

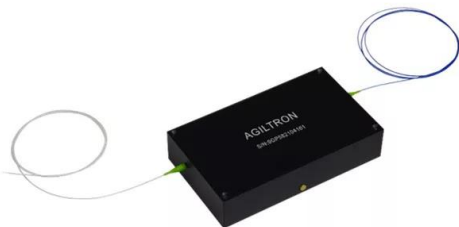
NanoSpeed™ 2x2 Fiber Optical Switch Dual Stage

(SMF, PMF, MM, 960-2300 nm, Bidirectional, >35dB on/off)



DATASHEET

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Features

- Solid-State
- High speed
- Ultra-high reliability
- Low insertion loss
- Compact

Applications

- Optical blocking
- Configurable operation
- Instrumentation



The NSSC series of NanoSpeed™ electro-optical switches uniquely feature low optical loss and high on-off extinction of 35dB, and high optical power handling. This is achieved by cascading several switches on a PCB board with a cover. Control is 5V TTL via an SMA signal input port, and power is 12V DC (a wall pluggable is accompanied inside the shipping box). The NS fiber-optic switch meets the most demanding reliability requirements for undersea, space, and continuous switching with a longevity of over 25 years. The switch is intrinsically bidirectional and selectable for polarization-independent or polarization-maintain by the fiber type. No optical signal loss occurs during the switching in which optical power is transferred continuously from one port to another (see graph at the end).

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 prior to shipping. The electrical power consumption is related to the repetition rate at which the switch is operated.

This plug-and-play module features devices mounted on a driver, and it is shipped with a wall-pluggable power supply.

Specifications

Parameter		Min	Typical	Max	Unit
Insertion Loss ^[1]	1700~2300nm		0.8	1.8	dB
	1260~1650nm		1.5	1.9	
	960~1260nm		1.9	2.5	
Cross Talk On/Off Ratio ^[2]		35	36	45	dB
Durability		10 ¹⁴			cycles
PDL (SMF Switch only)			0.15	0.3	dB
ER (PMF Switch only)		18	25		dB
IL Temperature Dependency			0.25	0.5	dB
Return Loss		45	50	60	dB
Electrical-Optical Delay				250	ns
Response Time (Rise, Fall)				300	ns
Fiber Type		SMF-28, Panda PM, or equivalent			
Driver Repeat Rate	100kHz driver	DC	100		kHz
Optic power Handling ^[3]	Normal power		0.3	0.5	W
	High power		1	20	W
Operating Temperature ^[4]		-5		45	°C
Storage Temperature		-40		85	°C

Note:

[1] Measured without connectors. For other wavelength, please contact us.

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

[3] Defined at 1550nm. Power handling level will be smaller at wavelength shorter than 1550nm.

[4]. 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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Ordering Information (Part Number)

	☐ ☐	☐	2	☐	☐	☐	☐	☐	☐
Prefix	Type	Wavelength	Configuration	Optical Power	Fiber Type	Fiber Cover	Fiber Length	Connector ^{[1][2]}	Benchtop
NSSC-	2x2 = 22	1060nm = 1 1310nm = 3 1410nm = 4 1550nm = 5 1750nm = A 2000nm = 2 Special = 0	Dual stage = 2	0.5W = 1 5W = C 10W = D 20W = E	SMF-28 = 1 HI1060 = 2 PM1550 = 5 PM980 = 9 MM50/125 ^[3] = M Special = 0	Bare Fiber = 1 900um Tube = 3 Special = 0	0.25m = 1 0.5m = 2 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 Duplex LC/PC = 8 LC/APC = 9 E2000 APC = A LC/UPC = U Special = 0	None = 1 Benchtop = B

[1]. Regular fiber connector has PER ~22dB. Connector with PER >27 dB is available using special process

