

Optical Line Protection Module

Product Description

Lightwave Link Inc OLP (Optical Line Protection Module) is combined with optical switch, optical splitter and optical power monitoring function. The OLP is consisted of one 1x2 optical switch, one 1x2 optical splitter and PD monitoring. The subsidiary electrical circuitries are for driving optical switch, performing PD monitoring and demarcating PD linear range with I2C interface. The main function of OLP are splitting optical signals, selecting optical light path and monitoring the optical power. Lightwave Link Inc OLP complies with TELCORDIA GR-1312-CORE.



Applications

- Split the input light source to two paths by 1x2 splitter (IN→TXA/TXB).
- Monitoring the optical powers from RXA/RXB and feedback to management system via I2C interface. Management system will control the optical switch via subsidiary circuitries to obtain the optical light path selecting function.

Product Function

- Inputport (IN) light signal output to TXA and TXB via 50/50 splitter.
- Light signal is from RXA to Tap1, 2.5% for optical power monitoring and 97.5% for transmission to 1x2 optical switch.
- Light signal is from RXB to Tap2, 2.5% for optical power monitoring and 97.5% for transmission to 1x2 optical switch.
- Output port (OUT) will output the light signal from RXA and RXB via selected optical path by 1x2 optical switch.
- The PD monitor results (analog signals) will convert to digital signals by AD convertor and output to management system via I2C interface.
- There are optical switch driving circuitry inside and control the optical switch's status via electrical pin and timing signals.
- There is EEPROM with I2C interface to keep two demarcated PDs' linear ranges.
- There is online function inside for status judgment from management system.
- There are 40 optical power data in EEPROM, the optical power of AD monitoring will compare with EEPROM and find the optical power range then upload to management system.

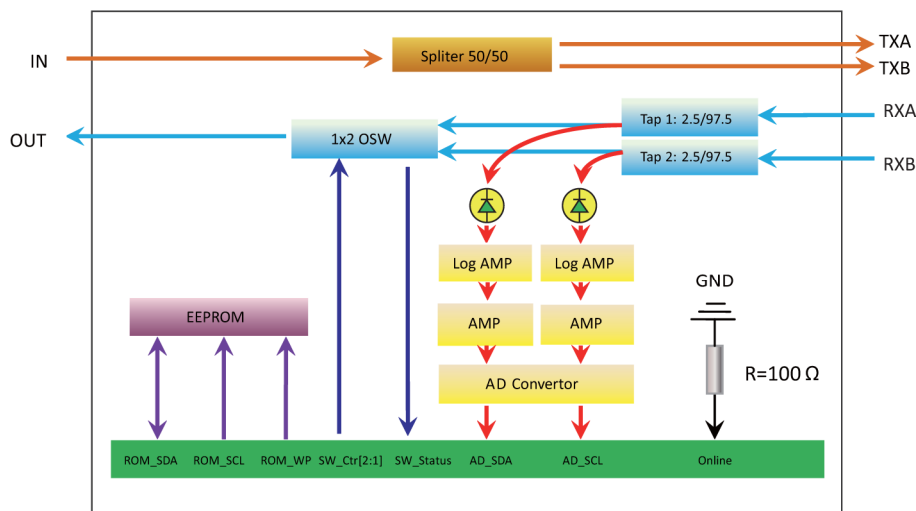


Figure 1 : Function Block

Performance Specification

● Single Mode OLPM optical parameter specification

Parameter	Symbol	Min.	Typ.	Max.	Unit
Application wavelength		1260~1360 / 1490~1640			nm
Optical Power Detect Range	λ_{op}	1528~1565			nm
Tap Coupler Ratio		2.5			%
Input Power Range	IN			≤ 500	mW
	RXA or RXB	-30			dBm
Optical Power Detect Precision		$\pm 0.5\text{dBm} @ 0\text{dBm} \leq P \leq +10\text{dBm}$			dB
		$\pm 0.6\text{dBm} @ -20\text{dBm} \leq P < 0\text{dBm}$			
		$\pm 0.8\text{dBm} @ -30\text{dBm} \leq P < -20\text{dBm}$			
Insertion Loss ¹	IN \Leftrightarrow TXA & TXB			4.5	dB
	RXA or RXB \Leftrightarrow OUT			1.6	
Polarization Dependent Loss	PDL			≤ 0.3	dB
Directivity	DIR	≤ -50			dB
Cross Talk	CT	≤ -55			dB
Polarization Mode Dispersion	PMD			≤ 0.2	Ps
Return Loss ¹	RL	≤ -40			dB
Operation Temperature	Top	-10		70	°C
Storage Temperature	Tstg	-40		85	°C
Operation Humidity	Hop	5		85	%RH
Storage Humidity	Hstg	5		85	%RH
Dimension (H x W x L)		13.5 x 75 x 55			mm ³
Weight ²		70			g

