

# PLS20-D6C-C4T1

## Features

- ◆ Single fiber quad-directional data link
- ◆ XGSPON/XGPON: 9.953Gbps downstream and 9.953/2.488Gbps upstream
- ◆ GPON: 2.488Gbps downstream and 1.25Gbps upstream
- ◆ XGSPON/XGPON: 1577nm continuous-mode EML laser transmitter and 1270nm burst-mode APD-TIA receiver
- ◆ GPON: 1490nm continuous-mode DFB laser transmitter and 1310nm burst-mode APD-TIA receiver
- ◆ 0 to 70°C operating case temperature
- ◆ +3.3V power supply
- ◆ SFP+ package with SC/UPC Receptacle connector
- ◆ 2-wire interface for integrated Digital Diagnostic Monitoring
- ◆ Digital Receiving Signal Strength Indication (RSSI)
- ◆ Low EMI and excellent ESD protection
- ◆ Class1 laser safety standard IEC-60825 compliant
- ◆ RoHS compliance

## Application

- ◆ XGSPON OLT (N2 class ODN)
- ◆ XGPON OLT (N2a class ODN)
- ◆ GPON OLT (class C+)

## Standard

- ◆ Complies with SFF-8431/SFF-8432
- ◆ Complies with SFF-8472
- ◆ Complies with ITU-T G.987.2 & G.9807.1 & G.984.2
- ◆ Complies with FCC 47 CFR Part 15, Class B
- ◆ Complies with FDA 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

## Description

The PLS20-D6C-C4T1 is a Combo OLT optical transceiver designed to compact XGSPON, XGPON and GPON applications. For XGSPON/XGPON, it employs a 1577nm EML CW mode downstream transmitter operating at 9.95328Gb/s and a 1270nm APD/TIA burst mode upstream receiver operating at 9.95328Gb/s or 2.48832Gb/s. For GPON, it employs a 1490nm DFB CW mode downstream transmitter operating at 2.48832Gb/s and a 1310nm APD/TIA burst mode upstream receiver operating at 1.25Gb/s. It is housed in SFP+ package and is designed to operate over the commercial temperature range from 0 to 70°C.

## Specification

Absolute Maximum Ratings				
Parameter	Symbol	Min	Max	Unit
Storage temperature	T <sub>s</sub>	-40	+85	°C
Operating case temperature	T <sub>c</sub>	0	+70	°C
Storage Relative Humidity	RH <sub>S</sub>	0	95	%
Operating Relative Humidity	RH <sub>O</sub>	0	85	%
Power Supply Voltage	V <sub>CC</sub>	0	+3.6	V

Recommended Operating Conditions					
Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T <sub>c</sub>	0		+70	°C
Power Supply Voltage	V <sub>CC3</sub>	3.135	3.3	3.465	V
Supply Current	I <sub>CC3</sub>	-	-	TBD	mA
Power Consumption	P <sub>W</sub>	-	-	TBD	W
Data Rate	XGSPON/ XGPON	-	TX 9.953 RX 9.953/2.488	-	Gbps
	GPON	-	TX 2.488 RX 1.25	-	

Electrical Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter Differential Data Input Swing	V <sub>INPP</sub>	120	-	800	mV	
Transmitter Differential Input Impedance	Z <sub>IN</sub>	80	100	120	Ω	
Receiver Differential Data Output Swing	V <sub>OUTPP</sub>	400	-	800	mV	
Receiver Differential Output Impedance	Z <sub>OUT</sub>	80	100	120	Ω	
TX Disable	V <sub>TDH</sub>	2.0	-	V <sub>CC</sub>	V	LVTTTL input
	V <sub>TDL</sub>	0	-	0.8		
TX Fault	V <sub>TFH</sub>	2.4	-	V <sub>CC</sub>	V	LVTTTL output
	V <sub>TFL</sub>	0	-	0.4		
RX Reset	V <sub>RSTH</sub>	2.0	-	V <sub>CC</sub>	V	LVTTTL input
	V <sub>RSTL</sub>	0	-	0.8		
RX_SD	V <sub>SDH</sub>	2.0	-	V <sub>CC</sub>	V	LVTTTL output
	V <sub>SDL</sub>	0	-	0.8		

