



Product Description

The LTC1304 is a 2.488Gb/sec, 3.3-volt, 1310 nm single-mode small form factor (SFF 2X5 footprint), up to 2 km reach (over 8/125 micron SMF) transceiver with LC duplex optical interface. It has been designed for use in low cost, high-speed serial OC-48/STM-16 PHY/PMD/PMA communications data links and is compliant with the ITU-G.957 STM-16, I-16 optical interfaces. The rugged die cast metal housing and cage assembly complies with the SFF MSA. It incorporates single-ended LVTTTL compatible control functions: Signal Detect (SD) and Tx Disable (Tx_DIS). The differential AC coupled Tx and Rx data interfaces (50 ohms to ground, 100 ohms line to line) are LVPECL and ECL 10K, 10KH, 100K compatible. The transmitter optical subassembly (TOSA) incorporates a highly reliable 1310 nm FP laser with back face monitor photo diode. The receiver optical subassembly (ROSA) incorporates a high sensitivity InGaAs 1310 nm PIN/TIA photo receiver. It typically consumes 500 mW of DC power.

The Class 1 laser transmitter meets industry and government requirements with respect to eye-safety (FDA/CDRH), electromagnetic interference (EMI), radio frequency interference (FCC Class B), and static sensitivity (ESD).

Features

- Meets ITU-G.957 STM-16, I-16 optical interface requirements
- Designed for SONET/SDH SR 2-R applications
- High reliability 1310 nm FP laser
- High sensitivity InGaAs 1310 nm photo receiver
- LC Duplex Small Form Factor (SFF) MSA compliant
- AC-coupled LVPECL and ECL 10K, 10KH, 100K ECL compatible data interfaces
- Single +3.3 V power supply, < 700mW DC power consumption
- LVTTTL compatible SD and TxDIS functions
- Operating temperature range: - 10 to 85 degrees Centigrade
- Class 1 laser safe device
- Complies with eye-safety, product safety, EMI/EMC, RFI and ESD standards and requirements

LTC1304 Single-mode SFF Transceiver



Applications

- ATM and OC-48/STM-16 SONET/SDH data links
- Rack to rack system interconnects
- Metro / Access networks
- Switch to switch interfaces and hub interconnects
- Buss or channel extenders
- Host adaptor interconnects
- Mass storage system interconnects
- Telecom switches and router interconnects



Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Unit	Notes
Storage Temperature	T _s	-40	+85	°C	
Supply Voltage	V _{cc}	0	3.6	V	
Relative Humidity		0	95%		

Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Case Temperature	T _A	- 10	25	85	°C	
Supply Voltage	V _{cc}	3.1	3.3	3.5	V	
Module Supply Current	I _{CC}		150	200	mA	
Power Dissipation	P _D		500	700	mW	
Signaling Speed	S		2.488		GBd	± 100ppm

Transmitter Electro-optical Characteristics

V_{cc} = 3.1V to 3.5V, T_A = 0°C to 70°C

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Output Optical Power	P _O	- 10		- 3	dBm	Average
Extinction Ratio	ER	8.2			dB	
Center Wavelength	λ _o	1270	1310	1360	nm	
Spectrum Width	Δλ			4	nm	RMS
Optical Rise/Fall Time	T _r /T _f		120	160	ps	20%-80%
Relative Intensity Noise	RIN			- 120	dB/Hz	
Transmitter Jitter (peak to peak)	J _{TXP-P}			0.1	UI	
Output Eye	Compliance with ITU - T G.957 6.2.5					
Differential Input Voltage	V _{in}	400		2400	mV	Note1
Disable Input Voltage-High	V _H	2		V _{cc}	V	
Disable Input Voltage-Low	V _L	0		0.8	V	

Note1: Internally AC coupled and terminated

Receiver Electro-optical Characteristics

$V_{cc} = 3.1V$ to $3.5V$, $T_A = 0^{\circ}C$ to $70^{\circ}C$

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Bit Error Rate	BER			1E-12		BER@Prmin
Maximum Input Power (Saturation)	P_{SAT}	- 3			dBm	
Sensitivity	Prmin			- 18	dBm	Note 1
Operating Center Wavelength	λ	1266		1360	nm	
Optical Return Loss	RL	27				
Receiver Electrical 3dB Upper Cutoff Frequency	f_c			2500	MHz	
Signal Detect-Asserted	P_{SDA}	- 27		- 19	dBm	
Signal Detect-Deasserted	P_{SDD}	- 27.5		- 19.5	dBm	
Signal Detect Hysteresis	P_H	0.5	2	5	dB	
Data Output Rise/Fall Time	T_o		100		ps	20%-80%
Signal Detect Voltage-Low	V_{SDL}	0		0.5	V	
Signal Detect Voltage-High	V_{SDH}	$V_{CC} - 0.5$		$V_{CC} + 0.3$	V	
Differential Output Voltage	V_{out}	400		1400	mV	Note 2

