



10Gbps 40km Duplex LC SFP+ OPTX-SFP-10-LC-DWDM

Product Features

- Up to 11.3Gbps data links
- DWDM EML Laser and PIN photo-detector
- Up to 40km on 9/125µm SMF
- Duplex LC receptacle optical interface compliant
- Hot pluggable
- All-metal housing for superior EMI performance
- RoHS6 compliant (lead free)
- Operating case temperature:
Commercial: -5°C to +70°C
Extended: -20°C to +80°C
Industrial: -40°C to +85°C

Applications

- 10GBASE-ER
- 10G Fiber Channel

Standards

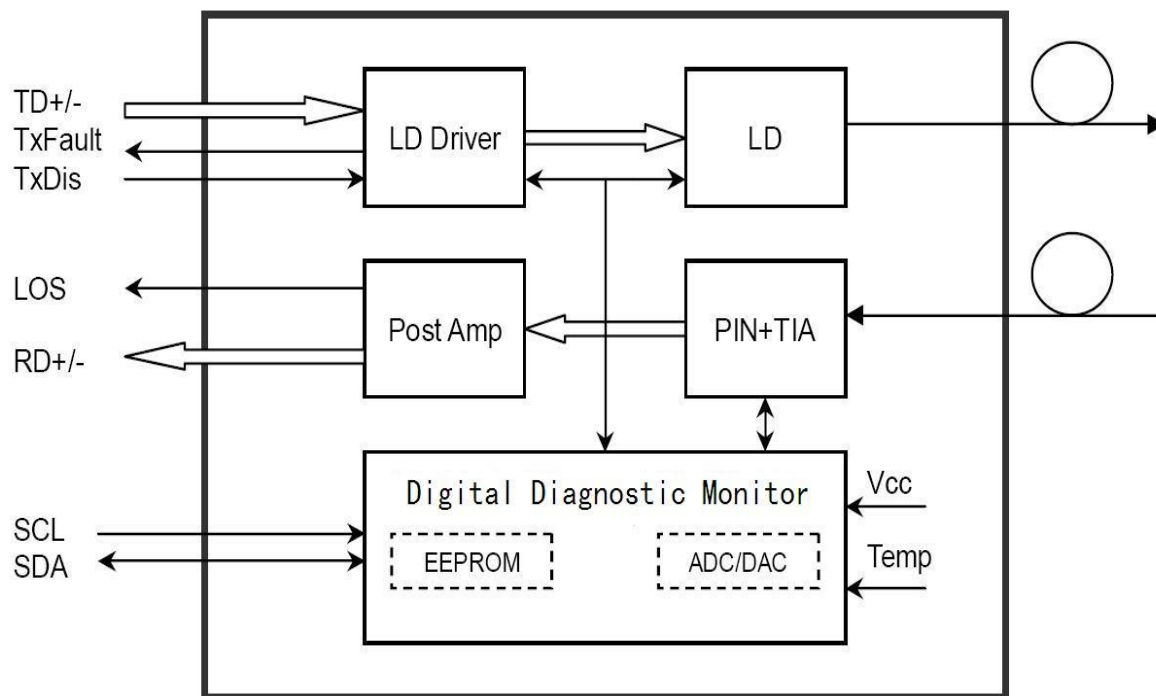
- Compliant with SFP+ MSA
- Compliant with SFF-8472
- Compatible with IEEE802.3ae

Description

The SFP+ transceivers are designed for use in 10-Gigabit Ethernet links up to 40km over Single Mode Fiber. The transceivers are compatible with SFP+ MSA and SFF-8472. For further information, please refer to SFP+ MSA and SFF-8472



Module Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit
Power Supply Voltage	V_{CC}	0		3.6	V
Storage Temperature	T_S	-40		+85	°C
Relative Humidity	RH	0		85	%
RX Input Average Power	P_{max}	-		1.5	dBm

Recommended Operating Environment

Parameter	Symbol	Min.	Typical	Max.	Unit
Power Supply Voltage	V_{CC}	3.13	3.3	3.46	V
Power Supply Current	I_{CC}			500	mA
Operating Case Temperature	Commercial	-5		+70	°C
	Extended	-20		80	
	Industrial	-40		85	
Data Rate			10.3125		Gbps



Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter Section						
Input Differential Impedance	R_{in}	90	100	110	Ω	
Differential Data Input Swing	$V_{in\ PP}$	180		700	mV	1
Transmit Disable Voltage	V_D	$V_{cc} - 1.3$		V_{cc}	V	
Transmit Enable Voltage	V_{EN}	V_{ee}		$V_{ee} + 0.8$	V	
Receiver Section						
Differential Data Output Swing	$V_{out\ PP}$	300		800	mV	
LOS Fault	$V_{los\ fault}$	$V_{cc} - 0.5$		V_{cc_host}	V	2
LOS Normal	$V_{los\ norm}$	V_{ee}		$V_{ee} + 0.5$	V	2

Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. LOS is an open collector output. Should be pulled up with 4.7k Ω – 10k Ω on the host board. Normal operation is logic 0; loss of signal is logic 1.

Optical Parameters

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter Section						
Centre Wavelength	λ_c	$\lambda_c -0.1$	λ_c	$\lambda_c +0.1$	nm	
Center Wavelength Spacing			100		GHZ	
Spectral Width(-20dB)	$\Delta\lambda$			0.3	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power (avg.)	P _{out}	-1		+3	dBm	1
Laser Off Power	P _{off}	-	-	-30	dBm	
Extinction Ratio	ER	8.2	-	-	dB	2
Relative Intensity Noise	RIN	-	-	-128	dB/Hz	
Transmitter Dispersion Penalty	TDP			3	dB	
Optical Rise/Fall Time	t _r / t _f		-	50	ps	3
Optical Return Loss Tolerance		-	-	12	dB	
Output Optical Eye	Compliant with IEEE802.3ae eye masks when filtered					2
Receiver Section						
Receiver Center Wavelength	λ_c	1260		1620	nm	
Receiver Sensitivity in Average	Sen	-16		-1	dBm	4



Power						
Los Assert	LOS _A	-30	-	-	dBm	
Los Dessert	LOS _D	-	-	-17	dBm	
Los Hysteresis	LOS _H	0.5	-	5	dB	
Overload	P _{in-max}	-	-	-1	dBm	4
Receiver Reflectance		-	-	-12	dB	
Receiver Power (damage)		-	-	1.5	dBm	

Notes:

1. The optical power is launched into 9/125μm SMF.
2. Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps.
3. Unfiltered, 20-80%. Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps.
4. Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps, ER=8dB, BER <10⁻¹².

Timing Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
TX_Disable Assert Time	t _{off}			100	us
TX_Disable Negate Time	t _{on}			2	ms
Time to Initialize	t _{start_up}			10	s
Tx_Fault Assert	t _{fault_on}			50	ms
Tx_Fault Reset	t _{reset}	10			us
Rx_LOS Assert Delay	t _{los_on}			100	us
Rx_LOS Negate Delay	t _{los_off}			100	us
Clock Frequency	f _{SCL}	0		400	kHz

Digital Diagnostic Monitor Characteristics (DDM)

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales stuff.

Parameter	Symbol	Min.	Max.	Unit
Temperature Monitor Absolute Error	DMI_Temp	-3	3	°C
Laser Power Monitor Absolute Error	DMI_TX	-3	3	dB
RX Power Monitor Absolute Error	DMI_RX	-3	3	dB
Supply Voltage Monitor Absolute Error	DMI_VCC	-3%	3%	V
Bias Current Monitor Absolute Error	DMI_Ibias	-10%	10%	mA

