MEMS Latching Type Series Fiber Optical Switch

(1x2, 2x2, Dual 2x2, Quad 1x1. SM, MM, PM, Bidirectional)

(Protected by U.S. patent 8,203,775 and pending patents)

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Features

- High Reliability
- Ultra-Small Size
- 1260 -1610 nm
- SM and PM
- Low Cost
- Intrinsic Tolerance to ESD
- Direct TTL Control

The MEMS Latching type series Fiber Optical Switch provides industrial-leading performance with fast switching speed, latching, low insertion loss, high reliability, and low cost. The switch connects optical channels using a proprietary electric-thermal activated micro-mirror, moving-in and -out optical paths, uniquely featuring high stability without long-term drift, fail-safe latching, and fast setting time. The same format accommodates configurations of 1x1, Dual 1x1, Quad 1x1, 1x2, Dual 1x2, Full 2x2, and Dual Full 2x2 for single mode and multimode fibers. The switches are also available with configurations of 1x1, 1x2 PM.

This series of latching devices is highly recommended for the occasionally switching operation. For frequently switching operation, please use our non-latching version.

Specifications

Parameter		Min	Typical	Max	Unit
Operation Wavelength	Single Mode		1260~1610		nm
	Multimode		820~1340 and / or 1260/1360		
	PM		980, 1060, 1310, 1550		
Insertion Loss [1], [2]			0.6	1.0 (1.2 [3])	dB
Return Loss [1]	SM, PM	50			dB
	Multimode	35			
Cross Talk/On-Off [1]	SM, PM	50			dB
	Multimode	35			dB
PDL				0.2	dB
WDL				0.3	dB
TDL				0.3	dB
Polarization Extinction Ratio (PM)		18			dB
Switching Time			5	10	ms
Repeatability				± 0.05	dB
Repetition Rate				5	Hz
Durability		10^9			cycle
Switching Type			Latching Type		
Operating Temperature [4]		–20		+70	°C
Storage Temperature		–40		+85	°C
Optical Power Handling (CW)			300	500	mW

Notes:

[1]. Excluding connectors.

[2]. Multimode IL measure @ Light Source CPR <13dB.

[3]. Dual band, and Dual 1x2, Full 2x2, Dual Full 2x2.

[4]. For wide operating temperature, please contact us.

Note: The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link]:

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Rev 10/07/26

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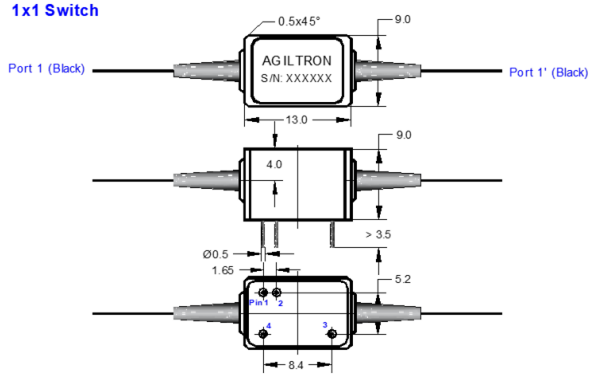
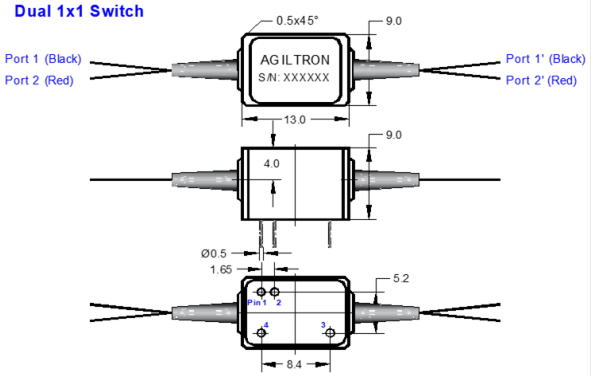
Mechanical Dimensions (mm) (Package for bare fiber with robber boot)

