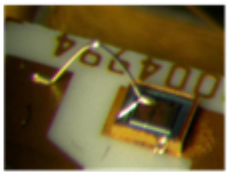
NIR VCSELs: Very High Performance – Ultra Low Power Consumption

NIR Lasers (VCSELs) for Sensing and Communications

VERTILAS GmbH, headquartered in Unterschleissheim (near Munich), Germany, develops, produces and markets innovative laser diodes for optical communications and tunable diode laser spectroscopy (TDLS).

VERTILAS' unique Buried Tunnel Junction (BTJ) laser diode technology offers a wavelength range of 1.3 µm to 2.3 µm. VERTILAS is one of the leading global providers in the field of **long wavelength Vertical Cavity Surface Emitting Laser diodes** (VCSEL), deploying reliable and cost efficient production methods. VERTILAS' VCSEL technology has been proven in several applications, including a variety of demanding spectroscopy and communications applications. Furthermore, VERTILAS has excelled in a range of core competencies for components development and manufacturing, including wafer processing, assembly and test and package design.



NIR VCSEL Gas Sensing

- Lasers from 1.3 µm to 2.3 µm
- Gases: HF, H_2O, NH_3, CH_4, HCl, CO_2, CO and more
- Cooled and uncooled TO packaging
- Fiber pigtail package

VCSEL Optical Communications

- Lasers for 1.3 µm, 1.49 µm, 1.55 µm
- Single mode and multi mode
- VCSEL arrays
- Cooled and uncooled TO packaging
- Fiber pigtail and LC TOSA package

The company is **ISO 9001** certified and has developed a wide range of product solutions to address various markets.

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VERTILAS InP VCSEL Technology: Vertilas has pioneered **InP based long wavelength (lw) VCSELs** by developing lasers with an optimized thermal design and excellent single mode behaviour. These VCSELs feature a dielectric bottom mirror, a buried tunnel junction (BTJ), a gold substrate acting as heat sink, a multi quantum well (MQW) active region and optimized waveguide design. The material structure and design enable the production of lasers with wavelengths from **1.3 µm to 2.3 µm**.

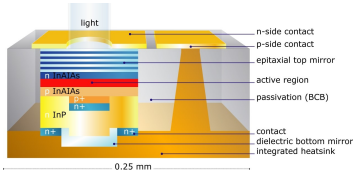


Fig.1: Cross section of InP VCSEL

NIR VCSEL for Sensing: Tunable diode laser spectroscopy can be deployed in a broad range of applications to measure many gas species. These gas detection systems require tunable lasers to scan the absorption lines of the various gases. The electrical and optical characteristics of a Vertilas laser for methane (CH_4) detection are shown in the graphs below. This class 1 laser features an extremely low power consumption of typ. 10mW (Fig. 2a), an optical power of max. 2 mW (Fig. 2a) and a wide current tuning range of 4 nm (Fig. 2b).

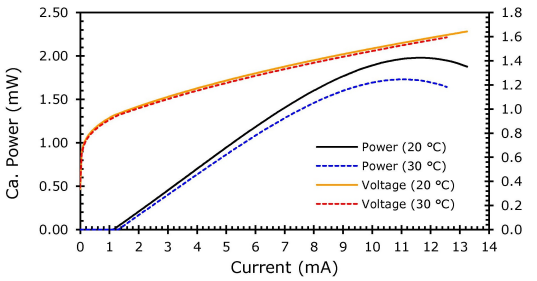
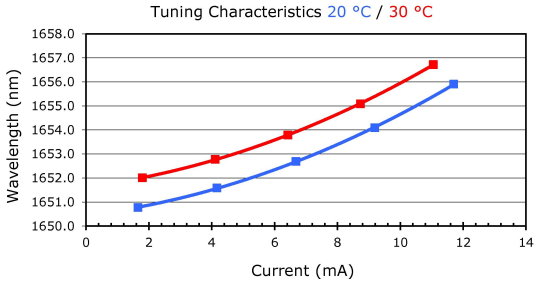


Fig. 2: a) LIV curves of 1654 nm VCSEL



b) Ibias current tuning range of 1654 nm VCSEL

High Data Rate VCSELs: Optical data communications systems for single mode fiber applications realize transmission speeds of 100 Gbps and 200 Gbps by modulating lasers at 25 Gbps or higher. These lasers require a high bandwidth and excellent single mode performance. Vertilas has developed high data rate lasers by optimizing the InP VCSEL design with a bandwidth up to 17 GHz, high max. optical power of 4 mW and a side mode suppression ratio (SMSR) of 40 dB. Single mode VCSELs for 1.3 µm and 1.55 µm have been demonstrated with a modulation performance of 25 Gbps to 50 Gbps. The graphs in fig. 4 show the electrical, optical, spectral and bandwidth parameters.

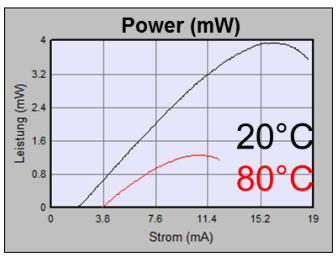
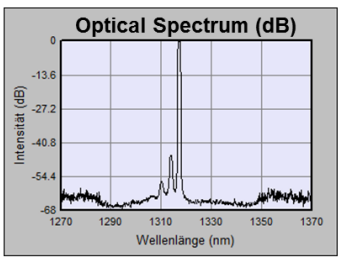
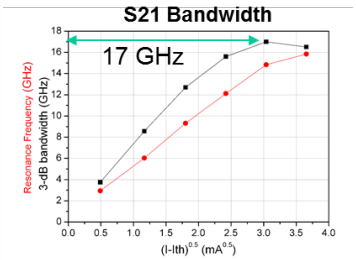


Fig. 4: a) LI curve



b) Spectrum of 1.3µm VCSEL



c) S21 bandwidth

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