Specification

Small Form Factor Pluggable

Duplex LC Receptacle – SFP28

Optical Transceivers



Ordering Information

T A S – A 1 E H 1 – 8 A Q

Model Name	Voltage	Category	Device type	Interface	Temperature	Distance
TAS-A1EH1-8AQ	3.3V	With DDMI	850 nm VSCEL	AC / AC LVTTL	0°C ~ +70°C	70m/100m OM3/OM4

Features

- 25Gb/s serial optical interface
- 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

Fiber type	850nm OFL Bandwidth	Supported Distances (meters)
50µm MMF	OM4 (3500 MHz-km)	Up to 100
50µm MMF	OM3 (2000 MHz-km)	Up to 70

General Description

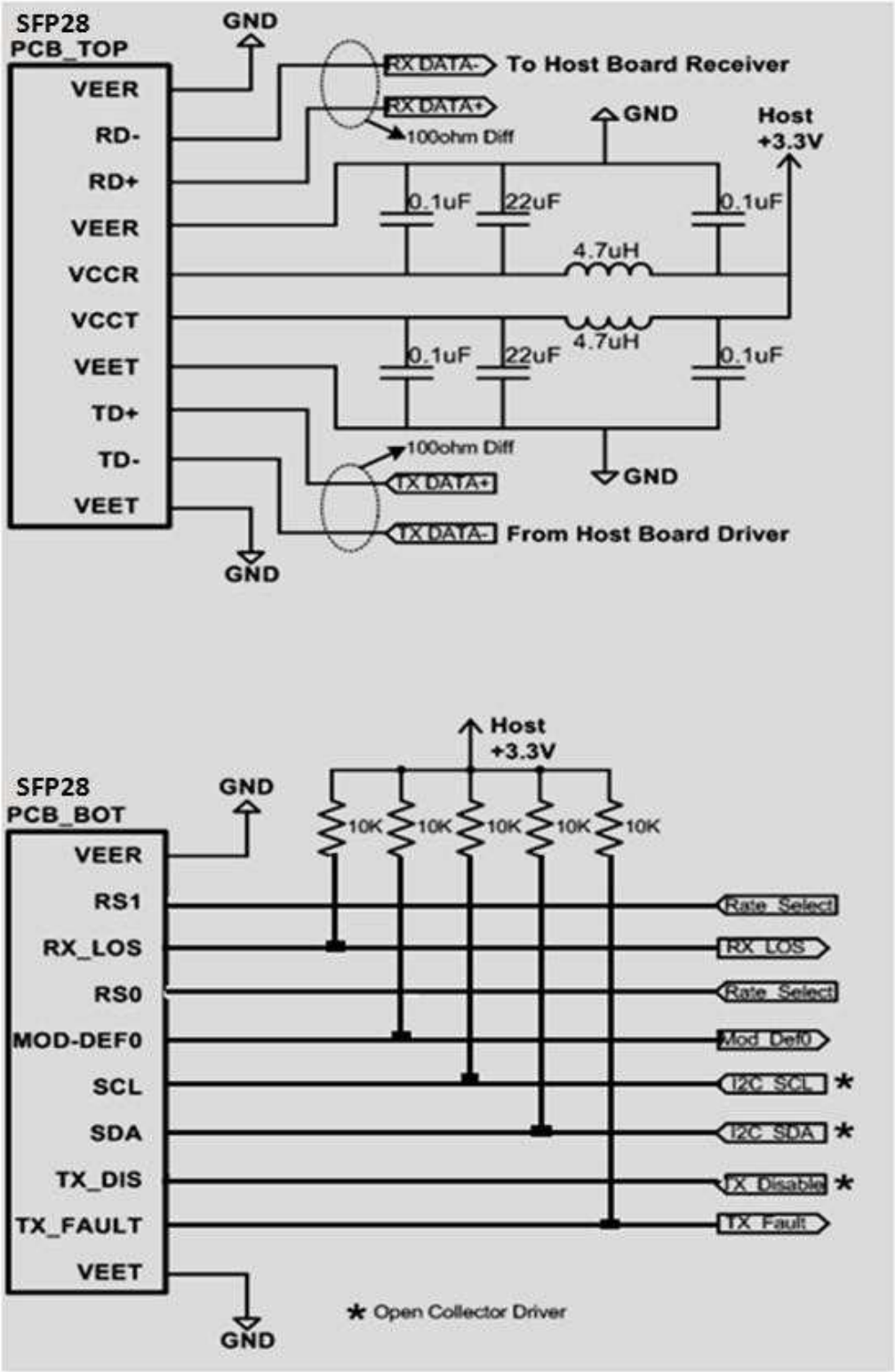
The SFP28 SR module electrical interface is compliant to SFI electrical specifications. The transmitter input and receiver output impedance is 100 Ohms differential. Data lines are internally AC coupled. The module provides differential termination and reduce differential to common mode conversion for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

