VER 1.0 / 060217

SFP-10GB-LRC

10Gb/s 1310nm Long-Wavelength SFP+ Transceiver

Feature

- Optical interface compliant to IEEE 802.3ae 10GBASE-LR
- Electrical interface compliant to SFF-8431
- Hot Pluggable
- 1310nm DFB transmitter, PIN photo-detector
- Operating case temperature: 0 to 70 °C
- Low power consumption
- Applicable for 10km SMF connection
- 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
- Single 3.3V power supply

Application

- Fiber Channel
- 10.325Gb/s Gigabit Ethernet

Performance Specifications

Absolute maximum rating

Exceeding the limits below may damage the transceiver module permanently.

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	V_{CC}	0	+4	V
Storage Temperature	Tc	-40	+85	
Operating Case Temperature	Tc	0	+70	
Relative Humidity	RH	5	95	%

Electrical Characteristics (T_{OP} = 0 to 70 °C, V_{CC} = 3.14 to 3.46 Volts)

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vc	3.14		3.46	V	
Supply Current	Ic			250	mA	
Transmitter						
Input differential impedance	R_i		100		Ω	1
Differential data input swing	Vin,pp	250		1600	mV	
Transmit Disable Voltage	V	2		Vcc	V	
Transmit Enable Voltage	V_E	Vee		Vee+ 0.8	V	
Data Dependent Input Jitter	DDJ			0.10	U	
Data Input Total Jitter	TJ			0.28	U	
Receiver						
Differential data output swing	Vout,pp	300		850	mV	2
Data output rise time, fall	t	28			p	3
LOS Fault	$V_{LOS\ fault}$	2		V_{CCHOST}	V	4
LOS Normal	$V_{LOS\ norm}$	Vee		Vee+0.8	V	4
Total Jitter	TJ			0.70	U	
Deterministic Jitter	DJ			0.42	U	

Notes:

1. Connected directly to TX data input pins, AC coupling from pins into laser driver
2. 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 in sequence in the PRBS^9 is an acceptable alternative. SFF-8431 Rev 2.1
4. 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. Maximum pull-up voltage is 5.5V

Optical characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

	Unit	Values	
Operating Reach	K**m**	**10**	
Transmit			
Center wavelength (range)	nm	1260 -1355	
Side Mode Suppression Ratio (min)	dB	30	
Launched power			
– maximum	dBm	+0.5	
– minimum	dBm	-8.2	Notes1
↕ OMA	dBm	-5.2	
↕ OMA-TDP (min)	dBm	-6.2	
Transmitter and dispersion penalty	dB	3.2	Notes4
Average launch power of OFF transmitter (max)	dBm	-30	

Extinction ratio (min)	dB	3.5 Notes2
RIN12 OMA (max)	dB/Hz	-128
Optical Return Loss Tolerance (min)	dB	12
Receiver		
Center wavelength (range)	nm	1260-1355
Receive overload (max) in average power[1]	dBm	0.5
Receive sensitivity (min) in average power[1]	dBm	-14.4 Notes3
Receiver sensitivity (max) in OMA (footnote 2)	dBm	-12.6 Notes3
Receiver Reflectance (max)	dB	-12
Stressed receiver sensitivity (max) in OMA[2]	dBm	-10.3
Vertical eye closure penalty (min)[3]	dB	2.2
Stressed eye jitter (min)[2]	UIp-p	0.7
Receive electrical 3dB upper cutoff frequency (max)	GHz	12.3
Receiver power (damage, Max)	dBm	1.5

Notes:

1. The optical power is launched into SMF
2. Measured with a PRBS 2^{31}-1 test pattern@10.3125Gbps
3. Measured with a PRBS 2^{31}-1 test pattern@10.3125Gbps BER≤10^{-12}
4. In G.652 and G.655(NDSF)

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF8472 Rev9.2 with internal calibration mode. For external calibration mode please contact our sales stuff.

