

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

(SMF, PMF, High Power, Bidirectional)



DATASHEET

[Return to the Webpage](#)



Features

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

Applications

- Optical protection
- Configurable operation
- Instrumentation

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 is provided. Box mounted version is an option.

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	
Central wavelength ^[1]	980		1650	nm	
Insertion Loss ^[2]	1260~1650nm	1.2	2.2	dB	
	960~1100nm	1.6	2.6	dB	
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)	50		300	ns	
Fiber Type	SMF-28, Panda PM, or equivalent				
Driver Repeat Rate	100kHz driver	DC	100		kHz
	500kHz driver	DC	500		kHz
Optic Power Handling ^[4]	Normal power switches		0.3	20	W
	High power switches			5	W
Operating Temperature	-5		70	°C	
Storage Temperature	-40		85	°C	

Notes:

- [1]. Operation bandwidth is ± 25 nm approximately at 1550nm.
- [2]. Measured without connectors. For other wavelength, please contact us.
- [3]. ± 25 nm, 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.

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.

Legal notices: All product information is believed to be accurate and is subject to change without notice. Information contained herein shall legally bind Agiltron only if it is specifically incorporated into the terms and conditions of a sales agreement. Some specific combinations of options may not be available. The user assumes all risks and liability whatsoever in connection with the use of a product or its application.

Rev 10/10/24

© Photonwares Corporation

[+1 781-935-1200](tel:+17819351200)

sales@photonwares.com

www.agiltron.com

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

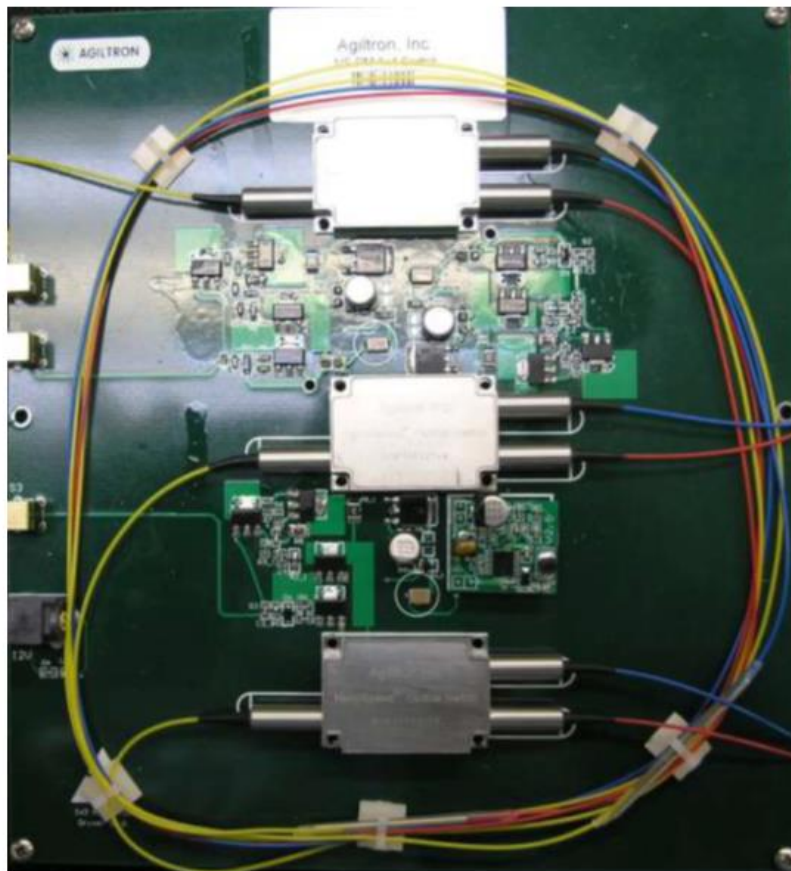
(SMF, PMF, High Power, Bidirectional)



DATASHEET

Mechanical Dimensions (Unit: 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)

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

(SMF, PMF, High Power, Bidirectional)



