

Features



- 25Gb/s serial optical interface
- Electrical interface compliant to SFF-8431 specifications for enhanced 25 Gigabit small form factor pluggable module “SFP28”
- 850nm VCSEL transmitter, PIN photo-detector
- 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface for optical transceivers
- Operating case temperature: 0 to 70°C
- All-metal housing for superior EMI performance
- Low power consumption
- Advanced firmware allow customer system encryption information to be stored in transceiver
- Cost effective SFP28 solution, enables higher port densities and greater bandwidth
- RoHS compliant

Applications

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

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units	Note
Supply Voltage	V_{cc}	0	3.6	V	
Storage Temperature	T_c	-40	85	°C	
Operating Case Temperature	T_c	0	70	°C	
Relative Humidity	RH	5	95	%	
RX Input Average Power	P_{max}	---	3	dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units	Note
Supply Voltage	V _{cc}	3.135	3.465	V	
Supply Current	I _{cc}	---	300	mA	
Case Operating Temperature	TC	0	70	°C	

Link Distances

Fiber type	850nm OFL Bandwidth	Supported Distances (meters)
50µm MMF	OM4 2000 MHz-km	2 to 100
50µm MMF	OM3 2000 MHz-km	2 to 70

SFP28 SR Operating Range for each Optical Fiber Type

Diagnostics

Parameter	Symbol	Accuracy	Unit	Notes
Temperature monitor absolute error	DMI_Temp	± 3	°C	Over operating Temp
Laser power monitor absolute error	DMI_TX	± 3 dB	dBm	
RX power monitor absolute error	DMI_RX	± 3 dB	dBm	-1dBm to -12dBm range
Supply voltage monitor absolute error	DMI_VCC	± 0.08	V	Full operating range
Bias Current	DMI_Bias	± 10%	mA	

Transmitter Electro-optical Characteristics

V_{CC} = 3.135 V to 3.465 V, T_C = 0 °C to 70 °C

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Center Wavelength	λ_t	840	850	860	nm	
RMS Spectral Width	P_m	---	---	0.6	nm	1
Average Optical Power	P_{avg}	-8.4	---	2.4	dBm	
Optical Power OMA	P_{oma}	-6.4	-1.5	3	dBm	1
Laser Off Power	P _{OFF}	---	---	-30	dBm	
Extinction Ratio	ER	2	---	---	dB	
Transmitter Dispersion Penalty	TDP	---	---	---	dB	TBD
Relative Intensity Noise	RIN	---	---	---	dB/Hz	12dB reflection
Optical Return Loss Tolerance		---	---	12	dB	
Data Rate		---	25.78	---	Gbps	
Power Consumption			800	1000	mW	
Single Ended Output Voltage Tolerance		-0.3	---	4	V	
C common mode voltage tolerance		15	---	---	mV	
TX Input Diff Voltage	V _I	180		700	mV	
TX Fault	V _{oL}	-0.3		0.4	V	At 0.7mA
Data Dependent Input Jitter	DDJ			---	UI	TBD
Data Input Total Jitter	TJ			---	UI	TBD

Note 1: per Tradeoff table 52.8, IEEE 802.3ae 2005

Receiver Electro-optical Characteristics

$V_{CC} = 3.135\text{ V to }3.465\text{ V}$, $T_C = 0\text{ }^\circ\text{C to }70\text{ }^\circ\text{C}$

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Operating Center Wavelength	λ_r	840	850	860	nm	
Receiver Sensitivity (OMA)	P_{sens}	---	---	-10	dBm	
Stressed Sensitivity (OMA)		---	---	-5.2	dBm	
LOS Assert	$LOSA$	---	---	---	dBm	TBD
LOS Deassert	$LOSD$	---	---	---	dBm	TBD
LOS Hysteresis	$LOSH$	---	---	---	dB	TBD
Overload	P_{IN}	---	---	2.4	dBm	
Receiver Reflectance		---	---	-12	dB	
Single Ended Output Voltage Tolerance		-0.3		4	V	
RX Output Diff Voltage	V_o	300		900	mV	
RX Output Rise and Fall Time	T_r/T_f	9.5			ps	20% to 80%
Total Jitter	TJ			---	UI	TBD
Deterministic Jitter	DJ			---	UI	TBD

