

# PRODUCT DATASHEET

## 10Gb/s 20Km SFP+ 1310nm Transceivers

### Features

- Compliant to SFP+ MSA
- Fully RoHS Compliant
- All metal housing for superior EMI performance
- Operating data rate up to 10.52Gbps
- High sensitivity Pin photodiode and TIA
- LC duplex connector
- Hot pluggable 20pin connector
- Low power consumption <1W
- 0°C to 70°C operatingwide temperature range
- Single +3.3V±5% power supply
- Digital Monitoring SFF-8472Rev 10.2compliant

### Applications

- 10GBASE-LR/LW
- 10G Fiber Channel
- SFP+ MSA (SFF-8472)
- IEEE802.3ae



The laser based 10Gigabit SFP+ Transceiver is designed to transmit and receive serial optical data over single mode optical fiber with 20Km. They are compliant with SFF-8431,SFF-8432, 10GFC Rev 4.0,. The transmitter converts serial DML electrical data into serial optical data compliant with theIEEE 802.3ae standard. The receiver converts serial optical data into serial DML electrical data.Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

Specifications								
Package	Data rate	Laser	Optical Power	Detector	Sensitivity	Temp	Reach	Other
SFP+	8.5 ~10.52G	1310nm	-5~2dBm	PIN	< -15dBm	0~70°C	20km	DDM

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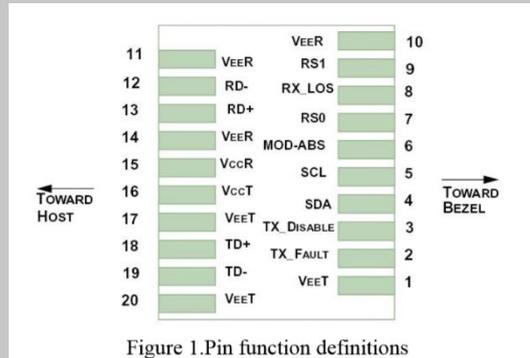


Figure 1. Pin function definitions

Table 1: Transceiver pin descriptions

Pin Number	Symbol	Name	Description
1,17,20	VeeT	Transmitter Signal Ground	These pins should be connected to signal ground on the host board.
2	TX Fault	Transmitter Fault Out (OC)	Logic "1" Output = Laser Fault (Laser off before t_fault) Logic "0" Output = Normal Operation This pin is open collector compatible, and should be pulled up to Host Vcc with a 10kΩ resistor.
3	TX Disable	Transmitter Disable In (LVTTL)	Logic "1" Input (or no connection) = Laser off Logic "0" Input = Laser on This pin is internally pulled up to VccT with a 10 kΩ resistor.
4	SDA	Module Definition Identifiers	Serial ID with SFF 8472 Diagnostics
5	SCL		Module Definition pins should be pulled up to Host Vcc with 10 kΩ resistors.
6	MOD-ABS		
7	RS0	Receiver Rate Select (LVTTL) Transmitter Rate Select (LVTTL)	These pins have an internal 30kΩ pull-down to ground. A signal on either of these pins will not affect module performance.
9	RS1		
8	LOS	Loss of Signal Out (OC)	Sufficient optical signal for potential BER < 1x10 <sup>-12</sup> = Logic "0" Insufficient optical signal for potential BER < 1x10 <sup>-12</sup> = Logic "1" This pin is open collector compatible, and should be pulled up to Host Vcc with a 10kΩ resistor.
10,11,14	VeeR	Receiver Signal Ground	These pins should be connected to signal ground on the host board.
12	RD-	Receiver Negative DATA Out (CML)	Light on = Logic "0" Output Receiver DATA output is internally AC coupled and series terminated with a 50Ω resistor.

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13	RD+	Receiver Positive DATA Out (CML)	Light on = Logic "1" Output Receiver DATA output is internally AC coupled and series terminated with a 50Ω resistor.
15	VccR	Receiver Power Supply	This pin should be connected to a filtered +3.3V power supply on the host board. See Figure 3.Recommended power supply filter
16	VccT	Transmitter Power Supply	This pin should be connected to a filtered +3.3V power supply on the host board. See Figure 3.Recommended power supply filter
18	TD+	Transmitter Positive DATA In (CML)	Logic "1" Input = Light on Transmitter DATA inputs are internally AC coupled and terminated with a differential 100Ω resistor.
19	TD-	Transmitter Negative DATA In (CML)	Logic "0" Input = Light on Transmitter DATA inputs are internally AC coupled and terminated with a differential 100Ω resistor.

### Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Storage Temperature Range	Ts	°C	-40	85
Relative Humidity	RH	%	0	95
Maximum Supply Voltage	Vcc3	V	-0.5	4.0

### General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate	BR	8.5		10.52	Gb/s	1
Bit Error Ratio	BER			10e-12		2
Max. Supported Link Length	LMAX		20		km	1

Notes:

- 10GBASE-LR, 10GBASE-LW, 1200-SM-LL-L 10GFC.
- Tested with a 2<sup>31</sup>-1 PRBS.

### Recommended Operating Conditions

Parameter	Symbol	Unit	Min	Typ	Max
Operating Case Temperature Range	Tc	°C	0		70
Power Supply Voltage	Vcc	V	3.14	3.3	3.46
Bit Rate	BR	Gb/s	8.5		10.52
Bit Error Ratio	BER				10 <sup>-12</sup>
Max Supported Link Length	L	Km			20

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### Electric Ports Definition

Parameter	Symbol	Unit	Min	Typ	Max	Note
Supply Voltage	V <sub>CC</sub>	V	3.14	3.3	3.46	
Module Power	I <sub>CC</sub>	mW			1200	
<b>Transmitter</b>						
Input Differential Impedance	R <sub>IN</sub>	Ω	80	100	120	
Differential Data Input	V <sub>IN</sub>	mVp-p	150		1200	
Transmit Disable Voltage	V <sub>DIS</sub>	V	2		V <sub>CC</sub> H0ST	
Transmit Enable Voltage	V <sub>EN</sub>	V	V <sub>EE</sub>		V <sub>EE</sub> +0.8	
Transmit Fault Assert Voltage	V <sub>FA</sub>	V	2		V <sub>CC</sub> H0ST	
Transmit Fault De-Assert Voltage	V <sub>FDA</sub>	V	V <sub>EE</sub>		V <sub>EE</sub> +0.4	
<b>Receiver</b>						
Differential Data Output	V <sub>OD</sub>	mVp-p	350		700	
Output Rise Time	t <sub>RISE</sub>	pS	25			
Output Fall Time	t <sub>FALL</sub>	pS	25			
LOS Fault	V <sub>LOSFT</sub>	V	2		V <sub>CC</sub> H0ST	
LOS Normal	V <sub>LOSNR</sub>	V	V <sub>EE</sub>		V <sub>EE</sub> +0.4	

### Optical Characteristics (T<sub>c</sub>=0 °C to 70 °C and V<sub>cc</sub>= 3.14 to 3.46)

Parameter	Symbol	Min	Typ	Max	Note	Unit
<b>Optical Transmitter Characteristics</b>						
Nominal Wavelength	λ		1310			nm
Optical Output Power	P <sub>AV</sub>	-5		2		dBm
Extinction Ratio	ER	3.5				dB
Average Launch Power of OFF Transmitter	P <sub>OFF</sub>			-35		dBm
Relative Intensity Noise	RIN			-128		dB/Hz
<b>Optical Receiver Characteristics</b>						
Center Wavelength	λ <sub>C</sub>	1260		1620		nm
Receiver Sensitivity@10.52Gb/s	RSENSE			-15	1	dBm
Receiver Overload		0.5				dBm
Optical Return Loss		27		-		dB
LOS Assert	LOSA	-30				dBm
LOS De-Assert LOS	LOSD			-17		dBm
LOS Hysteresis		0.5				dB

Note1: Measured at 1310nm, ER>4dBm, PRBS 2<sup>31</sup>-1 and BER better than or equal to 10E-12;

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### Typical Application Circuit

