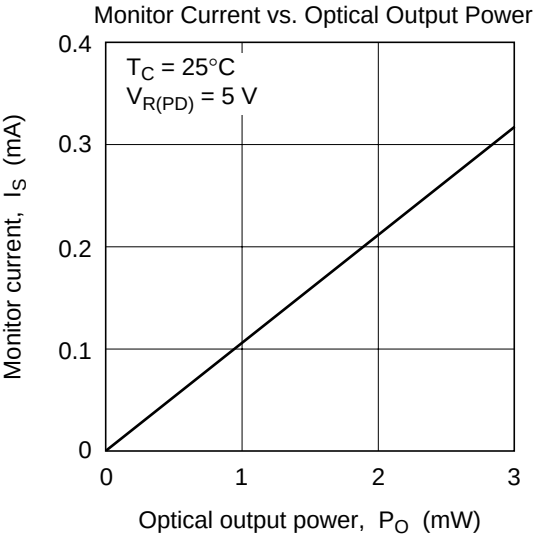
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

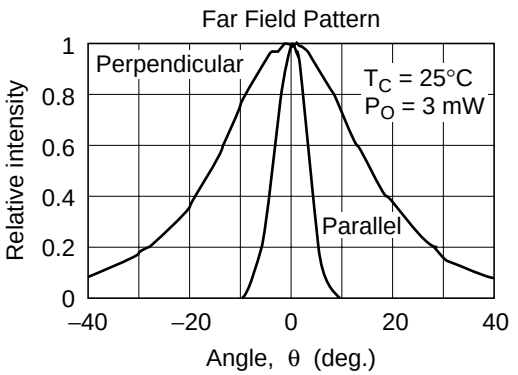
Optical and Electrical Characteristics (T_C = 25°C)

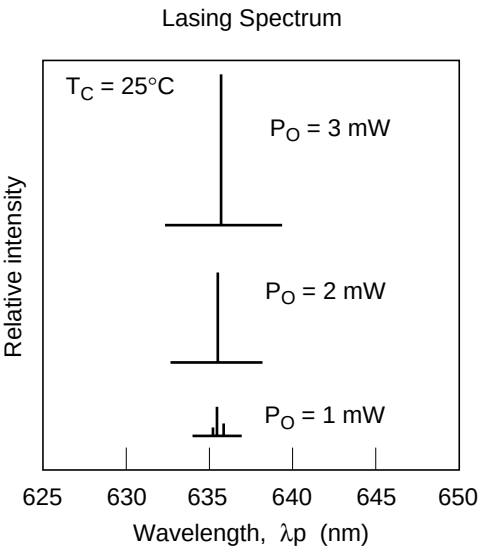
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	3	—	—	mW	Kink free
Threshold current	Ith	—	25	35	mA	
Operating current	I_{OP}	—	30	42	mA	P_O = 3 mW
Operating voltage	V_{OP}	—	—	2.7	V	P_O = 3 mW
Beam divergence parallel to the junction	θ//	6	8	10	deg.	P_O = 3 mW
Beam divergence parpendicular to the junction	θ⊥	23	30	39	deg.	P_O = 3 mW
Lasing wavelength	λp	630	635	640	nm	P_O = 3 mW
Monitor current	I_S	0.1	0.3	0.6	mA	P_O = 3 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

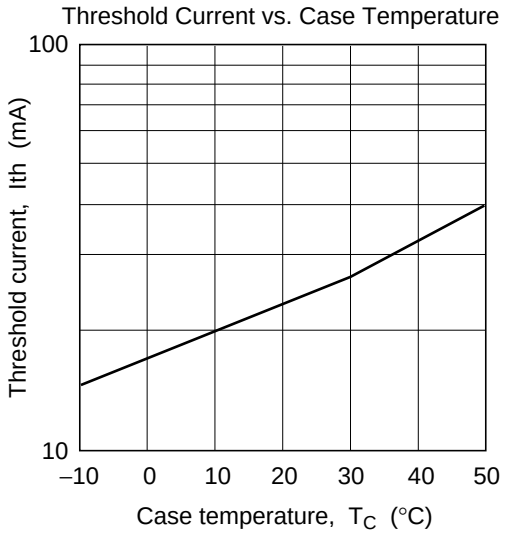


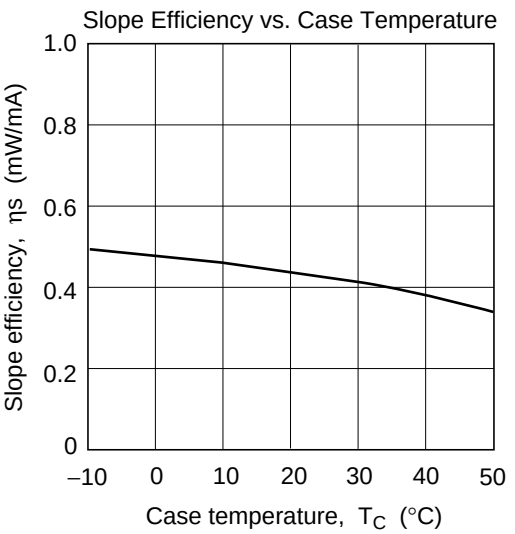


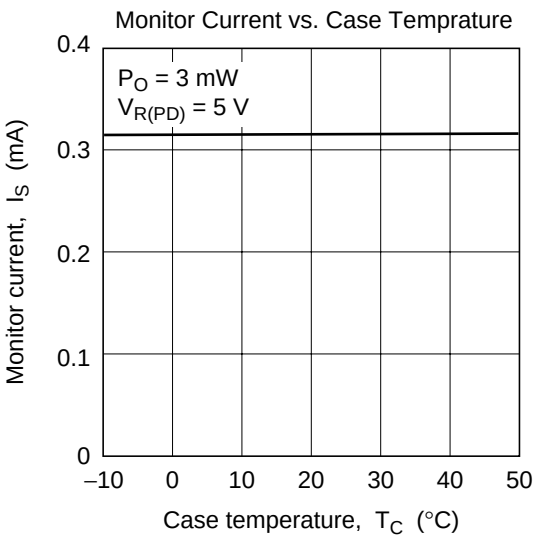


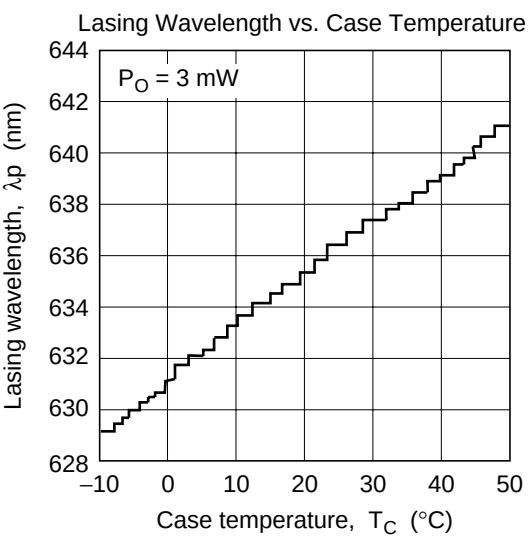


Typical Characteristic Curves (cont)

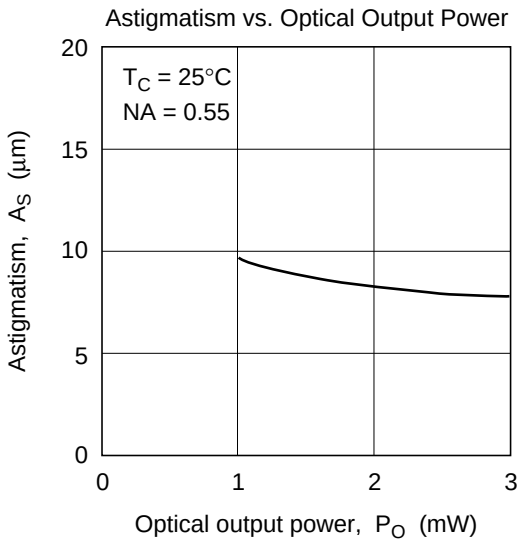


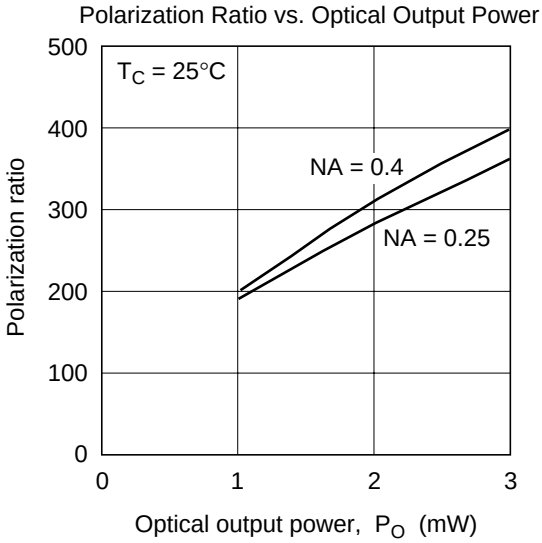






Typical Characteristic Curves (cont)





HL6319G/20G

AlGaInP Laser Diodes

HITACHI

ADE-208-479D (Z)
5th Edition
Dec. 2000

Description

The HL6319G/20G are 0.63 μm band AlGaInP laser diodes with a multi-quantum well (MQW) structure. They are suitable as light sources for laser levelers and optical equipment for measurement.

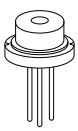
Application

- Laser levelers
- Measurement

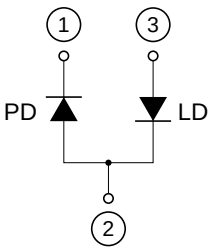
Features

- Visible light output: 635 nm Typ (nearly equal to He-Ne gas laser)
- Optical output power: 10 mW CW
- Low operating current: 95 mA Max
- Low operating voltage: 2.7 V Max
- TM mode oscillation

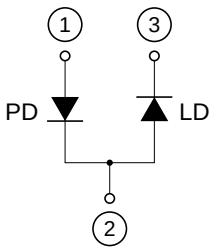
Package Type
• HL6319G/20G: G2



Internal Circuit
• HL6319G



Internal Circuit
• HL6320G



Absolute Maximum Ratings (T_C = 25°C)

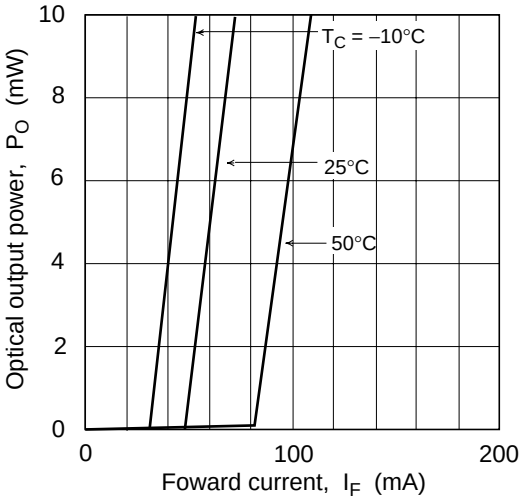
Item	Symbol	Rated Value	Unit
Optical output power	P_O	10	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

Optical and Electrical Characteristics (T_C = 25°C)

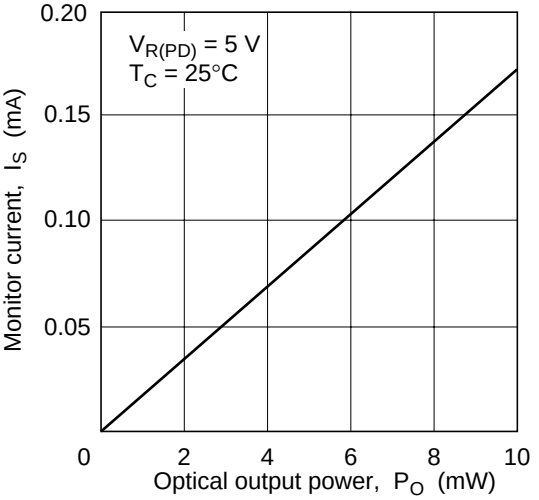
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	10	—	—	mW	Kink free
Threshold current	Ith	20	50	75	mA	
Operating current	I_{OP}	—	70	95	mA	P_O = 10 mW
Operating voltage	V_{OP}	—	—	2.7	V	P_O = 10 mW
Slope efficiency	ηs	0.3	0.5	0.7	mW/mA	6 (mW) / ($I_{(8mW)}$ – $I_{(2mW)}$)
Beam divergence parallel to the junction	θ//	5	8	11	deg.	P_O = 10 mW
Beam divergence parpendicular to the junction	θ⊥	25	31	37	deg.	P_O = 10 mW
Astigmatism	A_S	—	5	—	µm	P_O = 10 mW, NA = 0.55
Lasing wavelength	λp	625	635	640	nm	P_O = 10 mW
Monitor current	I_S	0.05	0.17	0.30	mA	P_O = 10 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

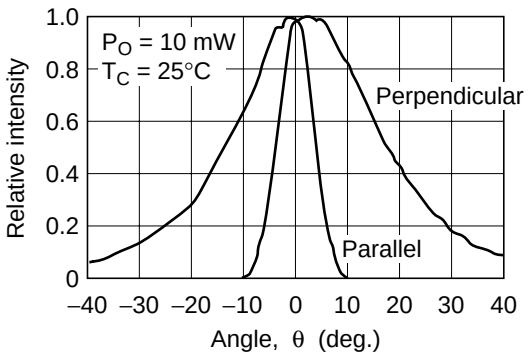
Optical Output Power vs. Foward Current



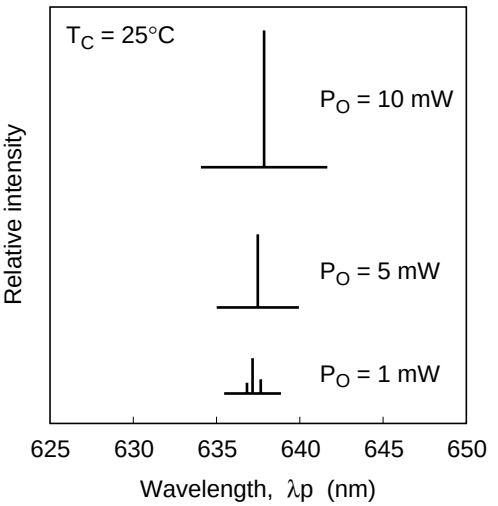
Monitor Current vs. Optical Output Power



Far Field Pattern

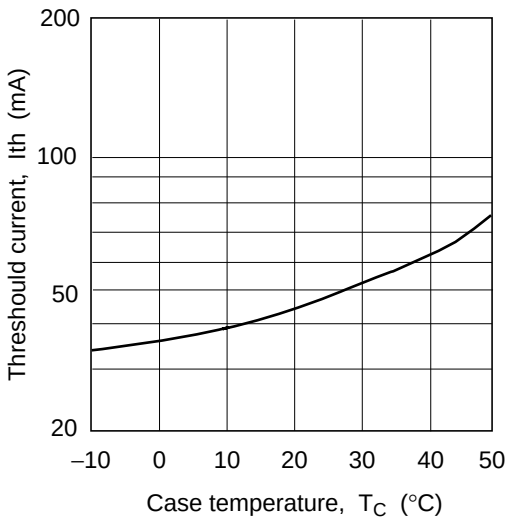


Lasing Spectrum

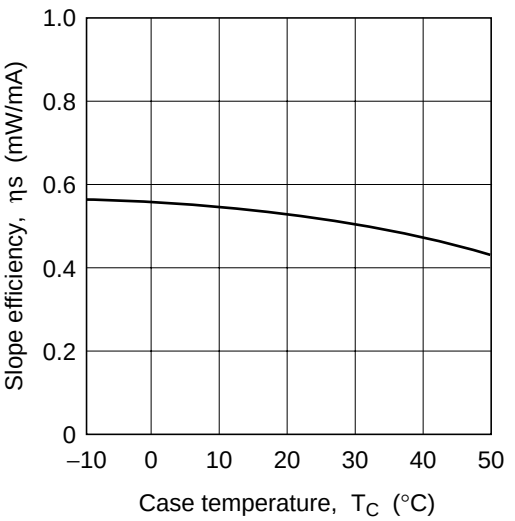


Typical Characteristic Curves (cont)

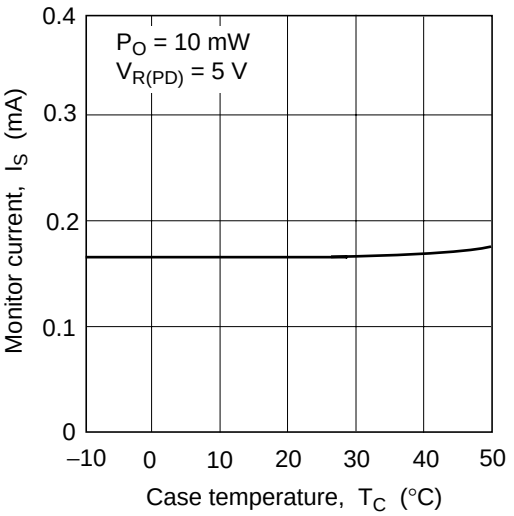
Threshold Current vs. Case Temperature



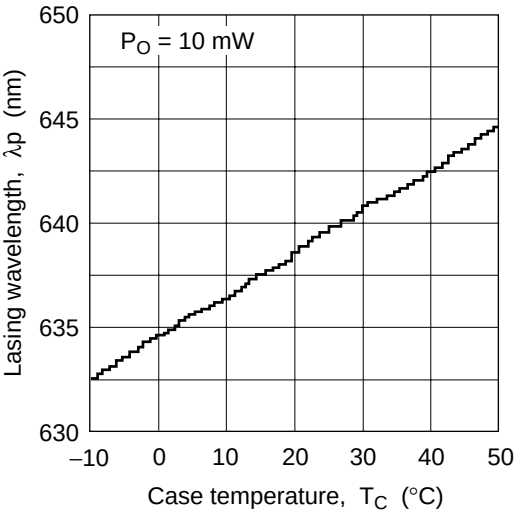
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temperature

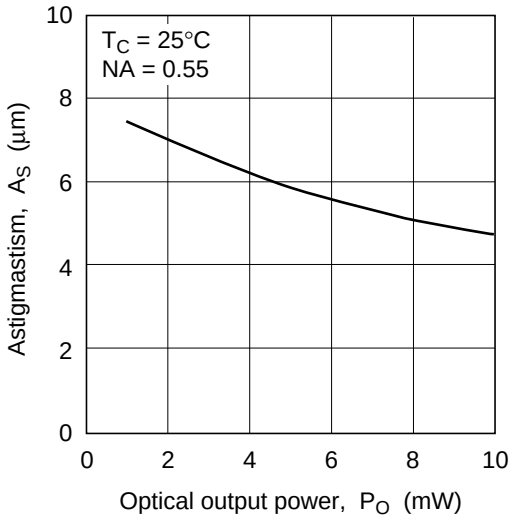


Lasing Wavelength vs. Case Temperature

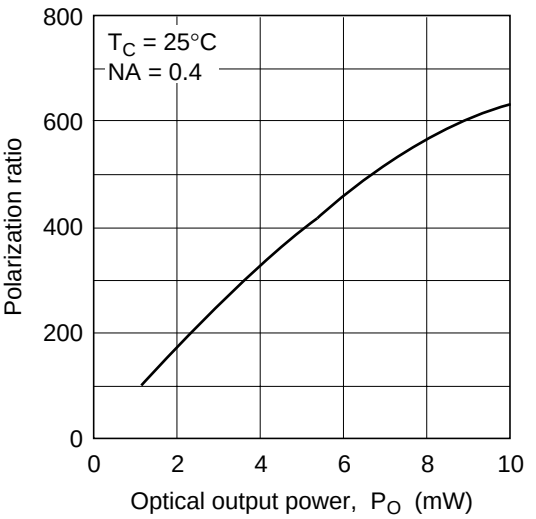


Typical Characteristic Curves (cont)

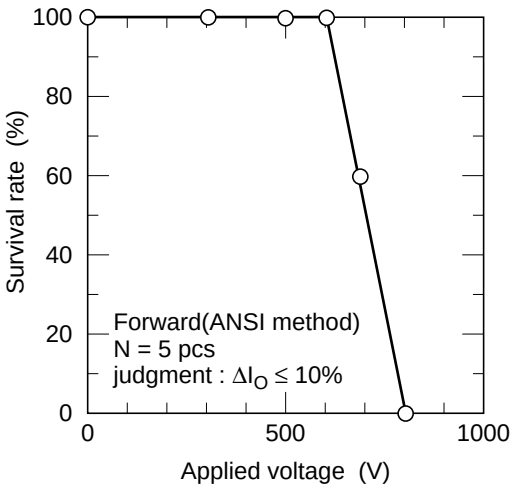
Astigmastism vs. Optical Output Power



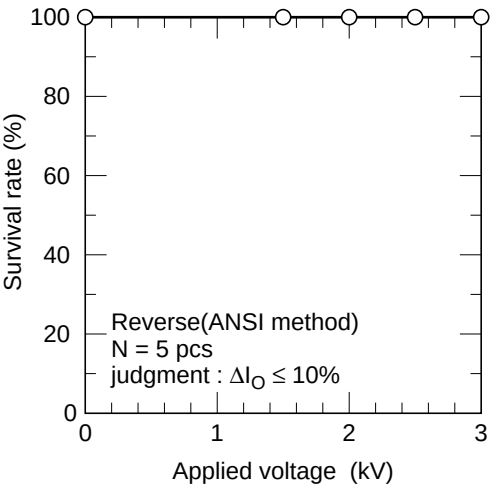
Polarization Ratio vs. Optical Output Power



Electrostatic Destruction (Forward)



Electrostatic Destruction (Reverse)



HL6321G/22G

AlGaInP Laser Diodes

HITACHI

ADE-208-598C (Z)
4th Edition
Dec. 2000

Description

The HL6321G/22G are 0.63 μm band AlGaInP laser diodes with a multi-quantum well (MQW) structure. They are suitable as light sources for laser levelers and optical equipment for measurement.

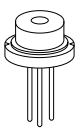
Application

- Laser levelers
- Measurement

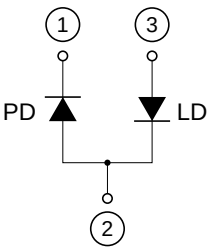
Features

- Visible light output: 635 nm Typ (nearly equal to He-Ne gas laser)
- Optical output power: 15 mW CW
- Low operating current: 105 mA Max
- Low operating voltage: 2.7 V Max
- TM mode oscillation

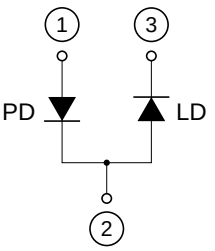
Package Type
• HL6321G/22G: G2



Internal Circuit
• HL6321G



Internal Circuit
• HL6322G



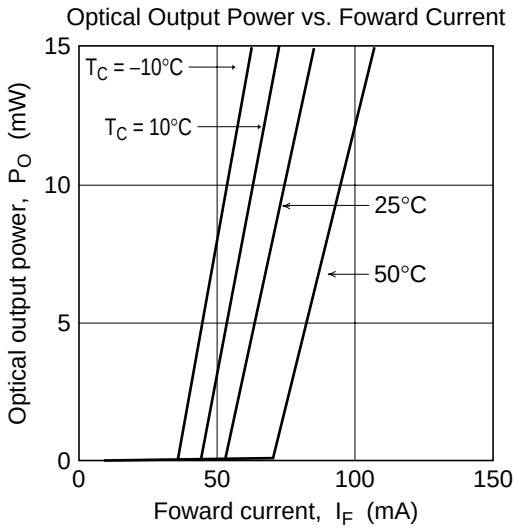
Absolute Maximum Ratings (T_C = 25°C)

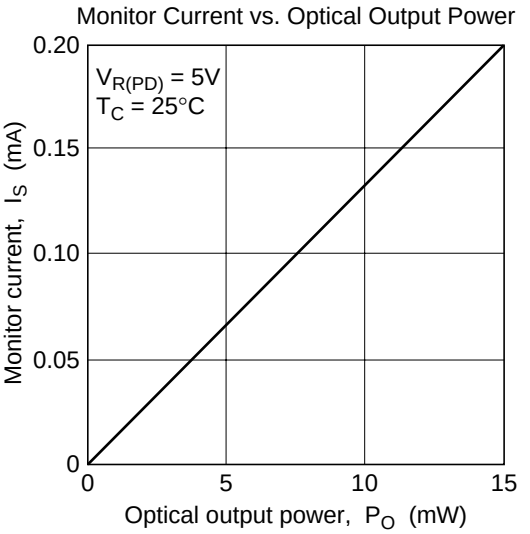
Item	Symbol	Rated Value	Unit
Optical output power	P_O	15	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

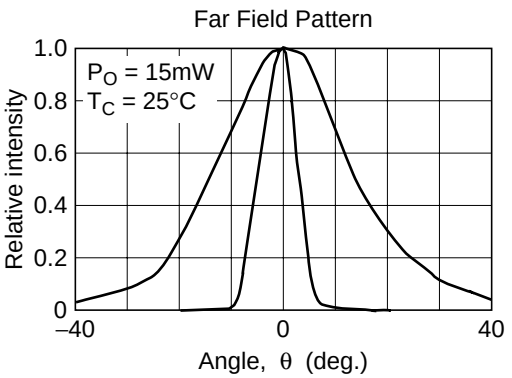
Optical and Electrical Characteristics (T_C = 25°C)

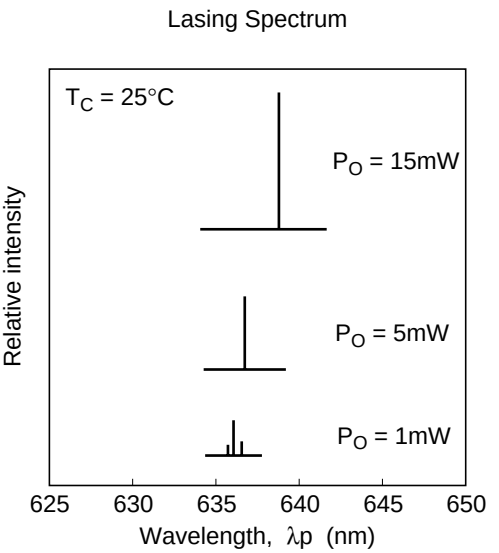
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	15	—	—	mW	Kink free
Threshold current	Ith	20	55	75	mA	
Operating current	I_{OP}	—	85	105	mA	P_O = 15 mW
Operating voltage	V_{OP}	—	—	2.7	V	P_O = 15 mW
Slope efficiency	ηs	0.3	—	0.7	mW/mA	9 (mW) / ($I_{(12mW)} – I_{(3mW)}$)
Beam divergence parallel to the junction	θ//	5	8	11	deg.	P_O = 15 mW
Beam divergence parpendicular to the junction	θ⊥	24	30	36	deg.	P_O = 15 mW
Lasing wavelength	λp	625	635	642	nm	P_O = 15 mW
Monitor current	I_S	0.07	0.20	0.45	mA	P_O = 15 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves



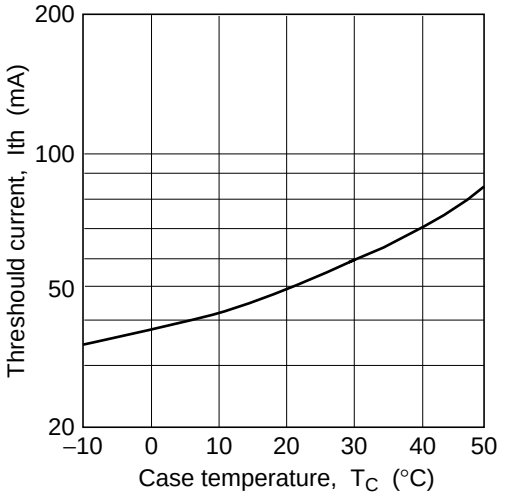




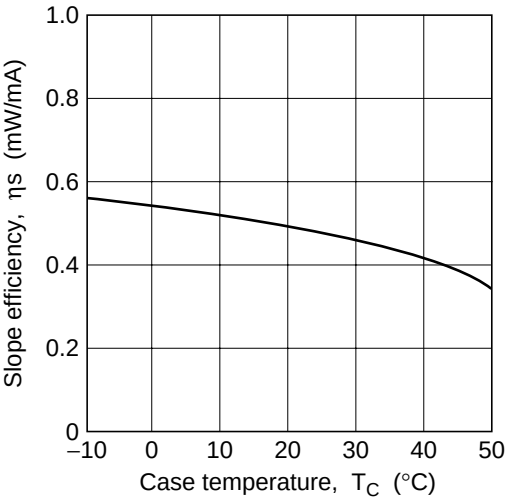


Typical Characteristic Curves (cont)

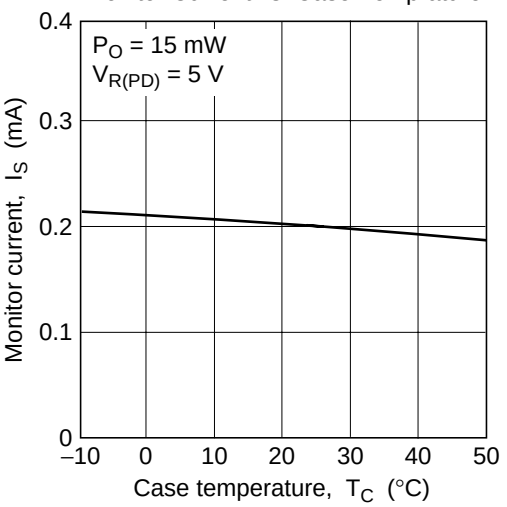
Threshold Current vs. Case Temperature



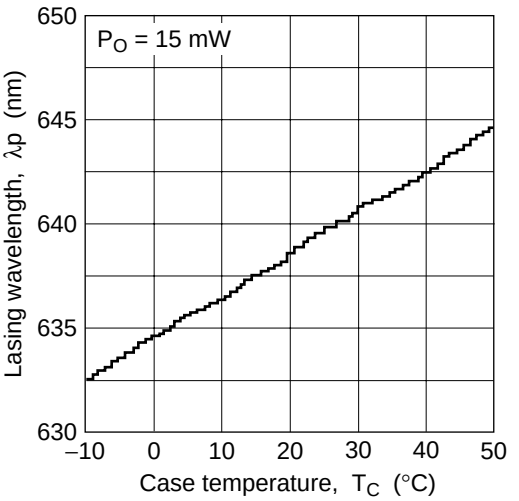
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temprature

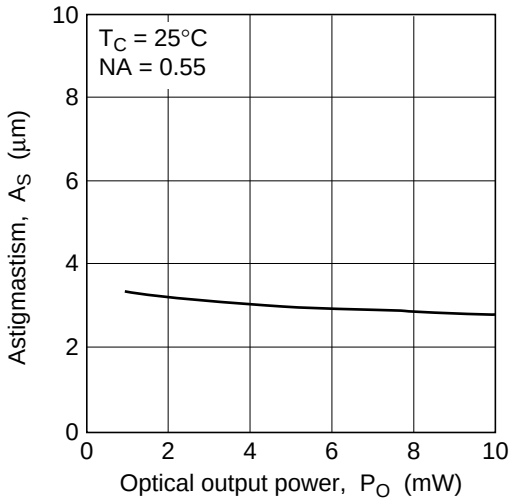


Lasing Wavelength vs. Case Temperature

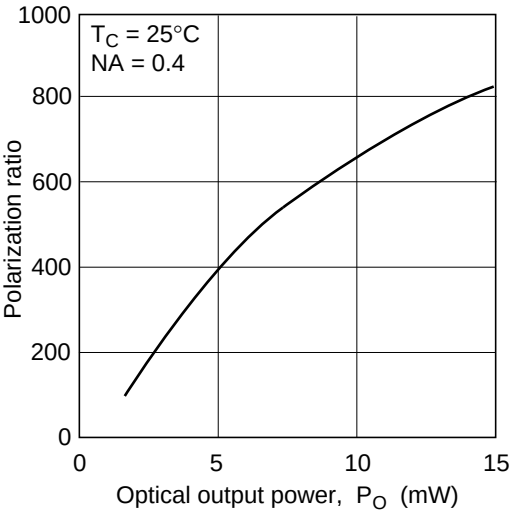


Typical Characteristic Curves (cont)

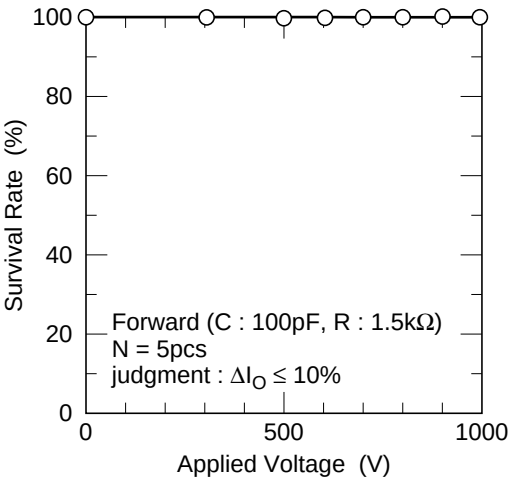
Astigmastism vs. Optical Output Power



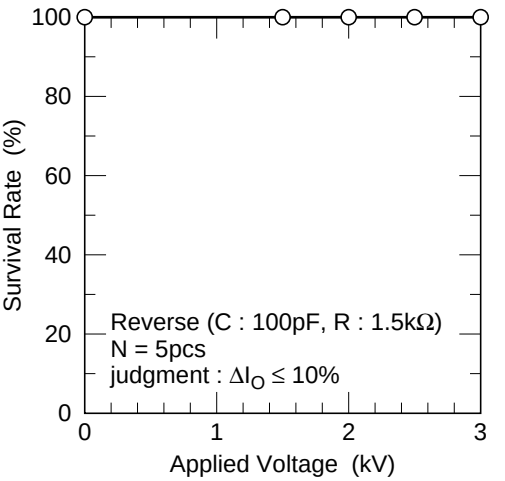
Polarization Ratio vs. Optical Output Power



Electrostatic Destruction (Forward)



Electrostatic Destruction (Reverse)



HL6323MG

AlGaInP Laser Diode

HITACHI

ADE-208-1410 (Z)
1st Edition
Mar. 2001

Description

The HL6323MG is a 0.63 μm band AlGaInP laser diode (LD) with a multi-quantum well (MQW) structure. It is suitable as a longer distance operating range for laser markers and a higher speed for positioning control sensors. The HL6323MG is packaged in the small can (ϕ5.6 mm), enabling end products to be kept small.

