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

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

DATASHEET

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The NanoSpeed™ Series polarization switch can quickly switch the incoming SOP between two orthogonal polarization states (SOPs). This is achieved using patented non-mechanical configurations with solid-state all-crystal designs, which eliminates the need for mechanical movement and organic materials and activated via an electrical control signal. The NS fiber optic switch is a fast switch device featuring very low loss, fast response, ultra-high reliability and high optical power handling. The input is PM fiber. The output could be either PM or SM fiber. For PM fiber, the polarizations is aligned with slow axis. The switch is intrinsically bidirectional and selectable for polarization-independent or polarization-maintain by the fiber type.

Agiltron's SWDR driver is highly recommended to this polarization switch, by which the switch can be driven by a 5V TTL signal through SMA input and a 12V power supply (wall pluggable). 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 prior to shipping. The electrical power consumption is related to the repetition rate the switch is operated.

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

Features

- High Reliability
- High Speed
- Low loss
- Compact

Applications

- Sensor
- Data process
- Instrumentation

RoHS COMPLIANT

Specifications

Parameter		Min	Typical	Max	Unit
Insertion Loss [1]	1900~2200nm		1.6	2.8	dB
	1700~2300nm		0.8	1.8	
	1260~1650nm		0.6	1.0	
	960~1100nm		0.8	1.3	
	780~960nm		1.2	1.5	
IL Temperature Dependency		20	0.25	0.5	dB
Wavelength Range [2]	Standard		50		nm
	Broadband		70		
Durability		10^{14}			cycles
Return Loss			50		dB
Polarization Rotation				90	Degree
SOP Tolerance		18	± 2.5	± 4.5	Degree
Extinction Ratio		18			dB
Response Time (Rise, Fall)		50		300	ns
Repeat Rate			100	500	kHz
Optic Power Handling [3]	Normal power switches		0.3	20	W
	High power switches			10	W
Operating Temperature [4]	Standard	-5		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].@1550nm. Within this rage, the spec will be met. The device operates well beyond this range with performance degradation.

[3]. @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.

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.**

Rev 05/13/26

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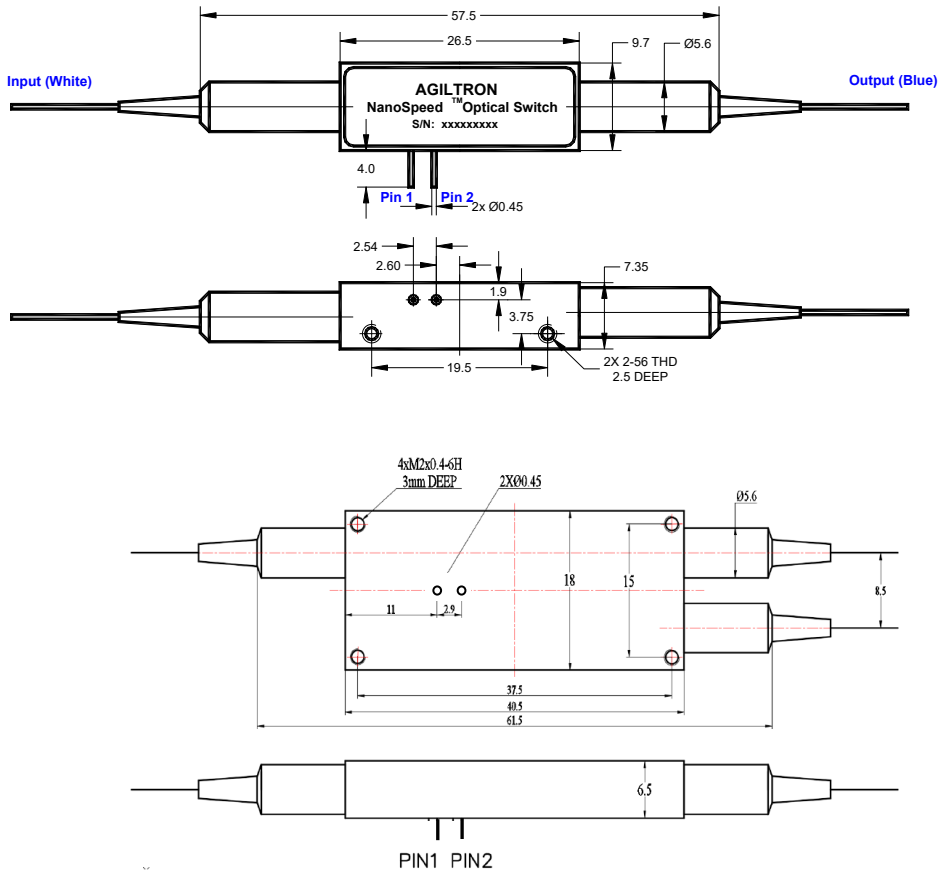
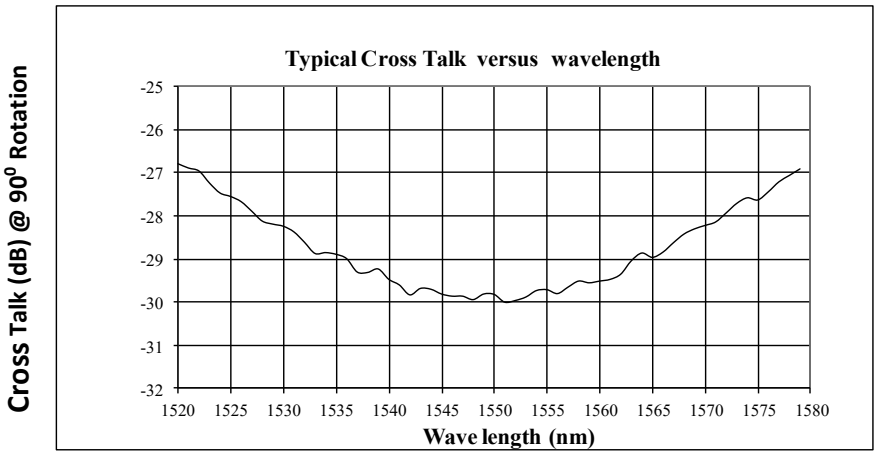
Mechanical Dimensions (Unit: mm)



