Panasonic

RED and IR Frame Laser Diodes

Introduction

Panasonic offers a series of dual-wavelength laser diode (LD) realized by the proprietary MOCVD fabrication technology. The LD, which emits 660nm and 780nm laser light, is assembled in an open-type frame package.

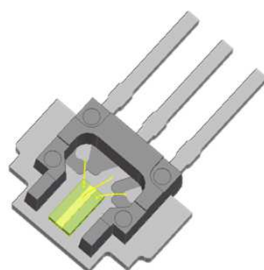


Fig.1 Figure of frame laser diode (LNCT28PF01WW)

Application

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

Caution for Safety

The products are ranked "Class IIIb 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 feature of Panasonic Frame Laser Diode (FLD) is adoption of an open-type plastic package for reduction of size and weight.

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 FLD usage is strongly required at the design stage and production line.

Please insert an appropriate protection circuit in the drive circuit of FLD, 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 FLD. There is a possibility of laser destruction by unexpected pulses generated by nearby equipment. Please avoid turning on/off a fluorescent lamp or other measurement equipment etc., near FLD products.

Please take the following measures to prevent a FLD 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

Since a particular plastic is used for the package of FLD, please pay special attention to any temperature rise during soldering. The soldering temperature should be controlled so that the temperature of the chip mounting area is maintained below 200℃. When the temperature exceeds this value, the joint strength between the sub-mount and package becomes weak rapidly.

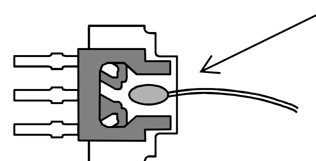
It is recommended to solder only one lead (terminal) at a time for a short period of time (after heating one lead with solder iron or laser beam etc., cooling down, then, heat another lead). Heating all the leads at once or full heating method like re-flow should be avoided. In addition, it is recommended 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 FLD is exposed to mechanical stress like vibration etc. at high temperatures when soldering, the stress may affect the package, leading to possible change of FLD characteristics.

- Soldering temperature and time

Temperature
: Below 360℃ (FLD only)
: Below 380℃
(FLD with holder for heat radiation)
Time
: Within 3sec recommended

Temperature measuring point / Die Pad parts



Mechanical stress

Pressure to package

Panasonic FLD is designed to be thinner and smaller. Therefore, the characteristics may be degraded by the mechanical stress in the chip mounting area. Please apply mechanical stress only on a lead part, but not on the back of a package at high temperatures when soldering. When it is needed to stress the back of a

package in soldering, "point" stressing should be avoided. Please stress it on a plane wider than a package and perform soldering within a condition of less than 2.0N (200gf).
For stressing the back of a package at normal temperature, it is also required to stress it on a plane wider than the package instead of point stressing and the pressure must be less than 2.9N(300gf).

Lead forming and cutting

Although it is recommended that FLD is used with our shipment condition, in case of use after modification of lead forming or cutting, the modification should be done at normal temperature before soldering. The process right after soldering at high temperatures brings heat and mechanical stresses to the package, which may cause substantial degradation of its characteristics. Applying stress, especially to the lead shoulder, should be avoided, because this may cause package cracks or other damages. The sufficient mold control is required in production.

Panasonic shall not be responsible for any failure due to lead processing at customer's site.

Storage condition (in-process)

When the devices are stored in an excessively humid environment for a long time before mounting, the resin will absorb moisture, and water evaporation by heating during mounting may cause peeling off of the resin from the lead.

To avoid the moisture absorption, the devices are shipped in damp-proof packages of an aluminum laminated bag enclosed with silica gel.

Mounting should be completed within four days after opening the damp-proof packing. In case long-term storage after opening is required, the devices should be put back into the aluminum laminated bag with the silica gel and re-sealed. The recommended storage condition until mounting is in the ranges of 5～35℃ and 45～75%RH.

Heat sink design of LD

As the case temperature of FLD becomes higher, the life of LDs in the FLD becomes shorter. It is important that an appropriate design is used for the heat dissipation. Mounting example of FLD is shown in Fig.2.

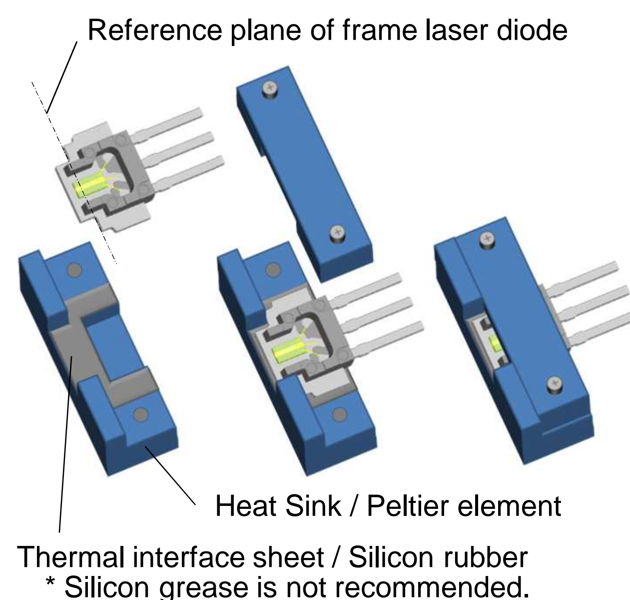


Fig.2 Mounting example of FLD

In applications using heat sink in the back side of FLD, we recommend to insert a thermal interface sheet or silicon rubber to assist the heat dissipation process.

