

### Introduction

Panasonic offers a series of dual-wavelength and single-wavelength laser diode (LD) realized by the proprietary MOCVD fabrication technology. The LD, which emits 660nm and/or 780nm laser light, is assembled in a versatile TO-56 CAN package.



Fig.1 Photograph of TO-CAN laser diode

### Application

- Optical disk drive
- Sensing
- Analysis
- Measurement
- Agriculture
- Other industrial use

### Caution for Safety

The products are ranked “Class IIb laser” according to IEC60825-1 and JIS standard 6802 “Laser Product Emission Safety Standards”, and can be hazardous to the human eyes, so that safety protection is necessary when laser beam is radiated.

The products contains Gallium Arsenide (GaAs).GaAs powder and vapor are hazardous to human health if inhaled or ingested. Do not burn, destroy, cut, cleave

off, or chemically dissolve the product. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.

### Package type

The Panasonic can provide two main types of LD package. One is a can type package and the other is an open-type frame package. In this note we provide explanations about a versatile TO-56 CAN type packaged LD series.

Please pay attention to the following points to make use of these advantages and ensure highly reliable operation.

### Precautions for ESD (Electro Static Discharge) and surge stress

A laser diode (LD) is one of the most sensitive devices to ESD and electrical surge, so that strict precautions are required when using LDs. If electric pulses that may cause optical emission over the absolute maximum ratings of a laser power are applied to a LD, the LD will be damaged by its own light intensity, resulting in degradation in a short period. Therefore, taking all possible measures against ESD and electrical surge for LD usage is strongly required at the design stage and production line.

Please insert an appropriate protection circuit in the drive circuit of LD, check the whole drive circuits including machine power supply, and take appropriate steps, in order that spike noises generated by

turning on/off the power supply do not exceed the absolute maximum rating of LD. There is a possibility of laser destruction by unexpected electrical pulses generated by nearby equipment. Please avoid turning on/off a fluorescent lamp or other measurement equipment etc., near LD products.

Please take the following measures to prevent a LD from breaking by ESD when handling :

- Using a wrist band (through 1 MΩ)
- Setting conductive mats on the floor and work tables
- Wearing conductive work uniforms and shoes
- Grounding the tip of a solder iron

Use of an ionizer and control of humidity and temperature are recommended especially in a facility or environment where static electrical charge can be easily generated.

### Precaution at soldering

Please pay special attention to any temperature rise when heating the solder. Excess heating to laser diode package during soldering may affect eutectic solder and/or laser diode itself. Soldering must be done as quickly as possible with controlling the heating temperature. Lead (terminal) soldering with appropriate cooling time is strongly recommended. Also soldering position of lead(terminal) is recommended to be more than 2mm away from the package body.

It is recommended to solder only one lead(terminal) at a time for a short period of time (after heating one lead with solder iron or laser beam etc., cooling down, then, heat another lead). Heating all the leads at once should be avoided. In addition, it is recommended to radiate heat by placing the package on a heat sink, because the package temperature becomes too high even when the lead alone is heated.

Please note that when a LD is exposed to mechanical stress like vibration etc. at high temperatures when soldering, the stress may affect the package, leading to possible change of LD characteristics.

- Soldering temperature, time and position

Temperature

: Below 350°C

Time

: Within 3sec recommended

Soldering position

: 2mm away from package body

### Mechanical stress

#### Pressure to package

This product is hermetic-sealed from the atmosphere with metallic cap and window-glass. Excess mechanical stress may cause mechanical damage to the window-glass and/or breakage of the sealing, which will extremely shortening the lifetime of a LD. Special care should be taken to avoid excess mechanical stress to the LD package when attaching it to a heat sink.

### Lead forming and cutting

Basically lead(terminal) is recommended to use with same condition as shipment. However, some sort of modification of lead forming or cutting may be required for its application. In such cases, please keep the following cautions. Lead forming is recommended to be 2.6mm away from the package body in order to avoid additional mechanical stress to the hermetic sealing. Also, lead forming or cutting has to be carried out at the room temperature before soldering. The forming and cutting process at high temperature may put thermal and mechanical stresses in the package, which cause severe degradation of laser diode characteristics.

Panasonic shall not be responsible for any failures and damages caused by customers lead forming and cutting process.

