RoHS Compliant
1310 nm Single-mode Transceiver, 12dB margin
Small Form Pluggable (SFP), with Diagnostic Monitoring
1.0625Gbd Fiber Channel/1.25 Gigabit Ethernet

Features

- RoHS compliant
- Compliant with IEEE802.3z Gigabit Ethernet Standard
- Compliant with SFF8472 diagnostic monitoring interface
- Duplex 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	INPUT/OUTPUT	SIGNAL DETECT	VOLTAGE	TEMPERATURE
LS38-C3S-TI-N-DD	AC/AC	TTL	3.3V	-40°C to 85 °C
LS38-C3S-TC-N-DD	AC/AC	TTL	3.3V	0°C to 70 °C

Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 95	± 3	°C	External
Voltage	3.0 to 3.6	± 0.1	V	
Bias Current	0 to 100	± 10%	mA	
TX Power	-9 to -3	± 3 dB	dBm	
RX Power	-23 to –3	± 3 dB	dBm	

Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Storage Temperature	T_S	–40	85	°C	
Supply Voltage	*Vcc*	–0.5	4.0	V	
Input Voltage	V_{IN}	–0.5	*Vcc*	V	

Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Case Operating Temperature	T_C	0	70	°C	LS38-C3S-TC-N-DD
		-40	85		LS38-C3S-TI-N-DD
Supply Voltage	*Vcc*	3.1	3.5	V	
Supply Current	$I_{TX} + I_{RX}$	---	250	mA	

Transmitter Electro-optical Characteristics

***Vcc* = 3.1 V to 3.5 V, T_C = 0 °C to 70 °C (-40 °C to 85 °C)**

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Output Optical Power 9/125 μm fiber	P_{out}	-9	---	-3	dBm	Average
Extinction Ratio	ER	9	---	---	dB	
Center Wavelength	λ_C	1270	1310	1355	nm	
Spectral Width (RMS)	$\Delta\lambda$	---	---	2.5	nm	
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	

Receiver Electro-optical Characteristics

Vcc = 3.1 V to 3.5 V, T_C = 0 °C to 70 °C (-40 °C to 85 °C)

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Optical Input Power-maximum	P_{IN}	–3	---	---	dBm	BER < 10^{-12}
Optical Input Power-minimum (Sensitivity)	P_{IN}	---	---	–21	dBm	BER < 10^{-12}
Operating Center Wavelength	λ_C	1260	---	1610	nm	
Optical Return Loss	ORL	12	---	---	dB	
Signal Detect-Asserted	P_A	---	---	–21	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	

EEPROM Serial ID Memory Contents (2-Wire Address A0h)

Address	Description	Hex	Real Value
0	Identifier	03	SFP or SFP+
1	Ext. Identifier	04	GBIC/SFP function is defined by two-wire interface ID only
2	Connector	07	LC
3	Specification Compliance	00	Unallocated
4		00	Unallocated
5		00	Unallocated
6		02	1000BASE-LX;
7		12	Longwave laser(LC);long distance(L);
8		00	Unallocated
9		01	Single Mode(SM);
10		01	100MBytes/sec;
11	Encoding	01	8B/10B
12	BR, nominal	0D	1300Mbps
13	Rate Identifier	0D	
14	Length(SMFm)-km	00	10(units of km)
15	Length(SMF)	00	100(units of 100m)
16	Length(50 μm)	00	
17	Length(62.5 μm)	37	
18	Length(cable)	1E	
19	Length(OM3)	00	
20-35	Vendor name	41, 50, 41, 43, 20, 4F, 70, 74, 6F, 20, 20, 20, 20, 20, 20, 20	APAC Opto
36	Extended Module	00	
37-39	Vendor OUI	00, 0F, 99	
40-55	Vendor PN	4C, 53, 33, 38, 2D, 43, 33, 53, 2D, 54, 49, 2D, 4E, 2D, 44, 44	LS38-C3S-TI-N-DD

