

## 10Gbps 40km Duplex LC CWDM SFP+ Transceiver PSP96-CXX40

### Features

- ✓ Up to 11.3Gbps data links
- ✓ CWDM 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

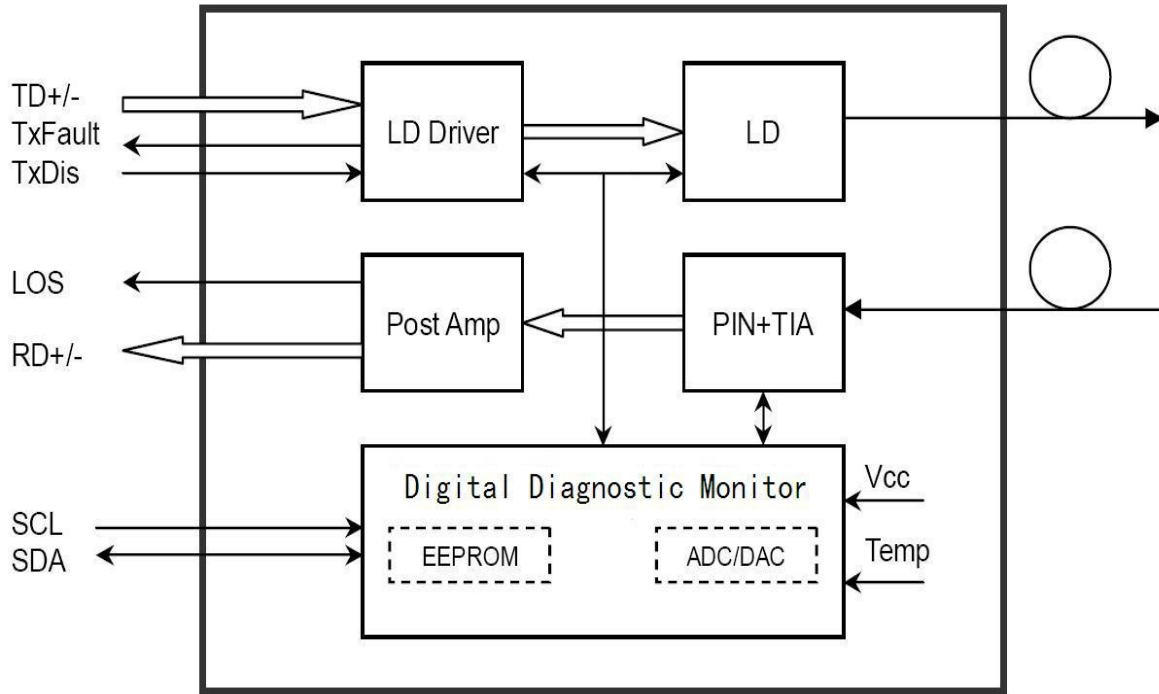
### Standards

- ✓ 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 <sub>cc</sub>	0		3.6	V
Storage Temperature	T <sub>s</sub>	-40		+85	°C
Relative Humidity	RH	0		85	%
RX Input Average Power	P <sub>max</sub>	-		1.5	dBm

Recommended Operating Environment

Parameter	Symbol	Min.	Typical	Max.	Unit
Power Supply Voltage	V <sub>cc</sub>	3.13	3.3	3.46	V
Power Supply Current	I <sub>cc</sub>			450	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
<b>Transmitter Section</b>						
Input Differential Impedance	$R_{in}$	90	100	110	$\Omega$	
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	
<b>Receiver Section</b>						
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 $\Omega$  – 10k $\Omega$  on the host board. Normal operation is logic 0; loss of signal is logic 1.

## Optical Parameters

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
<b>Transmitter Section</b>						
Centre Wavelength	$\lambda_c$	$\lambda_c - 6.5$	$\lambda_c$	$\lambda_c + 6.5$	nm	
Spectral Width(-20dB)	$\Delta\lambda$			1	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
<b>Receiver Section</b>						
Receiver Center Wavelength	$\lambda_c$	1260		1620	nm	
Receiver Sensitivity in Average Power	Sen	-16.0		-1	dBm	4
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  $2^{31}-1$  test pattern @10.3125Gbps.
3. Unfiltered, 20-80%. Measured with a PRBS  $2^{31}-1$  test pattern @10.3125Gbps.
4. Measured with a PRBS  $2^{31}-1$  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			300	ms
Tx_Fault Assert	t_fault_on			1	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 <sub>SCL</sub>	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 staff.

