25Gb/S SFP28 LR Transceiver

P/N: TSFP28-BC1F13A

Product Features

- Compliant to IEEE802.3by 25GBASE-LR
- Up to 25.78Gb/s data links
- 1310nm DFB laser and PIN photo-detector
- Maximum power consumption 1.5W
- All-metal housing for superior EMI performance
- 0°C to 70°C case temperature operating range
- 25G electrical interface (OIF CEI-28G-VSR)
- Advanced firmware allow customer system encryption information to be stored in transceiver
- Digital diagnostics functions are available via the I2C interface
- RoHS-6 Compliant

Application

- High-speed storage area networks
- Computer cluster cross-connect
- Custom high-speed data pipes
- Inter Rack Connection
- 25GBASE-LR Ethernet

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Absolute Maximum Rating

Parameter	Min	Max	Unit	Note
Storage Temperature	-40	85	℃	
3.3V Power Supply Voltage	0	3.6	V	
Relative Humidity	5	85	%	
Damage Threshold / Lane	3.4		dBm	

Recommended Operating Conditions

Parameter	Min	Typical	Max	Unit	Note
Case Operating Temperature	0		70	℃	
Power Supply Voltage	3.135	3.3	3.465	V	
Data Rate per Channel		25.78125		Gbps	
Control Input Voltage High	2		Vcc	V	
Control Input Voltage Low	0		0.8	V	
Data Rate Accuracy	-100		100	ppm	
Link Distance with G.652	0.002		10	km	

Electrical Characteristics

Parameter	Min	Typical	Max	Unit	Note
Transceiver Electrical Characteristics					
TRx Power Consumption			1.5	W	
Supply Current			450	mA	
Transmitter					
Overload Differential Voltage pk-pk	900			mV	
Common Mode Voltage (Vcm)	-350		2850	mV	1
Differential Termination Resistance Mismatch			10	%	At 1MHz
Differential Return Loss (SDD11)			See CEI-28G-VSR Equation 13-19	dB	

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Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)			See CEI-28G-VSR Equation 13-20	dB	
Stressed Input Test	See CEI-28G-VSR Section 13.3.11.2.1				
Receiver					
Differential Voltage, pk-pk			900	mV	
Common Mode Voltage (Vcm)	-350		2850	mV	1
Common Mode Noise, RMS			17.5	mV	
Differential Termination Resistance Mismatch			10	%	At 1MHz
Differential Return Loss (SDD22)			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)			See CEI-28G-VSR Equation 13-21	dB	
Common Mode Return Loss (SCC22)			-2	dB	2
Transition Time, 20 to 80%	9.5			ps	
Vertical Eye Closure (VEC)			5.5	dB	
Eye Width at 10^{-15} probability (EW15)	0.57			UI	
Eye Height at 10^{-15} probability (EH15)	228			mV	

Notes

1. Vcm is generated by the host. Specification includes effects of ground offset voltage.
2. From 250MHz to 30GHz.

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Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Note
Transmitter Optical Characteristics						
Center Wavelength	λ	1295		1325	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	Pavg	-7		2	dBm	
Optical Modulation Amplitude, each lane	OMA	-4		2.2	dBm	1
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP)		-5			dBm	
Transmitter Dispersion Penalty	TDP			2.7	dB	
Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise	$RIN_{20}OMA$			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Optical return loss tolerance				-12	dB	
Average Launch Power OFF Transmitter	Poff			-30	dBm	
Transmitter Eye Mask Definition		{X1, X2, X3, Y1,Y2, Y3}= {0.31, 0.4, 0.45, 0.34, 0.38, 0.4}				2

