NanoSpeed™ Fiber In and Free-Space Out Fiber Optical Switch

(SMF, PMF, High Power, Bidirectional)

DATASHEET

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The NanoSpeed™ Fiber In and Free-Space Out switches are fast laser beam shutter device featuring very low loss, fast response, and high optical power handling. The design uniquely provides a way to modulate/switch laser beam from a large core fiber. 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 free space out put has a collimating lens, which can be customer designed. The switch is intrinsically bidirectional and selectable for polarization-independent or polarization-maintain by the fiber type.

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

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 Speed
- High Reliability
- Low Loss
- Compact

Applications

- Sensor
- LiDar
- Instrumentation

Specifications

Parameter		Min	Typical	Max	Unit
Central Wavelength		450		2340	nm
Bandwidth (1550nm)			± 25		nm
Insertion Loss [1]			0.6	1.0	dB
On-Off Ratio [2]		15	25	35	dB
Durability		10^{14}			cycles
PDL (SMF fiber only)			0.15	0.3	dB
ER (PMF fiber only)		18	25		dB
IL Temperature Dependency			0.25	0.5	dB
Return Loss		45	50	60	dB
Response Time (Rise, Fall)				300	ns
Driver Repeat Rate	100kHz driver	DC	100		kHz
Optic power Handling [3]	Normal power		0.3	20	W
	High power			5	W
Operating Temperature		-15		70	°C
Storage Temperature		-40		85	°C

Notes:

[1]. Measured without connectors. For other wavelength, please contact us.

[2]. ±25nm, Measured at 5kHz, which may be degraded at higher repeat rate. Measured using a multimode laser with CPR ~14. Higher CPR lowers the on/off ratio

[3]. Defined at 1310nm/1550nm. For the shorter wavelength, the handling power may be reduced, please contact 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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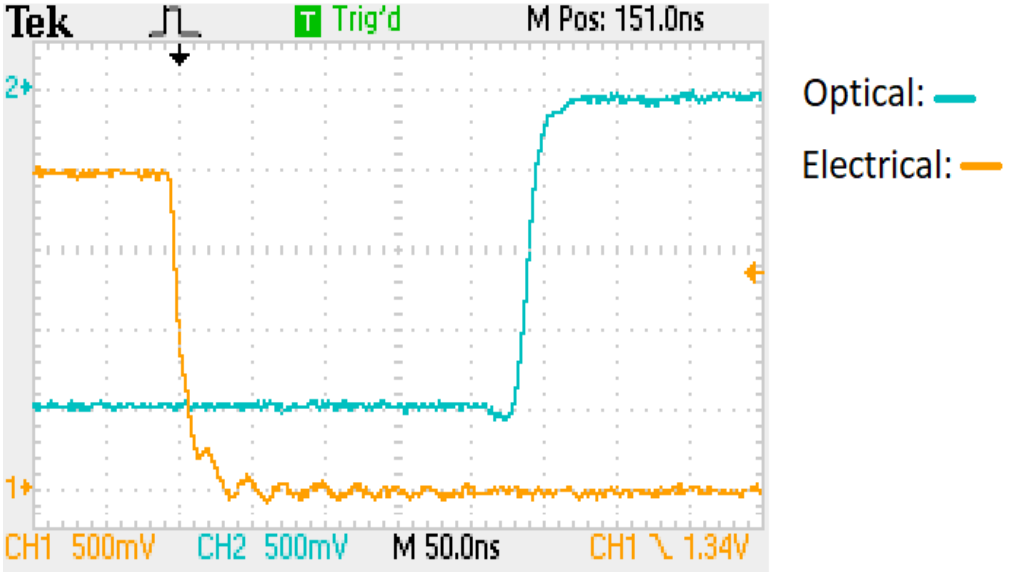
Mechanical Dimensions (Unit: mm)

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

Typical Bandwidth Measurement



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Ordering Information

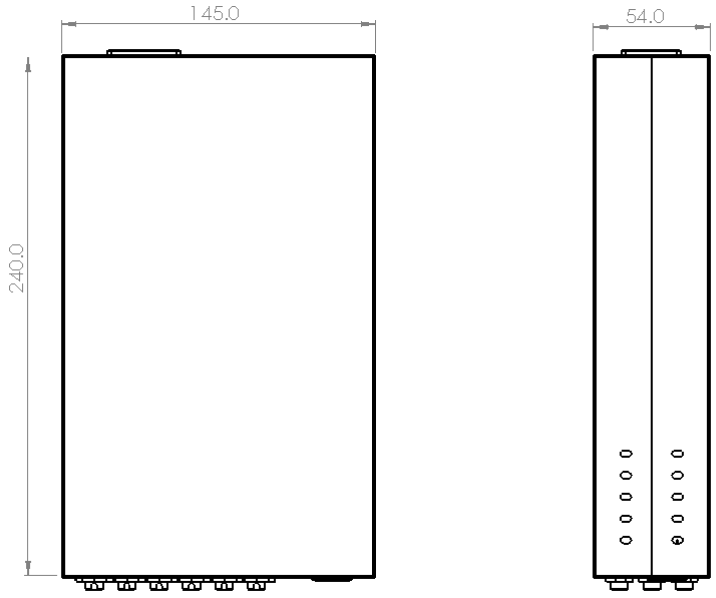
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength [1]**	**Configuration [2]**	**Optical Power**	**Collimating Lens**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector [3]**	**Benchtop**
NSFF-	1x1 = 1 1x2 = 2	1060nm = 1 2000nm = 2 1310nm = 3 1410nm = 4 1550nm = 5 1625nm = 6 850nm = 8 780nm = 7 650 = E 550 = F 400 = G Special = 0	Normally-On = 1 Normal-Off = 2	Standard = 1 5W = 5 10W = 6 20W = 7 30W = 8	Yes = 1 Special = 0	SMF-28 = 1 HI1060 = 2 HI780 = 3 PM1550 = 5 PM980 = 9 50/125 = 6 105/125 = 7 200 = 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 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	None = 1 Benchtop = B

