

*Discrete lasers from 405 to 980 nm*  
*Single, multimode, & PM fiber outputs*  
*Collimation/relay optics*  
*Integrated drive and control electronics*



## Single Wavelength Fiber Coupled Laser

Blue Sky Research is a world leading expert in precision fiber-coupling of laser diodes including; red, green, blue, violet, and IR laser diodes (405nm to 980nm). The FiberTec laser modules feature one fiber-coupled, high performance laser diode with integrated electronics that provide LD drive, temperature stability, protection and other functions. For example, RoHS compliant electronics provides ESD protection, laser driving current monitor, shutdown function, laser modulation and overdrive protection.

## Advantages of Using Fiber

The unique properties of optical fibers allow a reduction in optical systems complexity and enable lower system cost. System performance can be optimized while using cost effective fiber for light relay and beam shaping. A single mode fibers can maintain near perfect Gaussian beams without introducing aberrations. In addition, optical fibers possess the ability to maintain beam pointing and steering tolerances ( $<1\mu\text{rad}/\text{C}$ ) throughout temperature variations better than all traditional optics, enabling a robust and stable system performance over wide operation condition.

## Module Features

- ◆ Individually controllable laser
- ◆ Integrated drive, power, control circuits
- ◆ Custom wavelength and power options
- ◆ Single mode, multimode, and PM fiber options
- ◆ Rugged OEM grade package

## Laser System Characteristics

- 405nm - 980 nm wavelengths available
- $< 0.5\%$  @ 1 hr,  $< 2\%$  @ 24hrs power stability
- $< 0.5\%$  Noise (RMS) 20Hz to 2MHz
- $< 5\text{mrad}/\text{C}$  Beam Stability
- Up to 200kHz modulation speed

# Fiber-Coupled Laser Modules and Wavelengths

Blue Sky Research offers three different tiers of Fiber-Coupled laser modules that provide customer variety of options for specific applications. They include: FiberTec, a complete laser system with control, stability and monitoring circuits; FiberDrive, a FiberTec module without LD thermal stability electronics & TEC; and FiberMax, an OEM component allows direct access to LD pinouts & a fiber optic pigtail assembly.

Standard wavelengths for all fiber-coupled laser products (FiberTec, FiberDrive and FiberMax) include: 405, 450, 473, 488, 520, 532, 638, 658, 705, 740, 785, 808, 830, 850, 905, and 980nm. Single mode fiber (SMF), polarization maintaining fiber (PM SMF), and multimode (MM) fiber outputs are available as standard options.

Specifications		Popular Wavelengths							
Wavelengths*	nm	405	450	473	488	520	638	658	785
Optical Output Power (Max)*	mW	50	40	40	50	50	100	80	50
Fiber Mode Field Diameter	μm	3.0	4.0	4.0	3.5	3.5	4.2	4.2	4.5
SMF Numerical Aperture	NA	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11

\* Contact Sales@Blueskyresearch for latest information on Laser Diode wavelength/Power offerings and custom configurations

