

## **SFP-10G-80**

### **10Gb/s 80Km SFP+ ZR Optical Transceiver**

#### **PRODUCT FEATURES**

- 1550nm cooled EML, APD Receiver
- Up to 80km on 9/125um SMF
- SFP+ MSA package with duplex LC connector
- SFI High Speed Electrical Interface
- Very low EMI and excellent ESD protection
- +3.3V single power supply
- Case temperature range: -5°C to 70°C.
- 2-wire interface for management and diagnostic monitor
- 10Gb/s serial optical interface compliant to 802.3ae 10GBASE-ZR/ZW
- Power dissipation < 1.5W



#### **APPLICATIONS**

- 10G Base-ZR/ZW
- 10G Fiber Channel
- 10G Storage system

#### **STANDARD**

- Compliant to SFF-8431 and SFF-8432
- Compliant with SFF-8472
- Compliant with IEEE 802.3ae 10GBASE-ZR and 10GBASE-ZW
- Compliant with IEC 60825-1 Class 1 laser eye safe
- RoHS Compliant

## PRODUCT DESCRIPTION

Transceivers is 1550nm cooled EML laser and APD photo-detector receiver based 10Gigabit SFP+ transceiver, which is designed to transmit and receive optical data over single mode optical fiber for link length up to 80km. Digital diagnostics functions are available via a 2-wire serial interface, as specified in the SFF-8472, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage.

### I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc3	-0.5		4.0	V	
Storage Temperature	Ts	-40		85	°C	
Operating Relative Humidity	RH			85	%	
Case Operating Temperature	Tcase	-5		70	°C	
Receiver Damage Threshold		6			dBm	

### II. Electrical Characteristics (T<sub>case</sub> = -5 to 70 °C, Vcc3 = 3.13 to 3.47 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc3	3.13		3.47	V	
Supply Current	Icc			450	mA	
Module total power	P			1.5	W	1
<b>Transmitter</b>						
Input differential impedance	R <sub>in</sub>		100		Ω	1
Differential data input swing	V <sub>in,pp</sub>	300		1200	mV	
Transmit Disable Voltage	V <sub>D</sub>	2.0		Vcc3	V	
Transmit Enable Voltage	V <sub>EN</sub>	GND		GND+ 0.8	V	
Transmit Disable Assert Time				10	us	
Transmit Disable De-assert Time				2	ms	
<b>Receiver</b>						
Differential data output swing	V <sub>out-pp</sub>	500	650	800	mV	2
Data output rise and fall time	Tr, Tf	30			ps	3
LOS Fault	V <sub>los-fault</sub>	2		Vcc-host	V	4
LOS Normal	V <sub>los-nor</sub>	GND		GND+0.8	V	4

#### Notes:

1. Connected directly to TX data input pins.
2. Input 100Ω differential termination.
3. These are unfiltered 20-80% values
4. LOS is an open collector output. Should be pulled-up with 4.7k Ω-10 k Ω on the host board. Normal operation is logic 0, loss of signal is 1

### III. Optical Characteristics (T<sub>case</sub> = -5 to 70 °C, V<sub>CC3</sub> = 3.13 to 3.45 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
<b>Transmitter</b>						
Average Optical Power	P <sub>AVE</sub>	0		5.0		1
Optical Wavelength	λ	1530	1550	1565	nm	
Side-Mode Suppression ratio	SMSR	30			dB	
Optical Extinction Ratio	ER	6.0			dB	
Transmitter and Dispersion Penalty	TDP			3.0	dB	
Average Launch power of OFF transmitter	P <sub>OFF</sub>			-40	dBm	
Output Eye Mask	Compliant with IEEE 0802.3ae					
Relative Intensity Noise	RIN			-128	dB/Hz	
<b>Receiver</b>						
Receiver Sensitivity	R <sub>SENS</sub>			-23.0	dBm	2
Input Saturation Power (Overload)	Psat	-7			dBm	
Wavelength Range	λ <sub>C</sub>	1260		1600	nm	
Receiver Reflectance	R <sub>rx</sub>			-27	dB	
LOS De-Assert	LOS <sub>D</sub>			-24	dBm	
LOS Assert	LOS <sub>A</sub>	-32			dBm	
LOS Hysteresis		0.5		4.0	dB	