Optical transmitter Characteristics								
Parameter		Symbol	Min	Typical	Max	Unit	Notes	
Operating Wavelength Range	XGSPON	$\lambda_{c1}$	1575	-	1580	nm		
	XGPON	$\lambda_{c2}$	1575	-	1580	nm		
	GPON	$\lambda_{c3}$	1480	1490	1500	nm		
Launched Power	XGSPON	$P_{OUT1}$	+4	-	+7	dBm		
	XGPON	$P_{OUT2}$	+4	-	+7	dBm		
	GPON	$P_{OUT3}$	+3	-	+7	dBm		
Spectral Width(-20dB)		$\Delta\lambda$	-	-	1	nm		
Side Mode Suppression Mode		SMSR	30	-	-	dB		
Extinction Ratio		ER	8.2	-	-	dB		
Optical Output Power after TX Disable		$P_{OFF}$	-	-	-39	dBm		
Transmitter tolerance to reflected optical power			-15	-	-	dB		
Output Eye Diagram		Compliant with ITU-T G.987.2						
Optical receiver Characteristics								
Parameter		Symbol	Min	Typical	Max	Unit	Notes	
Operating Wavelength Range	XGSPON	$\lambda_{c4}$	1260	1270	1280	nm		
	XGPON	$\lambda_{c5}$	1260	1270	1280	nm		
	GPON	$\lambda_{c6}$	1290	1310	1330	nm		
Receiver Sensitivity	XGSPON	$P_{SEN1}$	-	-	-28	dBm		
	XGPON	$P_{SEN2}$	-	-	-29.5	dBm		
	GPON	$P_{SEN3}$	-	-	-32	dBm		
Saturation Optical Power	XGSPON	$P_{SAT1}$	-9	-	-	dBm		
	XGPON	$P_{SAT2}$	-9	-	-	dBm		
	GPON	$P_{SAT3}$	-11	-	-	dBm		
Immunity from Continuous Identical Digits		CID	72	-	-	Bit		
Receiver Reflectance			-	-	-20	dB		
Tolerance to the reflected optical power			-	-	12	dB		

Receiver Timing Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Guard Time	Tg	32	-	-	Bit	
Reset Pulse Width	Tr	25.6	-	-	ns	
Data Recovery Time	Tsettle	-	-	800	ns	
SD Assert Time	Ta	-	-	500	ns	
SD De-assert Time	Td	-	-	1000	ns	

