

10Gb/s XFP Tunable Optical Transceiver

XFP-1080-DTZR

Preliminary Datasheet

Features

- Supports 9.95Gb/s to 11.3Gb/s transmission
- Client side and Line side loopback functions
- XFP MSA compliant form factor connector
- XFI electrical interface compliant
- Hot-pluggable XFP footprint
- 80km MZM Tunable TOSA
- Supports 50GHz ITU-based channel spacing (C-Band) ,cover 80 ITU-based channel
- With wavelength locker function, wavelength precision about 0.02nm
- -300 to +1600 ps/nm Dispersion Tolerance
- Power Dissipation < 3.5W
- I2C interface for diagnostic monitoring
- Operation Temperature: -5~70°C
- RoHS 6 Compliant



Applications

- DWDM 10Gb/s SONET/SDH
- DWDM 10Gb/s SONET/SDH with FEC
- DWDM 10Gb/s Ethernet & 10G Fiber Channel
- DWDM 10Gb/s Ethernet & 10Gb/s Fiber Channel with FEC

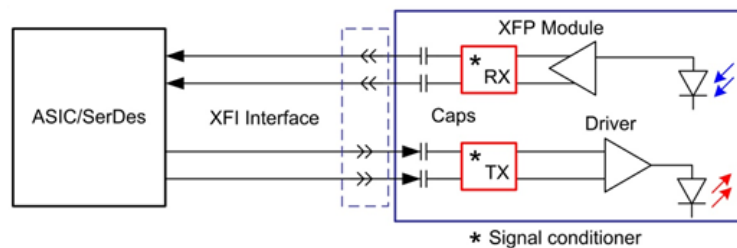


Figure 1 – System Application

1. General Description

The XFP-1080-DTZR series optical transceiver is a high performance and cost effective XFP transceiver modules designed for 10G SDH/SONET, 10G Ethernet DWDM fiber optic transmission applications, designed to support the full range of C-band ITU-T wavelengths data rates from 9.95Gbps to 11.3Gbps and distances up to 80km.

This transceiver contains both transmit and receive sections. An MZM, (C-band tunable laser with a wavelength locker) a laser driver and the supporting circuits constitute the transmit path while an APD ROSA, a post amplifier and the supporting circuits form the receive section. A microcontroller handles the communications between the module and the host board as well as the control and monitoring functions for both transmit and receive sections. A Clock and Data Recovery circuit (CDR) functions for both transmit and receive.

The transceiver module is fully compliant with the XFP MSA standard and can be hot-plugged into the 30-pin XFP connector on the host board. By limiting inrush currents, the device will not disturb the operations of the host board. The high-speed electrical interface is fully compliant with the XFI standard, providing transmission paths for the 10G signals.

2. Functional Description

The XFP-1080-DTZR series optical transceiver contains a duplex LC connector for the optical interface and a 30-pin connector for the electrical interface. Figure 2 " Transceiver Block Diagram " shows the functional block diagram of XFP-1080-DTZR series optical transceiver.

Transmitter Operation

The transceiver module receives 10Gb/s electrical data and convert it to an optical signal. The transmitter contains a Clock Data Recovery (CDR) circuit that reduces the jitter of received signal and reshapes the electrical signal before the electrical to optical (E-O) conversion. The optical output power is maintained constant by an automatic power control (APC) circuit. The transmitter output can be turned off by TX disable signal at TX_DIS pin. When TX_DIS is asserted high, the transmitter is turned off.

