

Features

- Compliant with SFF-8431, SFF-8432 and IEEE802.3ae
- 10GBASE-ER and 2G/4G/8G/10G Fiber Channel applications
- Cooled EML Transmitter and PIN receiver
- Link Length up to 40km
- Low Power Dissipation 1.5W Maximum
- Single 3.3V power supply
- RoHS6 compliant (lead free)
- Operating case temperature: -5°C ~70°C



Applications

- 10GBASE-ER (with/without FEC)
- 10G Fiber Channel (with/without FEC)

Description

This SFP+ ER 1550 transceiver is a "Limiting Module", designed for 10GBASE-ER and 2G/4G/8G/10G Fiber Channel applications.

The Transceiver consists of two sections: the transmitter section incorporates a cooled EML laser. And the receiver section consists of a PIN photodiode integrated with a TIA. All modules satisfy class I laser safety requirements. Digital Diagnostics Functions are available via a 2-wire serial interface, as specified in SF-8472, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage.

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Power Supply Voltage	V_{CC}	0.5		3.8	V	
Storage Temperature	T_c	-40		85	°C	
Relative Humidity	RH	0		85	%	

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units
Operating Case Temperature	T_c	-5		70	°C
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Supply Current	I_{CC}		360	450	mA
Module Power Dissipation	P_m		1.2	1.5	W

Digital Diagnostic Functions

Parameter	Symbol	Accuracy	Unit	Notes
Temperature Monitor Absolute Error	DMI_Temp	± 3	°C	Over operating Temp
Supply Voltage Monitor Absolute Error	DMI_VCC	± 0.08	V	Full operating range
RX Power Monitor Absolute Error	DMI_RX	± 3 dB	dB	1
Bias Current Monitor	DMI_I_{bias}	$\pm 10\%$	mA	
Laser Power Monitor Absolute Error	DMI_TX	± 3 dB	dB	1

Notes:

- Due to measurement accuracy of different single mode fibers, there could be an additional +/-1 dB fluctuation, or a +/- 3 dB total accuracy.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Transmitter						
Center Wavelength	λ_t	1530		1565	nm	
Average Optical Power	P_o	-3.8		3	dBm	
Optical Power in OMA	OMA	-2.1			dBm	
Side Mode Suppression Ratio	$SMSR$	30			dB	
Spectral Width (-20dB)	$\Delta\lambda$			0.3	nm	
Relative Intensity Noise	RIN			-128	dB/Hz	
Launch Power of OFF Transmitter	P_{OUT_OFF}			-30	dBm	1
Extinction Ratio	ER	8.2			dB	
Optical Return Loss Tolerance	Ori			21	dB	
Receiver						
Center Wavelength	λ_r	1260		1600	nm	
Average Receive Power	R_{X_avg}	-15.8		-1.0	dBm	
Receiver Sensitivity in 10.3Gbps (OMA)	R_{sen1}			-14.1	dBm	
Stressed Receiver Sensitivity in 10.3Gbps (OMA)	R_{sen2}			-11.3	dBm	
Reflectance	R_{rx}			-26	dB	
LOS Asserted	$LOSA$	-28			dBm	
LOS De-Asserted	$LOSD$			-19	dBm	
LOS Hysteresis	$LOSH$	0.5			dB	