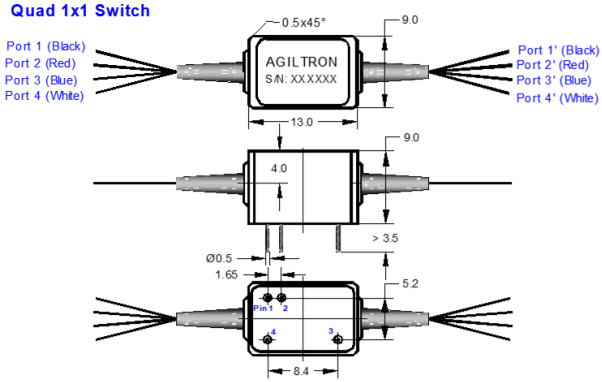
1x1 Switch



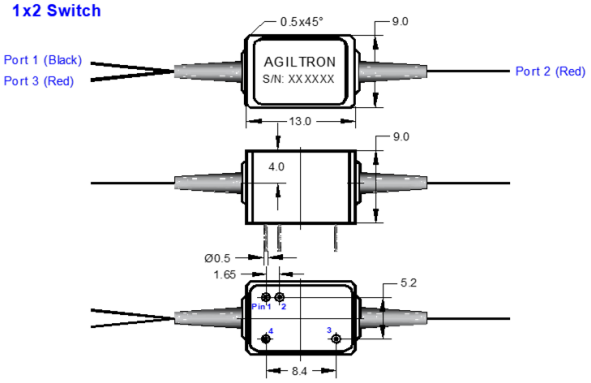
Dual 1x1 Switch



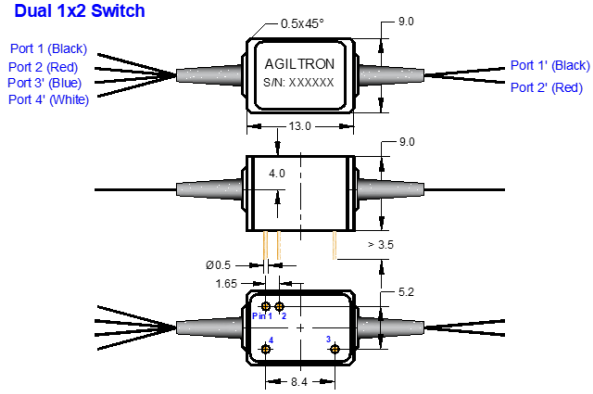
Quad 1x1 Switch



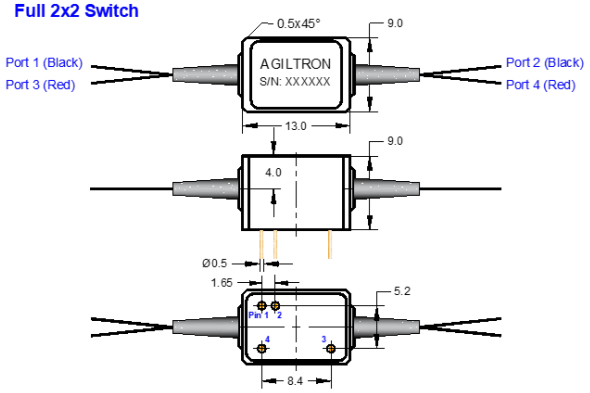
1x2 Switch



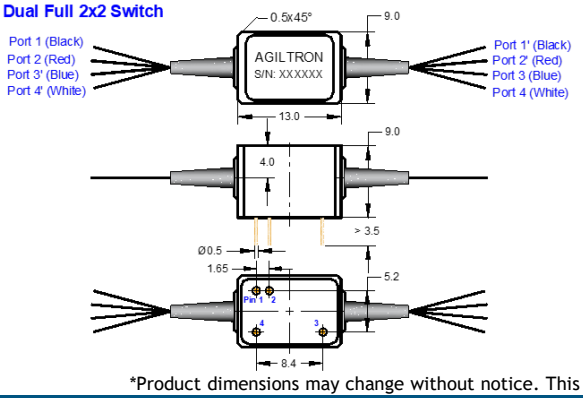
Dual 1x2 Switch



Full 2x2 Switch



Dual Full 2x2 Switch



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

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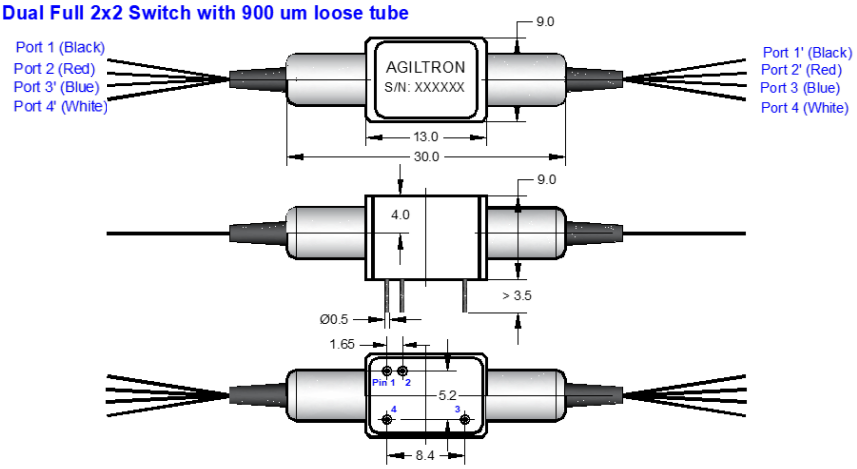
Mechanical Dimensions (mm)

Package of Quad 1x1, Dual 1x2, Dual Full 2x2 Switch with 900 μm loose tube



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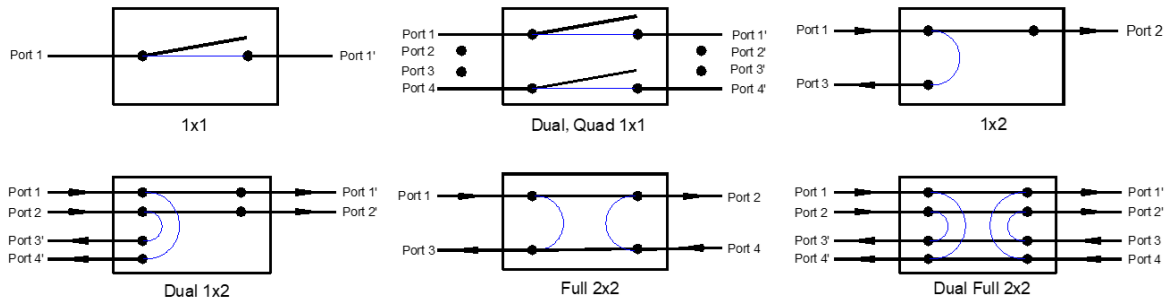
Electrical Driving Requirements

Status	Optical Path							Pin No.			
	1x1	Dual 1x1	Quad 1x1	1x2	Dual 1x2	Full 2x2	Dual Full 2x2	Pin 1	Pin 2	Pin 3	Pin 4
Status I	Port 1→1′	Port 1→1′ Port 2→2'	Port 1→1' Port 2→2' Port 3→3' Port 4→4'	Port 1→2	Port 1→1′ Port 2→2′	Port 1→2 Port 4→3	Port 1→1' Port 2→2' Port 3→3' Port 4→4'	5 VDC [1]	0	5V Pulse [2]	0
Status II	Dark	Dark	Dark	Port 1→3	Port 1→4′ Port 2→3′	Port 1→3 Port 4→2	Port 1→4' Port 2→3' Port 3→2' Port 4→1'			0	5V Pulse

[1]. 5VDC: 5.0±0.2 V. Static 3 mA; During Pulse Current is 100mA. The switch will remain in its previous light path state, if this voltage is removed (latching).