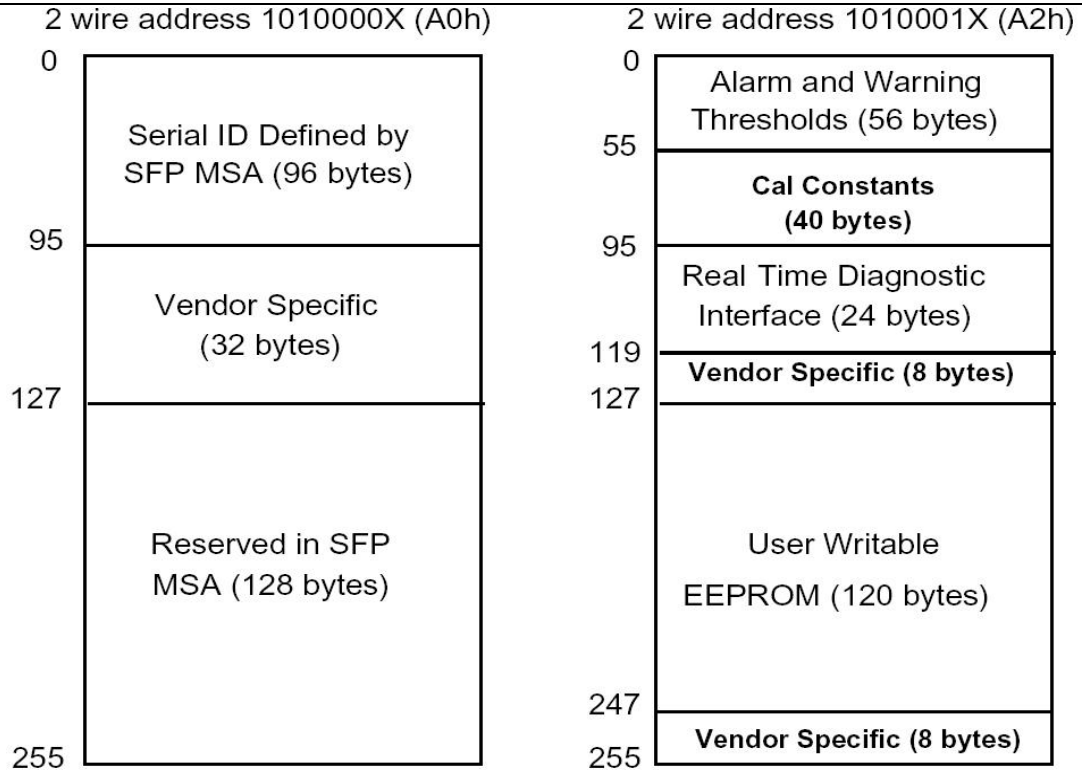
Parameter	Symbol	Min.	Max.	Unit
Temperature Monitor Absolute Error	DMI_Temp	-3	3	°C
Laser Power Monitor Absolute Error	DMI_TX	-3	3	dB
RX Power Monitor Absolute Error	DMI_RX	-3	3	dB
Supply Voltage Monitor Absolute Error	DMI_VCC	-3%	3%	V
Bias Current Monitor Absolute Error	DMI_Ibias	-10%	10%	mA