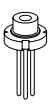
Application

- Laser markers
- Measurement equipment

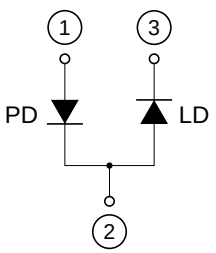
Features

- High output power : 35 mW (CW)
- Visible light output : λp = 639 nm Typ
- Small package : ϕ5.6 mm
- TM mode oscillation

Pakage Type
• HL6323MG: MG



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C ± 3°C)

Item	Symbol	Value	Unit
Optical output power	P_O	35 *1	mW
Optical output power (Puise)	P_O	50 *2	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

Notes: 1. This value is not the same as the specification for long term reliability, such as lifetime.
2. Pulse condition : Pulse width pw = 100 ns , duty = 20%

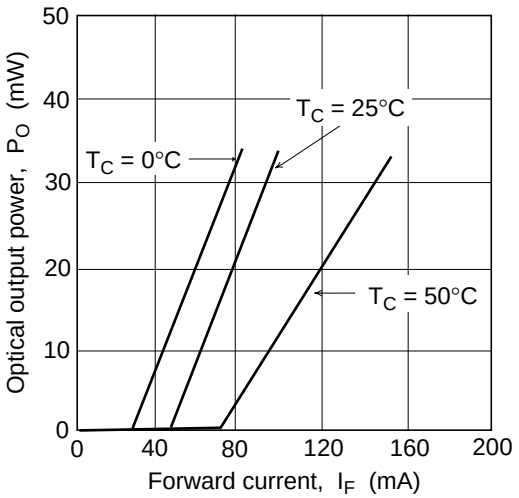
Optical and Electrical Characteristics (T_C = 25°C ± 3°C)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Optical output power	P_O	35	—	—	mW	Kink free *
Optical output power (Puise)	P_O	50	—	—	mW	Kink free *
Threshold current	Ith	30	45	65	mA	
Slope efficiency	ηs	0.4	0.6	0.9	mW/mA	18(mW) / ($I_{(24mW)}$ – $I_{(6mW)}$)
Operating current	I_{OP}	—	95	130	mA	P_O = 30 mW
Operating voltage	V_{OP}	—	2.3	2.8	V	P_O = 30 mW
Beam divergence parallel to the junction	θ//	7	8.5	11	deg.	P_O = 30 mW
Beam divergence parpendicular to the junction	θ⊥	26	30	34	deg.	P_O = 30 mW
Lasing wavelength	λp	635	639	642	nm	P_O = 30 mW
Monitor current	I_S	0.05	0.15	0.25	mA	P_O = 30 mW, $V_{R(PD)}$ = 5 V

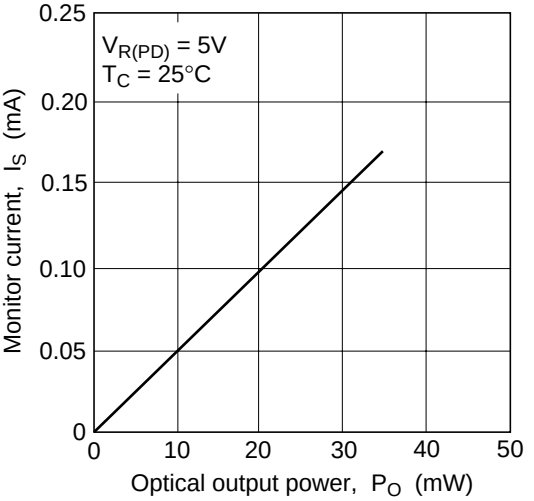
Note: Kink free is confirmed at the temperature of 25°C.

Typical Characteristic Curves

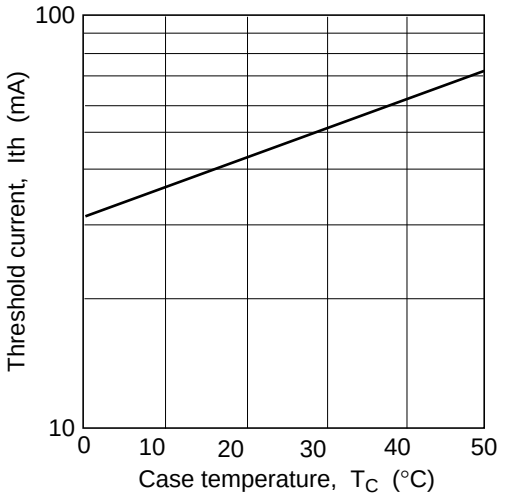
Opticai Output Power vs. Forward Current



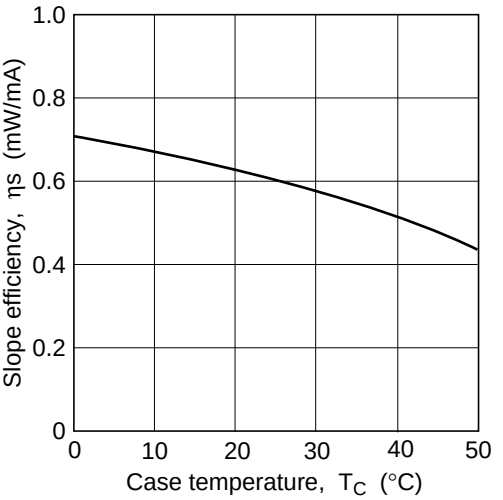
Monitor Current vs. Optical Output Power



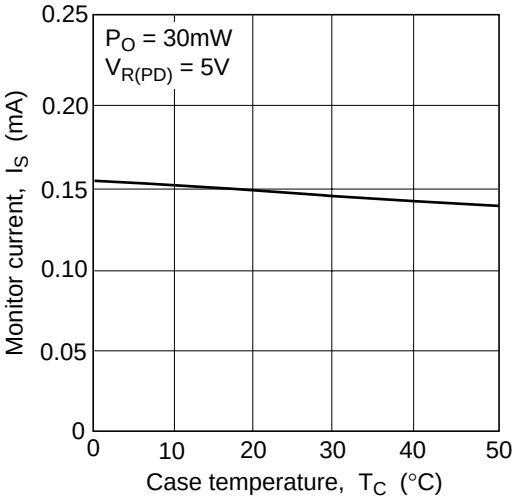
Threshold Current vs. Case Temperature



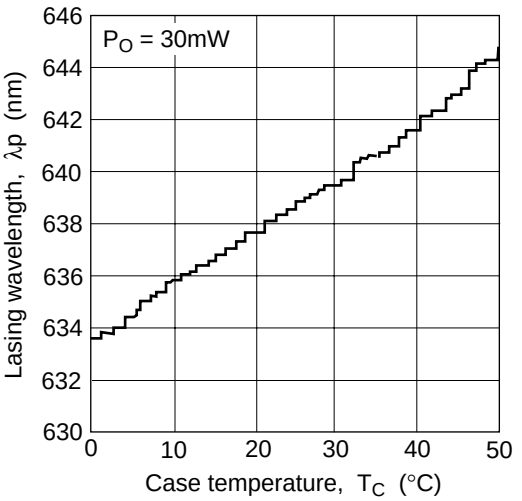
Slope Efficiency vs. Case Temperature



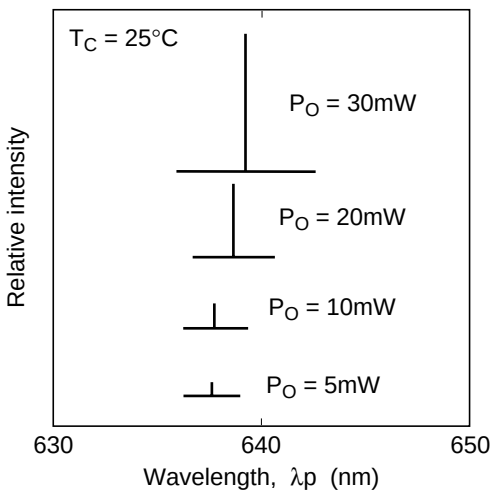
Monitor Current vs. Case Temperature



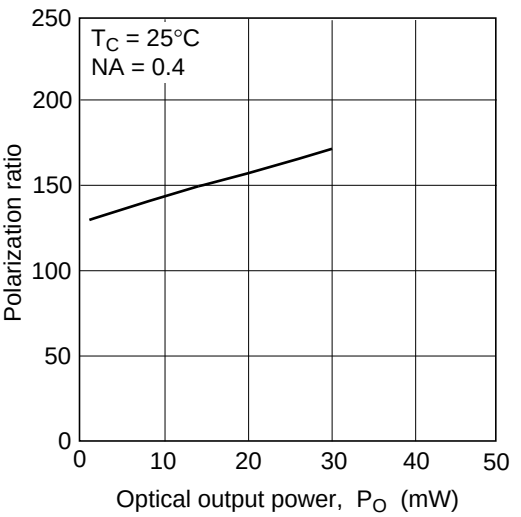
Lasing Wavelength vs. Case Temperature



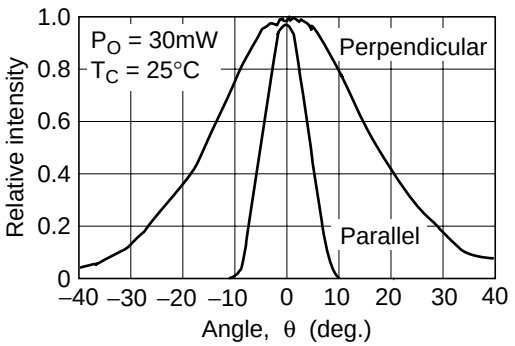
Lasing Spectrum



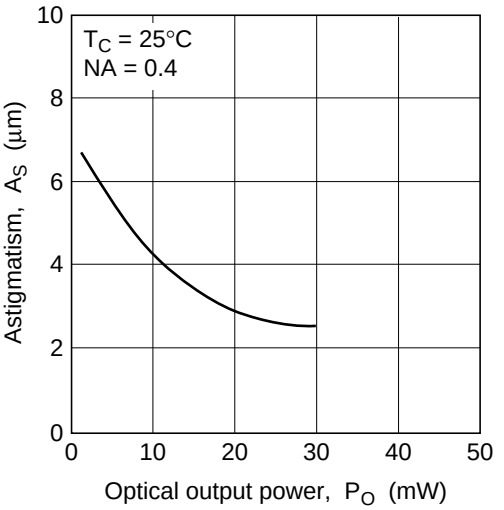
Polarization Ratio vs. Optical Output Power



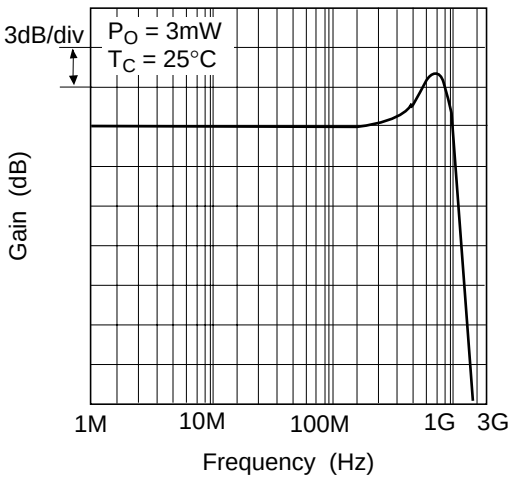
Far Field Pattern



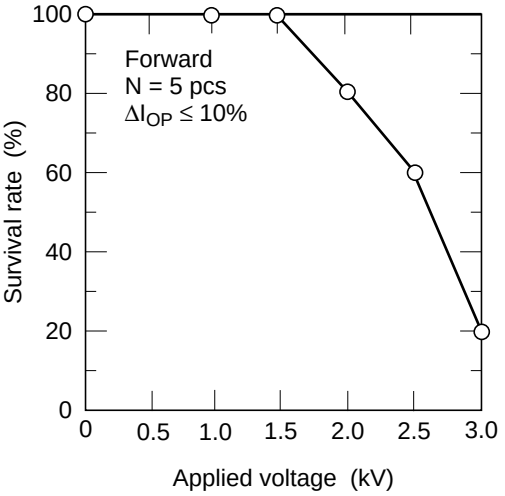
Astigmatism vs. Optical Output Power



Frequency Response



Electrostatic Destruction (MIL standard)



HL6325G/26G

Low Operating Current Visible Laser Diode

HITACHI

ADE-208-781B (Z)
3rd Edition
Dec. 2000

Description

The HL6325G/26G are 0.63 μm band AlGaInP laser diodes with a multi-quantum well (MQW) structure. They are suitable as light sources for laser levelers, laser scanners and optical equipment for measurement.

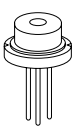
Application

- Laser leveler
- Laser scanner
- Measurement

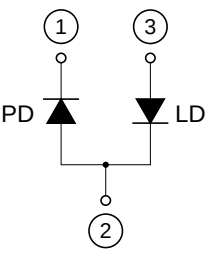
Features

- Visible light output : 635 nm Typ (nearly equal to He-Ne gas laser)
- Optical output power : 5 mW CW
- Low operating current : 40 mA Typ
- Low operating voltage : 2.4 V Max
- Operating temperature : +60°C
- TM mode oscillation

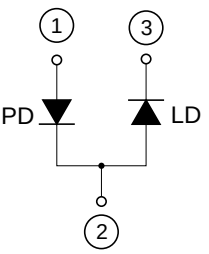
Package Type
• HL6325G/26G: G2



Internal Circuit
• HL6325G



Internal Circuit
• HL6326G



Absolute Maximum Ratings (T_C = 25°C)

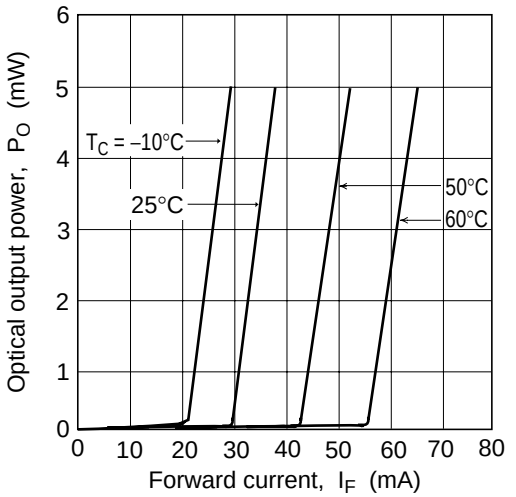
Item	Symbol	Value	Unit
Optical output power	P_O	5	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +60	°C
Storage temperature	Tstg	–40 to +85	°C

Optical and Electrical Characteristics (T_C = 25°C)

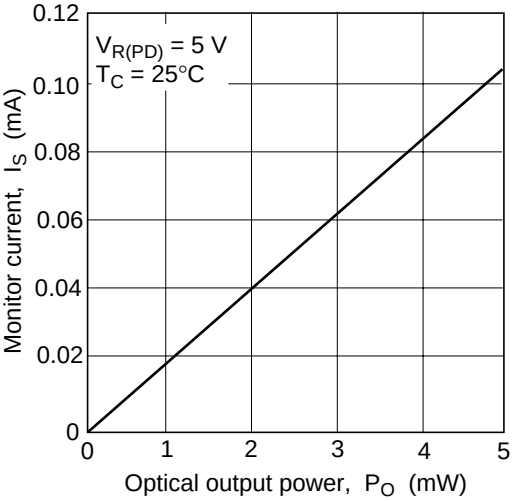
Item	Symbol	Min	Typ	Max	Unit	Test Condition
Optical output power	P_O	5	—	—	mW	Kink free
Threshold current	Ith	—	30	50	mA	
Operating current	I_{Op}	—	40	60	mA	P_O = 5 mW
Operating voltage	V_{OP}	—	2.2	2.4	V	P_O = 5 mW
Slope efficiency	ηs	0.3	0.5	0.8	mW/mA	3 (mW) / ($I_{(4mW)}$ – $I_{(1mW)}$)
Beam divergence parallel to the junction	θ//	6	8	11	deg.	P_O = 5 mW
Beam divergence parpendicular to the junction	θ⊥	25	31	37	deg.	P_O = 5 mW
Lasing wavelength	λp	630	635	640	nm	P_O = 5 mW
Monitor current	I_S	0.05	0.10	0.25	mA	P_O = 5 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

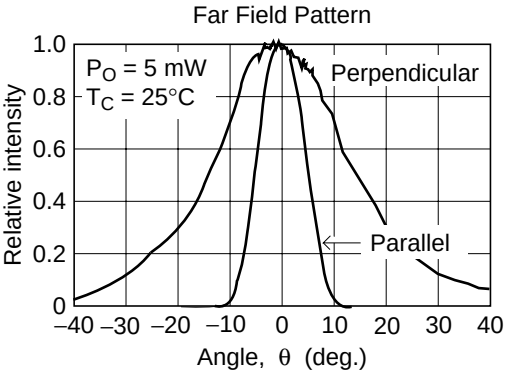
Optical Output Power vs. Forward Current



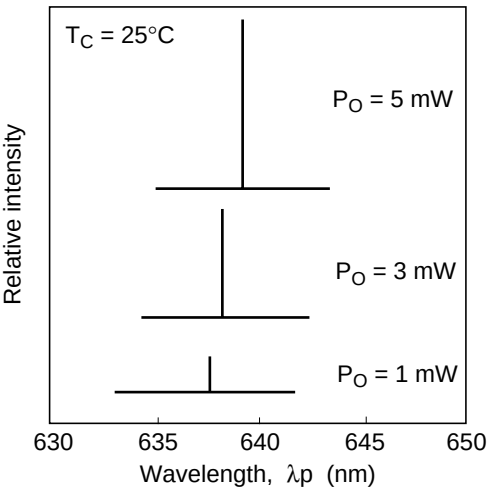
Monitor Current vs. Optical Output Power



Far Field Pattern

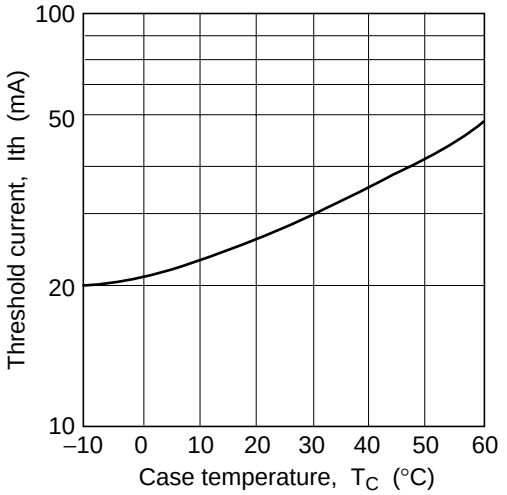


Lasing Spectrum

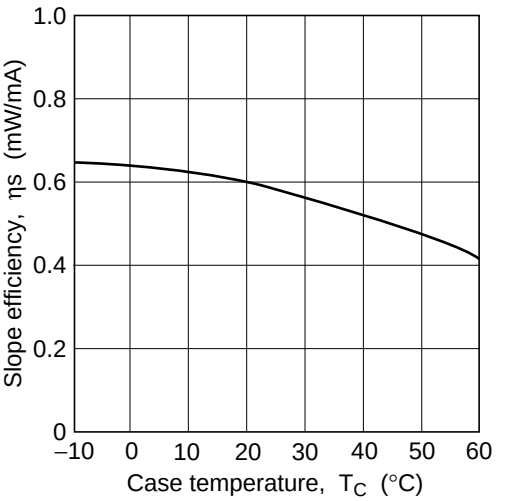


Typical Characteristic Curves (cont)

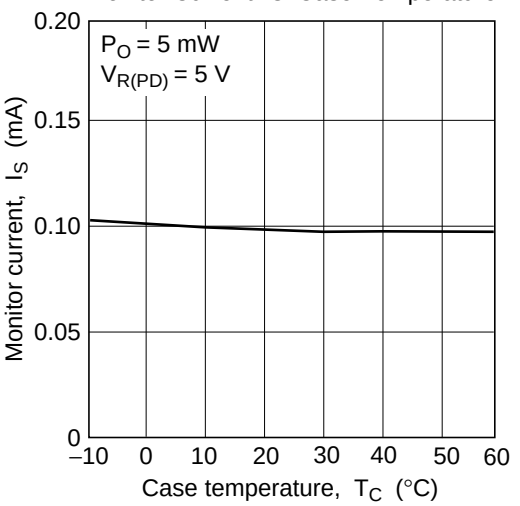
Threshold Current vs. Case Temperature



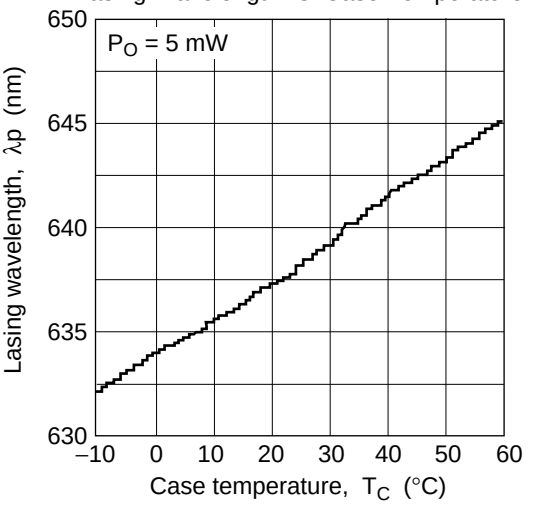
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temperature

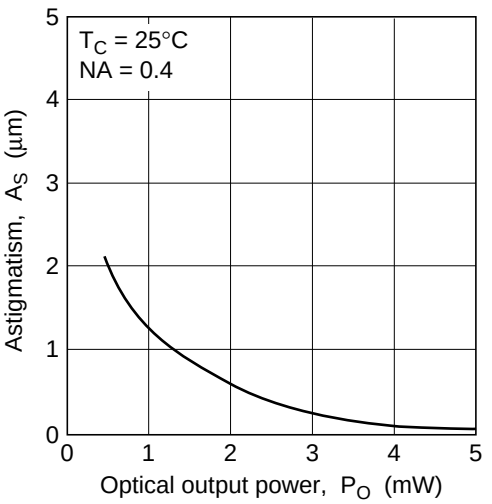


Lasing Wavelength vs. Case Temperature

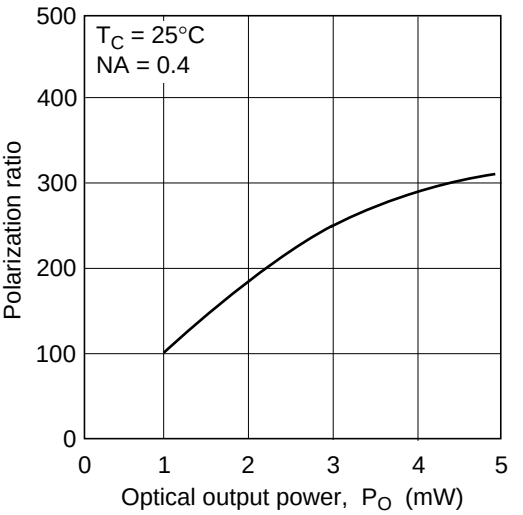


Typical Characteristic Curves (cont)

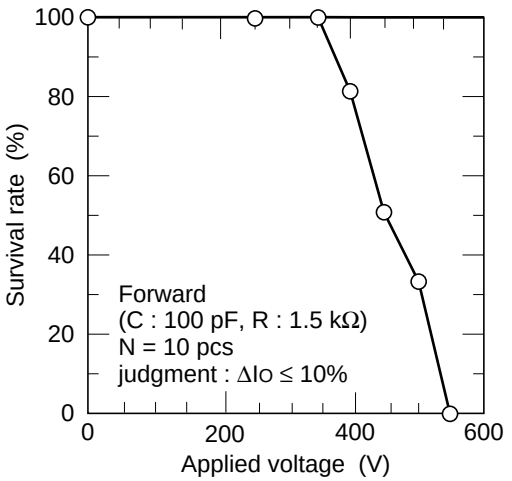
Astigmatism vs. Optical Output Power



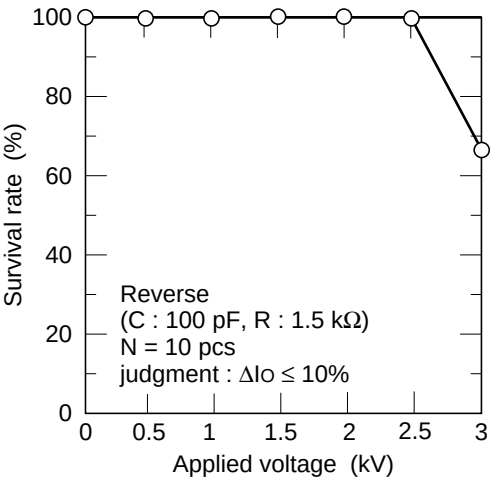
Polarization Ratio vs. Optical Output Power



Electrostatic Destruction (Forward)



Electrostatic Destruction (Reverse)



HL6327MG/28MG

Low Operating Current Visible Laser Diode

HITACHI

ADE-208-782B (Z)
3rd Edition
Dec. 2000

Description

The HL6327MG/28MG are 0.63 μm band AlGaInP laser diodes with a multi-quantum well (MQW) structure. They are suitable as light sources for laser levelers, laser scanners and optical equipment for measurement.

