Fiber-Fiber™
MEMS Broadband Optical Attenuator

(Protected by US 11125947 and pending Patents)

DATASHEET

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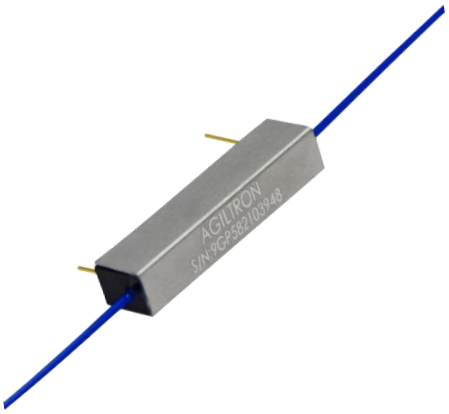

Features

- Low Insertion Loss
- High Reliability
- Broadband
- High Optical Power

Applications

- Dynamic gain equalization
- Sensor
- Instrumentation

The Fiber-Fiber™ series VOA is based on fiber-to-fiber direct coupling with a micro-electro-mechanical (MEMS) shutter in between. It eliminates the need for lens and optical coating, featuring low loss, ultra-broadband without altering fiber transmission character, high power, compact size, and easy drive. The current MEMS chips accommodate fiber with 3 to 105 mm core diameters. VOAs with fiber of larger diameters can be made with special chip fabrication run with an NRE charge. The Fiber-Fiber™ series VOA is compliant with the Telcordia 1209 and 1221 reliability standards. The VOA is driven by directly applying a low electrical voltage.

The VOA is electrically a resistor load, has no polarity, and is electrostatically insensitive.

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength	380 [1]		2000	nm
Band Width		broad same as fiber transmission		
Insertion Loss [2]		0.5	1.0	dB
Attenuation Resolution		Continuous		dB
Attenuation Range [3] (Core < 8 µm)	35	40	60	dB
Return Loss	28	30	40	dB
Response Time	5	20	30	ms
Optical Power Handling (CW) [6]		300	500	mW
Polarization Extinction Ratio	18	20	30	ms
Driving Voltage (full range) [7]		3.5	6	VDC
Power Consumption	0	80 [4]	220 [5]	mW
Reliability		Telcordia 1209 and 1221		
Operating Temperature		-40 ~ 80		°C
Storage Temperature		-40 ~ 85		°C
Fiber Type		50/125, 62.5/125		
Package Dimension		See drawing below		mm
105/125 Fiber Typical Driving Voltage	13	14.5	15.5	V
105/125 Fiber Typical Driving Power Consumption	410	480	530	mW

Notes:

[1]. Transmission is the same as the fiber without wavelength alternation

[2]. Measure with CPR<20 laser/LED source and excluding connectors

[3]. For a larger core, the value is reduced. For Core ~ 105µm, the max attenuation is about 10dB

[4]. About 15dB

[5]. At full attenuation

[6]. The power handling is related to wavelength: 0.2mW for 380nm, 200mW for 980nm, 500mW for 1060nm

[7]. The full range voltage is related to the fiber core size, the value for SM28 fiber only

Note: The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link]:

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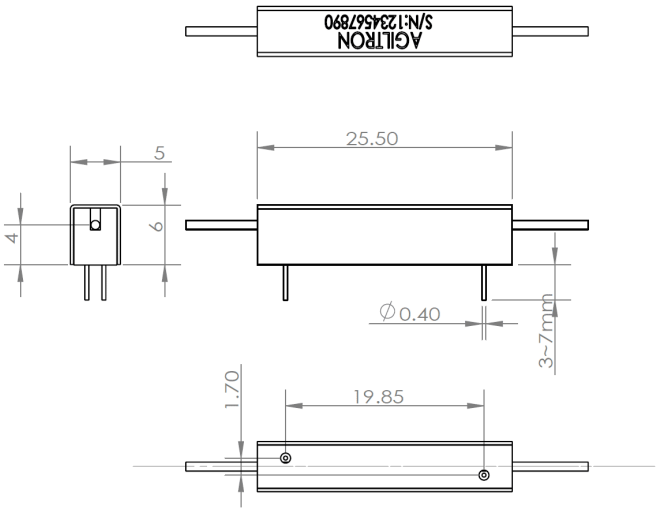
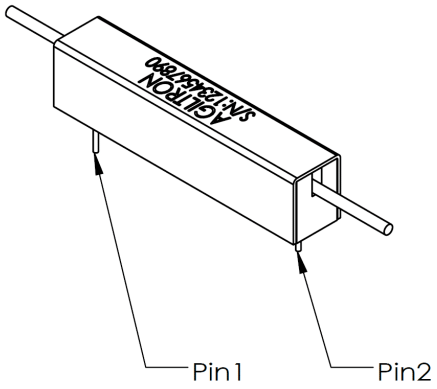
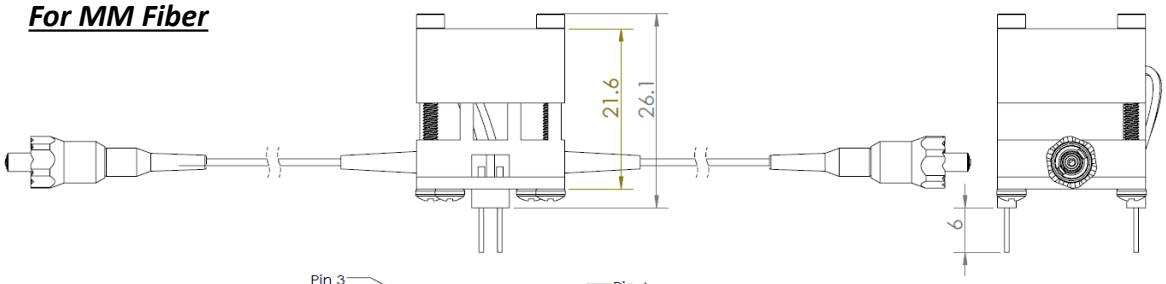
Mechanical Dimensions-Package

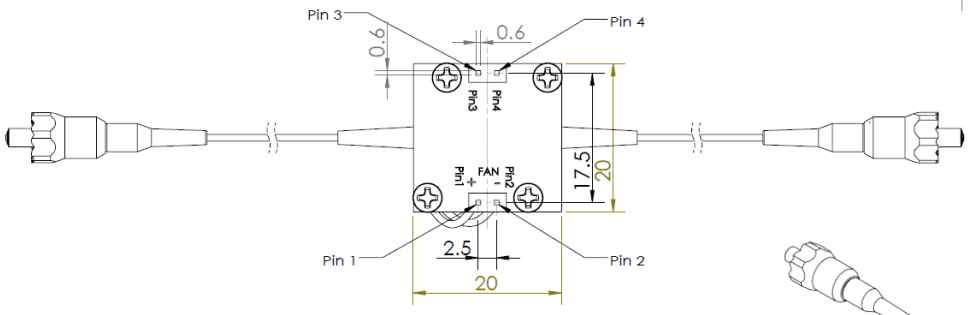
For SM/PM Fiber

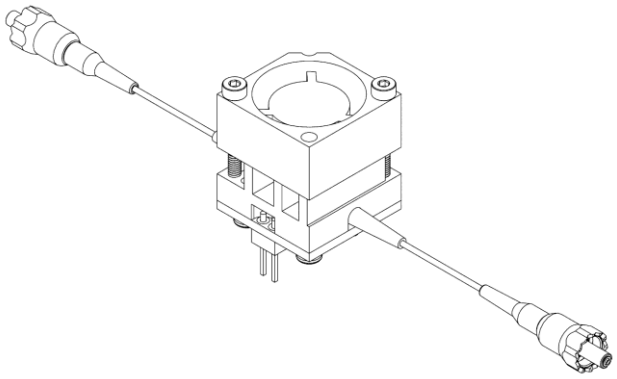




For MM Fiber







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

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Electrical Driving Information

