



Handling Instructions

PROTECTION AGAINST ELECTROSTATIC DAMAGE

Although electrostatic breakdown is most often associated with IC semiconductor devices, optoelectronic devices are also prone to electrostatic damage. Miniaturized and highly integrated components are particularly sensitive.

SENSITIVITY

Breakdown Voltages

Typical electrostatic discharge in the working environment can easily reach several thousand volts, well above the level required to cause a breakdown. As market requirements are moving towards greater miniaturization, lower power consumption, and higher speeds, optoelectronic devices are becoming more integrated and delicate. This means that they are becoming increasingly sensitive to electrostatic effects.

Device Breakdown

Electrostatic discharge events are often imperceptible. However, some of the the following problems may occur.

Delay Failure

Electrostatic discharge may damage the device or change its characteristics without causing immediate failure. The device may pass inspection, move into the market, then fail during its initial period of use.

Difficulty in Identifying Discharge Site

Human beings generally cannot perceive electrostatic discharges of less than 3000 V, while semiconductor devices can sustain damage from electrostatic voltages as low as 100 V. It is often very difficult to locate the process at which electrostatic problems occur.

Basic Countermeasures

Optoelectronic devices should be protected from static electricity at all stages of processing. Each device must be protected from the time it is received until the time it has been incorporated into a finished assembly. Each processing stage should incorporate the following measures.

Suppression of Electrostatic Generation

Keep relative humidity at 50 to 70 % (if humidity is above 70 %, morning dew may cause condensation). Remove materials which might cause electrostatic generation (such as synthetic resins) from your workplace. Check the appropriateness of floor mats, clothing (uniforms, sweaters, shoes), parts trays, etc. Use electrostatically safe equipment and machinery.

Removal of Electrostatic Charges

Connect conductors (metals, etc.) to ground, using dedicated grounding lines. To prevent dangerous shocks and damaging discharge surges, insert a resistance of 800 k Ω between conductor and grounding line.

Connect conveyors, solder baths, measuring machines, and other equipment to ground, using dedicated, grounding lines. Use ionic blowers to neutralize electrostatic charges on insulators. Blowers pass charged air over the targeted object, neutralizing the existing charge. They are useful for discharging insulators or other objects that cannot be effectively grounded.

Human Electrostatic

The human body readily picks up electrostatic charges, and there is always some risk that human operators may cause electrostatic damages to the semiconductor devices they handle. The following measures are essential.

Anti-Static Wrist Straps

All people who come into direct contact with semiconductors should wear anti-static wrist straps, i.e., those in charges of parts supply and people involved in mounting, board assembly and repair.

Be sure to insert a resistance of 800 k Ω to 1 M Ω into the straps. The resistance protects against electrical shocks and prevents instantaneous and potentially damaging discharges from charged semiconductor devices.

The straps should be placed next to the skin, placing them over gloves, uniforms or other clothing reduces their effectiveness.

Antistatic Mats, Uniforms and Shoes

The use of anti-static mats and shoes is effective in places where use of a wrist strap is inconvenient (for example, when placing boards into returnable boxes). To prevent static caused by friction with clothing, personnel should wear anti-static uniforms, gloves, sleeves aprons, finger covers, or cotton apparel.

Protection during Inspection, Mounting and Assembly

Each individual must ensure that hands do not come into direct contact with leads. Avoid non-conductive finger covers. Cover the work desk with grounded anti-static mats.

Storage and Transport

Always use conductive foams, tubes, bags, reels or trays when storing or transporting semiconductor devices.



MOUNTING PRECAUTIONS

Installation

Installation on PWB

When mounting a device on PWB whose pin-hole pitch does not match the lead pin pitch of the device, reform the device pins appropriately so that the internal chip is not subjected to physical stress.

Installation Using a Device Holder

Emitters and detectors are often mounted using a holder. When using this method, make sure that there is no gap between the holder and device.

Installation Using Screws

When lead soldering is not adequate to securely retain a photo interrupter, it may be retained with screws. The tightening torque should not exceed 6 kg/cm³. An excessive tightening torque may deform the holder, which results in poor alignment of the optical axes and degrades performance.

Lead Forming

Lead pins should be formed before soldering. Do not apply forming stress to lead pins during or after soldering. For light emitters or detectors with lead frames, lead pins should be formed just beneath the stand-off cut section. For optocouplers or opto sensors using dual-in-line packages, lead pins should be formed below the bent section so that forming stress does not affect the inside of the device. Stress to the resin may result in disconnection.

When forming lead pins, do not bend the same portion repeatedly, otherwise the pins may break.

CLEANING

General

Optoelectronic devices are particularly sensitive with regard to cleaning solvents. The Montreal Protocol for environmental protection calls for a complete ban on the use of chlorofluorocarbons. Therefore, the most harmless chemicals for optoelectronic devices should be used for environmental reasons. The best solution is to use a modern reflow paste or solder composition which does not require a cleaning procedure. No cleaning is required when the fluxes are guaranteed to be non-corrosive and of high, stable resistivity.

Cleaning Procedures

Certain kinds of cleaning solvents can dissolve or penetrate the transparent resins which are used in some types of sensors. Even black molding components used in standard isolators are frequently penetrated between the mold compound and lead frame. Inappropriate solvents may also remove the marking printed on a device. It is therefore

essential to take care when choosing solvents to remove flux.

Cleaning is not required if the flux in the solder material is non-aggressive and any residues are guaranteed to be non-corrosive and long-term stable of high resistivity. In cleaning procedures using wet solvents only high purity Ethyl and Isopropyl alcohol are recommended.

In each case, the devices are immersed in the liquid for typically 3 min and afterwards immediately dried for at least 15 min at 50 °C in dry air.

Precautions

Intensified cleaning methods such as ultrasonic cleaning, steam cleaning, and brushing can cause damage to optoelectronic devices. They are generally not recommended.

Ultrasonic cleaning (unless well controlled) can damage the devices due to mechanical vibrations.

Using high-intensity ultrasonic cleaning, the process might:

- a. Promote dissolution or crack the package surface and thus affect the performance of e.g., the sensors
- b. Promote separation of the lead frame and resin and thus reduce humidity resistance
- c. Promote the breakage of band wires

This method should only be used after extensive trials have been run to ensure that problems do not occur. Brushing can scratch package surfaces. Moreover, it can remove printed markings.

Special care should be taken to use only high purity or chemically well-controlled solvents. Chloride ions, from flux or solvents that remain in the package are a high risk for the long-time stability of any electronic device. These as well as other promote corrosion on the chip which can interrupt all bond connections to the outside leads.