

QSFP28-2Dxxxx-80C

100Gbps QSFP28 DWDM Transceiver, 80km Reach

Product Features

- Hot pluggable QSFP28 MSA form factor
- Up to 80km reach for G.652 SMF with transport white box
- Single +3.3V power supply
- Temperature Range 0 to 70°C
- Transmitter: Cooled EML 2*27.5Gbaud/s DWDM TOSA
- Receiver: 2*27.5Gbaud/s Pin-PD ROSA
- 4*25G CAUI4 electrical interface
- Integrated SFEC with high coding gain
- PAM4 modulation format on 100GHz ITU DWDM wavelength grid compatible
- Dual CS adaptor
- Compatible with RoHS6

Applications

- High bandwidth connectivity for Data Center Interconnection
- 100G Ethernet Metro-Access over DWDM
- P to P Access Network

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Typical	Max	Units
Storage Temperature	T _s	-40		+85	°C
Relative Humidity	RH	5		85	%
Power Supply Voltage	V _{cc}	-0.5		+3.6	V
Operating Case Temperature	T _o	0		+70	°C
Receiver Damage Threshold, Per Lane	P _{dag}	5.2			dBm

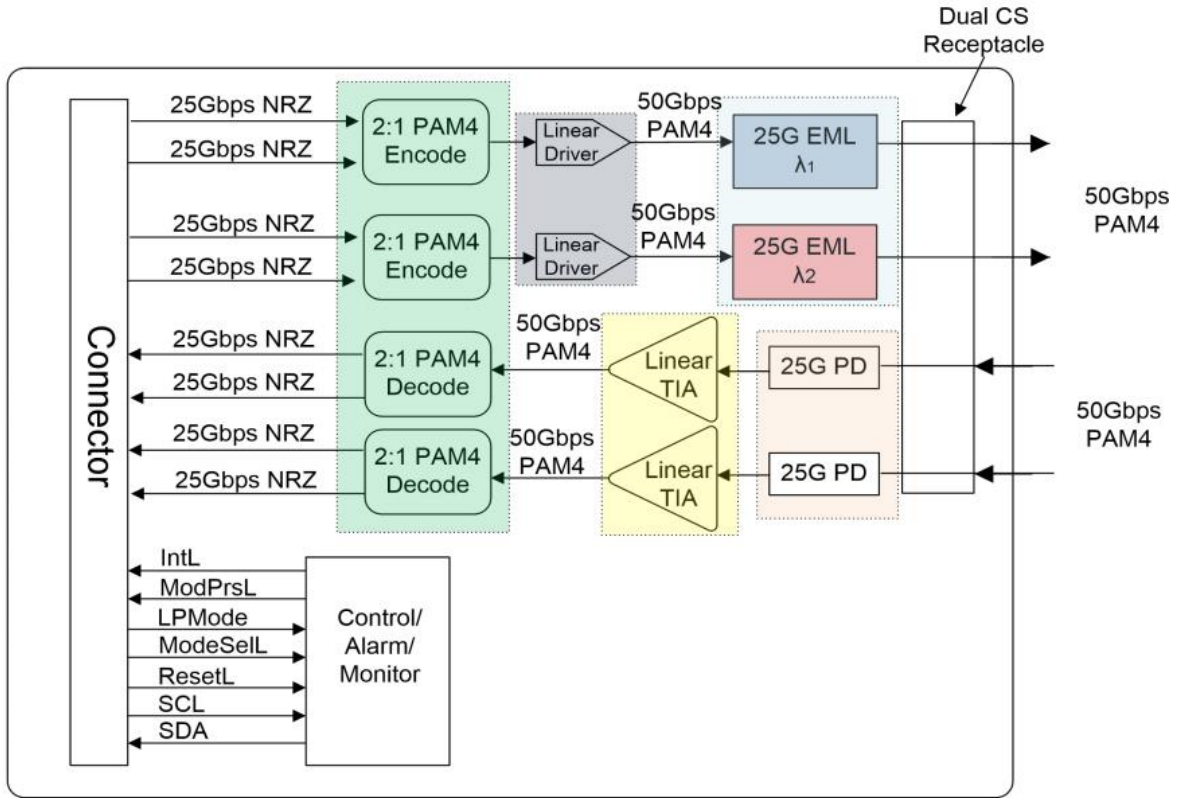
Recommended Operating Conditions

Parameter	Min	Typical	Max	Units	Notes
Operating Case Temperature	0		70	degC	
Power Supply Voltage	3.135	3.3	3.465	V	
Control Input Voltage High	2		V _{cc} +0.3	V	
Control Input Voltage Low	-0.3		0.8	V	
Rx Diff Data Output Load		100		Ω	
