Features

- Compliant with SFF-8431,SFF-8432 and IEE802.3ae
- CWDM DFB transmitter from 1270nm to 1610nm
- PIN photo-detector
- 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.
- RoHS6 compliant (Lead Free)
- Operating case temperature: 0°C ~ 70°C

Applications

- 10GBASE-LR at 10.3125Gbps
- 10G Ethernet
- Other Optical Links

Description

This SFP+ LR CWDM Transceiver is a “Limiting module”, designed for 10GBASE-LR, and 2G/4G/ 8G/10G Fiber- Channel applications.

The transceiver consists of two sections: The transmitter section incorporates a DFB 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 SFF-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.

Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Units
Power Supply Voltage	V_{CC}	0	3.6	V
Storage Temperature	*Tc*	-40	85	°C
Operating Case Temperature	*Tc*	0	70	°C
Relative Humidity	*RH*	0	85	%
RX Input Average Power	*Pmax*		0	dBm

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units
Supply Voltage	*Vcc*	3.13	3.3	3.47	V
Supply Current	*Icc*			360	mA
Operating Case Temperature	*Tca*	-5		70	ºC
Module Power Dissipation	*Pm*			1.5	W

Digital Diagnostic Functions

	Symbol	Min.	Max	Unit	Notes
Accuracy					
Transceiver Temperature	*DMI_Temp*	-3	+3	°C	Over operating temp.
TX Output Optical Power	*DMI_TX*	-3	+3	dB	
RX Input Optical Power	*DMI_RX*	-3	+3	dB	0dBm to -18dBm range
Transceiver Supply Voltage	*DMI_VCC*	-0.08	+0.08	V	Full operating range
Bias Current Monitor	*DMI_Ibias*	-10%	10%	mA	
Dynamic Range Accuracy					
Transceiver Temperature	*DMI_Temp*	-5	70	°C	
TX Output Optical Power	*DMI_TX*	-8.2	+2	dBm	
RX Input Optical Power	*DMI_RX*	-18	0	dBm	
Transceiver Supply Voltage	*DMI_VCC*	3.0	3.6	V	
Bias Current Monitor	*DMI_Ibias*	0	100	mA	

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Transmitter						
Center Wavelength	λ	(λ -6.5)		(λ +6.5)	nm	5
Side Mode Suppression Ratio	*SMSR*	30			dB	
Average Launched Power	*Pave*	-8.2		2	dBm	1
Optical Modulation Amplitude (OMA)	*Poma*	-2.5			dBm	
Transmitter and Dispersion Penalty	*TDP*			3.2	dB	3,4
Average Launch Power of OFF Transmitter	*Poff*			-30	dBm	
Extinction Ratio	*ER*	3.5			dB	2
Relative Intensity Noise				-128	dB/Hz	
Optical Return Loss Tolerance	*RIN*	12			dB	
Receiver						
Center Wavelength	λ	1260		1610	nm	
Receive Overload	*Pave*			0.5	dBm	
Receive Sensitivity	*Rsen*			-14.4	dBm	3
Receiver Sensitivity in OMA (footnote2)	*Rsen-oma*			-12.6	dBm	
Receiver Reflectance (max)	*Rrx*			-12	dB	
Stressed Receiver Sensitivity (max) in OMA[2]	*RSENS_Stress*			-10.3	dBm	

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)
5. The available transmitter center wavelengths (λ) are: 1271nm, 1291nm, 1311nm… and 1610nm as specified in the “Product Selection” section on page 1.

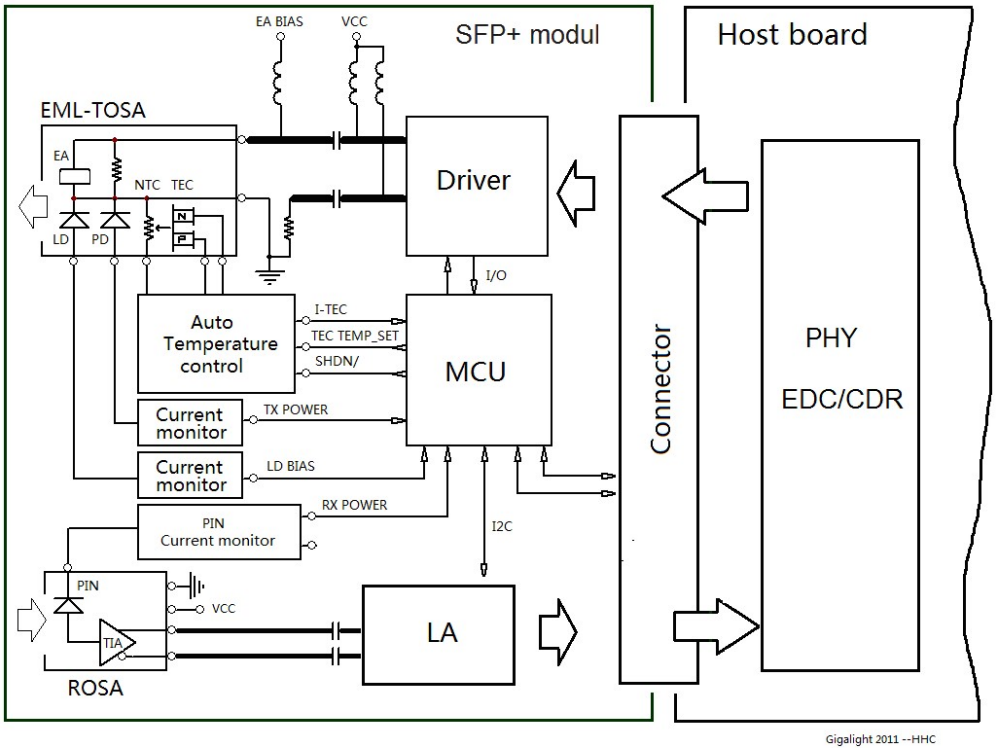
Electronical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Data Rate		0.6	10.3125	11.3	Gbps	
Power Consumption			1200	1500	mW	
Transmitter						
Input Differential Impedance	*Rin*		100		Ω	1
Differential Data Input Swing	*Vin,pp*	180		700	mV	
Tx Fault	*VoL*	-0.3		0.4	V	
Data Dependent Input Jitter	*DDJ*			0.10	UI	
Data Input Total Jitter	*TJ*			0.28	UI	
Receiver						
Differential Data Output Swing	*Vout,pp*	300		850	mV	2
Rx Output Rise and Fall Time	*Tr/Tf*	28		50	ps	3
Total Jitter	*TJ*			0.70	UI	
Deterministic Jitter	*DJ*			0.42	UI	

Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
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 sequence in the PRBS 9 is an acceptable alternative. SFF-8431 Rev 3.0.

Block Diagram of Transceiver



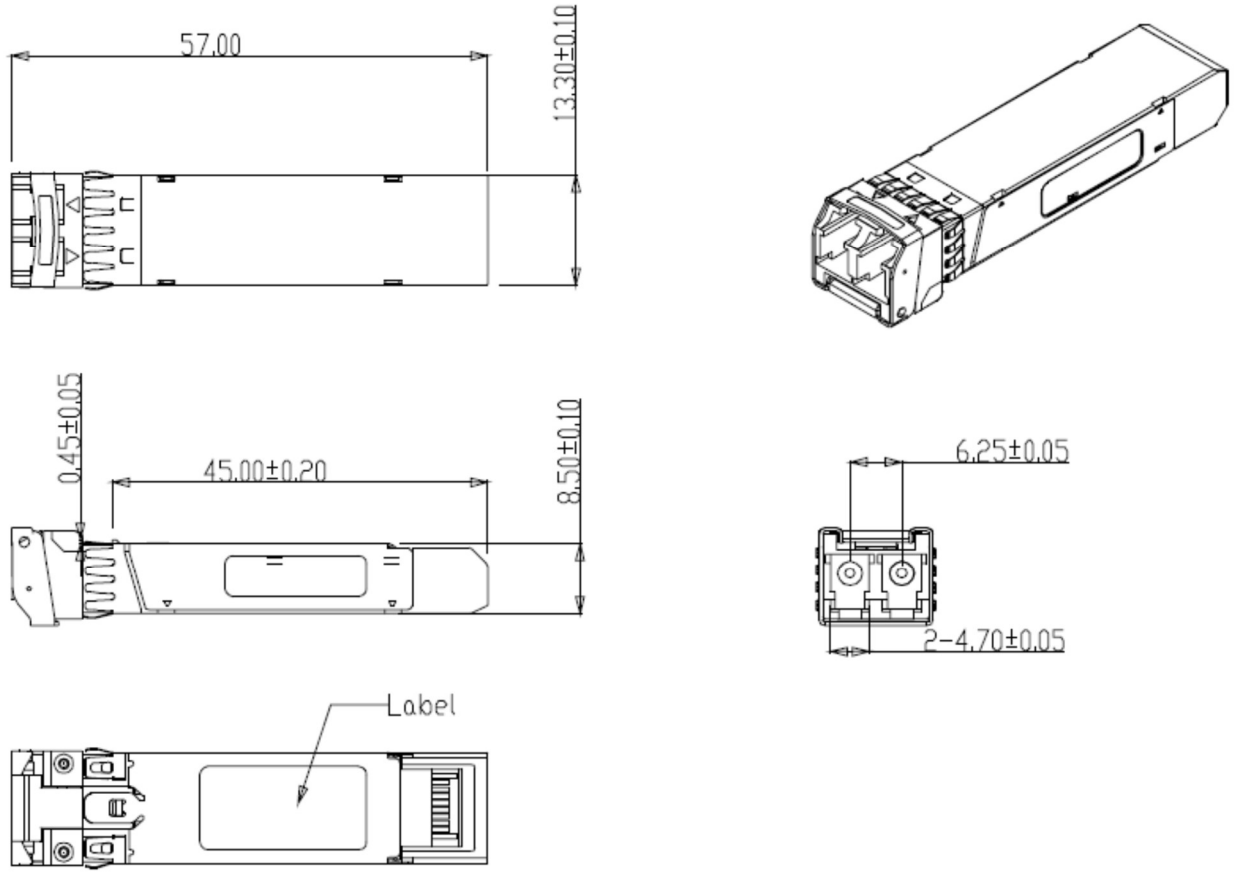
Pin Assignment

Pin	Symbol	Function/Description	Note
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:

1. Module circuit ground is isolated from module chassis ground within the module.
2. Should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15Vand 3.6V.
3. Tx Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.
4. 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 to10 kΩ.Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.
5. RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module.

Dimensions



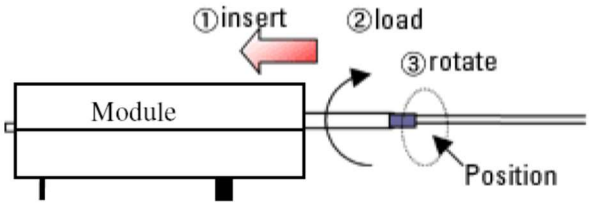
Mechanical Specifications

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

Model Number	Part Number	Distance	Voltage	Temperature
SFP-10G-CWDM 10km	OPAK-C14-yy-CF	10km	3.3V	0°C to 70 °C

Note: yy=27, Center Wavelength=1270nm ~ yy=61, Center Wavelength=1610nm

Modification History

Revision	Date	Description
A1	Dec.2014	Initial Release

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