DATA SHEET

MODULETEK – XFP-10GB-DWDM-ZR-xx.xx-C10
10 Gigabit DWDM XFP Optical Transceiver

XFP-10GB-DWDM-ZR-xx.xx-C10 Overview

ModuleTek's XFP-10GB-DWDM-ZR-xx.xx-C10 10 Gb/s DWDM XFP optical transceivers are designed for Storage, IP network and SONET/SDH, it supports DWDM 10G Ethernet, DWDM 10G Fiber channel and DWDM 10G SONET/SDH interface. XFP-10GB-DWDM-ZR-xx.xx-C10 is a hot pluggable module in the Z-direction that is mainly usable in typical router/switches line card applications. XFP-10GB-DWDM-ZR-xx.xx-C10 are compliant with the XFP Multi-Source Agreement (MSA) Specification. The digital diagnostics functions are available via the 2-wire serial interface, as specified in the XFP MSA.

Product Features

- Up to 9.95 Gb/s to 11.3 Gb/s bit rates.
- Compliant with 10GEthernet, 10GFC, OC192 application.
- Compliant with XFP MSA.
- Temperature stabilized EML transmitter.
- 100GHz ITU Grid, C Band
- 30 pin XFP compatible connector.
- Standard bail mechanism for consistent installation and removal
- Built-in digital diagnostic functions.
- Hot Pluggable XFP footprint.
- Duplex LC Connectors.
- Up to 80km on SMF
- RoHS Compliance
- Operating temperature range: 0℃ to 70℃.

Applications

- DWDM 10G Ethernet
- DWDM 10G Fiber Channel
- DWDM OC192 /STM-64

Ordering Information

Part Number	Description
XFP-10GB-DWDM-ZR-xx.xx-C10	10 Gigabit DWDM XFP Transceiver, Single Mode Fiber 80km (ITU 100GHz Grid)

For More Information:

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Product Selection

Product number	Description	ITU channel
XFP-10GB-DWDM-ZR-1530.33-C10	10GBASE-DWDM 1530.33 nm XFP (100-GHz ITU grid)	59
XFP-10GB-DWDM-ZR-1531.12-C10	10GBASE-DWDM 1531.12 nm XFP (100-GHz ITU grid)	58
XFP-10GB-DWDM-ZR-1531.90-C10	10GBASE-DWDM 1531.90 nm XFP (100-GHz ITU grid)	57
XFP-10GB-DWDM-ZR-1532.68-C10	10GBASE-DWDM 1532.68 nm XFP (100-GHz ITU grid)	56
XFP-10GB-DWDM-ZR-1533.47-C10	10GBASE-DWDM 1533.47 nm XFP (100-GHz ITU grid)	55
XFP-10GB-DWDM-ZR-1534.25-C10	10GBASE-DWDM 1534.25 nm XFP (100-GHz ITU grid)	54
XFP-10GB-DWDM-ZR-1535.04-C10	10GBASE-DWDM 1535.04 nm XFP (100-GHz ITU grid)	53
XFP-10GB-DWDM-ZR-1535.82-C10	10GBASE-DWDM 1535.82 nm XFP (100-GHz ITU grid)	52
XFP-10GB-DWDM-ZR-1536.61-C10	10GBASE-DWDM 1536.61 nm XFP (100-GHz ITU grid)	51
XFP-10GB-DWDM-ZR-1537.40-C10	10GBASE-DWDM 1537.40 nm XFP (100-GHz ITU grid)	50
XFP-10GB-DWDM-ZR-1538.19-C10	10GBASE-DWDM 1538.19 nm XFP (100-GHz ITU grid)	49
XFP-10GB-DWDM-ZR-1538.98-C10	10GBASE-DWDM 1538.98 nm XFP (100-GHz ITU grid)	48
XFP-10GB-DWDM-ZR-1539.77-C10	10GBASE-DWDM 1539.77 nm XFP (100-GHz ITU grid)	47
XFP-10GB-DWDM-ZR-1540.56-C10	10GBASE-DWDM 1540.56 nm XFP (100-GHz ITU grid)	46
XFP-10GB-DWDM-ZR-1541.35-C10	10GBASE-DWDM 1541.35 nm XFP (100-GHz ITU grid)	45
XFP-10GB-DWDM-ZR-1542.14-C10	10GBASE-DWDM 1542.14 nm XFP (100-GHz ITU grid)	44
XFP-10GB-DWDM-ZR-1542.94-C10	10GBASE-DWDM 1542.94 nm XFP (100-GHz ITU grid)	43
XFP-10GB-DWDM-ZR-1543.73-C10	10GBASE-DWDM 1543.73 nm XFP (100-GHz ITU grid)	42
XFP-10GB-DWDM-ZR-1544.53-C10	10GBASE-DWDM 1544.53 nm XFP (100-GHz ITU grid)	41
XFP-10GB-DWDM-ZR-1545.32-C10	10GBASE-DWDM 1545.32 nm XFP (100-GHz ITU grid)	40
XFP-10GB-DWDM-ZR-1546.12-C10	10GBASE-DWDM 1546.12 nm XFP (100-GHz ITU grid)	39
XFP-10GB-DWDM-ZR-1546.92-C10	10GBASE-DWDM 1546.92 nm XFP (100-GHz ITU grid)	38
XFP-10GB-DWDM-ZR-1547.72-C10	10GBASE-DWDM 1547.72 nm XFP (100-GHz ITU grid)	37
XFP-10GB-DWDM-ZR-1548.51-C10	10GBASE-DWDM 1548.51 nm XFP (100-GHz ITU grid)	36
XFP-10GB-DWDM-ZR-1549.32-C10	10GBASE-DWDM 1549.32 nm XFP (100-GHz ITU grid)	35
XFP-10GB-DWDM-ZR-1550.12-C10	10GBASE-DWDM 1550.12 nm XFP (100-GHz ITU grid)	34
XFP-10GB-DWDM-ZR-1550.92-C10	10GBASE-DWDM 1550.92 nm XFP (100-GHz ITU grid)	33
XFP-10GB-DWDM-ZR-1551.72-C10	10GBASE-DWDM 1551.72 nm XFP (100-GHz ITU grid)	32
XFP-10GB-DWDM-ZR-1552.52-C10	10GBASE-DWDM 1552.52 nm XFP (100-GHz ITU grid)	31
XFP-10GB-DWDM-ZR-1553.33-C10	10GBASE-DWDM 1553.33 nm XFP (100-GHz ITU grid)	30
XFP-10GB-DWDM-ZR-1554.13-C10	10GBASE-DWDM 1554.13 nm XFP (100-GHz ITU grid)	29
XFP-10GB-DWDM-ZR-1554.94-C10	10GBASE-DWDM 1554.94 nm XFP (100-GHz ITU grid)	28
XFP-10GB-DWDM-ZR-1555.75-C10	10GBASE-DWDM 1555.75 nm XFP (100-GHz ITU grid)	27
XFP-10GB-DWDM-ZR-1556.55-C10	10GBASE-DWDM 1556.55 nm XFP (100-GHz ITU grid)	26

XFP-10GB-DWDM-ZR-1557.36-C10	10GBASE-DWDM 1557.36 nm XFP (100-GHz ITU grid)	25
XFP-10GB-DWDM-ZR-1558.17-C10	10GBASE-DWDM 1558.17 nm XFP (100-GHz ITU grid)	24
XFP-10GB-DWDM-ZR-1558.98-C10	10GBASE-DWDM 1558.98 nm XFP (100-GHz ITU grid)	23
XFP-10GB-DWDM-ZR-1559.79-C10	10GBASE-DWDM 1559.79 nm XFP (100-GHz ITU grid)	22
XFP-10GB-DWDM-ZR-1560.61-C10	10GBASE-DWDM 1560.61 nm XFP (100-GHz ITU grid)	21

