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# MEMS Fiber Optical Switches

## 1x2, 2x2, Dual 2x2, Quad 1x1. SM, MM, PM

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

### Product Description

The MEMSLatch™ Series Fiber Optical Switches provide industrial leading performance of fast switching speed, latching, low insertion loss, and high reliability, as well as low cost. The switch connects optical channels using a proprietary thermal activated micro-mirror, moving-in and -out optical paths, uniquely featuring high stability without long-term drift, fail safe latching, fast setting time, and direct 5V drive convenience. The same format can accommodate configurations of 1x1, Dual 1x1, Quad 1x1, 1x2, Dual 1x2, Full 2x2, and Dual Full 2x2 for both single mode and multimode fibers. The switches are also available with configurations of 1x1, 1x2 PM.



### Performance Specifications

eMEMS™ Series Switch	Min	Typical	Max	Unit
Operation Wavelength	Single Mode	1260~1360 and / or 1510~1610		nm
	Multimode	810~890 and / or 1260/1360		
	PM	980, 1060, 1310, 1550		
Insertion Loss <sup>[1], [2]</sup>		0.6	1.0 (1.2 <sup>[3]</sup> )	dB
PDL	Single mode		0.1	dB
Return Loss <sup>[1]</sup>	SM, PM	50		dB
	Multimode	35		
Cross Talk <sup>[1]</sup>	SM, PM	50		dB
	Multimode	35		
Extinction Ratio	PM	18		dB
Switching Time		5	10	ms
Repeatability			±0.05	dB
Repetition Rate		15		Hz
Durability <sup>[4]</sup>		10 <sup>9</sup>		Cycle
Switching Type		Latching / Non-Latching		
Operating Temperature		-5	70	°C
Storage Temperature		-40	85	°C
Optical Power Handling (CW)		300	500	mW
Package Dimension		13L x 9W x 6H		mm

[1]. Excluding connectors.

[2]. Multimode IL measure @ Light Source CPR<14 dB.

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

[4]. See test data at the back page

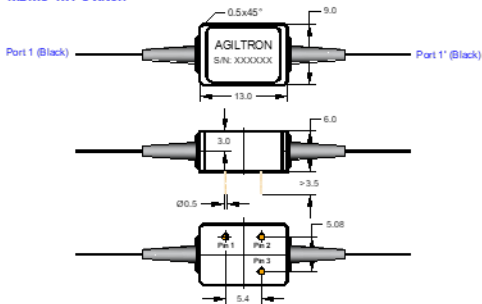


# MEMS 1x1, 1x2, ..., Dual 2x2 Fiber Optical Switch

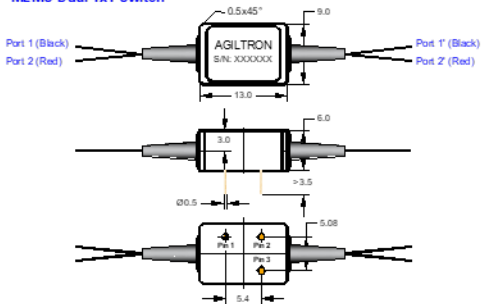
(\*SM & MM: 1x1, 1x2, 2x2, Dual 1x1, Dual 1x2, Dual 2x2, Quad 1x1. \*PM: 1x1, 1x2)

