

# MEMS Ultra Mini Multiple Series Fiber Optic Switch/VOA

(Quad, Octo, Twelve, Sixteen 1x2, Full 2x2 Switch)



DATASHEET

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The MEMS Ultra Mini Multiple Series Switch include Quad, Octo, Twelve, Sixteen 1x2, Full 2x2 Fiber Optic switch, integrates 4, 8, 12, 16 pcs 1x2, Full 2x2 switches in a single super compact format. It is designed for 40G, 100G transceiver bypass application. The device connects optical channels by redirecting incoming optical signals into selected output fibers. This is achieved using a proprietary MEMS configuration and activated via an electrical control signal. It uniquely features rugged thermal activated micro-mirror movement instead of rotation, and the novel design significantly simplify the control electronics, offering unprecedented high stability and an unmatched low cost.

We also offer the built-in driver version, which features a convenient user interface.

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.

## Features

- High Reliability
- Low Optical Distortions
- Intrinsic tolerance to ESD

## Applications

- Channel Routing
- Configurable Add/Drop
- System Monitoring
- Instrumentation

## Specifications

| Parameter                          |             | Min                        | Typical | Max                       | Unit  |
|------------------------------------|-------------|----------------------------|---------|---------------------------|-------|
| Operation Wavelength               | Single Mode | 1260~1360 and/or 1510~1610 |         |                           | nm    |
|                                    | Multimode   | 810~890 and/or 1260/1360   |         |                           |       |
| 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>         | Single Mode | 50                         |         |                           | dB    |
|                                    | Multimode   | 35                         |         |                           | dB    |
| Cross Talk <sup>[1]</sup>          | Single Mode | 50                         |         |                           | dB    |
|                                    | Multimode   | 35                         |         |                           | dB    |
| Switching Time                     |             |                            | 10      |                           | ms    |
| Repeatability                      |             |                            |         | ±0.05                     | dB    |
| Repetition Rate                    |             |                            | 10      |                           | Hz    |
| Durability                         |             | 10 <sup>9</sup>            |         |                           | Cycle |
| Switching Type                     |             | Non-Latching               |         |                           |       |
| Operating Temperature              |             | -5                         |         | 70                        | °C    |
| Storage Temperature                |             | -40                        |         | 85                        | °C    |
| Optical Power Handling (CW)        |             |                            | 300     | 500                       | mW    |

### Notes:

[1]. Excluding connectors.

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

[3]. Dual band.

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Rev 09/24/24

# MEMS Ultra Mini Multiple Series Fiber Optic Switch/VOA



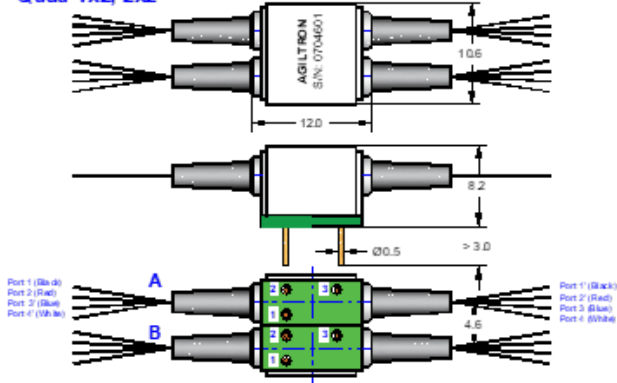
(Quad, Octo, Twelve, Sixteen 1x2, Full 2x2 Switch)

## DATASHEET

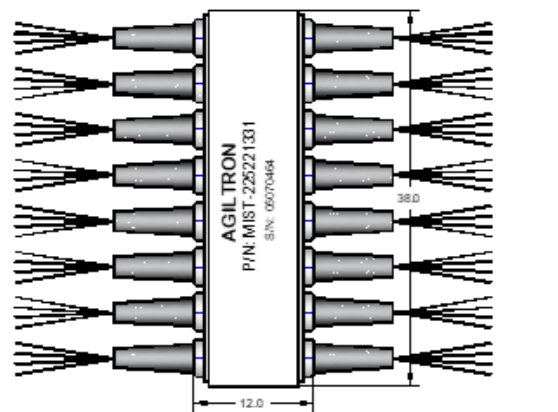
### Mechanical Dimensions (mm)