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Storage Ambient Temperature	T_S	– 40		85	℃	
Supply Voltage 5V		– 0.5		5.5		
Supply Voltage 3.3V	V_{CC_3}	– 0.5		4	V	

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	DR	9.95		11.3	Gb/s	
Bit Error Rate	BER			10^{-12}		
Total Power Consumption	P			3.5	W	
Supply Voltage – 5V	V_{CC_5}	4.75		5.25	V	1
Supply Voltage – 3.3V	V_{CC_3}	3.14		3.46	V	1
Supply Current –V_{CC_5} supply	I_{CC_5}			350		
Supply Current –V_{CC_3} supply	I_{CC_3}			500	mA	
Case Operating Temperature	T_C	0		70	℃	

Notes:

1. Operating Environment

Link Distances

Parameter	Fiber Type	Distance Range (km)
9.95 – 11.3Gb/s	9/125um SMF	80

Optical Characteristics - Transmitter

V_{CC_5}=4.75V to 5.25V, V_{CC_3}=3.14V to 3.46V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Wavelength	λ_C	λ-100	λ	λ+100	pm	1
Launch Power	P_{OUT}	0		4	dBm	2
Launch Power of OFF Transmitter	P_{OUT_OFF}			– 30	dBm	2
Side Mode Suppression Ratio	SMSR	30			dB	
Optical Extinction Ratio	ER	8.2			dB	
Relative Intensity Noise	RIN			– 130	dB/Hz	

Transmitter Dispersion Penalty	TDP		3	dB
Transmitter Jitter (Peak-to-Peak)	TJ		0.1	UI

Notes:

1. λ = specified ITU Grid wavelength
2. Average

Optical Characteristics - Receiver

V_{CC_5}=4.75V to 5.25V, V_{CC_3}=3.14V to 3.46V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Center Wavelength Range	λ_C	1260		1600	nm	
Optical Input Power	P_{IN}			– 7	dBm	
Receiver Sensitivity in OMA@ 10.3Gb/s	P_{SENS1}			– 24	dBm	1
Receiver Reflectance	TR_{RX}			– 27	dB	
LOS De-Assert	LOS_D			– 27	dBm	
LOS Assert	LOS_A	– 35			dBm	
LOS Hysteresis		0.5			dB	

Notes:

1. Measured with worst ER: BER<10^{-12} 2^{31}-1 PRBS

Electrical Characteristics – Transmitter

V_{CC_5}=4.75V to 5.25V, V_{CC_3}=3.14V to 3.46V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R_{in}		100		Ω	1
Differential data input swing	V_{IN_PP}	120		820	mV	
Transmit Disable Voltage	V_D	2		V_{CC}	V	2
Transmit Enable Voltage	V_{EN}	GND		GND+0.8	V	
Transmit Disable Assert Time				10	us	

Notes:

1. After internal AC coupling
2. Or open circuit

Electrical Characteristics – Receiver

V_{CC_5}=4.75V to 5.25V, V_{CC_3}=3.14V to 3.46V, T_C=0℃ to 70℃

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Differential data output swing	V_{OUT_PP}	340	650	850	mV	
Data output rise time	T_R			38	ps	1
Data output fall time	T_F			38	ps	1
LOS Fault	V_{LOS_F}	V_{CC}-0.5		V_{CC_HOST}	V	
LOS Normal	V_{LOS_N}	GND		GND+0.5	V	

Notes:

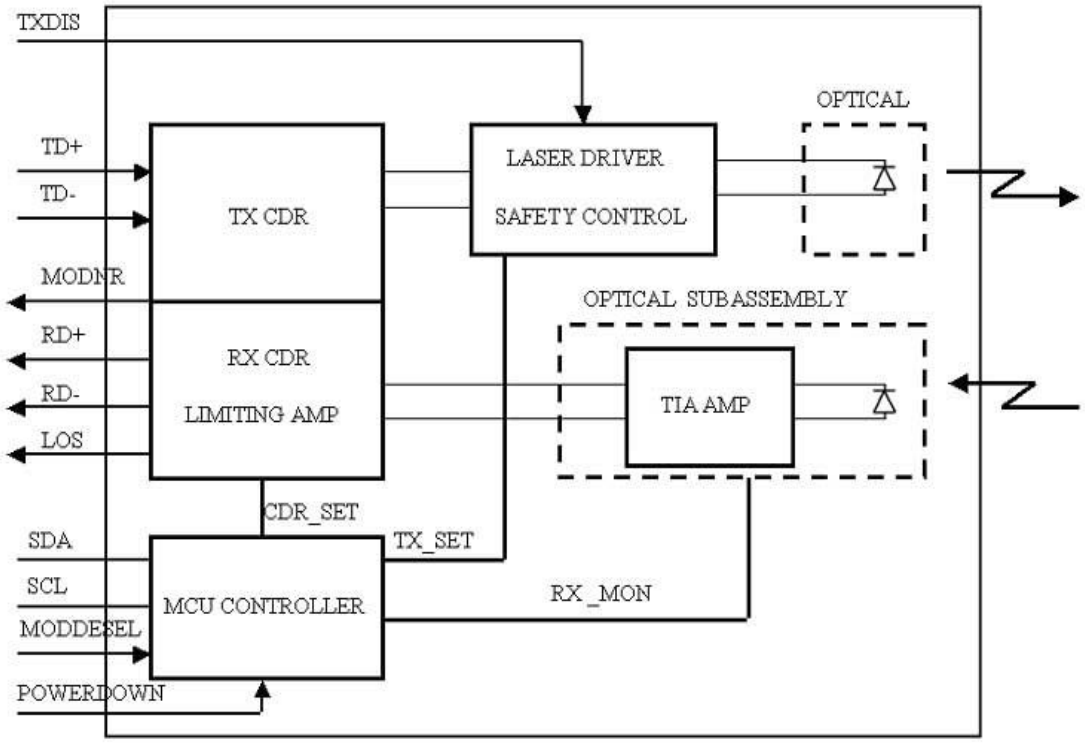
1. 20%-80%

Digital Diagnostic

ModuleTek's XFP-10GB-DWDM-ZR-xx.xx-C10 incorporates a XFP compliant 2-wire management interface which is used for serial ID, digital diagnostics, and certain control functions. It is modeled on the SFF-8472 Rev 9.3 specification modified to accommodate a single 2-wire interface address. In addition to the basic I^2C read/write functionality the modules support packet error checking that, when enabled, allows the host system to confirm the validity of any read data. Details of the protocol and interface are explicitly described in the MSA. And the digital diagnostic functions via a 2-wire serial interface can provide real-time access to following operating parameters:

a. Transceiver Temperature
b. Laser Bias Current
c. Transmitted Optical Power
d. Received Optical Power
e. Transceiver Supply Voltage

Block Diagram



Transmitter Section:

The Laser Driver accept differential input data and provide bias and modulation currents for driving a laser. An automatic power control (APC) feedback loop is incorporated to maintain a constant average optical power. Laser in an eye safe optical subassembly (OSA) mates to the fiber cable. TX CDR is used to overcomes host board and connector signal degradations by reshaping, regenerating, and attenuating jitter.

TXDIS:

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

Receiver Section:

The Receiver utilizes an APD detector integrated with a trans-impedance preamplifier in an OSA. The OSA is connected to a limiting Amplifier which providing post-amplification quantization, and optical signal detection. The limiting amplifier is AC coupled to the Trans-impedance amplifier, with internal 100ohm differential termination. RX CDR is used to overcomes host board degradations by reshaping, regenerating, and attenuating jitter.

LOS:

The LOS of an output pin, when LOS is high, it indicates insufficient optical power for reliable signal reception.