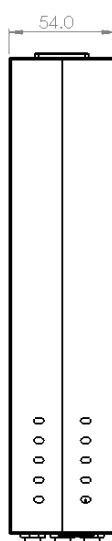
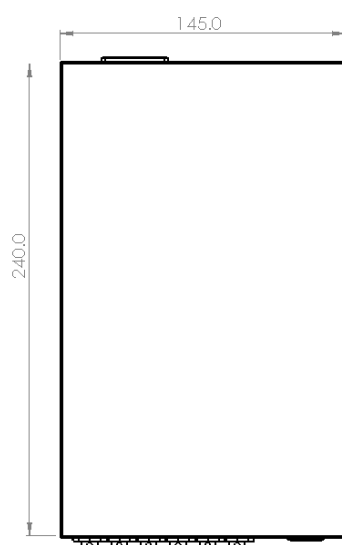
[2]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. 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.

[3]. For laser with mode fill ratio CPR <14

Note:

- ☐ **PM1550** fiber works well for **1310nm**

Benchtop Box Mechanical Dimension



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

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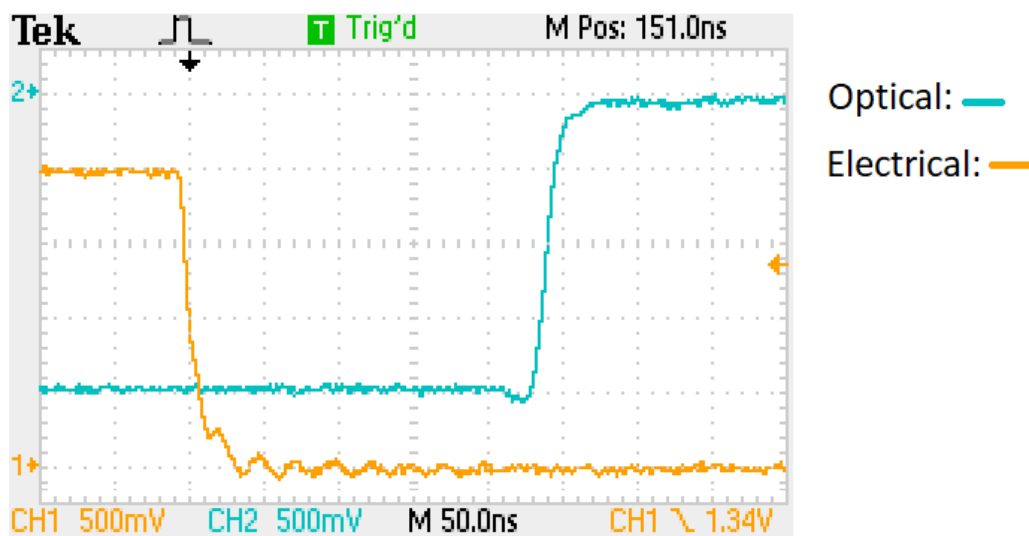
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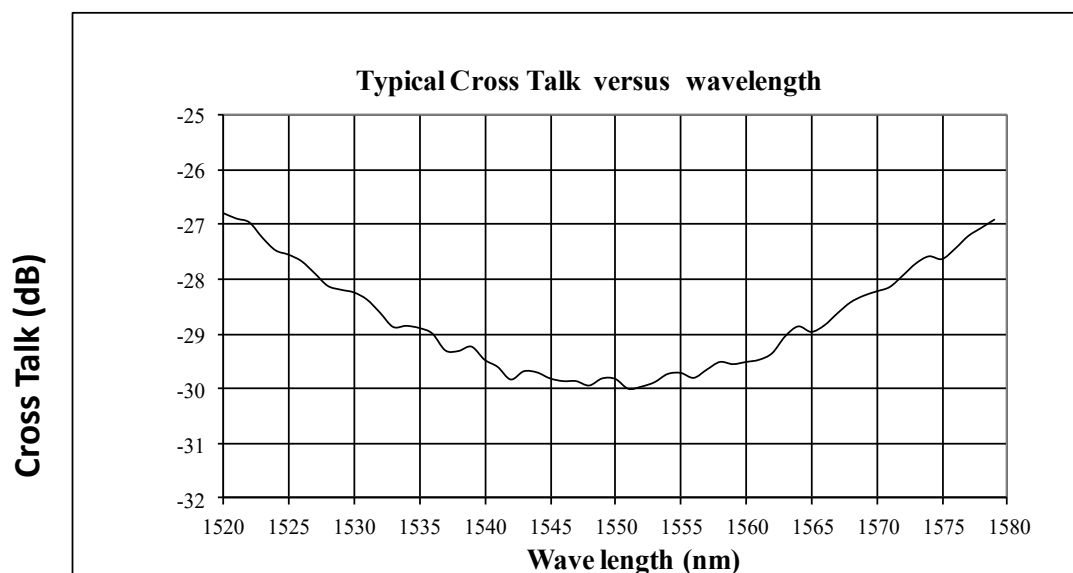


