Fiber Coupled VCSEL Laser Diode 795 nm

SM, PM

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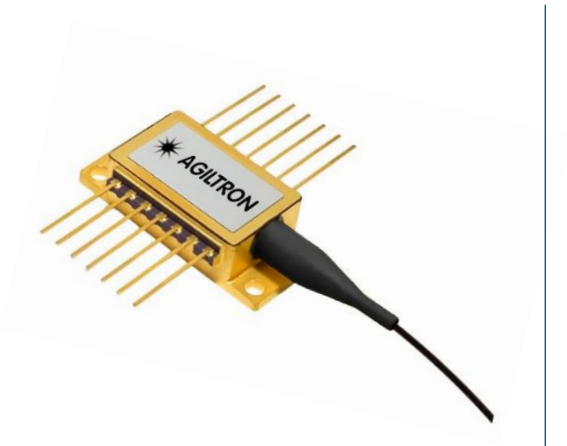

The FCVC is a fiber-coupled, vertically-emitting, single-mode diode laser based on a semiconductor quantum-well configuration. The diode chip is housed in a 14-pin butterfly package, featuring TEC cooling and a power monitoring photodetector. Wavelength tuning can be achieved through laser current and temperature adjustments. Our 795nm single-mode VCSEL is designed for high-speed, high-performance communication applications. All of our laser products are Telcordia GR-468 qualified and comply with RoHS Directives.

Due to their high sensitivity to electrostatic discharge, warranty coverage applies only to fully metal covered modules the benchtops, which include proper protection. Other versions of the lasers and photodetectors are not covered by any warranty. Please use them with great caution.

Features

- Low Temperature Dependence
- Data rates from OC-3 to OC-48
- Vertical Cavity Surface-Emitting Laser
- Internal TEC and Thermistor
- 2 nm tunability with TEC

Applications

- Access network
- Local area network
- Gigabit Ethernet

Specifications

Parameter	Min	Typical	Max	Unit
Emission Wavelength	794.5	795	795.5	nm
Peak Optical Output Power		0.1	0.2	mW
Bandwidth(-3dB)	100			MHz
Spectral Linewidth		2		nm
Side-mode Suppression Ratio	25			dB
Polarization Extinction Ratio	18			dB
Relative Intensity Noise		–130	–120	dB/Hz
Thermal resistance (VCSEL chip)	3		5	K/mW
Beam Divergence	10		25	°
Wavelength Temperature Coefficient		0.06		nm/K
Wavelength Current Coefficient		0.6		nm/mA
Threshold Current		1		mA
Slope Efficiency		0.3		W/A
Electro Optic Conversion Rate		12		%
Operating Current		-	3	mA
Differential series resistance		300	500	Ω
Laser Forward Voltage		2		V
NTC Thermistor Resistance	9.5	10	10.5	KΩ
Storage Temperature	–40	25	+125	℃
Chip Temperature	+10		+40	℃
Operating Current	0	2	3	mA
Laser Forward Voltage	0.8	1.2	1.8	V
TEC Current	–150		+300	mA
Soldering Temperature*	100	130	270	℃
Electrical Power Dissipation			5	mW
Pigtail Type		900 loose tube		μm
Pigtail Length		1.0±0.1		m
Connector Type		FC/APC		

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Note: *TEC temperature must be below 150℃

RoHS COMPLIANT

ATTENTION
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC

Warning: The device can be damaged by a spike in applying voltage. Do not touch by hand or use a regular power supply. The device mounted on PCB is a cost-effective OEM module for professional system integration only, not intended for laboratory use, which be a protected turn-key boxed package. Information is believed to be accurate and is subject to change without notice. Some specific combinations of options may not be available. The user assumes all risks and liability in connection with the use of a product or its application.

