

Article Overview

The on-resistance of a laser diode is the effective series resistance encountered when the diode conducts, typically ranging from a few ohms to tens of ohms depending on the diode type and operating conditions.

Definition and Importance

The on-resistance (R_{on}) of a laser diode represents the voltage drop per unit current beyond the threshold voltage, effectively modeling the diode as a series resistor in addition to its ideal diode behavior. It influences the forward voltage, power dissipation, and thermal load of the device, which are critical for maintaining stable operation and preventing thermal runaway .

Measurement

On-resistance is typically extracted from the V-I (voltage-current) characteristics of the laser diode. By plotting the forward voltage versus current above the lasing threshold, the slope of the linear region gives the series resistance. Advanced methods also use dV/dI curves or d^2V/dI^2 analysis to accurately determine R_{on} , especially in high-power diodes where thermal effects are significant .

Factors Affecting On-Resistance

- o Temperature: As the junction temperature increases, the diode's series resistance generally rises due to reduced carrier mobility, leading to higher forward voltage for the same current .
- o Material and Structure: The semiconductor material, contact quality, and internal geometry of the diode affect R_{on} . High-power diodes often have optimized metallization and solder interfaces to minimize resistance .
- o Current Level: At very high currents, additional resistive effects from the contacts and spreading resistance in the active region can increase the effective on-resistance.

Implications

- o Power Dissipation: The power lost as heat is $P = I^2 \times R_{on}$, which contributes to junction heating and can limit maximum output power .
 - o Efficiency: Higher on-resistance reduces electrical-to-optical conversion efficiency, as more input power is converted to heat rather than light .
 - o Thermal Management: Accurate knowledge of R_{on} is essential for designing heat sinks and cooling systems to maintain safe junction temperatures in high-power laser diodes .
- In summary, the on-resistance of a laser diode is a key parameter that affects voltage drop, efficiency, and thermal performance. It is measured from the V-I characteristics above threshold and is influenced by temperature, diode structure, and current

What is the on-resistance of a laser diode

level. Proper management of R_{on} is crucial for reliable and efficient laser diode operation.

Laser Diode: Construction, Working, Types, Advantages, Disadvantages & Applications Laser diode similar to LED is used for

Introduction: It is often necessary to quantitatively assess the quality, performance, and characteristics of laser diodes. This is done

I have harvested several laser diodes out of old 16X to 22X DVD writers. I used a driver circuit based on LM 317 but I was not able to

Laser Diode Physics is Explained, Spec's Comparison Site, ALL OF THE BRANDS on One Site. 10,592 laser diodes.

There are a number of laser diode specifications, or laser diode characteristics that are key to the overall performance and these are

A laser diode (semiconductor laser) is an electronic component that generates laser light by converting electric current

Laser diodes are highly susceptible to damage from forward and reverse voltage surges and transients, and they

Fundamentals of Laser Diode Control Laser Diode Characterization To assess the quality, performance, and characteristics of laser

Because laser diodes have to be operated at such a high current density, and have a very low forward resistance

A semiconductor device that generates coherent light of high intensity is known as laser diode. LASER is an acronym for Light

This is the ultimate beginner's guide to the laser diode. Learn how lasers work and how you

It is often necessary to quantitatively assess the quality, performance, and characteristics of laser diodes. This is done through

The purpose of this laser diode tutorial is to provide the information necessary to create a long lifetime, stable

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laser diode system.

Review of ESD approaches Simple resistor used as an ESD protection means The figure to the right shows one of the ESD

An Introduction to Laser Diodes Learn about the laser diode, including package types,

Laser diodes are semiconductor lasers with a current-carrying p-n junction as the gain medium. They are

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