

NanoSpeed™ Fiber Optical Resonant Switch

10 to 90MHz, High Power, Bidirectional



DATASHEET

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Features

- 10 to 100MHz
- High speed
- Ultra-high reliability
- Low insertion loss
- Compact

Applications

- Laser Systems
- Reconfigurable Optics
- Instrumentations



The resonance NS Series fiber optic switch/modulator is either a 2-port or a 3-port device featuring fast amplitude modulation at a fixed frequency with a selection from 10 to 90 MHz and low optical loss. This is achieved using a patented electro-optical configuration with a built-in high Q resonant circuit. Unlike other modulators, we use special electro-optical crystals of high stability that increase power handling and reduce drift/darkening. The NS fiber optic switch meets the most demanding switching requirements of continuous operations over 25 years and has non-mechanical ultra-high reliability. The switch is intrinsically bidirectional and selectable for polarization-independent or polarization-maintain by the fiber type.

Our resonant EO phase modulators can be driven by a standard laboratory function generator with a Half-Wave Drive Voltage of only 15 V at 633 nm. We offer an amplification driver with 5V.

The rise/fall time is intrinsically related to the crystal properties, and the repetition rate is associated with the driver. There are poor frequency response sections due to the device resonances. The NS devices are shipped mounted on a tuned driver.

The NS series switches respond to a control signal with any arbitrary timing with frequency from DC up to MHz. The switch is usually mounted on a tuned driver before shipping. The electrical power consumption is related to the repetition rate at which the switch is operated.

The dual-stage configuration increases the extinction ratio or cross-talk value.

Specifications

Parameter		Min	Typical	Max	Unit
Insertion Loss ^[1]	1900-2200nm		1.6	2.8	dB
	1700~2300nm		0.8	1.8	
	1260~1620nm		1	2	
	960~1100nm		1.5	2.6	
	780-960nm		1.7	3	
Cross Talk On/Off Ratio ^[2]		18	20	35	dB
Durability		10 ¹⁴			cycles
PDL (SMF Switch only)			0.15	0.3	dB
PMD (SMF Switch only)			0.1	0.3	ps
ER (PMF Switch only)		18	25		dB
IL Temperature Dependency			0.25	1.5	dB
Return Loss		45	50	60	dB
Repetition Rate			20	90	MHz
Driving Voltage		12		35	V
Optic Power Handling ^[4]	Normal power version		0.3	20	W
	High power version			5	W
Operating Temperature ^[5]		-5		45	°C
Storage Temperature		-40		85	°C

Notes:

[1]. Measured without connectors.

Wavelength <850nm or > 1700nm is available only in the special version with a long lead time.

[2]. ±25nm, Cross talk is measured at 100kHz, which may be degraded at a higher repeat rate.

[3]. It is defined as the rising or fall time between 10% and 90% of optical intensities.

[4]. Defined at 1310nm/1550nm. For the shorter wavelength, the handling power may be reduced, please contact us for more information. High power version is available by incorporating fiber core enlargement (expensive).

[5]. The switches can be operated in a wider temperature range from as -10 to 70°C, but some performances such as on/off ratio will be degraded.

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](#):

Warning: This is an OEM module designed for system integration. Do not touch the PCB by hand. The electrical static can kill the chips even without a power plug-in. Unpleasant electrical shock may also be felt. For laboratory use, please buy a Turnkey system.

