BW10-1550-Txx-PxFA

BANDWIDTH10, LTD.

Description:

Bandwidth10's BW10-1550-Txx-PxFA is part of a family of lasers based on the innovative High Contrast Grating (HCG) single mode 1550 nm VCSEL.

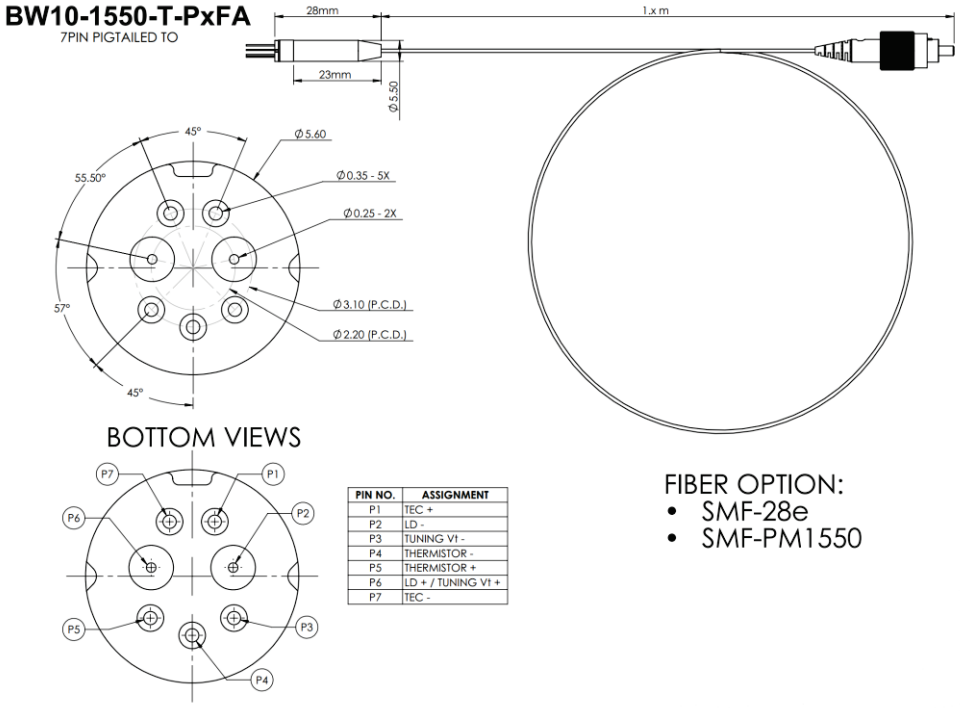
Applications:

- Fiber sensors
- Optical gas sensors
- Biosensors
- Metrology / Interferometry
- Swept source
- FMCW LIDAR / range finder
- Optical communications

Features:

- TO-56 7Pin Small Form Footprint with integrated TEC
- Single Mode VCSEL
- Permanently attached single mode fiber (SMF or 1550 Panda) with FC/APC connector
- Start wavelength can be chosen within the C-and lower L-band.
- Wide Tuning Range: 8 nm, up to 16nm
- Fast Wavelength Tuning >10KHz
- Internal optical isolator with isolation ratio >20 dB

Dimensional Drawing and Pin Assignment



PIN NO.	ASSIGNMENT
P1	TEC +
P2	LD -
P3	TUNING V1 -
P4	THERMISTOR -
P5	THERMISTOR +
P6	LD + / TUNING V1 +
P7	TEC -

ATTENTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

CAUTION: Device is sensitive to electrostatic discharge.

First Time Setup Sequence with lab equipment and BW10-420D fixture

Follow these steps in exact order, to avoid damage!

0. Here we assume an anode grounded laser driver and negative tuning voltages.
1. Hook up all equipment. Do short all supply outputs before use (to reduce the risk of surges when first switched on).
2. Power up the equipment. Ensure all supply outputs are disabled. Set supply compliance limits (if applicable).
3. Connect all cables to testing equipment, the fixture BW10-420D is recommended.
4. If possible, connect TO pin 2, 3 and 6 to GND, i.e. short the laser driver output and tuning voltage source output to GND.
5. Observing ESD protection, load the TO into mount or heatsink (clamp it down if applicable).
6. Check TEC controller reading (room temperature).
7. If OK, set TEC controller to 25°C and turn it on, and wait for stable 25°C reading. If the temperature is oscillating adjust the gain or PID settings of the controller.
8. Turn on Tuning voltage, with setting to 0V.
9. Remove the GND connecting from point 4.
10. Turn on Laser driver (low bias <0.5mA). Slowly increase bias to 15 mA (or the current specified in test report for specific part). TEC controller shall indicate a TO temperature jump, followed by stabilization back to set point.
11. Check the Laser driver readouts to verify that voltage is within expected range (as per datasheet).
12. Connect optical output to Power meter and/or Optical spectrum analyzer respective Spectrometer (using fiber splitter if applicable)
13. Double check TEC controller for stable reading at set point.
14. Slowly increase Tuning voltage to the tuning voltage for WLstart given in the test report. You should be able to measure an optical power larger than the value P_O given in the datasheet. If you measure the spectrum you will notice that the laser will lase at the start wavelength given in the test report.
15. Apply various tuning voltages (observing max. ratings as of testsheet), for detailed check of tuning function. If you AC sweep the tuning voltage ensure that you never have a negative tuning voltage, i.e. apply a DC bias first and slowly increase the AC voltage

System and laser are now ready for standard testing procedure.

