10-bit MEMS Variable Fiber Optical Time Delay/VOA

AGILTRON®

(Protected by US Patent 10752492B2)

The MEMS Series Photonic Time Delay digitally varies the optical delay time in fiber by selectively routing optical signal through N fiber loops whose lengths increase successively by a power 2 of the increment time delay ΔT. Since each switching element allows the signal to either pass or bypass a fiber loop, a delay T may be inserted, which can take any value (in increments of ΔT) up to the maximum value ($T = (2^{N+1}-1)\ \Delta T$).

This is achieved using a patent pending MEMS switching configuration and activated via an direct DC electrical control signal.

The driver is available with USB and/or RS232 control interface separately.

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

- 7-bit Resolution or more
- High Reliability
- Compact

Applications

- Phase-Array Antennas
- Instrumentation

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength Band	780	1550	2000	nm
Insertion Loss [1]		3	4.5	dB
Polarization Dependent Loss (SM)		0.1	0.2	dB
Polarization Extinction Ratio (PM)	18	24		dB
Cross Talk	40	50		dB
Return Loss	50	55		dB
Switching Time (fall, rise)		2	10	ms
Fiber Segment Number	4		10	
Delay Time Range [2]			10	ms
Polarization Mode Dispersion (SM)		0.1	0.2	ps
Operating Temperature	-5		70	°C
Storage Temperature	-40		85	°C
Optical Power Handling		300		mW
Package Dimension [1]		See drawing		

Notes:

[1]. It is defined for 4-bit Time Delay with the short fiber loops. The maximum Insertion Loss is: 5.6dB for 5-bit version, 6.8 dB for 6-bit, 7.8 dB for 7-bit, and 12.0 dB for 10-bit respectively.

[2]. The delay fiber loops can be spliced in precise control per customer's request.

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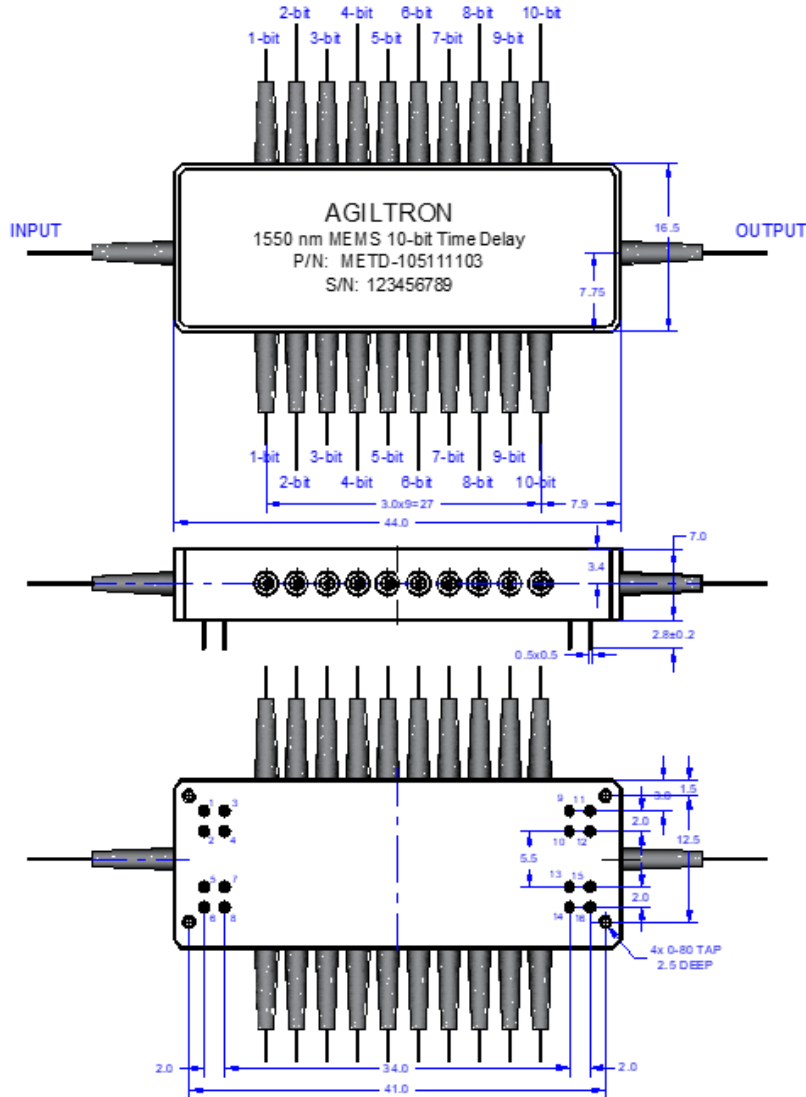## Mechanical Dimensions (mm)

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

Electrical Driving Requirements

The electrical driver is available with USB and/or RS232 control interfaces and Windows™ GUI. It comes with a wall-plug 5V power supply. Please contact us it.

