Fiber-Fiber™ 1x3, 1x4 Fiber Optical Switch

(SM, PM, MM, Bidirectional)

DATASHEET

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The FF Series fiber optic switch connects optical channels using a micro-mechanical fiber-to-fiber auto-alignment platform activated via an electrical relay. Its advanced, lensless design enables ultra-low insertion loss, broad wavelength compatibility without coatings, and high optical power handling at a significantly reduced cost. The switch is bidirectional and supports all fiber types — including SM, MM, PM, double-cladding, bend-insensitive, and large/small core fibers. Latching operation maintains the optical path after control signal removal, with convenient 5V TTL control. A proprietary, non-fluorescent index-matching liquid fills a sub-5 µm gap between fibers. When configured with PM fibers, both polarizations are transmitted consistently with the fiber orientation and maintain high extinction ratio.

Applications

- Protection
- Instrumentation

Features

- Low Optical Distortions
- High Isolation
- High Reliability
- Fail-Safe Latching
- Epoxy-Free Optical Path
- Low Cost

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength	200		2500	nm
Insertion Loss [1]		0.6	1	dB
Cross Talk On/Off Ratio		50	60	dB
Wavelength Dependent Loss		0.05	0.1	dB
Polarization Dependent Loss			0.1	dB
Polarization Extinction Ratio [2]	22	26	30	dB
Return Loss	35 [3]	55		dB
Rise/Fall Time (low speed version)	5		40 [4]	ms
Rise/Fall Time (high speed version)	1	2	15 [5]	ms
Repeatability			± 0.02	dB
Durability	10^7			Cycles
Repetition Rate			5	Hz
Operating Optical Power [2]		0.5		W
Operating Voltage	4.3		4.5	VDC
Operating Current (Latching/Non-Latching)		30	70	mA
Switching Type	Latching / Non-Latching			
Operating Temperature	-20 ~ 80			°C
Storage Temperature	-40 ~ 85			°C

Notes:

[1]. SM 28 fiber, Excluding Connectors. For MM fiber with laser CPR<14

[2]. For PM fiber only

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

[4]. For PM type mainly

[5]. For SM, MM type, 15ms including the electrical delay as shown in the testing data

RoHS COMPLIANT

Rev 04/07/26

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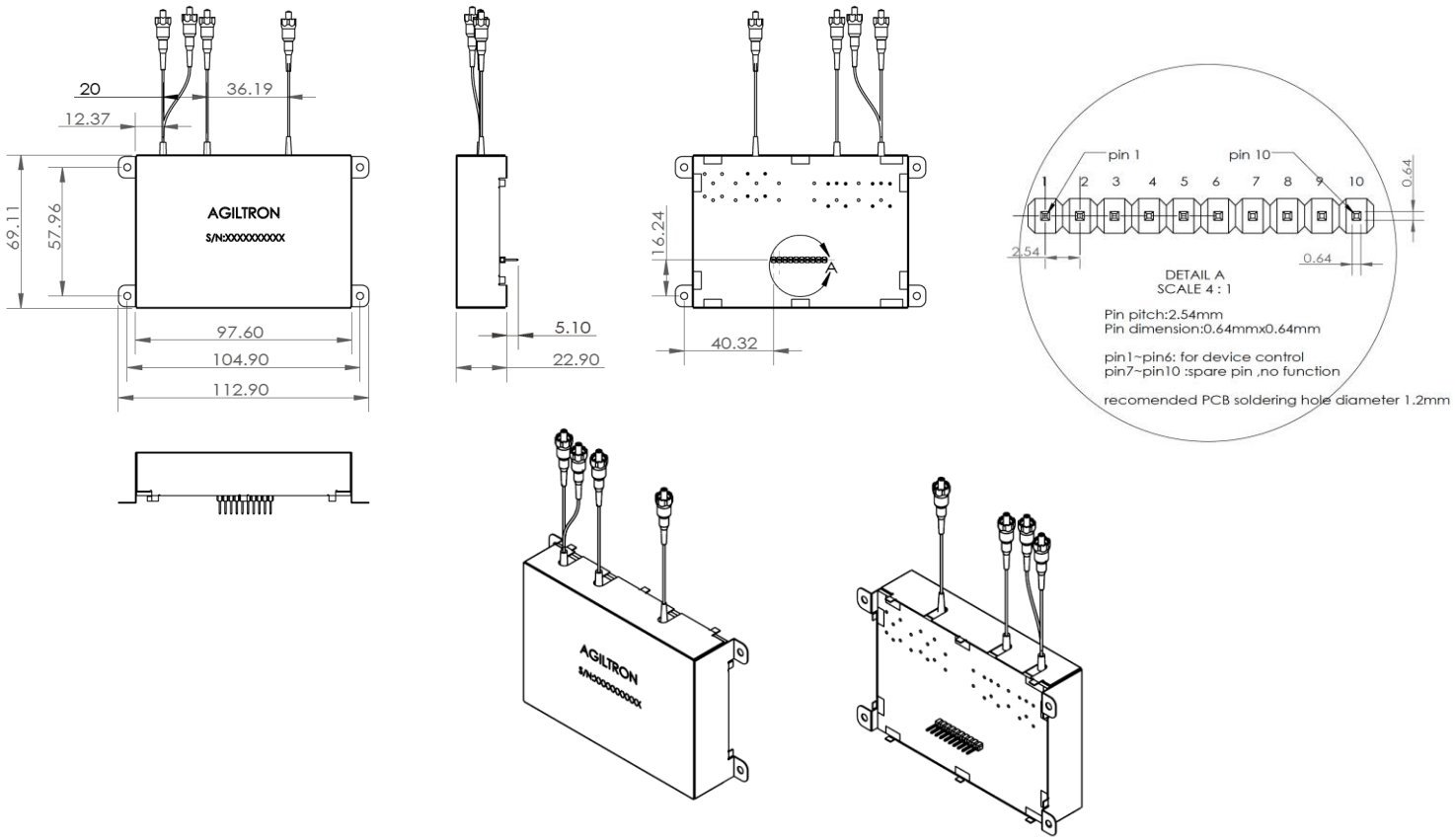
Mechanical Dimensions (mm)