## Mechanical Dimensions (Unit: mm)

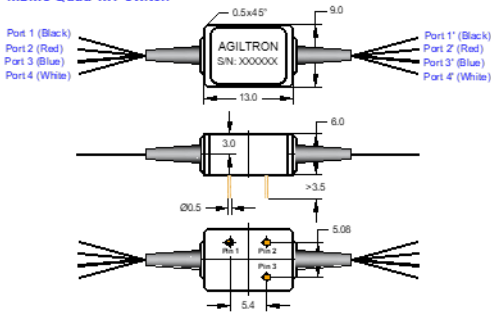
**MEMS 1x1 Switch**



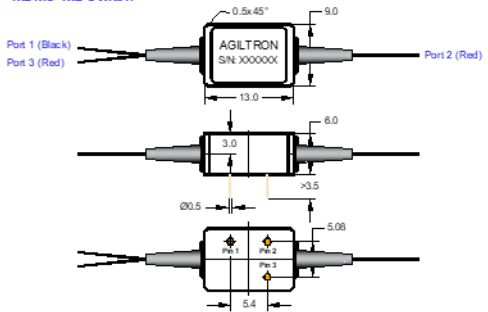
**MEMS Dual 1x1 Switch**



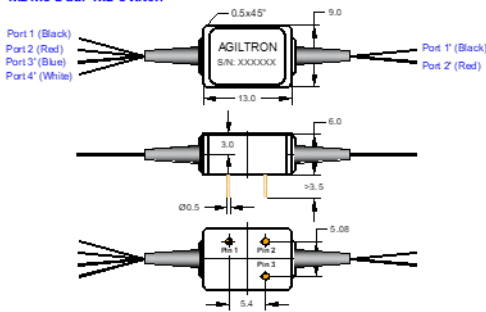
**MEMS Quad 1x1 Switch**



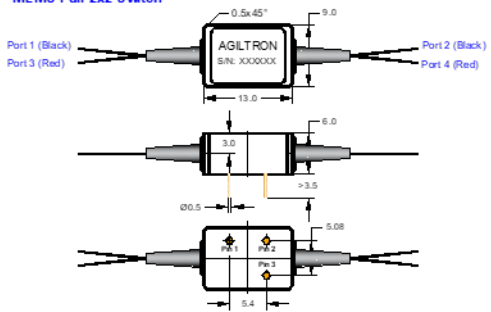
**MEMS 1x2 Switch**



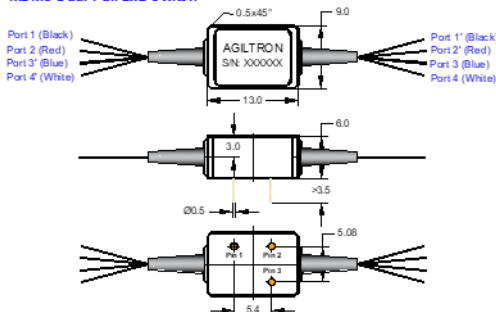
**MEMS Dual 1x2 Switch**



**MEMS Full 2x2 Switch**



**MEMS Dual Full 2x2 Switch**

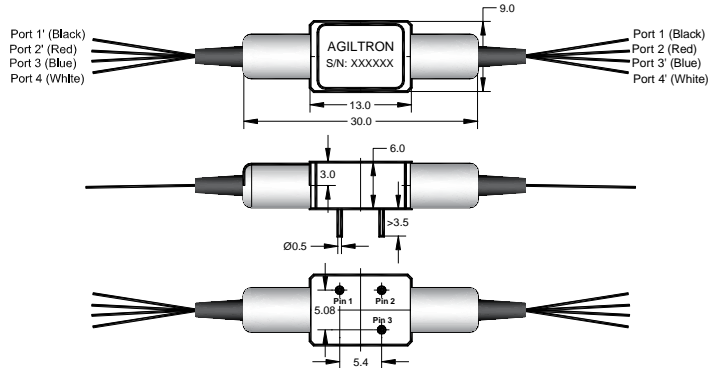


\*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

# etMEMS™ 1x1, 1x2, ..., Dual 2x2 Fiber Optical Switch

(\*SM & MM: 1x1, 1x2, 2x2, Dual 1x1, Dual 1x2, Dual 2x2, Quad 1x1. \*PM: 1x1, 1x2)

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



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

## Electrical Driving Requirements

### Latching Type

Status	Optical Path							Pin No.		
	1X1	Dual 1X1	Quad 1X1	1X2	Dual 1X2	Full 2x2	Dual Full 2x2	Pin 1	Pin 2	Pin 3
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'	NC [1]	GND	+V Pulse
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'	NC	+V Pulse	GND

[1]. NC: No electronic connection. [2]. +V Pulse: 4.8-5 VDC, Pulse width is 35-45 ms, Typical is 40 ms. [3]. Power Consumption is about 170 mW.

