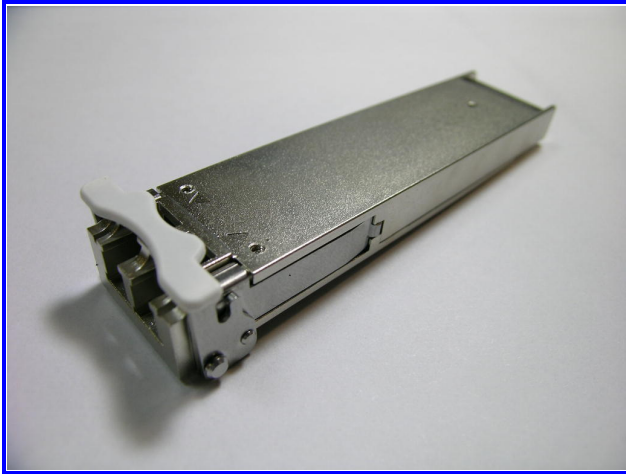




RoHS Compliant
DWDM XFP Transceiver up to 80km link length
10GBASE-ZW/ZR
10G Fiber Channel
10G SONET/SDH



Features

- Compliant with IEEE802.3ae 10GBASE-ZW/ZR
- Compliant with SONET OC-192/SDH STM-64
- Compliant with ITU-T G.709
- Compliant with 80km 10G Fiber Channel
- Compliant with XFP MSA INF-8077i
- Differential CML inputs and outputs
- Hot Pluggable
- Power consumption < 3.5W
- Class 1 laser product complies with EN 60825-1
- Support XFI loopback mode

Ordering Information

PART NUMBER	DESCRIPTION	NOTE
LS47-H3U-T _x -ND _{xx} -	T_x : Case operating Temperature TC =Case operating Temp :0°C~ 70°C TI =Case operating Temp:-40°C~ 85°C	

Channel	PART NUMBER	Frequency (THz)	Center Wavelength (nm)	Temperature
17	LS47-H3U-Tx-ND17	191.7	1563.86	TC = 0°C to 70°C TI = -40°C~85°C
18	LS47-H3U-Tx-ND18	191.8	1563.05	TC = 0°C to 70°C TI = -40°C~85°C
19	LS47-H3U-Tx-ND19	191.9	1562.23	TC = 0°C to 70°C TI = -40°C~85°C
20	LS47-H3U-Tx-ND20	192.0	1561.42	TC = 0°C to 70°C TI = -40°C~85°C
21	LS47-H3U-Tx-ND21	192.1	1560.61	TC = 0°C to 70°C TI = -40°C~85°C
22	LS47-H3U-Tx-ND22	192.2	1559.79	TC = 0°C to 70°C TI = -40°C~85°C
23	LS47-H3U-Tx-ND23	192.3	1558.98	TC = 0°C to 70°C TI = -40°C~85°C