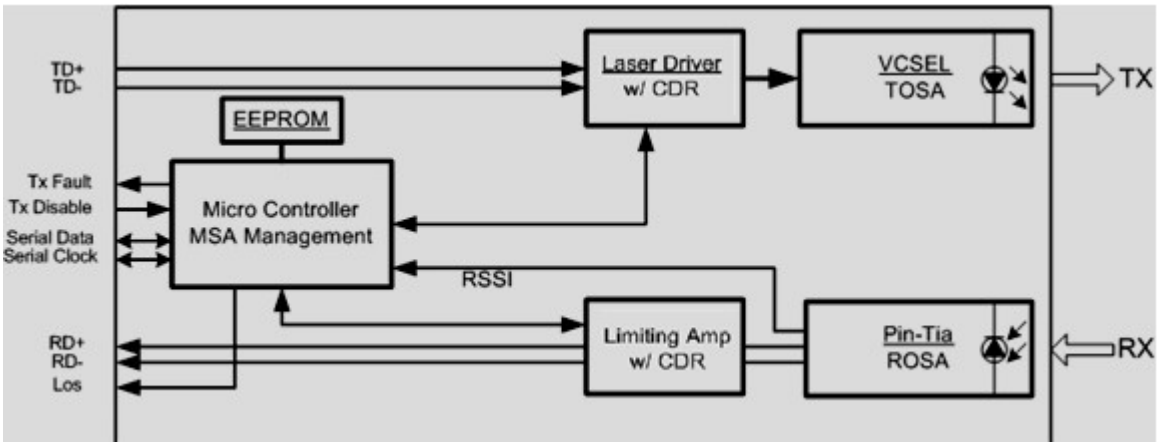
TX_Fault is module output contact that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7-10 kΩ. 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.