Driving Voltage	Min	Typical	Max	Unit
+V	4.0	4.2	4.5	VDC
Power Consumption (For each MEMS Chip)		170		mW

Electrical Driving Requirements

Status	Pin Number										
	1	2	3	4	5	9	10	11	12	13	6, 7, 8, 14, 15
Bypass	H	H	H	H	H	H	H	H	H	H	
1st bit	0	H	H	H	H	H	H	H	H	H	
2nd bit	H	0	H	H	H	H	H	H	H	H	
3rd bit	H	H	0	H	H	H	H	H	H	H	
4th bit	H	H	H	0	H	H	H	H	H	H	
5th bit	H	H	H	H	0	H	H	H	H	H	GND
6th bit	H	H	H	H	H	0	H	H	H	H	
7th bit	H	H	H	H	H	H	0	H	H	H	
8th bit	H	H	H	H	H	H	H	0	H	H	
9th bit	H	H	H	H	H	H	H	H	0	H	
10th bit	H	H	H	H	H	H	H	H	H	0	

Delay Path Definition: ex. 5th-bit path diagram
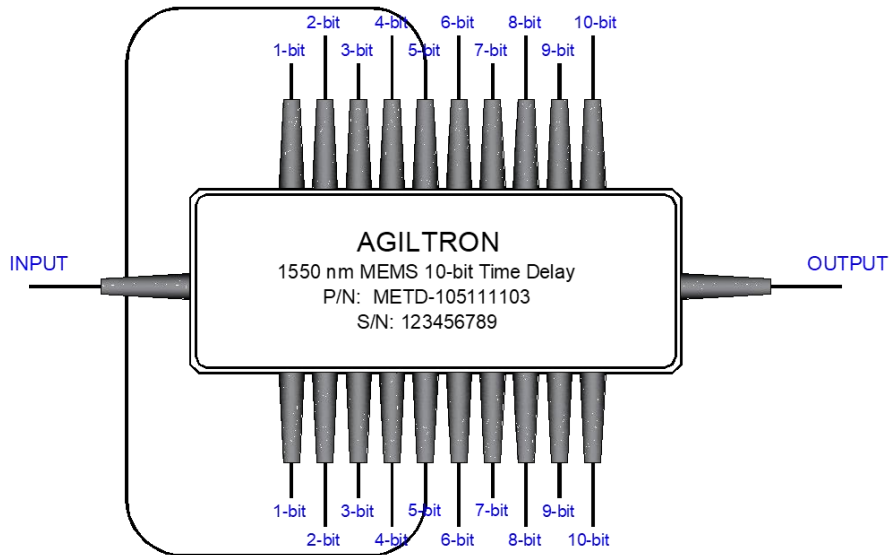
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Typical Switching Rise/Fall at -40°C and 70°C

-40 ºC

+70 ºC
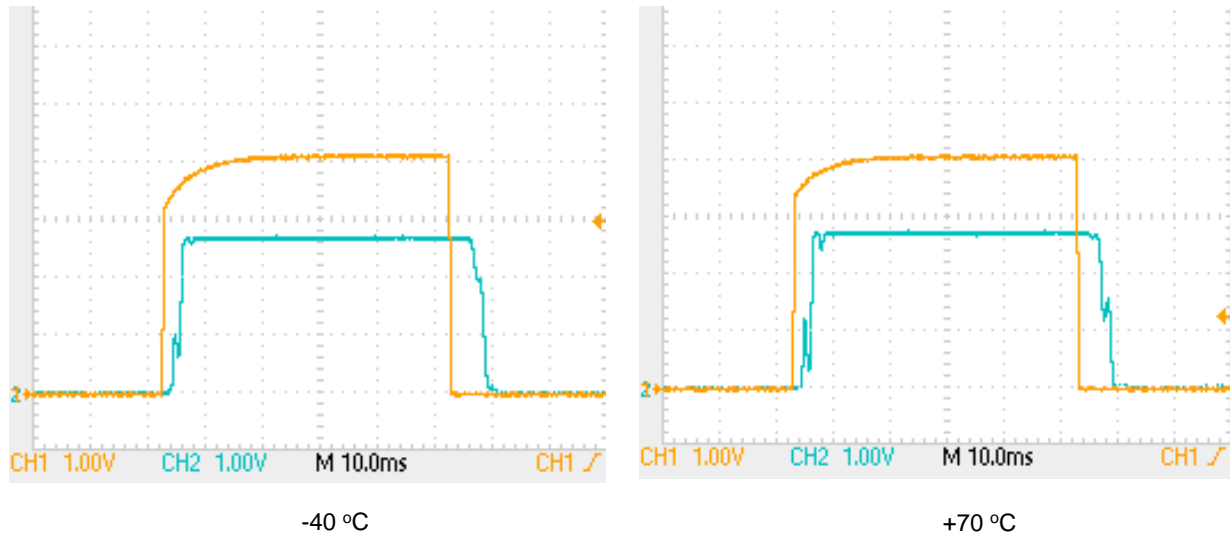
Typical Insertion Loss vs Wavelength (1240-1630nm)