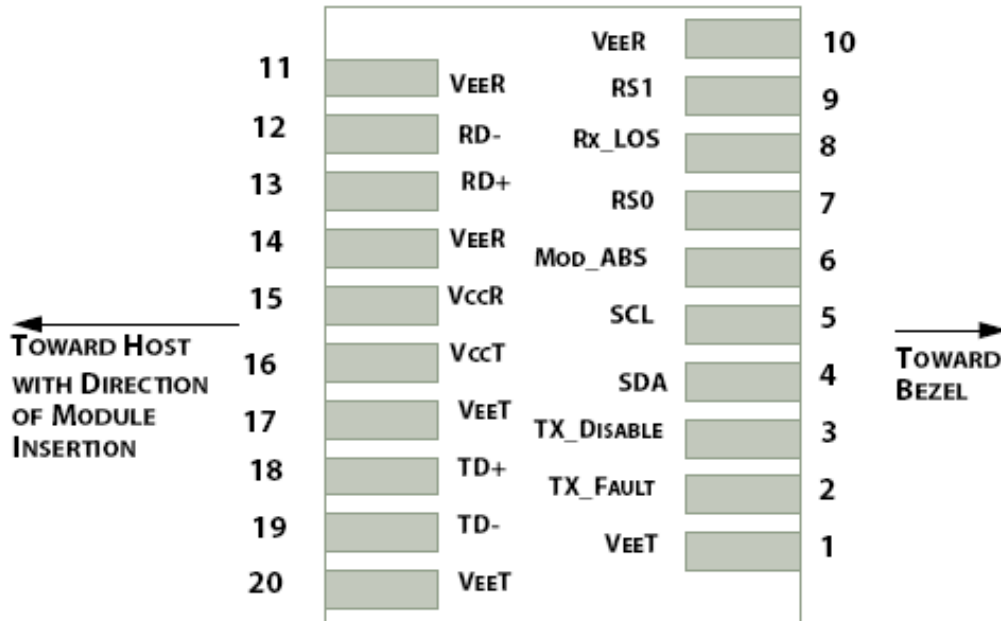
General description

The SFP28 SR module electrical interface is compliant to SFI electrical specifications. The transmitter input and receiver output impedance is 100 Ohms differential. Data lines are internally AC coupled. The module provides differential termination and reduce differential to common mode conversion for quality signal termination and low EMI. SFI typically operates over 200 mm of improved FR4 material or up to about 150mm of standard FR4 with one connector.

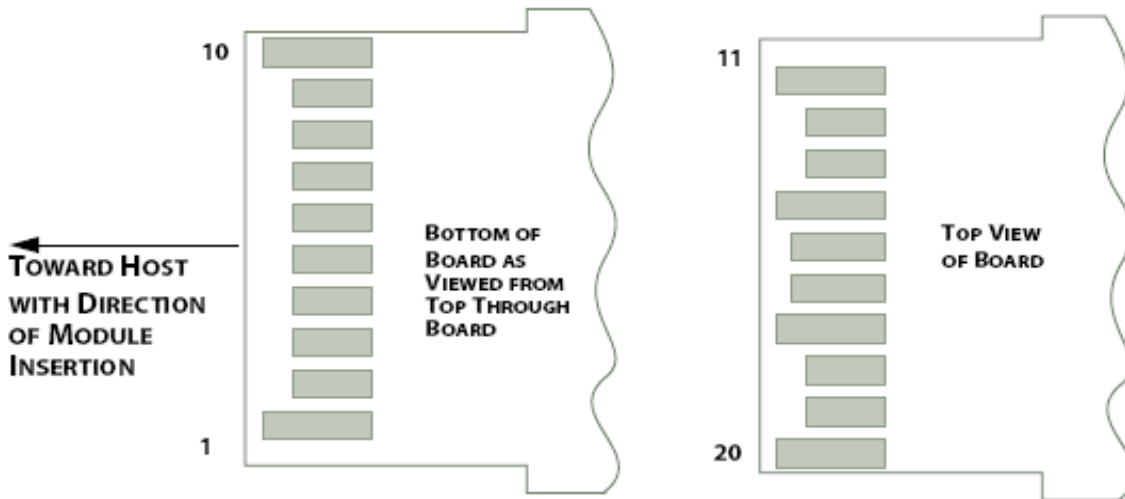
The transmitter converts 25Gbit/s serial PECL or CML electrical data into serial optical data compliant with the 25GBASE-SR standard. An open collector compatible Transmit Disable (Tx_Dis) is provided. Logic "1" or no connection on this pin will disable the laser from transmitting. Logic "0" on this pin provides normal operation. The transmitter has an internal automatic power control loop (APC) to ensure constant optical power output across supply voltage and temperature variations. An open collector compatible Transmit Fault (Tx_Fault) is provided. TX_Fault is module output contact that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7-10 kΩ. TX_Disable is a module input contact. When TX_Disable is asserted high or left open, the SFP28 module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor

The receiver converts 25Gbit/s serial optical data into serial PECL/CML electrical data. An open collector compatible Loss of Signal is provided. Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx_LOS contact is an open drain/collector output and shall be pulled up to Vcc_Host in the host with a resistor in the range 4.7-10 kΩ, or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx_LOS signal is intended as a preliminary indication to the system in which the SFP28 is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

