

Semiconductor Laser Diode



Article Overview

A semiconductor laser diode is a compact device that converts electrical energy into coherent, monochromatic, and highly focused light through stimulated emission.

Structure and Materials

A laser diode is a semiconductor device similar to a light-emitting diode (LED) but designed to produce coherent light. It typically consists of three layers forming a PIN structure: a P-type layer, an intrinsic (I) layer, and an N-type layer. The intrinsic layer serves as the active region where electrons and holes recombine to generate photons. Common materials include Gallium Arsenide (GaAs), with P-type doping using trivalent elements like aluminum or zinc, and N-type doping using pentavalent elements like selenium or tellurium. Modern laser diodes often incorporate quantum wells in the active region to reduce threshold current and improve efficiency.

Working Principle

Laser diodes operate on the principle of stimulated emission. When a forward voltage is applied, electrons from the N-type region and holes from the P-type region move into the intrinsic layer. Their recombination releases energy as photons. These photons can stimulate further emission of photons with the same phase, frequency, and direction, producing a coherent and monochromatic laser beam. The device includes an optical cavity formed by cleaved or coated facets of the semiconductor, providing feedback to sustain laser oscillation. Below the lasing threshold, spontaneous emission occurs, similar to an LED, but above threshold, stimulated emission dominates.

Types of Laser Diodes

Article Content

Laser Diodes: The power of brilliance -

Laser Diodes: The power of brilliance — the past and future of high-power semiconductor lasers With continuously

Laser Diode Tutorial

This tab takes us through an introduction to the various types of semiconductor diode lasers. Background information on the

Diode Lasers - semiconductor lasers, laser diodes

Diode lasers are semiconductor lasers based on laser diodes. In contrast to some other types of semiconductor lasers, they contain

Semiconductor Laser

C. Semiconductor Lasers Semiconductor lasers (also called diode lasers or injection lasers) employ structures that are much

Laser Diodes - semiconductor, gain, index guiding, high power

An easy-to-understand overview of how semiconductor diodes work like a cross between ordinary (gas) lasers and LEDs.

Semiconductor laser theory

Semiconductor lasers or laser diodes play an important part in our everyday lives by providing cheap and

Semiconductor Laser Diodes

A laser diode generates some heat at the junction points with a long time of electric current like general semiconductors. As a result,

Semiconductor Laser Diodes

Semiconductor laser diodes come in many shapes and sizes. They maybe round, square, or rectangular, and have a few to many

An Introduction to Laser Diodes

Laser diodes are semiconductor devices that use stimulated emissions of electromagnetic

Laser Diode

A laser diode is a small semiconductor gadget that produces strong and precise light

Laser Diode

A laser diode is an advanced semiconductor device capable of generating coherent, monochromatic, and directional

Semiconductor Lasers

Semiconductor Lasers Uncover the latest and most impactful research in Semiconductor Lasers. Explore pioneering

What are Laser Diodes? | TechWeb

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

What Is A Semiconductor Laser And How Does It Work?

Semiconductor lasers, often referred to as laser diodes, are integral to numerous modern technologies. These lasers

Lecture 4: Semiconductor Lasers

Lecture 4: Semiconductor Lasers Semiconductor Optical Sources The optical sources practically used in optical communications are

What Are Semiconductor Lasers and How Are They Used?

Semiconductor lasers are generated via radiative recombination of charge carrier pairs in semiconductors. They are

Semiconductor Diode laser: Principle, Construction, Working

Semiconductor Diode laser: Definition: It is specifically fabricated p-n junction diode. This diode emits laser light when it is forward

Laser Diodes: Definition, Types, and Applications

A laser diode is a semiconductor device that emits coherent light via stimulated emission, which is more complex and

Laser diode

Laser diode Laser diodes play an important role in our everyday lives. They are very cheap and small. Laser diodes are the smallest

Laser Diode

A laser diode (LD) is defined as a forward-biased semiconductor diode that emits coherent light when an electrical current stimulates

Laser Diodes by Wavelength

We also offer Quantum Cascade Lasers (QCLs) and Interband Cascade Lasers (ICLs) with center

Diode and Other Semiconductor Lasers

This chapter covers electrically powered lasers made from semiconductors. It starts by defining the types of electrically powered

Laser Diode: Working Principle, Construction, Types, Application

A laser diode is a small semiconductor device that emits powerful and precise light using a process known as

Semiconductor Laser

Nuvoton owns advanced technologies of laser diode accumulated over more than 40 years.

Semiconductor Lasers: Basics and Technology

Laser diodes have become the essential part of electro-optical systems used in different areas of human activity. To

Laser Diode and LED Physics

Furthermore, laser diodes leverage mature semiconductor manufacturing processing for good quality control, large-scale production,

Laser Diode

A laser diode is a semiconductor device that is identical to a light-emitting diode (LED) and

Semiconductor Lasers – laser diodes

Most semiconductor lasers are laser diodes, which are pumped with an electric current in a region where

Contact Us

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