Receiver Operation

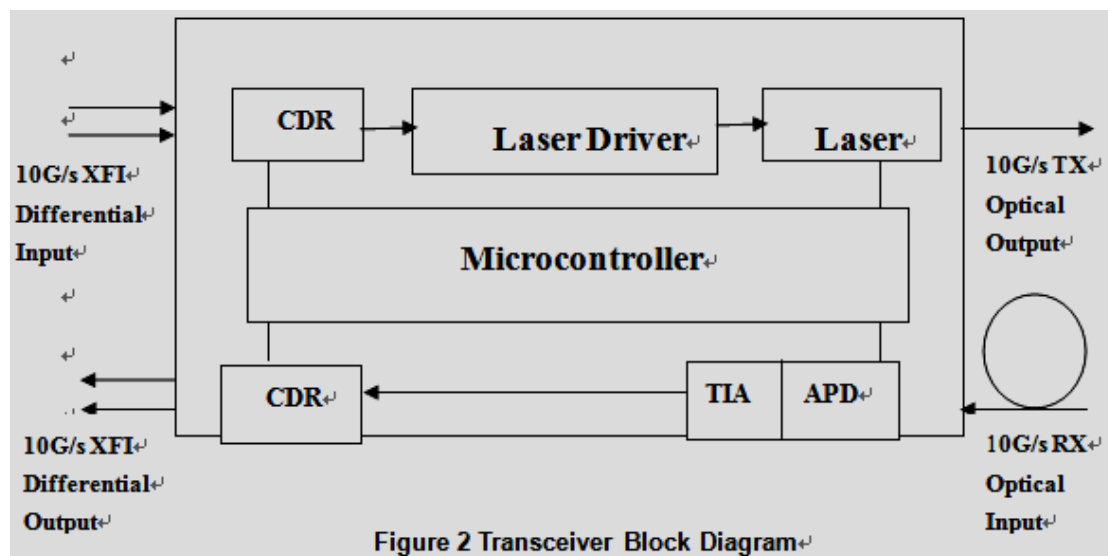
The received optical signal is converted to serial electrical data signal. The optical

receiver contains a CDR circuit that reshapes and retimes an electrical signal before sending out to the XFI channel (i.e. XFP connector and high speed signal traces). The RX_LOS signal indicates insufficient optical power for reliable signal reception at the receiver.

Management Interface

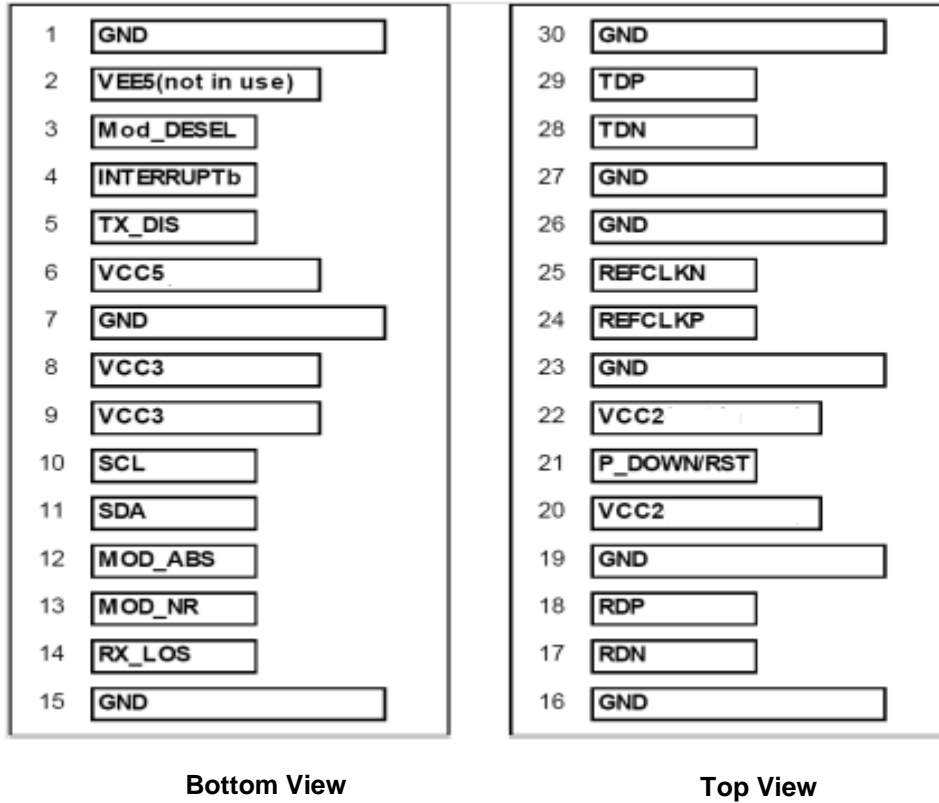
A 2-wire interface (SCL, SDA) is used for serial ID, digital diagnostics and other control/monitor functions. The address of XFP transceiver is 1010000x. MOD_DESEL signal can be used to support multiple XFP modules on the same 2-wire interface bus. Management interface is compliant with XFP MSA.