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24	LS47-H3U-TC- ND24	192.4	1558.17	TC = 0°C to 70°C TI = -40°C~85°C
25	LS47-H3U-Tx- ND25	192.5	1557.36	TC = 0°C to 70°C TI = -40°C~85°C
26	LS47-H3U-Tx- ND26	192.6	1556.55	TC = 0°C to 70°C TI = -40°C~85°C
27	LS47-H3U-Tx- ND27	192.7	1555.75	TC = 0°C to 70°C TI = -40°C~85°C
28	LS47-H3U-Tx- ND28	192.8	1554.94	TC = 0°C to 70°C TI = -40°C~85°C
29	LS47-H3U-Tx- ND29	192.9	1554.13	TC = 0°C to 70°C TI = -40°C~85°C
30	LS47-H3U-Tx- ND30	193.0	1553.33	TC = 0°C to 70°C TI = -40°C~85°C
31	LS47-H3U-Tx- ND31	193.1	1552.52	TC = 0°C to 70°C TI = -40°C~85°C
32	LS47-H3U-Tx- ND32	193.2	1551.72	TC = 0°C to 70°C TI = -40°C~85°C
33	LS47-H3U-Tx- ND33	193.3	1550.92	TC = 0°C to 70°C TI = -40°C~85°C
34	LS47-H3U-Tx- ND34	193.4	1550.12	TC = 0°C to 70°C TI = -40°C~85°C
35	LS47-H3U-Tx- ND35	193.5	1549.32	TC = 0°C to 70°C TI = -40°C~85°C
36	LS47-H3U-Tx- ND36	193.6	1548.51	TC = 0°C to 70°C TI = -40°C~85°C
37	LS47-H3U-Tx- ND37	193.7	1547.72	TC = 0°C to 70°C TI = -40°C~85°C
38	LS47-H3U-Tx- ND38	193.8	1546.92	TC = 0°C to 70°C TI = -40°C~85°C
39	LS47-H3U-Tx- ND39	193.9	1546.12	TC = 0°C to 70°C TI = -40°C~85°C
40	LS47-H3U-Tx- ND40	194.0	1545.32	TC = 0°C to 70°C TI = -40°C~85°C
41	LS47-H3U-Tx- ND41	194.1	1544.53	TC = 0°C to 70°C TI = -40°C~85°C
42	LS47-H3U-Tx- ND42	194.2	1543.73	TC = 0°C to 70°C TI = -40°C~85°C
43	LS47-H3U-Tx- ND43	194.3	1542.94	TC = 0°C to 70°C TI = -40°C~85°C
44	LS47-H3U-Tx- ND44	194.4	1542.14	TC = 0°C to 70°C TI = -40°C~85°C
45	LS47-H3U-Tx- ND45	194.5	1541.35	TC = 0°C to 70°C TI = -40°C~85°C
46	LS47-H3U-Tx- ND46	194.6	1540.56	TC = 0°C to 70°C TI = -40°C~85°C
47	LS47-H3U-Tx- ND47	194.7	1539.77	TC = 0°C to 70°C TI = -40°C~85°C
48	LS47-H3U-Tx- ND48	194.8	1538.98	TC = 0°C to 70°C TI = -40°C~85°C
49	LS47-H3U-Tx- ND49	194.9	1538.19	TC = 0°C to 70°C TI = -40°C~85°C
50	LS47-H3U-Tx- ND50	195.0	1537.40	TC = 0°C to 70°C TI = -40°C~85°C
51	LS47-H3U-Tx- ND51	195.1	1536.61	TC = 0°C to 70°C TI = -40°C~85°C
52	LS47-H3U-Tx- ND52	195.2	1535.82	TC = 0°C to 70°C TI = -40°C~85°C



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53	LS47-H3U-Tx- ND53	195.3	1535.04	TC = 0 °C to 70 °C TI = -40 °C~85 °C
54	LS47-H3U-Tx- ND54	195.4	1534.25	TC = 0 °C to 70 °C TI = -40 °C~85 °C
55	LS47-H3U-Tx- ND55	195.5	1533.47	TC = 0 °C to 70 °C TI = -40 °C~85 °C
56	LS47-H3U-Tx- ND56	195.6	1532.68	TC = 0 °C to 70 °C TI = -40 °C~85 °C
57	LS47-H3U-Tx- ND57	195.7	1531.90	TC = 0 °C to 70 °C TI = -40 °C~85 °C
58	LS47-H3U-Tx- ND58	195.8	1531.12	TC = 0 °C to 70 °C TI = -40 °C~85 °C
59	LS47-H3U-Tx- ND59	195.9	1530.33	TC = 0 °C to 70 °C TI = -40 °C~85 °C
60	LS47-H3U-Tx- ND60	196.0	1529.55	TC = 0 °C to 70 °C TI = -40 °C~85 °C
61	LS47-H3U-Tx- ND61	196.1	1528.77	TC = 0 °C to 70 °C TI = -40 °C~85 °C

Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Storage Temperature	T_s	-40	85	°C	
Supply Voltage	V_{cc3}	-0.5	3.6	V	
	V_{cc5}	-0.5	6.0	V	

Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Case operating Temperature	T_C	-5	70	°C	
Supply Voltage	V_{cc3}	3.1	3.5	V	
Supply Current	I_{cc3}	---	500	mA	
Supply Voltage	V_{cc5}	4.75	5.25	V	
Supply Current	I_{cc5}	---	380	mA	



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Diagnostics

Data Address	PARAMETER	RANGE	ACCURACY
96-97	Temperature	-10 to 75°C	±3°C
100-101	Bias Current	0 to 120mA	±10%
102-103	TX Power	0to +4dBm	±2dB
104-105	RX Power	-23to -10dBm	±2dB
106-107	Vcc3 Voltage	3.0~3.6Volts	±3%
108-109	Vcc5 Voltage	4.7~5.3Volts	±3%