1x2 MEMS Switch
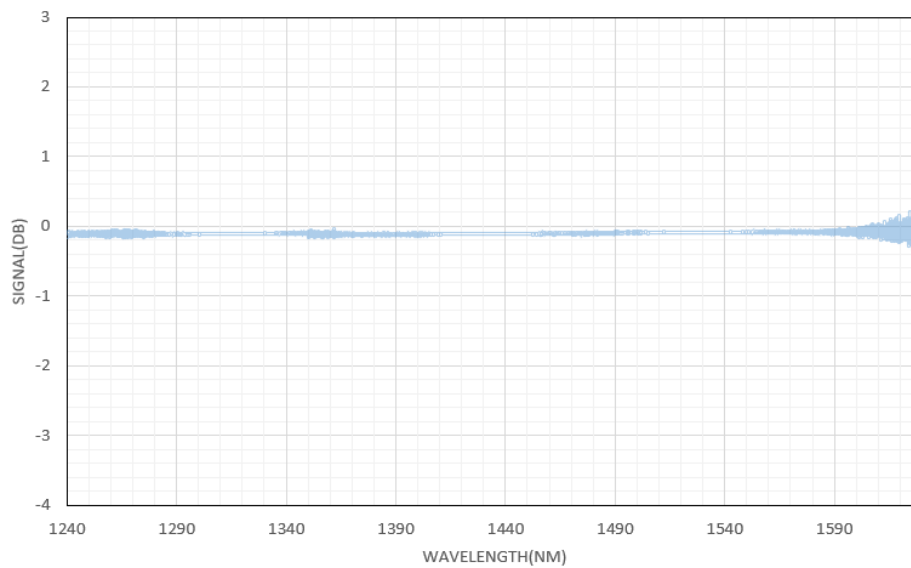
Ordering Information

							0	
Prefix	**Type**	**Wavelength**	**Configuration**	**Switch type**	**Fiber Type**	**Fiber Cover**	**Delay Range**	**Connector**
METD-	2-Bit = 02 3-Bit = 03 4-Bit = 04 5-Bit = 05 6-Bit = 06 7-Bit = 07 8-Bit = 08 9-Bit = 09 10-Bit =10 Special=0	1260~1620 =1 Special=0	Standard = 1 Inversion = 2 Special = 0	Non-latching=2 Special=0	SMF-28=1 PM 1550=B PM 1310=D PM 980=E PM 850=F Special=0	Bare fiber = 1 0.9mm tube = 3 Special = 0	Customized=0	None=1 FC/PC=2 FC/APC=3 SC/PC=4 SC/APC=5 ST/PC=6 LC/PC=7 Special=0

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.

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Command List

```
Baud rate: 9600-8-N-1

CMD: Set Delay Bit:
          0x01 0x14 <high byte> <low byte>
          <high byte>:
```

Bits	7	6	5	4	3	2	1	0
Value	0	0	0	0	0	0	Bit 9 Enable	Bit 8 Enable

```
          <low byte>:
```

Bits	7	6	5	4	3	2	1	0
Value	Bit 7 Enable	Bit 6 Enable	Bit 5 Enable	Bit 4 Enable	Bit 3 Enable	Bit 2 Enable	Bit 1 Enable	Bit 0 Enable

```
          For each Bit X enable: 0 means Bit Disable, 1 means Bit Enable
```