1550nm 1.0mW SM VCSEL with Isolator

Product Description

1550nm 1.0mW SM VCSEL with Isolatorertical-Cavity Surface-Emitting Laser, or VCSEL for short, is a semiconductor laser that emits light vertically from the top surface.Based on GaAs semiconductor material, it differs from both LEDs (Light-Emitting Diodes) and LDs (Laser Diodes).The structure consists of mirrors, an active layer, and a metal contact layer.The two emission mirrors are P-type and N-type Bragg reflectors respectively.The active region is composed of quantum wells.A metal contact layer is formed on the outer surface of the P-type DBR to provide ohmic contact,and a circular aperture is patterned on the P-type DBR for laser output.It features a small far-field divergence angle with a narrow and circular beam;low threshold current and high modulation frequency up to 300 kHz.Wavelength tuning can be achieved by varying the drive current and temperature.Packaged with built-in TEC and PD, it is specifically designed for high-speed optical fiber communications.

Product features

High stability; narrow linewidth; low noise; stable wavelength; industrial-grade reliability

Part Number

MP-VCS-1550-1-A81-SA-TEC-ISO

Application area

Fiber Optic Sensing | Coherent Communications | LiDAR | Quantum Technology | Scientific Research

Core parameters

Center Wavelength
1550nm

General Parameters

Technical Specifications

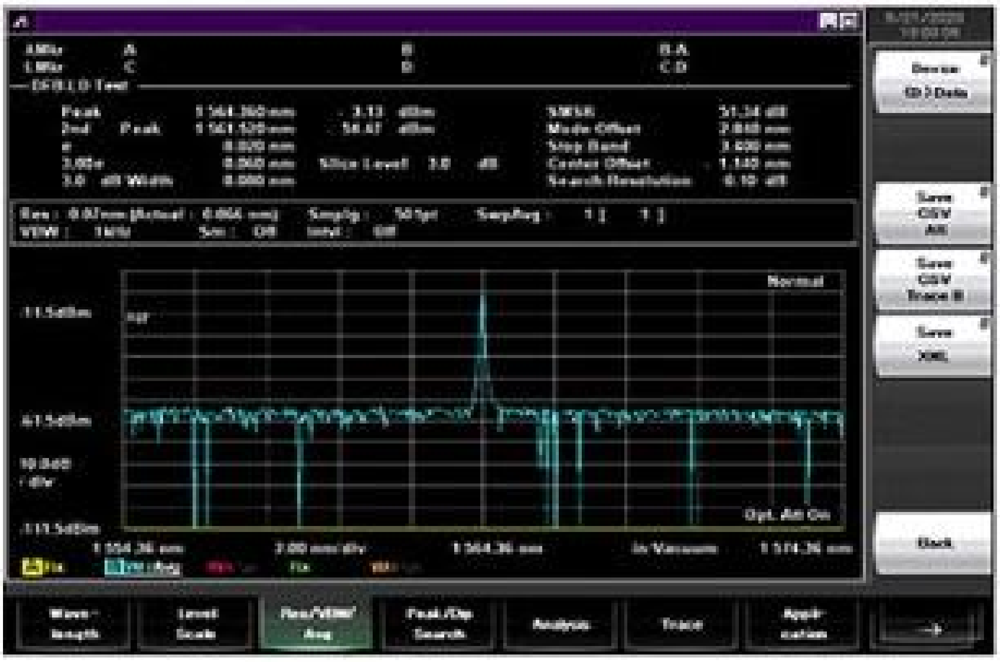
Tc = 20 °C, IOP = 2.0 mA unless otherwise noted(Tc = chip backside temperature, controlled by TEC)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Optical Output Peak Power @ 25 °C	P	1.0	1.6	–	mW
Operating Bias Current	Iop	0	18	25	mA
Operating Temperature Range	Top	-40	25	85	°C
Threshold Current	Ith	–	8	12	mA
Slope Efficiency (CW, Tc = 25 °C)	SE	0.14	0.18	–	mW/mA
Laser Drive Voltage	VCC	0	1.5	2.5	V
Series Resistance	Rs	–	50	–	Ω
Center Wavelength	–	1525	–	1575	nm
Guaranteed Tuning Range(Positive voltage reduces peak wavelength)	λ	8	10	–	nm
Max. Frequency Tuning Response	fmax	100	200	–	kHz

