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# NanoSpeed™ Fiber Optical Variable Attenuator (MMF Version, Bidirectional)

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

## Product Description

The Nano-speed Premium Variable Fiber Optical Attenuator (NPOA) provides electrical control of optical power. This is achieved using a patent pending non-mechanical configuration and activated via a voltage electrical control signal. The solid-state optical crystal design eliminates mechanical movement and organic materials. The NP Series Variable Optical Attenuators are designed to meet the most demanding operation requirements of ultra-high reliability and fast response time with minimal mechanical footprint. Agiltron also offers customized electronic designs to meet special control requirements and applications. The NPOA is bidirectional. The NP Series VOA is available in either normally-transparent in which the light passing through without the applying a voltage or normally-opaque in which the light is blocked without the applying of a voltage. The attenuation level is related to the stage. The response speed is related to the attenuation level and driver power (repetition rate). Small attenuation can reach MHz response.

The NP Series VOA is mounted on a specially designed electronic driving PCB board with a 0-5V control input and having performance optimized for various repetition rate.



## Features

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

## Performance Specifications

NanoSpeed MM VOA		Min	Typical	Max	Unit
Central wavelength <sup>[1]</sup>		630		2000	nm
Insertion Loss <sup>[2]</sup>			1.5	1.8	dB
Attenuation <sup>[3]</sup>		15	20		dB
IL Temperature Dependency			0.25	0.5	dB
Return Loss		20	25		dB
Response Time (Rise, Fall)				300	ns
Fiber Type		50/125, 62.5/125, or equivalent			
Driver Repeat Rate	10kHz driver	DC	10		kHz
	100kHz driver	DC	100		
Optic power handling <sup>[4]</sup>			0.5	2	W
Operating Temperature		-5		70	°C
Storage Temperature		-40		85	°C

## Applications

- Optical protection
- Configurable operation
- Instrumentation

[1] Operation bandwidth is +/- 25nm approximately at 1550nm.  
**Wavelength shorter than 850nm may be with a long lead time.**  
 [2] Measured without connector under source with CPR <=13dB  
 [3] It is measured at 5kHz under light source with CPR <=13dB, which may be degraded at the high repeat rate and higher CPR.  
 [4] The handling power must be identified in P/N at the normal (<=0.5W) or high power (>=1W) when the PO is placed.

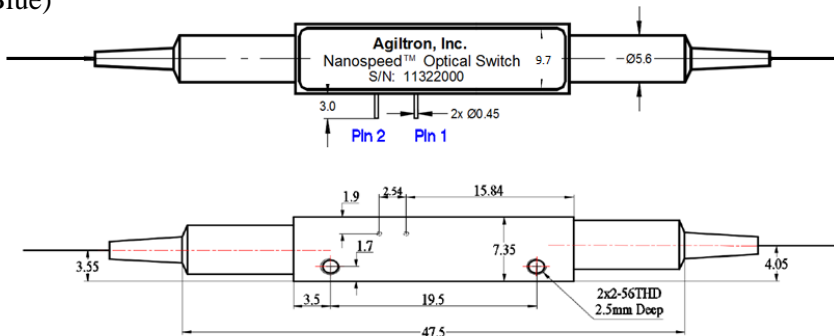
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## Mechanical Dimensions (mm)

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

Output (Blue)

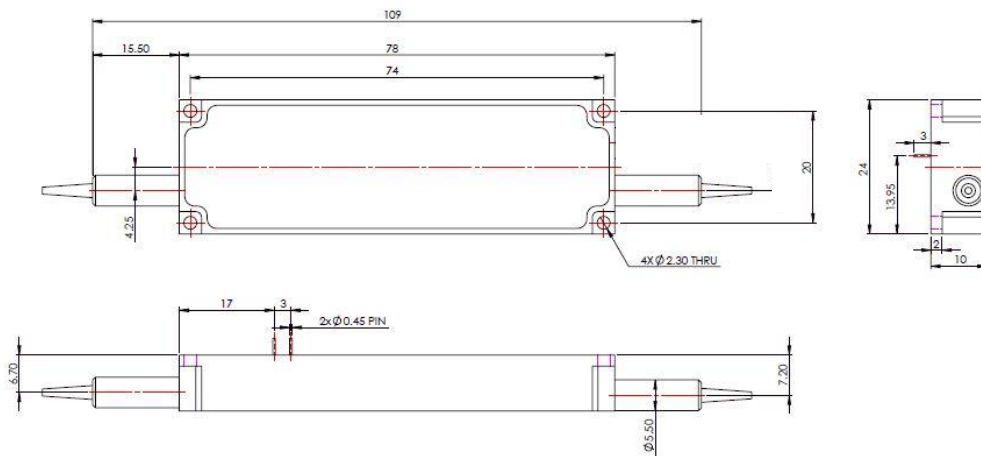
Input (White)



