



# NanoSpeed™ Dual-stage 1x2 Series Fiber Optical Switch (SM, PM, High Power, Bidirectional)

(Protected by U.S. patent 7,403,677B1 and pending patents)

## Features

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

## Applications

- Optical blocking
- Configurable operation
- Instrumentation

## Product Description

The NS Series dual-stage 1x2 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, which eliminates the need for mechanical movement and organic materials. The dual-stage series of NS fiber-optic switch is designed to meet the demand of high cross-talk in addition of ultra-high reliability, fast response time, and continuous switching operation. The device is bidirectional.

The NS Series switch is controlled by 5V TTL signals with a specially designed electronic driver having performance optimized for various repetition rate.

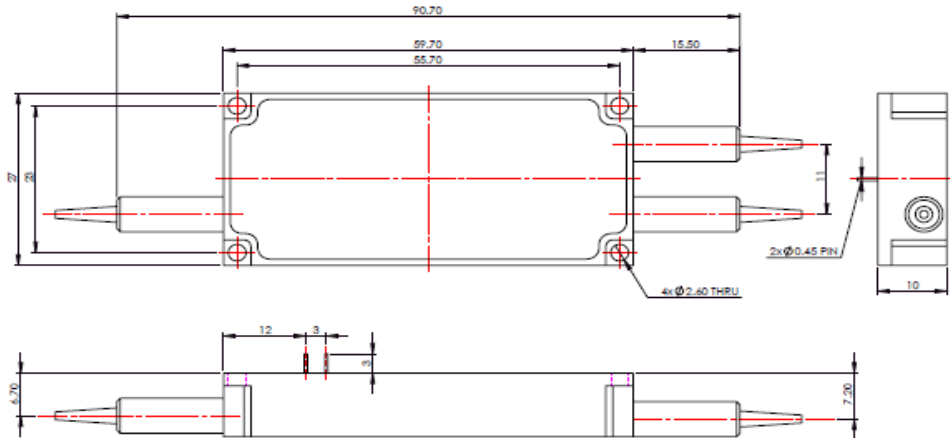
## Performance Specifications

NS Series Dual-stage 1x2 Switch		Min	Typical	Max	Unit
Central wavelength <sup>[1]</sup>		960		1650	nm
Insertion Loss <sup>[2]</sup>	1260-1650nm 960-1100nm		1.0	1.4	dB
Cross Talk <sup>[3]</sup>		30	35	45	
Durability		10 <sup>14</sup>			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)				300	ns
Fiber Type		SMF-28, Panda PM, or equivalent			
Driver Repeat Rate	60kHz driver	DC	60		kHz
	300kHz driver	DC	300		
Optic power Handling <sup>[4]</sup>	Normal power switches		300		mW
	High power switches			5	W
Operating Temperature		-5		70	°C
Storage Temperature		-40		85	°C

[1] Operation bandwidth is +/- 25nm approximately at 1550nm.  
 [2] Measured without connectors. For other wavelength, please contact us.  
 [3] Cross talk is measured at 100kHz, which may be degraded at the high repeat rate.  
 [4] Defined at 1310nm/1550nm.

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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	TTL Signal
Port 1 → Port 2	L (< 0.8V)
Port 1 → Port 3	H (> 3.5V)

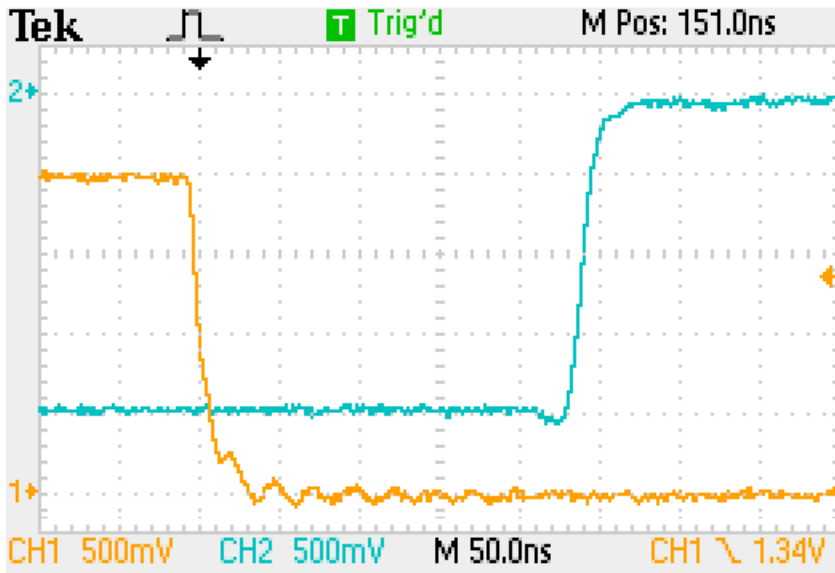
## Driving Board Selection

Maximum Repetition Rate	Part Number (P/N)
60kHz	NSDR-2s1a61111
300kHz	NSDR-2s1a91111

\* 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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## Typical Speed Response Measurement



## Ordering Information

	Type	Wavelength [1]	Configuration	Package	Fiber Type	Fiber Length	Connector [2]	
□□□□ - 1 2 □ 2 2 □ □ □ □	1x 2=12	1060nm=1 1310nm=3 1410nm=4 1550nm=5 1625nm=6 Special=0	Dual stage = 2	Dual stage 3-cap package = 2	SMF-28=1 HI1060=2 HI780=3 PM 1550/250=5 PM980=9 Special=0	Bare fiber=1 900um loose 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=8 LC/APC=9 Special=0

[1]. Please check NP type of switch for the wavelength shorter than 960nm.

[2]. There isn't any connector in high power switches. Please contact us for high power connectors.

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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 °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.