

**10G EPON Symmetric ONU SFP+ Transceiver**  
**PES96-B2510****Features**

Single fiber bi-directional data links with Symmetric 10.3125Gbps upstream and downstream  
Operating Case Temperature Commercial: 0 to 70°C  
SFP+ Package with SC Receptacle  
Hot-pluggable capability  
Single +3.3V Power Supply  
10.3125Gbps / 1270nm Burst-Mode Transmitter with DFB laser  
10.3125Gbps / 1577nm High Sensitivity Continuous-Mode APD-TIA Receiver  
LVTTTL burst enable control, active low  
LVTTTL TX\_SD, TX\_Fault, RX\_LOS  
LVTTTL Sleep Mode for Power Consumption  
Digital diagnostic monitor interface compatible with SFF-8472  
Class 1 Laser eye safety standard IEC-60825 compliant  
Low EMI and excellent ESD protection  
RoHS-6 compliance

**Applications**

Symmetric 10G EPON PR30 ONU

**Standards**

Complies with SFP+ MSA (SFF-8431)  
Complies with SFF 8432  
Compliant with SFF-8472 MSA  
Complies with IEEE 802.3av  
Complies with FCC 47 CFR Part 15, Class B  
Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

ABSOLUTE MAXIMUM RATINGS						
Parameter	Symbol	Min	Max	Units	Notes	
Storage Temperature	$T_{stg}$	-40	+85	°C	Exceeding the Absolute Maximum Ratings may cause irreversible damage to the device. The device is not intended to be operated under the condition of simultaneous Absolute Maximum Ratings, a condition which may cause irreversible damage to the device.	
Operating Case Temperature(Commercial)	$T_{case}$	0	+70	°C		
DC Supply Voltage	$V_{CC}$	0	4	V		
Relative Humidity - Operating	$RH_o$	5	90	%		

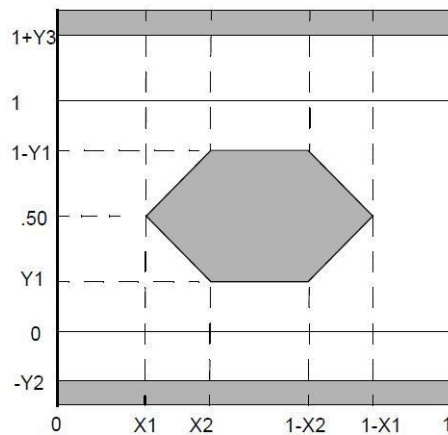
RECOMMENDED OPERATING CONDITION						
Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature(Commercial)	$T_{case}$	0		+70	°C	
Power Supply Voltage	$V_{CC}$	3.14	3.3	3.46	V	
Power Supply Current	$I_{CC}$			400	mA	
Data Rate	@Tx		10.3125		Gbps	
	@Rx		10.3125			

TRANSMITTER ELECTRICAL CHARACTERISTICS						
Parameter	Symbol	Min	Typical	Max	Units	Notes
Tx_Data Differential Input Voltage	$V_{IH}-V_{IL}$	100		1000	mV	AC coupled
Input Differential Impedance	$R_{in}$	90	100	110	$\Omega$	
Transmitter burst control Voltage - Low	$V_{IL}$	0		0.8	V	LVTTTL
Transmitter burst control Voltage - High	$V_{IH}$	2.0		$V_{CC}$	V	
TX_SD indicate voltage - Low	$V_{OL}$	0		0.4	V	
TX_SD indicate voltage - High	$V_{OH}$	2.4		$V_{CC}$	V	
TX_Fault indicate voltage - Low	$V_{OL}$	0		0.4	V	
TX_Fault indicate voltage - High	$V_{OH}$	2.4		$V_{CC}$	V	
P_Down control Voltage - Low	$V_{IL}$	0		0.8	V	
P_Down control Voltage - High	$V_{IH}$	2.0		$V_{CC}$	V	

RECEIVER ELECTRICAL CHARACTERISTICS						
Parameter	Symbol	Min	Typical	Max	Units	Notes
Rx_Data Differential Output Voltage	$V_{OH}-V_{OL}$	600		900	mV	CML, AC coupled
Output Differential Impedance	$R_{out}$		100		$\Omega$	
RX_LOS indicate voltage - Low	$V_{OL}$	0		0.4	V	LVTTTL
RX_LOS indicate voltage - High	$V_{OH}$	2.4		$V_{CC}$	V	

