NanoSpeed™ Cascaded 1x4 Premium Fiberoptic Switch

(Bidirectional, 50ns rise/fall, up to 0.5MHz)

DATASHEET

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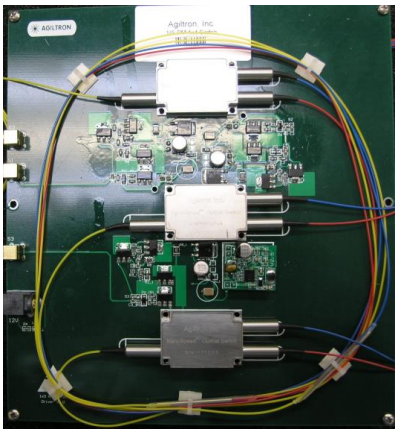

Features

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

Applications

- Optical blocking
- Configurable operation
- Instrumentation

The NP (NanoSpeed Premium) Series 1x4 or 1x3 solid-state fiber optic switch is made of cascaded three 1X2 premium switches. It connects optical channels by redirecting an incoming optical signal into a selected output optical fiber. This is achieved using patent pending non-mechanical configurations with solid-state all-crystal designs, which eliminates the need for mechanical movement and organic materials. The NP fiber-optic switch is designed to meet the most demanding switching requirements of fast response time, and continuous switching operation at high repeat rate. The switch is intrinsically bidirectional and selectable for polarization-independent or polarization-maintain by the fiber type.

NP series of 1x4 and 1x3 switches is mounted on Agiltron's PCB driver, featuring high efficiency with 12V DC power and TTL control signals.

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 NP series switches respond to a control signal with any arbitrary timing with frequency from DC up to sub-MHz. The electrical power consumption is related to the repetition rate of switch operated.

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

Specifications

Parameter		Min	Typical	Max	Unit
Central Wavelength		780		2000	nm
Insertion Loss [1]	1260~1650nm		1.4	2.0	dB
	960~1260nm		2.0	2.6	
	760~960nm		2.2	2.8	
Cross Talk [2]		20	25		dB
Durability		10^{14}			cycles
Polarization Dependent Loss			0.15	0.35	dB
IL Temperature Dependency			0.25	0.5	dB
Polarization Mode Dispersion			0.1	0.3	ps
Return Loss		45	50		dB
Response Time (Rise, Fall)				50	ns
Repetition Rate		DC		800	kHz
Operating Temperature		-5		70	°C
Optical Power Handling [3]			0.3	20	W
Storage Temperature		-40		85	°C

Notes:

[1] Excluding connectors.

[2] Within ± 25nm.

[3] Defined at 1550nm. For the shorter wavelength, the handling power may be reduced. High power version (up to 5W) for 1310nm/1550nm is available; please call 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.**

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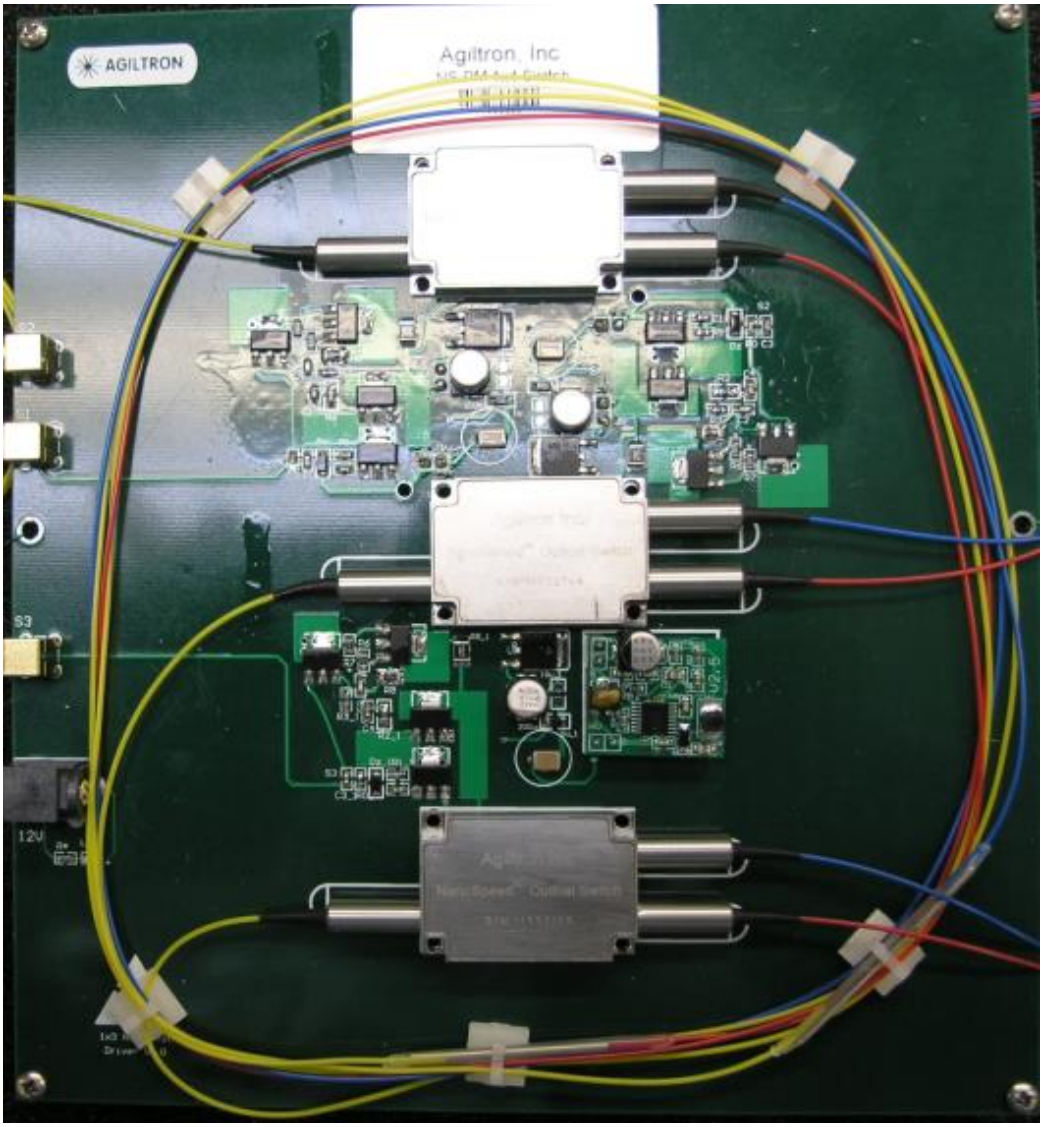
Schematic Assembly on PCB driver (illustration only)