### Storage condition (in-process)

The surface of package lead(terminal) is metallic plated to ensure good soldering and good electrical contact. Corrosive atmosphere during storage is likely to change its surface characteristics. From this view point, this product is packed in a damp-proof aluminum laminated bag to assure its quality at the shipment. In case of long-period storage after opening damp-proof packing, remaining devices should be used at least within one year to keep its quality. After opening the packing, a recommended storage condition until next mounting is in the ranges of 5~35°C and 45~75%RH.

### Heat sink design of LD

Generally, lifetime of laser diode device gets shorter as environmental temperature increases. It is important to design good heat dissipation scheme in order to maximize its performance.

Mounting example of CAN packaged LD is shown in Fig.2.

In applications using a heat sink, the most effective way to dissipate heat is bringing the heat sink into contact with the base plate.

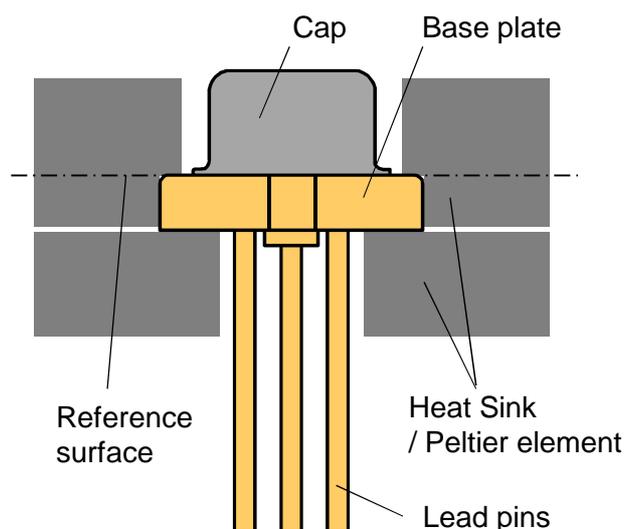


Fig.2 Mounting example of to56 package

In Fig.3 the influence of heat dissipation condition for the output power versus operating current is shown for a RED laser diode. If inadequate thermal management is used, the saturated output power can be less than half of that when appropriate thermal management is used.

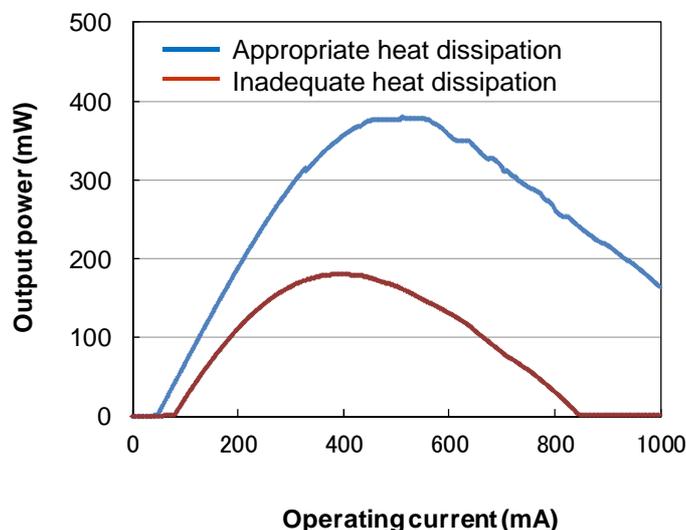


Fig.3 Output power examples depending on thermal conditions of RED laser diode (LNCQ28PS01WW).

If heat dissipation is not good enough, sometime may damage laser-diode with excess current supplied through APC (Auto Power Control) circuit.

**LD driving**

To operate an LD, constant and/or modulated current source is required, because LD is a current-driven device. The current source must have very low switching noise characteristics to prevent LD degradation due to surge currents associated with turning on/off of the electrical power. As temperature changes, optical output power from LD for a given current will change. Therefore, APC function is necessary for applications that require a constant output power over a wide range of temperatures.

Usually, a photodiode (PD) is used to monitor the power. The signal from the PD will be fed back to the current source to maintain the output power from LD at a constant level.

Depending on the application type, LD driving current source should be selected, from the viewpoints of maximum current, maximum voltage, and with or without modulation and APC function.

Pin connections are shown in Fig.4.