[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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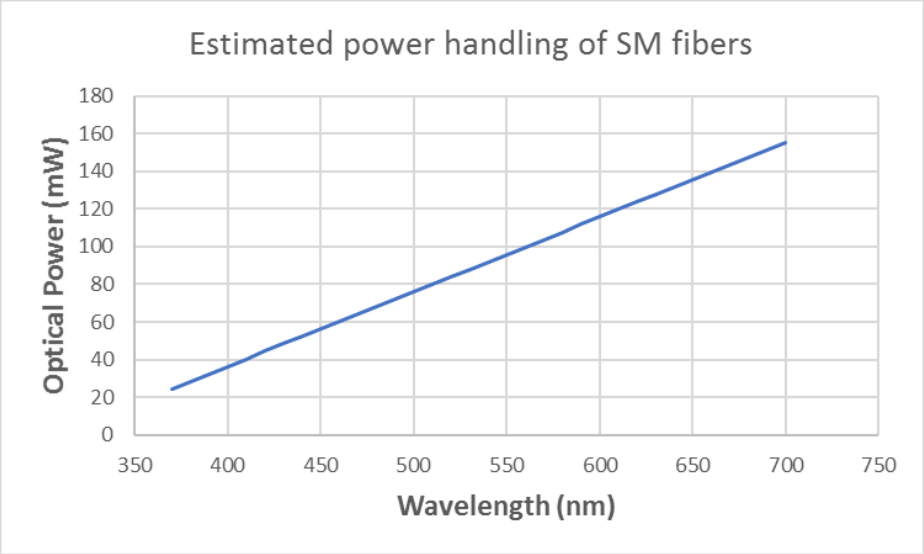
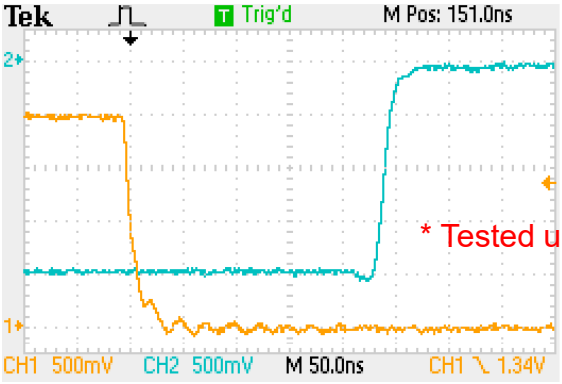
Optical Power Handling vs Wavelength For Single-Mode Fibers



