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

(Protected by US Patent 10752492B2)

Features

- Vacuum Compatible
- Direct DC drive
- Ultra Small
- ESD Insensitive
- Bidirectional
- High Reliability

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 stability over wide temperature range without compensation, small size and very long life cycle. The thermal MEMS is insensitive to moisture and ESD without drift issues, providing a high reliability platform for over 25 years continuous operation. 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 standards GR1221 qualified.

Agiltron provides customized design and modular assemblies to meet control and integration applications.

Performance Specifications

MEMS U-Mini Series Switch	Min	Typical	Max	Unit
Operation Wavelength	Single Mode	1260 ~ 1610		nm
	Multimode	810 ~ 890 and / or 1260 ~ 1360		
Insertion Loss ^{[1], [2]}		0.6	1.0 / 1.2 ^[3]	dB
PDL (Single mode)			0.1	dB
Extinction Ratio	PM	18		dB
	SM, PM	50		dB
Return Loss ^{[1], [2]}	Multimode	35		
	Cross Talk ^{[1], [2]}	SM, PM	50	
		Multimode	35	
Switching Time		5	10	ms
Repeatability			±0.05	dB
Repetition Rate			10	Hz
Durability		10 ⁹		Cycle
Power Consumption (in pulse)			170	mW
Switching Type		Latching Type		
Operating Temperature ^[5]		-5	70	°C
Storage Temperature		-40	85	°C
Optical Power Handling		300	500	mW
Package Dimension		12L x 6.6W x 4.6H		mm
Package Weight		1.9		g
Fiber Type ^[4]	Single Mode	SMF-28 or equivalent		
	PM	Panda 250 PM or equivalent		
	Multimode	MM 50/125, MM 62.5/125 or equivalent		

[1]. Excluding connectors.

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

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

[4]. PM fiber version only in 1x1 and 1x2 configuration.

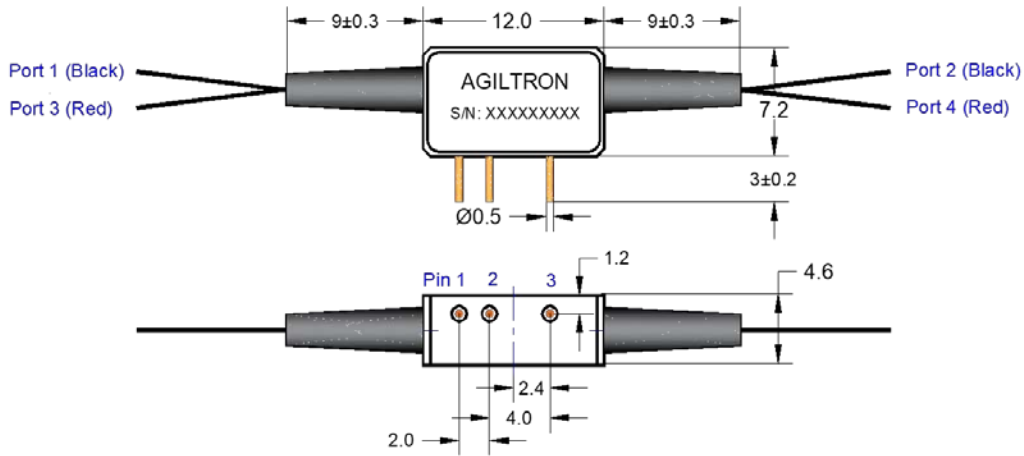
[5]. Lower temperature version is available, please call us.



Revised on 10/11/21
(Click here for latest revision)

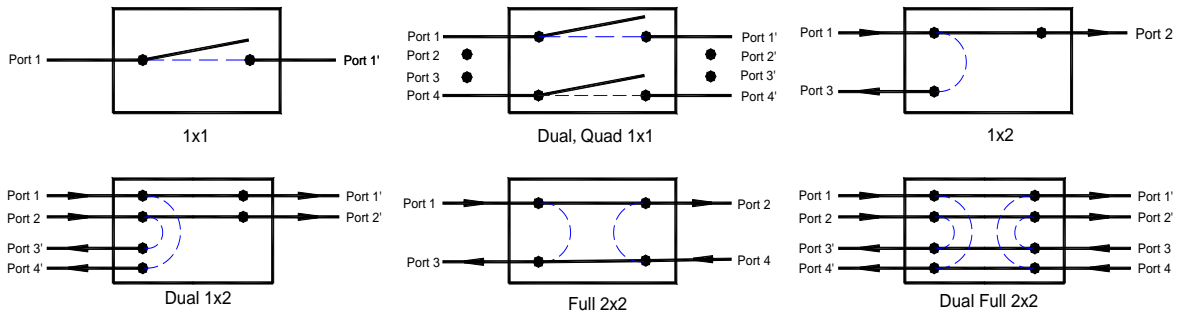
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Mechanical Dimension (unit: mm)



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

Functional Diagram



Driving Table

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'	Pulse-1 [1]	Pulse-2 [1]	4.5VDC
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'	Pulse-2 [1]	Pulse-1 [1]	

[1]: The driving pulses on Pin 1 and 2 must be sequenced in time. The timing sequence of pulses is defined in the next section.

