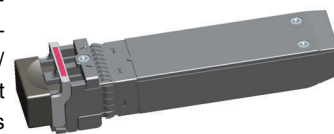




LTF54XX SFP+ DWDM Optical Transceiver

C-Band DWDM 8.5 to 11.3Gb/s 40km

The LTF54XX SFP+ transceiver is intended for 40km reach service from 8.5Gb/s to 11.3b/s DWDM high-speed communications equipment where low-cost, extraordinary performance and reliability are essential. It consumes low power, operates from a 3.3V DC power supply and is offered in the commercial temperature range and industrial temperature range. They are compliant with IEEE802.3ae 10GBASE-ER/EW, SFF-8431 and SFF-8432. It incorporates the SFP+ MSA LVTTTL Loss of Signal (Rx_LOS) and Tx Fault (Tx_FAULT) are available via a 2-wire serial interface, as specified in the SFP+ MSA. The transceiver is RoHS compliant and lead free per Directive 2002/95/EC. The low jitter and low bit error rate optical assemblies features a DWDM-rated EML and PIN/TIA receiver. The differential AC coupled Tx and Rx data interfaces are CML compatible. The device is Class I laser safety compliant.



Applications

- 10G BASE ER/EW 10G Ethernet
- 10G Fiber channel

Features

- 2x10 SFP+ MSA compliant package
- 40km reach
- Single mode
- Single 3.3V power supply
- LC duplex transceiver
- Hot pluggable
- RoHS compliance

Optical Transmitter

- C-Band DWDM EML
- 8.5 to 11.3Gb/s data rate
- CML Tx_Data electrical input
- AC coupled and terminated differential 100Ω input

Optical Receiver

- PIN/TIA optical receiver
- 8.5 to 11.3b/s data rate
- CML Rx_Data electrical output
- AC coupled differential 100Ω output

Control and Monitor Interface

- LVTTTL SCL (I²C serial clock)
- LVTTTL SDA (I²C serial data)
- LVTTTL MOD_ABS
- LVTTTL Rx_LOS
- LVTTTL Tx_Fault
- LVTTTL Tx_Disable

Case Operating Temperature Range:

- Industrial: -40 to 85°C

Recommended Operating Conditions						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Case Operating Temperature	T _{case}	-40	25	85	°C	Temperature Range = H
Module Supply Voltage	V _{cc}	3.135	-	3.465	V	
Module Supply Current	I _{IN}	-	-	580	mA	Temperature Range = H

Ordering Information	
Part Number	Case Operating Temperature
LTF54XX-BH+	-40 to 85°C

Absolute Maximum Ratings (EXCEEDING THESE RATINGS MAY CAUSE IRREVERSIBLE DAMAGE TO THE DEVICE)						
Parameter	Symbol	Min	Max	Units	Notes	
Storage Ambient 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.	
Relative Humidity - Storage	RH _s	0	95	%		
Relative Humidity - Operating	RH _o	0	85	%		
Module Supply Voltage	V _{cc}	0	3.6	V		



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Wavelength Guide					
Part No. (xx)	Frequency (THz)	Wavelength (nm)	Part No. (xx)	Frequency (THz)	Wavelength (nm)
LTF5418-BH+	191.8	1563.05	LTF5441-BH+	194.1	1544.53
LTF5419-BH+	191.9	1562.23	LTF5442-BH+	194.2	1543.73
LTF5420-BH+	192.0	1561.42	LTF5443-BH+	194.3	1542.94
LTF5421-BH+	192.1	1560.61	LTF5444-BH+	194.4	1542.14
LTF5422-BH+	192.2	1559.79	LTF5445-BH+	194.5	1541.35
LTF5423-BH+	192.3	1558.98	LTF5446-BH+	194.6	1540.56
LTF5424-BH+	192.4	1558.17	LTF5447-BH+	194.7	1539.77
LTF5425-BH+	192.5	1557.36	LTF5448-BH+	194.8	1538.98
LTF5426-BH+	192.6	1556.55	LTF5449-BH+	194.9	1538.19
LTF5427-BH+	192.7	1555.75	LTF5450-BH+	195.0	1537.40
LTF5428-BH+	192.8	1554.94	LTF5451-BH+	195.1	1536.61
LTF5429-BH+	192.9	1554.13	LTF5452-BH+	195.2	1535.82
LTF5430-BH+	193.0	1553.33	LTF5453-BH+	195.3	1535.04
LTF5431-BH+	193.1	1552.52	LTF5454-BH+	195.4	1534.25
LTF5432-BH+	193.2	1551.72	LTF5455-BH+	195.5	1533.47
LTF5433-BH+	193.3	1550.92	LTF5456-BH+	195.6	1532.68
LTF5434-BH+	193.4	1550.12	LTF5457-BH+	195.7	1531.90
LTF5435-BH+	193.5	1549.32	LTF5458-BH+	195.8	1531.12
LTF5436-BH+	193.6	1548.51	LTF5459-BH+	195.9	1530.33
LTF5437-BH+	193.7	1547.72	LTF5460-BH+	196.0	1529.55
LTF5438-BH+	193.8	1546.92			
LTF5439-BH+	193.9	1546.12			
LTF5440-BH+	194.0	1545.32			



