



LTC1595 2x10 SFF Optical Transceiver SONET OC12 / SDH STM-4 622 Mb/s 15 km

The LTC1595 SFF SONET/SDH LC duplex transceiver is intended for 15 km reach service in 622 Mb/s 1310 nm single mode high-speed telecommunications equipment where low-cost, extraordinary performance and reliability are essential. It meets the requirements of Telcordia SONET OC-12/IR-1 and ITU-T G.957 SDH STM-4/S-4.1, consumes low power, operates from a 3.3 volt DC power supply and is offered in the 0 to 70°C commercial temperature range. The industry standard 2x10 small form factor (SFF) package is fabricated with a rugged die cast metal housing and cage assembly. The low jitter and low bit error rate optical assemblies features a 1310 nm F-P laser transmitter and PIN/TIA receiver. It incorporates the SFF MSA LVTTTL Signal Detect (Rx_SD) and Tx Disable (Tx_DIS) monitor and control functions. Differential output pins are provided to monitor the laser diode current and the back facet monitor diode current. The P-I-N Photo Detector is biased via an external 3.3 Volt source. The differential AC coupled Tx and Rx data interfaces (50 ohms to ground, 100 ohms line to line) are LVPECL compatible. The device is Class I laser safety compliant.



Applications

622 Mb/s SONET/SDH telecom equipment	Hub interconnects	Mass storage system interconnects
Rack to rack system interconnects	Bus extenders	Telecom switches
Metro / Access Networks	Channel extenders	Router interconnects
Switch to switch interfaces	Host adapter interconnects	

Features

LC Duplex optical interface	BER < 1X10 ⁻¹⁰ (2 ²³ - 1 NRZ PRBS)	Monitor and Control Functions
15 km reach	Telcordia SONET OC-12/IR-1compliant	• Rx SIGNAL DETECT (LVTTTL)
622 Mb/s data rate	ITU-T G.957 SDH STM-4/S-4.1 compliant	• Tx DISABLE (LVTTTL)
+3.3 V power supply	0 to 70°COperating temperature range	• Laser Diode Current
Low DC power consumption	Internally AC coupled and terminated	• Back Facet Monitor Current
2x10 SFFMSA compliant package	LVPECL Rx and Tx data interface	
High performance 1310 nm F-P laser	• 100 Ohms differential (line to line)	
High sensitivity PIN/TIA optical receiver:	• 50 Ohms single ended (line to ground)	
Single Mode operation		



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Absolute Maximum Ratings (EXCEEDING THESE RATINGS MAY CAUSE IRREVERSIBLE DAMAGE TO THE DEVICE)

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T _{stg}	-40	+85	°C
Relative Humidity - Storage	RH _S	0	95	%
Relative Humidity - Operating	RH _O	0	85	%
DC Supply Voltage	V _{CC}	-0.5	3.6	V
Rx DATA Output Current	I _{OUT}	-	50	mA
Tx DATA Input Voltage	V _{in}	0	V _{CC} + 0.5	V
Rx Optical Input Power (Burnout Level)	P _{inMAX}	-	6	dBm
Soldering Temperature (duration = 10 seconds maximum)	T _{slid}	0	260	°C

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units	Notes
Ambient Operating Temperature	T _{amb}	0	25	+70	°C	
DC Supply Voltage	V _{CC}	3.1	3.30	3.6	Volts	
Tx Differential Input Voltage	VD	0.3	-	2.4	V	
Rx DATA Output Load Impedance	Zload	-	50	-	Ohms	
Tx DISABLE Input Voltage - LOW State	TDIS	-	-	0.6	V	Tx "ON"
Tx DISABLE Input Voltage - HIGH State	TDIS	2.0	-	-	V	Tx "OFF"