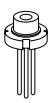
Application

- Laser leveler
- Laser scanner
- Measurement

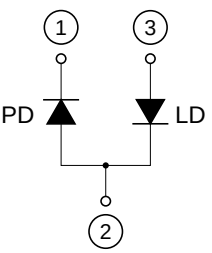
Features

- Visible light output : 635 nm Typ (nearly equal to He-Ne gas laser)
- Optical output power : 5 mW CW
- Low operating current : 40 mA Typ
- Low operating voltage : 2.4 V Max
- Operating temperature : +50°C
- TM mode oscillation

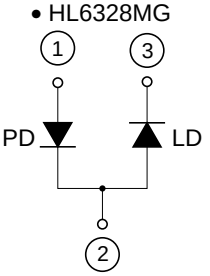
Package Type
• HL6327MG/28MG: MG



Internal Circuit
• HL6327MG



Internal Circuit
• HL6328MG



Absolute Maximum Ratings (T_C = 25°C)

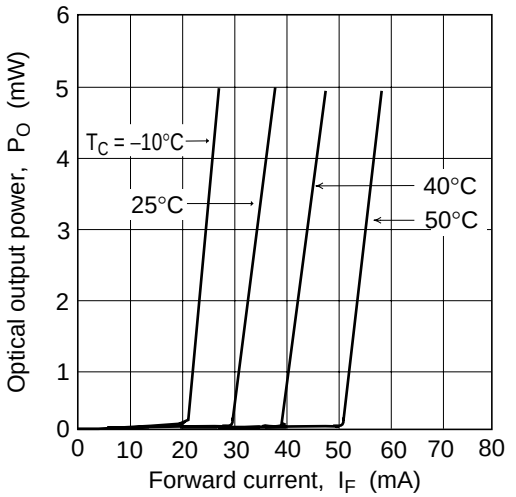
Item	Symbol	Value	Unit
Optical output power	P_O	5	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

Optical and Electrical Characteristics (T_C = 25°C)

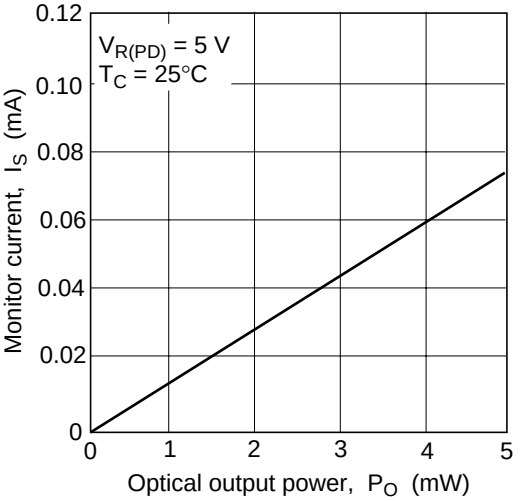
Item	Symbol	Min	Typ	Max	Unit	Test Condition
Optical output power	P_O	5	—	—	mW	Kink free
Threshold current	Ith	—	30	50	mA	
Operating current	I_{Op}	—	40	60	mA	P_O = 5 mW
Operating voltage	V_{OP}	—	2.2	2.4	V	P_O = 5 mW
Slope efficiency	ηs	0.3	0.5	0.8	mW/mA	3 (mW) / ($I_{(4mW)}$ – $I_{(1mW)}$)
Beam divergence parallel to the junction	θ//	6	8	11	deg.	P_O = 5 mW
Beam divergence parpendicular to the junction	θ⊥	25	31	37	deg.	P_O = 5 mW
Lasing wavelength	λp	630	635	640	nm	P_O = 5 mW
Monitor current	I_S	0.02	0.07	0.12	mA	P_O = 5 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

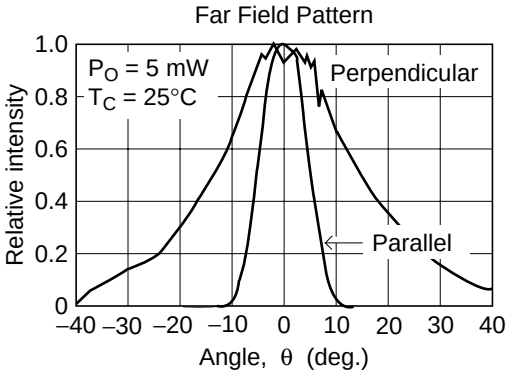
Optical Output Power vs. Forward Current



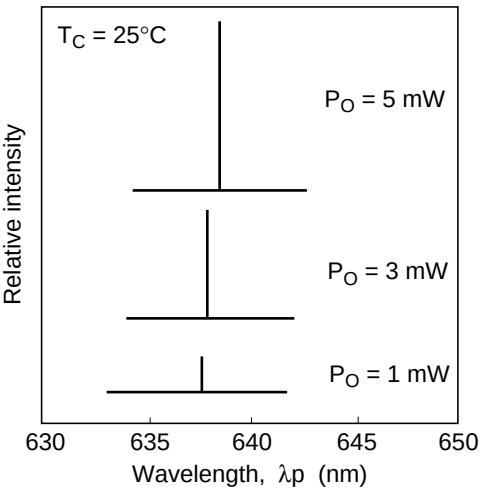
Monitor Current vs. Optical Output Power



Far Field Pattern

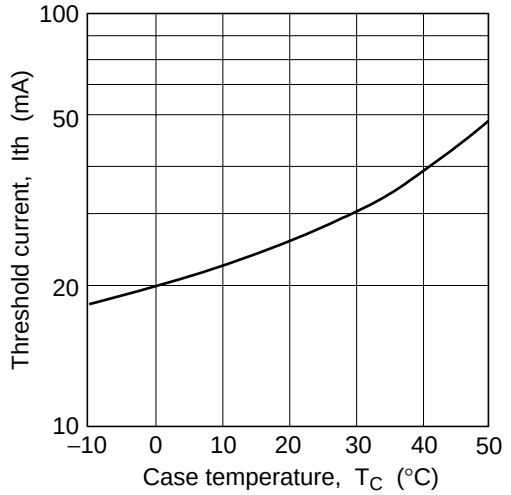


Lasing Spectrum

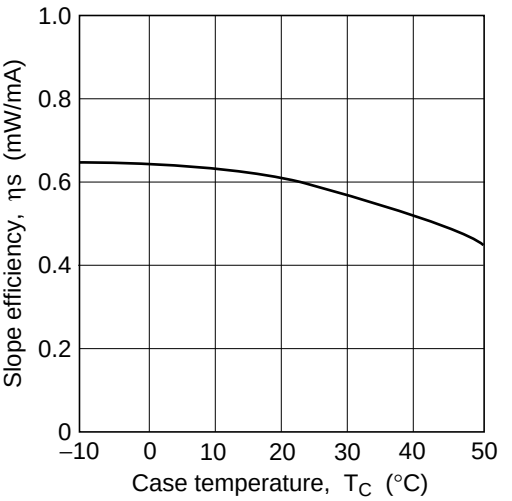


Typical Characteristic Curves (cont)

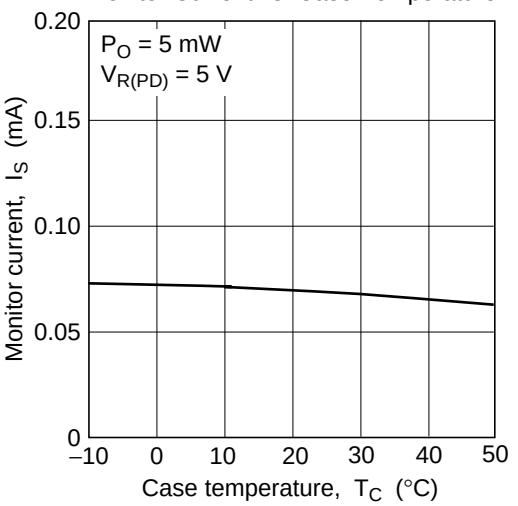
Threshold Current vs. Case Temperature



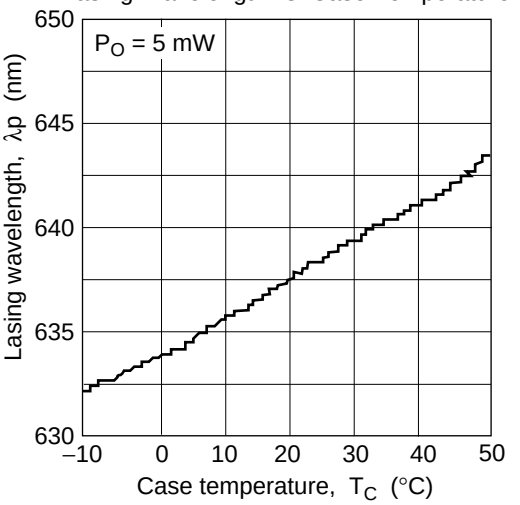
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temperature

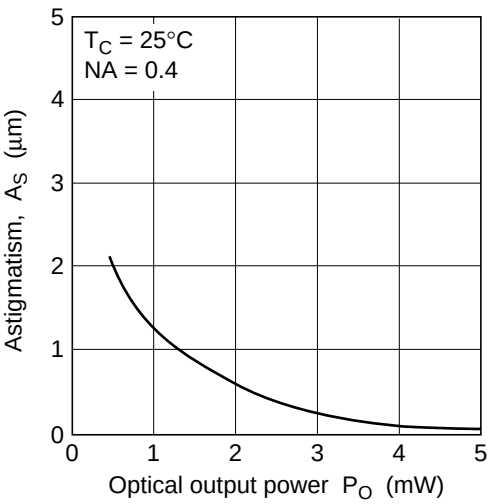


Lasing Wavelength vs. Case Temperature

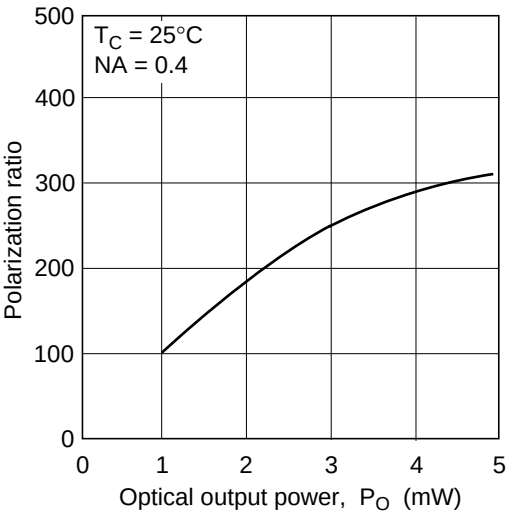


Typical Characteristic Curves (cont)

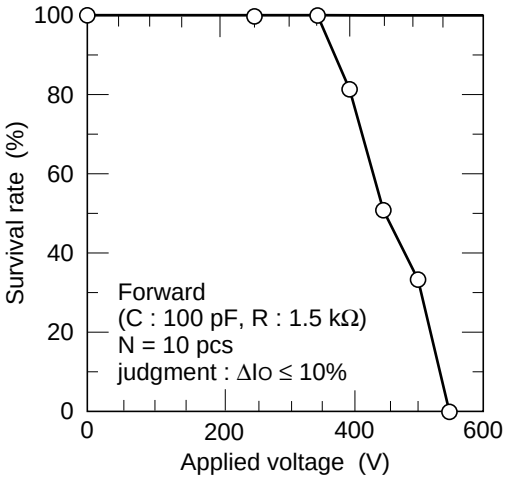
Astigmatism vs. Optical Output Power



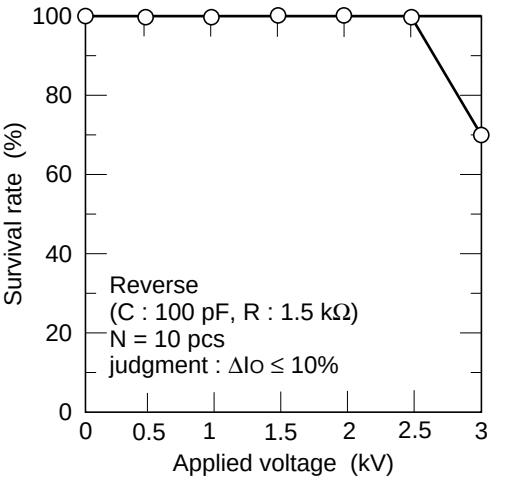
Polarization Ratio vs. Optical Output Power



Electrostatic Destruction (Forward)



Electrostatic Destruction (Reverse)



HL6331G/32G

Low Operating Current Visible Laser Diode

HITACHI

ADE-208-819B (Z)
3rd Edition
Dec. 2000

Description

The HL6331G/32G are 0.63 μm band AlGaInP 10mW laser diodes with a multi-quantum well (MQW) structure. They are suitable as light sources for laser levelers, laser scanners and optical equipment for measurement.

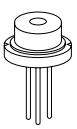
Application

- Laser leveler
- Laser scanner
- Measurement

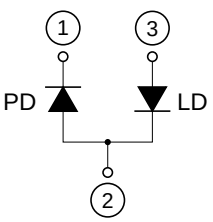
Features

- Visible light output : 635 nm Typ
- Optical output power : 10 mW CW
- Low operating current : 55 mA Typ
- Low operating voltage : 2.4 V Max
- Operating temperature : +60°C
- TM mode oscillation

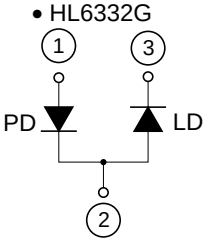
Package Type
• HL6331G/32G: G2



Internal Circuit
• HL6331G



Internal Circuit
• HL6332G



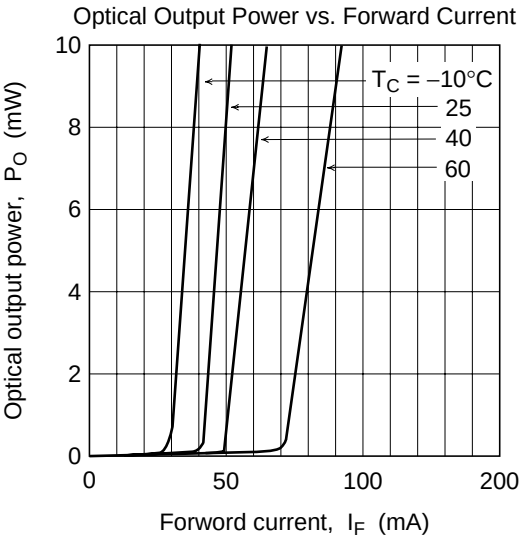
Absolute Maximum Ratings (T_C = 25°C)

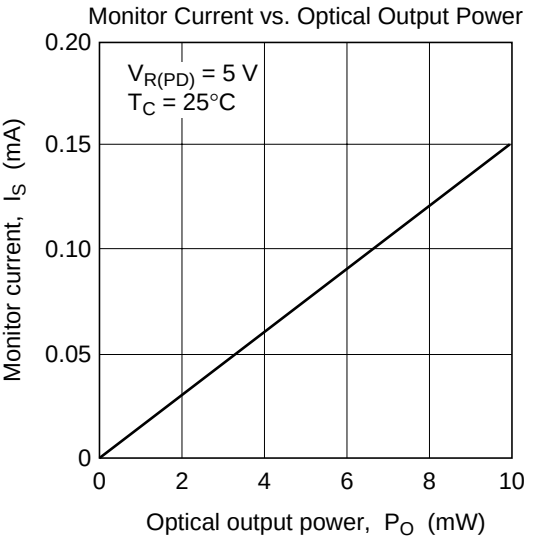
Item	Symbol	Value	Unit
Optical output power	P_O	10	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +60	°C
Storage temperature	Tstg	–40 to +85	°C

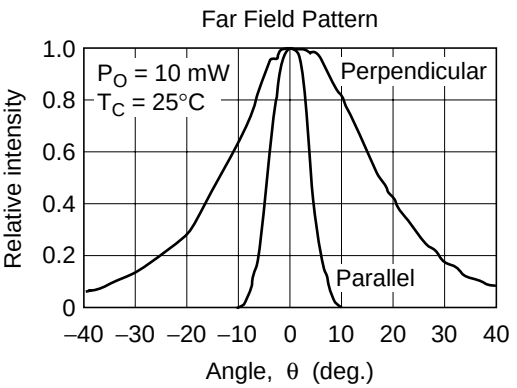
Optical and Electrical Characteristics (T_C = 25°C)

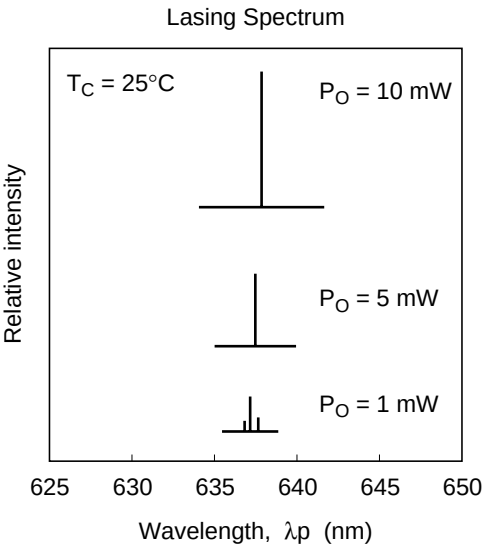
Item	Symbol	Min	Typ	Max	Unit	Test Condition
Optical output power	P_O	10	—	—	mW	Kink free
Threshold current	Ith	—	40	60	mA	
Operating current	I_{Op}	—	55	75	mA	P_O = 10 mW
Operating voltage	V_{OP}	—	2.2	2.4	V	P_O = 10 mW
Slope efficiency	ηs	0.40	0.65	0.90	mW/mA	6 (mW) / ($I_{(8mW)}$ – $I_{(2mW)}$)
Beam divergence parallel to the junction	θ//	6	8	11	deg.	P_O = 10 mW
Beam divergence parpendicular to the junction	θ⊥	25	31	36	deg.	P_O = 10 mW
Lasing wavelength	λp	630	635	640	nm	P_O = 10 mW
Monitor current	I_S	0.08	0.15	0.30	mA	P_O = 10 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves



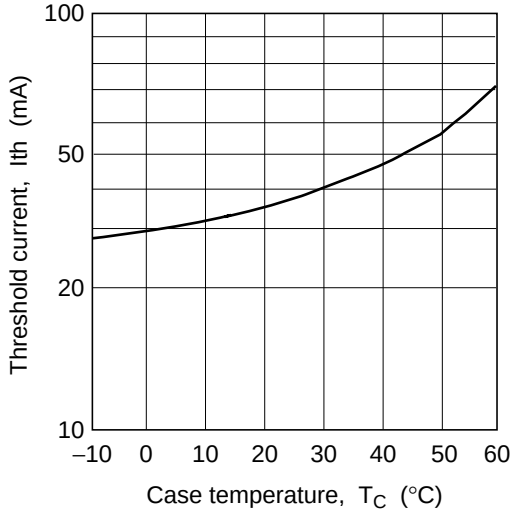




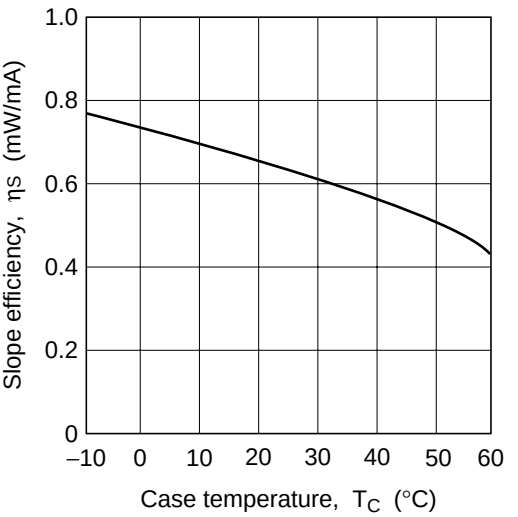


Typical Characteristic Curves (cont)

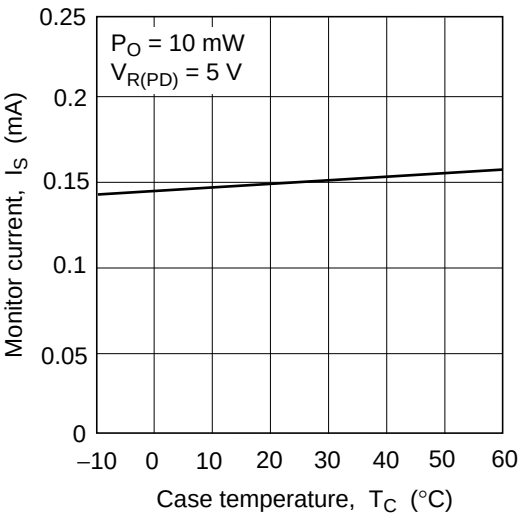
Threshold Current vs. Case Temperature



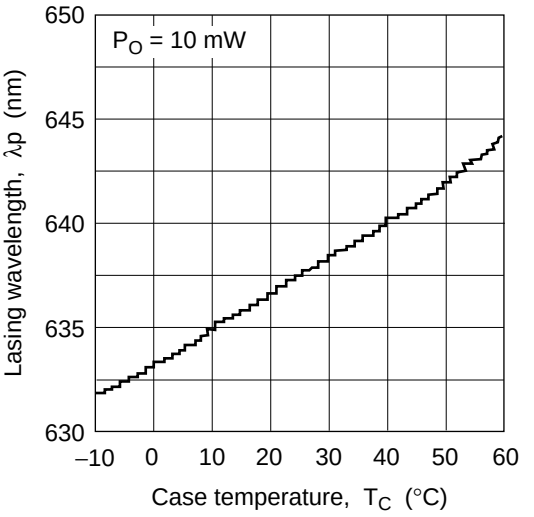
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temperature

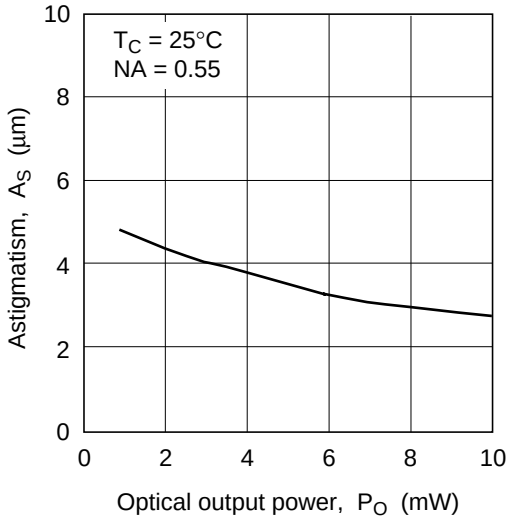


Lasing Wavelength vs. Case Temperature

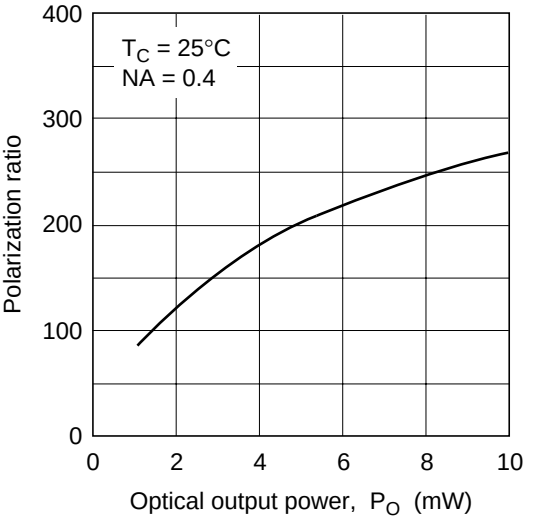


Typical Characteristic Curves (cont)

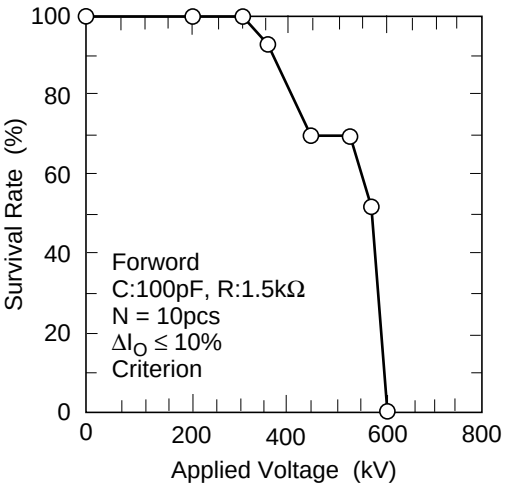
Astigmatism vs. Optical Output Power



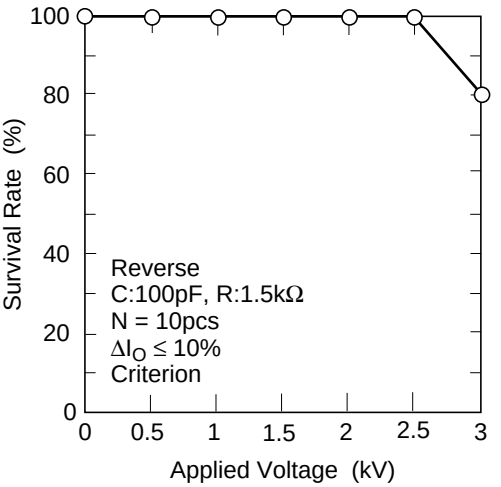
Polarization Ratio vs. Optical Output Power



Electrostatic Destruction (MIL standard) (1)



Electrostatic Destruction (MIL standard) (2)



HL6333MG/34MG

Low Operating Current Visible Laser Diode

HITACHI

ADE-208-820C (Z)
4th Edition
Dec. 2000

Description

The HL6333MG/34MG are 0.63 μm band AlGaInP 10mW laser diodes with a multi-quantum well (MQW) structure. They are suitable as light sources for laser levelers, laser scanners and optical equipment for measurement.

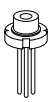
Application

- Laser leveler
- Laser scanner
- Measurement

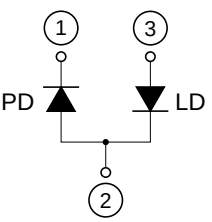
Features

- Visible light output : 635 nm Typ
- Optical output power : 10 mW CW
- Low operating current : 55 mA Typ
- Low operating voltage : 2.4 V Max
- Operating temperature : +50°C
- TM mode oscillation

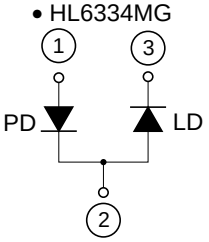
Package Type
• HL6333MG/34MG: MG



Internal Circuit
• HL6333MG



Internal Circuit
• HL6334MG



Absolute Maximum Ratings (T_C = 25°C)

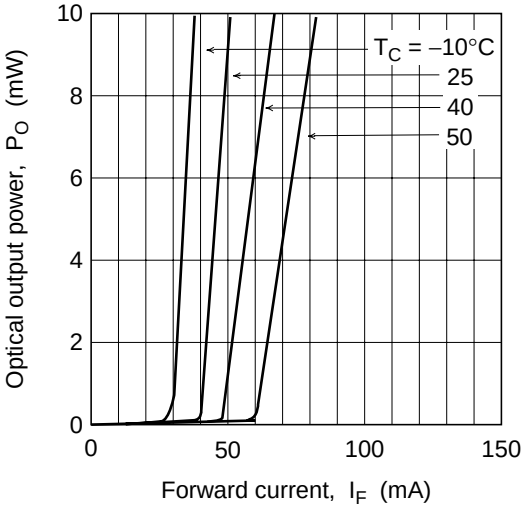
Item	Symbol	Value	Unit
Optical output power	P_O	10	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

Optical and Electrical Characteristics (T_C = 25°C)

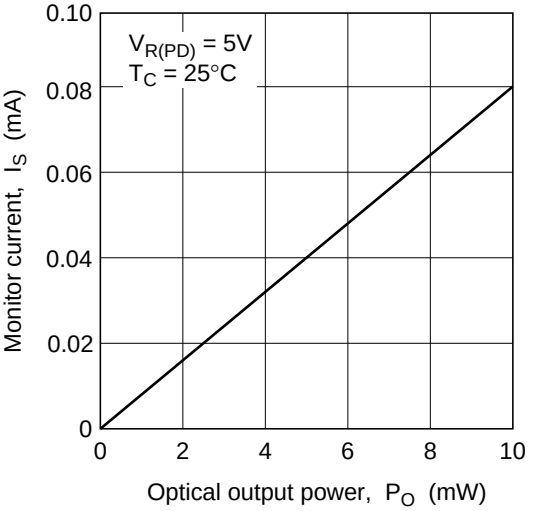
Item	Symbol	Min	Typ	Max	Unit	Test Condition
Optical output power	P_O	10	—	—	mW	Kink free
Threshold current	Ith	—	40	60	mA	
Operating current	I_{Op}	—	55	75	mA	P_O = 10 mW
Operating voltage	V_{OP}	—	2.2	2.4	V	P_O = 10 mW
Slope efficiency	ηs	0.40	0.65	0.90	mW/mA	6 (mW) / ($I_{(8mW)}$ – $I_{(2mW)}$)
Beam divergence parallel to the junction	θ//	6	8	11	deg.	P_O = 10 mW
Beam divergence parpendicular to the junction	θ⊥	25	31	36	deg.	P_O = 10 mW
Lasing wavelength	λp	630	635	640	nm	P_O = 10 mW
Monitor current	I_S	0.04	0.08	0.16	mA	P_O = 10 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

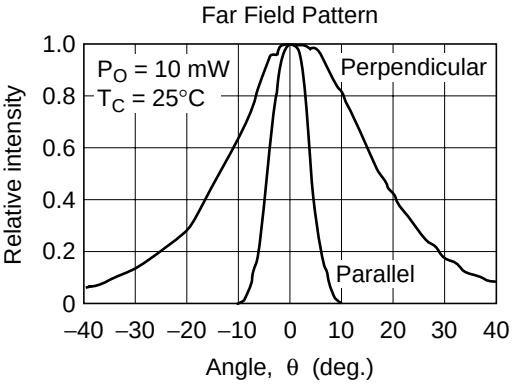
Optical Output Power vs. Forward Current



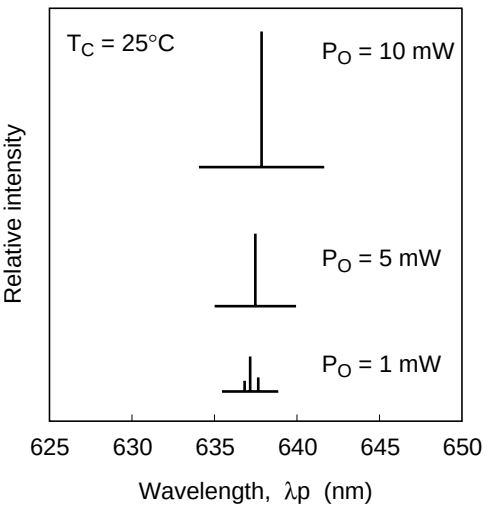
Optical Output Power vs. Monitor Current