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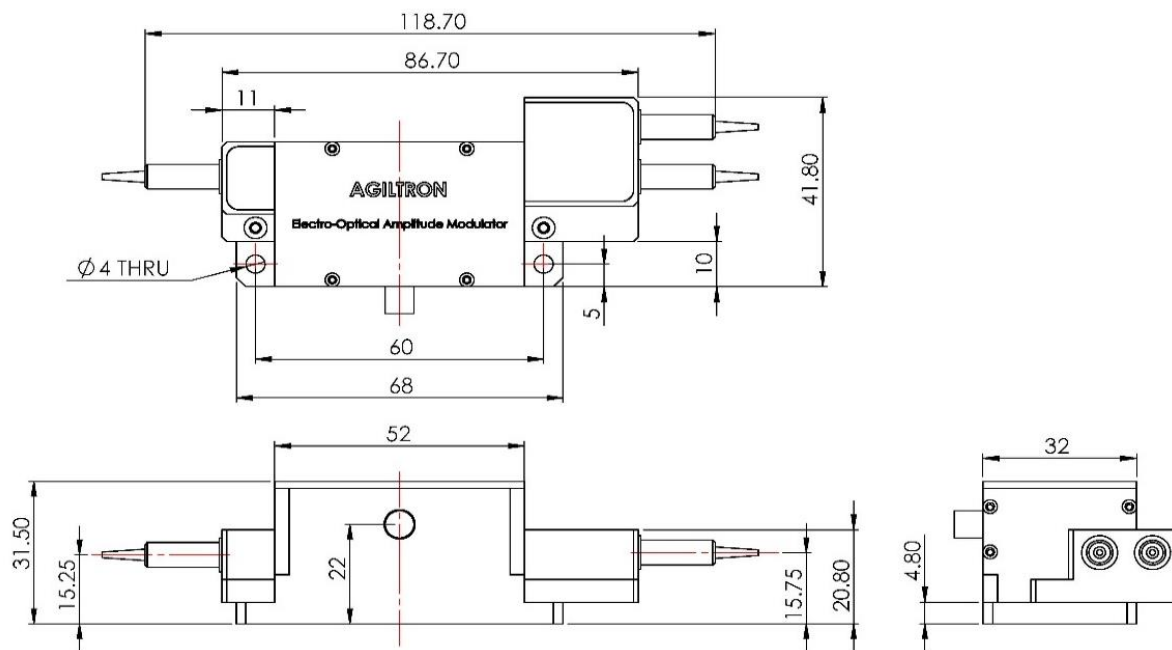


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Electrical Information

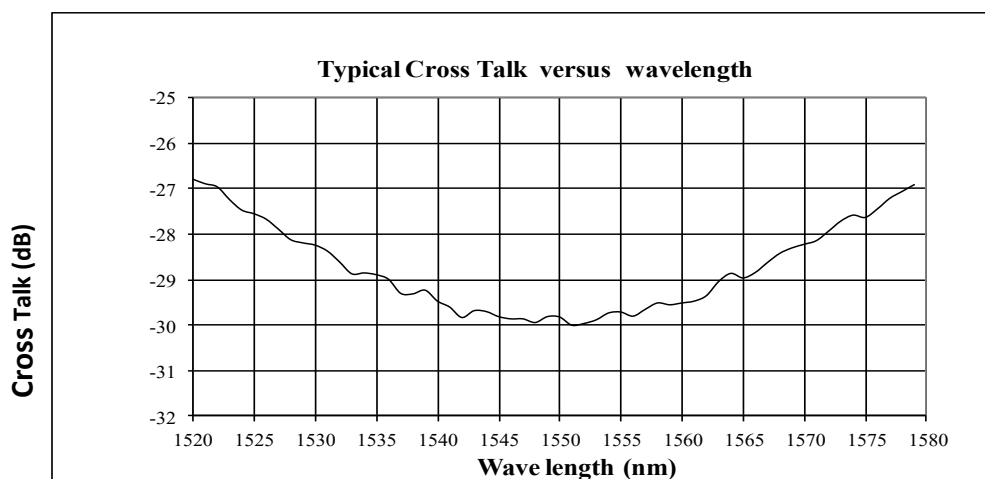
Signal Control Input: 0-15 V Analog SMA

Mechanical Dimensions (Unit: mm)