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

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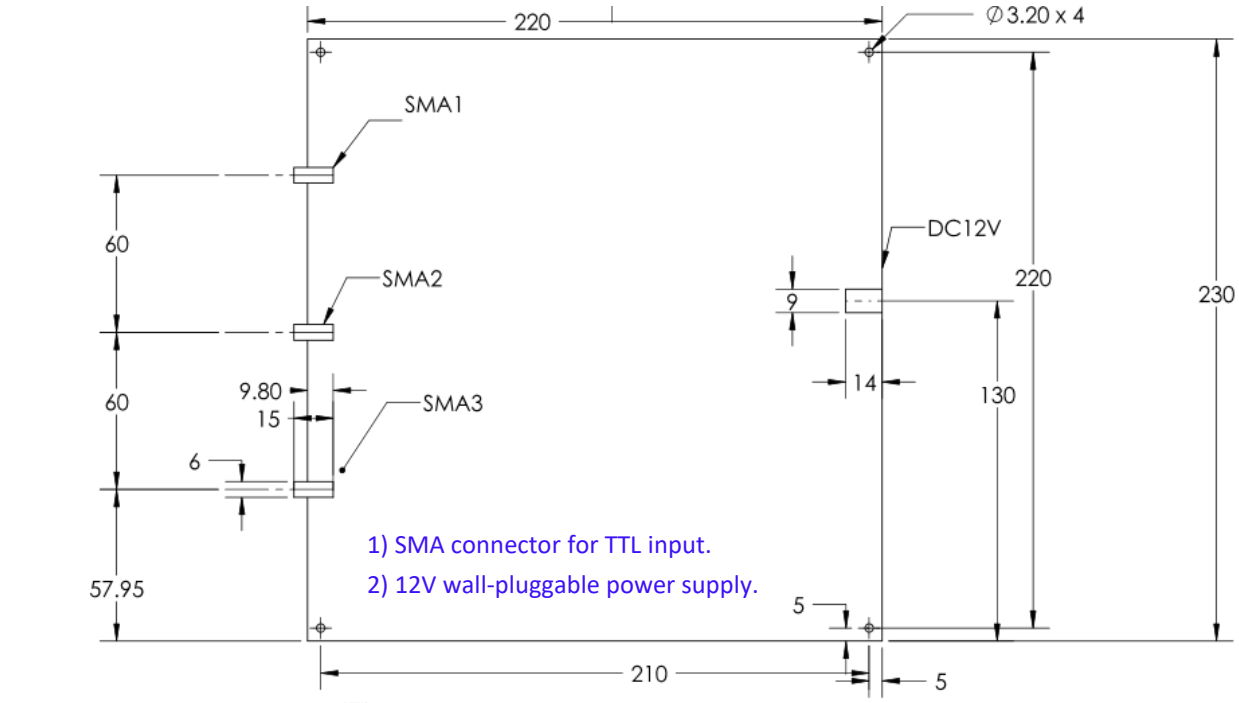
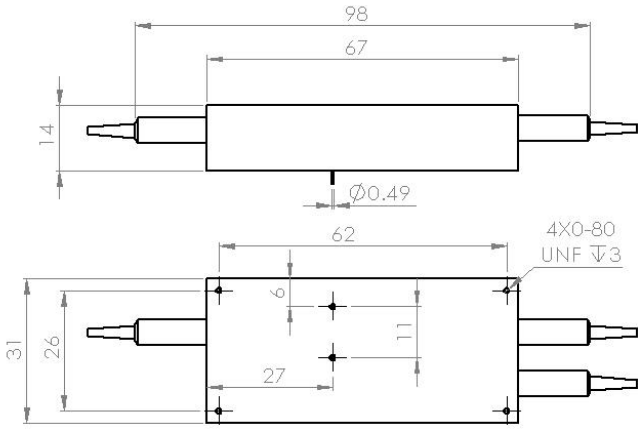
Driver PCB Dimensions (Unit: mm)