3. Transceiver Block Diagram



Pin Assignment and Pin Description

XFP Transceiver Electrical Pad Layout



Pin Description

Pin#	Name	Logic	Description	Note
1	GND		Module Ground	1
2	VEE5		-5V Power Supply , not in use	3
3	MOD_DESEL	LVTTTL-I	Module De-select; When held Low allows module to respond to 2-wire serial interface	
4	INTERRUPT	LVTTTL-O	Indicates presence of an important condition, which can be read over the 2-wire serial interface. This pin is an open collector output and must be pulled up to host_Vcc on the host board.	2
5	TX_DIS	LVTTTL-I	Transmitter Disable; When asserted High, transmitter output is turned off. This pin is pulled up to VCC3 in the module	

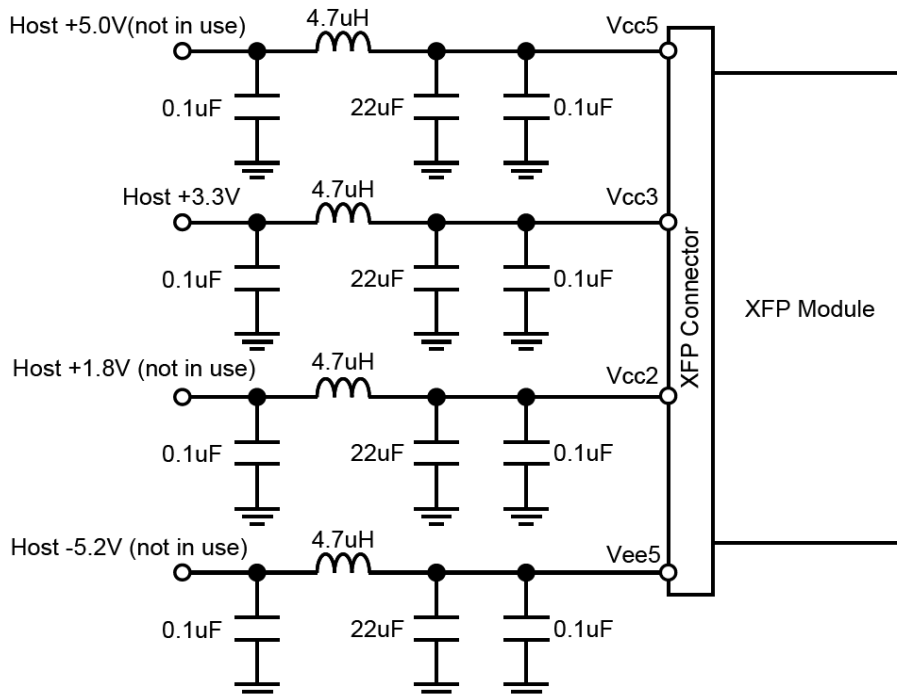
6	VCC5		+5V Power Supply	3
7	GND		Module Ground	1
8	VCC3		+3.3V Power Supply	
9	VCC3		+3.3V Power Supply	
10	SCL	I/O	2-wire serial interface clock. Host shall resistor connected to host_Vcc of +3.3V.	2
11	SDA	I/O	2-wire serial interface data. Host shall use a pull-up resistor connected to host_Vcc of +3.3V.	2
12	MOD_ABS	LVTTTL-O	Indicates Module is not present. Host shall pull up this pin, and grounded in the module. "High" when the XFP module is absent from a host board.	2
13	MOD_NR	LVTTTL-O	Module not ready; When High, Indicates Module Operational Fault. This pin is an open collector and must be pulled to host_Vcc on the host board.	2,3
14	RX_LOS	LVTTTL-O	Receiver Loss of Signal; When high, indicates insufficient optical input power to the module. This pin is an open collector and must be pulled to host_Vcc on the host board.	2
15	GND		Module Ground	
16	GND		Module Ground	
17	RDN	CML-O	Receiver Inverted Data Output; AC coupled inside the module.	
18	RDP	CML-O	Receiver Non-Inverted Data Output; AC coupled in side the module.	
19	GND		Module Ground	1
20	VCC2		+1.8V Power Supply	
21	P_DOWN/RST	LVTTTL-I	Power down; When High, module is limited power mode. Low for normal operation. Reset; The falling edge indicates complete reset of the module. This pin is pulled up to VCC3 in the module. (Power Down function support upon request)	
22	VCC2		+1.8V Power Supply; not in use	