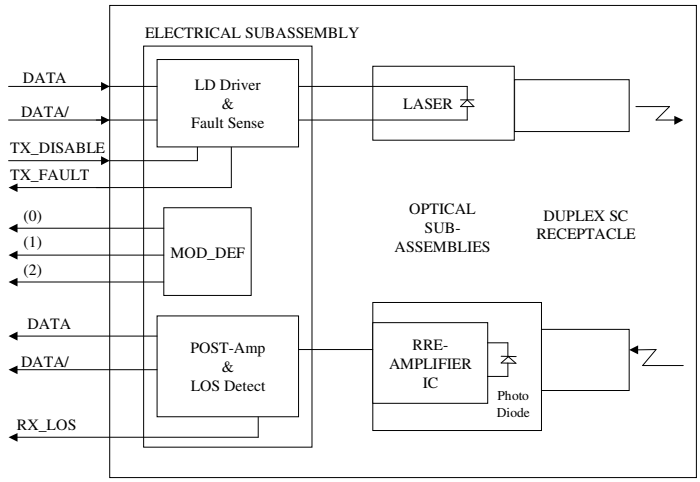
56-59	Vendor rev	00,00,00,00	Unspecified
60-61	Wave length	05, 1E	1310nm
62	Unallocated	00	
63	CC_BASE.	DC	Check sum of byte 0 ~ 62
64-65	Options	00,1A	Loss of Signal;Tx_Fault;Tx_Disable;
66-67	BR	00, 00	
68-83	Vendor SN		
84-91	Date Code		
92	Diagnostic Monitoring Type	58	Received Power Measurement Type;Externally Calibrated;Digital diagnostic monitoring implemented;
93	Enhanced Options	B0	Rx_Loss Monitoring;Tx_Fault Monitoring;Alarm/warning Flags;
94	SFF-8472 Compliance	01	includes functionality described in Rev 9.3 of SFF-8472
95	CC_EXT	2E	Check sum of byte 64 ~ 94
96-127	Vendor Specific		

EEPROM Serial ID Memory contents(A2h)

Address	Description	Value
00-01	Temp High Alarm	85 Degree C
02-03	Temp Low Alarm	-15 Degree C
04-05	Temp High Warning	80 Degree C
06-07	Temp Low Warning	-10 Degree C
08-09	Voltage High Alarm	3.8 V
10-11	Voltage Low Alarm	2.8 V
12-13	Voltage High Warning	3.6 V
14-15	Voltage Low Warning	2.97 V
16-17	Bias High Alarm	80 mA
18-19	Bias Low Alarm	0.1 mA
20-21	Bias High Warning	70 mA
22-23	Bias Low Warning	0.5 mA
24-25	TX Power High Alarm	-1 dBm
26-27	TX Power Low Alarm	-11.5 dBm
28-29	TX Power High Warning	-2 dBm
30-31	TX Power Low Warning	-10.5 dBm
32-33	RX Power High Alarm	-2 dBm
34-35	RX Power Low Alarm	-22 dBm
36-37	RX Power High Warning	-3 dBm
38-39	RX Power Low Warning	-19 dBm
40-55	Reserved for future monitored quantities	
56-91	Calibration constant	
92-94	Reserved	
95	Check sum	
96-97	Real Time temperature	
98-99	Real Time supply voltage	
100-101	Real Time TX bias current	
102-103	Real Time TX optical power	
104-105	Real Time RX received power	
106-109	Reserved	
110(bit7)	NA	
110(bit6)	NA	
110(bit5)	Reserved	
110(bit4)	NA	
110(bit3)	NA	
110(bit2)	Digital state of TX fault output pin	
110(bit1)	Digital state of LOS output pin	
110(bit0)	NA	
111	Reserved	
112(bit7)	Set when internal temperature exceeds high alarm level	
112(bit6)	Set when internal temperature exceeds is below alarm level	
112(bit5)	Set when internal supply voltage exceeds high alarm level	
112(bit4)	Set when internal supply voltage is below alarm level	
112(bit3)	Set when TX bias exceeds high alarm level	
112(bit2)	Set when TX bias voltage is below alarm level	
112(bit1)	Set when TX output power exceeds high alarm level	
112(bit0)	Set when TX output power voltage is below alarm level	
113(bit7)	Set when RX received power exceeds high alarm level	
113(bit6)	Set when RX received power is below alarm level	
113(bit5-0)	Reserved	

