



RoHS compliant
1310 nm Single-mode XFP Transceiver
10GFC 1200-SM-LL-L(Fiber Channel), 10GBASE-LW/LR(Ethernet)



Features

- Supports 9.95Gb/s to 11.1Gb/s bit rates
- Power dissipation <2.0W
- Commercial/Extended/Industrial temperature range: -5°C to 70°C, -30°C to 70°C/-40°C to 80°C
- RoHS-6 Compliant (lead-free)
- Hot-pluggable XFP footprint
- Single power supply: 3.3V
- Maximum link length of 20km
- Uncooled 1310nm DFB laser
- Full Duplex LC connector
- No Reference Clock required
- Built-in digital diagnostic functions
- Standard bail release mechanism

Applications

Carelink's CL-XFP-LR-20 Small Form Factor 10Gb/s (XFP) transceivers are compliant with the current XFP Multi-Source Agreement (MSA) Specification. They comply with 10-Gigabit Ethernet 10GBASE-LR/LW per IEEE 802.3ae and 10G Fibre Channel 1200-SM-LL-L. Digital diagnostics functions are available via a 2-wire serial interface, as specified in the XFP MSA. The transceiver is RoHS compliant and lead free per Directive 2002/95/EC

Ordering Information

PART NUMBER	INPUT/OUTPUT	SIGNAL DETECT	VOLTAGE	TEMPERATURE
CL-XFP-LR-20	AC/AC	TTL	3.3V	-5°C to 70 °C
CL-XFP-LR-20e	AC/AC	TTL	3.3V	-30°C to 70 °C
CL-XFP-LR-20i	AC/AC	TTL	3.3V	-40°C to 85 °C

Product Selection

I. Absolute Maximum Rating

Parameter	Symbol	Min	Typ	Max	Unit
Maximum Supply Voltage	Vcc	-0.5		4.0	V
Storage Temperature	Ts	-40		85	C
Case Operating Temperature	Top	-5		70	C
Case Operating Temperature	Te	-30		70	C
Case Operating Temperature	Ti	-40		85	C



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II. Electrical Characteristics (Top= -5 to 70 °C, Vcc3= 3.13 to 3.45 Volts)

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	Vcc3	3.13		3.45	V
Supply Current	Icc3			600	mA
Module total power	P			2.0	W
Transmitter					
Input differential impedance	R_{in}		100		Ω
Differential data input swing	V _{in,pp}	120		820	mV
Transmit Disable Voltage	V _D	2.0		Vcc	V
Transmit Enable Voltage	V _{EN}	GND		GND+0.8	V
Transmit Disable Assert Time				10	us
Receiver					
Differential data output swing	V _{out,pp}	340	650	850	mV
Data output rise time	t _r			38	ps
Data output fall time	t _f			38	ps
LOS Fault	V _{LOS fault}	Vcc – 0.5		Vcc _{HOST}	V
LOS Normal	V _{LOS norm}	GND		GND+0.5	V
Power Supply Rejection		PSR			See Note 7 below

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. After internal AC coupling.
3. Or open circuit.
4. Into 100 ohms differential termination.
5. 20 – 80 %
6. Loss Of Signal is open collector to be pulled up with a 4.7k – 10kohm resistor to 3.15 – 3.6V. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
7. Per Section 2.7.1. in the XFP MSA Specification



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III. Optical Characteristics ($T_{OP} = -5$ to 75 °C, $V_{CC3} = 3.13$ to 3.45 Volts)

Parameter	Symbol	Min	Typ	Max	Unit
Transmitter					
Average Optical Power	P_f	-5.0		0.5	dBm
Optical Wavelength	λ	1290	1310	1330	nm
Sidemode Supression ratio	SSR_{min}	30			dB
Optical Extinction Ratio	ER	3.5			dB
Transmitter and Dispersion Penalty	TDP			3.2	dB
Average Launch power of OFF transmitter	P_{OFF}			-30	dBm
Tx Jitter			Tx_j		Per 802.3ae requirements
Relative Intensity Noise	RIN			-130	dB/Hz
Receiver					
Receiver Sensitivity	R_{SENS}			-15.5	dBm
Maximum Input Power	P_{MAX}	+0.5			dBm
Optical Center Wavelength	λ_C	1260		1600	nm
Receiver Reflectance	R_{rx}			-12	dB
LOS De-Assert	LOS_D			-18	dBm
LOS Assert	LOS_A	-32			dBm
LOS Hysteresis		0.5			dB