Far Field Pattern

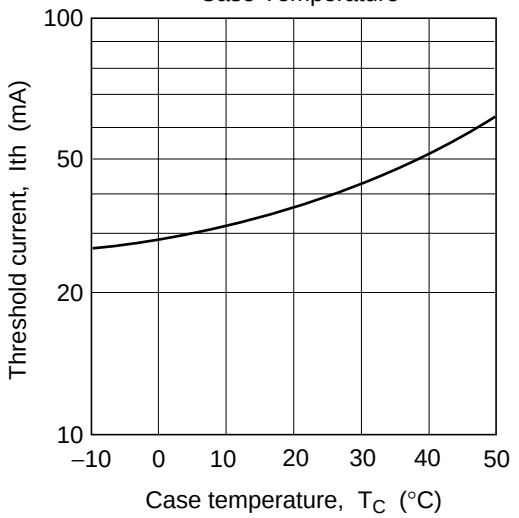


Lasing Spectrum

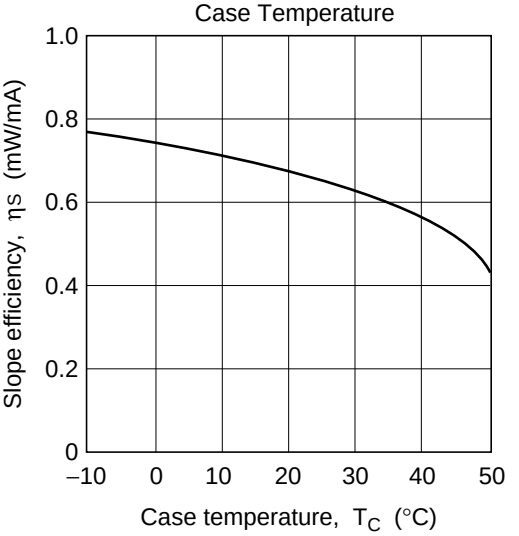


Typical Characteristic Curves (cont)

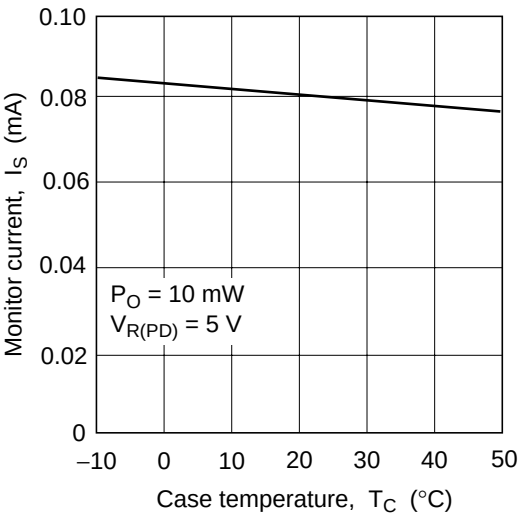
Threshold Current vs. Case Temperature



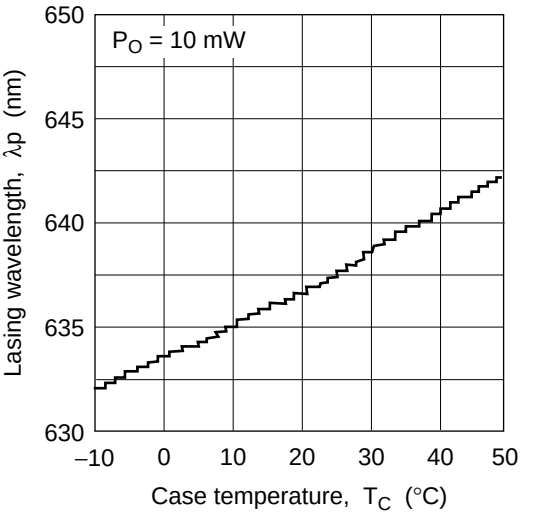
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temperature

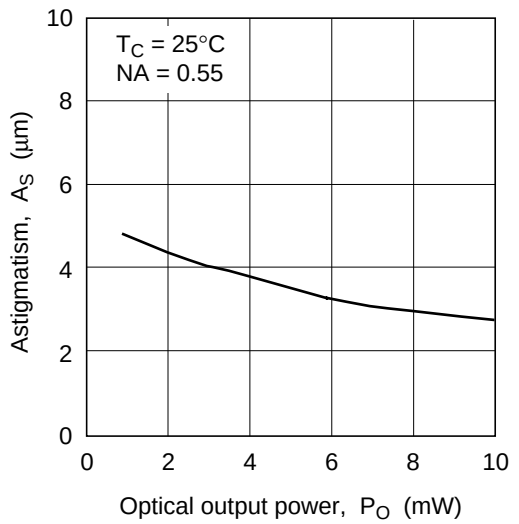


Lasing Wavelength vs. Case Temperature

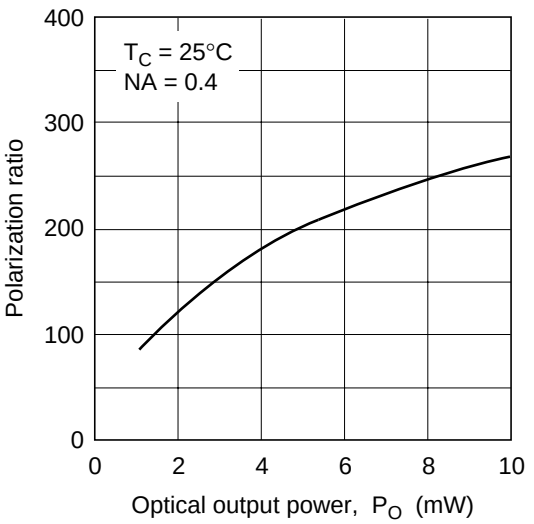


Typical Characteristic Curves (cont)

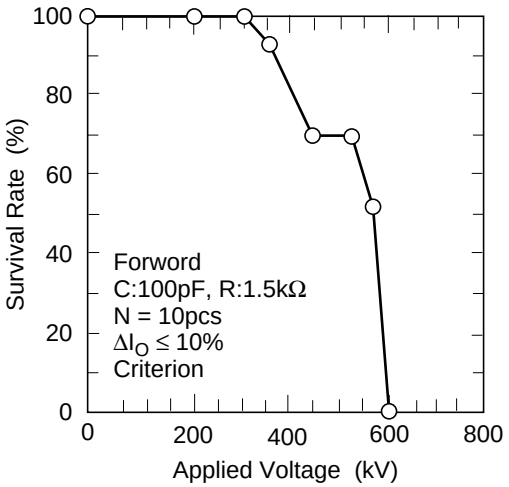
Astigmatism vs. Optical Output Power



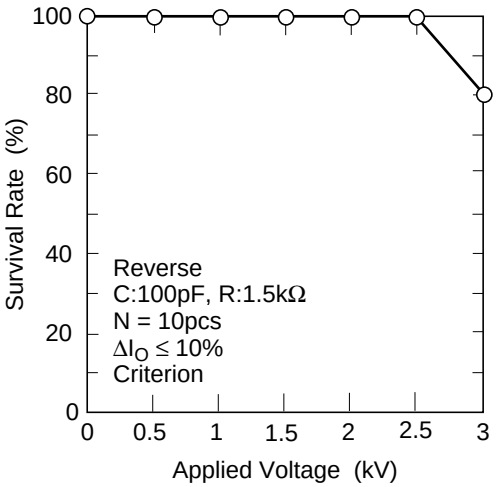
Polarization Ratio vs. Optical Output Power



Electrostatic Destruction (MIL standard) (1)



Electrostatic Destruction (MIL standard) (2)



HL6501MG

Visible High Power Laser Diode for DVD-RAM

HITACHI

ADE-208-515H (Z)
9th Edition
Dec. 2000

Description

The HL6501MG is a 0.65 μm band AlGaInP laser diode (LD) with a multi-quantum well (MQW) structure. It is suitable as a light source for large capacity optical disc memories, such as DVD-RAM, and various other types of optical equipment.

Hermetic sealing of the small package (ϕ5.6 mm) assures high reliability.

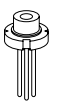
Application

- Optical disc memories
- Optical equipment

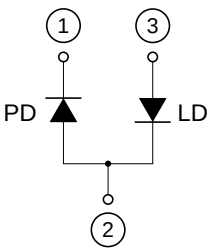
Features

- High output power: 35 mW (CW)
- Visible light output: λp = 658 nm Typ
- Small package: ϕ 5.6 mm
- Low astigmatism: 6 μm Typ (P_O = 5 mW)

Package Type
• HL6501MG: MG



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Unit
Optical output power	P_O	35	mW
Pulse optical output power	$P_{O(pulse)}$	50 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +60	°C
Storage temperature	Tstg	–40 to +85	°C

Note: Pulse condition : Pulse width = 100 ns , duty = 50%

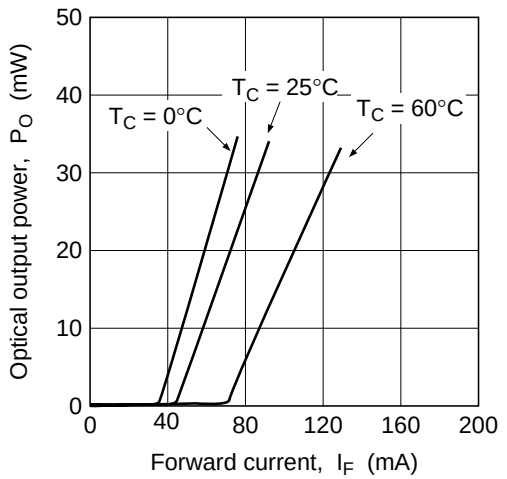
Optical and Electrical Characteristics (T_C = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	35	—	—	mW	Kink free *
Optical output power	$P_{O(pulse)}$	50	—	—	mW	Kink free *
Threshold current	Ith	30	45	70	mA	—
Operating voltage	V_{OP}	2.1	2.6	3.0	V	P_O = 30 mW
Slope efficiency	ηs	0.5	0.75	1.0	mW/mA	18 (mW) / ($I_{(24mW)} – I_{(6mW)}$)
Beam divergence parallel to the junction	θ//	7	8.5	10.5	deg.	P_O = 30 mW
Beam divergence parpendicular to the junction	θ⊥	18	22	26	deg.	P_O = 30 mW
Astigmatism	A_S	—	6	—	µm	P_O = 5 mW, NA = 0.55
Lasing wavelength	λp	645	658	665	nm	P_O = 30 mW
Monitor current	I_S	0.05	0.3	1.5	mA	P_O = 30 mW, $V_{R(PD)}$ = 5 V

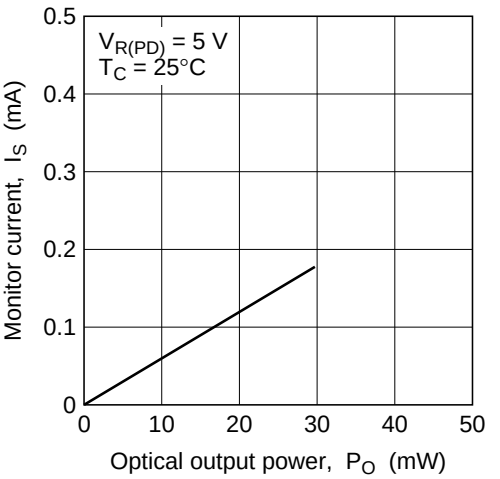
Note: Kink free is confirmed at the temperature of 25°C.

Typical Characteristic Curves

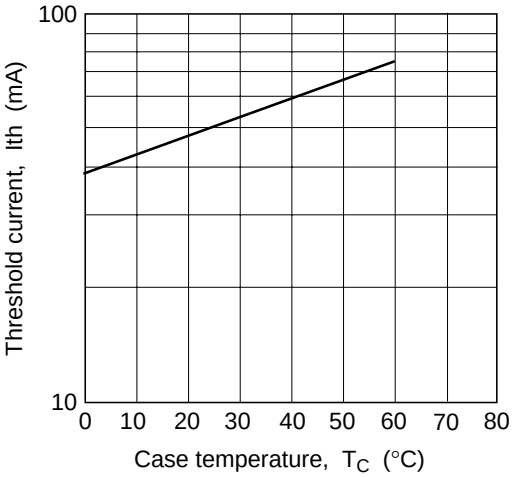
Optical Output Power vs. Forward Current



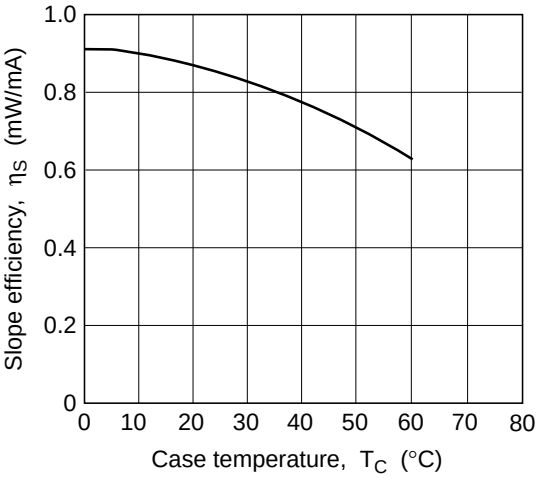
Monitor Current vs. Optical Output Power



Threshold Current vs. Case Temperature

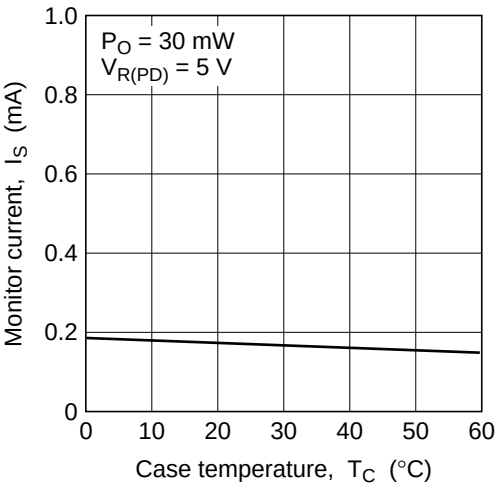


Slope Efficiency vs. Case Temperature

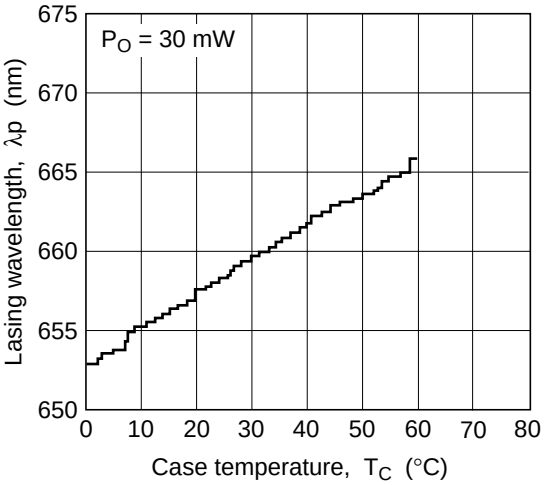


Typical Characteristic Curves (cont)

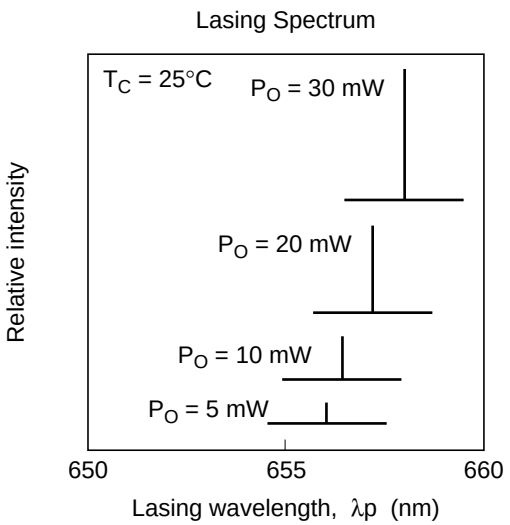
Monitor Current vs. Case Temperature



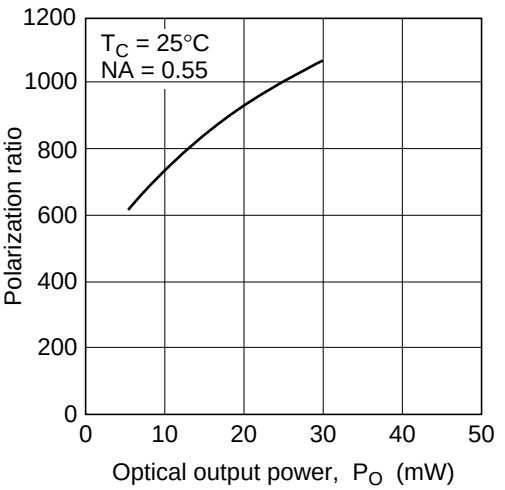
Lasing Wavelength vs. Case Temperature



Lasing Spectrum

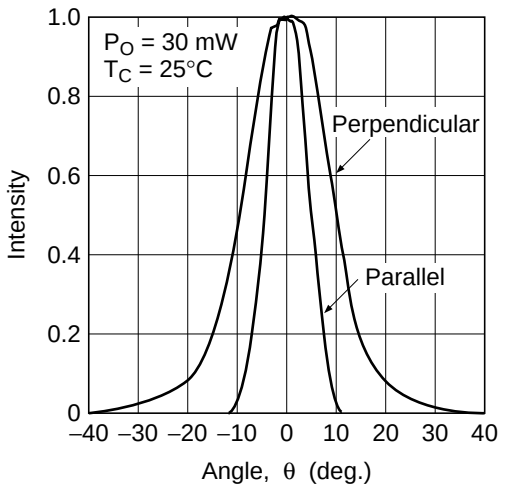


Polarization Ratio vs. Optical Output Power

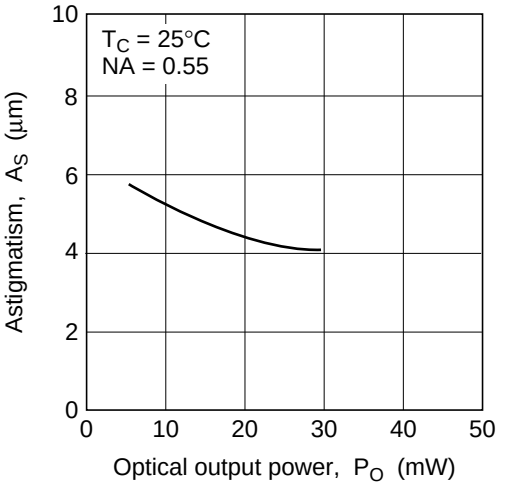


Typical Characteristic Curves (cont)

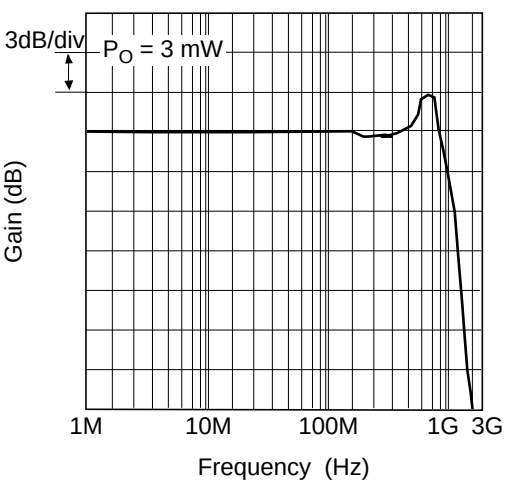
Far Field Pattern



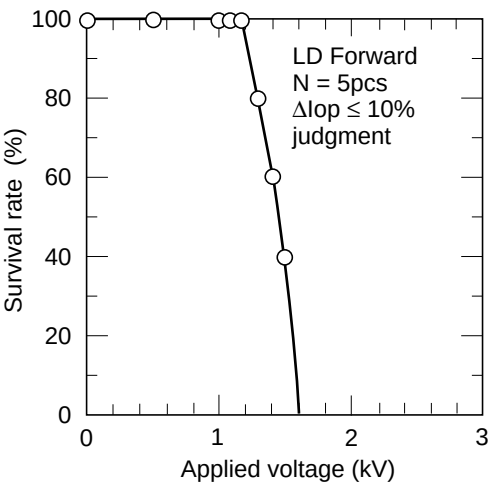
Astigmatism vs. Optical Output Power



Frequency Response



Electrostatic Destruction(MIL standard)



HL6503MG

Visible High Power Laser Diode for DVD-RAM

HITACHI

ADE-208-670D (Z)
5th Edition
Dec. 2000

Description

The HL6503MG is a 0.66 μm band AlGalnP laser diode (LD) with a multi-quantum well (MQW) structure. It is suitable as a light source for large capacity optical disc memories, such as DVD-RAM, and various other types of optical equipment.

Hermetic sealing of the small package (ϕ 5.6 mm) assures high reliability.

Application

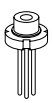
- Optical disc memories
- Optical equipment

Features

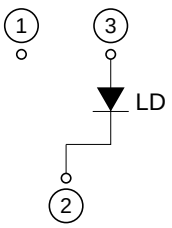
- High output power : 50 mW (CW)
- Visible light output : λp = 664 nm Typ
- Small package : ϕ 5.6 mm
- Low astigmatism : 5 μm Typ (P_O = 5 mW)

Internal Circuit

Package Type
• HL6503MG: MG



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Value	Unit
Optical output power	P_O	50	mW
Pulse optical output power	$P_{O(pulse)}$	70 *	mW
Laser diode reverse voltage	$V_{R(LD)}$	2	V
Operating temperature	Topr	–10 to +60	°C
Storage temperature	Tstg	–40 to +85	°C

Note: Pulse condition : Pulse width = 100 ns, duty = 50%

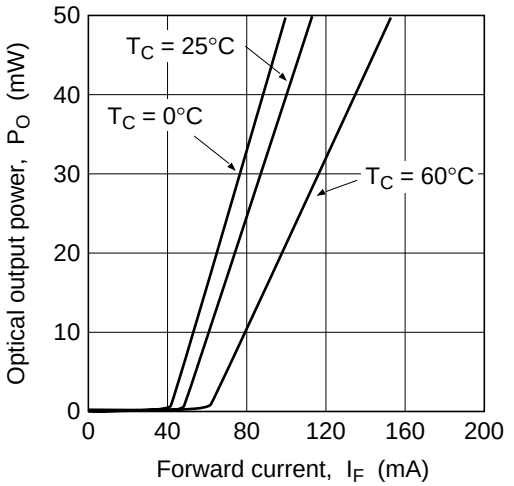
Optical and Electrical Characteristics (T_C = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	50	—	—	mW	Kink free *
Pulse optical output power	$P_{O(pulse)}$	70	—	—	mW	Kink free *
Threshold current	Ith	30	45	60	mA	—
Operating current	Iop	—	115	135	mA	P_O = 50 mW
Operating voltage	V_{OP}	2.1	2.6	3.0	V	P_O = 50 mW
Beam divergence parallel to the junction	θ//	7	8.5	11	deg.	P_O = 50 mW
Beam divergence parpendicular to the junction	θ⊥	18	21	26	deg.	P_O = 50 mW
Asitgmatism	A_S	—	5	—	μm	P_O = 5 mW, NA = 0.55
Lasing wavelength	λp	655	664	667	nm	P_O = 50 mW

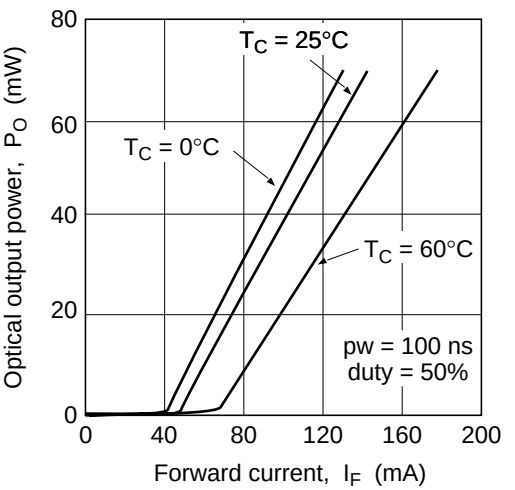
Note: Kink free is confirmed at the temperature of 25°C.

Typical Characteristic Curves

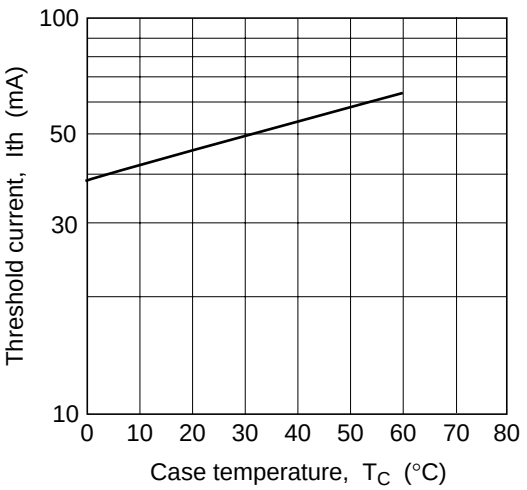
Optical Output Power vs. Forward Current



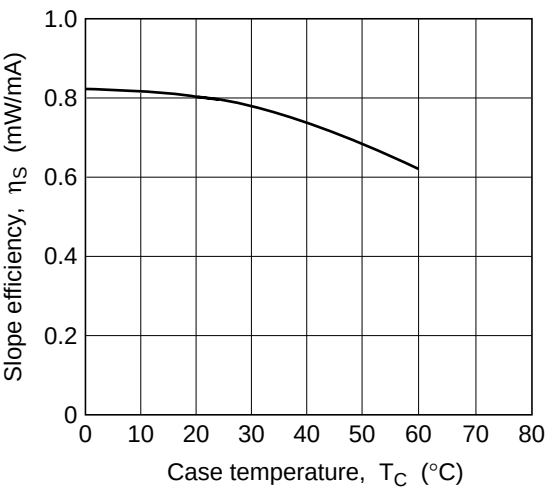
Pulse Optical Output Power vs. Forward Current



Threshold Current vs. Case Temperature

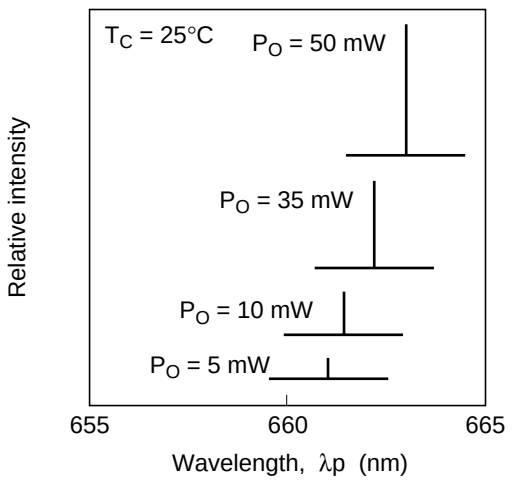


Slope Efficiency vs. Case Temperature

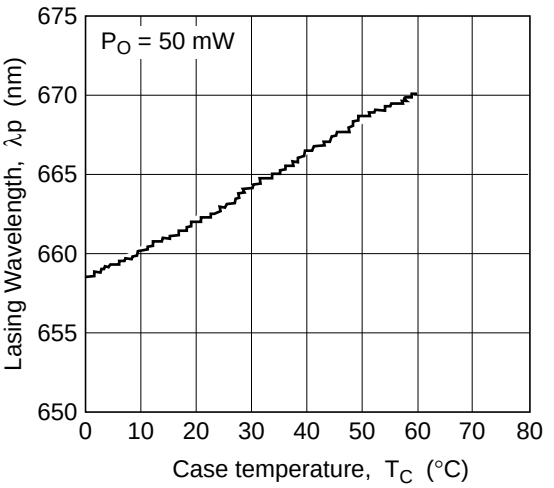


Typical Characteristic Curves (cont)

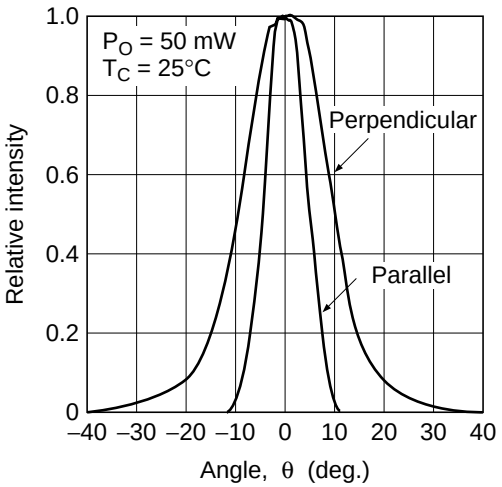
Lasing Spectrum



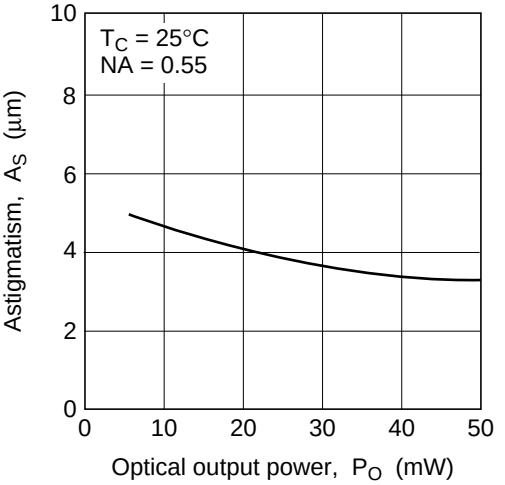
Wavelength vs. Case Temperature



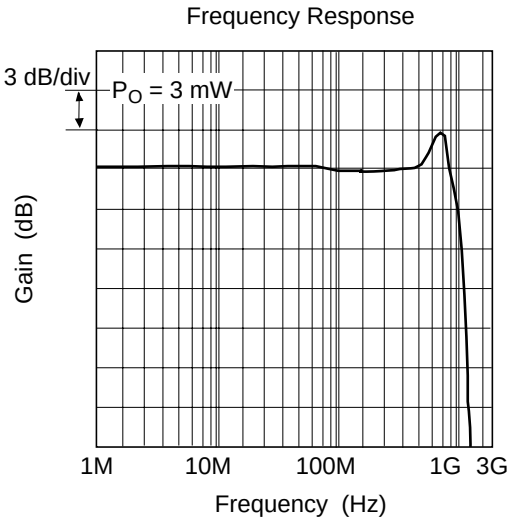
Far Field Pattern

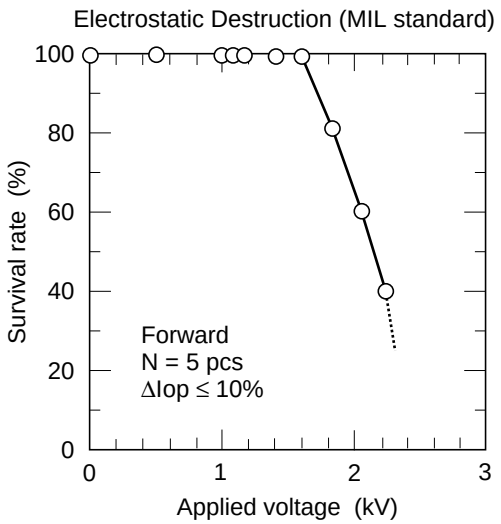


Astigmatism vs. Optical Output Power



Typical Characteristic Curves (cont)





HL6504FM

Visible High Power Laser Diode for DVD-RAM

HITACHI

ADE-208-825A (Z)
2nd Edition
Dec. 2000

Description

The HL6504FM is a 0.66 μm band AlGaInP laser diode (LD) with a multi-quantum well (MQW) structure. It is suitable as a light source for large capacity optical disc memories, such as DVD-RAM, and various other types of optical equipment.