[2]. 5V Pulse: 5.0±0.2 V. Pulse width is 40±5ms.

Functional Diagram



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Ordering Information (Part Number)

	☐☐	☐	1	3	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Configuration**	**Package**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector[5]**
MESW- [1] **MEDU-** [2] **MEQU-** [3] **MEPM-** [4]	1x1 = 11 1x2 = 12 Full 2x2 = 22 Special = 00	1260~1620 = B 1060 = 1 780 = 7 850 = 8 1310/1550 = 9 820~1340 = A 1550 = 5 Special = 0	Latching = 1	Standard = 3	SMF-28 = 1 MM 50/125 = 5 MM 62.5/125 = 6 PM1550 = B Special = 0	Bare fiber = 1 900um loose tube = 3 Special = 0	0.25m = 1 0.5m = 2 1.0m = 3 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 ST/PC = 6 LC/PC = 7 Duplex LC/PC = 8 LC/APC = A LC/UPC = U Special = 0

[1]. **MESW**: **ME**MS 1x1, 1x2, 2x2 **SW**ITCH.
[2]. **MEDU**: **ME**MS **DU**AL 1x1, 1x2, 2x2 Switch.
[3]. **MEQU**: **ME**MS **QU**AD 1x1 Switch.
[4]. **MEPM**: **ME**MS 1x1, 1x2 **PM** Switch.
[5]. 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.

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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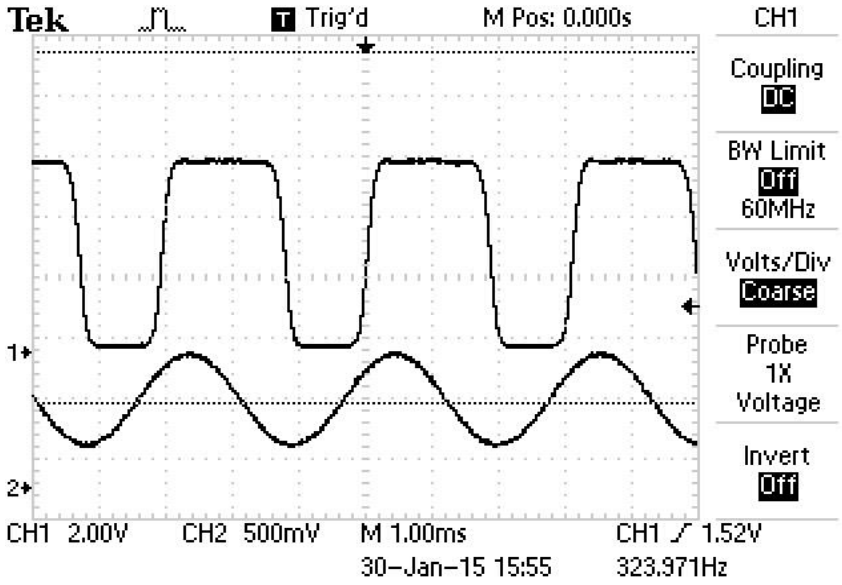
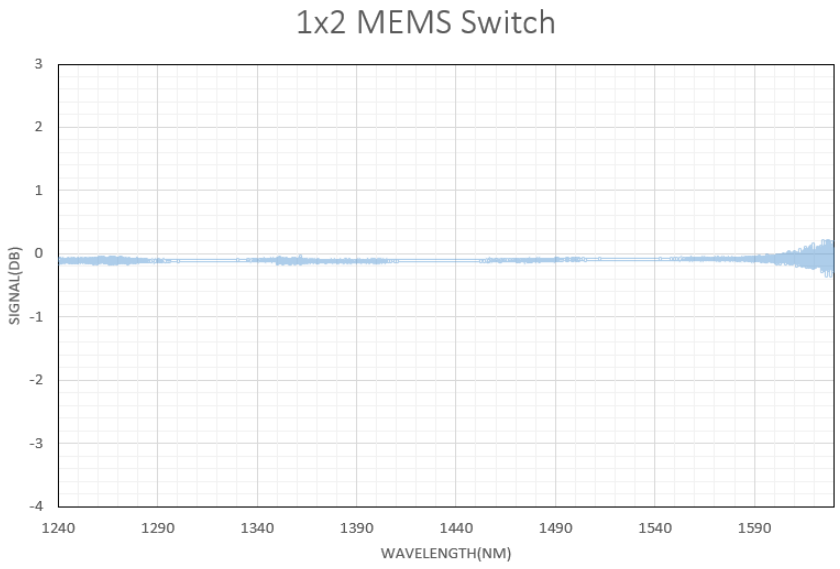
10^9 Switching Cycle Test

