

## 10G DWDM SFP+ Transceiver Duplex L C80Km

### Features

- ✓ Optical interface compliant to IEEE 802.3ae
- ✓ Electrical interface compliant to SFF-8431
- ✓ Hot Pluggable
- ✓ Maximum link length of 80Km on SMF
- ✓ Cooled EML transmitter and PIN receiver
- ✓ Suitable for use in 100GHz channel spacing DWDM systems
- ✓ All-metal housing for superior EMI performance
- ✓ Advanced firmware allow customer system encryption
- ✓ information to be stored in transceiver
- ✓ Cost effective SFP+ solution, enables higher port densities and greater bandwidth
- ✓ RoHS6 compliant (lead free)
- ✓ Operating case temperature:  
Commercial : -5 to +70°C

### Applications

- ✓ 10GBASE-ZR/ZW 10G Ethernet
- ✓ Other optical links

### Description

HD-SFP+/10G-DWDM-YY-80 10Gb/s SFP+ transceivers are designed for use in 10-Gigabit Ethernet links up to 80km over Single Mode fiber, and 10GBASE-ZR/ZW, and This module is designed for single mode fiber and operates at a nominal wavelength of 100GHz ITU Grid, C Band DWDM wavelength.

### 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
Operating Case Temperature	T <sub>c</sub>	-5		+70	°C
Relative Humidity	RH	0		85	%
RX Input Average Power	P <sub>max</sub>	-		0	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	T <sub>C</sub>	-5		+70	°C
Data Rate			10.3125		Gbps

## Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
<b>Transmitter Section:</b>						
Input differential impedance	R <sub>in</sub>	90	100	110		
Single ended data input swing	V <sub>in PP</sub>	180		700	mVp-p	
Transmit Disable Voltage	V <sub>D</sub>	V <sub>CC</sub> – 1.3		V <sub>CC</sub>	V	
Transmit Enable Voltage	V <sub>EN</sub>	V <sub>EE</sub>		V <sub>EE</sub> + 0.8	V	
<b>Receiver Section:</b>						
Single ended data output swing	V <sub>out,pp</sub>	300		850	mv	2,6
Data output rise time	t <sub>r</sub>				ps	3
Data output fall time	t <sub>f</sub>				ps	3
LOS Fault	V <sub>losfault</sub>	V <sub>CC</sub> – 0.5		V <sub>CC_host</sub>	V	4
LOS Normal	V <sub>los norm</sub>	V <sub>EE</sub>		V <sub>EE</sub> +0.5	V	4

### Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into 100Ω differential termination.
3. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative. SFF-8431 Rev 4.1.
4. LOS is an open collector output. Should be pulled up with 4.7kΩ – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.
5. See Section 2.8.3 of SFF-8431 Rev 4.1

## Optical Parameters

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
<b>Transmitter Section:</b>						
Center Wavelength	λ <sub>c</sub>	λ <sub>c</sub> -0.1		λ <sub>c</sub> +0.1	nm	
Center Wavelength Spacing			100		GHZ	
Spectral Width (-20dB)	σ			0.3	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Average Optical Power	P <sub>avg</sub>	0		+5.0	dBm	
Laser Off Power	P <sub>off</sub>	-	-	-30	dBm	
Extinction Ratio	ER	6.0	-	-	dB	
Transmitter Dispersion Penalty	TDP	-	-	3.2	dB	
Relative Intensity Noise	Rin	-	-	-128	dB/Hz	12dB reflection
Optical Return Loss Tolerance		-	-	12	dB	

Receiver Section:						
Center Wavelength	$\lambda_r$	1260		1620	nm	
Receiver Sensitivity in Average Power	Sen	-23		-7.0	dBm	1
Stressed Sensitivity (OMA)		-22.1	-		dBm	2
Stressed Sensitivity (OMA)		-21.3	-		dBm	2
Vertical eye closure penalty		2.2	-	-	dB	3
Los Assert	LosA	-30	-	-	dBm	
Los Dessert	LosD	-	-	-24	dBm	
Los Hysteresis	LosH	0.5	-	-	dB	
Overload	Pin	-	-	0.5	dBm	1
Receiver Reflectance		-	-	-12	dB	
Stressed eye jitter		0.3	-	-	Ulp-p	2
Receive electrical 3dB upper cutoff frequency		-	-	12.3	GHz	
Receiver power (damage)		-	-	-7	dBm	

#### Notes:

1. Average optical power shall be measured using the methods specified in TIA/EIA-455-95.
2. Receiver sensitivity is informative. Stressed receiver sensitivity shall be measured with conformance test signal for BER =  $1 \times 10^{-12}$ .
3. Vertical eye closure penalty and stressed eye jitter are the test conditions for measuring stressed receiver sensitivity. They are not the required characteristic of the receiver.
4. Power budget is defined as the different between the Rx sensitivity and the Tx output power of the interface.
5. Path penalty is intended as the power penalty of the interface between back-to-back and the maximum applied dispersion.

