10GBASE-ER SFP+ 1550nm 40km DOM Transceiver

EX-SFP-10GE-ER-LL

Application

- 10GBASE-ER/EW
- OTN G.709 OTU1e/2/2e FEC bit rates
- 4x, 8x and 10x Fibre Channel
- CPRI option 2 through 8

Features

- Hot-pluggable SFP+ footprint
- 3.1G through 11.3G bit rates
- 40km link length
- Cooled 1550nm EML laser
- Limiting electrical interface receiver
- 0° C to 70° C temperature range
- Duplex LC connector
- Built-in digital diagnostic functions
- RoHS-6 compliant (lead-free)

Description

10Gb/s Pluggable SFP+ transceivers are Enhanced Small Form Factor Pluggable SFP+ transceivers designed for use in 10-Gigabit multi-rate links up to 40km of G.652 single mode fiber. They are compliant with SFF-8431 1 , SFF-8432 2 and 10GBASE- ER/EW; support 4x, 8x and 10x Fibre Channel, as well as CPRI option 2 through 8, over 40km links.

Digital diagnostics functions are available via a 2-wire serial interfacee, as specified in SFF-8472 . The transceivers are RoHS compliant per Directive 2011/65/EU.

Product Specifications

I. General Specifications

Data Rate Specifications	Symbol	Min	Typ.	Max	Units	Ref.
Bit Rate	BR	3.144		11.3168	Gb/s	1
Max. Supported Link Length	L MAX			40	km	2

Notes:

1. Tested with a 231 – 1 PRBS pattern at the BER defined in Table IV.
2. Over G.652 single mode fiber.

II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		4.0	V	
Storage Temperature	Ts	-40		85	° C	
Case Operating Temperature	Top	0		70	° C	
Relative Humidity	RH	0		85	%	1
Receiver Optical Damage Threshold	RxDamage	5			dBm	

Note:

Non-condensing.

III. Electrical Characteristics (TOP = 0 to 70 ℃, VCC = 3.14 to 3.46 V)

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Supply Voltage	Vcc	3.14	3.30	3.46	V	
Power Dissipation	Pdiss			1.5	W	1
	Transmitter (per Lane)					
Input differential impedance	VinT	-0.3		4.0	V	
Differential data input swing	Vin,pp	120		1200	mVpp	3
Transmit Disable Voltage			50		mV	
Transmit Enable Voltage		15			mV	

Receiver (per Lane)

Differential data output swing	Vout,pp	300		850	mV	2
Output rise time and fall time	Tr, Tf	28			ps	3
LOS asserted	VLOS A	Vcc-0.8		Vcc	V	4
LOS de-asserted	VLOS D	Vee		Vee+0.8	V	4
Power Supply Noise Tolerance	VccT/VccR		Per SFF-8431 Rev 3.0		mVpp	5

Notes:

1. Measured at 70° C, 3.3V and beginning of life.
2. Internally AC coupled.
3. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative. SFF-8431 Rev 4.1.
4. LOS is an open collector output. Should be pulled up with 4.7kΩ– 10k Ω on the host board. Normal operation is logic 0; loss of signal is logic 1.
5. See Section 2.8.3 of SFF-8431 Rev 4.1.

IV. Optical Characteristics (TOP = 0 to 70 ℃, VCC = 3.14 to 3.46 V))

Parameter			Symbol	Min	Typ.	Max	Unit	Ref.
Transmitter (per Lane)								
Average Launch Power		**Average**	PAVE	-1		4	dBm	
		OMA	POMA-TDP	-2.1			dBm	1
Optical Wavelength			λ	1530		1565	nm	
Side-Mode Suppression Ratio			SMSR	30			dB	
Optical Extinction Ratio			ER	8.2			dB	
Average Launch power when Tx is OFF			POFF			-30	dBm	
Relative Intensity Noise			RIN			-128	dB/Hz	
Transmitter and Dispersion Penalty			TDP			3	dB	
Receiver (per Lane)								
Optical Center Wavelength			λC	1260		1600	nm	
Sensitivity	**3.1G - 10.7G**	**Average**	RSAVE1			-16	dBm	1,2
		OMA	RSOMA			-14.1	dBm	2,3
	11.3G	**Average**	RSAVE2			-15	dBm	1,2
Stressed Sensitivity	**10.3G**	**OMA**	RSOMA			-11.3	dBm	2,3
Overload			ROVL	-1			dBm	2,3
Receiver Reflectance			Rrx			-27	dB	

Receiver Reflectance	PP			-14	dB	
LOS De-Assert	LOS_D			-22	dBm	
LOS Assert	LOS_A	-42			dBm	
LOS Hysteresis	LOSH	0.5			dB	

Notes:

1. Measured with worst ER=8.2dB
2. PRBS 2 31 – 1 and BER<1E -12
3. Measured with worst ER=3.0 dB

V. Digital Diagnostic Specifications

Parameter	Symbol	Units	Min	Max	Accuracy	Ref.
		Accuracy				
Transceiver temperature	ΔDD_{Temp}	℃	-5	75	±5℃	1
Transceiver supply voltage	$\Delta DD_{Voltage}$	V	2.8	4.0	±3%	
Transmitter bias current	ΔDD_{Bias}	mA	0	127	±10%	2
Transmitter output power	$\Delta DD_{Tx\text{-}Power}$	dBm	-2	+3	±2dB	
Receiver average optical input power	$\Delta DD_{Rx\text{-}Power}$	dBm	-20	+1	±2dB	

Notes:

1. Internally measured
2. The accuracy of the Tx bias current is 10% of the actual current from the laser driver to the laser

VI. Pin Description

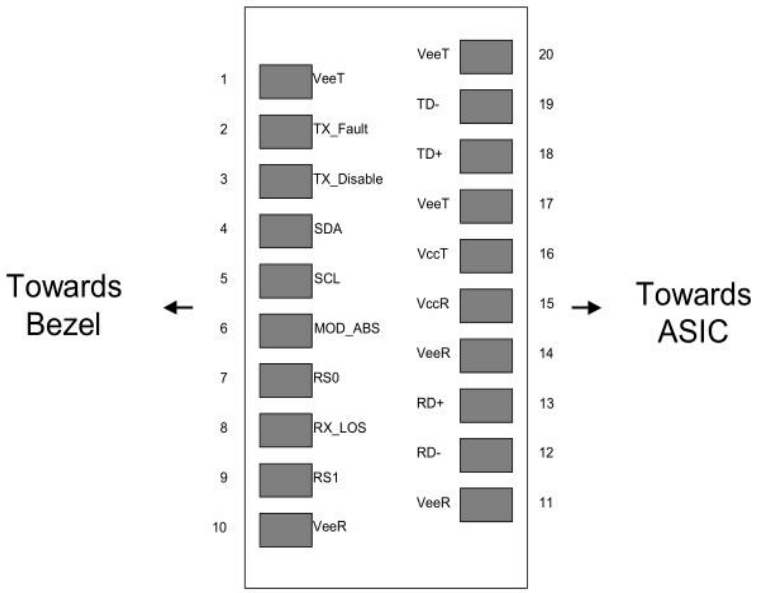


Figure 1 – Diagram of Host Board Connector Block Pin Numbers and Names.

Pin	Symbol	Name/Description	Notes
1	VEET	Transmitter 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	2
5	SCL	2-wire Serial Interface Clock Line	2
6	MOD_ABS	Module Absent. Grounded within the module	2
7	RS0	Rate Select 0.	4
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	RS1	Rate Select 1.	4

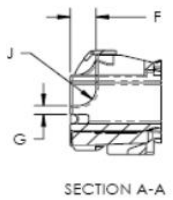
10	VEER	Receiver Ground	1
11	VEER	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	VEER	Receiver Ground	1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground	1

Note:

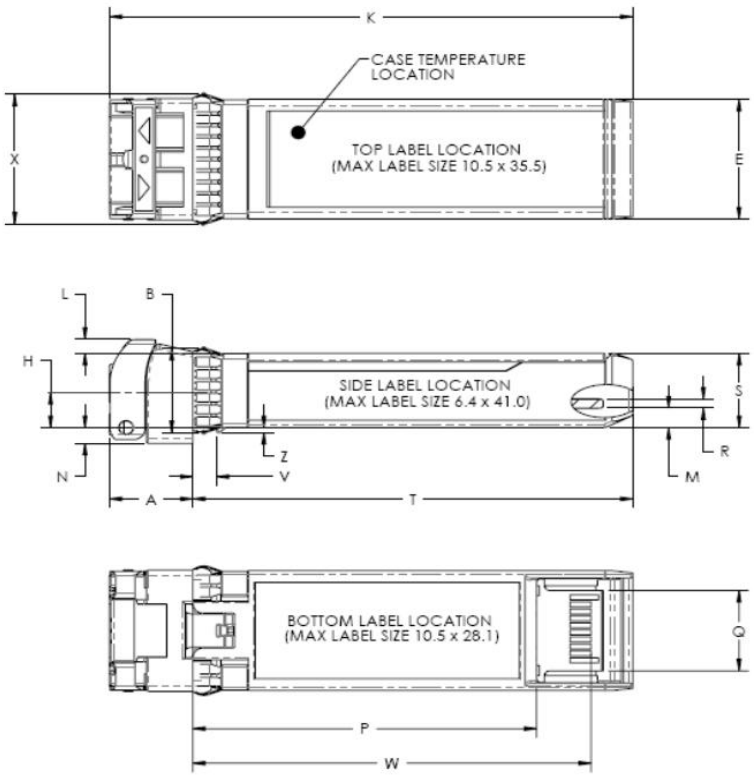
1. Circuit ground is internally isolated from chassis ground.
2. TFAULT is an open collector/drain output, which should be pulled up with a 4.7k -10k Ohms resistor on the host board if intended for use. Pull up voltage should be transmitter fault caused by either the TX bias current or the TX output powerexceeding 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. Internally pulled down per SFF-8431 Rev 2.0. See Sec. X for the logic table to use for the internal CDRs locking modes.
5. LOS is open collector output. Should be pulled up with 4.7kΩ -10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal. .

VII. Mechanical Specifications

ITEM	DIM (mm)	TOL (mm)
A	9.00	± 0.3
B	9.60	± 0.5
C	11.90	± 0.5
D	13.85	± 0.15
E	13.65	± 0.15
F	2.80	± 0.2
G	1.00	± 0.2
H	4.00	REF
J	2.00	± 0.2
K	56.50	REF
L	1.60	± 0.5
M	2.25	± 0.1
N	1.80	± 0.1
P	37.10	± 0.3
Q	9.15	± 0.15
R	1.00	± 0.1
S	8.55	± 0.15
T	47.50	± 0.2
V	2.55	± 0.1
W	43.00	± 0.2
X	14.70	± 0.5
Z	0.55	± 0.15



SECTION A-A



Note:

the option of the label on the top side of the transceiver is not recommended.