Transmitter Electro-optical Characteristics

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Operating Data Rate		9.95		11.3	Gbps	
Input Reference Clock Rate		Not Required				
Output power	POUT	0		+4	dBm	
Extinction Ratio	ER	8.2			dB	
Center Wavelength Spacing			100		G	
Optical Wavelength-EOL	λ_c	X-100	X	X+100	pm	1
Optical Wavelength-BOL	λ_c	X-25	X	X+25	pm	1
Transmitter Dispersion Penalty (@ 800 ps/nm)	TDP			3	dB	
Sidemode Supression ratio	SSRmin	30			dB	
Relative Intensity Noise	RIN	---	---	-130	dB/Hz	
Output Eye		Compliant with IEEE802.3ae				
Differential Input Voltage	V_{DIFF}	0.12	---	1.0	V	
Transmit Fault Output-Low	TX_FAULT_L	0.0	---	0.5	V	
Transmit Fault Output-High	TX_FAULT_H	2.4	---	V_{CC}	V	
TX_DISABLE Assert Time	t_{off}	---	---	10	μs	
TX_DISABLE Negate Time	t_{on}	---	---	2	ms	
Time to initialize	t_{init}	---	---	300	ms	



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Interrupt assert delay	$\overline{\text{Interrupt_on}}$	---	---	200	ms
Interrupt negate delay	$\overline{\text{Interrupt_off}}$	---	---	500	μs
P_Down/RST assert delay	$\overline{\text{P_Down/RST_on}}$			100	μs
Mod_NR assert delay	$\overline{\text{Mod_nr_on}}$			1	ms
Mod_NR negate delay	$\overline{\text{Mod_nr_off}}$			1	ms
P-Down reset time		10			μs
RX_LOS assert delay	$\overline{\text{t_loss_on}}$			100	μs
RX_LOS negate delay	$\overline{\text{t_loss_off}}$			100	μs

Note 1: X = Specified ITU Grid wavelength.

Receiver Electro-optical Characteristics

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Optical Input Power-maximum	P_{IN}	-7				BER < 10 ⁻¹²
Receiver Sensitivity	P_{IN}			-23	dBm	BER < 10 ⁻¹²
Operating Center Wavelength	λ_C	1270	---	1570	nm	
Receiver Reflectance	R_{rx}	---	---	-27	dB	
Loss of Signal-Asserted	P_A	-36	---	---	dBm	
Loss of Signal-Deasserted	P_D	---	---	-28	dBm	
Differential Output Voltage	V_{DIFF}	0.6		0.8	V	
TTL Input High Voltage		2		V _{cc}	V	
TTL Input Low Voltage		0		0.8	V	
TTL Output High Voltage		2.4	---	V _{cc}	V	
TTL Output Low Voltage		0	---	0.4	V	
Receiver Loss of Signal Assert Time (off to on)	t_{A,RX_LOS}	---	---	100	μs	
Receiver Loss of Signal Assert Time (on to off)	t_{D,RX_LOS}	---	---	100	μs	



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Serial ID Memory Contents (Table 01h)

<i>Address</i>	<i>Size</i>	<i>Name</i>	<i>Hex</i>	<i>Description</i>
128	1	Identifier	06	XFP
129	1	Ext. Identifier	B0	Power consumption<3.5W Tx reference clock not required
130	1	Connector	07	LC Connector
131-138	8	Transceiver	00 00 00 00 00 00 00 00	
139	1	Encoding	80	64B/66B
140	1	BR-Min	63	9.95Gbps
141	1	BR-Max	71	11.3Gbps
142	1	Length(SMF)-km	50	80km
143	1	Length(E-50um)	00	0
144	1	Length(50um)	00	0
145	1	Length(62.5um)	00	0
146	1	Length(copper)	00	0
147	1	Device Tech	76	Cooled 1550 EML, APD
148-163	16	Vendor name	4F 45 4D 20 20 20 20 20 20 20 20 20 20 20 20 20	OEM
164	1	CDR support	F9	XFI Loopback Mode , 9.95~11.3Gbps
165-167	3	Vender OUI	00 00 00	
168-183	16	Vendor PN	4C 53 34 37 2D 48 33 55 2D 54 43 2D 4E 44 xx xx	LS47-H3U-TC-NDxx
184-185	2	Vender rev	30 41	0A
186-187	2	Wavelength	7A 2D	1563.86nm(Ex :CH17)
188-189	2	Tolerance Tolerance	00 50	+/- 25pm