Upstream Burst Mode Transmitter Optical Specification						
Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter Type		1270			nm	DFB Laser
Upstream Signaling Speed	Stx		10.3125		Gbps	
Centre Wavelength	$\lambda_c$	1260	-	1280	nm	
Side Mode Suppression Ration	SMSR	30			dB	
-20db Spectral Width				1	nm	
Average Output Power(BOL)	Pout_b	4.5		8.2	dBm	Begin of life
Average Output Power(EOL)	Pout_e	4		8.2	dBm	End of life
Optical Output with TX OFF	Pout			-45	dBm	
Extinction Ratio	ER	6.5			dB	
Transmitter Turn ON / Turn OFF Time	Ton /Toff			30	ns	
Optical Rise and Fall Time	t <sub>r</sub> /t <sub>f</sub>			38	ps	20% to 80%
Total Jitter	TJ			0.35	UI	
Transmitter and Dispersion Penalty	TDP			1.5	dB	
Eye Diagram(PRBS 2 <sup>31</sup> -1 @10.3125Gbps)		IEEE Std 802.3av Compliant				Note1

Note1: Eye pattern mask

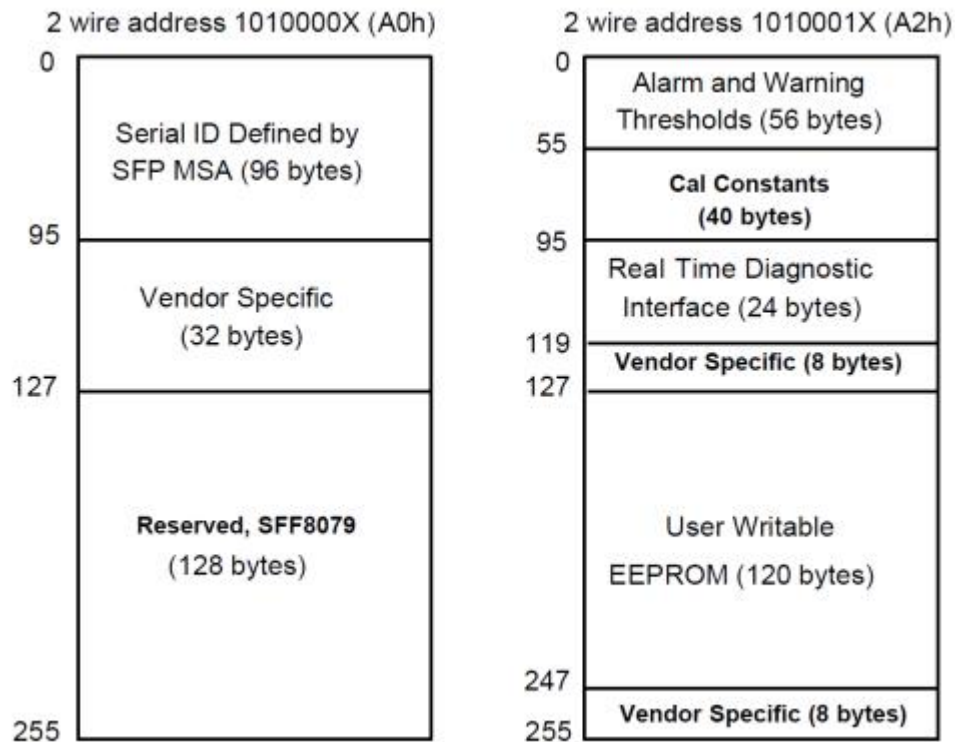


X1	X2	X3	Y1	Y2	Y3	Unit
0.25	0.40	0.45	0.25	0.28	0.40	UI

Downstream CW Mode Receiver Optical Specifications						
Parameter	Symbol	Min	Typ	Max	Unit	Notes
Receiver Type		1577			nm	APD CW Mode
Downstream Signaling Speed	Stx		10.3125		Gbps	
Wavelength	$\lambda_c$	1575		1580	nm	
Sensitivity(BOL)	SEN_b			-28.5	dBm	Note1
Saturation Optical Power	SAT	-8			dBm	
LOS De-assert Level	LOS <sub>D</sub>			-29	dBm	
LOS Assert Level	LOS <sub>A</sub>	-39			dBm	

