

MPOF22-LD6C-T2

Features

- ◆ Single Fiber10G symmetrical EPON ONU Transceiver
 - 1270nm burst-mode 10.3125 Gb/s transmitter with DFB laser
 - 1577nm continuous-mode 10.3125Gb/s APD/TIA receiver
- ◆ Digital diagnostic monitoring (DDM) with internal calibration
- ◆ SFP+ package with SC/UPC receptacle connector
- ◆ +3.3V separated power supply, low power dissipation
- ◆ LVPECL interface logic level for data input
- ◆ CML interface logic level for data output
- ◆ LVTTTL for burst signal input
- ◆ LVTTTL for receiver loss of signal detect indication
- ◆ Compliant with IEEE 802.3av
- ◆ SFF-8472 compliant
- ◆ Telcordia GR-468-CORE and MIL-STD-883 compliant
- ◆ RoHS-6/6 compliant
- ◆ IEC 60825-1 compliant
- ◆ FCC Part 15 Class B /EN55022 Class B (CISPR 22B)/ VCCI Class B compliant

Applications

- ◆ Symmetric 10GEPON PR30 ONU

Description

The 10/10G symmetrical EPON ONU transceiver is designed for single mode fiber and operates at wavelength of 1270nm. The transceiver module uses a DFB laser diode and fully compliant with IEC60825 and CDRH class 1 eye safety. It contains APC functions, a temperature compensation circuit to ensure compliance with IEEE 802.3av requirements at operating temperature.

The receiver section uses a hermetic packaged APD-TIA (APD with trans-impedance amplifier) and a limiting amplifier. The APD converts optical power into electrical current and the current is transformed to voltage by the trans-impedance amplifier. The differential DATA and /DATA CML data signals are produced by the limiting amplifier. The APD-TIA is AC coupled to the limiting amplifier through a low pass filter.

Specification

Absolute Maximum Ratings					
Parameter	Symbol	Min.	Max.	Unit	Note
Storage Ambient Temperature	T _{STG}	-40	+85	°C	
Relative Humidity	RH	5	95	%	
Input Voltage	VCC	-0.5	4	V	
Receiver Damaged Threshold	Pin	5		dBm	0

Recommended Operating Conditions						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	V _{CC}	2.97	3.3	3.63	V	1
Power Supply Current	I _{CC}			400	mA	
power dissipation	P _W			2	W	2
Operating case Temperature	T _{case}	0		+70	°C	
Power Supply Noise Rejection (peak – peak)	PSNR	100			mV	

Note 0: 5dbm is peak-to-peak value.

Note 1: When the Power Supply Voltage between $3.3V \pm 5\%$, must ensure that all modules characteristics meet the requirements; within 3~3.6V, the module should be able to work, shall not be shut off, but the characteristics are allowed a certain degree to reduce characteristics.

Note 2: Measured with upstream /downstream 10.3125G, PRBS 2³¹-1, 70°C.

Transmitter Optical and Electrical Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter type	DFB					
Data Rate	BR		10.3125		Gb/s	
Optical Transmitter Power	P _{OUT}	4		9	dBm	1
Output Center Wavelength	λ _C	1260	1270	1280	nm	
Output Spectrum Width (-20dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Output Power At Transmit Off	P _{OFF}			-45	dBm	
Extinction Ratio	ER	6			dB	
Tolerance to Tx Back Reflection	RL			12	dB	
Transmitter Reflectance		-10			dB	
Transmitter and Dispersion penalty	TDP			1.5	dB	
Tx_Burst Enable Time	T _{on}			512	ns	
Tx_Burst Disable Time	T _{off}			512	ns	
Optical Eye Diagram	Compliant With IEEE 802.3av					2,3

Initial Time	T_{ini}			800	ns	
Data Input Differential Swing	V_{IN}	200		1600	mV	
Input Differential Impedance	Z_{IN}		100		Ω	
TX_burst - Enable		0		0.8	V	
TX_burst - Disable		2.0		$V_{cc}+0.3$	V	
Tx_Fault - Fault		2.4		VCC	V	
Tx_Fault - Normal		0		0.4	V	
Tx_SD - High		2.4		VCC	V	
Tx_SD - Low		0		0.4	V	
TX Transmitter State Indication Turn ON Time	TINDI_ON			200	ns	
TX Transmitter State Indication Turn OFF Time	TINDI_OFF			200	ns	

Note 1: Launched into 9/125um SMF.

