

Features

- Support 9.8 to 11.3Gb/s
- Link length up to 80km (1471~1571nm)/70km(1591~1611nm) on G.652D SMF
- Suitable for use 20nm channel spacing CWDM systems
- Cooled EML transmitter and APD receiver
- Hot-pluggable SFP+ module
- Single 3.3V power supply
- Duplex LC connector
- Maximum power dissipation <2W (Typical 1.4W)
- Built-in Digital Diagnostic Interface
- RoHS compliant (lead Free)
- Operating case temperature: -5°C ~ 75°C



Applications

- CPRI standard
- 10G SONET/SDH/OTN
- 10G Fiber Channel
- 10G Ethernet

Description

This SFP+ CWDM Transceiver is a "Limiting module", designed for CPRI, 10GBASE-ZR, SDH/SONET, OTN and 10G Fiber-Channel applications. Link length up to 80km on G.652D SMF. They are compliant with SFF-8431 Rev 4.1, SFF-8432 and SFF8472 Rev 10.3.

The transmitter section incorporates a cooled EML laser, and the receiver section consists of a APD photodiode integrated with TIA.

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 case temperature, laser bias current, transmitted optical power, received optical power and module supply voltage.

Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Units
Power Supply Voltage	V_{CC}	-0.5	+3.8	V
Storage Temperature	T_c	-40	+85	°C
Relative Humidity	RH	0	85	%
Max Link Length	L_{max}	-	80	km

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}	3.13	3.3	3.47	V
Supply current	I_{CC}	-	420	550	mA
Operating Case temperature	T_{ca}	-20	-	85	°C
Module Power Dissipation	P_m	-	1.4	2	W
ESD (High speed pins)				1000	V

Digital Diagnostic Functions

	Symbol	Min.	Max	Unit	Notes
Accuracy					
Transceiver Temperature	DMI_Temp	-3	+3	°C	
TX Output optical power	DMI_TX	-2	+2	dB	
RX Input optical power	DMI_RX	-2	+2	dB	
Transceiver Supply voltage	DMI_VCC	-3%	+3%	V	Full operating
Bias current monitor	DMI_I_{bias}	-10%	10%	mA	
Dynamic Range Accuracy					
Transceiver Temperature	DMI_Temp	-5	70	°C	
TX Output optical power	DMI_TX	-1	+5	dBm	
RX Input optical power	DMI_RX	-28	-5	dBm	
Transceiver Supply voltage	DMI_VCC	3.0	3.6	V	
Bias current monitor	DMI_I_{bias}	0	120	mA	

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Transmitter						
Center wavelength	λ	($\lambda - 6.5$)		($\lambda + 6.5$)	nm	3
Side Mode Suppression Ratio	<i>SMSR</i>	30			dB	
Average Optical power	<i>P_{out}</i>	0		+4	dBm	1.2
Optical Transmit Power (Disable)	<i>P_{off}</i>			-30	dBm	
Extinction ratio	<i>ER</i>	8.2			dB	
Spectral Width (-20dB)	$\Delta\lambda_{20}$			0.3	nm	
Relative Intensity Noise				-128	dB/Hz	
Optical Return Loss Tolerance	<i>Orl</i>			21	dB	
Receiver						
Center wavelength	λ	1260		1620	nm	
Average receive power	<i>P_{avg}</i>	-24		-5	dBm	
Sensitivity (0km, 9.95~10.7G)	<i>R_{sen1}</i>			-24	dBm	4
Sensitivity (80km, 9.95~10.7G)	<i>R_{sen3}</i>			-22	dBm	4
Sensitivity (0km, 11.1~11.3G)	<i>R_{sen2}</i>			-27	dBm	5
Sensitivity (80km, 11.1~11.3G)	<i>R_{sen4}</i>			-24	dBm	5
Maximum Input Power	<i>RX-overload</i>	-5			dBm	
LOS De-Assert	<i>LOSD</i>			-24	dBm	
LOS Assert	<i>LOSA</i>	-34			dBm	
LOS Hysteresis	<i>LOSH</i>	0.5			dB	

