

# BW10-1550-T-TO



**BANDWIDTH10, LTD.**

## Description:

Bandwidth10's BW10-1550-T-TO is part of a family of lasers based on the innovative High Contrast Grating (HCG) single mode 1550 nm VCSEL.

## Applications:

- Optical communications
- Swept source
- Optical gas sensing
- LIDAR

## Features:

- TO-56 7Pin Small Form Footprint with integrated TEC
- Aspherical lens cap
- Single Mode / Single Gaussian Lob e VCSEL
- Start wavelength can be within several bands through the C and L band.
- Wide Tuning Range:  $\geq 8$  nm
- High modulation bandwidth (10 Gbps)
- Fast Wavelength Tuning ( $\sim 100$  kHz)

## Pin Assignment and Drawing

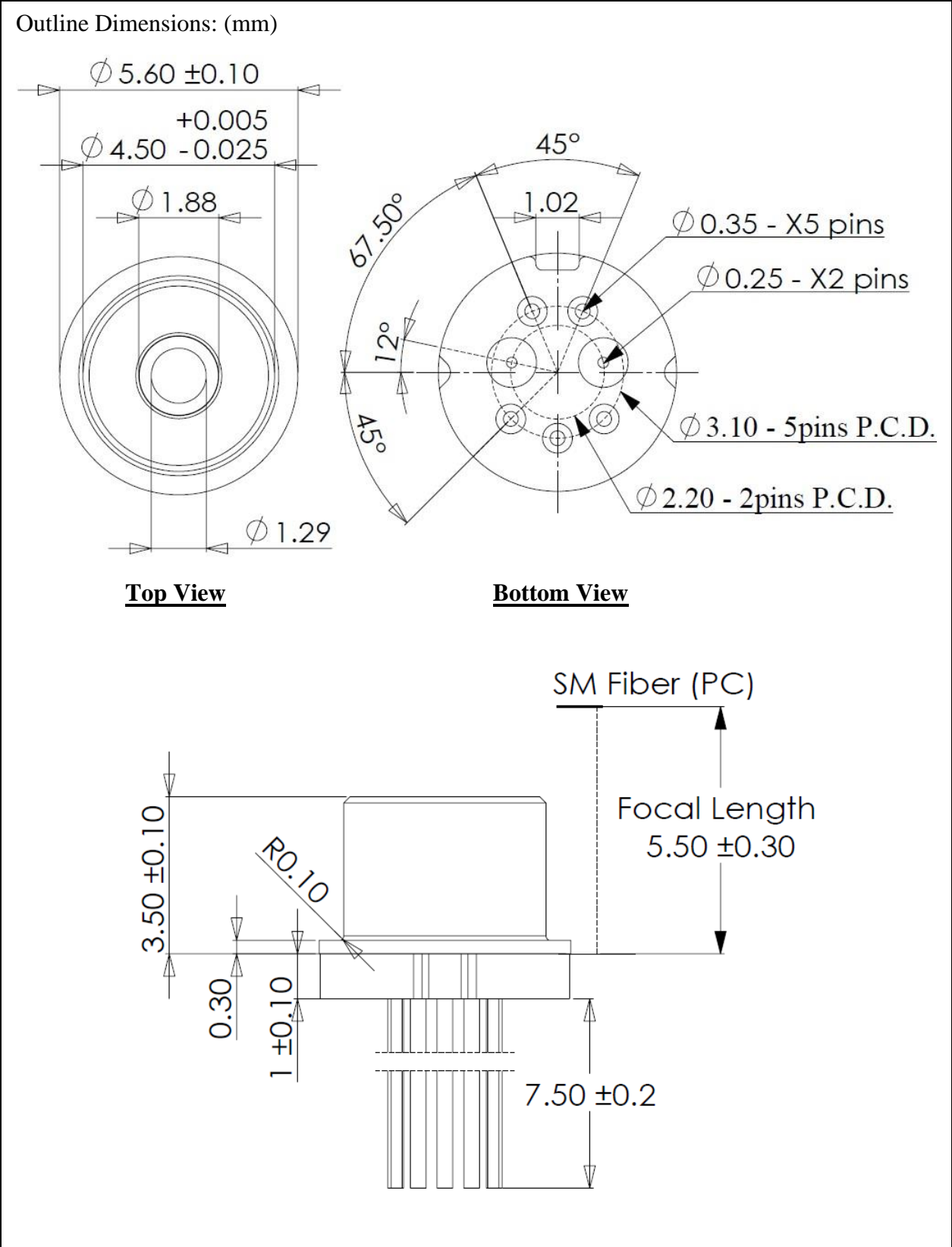
**Bottom View**

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



**CAUTION:** Device is sensitive to electrostatic discharge.

**Dimensional Drawing**



## Absolute Maximum Ratings

The device should be used within the defined absolute maximum ratings. Exceeding these parameters might damage the laser. The sign of the laser current, laser voltage and tuning voltage depends on the used laser driver. Please check the application notes or contact Bandwidth10 for further information.

Parameter	Symbol	Safe Ratings	Unit
Storage Temperature Storage at 70°C is limited due to the foam used in the shipment package. The TO can be qualified for 85°C without package	$T_{stg}$	-20 to +70	°C
Operating Case Temperature	$T_c$	-5 to +70	°C
Absolute value of maximum VCSEL bias current between pin 2 and pin 6	$ I_{bias\_max} $	25	mA
Absolute value of maximum VCSEL drive voltage between pin 2 and pin 6	$ V_{ld\_max} $	3	V