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

Electrical Connector Configurations

The load is a resistive coil which is activated by applying 4.5V (draw ~ 40mA). Applying a constant driving voltage increases stability. The switches can also be driven by a pulse mode using Agiltron recommended circuit for energy saving.

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.

Latching Type

Optical Path	Switch 1		Switch 2		Switch 3	
	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
Common → Port 1	L	H	L	H		
Common → Port 2	L	H	H	L		
Common → Port 3	H	L			L	H
Common → Port 4	H	L			H	L

Notes:
H – 4.5V
L – 0V
Empty – Don't care H or L

Non-Latching Type

Optical Path	Switch 1		Switch 2		Switch 3	
	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
Common → Port 1	L	L	L	L		
Common → Port 2	L	L	H	L		
Common → Port 3	H	L			L	L
Common → Port 4	H	L			H	L

Notes:
H – 4.5V
L – 0V
Empty – Don't care H or L

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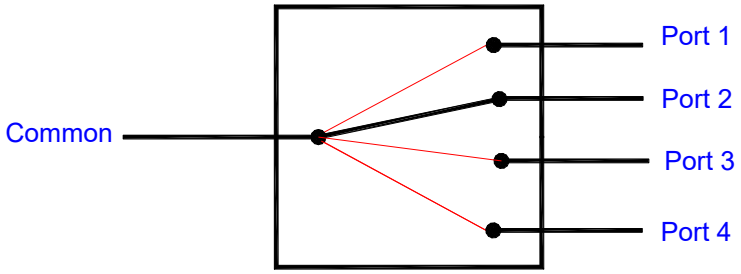
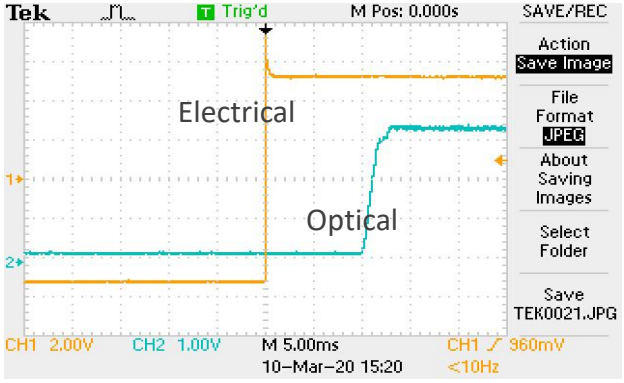
Functional Diagram