MODNR:

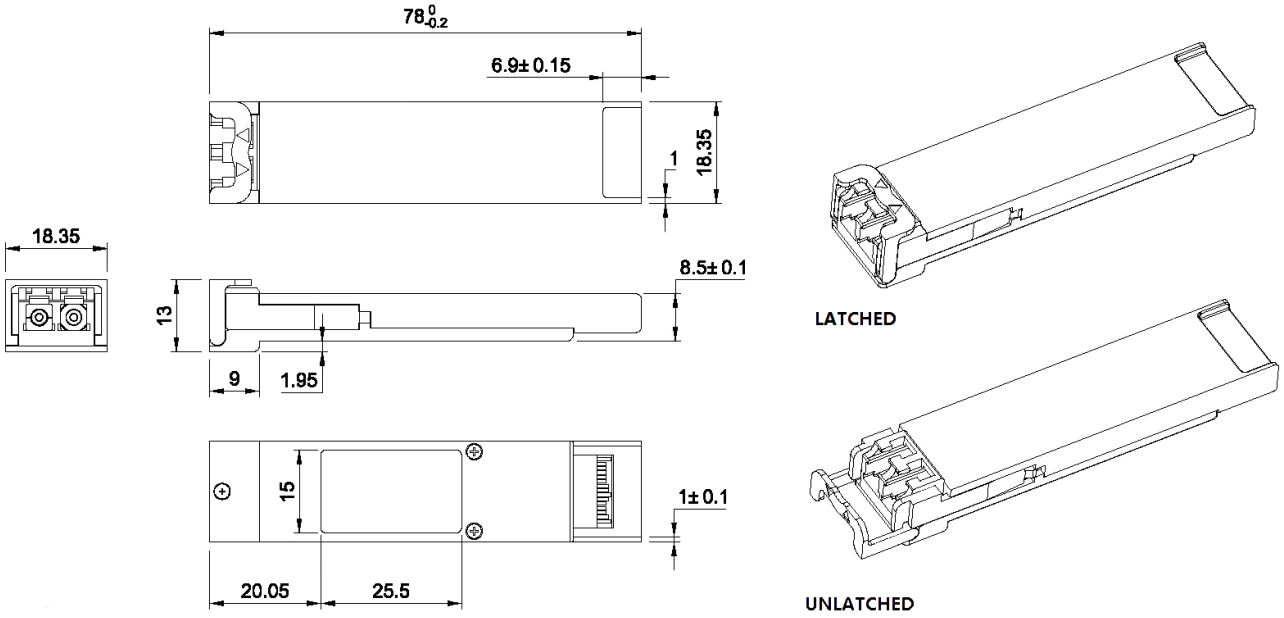
The MODNR is an output pin that when High, indicates that the module has detected a condition that renders transmitter and or receiver data invalid, shall consist of logical OR of the following signals:

f. Transmit Signal Conditioner Loss of Lock
g. Transmitter Laser Fault
h. Receiver Signal Conditioner Loss of Lock

Controller Section

The micro controller unit initializes the control register of laser driver, limiting amplifier and CDR. And monitors the running information from the laser driver, limiting amplifier and CDR. Then report these information to the customer.

Dimensions



ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED

UNIT: mm

Pin Assignment – Pin 1 to Pin 23

PIN #	Symbol	Logic	Description	Remarks
1	GND		Module Ground	1
2	VEE5		Optional – 5.2 Power Supply (Not required)	
3	Mod-Desel	LVTTL-I	Module De-select, when held low allows the module to respond to 2-wire serial interface commands	
4	$\overline{\text{Interrupt}}$	LVTTL-O	Indicates presence of an important condition which can be read over the serial 2-wire interface	2
5	TX_DIS	LVTTL-I	Transmitter Disable, Transmitter laser source turned off	
6	VCC5		+5V Power Supply	
7	GND		Module Ground	3
8	VCC3		+3.3V Power Supply	
9	VCC3		+3.3V Power Supply	
10	SCL	LVTTL-I	Serial 2-wire interface clock	4
11	SDA	LVTTL-I/O	Serial 2-wire interface data line	4
12	Mod_ABS	LVTTL-O	Module Absent, indicates module is not present. Grounded in the module	4
13	Mod_NR	LVTTL-O	Module Not Ready, indicates module operating fault	4
14	RX_LOS	LVTTL-O	Receiver Loss of Signal indicator	4
15	GND		Module Ground	3
16	GND		Module Ground	3
17	RD-	CML-O	Receiver inverted data output	
18	RD+	CML-O	Receiver non-inverted data output	
19	GND		Module Ground	3
20	VCC2		+1.8V Power Supply	
21	P_Down/RST	LVTTL-I	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 rest 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	
23	GND		Module Ground	3

