

Laser diode switching frequency

Article Overview

Laser diode switching frequencies can range from a few MHz to several GHz, depending on the diode type, driver electronics, and modulation method.

Gain-Switched Laser Diodes

Gain switching is a common method to achieve high-speed pulsing in laser diodes. By rapidly modulating the pump current, the laser emits short pulses whose repetition rate matches the modulation frequency. Typical gain-switched diode lasers can produce pulses as short as tens of picoseconds with repetition rates up to 2 GHz for commercial devices, such as Innolume's DFB lasers . The pulse width and stability depend on the diode's cavity length, gain medium, and pump current amplitude .

RF Modulation and Chirping

Laser diodes can also be modulated using fast RF current pulses. This allows not only amplitude switching but also frequency tuning (chirping) on nanosecond timescales. Systems have demonstrated optical pulses with durations of a few nanoseconds and frequency shifts up to 300 MHz with chirp rates of 150 MHz/ns, achieving high ON:OFF ratios in under 65 ns . Such modulation is particularly useful in quantum optics and high-speed optical communication.

Pulsed Laser Drivers

The achievable switching frequency is also limited by the driver electronics. Advanced drivers using GaN HEMT transistors can generate nanosecond pulses with...

Article Content

Apr 22, 2026

6_Q-switching

Actively Q-switched microchip laser J. J. Zayhowski et al., Opt. Lett. 20, 716, 1995
Tunable etalon (i.e. Fabry-Perot) Active Q

Feb 10, 2026

Switching, Amplifying, and Chirping Diode Lasers with Current Pulses ...

Fast rf pulses are applied directly to a laser diode to shift its emission frequency by up to 300 MHz in either direction and at a

Sep 17, 2025

Effect of gain switching frequency on ultrashort pulse generation from ...

In this work, the effects of gain switching frequency on ultrashort pulse generation are investigated using a model based on the multi

Jun 06, 2026

Effect of gain switching frequency on ultrashort pulse generation from ...

Effects of some laser diode parameters, and d.c. and RF drive conditions on the full width at half-maximum (FWHM) of gain switched

Feb 10, 2026

Towards ultra fast pulse generation by gain-switching of diode pumped ...

Here, we will give some very first insights on our research on cascaded gain-switching of a vertical-cavity surface-emitting laser

Oct 10, 2025

Q-switching – active, passive Q-switched laser pulse generation ...

It discusses which lasers are suitable for Q-switching, primarily solid-state bulk lasers, and explains key performance aspects, such

Sep 27, 2025

Design of High Peak Power Pulsed Laser Diode Driver

Some researchers integrated the power switch with its driver using CMOS technology in order to operate at

Jun 03, 2026

Ultrafast switch-on dynamics of frequency-tuneable semiconductor lasers

These results suggest that for any frequency-tuneable laser based on Vernier selection, where switching speeds are important, the

Feb 21, 2026

Spontaneous emission rate and phase diffusion in gain-switched laser diodes

Interferometric detection of phase diffusion in gain-switched single-mode semiconductor lasers is one of the main

Apr 25, 2026

Design of High Current Nanosecond Resonant Pulse Drivers for Laser ...

Figure 5 provides some typical numbers necessary to drive laser diodes in present-day DToF lidar laser transmitters. They are

Aug 28, 2025

Switching, amplifying, and chirping diode lasers with current pulses ...

A series of simple and low-cost devices for switching, amplifying, and chirping diode lasers based on current

Mar 28, 2026

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

This technique generates a high repetition frequency pulse through synthesizing the driving signals for multiple parallel

Jun 22, 2026

Frequency-Modulation Characteristics of Laser Diodes

If a laser diode is directly modulated one obtains a modulation of the optical power and also a modulation of the optical frequency. In

Sep 16, 2025

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

This comprehensive introduction explains laser diodes — electrically pumped semiconductor lasers where optical gain is obtained in

Jan 31, 2026

Optical frequency comb generation via pulsed gain-switching in ...

Abstract We report on the experimental generation of high-quality Optical Frequency Combs (OFCs) at low repetition

Jan 11, 2026

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

Apr 26, 2026

Lecture4_228B_S09_Final.ppt

Laser Chirp Another important parameter is the laser frequency chirp (frequency shift) Chirp will limit the bit-rate-distance product

May 21, 2026

A Single-Chip Laser Diode Driver with Built-In Frequency-Sweep ...

A laser diode driver with supply-intrinsic current shaping for FMCW LiDAR is presented. By combining a fast optical loop and an

Nov 10, 2025

High repetition-Rate laser diode side-Pumped burst-mode Nd:YAG laser ...

These intrinsic factors restrict the improvement of the Q-switched repetition frequency in side-pumped lasers and

Dec 10, 2025

4.4: Q-Switching

Active Q-Switching Single-Frequency Q-Switched Pulses Theory of Active Q-Switching Pumping Interval Passive Q-Switching

Jan 05, 2026

Experimental study on frequency doubling of Q-switched partially ...

Abstract In this paper, we investigate the frequency doubling of Q-switched partially coherent laser pulses. Such laser pulses are

Dec 15, 2025

Laser Diode Tutorial

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

Dec 06, 2025

AN-LD18 Optimizing Laser Diode Control

Optimized diode control will reduce wavelength instability, noise produced and added to the system, and keep the user safe to

Feb 11, 2026

Q-switched Lasers – Q-switching, light pulses, design

Q-switched lasers are lasers which emit optical pulses, using the method of Q-switching. Typically, they produce pulses with

Mar 11, 2026

Red narrow-linewidth lasing and frequency comb from gain ...

A gain-switching technique was implemented to the stabilized laser diode, and the generation of a high-contrast

Contact Us

For more information, pricing, or custom solutions, please contact us:

Website: <https://www.iiss.co.za>

Email: sales@iiss.co.za

Phone: +27 63 174 2895

Address: Unit 8, Innovation Park, 15 Rivonia Road, Sandton, Johannesburg, 2196, South Africa

This document is for informational purposes only. Specifications subject to change without notice.

