

# MEMS 1xN Fiber Optical Switch

N up to 380 ports, bidirectional



DATASHEET

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## Applications

- Network
- Data Storage
- Sensor System
- Instrument

## Features

- Up to 380 Channels
- 780 to 2100nm
- SM, PM
- Compact
- Low Cost
- Bidirectional
- High Reliability

The MEMS 1xN Fiber Optical Switch is based on a reflecting silicon mirror that directs light from an input fiber to the requested output fiber among the N output fibers. The light path length difference between each state is small. The switch is bidirectional, that can be used as Nx1. It comes mounted on a PCB with control electronics powered by 5-12VDC. TTL control interface is a standard. USB or RS232 with GUI is achieved through an optional adapting board that comes with a wall pluggable power supply and a computer interface cable.

This MEMS platform offers the advantages of low cost and compact size. The on/off ratio, channel isolation, optical power handling, and response speed are less than our digital silicon mirrors-based switches.

## Specifications

Parameter	Min	Typical	Max	Unit
Wavelength	750		2200	nm
Wavelength Range		± 30		nm
Insertion Loss <sup>[1]</sup>	0.7		1.6	dB
Cross Talk <sup>[2]</sup>	30	45	50	dB
Return Loss <sup>[3]</sup>	30		50	dB
Repeatability	0.03		0.05	dB
Polarization Dependent Loss			0.15	dB
Wavelength Dependent Loss <sup>[4]</sup>			0.3	dB
Temperature Dependent Loss			0.3	dB
Switching Time			20	ms
Optical Power Handling			500	mW
Life Time	10 <sup>9</sup>			cycle
Operating Temperature	-5		70	°C
Storage Temperature	-40		80	°C
Power Supply	0		5	VDC
Power Consumption			100	mW

### Notes:

[1]: measured at 1550nm without connectors @CWL ±30nm, 23°C: other wavelength may be larger but less than 2dB. Each connector adds 0.3dB. 0.7dB for 8 ch, 1dB for 12 ch, 1.2dB for 24 ch., 1.4dB for 32 ch., 1.5dB for 48 ch, 1.6 dB for 64 ch.

[2]: 30dB for multimode fiber, 45dB for >single mode 24 ch., 50dB for < single mode 16 ch.

[3]: 30dB for multimode fiber, 50dB for single mode

[4]: @CWL ±30nm, 23°C

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# MEMS 1xN Fiber Optical Switch

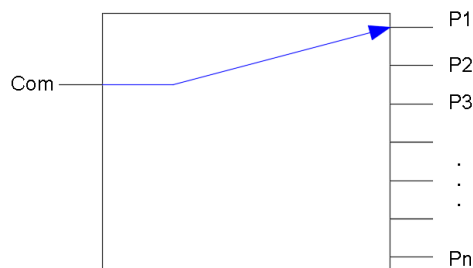
N up to 380 ports, bidirectional



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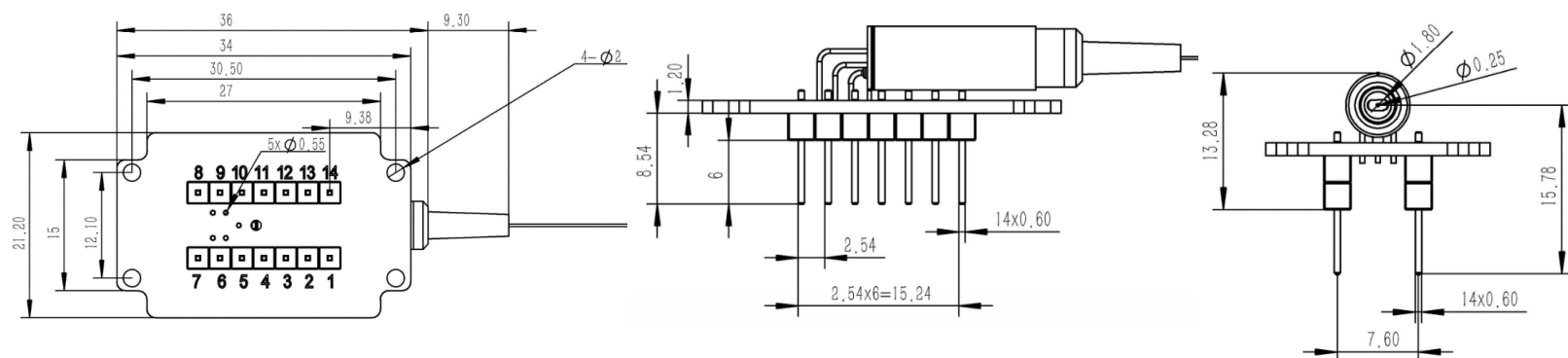
### Optical Path Diagram