Hermetic sealing of the small package (ϕ 5.6 mm) assures high reliability.

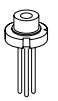
Application

- Optical disc memories
- Optical equipment

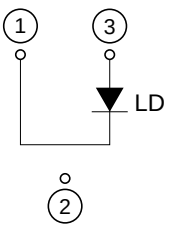
Features

- High output power : 50 mW (CW)
- Visible light output : λp = 664 nm Typ
- Small package : ϕ 5.6 mm
- Low astigmatism : 5 μm Typ (P_O = 5 mW)

Package Type
• HL6504FM: FM



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Value	Unit
Optical output power	P_O	50	mW
Pulse optical output power	$P_{O(pulse)}$	70 *	mW
Laser diode reverse voltage	$V_{R(LD)}$	2	V
Operating temperature	Topr	–10 to +60	°C
Storage temperature	Tstg	–40 to +85	°C

Note: Pulse condition : Pulse width = 100 ns, duty = 50%

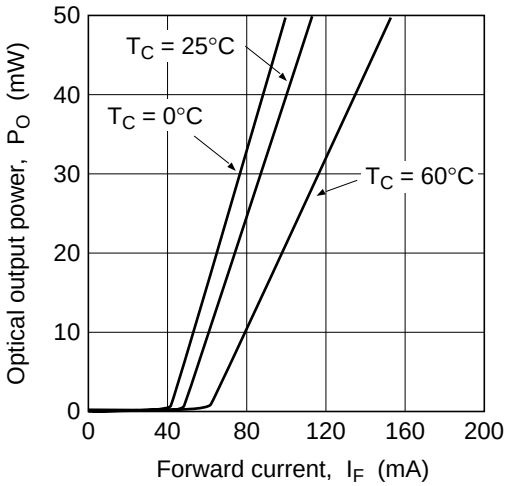
Optical and Electrical Characteristics (T_C = 25°C)

Items	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	50	—	—	mW	Kink free *
Pulse optical output power	$P_{O(pulse)}$	70	—	—	mW	Kink free *
Threshold current	Ith	30	45	60	mA	—
Operating current	Iop	—	115	135	mA	P_O = 50 mW
Operating voltage	V_{OP}	2.1	2.6	3.0	V	P_O = 50 mW
Beam divergence parallel to the junction	θ//	7	8.5	11	deg.	P_O = 50 mW
Beam divergence parpendicular to the junction	θ⊥	18	21	26	deg.	P_O = 50 mW
Asitgmatism	A_S	—	5	—	μm	P_O = 5 mW, NA = 0.55
Lasing wavelength	λp	655	664	667	nm	P_O = 50 mW

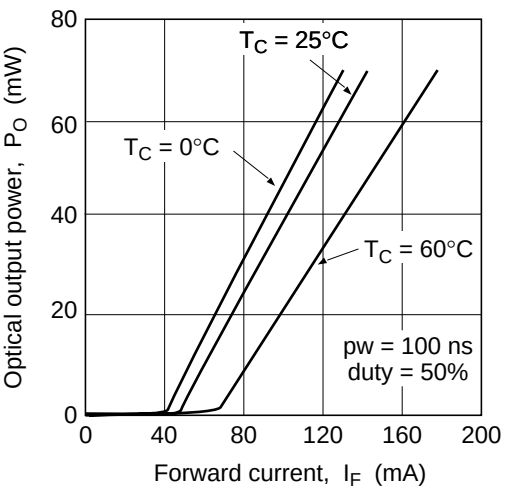
Note: Kink free is confirmed at the temperature of 25°C.

Typical Characteristic Curves

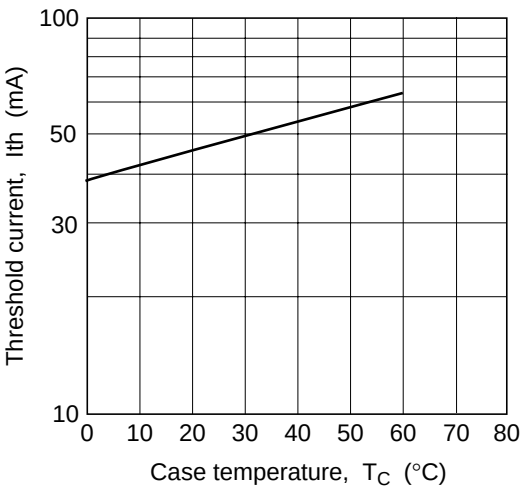
Optical Output Power vs. Forward Current



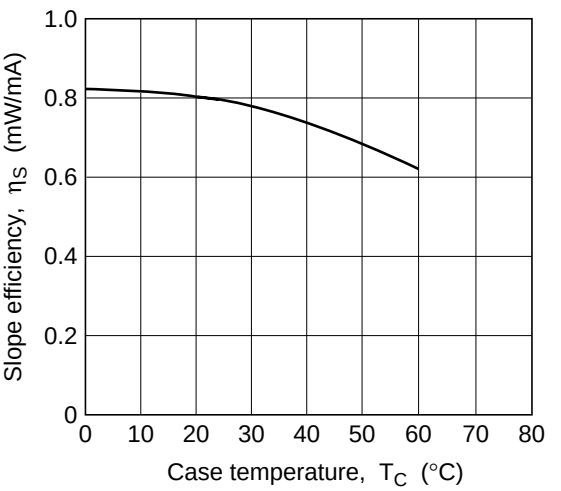
Pulse Optical Output Power vs. Forward Current



Threshold Current vs. Case Temperature

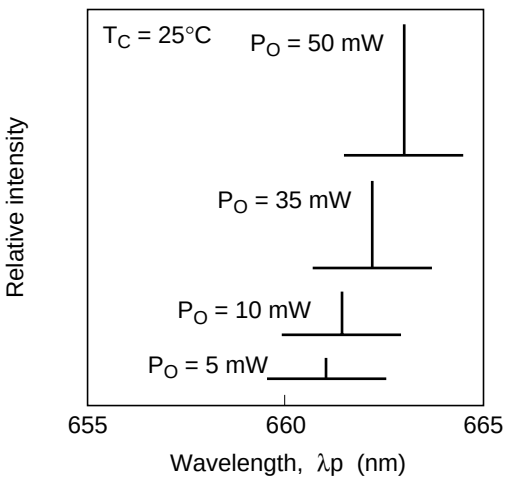


Slope Efficiency vs. Case Temperature

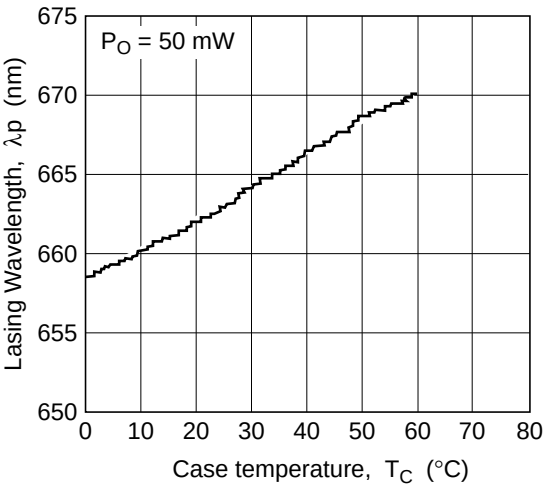


Typical Characteristic Curves (cont)

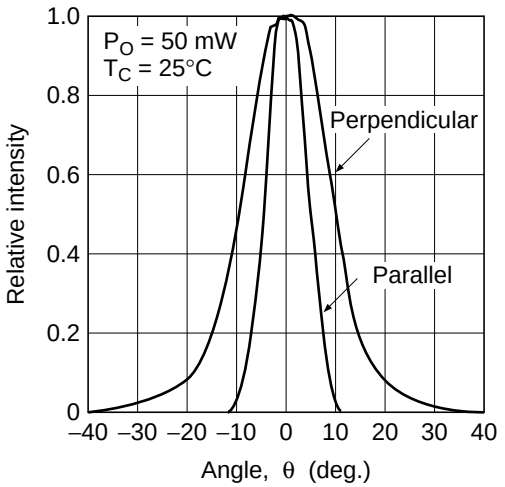
Lasing Spectrum



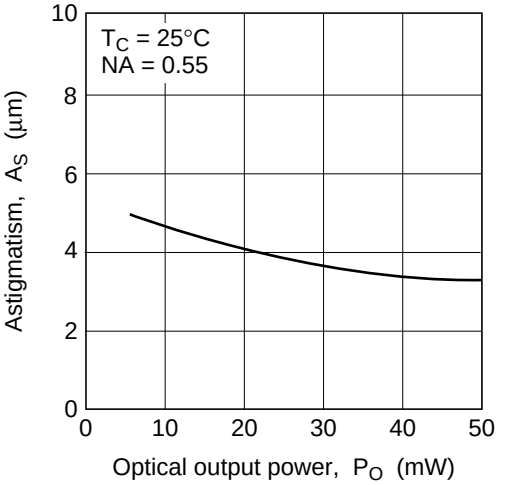
Wavelength vs. Case Temperature



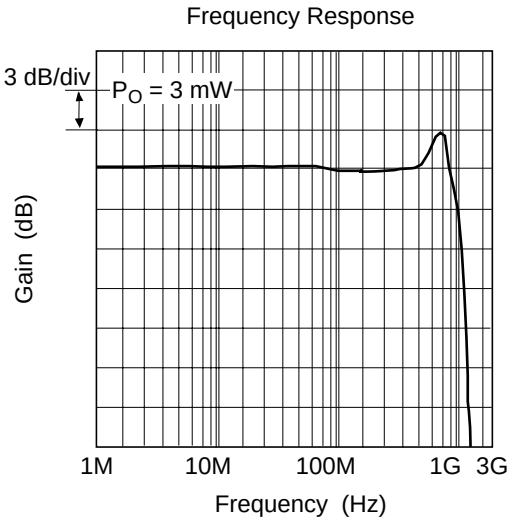
Far Field Pattern

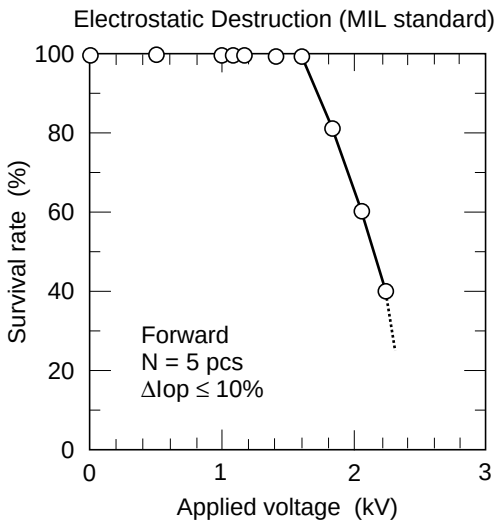


Astigmatism vs. Optical Output Power



Typical Characteristic Curves (cont)





HL6712G

AlGaInP Laser Diode

HITACHI

ADE-208-994 (Z)
1st Edition
Dec. 2000

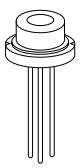
Description

The HL6712G is 0.67 μm band AlGaInP index-guided laser diode with a double heterostructure. It is suitable as light sources for barcode readers, levelers, laser printers, and various other types of optical equipment. Hermetic sealing of the packages assure high reliability.

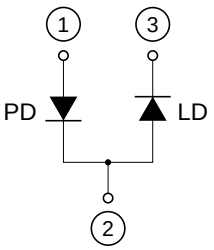
Features

- Visible light output at wavelengths up to 680 nm
- Single longitudinal mode
- Low threshold current: 40 mA Typ
- Low astigmatism: 10 μm Typ
- Operates at temperatures up to 50°C
- Built-in monitor photodiode

Package Type
• HL6712G: G1



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Unit
Optical output power	P_O	5	mW
Pulse optical output power	$P_{O(pulse)}$	6 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

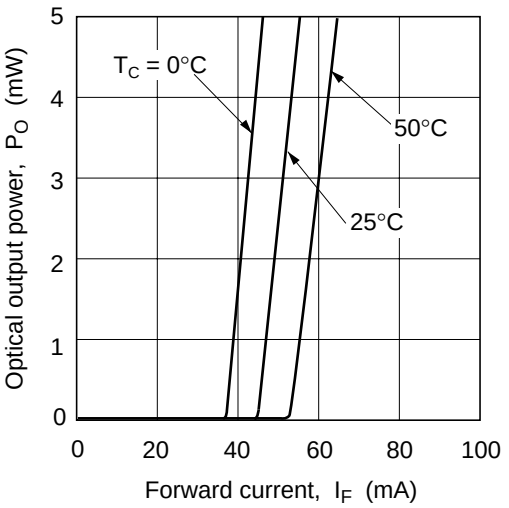
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

Optical and Electrical Characteristics (T_C = 25°C)

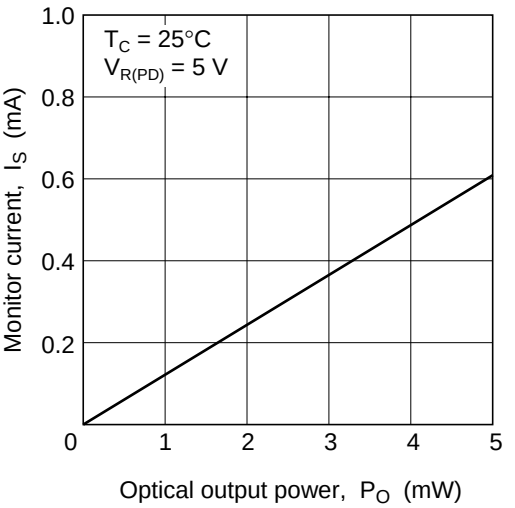
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	5	—	—	mW	Kink free
Threshold current	Ith	—	40	65	mA	
Slope efficiency	ηs	0.30	0.55	0.70	mW/mA	3 (mW) / ($I_{(4mW)}$ – $I_{(1mW)}$)
Beam divergence parallel to the junction	θ//	5	8	11	deg.	P_O = 5 mW, FWHM
Beam divergence parpendicular to the junction	θ⊥	22	27	37	deg.	P_O = 5 mW, FWHM
Astigmatism	A_S	—	10	—	µm	P_O = 5 mW, NA = 0.4
Lasing wavelength	λp	660	670	680	nm	P_O = 5 mW
Monitor current	I_S	0.25	0.6	1.25	mA	P_O = 5 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

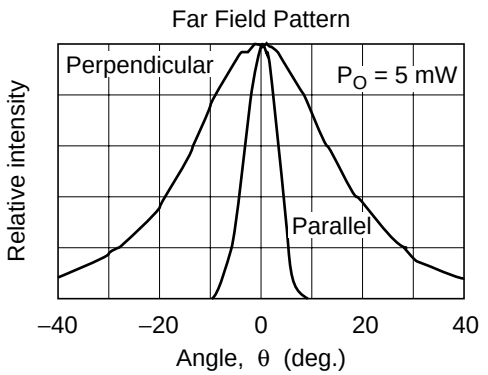
Optical Output Power vs. Forward Current



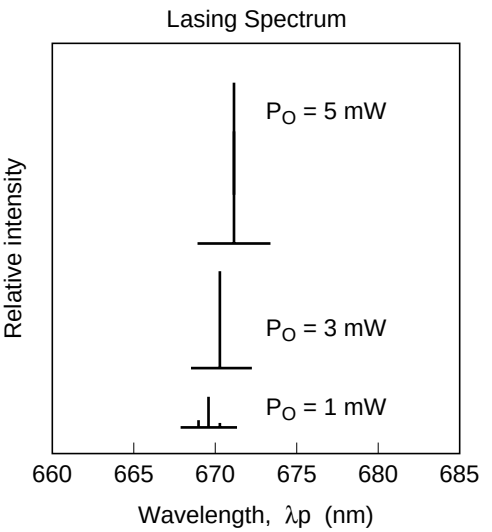
Monitor Current vs. Optical Output Power



Far Field Pattern

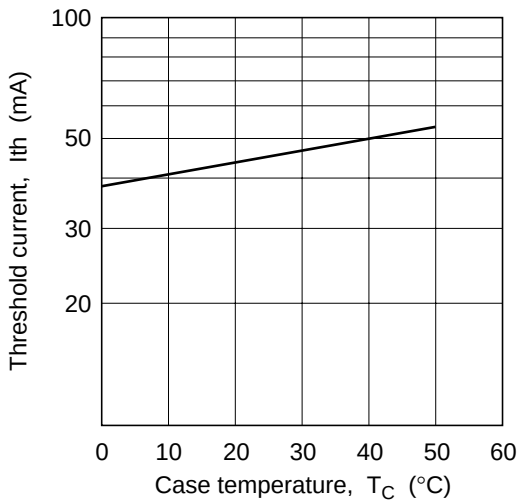


Lasing Spectrum

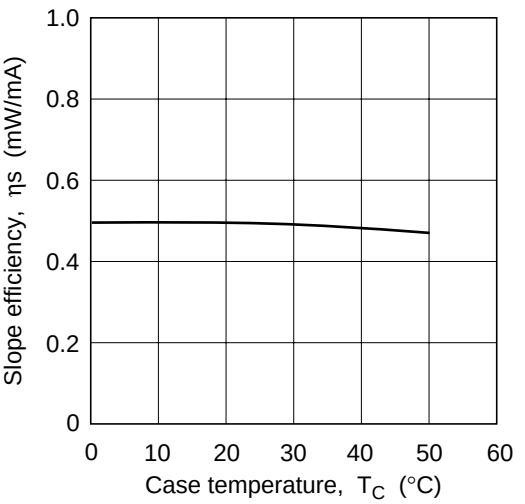


Typical Characteristic Curves (cont)

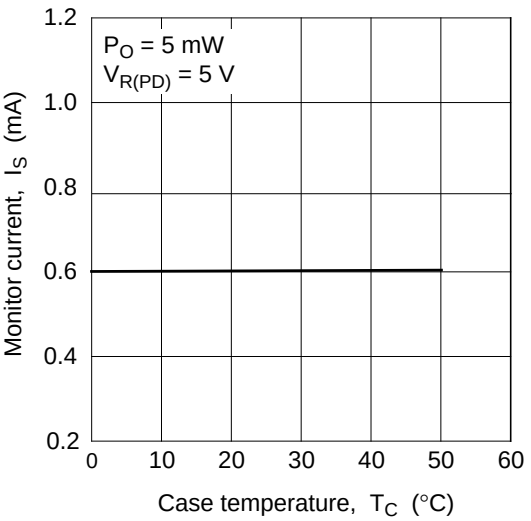
Threshold Current vs. Case Temperature



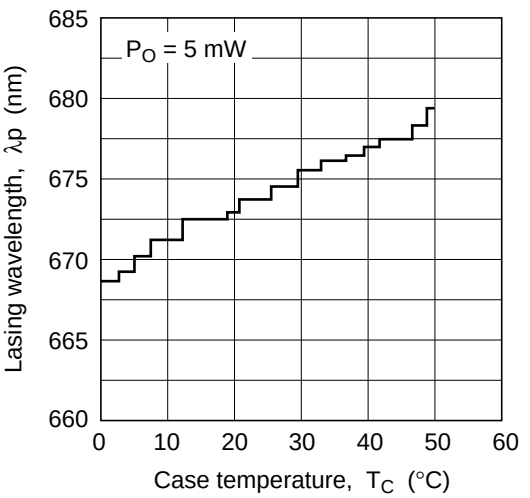
Slope Efficiency vs. Case Temperature



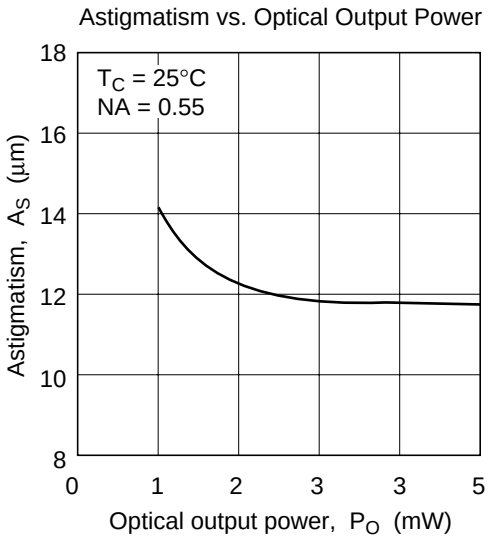
Monitor Current vs. Case Temperature

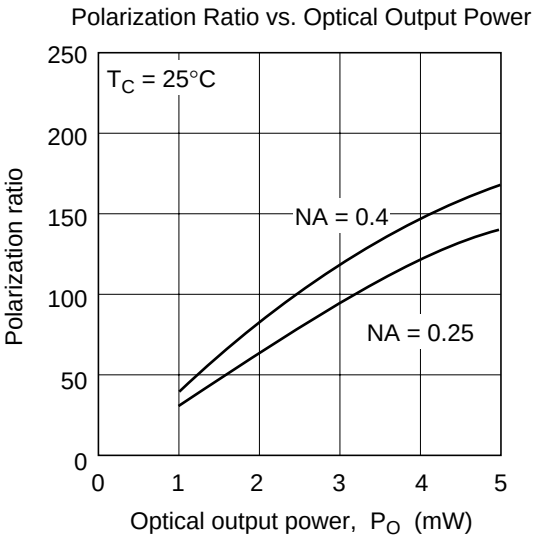


Wavelength vs. Case Temperature



Typical Characteristic Curves (cont)





HL6713G

AlGaInP Laser Diode

HITACHI

ADE-208-995 (Z)
1st Edition
Dec. 2000

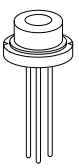
Description

The HL6713G is a 0.67 μm band AlGaInP index-guided laser diode with a double heterostructure. It is suitable as a light source for laser beam printers, levelers and various other types of optical equipment. Hermetic sealing of the package assures high reliability.

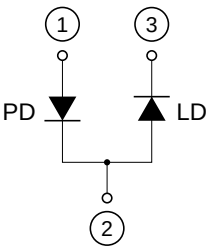
Features

- Visible light output at wavelengths up to 680 nm
- Single longitudinal mode
- Low astigmatism: 10 μm Typ
- Small droop under pulse operation: 10% Max
- Built-in monitor photodiode

Package Type
• HL6713G: G1



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

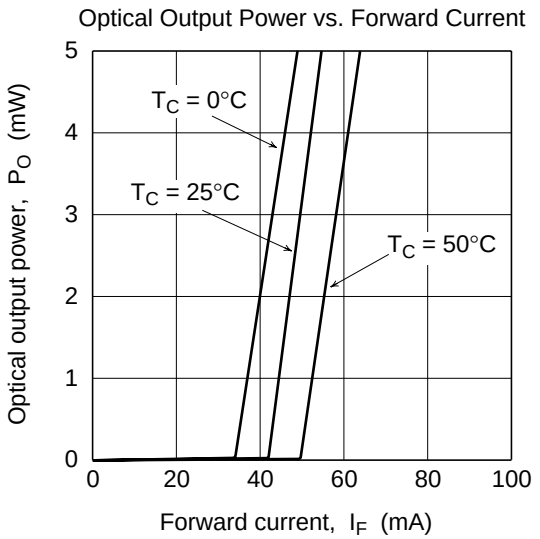
Item	Symbol	Rated Value	Unit
Optical output power	P_O	5	mW
Pulse optical output power	$P_{O(pulse)}$	6 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

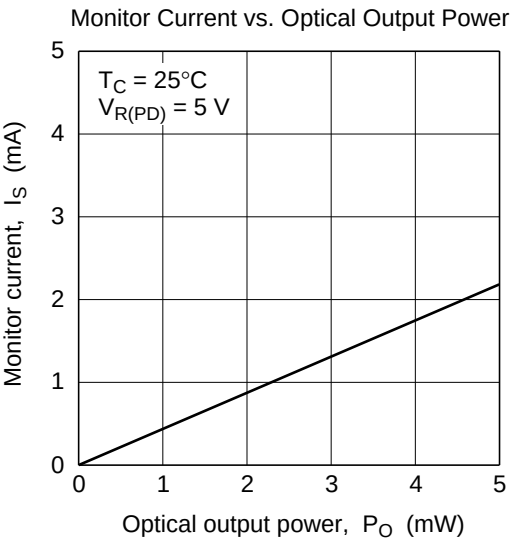
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

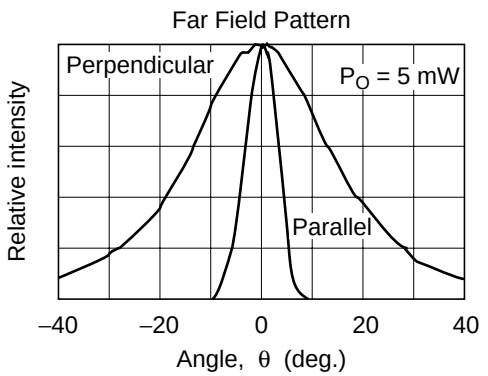
Optical and Electrical Characteristics (T_C = 25°C)

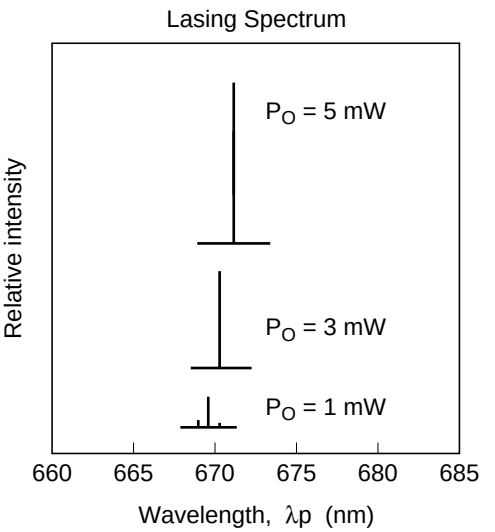
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	5	—	—	mW	Kink free
Threshold current	Ith	20	40	50	mA	
LD operating voltage	V_{OP}	—	2.3	2.7	V	P_O = 5 mW
Slope efficiency	ηs	0.16	—	0.45	mW/mA	3 (mW) / ($I_{(4mW)}$ – $I_{(1mW)}$)
Droop	–Rth	—	—	10	%	P_O = 3 mW, f = 600 Hz
Beam divergence parallel to the junction	θ//	7	9	11	deg.	P_O = 5 mW, FWHM
Beam divergence parpendicular to the junction	θ⊥	25	30	38	deg.	P_O = 5 mW, FWHM
Astigmatism	A_S	—	10	—	µm	P_O = 3 mW, NA = 0.55
Lasing wavelength	λp	660	670	680	nm	P_O = 5 mW
Monitor current	I_S	1.0	2.0	3.0	mA	P_O = 5 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves



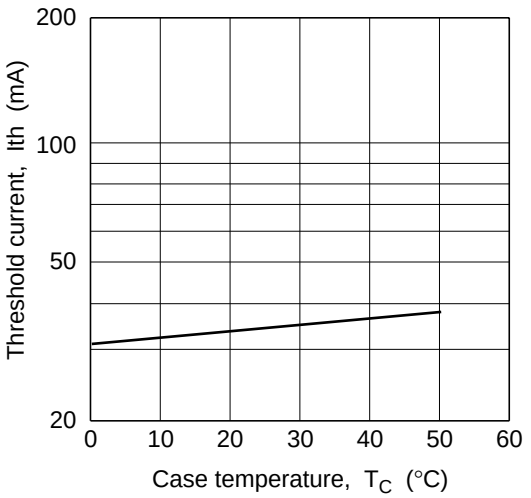




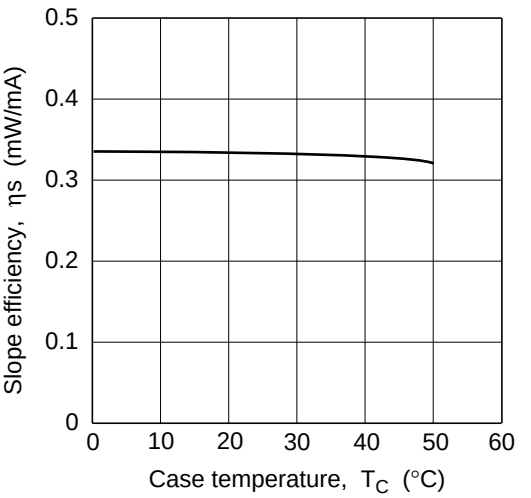


Typical Characteristic Curves (cont)

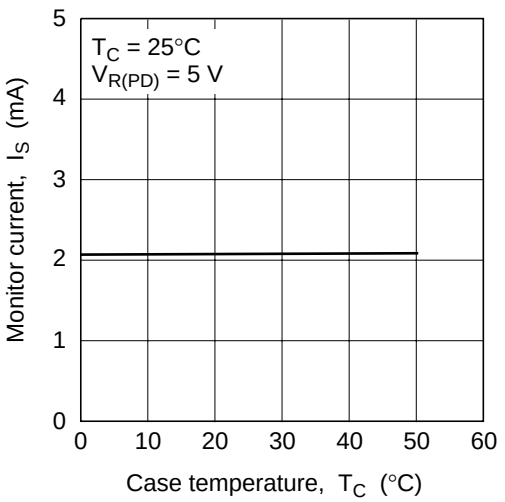
Threshold Current vs. Case Temperature



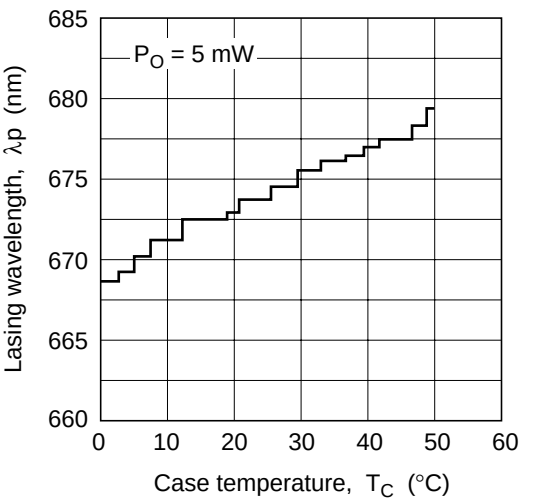
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temperature

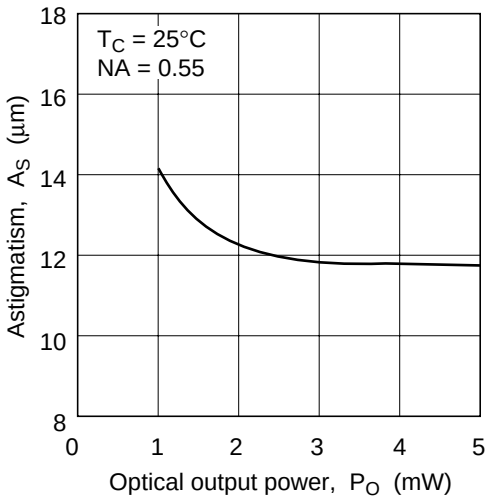


Wavelength vs. Case Temperature

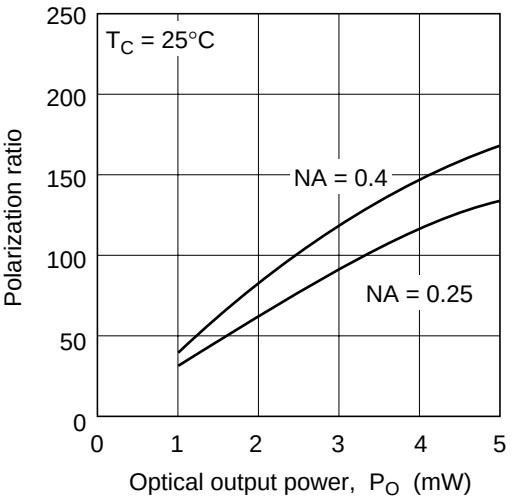


Typical Characteristic Curves (cont)

Astigmatism vs. Optical Output Power



Polarization Ratio vs. Optical Output Power



HL6714G

AlGaInP Laser Diode

HITACHI

ADE-208-192B (Z)
3rd Edition
Dec. 2000

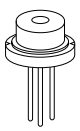
Description

The HL6714G is a 0.67 μm band AlGaInP index-guided laser diode with a multi-quantum well (MQW) structure. It is suitable as a light source for laser beam printers, levelers and various other types of optical equipment. Hermetic sealing of the package assures high reliability.

