



**RoHS Compliant**  
**TX-1550/RX-1310 nm Single-mode Bi-directional (15dB margin)**  
**SFP LC Simplex Connector, with Diagnostic Monitoring**  
**1.0625Gbd Fiber Channel/1.25 Gigabit Ethernet**



**Features**

- Compliant with IEEE802.3z Gigabit Ethernet Standard
- Compliant with Fiber Channel 100-SM-LC-L standard
- Multi rate 125Mbps to 1.25Gbps
- Industry standard small form pluggable (SFP) package
- Simplex LC connector
- Differential LVPECL inputs and outputs
- Single power supply 3.3V
- TTL signal detect indicator
- Hot Pluggable
- Class 1 laser product complies with EN 60825-1

**Ordering Information**

PART NUMBER	TX/RX	TEMPERATURE	LD Type	Distance
LS48-C3M-TC-N-D5	1550/1310	0°C to 70 °C	1550 DFB	20km
LS48-C3M-TI-N-D5	1550/1310	-40°C to 85 °C	1550 DFB	20km

**Diagnostics**

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-20 to 95	± 3	°C	External
Voltage	0 to VCC	± 0.1	V	
Bias Current	0 to 120	± 5	mA	
TX Power	-11 to 0	± 3 dB	dBm	
RX Power	-23 to -3	± 3 dB	dBm	



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**Absolute Maximum Ratings**

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Storage Temperature	$T_S$	-40	85	°C	
Supply Voltage	$V_{CC}$	-0.5	4.0	V	
Input Voltage	$V_{IN}$	-0.5	$V_{CC}$	V	
Output Current	$I_o$	---	50	mA	
Operating Current	$I_{OP}$	---	400	mA	

**Recommended Operating Conditions**

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Case Operating Temperature	$T_C$	0 -40	70 85	°C	LS48-C3M-TC-N-D5 LS48-C3M-TI-N-D5
Supply Voltage	$V_{CC}$	3.1	3.5	V	
Supply Current	$I_{TX} + I_{RX}$	---	300	mA	



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**Transmitter Electro-optical Characteristics**

$V_{CC} = 3.1\text{ V to }3.5\text{ V}$ ,  $T_C = 0^\circ\text{C to }70^\circ\text{C}$  ( $-40^\circ\text{C to }85^\circ\text{C}$ )

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Output Optical Power 9/125 $\mu\text{m}$ fiber	$P_{out}$	-8	---	-2	dBm	Average
Extinction Ratio	$ER$	9	---	---	dB	
Center Wavelength	$\lambda_C$	1530	1550	1570	nm	
Spectral Width (-20dB)	$\Delta\lambda$	---	---	1	nm	
Side Mode Suppression Ratio	$SMSR$	30	---	---	dB	
Rise/Fall Time, (20–80%)	$T_{r,f}$	---	---	260	ps	
Relative Intensity Noise	$RIN$	---	---	-120	dB/Hz	
Total Jitter	$TJ$	---	---	227	ps	
Output Eye						Compliant with IEEE802.3z
Max. $P_{out}$ TX-DISABLE Asserted	$P_{OFF}$	---	---	-45	dBm	
Differential Input Voltage	$V_{DIFF}$	0.4	---	2.0	V	
Transmit Fault Output-Low	$TX\_FAULT_L$	0.0	---	0.5	V	
Transmit Fault Output-High	$TX\_FAULT_H$	2.4	---	$V_{CC}$	V	
Time to initialize, include reset of TX_FAULT	$t_{init}$	---	---	300	ms	
TX_FAULT from fault to assertion	$t_{fault}$	---	---	100	$\mu\text{s}$	
TX_DISABLE time to start reset	$t_{reset}$	10	---	---	$\mu\text{s}$	



