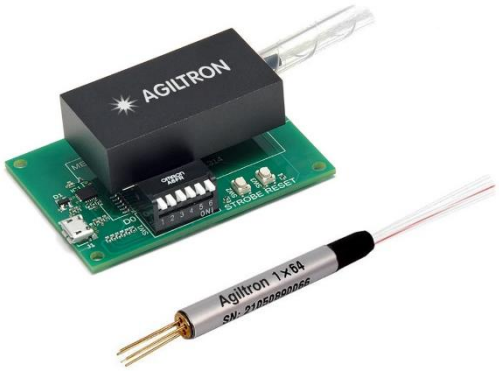
MEMS 1xN Fiber Optical Switch

N up to 380 ports, Crosstalk up to 70dB, Bidirectional, USB, RS232, I2C, TTL

DATASHEET

Return to the Webpage



The MEMS 1xN Fiber Optical Switch utilizes a reflecting silicon mirror to direct light from an input fiber to the requested output fiber among the N output fibers. This design, based on bending single crystal arms that do not fatigue or wear out, ensures high reliability and longevity in switching operations. The light path length difference between states is minimal, and the switch supports bidirectional functionality that can be used as Nx1. Available in single mode, polarization maintaining, and multi-mode. The switch is available as a standalone component and mounted on a PCB with control electronics powered by 5VDC. Standard control interfaces include TTL for components and USB or RS232 with GUI for PCB-mounted versions, which come with a wall-pluggable power supply and a computer interface cable, making them suitable for telecommunications, data centers, and advanced laboratory applications.

Applications

- Network
- Data Storage
- Sensor System
- Instrument

Features

- Up to 380 Channels
- Crosstalk up to 70dB
- 780 to 2100nm
- SM, PM
- Compact
- Low Cost
- Bidirectional
- High Reliability

Specifications

Parameter		Min	Typical	Max	Unit
Wavelength		750		2200	nm
Wavelength Range			± 30		nm
Insertion Loss [1]		0.7		1.6	dB
	<32 Channel	0.4	0.7	0.9	dB
	>32 Channel	1	1.3	1.6	
Cross Talk [2]	SM	55	60	70	dB
	MM	30	45	50	
Return Loss [3]	SM	50	50	55	-dB
	MM	30	30	35	
Repeatability		0.03		0.05	dB
Polarization Dependent Loss (SM)			0.05	0.1	dB
Polarization Extinction Ratio (PM)		18	23	29	dB
Wavelength Dependent Loss [2]				0.3	dB
Temperature Dependent Loss				0.2	dB
Switching Time			5	10	ms
Actuation			No-latching		
Optical Power Handling				500	mW
Life Time		10^{10}			cycle
Operating Temperature		-5		70	°C
Storage Temperature		-40		80	°C
Power Supply		0		5	VDC
Operation Current				500	mA
Digital Logic High		3.3		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.
At 750nm, the loss is about 3dB for 1x8

[2]: @CWL ±30nm, 23°C

[3]: measured without connectors. With FC/ACP single mode fiber RL~60dB, and multimode fiber <40dB

Note: The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link]:

Rev 06/02/25

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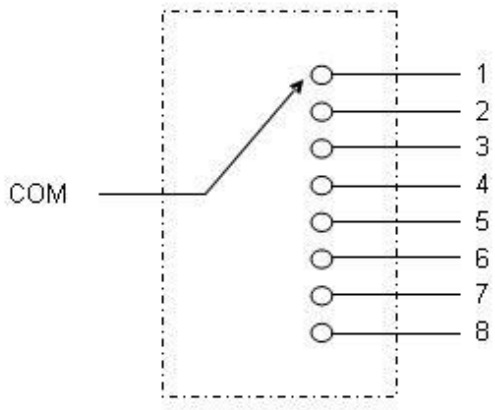
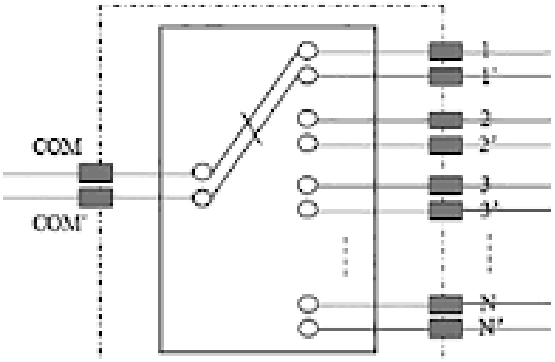
Optical Path Diagram