#### Notes:

1. Average power figures are informative only, per IEEE 802.3ae.
2. Measured with conformance test signal for BER = 10<sup>-12</sup>.@10.3125Gbps, PRBS=2<sup>31</sup>-1,NRZ

## IV. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate	BR		10.3125			1
Bit Error Ratio	BER			$10^{-12}$		2
Maximum Supported Distances	Lmax		80		km	3

### Notes:

- 10GBASE-ZR/ZW
- Tested with a  $2^{31} - 1$  PRB
- SMF fiber, 1550nm wavelength

## V. Pin Descriptions

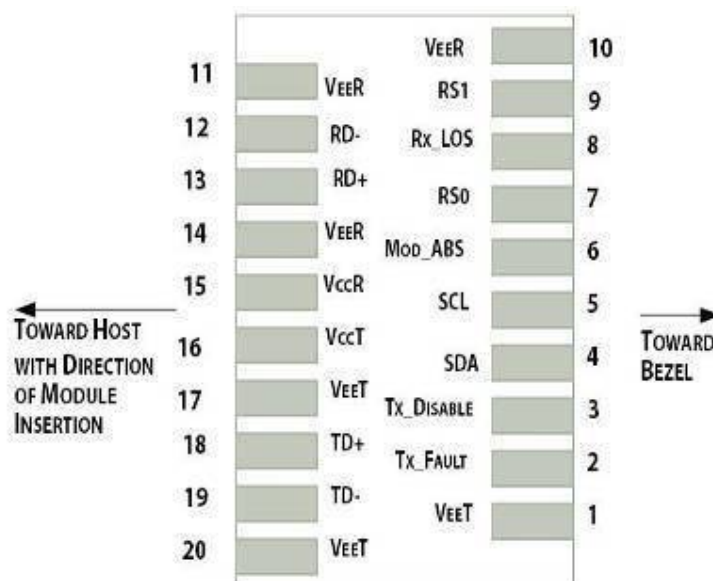


Diagram of Host Board Connector Block Pin Numbers and Name

Pin	Symbol	Name/Description	Ref
1	VEET	Transmitter Ground	1
2	Tx_FAULT	Transmitter fault	2
3	Tx_DISABLE	Transmitter Disable. Laser output disabled on high or open	3
4	SDA	2-wire Serial Interface Data Line	2
5	SCL	2-wire Serial Interface Clock Line	2

6	MOD_ABS	Module Absent. Grounded within the module	4
7	RS0	No connection required	
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation	2
9	RS1	No connection required	
10	V <sub>EE</sub> R	Receiver Ground	1
11	V <sub>EE</sub> R	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver DATA out. AC Coupled	
14	V <sub>EE</sub> R	Receiver Ground	1
15	V <sub>CC</sub> R	Receiver Power Supply	
16	V <sub>CC</sub> T	Transmitter Power Supply	
17	V <sub>EE</sub> T	Transmitter Ground	1
18	TD+	Transmitter DATA in. AC Coupled	
19	TD-	Transmitter Inverted DATA in. AC Coupled	
20	V <sub>EE</sub> T	Transmitter Ground	1

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 3.13V and 3.6V.
3. Tx\_Disable is an input contact with a 4.7 k $\Omega$  to 10 k $\Omega$  pull-up to V<sub>CC</sub>T inside the module
4. Mod\_ABS is connected to V<sub>EE</sub>T or V<sub>EE</sub>R in the SFP+ module. The host may pull this contact up to V<sub>CC</sub>\_Host with a resistor in the range 4.7 k $\Omega$  to 10 k $\Omega$ . Mod\_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.