**Digital Diagnostic Memory Map (Compliant with SFF-8472)**

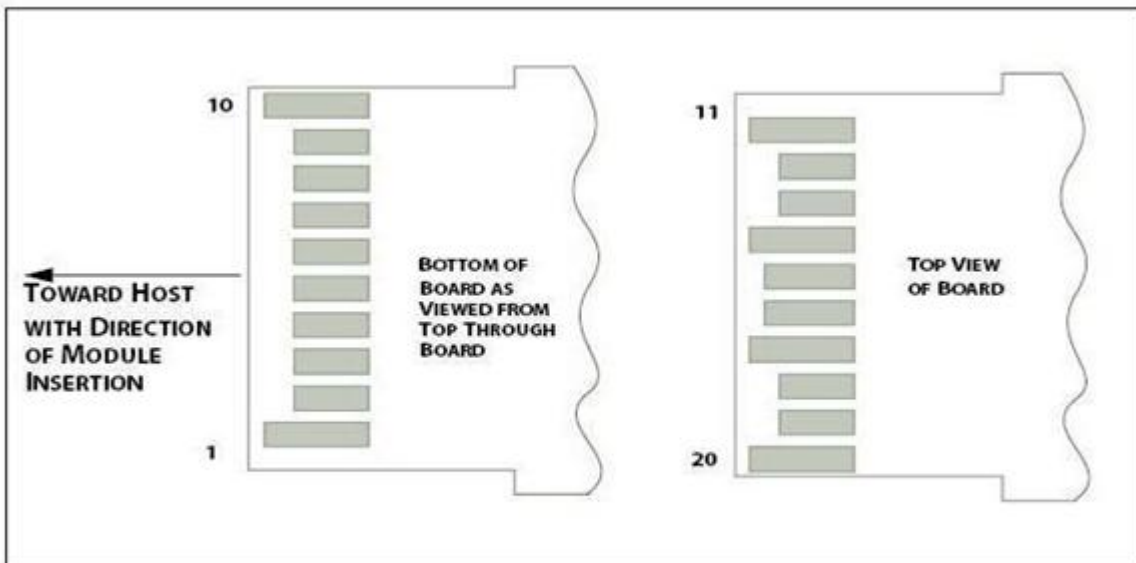
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

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**

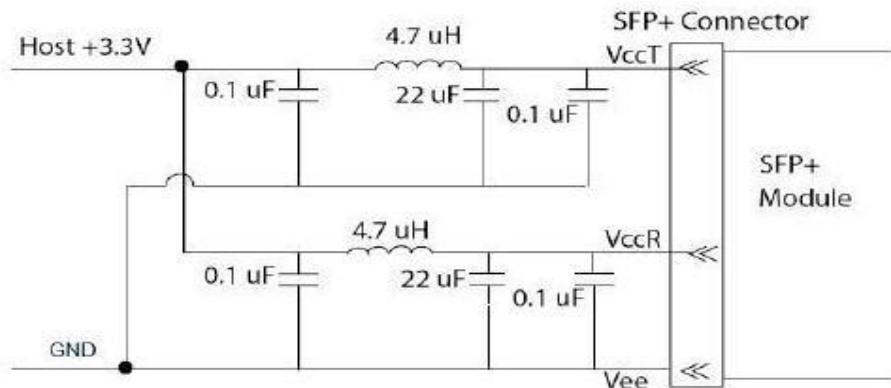
Pin	Signal Name	Description	Plug Seq.	Notes
1	VeeT	Module Transmitter Ground	1	1
2	TX FAULT	Module Transmitter Fault	3	
3	TX Disable	Transmitter Disable; Turns off transmitter laser output	3	
4	SDA	2-Wire Serial Interface Data Line	3	2
5	SCL	2-Wire Serial Interface Clock	3	2
6	Mod_ABS	Module Definition, 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.

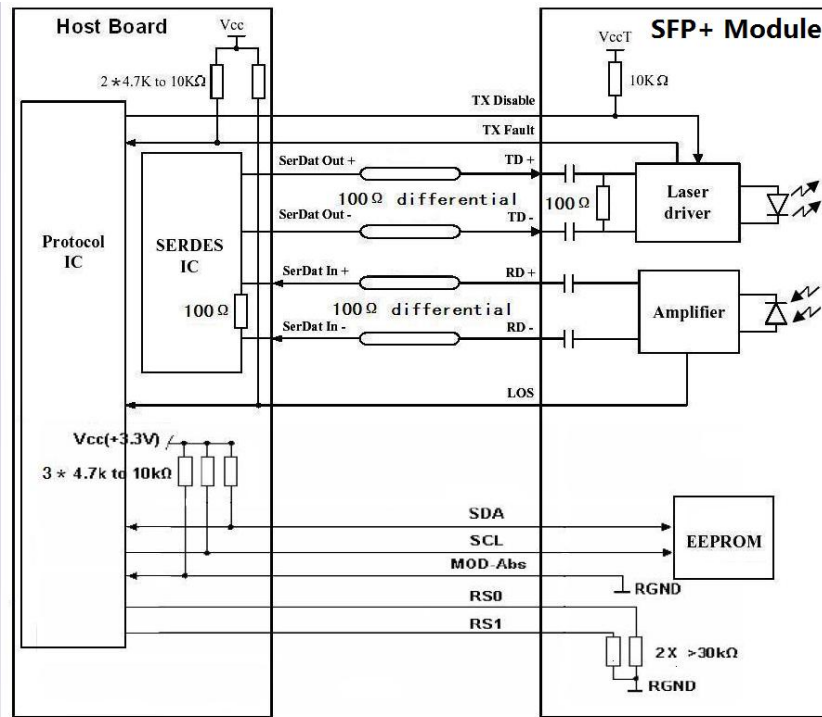
1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