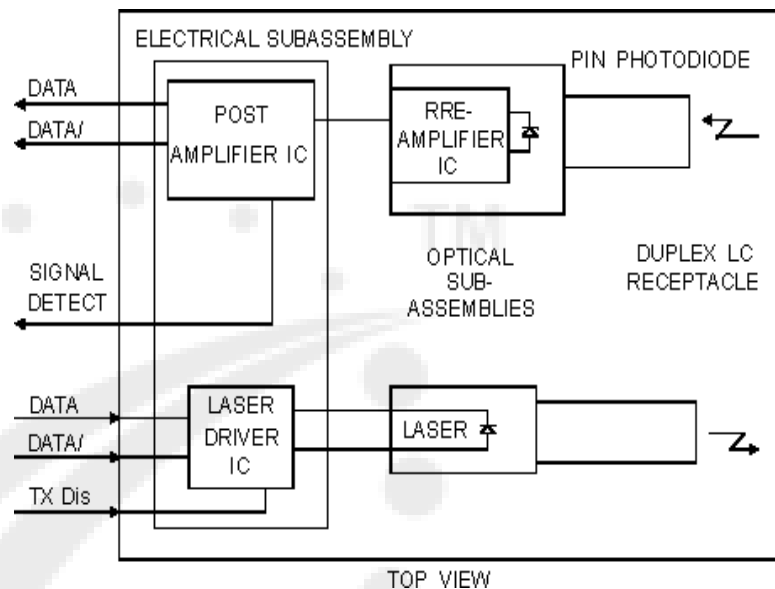
Note 1: Average power at which the BER is 1E -12. Measured with a $2^{31} - 1$ NRZ PRBS test pattern and ER = 8.2dB.

Note 2: Internally AC coupled and terminated. Load 50 ohms to GND or 100 ohms differential.

Block Diagram of Transceiver

Transmitter Section

The transmitter section consists of a high reliability 1310 FP nm laser diode (LD) with back face monitor photo detector (PD) in an eye safe optical subassembly (TOSA), which is mated to the Tx port of the fiber optic LC duplex receptacle. A driver IC converts LVPECL differential input data signals into an analog current source that drives the LD.



Receiver Section

The receiver section consists of a high-speed InGaAs PIN photodiode (PD) and trans-impedance preamplifier mounted in an optical sub-assembly (ROSA), which mated to the Rx port of the fiber optic LC duplex receptacle. The output of the PD drives the post-amplification, quantizing, and optical signal detection circuits.

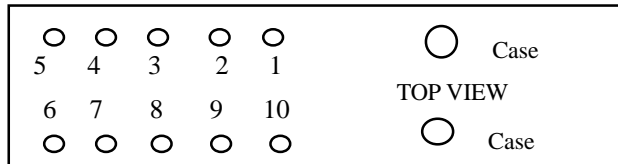
Receiver Signal Detect (SD)

If the received signal is above the Rx threshold, then the LVTTTL SD logic state is set HIGH (ASSERT). If the received signal is below the Rx threshold, then the LVTTTL SD logic state is set LOW (DEASSERT) indicating a possible broken fiber, unplugged connector, no Tx host signal or the receiver is switched OFF in accordance with the SONET OC-48/SDH STM-16, I-16 specifications.