LOS Hysteresis		1		5	dB	
WDM filter isolation		35			dB	1560nm
		35			dB	1600nm

**EEPROM INFORMATION**



DIGITAL DIAGNOSTIC MONITORING INTERFACE			
Parameter	Range	Accuracy	Calibration
Temperature	Commercial:0 to 70°C	±3°C	Internal
Voltage	3.0 to 3.6V	±5%	Internal
Bias Current	1 to 100mA	±10%	Internal
TX Power	3 to 9dBm	±2dB	Internal
RX Power monitor	-29 to -8dBm	±2dB	Internal

Pin Function Definitions			
Pin	Symbol	Description	Note
1	VeeT	Transmitter Ground	Note1
2	TX_Fault	Transmitter Fault Indication	Note2
3	TX_Burst	Burst Enable, active low	Note3
4	SDA	Module Definition 2	Note4
5	SCL	Module Definition 1	Note4
6	MOD_ABS	Module Definition 0	Note4
7	TX_SD	TX signal detector	Note5
8	RX_LOS	RX Loss of Signal	Note6
9	P_Down	Power down	Note7
10	VeeR	Receiver Ground	Note1
11	VeeR	Receiver Ground	Note1
12	RD-	Inverting Receiver data output	Note8
13	RD+	Non-inverting Receiver data output	Note8
14	VeeR	Receiver Ground	Note1
15	VccR	Receiver Power	Note9
16	VccT	Transmitter Power	Note9
17	VeeT	Transmitter Ground	Note1
18	TD+	Non-inverting Transmitter data input	Note10
19	TD-	Inverting Transmitter data input	Note10
20	VeeT	Transmitter Ground	Note1

Note1: VeeR and VeeT may be internally connected within the SFP+ module.

Note2: TX Fault is an open collector/drain output, which should be pulled up with a 4.7K~10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

Note3: TX\_Burst is an input that is used to open the transmitter burst optical output. It is pulled up within the module with a 4.7~10 K Ω resistor.

It's states are:

Low (0~0.8V): Default Transmitter burst on (>0.8, < 2.0V): Undefined

High (2.0~3.3V): Default Transmitter burst off

Note4: SDA/SCL is the 2 wire serial interface, which should be pulled up with a 4.7K~10KΩ resistor on the host board. MOD\_ABS is GND internal, which should be pulled up with a 4.7K~10KΩ resistor on the host board, high indicates module is absence.

Note5: TX\_SD is the indicator of TX signal. High indicates laser on, low indicates laser off.

Note6: RX\_LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K~10KΩ resistor. Assert high when the input optical power below the threshold.

Note7: Internal pulled up with a 4.7K~10KΩ resistor internal. P\_Down is a controller PIN for saving power consumption. If not use this feature, main board connection should be NC.

Low (0~0.8V): TX power saving is on and transmitter will be set to sleep mode. (>0.8, < 2.0V): Undefined

High (2.0~3.3V) or NC: TX power saving off

Note8: AC coupled internal.