Note 2: Measured with PRBS 2³¹-1 @10.3125Gbit/s, and the 4thBessel-Thompson filter is turned on.

Note 3: Transmitter eye mask definition in IEEE 802.3av

Note 4: Included Tx_Burst (See Pin Function Definitions).

Note 5: Included Tx_SD, Tx_Fault, LOS (See Pin Function Definitions).

Receiver Optical and Electrical Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Receiver type	APD/TIA					
Data rate	BR		10.3125		Gb/s	
Operating Wavelength	λ_c	1575	1577	1580	nm	
Receiver Sensitivity	P_{SEN}			-28	dBm	1
Overload Input Optical Power	P_{SAT}	-8			dBm	
Maximum Input Optical Power	P_{MAX}	+5			dBm	0
LOS Assert	P_{LOSA}	-39			dBm	2
LOS De-Assert	P_{LOSD}			-29	dBm	3
LOS Hysteresis	$P_{LOSD}-P_{LOSA}$	1		5	dBm	$\lambda=1577nm$
Receiver Reflectance				20	dB	$\lambda=1577nm$
1310nm Tx to 1577nm Rx Crosstalk				-47	dB	
Optical Isolation From External Source	ISO_1	35			dB	$\lambda=1560nm$
Optical Isolation	ISO_2	35			dB	$\lambda=1600nm$

From External Source						
Data Output Differential Swing	V_{OUT}	340		850	mV	4
RX_LOS - Low		0		0.4	V	
RX_LOS - High		2.4		V_{CC}	V	
LOS Assert Time	T_{ASS}			100	us	
LOS De-Assert Time	T_{DAS}			100	us	

Note 0: 5dbm is peak-to-peak value.

Note 1: P_{SEN} Measured with a PRBS $2^{31}-1$ test pattern @10.3125 Gbit/s, BER = 10^{-3} , ER=8.2dB.

Note 2: A decrease in optical power below the specified level will cause the Loss of Signal output to switch from a low state to a high state.

Note 3: An increase in optical power above the specified level will cause the Loss of Signal output to switch from a high state to a low state.

Note 4: CML output, AC coupled internally, guaranteed in the full range of input optical power.

Digital Diagnostic Monitoring Information

Parameter	Range	Accuracy	Calibration	Notes
Voltage	2.97to 3.63V	$\pm 3\%$	Internal	
TX Power	4~9dBm	$\pm 3.0\text{dB}$	Internal	1
Bias Current	1~100mA	$\pm 10\%$	Internal	
RX Power	-28~-8dBm	$\pm 3.0\text{dB}$	Internal	

Note 1: For the TX Power DDM and TX Power alarm& warning thresholds, the LSB is $0.2 \mu\text{W}$.

