NanoSpeed™
Multicast 2x2 Fiber Optical Switch

(SM, PM, Bidirectional, 100%, 0%, 50%)

DATASHEET

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Features

- Solid-State
- High Speed
- Ultra-High Reliability
- Low Insertion Loss
- Compact

Applications

- Optical blocking
- Configurable operation
- Instrumentation

The NSMC series is a 2x2 fiber optic multicast switch that redirects an incoming optical signal to two output ports with three selectable light intensity states: 100%, 0%, and 50%. This precise optical splitting is achieved using a patented electro-optical crystal design, with no organic materials in the light path, ensuring maximum stability and longevity. Designed for ultra-high reliability, fast response, and continuous operation, the switch is intrinsically bidirectional and can be configured as polarization-independent or polarization-maintaining, depending on the fiber type. The NSMC switch is delivered mounted on a custom-tuned electronic driver PCB, which accepts 5V TTL control signals and a 12V DC power input. Performance is optimized for a range of repetition rates. The rise/fall time is determined by the crystal properties, while the frequency response is influenced by the driver design. Some narrow frequency bands may exhibit poor response due to device resonances. The switch operates over a broad control frequency range, from DC to several MHz, with power consumption dependent on switching repetition rate. All NS series switches are qualified for telecom and space applications.

⚠ Note: Components purchased without drivers cannot be returned for driver mounting, as the handling cost is comparable to purchasing a new unit with the driver included.

Specifications

Parameter		Min	Typical	Max	Unit
Insertion Loss [1]	1260~1650nm		1.0	1.5	dB
	960~1260nm		1.2	1.6	dB
Cross Talk [2]		18	22	35	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
	300kHz driver	DC	300		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.

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 benchtop system.**

Rev 05/30/25

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Light Path Diagram (bidirectional)

State		Port 3	Port 4
State 1	**Port 1**-	100%	0%
	Port 2 -	0%	100%
State 2	**Port 1**-	50%	50%
	Port 2 -	50%	50%
State 3	**Port 2**-	100%	0%
	Port 1 -	0%	100%

Mechanical Dimensions (mm)

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

Optical Path Driving Table

P +1 781-935-1200 E sales@photonwares.com W www.agiltron.com

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100kHz Driver Mechanical Drawing (mm)