Power Dissipation		5		W	1

Notes:

1. T_c=70°C, V_{cc} = 3.465V, End of Life

Transceiver Block Diagram



Optical Characteristics

Parameter	Min	Typical	Max	Units	Notes
Transmitter (TP2)					
Optical Output Power	-1		+4	dBm	
Transmitter Rate		55.04318		Gbps	1
Lane Center Wavelength Spacing		100		GHz	
Center Wavelength	See Wavelength Table			nm	
Extinction Ratio		6		dB	
Side-mode Suppression Ratio	30			dB	
RIN OMA			-132	dB/Hz	
Optical Return Loss Tolerance			20	dB	

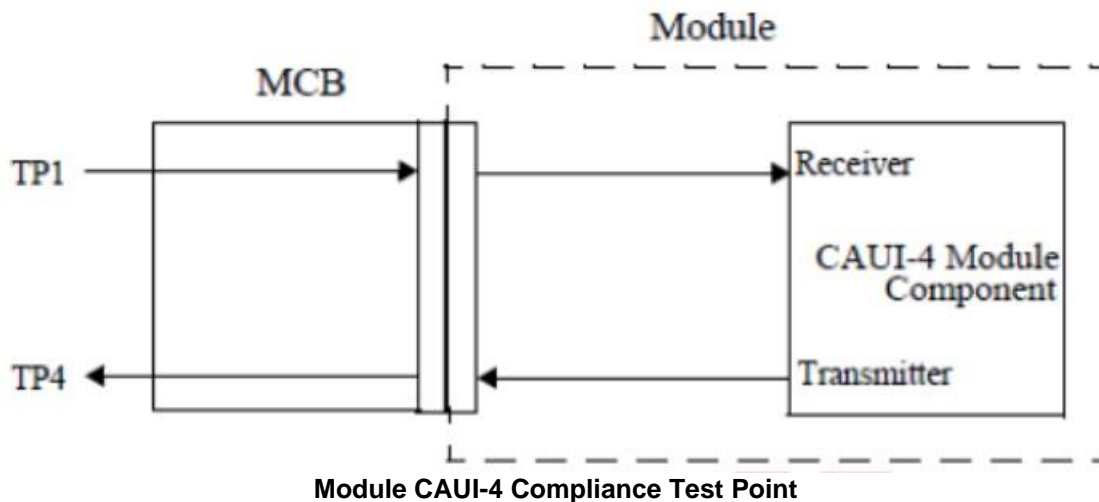
Transmitter Reflectance			-12	dB	
Dispersion Tolerance	-150		50	ps/nm	2
Receiver (TP3)					
Receiver Rate		55.04318		Gbps	1
Center Wavelength	See Wavelength Table			nm	
Receiver Reflectance			-26	dB	
Receiver Power, each lane	-12.5		6	dBm	3
Required OSNR	31			dB	
LOS Assert	-26			dBm	
LOS De-assert			-11	dBm	
LOS Hysteresis	1			dB	
RSSI Accuracy	-3		3	dB	

Note:

1. 55.04318 * 2 λ
2. Residual dispersion (RD) after DCM, and at worst OSNR
3. Pre-FEC BER 4E-3

Electrical Characteristics

For electrical characteristics, refer to CAUI-4 chip-to-module draft specifications (IEEE P802.3bm Annex 83E). The CAUI-4 host output shall meet the specifications defined below while measured at TP1 for transmitter, TP4 for receiver.