It is not recommended to use silicon grease as assistant material for heat dissipation. The silicon grease can be separated into oil components and easily soak into the LD chip area of the package. If carbide particles originated from the oil components adhere to laser emitting point, it is possible to cause degradation of LD characteristics.

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.

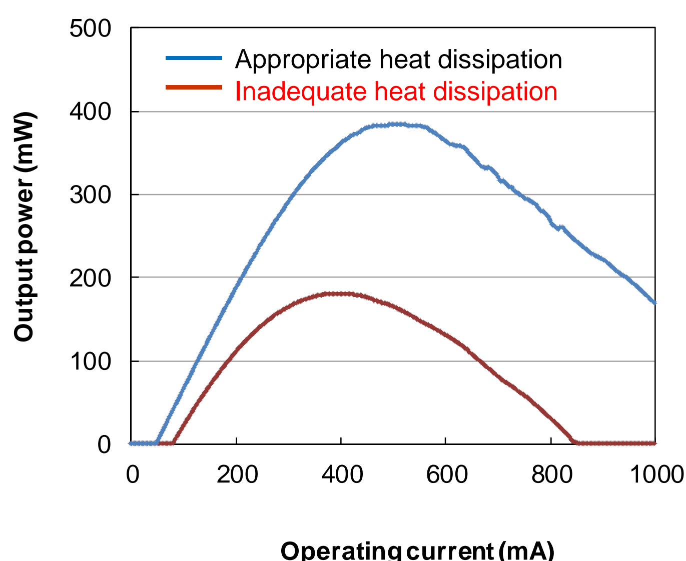


Fig.3 Output power examples depending on thermal conditions of red frame laser diode (LNCT28PF01WW).

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 rage 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.

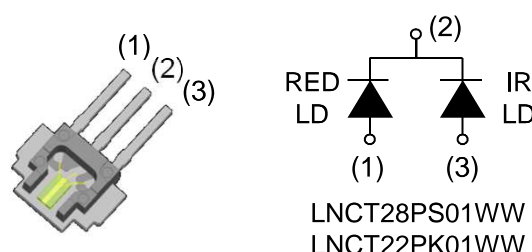


Fig. 4 Pin connections

Equivalent circuit

To assist with the selection of the LD driving current source, an equivalent circuit of Panasonic FLD is shown in Fig. 5. LD parameters are calculated by fitting with actual S-parameter measurement result.

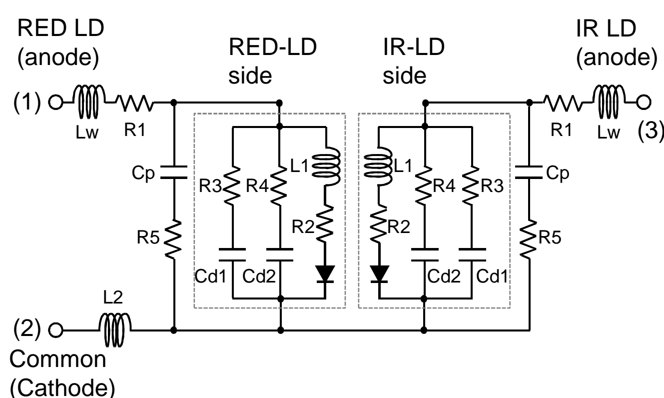


Fig. 5 Equivalent circuit of dual wavelength LD

Table 1 Parameter list of equivalent circuit
e.g. LNCT28PF01WW

parameter	LNCT28PF01WW	
	RED-LD side	IR-LD side
R2	3.2Ω	4.0Ω
R3	230.0Ω	100.0Ω
R4	1.6Ω	1.4Ω
L1	0.4nH	0.4nH
Cd1	58.0pF	52.0pF
Cd2	27.0pF	28.0pF
R1	≒0.3Ω	≒0.3Ω
R5	15.0Ω	15.0Ω
L2	2.5nH	2.5nH
Lw	≒2.5nH	≒2.5nH
Cp	≒0.32pF	≒0.32pF

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.

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

The top surface of FLD is completely opened. Therefore, please take special care not to touch the laser diode chip and wires, when handling FLDs with tweezers etc.

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 FLD. 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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