LTF54XX SFP+ DWDM Optical Transceiver

C-Band DWDM 8.5 to11.3Gb/s 40km

Transmitter Electrical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Tx_Data Differential Input Voltage	V_{IN}	180	-	700	mV	
Tx Differential Input Impedence	Z_{IN}	-	100	-	Ω	
Tx_DIS=HIGH(Transmitter OFF/DISABLED)	V_{TDH}	2	-	V_{CC}	V	
Tx_DIS=LOW(Transmitter ON/ENABLED)	V_{TDL}	0	-	+0.8	V	

Receiver Electrical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Rx_Data Differential Output Voltage	V_{OUT}	300	-	850	mV	
Rx Differential Output Impedence	Z_{OUT}	-	100	-	Ω	
Rx_LOS = HIGH (Receiver OFF / LOS)	-	2.4	-	V_{CC}	V	
Rx_LOS = LOW (Receiver ON / NORMAL)	-	V_{EE}	-	$V_{EE}+0.4$	V	

Transmitter Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Average Launch Power	P_{OUT}	-2	-	3	dBm	10.3125Gbps, PRBS2^31-1
Average Output Power (Laser Off)	P_{OFF}	-	-	-30	dBm	
Optical Center Wavelength	λ	Order Information			nm	
Wavelength Tolerance (EOL)	-	-100	-	+100	pm	
Wavelength Tolerance (BOL)	-	-40	-	+40	pm	
Spectral Line Width@-20dB	$\Delta\lambda$	-	-	1	nm	
Extinction ratio	ER	6	-	-	dB	10.3125Gbps, PRBS2^31-1
Dispersion Penalty	DP	-	-	3	dB	10.3125Gbps, PRBS2^31-1, BER<10 ⁻¹²
Relative Intensity Noise	RIN	-	-	-128	dB/Hz	
Transmitter Output Eye	Compliant with IEEE802.3ae					



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Receiver Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Optical Center Wavelength	λ	1525	-	1565	nm	
Received Sensitivity(OMA)	$P_{IN}(OMA)$	-	-	-14.1	dBm	10.3125Gbps, PRBS2 ³¹ -1
Average receive sensitivity	P_{IN}	-	-	-15.8	dBm	10.3125Gbps, PRBS2 ³¹ -1
Receiver Optical Overload	$P_{IN}(SAT)$	-1	-	-	dBm	
Receiver Reflectance	RFL	-	-	-26	dB	
Rx_LOS Assert	LOS_A	-30	-	-	dBm	
Rx_LOS De-assert	LOS_D	-	-	-19	dBm	
Rx_LOS Hysteresis	P_{hy}	0.5	-	5	dB	

General Optical Parameter						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Data rate	BR	8.5	-	11.3	Gb/s	
Bit Error Rate	BER	-	-	10^{-12}		PRBS 2 ³¹ -1
Maximum Supported Link Length	L(MAX)	-	-	40	km	