Rev 10/01/26

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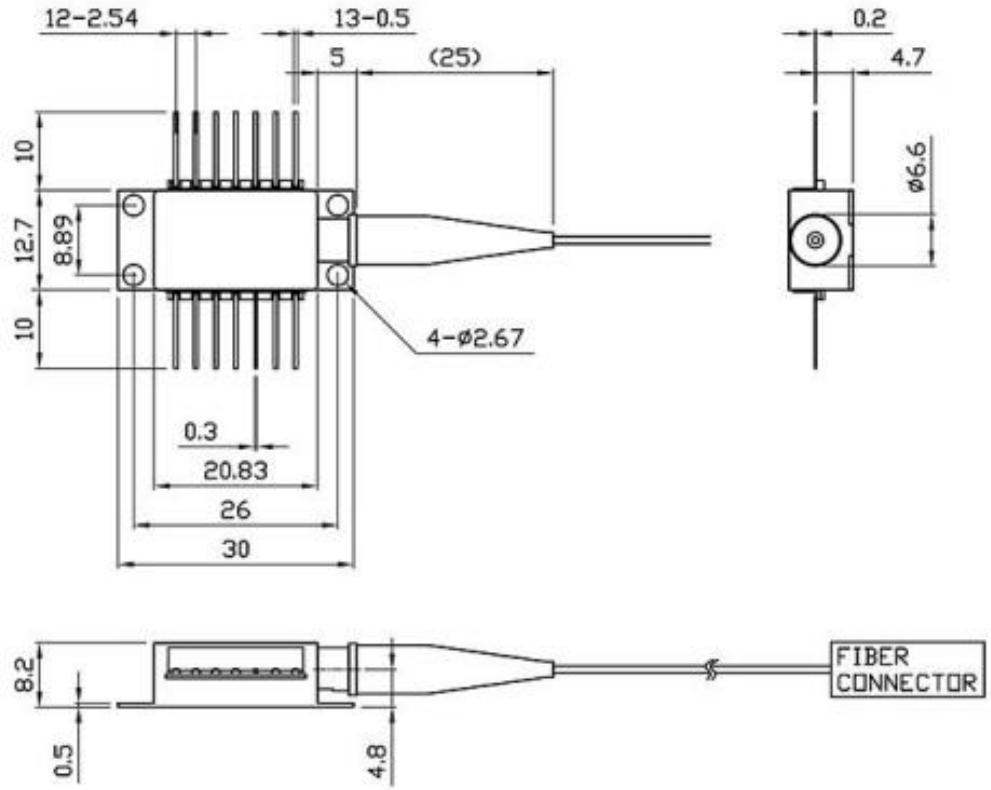
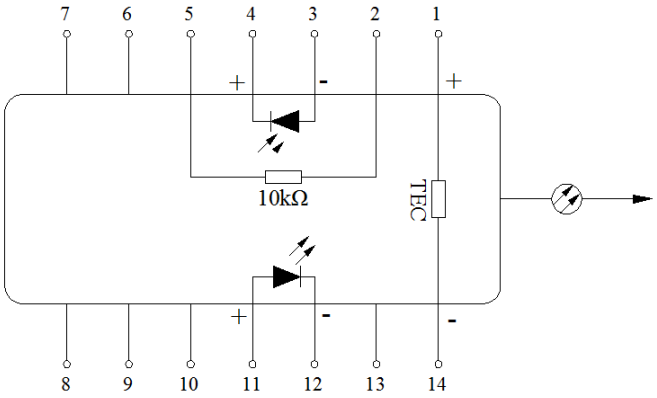
Mechanical Dimensions (mm)



*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

Electrical Connection



PIN	Description	PIN	Description
1	Thermoelectric Cooler (+)	8	NC
2	Thermistor	9	NC
3	Monitor PD Anode (-)	10	NC
4	Monitor PD Cathode (+)	11	Laser Anode (+)
5	Thermistor	12	Laser Cathode (-)
6	NC	13	NC
7	NC	14	Thermoelectric Cooler (–)

