

## DATA SHEET

### MODULETEK: SFP-8G-SR-C10

8.5Gb/s SFP+ Short Wavelength (850nm) Transceiver

#### SFP-8G-SR-C10 Overview

ModuleTek's SFP-8G-SR-C10 SFP+ optical transceivers are designed for use in Fibre Channel links up to 8.5Gb/s data rate over multimode fiber. The product implements digital diagnostics via a 2-wire serial bus. They are compliant with FC-PI-4 Rev.8.00 and SFF-8472 Rev 11.0, and compatible with SFF-8432 and applicable portions of SFF-8431 Rev.4.1.

#### Product Features

- Up to 8.5 Gb/s bi-directional data links
- Hot-pluggable SFP+ footprint
- 850nm VCSEL laser transmitter
- Duplex LC connector
- Built-in digital diagnostic functions
- Up to 300m on OM3 MMF
- Single 3.3V power supply
- RoHS Compliant
- Class 1 laser safety certified
- Operating temperature range:0°C to 70°C

#### Applications

- 8G Fiber Channel

## Ordering Information

Part Number	Description	Color on Clasp
SFP-8G-SR-C10	8G SFP+ 850nm LC Connectors 300m on MMF, with DOM function.	black
<b>For More Information:</b> ModuleTek Limited Web: <a href="http://www.moduletek.com">www.moduletek.com</a> Email: <a href="mailto:sales@moduletek.com">sales@moduletek.com</a>		

## General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Data Rate	DR		8.5		Gb/s	
Bit Error Rate	BER			$10^{-12}$		
Operating Temperature	$T_C$	0		70	°C	1
Storage Temperature	$T_{STO}$	-40		85	°C	2
Supply Current	$I_{CC}$			180	mA	3
Input Voltage	$V_{CC}$	3.14	3.3	3.46	V	
Maximum Voltage	$V_{MAX}$	-0.5		4	V	3

### Notes:

1. Case temperature
2. Ambient temperature
3. For electrical power interface

## Optical-Characteristics-Transmitter

$V_{CC}=3.14V$  to  $3.46V$ ,  $T_C=0^{\circ}C$  to  $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Output Optical Power	$P_{TX}$	-7		-1	dBm	1
Optical Center Wavelength	$\lambda_C$	840		860	nm	
Optical Modulation Amplitude	OMA	302			$\mu W$	
Extinction Ratio	ER	3			dB	
Spectral Width	$\Delta\lambda$			0.65	nm	
Relative Intensity Noise	RIN			-128	dB/Hz	
Transmitter Dispersion Penalty	TDP			3.9	dB	
Launch Power of OFF Transmitter	$P_{OUT\_OFF}$			-30	dBm	

**Notes:**

1. Class 1 Laser Safety per FDA/CDRH, and EN (IEC) 60825 laser safety standards.

## Optical-Characteristics-Receiver

$V_{CC}=3.14V$  to  $3.46V$ ,  $T_C=0^{\circ}C$  to  $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength	$\lambda_C$	840		860	nm	
Receiver Sensitivity	$R_{X\_SEN}$			-10	dBm	1
Receiver Overload	$P_{OL}$	0.5			dBm	
LOS Assert	$LOS_A$	-30			dBm	
LOS De-Assert	$LOS_D$			-18	dBm	
LOS Hysteresis	$LOS_H$	0.5			dB	

**Notes:**

1. Measured with worst ER; BER <  $10^{-12}$ ;  $2^{31}-1$  PRBS

## Electrical – Characteristics – Transmitter

$V_{CC}=3.14V$  to  $3.46V$ ,  $T_C=0^{\circ}C$  to  $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	$R_{IN}$		100		$\Omega$	
Differential data input swing	$V_{IN\_PP}$	180		700	mV	
Transmit disable voltage	$V_D$	2		$V_{CC}$	V	
Transmit enable voltage	$V_{EN}$	$V_{EE}$		$V_{EE}+0.8$	V	

## Electrical – Characteristics – Receiver

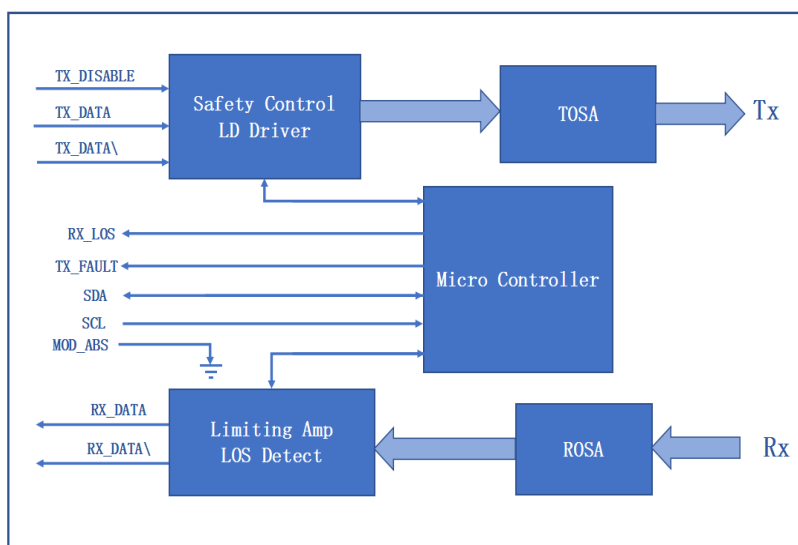
$V_{CC}=3.14V$  to  $3.46V$ ,  $T_C=0^{\circ}C$  to  $70^{\circ}C$

