NanoSpeed™ 15ns Pulse Generation Switch

450 – 2200nm center wavelength, 1Mhz, polarization insensitive, bidirectional, up to 20W

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The NSPG Series Fiber Optic Pulse Generation Switch from NS is based on a patented electro-optical design that delivers low optical loss, wide operating temperature range, and polarization-insensitive performance. Engineered for ultra-high reliability, the NSPG switch is qualified to Telcordia and space standards and is capable of continuous operation for over 25 years, even in vibration-prone environments. The switch supports bidirectional operation and is available in both polarization-independent and polarization-maintaining configurations. It features a preset pulse width of 15 ns and supports repetition rates up to 1 MHz. The system is housed in a 1U rack-mounted enclosure, with SMA signal input on the front panel and a 100–240 VAC power input on the rear, enabling convenient plug-and-play operation. The NSPG switch responds to a 0–5 V digital control signal with frequencies ranging from DC to MHz levels. Power consumption varies with the operating repetition rate. Due to inherent mechanical resonances, certain frequency regions may exhibit reduced performance where the on/off ratio does not fully meet specification.

Features

- Low Loss
- High Reliability
- High Power
- Bidirectional

Applications

- Laser System
- Quantum System
- Instruments

Specifications

Parameter		Min	Typical	Max	Unit
Insertion Loss [1]	1900~2200nm		3.6	3.8	dB
	1700~2300nm		1.8	3.8	
	1260~1650nm		1.6	2.2	
	960~1100nm		1.8	3.0	
	780~960nm		2.2	3.5	
	520~680nm		2.5	3.3	
Cross Talk On/Off Ratio [2]		18	22 [2]	30	dB
PDL (SMF Switch only)			0.15	0.3	dB
PMD (SMF Switch only)			0.1	0.3	ps
PER (PMF Switch only)		18	25		dB
IL Temperature Dependency			0.25	0.5	dB
Return Loss		45	50		dB
Electrical-Optical Delay				200	ns
Optical Pulse Width			15		ns
Repetition Rate [5]		DC		1	MHz
Optic Power Handling [4]	Normal power version		0.3	0.5	W
	High power version		5	20	W
Operating Temperature	Standard	-5		75	°C
	Special version	-30		85	
Storage Temperature		-40		100	°C

Notes:

[1] Measured without connectors. Each connector adds 0.2 to 0.3dB

[2] ± 25nm, The typical cross talk is measured at DC-20kHz and may be degraded at a higher repeat rate.

[3] It is defined as the time it takes for the signal to transition between 10% and 90% of its peak intensity. For wavelengths > 1550 nm, the response is slow due to the limitation of the current driver. At 2000 nm, the rise/fall time is about 20 nanoseconds.

[4] The standard version is defined at 1310nm/1550nm. For the shorter wavelength, the handling is reduced see the graph. High power version has a fiber end beam expander, thus cost more

[5] The driver is optimized at a repeat rate >500kHz. The specs exclude a few resonant frequency points. The performance can be optimized at other frequencies.

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Th Half-Wave Voltage (Vπ) Adjustment Guide

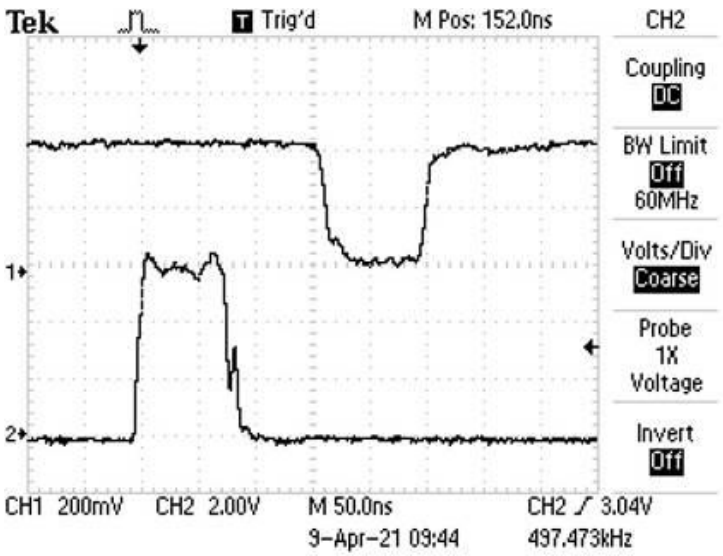
The crystal's half-wave voltage (Vπ) may vary from the manufacturer setting due to factors such as shipping or operating under different conditions like wavelength and switching frequencies. You can optimize the extinction ratio by adjusting the Vπ using the instructions below:

1. **Setup**: Connect a laser and a power meter to the switch, and measure the on/off ratio.
2. **Adjustment**: Adjust the potentiometer to increase the extinction ratio or PDL value. Note that different frequency bands have different Vπ.

