


## TSDP-XX192L-L8 Optical Transceiver

SFP+ Single-Mode for DWDM Application, With Diagnostic Monitoring  
Duplex SFP+ 80km Transceiver

### Features

- Compliant with SFF-8431 MSA
- Compliant with SFF-8432 MSA
- Hot-Pluggable SFP+ Footprint
- Available in all C-Band Wavelengths on the 100GHz DWDM ITU Grid
- Temperature-Stabilized DWDM EML Transmitter
- Power Dissipation < 1.6W
- Duplex LC Connector
- Dispersion tolerance from -500ps/nm to 1600ps/nm
- Case operation temperature range :  
Standard: temperature 0°C to 70°C  
Industrial temperature: -40°C to 85°C
- RoHS6 compliant (lead free) 



### Applications

- 10GBASE-ER/EW
- 10G FC

### Product Description

The TSDP-XX192L-L8 series single mode transceiver is small form factor pluggable module for duplex optical data communications. This module is designed for single mode fiber and operates at a nominal DWDM wavelength from 1528nm to 1566nm as specified by the ITU-T.

It is designed to deploy in the DWDM networking equipment in metropolitan access and core networks. It is with the SFP+ 20-pin connector to allow hot plug capability. The transmitter section uses a DWDM EML laser and is a class 1 laser compliant according to International Safety Standard IEC-60825.

The receiver section uses APD detector and a limiting post-amplifier IC. The TSDP-XX192L-L8 series are designed to be compliant with SFP+ Multi-Source Agreement (MSA) Specification SFF-8431.

## Absolute Maximum Rating

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	VCC	-0.5	+3.6	V
Storage Temperature	Tc	-40	+85	°C
Relative Humidity	RH	0	85	%

## Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	VCC	3.15	3.3	3.45	V
Supply current	Icc	-	-	464	mA
Operating Case Temperature (Standard)	Tca	0	-	70	°C
Operating Case Temperature (Industrial)	Tca	-40	-	85	°C

### Notes:

- [1] Supply current is shared between VCCTX and VCCR. X.  
 [2] In-rush is defined as current level above steady state current requirements.

## Electrical characteristics

Parameter	Symbol	Min.	Typical	Max	Unit
<b>Transmitter</b>					
Data Rate	Mra	1.0	10.3	11.3	Gbps
Input differential impedance	Rin	-	100	-	Ω
Differential Input Voltage swing	Vin	150	-	1200	mV
Transmit Disable Voltage	VD	2.0	-	VCC+0.3	V
Transmit Enable Voltage	Ven	Vee	-	Vee+0.8	V
Transmit Disable Assert Time	Vn	-	-	100	us
<b>Receiver</b>					
Data Rate	Mra	-	10.3	11.3	Gbps
Output differential impedance	Rout	-	100	-	Ω
Differential Output Swing	Vout	300	-	700	mV
Loss of Signal –Asserted	-	2.0	-	VCC+0.3	V
Loss of Signal –Negated	-	Vee	-	Vee+0.8	V

### Notes:

- [1] AC coupled.  
 [2] Or open circuit.  
 [3] Into 100 ohm differential termination.  
 [4] LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

## Transmitter Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Average Optical Power <sup>1</sup>	Po	-1	-	+3	dBm
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Center Wavelength Spacing	-	-	0.8	-	nm
Extinction Ratio	ER	3.0	-	-	dB
Transmitter and Dispersion Penalty @800ps/nm	TDP	-	-	3.0	dB
Average Launch Power of OFF Transmitter	Poff	-	-	-30	dBm

## Receiver Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Receiver sensitivity in 10.5Gbps (OMA) <sup>2</sup>	Rsen	-	-	-23	dBm
Receiver Overload	Pmax	-6	-	-	dBm
LOS Asserted	Lsa	-37	-	-	dBm
LOS De-Asserted	Lda	-	-	-28	dBm
LOS Hysteresis	Lh	0.5	-	-	dB