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Differential data output swing	$V_{OUT\_PP}$	300		850	mV	
Data output rise/fall time (20%-80%)	$t_r/t_f$	28			ps	
LOS Assert	$V_{LOS\_A}$	2		$V_{CC\_HOST}$	V	
LOS De-Assert	$V_{LOS\_D}$	$V_{EE}$		$V_{EE}+0.5$	V	

## Digital Diagnostic Functions

SFP-8G-SR-C10 supports the 2-wire serial communication protocol as defined in SFF-8472. Digital diagnostic information is accessible over the 2-wire interface at the address 0xA2. Digital diagnostics for SFP-8G-SR-C10 are internally calibrated by default. The internal micro control unit accesses the device operating parameters in real time, Such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. The module implements the alarm function of the SFF-8472, alerts the user when a particular operating parameter exceeds the factory-set normal range.

## Block-Diagram-of-Transceiver

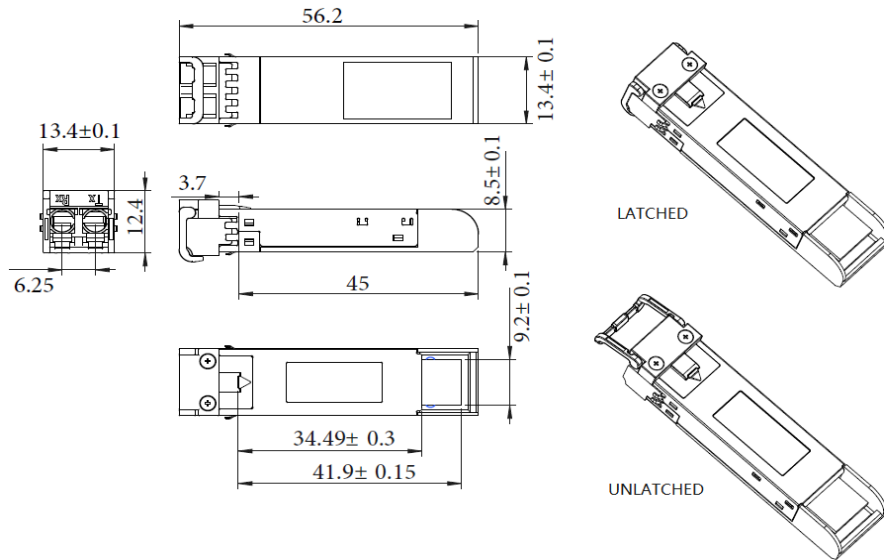


## Functions Description

The transmitter consists of a laser driver chip and a TOSA (light-emitting component). The TOSA includes a 850nm VCSEL laser and a backlight photodetection chip. When the module is working, and the input signal is connected to the laser driver chip. The laser driver chip supplies the bias current and the modulation current to the laser. The laser driver chip simultaneously uses an automatic optical power control (APC) feedback loop to maintain a constant average optical power of the laser output. The purpose is to eliminate the change of the output optical signal due to temperature changes and aging of the light source device. When the transmitter enable pin (TX\_Disable) is high (TTL logic “1”), the laser output is turned off. When TX\_Disable is low (TTL logic “0”), the laser will turn on within 1ms. When the transmitter fault signal (TX\_Fault) is reported as high, indicates a transmitter failure caused by the transmitter’s bias current or transmitted optical power or laser tube temperature exceeding a preset alarm threshold. Low indicates normal operation.

