

**ESD  
precautions**thermal  
managementDFB laser  
conceptTunable Diode  
Laser  
Spectroscopy  
(TDLAS)

n+ packages

# ESD precautions

## semiconductor diodes

### the nature of ESD

Using nanoplus lasers, correct handling of the device and electronic connections are important. Many critical parameters, including wavelength tuning, lifetime, day-to-day repeatability, threshold current and efficiency, are highly dependent on these precautions. This note gives a short introduction to Electro Static Discharge (ESD) issues and ways to avoid damage of your laser. More general information may be found e. g. in [1] and a detailed description of the causes and damages for semiconductor lasers in [2, 3]. More than 30 % of electronic failures are caused by ESD, so it is worth spending some time for finding ways to avoid ESD. The main cause of electrostatic charge on materials is the unequal sharing of surface charge when two materials are brought together or separated. But charge may also build up due to external electric fields. It is easy to generate voltages  $>100$  V by the simple act of walking over a carpet. ESD occurs when the charged object is connected to ground or an object at a different potential, involving the transfer of electrons. In principle all objects are on different potential, unless they are on the same ground. The noticeable visible sparks are in the order of 10.000 V, but an invisible 15 V ESD may already destroy your device.

### wrist straps and work areas

Bringing all items including the operator to the same ground is the only way to avoid ESD. This is as easy as wearing a wrist strap at all times when handling laser diodes, as the main cause of ESD is people. The wrist strap must be properly grounded to the same ground as the other items (tools, instruments, other material) in use. In addition, you may use ESD protective floors, shoes and foot straps [4]. Shoes that are not ESD safe should have a strap connecting the inside of the operator's socks to the outside of the shoes, as these shoes are mostly insulating. Designing an ESD protective area is the best way to protect the device.



### warranty

ESD precautions when handling the device cannot be influenced by the manufacturer, in consequence nanoplus is not responsible for ESD-damaged lasers. All devices leave nanoplus in tested condition and in ESD safe environment to prevent ESD damage during transport. Before unpacking the laser, use ESD precautions. E. g. using a voltmeter for testing will destroy it immediately, so only use appropriate instruments and tools for a long lifetime of your laser.



device protected by  
US patent 6.671.306  
US patent 6.846.689  
EU patent EP0984535

nanoplus  
Nanosystems and Technologies GmbH  
Oberer Kirschberg 4  
D-97218 Gerbrunn

phone: +49 (0) 931 90827-0  
fax: +49 (0) 931 90827-19  
email: sales@nanoplus.com  
internet: www.nanoplus.com

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[1] <http://www.esda.org/aboutesd.html>

[2] *Semiconductor laser damage due to human-body-model electrostatic discharge*, Twu, Y. et al, J. Appl. Phys. 74 (3), 1510-1520, 1993.

[3] *Human-body-model electrostatic-discharge and electrical-overstress studies of buried-heterostructure semiconductor lasers*, Huang, J. et al, IEEE Transaction on Devices and Materials Reliability, 7 (3), 453-461, 2007.

[4] Such item may be purchased from optical laboratory equipment vendors.