NanoSpeed™ Dual-Stage 1x1 Series Fiber Optical Switch

(SM, PM, High Power, Bidirectional)

DATASHEET

BUY NOW

The NS Series dual-stage 1x1 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-pending non-mechanical configurations with solid-state all-crystal designs, eliminating the need for mechanical movement and organic materials. The dual-stage series of NS fiber-optic switches is designed to meet the demand of high cross-talk in addition to 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.

Agiltron's PCB driver listed on the web is recommended to operate this device, featuring high efficiency and low cost with 12V DC power and TTL control signal.

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.

Features

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

Applications

- Optical blocking
- Configurable operation
- Instrumentation

Specifications

Parameter		Min	Typical	Max	Unit
Central Wavelength [1]		960		1650	nm
Insertion Loss [2]	1260~1650nm		0.6	1.0	dB
	960~1100nm		0.8	1.3	dB
On-Off Ratio [3]		30	35	45	dB
Durability		10^{14}			cycles
PDL (SMF Switch only)			0.2	0.35	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)		30		300	ns
Fiber Type		SMF-28, Panda PM, or equivalent			
Driver Repeat Rate	60kHz driver	DC	60		kHz
	300kHz driver	DC	300		kHz
Optical 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 ±25nm approximately at 1550nm.

[2] Measured without connectors. Wavelength with red color can be implemented in the special version.

[3] ±25nm, Measured at 100kHz repeat rate. For the higher repeat rate, the on-off ratio may be degraded.

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

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 02/18/24

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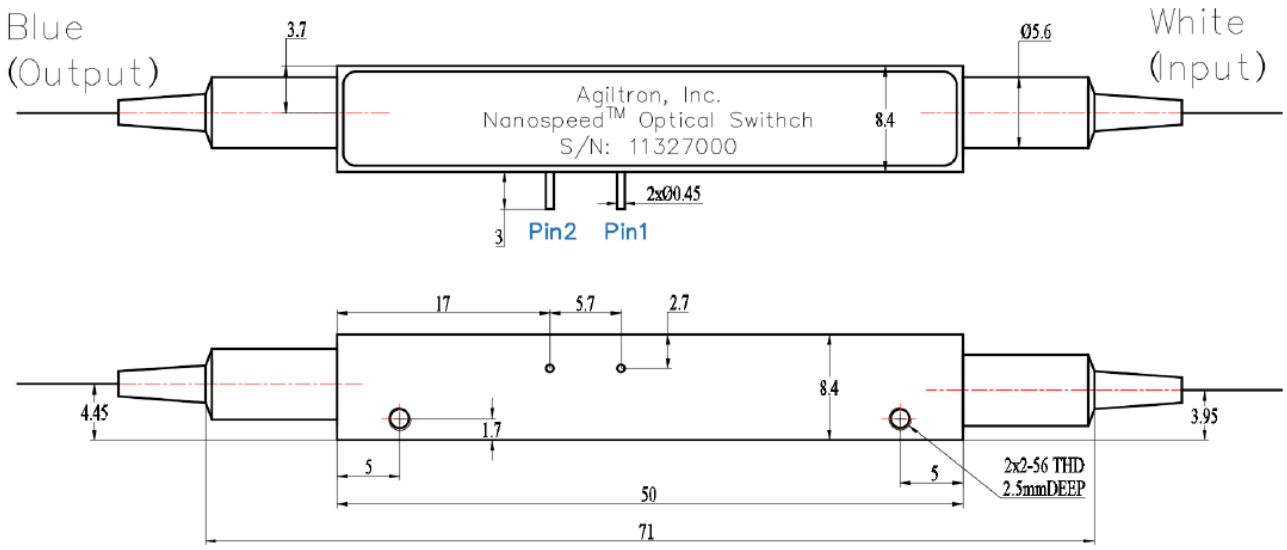
Mechanical Dimensions (mm)



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

Optical Path Driving Table

Optical Path	Pin 1	Pin 2
Port 1 → Port 2	No Power	
Port 1 → Port 3	H	GND
H: 360 ~ 420 V		

Driving Board Selection

Maximum Repetition Rate	Part Number (P/N)
60 kHz	NSSW100ns100kHzD
300 kHz	NSSW100ns300kHzD

* 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.