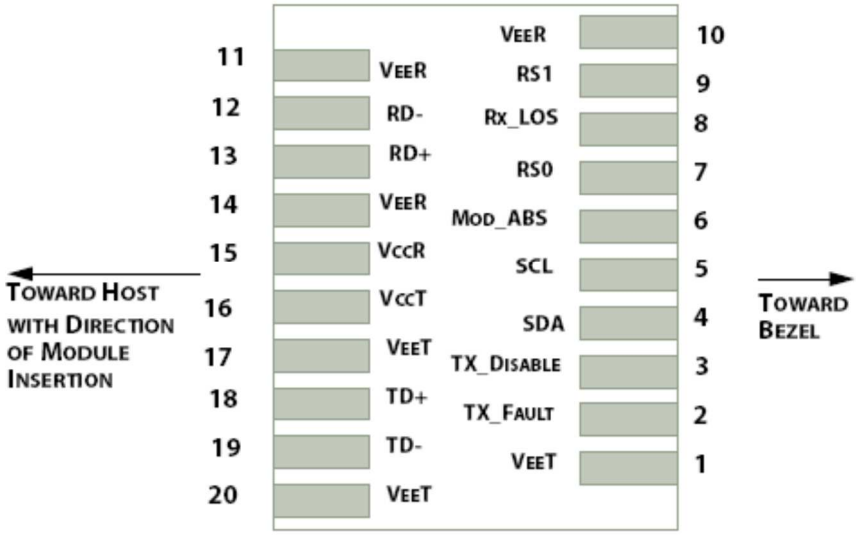
Proposed Application Schematics

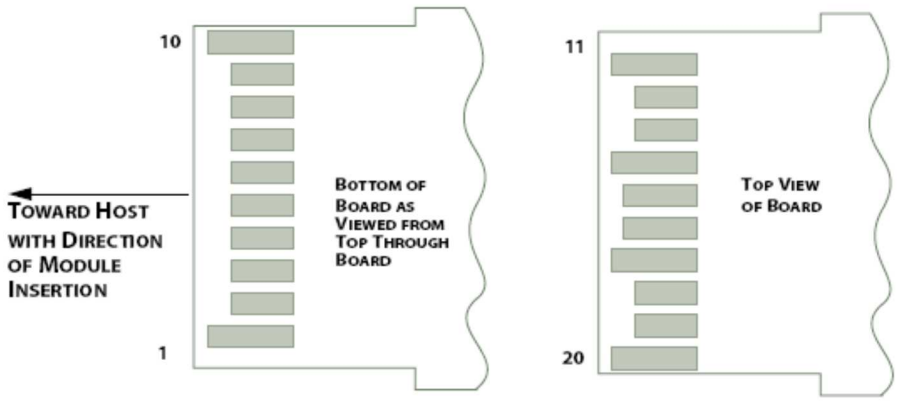


Transceiver Block Diagram



Pin Definition and Descriptions





PIN	Logic	Symbol	Name / Description	Note
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, default is high for 8G/10G application, when set to low by system, transceiver will set the bandwidth to under 4.25G to improve the sensitivity at low data rate	
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication Active LOW	
9	LVTTL-I	RS1	Transmitter Rate Select, default input is high for 8G/10G application, when set to low by system, transceiver will set the TX optical output to be compliant with low data rate fiber channel specifications	
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 Transmitter 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.

Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	V_{CC}	0	3.6	V
Storage Temperature	TS	-40	85	°C
Operating Case Temperature	TOP	0	70	°C
Relative Humidity	RH	5	85	%
Damage Threshold	DT	3.4		dBm

Recommended Operating Environment

Recommended Operating Environment specifies parameters for which the electrical and optical characteristics hold unless otherwise noted.

Parameters	Symbol	Min.	Typical	Max	Unit
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Power Supply Current	Icc			300	mA
Operating Case Temperature	T_{OP}	0	25	70	°C

Optical Characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ	840	850	860	nm	
RMS spectral width				0.6	nm	
Average Optical Power	POAVG	-8.4		2.4	dBm	
Optical Power OMA	POMA	-6.4		3	dBm	1
Lunch Power in OMA minus TDEC	POMA - TDEC	-7.3			dB	
Transmitter and Dispersion Eye Closure	TDEC			4.3	dB	
Extinction Ratio	ER	2			dB	
Optical Return Loss Tolerance				12	dB	
Average Return Power OFF Transmitter	Poff			-30	dBm	
Encircled Flux		≥ 86% @ 19um, ≤ 30% at 4.5um				2
Transmitter eye mask definition		(X1, X2, X3, Y1, Y2, Y3) = (0.3, 0.38, 0.45, 0.35, 0.41, 0.5)				3
Receiver						
Center Wavelength	λ	840	850	860	nm	
Damage Threshold		3.4			dBm	4
Average Receiver Power		-10.3			dBm	5
Average Receiver Power(Overload)				2.4	dBm	6
Receiver Power (OMA) (Overload)				3	dBm	7
Stressed Receiver Sensitivity (OMA)				-5.2	dBm	8
Receiver Reflectance				-12	dB	
LOS Assert	LOSA	-30			dBm	
LOS De-assert	LOSD			-12	dBm	
LOS Hysteresis	LOSH	0.5			dB	

Stressed Receiver Sensitivity Test Condition (Note 9)				
Stressed Eye Closure (SEC)	SEC	4.3	dB	
Stressed Eye J2 Jitter	J2	0.39	UI	
Stressed Eye J4 Jitter	J4	0.53	UI	
OMA of each Aggressor Lane		3	dBm	
Stressed Receiver Eye Mask Definition		(X1, X2, X3, Y1, Y2, Y3) = {0.28, 0.5, 0.5, 0.33, 0.33,0.4}		
As Sinusoidal Jitter for Receiver Conformance Test		See IEEE802.3bm Table 95-11		

Notes:

1. **Even if the TDEC < 0.9dB, the OMA (min) must exceed the minimum value specified here.**
2. **If measured into type A1a.2 or type A1a.3 50µm fiber in accordance with IEC 61280-1-4.**
3. **Mask margin shall be higher than 5%.**
4. **The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level on one lane. The receiver does not have to operate correctly at this input power.**
5. **Average receive power (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.**
6. **If TX ER < 5.68dB.**
7. **If TX ER > 5.68dB.**
8. **Measured with conformance test signal at TP3 for BER specified in IEEE802.3bm 95.1.1.**
9. **These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.**

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF8472 Rev11 with internal calibration mode. For external calibration mode please contact our sales.