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Ordering Information

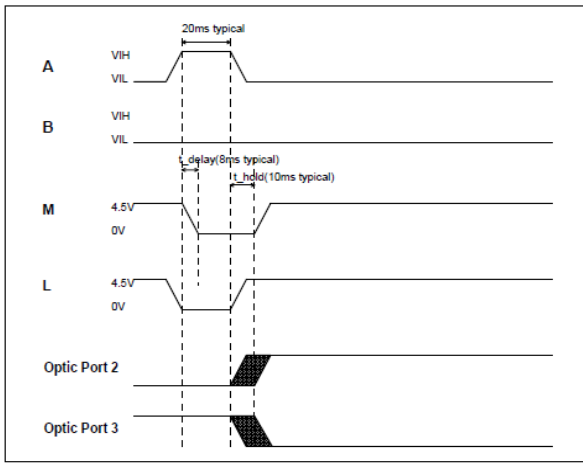
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Type	Wavelength	Switch	Package	Fiber Type	Fiber Length	Connector		
MISW ^[1] MIDU ^[2] MIQU ^[3] MIPM ^[4]	1x1=11 1x2=12 2x2=22 Special=00	850~1310=A 1260~1620=B Special=0	Latching =1	Standard=2 Special=0	SMF-28=1 PM1550/250=B MM 50/125=5 MM 62.5/125=6 Special=0	Bare fiber=1 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 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.

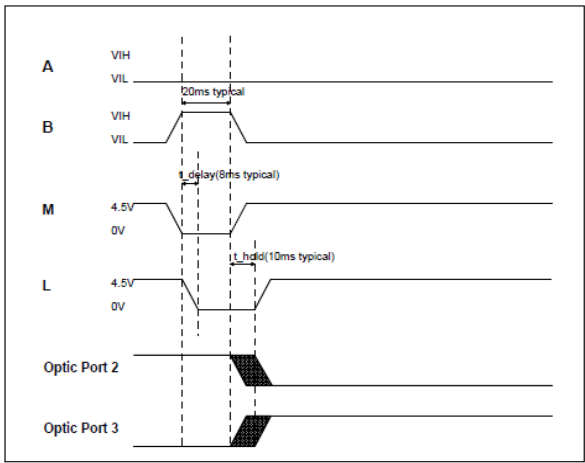
Timing Pulse and Recommended Driving Circuit

This switch requires timing pulse of 4.5V to actuate MEMS latching chip. The timing sequence of pulses is shown below.

- 1) A and B are the control signals.
- 2) M and L are the driving pulses applied on PIN#1 and #2 respectively. The optical path changes is shown for 1x2 as example, and also valid for other optical configuration.
- 3) Pulse-#1 is delayed to the control signal, while Pulse-#2 isn't delayed.
- 4) The width of driving pulse is 40~60ms typically.
- 5) The falling delay between two driving pulses is 8ms typically per the control signal A, and the rising delay between two driving pulses is 10ms typically per the control signal B.



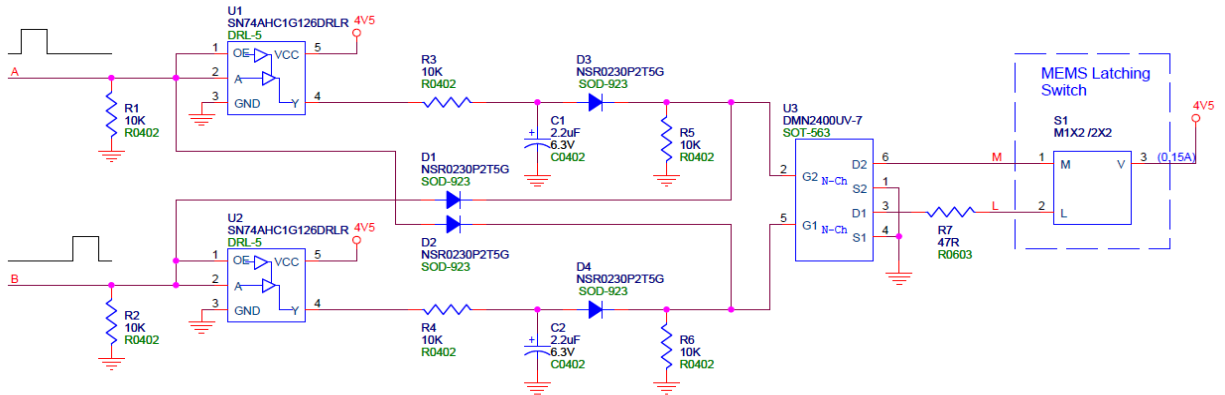
Timing of Port 1→ 2



Timing of Port 1→ 3

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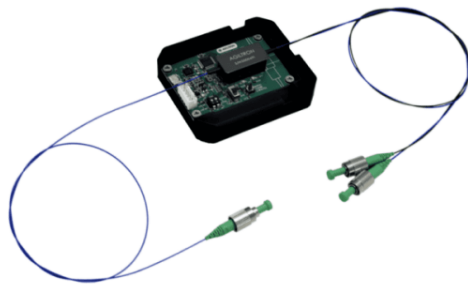
A recommended circuitry is shown as following



- 1) 5V+/-5% should be ok for all power supplies.
- 2) R7 = 47~50ohm for avoiding the over-current applied on MEMS chip.

Demo Driving Board (\$230)

Customer can buy this manual push button and computer USB interface board to test the switch.



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.