#### Package 1: Bare fiber version

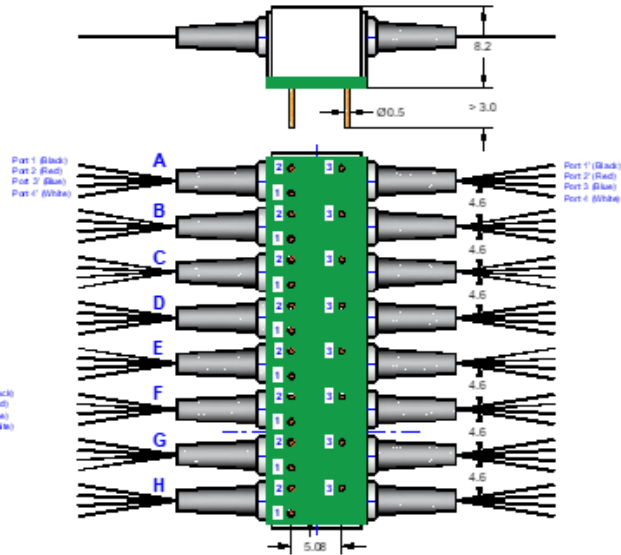
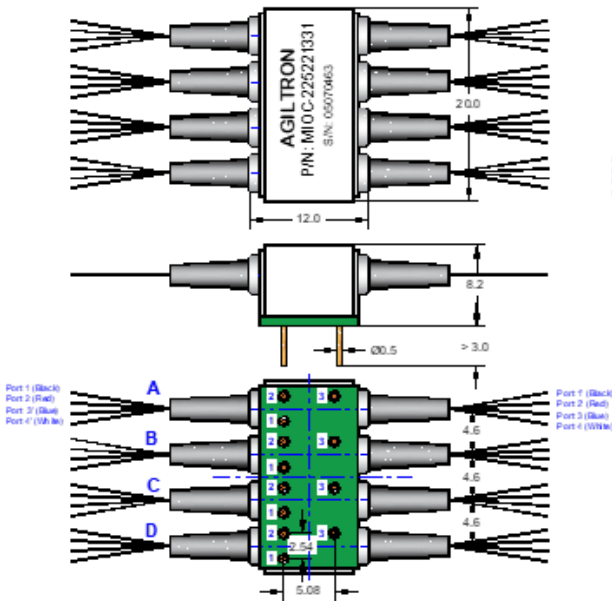
##### Quad 1x2, 2x2