For SM/PM Fiber

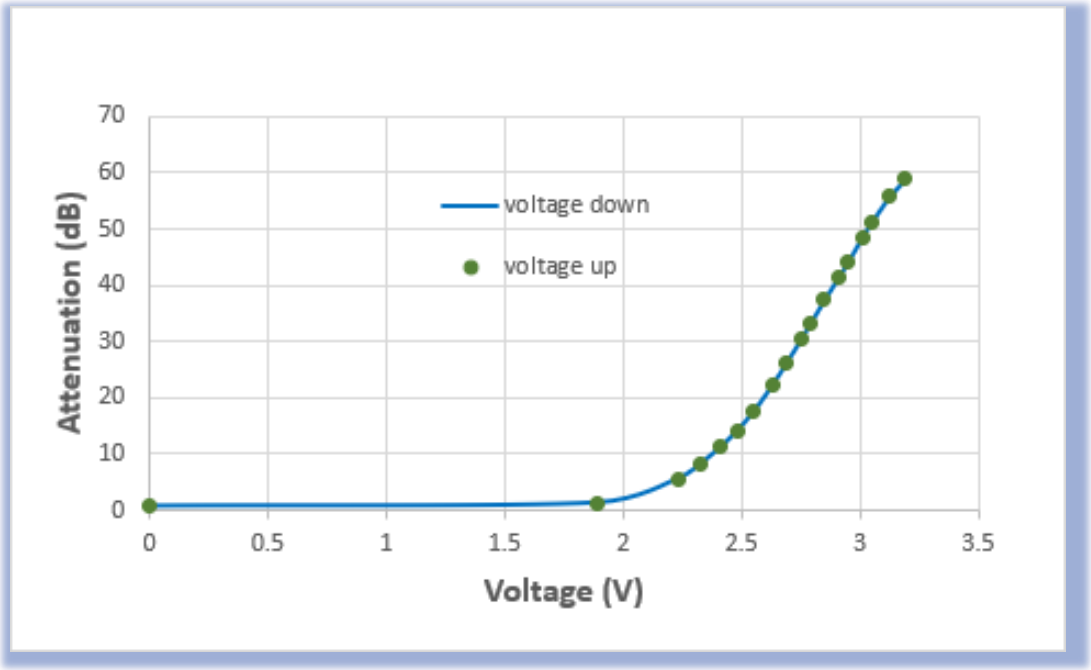
FVOA IL control	Pin 1	Pin 2
SM/PM Fiber	DC 0 ~ 5.5 V (0V)	DC 0V (0 ~ 5.5 V)

For MM Fiber

	Pin 1	Pin 2
Fan control	DC 5 V	0 V

FVOA IL control	Pin 3	Pin 4
fiber core ≤ 62.5 µm	DC 0 ~ 5.5 V	0 V
fiber core 105 µm	DC 0 ~ 14.5 V	0 V