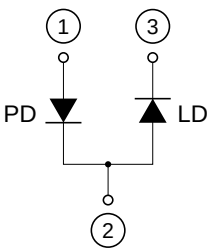
Features

- Visible light output at wavelengths up to 680 nm
- Single longitudinal mode
- Low astigmatism: 10 μm Typ
- High output power: 10 mW (CW)
- Built-in monitor photodiode

Package Type
• HL6714G: G2



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Unit
Optical output power	P_O	10	mW
Pulse optical output power	$P_{O(pulse)}$	12 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

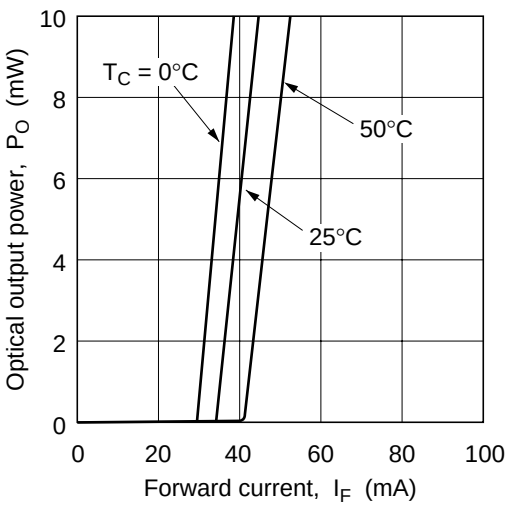
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

Optical and Electrical Characteristics (T_C = 25°C)

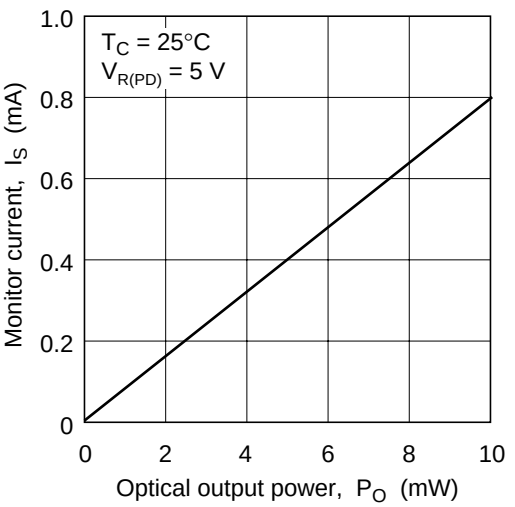
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	10	—	—	mW	Kink free
Threshold current	Ith	20	35	60	mA	
LD operating voltage	V_{OP}	—	—	2.7	V	P_O = 10 mW
Slope efficiency	ηs	0.3	0.5	0.8	mW/mA	6 (mW) / ($I_{(8mW)} – I_{(2mW)}$)
Beam divergence parallel to the junction	θ//	5	8	11	deg.	P_O = 10 mW, FWHM
Beam divergence parpendicular to the junction	θ⊥	18	22	30	deg.	P_O = 10 mW, FWHM
Astigmatism	A_S	—	10	—	µm	P_O = 10 mW, NA = 0.55
Lasing wavelength	λp	660	670	680	nm	P_O = 10 mW
Monitor current	I_S	0.3	0.8	1.5	mA	P_O = 10 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

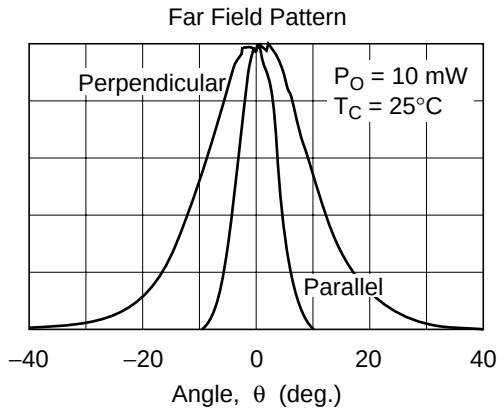
Optical Output Power vs. Forward Current



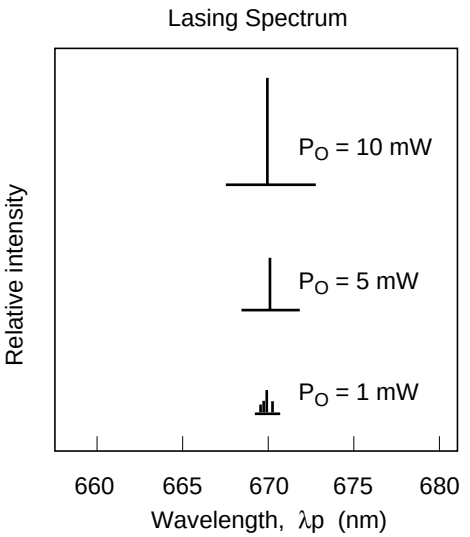
Monitor Current vs. Optical Output Power



Far Field Pattern

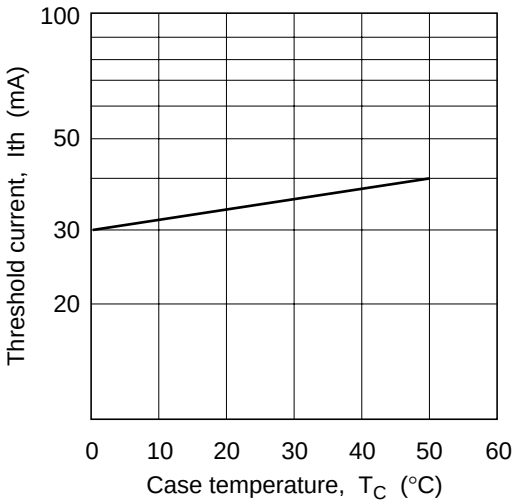


Lasing Spectrum

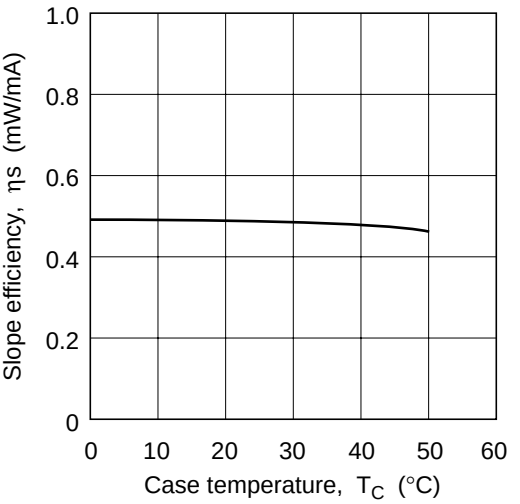


Typical Characteristic Curves (cont)

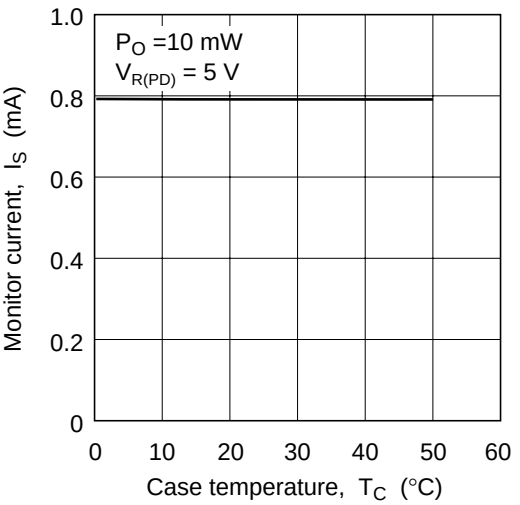
Threshold Current vs. Case Temperature



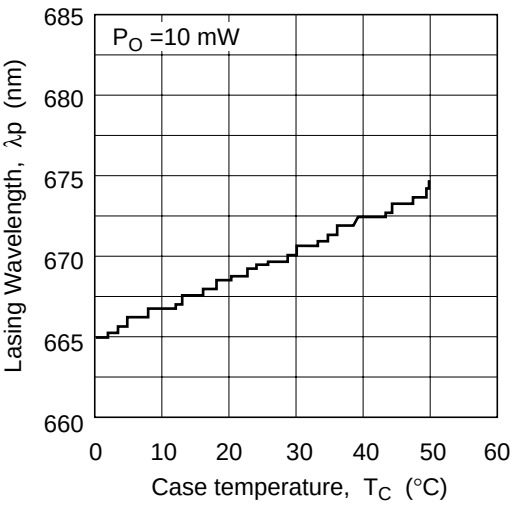
Slope Efficiency vs. Case Temperature



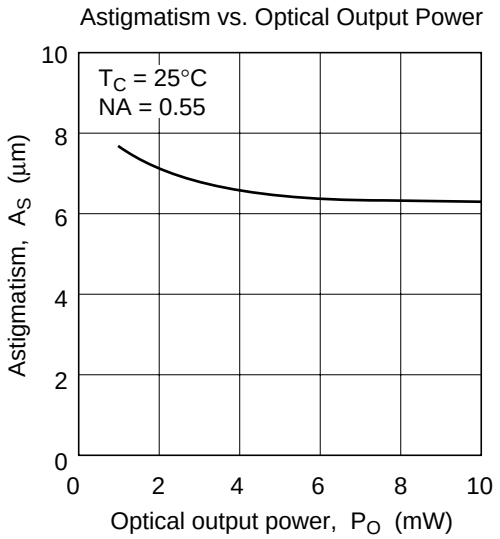
Monitor Current vs. Case Temperature

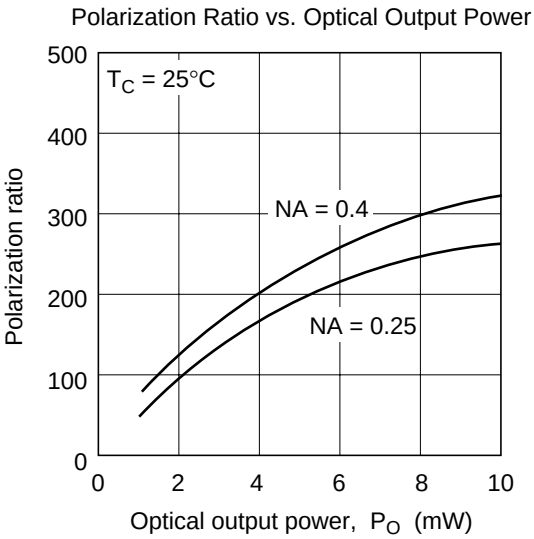


Wavelength vs. Case Temperature



Typical Characteristic Curves (cont)





HL6720G

AlGaInP Laser Diode

HITACHI

ADE-208-193D (Z)
5th Edition
Dec. 2000

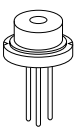
Description

The HL6720G is a 0.67 μm band AlGaInP index-guided laser diode with a double heterostructure. It is suitable as a light source for pointers, and various other types of optical equipment. Hermetic sealing of the package assures high reliability.

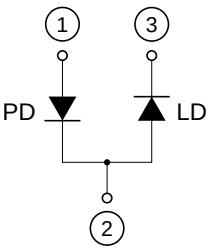
Features

- Visible light output at wavelengths up to 680 nm
- Continuous operating output: 5 mW CW
- Low voltage operation: 2.7 V Max
- Single longitudinal mode
- Built-in monitor photodiode

Package Type
• HL6720G: G2



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Unit
Optical output power	P_O	5	mW
Pulse optical output power	$P_{O(pulse)}$	6 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

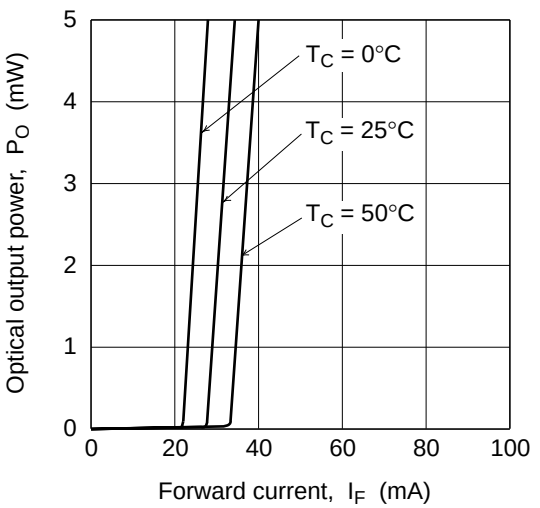
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

Optical and Electrical Characteristics (T_C = 25°C)

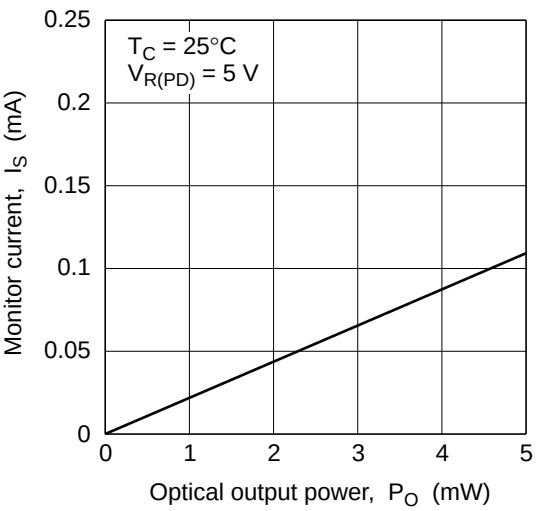
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	5	—	—	mW	Kink free
Threshold current	Ith	—	30	60	mA	
LD operating current	I_{OP}	—	35	70	mA	P_O = 5 mW
LD operating voltage	V_{OP}	—	—	2.7	V	P_O = 5 mW
Slope efficiency	ηs	0.4	—	1.0	mW/mA	3 (mW) / ($I_{(4mW)}$ – $I_{(1mW)}$)
Beam divergence parallel to the junction	θ//	6	9	12	deg.	P_O = 5 mW
Beam divergence parpendicular to the junction	θ⊥	20	30	40	deg.	P_O = 5 mW
Lasing wavelength	λp	660	670	680	nm	P_O = 5 mW
Monitor current	I_S	0.03	0.10	0.20	mA	P_O = 5 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

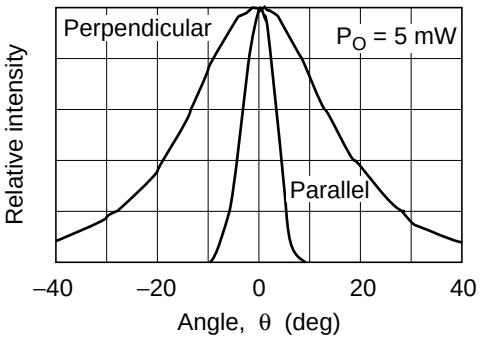
Optical Output Power vs. Forward Current



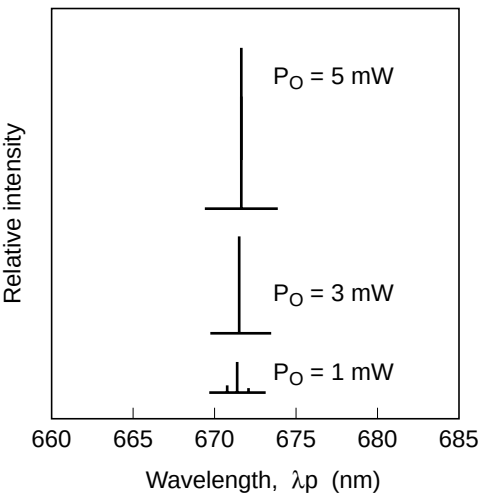
Monitor Current vs. Optical Output Power



Far Field Pattern

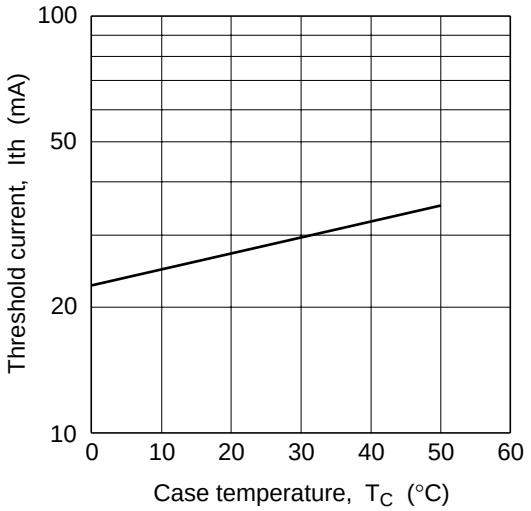


Lasing Spectrum

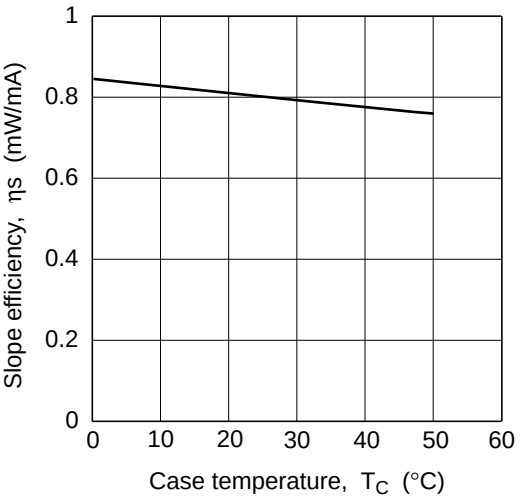


Typical Characteristic Curves (cont)

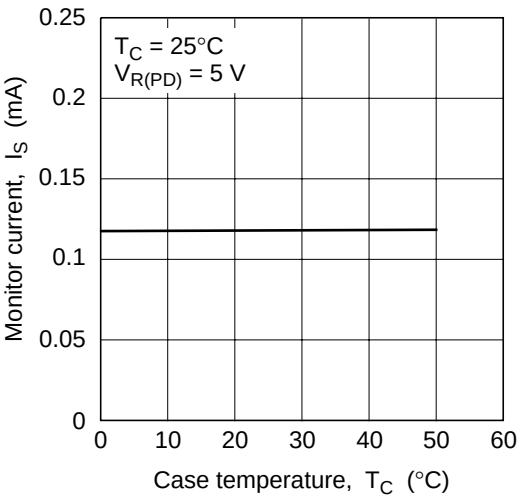
Threshold Current vs. Case Temperature



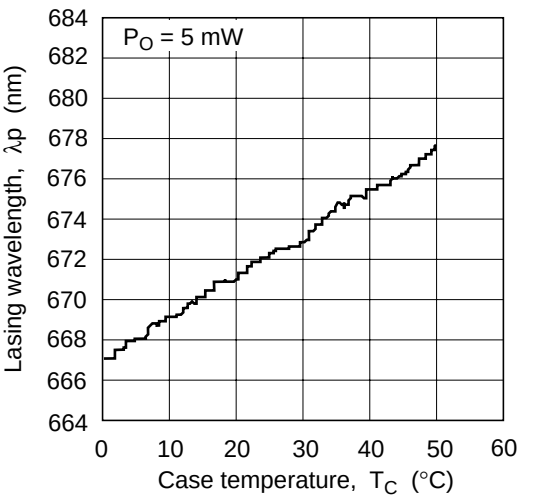
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temperature

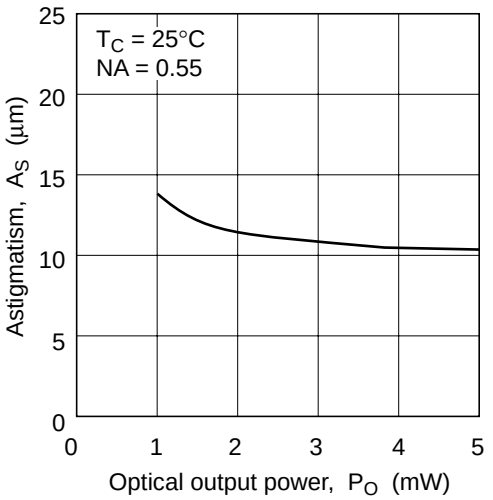


Wavelength vs. Case Temperature

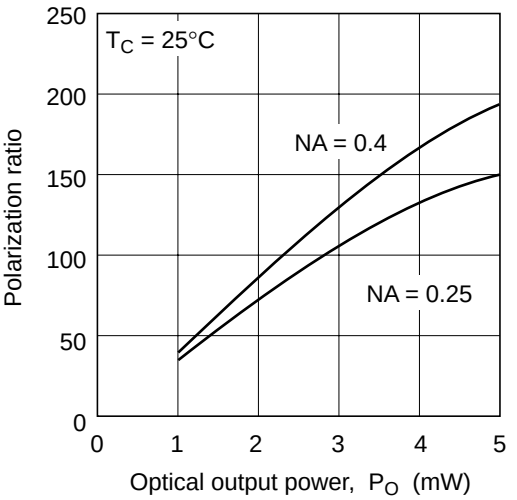


Typical Characteristic Curves (cont)

Astigmatism vs. Optical Output Power



Polarization Ratio vs. Optical Output Power



HL6722G

AlGaInP Laser Diode

HITACHI

ADE-208-220C (Z)
4th Edition
Dec. 2000

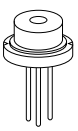
Description

The HL6722G is a 0.67 μm band AlGaInP index-guided laser diode with a multi-quantum well (MQW) structure. It is suitable as a light source for bercode scanner, and various other types of optical equipment. Hermetic sealing of the package assures high reliability.

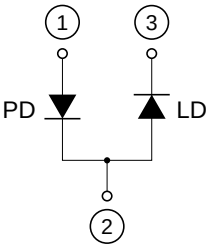
Features

- Visible light output at wavelengths up to 680 nm
- Continuous operating output: 5 mW CW
- Low voltage operation: 2.7 V Max
- Low current operation: 32 mA Typ
- Single longitudinal mode
- Built-in monitor photodiode

Package Type
• HL6722G: G2



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Unit
Optical output power	P_O	5	mW
Pulse optical output power	$P_{O(pulse)}$	6 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

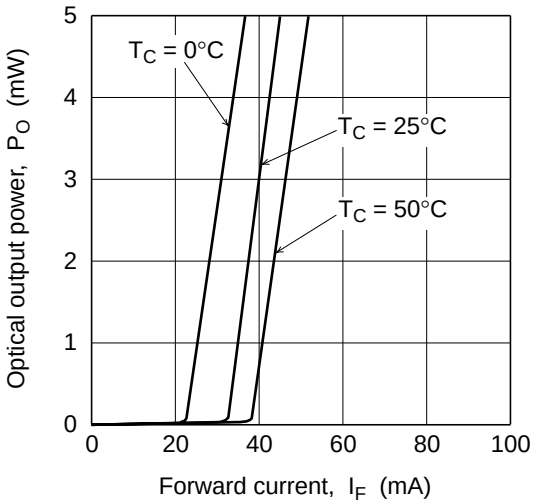
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

Optical and Electrical Characteristics (T_C = 25°C)

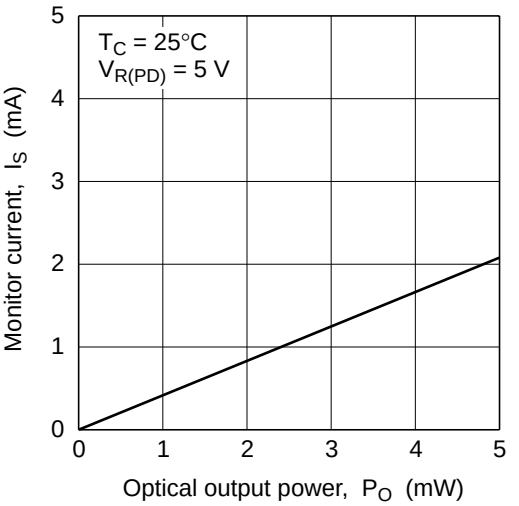
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	5	—	—	mW	Kink free
Threshold current	Ith	20	32	55	mA	
LD operating current	I_{OP}	—	42	70	mA	P_O = 5 mW
LD operating voltage	V_{OP}	—	—	2.7	V	P_O = 5 mW
Slope efficiency	ηs	0.3	0.5	0.7	mW/mA	3 (mW) / ($I_{(4mW)}$ – $I_{(1mW)}$)
Beam divergence parallel to the junction	θ//	5	8	11	deg.	P_O = 5 mW
Beam divergence parpendicular to the junction	θ⊥	22	30	38	deg.	P_O = 5 mW
Astigmatism	A_S	—	8	—	µm	P_O = 5 mW, NA = 0.55
Lasing wavelength	λp	660	670	680	nm	P_O = 5 mW
Monitor current	I_S	1	2	3	mA	P_O = 5 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

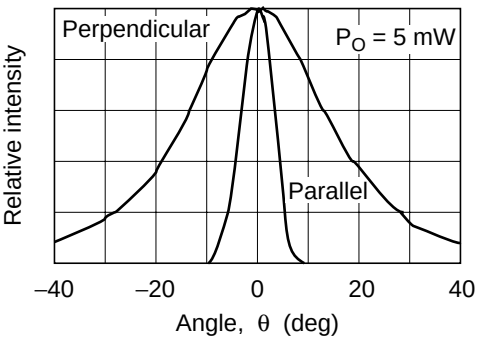
Optical Output Power vs. Forward Current



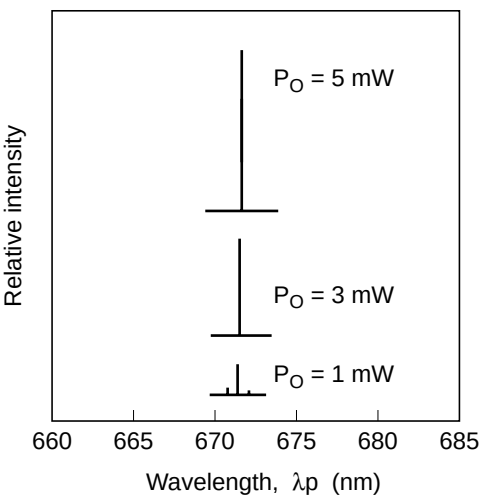
Monitor Current vs. Optical Output Power