Absolute value of maximum wavelength tuning voltage between pin 3 and pin 6	$ V_{tune\_max} $	See test sheet	V
Soldering Temperature	$T_{sld}$	350 (10 sec.)	°C

## Operating Conditions

The table below shows the recommended operating conditions. The guaranteed parameters like output power and tuning range are valid under these operating conditions and tested in production. The user can operate the device at different operating conditions, i.e. can change the temperature or bias current, but parameters given in the general specification section are not guaranteed anymore. Please check the application notes and contact Bandwidth10 for information about the voltage polarities.

Parameter	Symbol	Values	Unit
Operating TEC temperature	$T_{op}$	Typically, around 25°C – see test sheet for further information	°C
Absolute value of operating VCSEL bias current between pin 2 and pin 6	$ I_{op} $	Typically, around  18  mA – see test sheet for further information	mA
Absolute value of tuning voltage for achieving start wavelength	$ V_t@λ_{start} $	Typically, around 0V – see test sheet for further information	V
Absolute value of tuning voltage for achieving stop wavelength	$ V_t@λ_{stop} $	Typically, around  18 V – see test sheet	V

## General Specification

The parameters below are guaranteed by design for  $I_{op}$  and  $T_{op}$  and might not be checked for each individual part. The tuning voltage sign and value might depend on the laser driver and might be different for floating, anode grounded or cathode grounded laser drivers.