1. With connectors.

2. The product weight exclude optical connectors.

● Single Mode OLPM electrical parameter specification

Parameter	Symbol	Min	Typ	Max	Unit
Optical Switch Voltage	Vcc	4.75	5.00	5.25	V
Optical Switch Current				40	mA
Optical Switch Time	ST	≤ 5			ms
Optical Switch Durability		$\square 3 \times 10^7$			Cycle

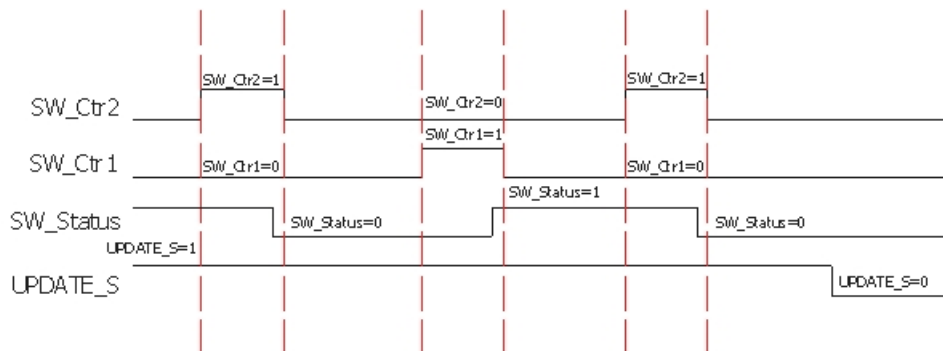
PIN Assignment

PIN Number	Pin Name	Description	Function
1	V _{CC1}	Power supply	+ (5.0±5%) V Analog Power Supply(for AD),Max 100mA
2	A _{GND}	Power supply ground	Vcc1 Ground
3	ROM_SCL	Input	I2C interface clock(EEPROM)
4	ROM_SDA	Input/Output	I2C interface data (EEPROM)
5	ROM_WP	Input	EEPROM Write Protection
6	Online	Output	PCB online indication
7	AD_SCL	Input	I2C interface clock
8	AD_SDA	Input/Output	I2C interface data
9	UPDATE_S	Input	System update status
10	D _{GND}	Power supply ground	Vcc2 Ground
11	V _{CC2}	Power supply	+ (5.0±5%) V Digital Power Supply (for SW), Max 80mA
12	SW_Ctr1	Input	SWITCH control bit 1
13	SW_Ctr2	Input	SWITCH control bit 2
14	SW_Status	Output	SWITCH status

Note:

1. OLPM with 2mm pitch female electrical connector.
2. EEPROM and I2C interface Logic Family are +3.3V LVTTTL.
3. When system in normal status,the UPDATE_S must be high(+3.3V LVTTTL)and when system in upgrade, the UPDATE_S must be low.

Timing Diagram



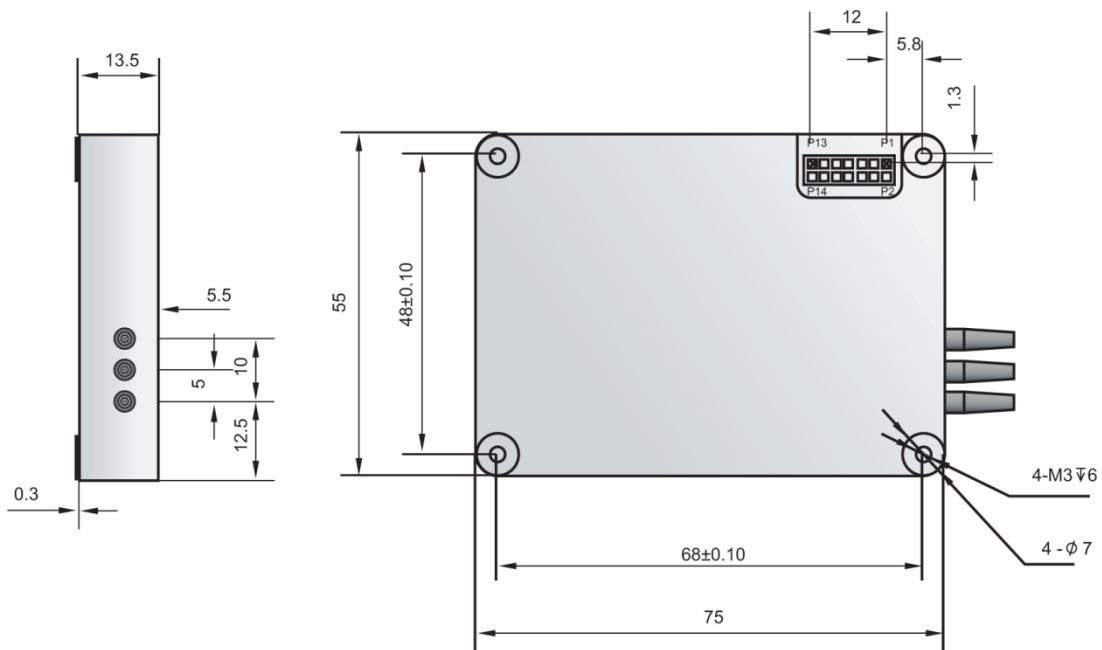
Note:

1. SW_Ctr1 is high and SW_Ctr2 is low($t_{SW} > 5ms$) and UPDATE_S is high, switch status is OUT-RXA.
2. SW_Ctr1 is low and SW_Ctr2 is high($t_{SW} > 5ms$) and UPDATE_S is high, switch status is OUT-RXB.
3. When switch status is OUT-RXA, the SW_Status is high level.
4. When switch status is OUT-RXB, the SW_Status is low level.

Fiber and Connectors

NO	PARAMETER	SPECIFICATION	UNITS	NOTE
1	Fiber Pigtail (All Ports)	Compatible SMF-28e with 900 μm Loose Tube		
2	Fiber Length (All Ports)	400±25	mm	
3	Connectors	LC/UPC		
4	Dimension	(L)75x(W)55x(H)13.5	mm	

Physical Dimension



1. Physical Dimension : (L) 75mmx(W)55mmx(H)13.5mm
2. The bottom of OLPM needs isolation.

Application Notice

1. Need to carefully for usage don't exceed the relevant absolutely maximum rating of optical and electrical parameter.
2. Need to perform ESD protective action for usage.

Green Information

The OLPM comply with RoHS Directive (2002/95/EC)

Ordering Information

OLPM -	3 -	3-	L-	9 -	L -	8
Product Version	Input	Output	Operation Function	Fiber Type	Fiber Cabling	Connector Type
	No. of Input	No. of Output	L: Latching	9: 9/125μm	L: 900μm loose tube	8: LC/PC

EEPROM Definition

1. Data format definition:
2. The data are 0x12345678 then Address is 0x12, Addr+1 is 0x34, Addr+2 is 0x56, Addr+3 is 0x78.
3. The optical power unit is 0.1 dBm
4. If the optical power is -7dbm and the value is -70 and showed 0xFFFFFBA
5. Optical power detect range: Marked 40 points from -30dbm to +10dbm.

EEPROM address	Number 0~F is EEPROM's last address , marked "X"															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Table head of EEPROM																
0x000X	0x3c	0x45	0x45	0x50	0x52	0x4f	0x4d	0x5f	0x4e	0x45	0x57	0x49	0x4e	0x50	0x3e	0x00
0x001X	0x01	0	0x01	0	0x00	0x00	0x40	0x00	0	0	0	0	0	0	0	0
0x002X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x003X	0	0	0	0	0	0	0	0	0	0	0	0	0x00	0x00	0x04	0xb4
Document head for the upload and download usage																
0x004X	0	0x01	0	0	0x45	0x45	0x50	0x52	0x4f	0x4d	0x2e	0x54	0x4d	0x50	0	0
0x005X Description	Document title (20 words includes/null , Suggestion content : Name of module + Module type)															
0x005X																
0x006X Description	Continuous above , Document title				Reserve				Document type				Document length			
0x006X					0	0	0	0	0	0	0	0x06	0	0	0x04	0x10
0x007X Description	Checksum , from 0x00C0 to 0x04cf				Document version (Shipping date , by hexadecimal)											
					Year		month	day	hour	min	sec	ms				
0x007X					0x07	0xd6							0	0	0	0
0x008X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x009X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x00aX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x00bX Description	Reserve												Checksum , from 0x0040 to 0x00bb			
0x00bX	0	0	0	0	0	0	0	0	0	0	0	0				
The beginning address of parameter table that meant started checksum address and the beginning document length address																
0x00cX	0x3c	0x5f	0x54	0x48	0x49	0x53	0x5f	0x49	0x53	0x5f	0x50	0x41	0x52	0x41	0x46	0x49
0x00dX	0x4c	0x45	0x5f	0x43	0x48	0x45	0x43	0x4b	0x5f	0x48	0x45	0x41	0x44	0x5f	0x3e	0x00
0x00eXD	According to module status and put into module description												Main	Sub	Table	Table1