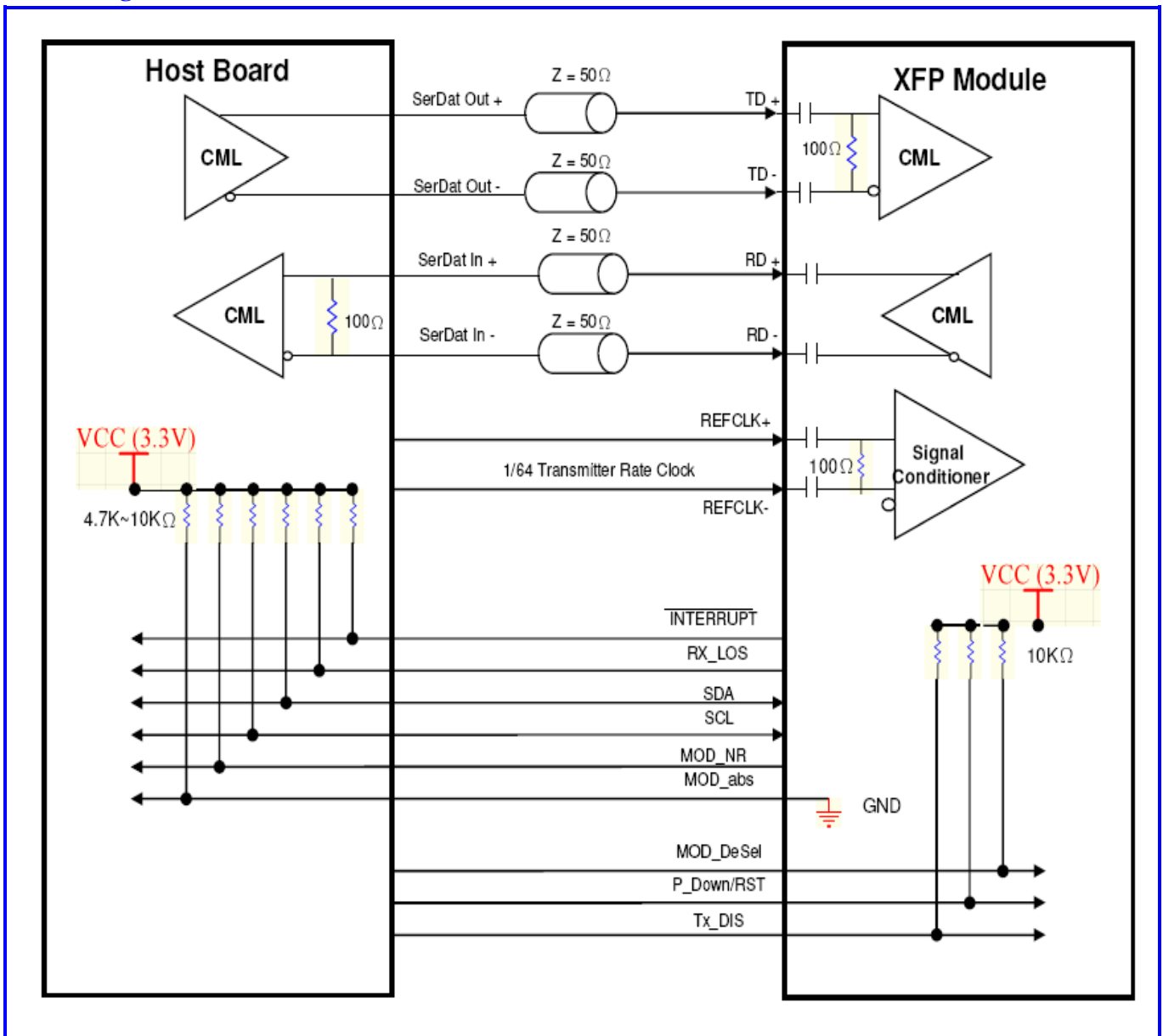
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190	1	Max Case Temp	46	70degC
191	1	CC_BASE		Check code(128~190)
192-195	4	Power Supply	AF FA 66 00	3.5W (power consumption) 2.5W (power down mode) 300mA (5V) 600mA (3.3V)
196-211	16	Vender SN		ASCII
212-219	8	Vender date code	xx xx xx xx xx xx 20 20	ASCII Year(2bytes) , Month(2bytes) , Day(2bytes)
220	1	Diagnostic Monitoring Type	08	No BER support; Average Power
221	1	Enhanced Options	60	Optional soft Tx_disable and P_down
222	1	Aux Monitoring	76	AUX1:+3.3V power supply AUX2:+5V power supply
223	1	CC_EXT		Check code(192~222)
224-255	32	Vendor specific		Reserved



