

MEMS Ultra-Mini 1x2, 2x2 Fiber Optical Switch

(Protected by US Patent 10752492B2)

Product Description

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.



Features

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

Performance Specifications

MEMS Ultra-Mini Series Switch	Min	Typical	Max	Unit	
Operation Wavelength	Single Mode	1260~1620			
	Multimode	810~890 and/or 1260~1360		nm	
	PM				
Insertion Loss ^{[1], [2]}		0.6	1.0 / 1.2 ^[3]	dB	
PDL	SM version		0.1	dB	
Extinction Ratio	PM version	18		dB	
Return Loss ^[1]	SM, PM	50		dB	
	Multimode	35			
Cross Talk ^[1]	SM, PM	50	60	dB	
	Multimode	35	40	dB	
Switching Time		5	10	ms	
Repeatability			±0.05	dB	
Repetition Rate		10		Hz	
Durability		10 ⁹		Cycle	
Power Consumption (activated)			270	mW	
Switching Type			Non-Latching		
Operating Temperature ^[5]		-5	+70	°C	
Storage Temperature		-40	+85	°C	
Optical Power Handling (CW)			300	500	mW
Package Dimension			10L x 6.6W x 4.6H	mm	
Package Weight			1.9	g	
Fiber Type ^[4]	Single Mode		SMF-28 or equivalent		
	PM		Panda 1550/250 PM or equivalent		
	Multimode		MM 50/125, MM 62.5/125 or equivalent		

[1]. Excluding connectors.
 [2]. Multimode IL measured @ Light Source CPR < 14dB.
 [3]. Dual band, and Dual 1x2, Full 2x2, Dual Full 2x2.
 [4]. PM fiber version only in 1x1 and 1x2 configuration.
 [5]. Lower temperature version is available, please call us.

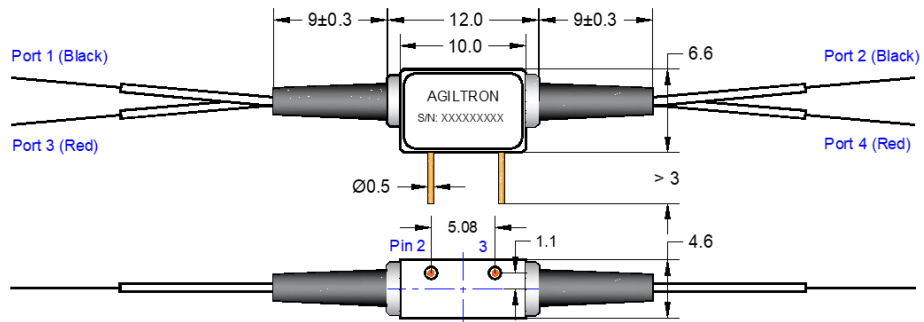


Revised on 12/07/22

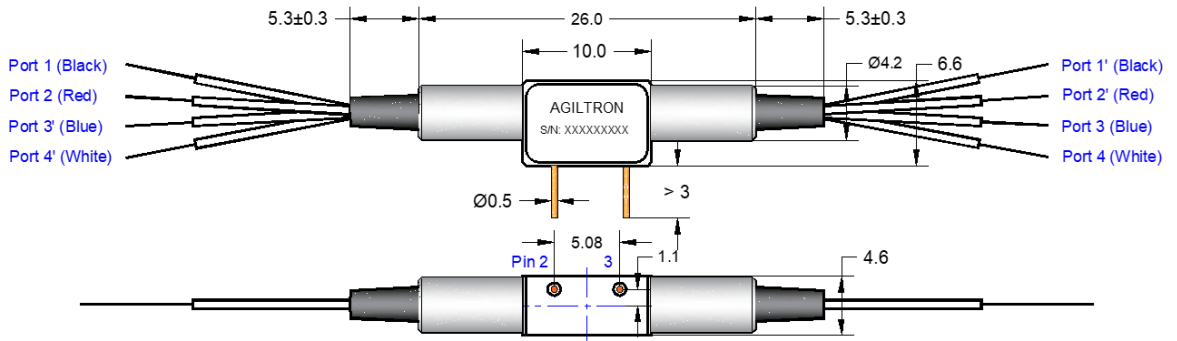
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Mechanical Dimension (unit: mm)