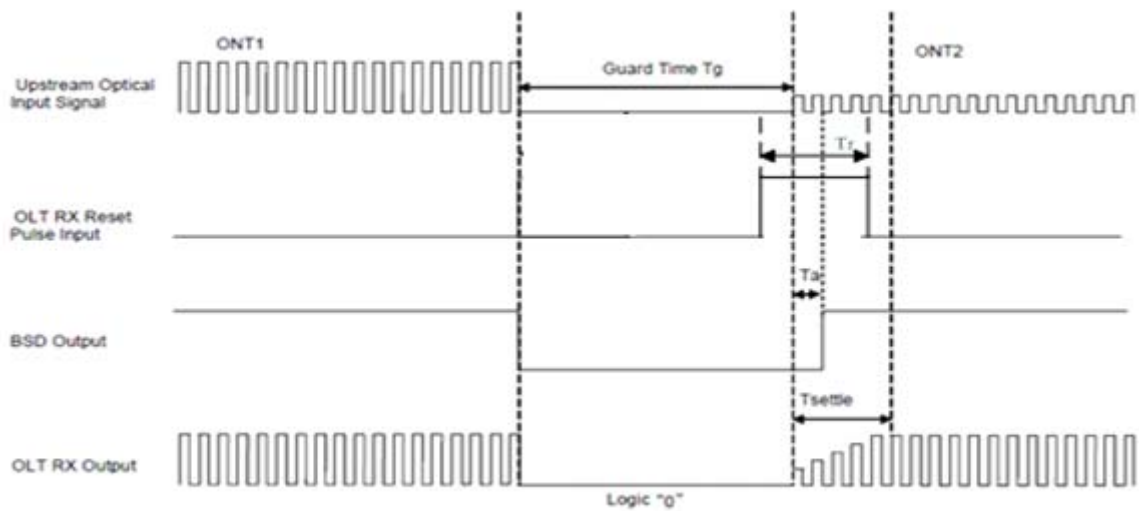


Figure 1 Timing Parameter Definitions in Burst Mode Sequence a

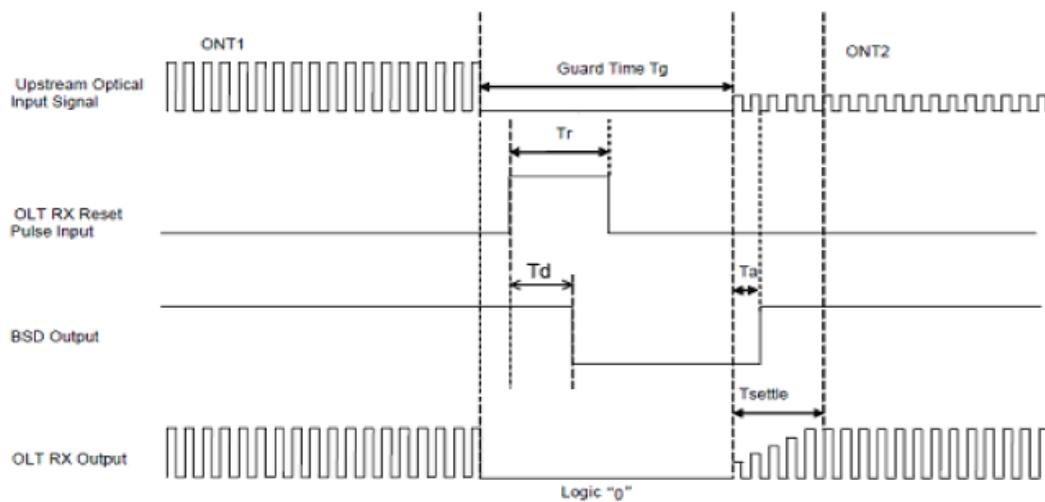


Figure 2 Timing Parameter Definitions in Burst Mode Sequence b

RSSI Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
RSSI Trigger-Low		0	-	0.8	V	
RSSI Trigger-High		2.0	-	V <sub>CC</sub>	V	
RSSI Trigger Delay	T <sub>D</sub>	0	-	3000	ns	
Optical Signal During Time	T <sub>ONT</sub>	300	-	-	ns	
RSSI Trigger width	T <sub>W</sub>	300	-	T <sub>ONT</sub> - T <sub>D</sub>	ns	
I2C Access Prohibited Time	T <sub>p</sub>	-	-	500	μs	

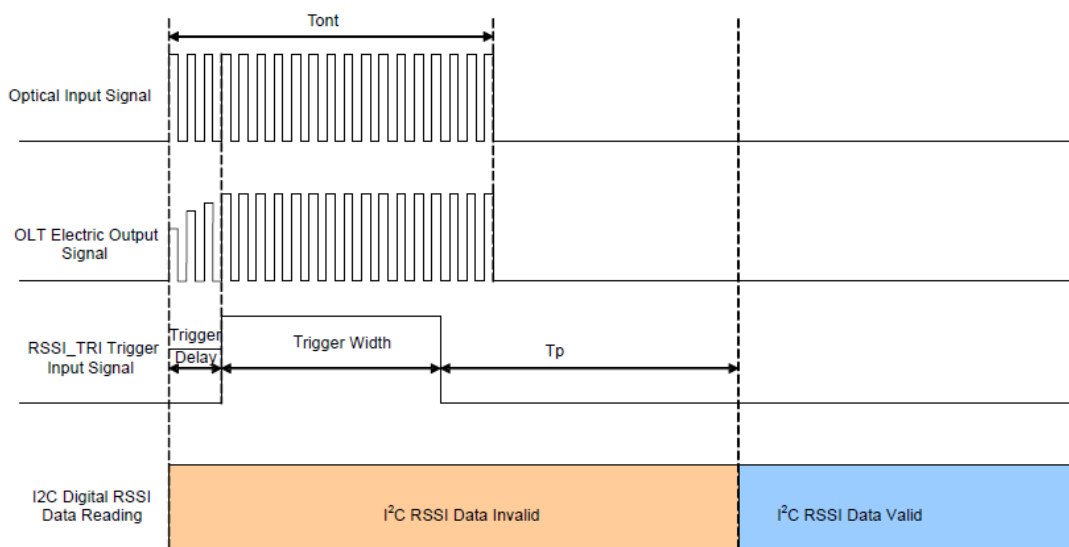


Figure 3 Timing Parameter Definitions in RSSI Trigger

## Digital Diagnostic Monitoring Information

Parameter	Accuracy	Calibration	Unit
Temperature	±3	Internal	°C
Voltage	±3%	Internal	V
Bias Current	±10%	Internal	mA
TX Power	±2	Internal	dBm
RX Power	±2	External	dBm