## **VI. Digital Diagnostic Functions**

As defined by the SFP MSA, SFP+ transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

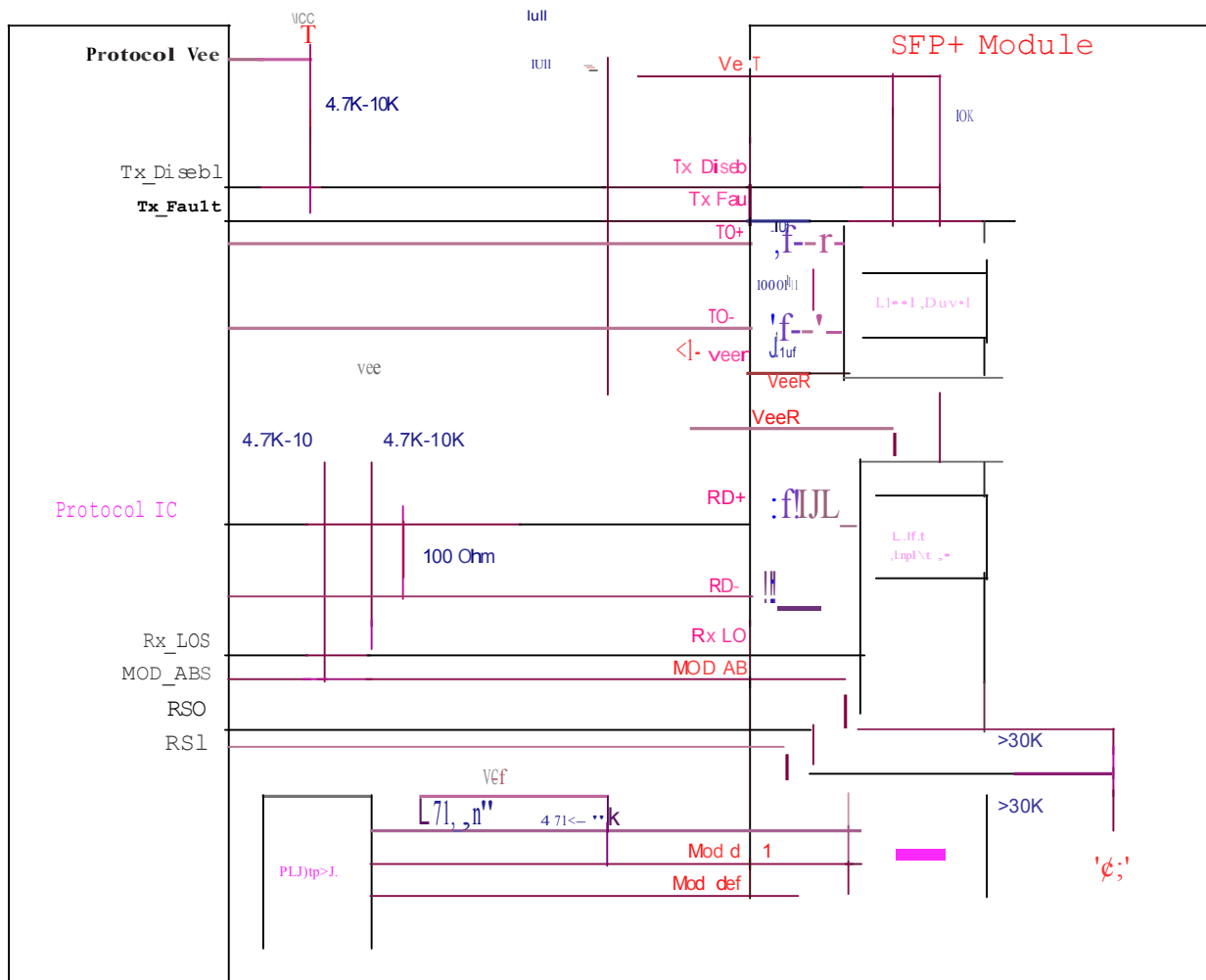
- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The SFP MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

## W. Host- Transceiver Interface Block Diagram



## VIII. Outline Dimensions

Transceivers are compliant with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).

