



NanoSpeed™ 1x3, 1x4 Fiber Optical Switch (Cascaded)

(SMF, PMF, High Power, Bidirectional)

(Protected by U.S. patent 7,403,677B1 and pending patents)

Product Description

The NanoSpeed™ Series 1x3/1x4 solid-state fiber optic switch connects optical channels by redirecting an incoming optical signal into a selected output optical fiber. This is achieved using patent non-mechanical configurations with solid-state all-crystal designs, which eliminates the need for mechanical movement and organic materials. The device is intrinsic bidirectional and has variable coupler behavior in which light is transferred from one to another port without loss. The NS fiber optic switch is designed to meet the most demanding switching requirements of ultra-high reliability, fast response time, and continuous switching operation. The switch is intrinsically **bidirectional** and selectable for polarization-independent or polarization-maintain by the fiber type.

The NS Series 1x3/1x4 switch is cascade several NS 1x4. The device is mounted on a specially designed electronic PCB and controlled by 5V TTL input signals. A wall plug power supply in provided. Box mounted version is an option.



Performance Specifications

NanoSpeed Series 1x2 Switch		Min	Typical	Max	Unit
Central wavelength [1]		980		1650	nm
Insertion Loss [2]	1260-1650nm		1.2	2.2	dB
	960-1100nm		1.6	2.6	
Cross Talk [3]		20	25	45	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	0.5	dB
Return Loss		45	50	60	dB
Response Time (Rise, Fall)		300			ns
Fiber Type		SMF-28, Panda PM, or equivalent			
Driver Repeat Rate	100kHz driver	DC	100		kHz
	500kHz driver	DC	500		
Optic power Handling [4]	Normal power switches		300		mW
	High power switches			5	W
Operating Temperature		-5		70	°C
Storage Temperature		-40		85	°C

[1] Operation bandwidth is +/- 25nm approximately at 1550nm.

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

[3] ±25nm, Cross talk is measured at 100kHz, which may be degraded at the high repeat rate.

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

Features

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

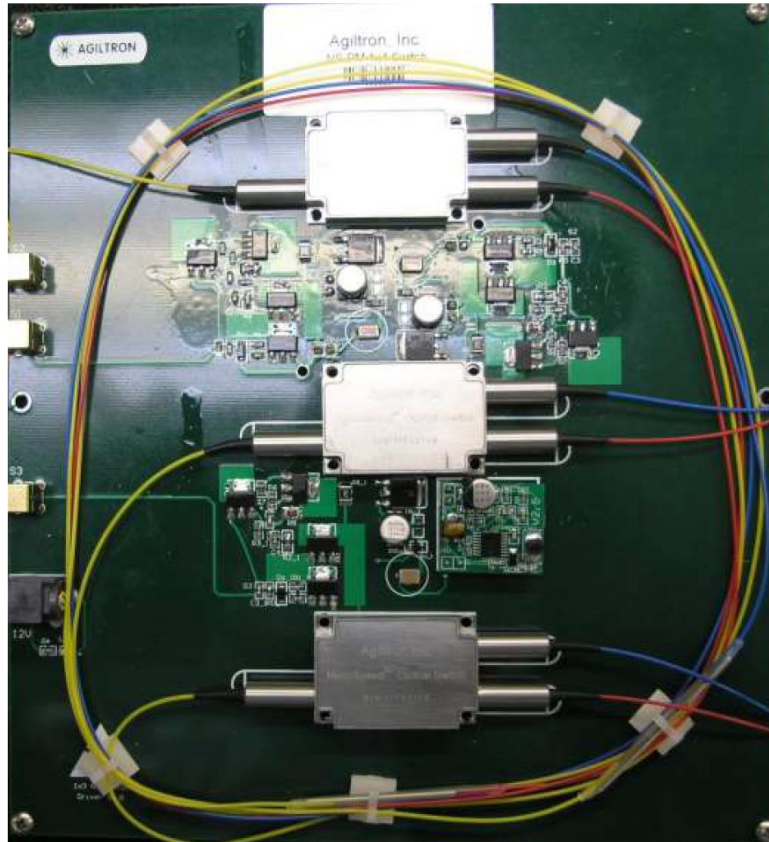
Applications

- Optical protection
- Configurable operation
- Instrumentation

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Mechanical Dimensions (mm)

The size is varied.