## Pin Definition

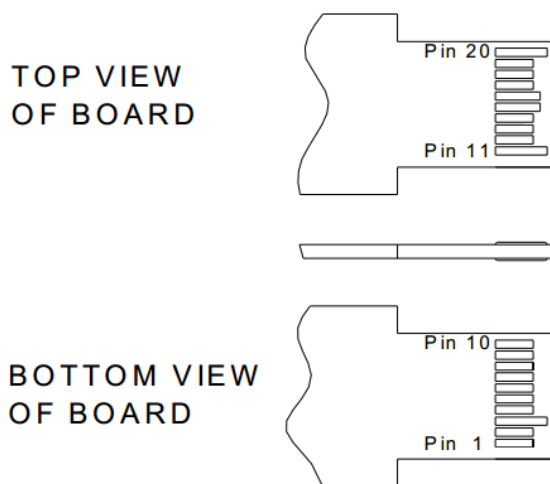


Figure 4 Pin out Drawing

Pin No	Name	Default Description	Note
1	GPON_TD+	Non-Inverted 2.488Gbps Transmit Data input	CML, AC coupled
2	GPON_TD-	Inverted 2.488Gbps Transmit Data input	CML, AC coupled
3	GND	Module Ground	
4	SDA	2-Wire Serial Interface data line	LVTTTL
5	SCL	2-Wire Serial Interface clock line	LVTTTL
6	GPON_RD-	Inverted 1.25Gps RX Data Output	CML, DC coupled
7	XGSPON/X GPON_RST	Burst Module Reset Signal, high active	LVTTTL Input
8	XGSPON/X GPON_SD	High: normal; Low: loss of signal	LVTTTL Output
9	TRIG/TXDIS	RSSI Trigger/TX_Disable	LVTTTL Input
10	GPON_RD+	Non-inverted 1.25Gps RX Data Output	CML, DC coupled
11	GND	Module Ground	
12	XGSPON/X GPON_RD-	Inverted 9.953Gps RX Data Output	CML, DC coupled
13	XGSPON/X GPON_RD+	Non-inverted 9.953Gps RX Data Output	CML, DC coupled
14	GPON_SD	High: normal; Low: loss of signal	LVTTTL Output
15	VCC3_RX	Receiver 3.3V Power Supply	

16	VCC3_TX	Transmitter 3.3V Power Supply	
17	GPON_RST	GPON RX Reset	
18	XGSPON/X GPON_TD+	Non-Inverted 9.953Gbps Transmit Data input	CML, AC coupled
19	XGSPON/X GPON_TD-	Inverted 9.953Gbps Transmit Data input	CML, AC coupled
20	GND	Module Ground	