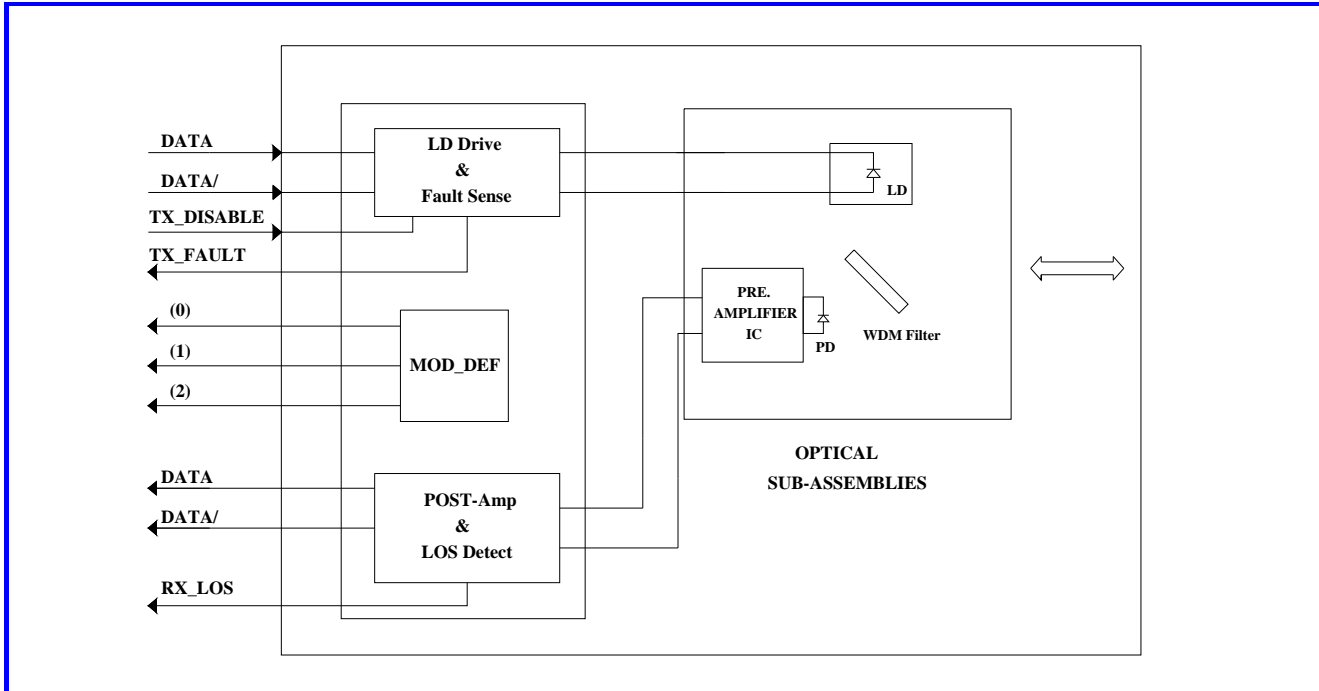
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**Receiver Electro-optical Characteristics**

$V_{CC} = 3.1\text{ V to }3.5\text{ V}, T_C = 0^\circ\text{C to }70^\circ\text{C} (-40^\circ\text{C to }85^\circ\text{C})$

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Optical Input Power-maximum	$P_{IN}$	-2	---	---	dBm	BER < $10^{-12}$
RX Sensitivity @GbE	$P_{IN}$	---	---	-23	dBm	PRBS7, BER < $10^{-12}$
RX Sensitivity @1x FC	$P_{IN}$	---	---	-23	dBm	PRBS7, BER < $10^{-12}$
RX Sensitivity @OC-12	$P_{IN}$	---	---	-23	dBm	PRBS23, BER < $10^{-10}$
RX Sensitivity @OC-3	$P_{IN}$	---	---	-23	dBm	PRBS23, BER < $10^{-10}$
RX Sensitivity @125Mbps	$P_{IN}$	---	---	-23	dBm	PRBS7, BER < $10^{-10}$
Operating Center Wavelength	$\lambda_C$	1260	---	1360	nm	
Optical Return Loss	$ORL$	14	---	---	dB	$\lambda=1260\sim1360\text{nm}$
Optical isolation	$ISO$	---	---	-45	dB	$\lambda=1480\sim1580\text{nm}$
Signal Detect-Asserted	$P_A$	---	---	-23	dBm	
Signal Detect-Deasserted	$P_D$	-35	---	---	dBm	
Differential Output Voltage	$V_{DIFF}$	0.5	---	1.2	V	
Data Output Rise, Fall Time (20~80%)	$T_{r,f}$	---	---	0.35	ns	
Receiver Loss of Signal Output Voltage-Low	$RX\_LOS_L$	0	---	0.5	V	
Receiver Loss of Signal Output Voltage-High	$RX\_LOS_H$	2.4	---	$V_{CC}$	V	

### Block Diagram of Transceiver



#### Transmitter and Receiver Optical Sub-assembly Section

A 1550 nm InGaAsP laser and an InGaAs PIN photodiode integrate with an WDM filter to form a bi-directional single fiber optical subassembly (OSA). The laser of OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current. And, The photodiode of OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

#### TX\_FAULT

When sensing an improper power level in the laser driver, the SFP set this signal high and turns off the Laser. TX\_FAULT can be reset with the TX\_DISABLE line. The signal is in TTL level.

