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LIGHTING DEVICE DIVISION
ELECTRONIC COMPONENTS AND DEVICES GROUP
SHARP CORPORATION

TECHNICAL LITERATURE

DEVICE TECHNICAL LITERATURE FOR

Laser Diode

MODEL No.

GH0942WA2G

◆ This technical literature is subject to change without notice. ◆

SHARP CORPORATION
ELECTRONIC COMPONENTS AND DEVICES GROUP

Product name : Laser Diode
Model No. : GH0942WA2G

2. When using this Sharp product, please observe the absolute maximum ratings, other conditions and instructions for use described in the specification sheets, as well as the precautions mentioned below. Sharp assumes no responsibility for any damages resulting from use of the product which does not comply with absolute maximum ratings, other conditions and instructions for use included in the specification sheets, and the precautions mentioned below.

(Precautions)
(1) In making catalogue or instruction manual based on the specification sheets, please verify the validity of the catalogue or instruction manuals after assembling Sharp products in customer's products at the responsibility of customer.

(2) This Sharp product is designed for use in the following application areas ;
• Computers • OA equipment • Telecommunication equipment (Terminal) • Measuring equipment
• Tooling macl * OA equipment * Audio visual equipment * Home appliance
If the use of the * Telecommunication equipment (Terminal) * Measuring equipment
please be sure tc * Tooling machines * Computers

(3) Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when Sharp product is used for equipment in responsibility of customer which demands high reliability and safety in function and precision, such as ;
• Transportation control and safety equipment (aircraft, train, automobile etc.)
• Traffic signals • Gas leakage sensor breakers • Rescue and security equipment
• Other safety equipment

(4)Sharp product is designed for consumer goods and controlled as consumer goods in production and quality. Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;
• Space equipment • Telecommunication equipment (for trunk lines)
• Nuclear power control equipment • Medical equipment

(5) Please contact and consult with a Sharp sales representative if there are any question regarding interpretation of the above four paragraphs.

3. Disclaimer
The warranty period for Sharp product is one (1) year (or six (6) months in case of generalized product) after shipment. During the period, if there are any products problem, Sharp will repair (if applicable), replace or refund. Except the above, both parties will discuss to cope with the problems.

The failed Sharp product after the above one (1) year (or six (6) month for generalized product) period will be coped with by Sharp, provided that both parties shall discuss and determine on sharing responsibility based on the analysis results thereof subject to the above scope of warranty.

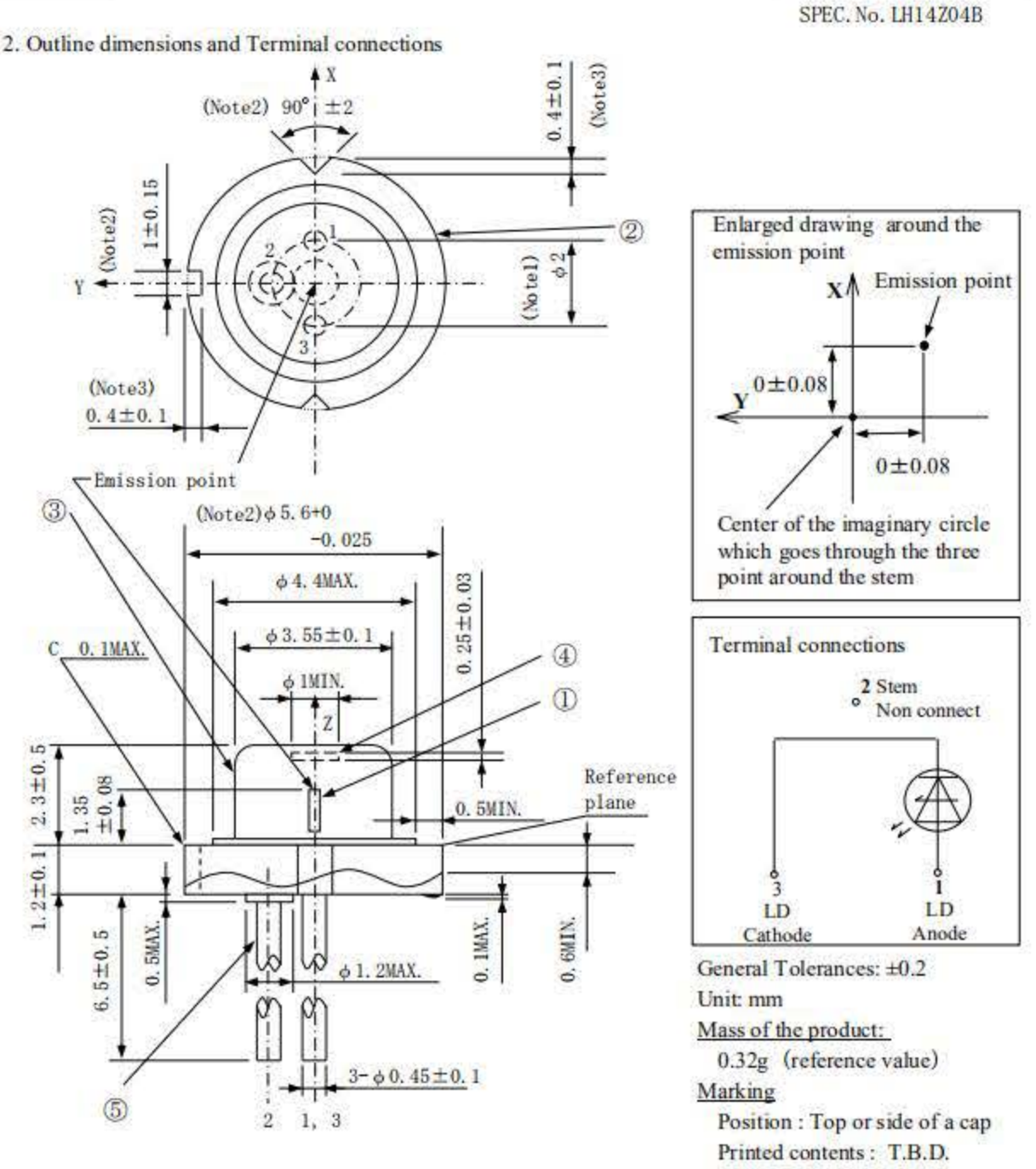
The warranty described herein is only for Sharp product itself which are purchased by or delivered to customer. Damages arising from Sharp product malfunction or failure shall be excepted.