Pin Assignment

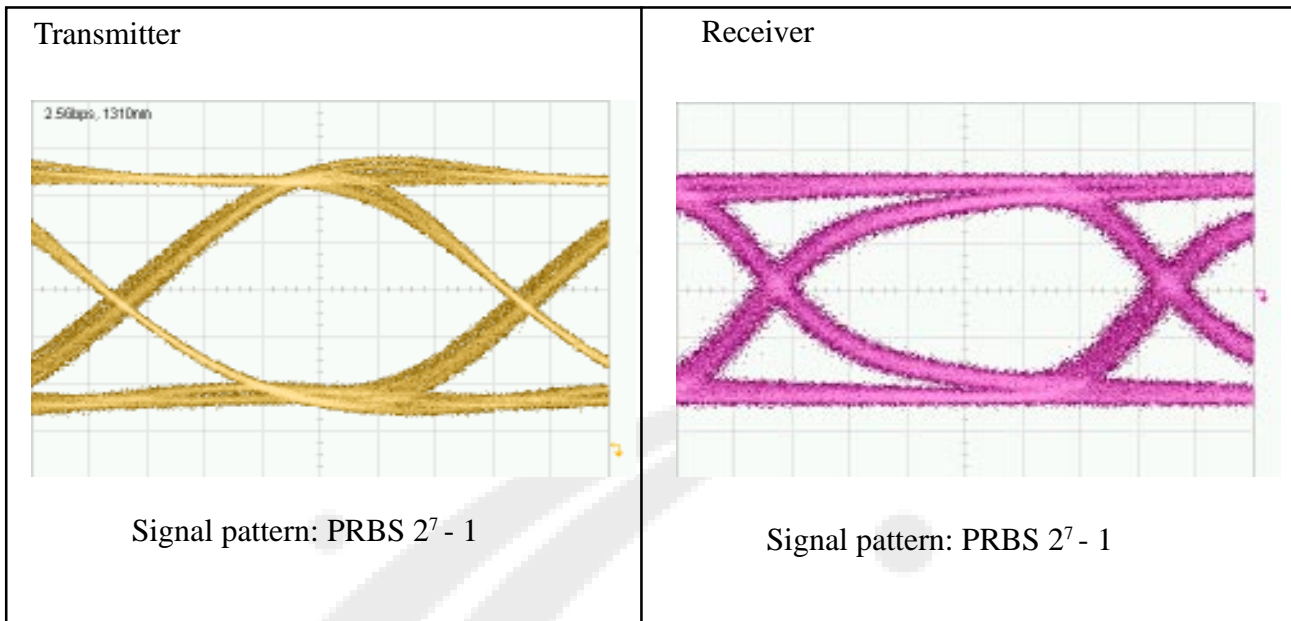
Pin-Out



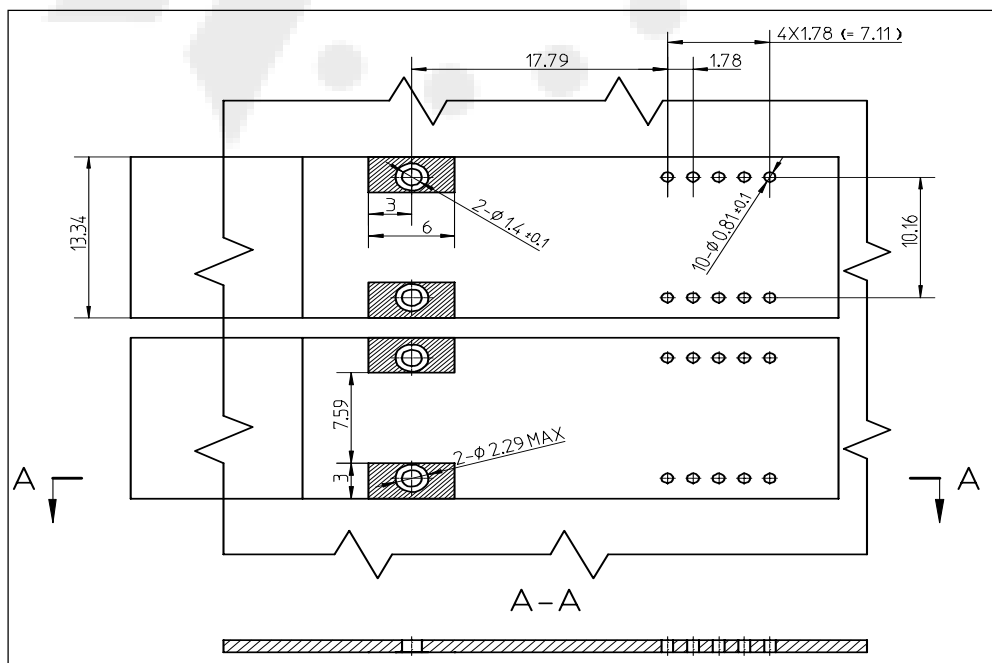
PIN	SYMBOL	DESCRIPTION
Mounting Posts		The mounting posts are provided for transceiver mechanical attachment to the circuit board. They should not be connected to the circuit ground but can be connected to the chassis ground.
Housing Leads		The housing leads should be connected to circuit ground.
1	V _{BR}	Receiver Signal Ground
2	V _{CCR}	Receiver +3.3 Volt Receiver Power Supply
3	SD	Signal Detect, TTL Logic: HIGH = Normal Operation; LOW = Fault Condition
4	RD -	Receiver Data - Inverted Differential Output
5	RD +	Receiver Data - Non-Inverted Differential Output
6	V _{CCT}	Transmitter + 3.3 V Transmitter Power Supply
7	V _{BET}	Transmitter Signal Ground
8	T _{DIS}	Transmitter Disable
9	TD +	Transmitter Data - Non-Inverted Differential Input
10	TD -	Transmitter Data - Inverted Differential Input