\*\* With collimator

## General Product Specifications

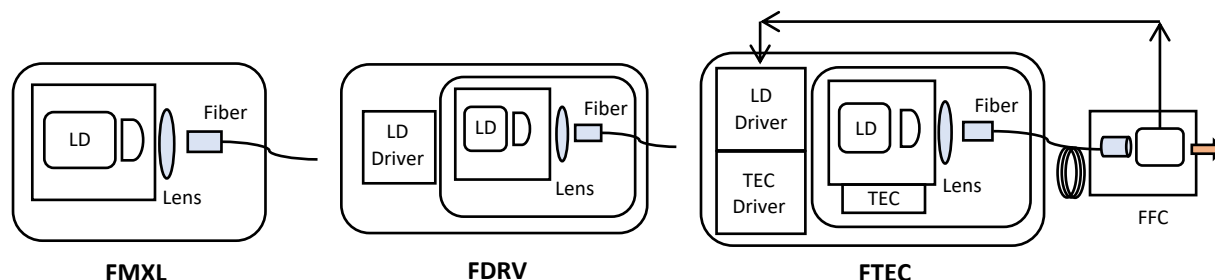
Optical Parameter	Unit	Min	Typ	Max	Conditions
	s				
FiberTec Power Stability (1hr) ( + C* or FFC**)	%			0.5	$\Delta T$ +/- 3 °C, all laser wavelengths
FiberTec Power Stability (24hr) ( + C* or FFC**)	%		1.2	2.0	$\Delta T$ +/- 3 °C, all laser wavelengths
FiberTec Power Stability over Temperature ( + C* )	%		2.5	3.5	$\Delta T = 10^{\circ} - 40^{\circ} 1^{\circ}\text{C}/\text{min}$
FiberTec Power Stability over Temperature ( + FFC* )	%			1.5	$\Delta T = 10^{\circ} - 40^{\circ} 1^{\circ}\text{C}/\text{min}$
FiberDrive power Stability (1hr)	%			1.0	$\Delta T$ +/- 3 °C, all laser wavelengths
FiberDrive Power Stability (24hr)	%			3	$\Delta T$ +/- 3 °C, All wavelengths, 24 hrs
Laser Noise, RMS	%			0.5	10Hz – 2MHz,@ 50-100% Pout
Laser Noise, Pk-Pk	%			1.2	10Hz – 2MHz,@ 50-100% Pout
Polarization w/PM fiber + C*	dB	17	20		@ 638nm, Constant Pout
Polarization w/PM fiber + FFC *	dB	23	25		@ 638nm, Constant Pout
Laser Shutdown Time	μs			1	

\* Collimator , \*\* Fiber Feedback Collimator

FiberTec and Fiber Drive Modules come standard with 1-meter fiber pigtail.

# Fiber-Coupled Laser Modules

Blue Sky Research offers four different tiers of Fiber-Coupled laser modules that provide customer variety of options for specific applications. They include: **FiberTec**, a complete laser system with control, stability and monitoring circuits; The **FiberTec + FFC**, the FiberTec and an active feedback and collimation unit to increase power stability and collimate the output laser beam; the **FiberDrive**, a FiberTec module without LD thermal stability electronics & TEC; and the **FiberMax**, an OEM component allows direct access to LD pinouts & a fiber optic pigtail assembly.



	FMXL	FDRV	FTEC	FTEC + Collimator	FTEC + FFC
Optical Output	Fiber	Fiber	Fiber	Free Space Collimated beam	Free Space Collimated Beam
Customer Benefits	Low Cost	Integrated Driver Electronics	Laser Power Stability	Laser Power Stability, Beam placement at target	Optical stability and high PER to environment
Customer to-Do	LD Driver, Temp control, optics after fiber	Temp Control, optics after fiber	Optics beam control after fiber	Optical Stability and polarization control	

## Fiber-Coupled Laser Module Wavelengths

Standard wavelengths for all fiber-coupled laser products (FiberTec, FiberDrive and FiberMax) include: 405, 450, 473, 488, 520, 532, 638, 658, 705, 740, 785, 808, 830, 850, 905, and 980nm. Single mode fiber (SMF), polarization maintaining fiber (PM SMF), and multimode (MM) fiber outputs are available as standard options.

### Specifications

### Popular Wavelengths

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\* Contact Sales@Blueskyresearch for latest information on Laser Diode wavelength/Power offerings and custom configurations

\*\* With collimator

# Collimation Optics and Feedback

Blue Sky Research offers two options for beam collimation; the Fiber Feedback Collimator or FFC, or the miniature cylinder collimator. The Fiber Feedback Collimator is a combination of an aspheric/doublet lens collimator and an active laser power feedback system. The FiberTec module and FFC combination will provide a stabilized optical output of < 0.5% (after 5min warm-up) and high polarization extinction ratio > 23dB.

The cylindrical collimator is a miniature lens enclosure secured to the fiber pigtail's connector and houses an aspheric or doublet lens which provides a specific collimated beam diameter and divergence. Both the Fiber Feedback and Cylindrical collimator options have the same beam size and divergence specifications (e.g. M, N, P, Q). Collimated beam specifications must be specified at time of purchase. Please contact Blue Sky Research for exact beam specifications at beam Diameter and divergence are LD (wavelength dependent).

