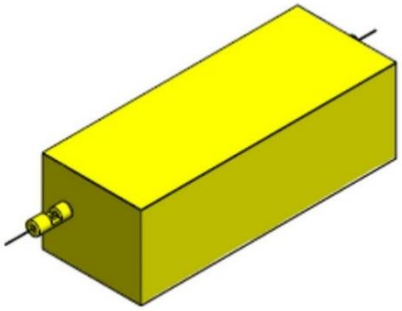
Fiber-Fiber™ Hermetic Optical Switch

1x1, Dual 1x1, 1x2, 2x2

(SM, PM, MM, Broadband, Bidirectional)

DATASHEET

BUY NOW



The FFSH Series hermetic fiber optic switch is designed for space applications. It is based on a patented MEMS technology that self-aligns a fiber directly to another fiber with a tiny gap filled with an index-matching liquid. The breakthrough technology enables light to propagate continuously without interruptions, eliminating the need for lenses, AR coating, and reflections from internal surfaces. It offers unparalleled advantages of nearly lossless low loss, broad wavelength operation from 200nm~4000nm, little back-reflection, amicable to any fiber types, and vibration insensitive. The switching is activated via an electromagnetic relay. It has non-latching and latching options. Latching operation only consumes power during switching; it magnetically preserves the selected optical path after removing the electrical power. The switch is bidirectional and conveniently controllable by 4.5V.

The FFSH Series switch can accommodate all types of fibers, including SM, MM, PM, double cladding, bendable, large core, and small core. The FFSH switches provide performance for special fiber no other technology can match.

Lightpath in the device is bidirectional.

Features

- Solid-State
- High speed
- Ultra-high reliability
- Low insertion loss
- Compact

Applications

- Laser Systems
- Reconfigurable Optics
- Instrumentations

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength	350		2500	nm
Insertion Loss [1]	0.01	0.2	0.5	dB
Wavelength Dependent Loss			0.01	dB
Polarization Dependent Loss			0.05	dB
Polarization Extinction Ratio [2]	18			dB
Return Loss	50 (SM)			dB
	35 (MM) [3]			dB
Cross Talk	50		75	dB
Optical Rise/Fall Time (PM)	5		20	ms
Optical Rise/Fall Time (SM,MM)	1	2	5	ms
Repetition Rate (PM)			1	Hz
Repetition Rate (SM,MM)			5	Hz
Repeatability			±0.02	dB
Durability	10^8			cycles
Operating Optical Power [4]		0.5	0.7	W
Operating Voltage	4.3		4.5	VDC
Operating Current		30	60	mA
Switching Type	Latching / Non-Latching			
Operating Temperature	-40		80	°C
Storage Temperature	-50		90	°C

Notes:

[1]. For SM 28 Fiber, Typical loss is 0.3dB. Ultra-low loss version is special order. For small core fibers the specs are reduced. . Excluding Connectors. Each connector adds about 0.3dB and ER reduce 3dB

[2]. For PM fiber only

[3]. For MM fiber with laser CPR<14

[4]. For SM 28 and MM fibers, other wavelength SM fiber see the chart at the end.

Rev 01/18/24

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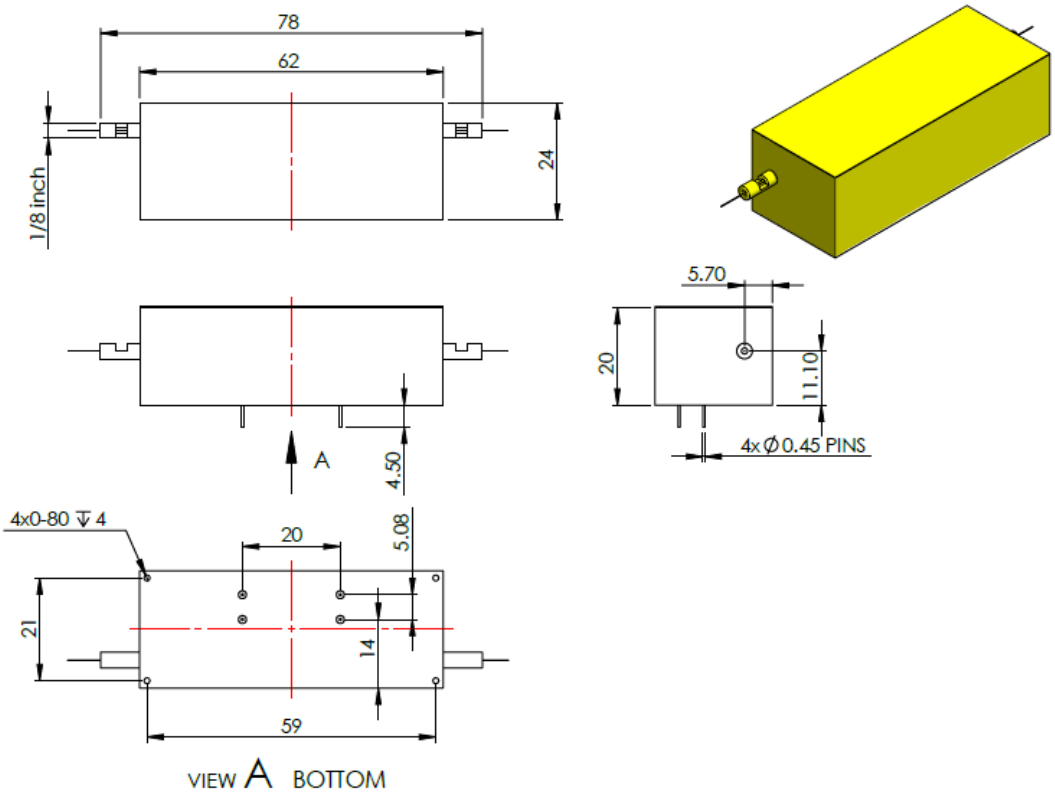
Mechanical Dimensions (Unit: mm)