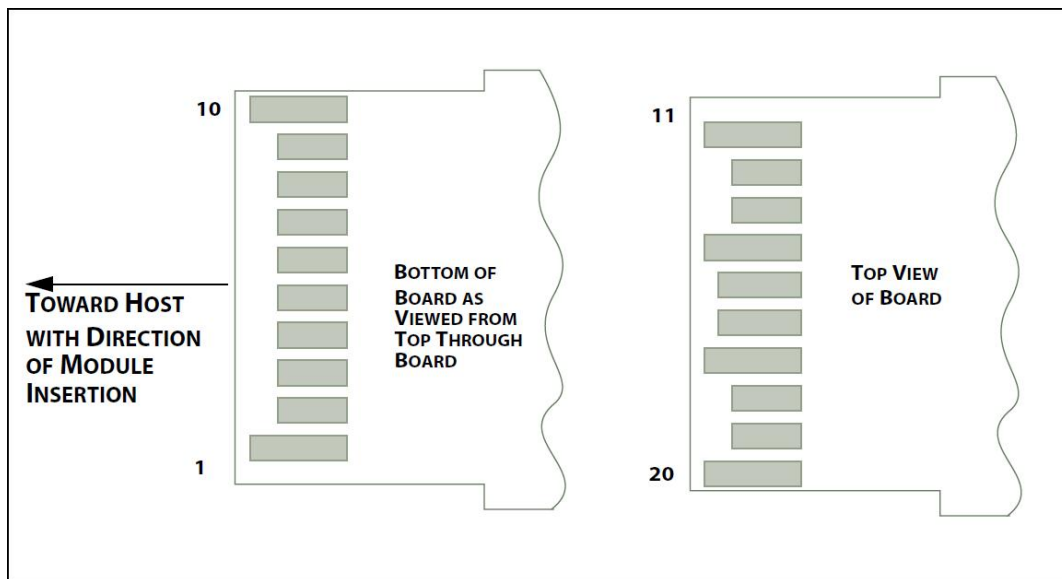
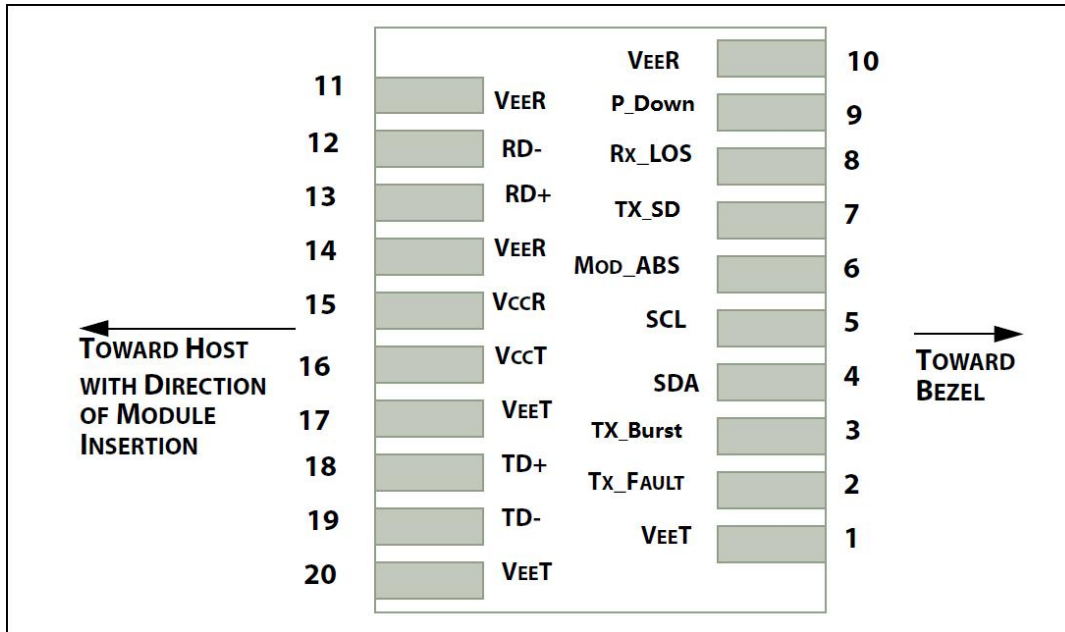
Note9: VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP+ connector pin.

Maximum supply current is 400mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no