### Notes:

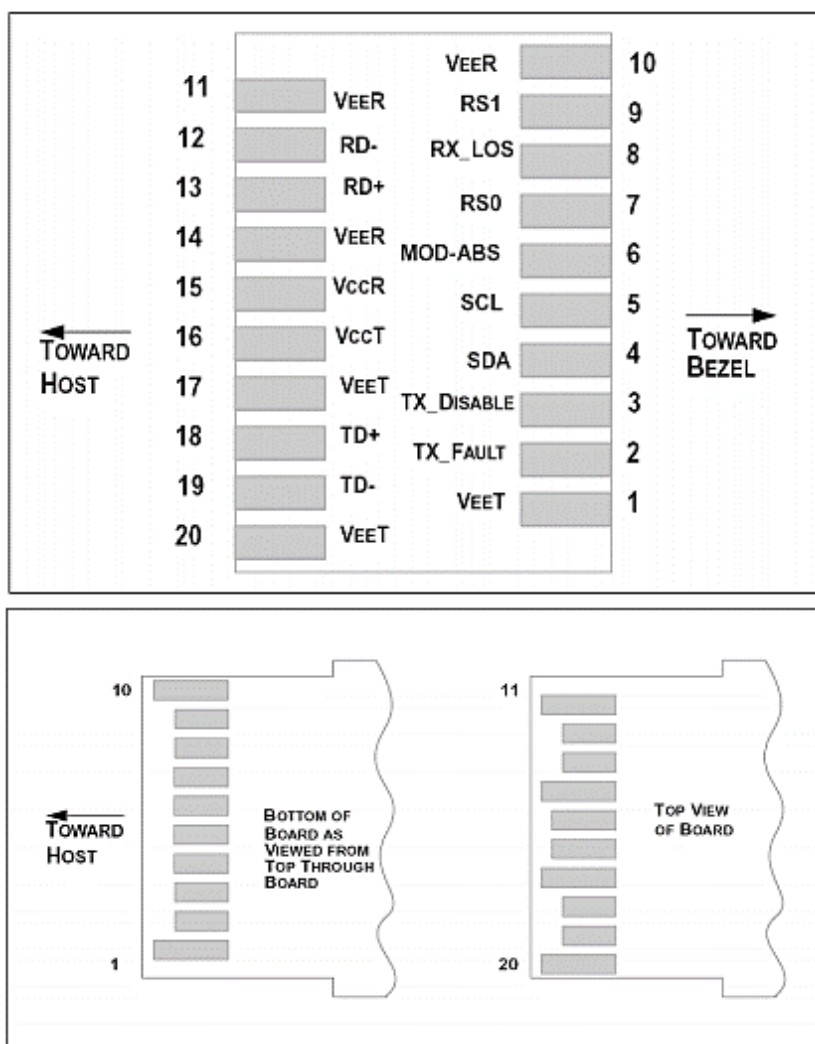
[1] Output is coupled into a 9/125μm single-mode fiber.

[2] BER less than 1E-12. The measure pattern is PRBS 2<sup>31</sup>-1.

## Low Speed Characteristics

Parameter	Symbol	Min	Typical	Max	Unit
TX_Fault, RX_LOS	VOL	0	-	0.4	V
	VOH	Host_VCC-	-	Host_VCC+0	V
TX_DIS	VIL	-0.3	-	0.8	V
	VIH	2.0	-	VCCT+0.3	V
RS0, RS1	VIL	-0.3	-	0.8	V
	VIH	2.0	-	VCCT+0.3	V

### SFP+ Transceiver Electrical Pad Layout



### Pin Definition

Pin	Symbol	Name/Description
1	VEET [1]	Transmitter Ground
2	Tx_FAULT [2]	Transmitter Fault
3	Tx_DIS [3]	Transmitter Disable. Laser output disabled on high or open
4	SDA [2]	2-wire Serial Interface Data Line
5	SCL [2]	2-wire Serial Interface Clock Line
6	MOD_ABS [4]	Module Absent. Grounded within the module
7	RS0 [5]	Rate Select 0
8	RX_LOS [2]	Loss of Signal indication. Logic 0 indicates normal operation
9	RS1 [5]	Rate Select 1
10	VEER [1]	Receiver Ground
11	VEER [1]	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled

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13	RD+	Receiver DATA out. AC Coupled
14	VEER [1]	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET [1]	Transmitter Ground
18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET [1]	Transmitter Ground

**Notes:**

[1] Module circuit ground is isolated from module chassis ground within the module.

[2] Should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.

[3] Tx\_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VCCT inside the module.

[4] Mod\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to VCC\_Host with a resistor in the range 4.7 kΩ to 10 kΩ. Mod\_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.

[5] RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module.

**Ordering Information**

Part Number	Product Description
TSDP-XX192L-L8C	10Gbps SFP+ DWDM 80Km 0°C ~ +70°C
TSDP-XX192L-L8T	10Gbps SFP+ DWDM 80Km -40°C ~ +85°C

**CWDM Wavelength**

XX	Frequency (THz)	Wavelength(nm)
61	196.1	1528.773
60	196.0	1529.553
59	195.9	1530.334
58	195.8	1531.116
57	195.7	1531.898
56	195.6	1532.681
55	195.5	1533.465
54	195.4	1534.25
53	195.3	1535.036
52	195.2	1535.822
51	195.1	1536.609
50	195.0	1537.397
49	194.9	1538.186
48	194.8	1538.976
47	194.7	1539.766

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46	194.6	1540.557
45	194.5	1541.349
44	194.4	1542.142
43	194.3	1542.936
42	194.2	1543.73
41	194.1	1544.526
40	194.0	1545.322
39	193.9	1546.119
38	193.8	1546.917
37	193.7	1547.715
36	193.6	1548.515
35	193.5	1549.315
34	193.4	1550.116
33	193.3	1550.918
32	193.2	1551.721
31	193.1	1552.524
30	193.0	1553.329
29	192.9	1554.134
28	192.8	1554.94
27	192.7	1555.747
26	192.6	1556.555
25	192.5	1557.363
24	192.4	1558.173
23	192.3	1558.983
22	192.2	1559.794
21	192.1	1560.606
20	192.0	1561.419
19	191.9	1562.233
18	191.8	1563.047
17	191.7	1563.863
16	191.6	1564.679
15	191.5	1565.496

## 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. IEEE802.3ae – 2002
4. “Diagnostic Monitoring Interface for Optical Transceivers” SFF-8472, Rev 10.3, Dec 1,2007

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