- 1x8



- Duplex 1xN

Three Package Formats

- Device (with calibration table)

- Mounted on TTL PCB with PINS

- Mounted on USB/RS232/TTL PCB with Power Supply

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Power Cord

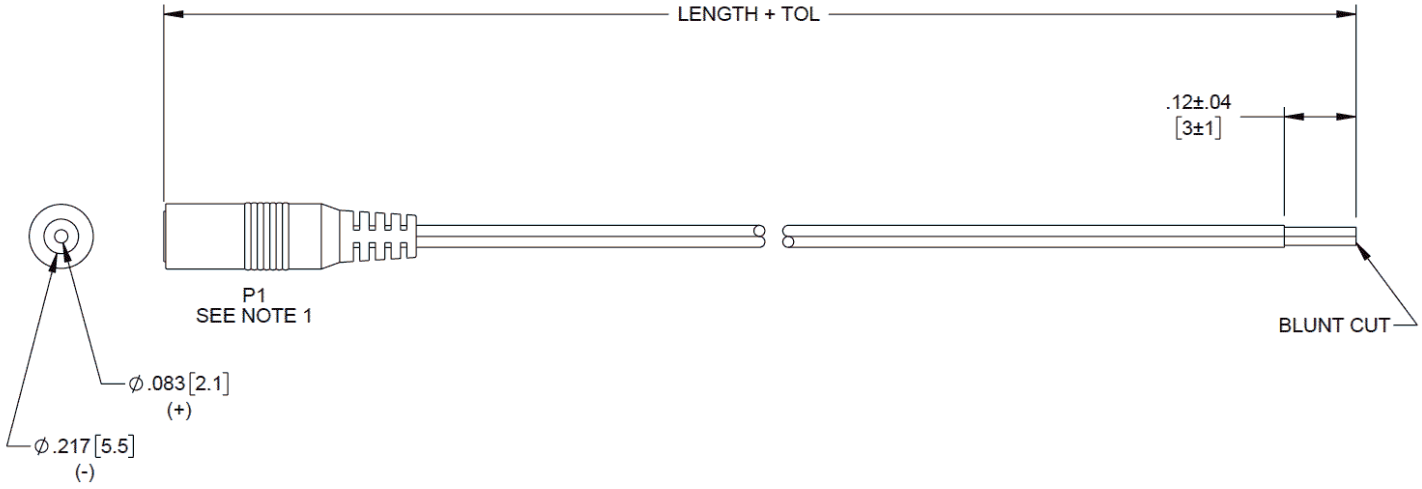
DC Power Cable, 5.5mm/2.1mm Female To Open, 2-Foot

The DC power cable with a 5.5mm/2.1mm female to open connector configuration. Our 2-foot long DC cable assembly is used in numerous small devices from household appliances and devices to network extenders and switches. This DC power cable is suitable for device manufacturing, network wiring, industry, telecom, office installation, DC power adapters, AC power cords, switches and extenders, USB cables, and power to small device applications. Our 2-foot power cables have a center-positive connector.

