

Precautions for Laser Diodes

This application note describes precautions in the use of laser diodes.

Absolute Maximum Ratings

If an excessive current flows in a laser diode, a large optical output is generated occur and the emitting facet may be damaged. This optical damage can happen even with a momentary over-current. Therefore, it specifies the largest current that must not be exceeded even for a moment. In particular, please pay attention to excessive currents when a power supply is applied and excessive currents caused by static electricity. Although an use within the absolute maximum ratings is guaranteed, the values are specified in the condition of 25°C. As the temperature of the laser diode rises, its maximum output power and power dissipation decreases and its operating range is reduced. Even within the absolute maximum ratings, the life becomes shorter by using at high temperatures. For this reason, the design should include sufficient margin for heat radiation and light output.

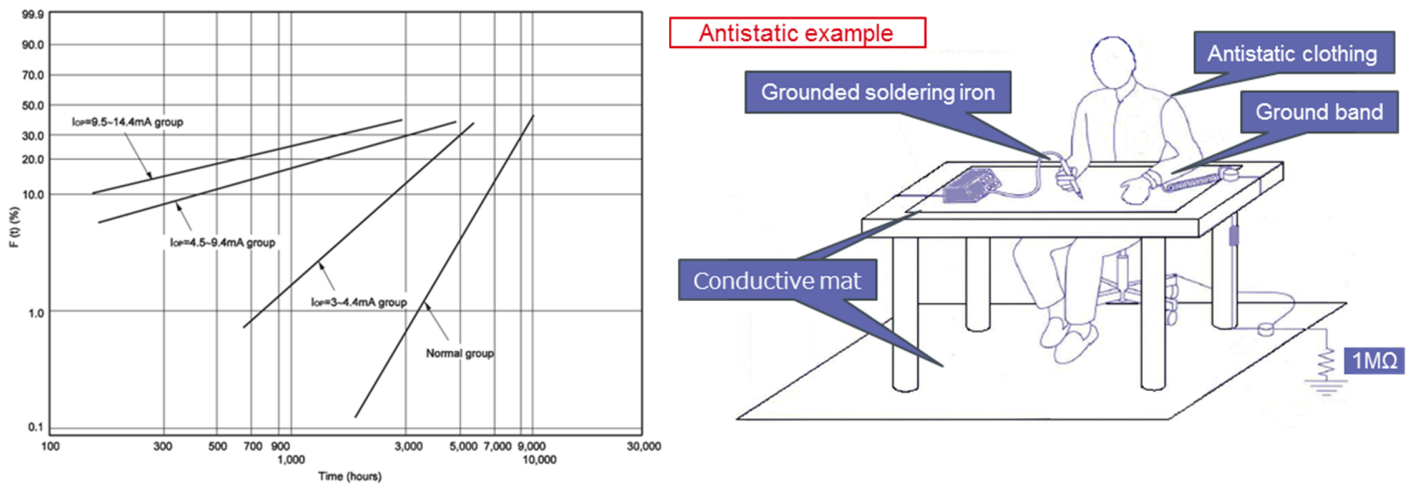
About Heat radiation

A laser diode generates some heat at the junction points with a long time of electric current like general semiconductors. As a result, the temperature of the element increases. Without an enough heat dissipation, the case temperature rises, and the light output is reduced, so a more current must be needed to maintain the light output. An increase in the forward current causes a further rise temperature of the case, and then that requires a more forward current. It seems a negative spiral. Therefore, please use a heat sink (30x30x3 mm or larger) of aluminum or similar materials in close contact with the stem of the laser diode.

Protection against damage due to electrostatic discharge and other current surges

Electrostatic discharge and other current surges can cause deterioration and damage in a laser diode, resulting in reduced reliability (Fig.1). Please note the following.

- a. Ground equipment and circuits. Do not allow a noise into the ground line. Please implement countermeasures such as noise filters or noise-cut transformers for each power input section.
- b. Wear anti-static clothing, hat and shoes when working. Always use a grounding band to ground the human body through a high resistance 1MΩ, especially while working.
- c. Use an antistatic case for transport and storage.
- d. Note that if an excessive surge current flows through the laser diode when the power is turned on and off, it may damage and deteriorate.
- e. Nearby equipment that generates high-frequency surges, induced surges may degrade and destroy a laser diode. Therefore, avoid using it near something like fluorescent glow lamps.



(Fig.1) Effect of electrostatic discharge on LD life

About Soldering

When soldering to the laser lead, the soldering iron must be grounded and the soldering conditions must be the following;

- temperature : 350°C or below
- time : 3 seconds or shorter
- distance : at least 2 mm away from the root of the lead

Do not solder the lead edge as the plating may be thin. Please be careful with below points.

- a. The adhesiveness of the die-bonding paste drastically declines at a high temperature; thus, entire temperature of the package must be careful to prevent increasing. **We don't recommend heating the whole package such as reflow soldering.**
- b. Partial heating of the lead terminals one by one is recommended. (Please avoid simultaneous heating of multiple leads.)
- c. Even if only the leads are heated, the package will become hot due to heat conduction, so it is recommended to use a heat sink or other means to dissipate heat before soldering.
- d. It is recommended to solder the GND lead first to restrain the heat conduction from the lead frame.

About the use of the glue

There is the possibility that the volatilization component of the glue exerts the influence on the characteristic of laser diode. Please use it after checking sufficiently.

About handling packages

Do not drop from a height or apply excessive pressure to the package. Please be careful to ensure that the forming process that bends the leads does not damage the glass seal or cut the wire by applying stress to the leads in the package.

For products with glass windows

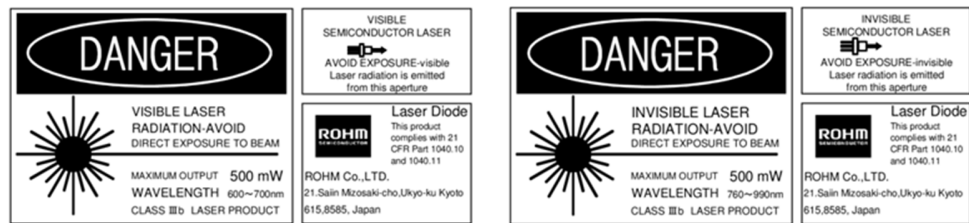
Never touch the glass part of the laser. Any scratches or stains on the glass window will alter the optical characteristics of the laser.

For open package products

The external environment may degrade the characteristics and reliability. Please take enough measures against toner, human foreign objects, foreign objects including cigarette smoke, corrosion by ions, effects of volatile components of adhesives and flux, condensation, optical tweezers effect, etc. Also, be careful not to touch the components inside the cap, including the laser chip.

About Safety

Viewing the light emitted from a laser diode directly or through the lens is very dangerous. Use a TV camera or other similar device to adjust the optical axis. The laser diodes package has a warning label as shown below.



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