NanoSpeed™ 8x8, 8x12, 12x12 Fiber Optical Switch

(100ns, Bidirectional)

DATASHEET

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The NSSB Series high-speed fiber optic switch features ultra-fast switching, exceptionally low optical loss, and high optical power handling in a turnkey rack-mount package with high-speed TTL SMA control inputs. Switching is achieved through a patented electro-optical configuration that delivers clean, ripple-free transitions, ensuring continuous operation for over 25 years with non-mechanical, ultra-high reliability. A non-blocking configuration is constructed using multiple NS 1×2 switches, all managed via five TTL pins for rapid routing among all possible light paths. The NS Series is intrinsically bidirectional and available in either polarization-independent or polarization-maintaining versions. Switching speed is defined by the crystal's rise/fall time, while the repetition rate depends on the tuned driver, with resonances limiting frequency response in certain bands. Each unit ships pre-mounted on a matched driver optimized for the intended operating range. Electrical power consumption varies with switching frequency.

Each switch driver includes a GUI for programming and a command set (API) so customers can develop their own control software. Python and LabVIEW interface libraries; integration support is available for a fee.

Features

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

Applications

- Optical blocking
- Configurable operation
- Instrumentation

Specifications

Parameter		Min	Typical	Max	Unit
Insertion Loss [1]	1900-2200nm		1.6	2.8	dB
	1700~2300nm		0.8	1.8	dB
	1260~1650nm		4	5	dB
	860~1100nm		6	8	dB
	480-860nm		7	10	dB
Cross Talk On/Off Ratio [2]		60	65	70	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	dB
Return Loss		45	50	60	dB
Optical transition time [3]			100	300	ns
Repetition Rate		DC		200	kHz
Optic power Handling [4]	Normal power switches		0.3	20	W
	High power switches			5	W
Operating Temperature	Standard	-5		75	°C
	Large range version	-30		85	°C
Storage Temperature		-40		100	°C

Notes:

[1] Measured without connectors. Wavelength with red color can be implemented in the special version with a long lead time. For 8x12

[2] ±25nm, 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).

RoHS COMPLIANT

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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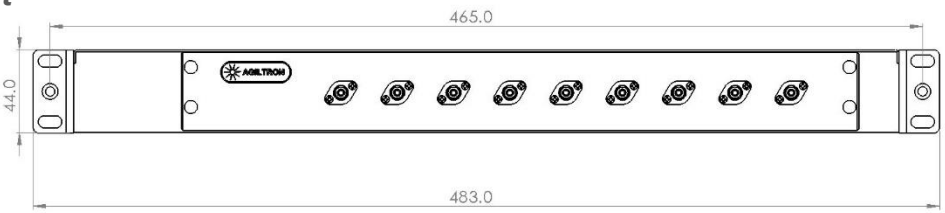
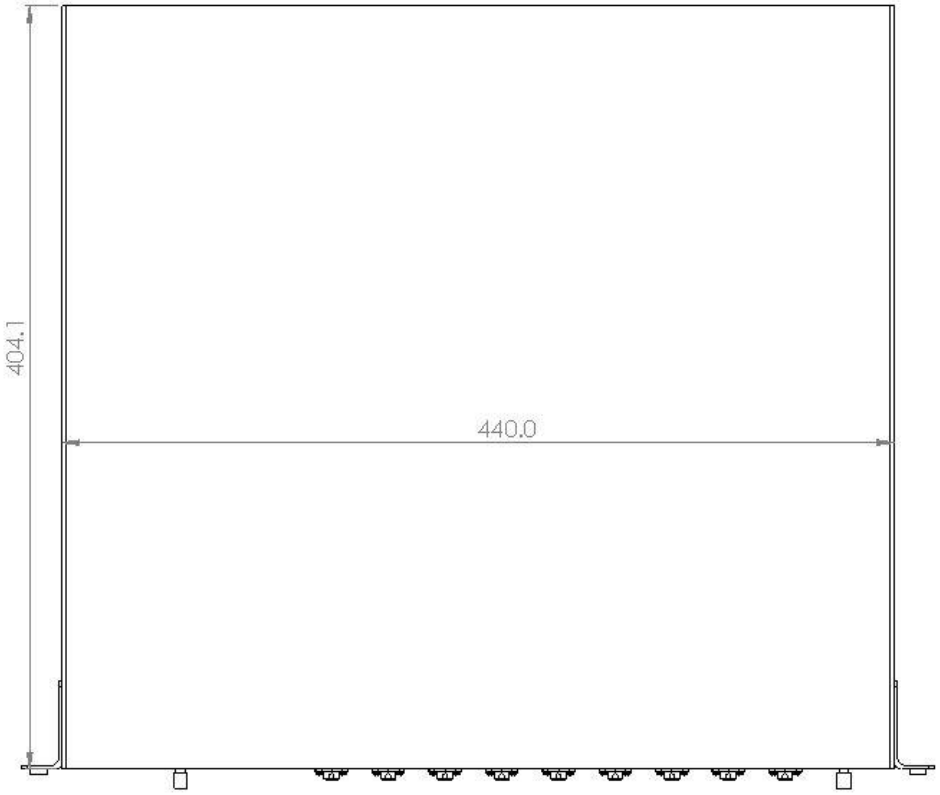
Mechanical Dimensions (Unit: mm)