Collimator Specifications	M	N	P	Q
Beam Diameter* @ 1/e <sup>2</sup> (mm) , +/- 25%	0.75	1.25	1.8	4
Beam Divergence ** (mrad)	<1.2	<0.8	<0.5	<0.4

\* All data at 635nm, constant temp of 25°C, constant Pout.

\*\* Beam Diameter and Divergence will change with LD wavelength, contact Blue Sky Sales for exact specifications relative to your specific wavelength of interest

## Environmental Specifications

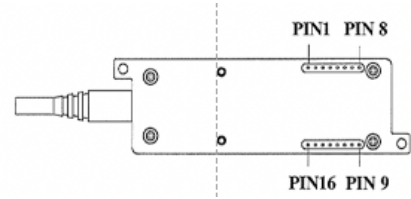
Parameter	Units	Specification		Conditions
		Min	Max	
Operating Temperature	°C	10	40	Non-Condensing
Storage Temperature	°C	-10	75	Non-Condensing
Storage Humidity	%	10	90	Non-Condensing

## Electrical Specifications

Electrical Specification	Units	Specifications	
FiberTec Operating Voltage	V	3.3V ± 0.5, 5V ± 0.5V, 6.5V ± 0.5, 8V ± 0.5 (laser specific)	
Operating Current	A	1.5A max for 3.3V (TEC), < 0.5A for 5.0V, 6.5V & 8.0V (LD specific)	
Modulation		High-Speed Modulation ACC mode only	Standard Modulation APC or ACC mode
Analog Modulation Frequency		200kHz	10kHz
Rise Time	ns	700	10,000
Fall Time	ns	100	5,000
Dynamic Extinction Ratio	dB	>25	>25

# Electrical Connection and Operation of FiberTec & FiberDrive

Customer can choose one from two options of electrical connection for FiberTec operation: 16 Pin or 8 wire ribbon. The most advanced interface (16 Pin) uses two rows of 8 pins on the bottom of the unit. You can remotely access all functions available in the FiberTec. FiberDrive product only has 8 wire ribbon connection, as there is no TEC.

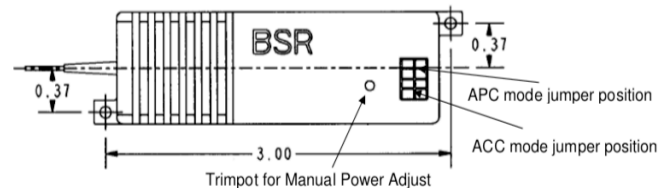


The Pin outs are shown above. When looking at the bottom of the module and the fiber existing from the left, Pin #1 is in the upper left-hand corner, and Pin #16 is in the lower left-hand corner.

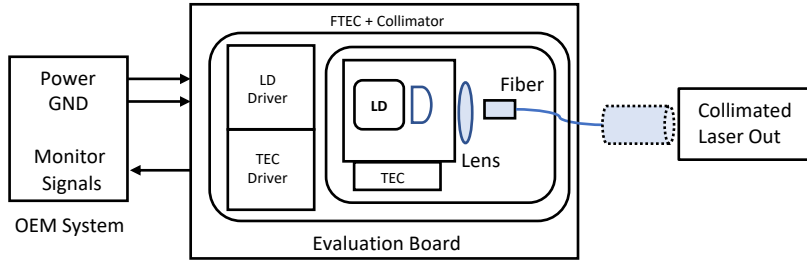
## Control functions for FiberTec – 16Pin or 8 wire ribbon