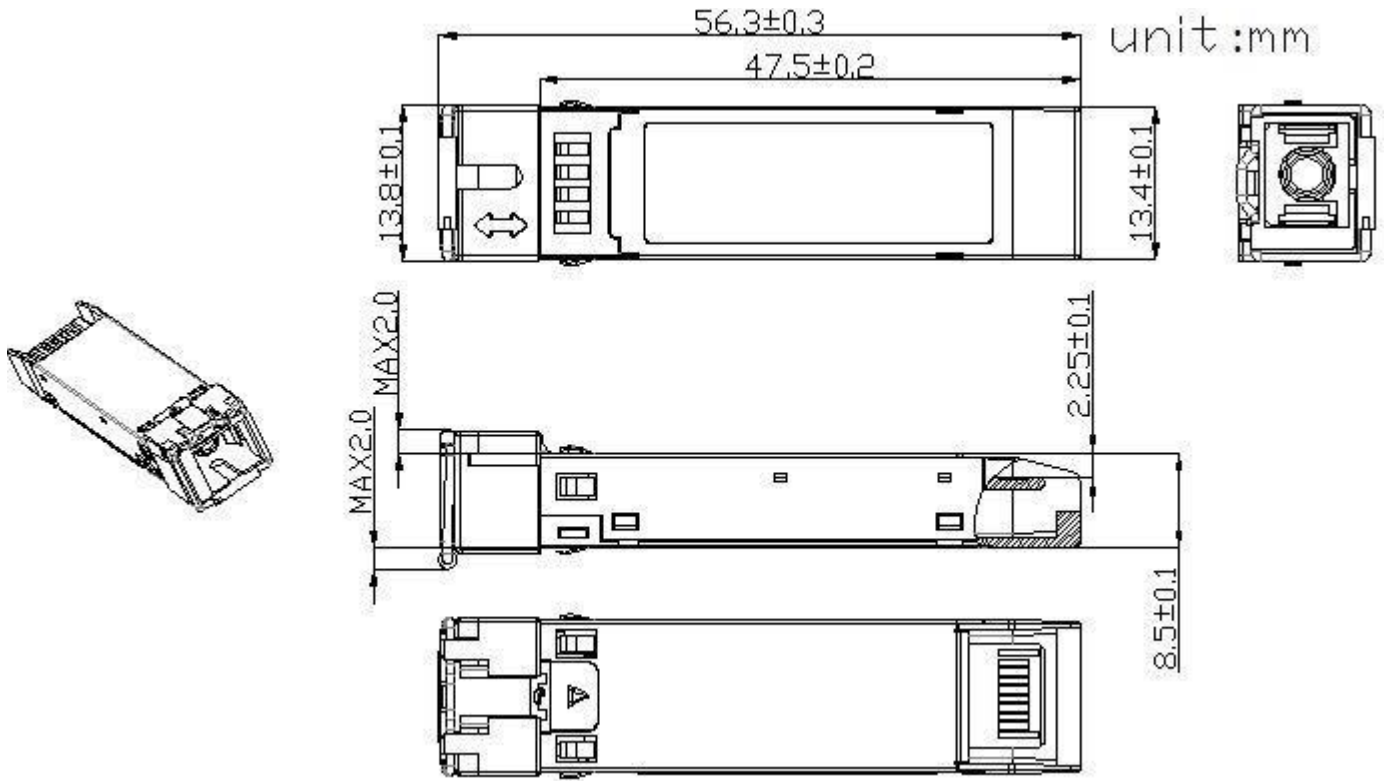
more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.

Note10: AC coupled internal.