1U Rack Mount





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

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Ordering Information (Part Number)

8x12 module will be packaged in 2RU 19” mounting rack or similar package. The control interface of TTL will be through D-shape connector.

	☐☐☐☐	☐	☐	☐	☐	☐	☐
Prefix	**Configuration**	**Wavelength**	**Repetition Rate**	**Fiber Type**	**Connector [1][3]**	**Optical Power**	**Interface Code [2]**
NSSB-	8x12 = 0812 8x8 = 0808 12x12 = 1212	1060 = 1 2000 = 2 1310 = 3 1550 = 5 1625 = 6 1750 = A 780 = 7 850 = 8 650 = E Special = 0	100kHz = 1 200kHz = 2 300kHz = 3 Special = 0	SMF-28 = 1 HI1060 = 2 HI780 = 7 PM1550 = 5 PM980 = 9 PM850 = 8 PM1310 = 3 MM50/125 [4]=M 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 E2000 APC = 9 MPO = Y Special = 0	Regular = 1 1W = A 2W = B 5W = C 10W = D 20W = E	Non = N Python = P LabVIEW = L

[1]. Regular fiber connector has PER ~22dB. Connector with PER >27 dB is available using special process

[2]. GUI and a command set (API) are included. Python $**560**. LabVIEW interface libraries $**750**

[3]. 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.

[4]. For laser with mode fill ratio CPR <14

* Rack Mount Depth ~ 430mm.

Note:

- **PM1550** fiber works well for **1310nm**

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.

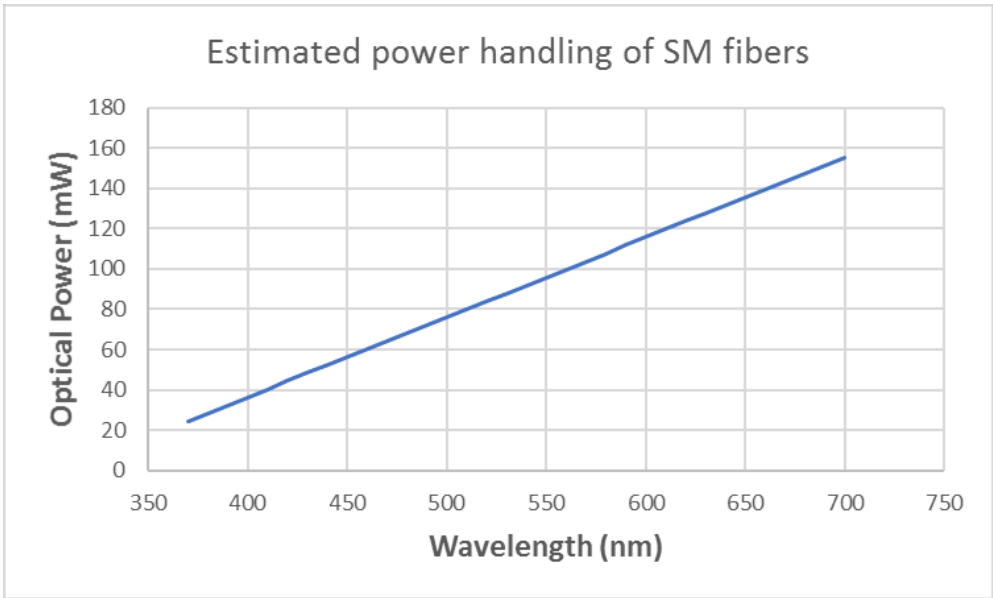
Fiber Cleanliness

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.

