



LTB3485 1250 Mb/s PX-20 P2MP OLT Burst Mode 2x10 SFF E-PON Transceiver, 20 km

The LTB3485 is a low cost point to multi point (P2MP) Fiber to the Home, Business or Curb (FTTx) E-PON (GE-PON) OLT transceiver. It is designed for 1250 Mb/s symmetrical duplex data links that employ high-speed burst mode TDM receivers/transmitters. It is based on the IEEE 802.3ah, Revision D3.3, 1000BASE PX-20D specification for bidirectional communications over a single fiber and incorporates a high performance 1310 nm Burst Mode APD/TIA receiver and 1490 nm CW mode DFB transmitter. It is intended to serve up to 32 subscribers over distances of up to 20 km. The monitor and control functions, which are implemented as LVTTTL logic, include the Receiver Signal Detect (Rx_SD), Transmit Disable (Tx_DIS), Transmit Fault (Tx_FAULT) and the Page A0 (HEX) I²C diagnostic interface (equivalent to SFP MSA specification). The industry standard 2x10 small form factor (SFF) package incorporates a pigtail fiber with SC/APC or SC/UPC optical connector. It is fabricated with a rugged die cast metal housing and cage assembly and operates over the temperature range from 0 to +70 degrees Centigrade.



Applications

- Gigabit Ethernet Access Networks
- Fiber to the Home, Curb, Office (FTTx)
- Point to Multi Point Service (P2MP)
 - Up to 20 km Reach (32:1 Split)

Features

- Dual Wavelength Bidirectional Transceiver
- 1250 Mb/s Symmetrical Tx/Rx Data Rate
- BER 10^{-10} (PRBS = 2⁷-1)
- 1310 nm APD/TIA Burst Mode Receiver
- 1490 nm CW Mode DFB Laser
- IEEE 802.3ah, Revision D3.3 Compliant
- Single 3.3 Volt DC supply
- Low Power Consumption
- 2x10 SFF Package Outline
- Single Fiber, Full Duplex Operation
- Fiber Pigtail with Optional Optical Connector
- 0 to 70°C Operating Temperature Range
- Tx DATA
 - LVPECL Differential Data Interface
 - Internally AC Coupled and Terminated
- RX DATA
 - LVPECL Differential Data Interface
 - Internally DC Coupled
- LVTTTL Monitor and Control Interfaces
 - Rx Signal Detect
 - Tx Disable
 - Tx Fault
 - I²C Serial Data (Page A0 HEX)
 - I²C Serial Clock

Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units
Ambient Operating Temperature	T _{amb}	0	25	+70	°C
DC Supply Voltage	V _{CC}	3.135	3.3	3.465	Volts
Module Supply Current	I _N	-	150	200	mA
Module Power Dissipation	P _D	-	500	700	mW
Signaling Speed +/- 100 ppm	S	-	1.25	-	GBd
Useful Reach (32:1 Split)	D	-	20	-	km

Ordering Information		
Part Number	Package Option (X)	
LTB3485 X	A	SMF Pigtail Without Connector
	B	SMF Pigtail with SC/APC
	C	SMF with SC/UPC



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Absolute Maximum Ratings					
Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	T_{slg}	-40	+85	°C	Exceeding the Absolute Maximum Ratings may cause irreversible damage to the device.
Case Temperature	T_{case}	0	+70	°C	
Relative Humidity - Storage	RH_S	0	95	%	
Relative Humidity - Operating	RH_O	0	85	%	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.
DC Supply Voltage	V_{CC}	0	3.6	V	
Soldering Temperature	T_{slid}	0	260	°C	
Soldering Duration	t_{slid}	0	10	sec	