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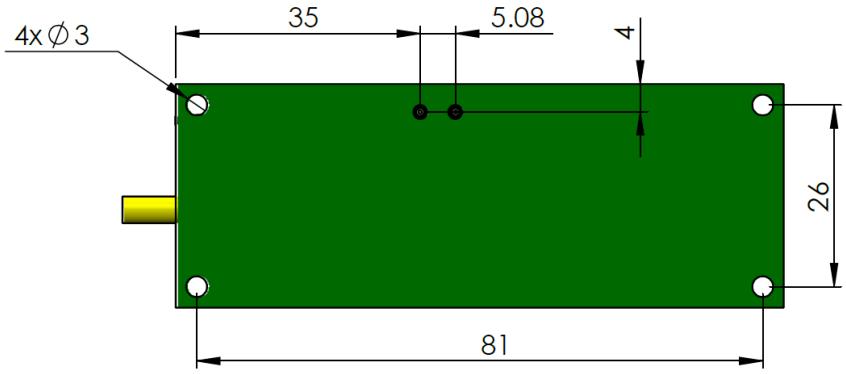
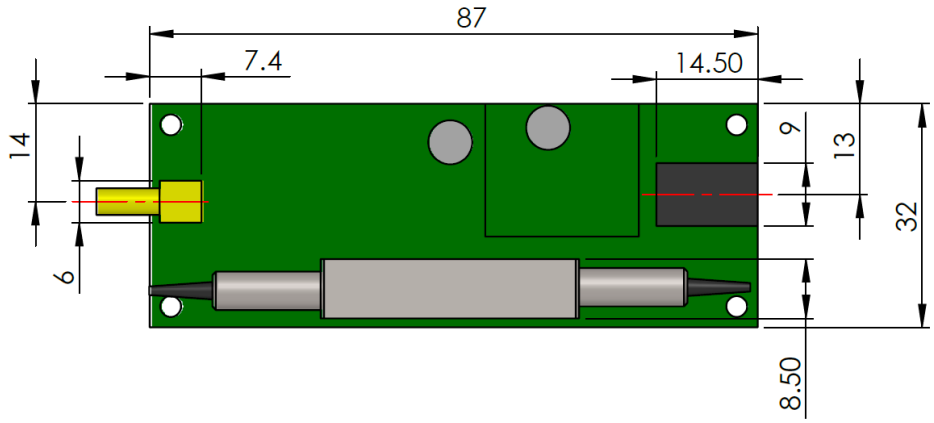
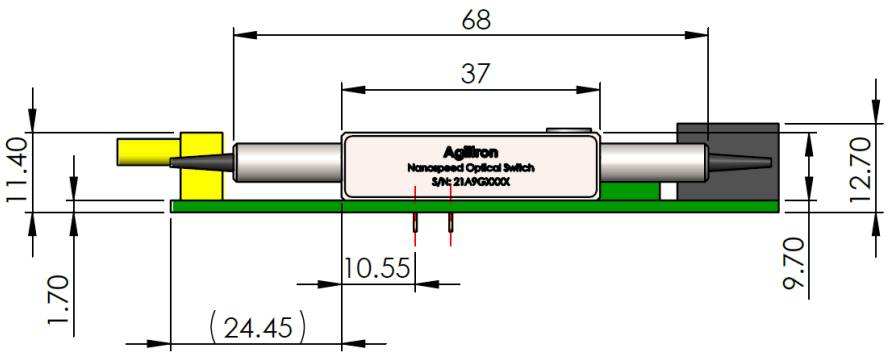
Mechanical Dimensions, mounting on 100kHz driver (mm)



Back view





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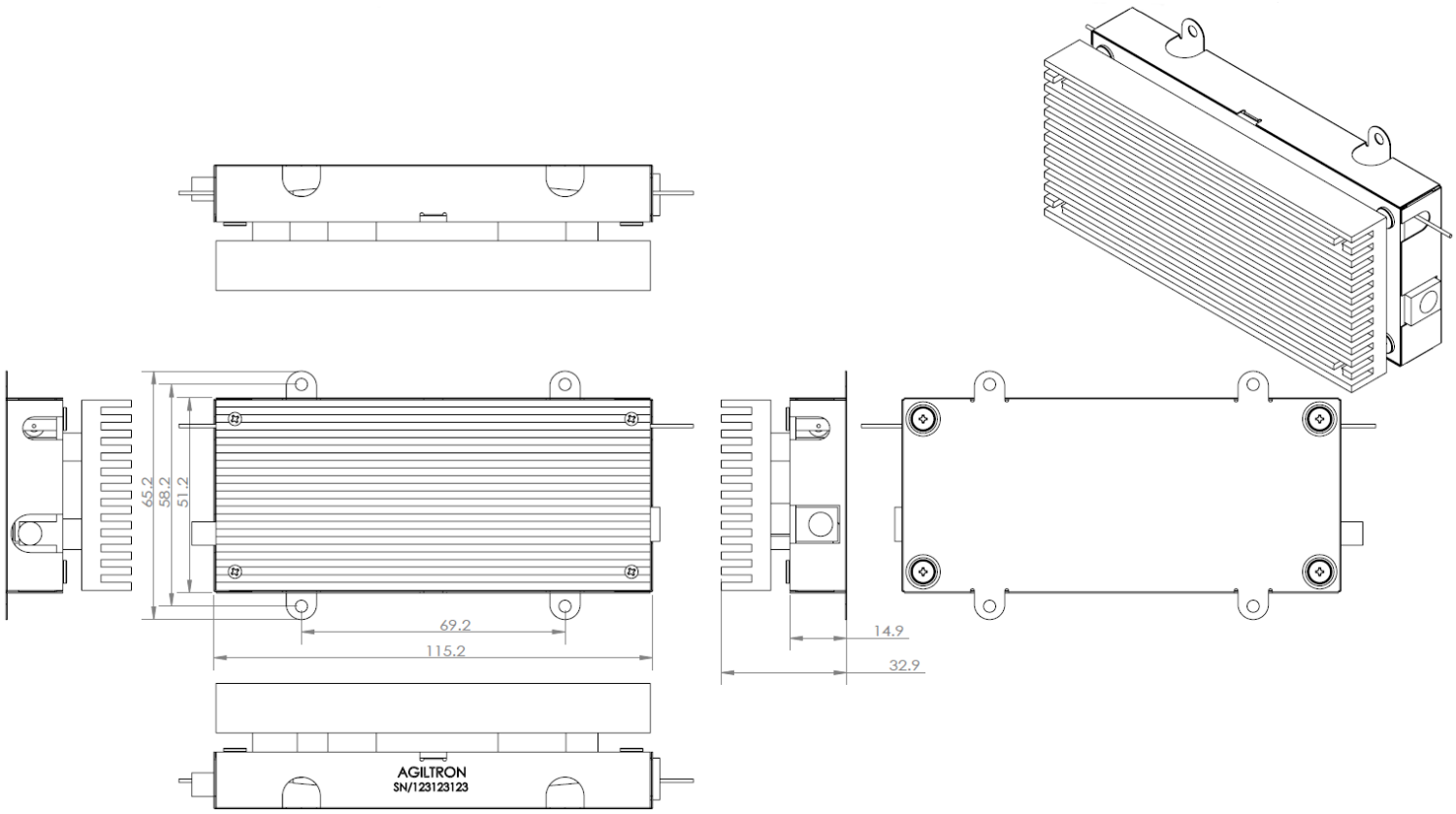
300kHz Driver Mechanical Drawing (mm)