### Functional Diagram

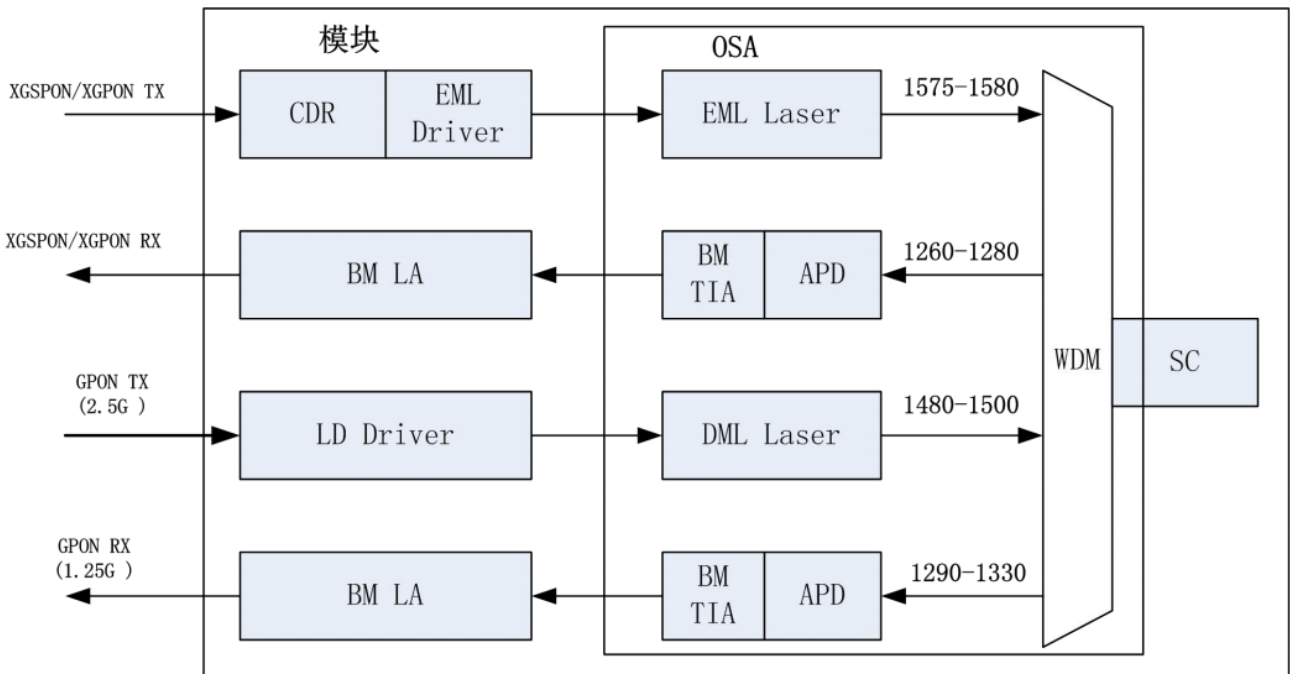


Figure 5 PLS20-D6C-B4T1 functional diagram

## 2-Wire Serial Memory Map

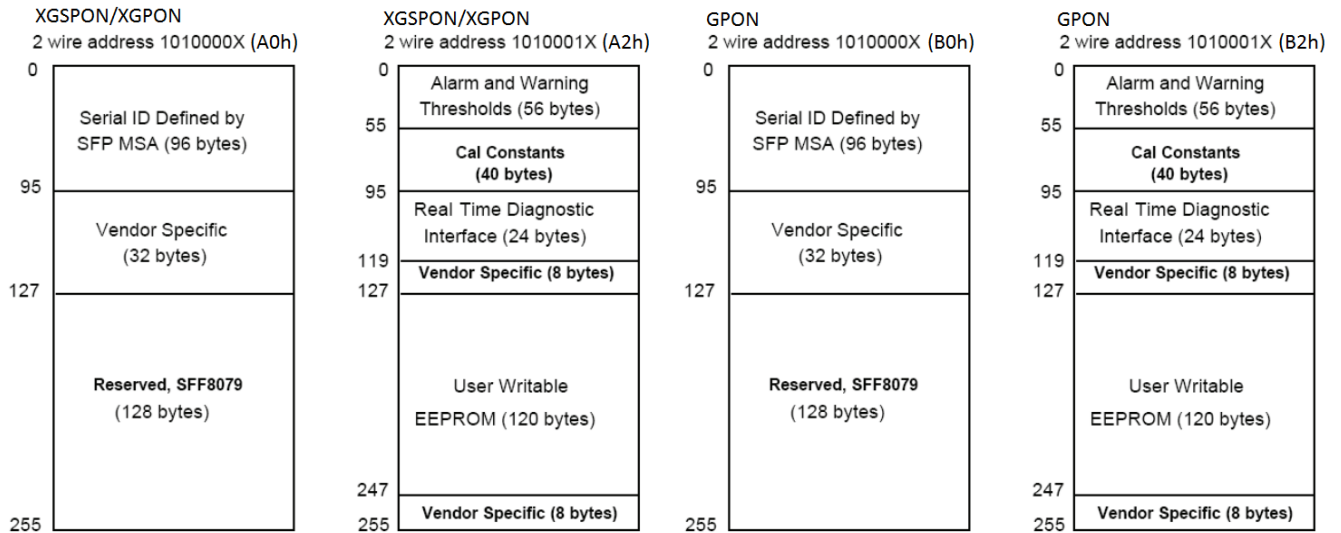


Figure 6 EEPROM Memory Map Specific Data Field Descriptions

## EEPROM serial ID memory contents (XGSPON/XGPON A0h)

Address	#Bytes	Name	HEX	Description
0	1	Identifier	03	SFP+
1	1	Ext. Identifier	04	Non Standard GBIC Interface
2	1	Connector	01	SC connector
3-10	8	Transceiver	47 13 01 00 00 01 00 40	Code for electronic compatibility or optical compatibility
11	1	Encoding	03	NRZ
12	1	BR, Nominal	64	10Gbps
13	1	Reserved	00	Reserved
14	1	Length(9μm)-km	14	20km
15	1	Length(9μm)-100m	C8	20km
16	1	Length (50μm OM2)-10m	00	Not Supported
17	1	Length (62.5μm OM1)-10m	00	Not Supported
18	1	Length (Copper)	00	Not Supported
19	1	Length (50μm OM3)-10m	00	Not Supported
20-35	16	Vendor name	4D 45 4E 54 45 43 48 4F 50 54 4F 20 20 20 20 20	"MENTECHOPTO"(ASCII character)



36	1	Reserved	00	Reserved
37-39	3	Vendor OUI	00 00 00	No specific
40-55	16	Vendor PN	50 4C 53 32 30 2D 44 36 43 2D 43 34 54 31 20 20	PLS20-D6C-C4T1
56-59	4	Vendor rev	41 30 20 20	A0
60-61	2	Wavelength	06 29	1577nm
62	1	Reserved	00	Reserved
63	1	CC_BASE	Programmed by Factory	Check sum of bytes 0-62
64-65	2	Transceiver Options	24 1C	RX_SD, TX_Fault, TX_Disable
66	1	BR, max	00	
67	1	BR, min	00	
68-83	16	Vendor SN	Programmed by Factory	Serial number provided by vendor (ASCII)
84-91	8	Date Code	“YYMMDDLL”	Vendor's manufacturing date code (ASCII)
92	1	Diagnostic Monitoring Type	68	Internal Calibrated; Received power measurement type: Average Power
93	1	Enhanced Options	E0	Optional Alarm/warning implemented; Soft TX_DISABLE, TX_FAULT implemented
94	1	Compliance	08	Revision Implemented