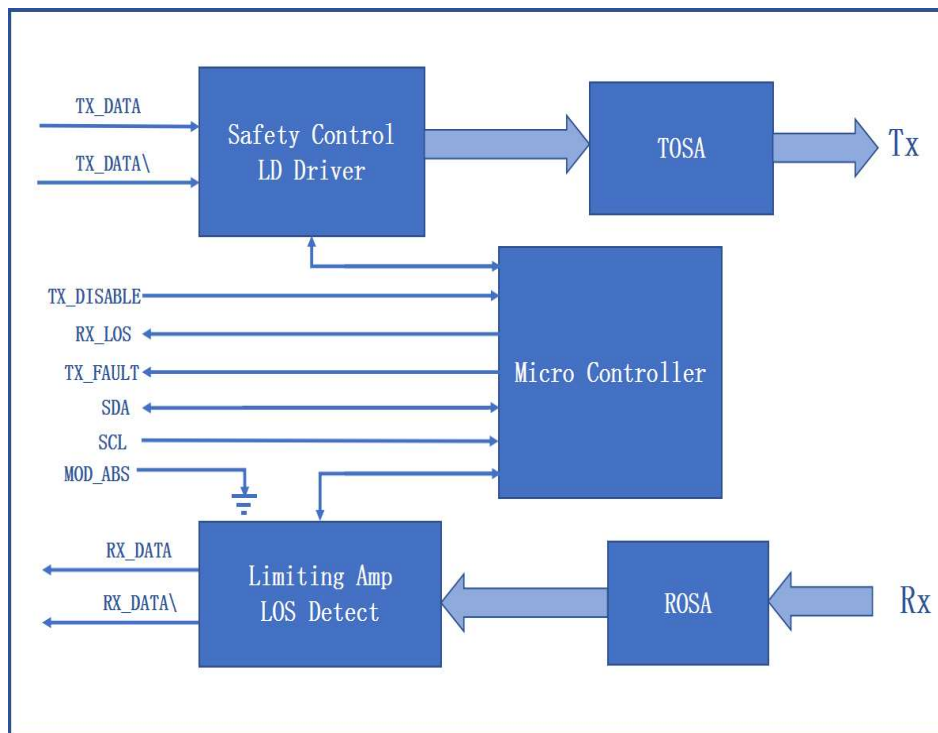
Note:

1. Measured with conformance test signal for BER=10⁻¹². The stressed sensitivity values in the table are for systems level BER measurements which include the effects of CDR circuits. It is recommended that at least 0,4dB additional margin be allocated if component level measurements are made without the effects of CDR circuits.

Electro Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Transmitter						
Data Rate	<i>MRA</i>	1.0	10.3	11.3	Gbps	
Input Differential Impedance	<i>RIN</i>		100		Ω	
Differential Data Input	<i>VtxDiff</i>	120		850	mV	
Transmit Disable Voltage	<i>VD</i>	2.0		Vcc3+0.3	V	
Transmit Enable Voltage	<i>VEN</i>	0		0.8	v	
Transmit Disable Assert Time	<i>VN</i>			100	us	
Receiver						
Data Rate	<i>MRA</i>		10.3	11.3	Gbps	
Differential Output Swing	<i>Vout P-P</i>	350		850	mV	
Rx Output Rise and Fall Time	<i>Tr/Tf</i>	24			ps	
LOS – Asserted	<i>VOA</i>	2		Vcc3+0.3	V	
LOS – Negated	<i>VOL</i>	0		0.4	V	

Block Diagram of Transceiver



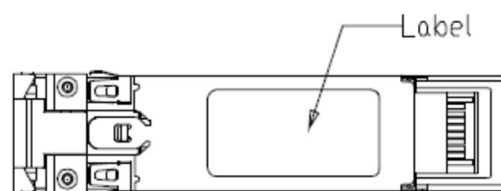
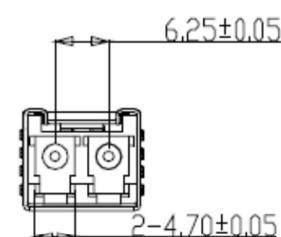
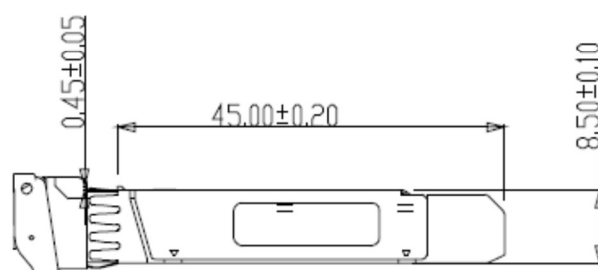
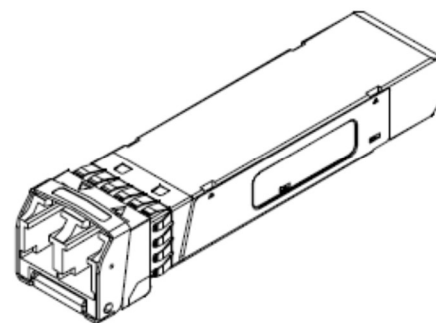
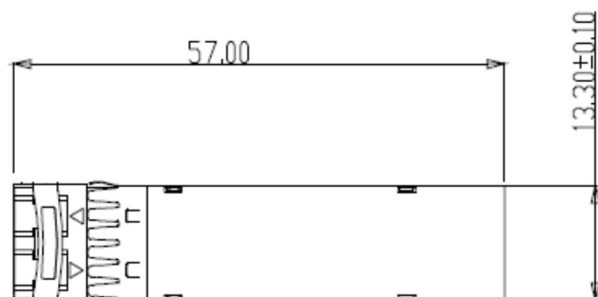
Pin Assignment