Sharp will not be responsible for the Sharp product due to the malfunction or failures thereof which are caused by:
(1) storage keep trouble during the inventory in the marketing channel.
(2) intentional act, negligence or wrong/poor handling.
(3) equipment which Sharp products are connected to or mounted in.
(4) disassembling, reforming or changing Sharp products.
(5) installation problem.
(6) act of God or other disaster (natural disaster, fire, flood, etc.)
(7) external factors (abnormal voltage, abnormal electromagnetic wave, fire, etc.)
(8) special environment (factory, coastal areas, hotspring area, etc.)
(9) phenomenon which cannot be foreseen based on the practical technologies at the time of shipment.
(10) the factors not included in the product specification sheet.

4. Please contact and consult with a Sharp sales representative for any questions about Sharp product.

1. Scope
This technical literature covers the appearance and characteristics of infra red Laser Diode, Model No. GH0942WA2G
【Outline of this product】
This product is equipped with an GaAlAs multiple quantum well infra red laser diode .
Oscillating transverse mode of this model is TE.

2. Outline dimensions and Terminal connections



General Tolerances: ±0.2
Unit: mm
Mass of the product:
0.32g (reference value)
Marking
Position : Top or side of a cap
Printed contents : T.B.D.

(Note 1) Dimension of the bottom of leads.
(Note 2) These dimensions are valid only in the range of 0~0.6mm below from the reference plane.
(Note 3) These dimensions are defined from the imaginary circle which goes through the three points around the stem to the bottom of cut off parts.

No.	Component	Material	Finish
①	Laser diode chip	AlGaInP/GaAlAs	-
②	Stem	Fe	Au plated
③	Cap	45 Alloy	Ni+Pd plated
④	Window glass	Borosilicate glass	Typ. n=1.516 (λp = 830nm)
⑤	Lead pins	Kovar	Au plated