Normal Power VOA

Input (White)

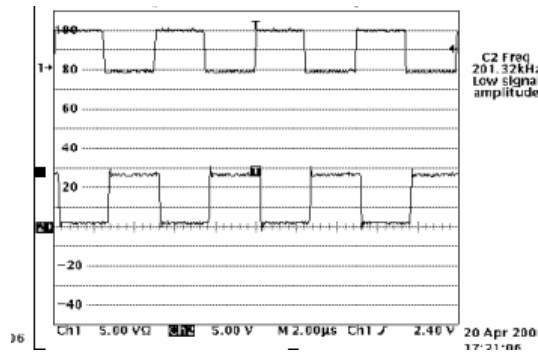
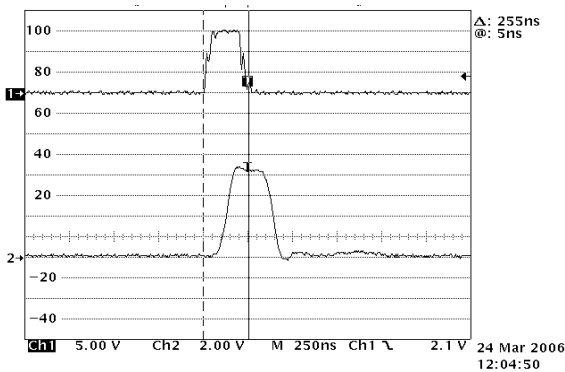
Output (Blue)



High Power VOA

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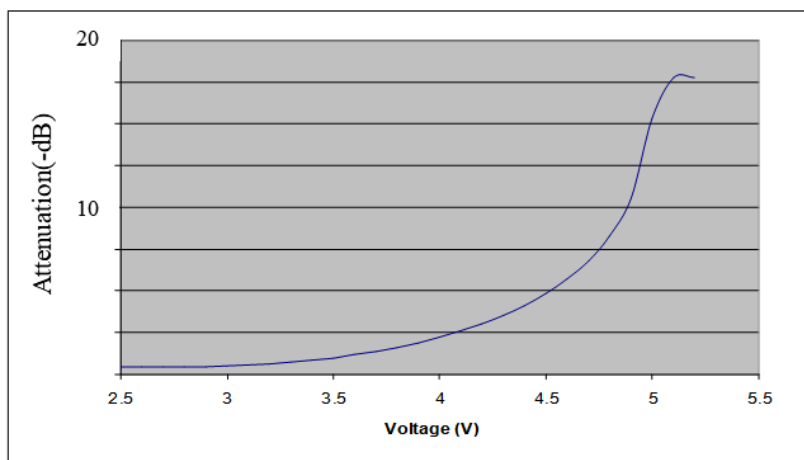
## Typical Speed and Repetition Measurement



## Driving Board Selection

Maximum Repetition Rate	Part Number (P/N)
5kHz	NVDR-111221112
20kHz	NVDR-113235112
100kHz	NVDR-112221112

## Typical Attenuation versus Voltage



\* 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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## 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.

## 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.

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## Ordering Information

Prefix	Type	Wavelength <sup>[3]</sup>	Configuration	Package	Fiber Type	Fiber Cover	Fiber Length	Connector
NMOA- <sup>[1]</sup> NHMA- <sup>[2]</sup>	3 2	1060nm=1 1310nm=3 1550nm=5 780nm=7 850nm=8 660 = 6 Special=0	Transparent = 1 Opaque = 2 Special = 0	Standard <sup>[4]</sup> = 1 Hi Power <sup>[5]</sup> = 2 Special = 0	50/125 = 5 62.5/125 = 6 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]. NMOA – NS Normal Power MMF Optical Attenuator

[2]. NHMA – NS High power MMF Optical Attenuator

[3]. The wavelength shorter than 850nm can be produced in the special version with a long lead time.

[4]. for optical power < =500mW

[5]. for optical power >= 1W

**NOTE:**

“transparent” means no attenuation without applying a controlling voltage, the “opaque” means the highest attenuation without applying a controlling voltage.