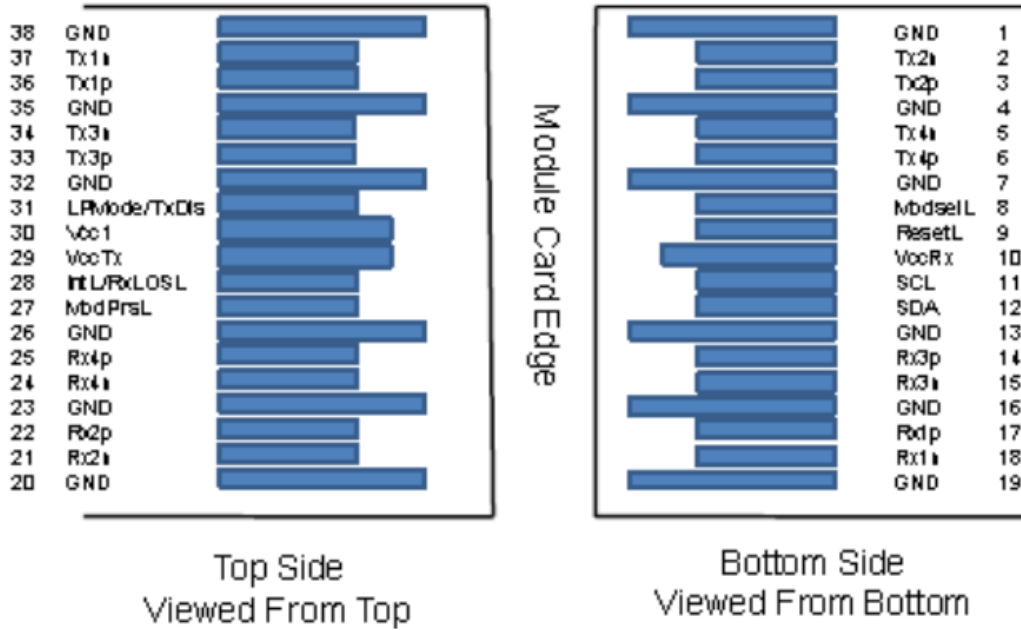


Parameter	Min	Typical	Max	Units	Comment
Transmitter (TP1)					
Signaling Rate, each Lane	Typ -100 ppm	25.7813	Typ +100 ppm	GB/s	
DC Common Mode Output Voltage	-350		2850	mV	
Differential Return Loss				dB	See template1
Common to Differential Mode Conversion Return Loss				dB	See template2
Differential Termination Mismatch			10	%	At 1 MHz
Receiver (TP4)					
Signaling Rate, each lane	Typ -100 ppm	25.7813	Typ +100 ppm	GB/s	
Common-Mode AC Output Voltage			17.5	mV	
Differential pk-pk output voltage swing			900	mVpp	
Eye Width	0.57			UI	EW15 at 10-15 probability; PRBS 29-1
Eye Height Differential	228			mV	EH15 at 10-15 probability; PRBS 29-1
Vertical Eye Closure			5.5	dB	
Differential Output Return Loss				dB	See template1
Common to Differential Mode Conversion Return Loss				dB	See template2
Differential Termination Mismatch			10	%	
Transition Time (20% to 80%)	12			ps	
DC Common Mode Voltage3	-350		2850	mV	

Notes:

1. Reference IEEE P802.3bm Annex 83E, Figure 83E-7 for template.
2. Reference IEEE P802.3bm Annex 83E, Figure 83E-8 for template.