Digital Diagnostic Memory Map

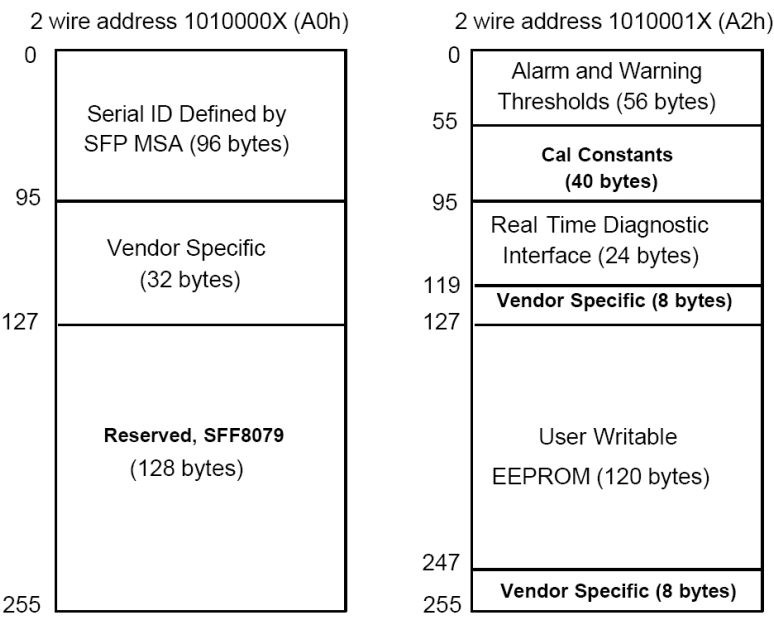


Figure1

2 wire address 1010000X (A0h)				
Address	Field Size (Byte)	Name of Field	Hex	Description
0	1	Identifier	03	SFP or SFP "Plus"
1	1	Ext. Identifier	04	
2	1	Connector	01	
3-10	8	Transceiver	00 00 00 00 00 00 00 00	SC Receptacle
11	1	Encoding	03	NRZ
12	1	BR, upstream	67	10.3125Gbps
13	1	BR, downstream	67	10.3125Gbps
14	1	Length (9um)-km	14	20(km)
15	1	Length (9um)	C8	200(100m)
16	1	Length (50um OM2)	00	Not Support MMF
17	1	Length (62.5um OM1)	00	Not Support MMF
18	1	Length (Copper)	00	Not Support Copper
19	1	Length (50um, OM3)	00	Not Support MMF

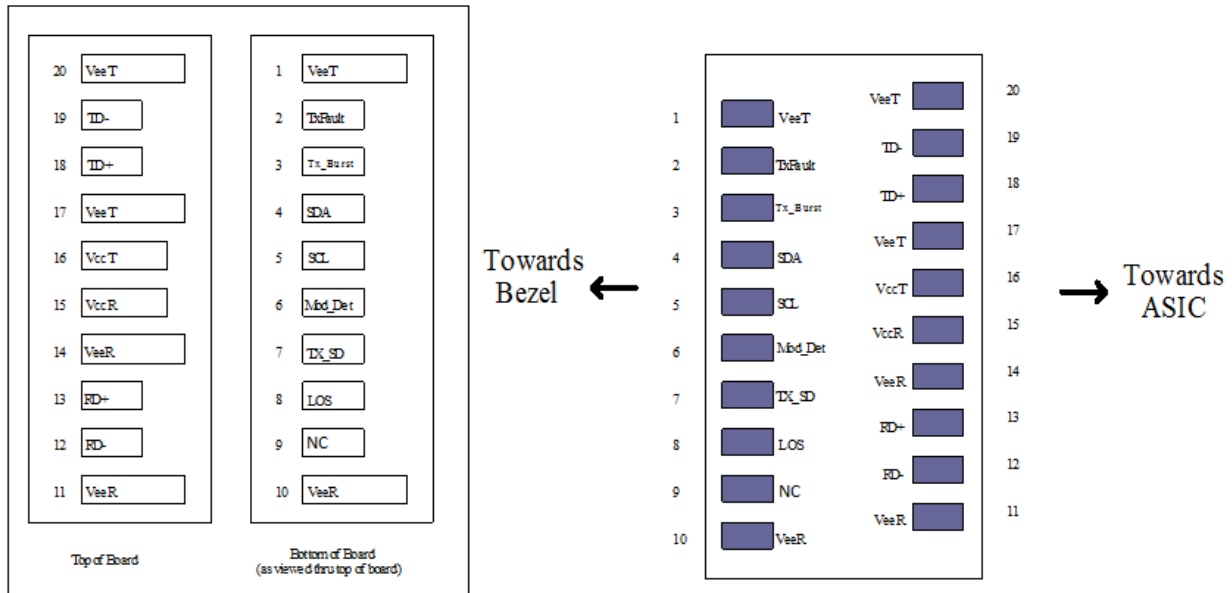
2 wire address 1010000X (A0h)				
Address	Field Size (Byte)	Name of Field	Hex	Description
20-35	16	Vendor name	4D 45 4E 54 45 43 48 4F 50 54 4F 20 20 20 20 20	"MENTECHOPTO" (ASCII)
36	1	Transceiver	00	Code for electronic or optical compatibility
37-39	3	Vendor OUI	00 00 00	SFP vendor IEEE company ID
40-55	16	Vendor PN	4D 50 4F 46 32 32 2D 4C 44 36 43 2D 54 32 20 20	"MPOF22-LD6C-T2"(ASCII)
56-59	4	Vendor Rev	31 2E 30 20	version"1.0" (ASCII)
60-61	2	Wavelength	04 F6	1270nm
62	1	Reserved	00	
63	1	CC_BASE	xx	Check sum of byte 0-62
64-65	2	Options	00 0C	Support TX_Fault & LOS signal
66	1	BR, max	14	+20%
67	1	BR, min	14	-20%
68-83	16	Vendor SN	xx.....xx	ASCII
84-91	8	Date code	xx.....xx	Year,Month,Day
92	1	Diagnostic Monitoring Type	68	Internally Calibrated (0x68) Received power measurement type-Average Power
93	1	Enhanced Options	B0	Optional Alarm/warning implemented. Soft TX_DISABLE (alternative), TX_FAULT, RX_LOS monitoring implemented
94	1	SFF-8472 Compliance	05	Diagnostics Compliance(SFF-8472 V11.0)
95	1	CC_EXT	xx	Check sum of byte 64-94
96-127	32	Reserved	xx	