##### Sixteen 1x2, 2x2

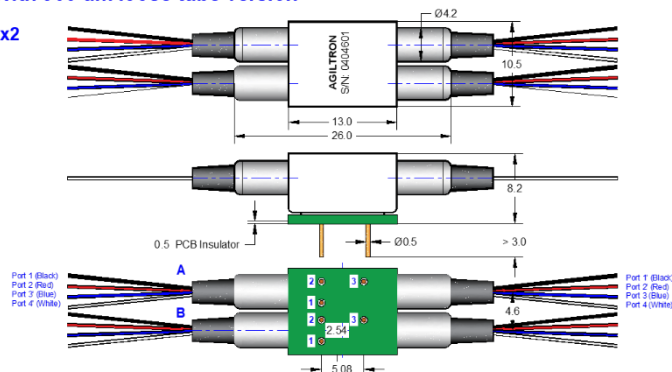


##### Octo 1x2, 2x2



#### Package 2: With 900 um loose tube version

##### Dual 1x2, 2x2



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

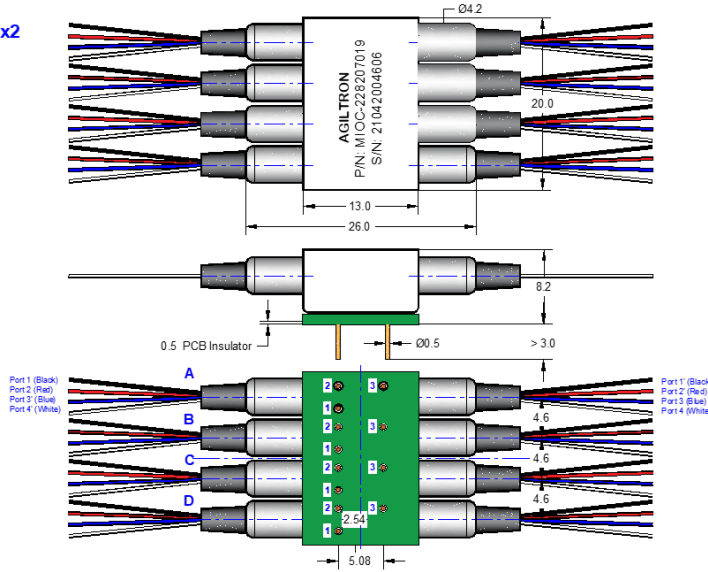
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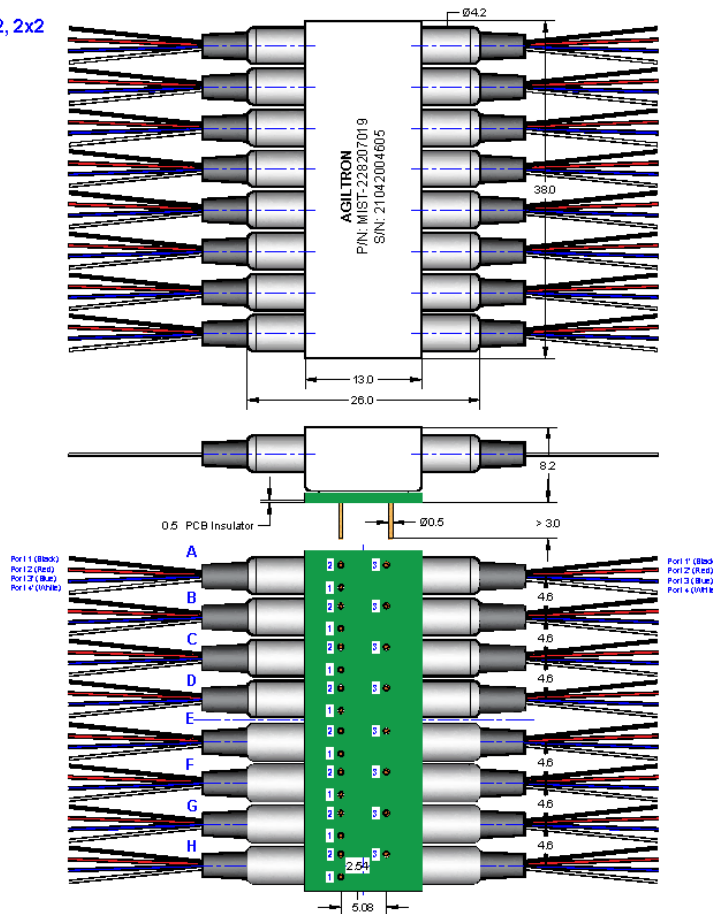


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Octo 1x2, 2x2



Sixteen 1x2, 2x2



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### Electrical Driving Requirements

**Driving Table** (For MEMS U-Mini Dual 1x2, 2x2 Switch A, B, ..., H)

| Status    | Optical Path for Switch A, B, ..., H |  | Pin No.           |       |                   |
|-----------|--------------------------------------|--|-------------------|-------|-------------------|
|           | 1x2                                  | Full 2x2                                     | Pin 1             | Pin 2 | Pin 3             |
| Status I  | Port 1→1'<br>Port 2→2'               | Port 1→1', Port 2→2'<br>Port 3→3', Port 4→4' | NC <sup>[1]</sup> | 0V    | +V <sup>[2]</sup> |
| Status II | Port 1→4'<br>Port 2→3'               | Port 1→4', Port 2→3'<br>Port 3→2', Port 4→1' |                   | 0V    | 0V                |

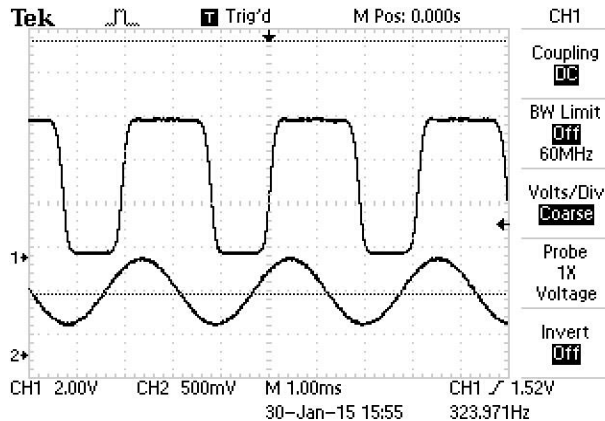
[1]. NC: No electronic connection.