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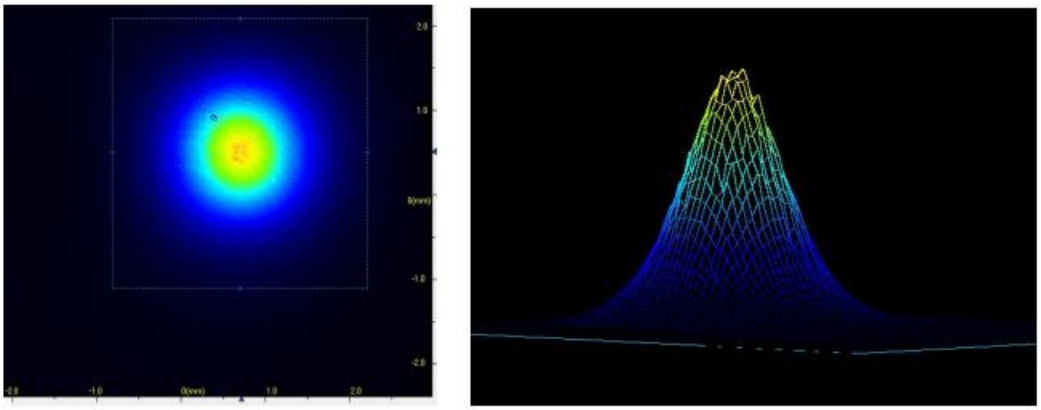
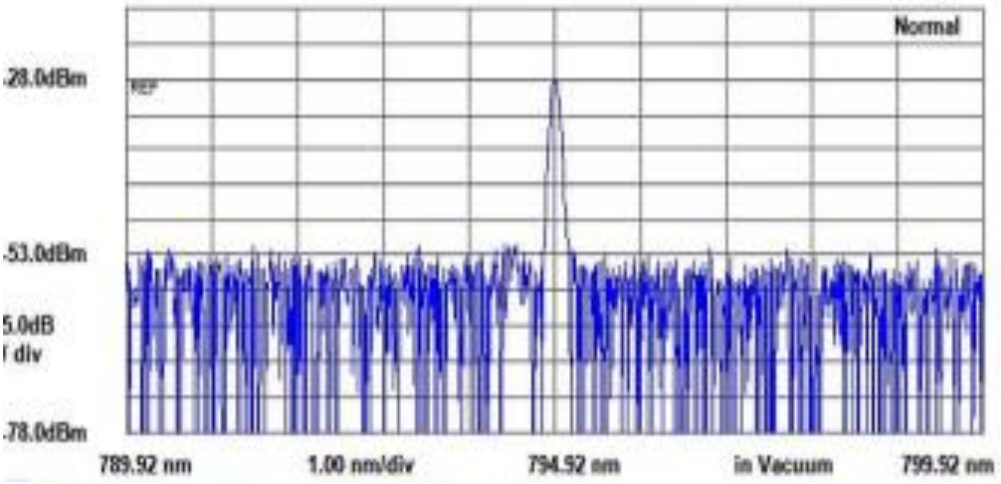
Typical Optical Characters

Beam Profiler (2D/3D)