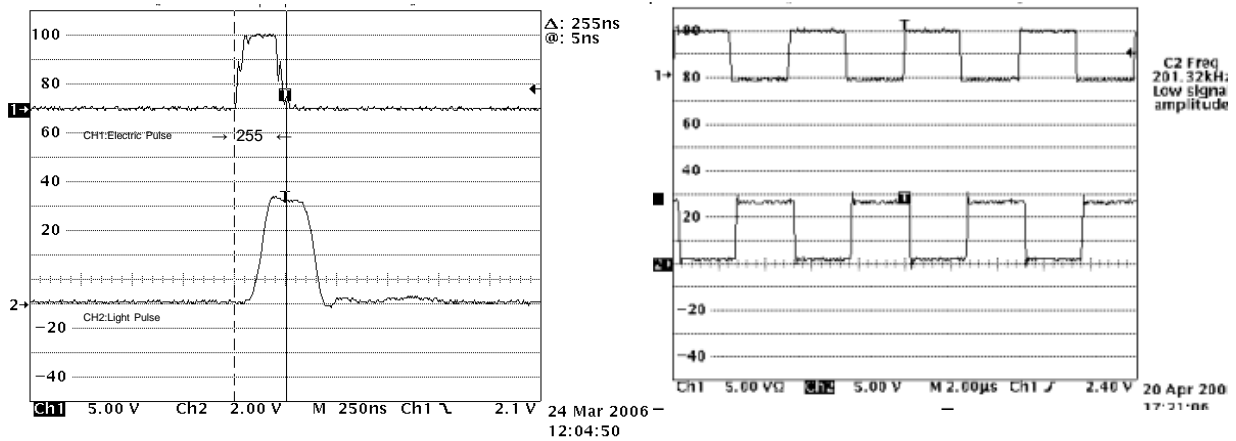
DATASHEET

Driving Board Selection

Maximum Repetition Rate	Part Number (P/N)
100 kHz	NSSW100ns100kHzD
500 kHz	SWDR-11a291111

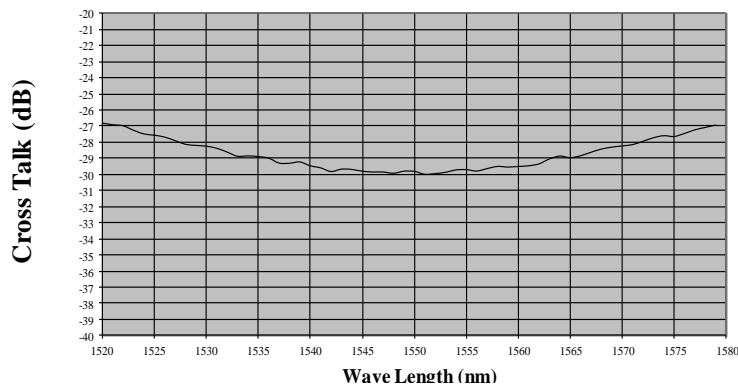
* Note: For customers that prefer to design their own driving circuit, they are responsible for the optical performance. For more technical information, please contact us.

Speed and Repetition Measurement



Bandwidth Measurement

Typical Cross Talk versus wavelength



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

(SMF, PMF, High Power, Bidirectional)



DATASHEET

Ordering Information

Prefix	Type	Wavelength ^[4]	Configuration	Package	Fiber Type	Fiber Cover	Fiber Length	Connector ^[5]	Optical Power	Benchtop
NSSW - ^[1]	1x3 = 11	1060nm = 1	Single stage = 1	Standard = 1	SMF-28 = 1	Bare Fiber = 1	0.25m = 1	None=1	Regular = 1	None = 1
NHSW - ^[2]	1x4 = 14	L Band = 2		Special = 0	HI1060 = 2	900um Tube = 3	0.5m = 2	FC/PC=2	1W = A	Benchtop = B
NHHW - ^[3]		1310nm = 3			PM1550 = 5	Special = 0	1.0 m = 3	FC/APC=3	2W = B	
		1410nm = 4			PM980 = 9		Special = 0	SC/PC=4	5W = C	
		1550nm = 5			Special = 0			SC/APC=5	10W = D	
		Special = 0						ST/PC=6	20W = E	
								LC/PC=7		
								Duplex LC/PC=8		
								LC/APC=9		
								E2000 APC=A		
								LC/UPC = U		
								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

Note:

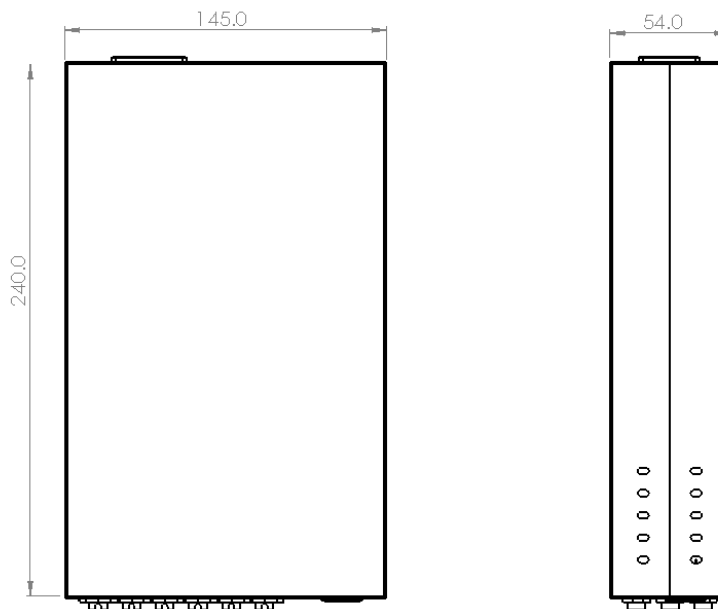
- PM1550** fiber works well for **1310nm**

Note:

Standard fiber optical connectors can only handle optical power of about 0.5W and will slowly burn over 1W. Agiltron produces high-power connectors with optical power handling of up to 15W, but they must work in pairs. *For details, click the link below.*

<https://agiltron.com/product/high-power-fiber-optic-connector/>

Benchtop Box Mechanical Dimension



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

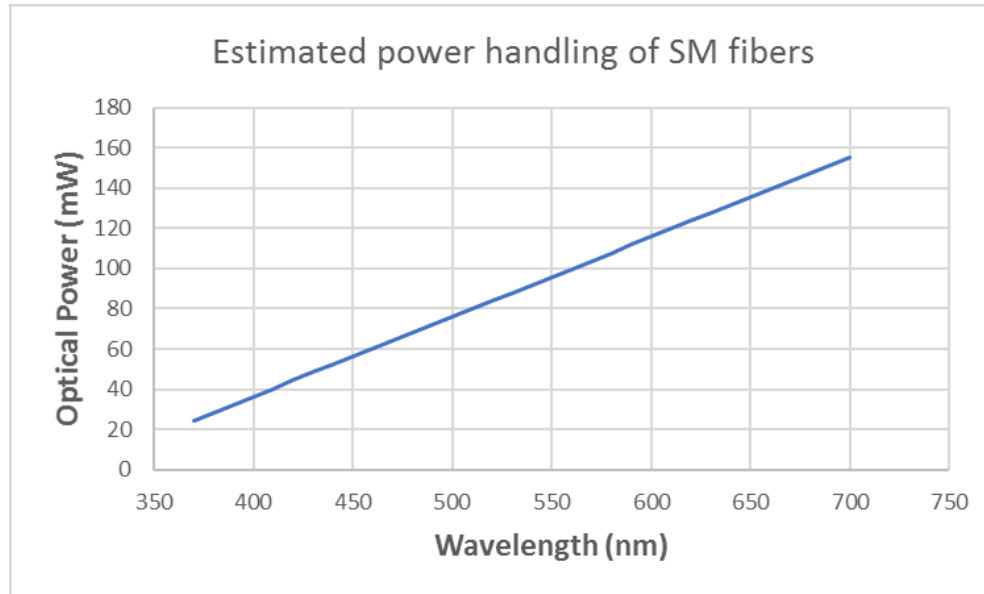
NanoSpeed™ 1x3, 1x4 Fiber Optical Switch (Cascaded)

(SMF, PMF, High Power, Bidirectional)



DATASHEET

Optical Power Handling vs Wavelength For Single-Mode Fibers



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.

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

(SMF, PMF, High Power, Bidirectional)



DATASHEET

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 handling by expanding the core side at the fiber ends.