#### Timing Characteristics:

Parameter	Symbol	Min.	Typical	Max.	Unit
TX_Disable Assert Time	t_off			10	us
TX_Disable Negate Time	t_on			1	ms
Time to Initialize Include Reset of TX_FAULT	t_int			300	ms
TX_FAULT from Fault to Assertion	t_fault			100	us
TX_Disable Time to Start Reset	t_reset	10			us
Receiver Loss of Signal Assert Time	T <sub>A,RX_LOS</sub>			100	us
Receiver Loss of Signal Deassert Time	T <sub>d,RX_LOS</sub>			100	us
Rate-Select Change Time	t_ratesel			10	us
Serial ID Clock Time	t_serial-clock			100	kHz

#### Digital Diagnostic Monitor Characteristics

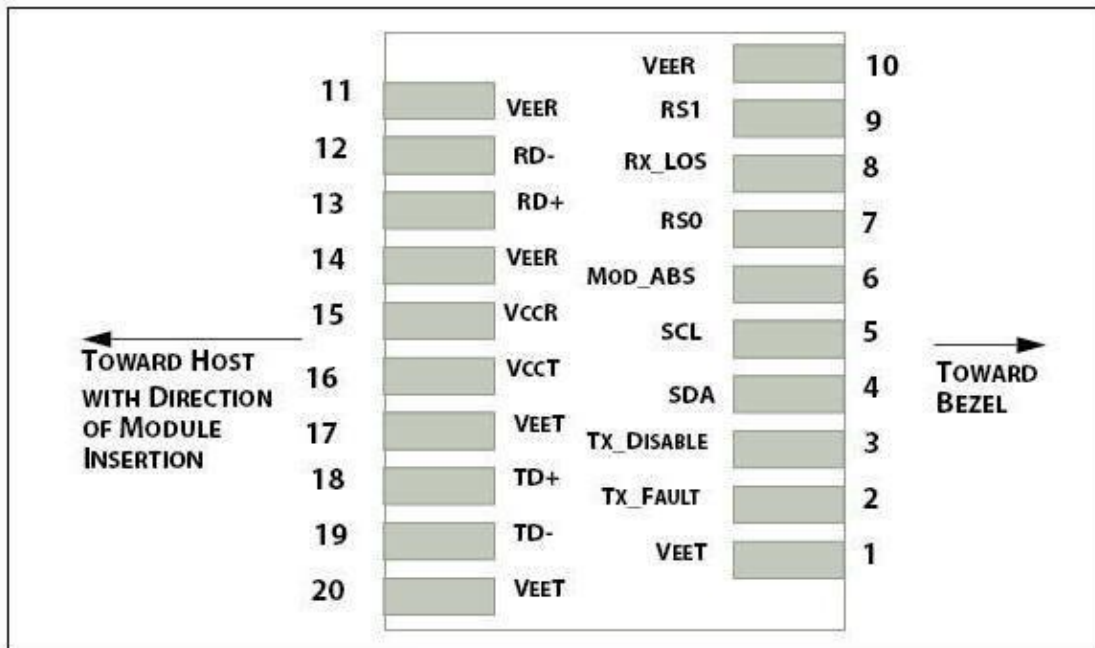
The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales stuff.

Parameter	Symbol	Min.	Max.	Unit
Temperature monitor absolute error	DMI_Temp	-3	3	degC
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	-0.08	0.08	V
Bias current monitor absolute error	DMI_Ibias	-10%	10%	mA

