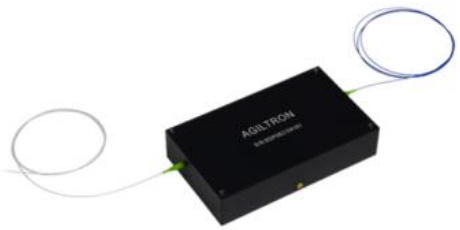
NanoSpeed™
Fiber Optical Polarization Switch Low Drift
(Low-Loss, Bidirectional)

(Protected by U.S. patents 7,403,677B1; 6,757,101B2; and pending patents)

DATASHEET

BUY NOW



The NanoSpeed™ Series polarization switch swiftly changes the incoming State of Polarization (SOP) between two orthogonal SOPs. The version uniquely features low optical loss and low drift, fast response, and high optical power handling. This is achieved using drift-compensating electro-optical control technology. The unit is integrated with a driver and packaged in a metal box. The switch uses a 5V TTL signal via an SMA input and a 12V power supply that is wall-pluggable. The switch's rise and fall times are inherently linked to the properties of the crystal, while the repetition rate is determined by the driver. Some frequency response issues may occur due to device resonances.

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. 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 Low-Drift series of Nanospeed™ devices are intended to be operated at a repetition rate >1Hz. The NS series switches respond to a control signal with any arbitrary timing. 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 device may have some drift over time when operated at a zero switching rate.

Features

- High Reliability
- High Speed
- Low loss
- Compact

Applications

- Sensor
- Data process
- Instrumentation

Specifications

Parameter		Min	Typical	Max	Unit
Insertion Loss [1]	1900~2200nm		1.2	1.8	dB
	1260~1650nm		0.6	1.0	dB
	960~1100nm		0.8	1.3	dB
	780~960nm		1.2	1.5	dB
IL Temperature Dependency		20	0.25	0.5	dB
Durability		10^{14}			cycles
Return Loss			50		dB
Polarization Rotation				90	Degree
SOP Tolerance		18	± 2.5	± 4.5	Degree
Extinction Ratio [2]		18			dB
Response Time (Rise, Fall)		50		300	ns
Repeat Rate		0.0001		20	kHz
Optic Power Handling [3]	Normal power switches		0.3	20	W
	High power switches			10	W
Operating Temperature [4]	Standard	-20		75	°C
Storage Temperature		-40		100	°C

Notes:

[1]. Measured without connectors. Wavelength < 850nm or > 1700nm is available only in the special version with a long lead time.

[2]. ±25nm, Input is PM fiber.

[3]. Defined at 1310nm/1550nm. For the shorter wavelength, the handling power may be reduced, please contact us for more information.

[4]. Wider temperature range can be customized. Please contact us.