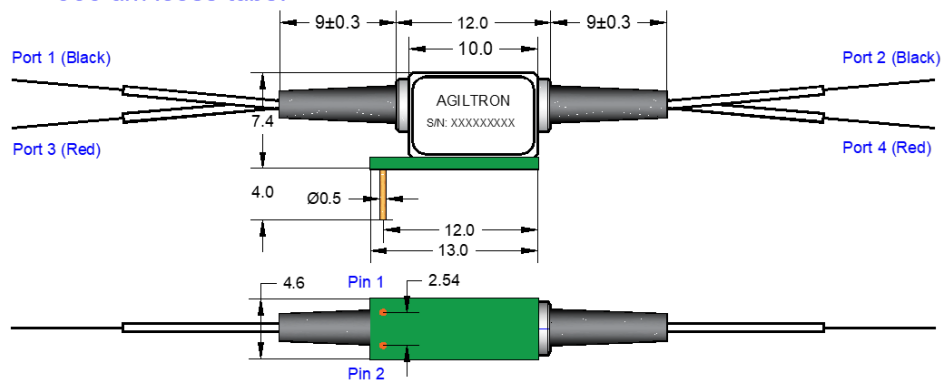
Package 1: For 1 ~ 4 bare fibers and = 2 fibers with 900 um loose tube.



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.

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Electrical Driving Requirements

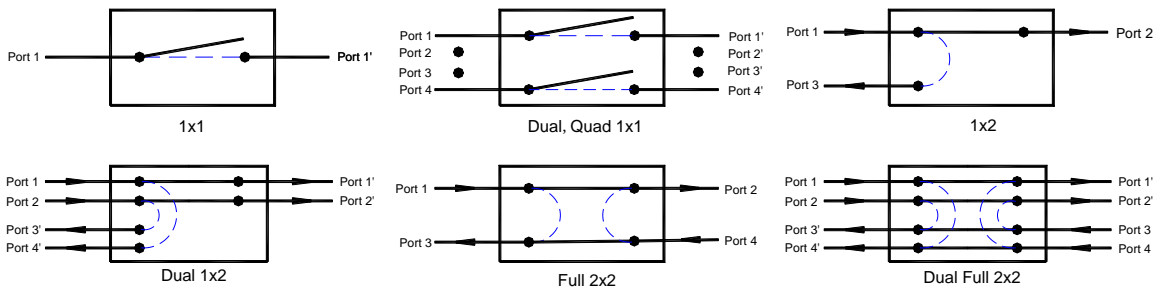
Status	Optical Path				Pin No.	
	1x2	Dual 1X2	Full 2x2	Dual Full 2x2	Pin 2	Pin 3
Status I	Port 1→2	Port 1→1' Port 2→2'	Port 1→2 Port 4→3	Port 1→1', Port 2→2' Port 3→3', Port 4→4'	0	+V [1]
Status II	Port 1→3	Port 1→4' Port 2→3'	Port 1→3 Port 4→2	Port 1→4', Port 2→3' Port 3→2', Port 4→1'	0	0

[1]. +V: 3.8 ~ 4.2VDC @ T<=45°C operation; 3.8 ~ 4.0VDC @ T>45°C operation.

[Pushbutton/USB Driver](#)

