

# NanoSpeed™ Dual-stage 1x1 Series Fiber Optical On-Off Switch (SMF, PMF, High Power)

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

## Product Description

The NanoSpeed™ 1x1 series fiber optic on-off switches are fast shutter device featuring very low loss, fast response, and high optical power handling. This is achieved using patented non-mechanical configurations with solid-state all-crystal designs, which eliminates the need for mechanical movement and organic materials. The NS fiber-optic switch is designed to meet the most demanding switching requirements of ultra-high reliability, fast response time, and continuous switching operation. The switch 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

NanoSpeed Series 1x 1 Switch	Min	Typical	Max	Unit
Central wavelength <sup>[1]</sup>	780		1650	nm
Insertion Loss <sup>[2]</sup>	1260-1650nm	0.6	1.0	dB
	960-1100nm	0.8	1.3	
Durability	10 <sup>14</sup>			cycles
On-Off Ratio <sup>[3]</sup>	30	35	45	dB
PDL (SMF Switch only)		0.15	0.3	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		300	mW
	High power		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] Measured at 100kHz, which may be degraded at higher repeat rate.

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

## Features

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

## Applications

- Optical blocking
- Configurable operation
- Instrumentation





# NanoSpeed™ 1x1 Series



## Fiber Optical On-Off Switch (SMF, PMF, High Power)

### Optical Path Driving Table

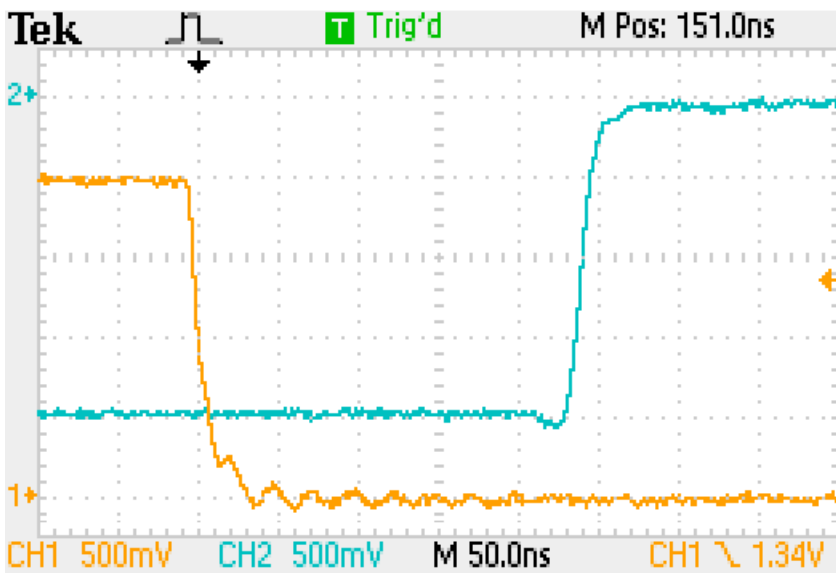
Optical Path	TTL Signal
ON for normal-open or OFF for normal-dark	L (< 0.8V)
OFF for normal-open or ON for normal-dark	H (> 3.5V)

### 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.

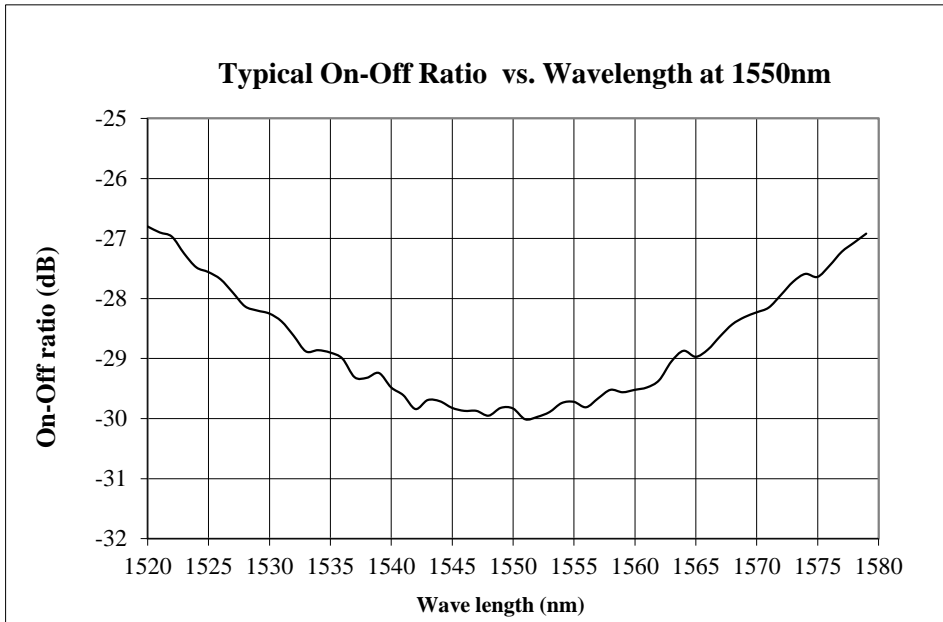
### Typical Speed Response Measurement



Optical: —  
Electrical: —

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## Typical Bandwidth Measurement



## Ordering Information

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Type	Wavelength <sup>[1]</sup>	Configuration	Fiber Type	Fiber Length	Connector <sup>[2]</sup>	
NSSW = Normal power switch NHSW = High power switch	1x1=11	1060nm=1 L Band=2 1310nm=3 1410nm=4 1550nm=5 Special=0	Normally on & dual stage = 12 Normally off & dual stage package= 22	SMF-28=1 HI1060=2 HI780=3 PM 1550/400=4 PM 1550/250=5 PM980=9 PM850=8 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]. High power switch isn't available for the wavelength shorter than 960nm  
 [2]. There isn't any connector in the high power switches normally. 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.