Far Field Pattern

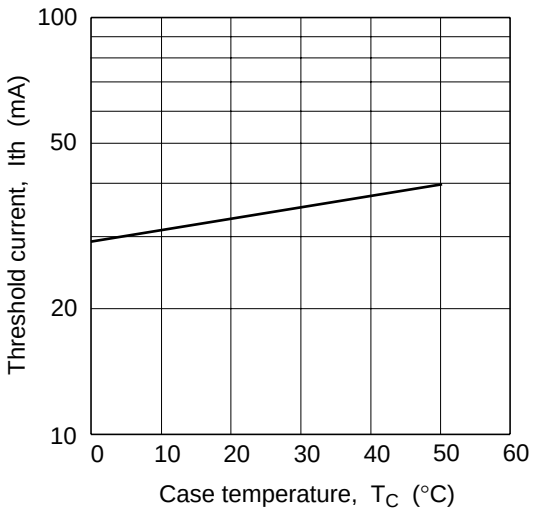


Lasing Spectrum

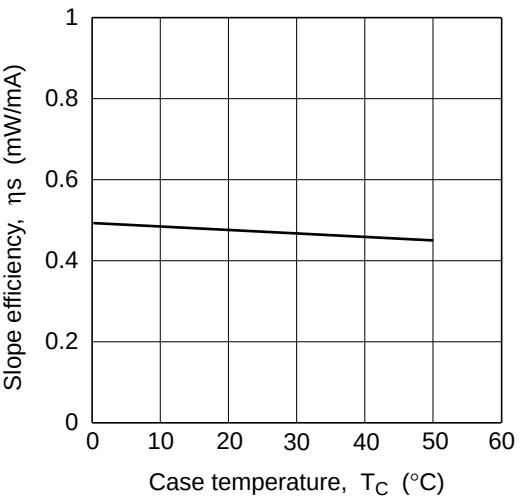


Typical Characteristic Curves (cont)

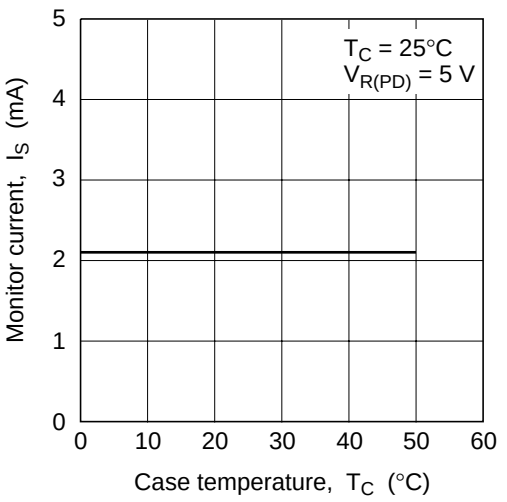
Threshold Current vs. Case Temperature



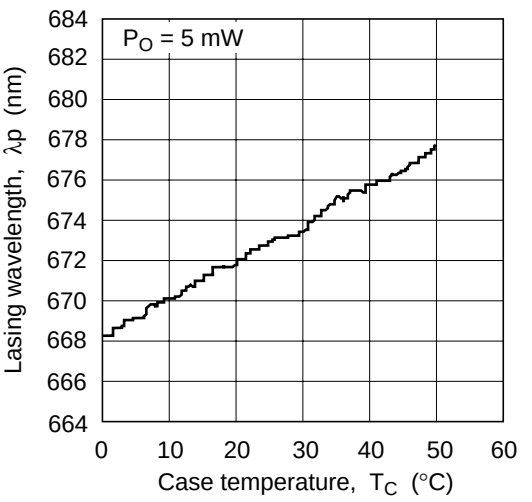
Slope Efficiency vs. Case Temperature



Monitor Current vs. Case Temperature

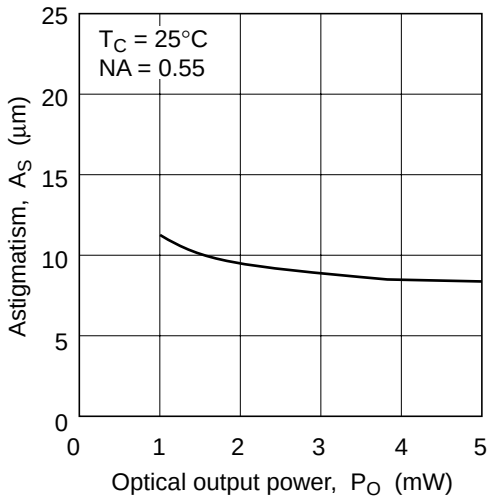


Wavelength vs. Case Temperature

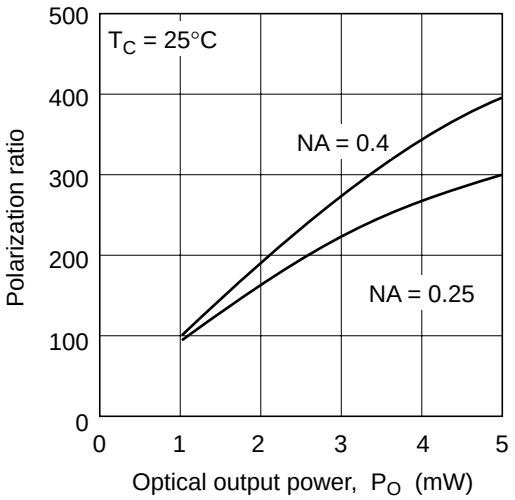


Typical Characteristic Curves (cont)

Astigmatism vs. Optical Output Power



Polarization Ratio vs. Optical Output Power



HL6724MG

AlGaInP Laser Diode

HITACHI

ADE-208-261D (Z)
5th Edition
Dec. 2000

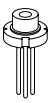
Description

The HL6724MG is a 0.67 μm band AlGaInP laser diode with a multi-quantum well (MQW) structure. It is suitable as a light source for laser pointers and optical equipments for amusement.

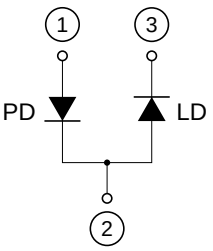
Features

- Visible light output: 670 nm Typ
- Optical output power: 5 mW CW
- Low operating current: 35 mA Typ
- Low operating voltage: 2.7 V Max

Package Type
• HL6724MG: MG



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Unit
Optical output power	P_O	5	mW
Pulse optical output power	$P_{O(pulse)}$	6 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
PD reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C

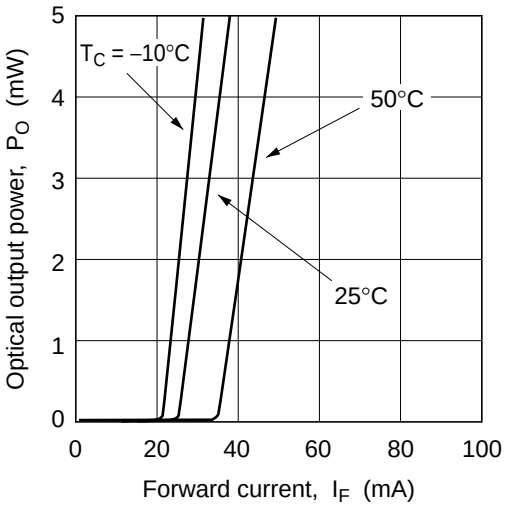
Note: Pulse condition : Pulse width ≤ 1 µs , duty ≤ 50%

Optical and Electrical Characteristics (T_C = 25°C)

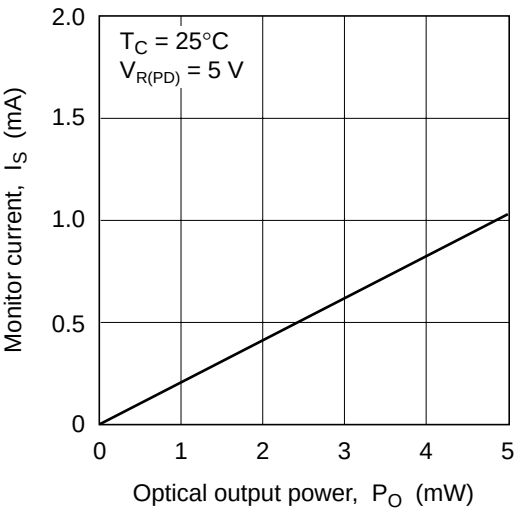
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	5	—	—	mW	Kink free
Threshold current	Ith	—	25	35	mA	
LD operating current	I_{OP}	—	35	50	mA	P_O = 5 mW
LD operating voltage	V_{OP}	—	—	2.7	V	P_O = 5 mW
Beam divergence parallel to the junction	θ//	5	8	11	deg.	P_O = 5 mW
Beam divergence parpendicular to the junction	θ⊥	22	30	40	deg.	P_O = 5 mW
Astigmatism	A_S	—	5	—	µm	P_O = 5 mW, NA = 0.55
Lasing wavelength	λp	660	670	680	nm	P_O = 5 mW
Monitor current	I_S	0.4	0.9	2.0	mA	P_O = 5 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

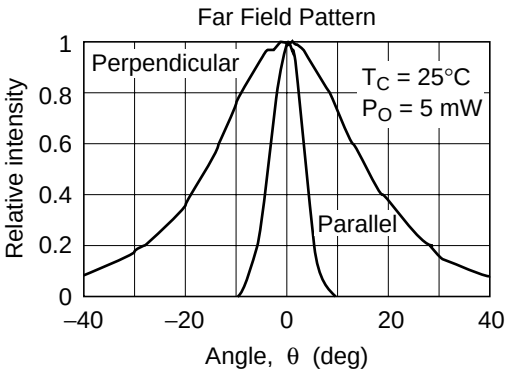
Optical Output Power vs. Forward Current



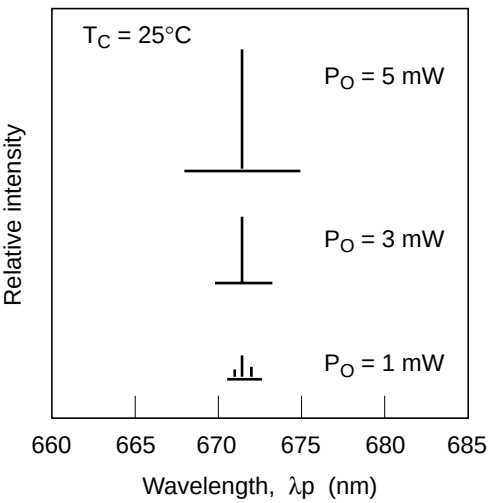
Monitor Current vs. Optical Output Power



Far Field Pattern

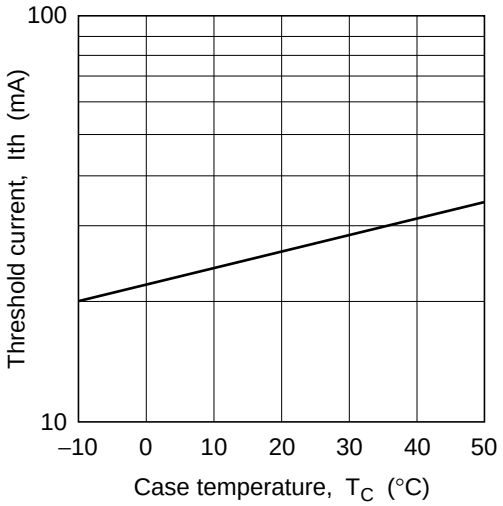


Lasing Spectrum

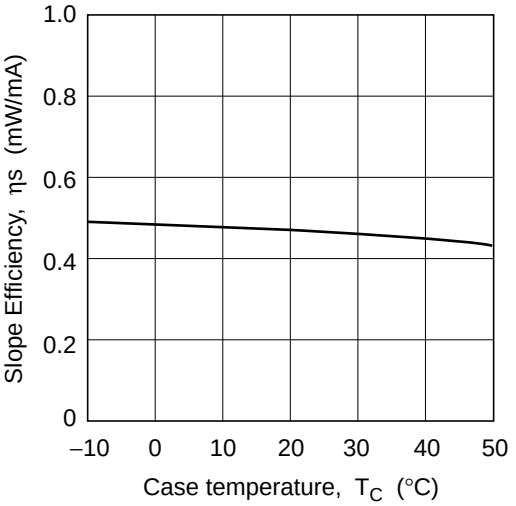


Typical Characteristic Curves (cont)

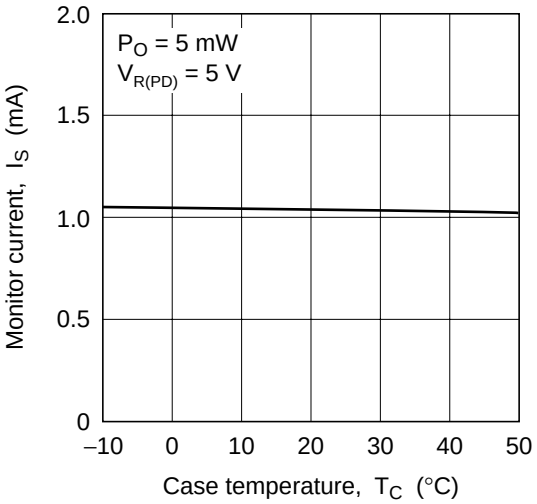
Threshold Current vs. Case Temperature



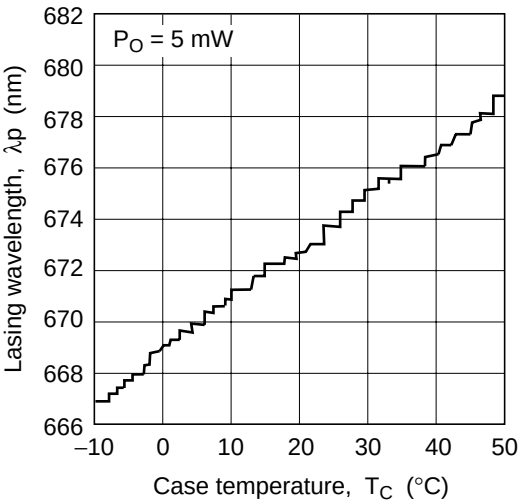
Slope Efficiency vs. Case Temperature



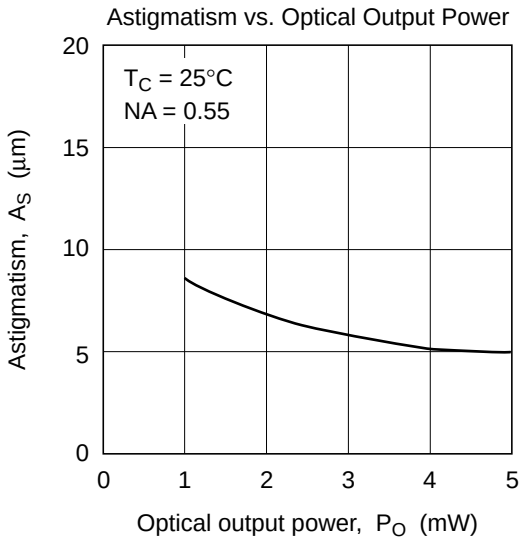
Monitor Current vs. Case Temperature

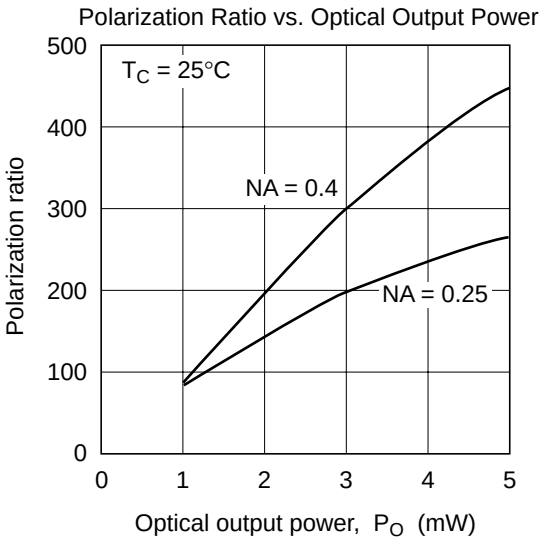


Lasing Wavelength vs. Case Temperature



Typical Characteristic Curves (cont)





HL6733FM

Visible High Power Laser Diode

HITACHI

ADE-208-516C (Z)
4th Edition
Dec. 2000

Description

The HL6733FM is a 0.68 μm band AlGaInP laser diode (LD) with a multi-quantum well (MQW) structure. It is suitable as a light source for large capacity optical disc memories and various other types of optical equipment.

It does not have a photodiode, and the GND pin is not connected to the LD chip. The outline is the same as MG-type (ϕ 5.6 mm).

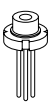
Application

- Optical disc memories.
- Optical equipment

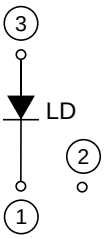
Features

- High output power: 35 mW (CW)
- Visible light output: λp = 680 to 695 nm
- Small package: ϕ 5.6 mm
- Low astigmatism: 6 μm Typ (P_O = 5 mW)

Package Type
• HL6733FM: FM



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Unit
Optical output power	P_O	35	mW
Pulse optical output power	$P_{O(pulse)}$	50 *	mW
LD reverse voltage	$V_{R(LD)}$	2	V
Operating temperature	Topr	–10 to +70	°C
Storage temperature	Tstg	–40 to +85	°C

Note: Pulse condition : Pulse width = 100 ns , duty = 50%

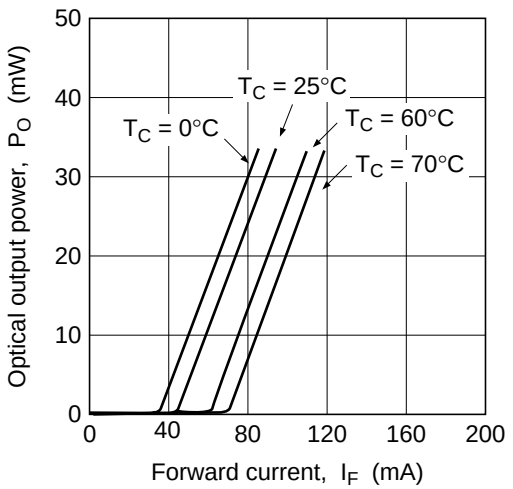
Optical and Electrical Characteristics (T_C = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	35	—	—	mW	Kink free *
Pulse optical output power	$P_{O(pulse)}$	50	—	—	mW	Kink free *
Threshold current	Ith	30	45	70	mA	—
LD operating voltage	V_{OP}	2.1	2.5	2.8	V	P_O = 30 mW
Slope efficiency	ηs	0.5	0.7	0.9	mW/mA	18 (mW) / ($I_{(24mW)}$ – $I_{(6mW)}$)
Beam divergence parallel to the junction	θ//	7	8.5	10.5	deg.	P_O = 30 mW
Beam divergence parpendicular to the junction	θ⊥	17	19	23	deg.	P_O = 30 mW
Astigmatism	A_S	—	6	—	μA	P_O = 5 mW, NA = 0.55
Lasing wavelength	λp	680	690	695	nm	P_O = 30 mW

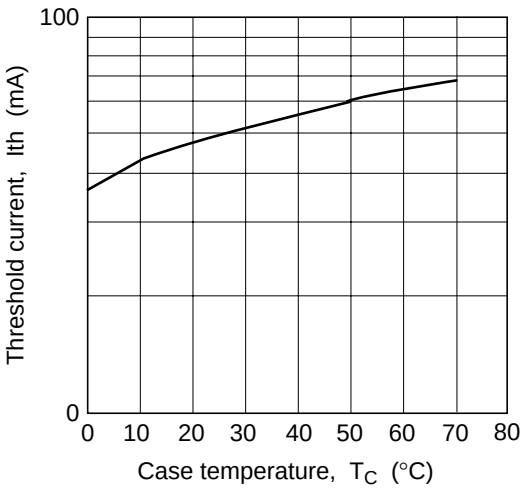
Note: Kink free is confirmed at the temperature of 25°C.

Typical Characteristic Curves

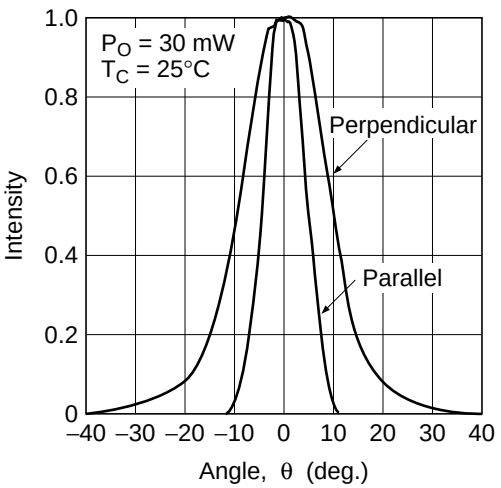
Optical Output Power vs. Forward Current



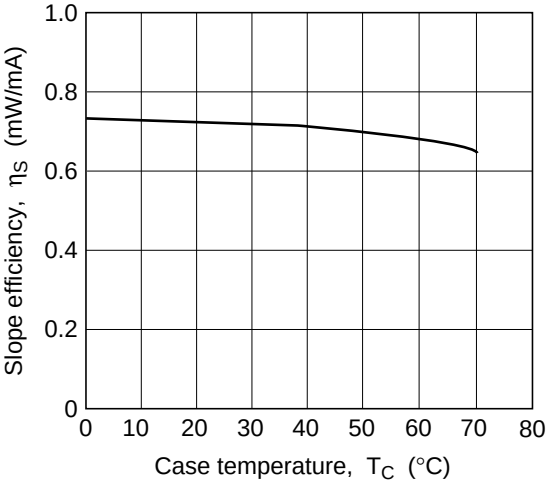
Threshold Current vs. Case Temperature



Far Field Pattern

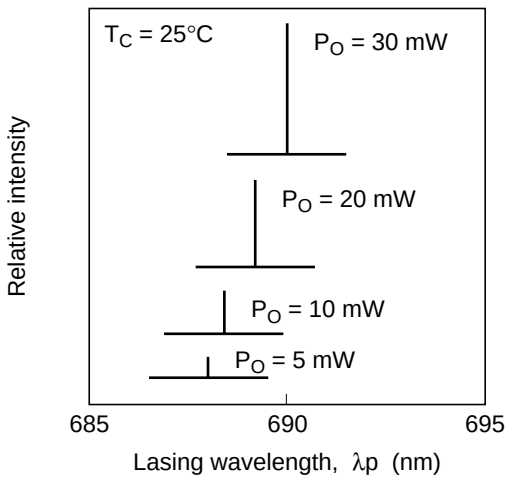


Slope Efficiency vs. Case Temperature

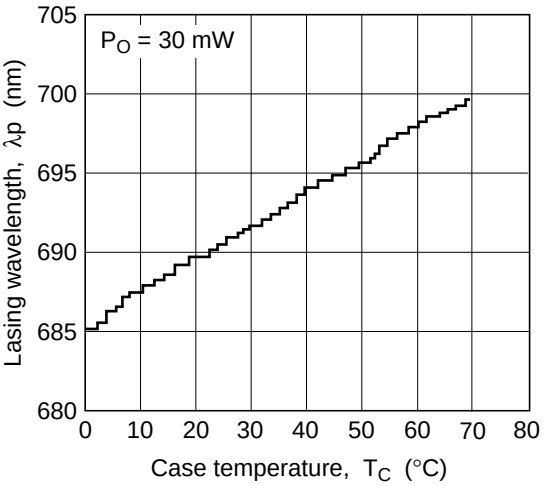


Typical Characteristic Curves (cont)

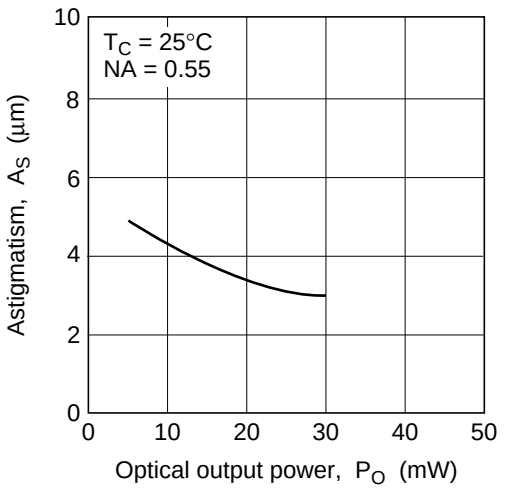
Lasing Spectrum



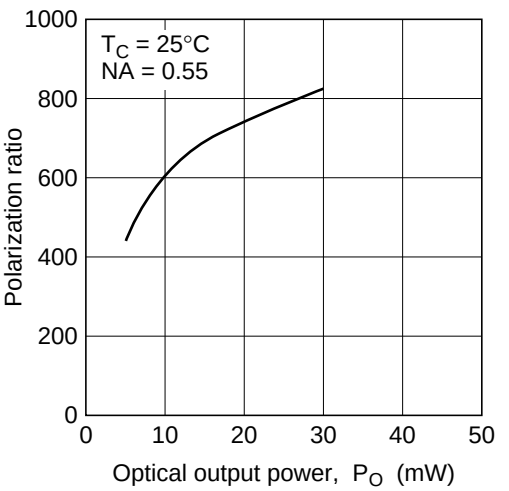
Lasing Wavelength vs. Case Temperature



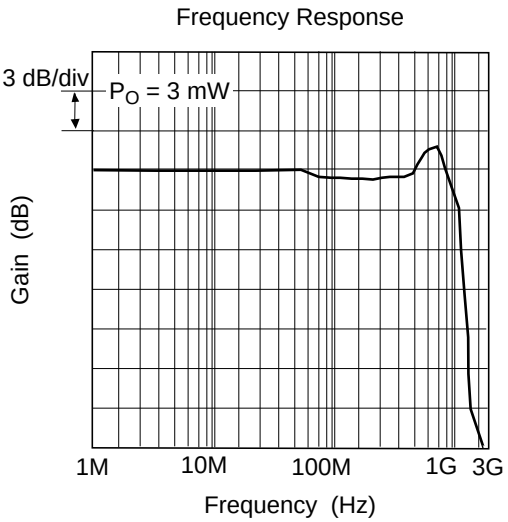
Astigmatism vs. Optical Output Power

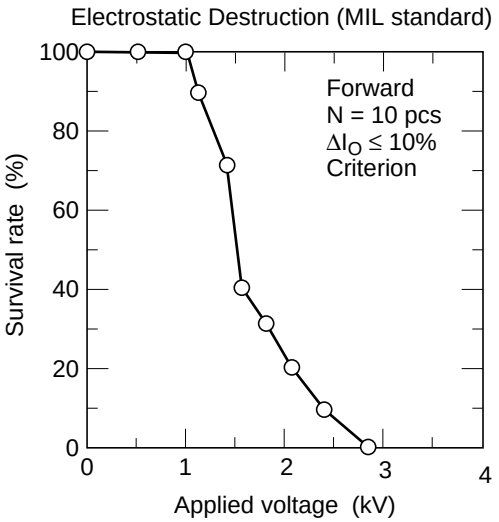


Polarization Ratio vs. Optical Output Power



Typical Characteristic Curves (cont)





HL6738MG

Visible High Power Laser Diode

HITACHI

ADE-208-601C (Z)
4th Edition
Dec. 2000

Description

The HL6738MG is a 0.68 μm band AlGaInP laser diode (LD) with a multi-quantum well (MQW) structure. It is suitable as a light source for large capacity optical disc memories and various other types of optical equipment.

Hermetic sealing of the small package (ϕ 5.6 mm) assures high reliability.

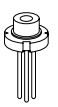
Application

- Optical disc memories
- Optical equipment

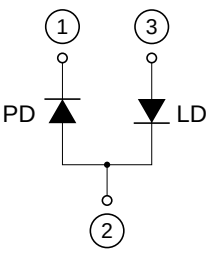
Features

- High output power : 35 mW (CW)
- Visible light output : λp = 680 to 695 nm
- Small package : ϕ 5.6 mm
- Low astigmatism : 6 μm Typ (P_O = 5 mW)

Package Type
• HL6738MG: MG



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Value	Unit
Optical output power	P_O	35	mW
Pulse optical output power	$P_{O(pulse)}$	50 *	mW
Laser diode reverse voltage	$V_{R(LD)}$	2	V
Photo diode reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +70	°C
Storage temperature	Tstg	–40 to +85	°C

Note: Pulse condition : Pulse width = 100 ns, duty = 50%

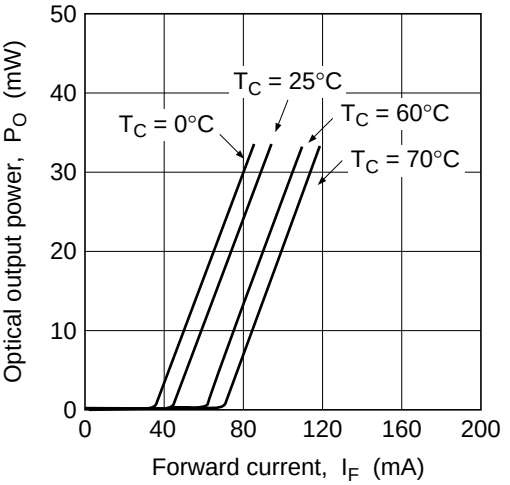
Optical and Electrical Characteristics (T_C = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	35	—	—	mW	Kink free *
Pulse optical output power	$P_{O(pulse)}$	50	—	—	mW	Kink free *
Threshold current	Ith	30	45	70	mA	—
Operating voltage	V_{OP}	2.1	2.5	2.8	V	P_O = 30 mW
Slope efficiency	ηs	0.5	0.7	0.9	mW/mA	18(mW) / ($I_{(24mW)}$ – $I_{(6mW)}$)
Beam divergence parallel to the junction	θ//	7	8.5	10.5	deg.	P_O = 30 mW
Beam divergence parpendicular to the junction	θ⊥	17	19	23	deg.	P_O = 30 mW
Asitgmatism	A_S	—	6	—	μm	P_O = 5 mW, NA = 0.55
Lasing wavelength	λp	680	690	695	nm	P_O = 30 mW
Monitor current	I_S	0.02	0.1	0.45	mA	P_O = 30 mW, $V_{R(PD)}$ = 5 V

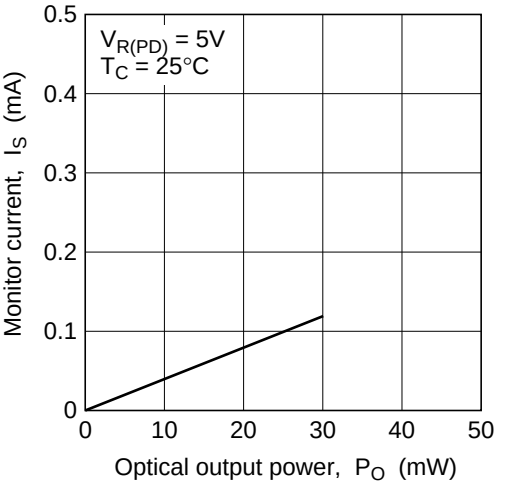
Note: Kink free is confirmed at the temperature of 25°C.