114-115	Reserved	
116(bit7)	Set when internal temperature exceeds high warning level	
116(bit6)	Set when internal temperature exceeds is below warning level	
116(bit5)	Set when internal supply voltage exceeds high warning level	
116(bit4)	Set when internal supply voltage is below warning level	
116(bit3)	Set when TX bias exceeds high warning level	
116(bit2)	Set when TX bias voltage is below warning level	
116(bit1)	Set when TX output power exceeds high warning level	
116(bit0)	Set when TX output power voltage is below warning level	
117(bit7)	Set when RX received power exceeds high warning level	
117(bit6)	Set when RX received power is below warning level	
117(bit5-0)	Reserved	
118-119	Reserved	
120-127	Vendor specific	

Block Diagram of Transceiver



TOP VIEW (Label side)

Transmitter Section

The transmitter section consists of a 1310 nm InGaAsP laser in an eye safe optical subassembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current.

TX_DISABLE

The TX_DISABLE signal is high (TTL logic “1”) to turn off the laser output. The laser will turn on when TX_DISABLE is low (TTL logic “0”).

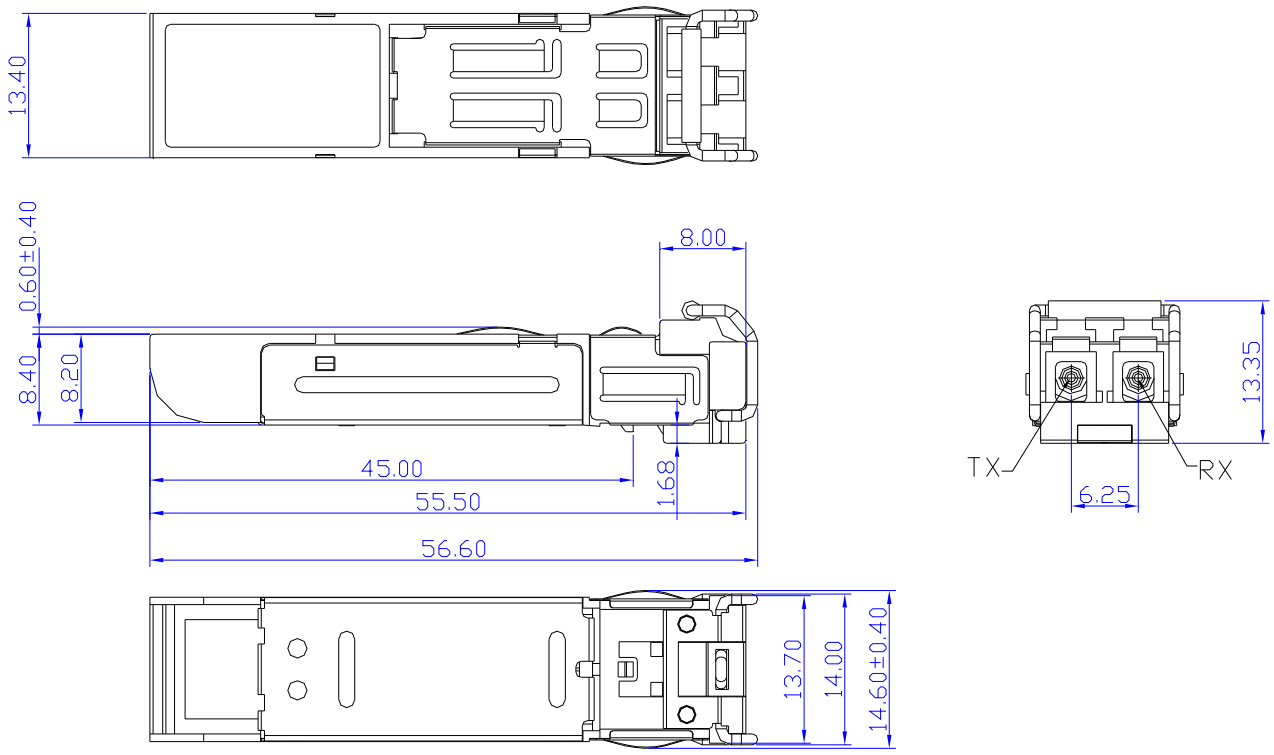
Receiver Section

The receiver utilizes an InGaAs PIN photodiode mounted together with a trans-impedance preamplifier IC in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

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 LVTTL level.

