

MEMS 1x4 Fiber Optical Switch/VOA

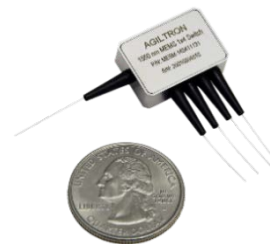
(Bidirectional, SM, PM)

(Protected by US Patent 10752492B2)

Product Description

The MEMS 1x4 Series Fiber Optical Switch uses a patented thermal activated micro-mirror, moving-in and -out optical paths at a 45 degree angle to direct an incoming light into a selected output fiber without hitting other ports, by which the degradation of multi-fiber collimator due to the laser steering in long period is entirely eliminated. It uniquely offers, unprecedented high stability over a wide temperature range, compact size, exceptionally long operation life, insensitive to moisture and ESD, no short and long-term drifts, and high-reliability for over 25 years of continuous operation.

The device can also simultaneously functions as a variable attenuator in which the output light intensity is continuously controlled. The switches are Telcordia GR1221 qualified. The switch is conveniently controlled by directly applying a voltage to each mirror actuator.



Features

- Hitless
- High Reliability
- Compact Size
- ESD Tolerance

Performance Specifications

| MEMS Mini 1x4 Switch | Min | Typical | Max | Unit |
|----------------------------------|----------------------------|-------------------------|--------------------|-------|
| Operation Wavelength | Single Band | 1310±40 or 1510±40 | | nm |
| | Dual Band | 1310±40 & 1510±40 | | |
| | Broad Band | 1260-1620 | | |
| Insertion Loss ^[1] | Single Band ^[2] | 0.6 | 1.0 | dB |
| | Dual Band ^[2] | 0.7 | 1.2 | dB |
| Wavelength Dependent Loss | | 0.15 | 0.3 ^[2] | dB |
| Polarization Dependent Loss (SM) | | | 0.1 | dB |
| Extinction Ratio (PM) | 18 | | | dB |
| Cross Talk ^[1] | 50 | | | dB |
| Return Loss ^[1] | 50 | | | dB |
| Switching Time | | 10 | | ms |
| Repeatability | | | ±0.05 | dB |
| Repetition Rate | | 10 | | Hz |
| Durability | 10 ¹⁰ | | | Cycle |
| Switching Type | | Non-Latching | | |
| Operating Temperature | -5 | | 70 | °C |
| Storage Temperature | -40 | | 85 | °C |
| Optical Power Handling | | 300 | | mW |
| Fiber Type | SM Switch | SMF-28 or equivalent | | |
| | PM Switch | Panda 250 or equivalent | | |

[1]. Exclude connectors.

[2]. Dual and Broad band.

Applications

- Channel Blocking
- Add/Drop
- System Monitoring
- Instrumentation

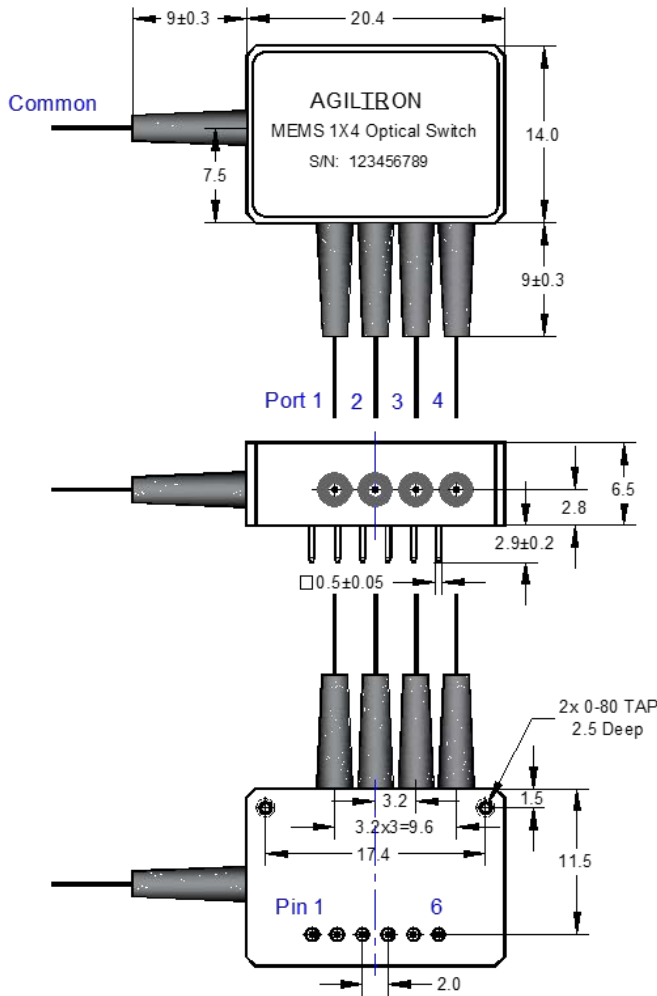


Revised on 1/13/22

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Mechanical Dimensions (Unit: mm)