95	1	CC_EXT	Programmed by Factory	Check sum of bytes 64-94
96-127	32	Vendor Specific		Vendor Specific EEPROM
128-255	128	Reserved	00	Reserved

### EEPROM serial ID memory contents (GPON B0h)

Address	#Bytes	Name	HEX	Description
0	1	Identifier	03	SFP+
1	1	Ext. Identifier	04	Non Standard GBIC Interface
2	1	Connector	01	SC connector
3-10	8	Transceiver	47 13 01 00 00 01 00 40	Code for electronic compatibility or optical compatibility
11	1	Encoding	03	NRZ

12	1	BR, Nominal	19	2.488Gbps
13	1	Reserved	00	Reserved
14	1	Length(9μm)-km	14	20km
15	1	Length(9μm)-100m	C8	20km
16	1	Length (50μm OM2)-10m	00	Not Supported
17	1	Length (62.5μm OM1)-10m	00	Not Supported
18	1	Length (Copper)	00	Not Supported
19	1	Length (50μm OM3)-10m	00	Not Supported
20-35	16	Vendor name	4D 45 4E 54 45 43 48 4F 50 54 4F 20 20 20 20 20	"MENTECHOPTO"(ASCII character)
36	1	Reserved	00	Reserved
37-39	3	Vendor OUI	00 00 00	No specific
40-55	16	Vendor PN	50 4C 53 32 30 2D 44 36 43 2D 43 34 54 31 20 20	PLS20-D6C-C4T1
56-59	4	Vendor rev	41 30 20 20	A0
60-61	2	Wavelength	05 D2	1490nm
62	1	Reserved	00	Reserved
63	1	CC_BASE	Programmed by Factory	Check sum of bytes 0-62
64-65	2	Transceiver Options	20 1C	RX_SD,TX_Fault, TX_Disable
66	1	BR, max	00	
67	1	BR, min	00	
68-83	16	Vendor SN	Programmed by Factory	Serial number provided by vendor (ASCII)
84-91	8	Date Code	"YYMMDDL"	Vendor's manufacturing date code (ASCII)
92	1	Diagnostic Monitoring Type	68	Internal Calibrated; Received power measurement type: Average Power
93	1	Enhanced Options	E0	Optional Alarm/warning implemented; Soft TX_DISABLE, TX_FAULT implemented
94	1	Compliance	08	Revision Implemented
95	1	CC_EXT	Programmed by Factory	Check sum of bytes 64-94
96-127	32	Vendor Specific		Vendor Specific EEPROM
128-255	128	Reserved	00	Reserved