23	GND		Module Ground	1
24	REFCLKP	PECL-I	Reference clock Non-Inverted Input; not in use	
25	REFCLKN	PECL-I	Reference clock Inverted Input; not in use	
26	GND		Module Ground	1
27	GND		Module Ground	1
28	TDN	CML-I	Transmitter Inverted Data Input; AC coupled inside the module.	
29	TDP	CML-I	Transmitter Non-Inverted Data Input; AC coupled inside the module.	
30	GND		Module Ground	1

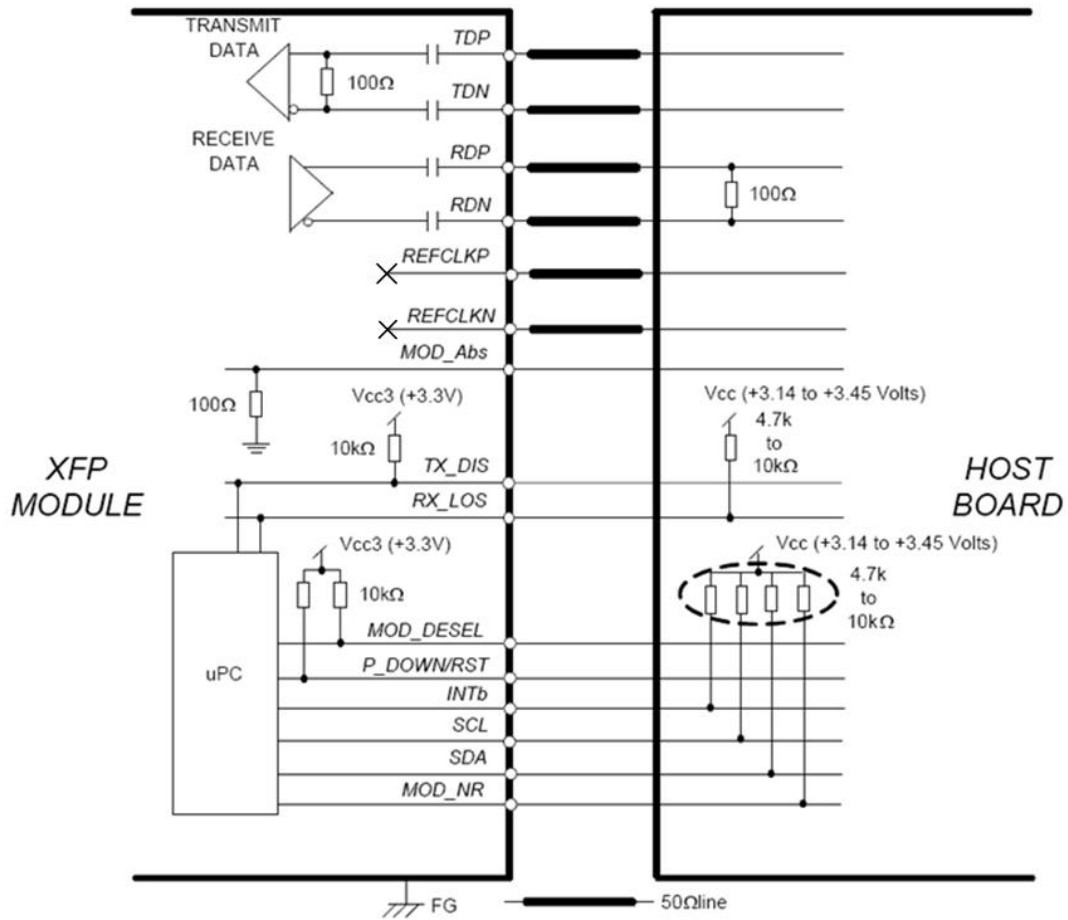
Notes:

1. Module GND pins are isolated from the module case and chassis GND within the module.
2. Shall be pulled up with 4.7k~10kohm to a 3.15V~3.45V on the host board.
3. MOD_NR = (TX LOL) OR (RX LOL).