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

Optical Path Driving Table

Optical Path	TTL Signal
Port 1 → Port 2	L (< 0.8V)
Port 1 → Port 3	H (> 3.5V)

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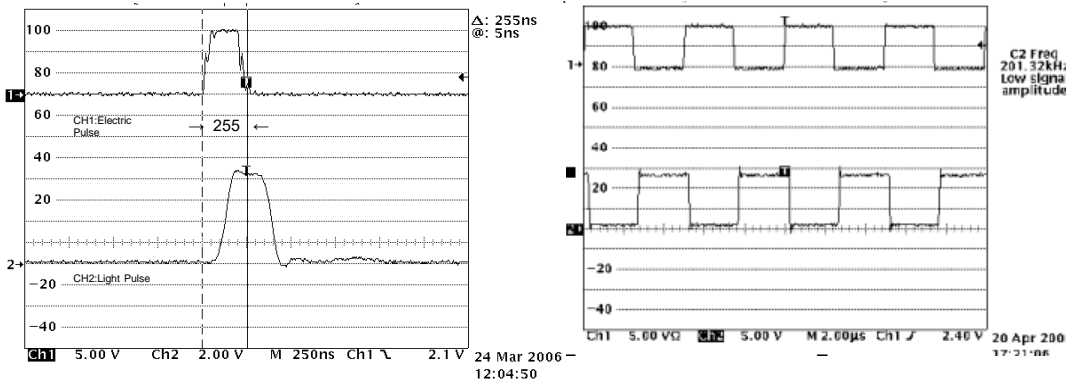
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Driving Board Selection

Maximum Repetition Rate	Part Number (P/N)
100kHz	SWDR-11a261111
500kHz	SWDR-11a291111

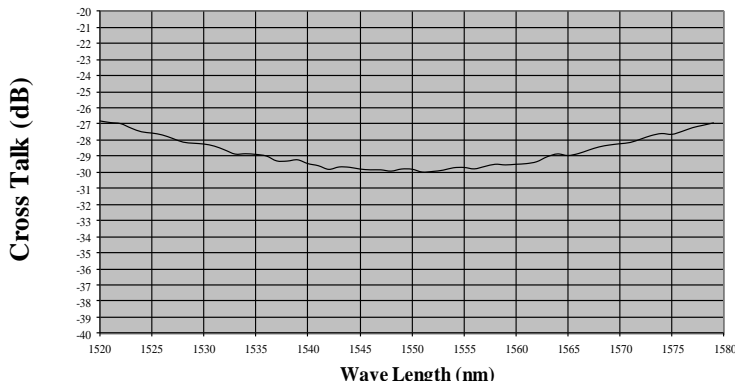
* Note: For customers that prefer to design their own driving circuit, they are responsible for the optical performance. For more technical information, please contact us.

Speed and Repetition Measurement



Bandwidth Measurement

Typical Cross Talk versus wavelength



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Ordering Information

Prefix	Type	Wavelength ^[4]	Configuration	Package	Fiber Type	Fiber Cover	Fiber Length	Connector ^[5]
NSSW- ^[1] NHSW- ^[2] NHHW- ^[3]	1x3 = 11 1x4 = 14	1060nm = 1 L Band = 2 1310nm = 3 1410nm = 4 1550nm = 5 Special = 0	Single stage = 1	Standard = 1 Special = 0	SMF-28 = 1 HI1060 = 2 PM1550 = 5 PM980 = 9 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=8 LC/APC=9 E2000 APC=A Special=0

[1]. NSSW – Normal power version

[2]. NHSW – 2W version

[3]. NHHW – 5W version

[4]. For shorter wavelength, please refer to Premium NS switches

[5]. Please contact us for high power connectors

* For short wavelength., please refer to Premium NS Switch.

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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, V_p , 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.