

# MEMS Ultra-Mini 1x2, 2x2 Fiber Optical Switch/VOA (SM, PM, MM)



(Protected by US Patent 10752492B2)

DATASHEET

[Return to the Webpage](#)



## Features

- High Reliability
- Direct DC drive
- Ultra Small
- ESD Insensitive

The MEMS Ultra-Mini Series Fiber Optical Switch uses a patented thermal activated micro-mirror, moving-in and-out optical paths, uniquely featuring high extinction, high stability over a wide temperature range, and small size. The thermal MEMS is insensitive to moisture and ESD and has no short and long-term drifts, uniquely providing a high-reliability platform for over 25 years of continuous operation. The device also functions as a high-performance variable attenuator in which the output light intensity can be continuously controlled. The ultra-mini series switches are configured in 1x1, Dual 1x1, Quad 1x1, 1x2, Dual 1x2, Full 2x2, and Dual Full 2x2 with single or multimode fibers. The Ultra-Mini switches are Telcordia GR1221 qualified.

Two pin layouts and 5V are available for retrofit. Agiltron provides driving circuit design and customer integrations. A low-cost and convenient USB driver is also available.

This device also features a variable attenuation function, allowing the output power of each fiber port to be independently adjusted by varying the applied switching voltage.

## Specifications

Parameter	Min	Typical	Max	Unit
Operation Wavelength	1260 ~ 1620 820 ~ 1340			nm
Insertion Loss <sup>[1], [2]</sup>	0.5	0.7	1.0	dB
Extinction Ratio	PM version			dB
Return Loss <sup>[1]</sup>	SM, PM			dB
	Multimode			
Cross Talk <sup>[1]</sup>	SM, PM	60		dB
	Multimode	40		dB
PDL			0.2	dB
WDL			0.3	dB
TDL			0.3	dB
Switching Time		5	10	ms
Repeatability			±0.05	dB
Repetition Rate		10		Hz
Durability	10 <sup>9</sup>			Cycle
Power Consumption (activated)			270	mW
Switching Type	Non-Latching			
Operating Temperature <sup>[3]</sup>	-5		70	°C
Storage Temperature	-40		85	°C
Optical Power Handling (CW)		300	500	mW
Package Weight		1.9		g

### Notes:

[1]. Excluding connectors.

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

[3]. Lower temperature version is available, please call us.

**Legal notices:** All product information is believed to be accurate and is subject to change without notice. Information contained herein shall legally bind Agiltron only if it is specifically incorporated into the terms and conditions of a sales agreement. Some specific combinations of options may not be available. The user assumes all risks and liability whatsoever in connection with the use of a product or its application.

Rev 05/08/25

# MEMS Ultra-Mini 1x2, 2x2 Fiber Optical Switch/VOA (SM, PM, MM)

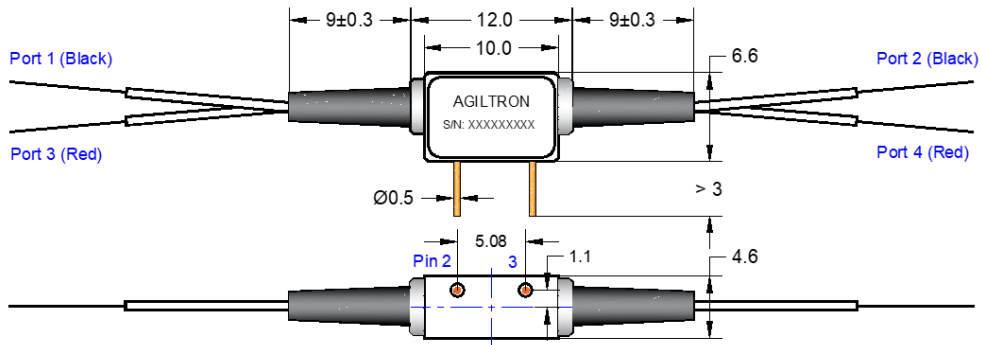


(Protected by US Patent 10752492B2)