#### TX\_DISABLE

The TX\_DISABLE signal is high (TTL logic "1") to turn off the laser output.

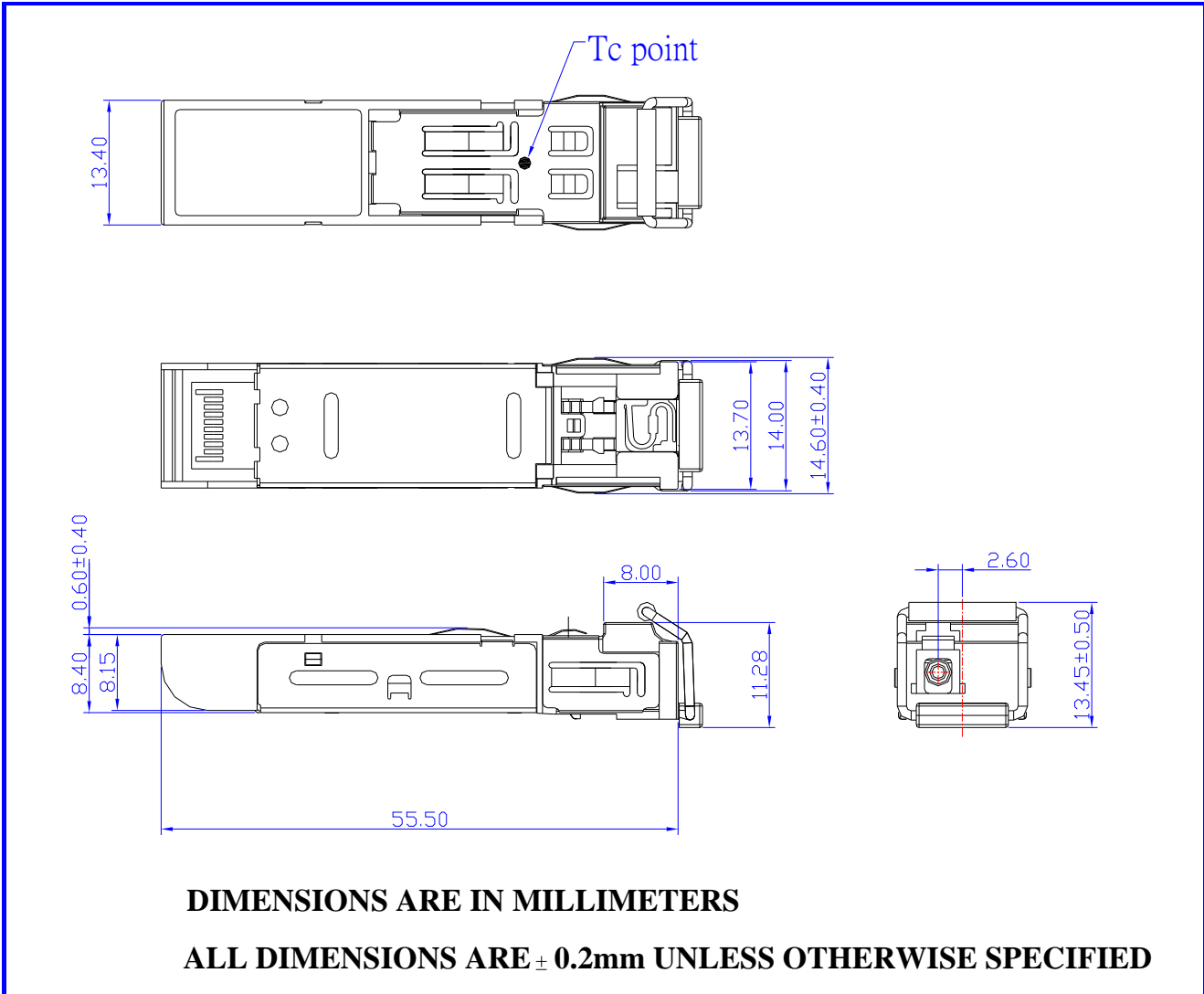
#### Receive Loss (RX\_LOS)

The RX\_LOS is high (logic "1") when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.