Notes:

1. Module ground pins (GND) are isolated from the module case and chassis ground within the module
2. Open collector, should be pulled up with 4.7kΩ-10kΩ on host board to a voltage between 3.15V and 3.6V
3. Same as Pin# 1
4. Same as Pin# 4

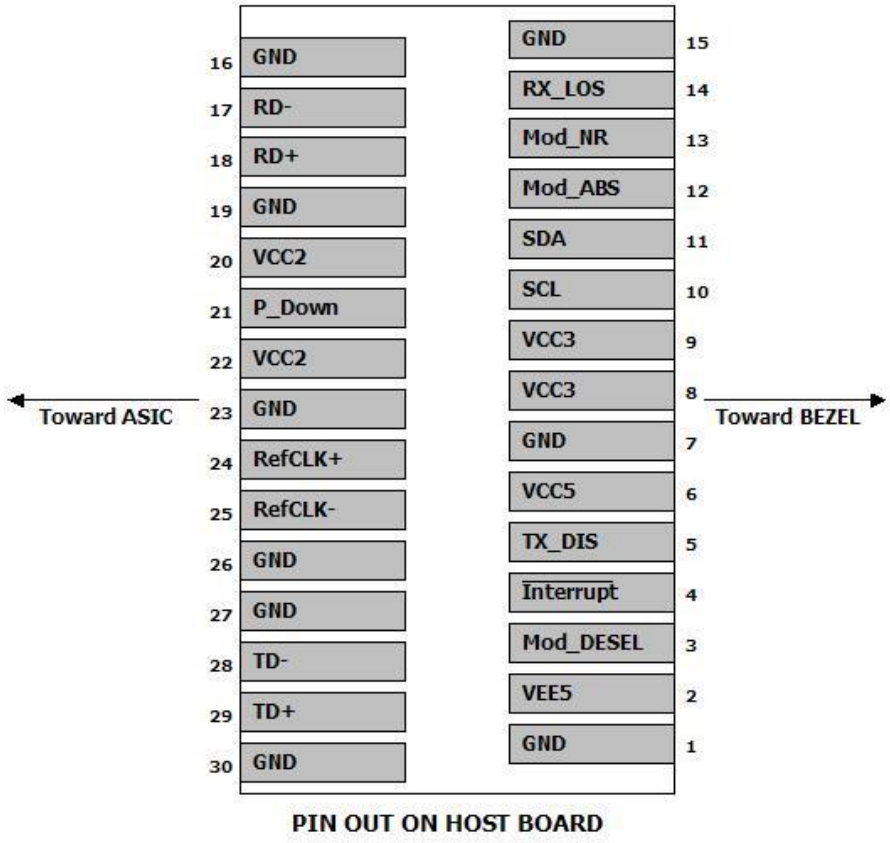
Pin Assignment – Pin 24 to Pin 30

PIN #	Symbol	Logic	Description	Remarks
24	RefCLK+	PECL-I	Reference Clock non-inverted input, AC coupled on the host board	
25	RefCLK-	PECL-I	Reference Clock inverted input, AC coupled on the host board	
26	GND		Module Ground	1
27	GND		Module Ground	1
28	TD-	CML-I	Transmitter inverted data input	
29	TD+	CML-I	Transmitter non-inverted data input	
30	GND		Module Ground	1

Notes:

1. Same as Pin# 1

Electrical Pad Layout



References

1. 10 Gigabit Small Form Factor Pluggable Module (XFP) Multi-Source Agreement (MSA), Rev 4.5 – August 2005.