Switchable fiber loops in series

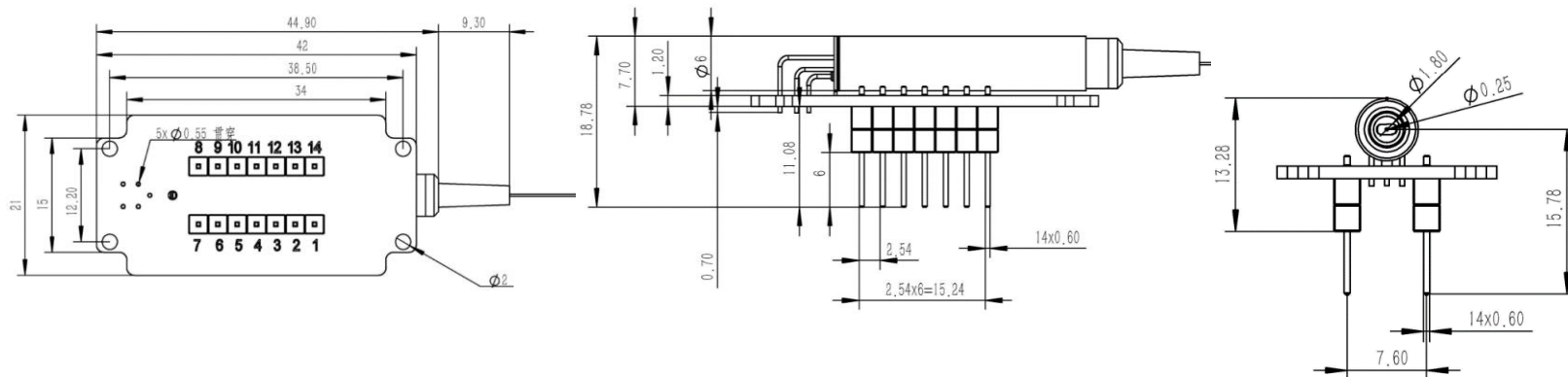


### Dimension (mm)

1x4, 1x8



1x12 to 1x64



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### Ordering Information

	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prefix	Configuration	Wavelength <sup>[1]</sup>	Driver <sup>[2]</sup>	Fiber Type	Fiber Cover	Fiber Length	Connector
MSWH-	1x4 = AA4	1240-1630nm = 1	TTL/USB = 1	SM28 = 1	Bare fiber = 1	0.25m = 1	None = 1
	1x8 = AA8	1550nm = 5	TTL/RS232 = 2	MM50/125 = 2	900um tube = 3	0.5m = 2	FC/PC = 2
	1x12 = A12	1310nm = 3	Non <sup>[2]</sup> = 5	Hi1060 = 3	Special = 0	1.0m = 3	FC/APC = 3
	...	1310/1550nm = B	Special = 0	PM1550 = 4		Special = 0	SC/PC = 4
	1x64 = A64	850nm = 8		MM62.5/125 = 5			SC/APC = 5
	...	850/1310 = C		SM600 = 6			SC/UPC = 5
	1x256 = 256	1060nm = 6		SM1950 = 9			ST/PC = 6
	...	980nm = 9		SM800 = 8			LC/PC = 7
	1x380 = 380	780nm = 7		Hi780 = 7			MTP = 9
		1950nm = D		PM850 = E			LC/APC = A
		895nm = E		PM980 = F			LC/UPC = U
		Special = 0		Special = 0			Special = 0

[1]. Selection of 5, 3, B is the same device as 1, but test at different wavelength with extra cost.

[2]. When selecting **Non**, one needs to have good knowledge and experience with circuit design.