Pa	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute	DMI_Temp	-3	+3	degC	Over operating
Laser power monitor absolute	DMI_TX	-3	+3	dB	
RX power monitor absolute	DMI_RX	-3	+3	dB	-3dBm to -12dBm
Supply voltage monitor absolute	DMI_VCC	-0.08	+0.08	V	Full operating
Bias current monitor	DMI_Ibias	-10%	10%	mA	

. Pin Descriptions

Pin	Symbol	Name/Descriptio	Ref.
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TFAULT	Transmitter Fault.	2
3	TDIS	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	4
5	SCL	2-wire Serial Interface Clock Line	4
6	MOD_ABS	Module Absent. Grounded within the module	4

7	RS	No connection required	
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	RS	No connection required	
10	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V_{EER}	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_{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	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_{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Tfault is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
4. Should be pulled up with 4.7kΩ – 10kΩon host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. LOS is open collector output. Should be pulled up with 4.7kΩ – 10kΩon host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

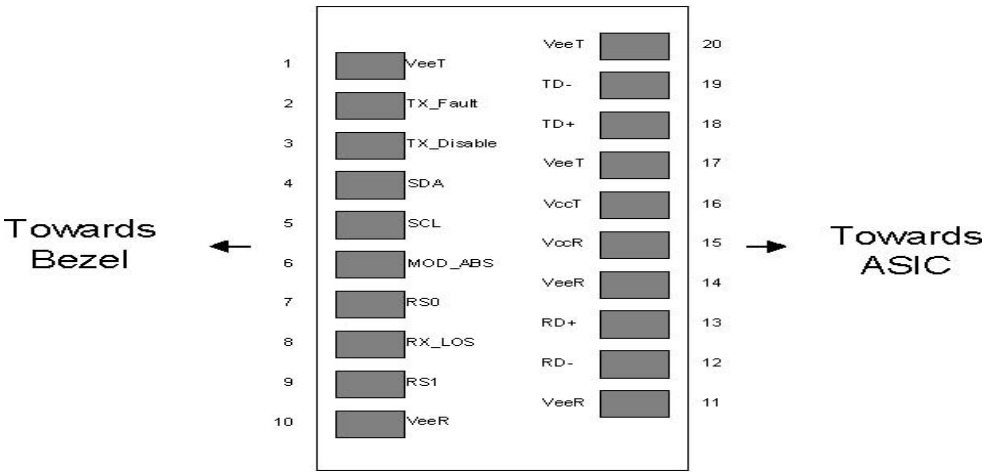
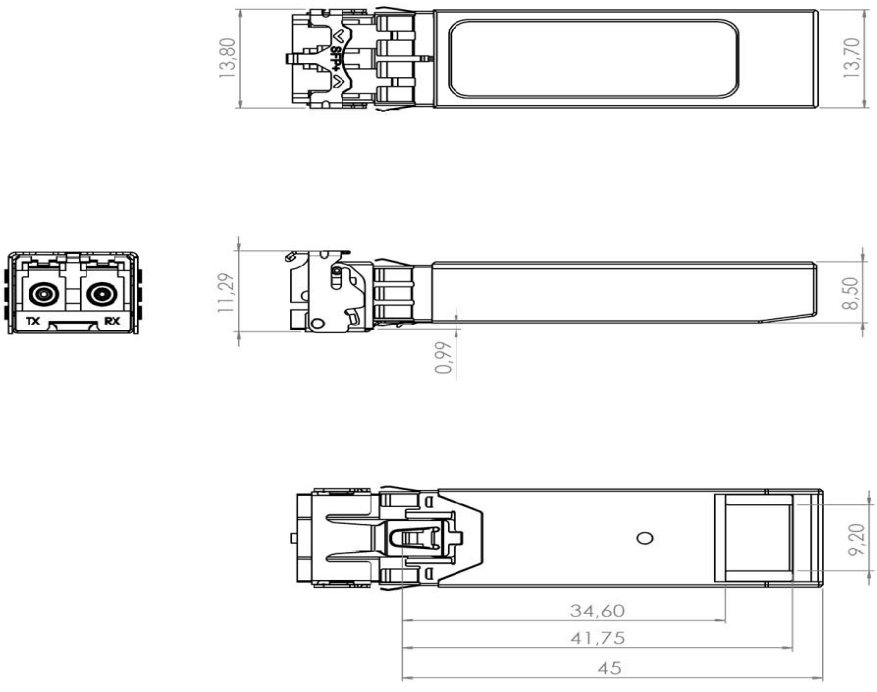
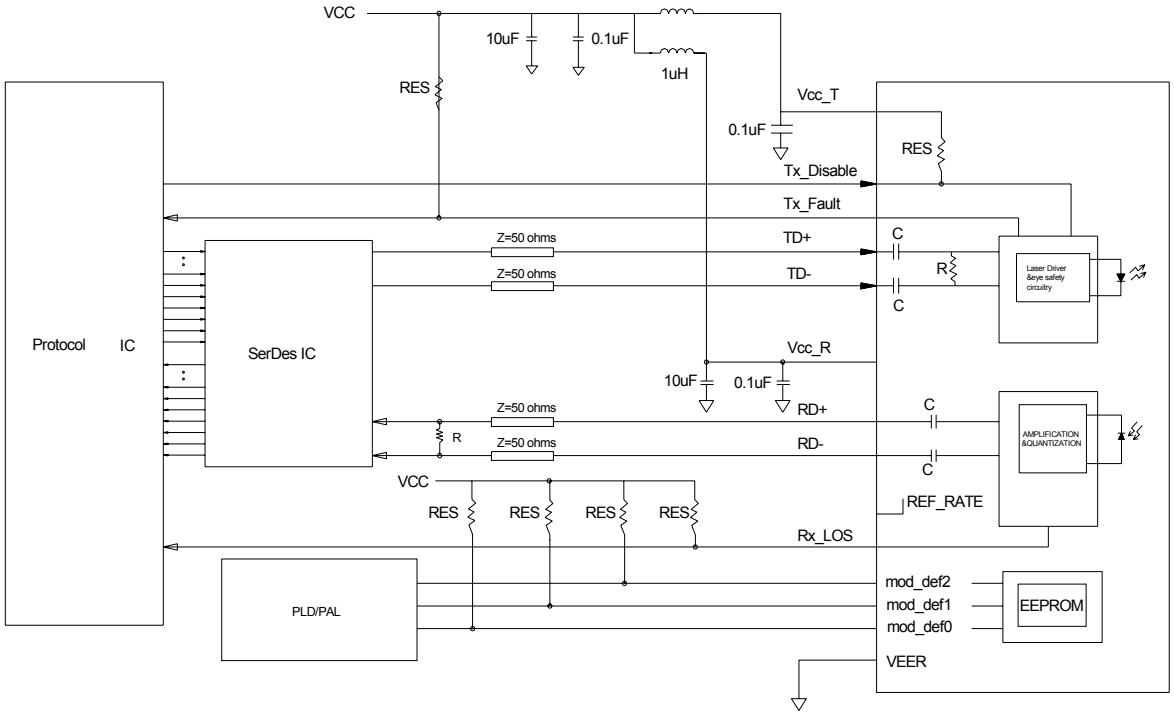


Diagram of Host Board Connector Block Pin Numbers and Names

6 Package Information



7 Recommended Circuit



NOTE: 4.7K ohms<RES<10K ohms

ESD

This transceiver is specified as ESD threshold 1kV for high speed 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.

LASER SAFTY

This is a Class 1 Laser Product according to IEC 60825-1:1993:+A1:1997+A2:2001. This product complies with

21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (July 26, 2001)

10 Ordering Information

Part Number	Product Description
SFP-10GB-LRC	1310nm, 10Gbps, 10Km, 0°C~+70°C