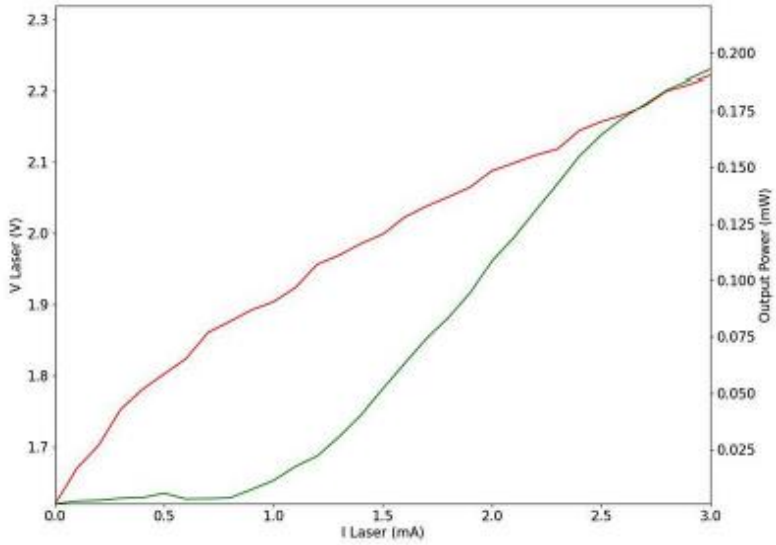


2D 3D

Spectrum



L-I Curve(T@25° C)



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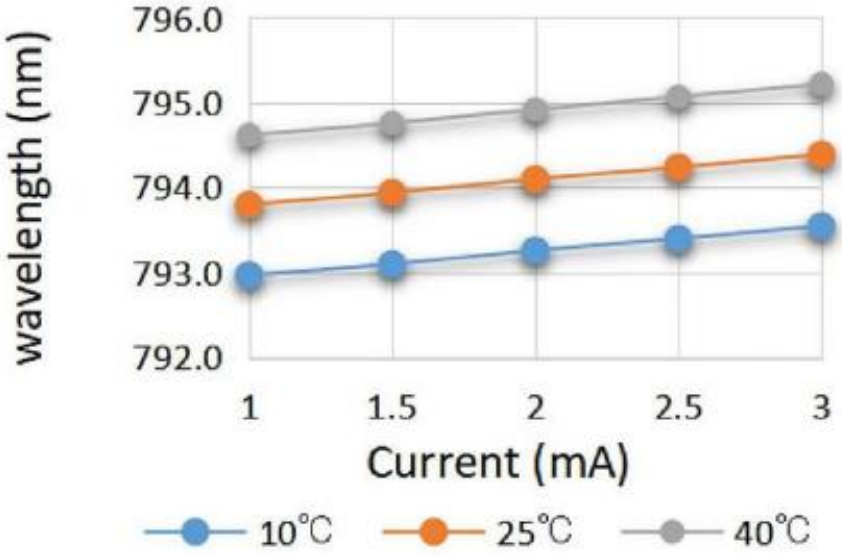
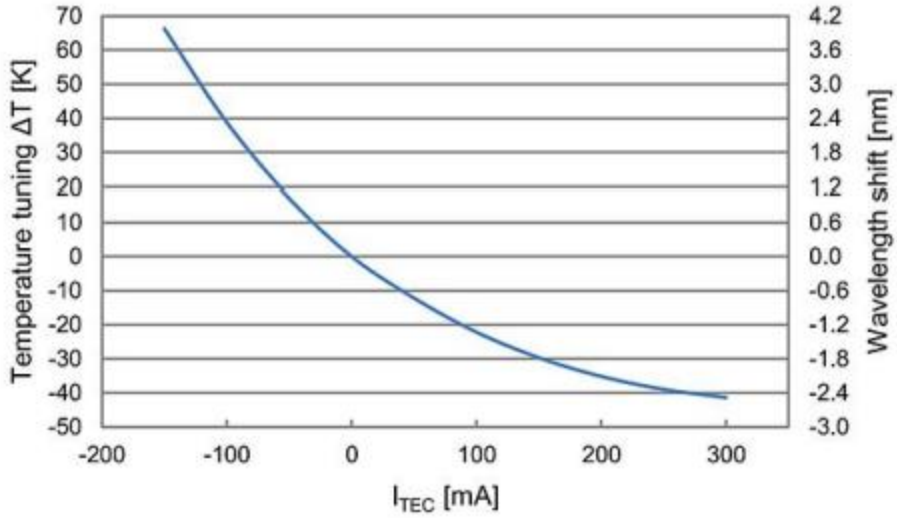
Tuning Characteristics



Temperature / wavelength tuning over TEC current*



* TEC performance is dependent on heat load, ambient temperature and heatsink properties