[1]. The wavelength with red color can be implemented in the special version with a long lead-time
[2]. Normal off selection only for 1x1 switch
[3]. Please contact for high power connectors

Note:

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

Benchtop Box Mechanical Dimension



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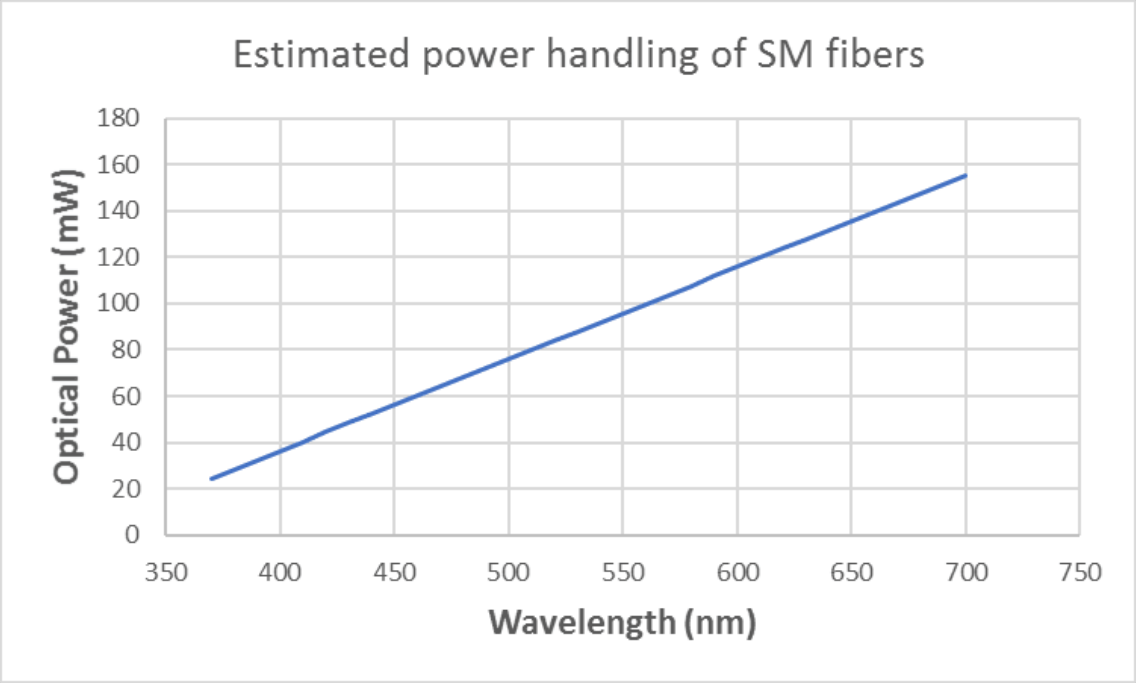
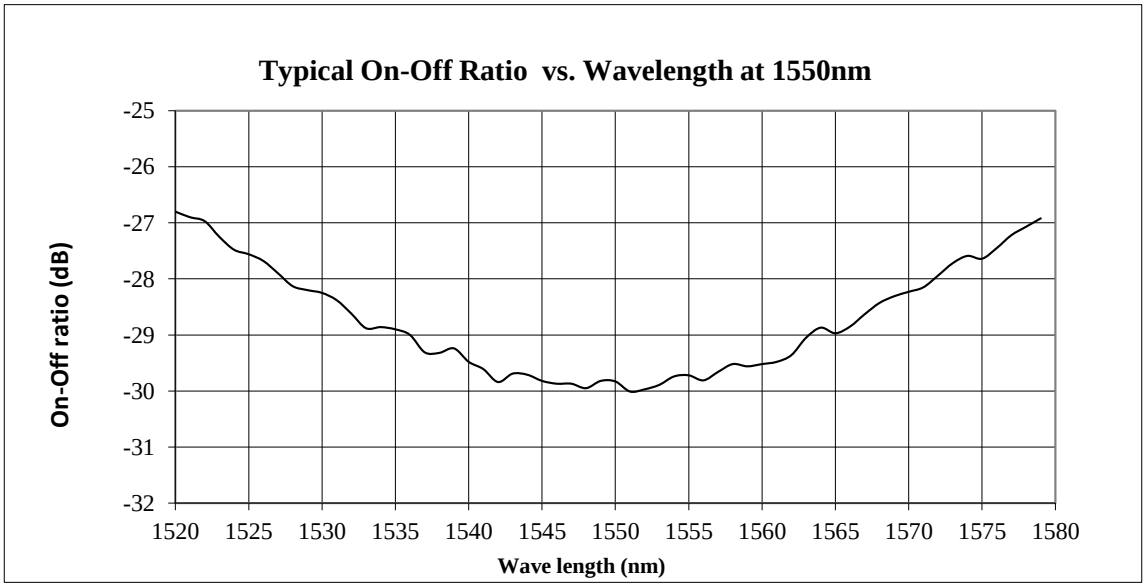
Optical Power Handling vs Wavelength For Single-Mode Fibers



Typical Bandwidth



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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.

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.