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Notes
DC Operating Current	ICC	180	-	320	mA	
Rx DATA Input Voltage Swing	VIH -VIL	200	-	1200	mV p-p	
Tx DATA Output Voltage Swing	VOH - VOL	400	-	800	mV p-p	
Tx DISABLE Input Voltage - LOW State	TDIS	-	-	0.6	V	LVTTL (LOW = Tx "ON")
Tx DISABLE Input Voltage - HIGH State	TDIS	2.0	-	-	V	LVTTL (HIGH = Tx "OFF")
Rx SIGNAL DETECT	Rx_SD	-	-	0.6	V	LVTTL (LOW = Rx "OFF")
Rx SIGNAL DETECT	Rx_SD	2.0	-	-	V	LVTTL (HIGH = Rx "ON")



Transmitter Electro-Optical Characteristics

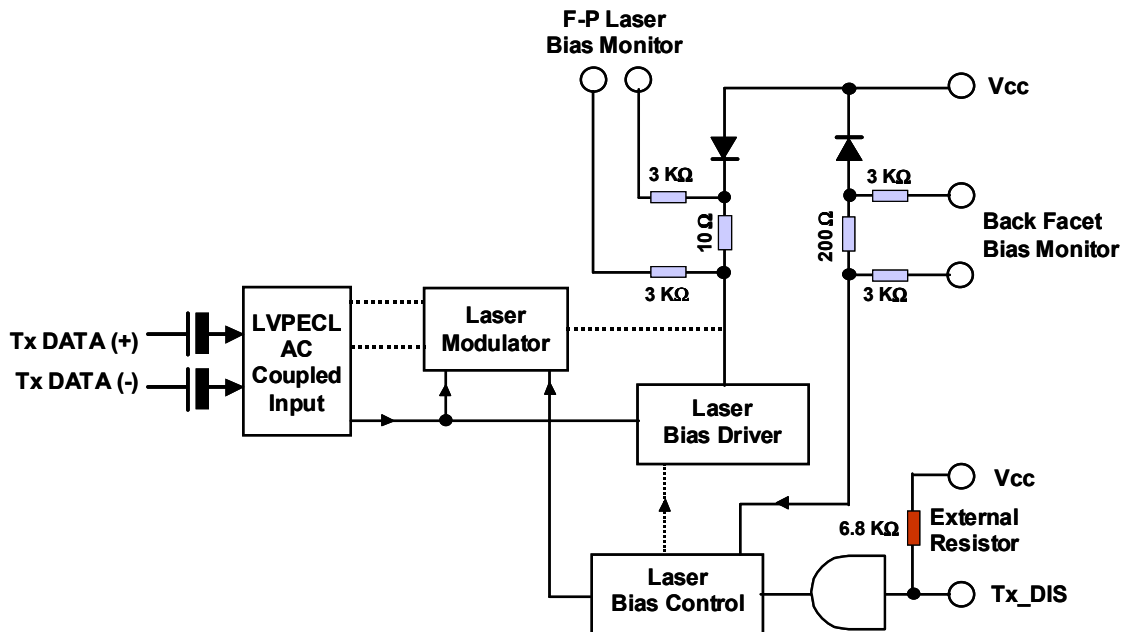
Parameter	Symbol	Min	Typ	Max	Units	Notes
Laser Type		1310 nm F-P				
Optical Output Power	P_o	-15		-8	dBm	Average Optical Output
Center Wavelength	λ	1280	1310	1360	nm	
Spectral Line Width	$\Delta\lambda$	-	-	4	nm	
Extinction Ratio	ER	10	-	-	dB	
Output Eye		GR-253-CORE				

Receiver Electro-Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Notes
Detector Type		1310 nm PIN / TIA				
Rx Sensitivity	Pin	-	-	-28	dBm	BER 10^{-10} (PRBS $2^{23}-1$)
Rx Overload	PinMAX	-3	-	-	dBm	BER 10^{-10} (PRBS $2^{23}-1$)
Rx_SD De-asserted	Pd	-	-	-28	dBm	
Rx_SD Asserted	Pa	-34	-	-	dBm	
Rx_SD Hysteresis	Ph	-	3	6	dB	