Pin Assignment



MSA Compliant Connector

Pin Definition

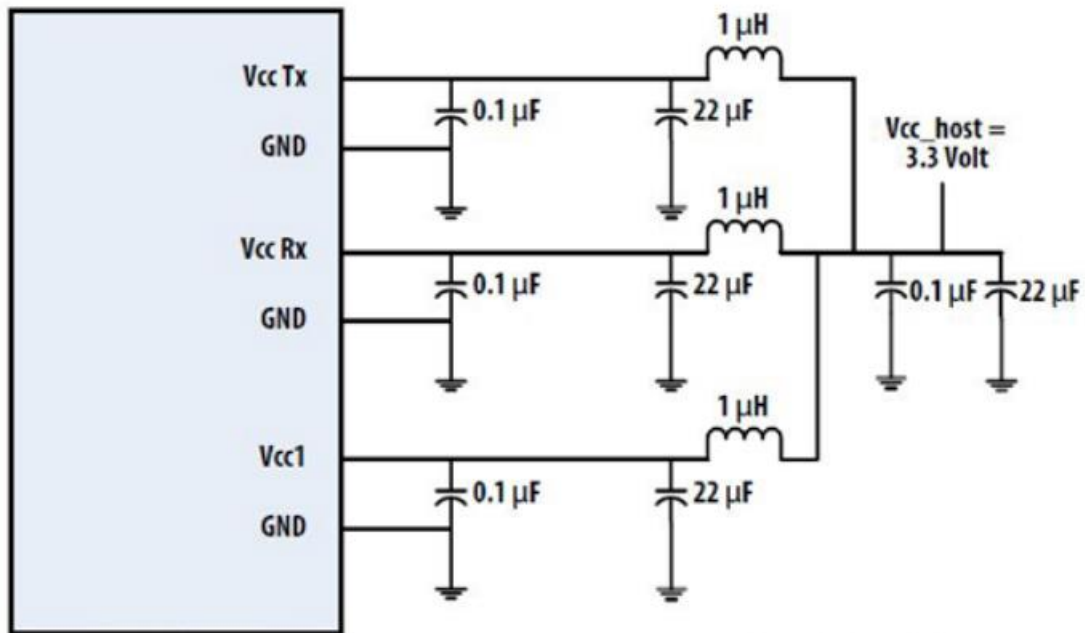
Pin #	Definition	Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	+3.3V Power Supply Receiver	2
11	SCL	2-wire serial interface clock	

12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	VccTx	+3.3V Power supply transmitter	2
30	Vcc1	+3.3V Power supply	2
31	LPMODE	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and VccTx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 2000mA.

Recommended Power Supply Filter



Memory Map

SFF-8636 defines a common management interface for 4-lane pluggable transceiver modules, direct attach modules and shielded cable assemblies. It sets the EEPROM memory space as follows:

2-Wire Serial Address 1010000x	
Lower Page 00h	
0 Identifier	
1- 2 Status	
3- 21 Interrupt Flags	
22- 33 Module Monitors	
34- 81 Channel Monitors	
82- 85 Reserved	
86- 98 Control	
99 Reserved	
100-106 Free Side Device and Channel Mask	
107 Reserved	
108-112 Free Side Device Properties	
113-118 Reserved	
119-122 Password Change Entry Area (Optional)	
123-126 Password Entry Area (Optional)	
127 Page Select Byte	

Upper Page 00h	Optional Page 01h	Optional Page 02h	Optional Page 03h (Cable Assemblies)
128 Identifier	128 CC_APPS	128-255 User EEPROM Data	128-175 Free Side Device Thresholds
129-191 Base ID Fields	129 AST Table Length (TL)		
	130 Application Code Entry 0		
	132-133 Application Code Entry 0		
	134-253 other entries		
192-223 Extended ID		176-223 Channel Threshold	
224-255 Vendor Specific ID		224-225 Reserved	
		226-227 Vendor Specific	
		238-241 Channel Controls	
		242-253 Channel Monitor Masks	
	254-255 Application Code Entry TL	254-255 Reserved	

