

# Product Specification

## XFP 10G LR 20km LC Optical Transceiver



### 1. Features

- Supports 9.95Gb/s to 11.1Gb/s bit rates
- Hot-pluggable XFP footprint
- Maximum link length of 10km with SMF
- 1310nm Uncooled DFB laser
- XFP MSA package with duplex LC connector
- No reference clock required
- Compatible with RoHS
- +3.3V power supply
- Power dissipation <2.5W
- Built-in digital diagnostic functions
- Temperature range 0°C to +70°C

### 2. Applications

- SDH STM I-64.1 at 9.953Gbps
- 10GBASE-LR/LW 10G Ethernet
- 1200-SM-LL-L 10G Fibre Channel
- 10GE over G.709 at 11.09Gbps
- OC192 over FEC at 10.709Gbps
- Other optical links, up to 11.1Gbps

### 3. Product Description

XFP 10G LR 20km LC is compliant with the 10G Small Form-Factor Pluggable (XFP) Multi-Source Agreement (MSA), supporting data-rate of 10.3125Gbps (10GBASE-LR) or 9.953Gbps (10GBASE-LW), and transmission distance up to 10km on SMF.

The transceiver module comprises a transmitter with 1310nm uncooled DFB laser and a receiver with a PIN photodiode. Transmitter and receiver are separate within a wide temperature range of 0°C to +70°C and offers optimum heat dissipation and excellent electromagnetic shielding thus enabling high port densities for 10 GbE systems.

## 4. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Storage Ambient Temperature Range		-40	+85	°C
Powered case Temperature Range		0	+75	°C
Operating Relative Humidity	RH		80	%
Supply Voltage Range @ 3.3V	V <sub>CC3</sub>	-0.5	4.0	V
Supply Voltage Range @ 3.3V	V <sub>CC3</sub>	-0.5	4.0	V

**Notes:**

Any stress beyond the maximum ratings can result in permanent damage. The device specifications are guaranteed only under the recommended operating conditions.

## 5. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature Range	T <sub>c</sub>	0		+70	°C
Power Supply Voltage @ 3.3V	V <sub>CC3</sub>	3.13	3.3	3.47	V
Module total power	P			2.5	W

### TRANSMITTER

Input differential impedance	R <sub>in</sub>		100		n <sup>[1]</sup>
Differential data input swing	V <sub>in, pp</sub>	120		820	mV
Transmit Disable Voltage	V <sub>D</sub>	2.0		V <sub>CC</sub>	V
Transmit Enable Voltage	V <sub>EN</sub>	GND		GND+0.8	V
Transmit Disable Assert Time				10	us

### RECEIVER

Differential data output swing	V <sub>out, pp</sub>	500		850	mV
Data output rise time	t <sub>r</sub>			38	ps <sup>[2]</sup>
Data output fall time	t <sub>f</sub>			38	ps <sup>[2]</sup>
LOS Fault	V <sub>LOS fault</sub>	V <sub>CC</sub> - 0.5		V <sub>CC_HOST</sub>	V <sup>[3]</sup>
LOS Normal	V <sub>LOS norm</sub>	GND		GND+0.5	V <sup>[3]</sup>
Power Supply Rejection	PSR <sup>[4]</sup>		See Note [3] below		

**Notes:**

- [1] After internal AC coupling.
- [2] 20 ÷ 80 %
- [3] 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.

## 6. Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
<b>TRANSMITTER</b>					
Optical output Power	P	-6.5		+0.5	dBm
Optical Wavelength	$\lambda$	1260		1355	nm
Optical Extinction Ratio	ER	6			dB <sup>[1]</sup>
Side Mode Suppression Ratio	SMSR	30			dB
Average Launch power of OFF transmitter	POFF	-30			dBm
Tx Jitter	Txj	Compliant with each standard requirements			
<b>RECEIVER</b>					
Receiver Sensitivity	RSSENS		-16	-14.5	dBm <sup>[2]</sup>
Receiver Sensitivity in OMA	RSSENS			-12.5	dBm <sup>[2]</sup>
Maximum Input Power	P <sub>MAX</sub>	+0.5			dBm
Optical Center Wavelength	AC	1260		1600	nm
LOS De-Assert	LOSD			-15	dBm
LOS Assert	LOSA	-25			dBm
LOS Hysteresis		1		4	dB