The device has a slightly difference Vπ for different operation frequency bands; therefore, adjustment can optimize the extinction ratio to some extent.

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

Typical Narrow Pulse Generation (90ns at 500kHz)



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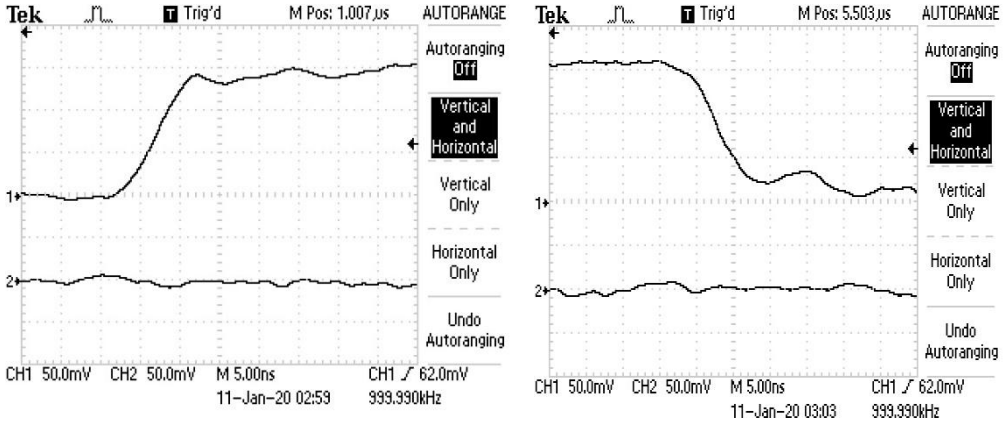
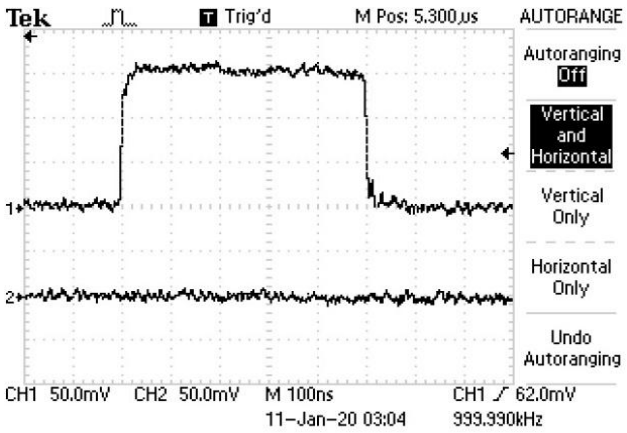
Typical Rise and Fall Optical Switching Profile (5ns)



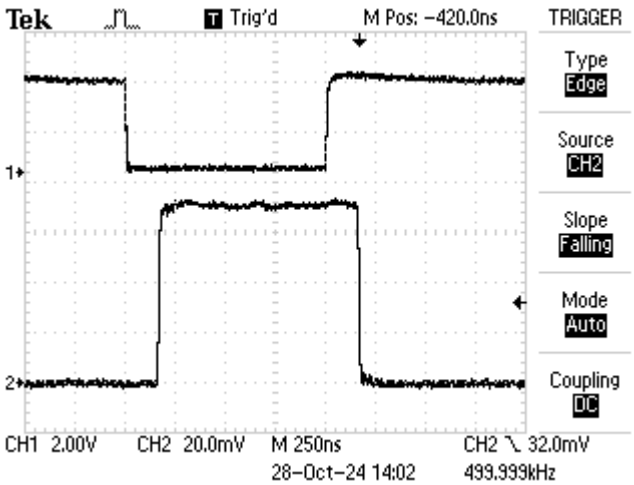
Typical Optical Switching Repetition Profile (1MHz)



Typical Switching Response (optical delay ~150ns)

Electrical

Optical



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Ordering Information (Part Number)