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Memory Map(Page 0xA0 HEX, Unlisted Fields are Blank/Empty, Memory is WRITE PROTECTED, SDA Communications is READ ONLY)				
Address	Size (Byte)	Name of Field	Description	Values (HEX)
0	1	Identifier	SFP plus	03
1	1	Ext. Identifier	Extended Identifier	04
2	1	Connector	Connector Type = LC	07
3-10	8	Transceiver	10G Base ER	80 00 00 00 00 10 01 00
11	1	Encoding	Encoding Type = 64B/66B	06
12	1	BR, Nominal	Nominal Bit Rate 10.3125Gb/s	67
13	1	Reserved	Reserved	00
14	1	Length(9μm)-km	40km Link Length in Kilometers / SMF	28
15	1	Length (9μm)-100m	40km Link Length in Hundreds of Meters / SMF	FF
16	1	Length (50μm)-10m	50-micron MMF Link Length = N/A	00
17	1	Length (62.5μm)-10m	62.5-micron MMF Link Length = N/A	00
18	1	Length (Copper)	Copper Link Length = N/A	00
19	1	Reserved	Reserved	00
20-35	16	Vendor name	Hisense	ASCII Format
36	1	Reserved	Reserved	00
37-39	3	Vendor OUI	SFP Vendor IEEE Company ID	AC 4A FE
40-55	16	Vendor PN	The Part Number in the Ordering Information	ASCII Format
56-59	4	Vendor Rev No.	Programmed by Factory	Programmed by Factory
60 to 61	2	Tx Wavelength	Programmed by Factory	Programmed by Factory
62	1	Tx Wavelength	Programmed by Factory	Programmed by Factory
63	1	CC_BASE	Check sum of bytes 0-62	Programmed by Factory
64-65	2	Transceiver Options	1. Cooled Transceiver Declaration 2. Rx_LOS 3. Tx_FAULT	04 1A
66	1	BR, max	unspecified	00
67	1	BR, min	unspecified	00
68-83	16	Vendor SN	Programmed by Factory	Programmed by Factory
84-91	8	Date code	Year,Month,Day	Programmed by Factory
92	1	Monitoring Type	Internally Calibrated Received power measurement type-Average Power	68
93	1	Enhanced Options	1. Optional Alarm/Warning Flags Implemented 2. Soft Rx_LOS Monitor 3. Soft Tx_FAULT Monitor	B0
94	1	Compliance	Revision Implemented	03
95	1	CC_EXT	Check sum of bytes 64-94	Programmed by Factory
96-127	32	Vendor Specific	Vendor Specific EEPROM	Programmed by Factory
128-255	128	Vendor Specific	Vendor Specific	Programmed by Factory



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A2 (hex) Table - Summary of Parameters in the A2 (hex) Parametric Table

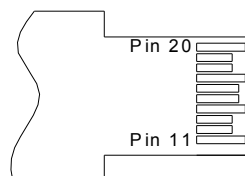
The data in the parameter tables are compared with the data in the measured data tables in order to create a warning or alarm status bit

The Warning or Alarm bit is set when the parameter drops below or exceeds the Low or High values stored in memory.

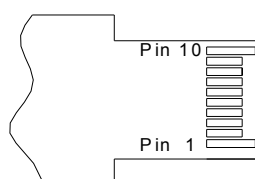
A2 (HEX) Address Table for Alarm and Warning Data														
Parameter	Alarm Threshold Data				Warning Threshold Data				Measured Values		Alarm Bit (Set) Address + Position		Warning Bit (Set) Address + Position	
	High Value		Low Value		High Value		Low Value				High	Low	High	Low
	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	High	Low	High	Low
Temperature	00	01	02	03	04	05	06	07	96	97	112 (7)	112 (6)	116 (7)	116 (6)
Vcc	08	09	10	11	12	13	14	15	98	99	112 (5)	112 (4)	116 (5)	116 (4)
Tx Bias	16	17	18	19	20	21	22	23	100	101	112 (3)	112 (2)	116 (3)	116 (2)
Tx Power	24	25	26	27	28	29	30	31	102	103	112 (1)	112 (0)	116 (1)	116 (0)
Rx Power	32	33	34	35	36	37	38	39	104	105	113 (7)	113 (6)	117 (7)	117 (6)