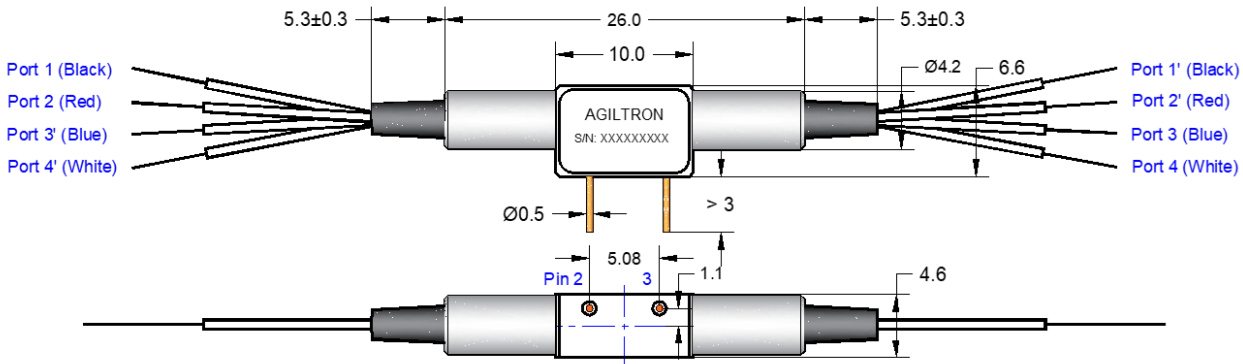
## DATASHEET

### Mechanical Dimension (mm)

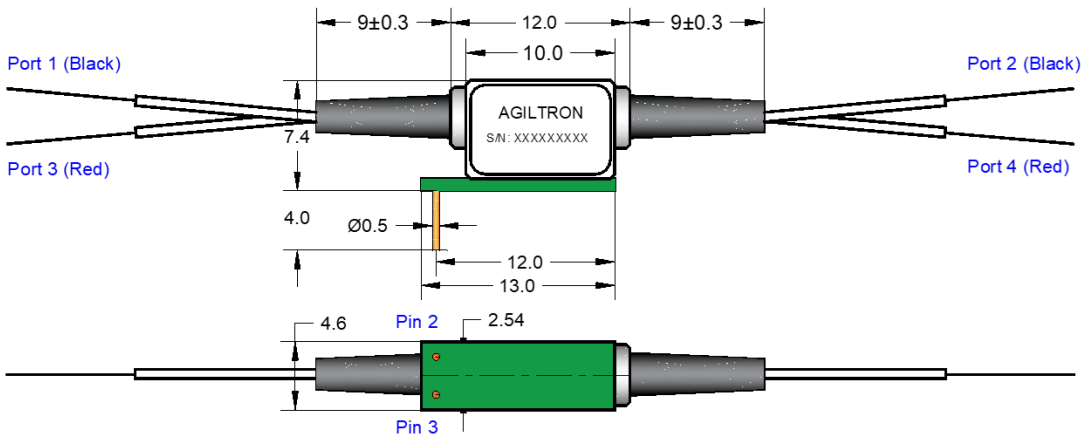
**Package 1:** For 1 ~ 4 bare fibers and = 2 fibers with 900 um loose tube.



**Package 2:** For = 3 fibers with 900 um loose tube.



**Package 3:** Add Adapting PCB version, for 1 ~ 4 bare fibers and = 2 fibers with 900 um loose tube.



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

# MEMS Ultra-Mini 1x2, 2x2 Fiber Optical Switch/VOA (SM, PM, MM)



(Protected by US Patent 10752492B2)

