Laser diode directly connected to power supply

Overview

The information contained within this tutorial will give all the general information necessary to create an excellent laser diode system.

Key Takeaways

Directly connecting a laser diode to a power supply without current regulation is highly risky and can easily destroy the diode. Why Direct Connection is DangerousLaser diodes have a highly nonlinear voltage–current characteristic and very low differential impedance, meaning a small increase in voltage can cause a large surge in current. If a diode is connected directly to a voltage source, even a slight voltage fluctuation can lead to thermal runaway, rapidly overheating and permanently damaging the diode.

The optical output power is directly linked to the drive current, not the voltage, so controlling current is critical.

Proper Power Supply Considerations

Laser diodes should be powered using a constant-current (CC) driver or, for some low-power diodes, an automatic power control (APC) driver.

C

C drivers maintain a fixed current regardless of voltage changes, preventing overcurrent conditions.

AP

© 2026 ALFA PRO COMMUNICATION SYSTEMS (Pty) Ltd - All rights reserved

C drivers use a photodiode feedback loop to stabilize optical output power, compensating for temperature variations. High-power or pulsed applications may require specialized drivers capable of delivering precise current pulses.

Grounding and Safety

Grounding configuration is important. Connecting the laser anode directly to the power supply can be acceptable if the grounding scheme is carefully managed. For example, earth-grounding the anode is generally safe, but the negative terminal must not be connected to ground elsewhere in the system to avoid conflicts.

Proper grounding also reduces electrical noise and ensures stable operation.

Practical Implementation

If a direct connection is unavoidable in a high-current setup, it must include: Current sensing and regulation using a series resistor or integrated current control loop. Fast response control to prevent overshoot, especially in pulsed or high-power applications. Switching-mode configurations for efficiency and precise current delivery.

Even with these measures, using a dedicated laser diode driver is strongly recommended for long-term reliability and safety.

Key Takeaway

Never connect a laser diode directly to a voltage source without current regulation. Use a constant-current or APC driver, ensure proper grounding, and consider thermal management to protect the diode and maintain stable optical output.

Article Content

Laser diodes require the right power source

When matching a lower-power laser diode with a power supply, the diode and photodiode configuration must be compatible with the power supply, because diode manufacturers offer a variety of pinout

LM5143: Constant Current Power Supply for Laser Diode

The Current regulator is connected to the Capacitor bank and supply directly the Laser Diode. The working voltage for Laser Diode is 16 Volts and the regulated current will be about 60/70

Laser Diode Tutorial

© 2026 ALFA PRO COMMUNICATION SYSTEMS (Pty) Ltd - All rights reserved

The information contained within this tutorial will give all the general information necessary to create an excellent laser diode system. For specific questions about laser diodes, mounts, and drivers please

LASER DIODE DRIVER BASICS – Wavelength Electronics

The block diagram in Figure 1 shows a very basic laser diode driver (or sometimes known as a laser diode power supply). Each symbol is defined in the table below.

Running different laser diodes using a single DC Source

I am trying to run two laser diodes (650 nm and 1550 nm). I made two current regulators to limit the diode current using the circuit given here. I connected these current regulators to a

Powering 5V (140mA) laser diode with 5V 1A AC to DC usb power

You need a constant current source that can supply 140mA at 5V. A USB power supply is constant voltage. It will destroy the laser diode. So a 9V supply and a series resistor of (9-5)/.14 = 28 ohms is

LDPPS Laser Diode Pulse Power Supply | 2 Independent TEC

It is designed to provide pulsed and continuous modes of operation for laser diode modules used both independently or as a source of diode pumping for solid-state lasers (DPSSL) in the laboratory,

High-repetition-frequency high-power pulsed laser diode driver

Here we propose a high-repetition-frequency high-power pulse power supply for laser diode driving by using frequency synthesis technique. This technique generates a high repetition

AN-LD16: Grounding with Special Laser Diode Configurations

In most cases, grounding the laser diode and power supply is straightforward. Figure 2 shows common power supply and ground configurations where the laser anode is connected directly to the power

Need help wiring a 5V laser diode up to a power source and a ...

Need help wiring a 5V laser diode up to a power source and a switch hopefully with minimal extra pc board and components. Hi all I''ve tried to google this myself to no avail and haven''t quite been able

Driving Diode Lasers: A Straightforward Procedure

It is important that diode lasers always have a regulated driver in either automatic current control or automatic power control operation. A standard laboratory power supply is not suitable for driving

© 2026 ALFA PRO COMMUNICATION SYSTEMS (Pty) Ltd - All rights reserved

Powering on a laser diode that exceeds PSU max current

I have a laser diode that I want to test (just seeing if it turns on). However, the threshold current is past the 10A that my bench power supply can supply, hence I can''t generate any light. How

Laser diodes require the right power source

The workhorse behind every semiconductor laser is its power supply, yet choosing the correct power supply is not always given much thought. The choice requires careful planning, because one

Course 4, Module 6, Diod Laser Power Supplies

MODULE 4-6 DIODE LASER POWER SUPPLIES General comments of John Simcik (1) A laser diode, or semiconductor laser, operates similarly to an ordinary forward-biased diode. They are very reliable

Sam''s Laser FAQ

Absolute current limiting. This includes immunity to power line transients as well as those that may occur during power-on and power-off cycling. The parameters of many electronic components like ICs are

Laser Diode Driver Basics and Design Fundamentals

Laser diodes are highly susceptible to damage from forward and reverse voltage surges and transients, and they require a special set of specifically designed electronic control elements.

How to Use Laser Diode: Examples, Pinouts, and Specs

Learn how to use the Laser Diode with detailed documentation, including pinouts, usage guides, and example projects. Perfect for students, hobbyists, and

LASER DIODE DRIVER BASICS – Wavelength Electronics

Separate Monitor & Power Grounds: One high power ground is designated to connect to the power supply on any laser diode driver. Several low current grounds are located amongst the monitor

Related Video Reference

This video was associated with the source search result. Verify technical details against current product documentation and project requirements.

© 2026 ALFA PRO COMMUNICATION SYSTEMS (Pty) Ltd - All rights reserved

Contact Us

Continue your research online:

Website: https://alfa-pro.co.za
Technical inquiry: https://alfa-pro.co.za/contact.html

This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

© 2026 ALFA PRO COMMUNICATION SYSTEMS (Pty) Ltd - All rights reserved