SN SERIES FIBER-OPTIC NETWORK SWITCH

APPLICATION NOTE AND DETAILED SPECIFICATIONS

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JDS Uniphase

SN Series Fiber-optic Switch

1 Introduction

The SN Switch is a single-mode latching switch component ideal for demanding central office applications.

The switch uses collimated beam optics and a specially designed mirror for excellent optical performance. The mirror is inserted in the optical path, redirecting the light to the desired output port. An electronically controlled actuator provides the precise motion for the mirror.

The SN Switch is directly mountable on printed circuit boards and is equipped with status contacts that allow electrical readout of the actual switch position.

JDS Uniphase also provides on request customized modular assemblies that incorporate taps, WDMs, splitters, and other components in a customized package.

Key Features

- 1x1, 1x2 (2x1) and 2x2 latching configurations
- Compact footprint
- Suitable for printed circuit board mounting
- GR-1221-CORE qualified

Applications

- Network switching in central office environments
- Optical network protection and restoration
- Configurable optical add/drop multiplexing
- Transmitter and receiver equipment protection

2 Specifications

The SN Switch takes advantage of a mirror, a proven technology for redirecting light. This free-space optics design has light coupled into and out of the system by using a collimating lens. The electrically controlled actuator moves the mirror into and out of the optical path, redirecting the light to the appropriate output channel. The simple nature of this design allows the switch to operate bi-directionally, either with one input and two outputs (1x2) or two inputs and one output (2x1) for example.

Parameter	Specification	Typical	Units
Wavelength range	1290-1330 *and/or* 1525-1610	-	nm
Insertion loss[1] 1x1, 1x2 2x2	 0.8 1.0	 0.6 0.8	dB
Return loss[2]	≥ 55	60	dB
Polarization dependent loss[2]	≤ 0.1	0.06	dB
Repeatability	≤ ± 0.05	± 0.03	dB
Crosstalk	≥ 60	65	dB
Optical input power (Continuous wave)	< 300	-	mW
Switching time	≤ 8	5	ms
Operating temperature[3, 4]	0 to +65 (or -5 to +70 short term[3, 4])	-	°C
Storage temperature	-40 to +85	-	°C
Humidity[3, 4]	0 to 85 (or 0 to 90 short term[3, 4])	-	% RH

1. Insertion loss is specified for the 1290 to 1330 nm and 1520 to 1610 nm wavelength ranges, all polarization states, and does not include connectors. Add 0.3 dB maximum over operating temperature range.
2. Excluding connectors.
3. The switch can be operated over the short term from -5 to 70 °C for 96 consecutive hours or less and a total of 15 days or less over a one year period.
4. Non-condensing and not to exceed 0.024 kg water per kg of dry air.

3 Electrical Control

Two internal drive coils are used to set the switch in each of the two possible optical states (mirror in optical path, mirror out of optical path). The SN is latching, so the switching current or voltage need only be applied for a short time (i.e., drive signal is a pulse).

The internal relay has a set of contacts that can be used to sense the position of the switch or to operate other circuits based on the switch path chosen.

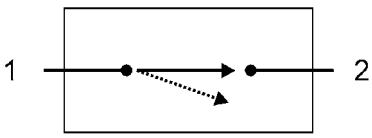
To operate the switch, connect relay coil pins (see table below) using +5 VDC ±10% with an operating current of 40 mA for approximately 20 ms. Once the switch has moved to the new output position, it will remain there until a drive pulse appears on the other drive coil and moves the switch to the other output position. It is not recommended that the switch be operated at cycle rates greater than 10 Hz.

Parameter	Specification	Units	Comments
DC supply voltage (Vcc)	5 +/- 10%	VDC	
Supply current	40	mA	
Nominal input pulse duration	20	ms	Control pulse width. Recommended pulse duration is 18 to 22 ms.
Cycle rate	< 10	Hz	
Switching time*	≤ 8	ms	

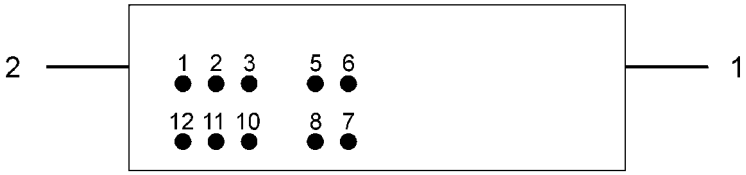
* The elapsed time between power application and achievement of 90% of steady-state value of the new switch state, such that no further drop occurs below 90% of steady-state value for both (all) switch states.