3. Ratings and Characteristics
3-1 Absolute Maximum Ratings (Tc=25℃ (Note 1))

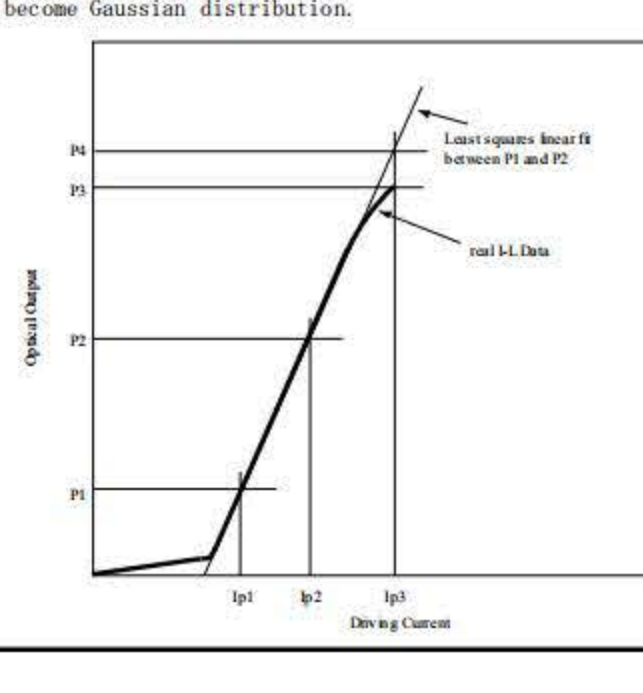
Parameter	Symbol	Value	Unit
Optical power output (CW) (Note 2)	Po	700	mW
Optical power output (Pulse) (Note 3)	Pp	2,000	mW
Reverse voltage	Vrl	2	V
Operating temperature (Case temperature)	Top(c)	-10 ～ +70	℃
Storage temperature	Tstg	-40 ～ +85	℃
Soldering temperature (Note 4)	Tsld	350	℃

(Note 1) Tc : Case temperature
(Note 2) CW : Continuous Wave Operation
(Note 3) Pulse : Pulse Operation (Pulse Width:1 μs Duty:10%)
(Note 4) Soldering temperature means soldering iron tip temperature (The power 20W) while soldering. Soldering position is 1.6mm apart from bottom edge of the case. (Immersion time: ≦3s)

3-2 Electro-optical Characteristics (Tc=25℃ (Note 1))

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Threshold current	Ith	-	-	200	T.B.D.	mA
Operating current	Iop	Po=700mW	-	1,000	T.B.D.	mA
Operating voltage	Vop		-	2	T.B.D.	V
Wavelength	λp		930	940	950	nm
$1/e^2$ Intensity Angle (Parallel) (Note 2,3,4)	$\theta /\!/ (1/e^2)$		T.B.D.	15	T.B.D.	°
$1/e^2$ Intensity Angle (Perpendicular) (Note 2,3)	$\theta \perp (1/e^2)$		T.B.D.	45	T.B.D.	°
Misalignment angle (Parallel) (Note 3)	$\Delta\theta /\!/ (1/e^2)$		-5	-	5	°
Misalignment angle (Perpendicular) (Note 3)	$\Delta\theta \perp (1/e^2)$		-5	-	5	°
Differential efficiency	ηd	$\frac{600mW}{I(700mW)-I(100mW)}$	T.B.D.	0.9	T.B.D.	mW/mA
Kink (Note 5)	K-LI	P1=100mW, P2=500mW P3=700mW	-10	-	10	%

(Note 1) Initial value, Continuous Wave Operation
(Note 2) Full angle of 13.5%(≒$1/e^2$) peak intensity
(Note 3) Parallel to the junction plane(X-Z plane)
Perpendicular to the junction plane(Y-Z plane)
(Note 4) This laser is multi-mode laser.
Parallel (Horizontal) FFP does not become Gaussian distribution.
(Note 5) Definition of K-LI
K-LI = (P4 - P3) / P3



4. Reliability
4-1 The reliability of products satisfy all the items listed below.
Reference Standards : JIS Confidence level : 90%

No.	Test	Test Conditions	Samples:n	Defective:C	LTPD(%)	Failure criteria No. [4-2]
1	Solderability	Soldering temperature: 240±5℃ (Flux used) Immersion time:5±0.5s	11	0	20	1
2	Resistance to soldering	Soldering iron tip temperature: 350±5℃ Immersion time:3±1s (Note 1)	11	0	20	3,4,5
3	Terminal strength (Tensile test)	Load:5N Duration:5±1s Once for each terminal	11	0	20	2
4	Terminal strength (Bending test)	Load:2.5N 0°～90°～0°～-90°～0° Once for each terminal	11	0	20	2
5	Mechanical shock	Acceleration:1000m/s² Pulse width:6ms Direction:±X, ±Y and ±Z Three times for each direction	11	0	20	3,4,5
6	Variable frequency vibration	Acceleration:100m/s² or Amplitude:1.5mm Frequency: 10～500～10Hz 15min reciprocation Direction: X, Y and Z 2 h for each direction	11	0	20	3,4,5
7	Temperature cycling	Lower temperature:-40℃ Higher temperature:+85℃ Duration:30min each, 30 times	11	0	20	3,4,5
8	High temperature storage	Storage temperature:85℃ t=500 h	11	0	20	3,4,5
9	Low temperature storage	Storage temperature:-40℃ t=500 h	11	0	20	3,4,5

(Note 1) Soldering position is 1.6mm apart from bottom edge of the case.
(Note 2) To be measured after 72 hours exposure to the room atmosphere.
(Note 3) These test results are sampling examples from a specific lot for reference purpose only, and do not constitute any warranty or assurance in connection with the devices.