Transmitter Description

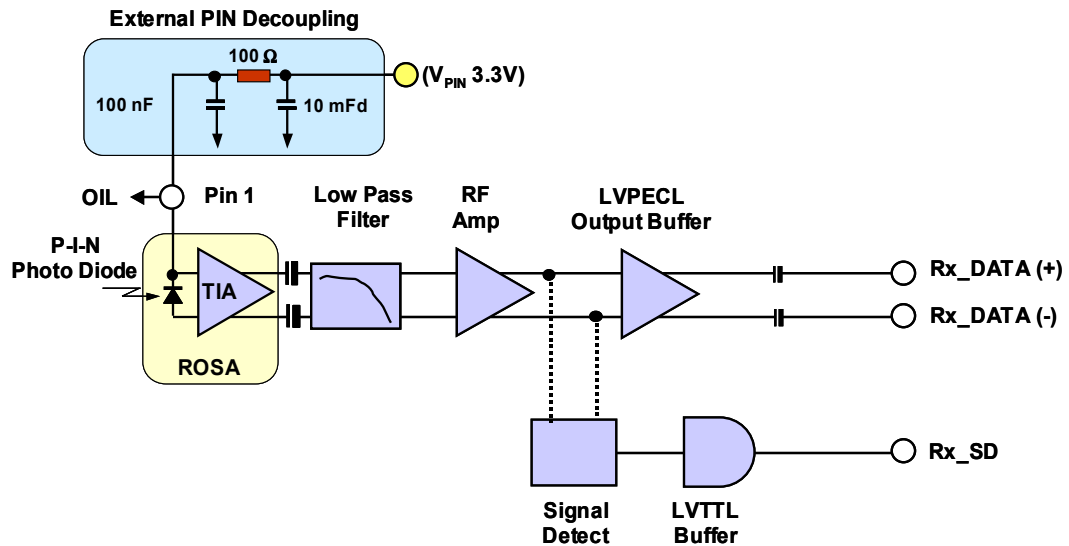
The transmitter is AC-Coupled LVPECL. It incorporates a F-P laser and Back Facet Monitor Diode, which can be monitored by the current sensing resistors. The optical output power is controlled by the signal developed by the Back Facet Monitor Diode and the laser modulator, laser bias driver and laser bias controller, which provide the compensated DC bias and modulation signal to assure optimum extinction ratio and eye compliance over temperature, supply voltage and operating life. The Tx_DISABLE function requires a 4,700 to 10,000 Ohm pull-up resistor.