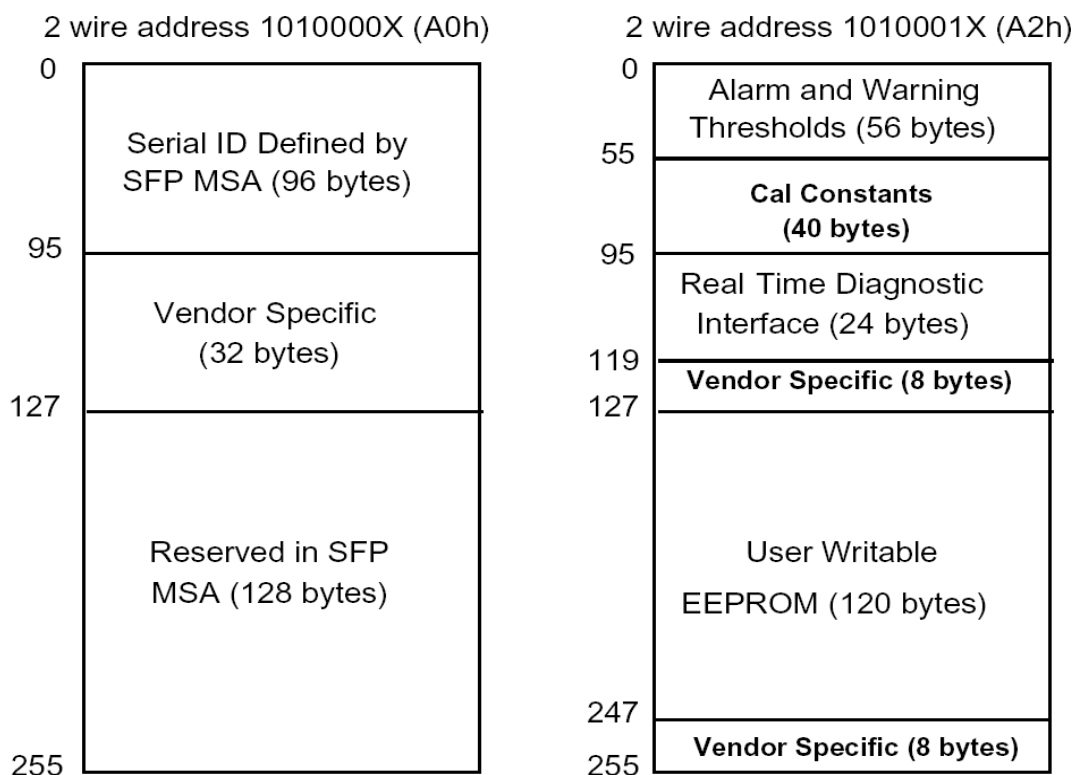


Digital Diagnostic Memory Map (Compliant with SFF-8472)

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

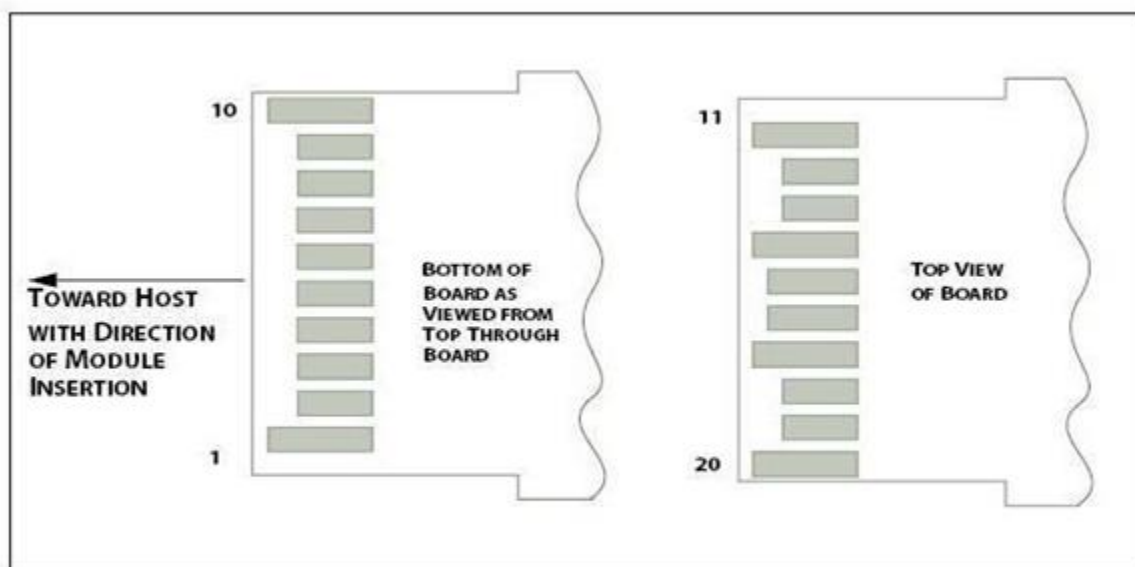
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following (For further information, please refer to SFF-8472).





