



# MEMS 1×N PM Optical Switch

## 1. Application:

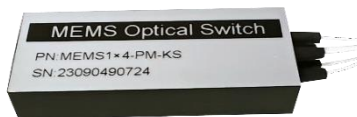
**MEMS-1XN ( $N \leq 8$ ) PM optical switch** type single mode optical switch module

is a light path switching function of the device, which has the following purposes:

- Multiple optical monitoring in optical transmission system
- LAN multi-light source / detector automatic transfer, light sensing multi-point dynamic monitoring system
- Optical test system for optical fiber, optical devices, network and field engineering cable test
- Optical devices installed

## 2. Product Features:

- Low loss, high reliability
- Simple parallel or serial port interface control
- Modular design



## 3. Technical Parameter:

- Working wavelength: 1550±20nm
- Fiber Ttype: PM1550 (9/125)
- Connector type: FC/APC(Slow axis alignment)
- Fiber length: 500±50 mm
- Insertion loss: ≤1.2dB
- Return Loss: ≥50dB
- Polarization dependent loss: ≤0.15 dB
- Wavelength dependent loss: ≤0.3 dB
- Temperature dependent loss: ≤0.3 dB



- Min. Extinction Ratio:  $\geq 17\text{dB}$
  - Repeatability:  $\leq \pm 0.05\text{dB}$
  - Channel crosstalk:  $\geq 50\text{dB}$
  - Switching time:  $\leq 10\text{ms}$
  - Optical power:  $\leq 500\text{mW}$
  - Durability:  $\geq 10$  billion
  - Operating temperature:  $-5 \sim +70^\circ\text{C}$
  - Storage temperature:  $-40 \sim +85^\circ\text{C}$
- Power supply: DC  $5\text{V} \pm 5\%$

## II. The appearance and installation

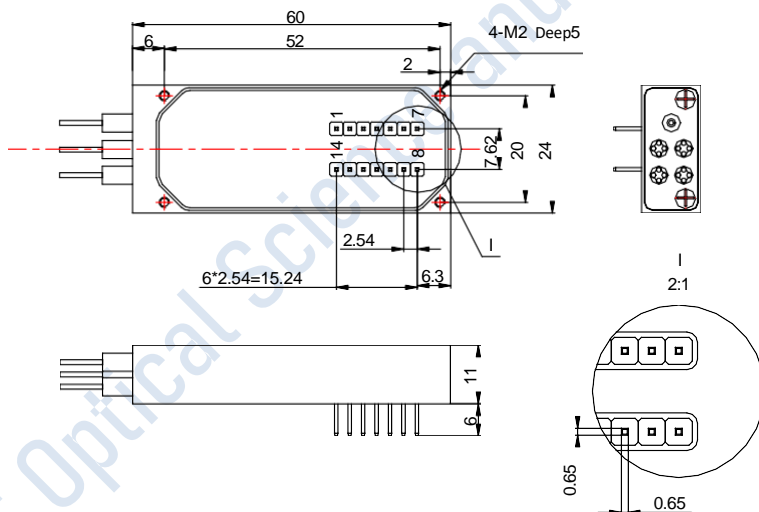


Figure 1 Dimensions

When installing the optical switch module, the optical fiber must not be bent excessively (refer to FIG. 2), so as not to affect the performance index of the optical switch module

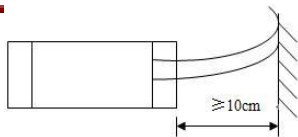


Figure 2 Optical installation diagram

### III. Pin Configure

#### 4. Specification Digital Interface Electrical

	ELECTRICAL INTERFACE	SPECIFICATION
1	Supply Voltage	5V ± 5%
2	Power Consumption	< 500 mW
3	Electrical control method	UART or Parallel mode (TTL level)

#### 5. Digital Interface Pin Assignment

PIN #	NAME	DESCRIPTION
1	NC	No physical internal connection
2	VCC	Power Supply (5V)
3	STROBE	Falling Edge Active (input)
4	GND	Signal Ground
5	D0	Data 0 (input)
6	D1	Data 1 (input)
7	D2	Data 2 (input)
8	D3	Data 3 (input)
9	UART TX	UART Transmit (output)
10	UART RX	UART Receive (input)
11	GND	Case Ground
12	RDY	Ready (output), used for internal debugging
13	MODE	0=TTL, 1=UART (input)
14	RESET	0=Reset (input)

**Note:**



- (1) . The digital interface is LVTTTL level.
- (2) . Input control signal threshold level: Input logic high: 2V min. Input logic low:0.8V max
- (3) . All unused inputs of the device must be held at logic high or GND to ensure proper device operation.