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Notes:

1. Measured with worst ER; $BER < 10^{-12}$; $2^{31} - 1$ PRBS.
2. Per IEEE 802.3ae. Equivalent to -13.3 dBm average power at Infinite ER.

IV. General Specifications

Parameter	Symbol	Min	Typ	Max	Units
Bit Rate	BR	9.95		11.1	Gb/s
Bit Error Ratio	BER			10^{-12}	
Max. Supported Link Length	L_{MAX}		20		km

Notes:

1. 10GBASE-LR/LW, 1200-SM-LL-L.
2. Tested with a $2^{31} - 1$ PRBS

V. Environmental Specifications

CL-XFP-LR-20 transceivers have a commercial operating case temperature range of -5°C to $+75^{\circ}\text{C}$.

Parameter	Symbol	Min	Typ	Max	Unit
Case Operating Temperature	Top	-5		70	C
Case Operating Temperature	Te	-30		70	C
Case Operating Temperature	Ti	-40		85	C



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Parameter	Symbol	Min	Typ	Max	Units
Case Operating Temperature	T_{op}	-5		75	°C
Storage Temperature	T_{sto}	-40		85	°C

Relative Humidity 5 - 85 %
Class 1 Laser Product EN 60825-1 Compliance

VI. Digital Diagnostic Functions

As defined by the XFP MSA, Carelink XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory.



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VII. Mechanical Specifications

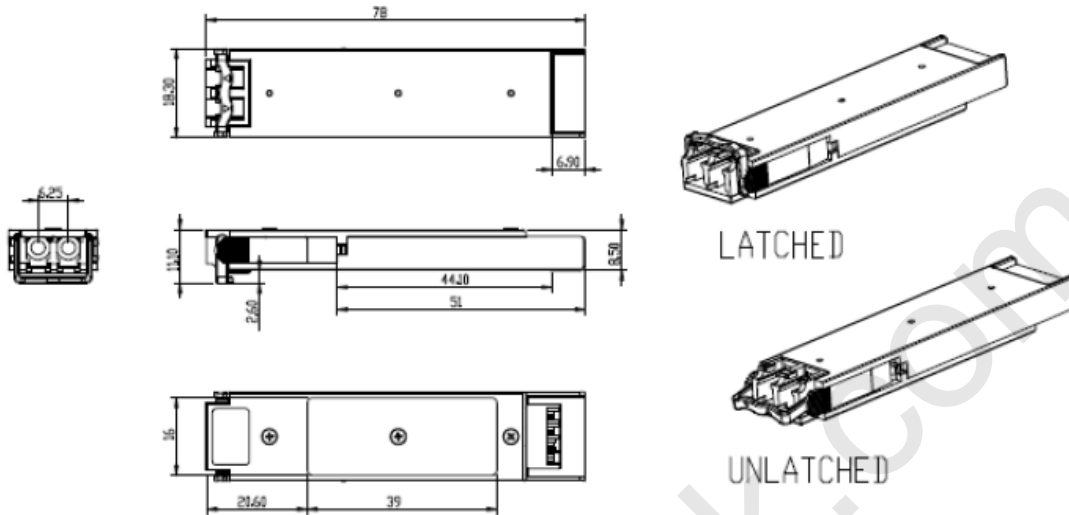
Carelink XFP transceivers are compliant with the dimensions defined by the XFP Multi-Sourcing Agreement (MSA).