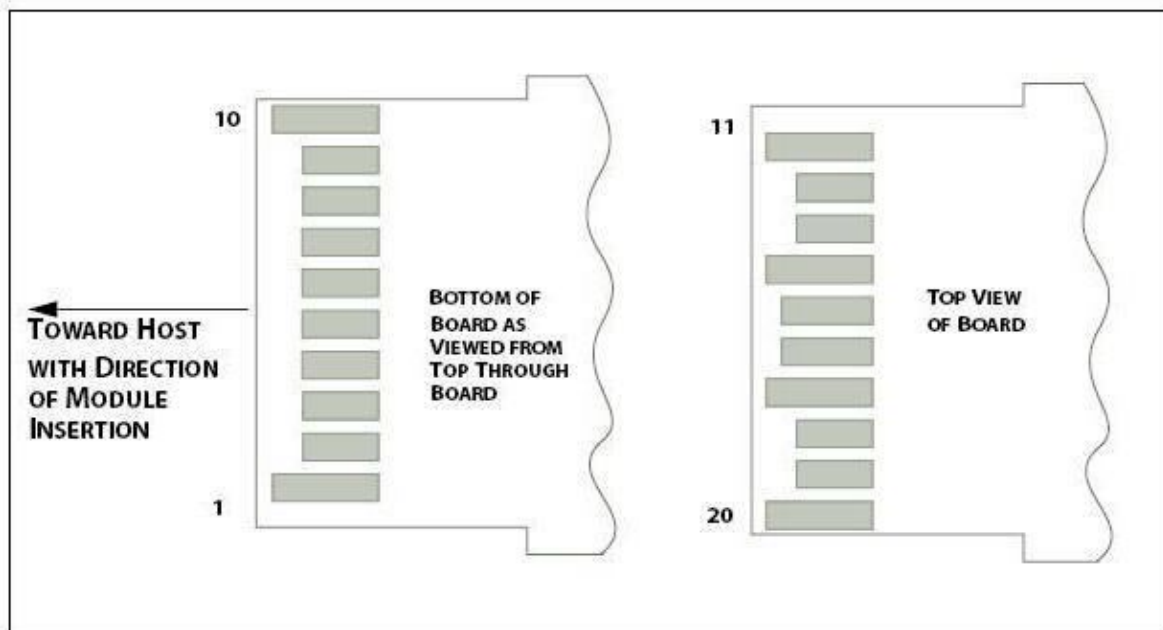
### C-band $\lambda_c$ Wavelength Guide Pin Descriptions

Channel	Wavelength (nm)	Frequency (THZ)	Channel	Wavelength (nm)	Frequency (THZ)
C13	1567.13	191.30	C37	1547.72	193.70
C14	1566.31	191.40	C38	1546.92	193.80
C15	1565.50	191.50	C39	1546.12	193.90
C16	1564.68	191.60	C40	1545.32	194.00
C17	1563.86	191.70	C41	1544.53	194.10
C18	1563.05	191.80	C42	1543.73	194.20
C19	1562.23	191.90	C43	1542.94	194.30
C20	1561.42	192.00	C44	1542.14	194.40
C21	1560.61	192.10	C45	1541.35	194.50
C22	1559.79	192.20	C46	1540.56	194.60
C23	1558.98	192.30	C47	1539.77	194.70
C24	1558.17	192.40	C48	1538.98	194.80
C25	1557.36	192.50	C49	1538.19	194.90
C26	1556.55	192.60	C50	1537.40	195.00
C27	1555.75	192.70	C51	1536.61	195.10
C28	1554.94	192.80	C52	1535.82	195.20
C29	1554.13	192.90	C53	1535.04	195.30
C30	1553.33	193.00	C54	1534.25	195.40
C31	1552.52	193.10	C55	1533.47	195.50
C32	1551.72	193.20	C56	1532.68	195.60
C33	1550.92	193.30	C57	1531.90	195.70
C34	1550.12	193.40	C58	1531.12	195.80
C35	1549.32	193.50	C59	1530.33	195.90
C36	1548.51	193.60	C60	1529.55	196.00
Non-ITU	Peak wavelength between 1528.77nm-1567.13		C61	1528.77	196.10

### Pin Assignment:



Host PCB SFP+ pad assignment top view



SFP+ module contact assignment

## Pin Descriptions

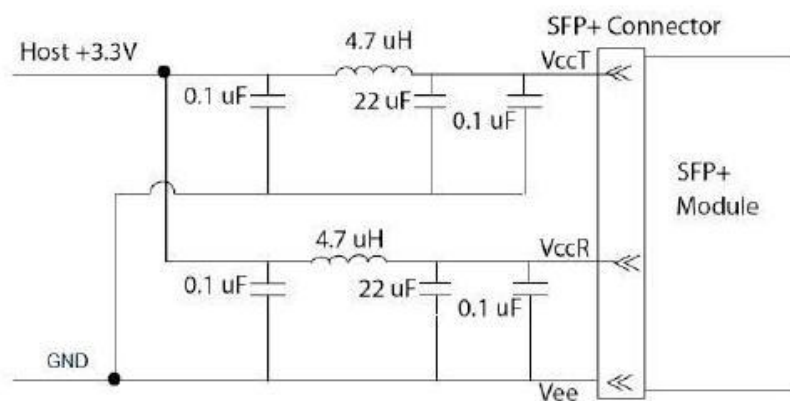
PIN	Logic	Symbol	Name / Description	Note
1		VeeT	Module Transmitter Ground	1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	
3	LVTTL-I	TX_Dis	Transmitter Disable; Turns off transmitter laser output	
4	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
5	LVTTL-I	SCL	2-Wire Serial Interface Clock	2
6		MOD_DEF0	Module Definition, Grounded in the module	
7	LVTTL-I	RS0	Receiver Rate Select	
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication Active LOW	
9	LVTTL-I	RS1	Transmitter Rate Select (not used)	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Data Output (not used)	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Receiver 3.3 V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