Typical Characteristic Curves

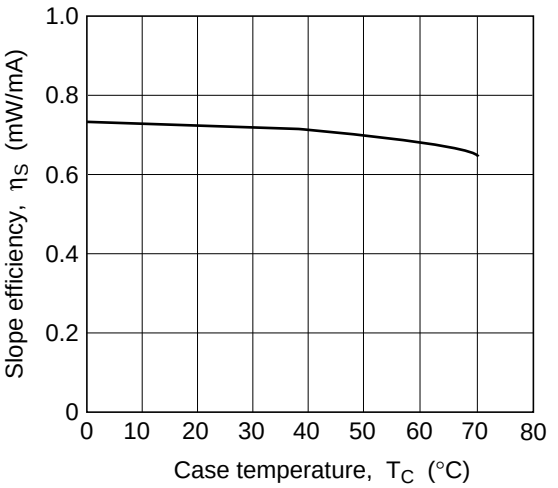
Optical Output Power vs. Forward Current



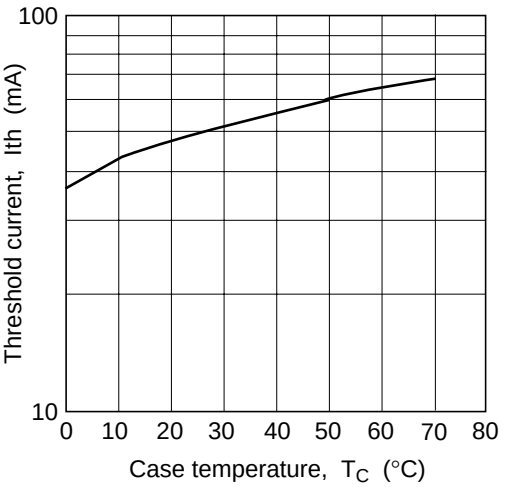
Monitor Current vs. Optical Output Power



Slope Efficiency vs. Case Temperature

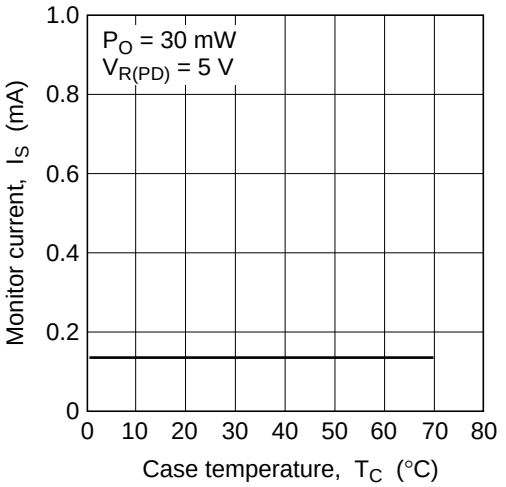


Threshold Current vs. Case Temperature

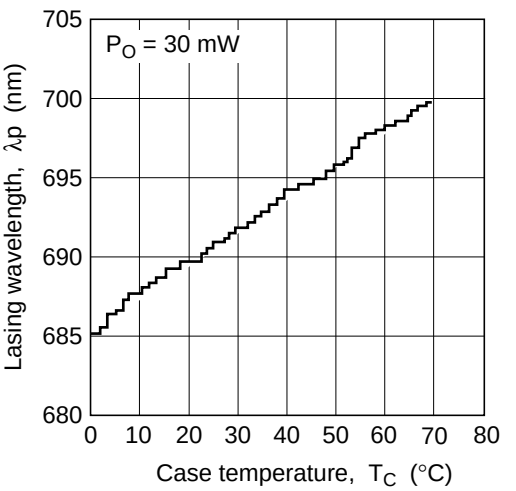


Typical Characteristic Curves (cont)

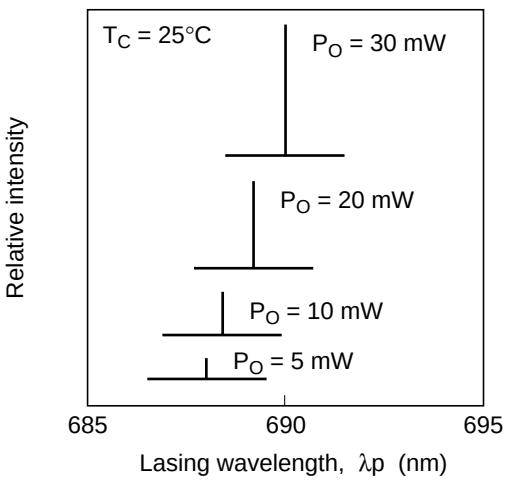
Monitor Current vs. Case Temperature



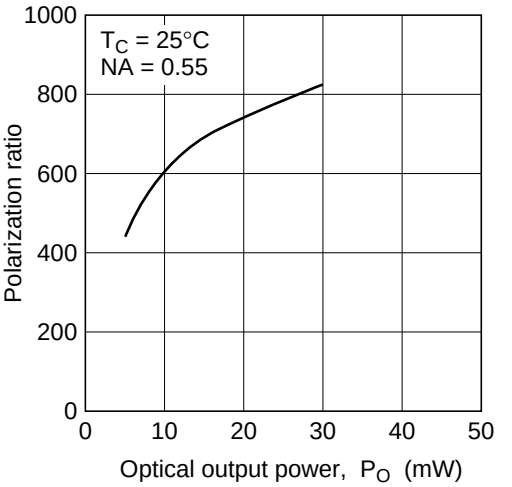
Lasing Wavelength vs. Case Temperature



Lasing Spectrum

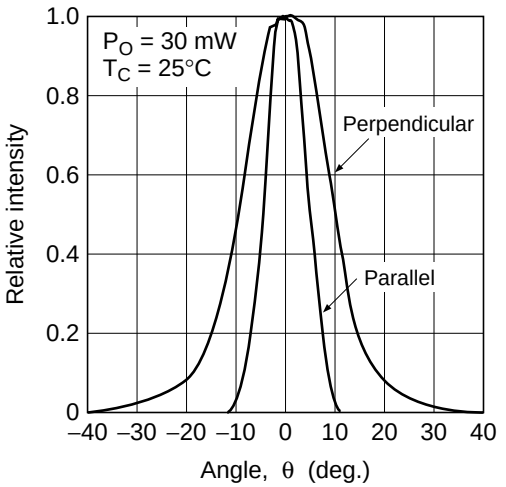


Polarization Ratio vs. Optical Output Power

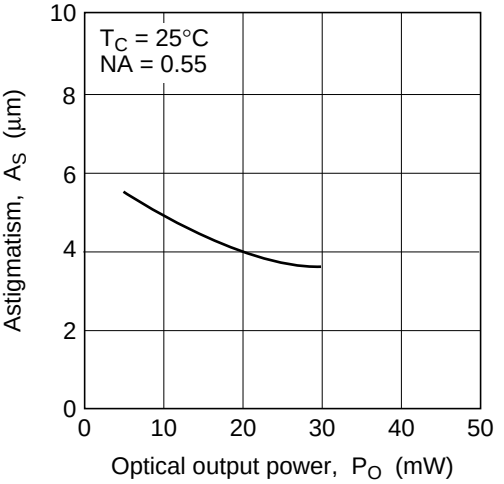


Typical Characteristic Curves (cont)

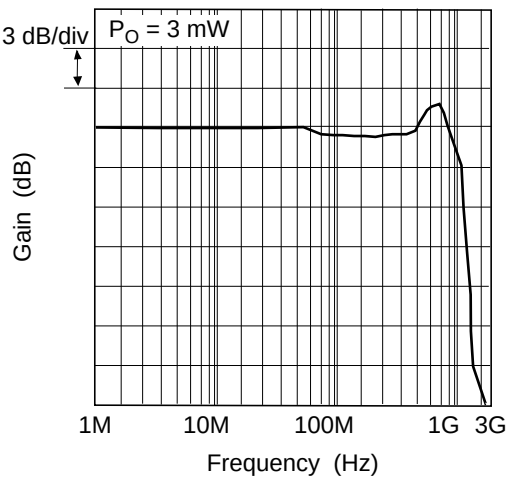
Far Field Pattern



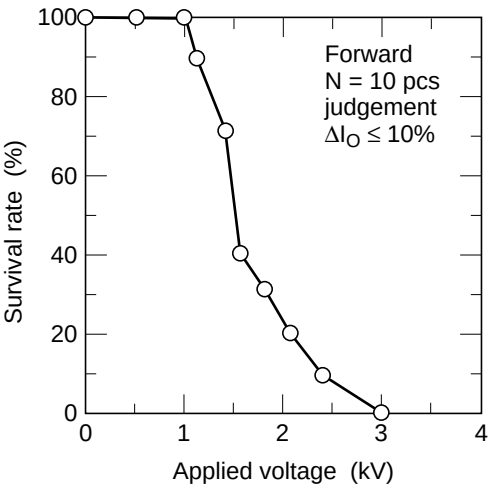
Astigmatism vs. Optical Output Power



Frequency Response



Electrostatic Destruction (MILstandard)



HL7859MG

Visible High Power Laser Diode

HITACHI

ADE-208-229D (Z)
5th Edition
Dec. 2000

Description

The HL7859MG is a 0.78 μm band GaAlAs laser diode with a multi-quantum well (MQW) structure. It is suitable as a light source for optical disc memories and various other types of optical equipment. Hermetic sealing of the small package (ϕ 5.6 mm) assures high reliability.

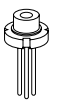
Application

- Optical disc memories

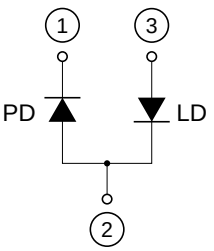
Features

- High output power : 35 mW (CW)
- Visible light output : λp = 775 to 795 nm
- Small package : ϕ 5.6 mm dia.
- Low astigmatism : 5 μm Typ (P_O = 5 mW)

Package Type
• HL7859MG: MG



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Value	Unit
Optical output power	P_O	35	mW
Pulse optical output power	$P_{O(pulse)}$	42 *	mW
Laser diode reverse voltage	$V_{R(LD)}$	2	V
Photo diode reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +60	°C
Storage temperature	Tstg	–40 to +85	°C

Note: Pulse condition : Pulse width ≤ 1 μs, duty ≤ 50%

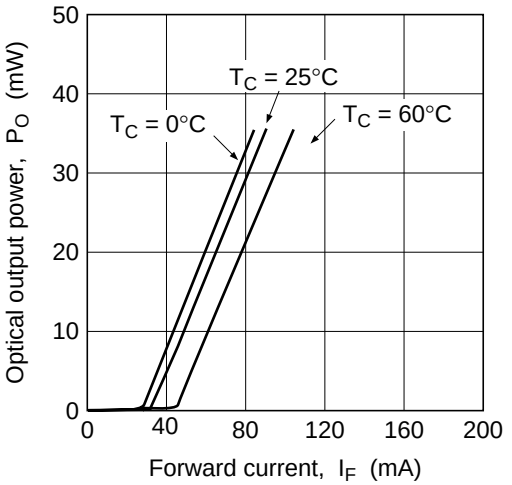
Optical and Electrical Characteristics (T_C = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	35	—	—	mW	Kink free *
Threshold current	Ith	—	35	60	mA	—
Operating voltage	V_{OP}	—	2.1	2.5	V	P_O = 35 mW
Slope efficiency	ηs	0.35	0.65	0.80	mW/mA	21 (mW) / ($I_{(28mW)}$ – $I_{(7mW)}$)
Beam divergence parallel to the junction	θ//	8	9.5	12	deg.	P_O = 35 mW
Beam divergence parpendicular to the junction	θ⊥	18	23	28	deg.	P_O = 35 mW
Asitgmatism	A_S	—	5	—	μm	P_O = 5 mW, NA = 0.4
Lasing wavelength	λp	775	785	795	nm	P_O = 35 mW
Monitor current	I_S	0.2	—	2	mA	P_O = 35 mW, $V_{R(PD)}$ = 5 V

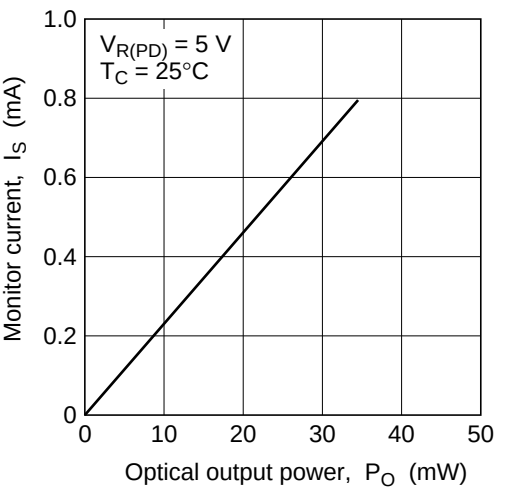
Note: Kink free is confirmed at the temperature of 25°C.

Typical Characteristic Curves

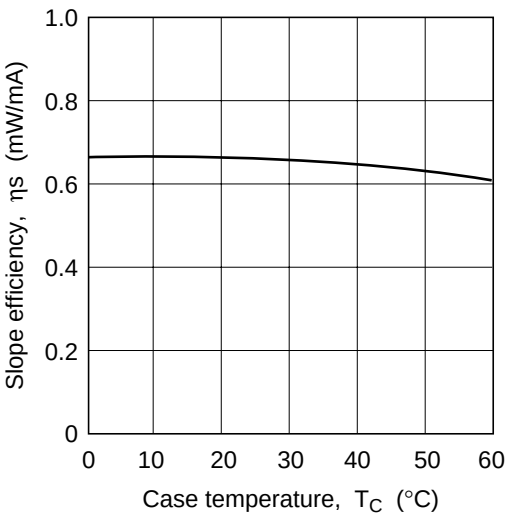
Optical Output Power vs. Forward Current



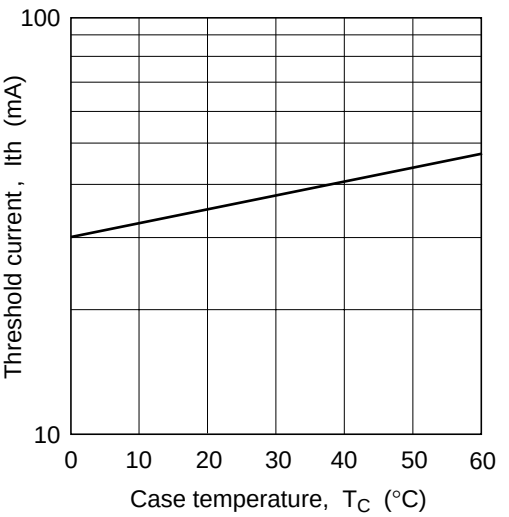
Monitor Current vs.Optical Output Power



Slope Efficiency vs. Case Temperature

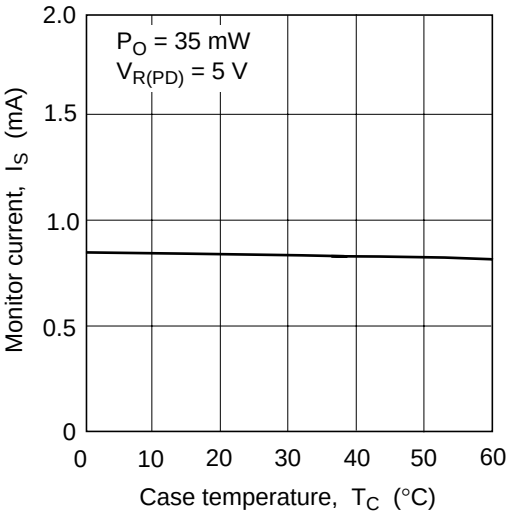


Threshold Current vs. Case Temperature

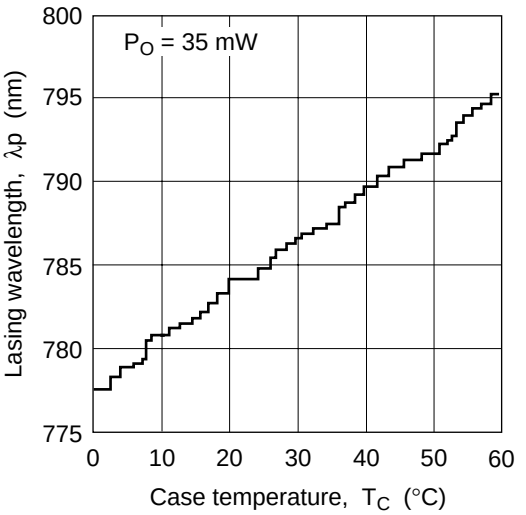


Typical Characteristic Curves (cont)

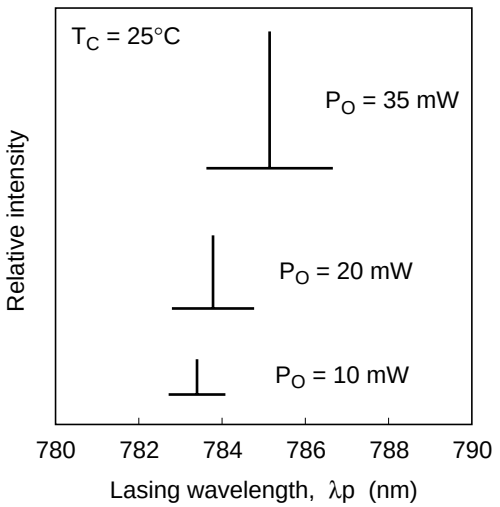
Monitor Current vs. Case Temperature



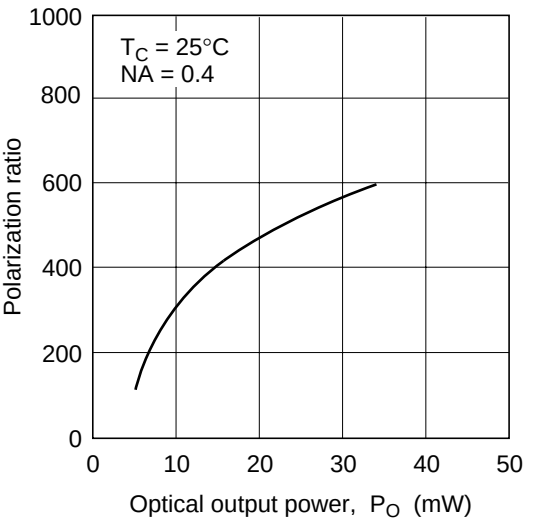
Lasing Wavelength vs. Case Temperature



Lasing Spectrum

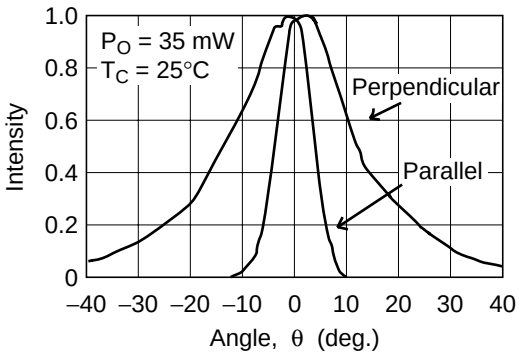


Polarization Ratio vs. Optical Output Power

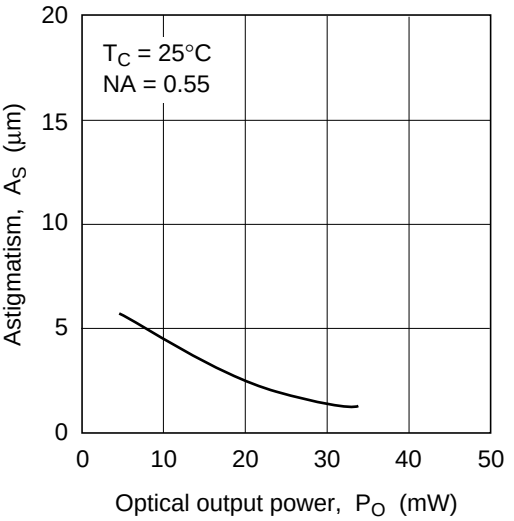


Typical Characteristic Curves (cont)

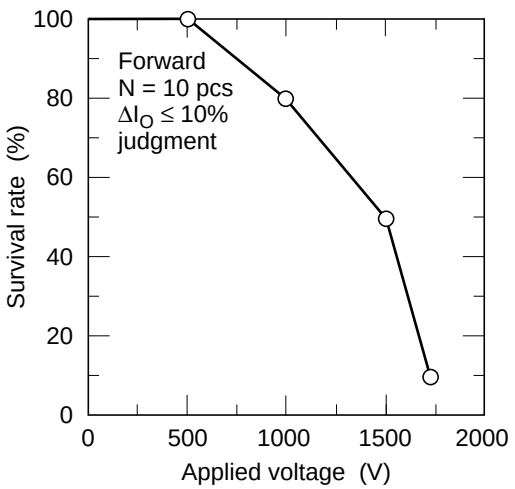
Far Field Pattem



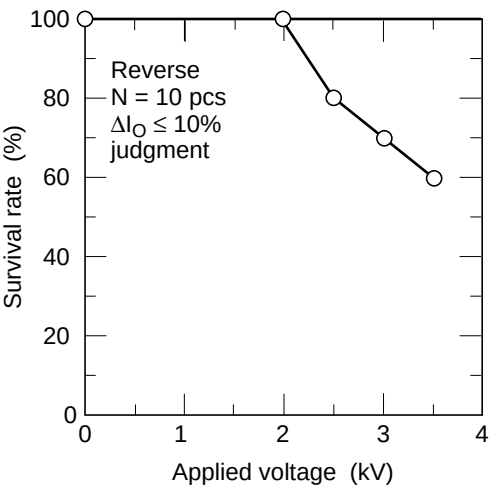
Astigmatism vs. Optical Output Power



Electrostatic Destruction(MIL standard)



Electrostatic Distruction (MIL standard)



HL8325G

GaAlAs Laser Diode

HITACHI

ADE-208-582A (Z)
2nd Edition
Dec. 2000

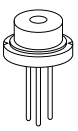
Description

The HL8325G is a high-power 0.8 μm band GaAlAs laser diode with a TQW (triple quantum well) structure. Its internal circuit configuration is suitable for operation on a single positive supply voltage. It is suitable as a light source for optical disk memories, card readers and various other types of optical equipment.

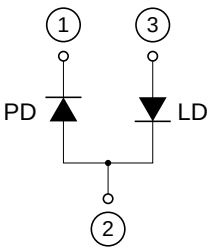
Features

- Infrared light output: λp = 820 to 840 nm
- High power: standard continuous operation at 40 mW (CW), pulsed operation at 50 mW
- Built-in monitor photodiode
- Single longitudinal mode

Package Type
• HL8325G: G2



Internal Circuit



Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Value	Unit
Optical output power	P_O	40	mW
Pulse optical output power	$P_{O(pulse)}$	50 *	mW
Laser diode reverse voltage	$V_{R(LD)}$	2	V
Photo diode reverse voltage	$V_{R(PD)}$	30	V
Operating temperature	Topr	–10 to +60	°C
Storage temperature	Tstg	–40 to +85	°C

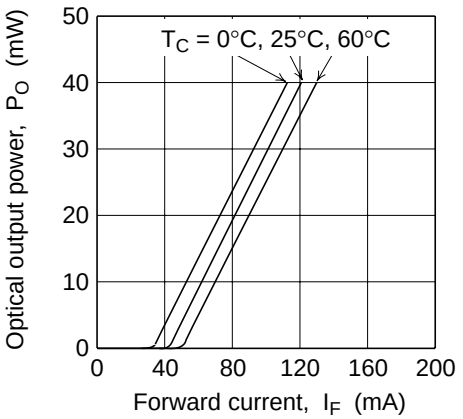
Note: Pulse condition : Pulse width = 1 μs, duty = 50%

Optical and Electrical Characteristics (T_C = 25°C ± 3°C)

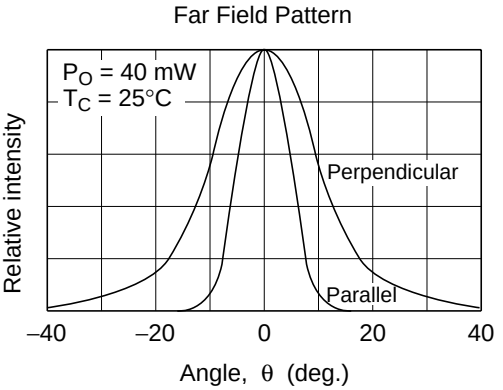
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Optical output power	P_O	40	—	—	mW	Kink free
Threshold current	Ith	—	40	70	mA	
Slope efficiency	ηs	0.4	0.5	0.9	mW/mA	24 (mW) / ($I_{(32mW)}$ – $I_{(8mW)}$)
Beam divergence parallel to the junction	θ//	7	10	14	deg.	P_O = 40 mW, FWHM
Beam divergence parpendicular to the junction	θ⊥	18	22	32	deg.	P_O = 40 mW, FWHM
Asitgmatism	A_S	—	5	—	μm	P_O = 4 mW, NA = 0.4
Lasing wavelength	λp	820	830	840	nm	P_O = 40 mW
Monitor current	I_S	20	40	130	μA	P_O = 4 mW, $V_{R(PD)}$ = 5 V

Typical Characteristic Curves

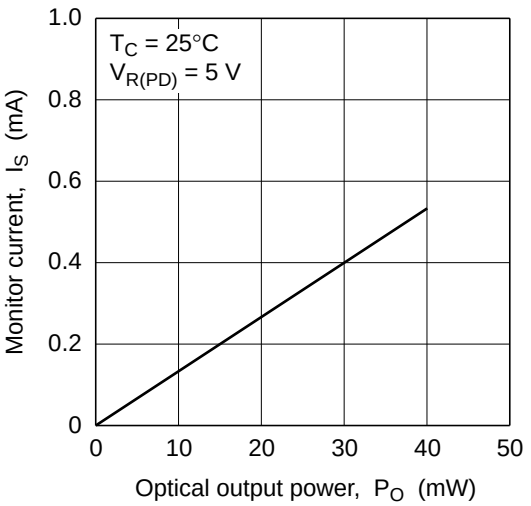
Optical Output Power vs. Forward Current



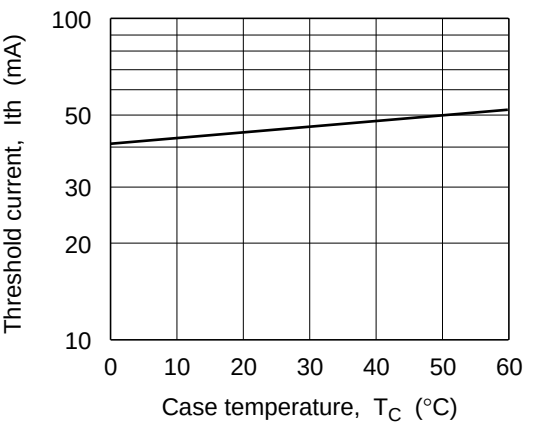
Far Field Pattern



Monitor Output vs. Optical Output Power

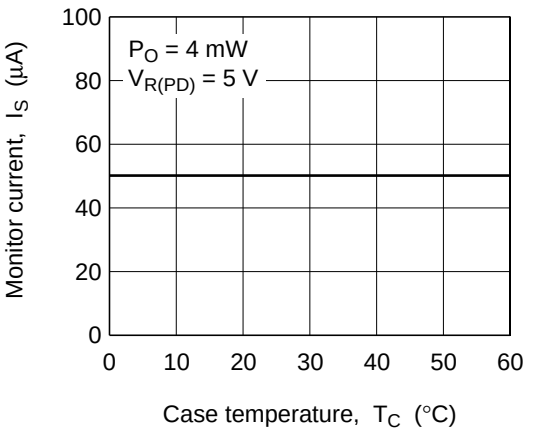


Temperature Dependence of Threshold Current

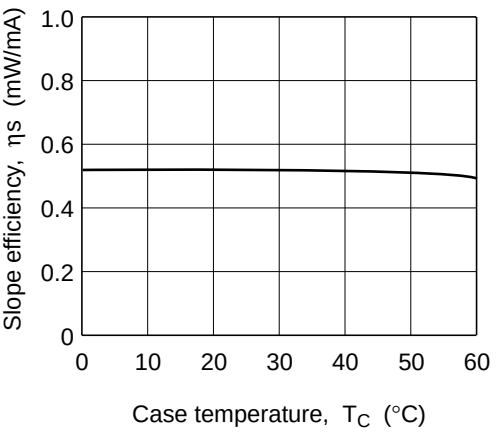


Typical Characteristic Curves (cont)

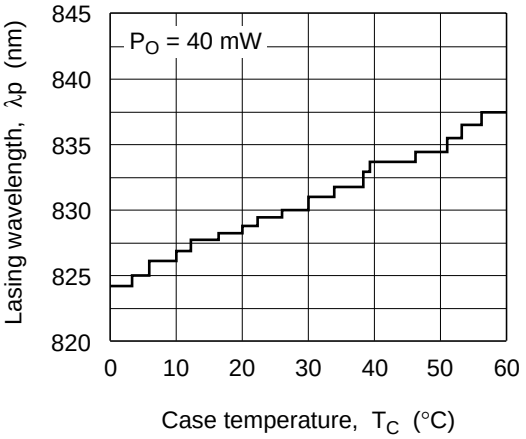
Temperature Dependence of Monitor Current



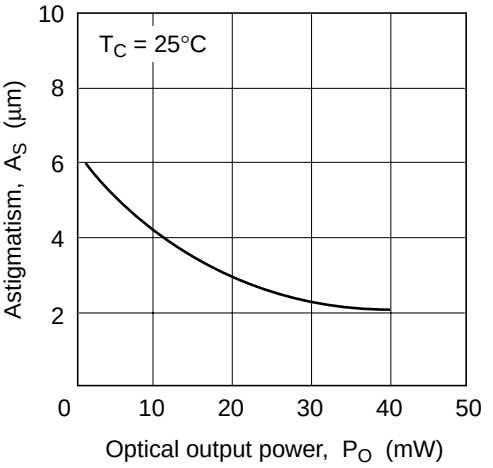
Temprature Dependence of Slope Efficiency



Temperature Dependence of Lasing Wavelength



Optical Output Power Dependence of Astigmatism



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