Pin Definitions



SFP+ module contact assignment

Pin Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	VeeT	Module Transmitter Ground	1	1
2	TX FAULT	Module Transmitter Fault	3	
3	TX Disable	Transmitter Disable; Turns off transmitter laser output	3	
4	SDA	2-Wire Serial Interface Data Line	3	2
5	SCL	2-Wire Serial Interface Clock	3	2
6	Mod_ABS	Module Definition, Grounded in the module	3	
7	RS0	Receiver Rate Select (not used)	3	
8	LOS	Receiver Loss of Signal Indication Active LOW	3	
9	RS1	Transmitter Rate Select (not used)	3	
10	VeeR	Module Receiver Ground	1	1
11	VeeR	Module Receiver Ground	1	1
12	RD-	Receiver Inverted Data Output	3	
13	RD+	Receiver Non-Inverted Data Output	3	
14	VeeR	Module Receiver Ground	1	1
15	VccR	Module Receiver 3.3 V Supply	2	



16	VccT	Module Transmitter 3.3 V Supply	2	
17	VeeT	Module Transmitter Ground	1	1
18	TD+	Transmitter Non-Inverted Data Input	3	
19	TD-	Transmitter Inverted Data Input	3	
20	VeeT	Module Transmitter Ground	1	1

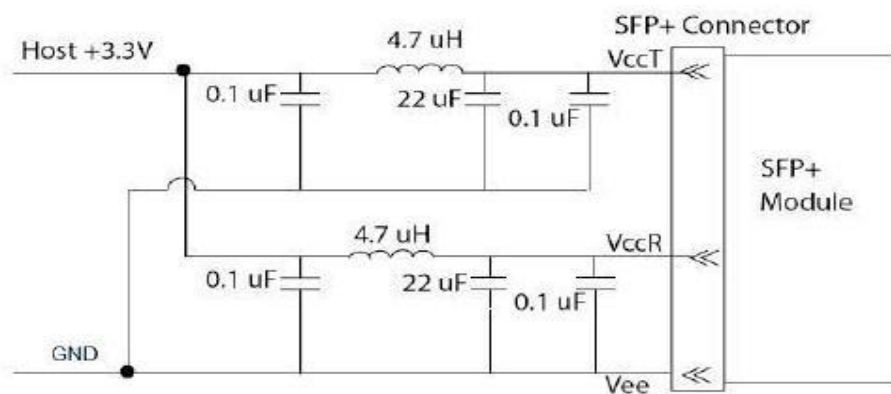
Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