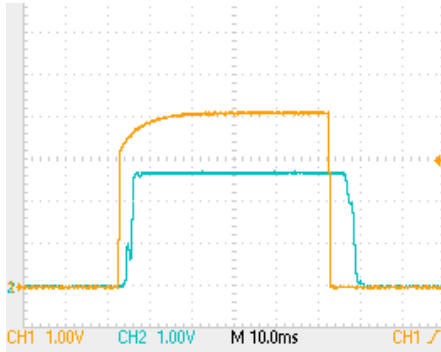


Functional Diagram



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

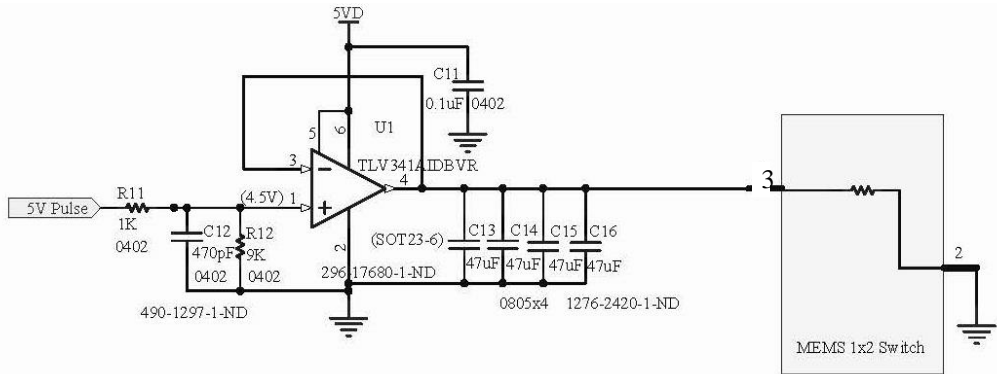


-40 °C



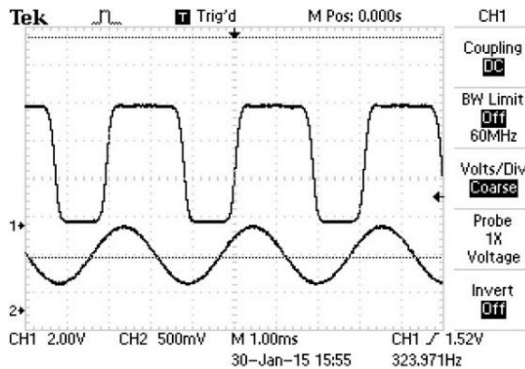
+70 °C

Driving Circuit Recommendation



10⁹ 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 10⁹ switching cycles. The measurements show little changes in Insertion loss, Cross Talk, Return loss, etc., all parameters are within our specs.



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Vibration (40-1200Hz) Test Results

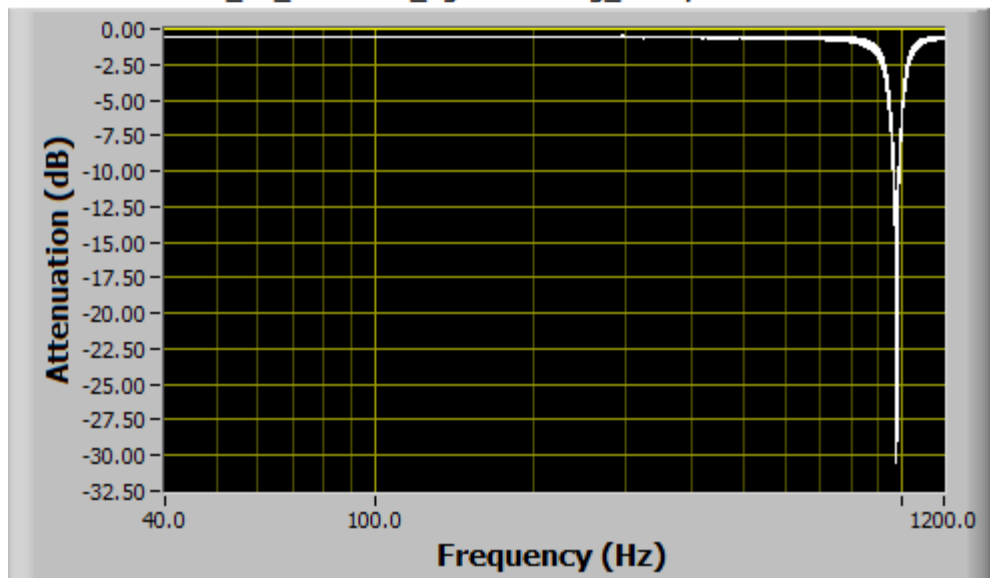
Test condition:

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

MSOA-U03081-Z_0V_40-100Hz_1g-1000Hz-2g_1 oct/min



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Ordering Information

Prefix	Type	Wavelength	Switch	Package	Fiber Type	Fiber Cover	Fiber Length	Connector
MISW- ^[1]	1x1 N/T ^[5] =1T	1260-1620 =B	Non-latching=2	Package 1=1 ^[7]	SMF-28=1	Bare fiber=1	0.25m=1	None=1
MIDU- ^[2]	1x1 N/O ^[6] =1O	1310 =3		Package 2=2 ^[8]	MM 50/125=5	900 um tube=3	0.5m=2	FC/PC=2
MIQU- ^[3]	1x2=12	1550 =5		Package 3=3 ^[9]	MM 62.5/125=6	Special=0	1.0m=3	FC/APC=3
MIPM- ^[4]	2x1=21 2x2=22 Special=00	850 & 1310 =A Special=0		Package 4=4 ^[10] Special=0	PM1550=B PM1310=D PM980=E PM850=F Special=0		Special=0	SC/PC=4 SC/APC=5 ST/PC=6 LC=7 Duplex LC=8 MTP=9 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.

[5]. N/T: MEMS U--MINI Non-Latching 1x1 Switch, Normally Transparence.

[6]. N/O: MEMS U--MINI Non-Latching 1x1 Switch, Normally Opaque.

[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.

NOTE: Opaque means the light is blocked when no electrical power is present.