Absolute Maximum Ratings: Optical and Electrical Signal Levels					
Parameter	Symbol	Min	Max	Units	Notes
Transmit DISABLE Logic HIGH State	Tx_DIS	0	$V_{CC}+0.5$	V	
Transmit FAULT Logic HIGH State	Tx_FAULT	0	$V_{CC}+0.5$	V	
Receiver SIGNAL DETECT Logic HIGH State	Rx_SD	0	$V_{CC}+0.5$	V	
I ² C Serial Data	SDA	-	$V_{CC}+0.5$	V	
I ² C Serial Clock	SCL	-	$V_{CC}+0.5$	V	

Transmitter Electrical Specifications						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Tx DC Supply Current	I_{CC}	-	-	150	mA	
Tx_Data Differential Input Voltage	V_{IH}, V_{IL}	600	-	1900	mV p-p	LVPECL Tx_DATA Electrical Signal
$Tx_DIS = HIGH$ (Transmitter OFF / DISABLED)	V_{OH}	2.4	-	3.3	V	LVTTTL
$Tx_DIS = LOW$ (Transmitter ON / ENABLED)	V_{OL}	0	-	0.8	V	LVTTTL
$Tx_FAULT = HIGH$ (Laser FAULT)	V_{OH}	2.4	-	3.3	V	LVTTTL
$Tx_FAULT = LOW$ (Laser NORMAL)	V_{OL}	0	-	0.8	V	LVTTTL

Receiver Electrical Specifications						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Rx DC Supply Current	I_{RX}	-	-	125	mA	Not Including the Output Load Current
Rx_Data Differential Output Voltage	V_{IH}, V_{IL}	600	-	1900	mV p-p	LVPECL Rx_DATA Electrical Signal
$Rx_SD = HIGH$ (Receiver ON / NORMAL)	V_{OH}	2.4	-	3.3	V	LVTTTL
$Rx_SD = LOW$ (Receiver OFF / LOSS OF SIGNAL)	V_{OL}	0	-	0.8	V	LVTTTL

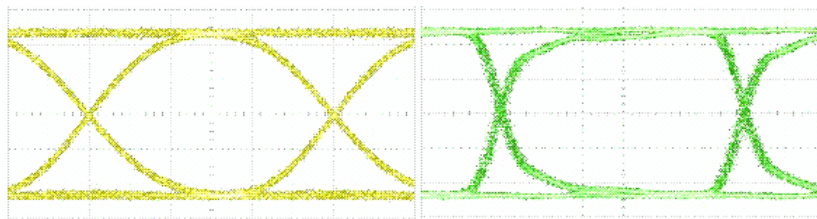
I ² C Serial Logic						
Parameter	Symbol	State	Logic	Min	Max	Units
I ² C Serial Data	SDA	HIGH	LVTTTL	2.4	3.3	V
		LOW	LVTTTL	0	0.8	V
I ² C Serial Clock	SCL	HIGH	LVTTTL	2.4	3.3	V
		LOW	LVTTTL	0	0.8	V



Transmitter Optical Specifications (Tamb = 0 to 70°C, Vcc = 3.3 Volts)						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Transmitter Type		1490 nm DFB CW Mode Laser				
Average Output Power (9/125 μ SMF)	P _{out}	+2.0	0	+7.0	dBm	
Optical Output with Tx OFF	P _{out}	-	-	-39	dBm	
Optical Rise and Fall Time	t _r / t _f	-	150	250	ps	20% to 80%
Tx Wavelength	λ	1480	1490	1500	nm	
Spectral Line Width @ -20dB	Δλ	-	-	0.44	nm	IEEE 802.3ah Compliant
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Extinction Ratio	ER	10	12	-	dB	
Relative Intensity Noise	RIN	-	-	-120	dB/Hz	
Optical Return Loss	RL	-	-	15	dB	
Total Jitter	T _j	-	-	0.2	UI	
Optical Cross Talk	C _{RT}	-	40	-	dB	
Transmit Reflectance	RFL	-	-	-12	dB	
Transmit Dispersion Penalty	DP	-	-	2.3	dB	