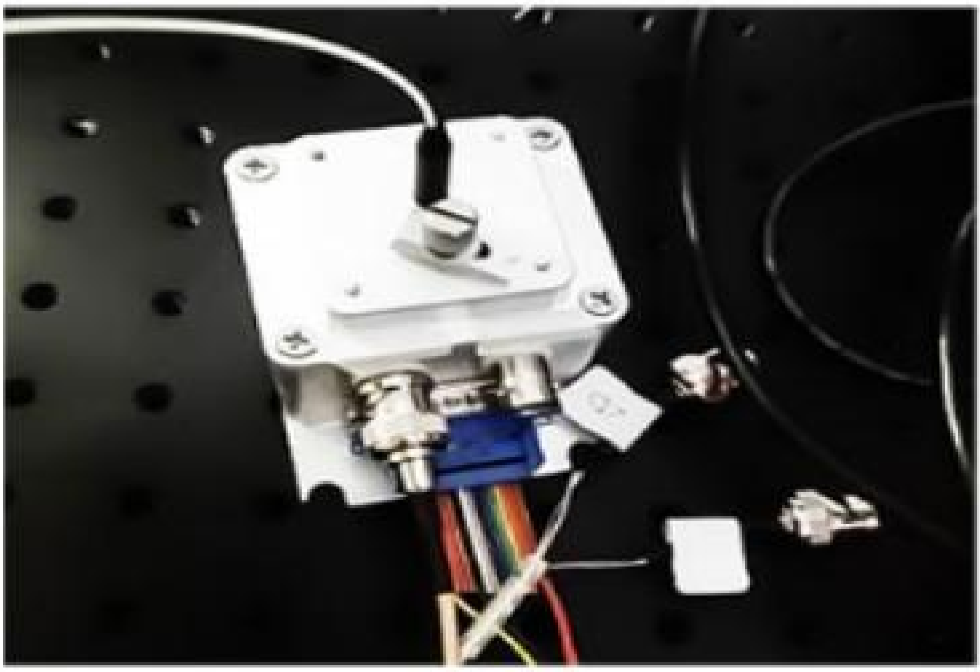
Side Mode Suppression Ratio	SMSR	30	40	–	dB
Linewidth (-3 dB FWHM, CW bias = IOP)	σ	–	–	300	MHz
Relative Intensity Noise	RIN	–	–	-128	dB/Hz
Tuning Voltage	Vtune	0	Test Sheet	Test Sheet	V
Tuning Current	Itune	0	–	100	μA
TEC Voltage	VTEC	–	0.35	1.5	V
TEC Current	ITEC	–	0.05	0.6	A

Experimental Data

We conducted experiments on the VCSEL laser, measuring the relationships of voltage, current with wavelength, as well as the relationship with frequency.