4-2 Parameters to be measured and Failure criteria

No.	Parameters	Failure judgment criteria
1	Solderability	95% or more is covered with solder.
2	Terminal strength	It is defective if there are breaking and loosening.
3	Threshold current	Ith > initial value ×1.2, Ith < initial value ×0.8
4	Operating current	Iop > initial value ×1.2, Iop < initial value ×0.8
5	Operating voltage	Vop > initial value ×1.1, Vop < initial value ×0.9

4-3 Lifetime Test
The target mean time to failure (MTTF) of this product is more than (T.B.D.) h. MTTF is confirmed by performing the operating test under the following conditions in time of development or change process related to the reliability of this product.
Samples tested should have a laser diode chip with the same structure of this model.

Conditions	Failure judgment criteria
Tc=70℃, If=1A, 500 hours ACC operation	Failure is defined as the time under the operating power under the conditions in the left changes 20% of the initial (12 h) value. (Note 1) As for the samples which do not fail within 500 hours, their life time is calculated by extrapolating operating power data of between 400 and 500 hours. MTTF is estimated by plotting each life time in Weibull function worksheet. (Note 1)

(Note 1) Defective samples caused by surge current is rejected.
(Note 2) These test results are sampling examples from a specific lot for reference purpose only, and do not constitute any warranty or assurance in connection with the devices.

5. Incoming inspection
5-1 Inspection standards ISO 2859 single sampling plan
5-2 Inspection level S-2 normal inspection
5-3 AQL
5-3-1 Definition of the lot the day shipping the product
5-3-2 Characteristics

AQL	Parameter	Failure judgment criteria
1.0	Ith, Iop, Vop, ηd, λp, θ//, θ⊥, Δθ//, Δθ⊥	Not conforming to the specifications

(Note1) Inspection is performed after blowing.

5-3-3 Appearance

AQL	Failure judgment criteria
1.0	Marking is not sufficiently clear to read.
	Bent lead can not be restored.
2.5	Diameter of stem is not conforming the specification

6. Supplements
6-1 ODS materials
This product shall not contain the following materials. Also, the following materials shall not be used in the production process for this product.
Materials for ODS : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methyl chloroform)

6-2 RoHS compliant product
This product complies with the RoHS Directive (2011/65/EU) and manufactured in accordance with Sharp's Green Device Guidelines.

6-3 Chemical substance information in the product
Product Information Notification based on Chinese law, Management Methods for Controlling Pollution by Electronic Information Products.
Names and Contents of the Toxic and Hazardous Substances or Elements in the Product

Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
○	○	○	○	○	○

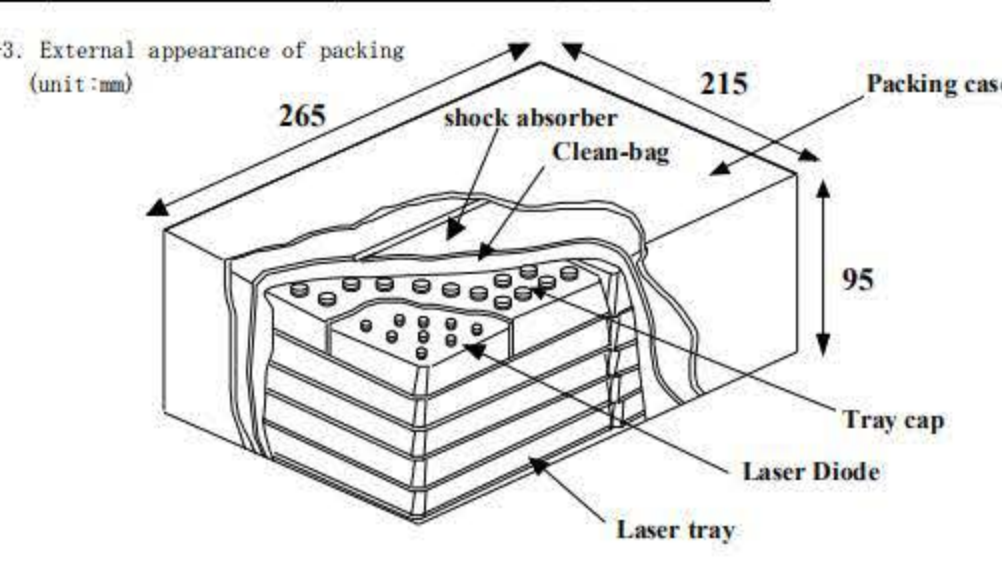
○ : indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in GB/T26572 standard.
× : indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the part exceeds the concentration limit requirement as described in GB/T26572 standard.