RED indicates special order

#### NOTE:

- ☐ PM1550 fiber works well for 1310nm

Driver Part Number: **SWDR-S1XN2D5VSUSB/TTL**

Driver Part Number: **SWDR-S1XN2D5VSR232/TTL**

### 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.

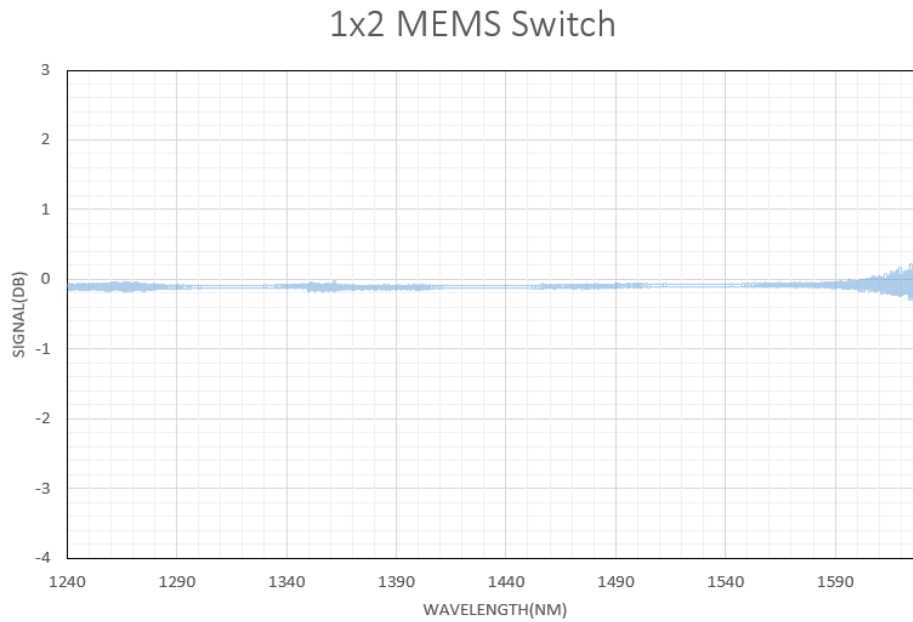
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## Typical Insertion Loss vs Wavelength (1240-1630nm)



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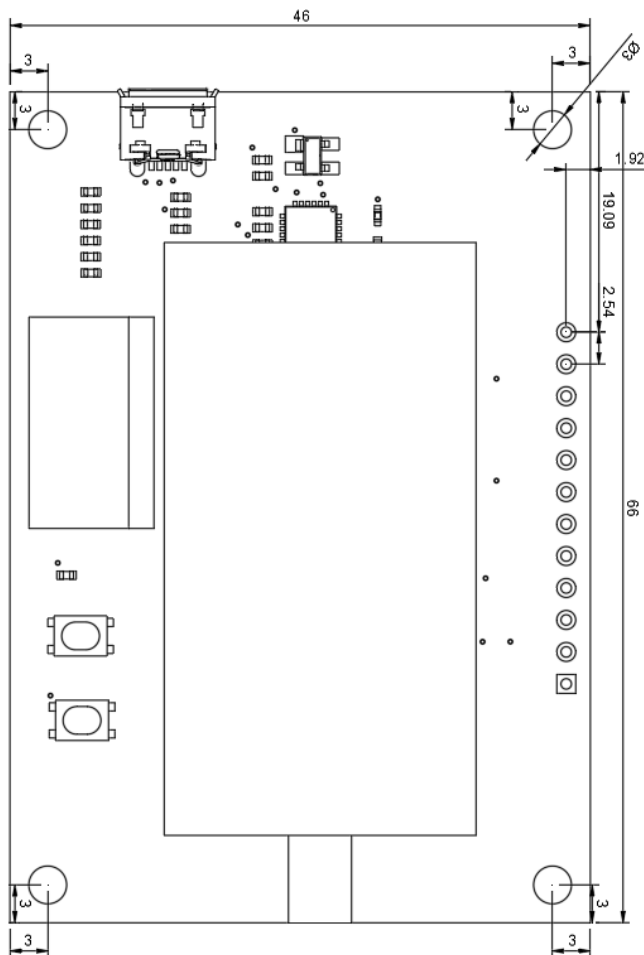


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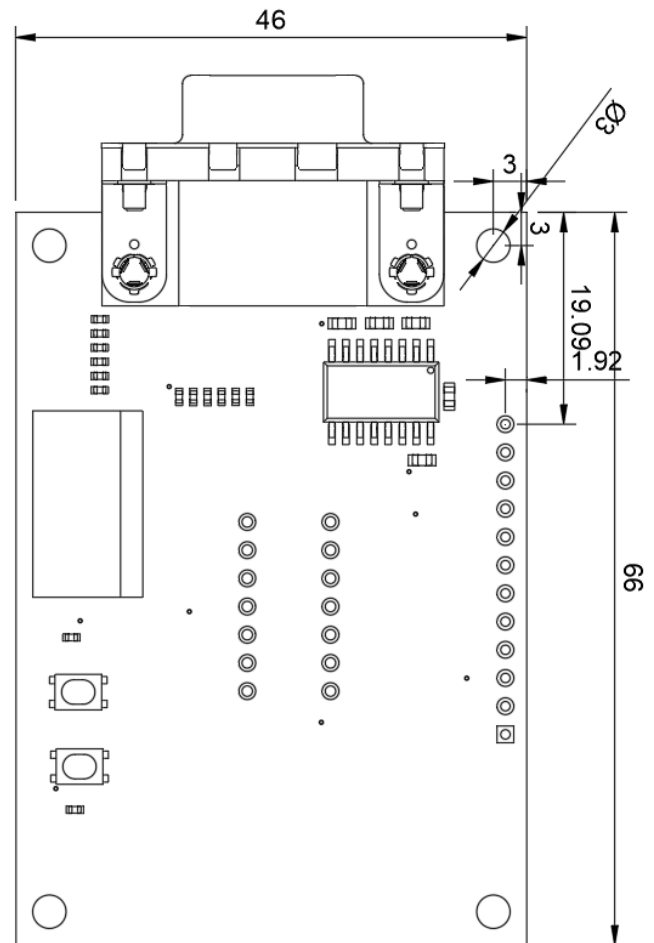
### Driver Description