**Notes:**

- [1] PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps.
- [2] PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps, BER≤10<sup>-12</sup>

## 7. Pin Descriptions

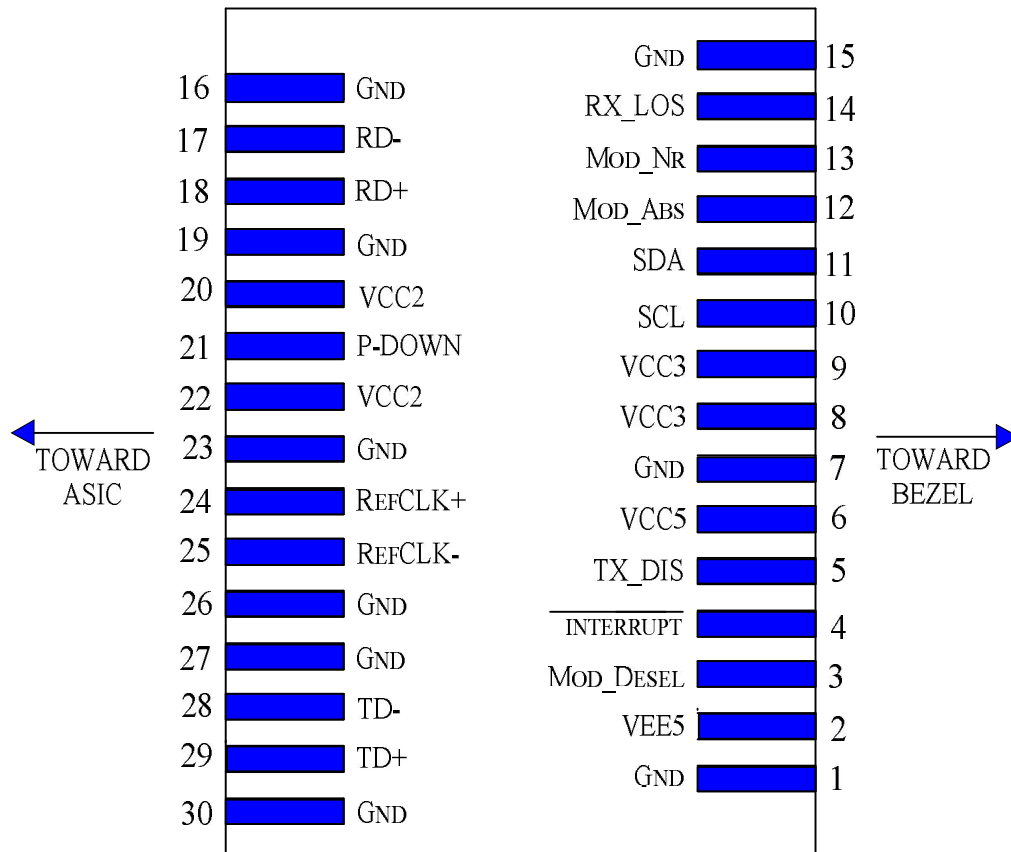
Pin	Logic	Symbol	Name/Description
1		GND	Module Ground <sup>[1]</sup>
2		V <sub>EES</sub>	Optional -5.2 Power Supply - <b>Not required</b>
3	LVTTL-I	Mod-Desel	Module De-select; When held low allows the module to respond to 2-wire serial interface commands
4	LVTTL-O	Interrupt	Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface <sup>[2]</sup>
5	LVTTL-I	TX_DIS	Transmitter Disable; Transmitter laser source turned off
6		V <sub>CC5</sub>	+5 Power Supply - <b>Not required</b>
7		GND	Module Ground <sup>[1]</sup>
8		V <sub>CC3</sub>	+3.3V Power Supply
9		V <sub>CC3</sub>	+3.3V Power Supply
10	LVTTL-I	SCL	Serial 2-wire interface clock <sup>[2]</sup>
11	LVTTL-I/O	SDA	Serial 2-wire interface data line <sup>[2]</sup>