## DATASHEET

### Electrical Driving Requirements

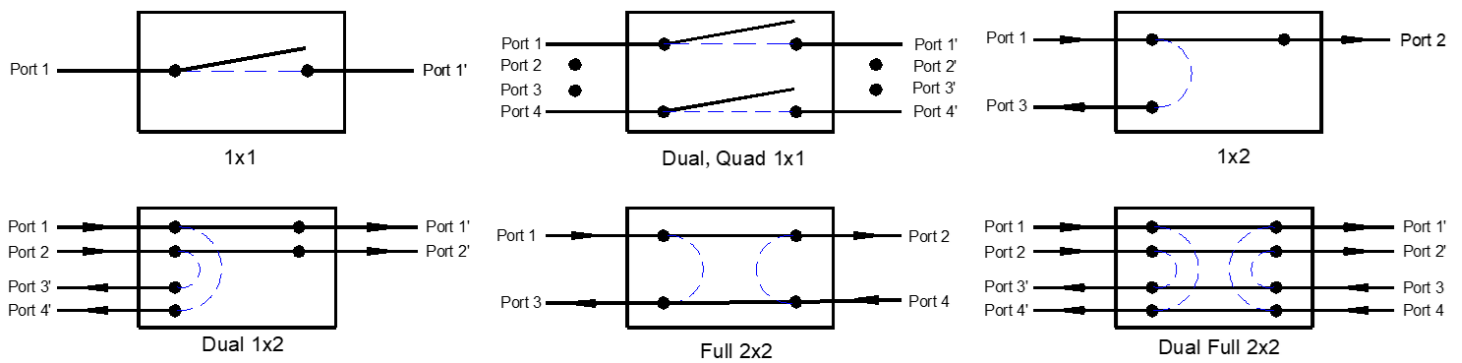
Status	Optical Path				Pin No.	
	1x2	Dual 1X2	Full 2x2	Dual Full 2x2	Pin 2	Pin 3
Status I	Port 1→2	Port 1→1' Port 2→2'	Port 1→2 Port 4→3	Port 1→1', Port 2→2' Port 3→3', Port 4→4'	0	+V [1]
Status II	Port 1→3	Port 1→4' Port 2→3'	Port 1→3 Port 4→2	Port 1→4', Port 2→3' Port 3→2', Port 4→1'	0	0

[1]. +V: 4.0 ~ 4.2VDC

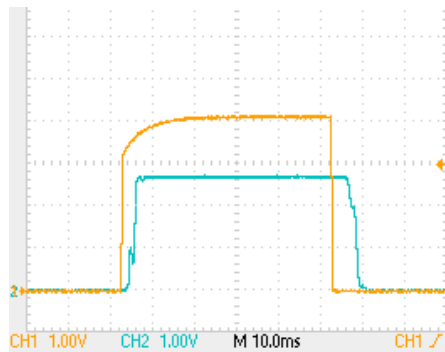
[Pushbutton/USB Driver](#)



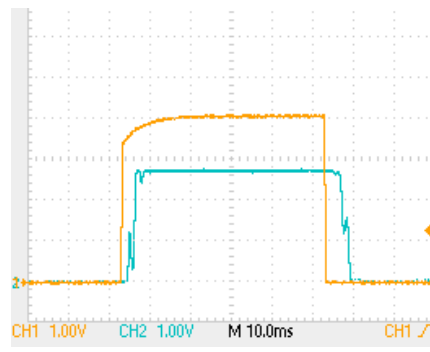
### Functional Diagram



### Typical Switching Rise/Fall at -40oC and 70oC



-40 °C



+70 °C

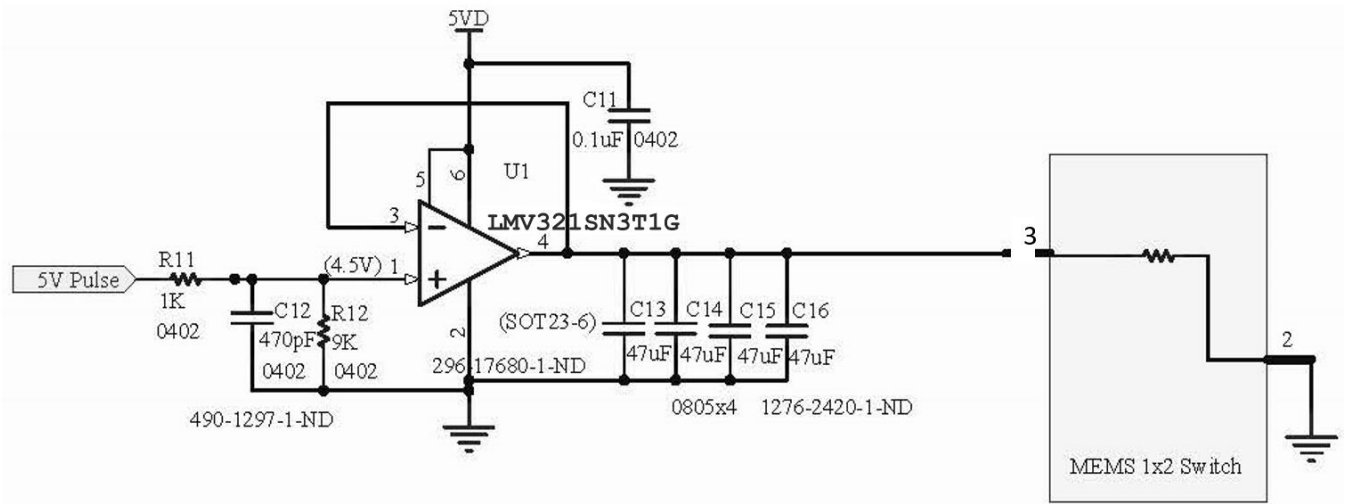
# MEMS Ultra-Mini 1x2, 2x2 Fiber Optical Switch/VOA (SM, PM, MM)