Recommended Power Supply Filter



Recommended Electrical Interface to Host



4. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	Tst	-40	85	degC	
Relative Humidity (non-condensation)	RH	-	85	%	
Operating Case Temperature	Topc	0	70	degC	1
Supply Voltage #3	VCC3	-0.5	3.6	V	
Supply Voltage #5	VCC3	-0.5	6.0	V	
Voltage on LVTTL Input	Vilvttl	-0.5	VCC3+0.5	V	
LVTTL Output Current	Iolvttl	-	15	mA	
Voltage on Open Collector Output	Voco	0	6	V	
Receiver Input Optical Power(Average)	Mip	-	-7	dBm	2

Notes:

1. Ta: -10 to 60degC with 1.5m/s airflow with an additional heat sink.
2. APD Receiver.

5. Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Max	Unit
Operating Case Temperature	Topc	0	70	degC
Relative Humidity (non-condensing)	Rhop	-	85	%
Power Supply Voltage #3	VCC3	3.135	3.465	V
Power Supply Current #3	ICC3	-	750	mA
Power Supply Voltage #5	VCC5	4.75	5.25	V
Power Supply Current #5	ICC5	-	300	mA
Power Supply Voltage #2	VCC2	1.71	1.91	V
Power Supply Current #5	ICC5	-	500	mA
Total Power Consumption	Pd	-	3.5	W

6. Low Speed Control and Alarm Signals Electrical Interface

Parameter	Symbol	Min	Max	Units	Note
XFP Interrupt, Mod_NR, RX_LOS	Vol	0.0	0.4	V	1
	Voh	Vcc-0.5	Vcc+0.3		2
XFP TX_DIS, P_DOWN/RST	Vil	-0.3	0.8	V	3
	Vih	2.0	VCC3+0.3		4
XFP SCL and SDA Output	Vol	0.0	0.4	V	1
	Voh	Vcc-0.5	Vcc+0.3		2
XFP SCL and SDA Input	Vil	-0.3	VCC3*0.3	V	5
	Vih	VCC3*0.7	VCC3+0.5		6
Capacitance for XFP SCL and SDA I/O pin	Ci	-	14	pF	
Total bus capacitive load for SCL and SDA	Cb	-	100	pF	7
			400	pF	8

Notes:

1. Pull-up resistor must be connected to host_Vcc on the host board. $I_{ol(max)}=3mA$
2. Pull-up resistor must be connected to host_Vcc on the host board.
3. Pull-up resistor connected to VCC3 within XFP module. $I_{il(max)}= -10\mu A$.
4. Pull-up resistor connected to VCC3 within XFP module. $I_{ih(max)}= 10\mu A$.
5. Pull-up resistor must be connected to host_Vcc on the host board. $I_{ol(max)}= -10\mu A$.
6. Pull-up resistor must be connected to host_Vcc on the host board. $I_{ol(max)}= 10\mu A$.
7. At 400KHz, 3.0kohms pull-up resistor, at 100kHz 8.0kohms pull-up resistor max.
8. At 400KHz, 0.8kohms pull-up resistor, at 100kHz 2.0kohms pull-up resistor max.