NOTES:

1. MATERIAL:
   CABLE: 22 AWG, 2 CONDUCTORS,
   PVC JACKET OD: .071 X .142 ±.006 [1.8 X 3.6 ±0.15]
   MARKING: AWM 2468 80°C 300V 22AWG*2C VW-1
   P1 PLUG: DC ø 5.5 X 2.1 mm FEMALE, NICKEL PLATED SHELL, INSULATOR COLOR: BLACK
   MOLDED PVC BOOT.
2. ELECTRICAL TEST:
   100% OPEN SHORT AND MISS WIRE TEST.
   CONDUCTIVE RESISTANCE: 0.2 Ω MAX.
   INSULATION RESISTANCE:10 MΩ MIN AT 300V DC.

REGULATORY COMPLIANCE:
EU RoHS DIRECTIVE (MOST RECENT RELEASED VERSION).



WIRING MAP	
P1	OPEN
(+) ---------- RED ----------	
(-) ---------- BLK ----------	

ITEM NO.	LENGTH	TOLERANCE
50-161-1FT	12 [305]	+1.4 [35] / -.6 [15]
50-161-2FT	24 [610]	+1.4 [35] / -.6 [15]
50-161-3FT	36 [914]	+1.4 [35] / -.6 [15]

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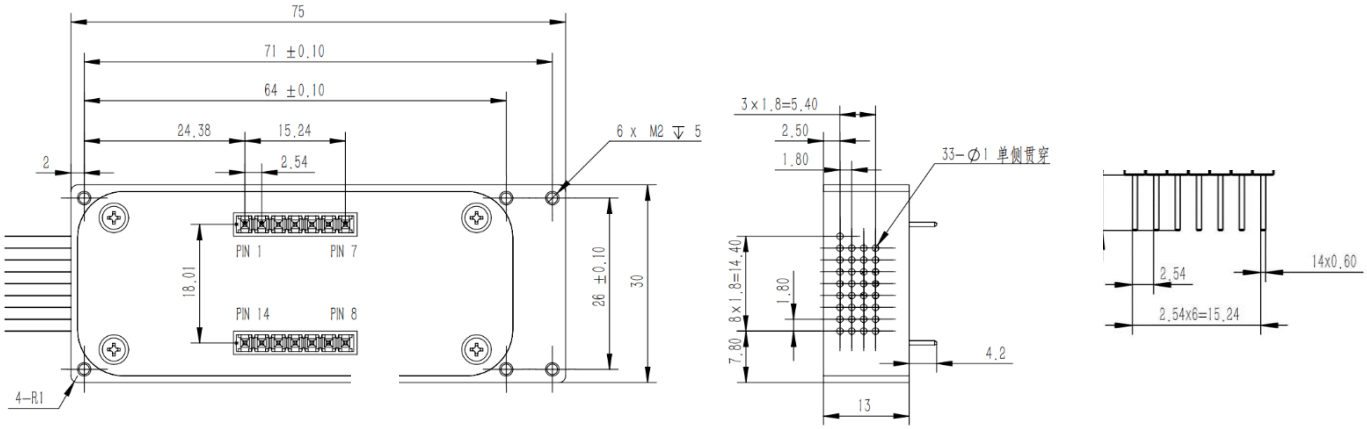
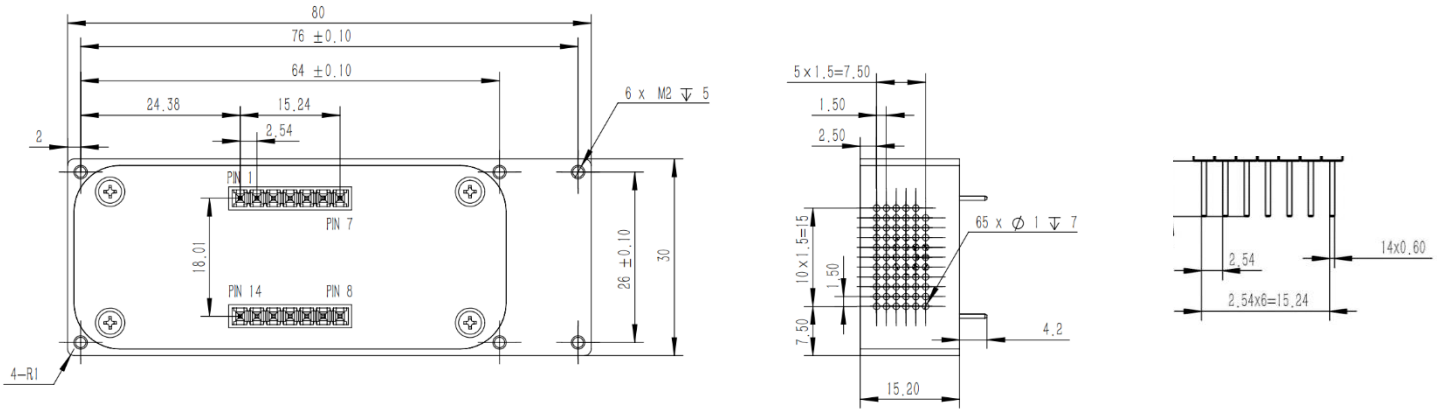
Dimension (mm)