Dimensions

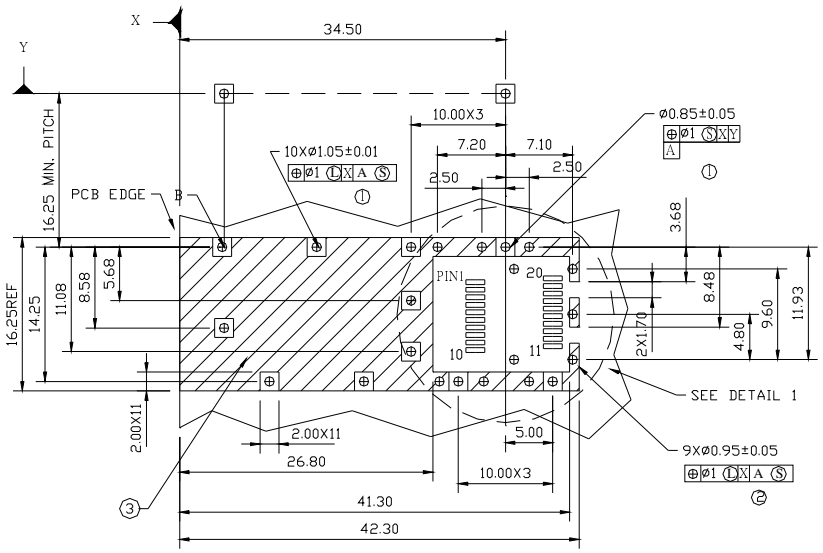


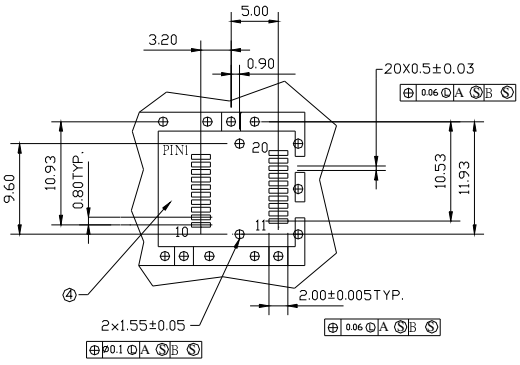
DIMENSIONS ARE IN MILLIMETERS

ALL DIMENSIONS ARE ± 0.2mm UNLESS OTHERWISE SPECIFIED

Unit: mm

SFP host board mechanical layout





DETAIL 1

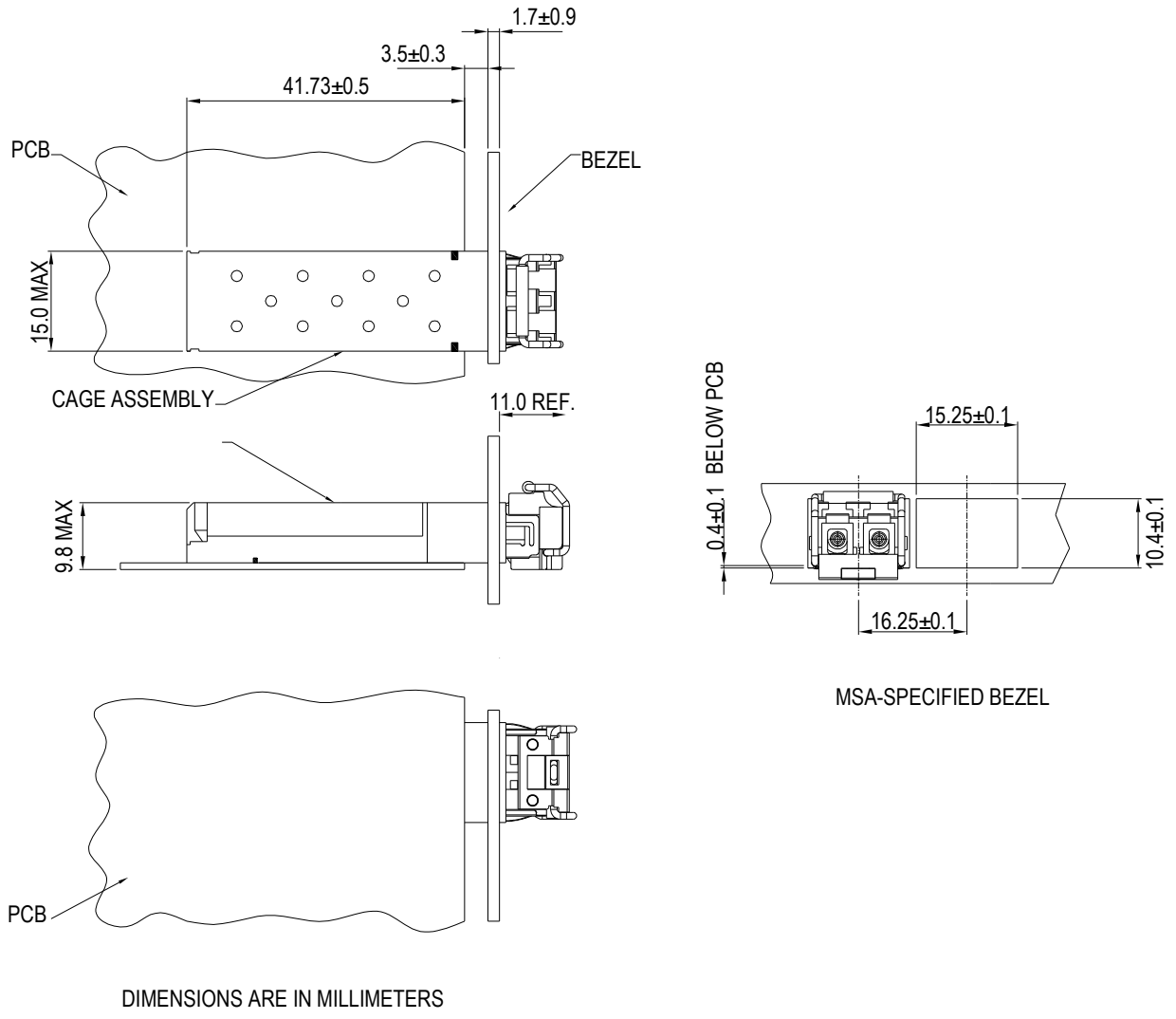
LEGEND

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

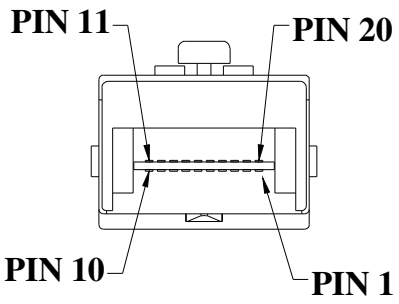
Assembly drawing



Unit: mm

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

Eye Safety Mark

The LS3 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.