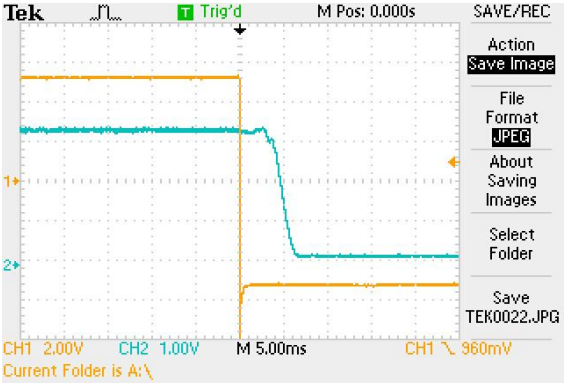


CL 1x4 Series Switch

Manual Operation Instruction



Rise



Fall

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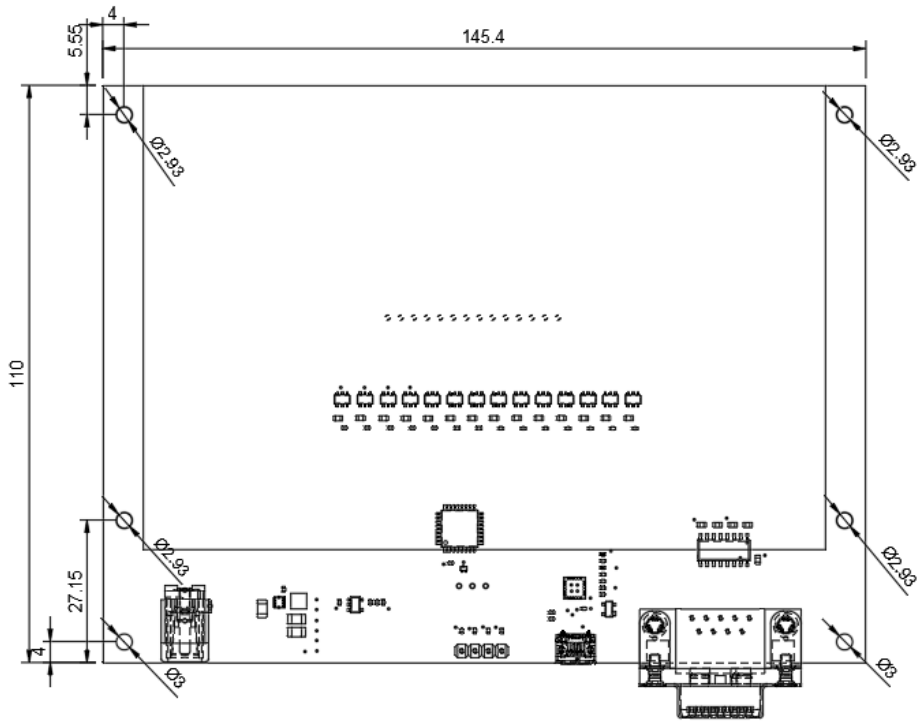
Switch Mounted On Driver PCB with USB/RS232 Interface, 5V DC Input



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Ordering Information (Part Number)

	☐☐	☐	☐	☐☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Switch**	**Test Wavelength [1]**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector[3]**	**Driver**	**Benchtop [2]**
FFSW-	1x4 = 14 1x3 = 13	Latching = L Non-Latching = N Fast Latching (F) = 6 Fast Non-Latching (F) = 7 Slow Latching (S) = 2 Slow Non-Latching (S) = 3	488 = 4 532 = 5 630 = 6 780 = 7 850 = 8 980 = 9 1060 = 1 1310 = 3 1550 = C 2000 = 2 2.3-4.1 µm = F 3.2-5.5 µm = G Special = 0	*Pick from below table*	Bare fiber = 1 900um 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	Non = 1 USB = 2 RS232 = 3 TTL = 4	Non = 1 Yes = 2

[1]. The device is ultra-broadband limited by the fiber transmission. However, we only test at one selected wavelength to save cost. If customer needs to test at several wavelengths, the selection is **Special=0** with added cost.

[2]. The benchtop integrates the modulator, driver, and power supply. Front Panel: SMA 0-5V electrical control input port for precise modulation. Fiber input and output ports with standard FC/APC connectors. Back Panel: 100-240 VAC power input for global compatibility and a Power switch for easy on/off control. This all-in-one design simplifies setup and operation

[3]. The connector cannot be installed directly onto bare fiber, as it 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 can remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SM28 fiber and decreases further with smaller core fibers.