3.1 1x1 Switch

Optical Schematic



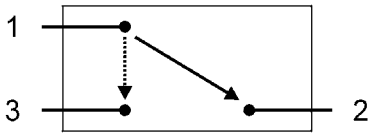
Bottom of the Switch Showing Location of Electrical Pins



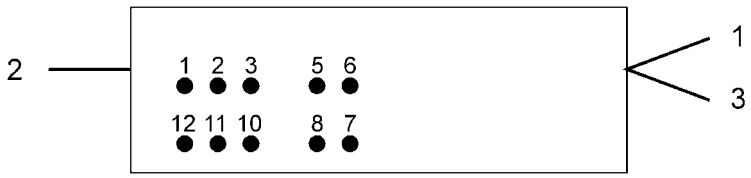
Optical Path	Electrical Drive				Status Contacts			
Pin #	**1**	**12**	**2**	**11**	**3 - 5**	**3 - 6**	**10 - 7**	**10 - 8**
No light	--	--	GND	+5 V DC	Closed	Open	Open	Closed
Port 1 - 2	GND	+5 V DC	--	--	Open	Closed	Closed	Open

3.2 1x2 Switch

Optical Schematic



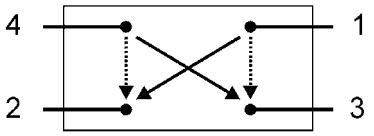
Bottom of the Switch Showing Location of Electrical Pins



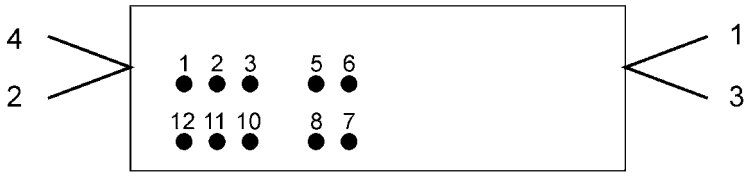
Optical Path	Electrical Drive				Status Contacts			
Pin #	**1**	**12**	**2**	**11**	**3 - 5**	**3 - 6**	**10 - 7**	**10 - 8**
Port 1-3	--	--	GND	+5 V DC	Closed	Open	Open	Closed
Port 1-2	GND	+5 V DC	--	--	Open	Closed	Closed	Open

3.3 2x2 Switch

Optical Schematic



Bottom of the Switch Showing Location of Electrical Pins

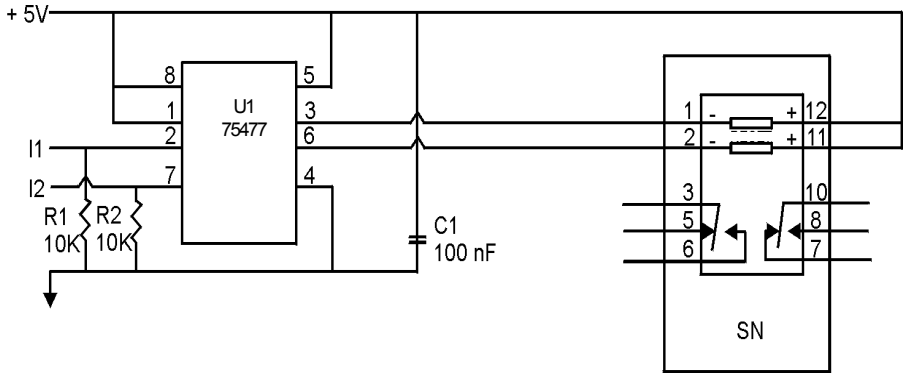


Optical Path	Electrical Drive				Status Contacts			
Pin #	**1**	**12**	**2**	**11**	**3 and 5**	**3 - 6**	**10 - 7**	**10 - 8**
Port 1-3, 4-2	--	--	GND	+5 V DC	Closed	Open	Open	Closed
Port 1-2, 4-3	GND	+5 V DC	--	--	Open	Closed	Closed	Open

4 Recommended Drive Circuit

The recommended drive circuit uses a Texas Instruments 75477 dual peripheral driver chip.