Pin	Logic	Symbol	Name/Description
12	LVTTTL-O	Mod_Abs	Module Absent; Indicates module is not present. Grounded in the module <sup>[2]</sup>
13	LVTTTL-O	Mod_NR	Module Not Ready <sup>[2]</sup>
14	LVTTTL-O	RX_LOS	Receiver Loss of Signal indicator <sup>[2]</sup>
15		GND	Module Ground <sup>[1]</sup>
16		GND	Module Ground <sup>[1]</sup>
17	CML-O	RD-	Receiver inverted data output
18	CML-O	RD+	Receiver non-inverted data output
19		GND	Module Ground <sup>[1]</sup>
20		V <sub>CC2</sub>	+1.8V Power Supply - <b>Not required</b>
21	LVTTTL-I	P_Down/R	Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset
		ST	Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.
22		V <sub>CC2</sub>	+1.8V Power Supply - <b>Not required</b>
23		GND	Module Ground <sup>[1]</sup>
24	PECL-I	RefCLK+	Reference Clock non-inverted input, AC coupled on the host board - <b>Not required</b> <sup>[3]</sup>
25	PECL-I	RefCLK-	Reference Clock inverted input, AC coupled on the host board - <b>Not required</b> <sup>[3]</sup>
26		GND	Module Ground <sup>[1]</sup>
27		GND	Module Ground <sup>[1]</sup>
28	CML-I	TD-	Transmitter inverted data input
29	CML-I	TD+	Transmitter non-inverted data input
30		GND	Module Ground <sup>[1]</sup>

**Notes:**

- [1] Module circuit ground is isolated from module chassis ground within the module.
- [2] Open collector; should be pulled up with 4.7 - 10 kΩ on host board to a voltage between 3.15V and 3.6V.
- [3] A Reference Clock input is not required.

## 8. Hostboard Connector Pinout



## 9. General Specifications

Parameter	Symbol	Min	Typ	Max	Units
Bit Rate	BR	9.95		11.1	Gb/s <sup>[1]</sup>
Bit Error Ratio	BER			10 <sup>-12</sup>	<sup>[2]</sup>
Max. Supported Link Length	L <sub>MAX</sub>		10		km <sup>[1]</sup>

**Notes:**

- [1] SONET OC-192 SR-1, SDH STM I-64.1, 10GBASE-LR/LW, 1200-SM-LL-L
- [2] Tested with a 231-1 PRBS