Module Type 1 (1xN, 2 < N ≤ 32)



Module Type 1 (1xN, 48 ≤ N ≤ 64)



PIN Definition

Pin	Type	Description	Input/Output	Remark
1	D0	Parallel Data Interface 0	Input	TTL (H level default)
2	D3	Parallel Data Interface 3	Input	TTL (H level default)
3	D4	Parallel Data Interface 4	Input	TTL(H level default)
4	VIN	Power Input	Input	DC 5V~12V
5	GND	GND	Input	
6	D5	Parallel Data Interface 5	Input	TTL (H level default)
7	D2	Parallel Data Interface 2	Input	TTL (H level default)
8	TX	Serial port send	Output	TTL
9	RX	Serial port receive	Input	TTL
10	D1	Parallel Data Interface 1	Input	TTL
11	BUSY	Busy signal, high level indicates busy	Output	TTL
12	ALARM	Alarm signal, high level indicates high temperature or Initial Abnormal	Output	TTL
13	STROBE	Signal of parallel port selection, falling edge is effective	Input	TTL (H level default)
14	RESET	Hardware reset, low level effective	Input	TTL

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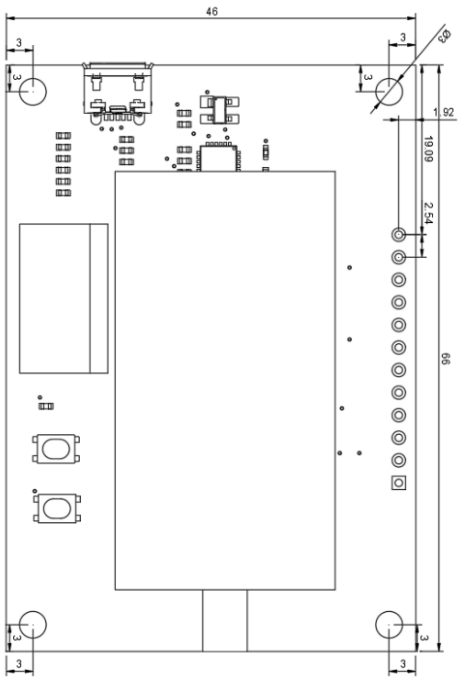
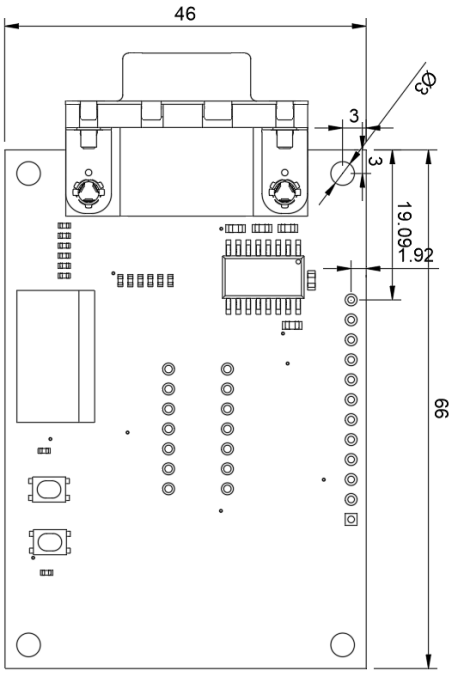
Dimension (mm) 1x64