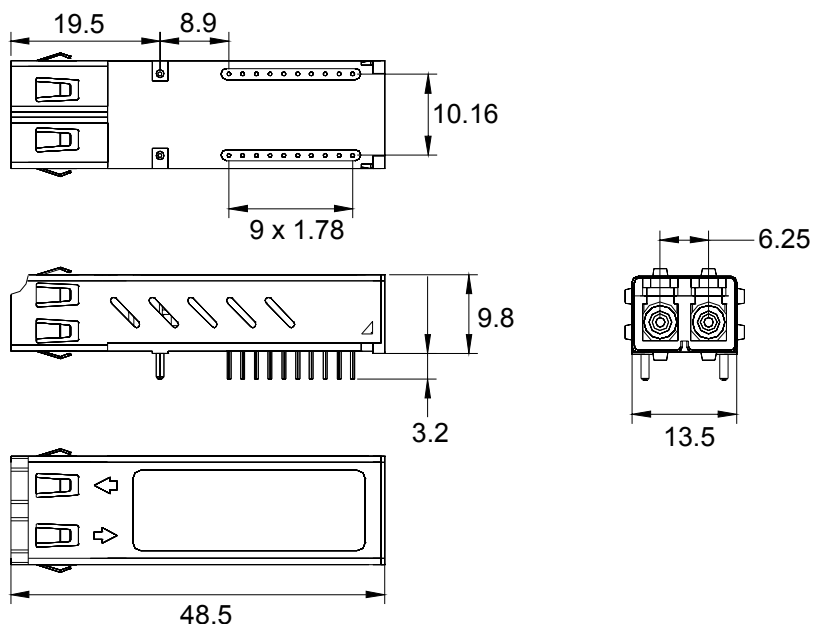


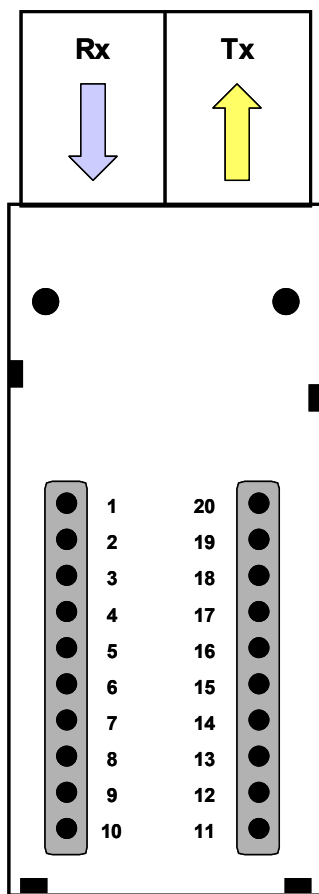
Receiver Description

The receiver section consists of a P-I-N Photo Detector and TIA mounted in a Receiver Optical Subassembly (ROSA). The output of the TIA is AC-Coupled to the Low Pass Filter and RF Amplifier. The value of the AC-Coupling capacitors are sufficiently large to pass the 622.08 Mb/s signal without increasing distortion or negating performance. The output of the RF Amplifier drives the LVPECL Output Buffer and the Signal Detect Driver, which senses the RF signal and compares it to the internal reference. The output of the Signal Detect Driver is coupled to the LVTTTL Output Buffer. The Rx_DATA output lines are AC-Coupled. The P-I-N photo detector requires an external decoupling network and bias as shown in the schematic below.



LTD1595 Outline Drawing (Dimensions are in mm)





TOP VIEW

Pin Identification and Description

Pin No	Symbol	Description	Notes
1	VPD	Photo Detector Bias / Optical Input Level Monitor	Note 1
2	Rx VEE	Rx Ground	
3	Rx VEE	Rx Ground	
4	N/C	Do Not Use	
5	N/C	Do Not Use	
6	Rx VEE	Rx Ground	
7	Rx VCC	Rx DC Input	
8	Rx_SD	Rx Signal Detect	LVTTTL
9	Rx_DATA (-)	Rx DATA Negative Output (AC-Coupled)	LVPECL
10	Rx_DATA (+)	Rx DATA Positive Output (AC-Coupled)	LVPECL
11	Tx VCC	Tx DC Input	
12	Tx VEE	Tx Ground	
13	Tx_DIS	Tx Disable	LVTTTL
14	Tx_DATA (+)	Tx DATA Positive Input (AC-Coupled)	LVPECL
15	Tx_DATA (-)	Tx DATA Positive Input (AC-Coupled)	LVPECL
16	Tx VEE	Tx Ground	
17	B-MON (-)	Laser Diode Negative Bias Monitor	Note 2
18	B-MON (+)	Laser Diode Positive Bias Monitor	Note 2
19	P-MON (-)	Back Facet Monitor Diode Negative Bias Monitor	Note 3
20	P-MON (+)	Back Facet Monitor Diode Positive Bias Monitor	Note 3

Note 1: Pin 1, the Optical Input Level (OIL) monitor requires a DC Bias for the photo detector. In order to monitor the optical input level an external bias resistor (100 Ohms) is required. See drawing on Page 4 for the electrical schematic.

Note 2: The voltage across Pins 17 and 18 is proportional to the Laser Diode current. A 10 Ohm resistor is in series with the Laser Diode. The current through the 10 Ohm resistor is isolated with 3,000 Ohm resistors. The block diagram of the transmitter is on Page 3.

Note 3: The voltage across Pins 19 and 20 is proportional to the Back Facet Monitor Diode Current. A 200 Ohm resistor is in series with the Back Facet Monitor Diode. The current through the 200 Ohm resistor is isolated with 3,000 Ohm resistors. The block diagram of the transmitter is on Page 3.



Ligent

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