2 wire address 1010001X (A2h)				
Address	Field Size (Byte)	Bits	Name of Field	Description
00~01	2	ALL	Temp High Alarm Thresholds	MSB at low address, 80°C
02~03	2	ALL	Temp Low Alarm Thresholds	MSB at low address, -10°C
04~05	2	ALL	Temp High Warning Thresholds	MSB at low address, 70°C
06~07	2	ALL	Temp Low Warning Thresholds	MSB at low address, 0°C
08~09	2	ALL	Voltage High Alarm Thresholds	MSB at low address, 3.7V
10~11	2	ALL	Voltage Low Alarm Thresholds	MSB at low address, 3.0V
12~13	2	ALL	Voltage High Warning Thresholds	MSB at low address, 3.5V
14~15	2	ALL	Voltage Low Warning Thresholds	MSB at low address, 3.1V
16~17	2	ALL	Bias High Alarm Thresholds	MSB at low address, 70mA
18~19	2	ALL	Bias Low Alarm Thresholds	MSB at low address, 1mA
20~21	2	ALL	Bias High Warning Thresholds	MSB at low address, 60mA
22~23	2	ALL	Bias Low Warning Thresholds	MSB at low address, 2mA
24~25	2	ALL	TX Power High Alarm Thresholds	MSB at low address, 11dBm
26~27	2	ALL	TX Power Low Alarm Thresholds	MSB at low address, 2dBm
28~29	2	ALL	TX Power High Warning Thresholds	MSB at low address, 10dBm
30~31	2	ALL	TX Power Low Warning Thresholds	MSB at low address, 3dBm
32~33	2	ALL	RX Power High Alarm Thresholds	MSB at low address, -6dBm
34~35	2	ALL	RX Power Low Alarm Thresholds	MSB at low address, -30dBm
36~37	2	ALL	RX Power High Warning Thresholds	MSB at low address, -8dBm
38~39	2	ALL	RX Power Low Warning Thresholds	MSB at low address, -28dBm
40~55	16	ALL	Reserved	Reserved

EEPROM Serial ID Memory Contents

The module provides digital diagnostic information of its operating conditions and status, including transmitting power, received power, laser bias current, module temperature, and supply voltage. Calibration and alarm/warning threshold data are written and stored in internal memory. The memory map is compatible with SFF-8472