**Recommended Power Interface Circuit**

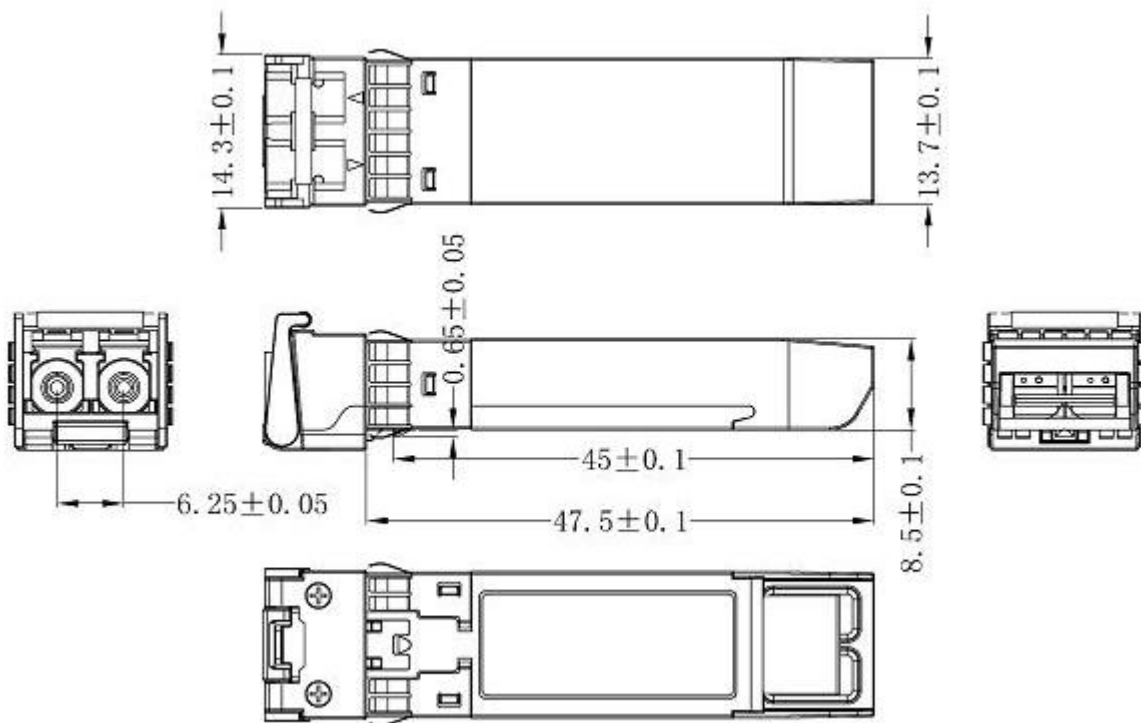


**Host Board Power Supply Filters Circuit**

Recommended Interface Circuit



Mechanical Dimensions



## Ordering information

Part Number	Product Description
PSP96-CXX40	CWDM-XX, 10Gbps, 40km, Duplex LC CWDM SFP+ Transceiver, -5°C ~ +70°C, With DDM.
PSP96-CXX40E	CWDM-XX, 10Gbps, 40km, Duplex LC CWDM SFP+ Transceiver, -20°C ~ +80°C, With DDM.
PSP96-CXX40T	CWDM-XX, 10Gbps, 40km, Duplex LC CWDM SFP+ Transceiver, -40°C ~ +85°C, With DDM.

Wavelength	xx	Clasp Color Code	Wavelength	xx	Clasp Color Code
1471nm	47	Gray	1551nm	55	Yellow
1491nm	49	Violet	1571nm	57	Orange
1511nm	51	Blue	1591nm	59	Red
1531nm	53	Green	1611nm	61	Brown

## 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.

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