1xN, 2<N≤64 on USB/ TTL PCB



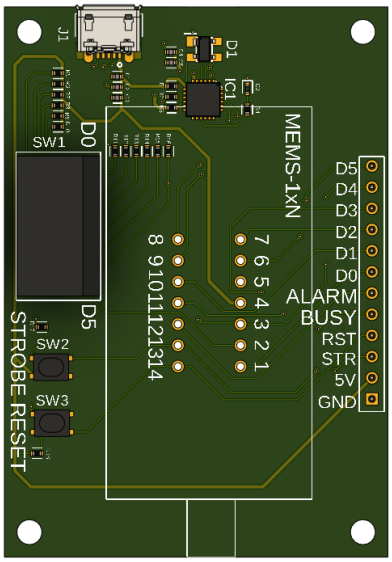
1xN, 2<N≤64 on RS232/TTL PCB



Interface Definition (1x64)

Name	Direction	Description
5V	Power	The driver board can also be powered up via these two holes.
GND	Ground	
D0-D5	Input	6 Plip Switches
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



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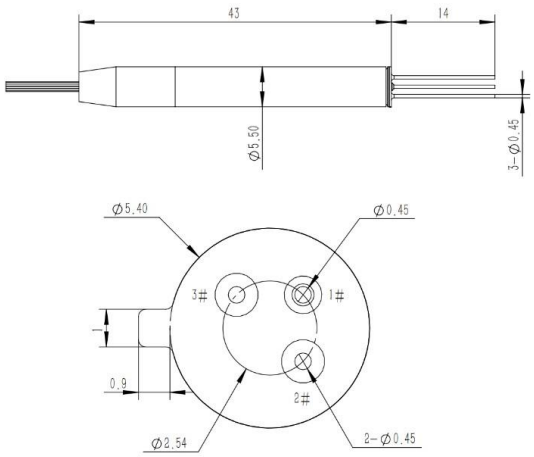
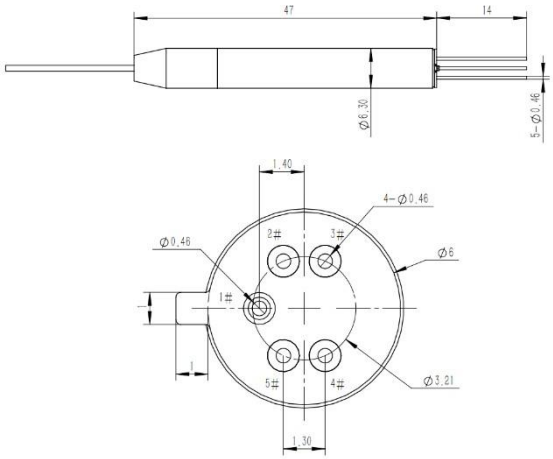
Dimension (mm)

1xN, N<16



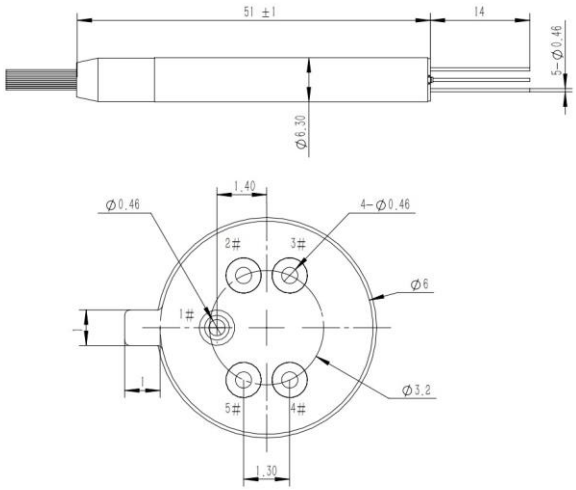
Pin number	Description
1	GND
2	Axis Y
3	Axis X