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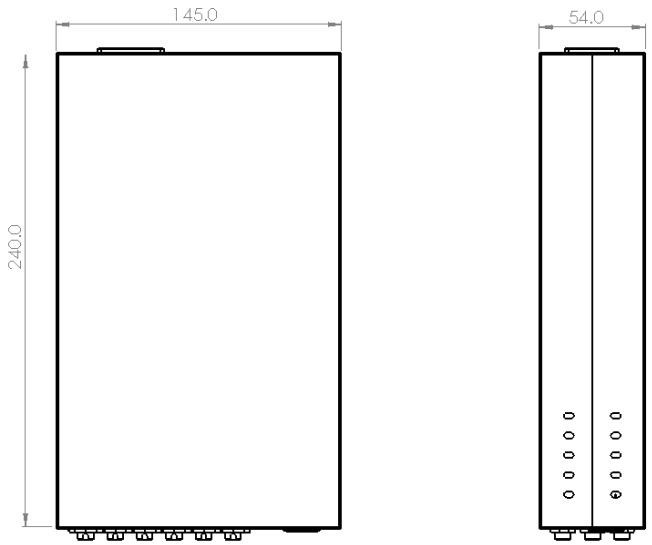
Ordering Information (Part Number)

	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Wavelength**	**Output Power**	**Linewidth**	**TEC Cooling**	**Package**	**Driver [1]**	**Fiber Type**	**Fiber Buffer**	**Fiber Length**	**Connector [2]**
FCVC-	795nm = 7	0.1mW = A	2nm = 1 Special = 0	Yes = 1	TOCAN = 2 Butterfly = 1	Non = 0 PCB = 1 Benchtop = 2	SM780 = S PM780= P	900µm loose tube= 3	1m = 1	FC/APC=3

[1]. PCB (with power supply) is ESD unprotected for OEM application. The benchtop is ESD protected plug-play unit that integrates a power supply compatible with 100-240 VAC, features an optical output connector on the front panel, and power/control interfaces on the rear panel.

[2]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

Benchtop Box Mechanical Dimension



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Benchtop Matching Laser Diode Driver

Agiltron cost-effective LDCB series benchtop control kit is designed for easy laser diode mounting and precise control. It incorporates a high-precision, low-noise auto-feedback drive electronics to ensure constant output power or a constant driving current and an integrated temperature control unit maintains optimal operating conditions. The system provides up to 1A driving current and up to 2A TEC cooling current. Each system features a front fiber output connector. The user interface includes an intuitive LCD display for independent control of output power and temperature via two front rotating knobs. The LDCB also includes a universal power supply compatible with 100 to 240 VAC. The LDCB has a built-in isolator option to prevent reflection-induced laser emissions instability. The LDCB is designed as a laser diode and TEC controller kit for customer to install laser diode. It has three types of pluggable laser mounts of butterfly, DIL, and TOCAN. The TOCAN mount contains an external TEC that maintains a constant temperature for wavelength stability.

For details please click: https://agiltron.com/product/laser-diode-tec-controllers-benchtop-kit/

Turn-Key Module Matching The Laser Diode

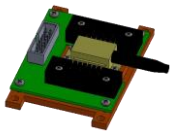
The Agiltron LDCM series laser source module is designed for OEM applications and features all-in-one high reliability and highly stable laser output. The LDCM contains high-precision, low-noise, auto-feedback laser diode drive electronics to ensure constant output power or driving current and an integrated temperature controller that maintains optimal operating conditions. An optional fiber optical isolator can be integrated to prevent reflection-induced laser emission instability, which is essential for achieving highly stable lasers. Agiltron produces isolators from 370nm to 2600nm. The system provides up to 1A driving current and up to 2A TEC cooling current. Each unit features a single FC/APC connector output and two front rotating knobs for independent setting of laser output power and temperature. A toggle switch allows selection between constant current control mode and feedback constant output power mode.