Notes

1. Even if the TDP < 1 dB, the OMA min must exceed the minimum value specified here.
2. Hit ratio 5x10-5 per sample.

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Parameter	Symbol	Min	Typical	Max	Unit	Note
Receiver Optical Characteristics						
Center wavelength, each lane	λ	1260		1350	nm	
Damage Threshold	THd	3.5			dBm	1
Average Receiver Power		-13.3		2	dBm	
Receiver Power(OMA)				2.2	dBm	
Receiver Reflectance				-26	dB	
Receiver Sensitivity (OMA)	Sen			-11.3	dBm	for BER =$5x10^{-5}$
Stress Receiver Sensitivity (OMA)				-8.8	dBm	2
LOS Assert	LosA	-30			dBm	
LOS Deassert	LosD			-14	dBm	
LOS Hysteresis	LosH	0.5			dB	
Receiver Electrical 3dB upper Cutoff Frequency	Fc			31	GHz	
Conditions of stressed receiver sensitivity test (Note5)						
Vertical Eye Closure Penalty, each lane			1.9		dB	
Stressed eye J2 Jitter			0.27		UI	
Stressed eye J4 Jitter,			0.39		UI	
Stressed receiver eye mask definition (Hit ratio $5x10^{-5}$ per sample)		{X1, X2, X3, Y1, Y2, Y3} = {0.24, 0.5, 0.5, 0.24, 0.24, 0.4}				

Notes

1. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
2. Measured with conformance test signal at receiver input for BER = $5x10^{-5}$.
3. Vertical eye closure penalty, stressed eye J2 jitter, stressed eye J4 jitter, and SRS eye mask definition are test conditions for measuring stressed receiver sensitivity. They are not the required characteristics of the receiver.

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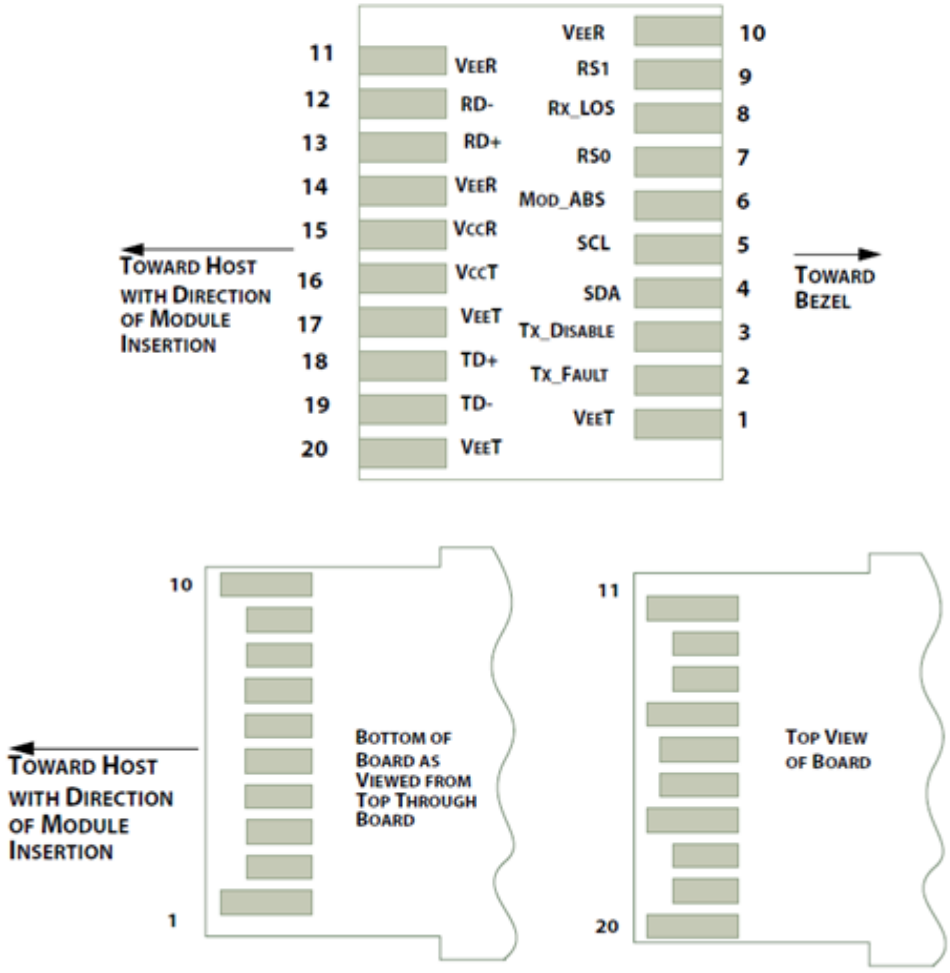
SFP28 Module Pad Assignments and Descriptions