Receiver Optical Specifications						
Parameter	Symbol	Min	Typ	Max	Units	Conditions / Notes
Receiver Type		1310 nm APD/TIA Burst Mode				
Optical Signal Indicator		Signal Detect				
Wavelength	λ	1260	1310	1360	nm	
Received Optical Power	P _{in}	-30	-	-9	dBm	BER<10 ⁻¹⁰ , 1250 Mb/s, PRBS 2 ⁷ -1
Maximum Input Optical Power	P _{in(max)}	-	-	2	dBm	Damage Threshold
Receiver Reflectance	RFL	-	-	-12	dB	
Vertical Eye Closure Penalty	VEP	2.2	-	-	dB	
Receiver Settling Time	t _{rx}	-	-	400	ns	
Rx_Signal Detect Assert	P _a	-36.5	-	-30	dBm	
Rx_Signal Detect Deassert	P _d	-37	-	-30.5	dBm	
Rx_Signal Detect Hysteresis	P _{hy}	0.5	-	5	dB	

Eye Diagram



Transmitter Test Conditions

- Optical Output Power = 2 dBm
- Test Pattern = 2⁷-1 NRZ PRBS

Receiver Test Conditions

- Optical Input Power = -20 dBm
- Test Pattern = 2⁷-1 NRZ PRBS



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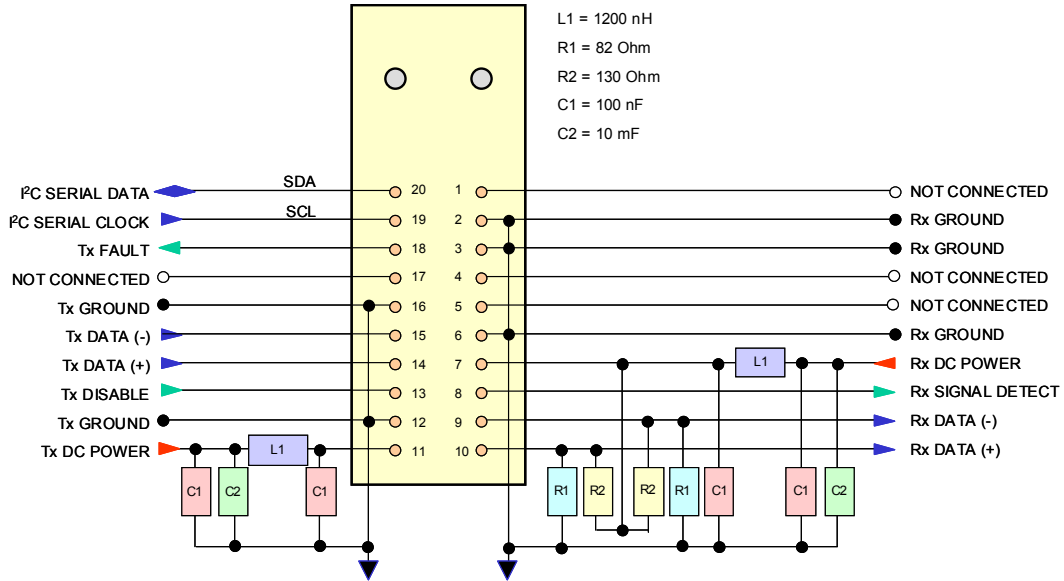
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LTB3485 I2C Memory Map (Page A0 HEX)