The MSWH MEMS 1xN Driver (Up to 164 ports) has three control modes: (1) USB/TTL (Virtual COM) with a user-friendly GUI Windows™ program supporting UART commands. The unit has a mini USB connector with a USB-to-MicroUSB cable. It can be powered by a 5V USB cable and USB power supply or via onboard 5V-GND holes. (2) RS232/TTL with a user-friendly GUI Windows™ program supporting UART commands. The unit has an RS232 connector. As shown below the switches are mounted on these driver PCBs and tested prior to shipping. This makes integration or performance evaluation easy. (3) The switches can also be mounted directly onto the customer PCB with 14 pins, following detailed instructions. This approach requires customers to have circuit design experience.

#### USB/TTL Driver



#### RS232/TTL Driver



### Manual Operation Instruction

#### • Power the Board

The unit can be powered up via 5V USB power supply.

#### • Onboard Switch Control

Onboard DIP-6 switch is available for quick TTL function test and fast manual control. After setting the DIP-6 switch, press the STROBE button to change the channel of MEMS 1xN switch.

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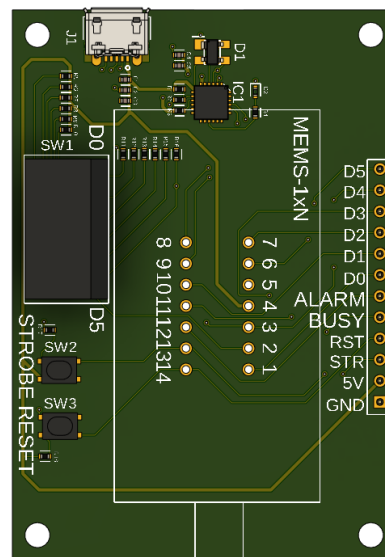
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### TTL Operation Instruction

#### TTL Interface Definition

Name	Direction	Description
5V	Power	The driver board can also be powered up via these two holes.
GND	Ground	
D0-D5	Input	6 Pin TTL
STR	Input	STROBE, Send a pulse to set the switch channel
RST	Input	RESET, Send a pulse to reset switch status
BUSY	Output	Logic HIGH when the device is busy
ALARM	Output	Logic HIGH when the device meets error when booting/ high temperature

CH	D5	D4	D3	D2	D1	D0
1	0	0	0	0	0	0
2	0	0	0	0	0	1
3	0	0	0	0	1	0
.						
64	1	1	1	1	1	1



### Computer Graphic Software User Guide

#### Install the Program

Click on setup.exe for the automatic installation, which should be provided with the product.

#### Run the Program

Run the "Switch Operation Program.exe" and the program will open the configuration window. Select the correct Switch Group and select the specific Switch Type. Then click the "Connect" button and the program will establish the connection between PC and board.