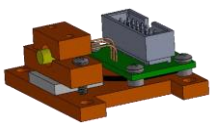
For details please click: https://agiltron.com/product/laser-diode-tec-controllers-module/

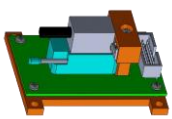
Laser Driver Kit

Agiltron cost-effective LDCD series module control kit is designed for easy laser diode mounting and precise control. It incorporates a high-precision, low-noise auto-feedback drive electronics to ensure constant output power or a constant driving current and an integrated temperature control unit maintains optimal operating conditions. The system provides up to 1A driving current and up to 2A TEC cooling current. It has three types of pluggable laser mounts of butterfly, DIL, and TOCAN. The TOCAN mount contains an external TEC that maintains a constant temperature for wavelength stability. It comes with cables to connect between the mounting module to the driving module, making integration convenient.

For details please click: https://agiltron.com/product/laser-diode-tec-controllers-compact/







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ESD Test

ESD - Discharge to housing	IEC 61000-4-2 Performance class B contact 4kV, air 8kV	ESD test setup	3	Link test during exposure	9/9/20	10/9/20	Pass	Class A 4kV (contact) Class B 8kV (contact) Class A 15kV (air)
ESD - Discharge to electrical pins - Trx	JEDEC/EIA JESD22-A114-B HBM class 1C ± 1kV	ESD test setup	3	E/O test	9/10/20	9/10/20	Pass	

Application Notes

Fiber Core Alignment
Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

Fiber Cleanliness
Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

Maximum Optical Input Power
Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.

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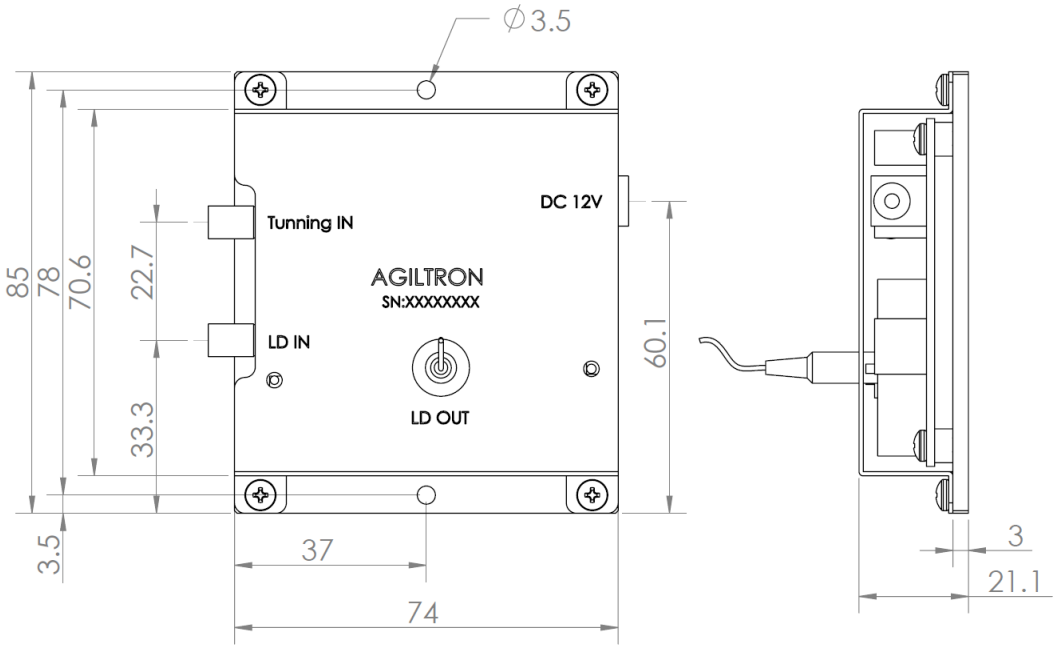
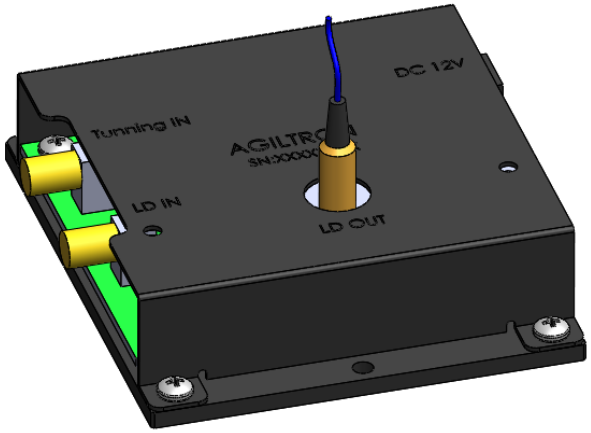
Driver Description