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Block Diagram of Transceiver





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MOD_NR

The Mod_NR is an output pin that when High, indicates that the module has detected a condition that renders transmitter and or receiver data invalid, shall consist of logical OR of the following signals:

- Transmit Signal Conditioner Loss of Lock
- Transmitter Laser Fault
- Receiver Signal Conditioner Loss of Lock

MOD_DeSEL

The Mod_DeSel is an input pin. When held Low by the host, the module responds to 2-wire serial communication commands. The Mod_DeSel allows the use of multiple XFP modules on a single 2-wire interface bus.

When the Mod_DeSel pin is “High”, the module shall not respond to or acknowledge any 2-wire interface communication from the host.

INTERRUPT

Interrupt is an output pin. When “Low”, indicates possible module operational fault or a status critical to the host system.

TX_DIS

TX_DIS is an input pin. When TX_DIS is asserted High, the XFP module transmitter output must be turned off.

MOD_ABS

Mod_ABS is pulled up to Host_Vcc on the host board and grounded in the XFP module. Mod_ABS is then asserted “High” when the XFP module is physically absent from a host slot.

RX_LOS

The RX_LOS when High indicates insufficient optical power for reliable signal reception.

P_Down/RST

This is a multifunction pin for module Power Down and Reset. The P_Down/RST pin must be pulled up to VCC3 in the XFP module.

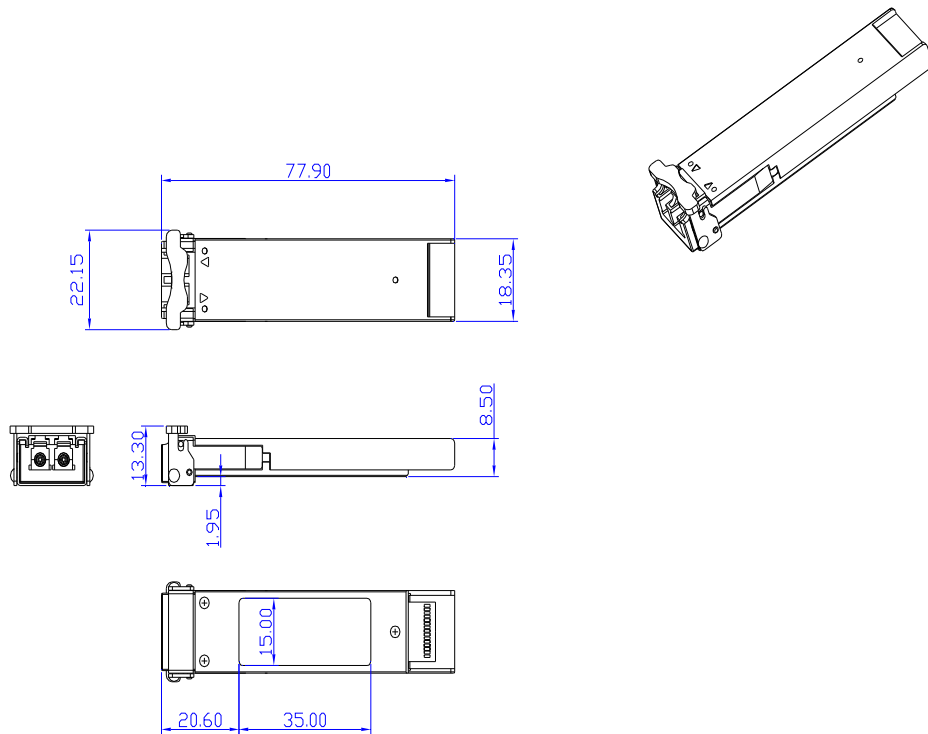
POWER DOWN FUNCTION

The P_Down pin, when held High by the host, places the module in the standby (Low Power) mode with a maximum power dissipation of 1.5W. This protects hosts which are not capable of cooling higher power modules which may be accidentally inserted.