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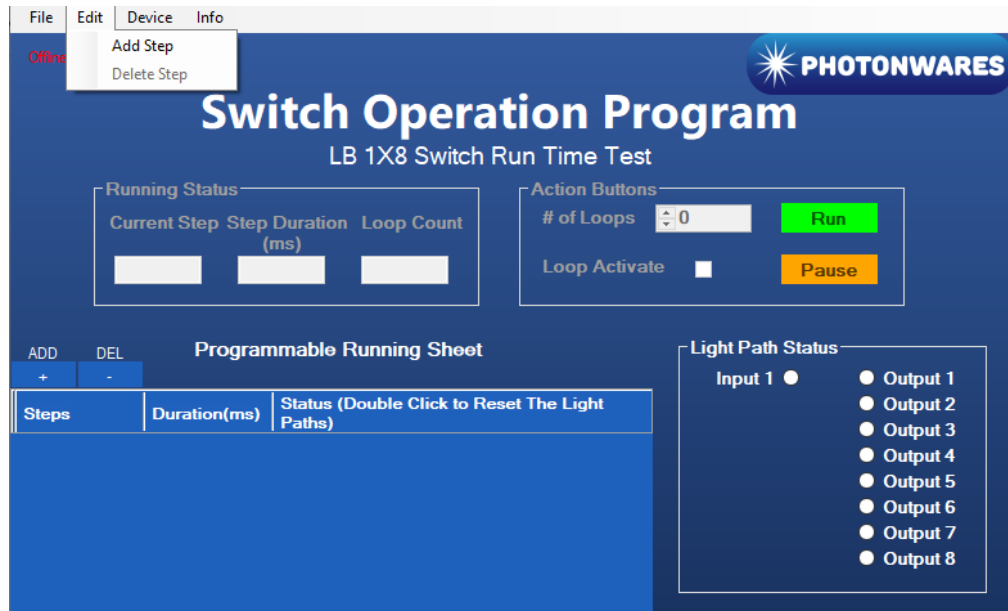
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### TTL Operation Instruction

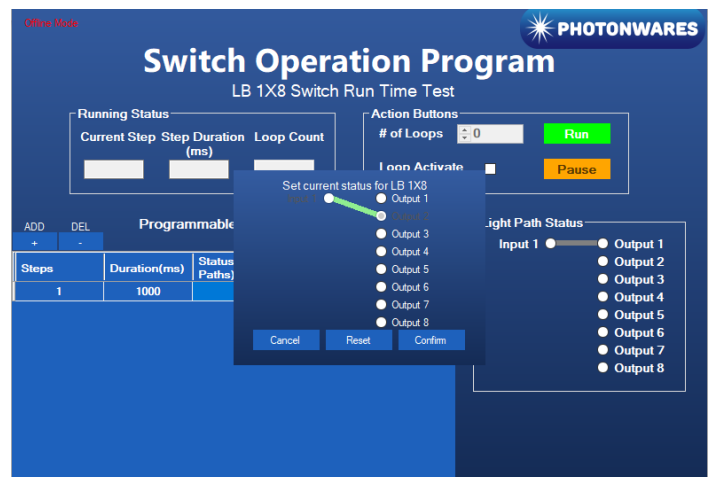
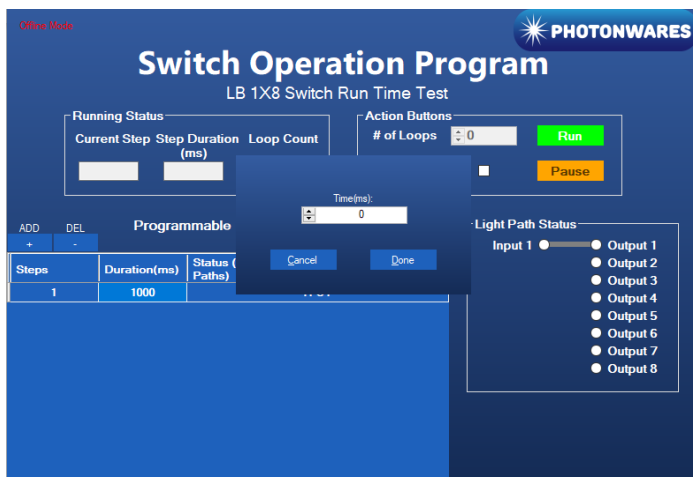
- **Create and edit testing time sequence**

**Add step:** Click the “Add Step” button in the menu strip or click the “+(ADD)” button would both add a step to the Programmable Running Sheet.

**Delete step:** Click the “Delete Step” button in the menu strip or click the “-(DEL)” button would both delete a step in the Programmable Running Sheet.



**Edit step:** There are two things that you can modify for one step. One is the light path, and the other is the duration for each step. Double click the cell that you want to modify, and the program will allow you to modify the setting.



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### Command List

- **Command in Serial**

The serial communication should be set in **115200 baud rate, none parity, 8 data bits, 1 stop bits**.

Command in **ASCII**:

1. Check PN of device:

CMD: \*PN<cr>

RTN: <cr><lf>AB.CD.EFGH<cr><lf>

2. Check SN of device:

CMD: \*SN<cr>

RTN: <cr><lf>ABCDEFGHIJ<cr><lf>

3. Set Channel:

CMD: \*SWABC<cr>

RTN: <cr><lf>CHAN:ABC<cr><lf>

Example: \*SW001<cr> RTN: <cr><lf>CHAN:001<cr><lf>

Note: <cr> is 0x0C in HEX, \n in ASCII