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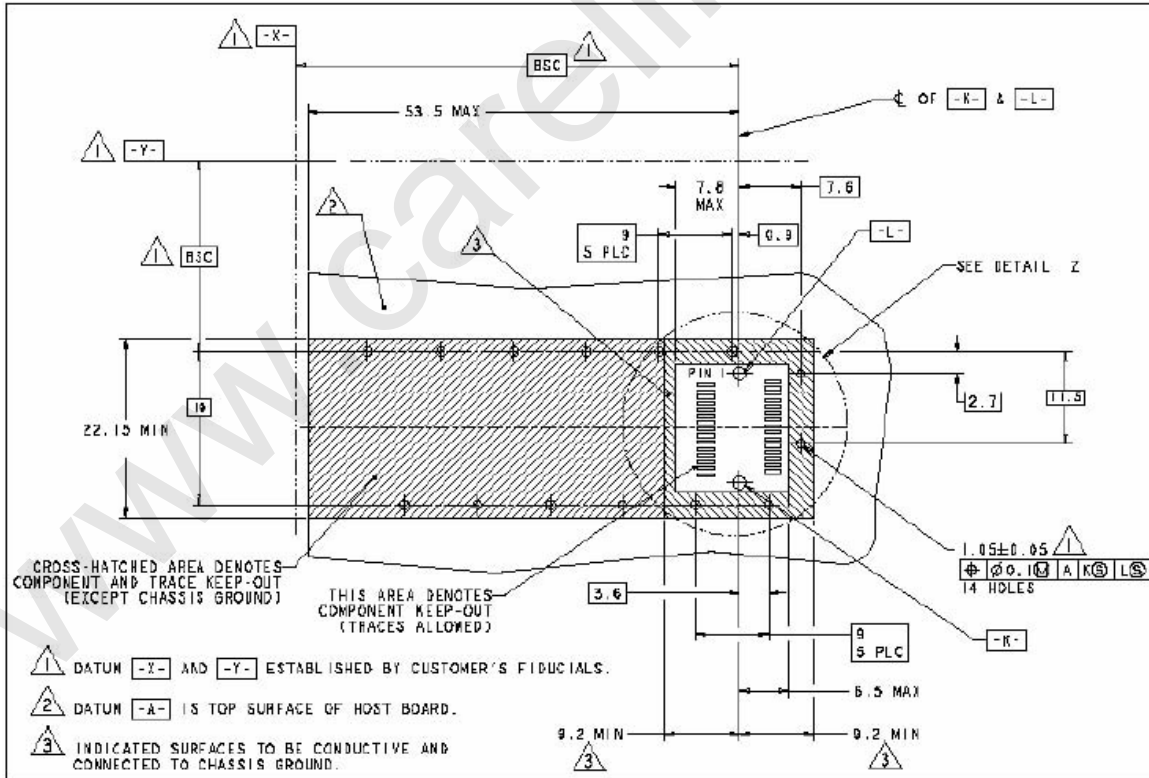


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XFP Transceiver (dimensions are in mm)