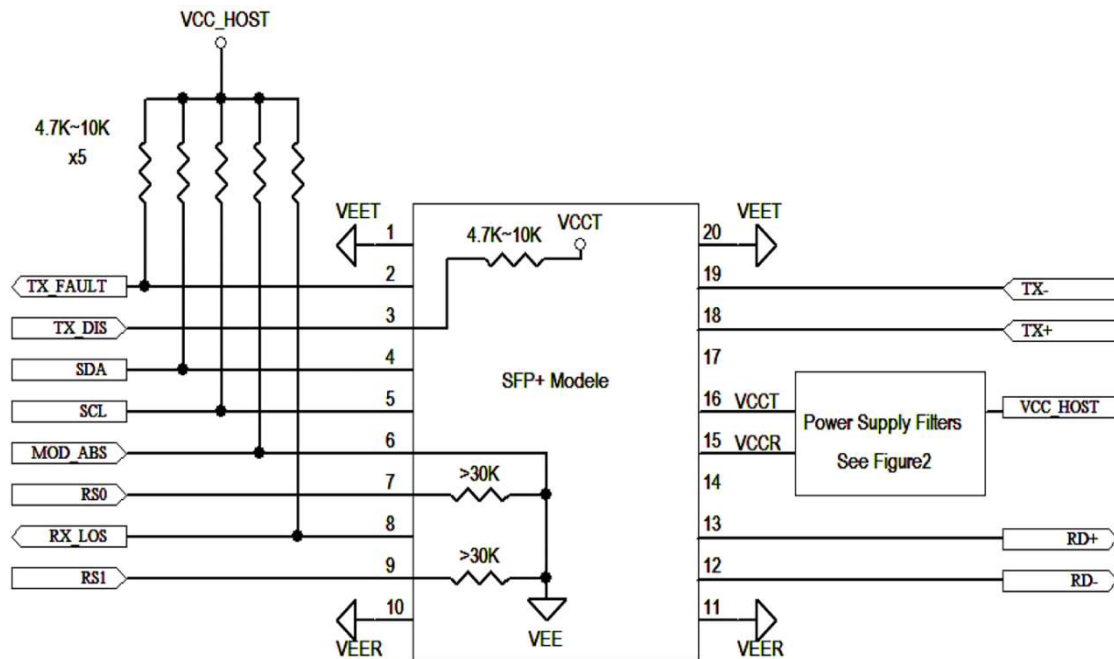
Notes:

1. Average power measured at output over the operating temperature
2. Ratio of the average output power in the dominant longitudinal mode to the power in the most significant side mode peak under full modulation condition
3. Deviation from the ITU G.694.2, wavelength range 1471~1611nm
4. Measured with worst ER=8.2dB; $2^{31} - 1$ PRBS. BER < 10^{-12}
5. PRBS $2^{31} - 1$ and BER < 10^{-4}

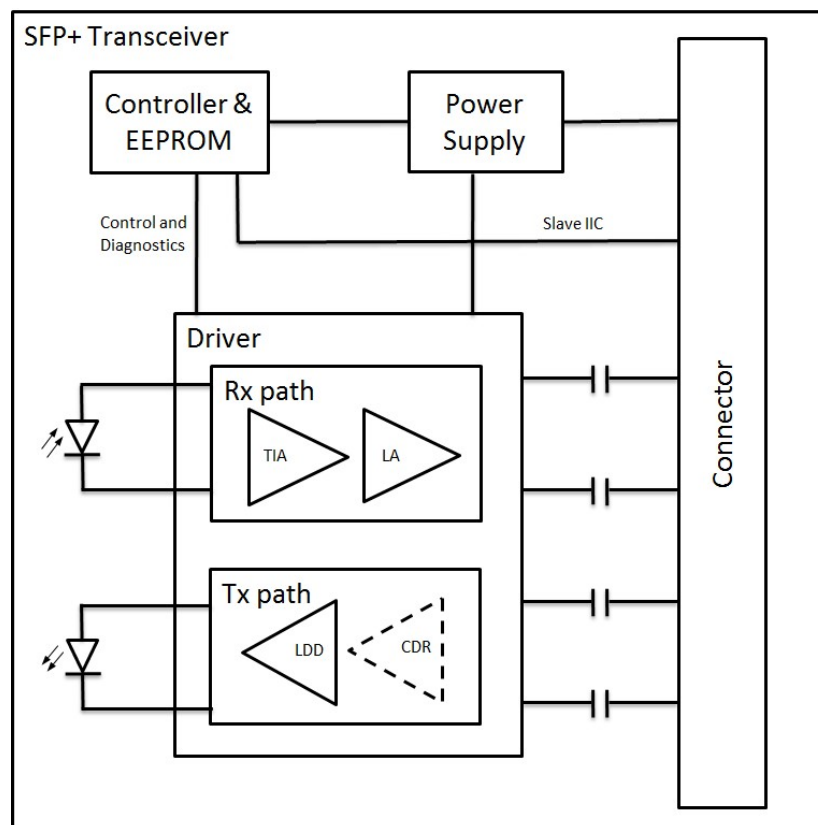
Electronical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Transmitter						
Bit Rate	<i>BR</i>	9.8		11.3168	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						
Differential output swing	<i>Vout,pp</i>	350		850	mV	
Rx Output Rise and Fall Time	<i>Tr/Tf</i>	24		50	ps	
Loss of Signal-Asserted	<i>VOH</i>	2		Vcc3+0.3	V	
Loss of Signal-Negated	<i>VOL</i>	0		0.4	V	