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.**

Rev 03/27/24

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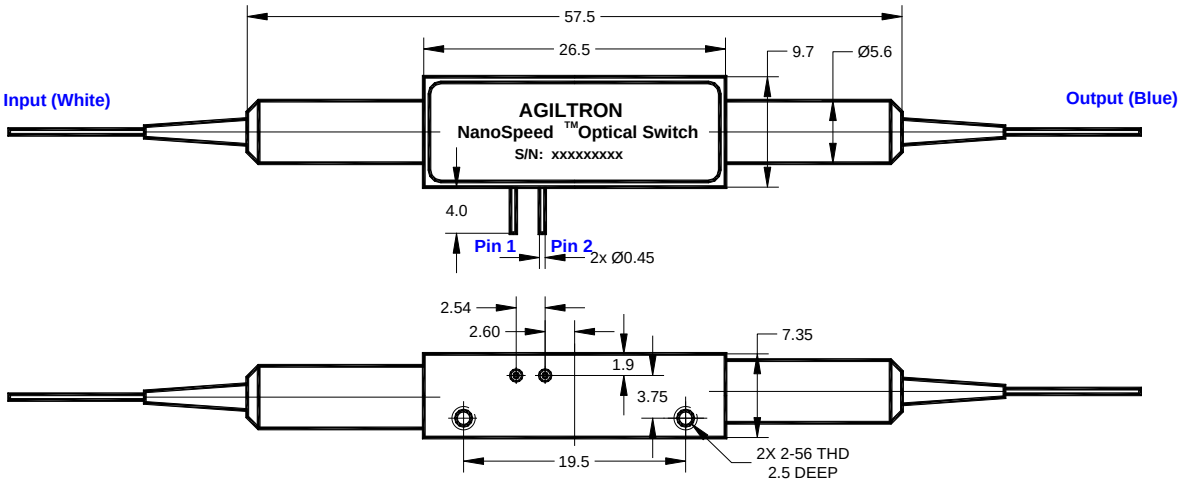
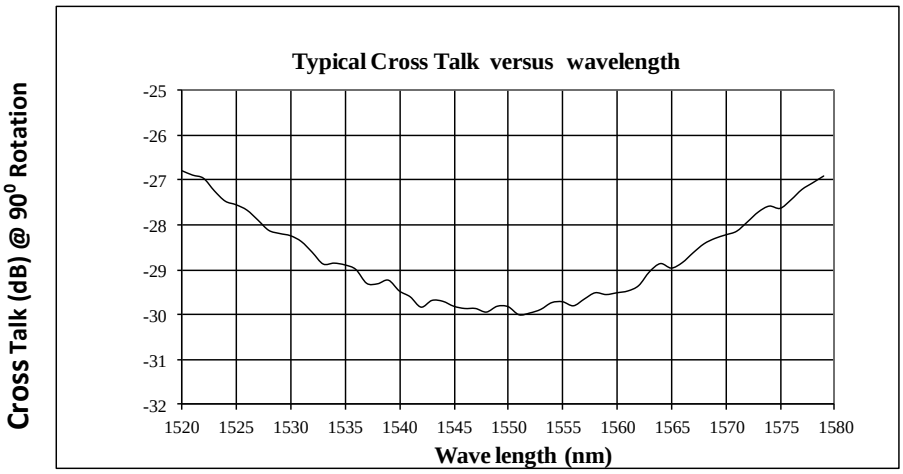
Device Mechanical Dimensions (Unit: mm)



[1] Package is for λ ≤ 1650nm
[2] Call us for λ > 1650nm

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

Typical Wavelength Dependence @ 1550nm



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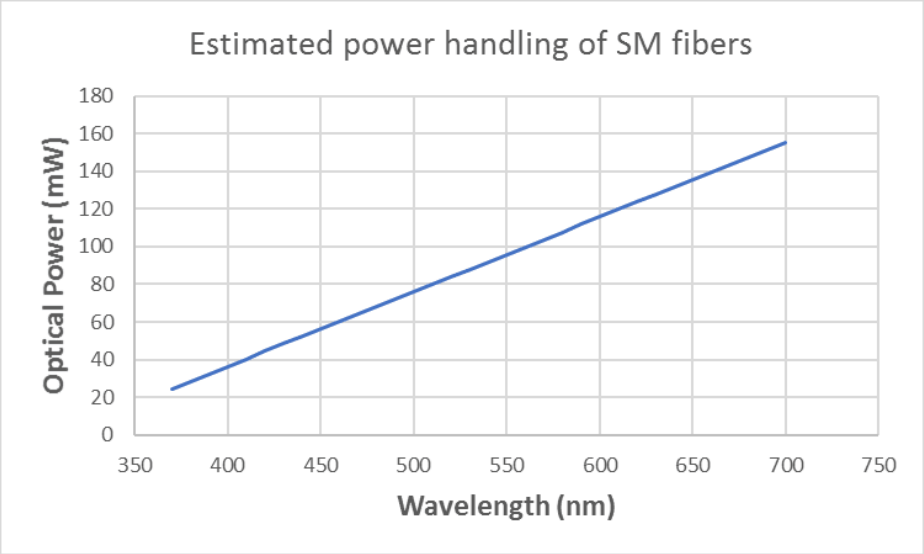
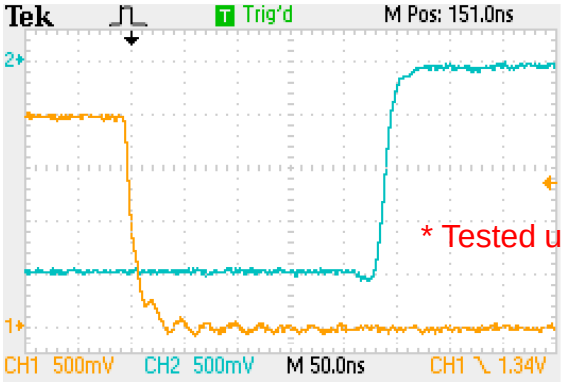
Optical Power Handling vs Wavelength For Single-Mode Fibers