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Typical Speed Response Measurement



Typical Bandwidth Measurement



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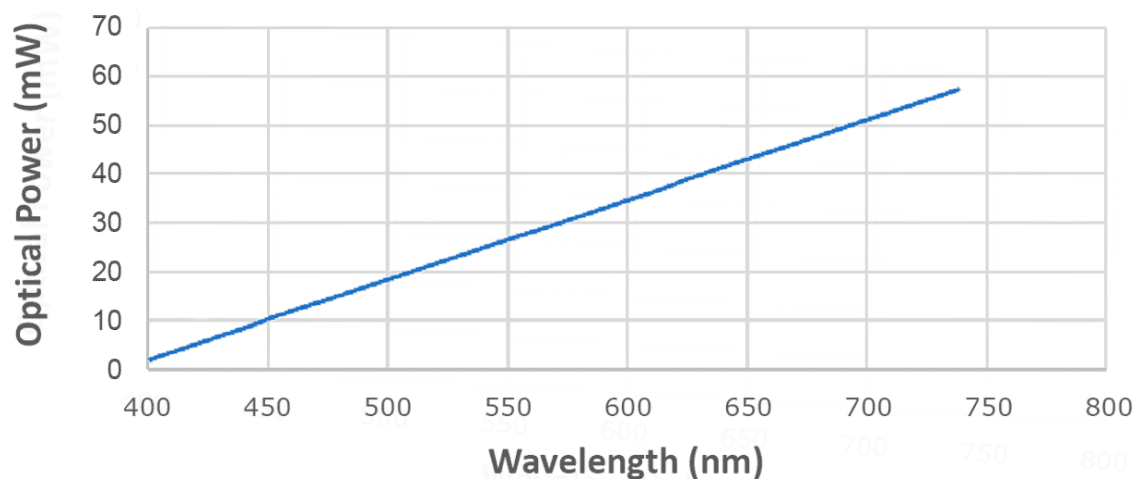
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Optical Power Handling vs Wavelength for Standard SM Fibers



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Q & A

Q: Does NS device drift over time and temperature?

A: NS devices are based on electro-optical crystal materials that can be influenced to a certain range by the environmental variations. The insertion loss of the device is only affected by the thermal expansion induced miss-alignment. For extended temperature operation, we offer special packaging to -40 -100 °C. The extinction or cross-talk value is affected by many EO material characters, including temperature-dependent birefringence, Vp, temperature gradient, optical power, at resonance points (electronic). However, the devices are designed to meet the minimum extinction/cross-talk stated on the spec sheets. It is important to avoid a temperature gradient along the device length.

Q: What is the actual applying voltage on the device?

A: 100 to 400V depending on the version.

Q: How does the device work?

A: NS devices are not based on Mach-Zander Interference, rather birefringence crystal's nature beam displacement, in which the crystal creates two different paths for beams with different polarization orientations.

Q: What is the limitation for faster operation?

A: NS devices have been tested to have an optical response of about 300 ps. However, practical implementation limits the response speeds. It is possible to achieve a much faster response when operated at partial extinction value. We also offer resonance devices over 20MHz with low electrical power consumption.

Operation Manual

1. Connect a control signal to the SMA connector on the PCB.
2. Attach the accompanied power supply (typically a wall-pluggable unit).
3. The device should then function properly.

Note: Do not alter device factory settings.

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.

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