6-4. Packing
6-4-1. Packing method
(1) Laser diodes are arranged in a tray.
(2) One tray can accommodate 200 lasers maximum.
(3) A vacant tray is stacked as a cover on the tray wherein the laser diodes are arranged. including a cover are bound with adhesive tape.
(4) The above bound trays are stuffed into a clean-bag. The bag is sealed by dissolving thermally.
(5) The trays in the bag are put into a packing case. One packing case can accommodate 2 000 lasers maximum, which is the minimum unit of packing. A Label where in the model number ,quantity and lot number are printed is stuck on both of the bag and the case (Refer to 6-4-4).

6-4-2. Materials for packing

No.	Component parts	Material
1	Laser tray	conductive polystyrene resin
2	Tray cap	conductive polystyrene resin
3	Clean-bag	anti-static plastic
4	Packing case	cardboard
5	shock absorber	anti-static polyethylene

6-4-3. External appearance of packing
(unit:mm)



6-4-4. Label

(1) A label on the clean-bag

TYPE	Model No. (Note2)
QTY	Quantity
LOT	Lot No. (Shipping Date)

SHARP CORPORATION MADE IN ****(Note 1) R.C. (Note 3)

(2) A label on the packing case

TYPE	Model No. (Note2)
QTY	Quantity
LOT	Lot No. (Shipping Date)

SHARP CORPORATION MADE IN ****(Note 1) R.C. (Note 3)

(Note 1) **** : Production country
(Note 2) A management number in the factory is written in ( ), if the product produced in a factory except Japan.
(Note 3) This identification mark shows the settlement product for RoHS designed by using a green material based on our green device guideline.

7. Operating and handling precautions
(1) This product has its life. The product life which is described in "4. Reliability" should be taken into account when using it.
(2) This product will be damaged by electrostatic discharge (ESD). Following precautions should be taken to avoid ESD damage.
⇒ Workers, workbenches and other equipment should always be grounded. Workers should always wear an antistatic wrist strap and an antistatic smock on them.
⇒ When handling this product, workers should always wear antistatic gloves or finger covers.
⇒ A stable DC power supply which is free from electrical transients should always be used when operating this product. A slow starter circuit should always be inserted between the power supply and this product in order to protect it from DC power surges.
⇒ Optical power output of this product should be set with a highly reliable and high quality variable resistance.
⇒ This product should always be connected to the driving circuit by soldering directly or through highly reliable connectors.
⇒ While this product is being operated, be sure to avoid touching the driving circuit or the terminals of this product with electrical probes from a synchroscope or a voltmeter.
⇒ An antistatic package should be used when storing this product.
⇒ This product should be processed in the rooms where relative humidity is kept at 50-70%RH.
(3) Process products in clean rooms, and avoid touching with bare hands. Because laser beam is highly coherent, dust traces or fingerprints on the window glass are sufficient to interfere with the passing beam, causing ripples in the far field pattern.
(4) A sufficient heat sink should be attached to this product when operating so that its case temperature is to be maintained at the same level as that of the surrounding.
(5) Even if the drive current supply has an automatic power control (APC), automatic current control (ACC), or both, be sure to monitor the optical power output with an optical power meter while setting it. Never estimate the optical power output only from the drive current because it is likely to be decreased by temperature rise of the surrounding.
(6) If the window glass of this product should become soiled, gently clean it with a cotton swab dipped in ethyl alcohol.
(7) Do not allow the heat sink to apply excessive pressure to the package cap. Because a window glass is as thin as 0.25mm.
(8) Although the beam emitted by this laser diodes is nearly invisible, it will be harmful to the human eyes. So the following precautions should be taken.
⇒ When this product is being operated, the emitting surface of a chip should not be viewed either directly or through a lens, microscope or optical fibers.
⇒ When operating this product, wear safety glasses.
⇒ To adjust the optical axis of this laser diode and peripheral devices, use an IR scope or a fluorescent screen that converts infrared light to visible light.
(9) When soldering this product, heat lead pins only using a soldering iron. Avoid heat the whole package using pre-heat or reflow soldering.