### Non-Latching Type

Status	Optical Path						Pin No.		
	1X1 (Normally Transparence)	1X1 (Normally Dark)	Dual 1X1 (Normally Transparence)	Dual 1X1 (Normally Dark)	Quad 1X1 (Normally Transparence)	Quad 1X1 (Normally Dark)	Pin 1	Pin 2	Pin 3
Status I	Dark	Port 1→1'	Dark	Port 1→1' Port 2→2'	Dark	Port 1→1' Port 2→2' Port 3→3' Port 4→4'	NC [1]	GND	+V [2]
Status II	Port 1→1'	Dark	Port 1→1' Port 2→2'	Dark	Port 1→1' Port 2→2' Port 3→3' Port 4→4'	Dark	NC	+V	GND

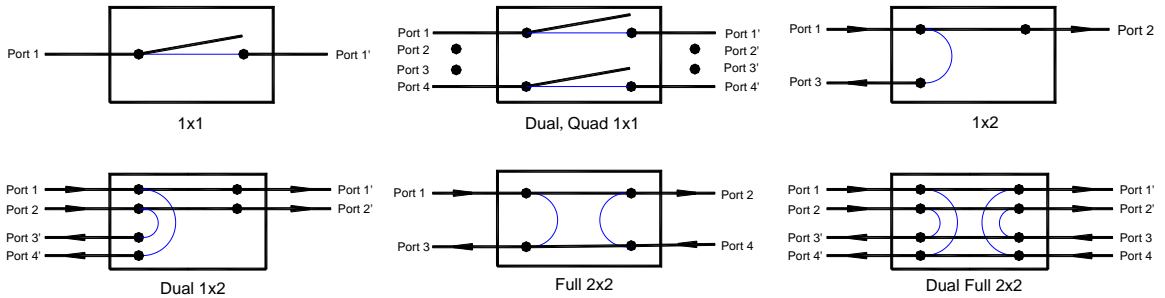
Status	Optical Path				Pin No.		
	1x2	Dual 1X2	Full 2x2	Dual Full 2x2	Pin 1	Pin 2	Pin 3
Status I	Port 1→2	Port 1→1' Port 2→2'	Port 1→2 Port 4→3	Port 1→1' Port 2→2' Port 3→3' Port 4→4'	NC	GND	+V
Status II	Port 1→3	Port 1→4' Port 2→3'	Port 1→3 Port 4→2	Port 1→4' Port 2→3' Port 3→2' Port 4→1'	NC	+V	GND

[1]. NC: No electronic connection. [2]. +V: 4.8-5 VDC. [3]. Power Consumption is about 170 mW.

# MEMS 1x1, 1x2, ..., Dual 2x2 Fiber Optical Switch

(\*SM & MM: 1x1, 1x2, 2x2, Dual 1x1, Dual 1x2, Dual 2x2, Quad 1x1. \*PM: 1x1, 1x2)

## Functional Diagram



## Ordering Information

Type	Wavelength [7]	Switch	Package	Fiber Type	Fiber Length	Connector	
MEMS [1] MEDU [2] MEQU [3] MEPM [4]	1060=1 1310=3 1550=5 780=7 850=8 1310/1550=9 850/1310=A 1260-1620=B Special=0	Latching=1 Non-latching=2 Special=0	Standard=2 Special=0	SMF-28=1 MM 50/125=5 MM 62.5/125=6 PM 250=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=7 Duplex LC=8 Special=0

[1] MEMS: MEMS 1x1, 1x2, 2x2 SWITCH.

[2] MEDU: MEMS DUAL 1x1, 1x2, 2x2 Switch.

[3] MEQU: MEMS QUAD 1x1 Switch.

[4] MEPM: MEMS 1x1, 1x2 PM Switch.

[5] NT: MEMS 1x1 Series Normally Transparency for Non-Latching Switch,

[6] ND: MEMS 1x1 Series Normally Dark for Non-Latching Switch,

# MEMS 1x1, 1x2, ..., Dual 2x2 Fiber Optical Switch

(\*SM & MM: 1x1, 1x2, 2x2, Dual 1x1, Dual 1x2, Dual 2x2, Quad 1x1. \*PM: 1x1, 1x2)

## 10<sup>9</sup> 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<sup>9</sup> switching cycles. The measurements show little changes in Insertion loss, Cross Talk, Return loss ect, all parameters are within our specs.