(Protected by US Patent 10752492B2)

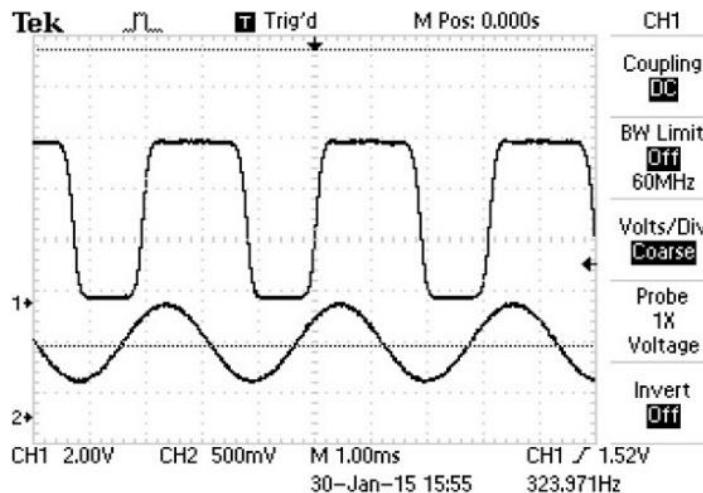
## DATASHEET

### Driving Circuit Recommendation



### 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, etc., all parameters are within our specs.



# MEMS Ultra-Mini 1x2, 2x2 Fiber Optical Switch/VOA (SM, PM, MM)



(Protected by US Patent 10752492B2)

## DATASHEET

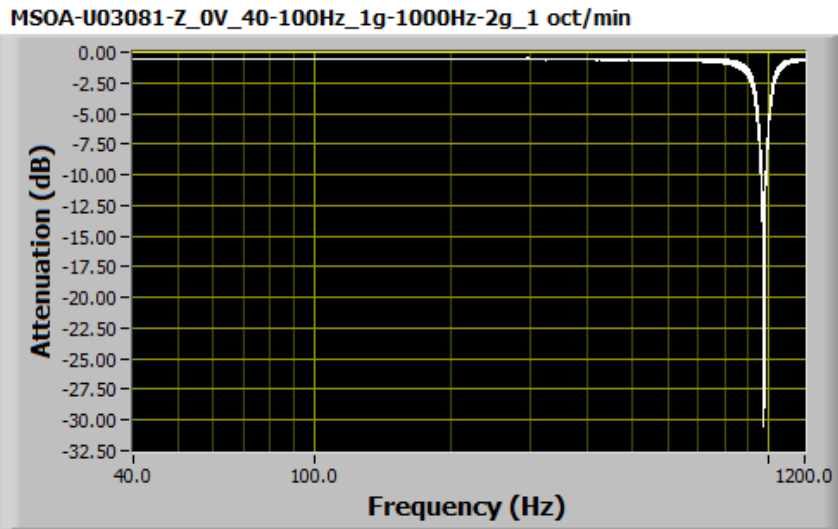
### Vibration (40-1200Hz) Test Results

**Test condition:**

- 1. Acceleration: 1g from 40Hz to 100Hz, and then from 100Hz to 1200Hz, from 1g to 2g
- 2. Vibration direction: Z axis of MSOA SN# U03081
- 3. Measure fiber optical insertion loss change