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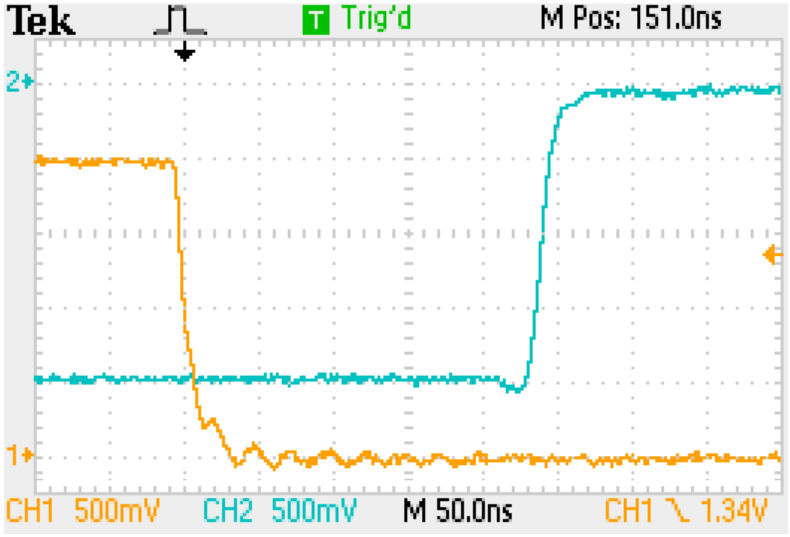
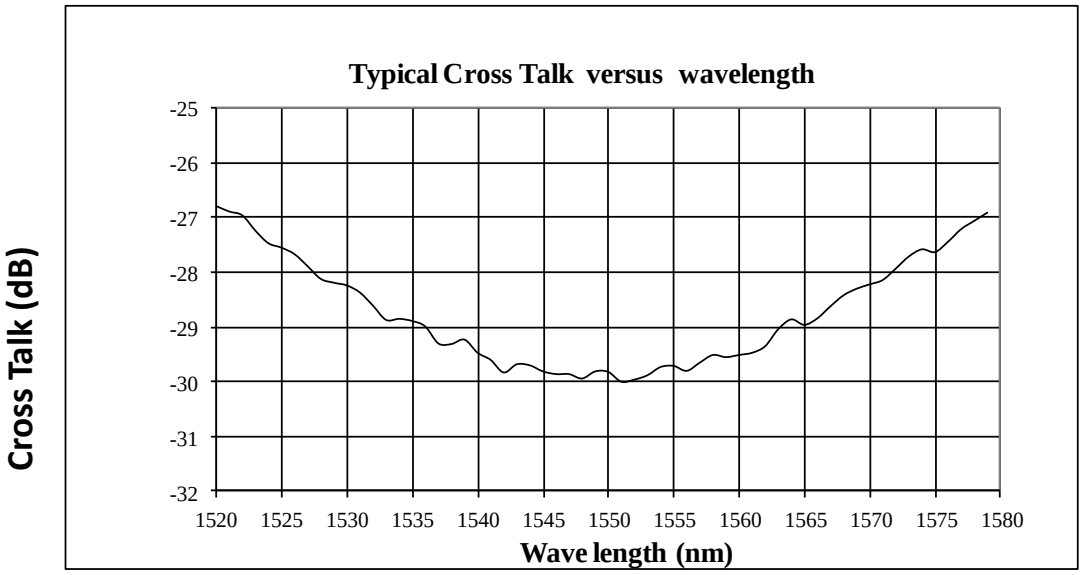
Typical Speed Response Measurement



Typical Bandwidth Measurement



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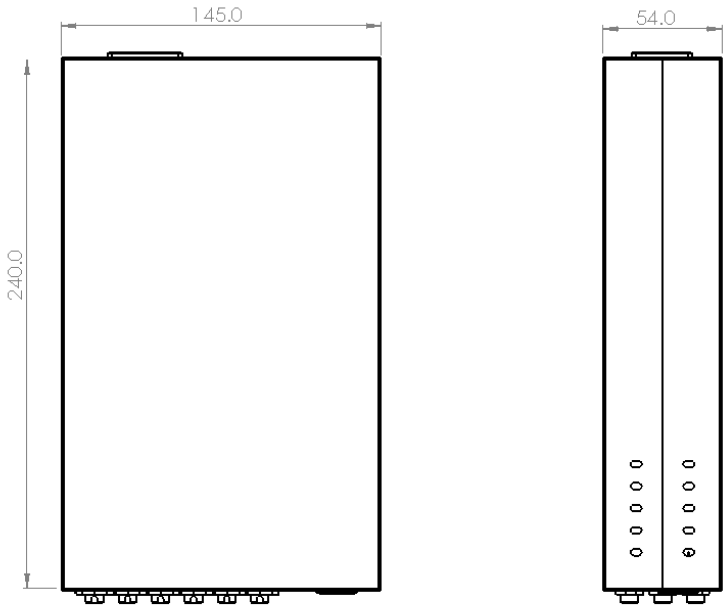
Ordering Information

	2 2	☐	1	☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength** [1]	**Configuration**	**Optical Power**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector**	**Benchtop**
NSMS-	2x2 = 22	1060nm = 1 1310nm = 3 1410nm = 4 1550nm = 5 Special = 0	Single stage = 1	0.5W = 1 5W = C 10W = D 20W = E	SMF-28 = 1 HI1060 = 2 PM1550 = 5 PM980 = 9 PM 1310 =3 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



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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.