Pin Description



SFP+ Transceiver Electrical Pad Layout

Host Board Connector Pad Layout

Figure2

Pin Num.	Name	Function	Note
1	VeeT	Transmitter Ground	1
2	Tx Fault	LVTTL, Transmitter Fault indication, Low=Normal operation, High= TX Fault	2
3	Tx_Burst	LVTTL ,Transmitter Burst control, logic "0" to burst on	3
4	SDA	Module Definition 2, SDA Serial Data Signal	4
5	SCL	Module Definition 1, SCL Serial Clock Signal	4
6	MOD_Det	Connected to the ground internal	4
7	TX_SD	LVLLT, Transmitter signal detect	
8	LOS	LVTTL, Loss of Signal, need external 4.7k~10k pull up resistor	5
9	P_DOWN	Power down, NC/ High=Normal operation, Low=Power down	7
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inv. Received Data Out, AC/CML	
13	RD+	Received Data Out, AC/CML	
14	VeeR	Receiver Ground	1
15	VccR	Receiver Power	

16	VccT	Transmitter Power	
17	VeeT	Transmitter Ground	1
18	TD+	Transmit Data In, AC/ LVPECL	6
19	TD-	Inv. Transmit Data In, AC/ LVPECL	6
20	VeeT	Transmitter Ground	1

Note 1: VeeR and VeeT internally connected within the PON module.

Note 2: TX Fault indicates the status of module with pull up resistor of 10 KΩ externally. In the low state, the output will be pulled to < 0.4V.

Note 3: TX_burst is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 10 KΩ resistor.

Note 4: These are the module definition pins.

SDA is serial data signal with 10 KΩ pull up resistor externally.

SCL is serial clock signal with 10 KΩ pull up resistor externally.

MOD_Det is grounded internally and need 10 KΩ pull up resistor externally to indicate that the module is present.

Note 5: LOS (Loss of Signal) indicates the status of received optical power with 10 KΩ pull up resistor externally.

Note 6: TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

Note 7: This pin is used to power down the module with 4.7KΩ~10 KΩ pull up resistor internally, High=normal operation, Low=shutdown the TX circuit to power down the module.