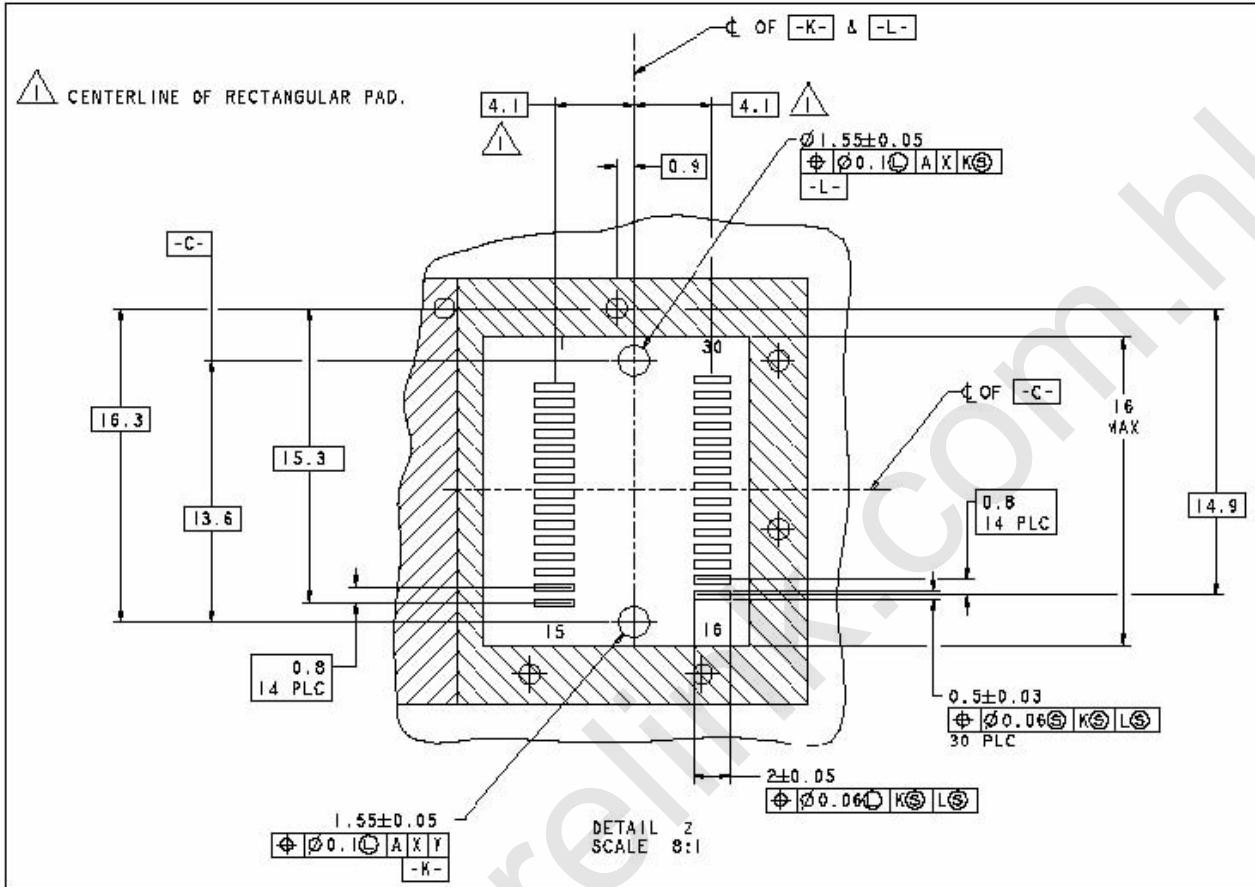
VIII. PCB Layout and Bezel Recommendations



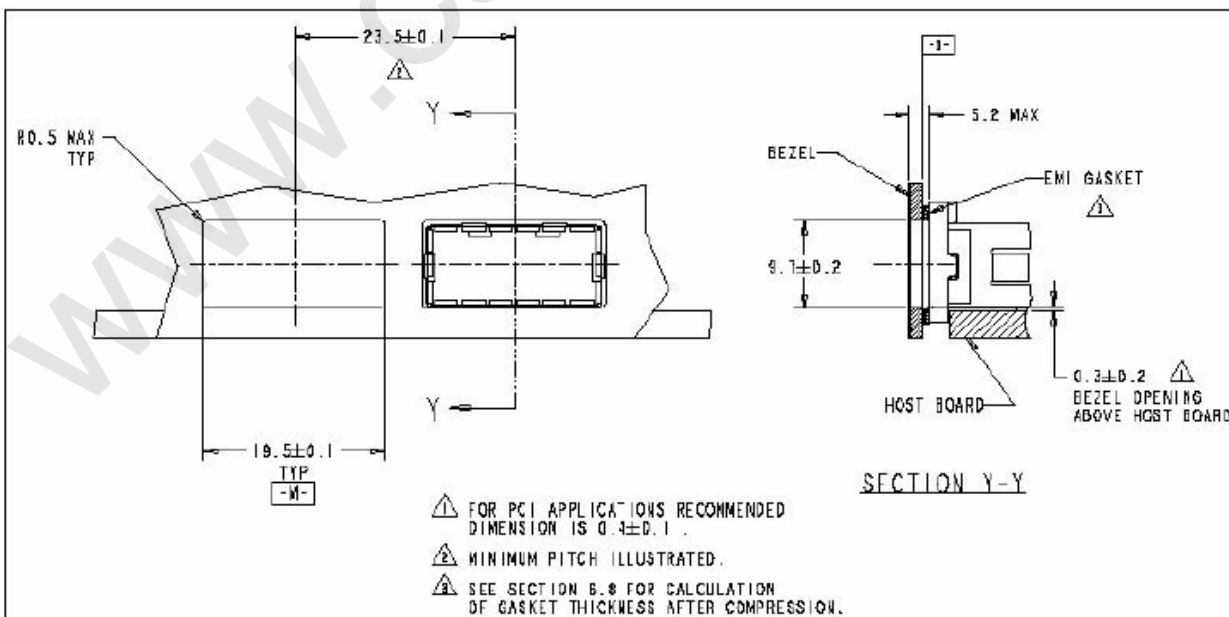
XFP Host Board Mechanical Layout (dimensions are in mm)



