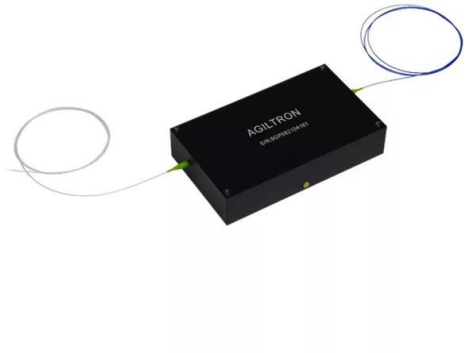
NanoSpeed™
2x2 Series Fiber Optical Switch Dual Stages

(SM, PM, Bidirectional, >35dB on/off)

DATASHEET

Return to the Webpage



The NS Series 2x2 solid-state fiber optic switch routes optical signals by redirecting an input into a selected output fiber using a patented non-mechanical electro-optical design — eliminating moving parts and organic materials. Engineered for ultra-high reliability, fast response time, and continuous operation, it is intrinsically bidirectional and configurable for either polarization-independent or polarization-maintaining performance, depending on the fiber type. A dual-stage configuration enhances extinction ratio and reduces crosstalk. The switch is controlled via 5V TTL signals using a specially designed, tuned electronic driver optimized for various repetition rates. Rise and fall times are determined by the crystal's intrinsic properties, while the repetition rate is driver-limited. Due to internal resonances, certain frequency bands exhibit reduced performance. Power consumption is dependent on switching frequency, and the devices are shipped pre-mounted on matched drivers to ensure optimal frequency response.

Features

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

Applications

- Optical blocking
- Configurable operation
- Instrumentation

Specifications

Parameter		Min	Typical	Max	Unit
Insertion Loss [1]	1260~1650nm		1.5	1.9	dB
	960~1260nm		1.9	2.5	dB
Cross Talk [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
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		-5		70	°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.

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 06/20/25

NanoSpeed™
2x2 Series Fiber Optical Switch Dual Stages

(SM, PM, Bidirectional, >35dB on/off)

DATASHEET

Mechanical Dimensions (mm) of NSSW-2x2 w/o driver

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

Optical Path Driving Table

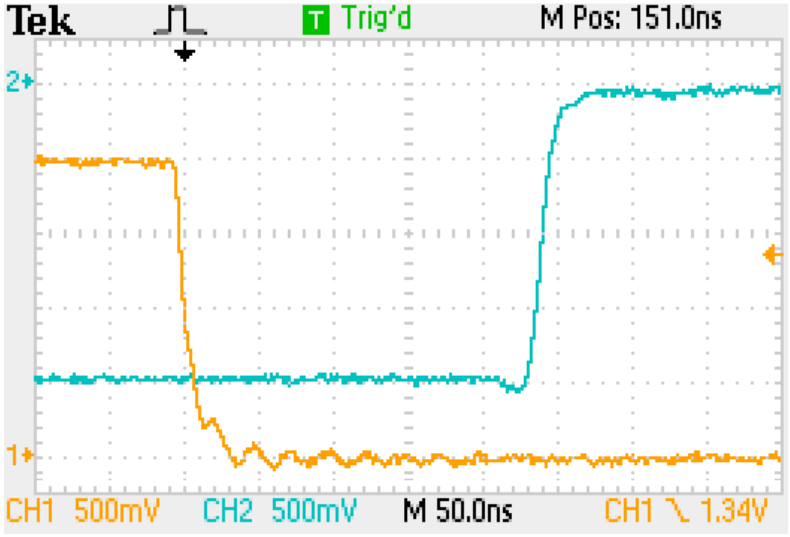
Optical Path	TTL with Driver	Direct Driving	
Port 1 → Port 3, Port 2 → Port 4	L (< 0.8V)	0V on PIN 1	0V on PIN 2
Port 1 → Port 4, Port 2 → Port 3	H (> 3.3V)	HV on PIN 1	
HV: 360 ~420V			