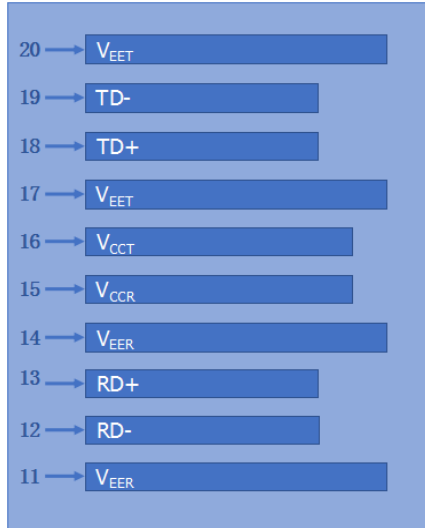
The receiver consists of a ROSA (light-receiving component) and a limiting amplifier chip. ROSA includes a PIN photodetector and a transimpedance amplifier chip. When the ROSA detects the incident light signal, it will be converted into a photo-generated current by the PIN photodetector. The photo-generated current is converted into an electrical signal after passing through the transimpedance amplifier. The electrical signal is further amplified by the limiting amplifier, then outputs a fixed-amplitude electrical signal to the host. When the amplitude of the electrical signal received from the incident light conversion of the opposite optical transceiver module is lower than the set threshold, the module reports that the received signal is lost, the RX\_LOS pin is high (logic “1”), which can be used to diagnose whether the physical signal is normal. The signal is operated in TTL level. The microprocessor inside the module monitors the module’s operating voltage, temperature, transmitted optical power, received optical power, and laser bias current value in real time. The host acquires this information over a 2-wire serial bus.

## Dimensions

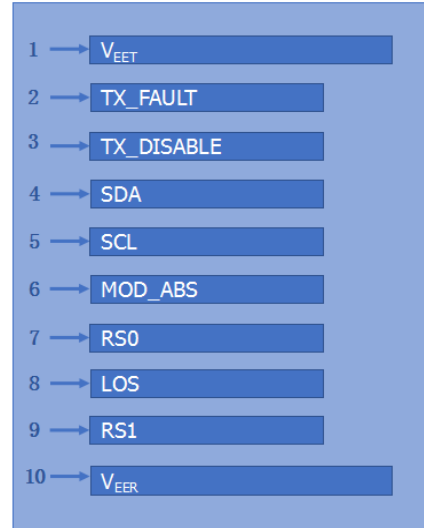
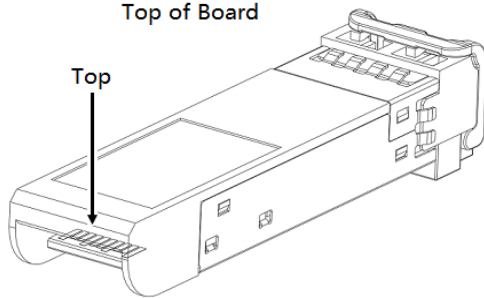


ALL DIMENSIONS ARE  $\pm 0.2$ mm UNLESS OTHERWISE SPECIFIED  
UNIT: mm

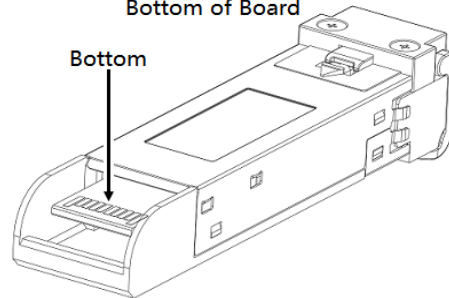
## Electrical Pad Layout



Top of Board



Bottom of Board



## Pin Assignment

PIN #	Symbol	Description	Remarks
1	V <sub>EET</sub>	Transmitter ground (common with receiver ground)	1
2	TX_FAULT	Transmitter Fault	
3	TX_DISABLE	Transmitter Disable. Laser output disabled on high or open	2
4	SDA	2-wire Serial Interface Data Line	3
5	SCL	2-wire Serial Interface Clock Line	3
6	MOD_ABS	Module Absent. Grounded within the module	3
7	RS0	No connection required	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation	4
9	RS1	No connection required	1
10	V <sub>EER</sub>	Receiver ground (common with transmitter ground)	1
11	V <sub>EER</sub>	Receiver ground (common with transmitter ground)	1
12	RD-	Receiver Inverted DATA out. AC coupled	
13	RD+	Receiver Non-inverted DATA out. AC coupled	
14	V <sub>EER</sub>	Receiver ground (common with transmitter ground)	1
15	V <sub>CCR</sub>	Receiver power supply	
16	V <sub>CCT</sub>	Transmitter power supply	
17	V <sub>EET</sub>	Transmitter ground (common with receiver ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC coupled	
19	TD-	Transmitter Inverted DATA in. AC coupled	
20	V <sub>EET</sub>	Transmitter ground (common with receiver ground)	1

### Notes:

1. Circuit ground is isolated from chassis ground
2. Disabled: T<sub>DIS</sub>>2V or open, Enabled: T<sub>DIS</sub><0.8V
3. Should Be pulled up with 4.7k –10k ohm on host board to a voltage between 2V and 3.6V
4. LOS is open collector output

## References

1. “Fibre Channel Physical Interface-4 Specification (FC-PI-4 Rev. 8.00)” . American National Standard for Information Systems, May 21, 2008.
2. “Improved Pluggable Form Factor” , SFF Document Number SFF-8432, Revision 5.0, July 16, 2007
3. Small Form Factor Pluggable (SFP) Transceiver Multi-source Agreement (MSA), September 14, 2000.