	11	☐	☐	9	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength [1]**	**Configuration**	**Repetition Rate**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector [4][6]**	**Optical Power [5]**
NSPG-	1x1 = 11	1060nm = 1 2000nm = 2 1310nm = 3 1480nm = 4 1550nm = 5 1625nm = 6 1750nm = A 780nm = 7 850nm = 8 650nm = E 550nm = F Special = 0	Standard = 1	900kHz = 9	SMF-28 = 1 HI1060 = 2 HI780 = 3 PM1550 = 5 PM850 = 8 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 ST/PC = 6 LC/PC = 7 LC/APC = A E2000 APC = 9 LC/UPC = U Special = 0	Regular = R 1W = 1 2W = 2 3W = 3 5W = 5 10W = A 15W = C 20W = D

[1]. Red Wavelength Bands are special orders. They use special crystals.
[2]. Ultra-fast 2x2 is made by four pc of 1x2.
[4]. High-power connectors can ordered as special.
[5]. Only single stage is available for power >1W.
[6]. The connector cannot be installed directly onto bare fiber, as it is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer can remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SM28 fiber and decreases further with smaller core fibers.

Red Color-marked is special order with a higher price and longer lead time.

Note:

- **PM1550** fiber works well for **1310nm**, **PM1310** fiber choice costs extra
- **Opaque** – light is blocked without applying a voltage
- **Transparent** – light goes through without applying a voltage

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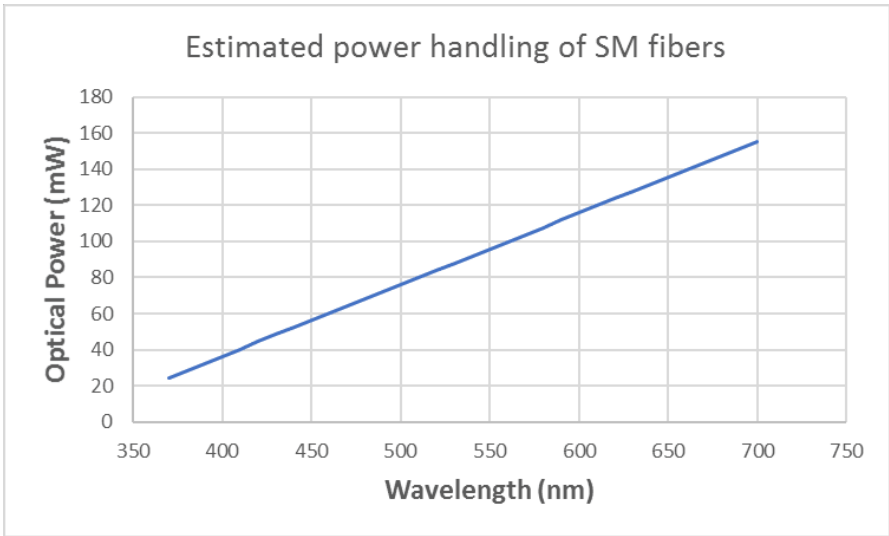
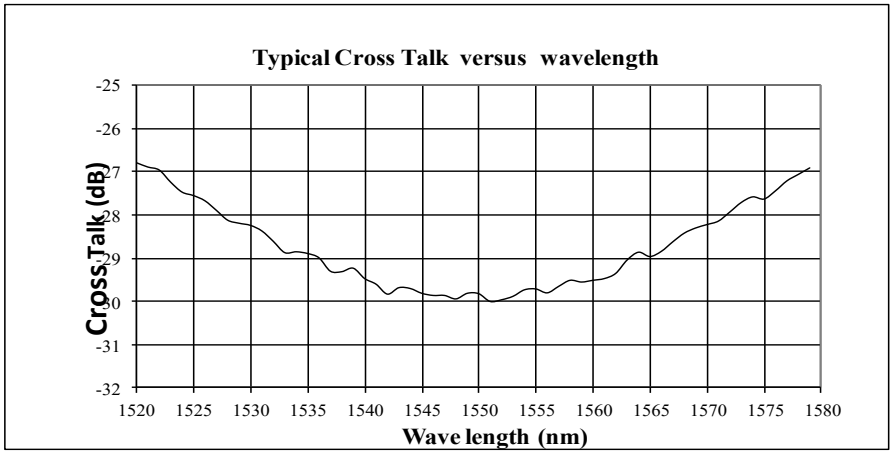
Optical Power Handling vs Wavelength For Single-Mode Fibers



Typical Wavelength Dependence Profile



Electrical Driving Specification

Control signal Input: 0-5V through SMA connector
Power supply in driver: 110-220 AC
Power Consumption in driver: <10W

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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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.