Eye Diagram



Circuit Board Layout Package Outline



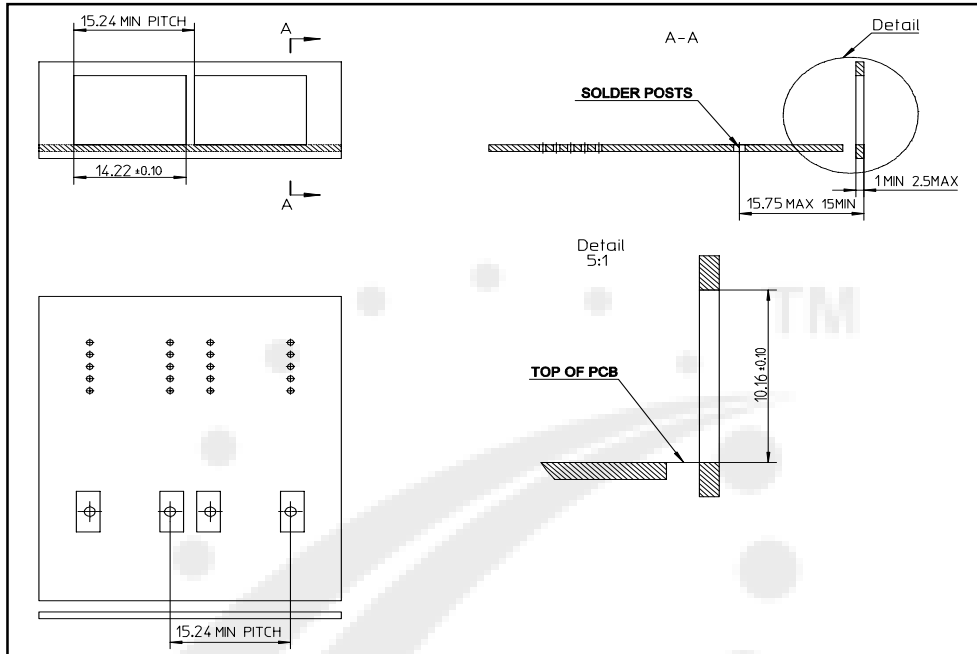


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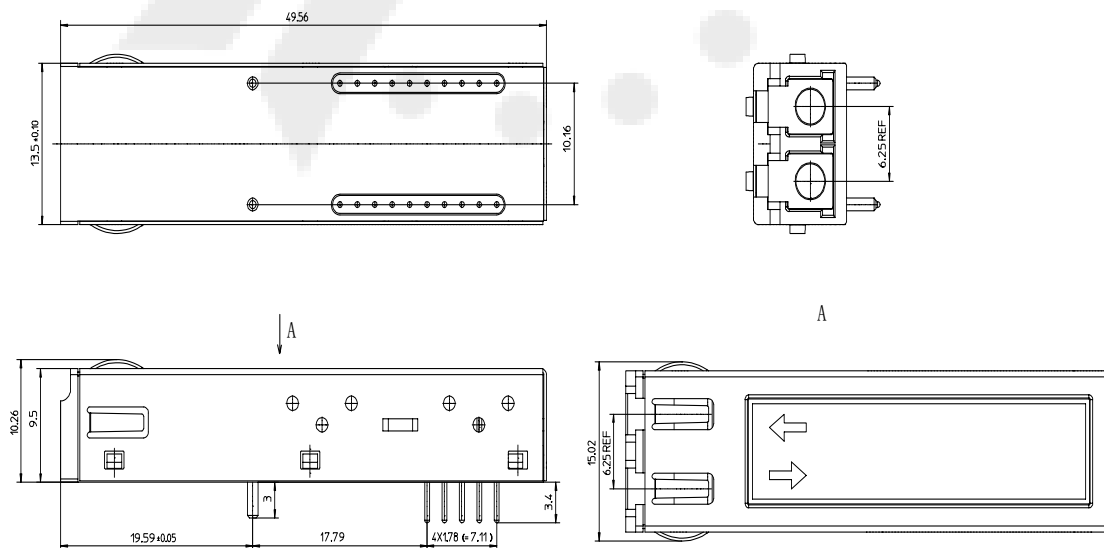
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LTC1304 3.3 Volt 1310nm 2.488 Gb/sec
SONET OC-48/SDH STM-16, I-16 SFF Transceiver

Recommended Front Panel Opening for LC



Dimensions



Dimensions are in millimeters
Dimension tolerance is ± 0.1 mm unless otherwise specified

Unit: mm



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LTC1304 3.3 Volt 1310nm 2.488 Gb/sec

SONET OC-48/SDH STM-16, I-16 SFF Transceiver

Regulatory Information

Eye Safety

The LTC1304 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

The LTC1304 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.