- TEC Cooling: Integrated thermoelectric cooler (TEC) with adjustable temperature settings (preset to 10°C).
- Laser Current Control: Constant current control, with user-settable 0-5V, SMA input with impedance>1K
- Direct Laser Modulation: The same SMA can be used to directly modulate laser at speeds up to 1 Gb/s.
- Fast Wavelength Scan: Capable of performing fast wavelength scanning at 100 kHz. 0-5V, SMA input with impedance>1K
- Constant Output Power Control: Optional external feedback tap available for maintaining stable laser output power.
- High Output Power: A cost effective optical amplifier can be integrated to increase the output power up to 100mW ($550).





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Driver Operation Manual

The TVCS driver integrates a low-noise laser driver with a modulation speed of up to 200MHz, a TEC cooler, and MEMS wavelength tuning circuitry. The TEC temperature is preset at factory to 15°C

Operation Instructions:

1. **Power Up**: Connect the included 12V DC power supply (5.5 x 2.1mm connector).
2. **Laser Diode Power/Modulation Control**: Apply a 0-5V control signal to the SMA connector labeled "LD IN." Ensure no negative voltage is applied.
3. **Wavelength Tuning**: Apply a 0-5V control signal to the SMA connector labeled "TUNING IN." Ensure no negative voltage is applied.
4. **Laser Output**: The laser output is available through the FC/APC connector labeled "LD OUT."
5. **Driven at Resonance or Beyond:** The resonance is between 250 and 320KHz, depends on the batch. Driving with sinusoidal signal at resonance achieve widest tuning. One can increase the sweep rate and adjust min and max tuning voltage for optimizing the optical spectrum. Do not exceed the max / min tuning voltage. When driving beyond resonance the optical spectrum is decreased. At 1MHz sinusoidal the tuning range is about 1nm.

Caution: Do not share the ground between the laser power control input and the laser tuning input. Doing so can cause permanent damage to the laser.

Benchtop

Agiltron cost-effective LDCB series benchtop control kit is designed for easy laser diode mounting and precise control. It incorporates a high-precision, low-noise auto-feedback drive electronics to ensure constant output power or a constant driving current and an integrated temperature control unit maintains optimal operating conditions. The system provides up to 1A driving current and up to 2A TEC cooling current. Each system features a front fiber output connector. The user interface includes an intuitive LCD display for independent control of output power and temperature via two front rotating knobs. The LDCB also includes a universal power supply compatible with 100 to 240 VAC. The LDCB has a built-in isolator option to prevent reflection-induced laser emissions instability. The LDCB is designed as a laser diode and TEC controller kit for customer to install laser diode.