1) SMA connector for TTL input.

2) 12V wall-pluggable power supply.



Typical NPNS-1x2 mounted on PCB driver

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Driving Table

Driving Table (TTL control)			
Optical Path	**SMA-1**	**SMA-2**	**SMA-3**
Input Port -> Port 1	0V	0V	0V
Input Port -> Port 2	0V	H	0V
Input Port -> Port 3	H	0V	0V
Input Port -> Port 4	H	0V	H

Note: 3.0V <= H <= 5.0V

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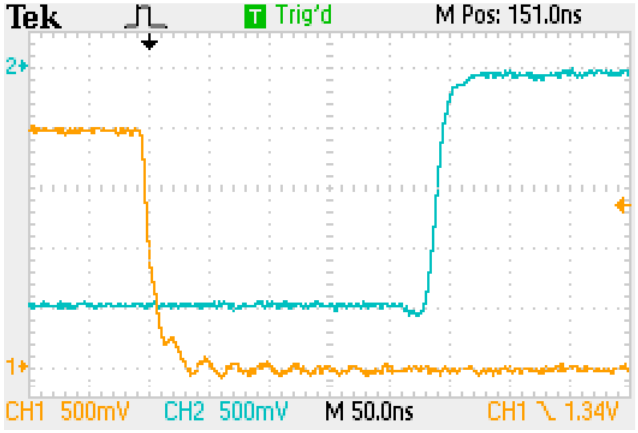
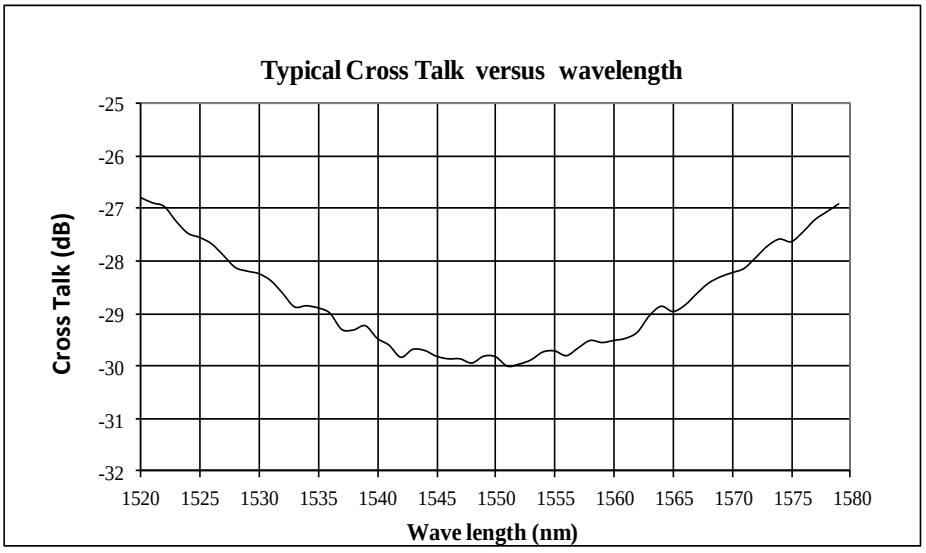
Typical Speed Response Measurement



Bandwidth Measurement (@ Optimal CT)