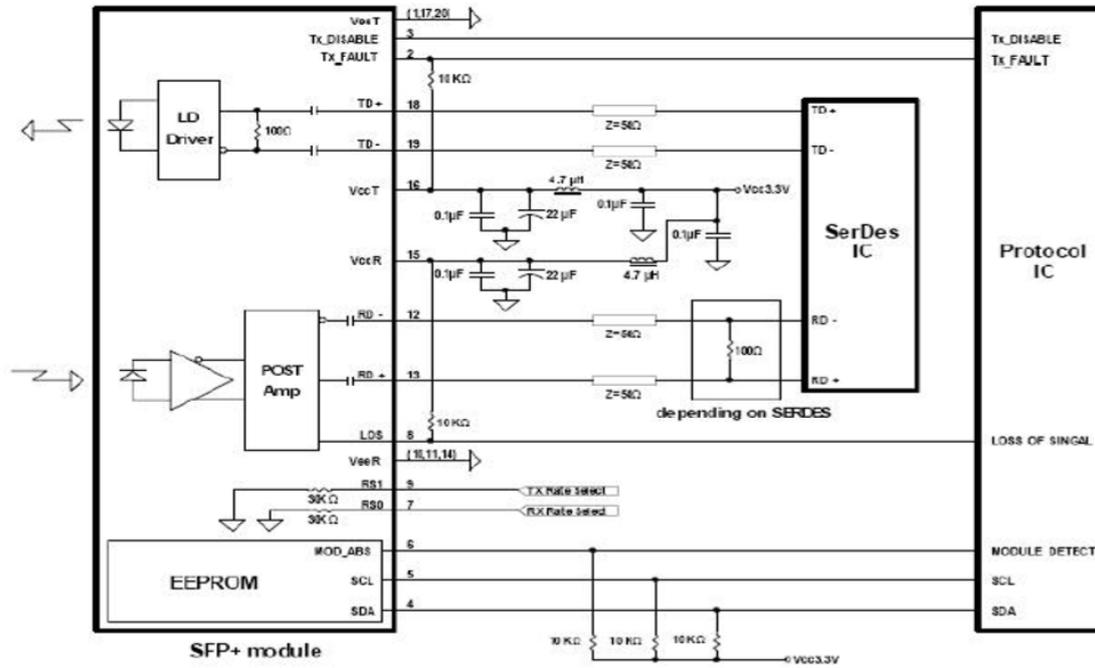


Figure 2. Typical application circuit

### Mechanical Dimensions

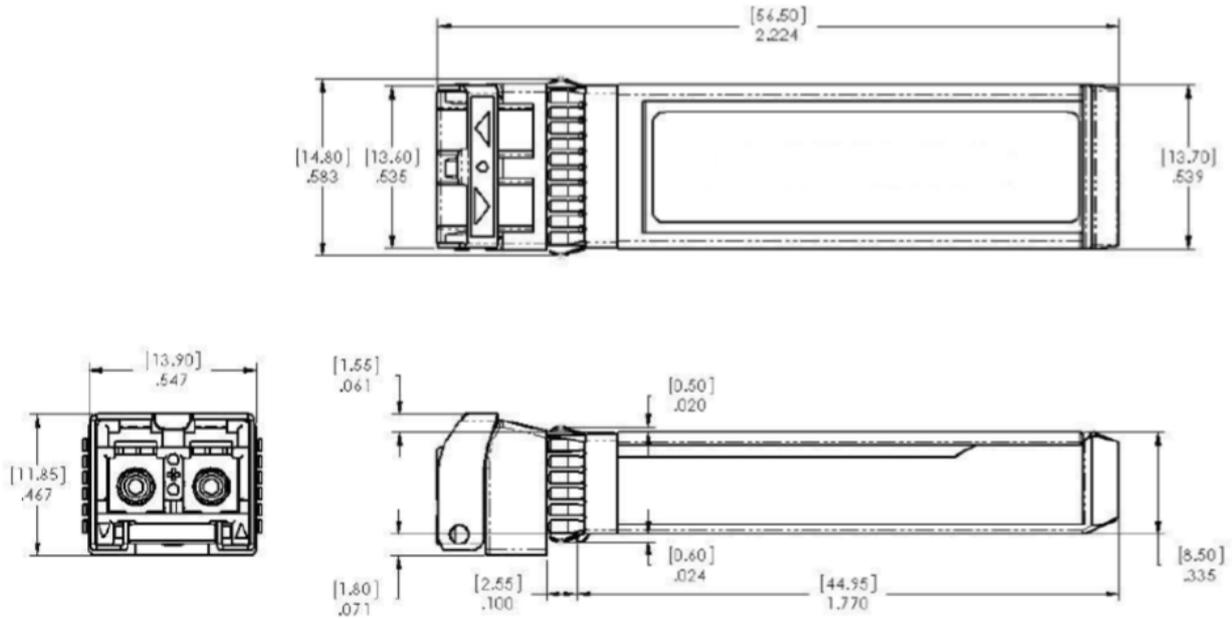


Figure 3. Module Mechanical Dimensions

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## 10Gb/s 20Km SFP+ 1310nm Transceivers

### Digital Diagnostics Functions

As defined by the SFF-8472, Our 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 operating and diagnostics information is monitored and reported by a DigitalDiagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the SFP+ transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory. For more detailed information, including memory map definitions, please see the SFF-8472 documentation<sup>1</sup>.

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