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Caution Electrostatic Sensitivity

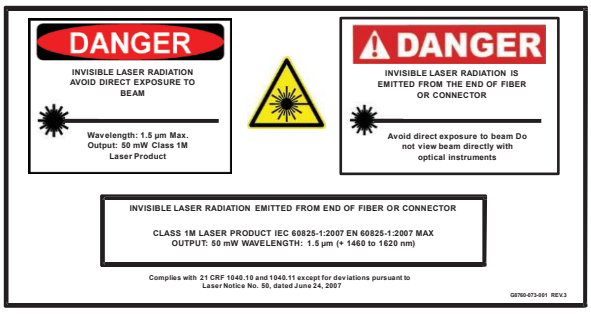
- Never touch laser diode and the module using hands
- Always use protections when handle a laser diode
- Recommend mounting the laser diode using an ionic gun and ESD finger cots

Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191. All versions of this laser are Class 1M laser products, tested according to IEC 60825-1:2007 / EN 60825-1:2007. An additional warning for Class 1M laser products. For diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. For collimated beams, this warning shall state that viewing the laser output with certain instruments designed for use at a distance (for example telescopes and binoculars) may pose an eye hazard.

Wavelength = 1.3/1.5 µm.

Maximum power = 30 mW.



*Caution - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
*IEC is a registered trademark of the International Electrotechnical Commission.

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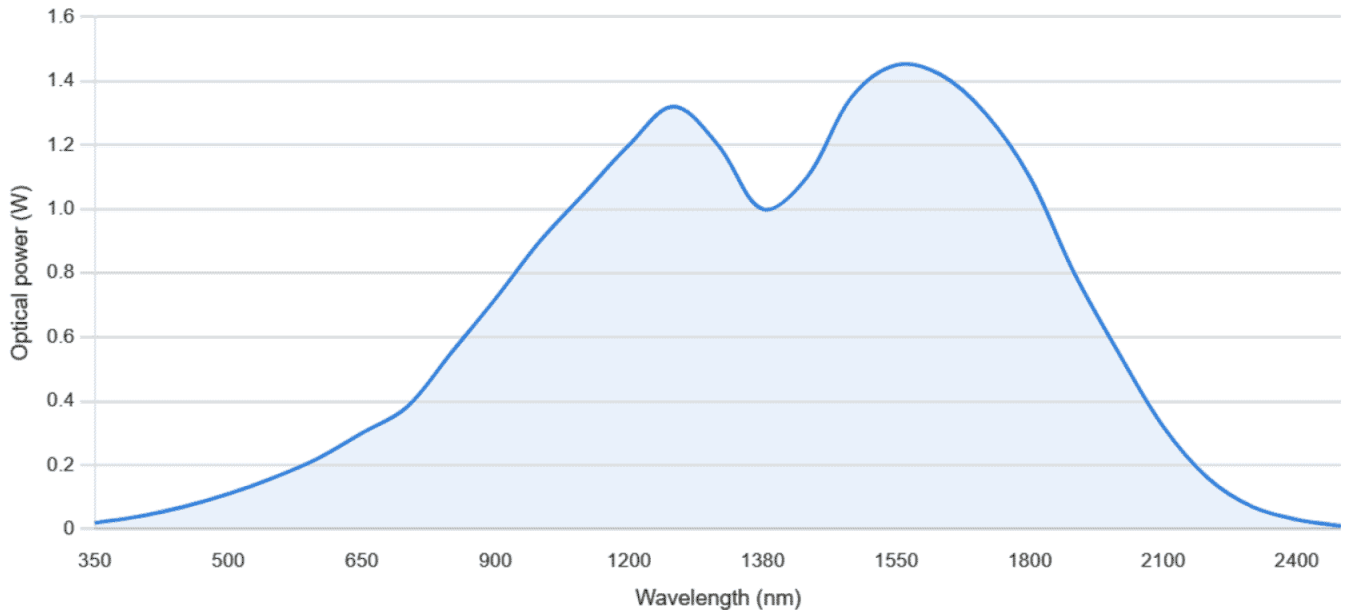
Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



Single mode fiber optical power is limited by nonlinear effects in addition to absorption that increase loss and generate heat. The curve shows the approximate safe CW power envelope for standard single-mode fiber. Actual limits depend on fiber design, core size, length, and laser characteristics. Specialty fibers can significantly increase the power limit.

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