Pin Assignment

TOP VIEW
OF BOARD



BOTTOM VIEW
OF BOARD



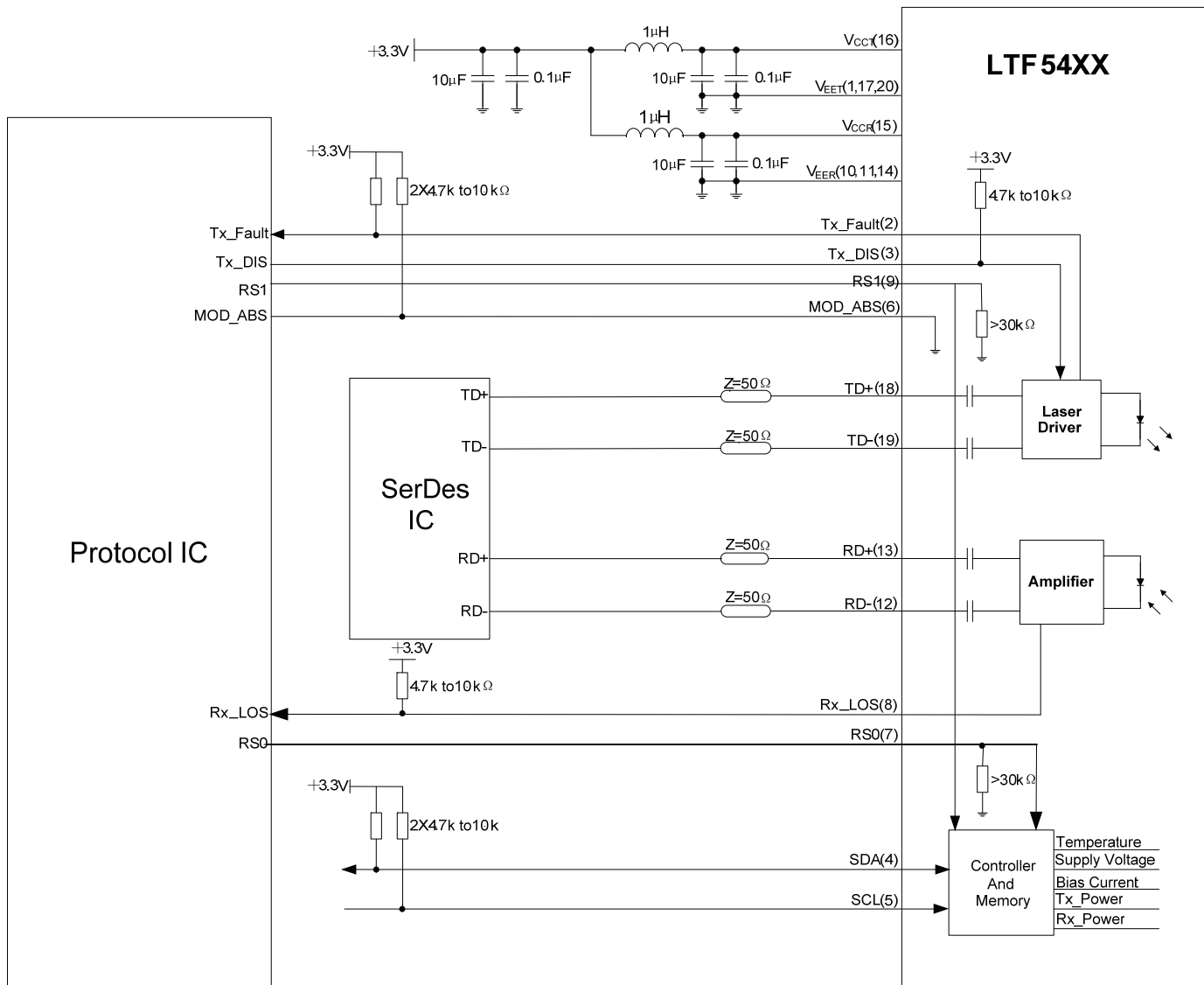
Pin Description			
Pin	Symbol	Name/Description	Note
1	V_{EET}	Transmitter Ground	1
2	T_{FAULT}	Transmitter Fault.	2
3	T_{DIS}	Transmitter Disable. Laser output disabled on high.	
4	SDA	2-wire Serial Interface Data Line (MOD-DEF2)	
5	SCL	2-wire Serial Interface Clock (MOD-DEF1)	
6	MOD_ABS	Module Absent, connected to V_{EET}	
7	RS0	Rx Rate Select: NOT implement	3
8	Rx_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	2
9	RS1	Tx Rate Select: NOT implement	3
10	V_{EER}	Receiver Ground	1
11	V_{EER}	Receiver Ground	1
12	RD-	Receiver Inverted DATA out.	4
13	RD+	Receiver Non-inverted DATA out.	4
14	V_{EER}	Receiver Ground	1
15	V_{CCR}	Receiver Power Supply	6
16	V_{CCT}	Transmitter Power Supply	6
17	V_{EET}	Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in.	5
19	TD-	Transmitter Inverted DATA in.	5
20	V_{EET}	Transmitter Ground	1
Notes			
<ol style="list-style-type: none"> Module ground pins V_{EET} and V_{EER} are isolated from the module case and chassis ground within the module. Shall be pulled up with 4.7k-10k ohms to a voltage between 3.15V and 3.6V on the host board. The pins are pulled low to V_{EET} with a >30k resistor in the module. The 100 Ohm differential Rx Data output is internally AC coupled and terminated. The 100 Ohm differential Tx Data input is internally AC coupled and terminated. The power supply pins V_{CCT} and V_{CCR} are connected together in the module. 			