Typical Response for SM28 Fiber



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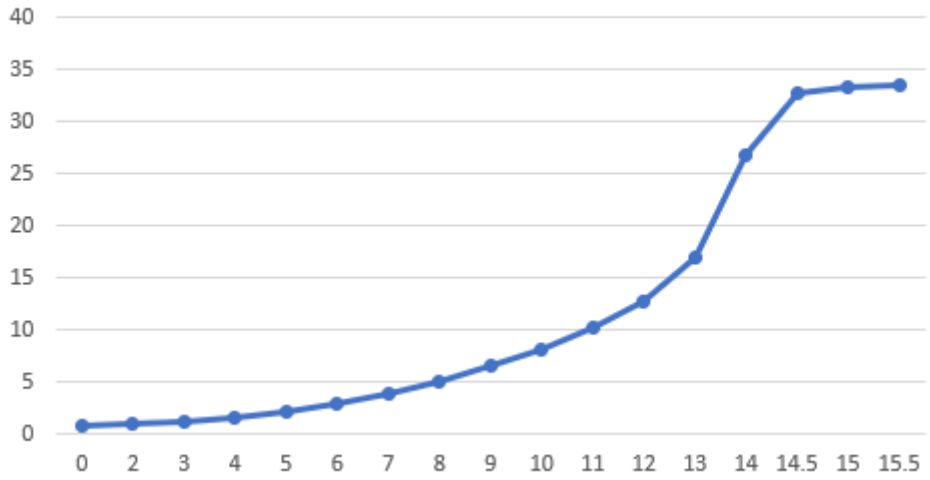
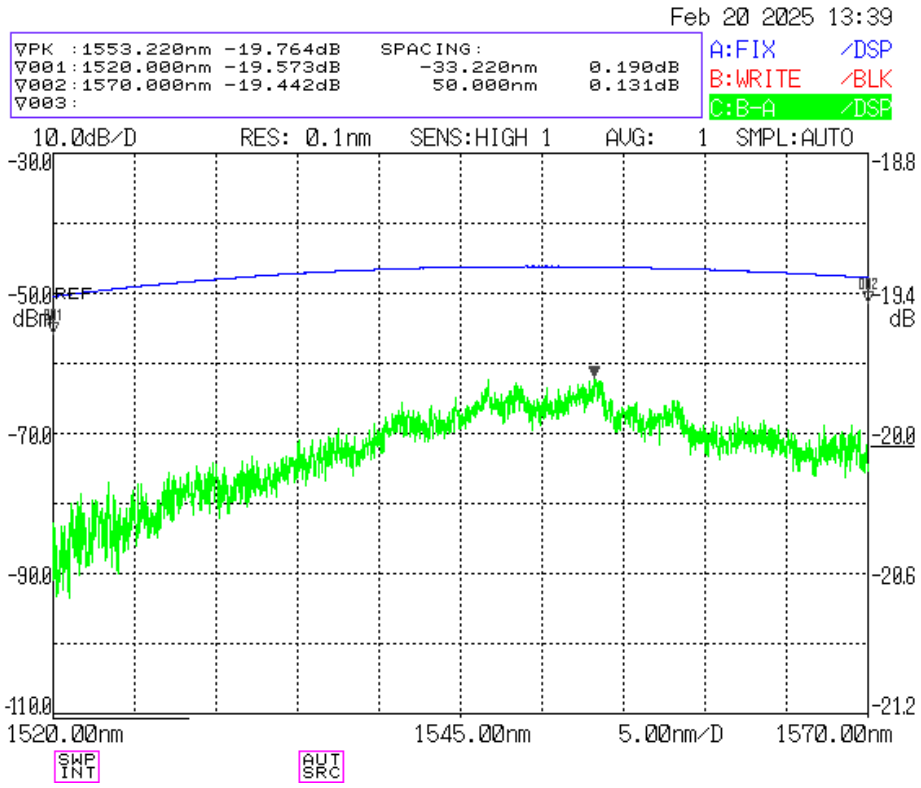
Typical Response 105/125 Fiber



Typical Wavelength Dependence @20dB Attenuation



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Ordering Information

	☐☐	☐	☐	☐☐	☐	☐	☐
Prefix	**Configuration**	**Type**	**Test Wavelength**	**Fiber Type [2]**	**Fiber Cover**	**Fiber Length**	**Connector**
FVOA-	Standard = 11 Beam Expand [1] = 22 Special = 00	Normally Open = 1	488 = 4 532 = 5 630 = 6 780 = 7 850 = 8 980 = 9 1060 = 1 1310 = 3 1550 = C 2000 = 2 Special = 0	*Pick from below table*	Bare fiber = 1 900um 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 ST/PC = 6 LC/PC = 7 LC/APC = A LC/UPC = U Special = 0

[1]. Beam expanding increase the power handling

[2]. For a larger core, the value of the Attenuation is reduced. For Core ~ 105µm, the max Attenuation is about 10dB

Fiber Type Selection Table:

01	**SMF-28**	34	**PM1550**	71	**MM 50/125µm**
02	**SMF-28e**	35	**PM1950**	72	**MM 62.5µm**
03	**Corning XB**	36	**PM1310**	73	**105/125µm**
04	**SM450**	37	**PM400**	74	**FG105LCA**
05	**SM1950**	38	**PM480**	75	**FG50LGA**
06	**SM600**	39	**PM630**	76	**STP 50/125**
07	**Hi780**	40	**PM850**	77	**IRZS23**
08	**SM800**	41	**PM980**	78	**IRFS32**
09	**SM980**	42	**PM780**		
10	**Hi1060**	43			
11	**SM400**	44	**PM405**		
12		45	**PM460**		
13		46			

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.