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

Typical Bandwidth Measurement



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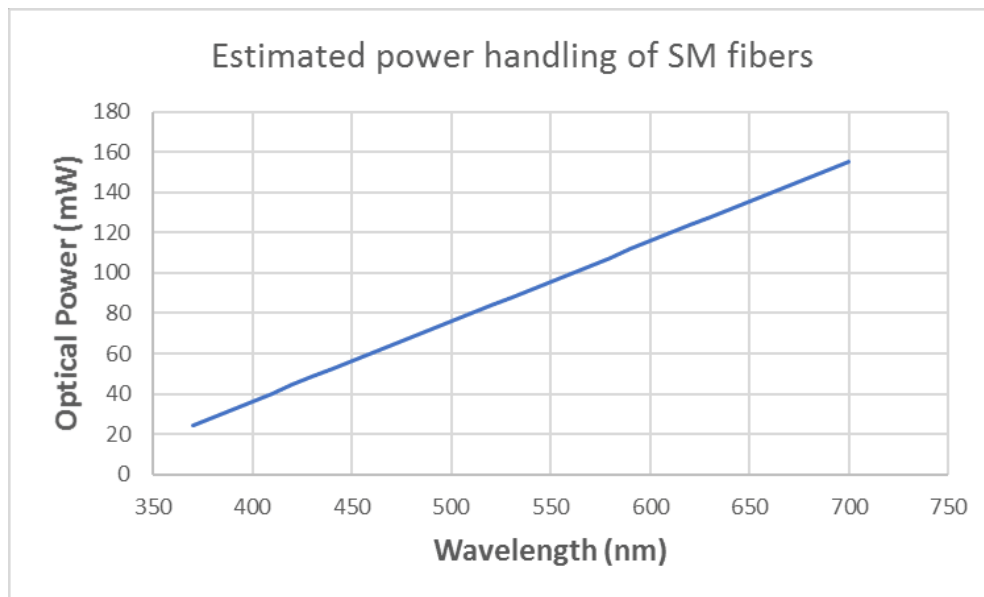
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Optical Power Handling vs Wavelength For Single-Mode Fibers



Operation Manual

1. Connect a control signal to the SMA connector on the box.
2. The device should then function properly.

Note: Do not open the box and alter device factory settings.

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Ordering Information (Part Number)

	☐	☐	☐	☐	☐	3	3	☐	☐	☐	☐
Prefix	Type	Wavelength	Power Handling ^[1]	Repetition Rate	Fiber Type	Fiber Cover	Fiber Length	Connector ^{[2][3]}	Driver	Benchtop	# Of Crystal
HSRS-	1x1 = 1 1x2 = 2 2x2 = 3	1060 = 1 2000 = 2 1310 = 3 1550 = 5 1625 = 6 780 = 7 850 = 8 650 = E 1750 = A Special = 0	Regular = 1 500mW = 2 5W = 5 10W = A 15W = C 20W = D Special = 0	10MHz = 10 20MHz = 20 30MHz = 30 40MHz = 40 50MHz = 50 60MHz = 60 70MHz = 70 80MHz = 80 90MHz = 90 Special = 00	SMF-28 = 1 HI1060 = 2 HI780 = 3 PM1550 = 5 PM850 = 8 PM980 = 9 MM50/125 ^[4] = M Special = 0	0.9mm tube = 3 Special = 0	1.0 m = 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 = 8 E2000 APC = 9 LC/UPC = U Special=0	None = 1 Yes = 2	None = 1 Benchtop = B	2 = 2 4 = 4 Special = 0

[1]: Wavelength < 850nm or > 1700nm is available only in the special version with a long lead time

[2]: Please contact the sale about the high power connector for NPHW version.

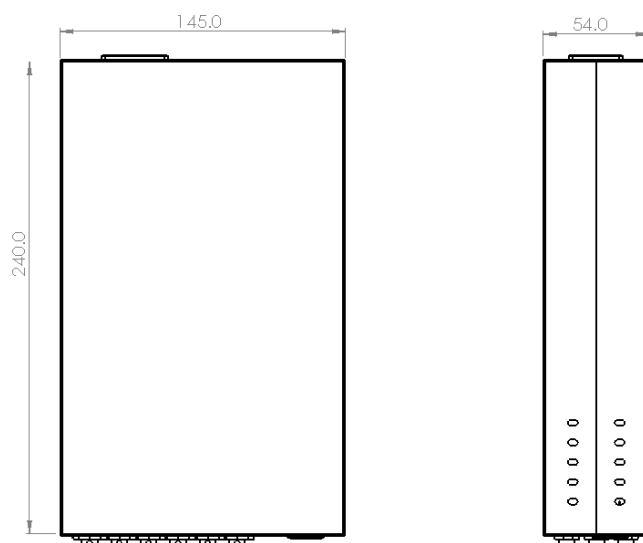
[3]: The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

[4]: For laser with mode fill ratio CPR <14

Note:

- ☐ **PM1550** fiber works well for **1310nm**
- ☐ **Opaque** – light is blocked without applying a voltage
- ☐ **Transparent** – light goes through without applying a voltage

Benchtop Box Mechanical Dimension



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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 ($<5\text{ }\mu\text{m}$) 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 handling by expanding the core side at the fiber ends.

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