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Electrical Interface

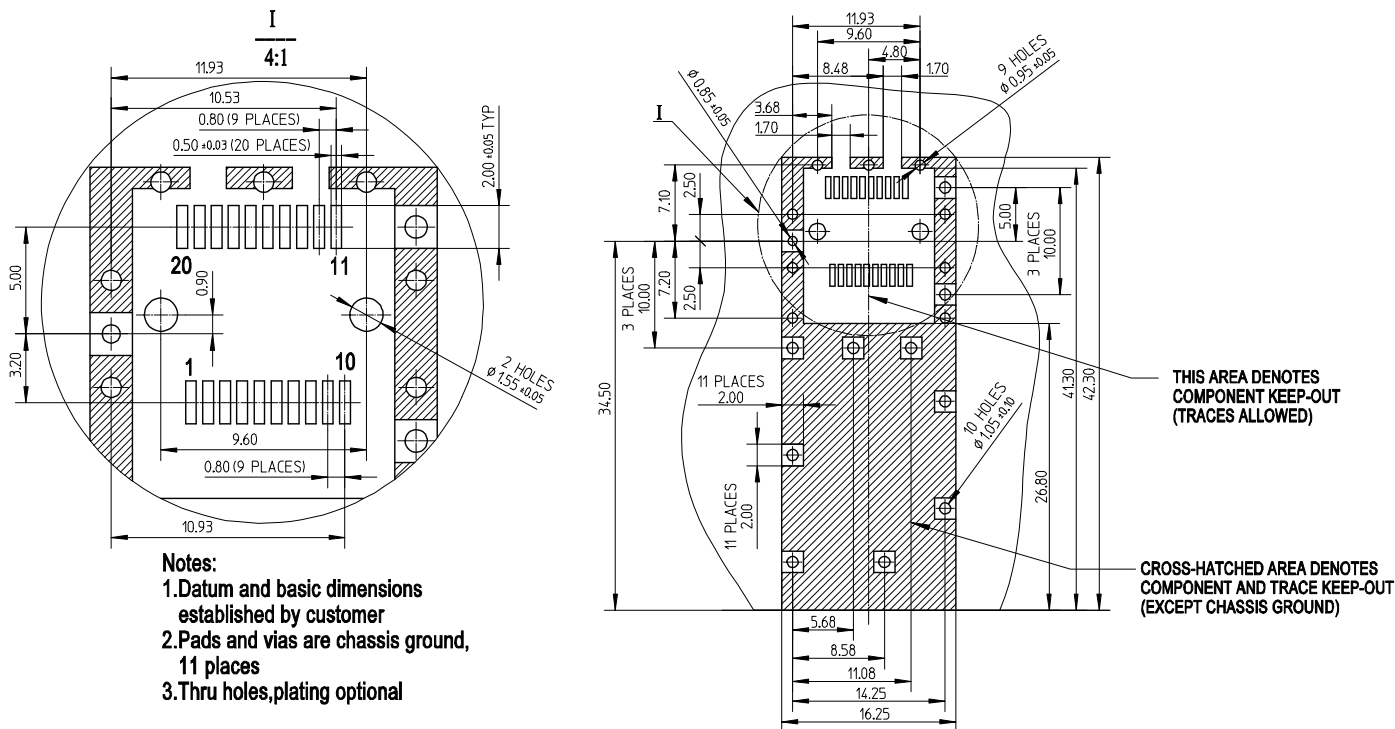




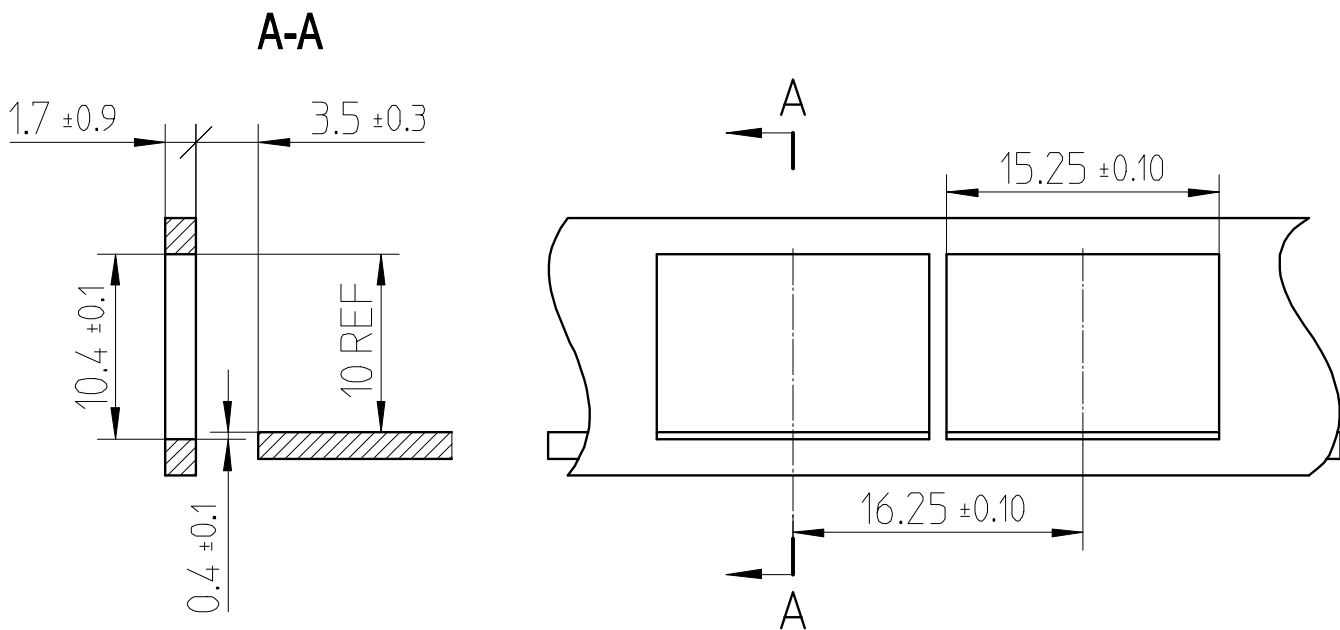
LTF54XX SFP+ DWDM Optical Transceiver

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Recommended Pcb Layout



Recommended Front Panel Layout

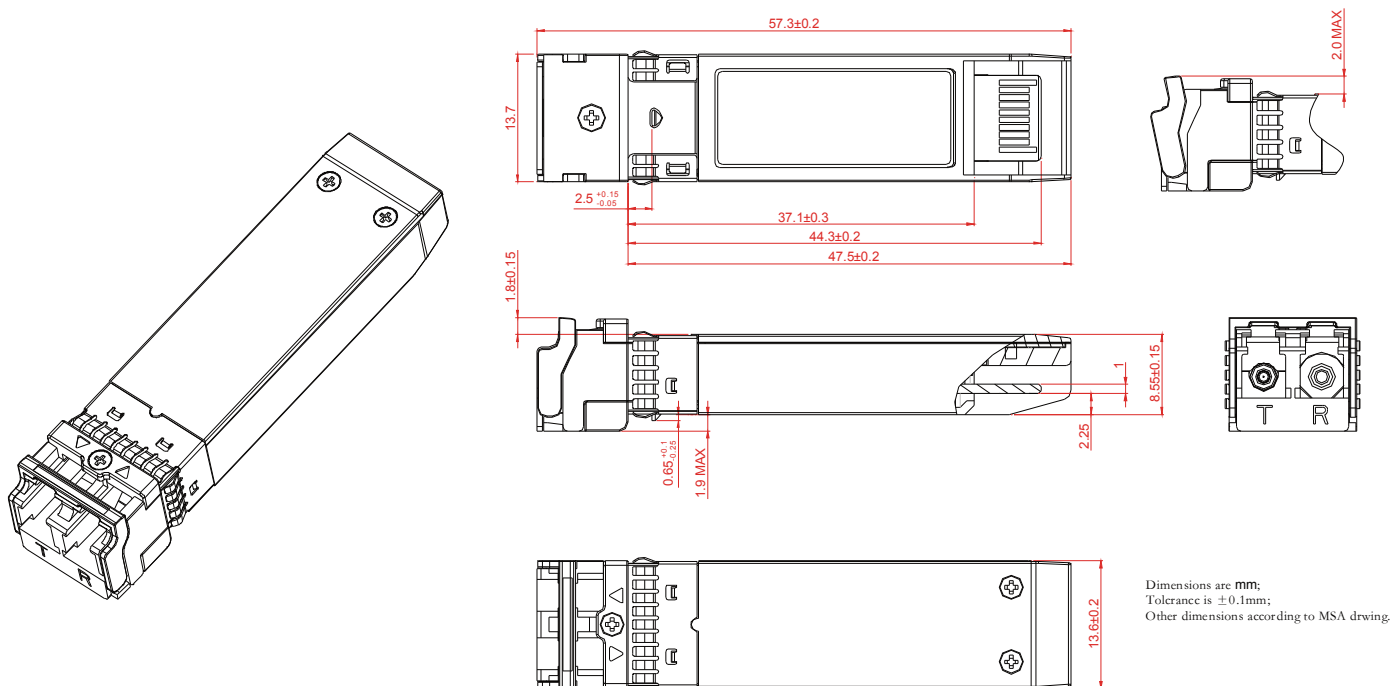




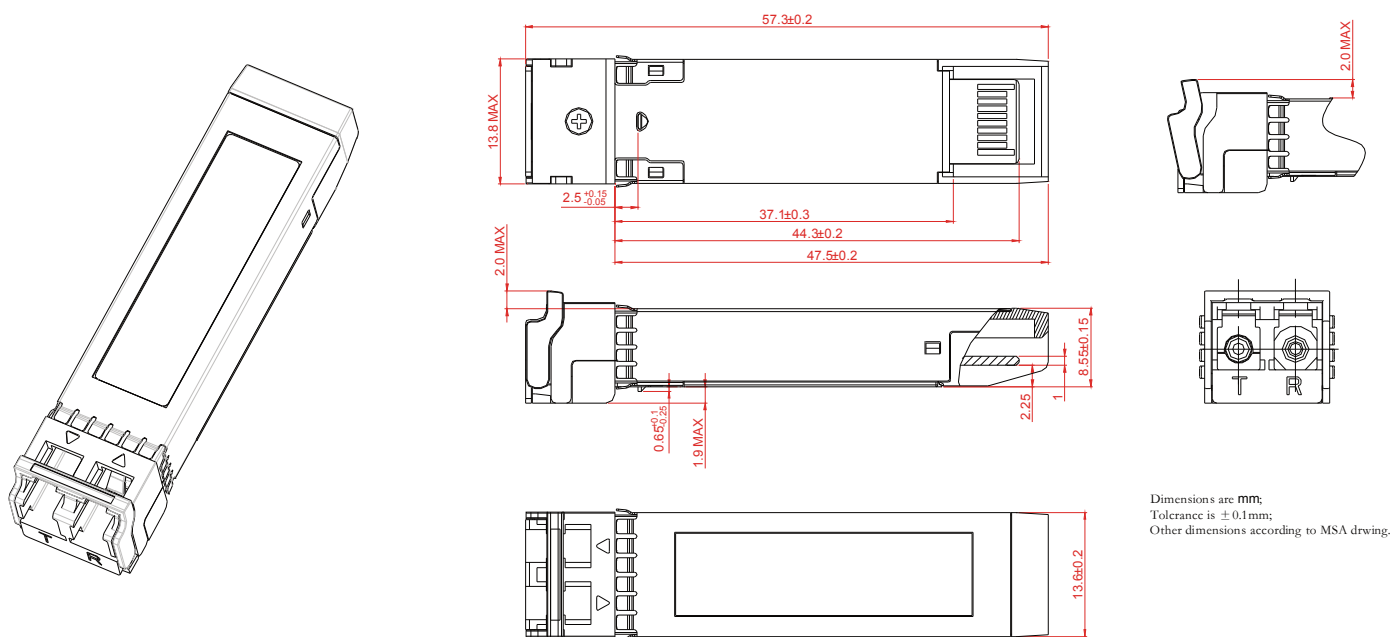
LTF54XX SFP+ DWDM Optical Transceiver

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Mechanical Dimensions (Structure A)



Mechanical Dimensions (Structure B)





LTF54XX SFP+ DWDM Optical Transceiver