PIN	Logic	Symbol	Name / Description	Note
1		VeeT	Module Transmitter Ground	
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	
5	LVTTL-I	SCL	2-Wire Serial Interface Clock	
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)	

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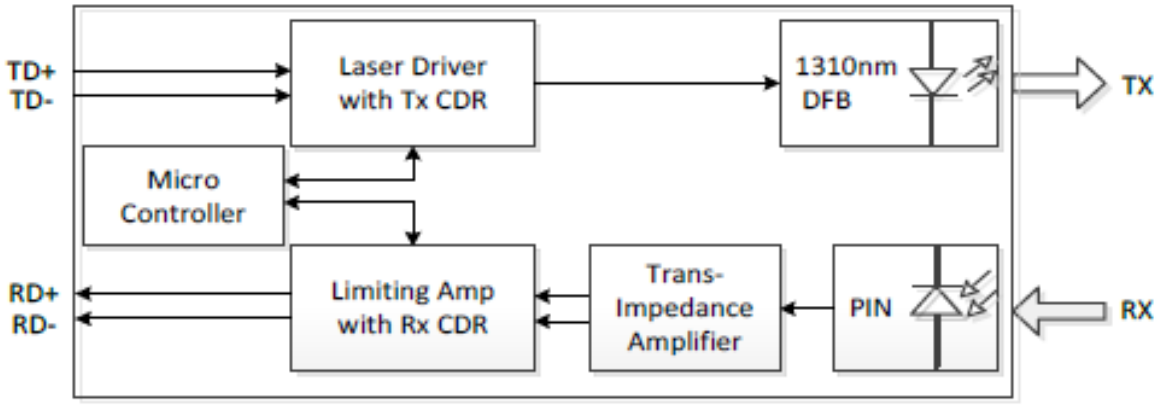
10		VeeR	Module Receiver Ground	
11		VeeR	Module Receiver Ground	
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Data Output	
14		VeeR	Module Receiver Ground	
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Transmitter 3.3 V Supply	
17		VeeT	Module Transmitter Ground	
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	

Transceiver Block Diagram



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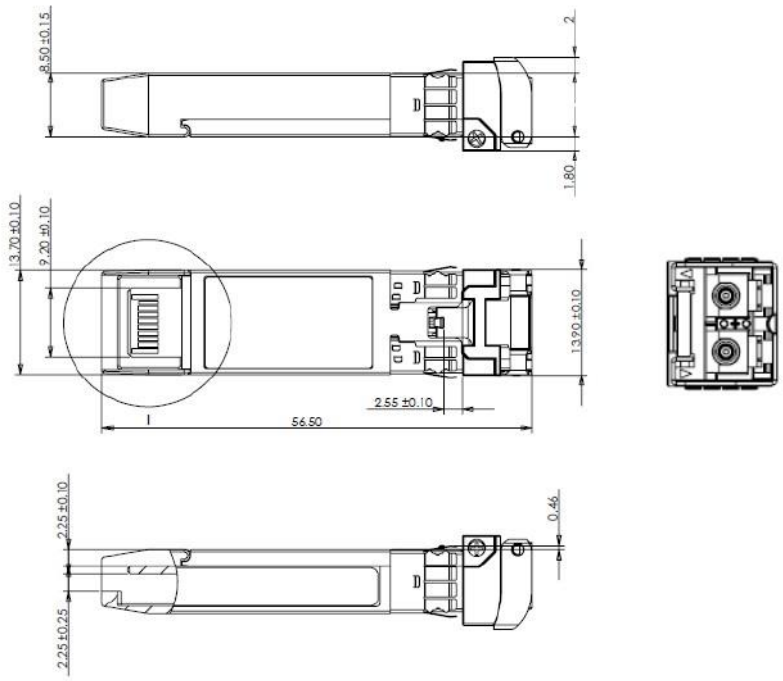
Mechanical Design Diagram

Unit: mm



ESD

This transceiver is specified as ESD threshold 1kV for high speed data pins and 2kV for all others 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 Safety

This is a Class 1 Laser Product according to EN 60825-1:2014. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

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