Pin Assignment



Module Interface to Host



Module Contact Assignment

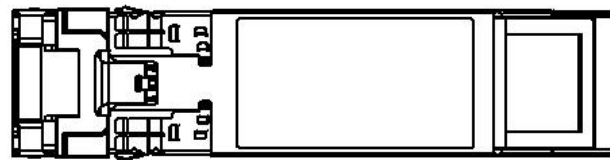
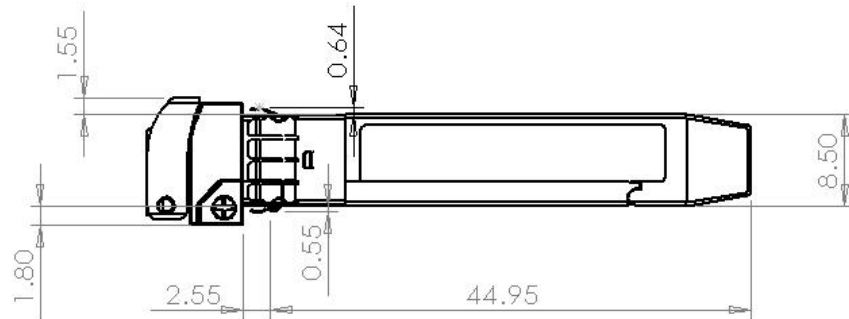
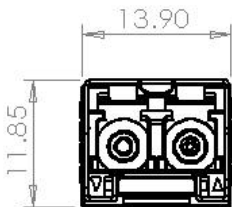
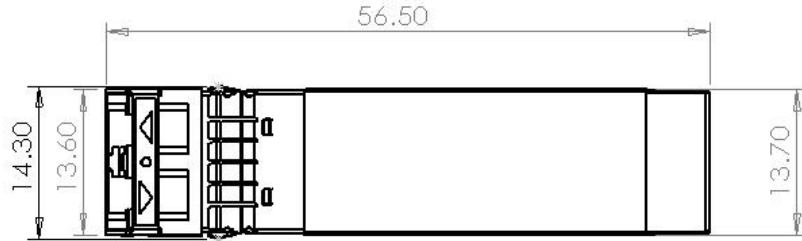
Pin Descriptions

<i>PIN</i>	<i>Logic</i>	<i>Symbol</i>	<i>Name / Description</i>	<i>Note</i>
1		VeeT	Module Transmitter Ground	1
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	2
5	LVTTL-I	SCL	2-Wire Serial Interface Clock	2
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)	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Data Output	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Receiver 3.3 V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

Note:

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

Dimensions



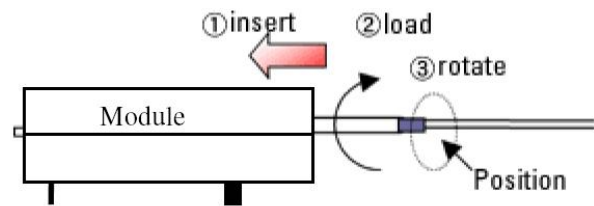
Optical Receptacle Cleaning Recommendations :

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.

*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

OP	6	C	-	S	10	-	13	-	C	M
	↑	↑		↑	↑		↑		↑	↑
Product Code:	Data Rate:	Type:	Reach:	Wavelength:	Operating Temperature:	Additional Feature:				
5=GBIC; 6=SFP-LC; 7=XFP; 8=XENPAK; 9=X2; A=SFP+ (SFP28); C=QSFP+ (QSFP28); F=CFP; P=SFP-SC; Q=SFP-MTRJ	A=155Mb/s; B=622Mb/s; C=1.25Gb/s; D=2.125Gb/s; E=2.5Gb/s; F=4.25Gb/s; G=3.1Gb/s; J=2.97G; P=6.144G; Q=7.37G; H=8.5Gb/s; K=10Gb/s; T=1/10Gb/s; L=11.09Gb/s; R=20Gb/s; X=25Gb/s; S=40Gb/s; W=100Gb/s (4x25G or 10x10G); M=100Base-X SGMII; N=100/1000Base-X SGMII;	S=Single-mode; M=Multi-mode; W=BWDM; C=CWDM; D=DWDM; T=Copper-T (RJ-45) E=GEPON ONU; F=GEPON OLT; G=GPON ONU; H=GPON OLT X=MMF/SMF	Normal: X1=Under 150m; X3=300m; X5=550m; 02=2km, 10=10km; 70=70km; A0=100km; C0=120km CWDM: 20=20dB; 24=24dB; 28=28dB	Normal: 85=850nm; 13=1310nm; 15=1550nm; 00=Copper T (RJ-45) CWDM: 27=1270nm; 47=1470nm; 61=1610nm BWDM: B3=Tx1310/Rx1550; B5=Tx1550/Rx1310; B4=Tx1310/Rx1490; B9=Tx1490/Rx1310; 51=Tx1510/Rx1570; 57=Tx1570/Rx1510; 27=Tx1270/Rx1330; 33=Tx1330/Rx1270; B2=Tx1270/Rx1577; B7=Tx1577/Rx1270 T2=2TX1310nm; T3=TX1310nm; T5=TX1550nm DWDM: 17=Channel 17 34= Channel 34 00=Channel 17~61 Tunable	C=Commercial Purpose (0~70°C); I= Industrial Purpose (Extended Range)	M=Digital Optical Monitoring (DOM) (RX_LOS for Copper TX); F=with Fiber Stub; I=with Isolator; S=Customized Style				

Model Number	Part Number	Reach	Input/Output	Signal Detect	Voltage	Temperature
SFP28-SR	OPAX-MX1-85-CB	100m	AC/AC	TTL	3.3V	0°C to 70 °C

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