Pin	Symbol	Function/Description	Notes
1	VEET	Transmitter Ground	1
2	Tx_FAULT	Transmitter Fault	2
3	Tx_DIS	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	4
7	RS0	Rate Select 0	5
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation	2
9	RS1	Rate Select 1	5
10	VEER	Receiver Ground	1
11	VEER	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver 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 DATA in. AC Coupled	
19	TD-	Transmitter Inverted DATA in. AC Coupled	
20	VEET	Transmitter Ground	1

Notes:

- Module circuit ground is isolated from module chassis ground within the module.
- Should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.
- Tx_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.
- Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc_Host with a resistor in the range 4.7 kΩ to 10 kΩ. Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.
- RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module

Dimensions

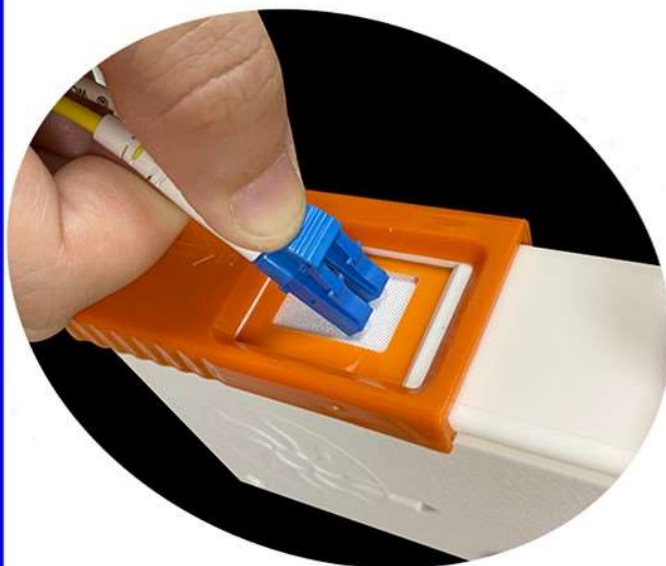


ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED UNIT: mm

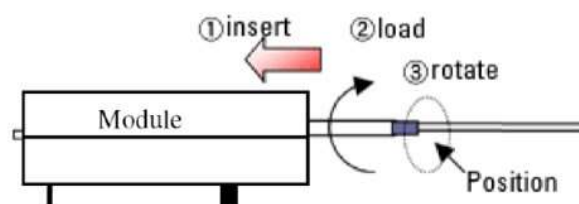
Optical Receptacle Cleaning Recommendations :

All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop® stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop® cleaning cassette.

Cleaning of patch-cord



Cleaning of fiber stub



1. Insert
Ensure that stick is held straight when inserting into sleeve.
2. Load
Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve.
3. Rotate
Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained.

*Notice: Number of possible wipes:
Maintenance (repair) ~1 use / piece
Equipment construction: 4 uses / piece (max.)*

Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME

Ordering Information

<i>Model Number</i>	<i>Part Number</i>	<i>Wavelength</i>	<i>Temperature</i>
SFP-10G-ER	OPAK-S40-15-CF	1550nm	-5 °C ~70 °C

Modification History

<i>Revision</i>	<i>Date</i>	<i>Description</i>
A1	Sep. 2021	Initial Release

Note: All information contained in this document is subject to change without notice.