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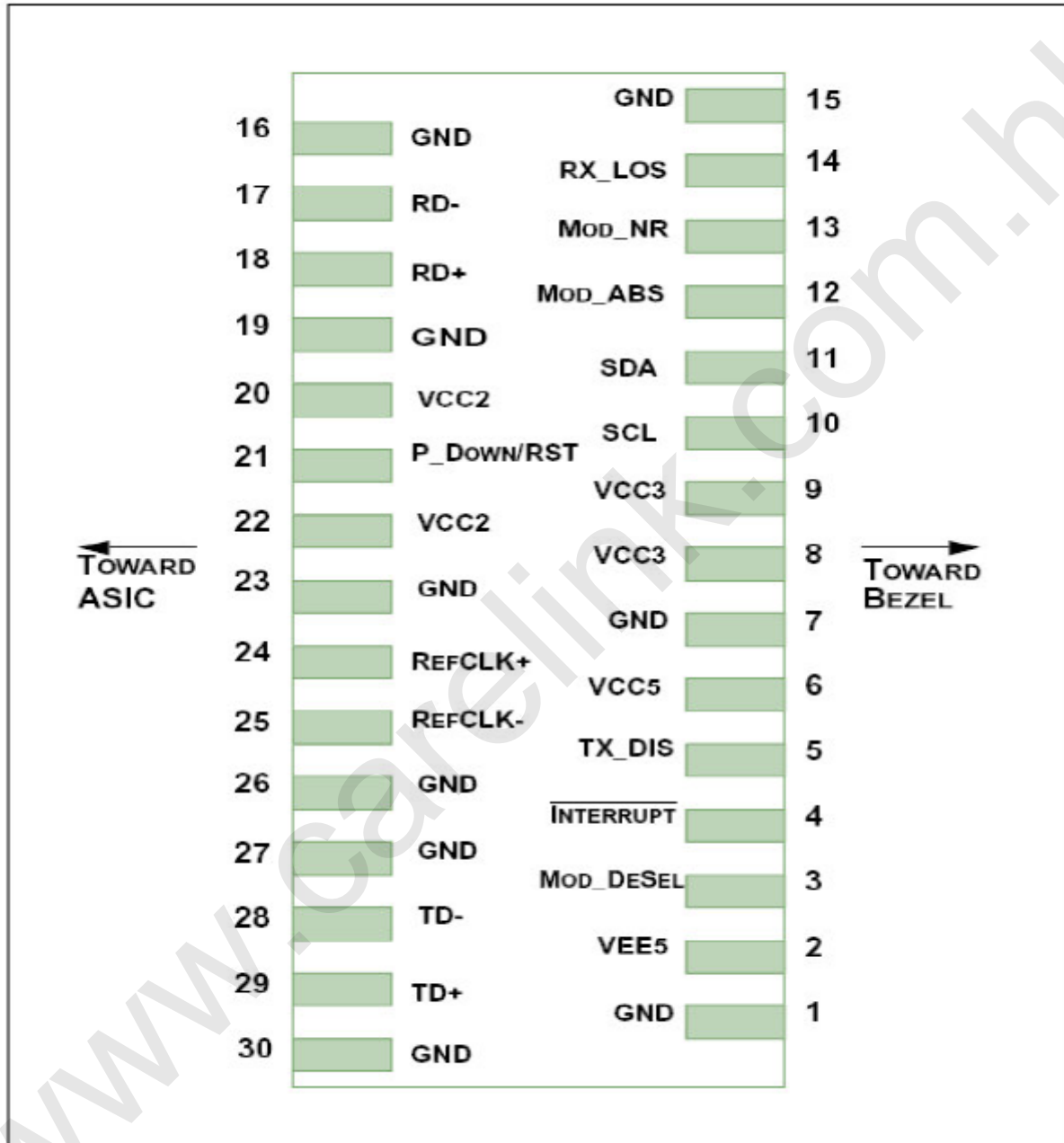
XFP Detail Host Board Mechanical Layout (dimensions are in mm)