1xN, 16<N<32



Pin number	Description
1	GND
2	Axis X+
3	Axis Y-
4	Axis X-
5	Axis Y+

1xN, 32<N<64



Pin number	Description
1	GND
2	Axis X+
3	Axis Y-
4	Axis X-
5	Axis Y+

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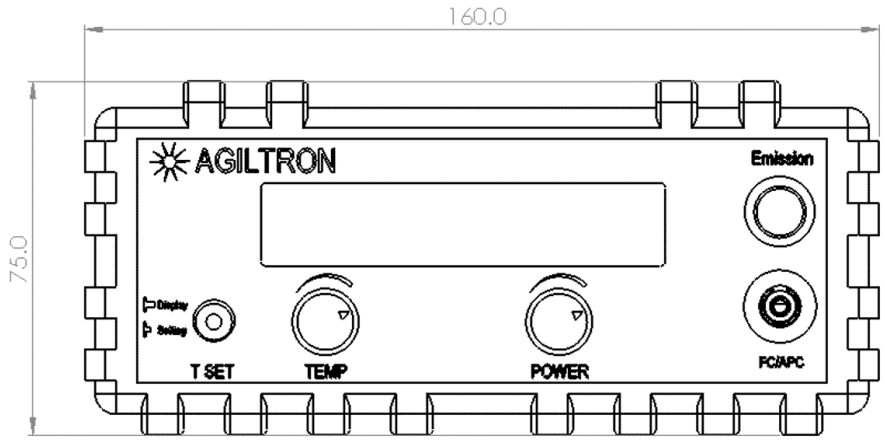
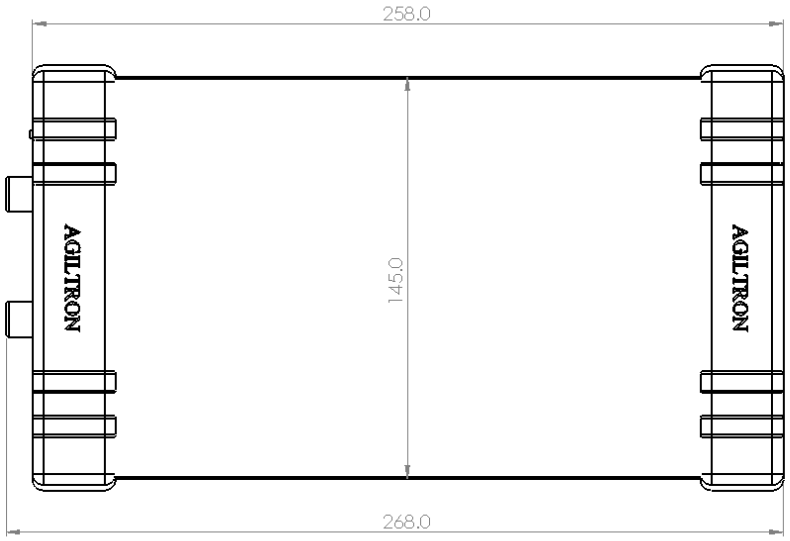
Mechanical Dimension (mm) -- Benchtop