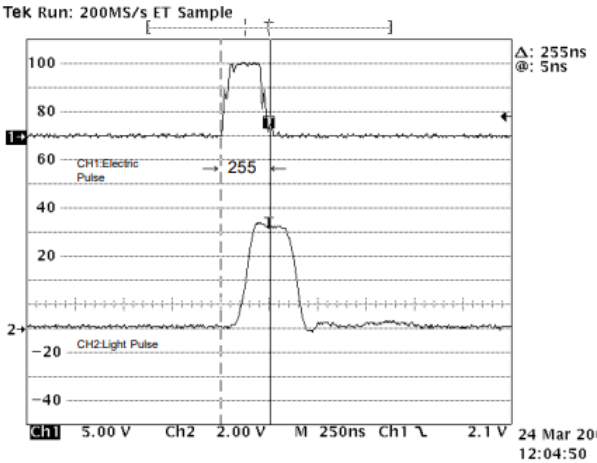
Fast Speed and Repetition Measurements

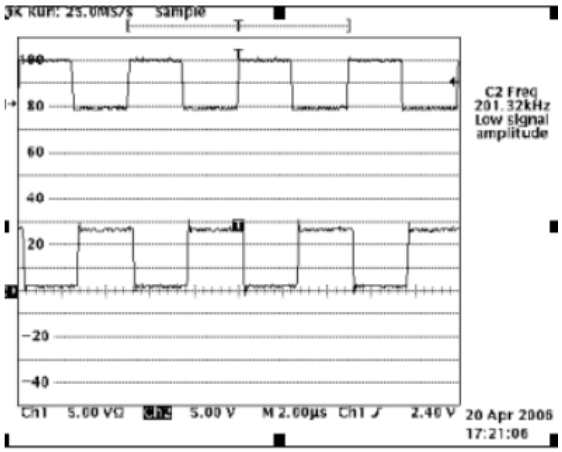


Optical: —

Electrical: —

* Tested under ultra-fast switch driver





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Ordering Information (Part Number)

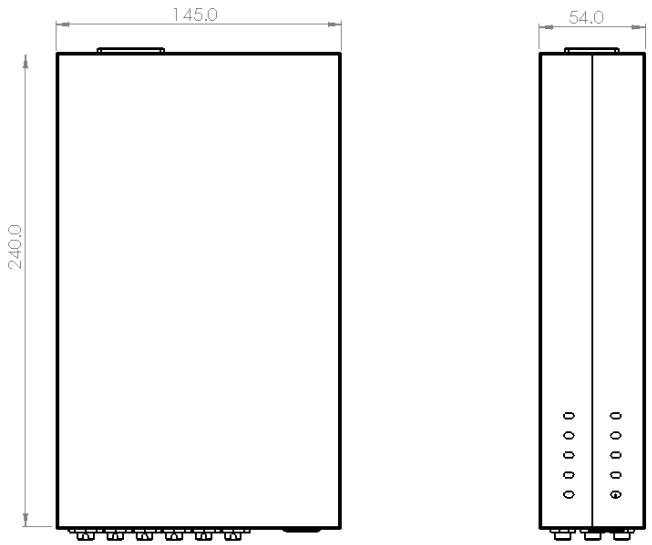
	☐	☐☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Configuration [1]**	**Wavelength**	**Power**	**Input Fiber**	**Output Fiber**	**Fiber Cover**	**Fiber Length**	**Connector [2]**	**Benchtop**
NSPS-	LN= 1 LT= 2 Special =0	1060 = 01 2000 = 02 1310 = 03 1550 = 05 1625 = 06 1750 = A 780 = 07 850 = 08 980 = 09 650 = 0E Special = 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 MM50/125 [3]=M Special = 0	PM1550 = 5 PM1310 =3 PM980 = 9 PM850 = 8 SMF28 = 1 HI1060 = 6 HI780 = 7 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 LC/APC = 8 E2000 APC = 9 LC/APC = A LC/UPC = U Special = 0	None = 1 Benchtop = B

[1]. LN is standard for wavelength 950-230nm, 100kHz. LT is premium for 400-2300

[2]. The connector cannot be installed directly onto bare fiber, as it 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 can remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SM28 fiber and decreases further with smaller core fibers.

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

Benchtop Box Mechanical Dimension



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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.

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.