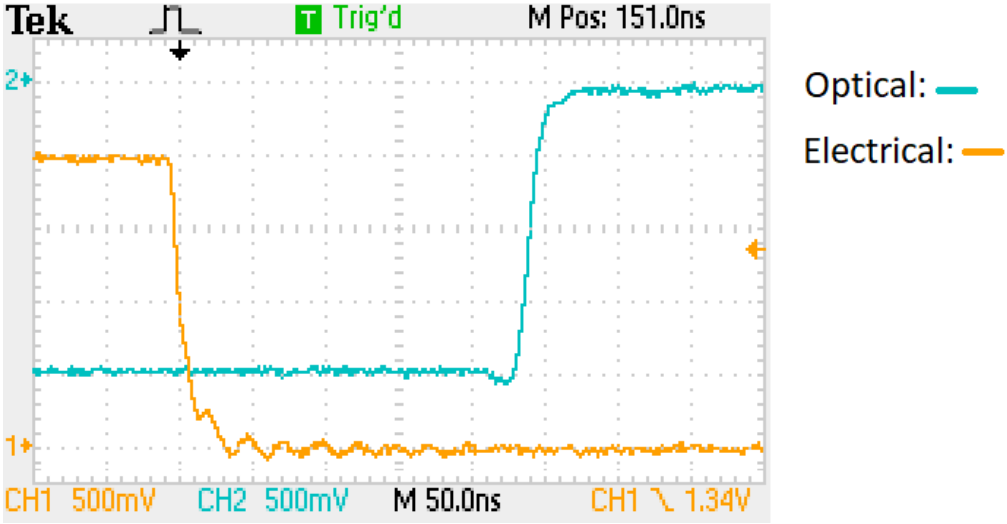
Maximum Optical Input Power

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.

Optical Power Handling vs Wavelength For Single-Mode Fibers



Typical Speed Response Measurement



Ethernet Remote Control with Python

Several options: Telnet, HTTP/JSON API, or VISA Raw Socket mode (SCPI over TCP/IP)

```
############################################################
Telnet:

import telnetlib

HOST = "192.168.0.1"
PORT = 23

#####################
username = "admin"
password="admin"
###################
tn=telnetlib.Telnet(HOST,PORT)

reply=tn.read_until(b"username:",timeout=10)
print(reply.decode("ascii"))#debug
tn.write(username.encode("ascii")+b"\r\n")

reply=tn.read_until(b"password:",timeout=10)
print(reply.decode("ascii"))#debug
tn.write(password.encode("ascii")+b"\r\n")

reply=tn.read_until(b"telnet>",timeout=10)
print(reply.decode("ascii"))#debug

tn.write(b"setswitch 31 32 0 0\r\n")
reply=tn.read_until(b"telnet>",timeout=10)
print(reply.decode("ascii"))#debug

tn.write(b"runswitch\r\n")
reply=tn.read_until(b"telnet>",timeout=10)
print(reply.decode("ascii"))#debug

tn.write(b"quit\r\n")

############################################################
```

Ethernet Remote Control with Python (ending)

Several options: Telnet, HTTP/JSON API, or VISA Raw Socket mode (SCPI over TCP/IP)

```
############################################################
API:
import requests

BASE_URL = "
TOKEN = "TOKEN"
def api_post(path, payload):
    r = requests.post(
        BASE_URL + path,
        json=payload,
        headers={"X-Auth-Token": TOKEN},
        timeout=3,
    )
    r.raise_for_status()
    return r.json()

def api_get(path):
    r = requests.get(
        BASE_URL + path,
        headers={"X-Auth-Token": TOKEN},
        timeout=3,
    )
    r.raise_for_status()
    return r.json()

# Set port 3
print(api_post("/api/set_permanent_port", {"port": 3}))
# Read status
print(api_get("/api/status"))

############################################################
pyVISA:
import pyvisa

HOST = "192.168.0.1"
TOKEN = "TOKEN"

rm = pyvisa.ResourceManager()

inst = rm.open_resource(f"TCPIP0::{HOST}::5025::SOCKET")
inst.read_termination = "\n"
inst.write_termination = "\n"
inst.timeout = 2000  # ms

print("IDN:", inst.query("*IDN?").strip())

# Set port
inst.write("SWITCH:PERMANENTPORT 3")
print("PORT?:", inst.query("SWITCH:PERMANENTPORT?").strip())

# Status
print("STATUS:", inst.query("SWITCH:STATUS?").strip())

############################################################
```