NanoSpeed™
Fiber Optical Resonant Modulator/Switch
(Bidirectional)

(Protected by U.S. patents 7,403,677B1; 6,757,101B2; and pending patents)

Features

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

Product Description

The NS Series fiber optic modulator features fast amplitude modulation about 20 Mhz, low driving voltage and low optical loss. This is achieved using a patented electro-optical configuration and operating at a fixed frequency with a built-in high Q resonant circuit. Unlike other modulators, we use special electro-optical crystals of high stability that increase power handling and reduce drift/darkening. The NS fiber optic switch meet the most demanding switching requirements of continuous operations over 25 years and non-mechanical ultra-high reliability.

Our resonant EO phase modulators can be driven by a standard laboratory function generator with a Half-Wave Drive Voltage of only 15 V at 633 nm. Custom versions are also available, with user-specified resonant frequencies from 0.1 to 100 MHz.

Performance Specifications

NanoSpeed Resonant Modulator		Min	Typical	Max	Unit
Insertion Loss [1]	1900-2200nm		1.3	1.9	dB
	1260~1650nm		1	1.5	
	960~1100nm		1.5	2	
	780-960nm		1.7	2.2	
Cross Talk [2]		18	20	35	dB
Durability		10^{14}			cycles
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	1.5	dB
Return Loss		45	50	60	dB
Repetition Rate			20	100	MHz
Optic power Handling [4]	Normal power version		300		mW
	High power version			5	W
Operating Temperature	Standard	-5		75	°C
	Large range version	-30		85	
Storage Temperature		-40		100	°C

[1] Measured without connectors. For other wavelengths, please contact us.
[2] Cross talk is measured at 100kHz, which may be degraded at the higher repeat rate.
[3] It is defined as the rising or fall time between 10% and 90% of optical intensities.
[4] Defined at 1310nm/1550nm. For the shorter wavelength, the handling power may be reduced, please contact us for more information.
High power version available by incorporating fiber core enlargement (expensive).

Applications

- Laser Systems
- Reconfigurable Optics
- Instrumentations

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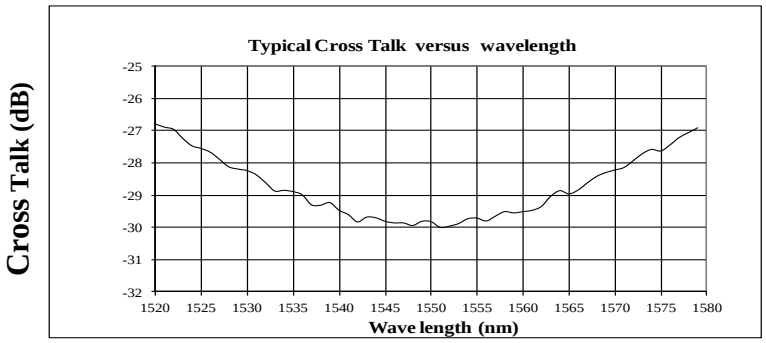
Typical Bandwidth Measurement



Ordering Information

NSRM	☐	☐	☐	☐☐	☐	☐	☐	☐
	Type	Wavelength	Power Handling [2]	Repetition Rate	Fiber Type		Fiber Length	Connector [1]
	1x1=1 1x2=2 2x2=3	1060=1 2000=2 1310=3 1480=4 1550=5 1625=6 780=7 850=8 650=E 1565~1620=L Special=0	Regular =1 500mw=2 5W =5	1MHz=01 2MHz=02 5MHz=05 10MHz=10 20MHz=20 Special = 00	SMF-28=1 HI1060=2 HI780=3 PM1550/400=4 PM1550/250=5 PM850=8 PM980=9 Special=0	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 LC/APC=8 Special=0

[1]: Please contact the sale about the high power connector for NPHW version.
[2]: wavelength shorter than 780nm regular power handling is 5 mW

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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.

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