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

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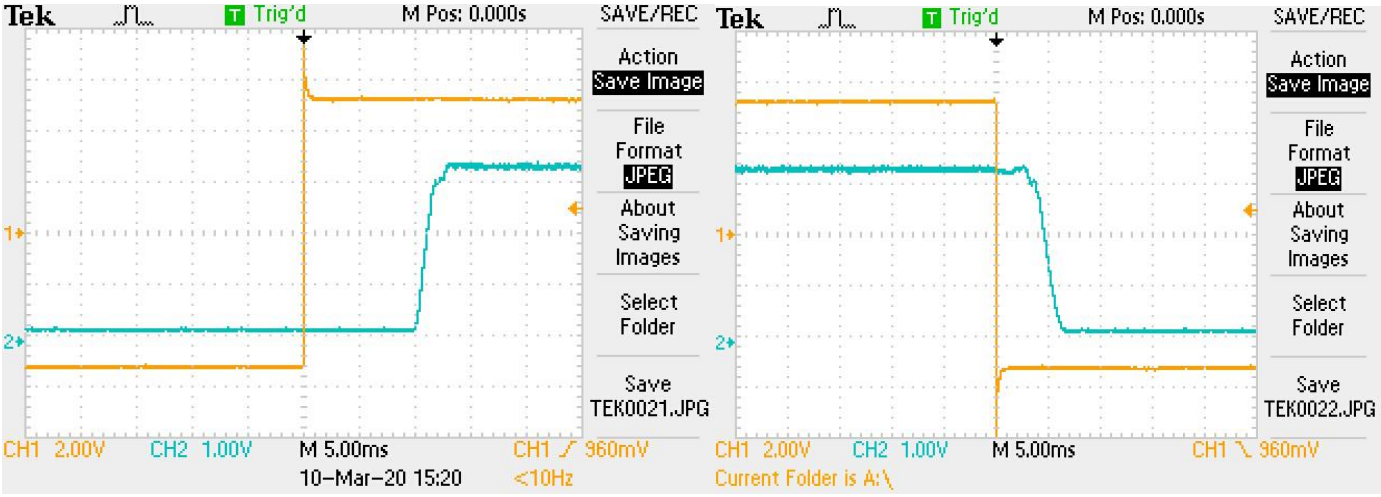
Response Speed (SM/MM)



Rise

Fall

Electrical Connector Configurations

Important Note: The device must be driven by the reference circuit. Otherwise, it is not stable. This is because the device contains a permanent magnet inside; thus current must flow in the correct direction to counter the magnet field.

The load is a resistive coil which is activated by applying 4.5V (draw ~ 40mA). Agiltron offers a computer control kit with TTL and USB interfaces and Windows™ GUI. We also offer RS232 interface as an option – please contact Agiltron sales. The switch can withstand 5V which may reduces its durability.

Latching Type – Single Coil

Application Note: Applying a constant driving voltage increases stability. The switches can also be driven by a pulse mode using Agiltron recommended circuit for energy saving.