1. Module ground pins GND are isolated from the module case.

2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

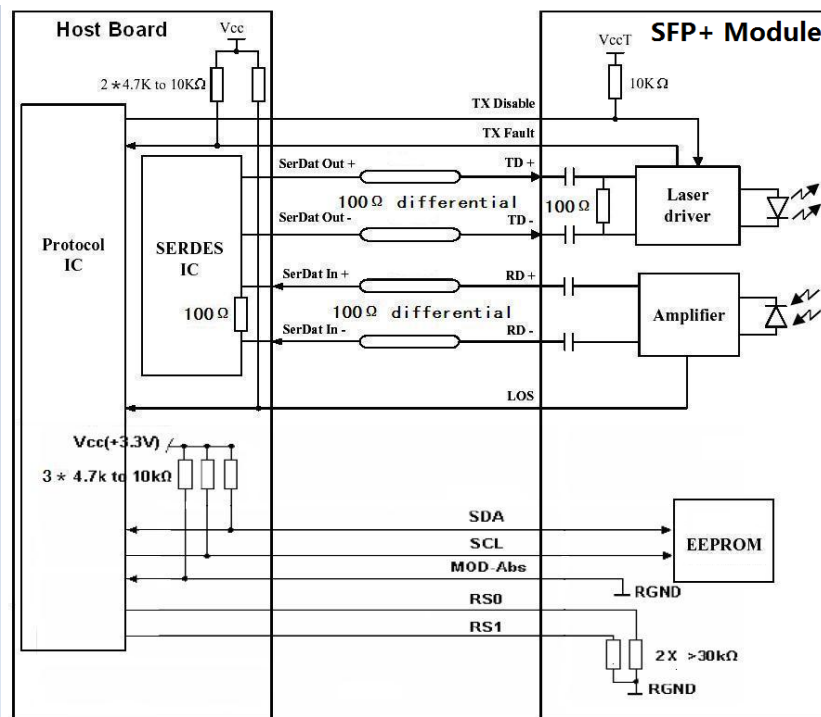
Recommended Power Interface Circuit



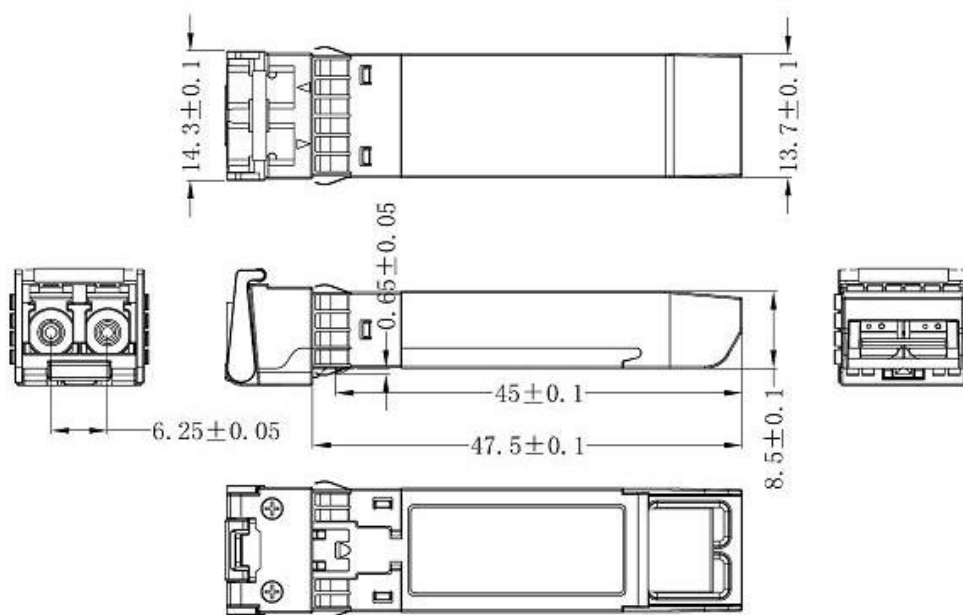
Host Board Power Supply Filters Circuit



Recommended Interface Circuit



Mechanical Dimensions





Ordering information

Part Number	Product Description
For: Commercial	DWDM-XX, 10Gbps, 40km, Duplex LC DWDM SFP+ Transceiver, -5°C ~ +70°C, With DDM.
For: Extended	DWDM-XX, 10Gbps, 40km, Duplex LC DWDM SFP+ Transceiver, -20°C ~ +80°C, With DDM.
For: Industrial	DWDM-XX, 10Gbps, 40km, Duplex LC DWDM SFP+ Transceiver, -40°C ~ +85°C, With DDM.

Code	Frequency (THz)	Center Wavelength(nm)	Code	Frequency (THz)	Center Wavelength(nm)
C17	191.7	1563.86	C40	194.0	1545.32
C18	191.8	1563.05	C41	194.1	1544.53
C19	191.9	1562.23	C42	194.2	1543.73
C20	192.0	1561.42	C43	194.3	1542.94
C21	192.1	1560.61	C44	194.4	1542.14
C22	192.2	1559.79	C45	194.5	1541.35
C23	192.3	1558.98	C46	194.6	1540.56
C24	192.4	1558.17	C47	194.7	1539.77
C25	192.5	1557.36	C48	194.8	1538.98
C26	192.6	1556.55	C49	194.9	1538.19
C27	192.7	1555.75	C50	195.0	1537.40
C28	192.8	1554.94	C51	195.1	1536.61
C29	192.9	1554.13	C52	195.2	1535.82
C30	193.0	1553.33	C53	195.3	1535.04
C31	193.1	1552.52	C54	195.4	1534.25
C32	193.2	1551.72	C55	195.5	1533.47
C33	193.3	1550.92	C56	195.6	1532.68
C34	193.4	1550.12	C57	195.7	1531.90
C35	193.5	1549.32	C58	195.8	1531.12
C36	193.6	1548.51	C59	195.9	1530.33
C37	193.7	1547.72	C60	196.0	1529.55
C38	193.8	1546.92	C61	196.1	1528.77
C39	193.9	1546.12			



References

1. "Specifications for Enhanced Small Form Factor Pluggable Module SFP+", SFF-8431, Rev 4.1, July 6, 2009.
2. "Improved Pluggable Form factor", SFF-8432, Rev 4.2, Apr 18, 2007.
3. "Diagnostic Monitoring Interface for Optical Transceivers" SFF-8472, Rev 10.2, June 1, 2007.
4. IEEE802.3ae 2002

NOTICE:

OptiX² reserves the right to make changes to this product in this specification without notice, in order to improve product performance