description													version	version	quantities	ID
0x00eX	0	0	0	0	0	0	0	0	0	0	0	0	0x01	0x01	0x02	0x01
0x00fX Description	Table1 items	Table1	Table 2 ID	Table 2items	Table2	Reserve										
0x00fX	0x28	0x01	0x02	0x28	0x01	0	0	0	0	0	0	0	0	0	0	0
0x010X Description	Reserve												Table1top value			
0x010X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x011X Description	Table1 top value	Table 1 bottom value				Table1 description "INPWR1\n"ASCII code										
0x011X	0	0	0	0	0	0x49	0x4e	0x50	0x57	0x52	0x31	0x0d	0xa	0	0	0
0x012X Description	Table1 description "INPWR1\n"ASCII code								Reserve							
0x012X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x013X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x014X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x015X Description	Reserve					Calibration 1 (unit: 0.1dbm)				Calibration 2 (unit: 0.1dbm)				Calibration 3 (unit: 0.1dbm)		
0x015X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x016X Description	Calibration3	Calibration 4 (unit: 0.1dbm)				Reverse										
0x016X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x017X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x018X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0x019X Description	Reverse					Top threshold 1 (unit: 0.1dbm)				Latching: 1 · Non-latching: 2				Top threshold 3 (unit: 0.1dbm)		
0x019X	0	0	0	0	0	0	0	0	0	0	0	0	1/2	0	0	0
0x01aX Description	Top thresh old 3	Bottom threshold 1 (unit: 0.1dbm)				Single Mode: 1 · Multi Mode: 2				Bottom threshold 3 (unit: 0.1dbm)				1 ADC value of input 1		
0x01aX	0	0	0	0	0	0	0	0	1/2	0	0	0	0			

0x01bX Description	1 ADC value of input 1	Optical power 1 of input 1 (unit: 0.1dbm)				2 ADC value of input 1				Optical power 2 of input 1 (unit: 0.1dbm)				3 ADC value of input 1			
0x01bX																	
The format are same as above from 1 ADC value of input 1 and Optical power 1 of input 1 (unit: 0.1dbm) to 40 ADC value of input 1 and Optical power 40 of input 1 (unit: 0.1dbm)																	
0x02eX Description	39 ADC value of input 1	Optical power 39 of input 1 (unit: 0.1dbm)				40 ADC value of input 1				Optical power 40 of input 1 (unit: 0.1dbm)				Table 2 top value			
0x02eX														0	0	0	
0x02fX Description	Table 2 top value	Table 2 bottom value				Table2description "INPWR2\n"ASCII code											
0x02fX	0	0	0	0	0	0x49	0x4e	0x50	0x57	0x52	0x32	0x0d	0xa	0	0	0	
0x030X Description	Table1 description "INPWR1\n"ASCII code									Reserve							
0x030X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0x031X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0x032X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0x033X Description	Reserve				Calibration1 (unit: 0.1dbm)				Calibration 2 (unit: 0.1dbm)				Calibration3 (unit: 0.1dbm)				
0x033X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0x034X Description	Calibration 3	Calibration 4 (unit: 0.1dbm)				Reserve											
0x034X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0x035X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0x036X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0x037X Description	Reserve				Top threshold 1 (unit: 0.1dbm)				Top threshold 2 (unit: 0.1dbm)				Top threshold 3 (unit: 0.1dbm)				
0x037X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0x038X Description	Top thresh	Bottom threshold 1 (unit: 0.1dbm)				Bottom threshold 2 (unit: 0.1dbm)				Bottom threshold 3 (unit: 0.1dbm)				1 ADC value of input 2			

on	old 3																
0x038X	0	0	0	0	0	0	0	0	0	0	0	0	0				
0x039X Description	1 ADC value of input 2	Optical power 1 of input 2 (unit: 0.1dbm)				2 ADC value of input 2				Optical power 2 of input 2 (unit: 0.1dbm)				3 ADC value of input 2			
0x039X																	
The format are same as above from 1 ADC value of input 2 and Optical power 1 of input 2 (unit: 0.1dbm) to 40 ADC value of input 2 and Optical power 40 of input 2 (unit: 0.1dbm)																	
0x04cX Description	39 ADC value of input 2	Optical power 39 of input 2 (unit: 0.1dbm)				40 ADC value of input 2				Optical power 40 of input 2 (unit: 0.1dbm)				End ·Data= 0 ·for checksum			
0x04cX														0	0	0	

Remark : Checksum from 0x00c0 to 0x04cf firstly · then Checksum from 0x0040 to 0x00bb. These two checksum used " DWORD" format.