Pin No	Wire Ribbon	Name	Type	Description
1		DIS	Input	SHUTDOWN, Laser enable/disable, GND active. CMOS HI (>4.2V) to disable, input impedance ~20kΩ
2	GREY	LDV	Output	Laser Diode Monitor, Voltage proportional to drive current on LD (in test report that comes w/FiberTec)
3	YELLOW	GND	Input	Ground
4	GREEN	Vset	Analog Input	Constant Current or Constant Power setting, Max ~ 5V, typ 1.23
5		Them Mon	Output	Monitor of Thermistor resistance (temperature)
6		APC	Input	Connect to Pin 15 to select APC mode operation
7		ACC	Input	Connect to Pin 8 to select ACC Mode operation
8		ACC	Input	Connect to Pin 7 to select ACC mode operation
9	ORANGE	Vcc	Power	LD Driver Circuit Supply Voltage, 5V/6.5V/8V laser specific, only wavelength < 500nm use 6.5 or 8 V, needs 250mA source
10	YELLOW	GND	Input	Ground
11		Vtemp	Input	Input voltage to change the set temperature of the TEC, typ 1.24V = 25°C
12		TEC OK	Digital Output	Output Hi for TEC within 1 C of set temperature
13	PURPLE	PD Mon	Output	PD Monitor, Voltage is inversely proportional to output power, laser specific, see FiberTec test report
14	BROWN	TEC GND	Input	GND for 3.3V TEC Supply
15		APC	Input	Connect to Pin 6 for APC Mode Operation
16	RED	Vtec	Input	TEC Supply Voltage, 3.3V ± 10%

If module has an eight-wire ribbon exiting from the rear of the module. the function assignment of each color wire is shown in the table above. If you want to switch between ACC and APC modes of operation manually and you are using the 8 wire configuration, there is a physical jumper located inside the FiberTec box (see right). Moving the jumper from one position to the next changes the mode of operation. All FiberTec and FiberDrive modules without pins use this jumper location for ACC and APC modes.



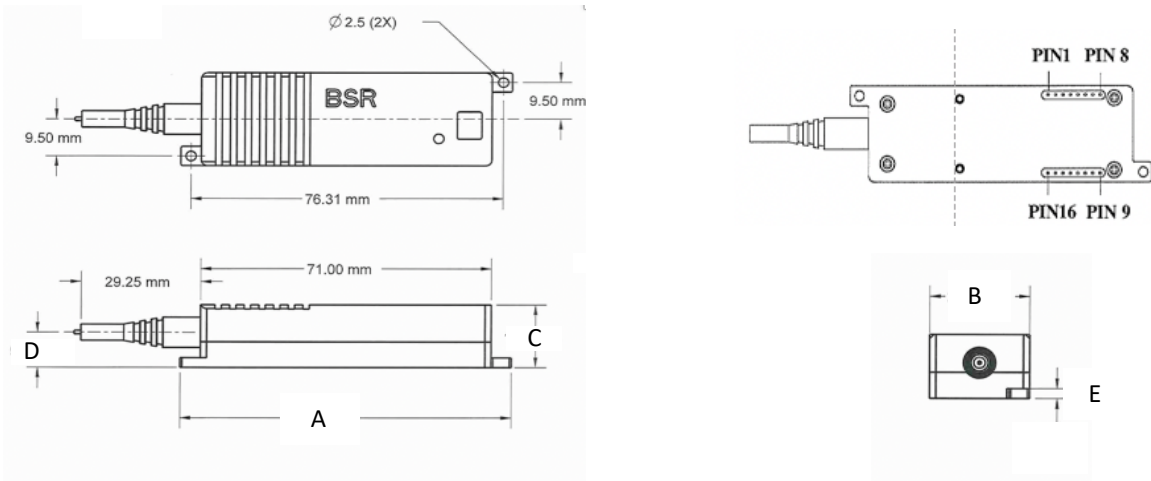
# Evaluation Board for FiberTec – FiberDrive



An optional Evaluation Board is available to quickly get FiberTec or FiberDrive modules (with a 16 Pin interface) up and running without the need to design/build a unique PCB. The evaluation board gives users access to the optical output beam and all electrical connections including LD drive, control, monitoring, and protection circuits

The Evaluation Board has a built-in heat sink to help with thermal management, and four corner posts to facilitate system mounting. All details to set up and operate FiberTec and evaluation board are detailed in Application Note: FiberTec/FiberDrive Evaluation Board, Sept. 2019, V 3.0. User must provide power supply for Laser Diodes, and TEC cooler if EB is controlling a FiberTec module.