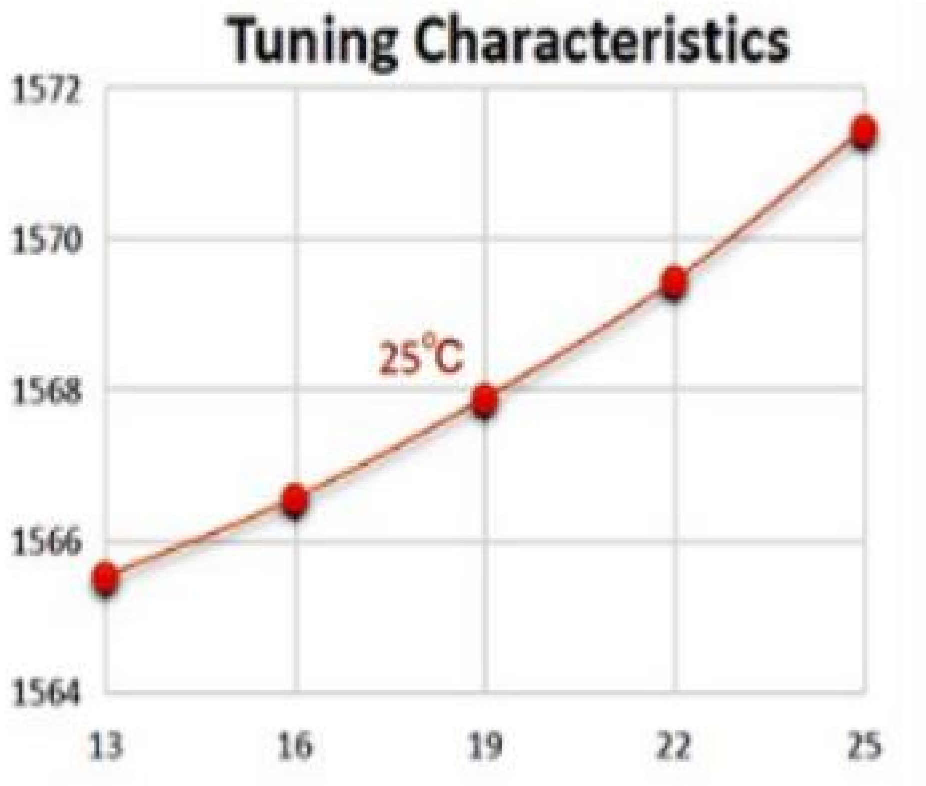
VCSEL Spectrum



VCSEL Test Socket

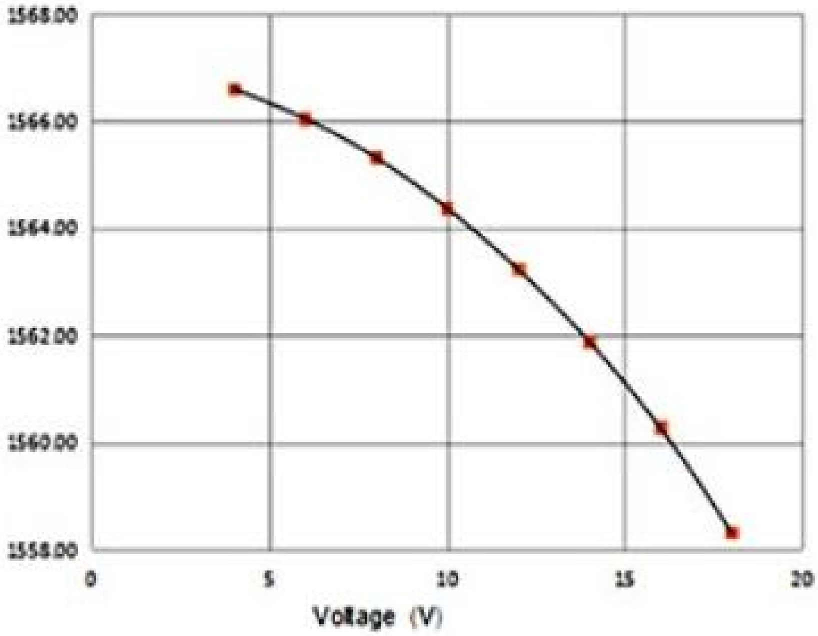
Relationship between current and wavelength:

We kept the voltage constant and adjusted the current from 13 mA to 25 mA in steps of 3 mA. It was found that as the current was adjusted, the wavelength changed significantly and exhibited a positive linear curve.

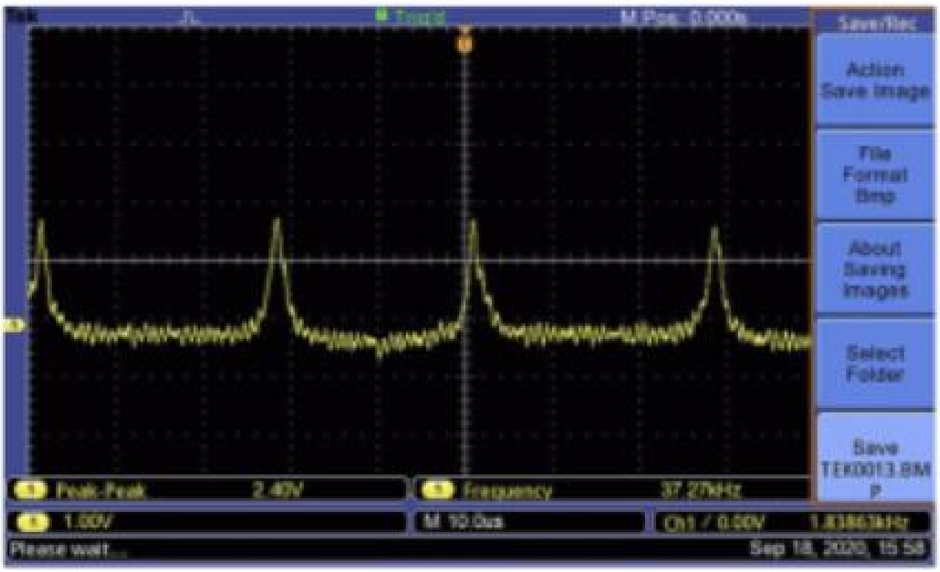


Relationship between voltage and wavelength:

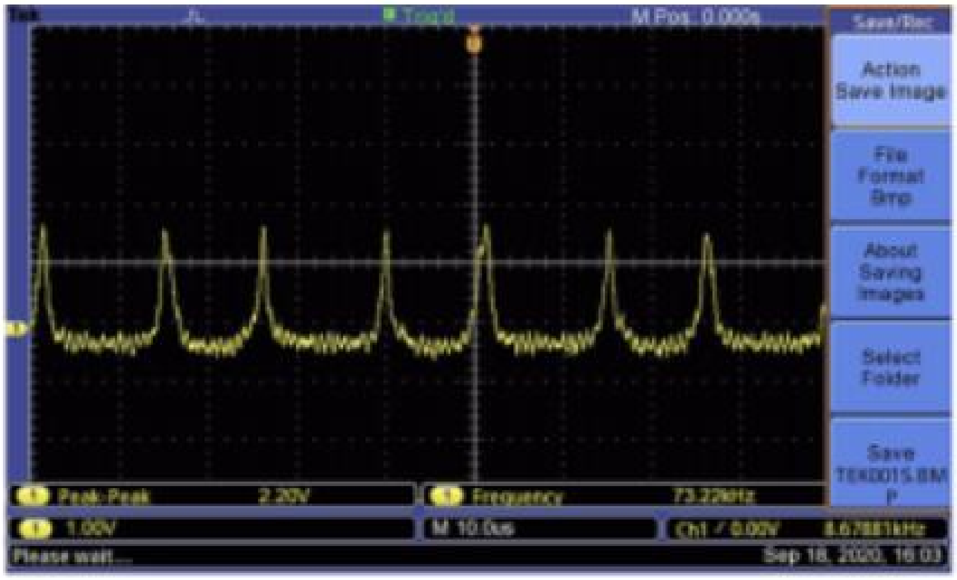
We applied voltages from 4V to 18V to the laser, increasing in 2V steps, and measured the data shown in the figure above. We observed that as the voltage increased, the wavelength decreased by approximately 8 nm, exhibiting a negative, nearly linear curve.



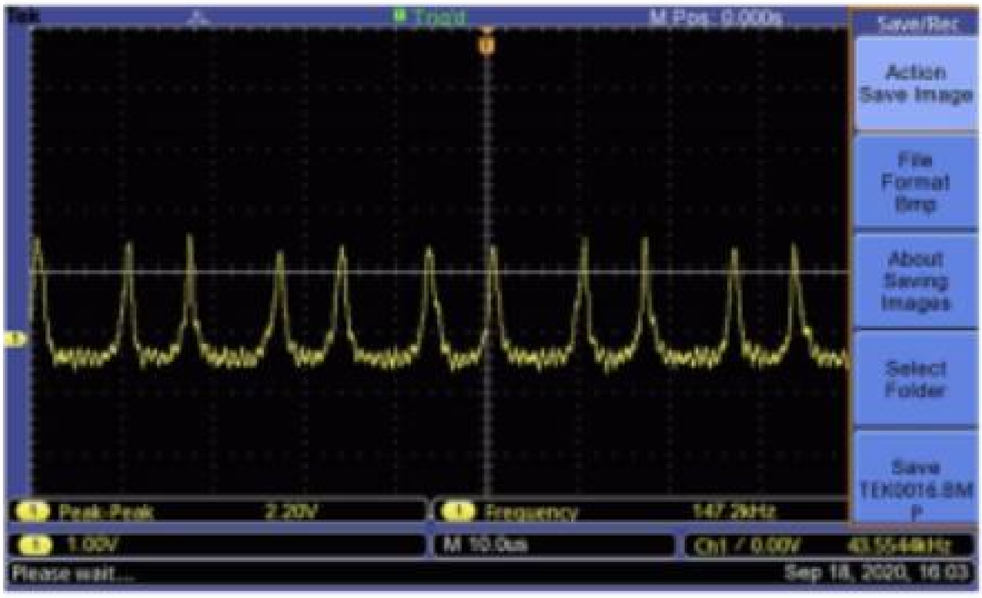
Load Variation at Different Frequencies：