Host Board Power Supply Filters Circuit



Block Diagram of Transceiver



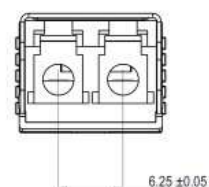
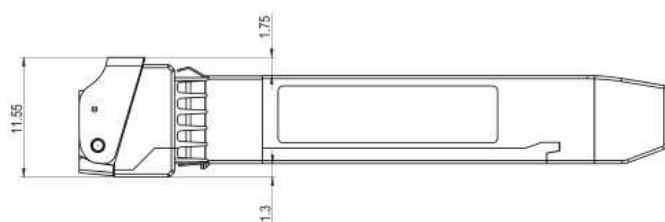
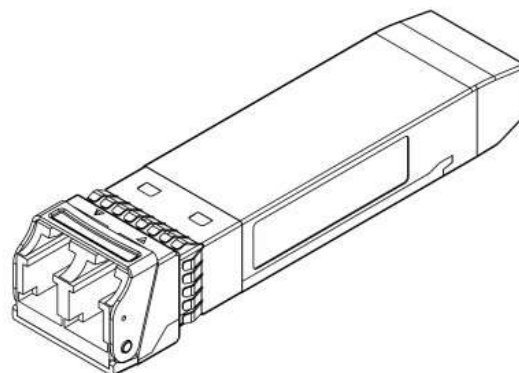
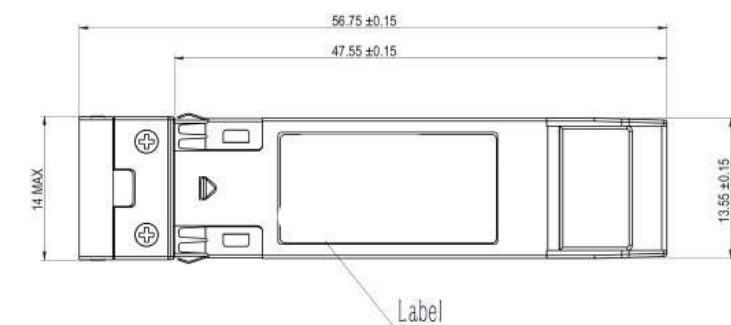
Pin Assignment

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:

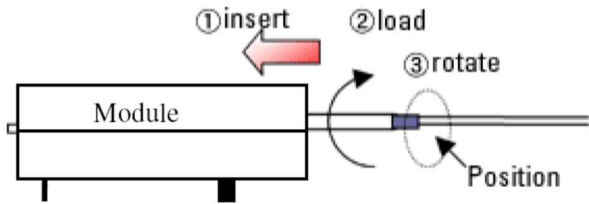
1. Module circuit ground is isolated from module chassis ground within the module.
2. Should be pulled up with 4.7k ~ 10k ohms on host board to a voltage between 3.15V and 3.6V
3. Tx_Disable is an input contact with a 4.7k Ω to 10 k Ω pullup to VccT inside the module.
4. Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc_Host with a resistor in the range 4.7k Ω to 10 k Ω . 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 >30k Ω resistors in the module.

Dimensions



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

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	Voltage	Temperature
SFP-10G-CWDM-24-yy	OPAK-C24-yy-CF	3.3V	-5°C to 75 °C

Note: yy=47, Center Wavelength=1470nm ~ yy=61, Center Wavelength=1610nm

1471 / 1491/ 1511/ 1531/ 1551/ 1571nm can reach 80km, 1591/ 1611nm can reach 70km

Modification History

Revision	Date	Description
A1	Jan.2021	Initial Release

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