

Electrostatic Discharge Requirements for Optical Modules

Article Overview

Electrostatic discharge (ESD) can severely damage optical modules, particularly VCSELs and photodiodes, making proper handling, testing, and protection essential.

Understanding ESD in Optical Modules

Electrostatic discharge is a sudden flow of electric current between objects with different charges, which can occur when a dielectric breaks down or objects come into close contact (). In optical modules, ESD can damage sensitive components such as vertical-cavity surface-emitting lasers (VCSELs) and photodiodes, often causing latent failures that degrade performance over time (). VCSELs, especially those with oxide confinement, are highly susceptible to ESD, with damage occurring at voltages as low as 200 V. Photodiodes, particularly InGaAs and silicon types, can degrade under reverse-bias ESD pulses as low as -150 V to -175 V (). LEDs in optical modules generally have higher forward-bias ESD thresholds (+10,000 V) but lower reverse-bias thresholds (-5,000 V) ().

Testing and Screening for ESD Damage

Screening optical transceivers for ESD damage involves isolating the laser diode from the driver and measuring its current-voltage (I-V) characteristics. Comparing these curves to baseline measurements allows detection of early-stage ESD damage, which may not be immediately visible in performance tests (). Advanced methods include in-situ optical transient measurements and high-speed digitization to capture micro...

Article Content

Nov 30, 2025

ESD: Electrostatic Discharge

JEDEC has taken a leadership role in developing standards for ESD since the early 1980s, including standards for device handling

Oct 29, 2025

Electrostatic Discharge (ESD): impacts and solutions

Understand Electrostatic Discharge and its impact on electronic devices. Learn about ESD protection and testing

Dec 22, 2025

Electrostatic Discharge (ESD), Factory Issues, Measurement ...

The number of failures caused by electrostatic discharges (ESD) has been increasing for some time now. So, it is necessary for

Apr 13, 2026

ESD-Sensitive Devices 101: Sensitivity Test, Handling

ESD sensitive device, are refer to electronic components vulnerable to to damage from

Oct 29, 2025

Sensitivity of multimode bidirectional optoelectronic modules to ...

The sensitivity to electrostatic discharges of the active opto-electronic components of two complimentary modules for

Sep 23, 2025

Cisco Optical Transceiver Handling Guide

Handling Guidelines for QSFP-DD, QSFP, SFP Transceiver This guide describes the general handling measures and precautions

Mar 26, 2026

ELECTROSTATIC DISCHARGE CONTROL REQUIREMENTS FOR

Verification of the requirements contained within this standard is primarily accomplished through the identification, inspection and

Nov 24, 2025

How can I prevent electrostatic discharge (ESD) damage to optical modules?

Handling guidelines: Wear anti-static gloves and shoes when handling optical modules e anti-static packaging during

Oct 29, 2025

The Prevention and Control of Electrostatic Discharge (ESD) (AN-40

An Introduction to ESD We experience occurrences of static electricity everyday. For example, walking along a carpeted floor in a

Nov 15, 2025

A Deep Dive into IEC 61340-5-1: A Step by Step Guide

Discover the guide on IEC 61340-5-1, covering key ESD control requirements and effective strategies for ensuring

Jun 15, 2026

Electrostatic Discharge (ESD) Protection Design Guide

ABOUT THIS GUIDE Choosing the most appropriate suppressor technology requires a balance between equipment protection

Nov 16, 2025

AN11267 EMC and system level ESD design guidelines for LCD drivers

IEC 61000-4-2 is about the immunity requirements and test methods for electronic equipment subjected to static electricity

Apr 03, 2026

Electrostatic discharge (ESD) protection in electronics

The importance of protecting against electrostatic discharge in electronics, its causes,

May 11, 2026

What is ESD (Electrostatic Discharge) and How to Prevent it?

Electrostatic static discharge (ESD) can damage sensitive components without anyone realizing it. Find out how to

Feb 15, 2026

Do the optical module interfaces of data center switches require ESD ...

Although the optical module interface of the data center switch transmits signals via optical fiber, the electrical pins

May 03, 2026

EOS/ESD Fundamentals | EOS/ESD Association, Inc.

A six-part series on Electrostatic Discharge (ESD) prepared by EOS/ESD Association, Inc. This series deals primarily with ESD

Jun 14, 2026

A Guide to Electrostatic Discharge (ESD): Bondline Electronics Ltd

Electrostatic discharge can occur when two surfaces come into contact and create friction with each other. Examples include:

Nov 09, 2025

Electrostatic Discharge (ESD)

Electrostatic discharge, or ESD, is the rapid and spontaneous transfer of electrostatic

Nov 19, 2025

EOS/ESD Fundamentals Part 1 | EOS/ESD Association, Inc.

This trend may be accelerating. The EOS/ESD Association, Inc.'s Electrostatic Discharge (ESD) Technology Roadmap is revised

Aug 31, 2025

Electrostatic Discharge (ESD), Factory Issues, Measurement ...

Actually, the measured values should only reflect our requirements and wishes to avoid electrostatic charges, or, if it is not possible,

Dec 05, 2025

ESD Testing

Get Electrostatic Discharge (ESD) testing information, methods, test equipment, and

Nov 11, 2025

Fundamentals of Electrostatic Discharge (ESD)

EOS/ESD Association, Inc. has multiple standards documents and technical reports available. These voluntary standards cover the

Sep 26, 2025

REQUIREMENTS FOR ELECTROSTATIC DISCHARGE CONTROL

1. SCOPE 1.1 Scope. This instruction provides a consistent application of requirements for an electrostatic discharge (ESD) control

May 29, 2026

Electrostatic Discharge (ESD) (Rev. A)

ABSTRACT This application report provides an overview of electrostatic-discharge (ESD) test models, failure modes, protection

Jul 29, 2025

Cisco Optical Transceiver Handling Guide

Transceivers are susceptible to ESD (electrostatic discharge) which can damage the sensitive integrated circuits. An ESD protective

Apr 02, 2026

ELECTROSTATIC DISCHARGE CONSIDERATIONS

Electrostatic Discharge may be defined as the transfer of electrostatic charge between bodies at different potentials, caused either by

Jul 26, 2025

Understanding electrostatic discharge (ESD) and its

Understanding ESD (electrostatic discharge): Learn how static electricity and discharge

Jan 11, 2026

Electrostatic Discharge Control (ESD) | IECQ

The IECQ ESD control programme includes various measures such as training, grounding, bonding, and packaging to prevent the

Jul 06, 2026

ELECTROSTATIC DISCHARGE CONTROL REQUIREMENTS FOR

The purpose of this document is to establish the standards for an Electrostatic Discharge (ESD) control program designed to protect

Oct 15, 2025

Basics of Electrostatic Discharge

Many electrostatic field meters simply measure the gross level of the electrostatic field and should be used as general indicators of

Apr 15, 2026

Basics of Electrostatic Discharge

Testing of devices for MM sensitivity using ESD SP5.2: Electrostatic Discharge Sensitivity Testing – Machine Model (MM)

Apr 20, 2026

A Guide to Electrostatic Discharge (ESD): Bondline Electronics Ltd

BONDLINE A Guide to Electrostatic Discharge (ESD) ESD Terminology Glossary
Antistatic The term "antistatic" is a minimal

Nov 06, 2025

Electrostatic-sensitive device

Warning symbol denoting a device's susceptibility to electrostatic discharge. Symbol for an ESD protection device – EPA Alternate

Nov 09, 2025

ESD Protection Guide: Equipment and Methods

ESD (Electrostatic Discharge) is a common yet huge threat to electronic components and devices. It can cause

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