Parameter	Symbol	Values			Unit
		Min	Typical	Max	
<b>Start Wavelength @<math>T_{op}</math> and <math>I_{op}</math></b> Ideally, the start wavelength is achieved at 0V tuning voltage. However, this is not guaranteed and can differ from part to part. The 0V wavelength can be greater than the start wavelength. The desired start wavelength can be specified in the purchase order.	$\lambda_{start}$	1529		1579	nm
<b>Stop wavelength @<math>T_{op}</math> and <math>I_{op}</math></b> The stop wavelength is achieved by applying a voltage potential to pin 3 lower than the potential at pin 6. The tuning voltage for achieving the stop wavelength is indicated by the symbol $V_{T_{stop}}$	$\lambda_{stop}$		$\lambda_{start}-8$		nm
<b>Guaranteed DC Tuning Range</b>	$\Delta\lambda$	8		-	nm
<b>Optical Output Peak Power @25° C</b> TEC temperature and $I_{op}$ over guaranteed tuning range	P	1.0			mW
<b>Operating TEC Temperature range</b> The user can operate the laser within this temperature range. Parameters are only guaranteed at $T_{op}$ TEC temperature (typically 25°C). If operated at lower or higher temp than $T_{op}$ , the power might be different, and the wavelength range will be shifted.	$T_{TEC}$	5	$T_{op}$	35	°C
<b>Absolute value of Threshold Current</b>	$ I_{th} $		7		mA
<b>Absolute value of Laser Drive Voltage</b>	$ V_{ld} $	0	1.5	2.5	V
<b>Resistance</b> Measured between pin 2 and 6	$R_s$		50		$\Omega$
<b>Max. Mechanical Tuning Response</b> We guarantee that the user can sweep the laser wavelength with at least 10kHz or more. Please contact BW10 is a higher guaranteed sweep rate is required.	$f_{max}$	10	100	-	kHz
<b>Side-mode suppression ratio</b>	SMSR	30	40		dB
<b>Linewidth (-3 dB FWHM), CW</b> $I_{bias}=I_{op}, V_{Tune}=0V$	$\sigma$			300	MHz

Relative Intensity Noise	RIN			-128	dB/Hz
Absolute value of Tuning Current	$ I_{\text{tune}} $	0	-	100	$\mu\text{A}$
TEC Voltage	$V_{\text{TEC}}$		0.35	1.5	V
TEC Current	$I_{\text{TEC}}$		0.05	0.5	A
Temperature Tuning Coefficient If the TEC temperature is increased by 1K the wavelength is typically increased by 0.4nm			0.2		nm/K
Current tuning coefficient If the laser current is increased by 1mA the wavelength is typically increased by 0.4nm			0.4		nm/mA

## System Design Recommendations

We recommend anode grounded laser drivers which ease the design of the tuning circuit.

Parameter / Explanation	Symbol	Values			Unit
		Min	Typical	Max	
<b>Design Recommendation Bias Current (anode grounded laser driver)</b> This value is an indication for circuit design considerations, we recommend using a circuit that can drive the laser up the given current. Note, that the recommended bias for each individual part might be lower and given in the test report.	$I_{\text{bias}}$			30	mA
<b>Design Recommendation Tuning Voltage</b> Note that the sign and min value of the tuning voltage depends on the used laser driver. Here we recommend and assume anode grounded laser drivers. When using other configurations, the user must ensure that, the potential at pin VT- must be equal or lower than on VT+. Please contact your local FAE if you have any questions.	$V_t$	-30		0	V
<b>Design Recommendations TEC Temperature range</b>	$T_{\text{TEC}}$	5		35	$^{\circ}\text{C}$
<b>Design Recommendations TEC voltage</b>	$V_{\text{TEC}}$			1.5	V
<b>Design Recommendations TEC current</b>	$I_{\text{TEC}}$			0.5	A

**Electrostatic Discharge (ESD)**

LD+/LD- ESD classification: Class 1A, Human Body Model (HBM).

Vt- ESD classification: Class 0, Human Body Model (HBM).

Since this is an ESD sensitive device, proper ESD precautions (limit exposure to below 100V HBM) should be taken during every step of the assembly process.

Standard ESD testing was to MIL-STD-883, Human Body Model, with 3 pulses forward/reverse applied to the signal leads. Failure is defined as a measurable (>10%) change in a key parameter, optical output power for the tunable VCSEL. The LD+/LD- and Vt- of VCSEL TO fails at 350 Volts and <50 Volts respectively for damage to the laser chip, with a decrease in optical power output.

**Order and Contact Information**

Model Number	Contact Information
<p style="text-align: center;"><b>BW10-1550-T-TO</b></p> <p>Please specify start wavelength in the purchase order</p>	<p style="text-align: center;">Bandwidth 10 Ltd. 2080 Addison Street, Suite 2 Berkeley, CA 94704, USA</p> <p style="text-align: center;"><a href="mailto:info@bandwidth10.com">info@bandwidth10.com</a></p>