NanoSpeed™
2x2 Series Fiber Optical Switch Dual Stages

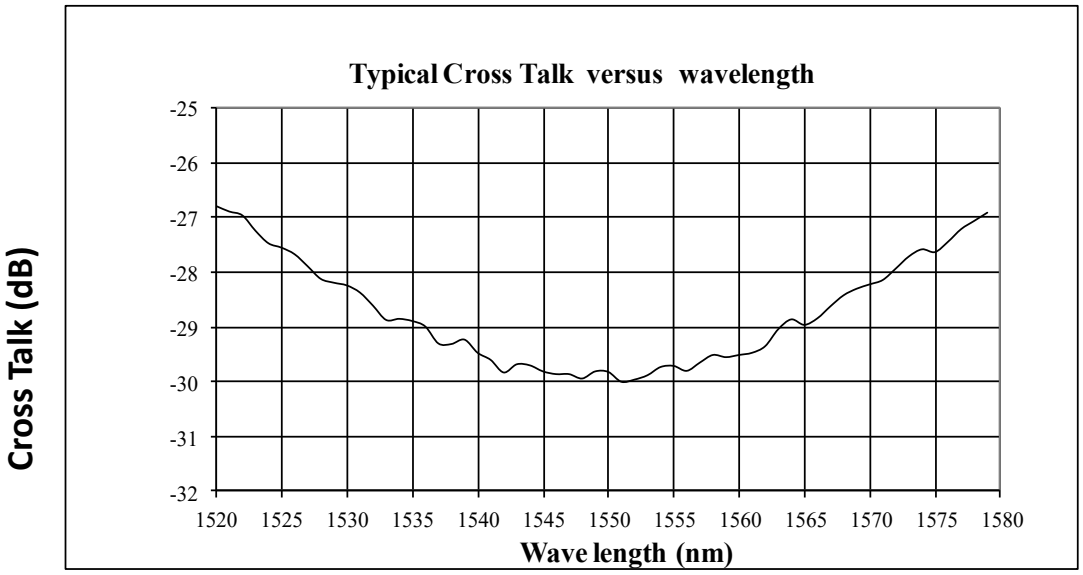
(SM, PM, Bidirectional, >35dB on/off)

DATASHEET

Typical Speed Response Measurement



Typical Bandwidth Measurement



NanoSpeed™
2x2 Series Fiber Optical Switch Dual Stages

(SM, PM, Bidirectional, >35dB on/off)

DATASHEET

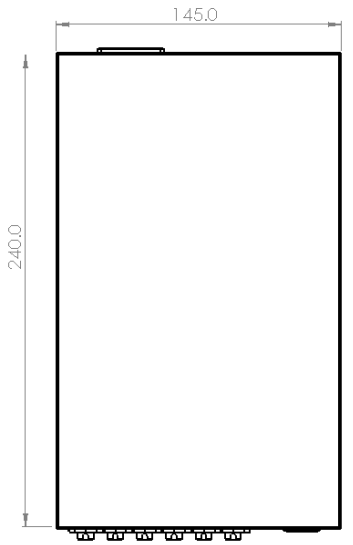
Ordering Information

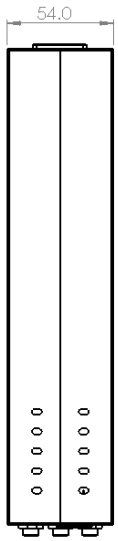
	2 2	☐	2	☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Configuration**	**Optical Power**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector**	**Benchtop**
NSSW-	2x2 = 22	1060nm = 1 1310nm = 3 1410nm = 4 1550nm = 5 Special = 0	Dual stage = 2	0.5W = 1 5W = C 10W = D 20W = E	SMF-28 = 1 HI1060 = 2 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/PC = 8 LC/APC = 9 E2000 APC = A LC/UPC = U Special = 0	None = 1 Benchtop = B

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.

NanoSpeed™
2x2 Series Fiber Optical Switch Dual Stages

(SM, PM, Bidirectional, >35dB on/off)

DATASHEET

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.