We have tested MEMS 1x2 switch at the resonant frequency ~300Hz for more than 40 days, as shown in the attachment, which corresponding over 10^9 switching cycles. The measurements show little changes in Insertion loss, Cross Talk, Return loss ect, all parameters are within our specs.



Typical Insertion Loss vs Wavelength (1240-1630nm)



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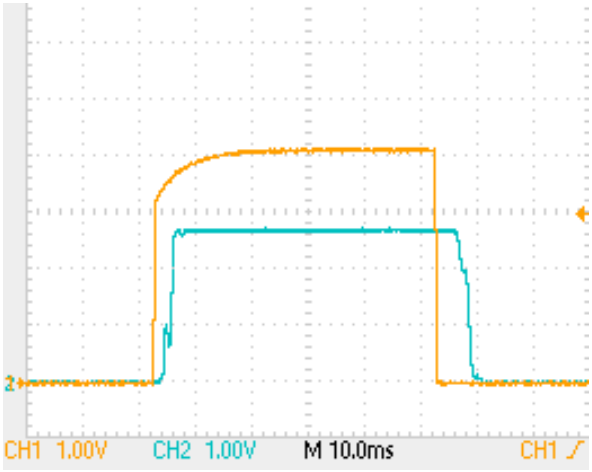
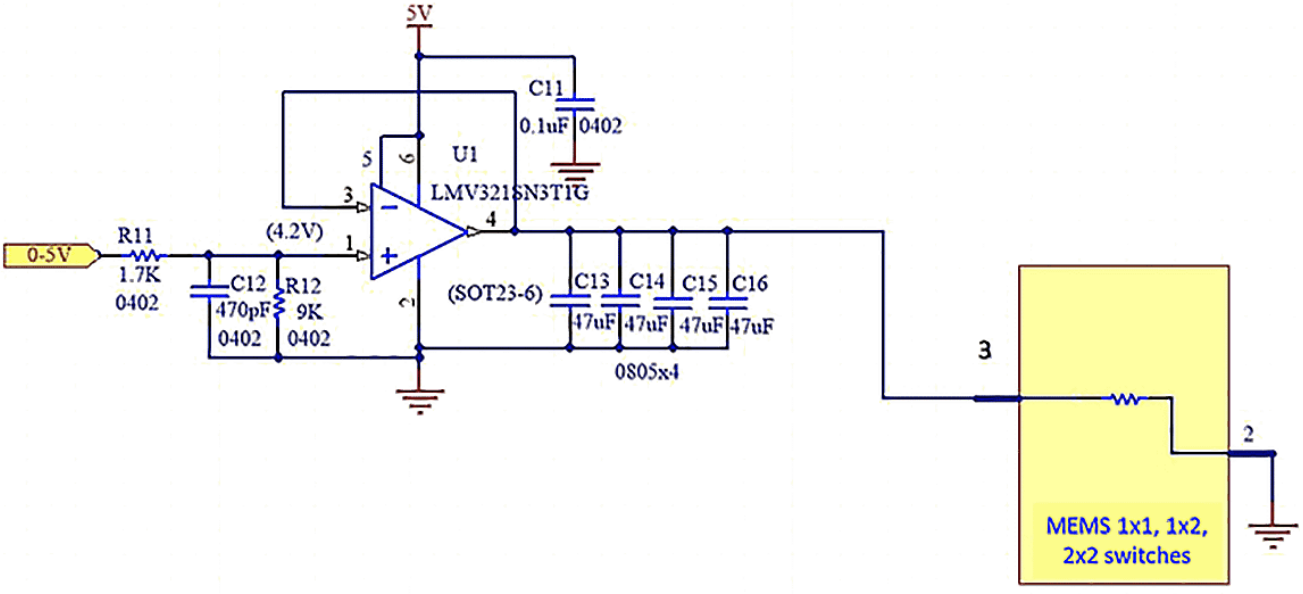
Typical Switching Rise/Fall at -40°C and 70°C