7. Optical Interface

Transmitter Optical Interface						
Parameter	Symbol	Min	Typical	Max	Unit	Note
Operating Data Rate	-	9.95		11.30	Gb/s	1
Wavelength range (ITU Grid)	Λ	1528.77		1563.86	nm	
Transmitter Center Wavelength – End Of Life	λ_c	$\lambda_c - 2.5$	λ_c	$\lambda_c + 2.5$	GHz	
Crossing Ratio		40		60	%	
Center Wavelength Spacing			50		GHz	
SMSR	SMSR	30		-	dB	
Wavelength tuning (Cold Start)				30	s	
Wavelength tuning (Warm)			0.5	2	s	
Average Output Power	Po	0	+2	+4	dBm	2
Dispersion Penalty @9.95G	DP			2	dB	2
Dispersion Penalty @10.3125G	DP			2.5	dB	3
Disabled Power	Poff	-		-30	dBm	2
Extinction Ratio	ER	9.0	10	-	dB	2
Eye Mask 1(SONET/SDH)		GR-253-CORE/ITU-T G.691				2
Eye Mask 2 (10G Ethernet)		IEEE802.3ae				3
Spectral Width (-20dB from Peak)	FW20		0.25		nm	
RIN	RIN	-		-130	dB/Hz	
Receiver Optical Interface						
Parameter	Symbol	Min	Typical	Max	Unit	Note
Operating Data Rate		9.95		11.30	Gb/s	1
Input Center Wavelength	Irc	1250		1620	nm	
Overload	Rovl	-7.0		-	dBm	
Minimum Sensitivity	Pmin	-	- 25.5	-24.0	dBm	2
LOS Assert	LOSA	-39			dBm	
LOS Deassert	LOSD			-26	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Optical Path Penalty	PN	-		TBD	dB	1
Optical Return Loss	ORL	27		-	dB	
Jitter Tolerance	JTL	GR-253-CORE/ITU-T G.783				

Notes:

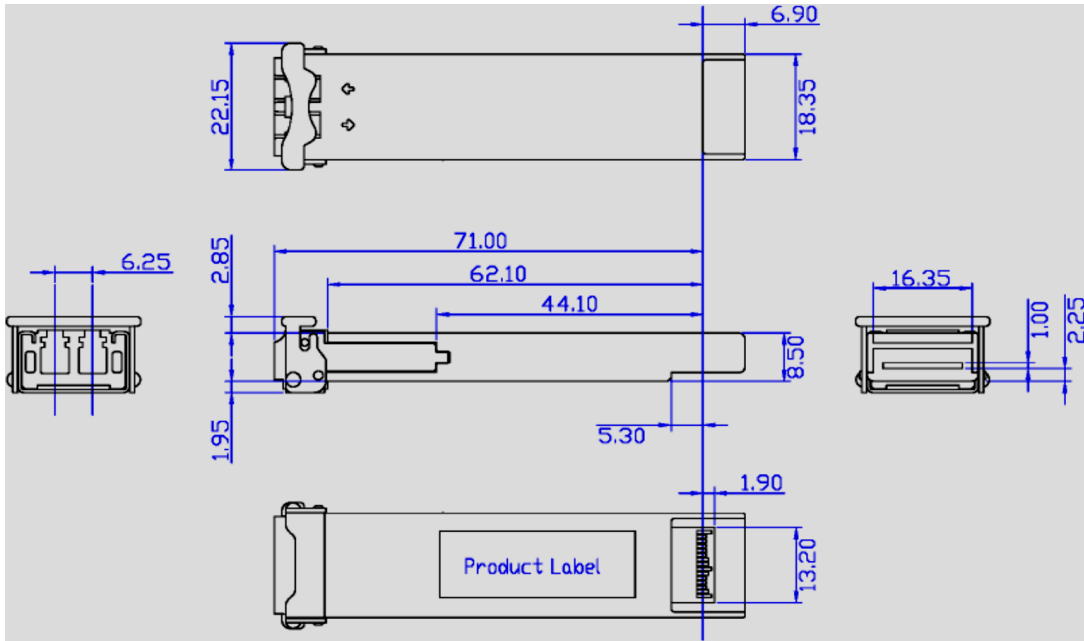
1. Data rate tolerance :
 - IR-2/S-64.2b, 10GBASE-ZW: typ.+/-20ppm
 - 10GBASE-ZR: typ.+/-100ppm
2. Measured at 9.95Gbps, Non-framed PRBS2^31-1, NRZ
3. Measured at 10.3125Gbps, Non-framed PRBS2^31-1, NRZ