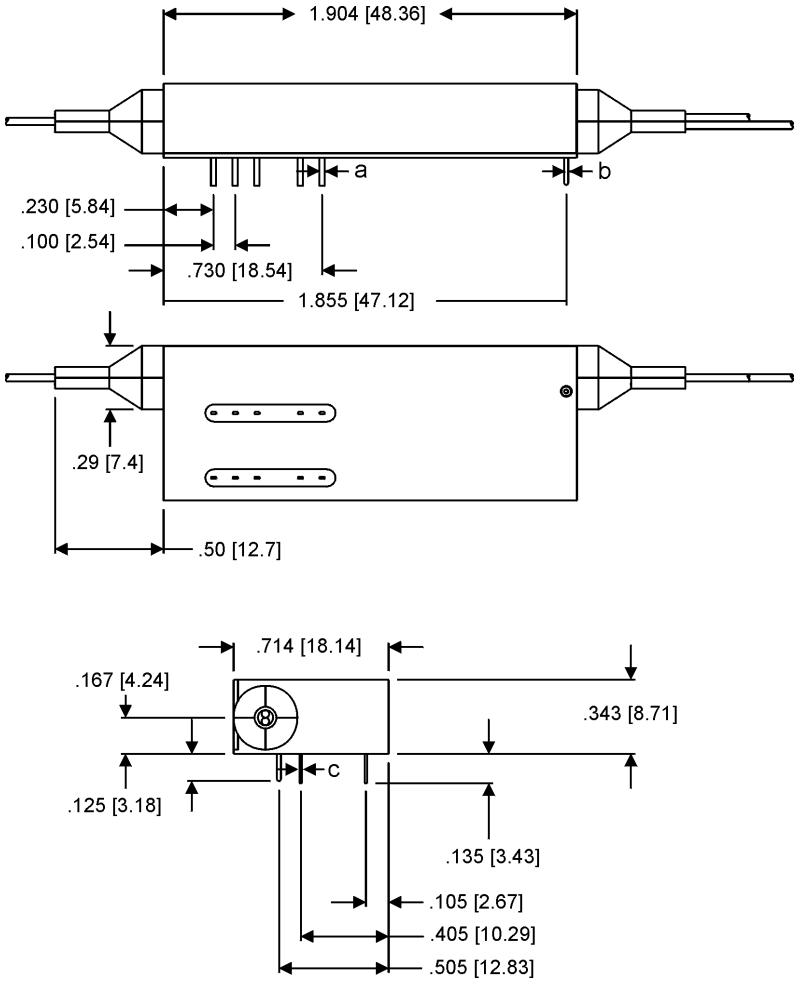
The SN requires that input drive signals I1 and I2 be pulsed, transistor-to-transistor logic (TTL) signals. This ensures that the circuit does not power the switch once it has been set to the required state. If the inputs I1 and I2 are not pulsed signals (for example, constant logic high or low), then a rising edge trigger has to be installed in front of the switch inputs (the switch is a single integrated circuit device). Without this edge trigger chip, the switch is constantly powered when set to the required state.



5 Packaging

The small package design makes the SN Series Fiber-optic Network Switch ideal for mounting on external control PCBs. The pins can be soldered directly to the PCB. A single pin (pin “b” below) aids in PCB mounting and does not have any electronic function. Strain relief sleeves protect fibers connected to the package from inadvertent bends or rough handling.

Basic Dimensions: 48.4 x 8.7 x 18.1 mm (1.91 x 0.34 x 0.71 in)



a 0.024 ±0.004 inches [0.6 ±0.1 mm] (rectangular pin)
b 0.018 ±0.002 inches [0.46 ±0.05 mm] (round pin)
c 0.010 ±0.004 inches [0.25 ±0.1 mm] (rectangular pin)