## FiberTec Mechanical Specifications

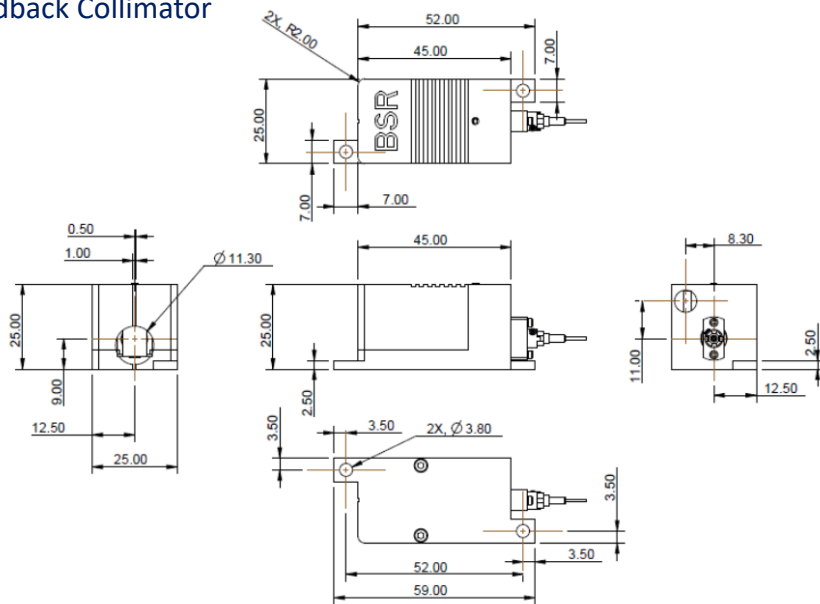


FiberTec Dimension	LD Wavelengths 405nm – 520nm	LD Wavelengths 532nm	LD Wavelengths 635nm - above
<b>A</b> Length	81 mm	81 mm	81 mm
<b>B</b> Width	24 mm	24 mm	24 mm
<b>C</b> Height	16.2 mm	22.6 mm	15 mm
<b>D</b> Beam Height	9.04 mm	12.5 mm	7.76 mm
<b>E</b> Flange Height	2.5 mm	2.5 mm	4.5 mm

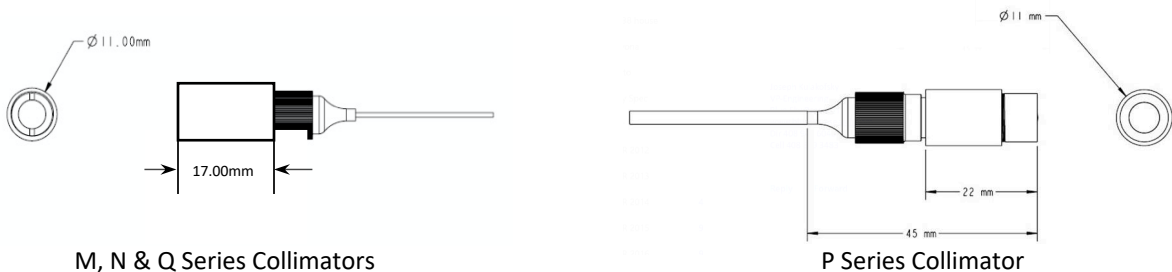
FiberTec and FiberDrive modules come with 1 meter connectorized fiber pigtail output as standard. Fiber Jacketing options include a 900µm PVC jacket with a bend radius of 13mm or an 3mm Armored metal jacket with Bend radius of 30mm.

# Mechanical Drawing

## FFC: Fiber Feedback Collimator



## Cylindrical Collimator



Blue Sky Research is ISO 9001:2015 Certified

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Blue Sky Research follows a policy of continuous product improvement. Specifications are subject to change without prior notice. Blue Sky Research's lasers comply with Federal Regulations (21 CFR Subchapter J, Part 1040) as administered by the Center for Devices and Radiological Health.

Blue Sky Research offers a limited warranty for all products. Full details of warranty coverage, please refer to Terms and Conditions section at [www.blueskyresearch.com](http://www.blueskyresearch.com) or contact your sales or service representative. FTECIIDS- 081220