## EEPROM A2h Alarm and Warning Thresholds (XGSPON/XGPON)

Address	Field Size(Byte)	Name of field	Hex Value	Description
00-01	2	Temp High Alarm	55 00	MSB at low address, 85°C
02-03	2	Temp Low Alarm	DC 00	MSB at low address, -35°C
04-05	2	Temp High Warning	50 00	MSB at low address, 80°C
06-07	2	Temp Low Warning	E1 00	MSB at low address, -30°C
08-09	2	3.3V Voltage High Alarm	8C A0	MSB at low address, 3.6V
10-11	2	3.3V Voltage Low Alarm	75 30	MSB at low address, 3.0V
12-13	2	3.3V Voltage High Warning	87 5A	MSB at low address, 3.465V
14-15	2	3.3V Voltage Low Warning	7A 76	MSB at low address, 3.135V
16-17	2	Bias High Alarm	EA 60	MSB at low address, 120mA
18-19	2	Bias Low Alarm	27 10	MSB at low address, 20mA
20-21	2	Bias High Warning	D6 D8	MSB at low address, 110mA
22-23	2	Bias Low Warning	30 D4	MSB at low address, 25mA
24-25	2	TX Power High Alarm		MSB at low address, +9dBm
26-27	2	TX Power Low Alarm		MSB at low address, +1dBm
28-29	2	TX Power High Warning		MSB at low address, +8dBm
30-31	2	TX Power Low Warning		MSB at low address, +2dBm
32-33	2	RX Power High Alarm	09 D0	MSB at low address, -6dBm
34-35	2	RX Power Low Alarm	00 04	MSB at low address, -34dBm
36-37	2	RX Power High Warning	06 31	MSB at low address, -8dBm
38-39	2	RX Power Low Warning	00 06	MSB at low address, -32dBm
40-41	2	TOSA Temp High Alarm	3A 00	MSB at low address, 58°C
42-43	2	TOSA Temp Low Alarm	1E 00	MSB at low address, 30°C
44-45	2	TOSA Temp High Warning	38 00	MSB at low address, 56°C
46-47	2	TOSA Temp Low Warning	20 00	MSB at low address, 32°C
48-55	8	Reserved		Reserved

## EEPROM B2h Alarm and Warning Thresholds (GPON)

Address	Field Size(Byte)	Name of field	Hex Value	Description
00-01	2	Temp High Alarm	55 00	MSB at low address, 85°C
02-03	2	Temp Low Alarm	DC 00	MSB at low address, -35°C
04-05	2	Temp High Warning	50 00	MSB at low address, 80°C
06-07	2	Temp Low Warning	E1 00	MSB at low address, -30°C
08-09	2	3.3V Voltage High Alarm	8C A0	MSB at low address, 3.6V
10-11	2	3.3V Voltage Low Alarm	75 30	MSB at low address, 3.0V
12-13	2	3.3V Voltage High Warning	87 5A	MSB at low address, 3.465V
14-15	2	3.3V Voltage Low Warning	7A 76	MSB at low address, 3.135V
16-17	2	Bias High Alarm	C3 50	MSB at low address, 100mA
18-19	2	Bias Low Alarm	03 E8	MSB at low address, 2mA
20-21	2	Bias High Warning	AF C8	MSB at low address, 90mA
22-23	2	Bias Low Warning	05 DC	MSB at low address, 3mA
24-25	2	TX Power High Alarm	F6 78	MSB at low address, +8dBm
26-27	2	TX Power Low Alarm	3D E9	MSB at low address, +2dBm
28-29	2	TX Power High Warning	C3 C7	MSB at low address, +7dBm
30-31	2	TX Power Low Warning	4D F1	MSB at low address, +3dBm
32-33	2	RX Power High Alarm	09 D0	MSB at low address, -6dBm
34-35	2	RX Power Low Alarm	00 05	MSB at low address, -33dBm
36-37	2	RX Power High Warning	06 31	MSB at low address, -8dBm
38-39	2	RX Power Low Warning	00 08	MSB at low address, -31dBm
40-55	16	Reserved		Reserved