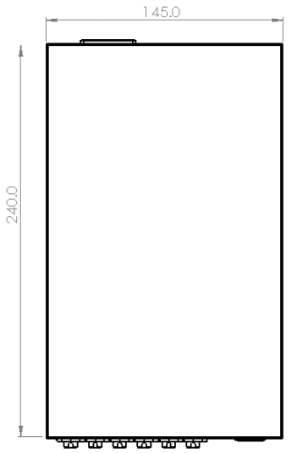
Note:

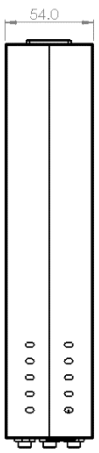
- **PM1550** fiber works well for **1310nm**

Fiber Type Selection Table:

01	**SMF-28**	34	**PM1550**	67	**OM1 (MMF 62.5/125µm)**
02	**SMF-28e**	35	**PM1950**	68	**OM2 (MMF 50/125µm)**
03	**Corning XB**	36	**PM1310**	69	**OM3 (MMF 50/125µm)**
04	**SM450**	37	**PM400**	70	**OM4 (MMF 50/125µm)**
05	**SM1950**	38	**PM480**	71	
06	**SM600**	39	**PM630**	72	
07	**Hi780**	40	**PM850**	73	**MM 105/125µm**
08	**SM800**	41	**PM980**	74	
09	**Hi980**	42		75	**FG50LGA**
10	**Hi1060**	43	**PM780**	76	**STP 50/125**
11	**Draka BBE**	44	**PM405**	77	**IRZS23**
12	**SM400**	45	**PM460**	78	**IRZS32**
13		46		79	
				80	
				81	**UV180nm**
				82	**LMA-PM-10**

Benchtop Box Mechanical Dimension





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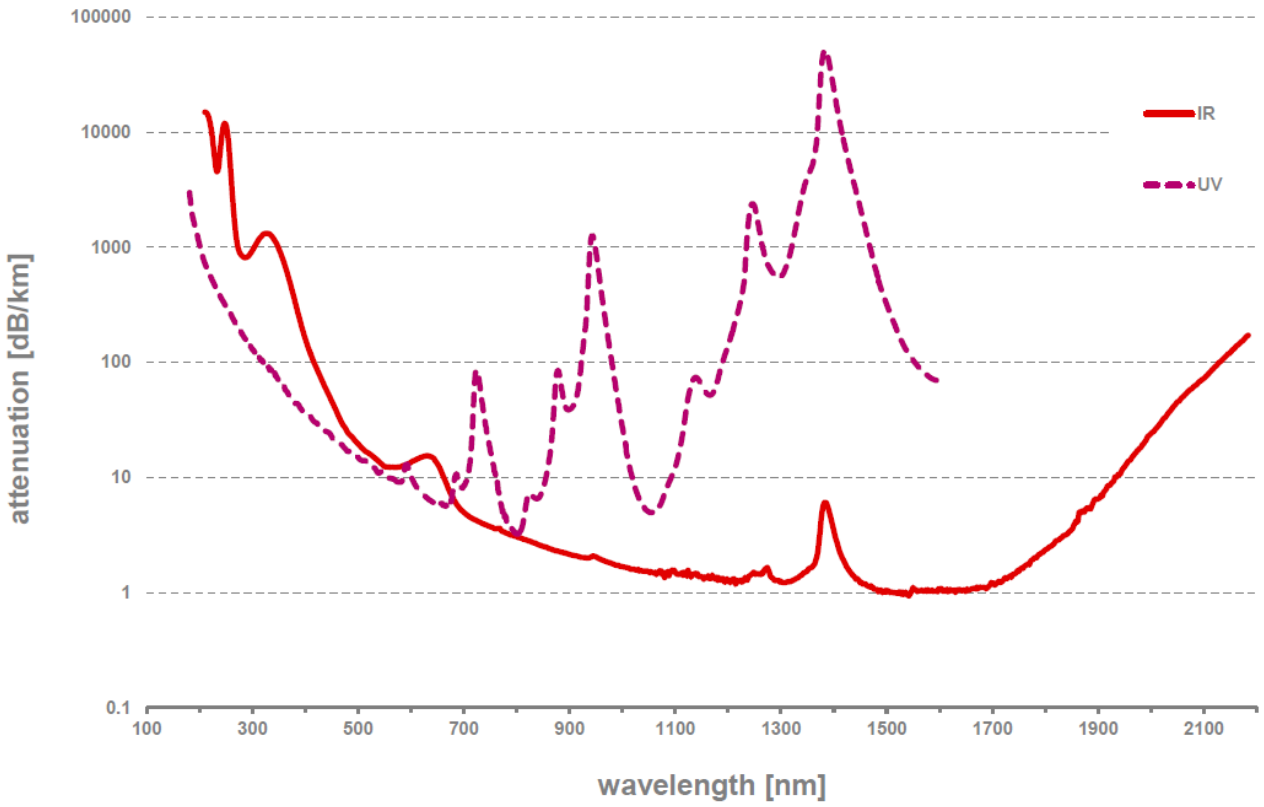
Typical Fiber Transmissions



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