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Ordering Information

	☐☐☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Configuration**	**Center Wavelength [1]**	**Driver [2]**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector**	**On/Off**	**PER**	**Enclosure**
MSWH-	1x4 = AA4 1x6 = AA6 1x8 = AA8 1x12 = A12 ... 1x64 = A64 ... 1x256 = 256 ... 1x380 = 380	1240-1680nm = 1 1550nm = 5 1310nm = 3 1310/1550nm = B 850nm = 8 760-1360nm = C 1060nm = 6 980nm = 9 780nm = 7 1950nm = D 895nm = E Special = 0	USB/TTL = 1 RS232/TTL = 2 TTL = T I2C = C Special = 0	SM28 = 1 50/125 = 2 Hi1060 = 3 PM1550 = 4 62.5/125 = 5 SM600 = 6 SM1950 = 9 SM800 = 8 Hi780 = 7 PM850 = E PM980 = F PM1310 = D Special = 0	Bare fiber = 1 0.9mm tube = 3 Special = 0	0.25m = 1 0.5m = 2 1.0m = 3 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 SC/UPC = S ST/PC = 6 LC/PC = 7 MTP = 9 LC/APC = A LC/UPC = U MPO = Y Special = 0	Regular = 1 SM/PM>62dB = 2 MM>50dB = 3	Non = N Regular = 1 23 = 2 29 = 3	None = 1 Benchtop = B Rack = R

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

RED indicates special order

Note:

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

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

Driver Part Number: **SWDR-S1XN2D5VSRS232/TTL**

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.

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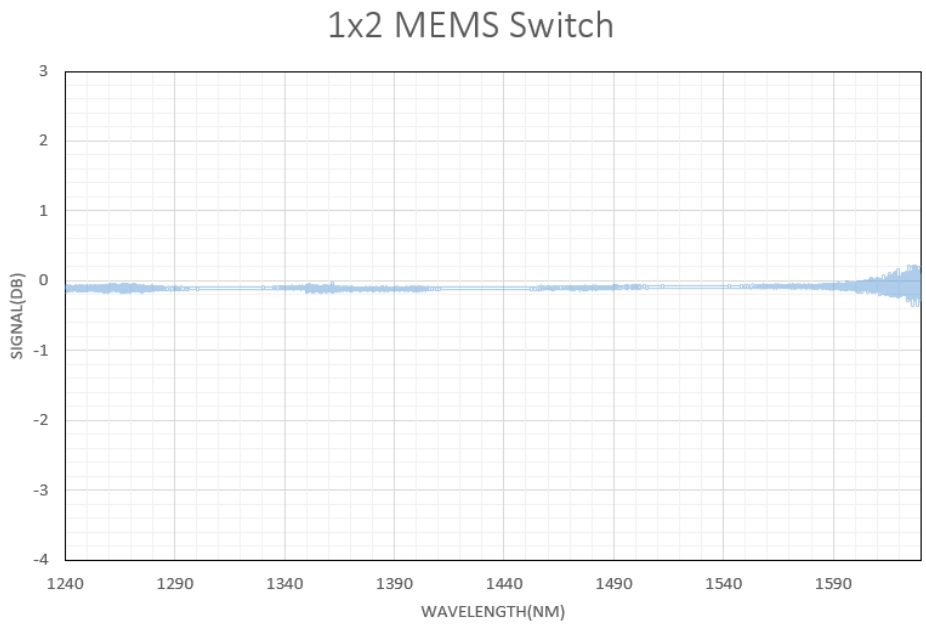
Typical Insertion Loss vs Wavelength (1240-1630nm)



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.

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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Command List (we provide service to write LabVIEW and python for customer integration)