## RSSI trigger/TX\_Disable selection (Table B2h Byte 118)

Address	Bit	Name of Field	Description
118	7	RSSI Select	Writing "0" for XGSPON/XGPON RSSI Monitor; Writing "1" for GPON RSSI Monitor. Default power up value is "0".
118	6	RSSI/TX_Disable Select	When set to "0", PIN9 as TX_Disable input; When set to "1", PIN9 as RSSI input. Default power up value is "0".
118	5	XGSPON TX_Disable Selection	When set "0", PIN9 as the XGSPON/XGPON TX_Disable input. Default power up value is "0".
118	4	GPON TX_Disable Selection	When set "0", PIN9 as the GPON TX_Disable input. Default power up value is "0".

## Package Outline

Dimensions are in millimeters. (Unit: mm)

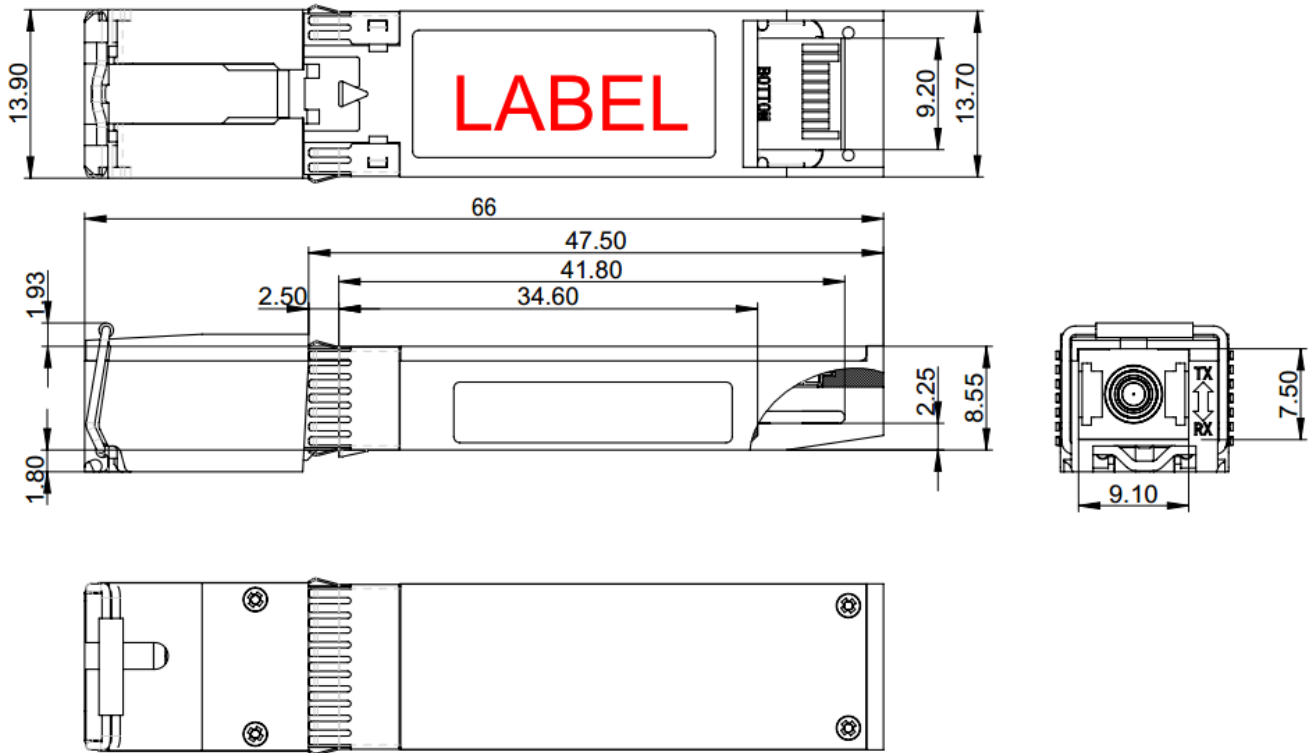


Figure7 Package Outline for PLS20-D6C-C4T1

## Ordering information

Part. No	Specifications				
	Package	Applications	Temp(°C)	Reach(km)	DDM
PLS20-D6C-C4T1	SFP+	XGSPON, XGPON, GPON	0~70	20	Y