8. Digital Diagnostic Functions

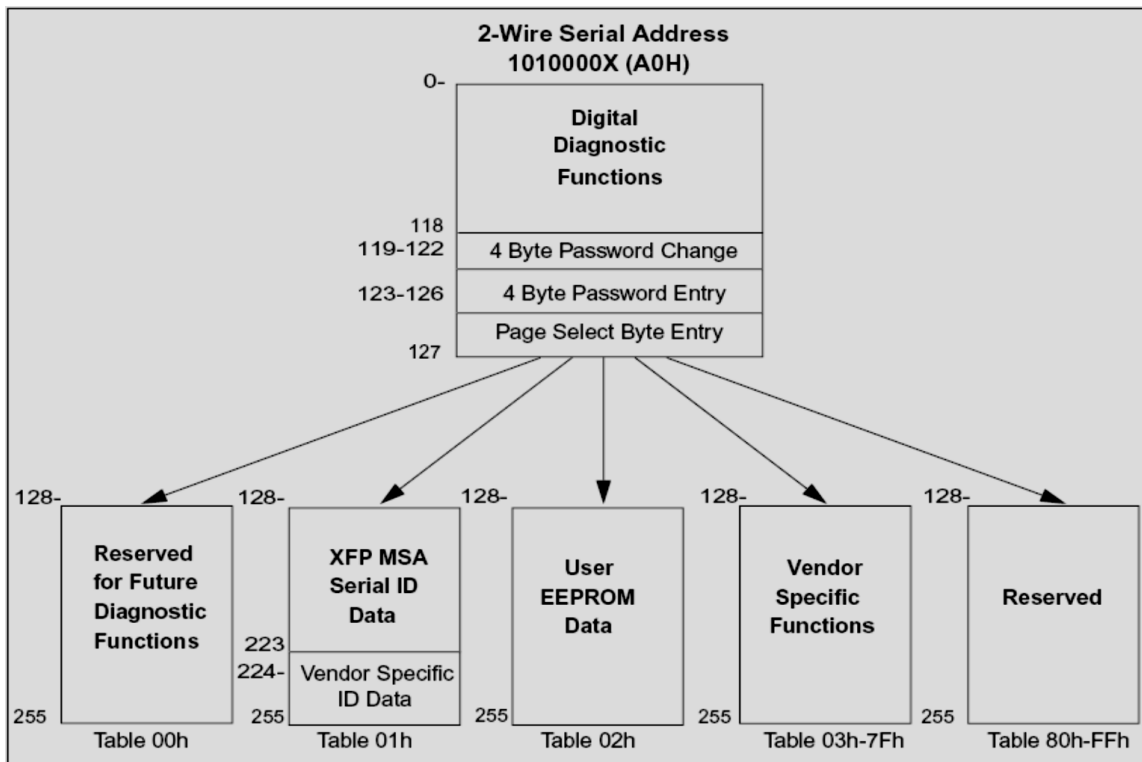
The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant with SFF8472 Rev10.7 with internal calibration mode. For external calibration mode, please contact our sales staff.

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temp
Laser power monitor absolute error	DMI_TX	-3	3	dB	
RX power monitor absolute error	DMI_RX	-3	3	dB	-1dBm to -15dBm range
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Full operating range
Bias current monitor	DMI_Ibias	-10%	10%	mA	

9. Mechanical Dimensions



10. MSA Compliant EEPROM Structure



11. Tuning Management Interface for ITU Frequency Grid Applications

A desired wavelength can be commanded by the user by writing into Bytes 72 (MSB) and 73 (LSB). Wavelength control command:

Address	Bit	Name	Description
72 (MSB) & 73 (LSB)	All	Wavelength Set	User input of Wavelength set point (in units of 50 pm)
74 (MSB) & 75 (LSB)	All	Wavelength Error	Monitor of Current Wavelength Error (in units of 5 pm)

Thus for instance a target wavelength of 1556.55 nm would correspond to 79h (MSB) written to Byte address 72 and 9Bh (LSB) written to Byte address 73.

12. ESD

This transceiver is specified as ESD threshold 1kV for XFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

13. Laser Safety

This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007)