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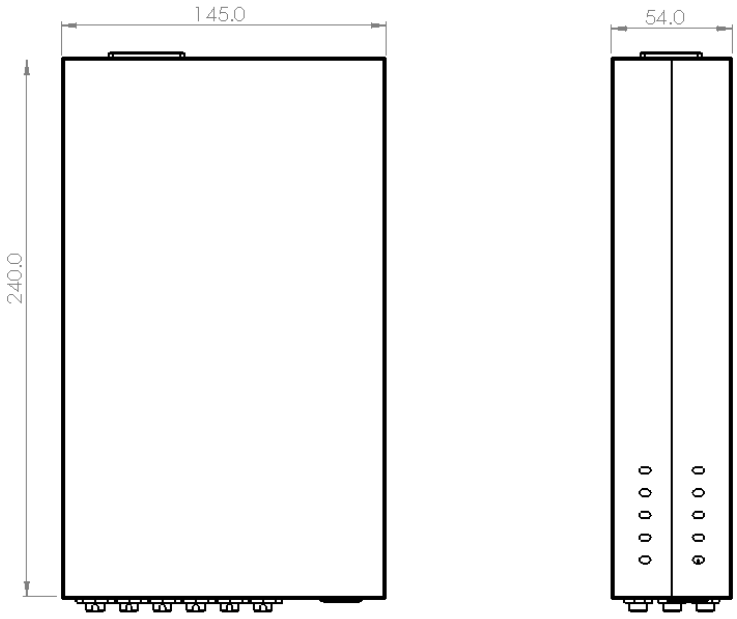
Ordering Information

	☐☐	☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Type [1]**	**Wavelength**	**Optical Power Handling [4]**	**Repetition Rate in max**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector**	**Benchtop**
NPNS-	SMF-1x4 = 14 SMF-1x3 = 13 PMF-1x4 [2] = 4A PMF-1x4 [3] = 4B PMF-1x3 [2] = 3A PMF-1x3 [3] = 3B	1060 = 1 L Band = 2 1310 = 3 1550 = 5 780 = 7 850 = 8 980 = 9	300mW = 1 5W = 2 10W = A 15W = C 20W = D Special = 0	0.2MHz = 2 0.8MHz = 9 Special = 0	SMF-28 = 1 PM1550 = 5 HI1060 = 2 PM980 = 9 HI780 = 3 PM850 = 8 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 LC/PC = 7 LC/APC = 9 E2000 APC = A LC/UPC = U Special = 0	None = 1 Benchtop = B

[1]. **SMF**: single mode fiber; **PMF**: polarization maintain fiber.
[2]. Blocking fast axis for PM fiber version in 1x3 or 1x4.
[3]. Blocking slow axis for PM fiber version in 1x3 or 1x4
[4]. Defined at 1550nm. Optical power handling will be reduced significantly @ wavelength <1100nm

Note:
- ❑ PM1550 fiber works well for 1310nm

Benchtop Box Mechanical Dimension



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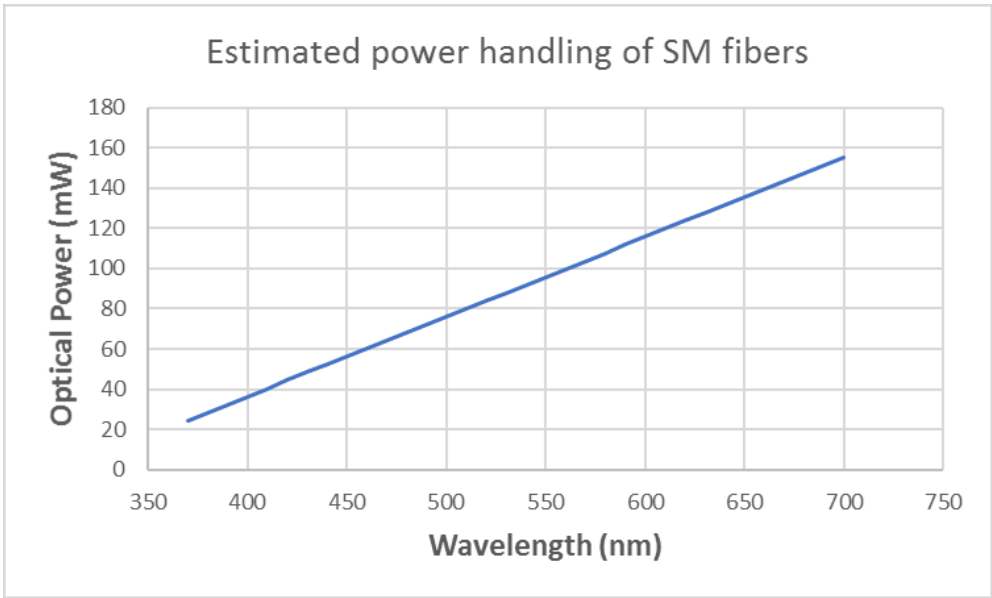
Optical Power Handling vs Wavelength For Single-Mode Fibers



Q & A

Q: Does NP 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: NP 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: NP 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 connectors 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.

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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.

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