Address		Memory Contents		Description	Name of Field	SFP MSA Reference	Notes
Decimal	HEX	ASCII	HEX				
0	00	2	02	Module is soldered to PCB	Identifier	Table 3.2	
1	01	4	04	Transceiver has Serial Interface	Extended Identifier		
2	02	128	80	Pigtail Fiber with SC/PC Connector	Connector Values	Table 3.3	LTB3485 C
2	02	129	81	Pigtail Fiber with SC/APC Connector	Connector Values	Table 3.3	LTB3485 B
2	02	130	82	Pigtail Fiber without Connector	Connector Values	Table 3.3	LTB3485 A
3	03	Blank	Blank	Reserved	Transceiver Codes	Table 3.4	
4	04	Blank	Blank	SONET OC-48 Codes (Not Used)	Transceiver Codes	Table 3.4	
5	05	Blank	Blank	SONET OC-12 and OC-3 Codes (Not Used)	Transceiver Codes	Table 3.4	
6	07	2	02	1000BASE-LX	Transceiver Codes	Table 3.4	
7	07	Blank	Blank	Fibre Channel Codes (Not Used)	Transceiver Codes	Table 3.4	Does Not Apply
8	08	Blank	Blank	Fibre Channel Codes (Not Used)	Transceiver Codes	Table 3.4	Does Not Apply
9	09	Blank	Blank	Fibre Channel Codes (Not Used)	Transceiver Codes	Table 3.4	Does Not Apply
10	0A	Blank	Blank	Fibre Channel Codes (Not Used)	Transceiver Codes	Table 3.4	Does Not Apply
11	0B	3	03	NRX Encoding	Encoding Codes	Table 3.5	
12	0C	12	0D	Nominal 1300 Mb/s Data Rate	Nominal Bit Rate		
13	0D	Blank	Blank	Reserved			
14	0E	20	14	20 km Link Length			Does Not Apply
15 to 18	0F to 12	Blank	Blank	Multi Mode and Copper Link Lengths			Does Not Apply
19	13	Blank	Blank	Reserved			
20 to 35	14 to 23	Insert Values	Insert Values	Vendor Name	"Ligent Photonics"		ASCII Format
36	24	Blank	Blank	Reserved			
37 to 39	25 to 27	Blank	Blank	Vendor IEEE Number			Not Used
40 to 47	28 to 2F	Insert Values	Insert Values	Vendor Part Number	"LTB3485X"		ASCII Format
48 TO 55	30 to 37	Blank	Blank	Vendor Part Number			Not Used
56 to 59	37 to 3B	1	02	Vendor Revision Number	Revision 1.0		
60 to 62	3C to 3E	Blank	Blank	Reserved			
63	3F	TBD	TBD	Check Code (Bytes 0 to 62)			
64	40	Blank	Blank	Reserved	Option Values	Table 3.6	
65	41	28	1C	Tx_DIS, Tx_FAULT, Rx_SD	Option Values	Table 3.6	
66	42	20	14	Maximum Bit Rate Tolerance			
67	43	20	14	Minimum Bit Rate Tolerance			
68 to 83	44 to 53	Insert Values	Insert Values	Vendor Serial Number	Ligent Serial Number		
84 to 91	54 to 5B	Insert Values	Insert Values	Vendor Date Code	Ligent Date Code		
92 to 94	5C to 5E	Blank	Blank	Reserved			
95	TBD	TBD		Check Code (Bytes 64 to 94)			
96 to 127	60 to 7F	Blank	Blank	Vendor Specific Data, Read Only	Not Used		



LTB3485 2x10 SFF Interface (Bottom View)



2x10 SFF PIN ASSIGNMENT

Pin	Symbol	Description	Pin	Symbol	Description
1	N/C	Not Connected	20	SDA	I2C Serial Data (LVTTTL)
2	V _{EER}	Receiver Ground	19	SCL	I2C Serial Clock (LVTTTL)
3	V _{EER}	Receiver Ground	18	Tx_FAULT	Transmitter Fault (LVTTTL)
4	N/C	Not Connected	17	N/C	Not Connected
5	N/C	Not Connected	16	V _{EET}	Transmitter Ground
6	V _{EER}	Receiver Ground	15	TD-	Tx_DATA Inverted Differential Input (AC-Coupled)
7	V _{CCR}	Receiver +3.3 VDC Power Supply	14	TD+	Tx_DATA Non Inverted Differential Input (AC-Coupled)
8	Rx_SD	Receiver SIGNAL DETECT (LVTTTL)	13	Tx_DIS	Transmit Disable (LVTTTL)
9	RD-	Rx_DATA Inverted Differential Output DC-Coupled)	12	V _{EET}	Transmitter Ground
10	RD+	Rx_DATA Non Inverted Differential Output (DC-Coupled)	11	V _{CC} T	Transmitter +3.3 VDC Power Supply
Mounting Posts	The mounting posts are provided for mechanically attaching the transceiver 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				



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 610004-3. 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.

