

LIF Technical Statement No. 50

ESD Guide for handling LED products

This guide is to inform users and installer of LED based products on ESD and how to avoid damaging LED based products by ESD mishandling



An Introduction to ESD

We experience occurrences of static electricity everyday. For example, walking along a carpeted floor in a heated room during winter generates sufficient static electricity to give us a rather shocking experience when we touch the door knob. While this sudden discharge of static electricity does not result in any harm to the human body, it can be very damaging to electronic devices which are sensitive to electrostatic discharge (ESD).



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Regard to protection of LED's for the chemical contamination conditions that may occur in specific installation conditions should also be considered

What are the common sources of static electricity?

The following table shows a sample list of sources of static electricity.

Object or process	Material or activity
Work surfaces	Waxed, painted or plastic surfaces
Floors	Waxed, common vinyl tiles, sealed concrete, carpet
Clothes	Synthetic materials (e.g. polyester, nylon, lycra), non-conductive shoes
Furniture	Plastic, fibre-glass, finished wood, synthetic leather, finished leather
Packaging	Common plastic bags & bubble wrap, foam, plastic containers, packaging tapes
Assembly areas	Spray cleaners, heat guns, blowers, plastic tools, metallic surfaces

ESD Definitions

Discharge to the device

ESD damage can occur when any charged conductor, including the human body, discharges through an ESD sensitive device. For example when a person walks across a floor an electrostatic charge may accumulate on the body. Simple contact such as handling the device allows the body to discharge, possibly causing ESD damage.

Discharge from the device

Static charge may accumulate on the device itself through handling or contact with packaging materials, work surfaces, machine surfaces, etc. This may then be discharged through contact with another grounded device, including the human body, causing ESD damage.

Field-induced discharge

Any charged object may generate an electrostatic field. If a device is placed in that field charge may also be induced on this device which will be discharged when the device is grounded, possibly causing ESD damage.

Typical electrostatic voltages

Many normal everyday activities cause very high voltages which are generated in our bodies. A human can feel electrostatic discharges from 3000V and higher. Semiconductor devices, including LED and LED driver, can easily be damaged by ESDs with a few volts. Humidity has a significant effect on the induced charge.

Activity	Charge Voltage (dependent on rel. humidity)	
	10 – 20 %	65 – 90 %
Walking on a carpet	35000 V	1500 V
Walking on a vinyl floor	12000 V	250 V
Sitting in an office chair (Movements in the chair)	6000 V	100 V
Handling a plastic bag	20000 V	1200 V

How does damage from ESD happen?

When a statically-charged person or object touches an electrostatic discharge sensitive (ESD) device, there is a possibility that the electrostatic charge could be drained through sensitive circuitry in the device. If the electrostatic discharge possesses sufficient energy, damage could occur in the device.

The modes in which ESD damage occurs are:

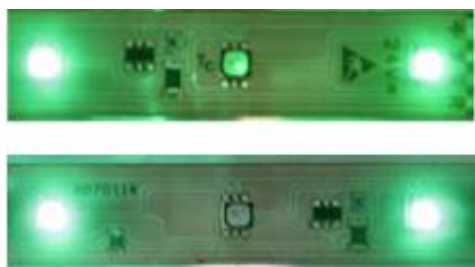
- Discharge to the device
- Discharge from the device
- Field-induced discharge.

LED can be damaged by ESD so badly that they fail totally (catastrophic failure). This means, that they emit neither light nor are electrically conductive. If the LED is damaged, but still electrically conductive, it is considered disturbance.

An LED, which is completely failed by ESD, does not only remain completely dark, but is also no longer electrically conductive (latent damage). Therefore any further LED in series connection does not light, even if they are undamaged. This is immediately visible after the damage.



In contrast to total failure, LED can be damaged in a way that initially there is light, however rapidly become dim. Since the damaged components remain electrically conductive, the remaining module continues to light normally



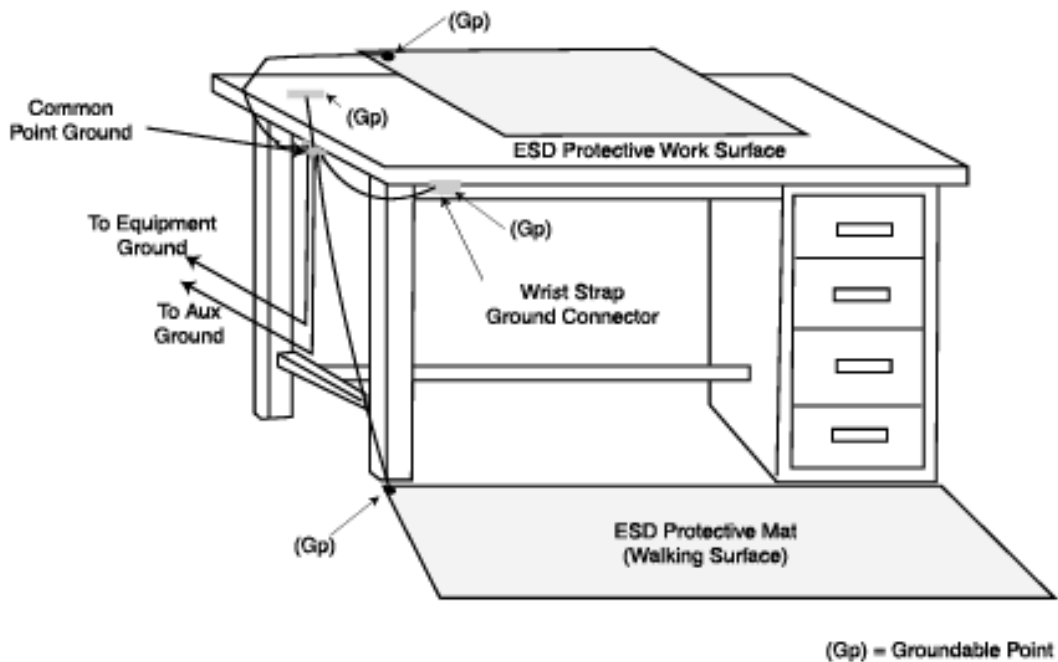
Prevention against ESD damages



Be sure to observe ESD sensitive labels on product and packaging, where present precautions should take place to avoid any ESD damages.

Work area:

- It is essential to handle ESD devices at static-safe workstations. This will prevent catastrophic damages, reliability failures in the field (through latent damage).
- Where it is impractical or impossible to use antistatic wrist-straps or remove items that are composed of insulative materials at a static-safe workstation, use an air ionizer designed to neutralize electrostatic charges or apply topical antistats to control generation and accumulation of static charges.
- Avoid bringing sources of static electricity within 1 meter of a static-safe work bench.
- Where it is necessary to use air-guns, use special models that do not generate static charges in the air stream.



TECHNICAL STATEMENT

Personnel:

- Any accumulated charge on the body of the human operator should be discharged first before opening the protective container with ESD devices inside. The discharge can be done by putting a hand on a grounded surface or by wearing a grounded antistatic wrist-strap.
- The use of an antistatic clothing and footwear is recommended.

**Packaging and Transportation:**

- ESD devices should be contained in a static protective bag or container at all times during storage or transportation.

TECHNICAL STATEMENT

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