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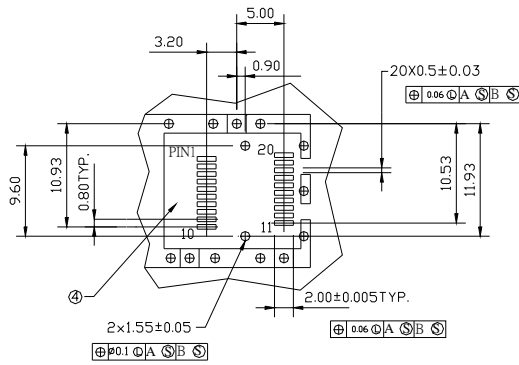
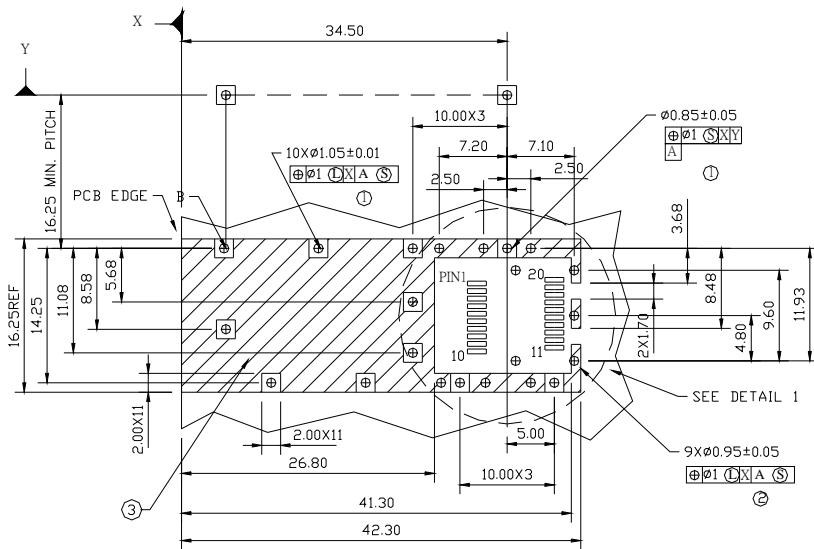
**Dimensions**





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**SFP host board mechanical layout**



DETAIL 1

**LEGEND**

- 1.PADS AND VIAS ARE CHASSIS GROUND
- 2.THROUGH HOLES, PLATING OPTIONAL
- 3.HATCHED AREA DENOTES COMPONENT AND TRACE KEEPOUT(EXCEPT CHASSIS GROUND)
- 4.AREA DENOTES COMPONENT KEEPOUT (TRACES ALLOWED)