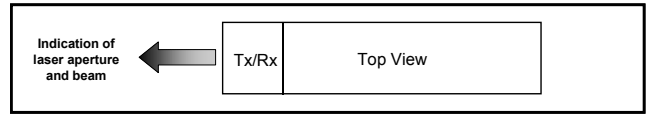
Notice

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 Subpart j.

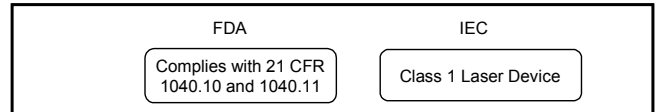
Required Label and Laser Emission

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

Required Label



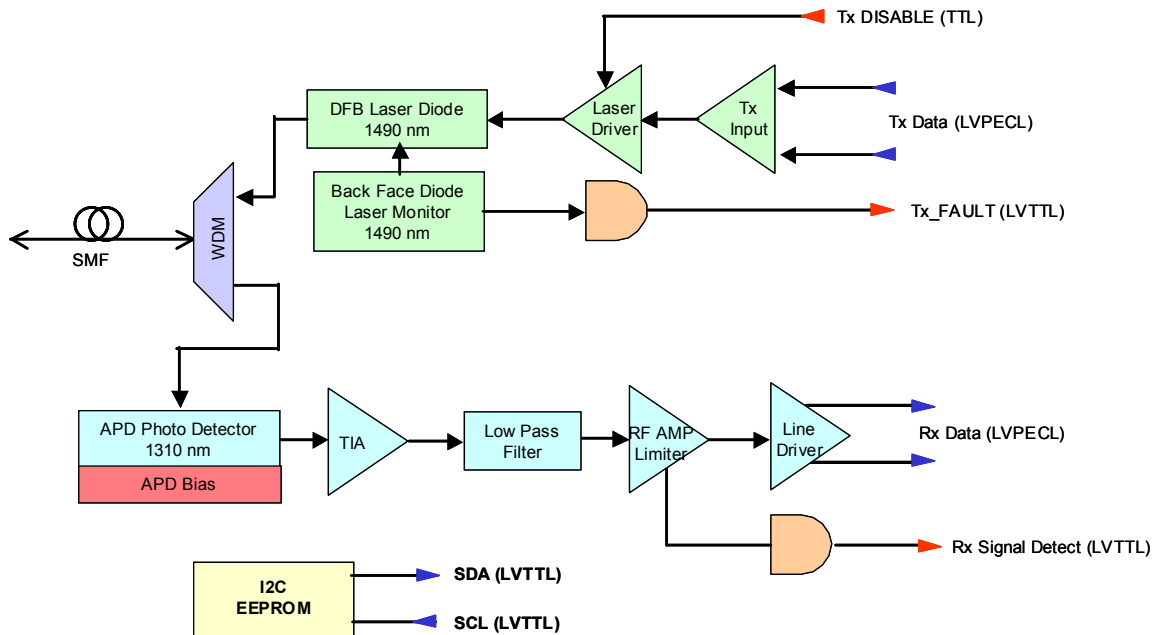
Laser Emission



Laser Radiation Information

Wavelength	1490 nm
FDA Total Optical Pout : 7 mm aperture at 20 cm distance	< 790 microwatts
IEC Total Optical Pout: 7 mm aperture at 14 cm distance	< 10000 microwatts
Beam Divergence	17.25°

LTB3485 Block Diagram





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LTB3485 1250 Mb/s PX-20 P2MP OLT Burst Mode

2x10 SFF E-PON Transceiver, 20 km

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