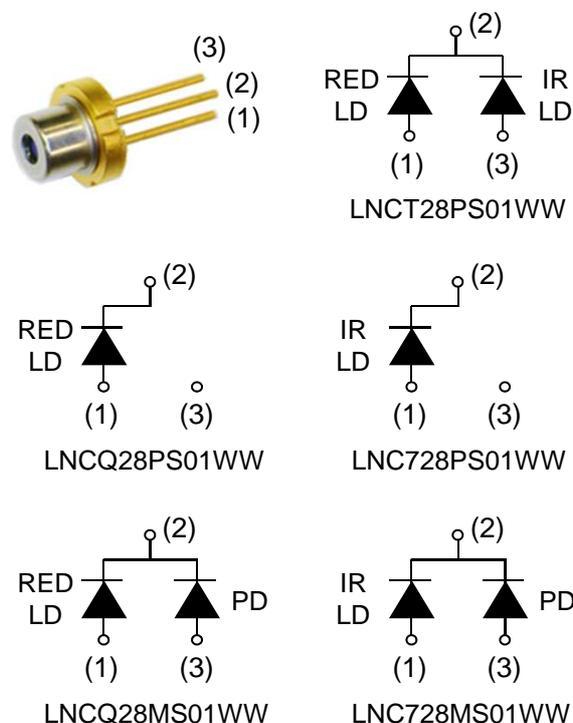


Fig. 4 Pin connections

**Equivalent circuit**

To assist with the selection of the LD driving current source, an equivalent circuit of Panasonic CAN packaged LD is shown in Fig.5.

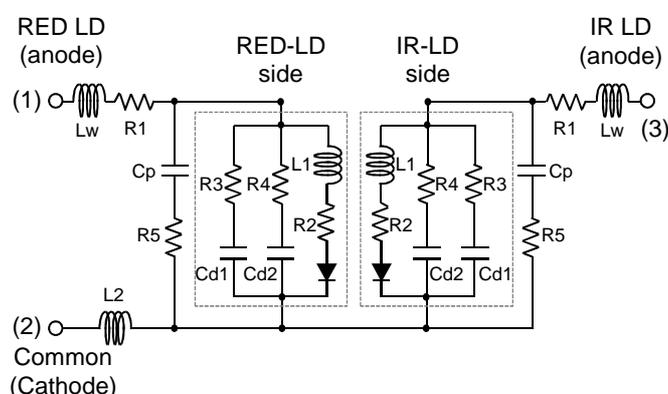


Fig. 5 Equivalent circuit of dual wavelength LD

LD parameters are calculated by fitting with actual S-parameter measurement result. Table 1 shows typical values under the condition of room temperature and 3mW output power from LD. These values are generally dependent on the temperature and injection current. Therefore, confirmation of matching between LD and the peripheral circuit is recommended.

Table 1 Parameter list of equivalent circuit  
e.g. LNCT28PS01WW

parameter	LNCT28PS01WW	
	RED-LD side	IR-LD side
R2	4.1Ω	4.6Ω
R3	395.0Ω	155.0Ω
R4	1.2Ω	1.3Ω
L1	0.30nH	0.25nH
Cd1	54.5pF	50.5pF
Cd2	28.0pF	29.0pF
R1	≐0.6Ω	≐0.6Ω
R5	1.3Ω	1.3Ω
L2	2.2nH	2.2nH
Lw	≐2.2nH	≐2.2nH
Cp	≐1.44pF	≐1.44pF

## Optical design

Collimating, focusing or spreading the output light beam from LD is realized by using lens systems. Important factors of the lens are wavelength, numerical aperture, focal length, working distance, and so on. Divergence angles of laser beam also need to be taken into account.

## Others

This product is designed for normal use; general electronic equipment (e.g. office, communication, measuring equipment or home electric appliance etc.). If you consider the particular use (aero, space, traffic, combustion or safety equipment etc.) requiring specific quality and reliability, which may threaten human life or body in case of its accidents or errors, or the use which is out of the intended normal use, please consult our sales representatives.

We shall not be responsible for any failure caused by the use outside the scope of our warranty.

There is a possibility that volatile gas generated from something like adhesive or grease can exert a bad influence on the characteristics of LD. We recommend you assess potential risks of outgassing material under the actual condition of use.



# Caution for Safety



**DANGER**

Do not touch or look into the laser beam directly.

The laser beam may cause injury to the eye or skin, or loss of eyesight.

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