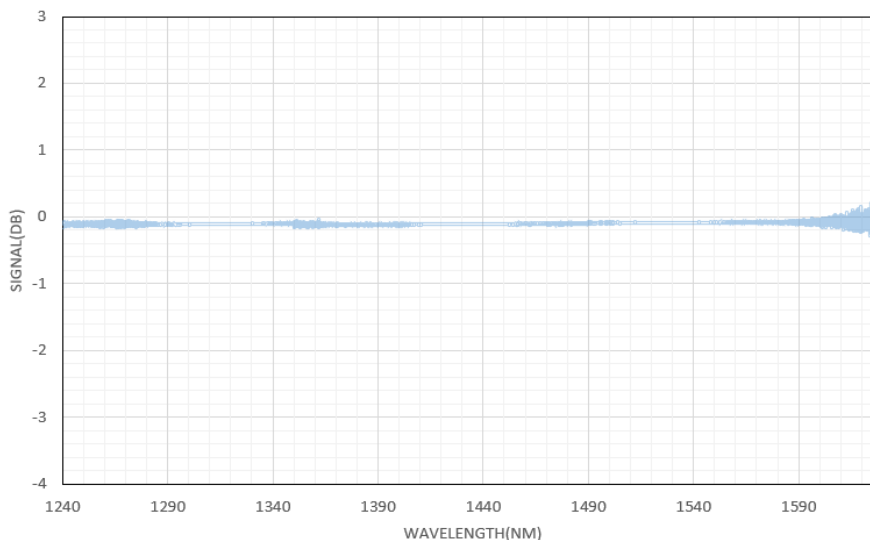
**Results:**

- 1. Resonance frequency: ~976 Hz, max IL change~30dB
- 2. IL change <0.1dB for frequency <200Hz, 0.1-0.2dB for frequency 200-500Hz.



### Typical Insertion Loss vs Wavelength (1240-1630nm)

#### 1x2 MEMS Switch



# MEMS Ultra-Mini 1x2, 2x2 Fiber Optical Switch/VOA (SM, PM, MM)



(Protected by US Patent 10752492B2)

## DATASHEET

### Ordering Information

Prefix	Type	Wavelength	Configuration	Package	Fiber Type <sup>[11]</sup>	Fiber Cover	Fiber Length	Connector
MISW- <sup>[1]</sup>	1x1 N/T <sup>[5]</sup> =1T	1260~1620 nm = B	Standard = 2	Package 1 <sup>[7]</sup> = 1	SMF-28 =1	Bare fiber = 1	0.25m=1	None = 1
MIDU- <sup>[2]</sup>	1x1 N/O <sup>[6]</sup> =1O	820~1340 nm = A	Low Loss = 3	Package 2 <sup>[8]</sup> = 2	MM 50/125 =5	900 um tube = 3	0.5m=2	FC/PC = 2
MIQU- <sup>[3]</sup>	1x2=12	Special = 0		Package 3 <sup>[9]</sup> = A	MM 62.5/125 =6	Special = 0	1.0m=3	FC/APC = 3
MIPM- <sup>[4]</sup>	2x2=22 2x1=21 Special=00			Package 4 <sup>[10]</sup> = B Special = 0	PM1550 =B PM1310 =D PM980 =E PM850 =F Special=0		Special=0	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

[1]. MISW: MEMS U--MINI 1x1, 1x2, 2x2 SWITCH.

[2]. MIDU: MEMS U--MINI DUAL 1x1, 1x2, 2x2 Switch.

[3]. MIQU: MEMS U--MINI QUAD 1x1.

[4]. MIPM: MEMS U--MINI 1x1, 1x2 PM Switch.

For PM 2x2 configuration, please select a different version:

<https://cdn-agl.agiltron.com/dlc/specs/MEMS%20Full%20Dual%20Full%202x2%20PM%20Non-latching%20Switch.pdf>

[5]. N/T: MEMS U--MINI Non-Latching 1x1 Switch, Normally Transparent (light pass through without applying a voltage).

[6]. N/O: MEMS U--MINI Non-Latching 1x1 Switch, Normally Opaque. (light blocked without applying a voltage).

[7]. Package 1 (see Drawing) is for 1 ~ 4 bare fibers and ≤ 2 fibers with 900 um loose tube.

[8]. Package 2 (see Drawing) is for ≥ 3 fibers with 900 um loose tube.

[9]. Package 3 (see Drawing) is for add an Adapting PCB version.

[10]. Package 4 is for add Adapting PCB and 5 VDC control version

[11]. PM fiber version only available 1x1 and 1x2 configuration. For 2x2 configuration see a dedicated datasheet

## 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.