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Pin Assignment





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<i>Pin</i>	<i>Logic</i>	<i>Symbol</i>	<i>Name/Description</i>	<i>Note</i>
1		GND	Module Ground	1
2		VEES	Optional -5.2V Power Supply	
3	LVTTL-I	Mod_DeSel	Module De-select; When held low allows module to respond to 2-wire serial interface	
4	LVTTL-O	Interrupt	Interrupt; Indicates presence of an important condition which can be read over the 2-wire serial interface	2
5	LVTTL-I	TX_DIS	Transmitter Disable; Turns off transmitter laser output	
6		VCC5	+5V Power Supply	
7		GND	Module Ground	1
8		VCC3	+3.3V Power Supply	
9		VCC3	+3.3V Power Supply	
10	LVTTL-I/O	SCL	2-Wire Serial Interface Clock	2
11	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
12	LVTTL-O	Mod_Abs	Indicates Module is not present. Grounded in the Module	2
13	LVTTL-O	Mod_NR	Module Not Ready; Indicating Module Operational Fault	2
14	LVTTL-O	RX_LOS	Receiver Loss Of Signal Indicator	2
15		GND	Module Ground	1
16		GND	Module Ground	1
17	CML-O	RD-	Receiver Inverted Data Output	
18	CML-O	RD+	Receiver Non-Inverted Data Output	
19		GND	Module Ground	1
20		VCC2	+1.8V Power Supply	3
21	LVTTL-I	P_Down/RST	Power down; When high, requires the module to limit power consumption to 1.5W or below. 2-Wire serial interface must be functional in the low power mode. Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22		VCC2	+1.8V Power Supply	3
23		GND	Module Ground	1
24	PECL-I	RefCLK+	Reference Clock Non-Inverted Input, AC coupled on the host board	
25	PECL-I	RefCLK-	Reference Clock Inverted Input, AC coupled on the host board	
26		GND	Module Ground	1
27		GND	Module Ground	1
28	CML-I	TD-	Transmitter Inverted Data Input	
29	CML-I	TD+	Transmitter Non-Inverted Data Input	
30		GND	Module Ground	1

1. Module ground pins Gnd are isolated from the module case and chassis ground within the module.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.
3. The 1.8 V power supply can be optionally programmed to voltages lower than 1.8 V in modules supporting the variable power supply.



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Regulatory Compliance

Feature	Reference	Performance
Electrostatic discharge (ESD)	IEC/EN 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2	Class 1 laser product
Component Recognition	IEC/EN 60950 , UL	Compatible with standards
ROHS	2002/95/EC	Compatible with standards
EMC	EN61000-3	Compatible with standards

Eye Safety Mark

The LM2 series multi-mode 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.