Function Description

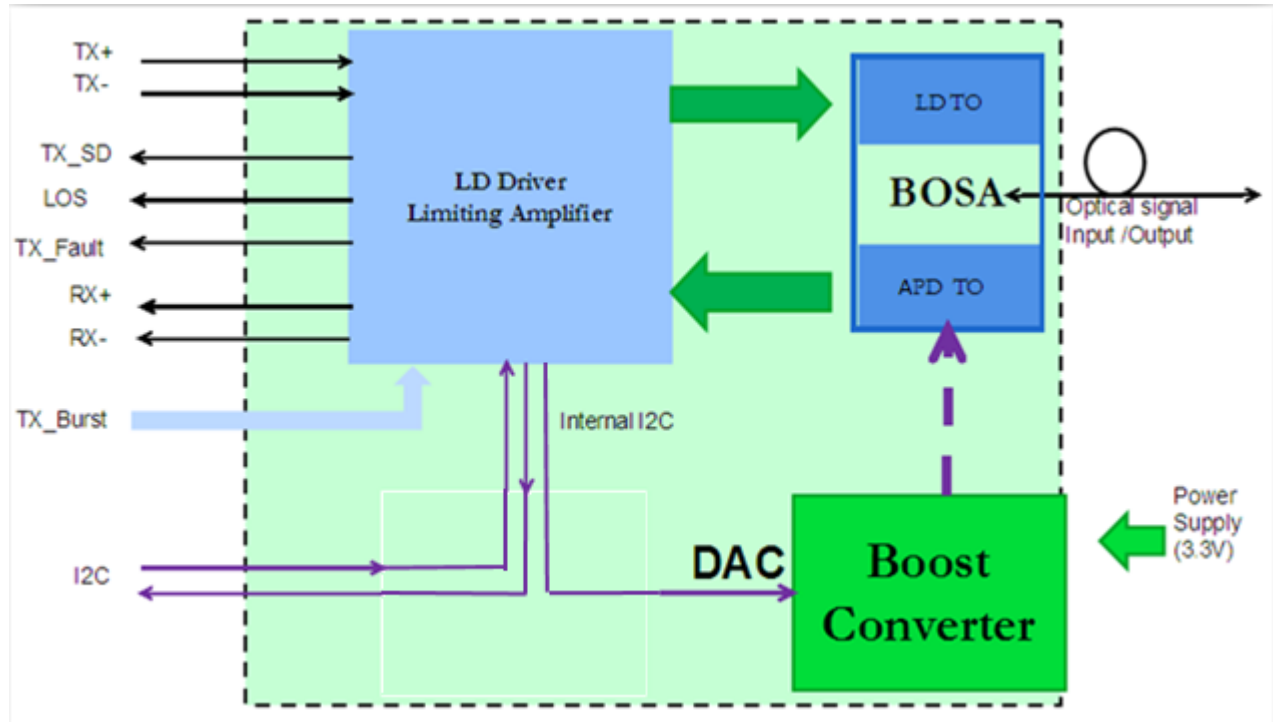


Figure3 Block diagram

The burst-mode transmitter part has a 1270nm DFB laser. It features AC-coupled differential data inputs. Tx_Burst is a LVTTTL input for TX shut down control. Logic"1" disables the LD driver .

The 1577nm continuous-mode receiver part has a high performance detector. The preamplifier (TIA) and limiting amplifier amplify the incoming optical signal into the stable range and convert the signal to differential AC-coupled CML outputs. LOS is LVTTTL output, which logic"1" indicates the input power is lower than the threshold, logic"0" indicates the input power is above the threshold.