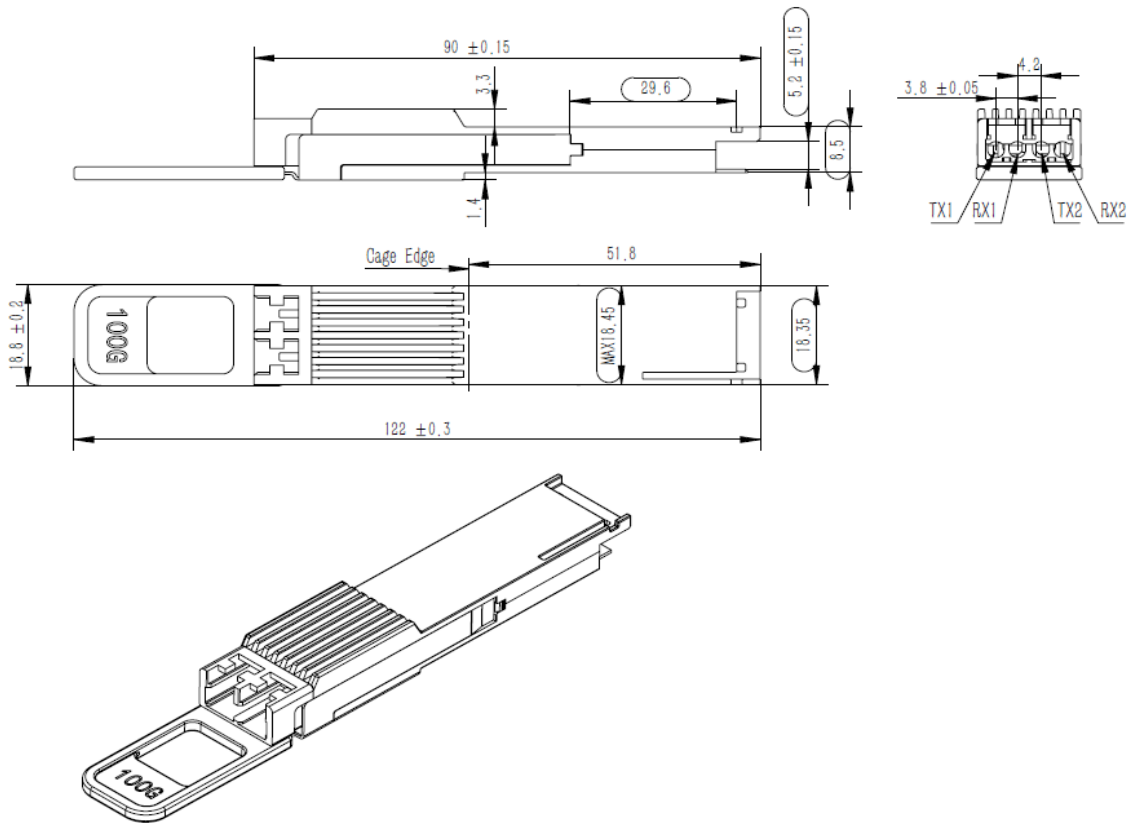
Digital Diagnostic Functions

Parameter	Requirements	Units	Note
Temperature	+/-3	°C	
Voltage	+/-5%	V	
Ibias	+/-10%	mA	
Rx Power	+/-3.0	dB	
Tx Power	+/-3.0	dB	

DDM Alarm & warning threshold is listed below

Parameters	Units	Requirements	Description
Temp low warning	°C	0	Min. case temperature
Temp high warning	°C	70	Max. case temperature
Voltage low warning	V	3.135	-5% Vcc target
Voltage high warning	V	3.465	+5% Vcc target
Tx power low warning	dBm	-1	Min. optical power in DS.
Tx power high warning	dBm	7	Max. optical power in DS.
Rx power low warning	dBm	-8.4	Sensitivity
Rx power high warning	dBm	4.2	Overload
Temp low alarm	°C	-10	Warning-10 °C
Temp high alarm	°C	+80	Warning+10 °C
Voltage low alarm	V	2.97	-10% Vcc target
Voltage high alarm	V	3.63	+10% Vcc target
Tx power low alarm	dBm	-4	Warning -3dB
Tx power high alarm	dBm	10	Warning +3dB
Rx power low alarm	dBm	-11.4	Warning -3dB
Rx power high alarm	dBm	7.2	Warning +3dB