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over-temp
Laser power monitor absolute error	DMI_TX	-2	2	dB	1
RX power monitor absolute error	DMI_RX	-2	2	dB	1
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Full-range
Bias current monitor	DMI_Ibias	-10%	10%	mA	

Notes:

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

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

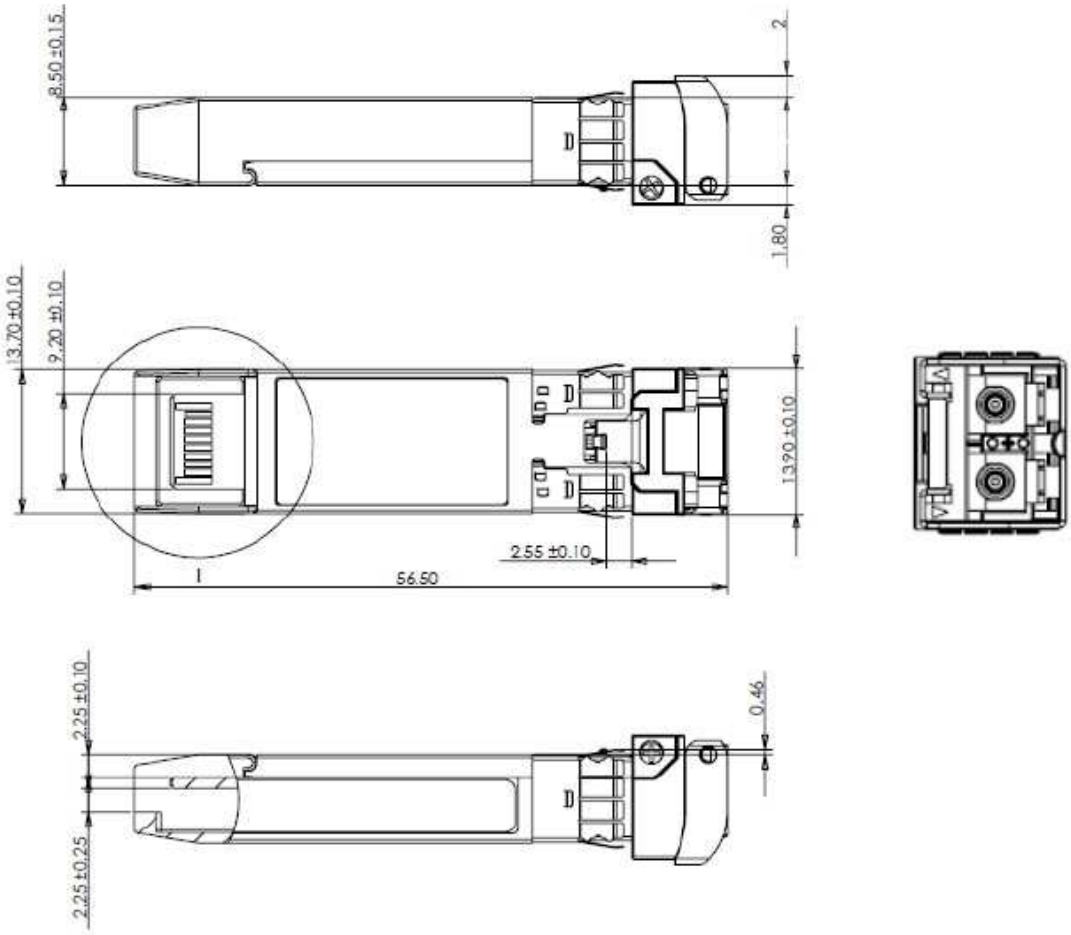
Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Overload Differential Voltage pk-pk	TP1	900			mV	
Common Mode Voltage (Vcm)	TP1	-350		2850	mV	1
Differential Termination Resistance Mismatch	TP1			10	%	At 1MHz
Differential Return Loss (SDD11)	TP1			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)	TP1			See CEI - 28G- VSR Equation 13-20	dB	
Stressed Input Test	TP1	See CEI-28G-VSR Section 13.3.11.2.1			dB	
Receiver						
Differential Voltage, pk-pk	TP4			900	mV	
Common Mode Voltage (Vcm)	TP4	-350		2850	mV	1
Common Mode Noise, RMS	TP4			17.5	mV	
Differential Termination Resistance Mismatch	TP4			10	%	At 1MHz
Differential Return Loss(SDD22)	TP4			See CEI-28G-VSR Equation 13-19	dB	

Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)	TP4			See CEI-28G-VSR Equation 13-21	dB	
Common Mode Return Loss (SCC22)	TP4			-2	dB	2
Transition Time, 20 to 80%	TP4	9.5			ps	
Vertical Eye Closure (VEC)	TP4			5.5	dB	
Eye Width at 10-15 probability (EW15)	TP4	0.57			UI	
Eye Height at 10-15 probability (EH15)	TP4	228			mV	

Notes:

1. **Vcm is generated by the host. Specification includes effects of ground offset voltage.**
2. **From 250MHz to 30GHz.**

Mechanical



Comply to SFF-8432 rev. 5.0, the improved Pluggable form factor specification.

ESD

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

This is a laser class 1 product according to IEC/EN 60825-1:2014 (Third Edition). This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

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