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

Electronic Control Requirements

| Optical Path | Pin Number | | | | | |
|-----------------|------------|---|----|----|---|----|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Common ↔ Port 1 | +V | 0 | 0 | 0 | 0 | 0 |
| Common ↔ Port 2 | 0 | | +V | 0 | | 0 |
| Common ↔ Port 3 | 0 | | 0 | +V | | 0 |
| Common ↔ Port 4 | 0 | | 0 | 0 | | +V |

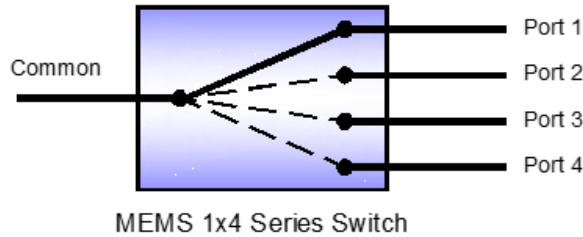
[1]. NC: No electronic connection. [2]. +V: 3.8–4.5 VDC, Typical is 4.0 VDC. [3]. Each MEMS Chip Power Consumption is about 170 mW.



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Functional Diagram



Note:

- 1) Standard version: None of ports is connected optically without voltage. In addition of On-Off operation, the attenuation can be realized in each port. When the applied voltage is increased, IL of the relevant port will be reduced from IL in max (>50dB) to IL in min (<1.0dB), realizing VOA function.
- 2) Default version: Port #4 is connected as default without voltage. VOA function isn't available any more in all ports.

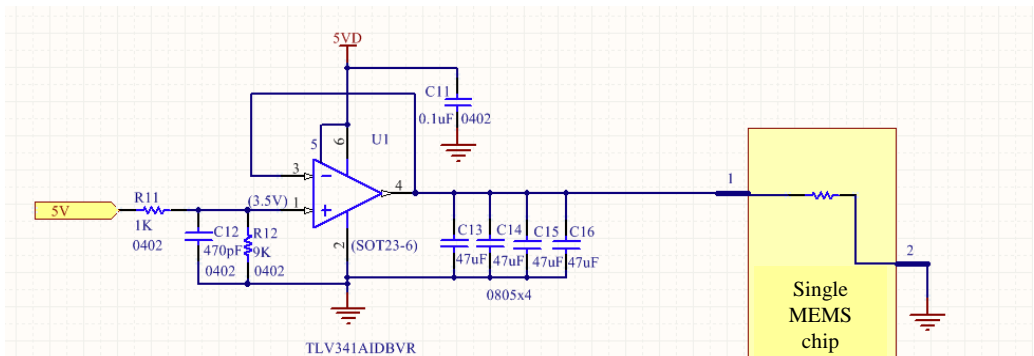
Ordering Information

| | Type | Wavelength | Switch | Version | Fiber Type | Fiber Length | Connector | |
|--------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------|----------------|----------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------|---------------------------------------------------------------------------|
| MESM ^[1] MEMP ^[2] | 1x3=13 1x4=14 Special=00 | 1260~1620=B 1060=1 1310=3 1550=5 780=7 850=8 1310/1550=9 Special=0 | Non-Latching=2 | Standard=1 Default = D Special=0 | SMF-28=1 PM1550/250=B PM1400/250=C PM1310/250=D PM980/250=E PM850/250=F Special=0 | Bare fiber=1 900 um 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 LC=7 Special=0 |

[1]. MESM: MEMS 1x4 SM Mini Switch.
[2]. MEMP: MEMS 1x4 Mini PM Switch.

Recommendation Control Circuit

In order to minimize the overshooting and oscillation in optics, the following circuit is recommended for driving signal on PIN.