FF 1x2 Switch

Optical Path	Electric Drive	
	Pin 2	Pin 3
Black	4.5V	0V
Red	0V	4.5V

Non-Latching Type

FF 1x2 Switch

Optical Path	Electric Drive	
	Pin 2	Pin 3
Black	0V	0V
Red	0V	4.5V

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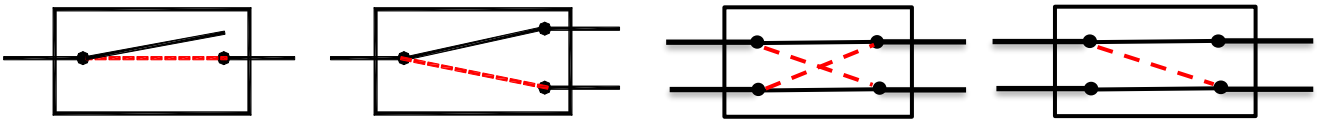
Light Path Diagram



1x1 1x2 2x2 Full 2x2 Bypass

Ordering Information

	☐☐	☐	☐	☐☐	☐	☐	☐
Prefix	**Type**	**Switch**	**Test Wavelength ****	**Fiber type**	**Fiber Cover**	**Fiber Length**	**Connector**
FFSH-	1x1 (Transparent) * = 11 1x1 (Opaque) = 1D 1x2 = 12 2x2 = 22 2x2 bypass = 2B Special = 00	Latching = 6 Non-latching = 7	488 = 4 360 = A 430 = B 532 = 5 630 = 6 780 = 7 850 = 8 980 = 9 1060 = 1 1310 = 3 1550 = C 2000 = 2 Special = 0	Pick from below table	Bare fiber = 1 0.9mm 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 MTP = 9 LC/APC = A LC/UPC = U Special = 0

***** Transparent means light passes without activation. Opaque means light is blocked at the nonactivation state.
****** The device is ultra-broadband limited by fiber transmission. However, we only test at one selected wavelength to save cost. If a customer needs to test at several wavelengths, the selection is special =0 with added cost.

NOTE:

- **PM1550** fiber works well for **1310nm**

Fiber Type Selection Table:

01	**SMF-28**	34	**PM1550**	71	**MM 50/125µm**
02	**SMF-28e**	35	**PM1950**	72	**MM 62.5µm**
03	**Corning XB**	36	**PM1310**	73	**105/125µm**
04	**SM450**	37	**PM400**	74	**FG105LCA**
05	**SM1950**	38	**PM480**	75	**FG50LGA**
06	**SM600**	39	**PM630**	76	**STP 50/125**
07	**Hi780**	40	**PM850**		
08	**SM800**	41	**PM980**		
09	**SM980**	42	**PM780**		
10	**Hi1060**	43	**PM350**		
11	**SM400**	44	**PM405**		
12		45	**PM460**		

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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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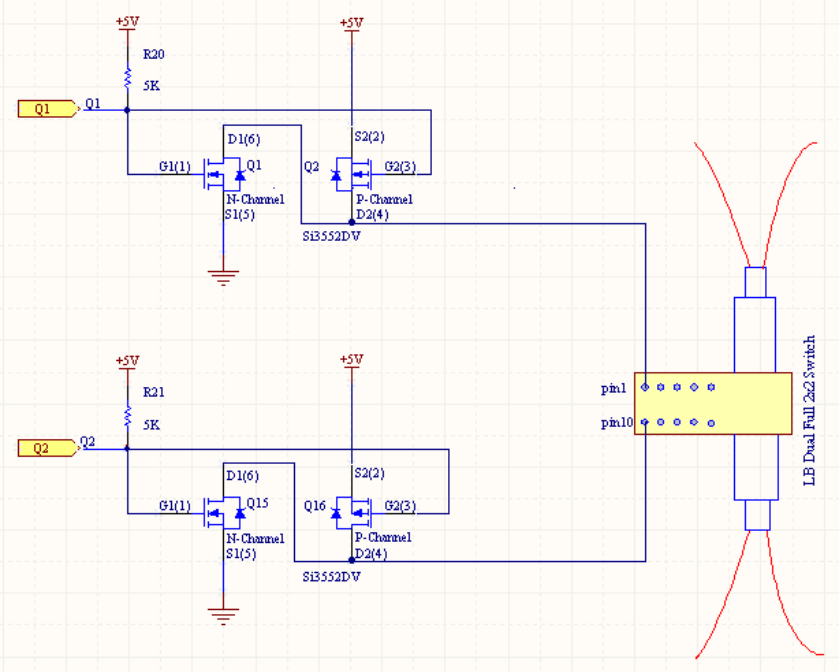
Driver Reference Design



Optical Power Handling vs Wavelength For Single-Mode Fibers