[2]. +V: 3.8 ~ 4.2VDC @ T≤45°C operation; 3.8 ~ 4.0VDC @ T>45°C operation.

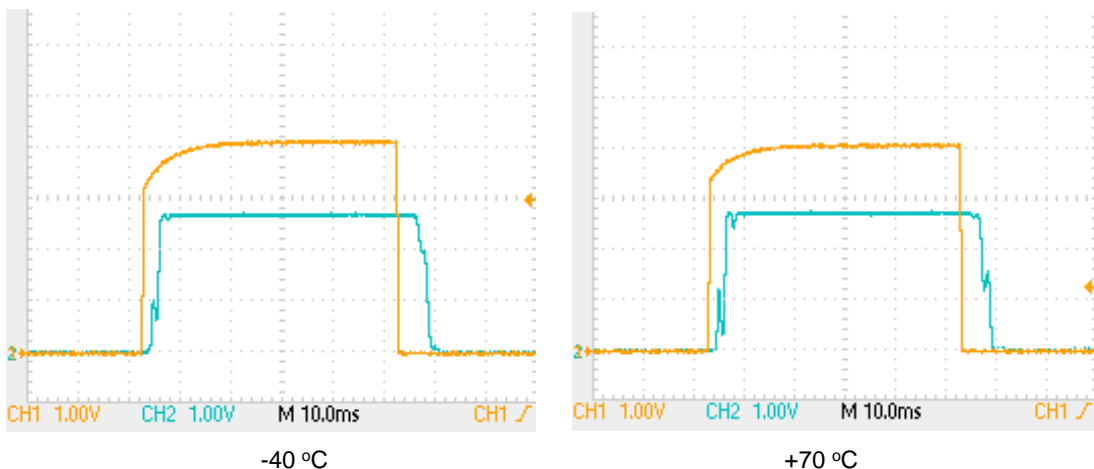
[3]. Each MEMS Chip power consumer is about 170 mW.

### 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.



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



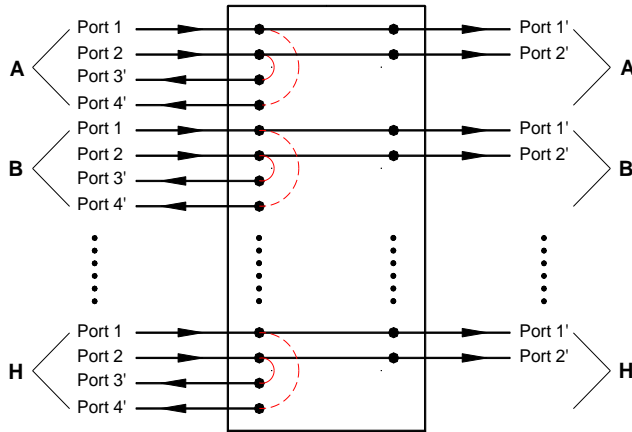
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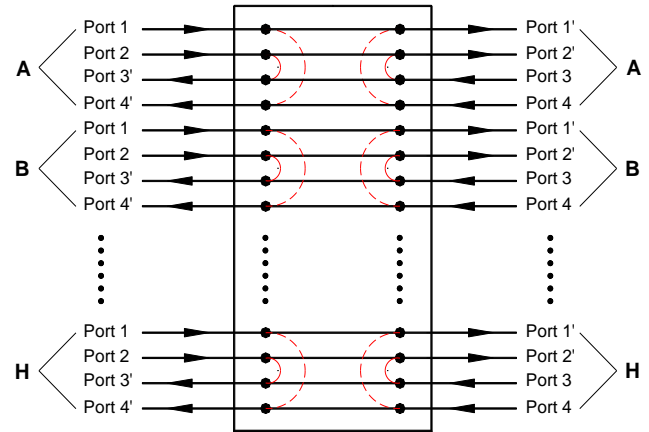
(Quad, Octo, Twelve, Sixteen 1x2, Full 2x2 Switch)