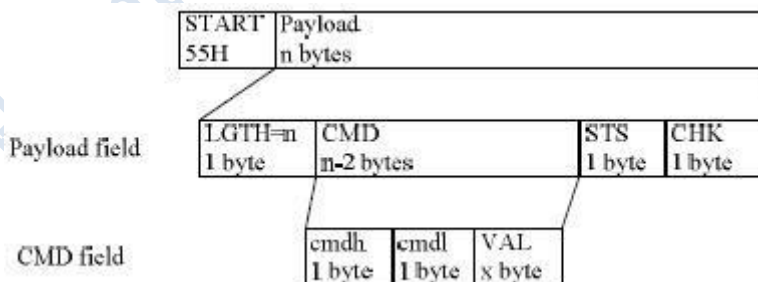
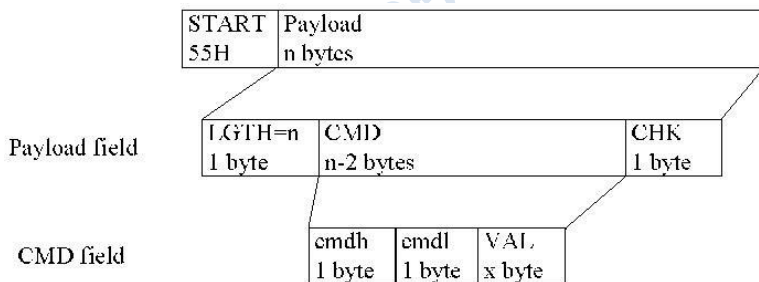
## IV. UART Interface

### 1. Specification Digital Interface Electrical

Parameter	Value	Unit
Baud Rate	115200	Baud
Data Bits	8	Bits
Parity	None	
Stop bits	1	Bit
Flow control	None	

### 2. UART Protocol

#### Command/Response Format





**Command Format:<START><LGTH><cmdh><cmdl><VAL><CHK>**

<START> Start byte, for synchronization 0x55  
<LGTH> Num of characters in command, except <START> byte,  
including <LGTH>  
<cmdh> Command or data, high byte  
<cmdl> Command or data, low byte  
<VAL> Command parameter (in addition to show that with the parameters of the ASCII,  
other all use Hex)  
<CHK> One byte Checksum

**Response Format: <START><LGTH><cmdh><cmdl><VAL><STS><CHK>**

<START> Start byte, for synchronizing 0x55  
<LGTH> Number of characters in command response except START byte, including  
<LGTH>  
<cmdh> Response command or data, high byte  
<cmdl> Response command or data, low byte  
<VAL> Command parameter  
<STS> Command execution status code  
<CHK> One byte checksum

**Notes:**

1) The command execution status code <STS> can have the following values:

Statuscode	Description
0x00	Command executed successfully
0x01	Frame format error
0x02	Checksum error
0x03	Command parameter error
0x04	Execution failed
0x05	Execution timeout
0x06	Module is not ready
0x07	Command error
0x08	Device without calibration data
...	Reserved

2) The <START> byte is used for synchronization. The module requires a 0x55 byte at



- 3) the beginning of a command.
- 4) Checksum calculation:  
Send Check Byte =  $(LGTH \oplus cmdh \oplus cmdl \oplus VAL) + 1$ .  
Return Check Byte =  $(LGTH \oplus cmdh \oplus cmdl \oplus VAL \oplus STS) + 1$ .  
For the above " $\oplus$ " is XOR.
- 5) In UART mode, the unit must receive a 0x55h byte to start up transmission. To avoid data loss, the device uses 0x55h as the frame head, and this means that 0x55 cannot be used again in the frame. Each 0x55h byte that appears in the frame must be replaced with the two bytes 0x56h 0x56h. If a 0x56h appears in the frame it must be replaced with the two bytes 0x56h 0x57h.

Data byte	Replaced with
55h	56h 56h
56h	56h 57h

When replacements are made, the checksum calculation uses the original data byte values.