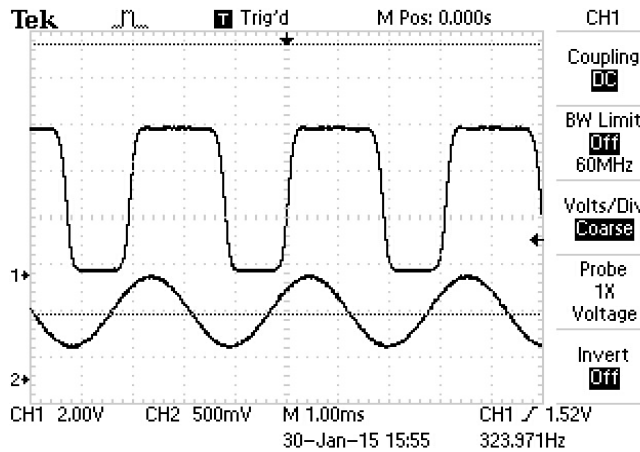


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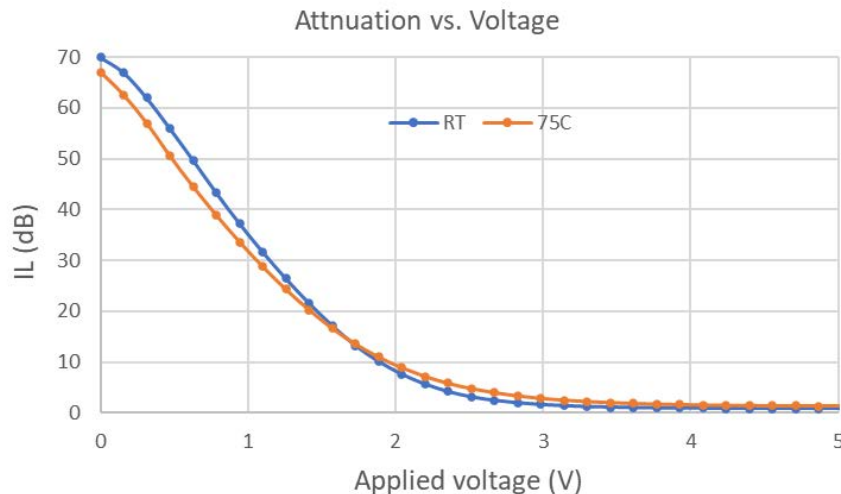
10⁹ Switching Cycle Verification

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 ect, all parameters are within our specs.



VOA Capability on Port

The attenuation in each channel can be realized in this MEMS switch without scarifying the switch performances. The attenuation is realized by the applied voltage between 0 and 4V, as shown in the following figure (typical).

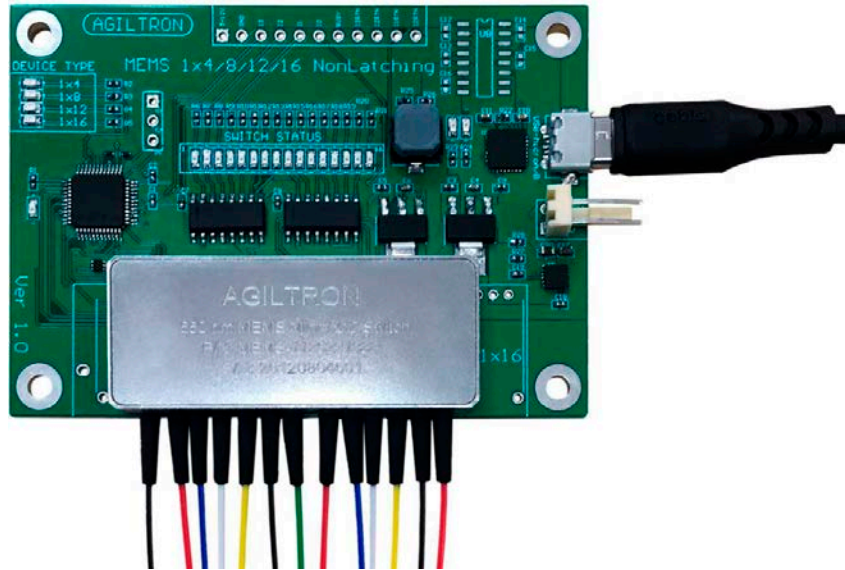


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Demo Driver

USB RS232/GUI, Pushbutton/LED Channel Indicators
Applicable to Non-latching MEMS-1x4, 1x8, 1x12 and 1x16 (\$255)



MEMS-1x12 on Demo driver