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Dimensions



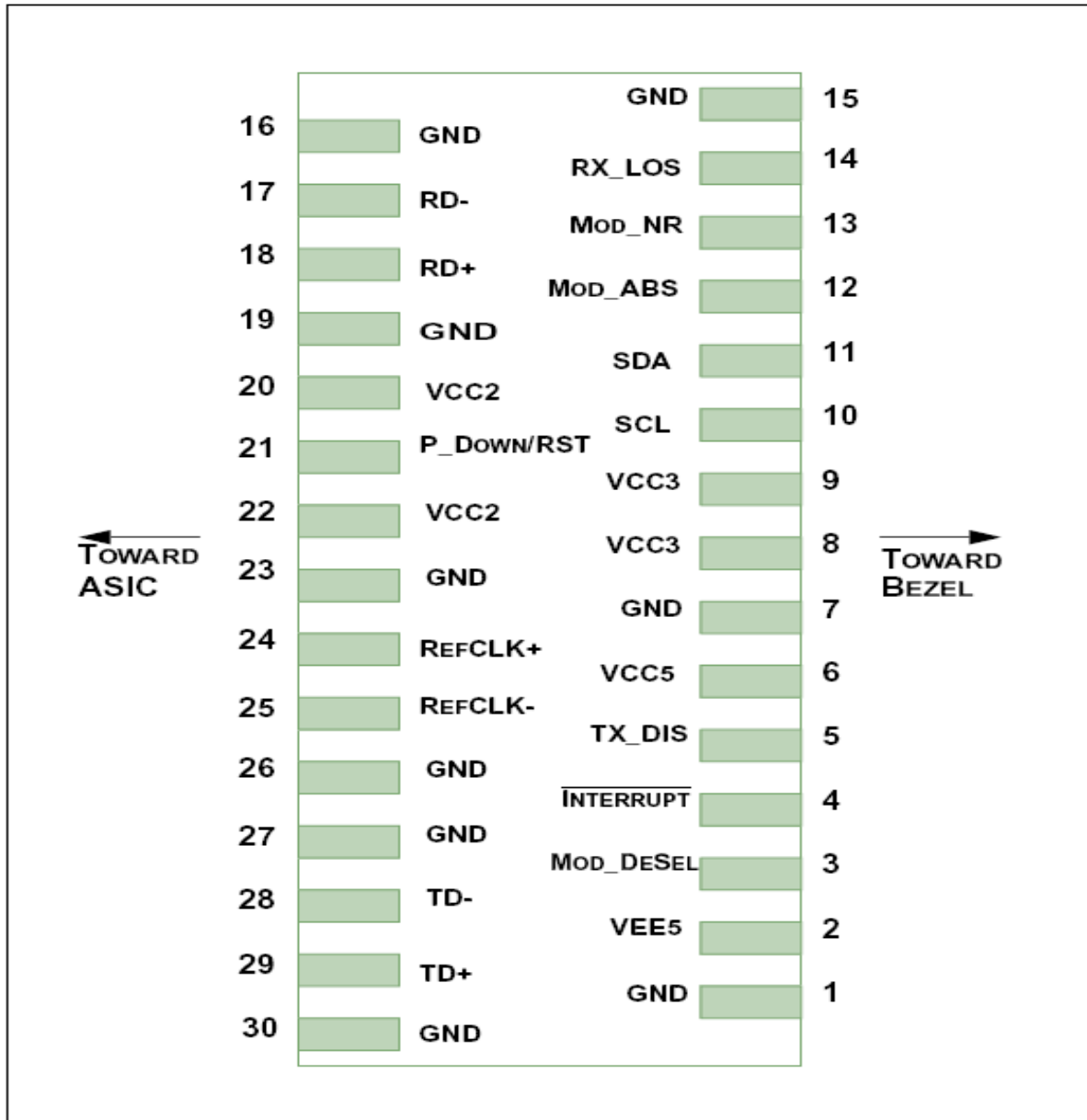
DIMENSIONS ARE IN MILLIMETERS

ALL DIMENSIONS ARE $\pm 0.2\text{mm}$ UNLESS OTHERWISE SPECIFIED



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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		VEE5	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	$\overline{\text{Interrupt}}$	$\overline{\text{Interrupt}}$; 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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Eye Safety Mark

The LS4 series single-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.