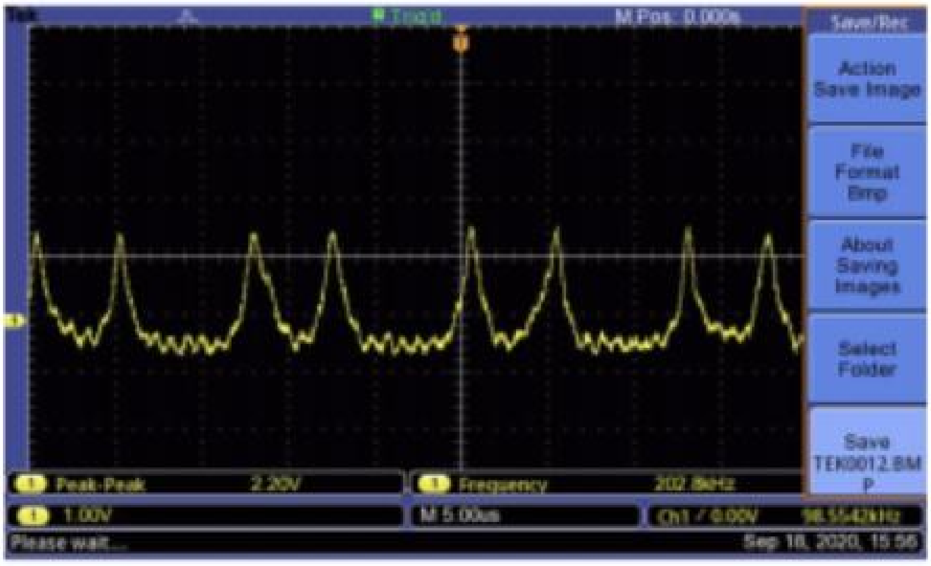
Waveform@5V 20kHz



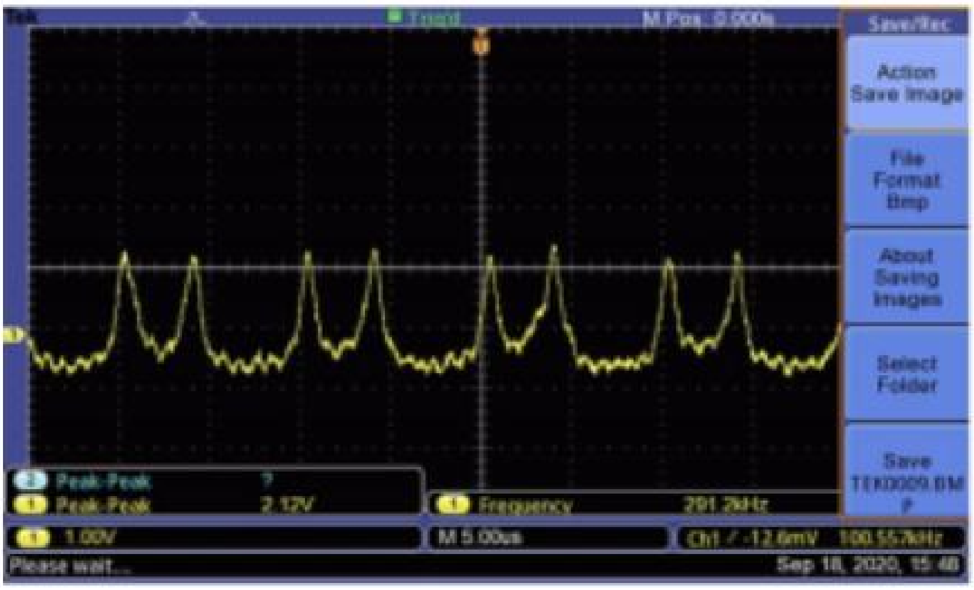
Waveform@5V 40kHz



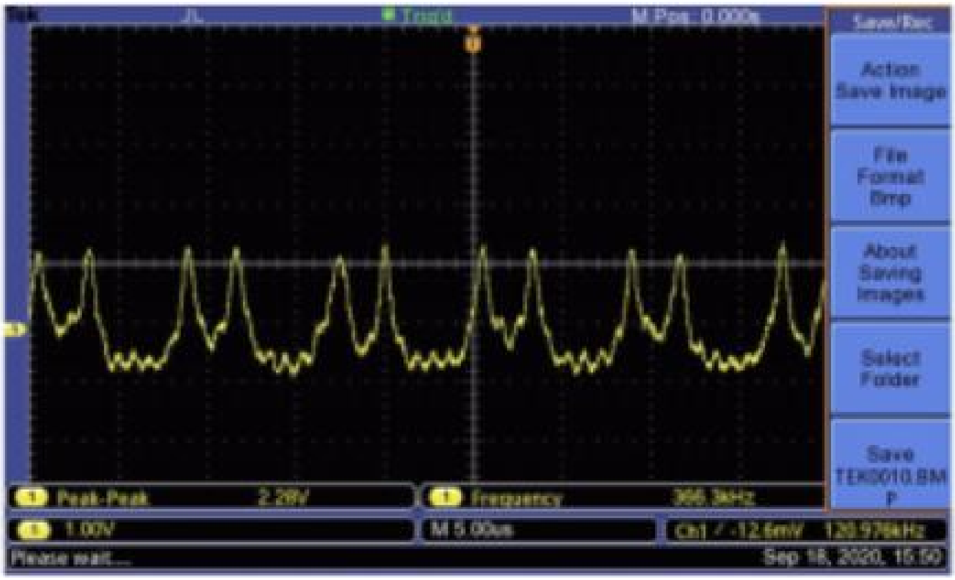
Waveform@5V 60kHz



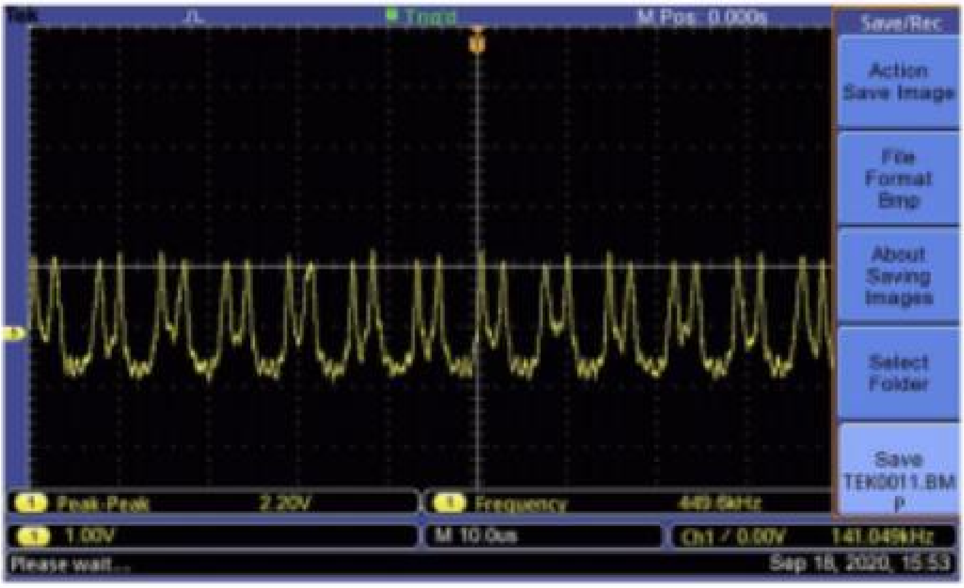
Waveform@5V 80kHz



Waveform@5V 100kHz



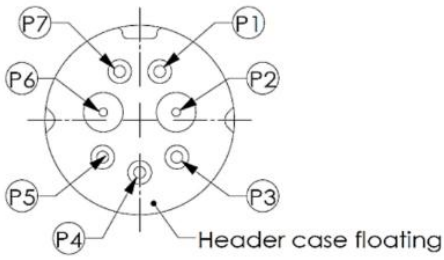
Waveform@5V 120kHz



Waveform@5V 140kHz

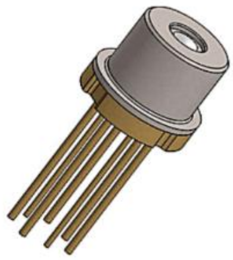
With a constant 5V voltage applied, the frequency was varied to obtain the figure above. Our modulation frequency is extremely high, allowing it to carry a greater amount of information and provide a faster response speed.

Pin Definition



Bottom View

PIN NUMBERS	ASSIGNMENT
P1	TEC (+)
P2	LD (-)
P3	TUNING Vt (-)
P4	THERMISTOR (-)
P5	THERMISTOR (+)
P6	LD (+) & Vt (+)
P7	TEC (-)



The generation of VCSEL laser mainly consists of three components: the laser gain medium, the pump source, and the optical resonant cavity.The pump source excites the gain medium to achieve population inversion and generate light emission.Within the resonant cavity formed by the bottom and top mirrors, the light is amplified and oscillates, finally outputting from the top mirror.The output light is confined only to the central region without an oxide layer, forming vertical-cavity surface-emitting laser and producing a stable, continuous, high-quality laser beam with sufficient output power.