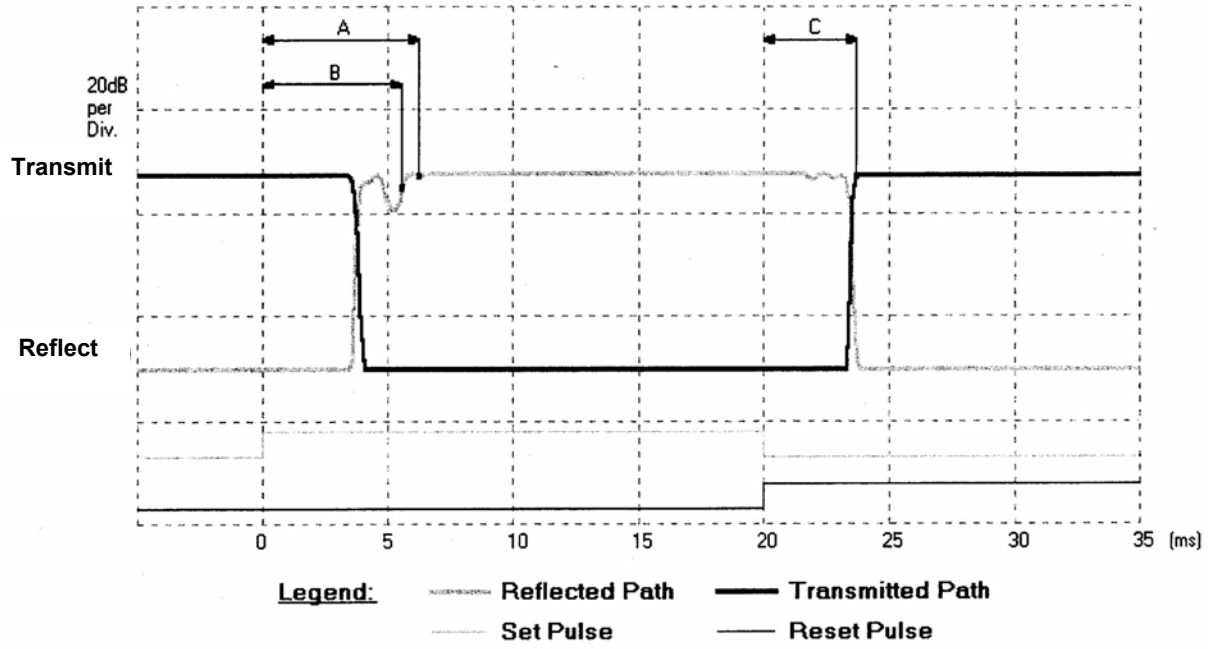
6 Performance

The information included here is intended as a demonstration of the SN switch performance. All information is believed to be reliable or accurate, but JDS Uniphase makes no guarantees nor assumes any responsibility in connection with its use.

6.1 Speed

PART INFORMATION	
Part Number	SN22+107DUFP
Serial Number	A1342

Switching Time (A)	6.30 (ms)
Switching Time (B)	5.60 (ms)
Switching Time (C)	3.80 (ms)
Input	Fiber 4



Definitions:

Switching Time (A): The time between the rising edge of the driving pulse and the time when the optical signal of the reflected path has been stabilized to within 0.45dB of the steady state power. (The optical signal has achieved 90% of the steady state power)

Switching Time (B): The time between the rising edge of the driving pulse and the time when the optical signal of the reflected path has been stabilized to within 3dB of the steady state power. (The optical signal has achieved 50% of the steady state power)

Switching Time (C): The time between the rising edge of the driving pulse and the time when the optical signal of the transmitted path has been stabilized to within 0.45dB of the steady state power. (The optical signal has achieved 90% of the steady state power)

7. Ordering Information

For more information on this or other products and their availability, please contact your local JDS Uniphase account manager or JDS Uniphase directly at 1-800-498-JDSU (5378) in North America and +800-5378-JDSU worldwide or via e-mail at jdsu.sales@jdsu.com.

Sample: SN22+10750FA

SN □□ +10□

Code	Configuration
11	1x1
12	1x2 (2x1)
22	2x2

Code	Control Type
0	Direct control

Code	Fiber Type
2	9/125/250 µm[1]
7	9/125/900 µm

Code	Wavelength
1	1525 to 1610 nm
3	1290 to 1330 nm
5	1525 to 1575 nm
D	1290 to 1330 nm and 1525 to 1575 nm
W	1290 to 1330 nm and 1525 to 1610 nm

Code	Fiber Length
0	1.0 m
5	1.5 m

Code	Connector Type
NC	No connector
FA	FC/APC
FP	FC/HPC
LC	LC/PC
SC	SC/HPC
SP	ST/HPC
SU	SC/APC
MU	MU

1. The 250 µm fiber option is only available with the "no connector" option.