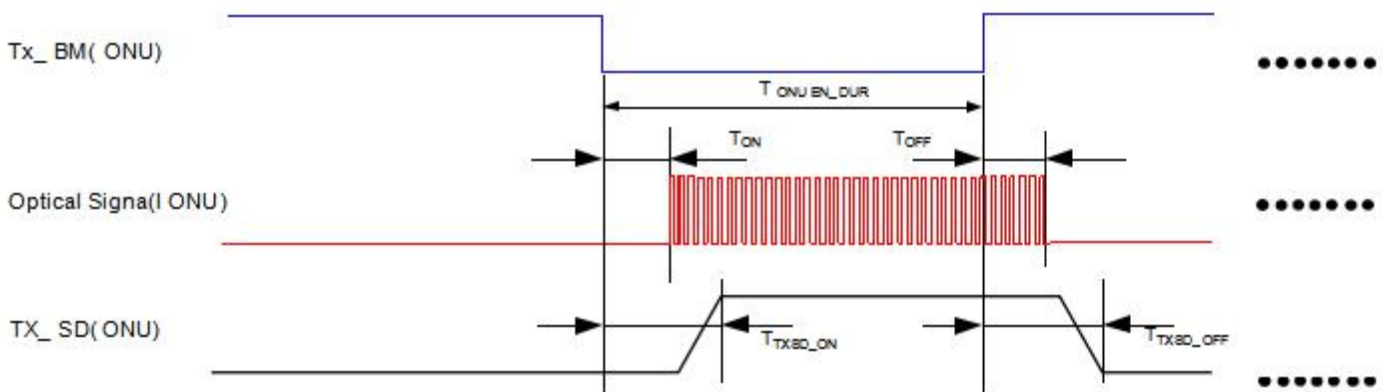
**PIN OUT DRAWING**



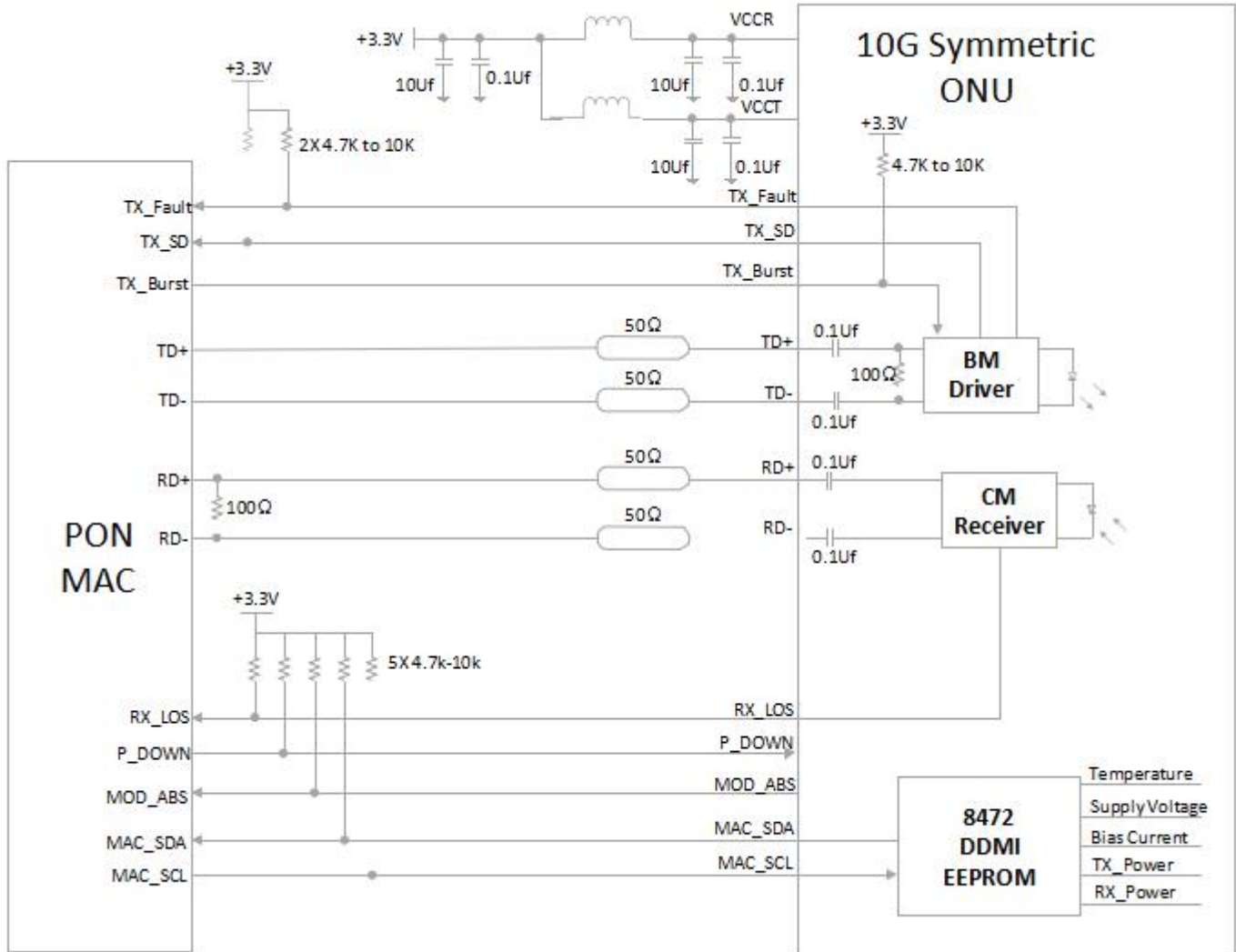
Specifications Mechanical (Unit: mm)



TYPICAL ONU TIMING SEQUENCE



Recommend Circuit Schematic



ORDER INFORMATION

Part Number	Product Description
PES96-B2510	1270nm 10.3125Gb/s(TX)/1577nm 10.3125Gb/s (RX), Symmetric 10GEPON PR30 ONU, active low, SFP+ SC/UPC receptacle connector, 0~70°C

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