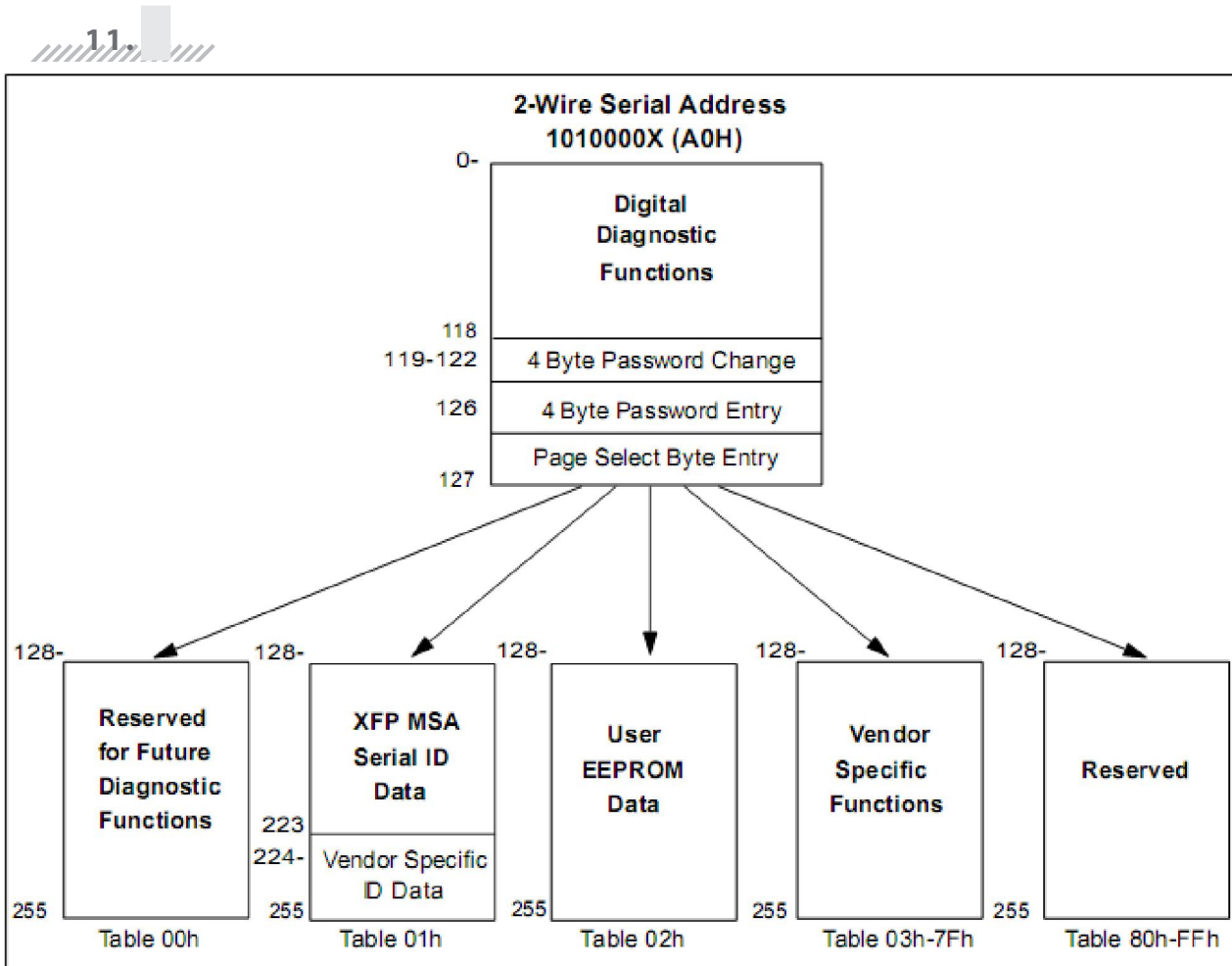
## 10. Management Interface

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA). The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Alarm/warning threshold data is written during device manufacture. Received power monitoring,

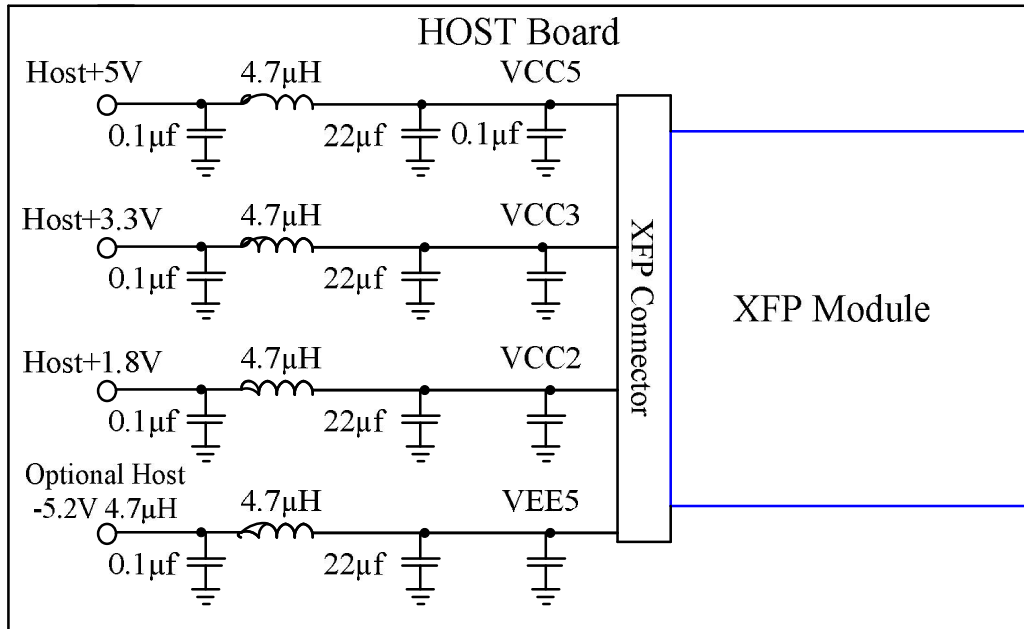
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transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented.