Example:

Original data frame: 0x55, 0x05, 0x00, 0x02, 0x55, CHK

Sent data frame: 0x55, 0x06, 0x00, 0x02, 0x56, 0x56, CHK

The two frames will have the same CHK value, based upon the bytes in the original data frame. Expect the head byte is 0x55, other byte should not appear 0x55 in one frame, including LGTH and CHK bytes.

Example:

Original bytes: 0x55 0x08 0x80 0x10 0x0 0x0 0xFF 0x33 0x55

Corrected bytes (these are sent to the UART): 0x55 0x08 0x80 0x10 0x0 0x0 0xFF 0x33 0x56 0x56

- 6) When there is a frame format error or command error, the return frame does not necessarily need to return command parameters.

Example: Return data frame in event of frame format error or command error: 0x55 0x05 0x00 0x00 STS CHK

### 3. Command List

Code	Description	Note
0x0001	Query manufacturer ID	Send command parameters: 0 bytes Return command parameters: 4 bytes



0x0002	Query module manufacturer name	Manufacturer name (up to 16 bytes, padded with zeros) Send command parameters: 0 bytes Return command parameters: 16 bytes(ASCII)
0x0003	Query module serial number	Module serial number Send command parameters: 0 bytes Return command parameters: 8 bytes (ASCII)
0x0004	Query module firmware version	Module firmware version Module firmware version: 7 bytes, format: x.xxTxx where x.xxTxx is a 7 character ASCII string. Send command parameters: 0 bytes Return command parameters: 7 bytes (ASCII)
0x0005	Query module hardware version	Module hardware version Module hardware version: 7 bytes, format: x.xxTxx where x.xxTxx is a 7 character ASCII string. Send command parameters: 0 bytes Return command parameters: 7 bytes (ASCII)
0x0006	Query module production date	Module production date Production date: 10-byte format: xxxx-xx-xx (Year-Month-Day separated by "-" characters) Send command parameters: 0 bytes Return command parameters: 10 bytes(ASCII)
0x0007~0x0009	Reserved	
0x0010	Set the optical switch channel	Switch channel Send command parameters: 1 byte (Switch channel) Return command parameters: 0 bytes Switch Channel Range: 0~7 and 0xFF 0 represents channel 1. 0xFF represents dark channel.



0x0011	Query the optical switch channel	Switch channel Send command parameters: 0 bytes Return command parameters: 1byte(Switch channel) Switch Channel Range: 0~7 and 0xFF 0 represents channel 1 0xFF represents dark
		channel.
0x0012~0xffff	Reserved	

#### Notes:

- 1) Value of optical switch channels: 0~7 and 0xFF, default is dark channel.
- 2) Command examples:

Query manufacturer ID:

Send 0x55, 0x04, 0x00, 0x01, CHK

Return 0x55, 0x09, 0x00, 0x01, ID\_hh, ID\_hl, ID\_lh, ID\_ll, STS, CHK

Query module firmware version:

Send 0x55, 0x04, 0x00, 0x04, CHK

Return 0x55, 0x0c, 0x00, 0x04, FW\_maj, 0x2e, FW\_hh, FW\_hl, 0x54, FW\_lh, FW\_ll, STS, CHK

Set the optical switch channel:

Send 0x55, 0x05, 0x00, 0x10, channel, CHK

Return 0x55, 0x05, 0x00, 0x10, STS, CHK

Query the optical switch channel:

Send 0x55, 0x04, 0x00, 0x11, CHK

Return 0x55, 0x06, 0x00, 0x11, channel, STS, CHK

## V. Parallel mode

### 1. Control Truth Table

Select CH	PIN#				Comment
	D3	D2	D1	D0	
Default	N/A	N/A	N/A	N/A	Default CH is off(*)
P1	0	0	0	0	
P2	0	0	0	1	

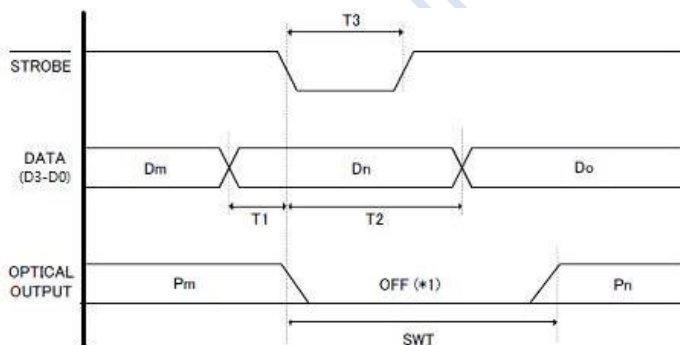




P3	0	0	1	0	
P4	0	0	1	1	
.....					
(*1)When power(VCC)is removed from the switch, it will go go the off(dark) position.					