**SFP+ Module PIN Definition**

**Notes:**

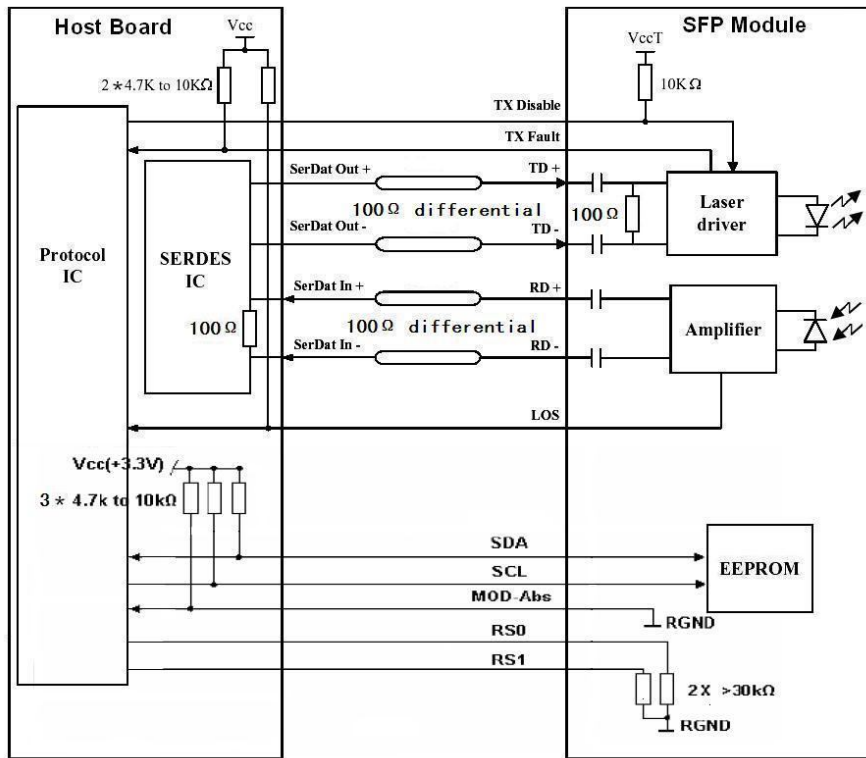
1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

**Recommended Power Interface Circuit**

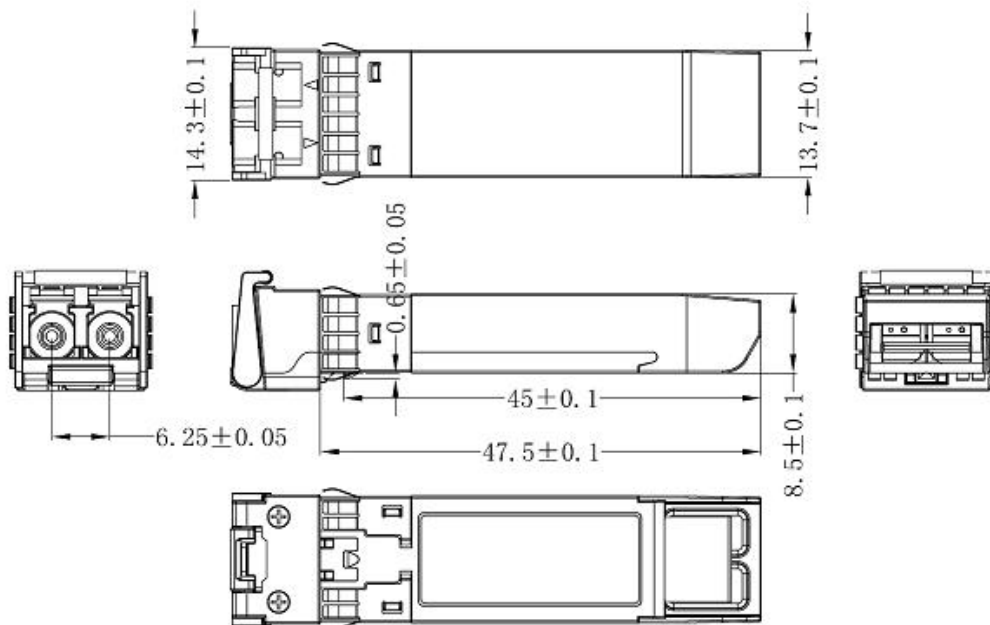


**Host Board Power Supply Filters Circuit**

**Host - Transceiver Interface Block Diagram**



## Mechanical Dimensions



## Ordering information

Part Number	Product Description
HD-SFP+/10G-DWDM-YY-80	XX= ITU Grid 13~61, 10Gbps, DWDM SFP+ 80km, -5°C ~ +70°C,DDM

## References

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

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