Interface Circuit

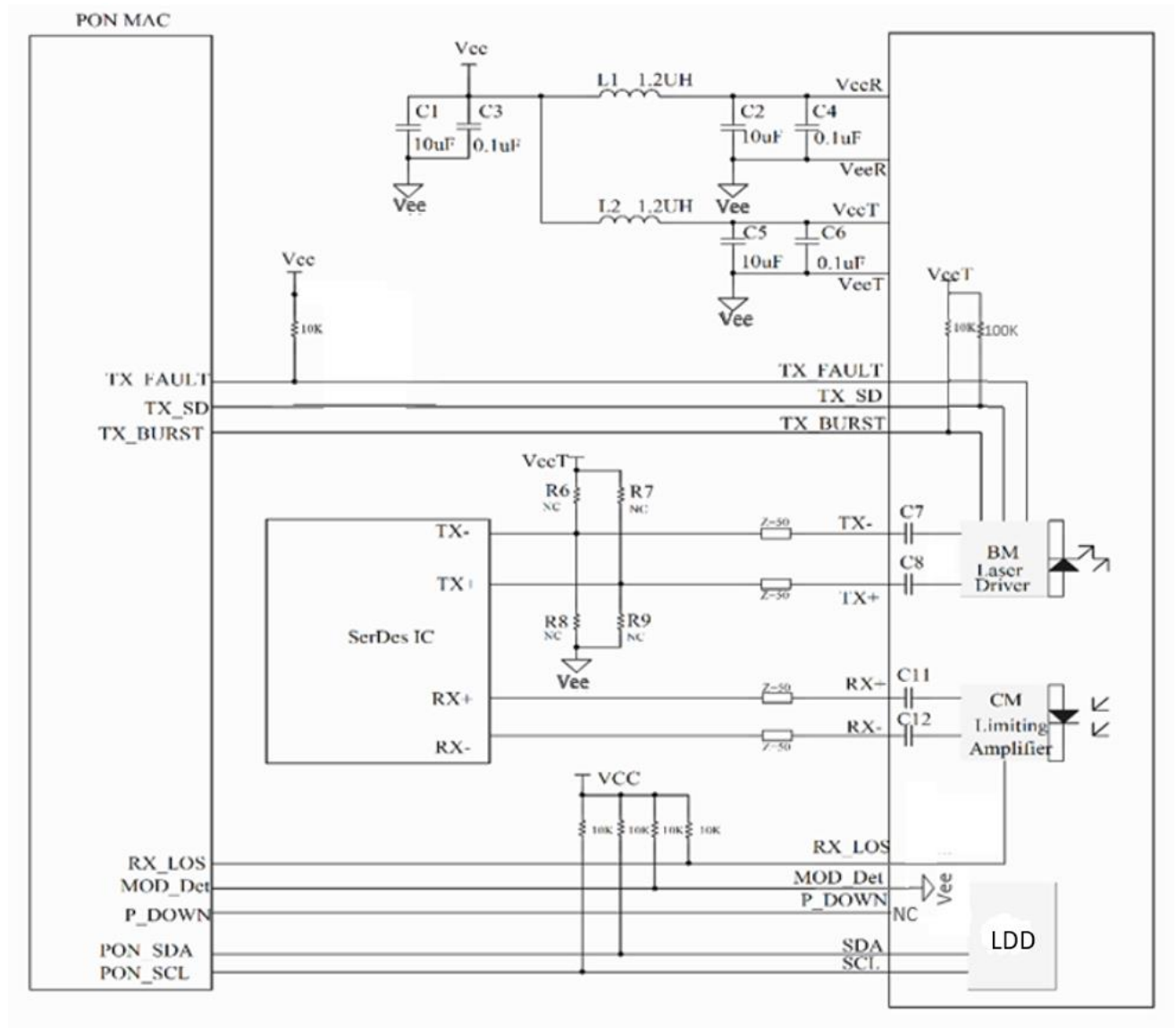


Figure4

Package Outline

(Unit: mm)

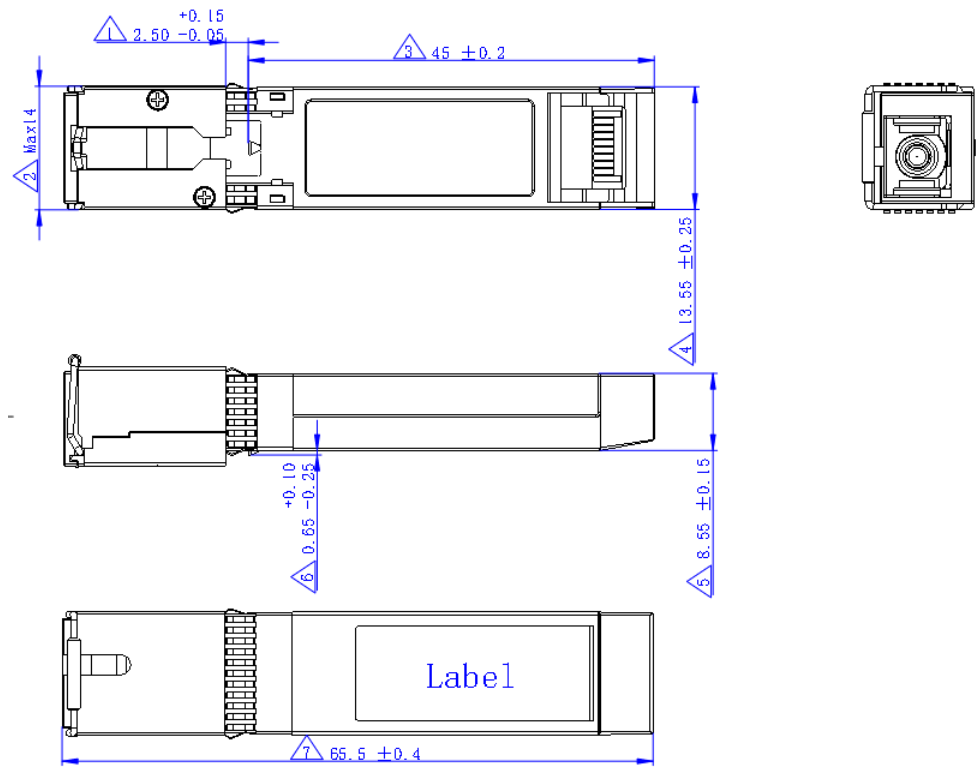


Figure5

Product Security requirements

Items	Contents
Virus scanning	Don't contain malicious code or code vulnerabilities such as Trojans, viruses, worms, backdoors, etc.
Source code static scanning	Don't contain dead pointers, divide by 0, integer overflow, invalid shift operations, memory management, null pointer indirect references, boundary overflow checks, uninitialized variables, write constants, etc.
Source code security scanning	Don't contain memory leaks, out of bounds errors, arithmetic errors, suspicious code, logic errors, etc.