-40 °C

+70 °C

Recommendation Control Circuit



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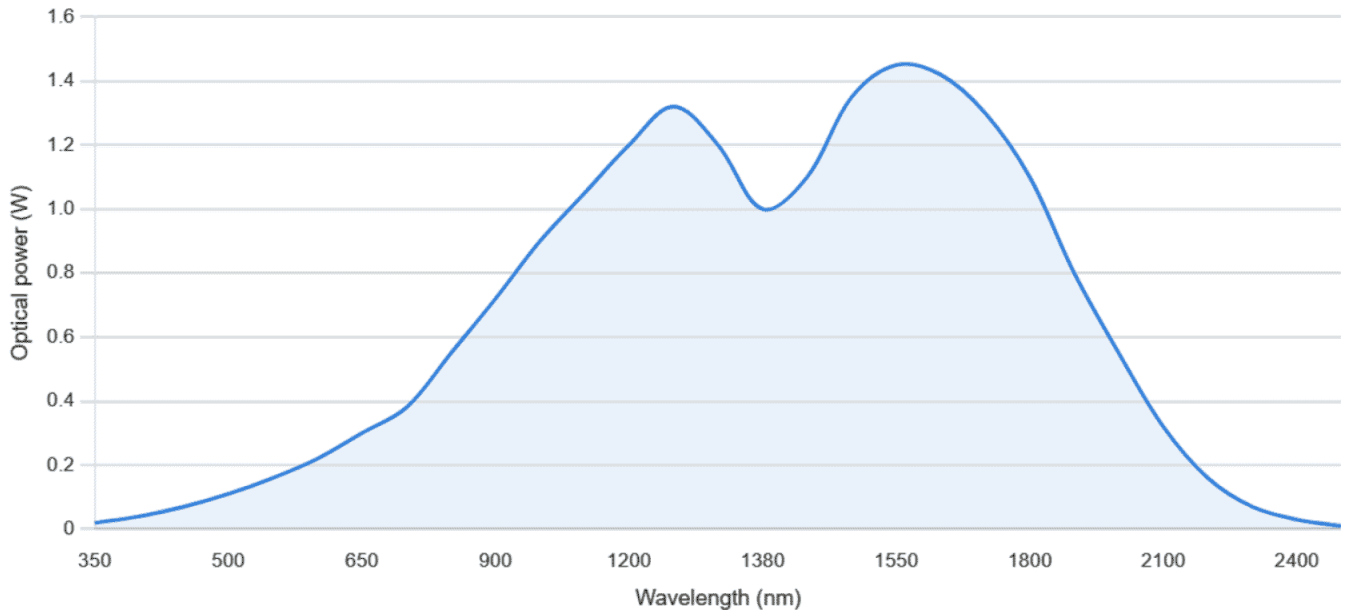
Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



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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