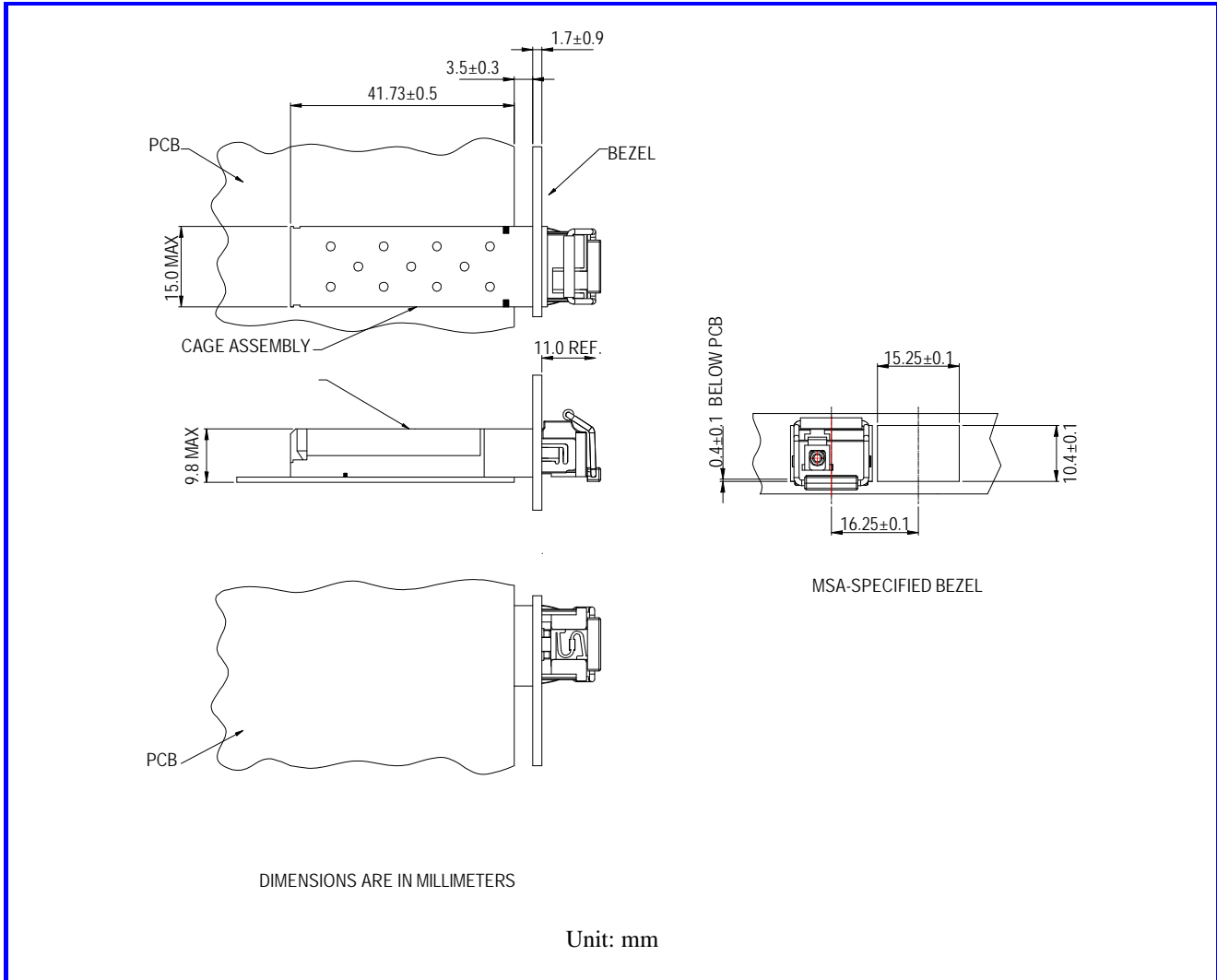
DIMENSIONS ARE IN MILLIMETERS

Unit: mm



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**Assembly drawing**



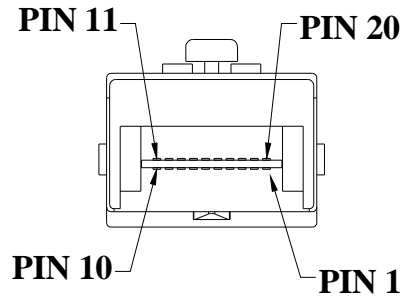




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**Pin Assignment**

Pin-Out



Pin	Signal Name	Description
1	$T_{GND}$	Transmit Ground
2	$TX\_FAULT$	Transmit Fault
3	$TX\_DISABLE$	Transmit Disable
4	$MOD\_DEF (2)$	SDA Serial Data Signal
5	$MOD\_DEF (1)$	SCL Serial Clock Signal
6	$MOD\_DEF (0)$	TTL Low
7	$RATE\_SELECT$	Open Circuit
8	$RX\_LOS$	Receiver Loss of Signal, TTL High, open collector
9	$R_{GND}$	Receiver Ground
10	$R_{GND}$	Receiver Ground
11	$R_{GND}$	Receiver Ground
12	$RX-$	Receive Data Bar, Differential PECL, ac coupled
13	$RX+$	Receive Data, Differential PECL, ac coupled
14	$R_{GND}$	Receiver Ground
15	$V_{CCR}$	Receiver Power Supply
16	$V_{CCT}$	Transmitter Power Supply
17	$T_{GND}$	Transmitter Ground
18	$TX+$	Transmit Data, Differential PCEL, ac coupled
19	$TX-$	Transmit Data Bar, Differential PCEL, ac coupled
20	$T_{GND}$	Transmitter Ground



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**Eye Safety Mark**

The LS4 series singlemode transceiver is a class 1 laser product. It complies with EN 60825-1 and FDA 21 CFR 1040.10 and 1040.11. In order to meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.

**Caution**

**All adjustments have been done at the factory before the shipment of the devices. No maintenance and user serviceable part is required. Tampering with and modifying the performance of the device will result in voided product warranty.**

**Required Mark**

Class 1 Laser Product  
Complies with  
21 CFR 1040.10 and 1040.11

Note : All information contained in this document is subject to change without notice.