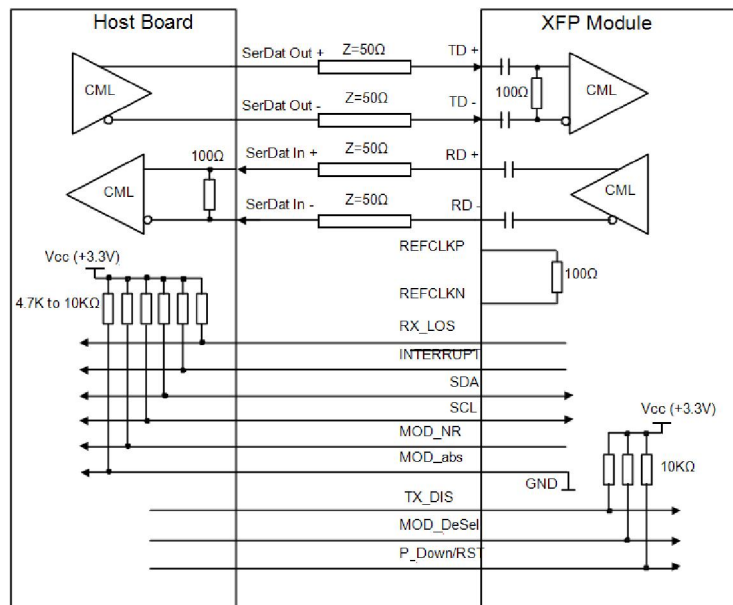
The digital diagnostic memory map specific data field defines as following.



## 12. Recommended Host Board Power Supply Circuit

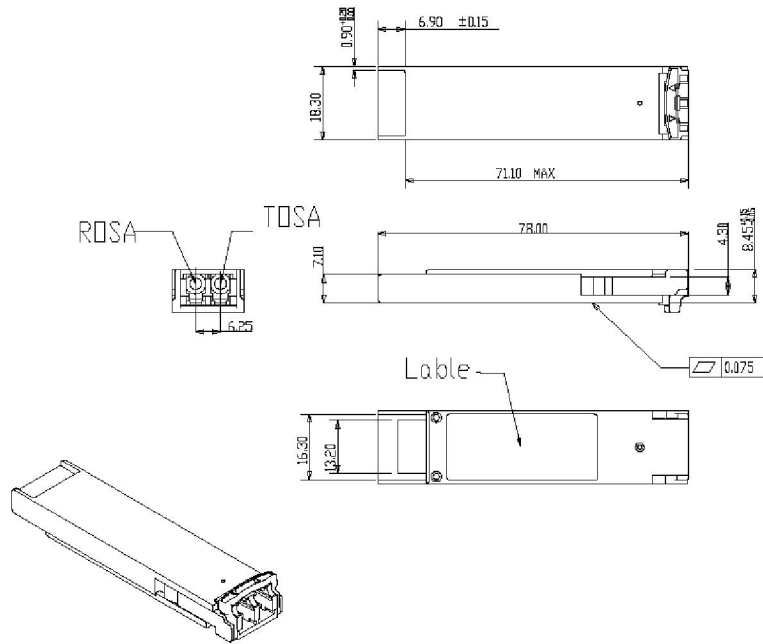


## 13. Recommended High-speed Interface Circuit



## 14. Mechanical Specifications

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



## 15. Ordering information

Part Number	Product Description
XFP 10G LR 20km LC	1310nm DFB, 10Gbps, 10km, 0°C ÷ +70°C, Ethernet/SDH Version