C-Band DWDM 8.5 to 11.3Gb/s 40km

EYE SAFETY

The transceiver is a Class 1 eye-safe device according to FDA 21CFR1040.10 and 1040.11, IEC 60825-1 and IEC 60825-2.

ELECTROMAGNETIC INTERFERENCE (EMI), IMMUNITY AND PRODUCT SAFETY

The transceiver is ESD safe (electrical pins) when tested according to MIL-STD-883, Method 3015.4 and ESD safe (optical connector) when tested according to IEC 61000-4-2. The device is immune to strong RF fields when tested in accordance with IEC 61000-4-3. The device complies with (US) FCC, Part 15, Subpart J; (Europe) CENELEC EN 55022; (Canada) Class B (CISPR22A); and (Japan) VCCI Class 1. The device has been designed to conform to product safety requirements including UL1950, CSA 22.2, and IEC 60950, and has been designed to meet the flammability requirements of UL94.

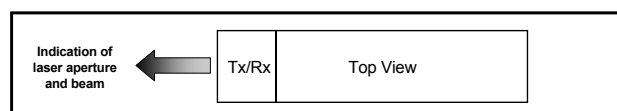
NOTICE

The factory has made all adjustments to this device prior to shipment. No adjustments or modifications to the device are required or permitted. Any adjustment, modification or tampering of the device voids the product warranty. The US Food and Drug Administration may consider that any adjustment or modification to this device is an act of manufacturing and therefore will require that the device be recertified in accordance with 21 CFR 1040.10 .

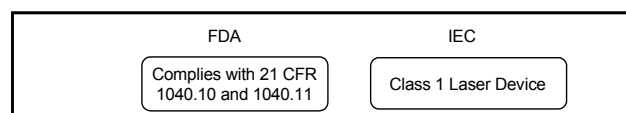
REQUIRED LABEL AND LASER EMISSION

This device is labeled in accordance with FDA and IEC requirements for laser safety.

REQUIRED LABEL



LASER EMISSION



LASER RADIATION INFORMATION	
Wavelength	C-band 1525~1565nm
FDA Total Pout: 7mm aperture at 20cm distance	< 790μwatts
IEC Total Pout: 7mm aperture at 14cm distance	< 10,000μwatts
Beam Divergence	17.25°



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