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### Functional Diagram



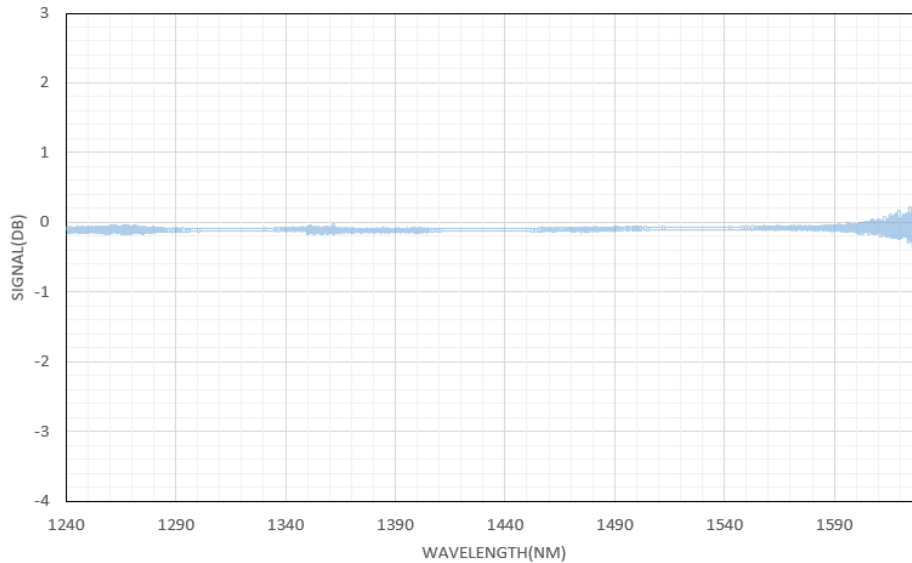
MEMS U-Mini Multiple 1x2 Switch



MEMS U-Mini Multiple Full 2x2 Switch

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

1x2 MEMS Switch



# MEMS Ultra Mini Multiple Series Fiber Optic Switch/VOA

(Quad, Octo, Twelve, Sixteen 1x2, Full 2x2 Switch)



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## Ordering Information

| Prefix               | Type          | Wavelength    | Switch                | Package                      | Fiber Type      | Fiber Cover    | Fiber Length | Connector        |
|----------------------|---------------|---------------|-----------------------|------------------------------|-----------------|----------------|--------------|------------------|
| MIQD- <sup>[1]</sup> | 1x2 = 12      | 1060 = 1      | NL <sup>[5]</sup> = 2 | Package 1 <sup>[6]</sup> = 1 | SMF-28 = 1      | Bare fiber = 1 | 0.25m = 1    | None = 1         |
| MIOC- <sup>[2]</sup> | Full 2x2 = 22 | 780 = 7       |                       | Package 2 <sup>[7]</sup> = 2 | MM 50/125 = 5   | 900um tube = 3 | 0.5m = 2     | FC/PC = 2        |
| MITW- <sup>[3]</sup> |               | 850 = 8       |                       | Special=0                    | MM 62.5/125 = 6 | Special = 0    | 1.0m = 3     | FC/APC = 3       |
| MIST- <sup>[4]</sup> |               | 1310/1550 = 9 |                       |                              | Special = 0     |                | Special = 0  | SC/PC = 4        |
|                      |               | 850/1310 = A  |                       |                              |                 |                |              | SC/APC = 5       |
|                      |               | 1260~1620 = B |                       |                              |                 |                |              | ST/PC = 6        |
|                      |               | Special = 0   |                       |                              |                 |                |              | LC/PC = 7        |
|                      |               |               |                       |                              |                 |                |              | Duplex LC/PC = 8 |
|                      |               |               |                       |                              |                 |                |              | MTP = 9          |
|                      |               |               |                       |                              |                 |                |              | LC/APC = A       |
|                      |               |               |                       |                              |                 |                |              | LC/UPC = U       |
|                      |               |               |                       |                              |                 |                |              | Special = 0      |

- [1]. **MIQD**: MEMS U-MINI **QUAD** 1x2, 2x2 Switch.
- [2]. **MIOC**: MEMS U-MINI **OCTO** 1x2, 2x2 Switch.
- [3]. **MITW**: MEMS U-MINI **TWELVE** 1x2, 2x2 Switch.
- [4]. **MIST**: MEMS U-MINI **SIXTEEN** 1x2, 2x2 Switch.
- [5]. Non-latching.
- [6]. Package1 is without 900 um loose tube.
- [7]. Package 2 is with 900 um loose tube

## 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.