Mechanical Dimensions



Ordering Information

Part Number	Product Description
QSFP28-2Dxxxx-80C	100G QSFP28 DWDM, DWDM Wavelengths, Dual CS Connector, 80km reach, with DDM

Wavelength Table

TX1			TX2		
Ch. No.	Frequency (THz)	Center Wavelength(nm)	Ch. No.	Frequency (THz)	Center Wavelength(nm)
C13	191.30	1567.13	C14	191.40	1566.31
C13+	191.35	1566.72	C14+	191.45	1565.90
C15	191.50	1565.50	C16	191.60	1564.68
C15+	191.55	1565.09	C16+	191.65	1564.27
C17	191.70	1563.86	C18	191.80	1563.05
C17+	191.75	1563.45	C18+	191.85	1562.64
C19	191.90	1562.23	C20	192.00	1561.42
C19+	191.95	1561.83	C20+	192.05	1561.01
C21	192.10	1560.61	C22	192.20	1559.79
C21+	192.15	1560.20	C22+	192.25	1559.39
C23	192.30	1558.98	C24	192.40	1558.17
C23+	192.35	1558.58	C24+	192.45	1557.77
C25	192.50	1557.36	C26	192.60	1556.55
C25+	192.55	1556.96	C26+	192.65	1556.15
C27	192.70	1555.75	C28	192.80	1554.94
C27+	192.75	1555.34	C28+	192.85	1554.54
C29	192.90	1554.13	C30	193.00	1553.33
C29+	192.95	1553.73	C30+	193.05	1552.93
C31	193.10	1552.52	C32	193.20	1551.72
C31+	193.15	1552.12	C32+	193.25	1551.32
C33	193.30	1550.92	C34	193.40	1550.12
C33+	193.35	1550.52	C34+	193.45	1549.72
C35	193.50	1549.32	C36	193.60	1548.51
C35+	193.55	1548.91	C36+	193.65	1548.11
C37	193.70	1547.72	C38	193.80	1546.92
C37+	193.75	1547.32	C38+	193.85	1546.52
C39	193.90	1546.12	C40	194.00	1545.32
C39+	193.95	1545.72	C40+	194.05	1544.92
C41	194.10	1544.53	C42	194.20	1543.73
C41+	194.15	1544.13	C42+	194.25	1543.33
C43	194.30	1542.94	C44	194.40	1542.14
C43+	194.35	1542.54	C44+	194.45	1541.75

C45	194.50	1541.35	C46	194.60	1540.56
C45+	194.55	1540.95	C46+	194.65	1540.16
C47	194.70	1539.77	C48	194.80	1538.98
C47+	194.75	1539.37	C48+	194.85	1538.58
C49	194.90	1538.19	C50	195.00	1537.40
C49+	194.95	1537.79	C50+	195.05	1537.00
C51	195.10	1536.61	C52	195.20	1535.82
C51+	195.15	1536.22	C52+	195.25	1535.43
C53	195.30	1535.04	C54	195.40	1534.25
C53+	195.35	1534.64	C54+	195.45	1533.86
C55	195.50	1533.47	C56	195.60	1532.68
C55+	195.55	1533.07	C56+	195.65	1532.29
C57	195.70	1531.90	C58	195.80	1531.12
C57+	195.75	1531.51	C58+	195.85	1530.72
C59	195.90	1530.33	C60	196.00	1529.55
C59+	195.95	1529.94	C60+	196.05	1529.16

Notes:

The two channels of the transceiver meet above wavelength table. And other channel wavelength configurations are acceptable for customize design. All the specification is designed by single wavelength.

ESD

This transceiver is specified as ESD threshold 1kV for high speed data pins and 2kV for all other 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