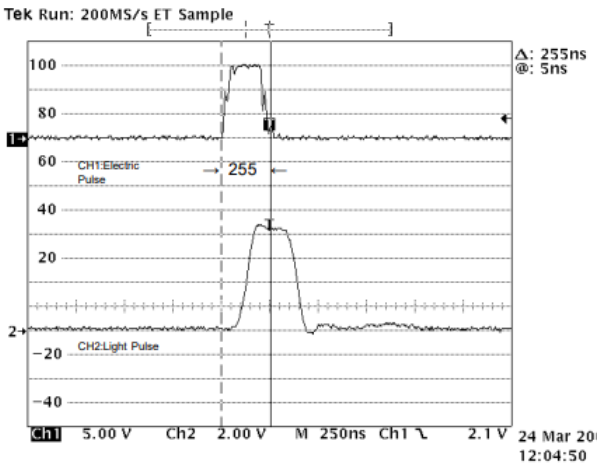
Fast Speed and Repetition Measurements

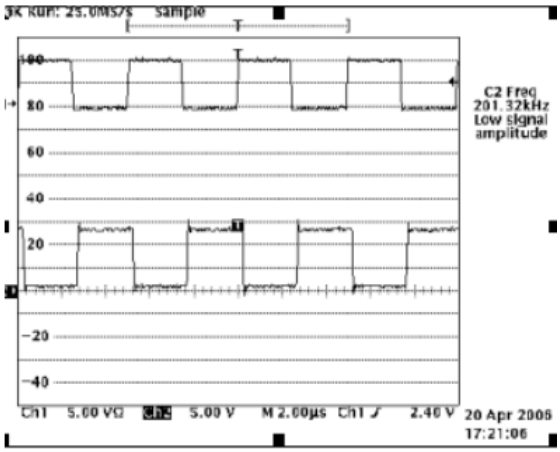


Optical:

Electrical:

* Tested under ultra-fast switch driver





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Ordering Information

	D	☐☐	☐	☐	☐	☐	☐	☐
Prefix	**Configuration**	**Wavelength [1]**	**Power**	**Input Fiber**	**Output Fiber**	**Fiber Cover**	**Fiber Length**	**Connector**
NSPS-	Low Drift= D	1060 = 01 2000 = 02 1310 = 03 1550 = 05 1625 = 06 780 = 07 850 = 08 980 = 09 650 = 0E Special = 00	Standard = 1 1W = 2 5W = 3 10W = 4 15W = C 20W = D Special = 0	PM1550 = 5 PM980 = 9 PM850 = 8 SMF28 = 1 HI1060 = 6 HI780 = 7 Special = 0	PM1550 = 5 PM980 = 9 PM850 = 8 SMF28 = 1 HI1060 = 6 HI780 = 7 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 LC/APC = 8 E2000 APC = 9 LC/APC = A LC/UPC = U Special = 0

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

NOTE:

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

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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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 ^{0}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.