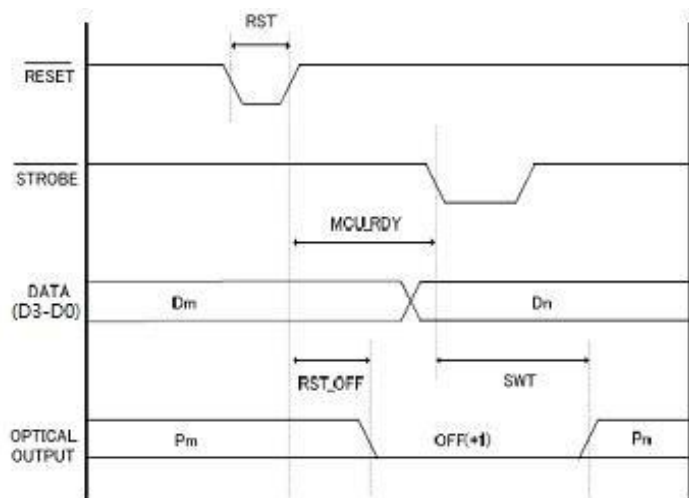
## 2. Control Truth Table

Symbol	Parameter (TTL mode)	Min.	Typ.	Max.	Unit
T1	Data setup time	1			ms
T2	Data hold time	10			ms
T3	Strobe pulse width	1			ms
SWT	Optical output switching			50	ms



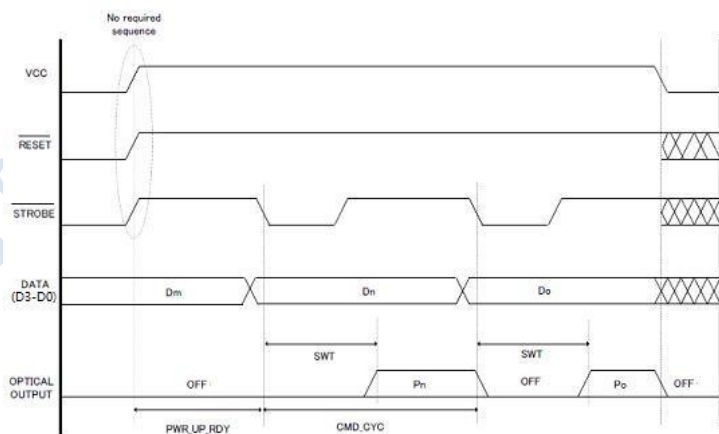
## 3. Reset Control Timing

Symbol	Parameter	Min.	Typ.	Max.	Unit
RST	Reset pulse width	100			ms
MCU_RDY	MCU Ready	20			ms
RST_OFF	Reset Power OFF			30	ms



Power/STROBE Sequence

Symbol	Parameter (TTL mode)	Min.	Typ.	Max.	Unit
PWR_UP_RDY	Power up Ready	200			ms
CMD_CYC	Command Cycle	50			ms





## VI. Precautions

Before using the optical switch module, in order to avoid any damage to the optical switch module, please read the following rules carefully:

1. Before use, clean the optical fiber end of the connector with alcohol cotton. Please take a dust cap when not in use to prevent the dust or other dirt from polluting or damaging the fiber end face. Fiber end damage or contamination will affect the optical switch module performance.
2. Do not pull, fold and twist the optical fiber, so as to avoid fiber damage.
3. Detailed pin definition for control interfaces, to ensure that the connection is correct. After determining the connection is correct, then power-up operation.
4. When the external circuit needs to be changed, please turn off the power, then disconnect the module control line, the control line is prohibited with hot-swappable.
5. Do not look directly at the fiber end when the optical switch module has an optical signal input. Laser radiation is not visible, but will cause harm to the human eye!
6. The device should be fireproof, shockproof, to avoid storage and work in an over-humid environment.
7. The device is a precision optical device, shall not be disassembled, so as not to damage.