- **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

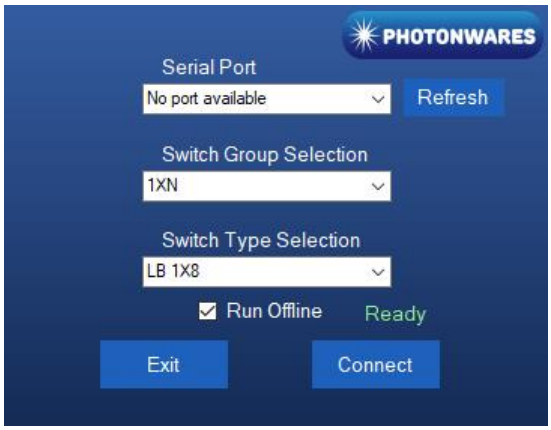
GUI User Guide

- **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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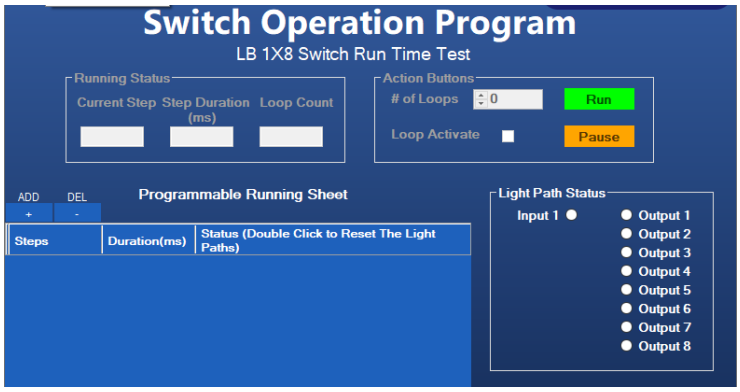
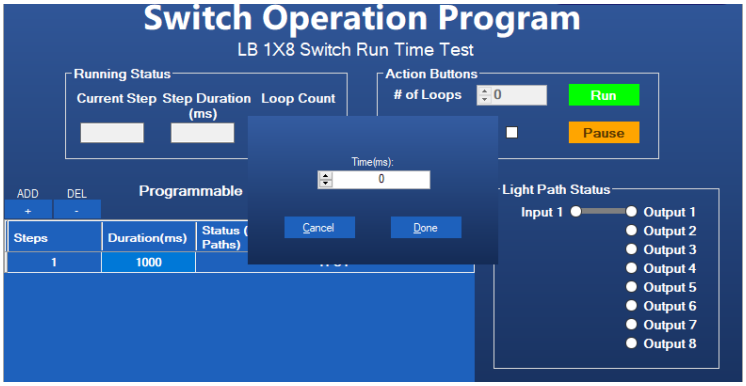
Operation Instruction

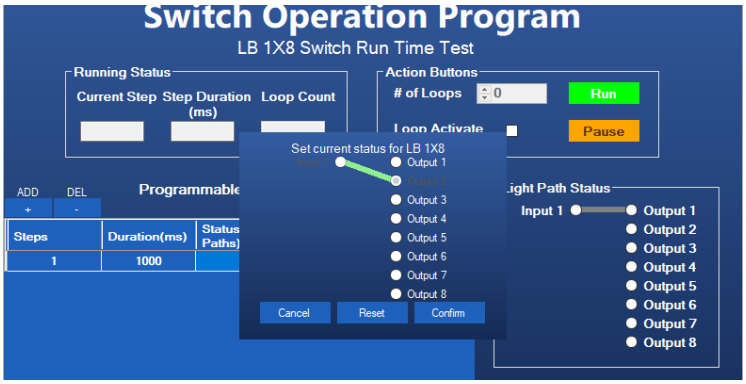
1. Add Step: Click the “Add Step” button in the menu strip or click the “+(ADD)” button to add a step to the Programmable Running Sheet.



2. Input Duration: Click the “Duration” button in the Programmable Running Sheet. Input time duration in ms.



3. Input Lightpath : Click the “Status” button in the Programmable Running Sheet. Select and input lightpath.



4. Add Another Step: The above process can be repeated to create a sequential running receipt.
5. 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.
6. 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.
7. Running: The entered receipt can be running repletely in loops. Enter loop number in the “Action Button”. Click “Run” to start the switching receipt. The process can be paused by clicking “Pause” or stopped by clicking “Run”
7. Display: All aspects of the switch action in the Programmable Running Sheet will be displayed by boxes, color, and visual lines.