Shutdown Procedure with lab equipment and BW10-420D fixture

Follow these steps in exact order, to avoid damage!

1. Lower the tuning voltage to 0V.
2. Lower the laser current to 0 mA.
3. Short the Laser current source outputs to GND.
4. Short the DC voltage source outputs to GND.
5. Disable the TEC.

You can now safely disconnect the laser. Please place the laser in the ESD safe container used for shipment.

Power sequencing when driving the laser with your own circuit.

Follow these steps in exact order, to avoid damage!

Enabling the laser:

1. We recommend adding SPDT electrical switches which short pin 2,3 and 6 to GND if the laser is not in use.
2. Tune on your circuity.
3. Turn on the TEC control.
4. Toggle SPDT switches to connect pin 2, 3 and 6 with your circuit. Verify applied laser diode current is 0 mA and tuning voltage is 0 V before toggling!
5. Next increase the laser current to the value given in the test sheet.
6. Apply the DC portion of the tuning voltage.
7. Apply the AC portion of the tuning voltage.
8. Once a tuning voltage is applied do not change the laser current.

Disabling the laser

1. Decrease the AC portion of the tuning voltage to ~0 Vpp.
2. Decrease the DC portion of the tuning voltage to 0 V.
3. Decrease the laser current to 0 mA.
4. Toggle the SPDT switches and short pin 2,3 and 6 to GND.
5. Turn off the TEC circuit.

Do not hesitate to contact BW10 for further support!

Please check also the detailed application note.

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 pigtail TO was 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	$\|Vt@\lambda_{start}\|$	Typically, around 0V – see test sheet for further information	V
Absolute value of tuning voltage for achieving stop wavelength	$\|Vt@\lambda_{stop}\|$	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 / Explanation	Symbol	Values			Unit
		Min	Typical	Max	
Start Wavelength @T_{op} and I_{op} 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.	λ_{start}	1529		1579	nm
Guaranteed DC Tuning Range Minimum guaranteed tuning range is specified by the model number given on the ordering information section. 8 nm: BW10-1550-T-PxFA 10 nm: BW10-1550-T10-PxFA 12 nm: BW10-1550-T12-PxFA 14 nm: BW10-1550-T14-PxFA	GTR	8			nm
		10			
		12			
		14			
Stop wavelength @T_{op} and I_{op} 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 VT_{Stop}	λ_{stop}		λ_{start}-GTR		nm
Optical Output Peak Power @25º C TEC temperature and I_{op} over guaranteed tuning range	P	0.4		2	mW
Operating TEC Temperature range 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
Absolute value of Threshold Current	$\|I_{th}\|$		|7|		mA
Absolute value of Laser Drive Voltage	$\|V_{ld}\|$	0	|1.5|	|2.5|	V
Resistance Measured between pin 2 and 6	R_s		20		Ω
Max. Mechanical Tuning Response We guarantee that the user can sweep the laser wavelength with at least 10kHz (sinusoidal driving signal) or more. Please	f_{max}	10		-	kHz

contact BW10 is a higher guaranteed sweep rate is required.					
Side-mode suppression ratio	SMSR	30	40		dB
Polarization Extinction Ratio for PM fiber version (BW10-1550-T-PPFA)	PER	20			dB
Relative Intensity Noise	RIN			-128	dB/Hz
Absolute value of Tuning Current	$\|I_{tune}\|$	0	-	100	µA
TEC Voltage	V_{TEC}		0.35	0.9	V
TEC Current	I_{TEC}		0.05	0.5	A
Temperature Tuning Coefficient If the TEC temperature is increased by 1K the wavelength is typically increased by 0.2nm.			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	
Design Recommendation Bias Current (anode grounded laser driver) 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_{bias}			30	mA
Design Recommendation Tuning Voltage 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.	Vt	-30		0	V
Design Recommendations TEC Temperature range	T_{TEC}	5		35	°C

Design Recommendations TEC voltage	V_{TEC}			0.9	V
Design Recommendations TEC current	I_{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

<table>
<tr><th colspan="4">Model Numbers</th><th>Contact Information</th></tr>
<tr><td colspan="4">Standard 8 nm tuning range version:

BW10-1550-T-PyFA

Extended tuning range versions:

BW10-1550-T1x-PyFA

Please specify the parameter</td><td rowspan="8">Bandwidth 10 Ltd.
2080 Addison Street,
Suite 2
Berkeley, CA 94704,
USA

info@bandwidth10.com</td></tr>
<tr><td></td><td>Description</td><td>Value</td><td>Explanation</td></tr>
<tr><td rowspan="3">x</td><td rowspan="3">Tuning Range</td><td>0</td><td>10 nm tuning rage</td></tr>
<tr><td>2</td><td>12 nm tuning rage</td></tr>
<tr><td>4</td><td>14 nm tuning rage</td></tr>
<tr><td rowspan="2">y</td><td rowspan="2">Fiber Type</td><td>S</td><td>1.0m 900µm SMF28 fiber and FC/APC connector</td></tr>
<tr><td>P</td><td>1.5m 900µm PM1550 polarization maintaining PANDA fiber. The FC/APC connector and output signal are aligned to the slow axis.</td></tr>
<tr><td colspan="4">Please specify start wavelength in the purchase order. Limited quantities of 12nm and 14nm versions with start wavelength around 1537nm and 1575nm are available today. Please contact your local sales representative for further information. Other start wavelengths can be made on request. MOQ will apply.</td></tr>
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