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Ordering Information

	1 1	☐	☐☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Configuration**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector [3]**	**Optical Power**
NSSW- [1] **NHSW**- [2]	1x1 = 11	1060nm = 1 2000nm = 2 1310nm = 3 1550nm = 5 1625nm = 6 950nm = 9 Special = 0	Normally-On = 12 Normally-Off = 22 Normally-On Enclosure [4] = 2E Normally-Off Enclosure [4] = 2F	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	Regular = 1 1W = A 2W = B 5W = C 10W = D 20W = E

[1]. **NSSW** – Normal power version
[2]. **NHSW** – High power version
[3]. Please contact us for high power connectors in high power switch
[4]. The Metal Enclosure protects the device against PCB damage and fiber breakage making it an instrument grade

NOTE:

- **PM1550** fiber works well for **1310nm**
- **Opaque** – light is blocked without applying a voltage
- **Transparent** – light goes through without applying a voltage

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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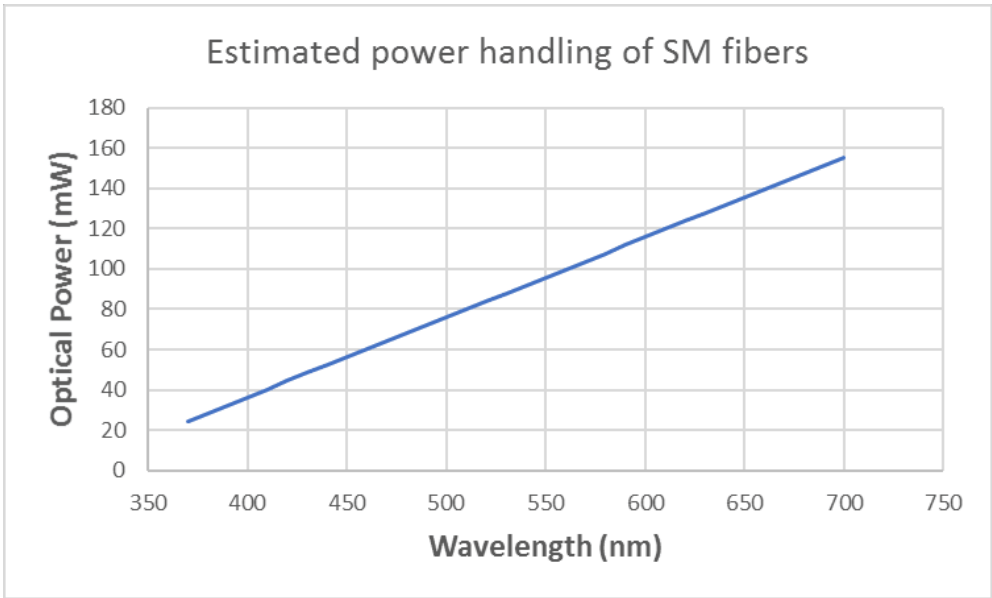
Optical Power Handling vs Wavelength For Single-Mode Fibers



Q&A (Conti)

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.

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