

25Gb/s SFP28 ER 1310nm 40km Optical Transceiver

Features

- Up to 25.78Gb/s data links
- 1310nm DFB laser and APD receiver
- Up to 40km on 9/125um SMF
- Hot-pluggable SFP footprint
- Digital diagnostic capabilities
- Class 1 laser safety certified
- Cost effective SFP28 solution, enables higher port densities and greater bandwidth
- RoHS-10 compliant and lead-free
- Single +3.3V power supply
- 2-wire interface for management specifications compliant with SFF-8472 digital diagnostic monitoring interface for optical transceivers
- All-metal housing for superior EMI performance
- Operating case temperature: 0~+70°C

Applications

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

Compliance

- Compliant with IEEE 802.3cc
- Compliant with FCC 47 CFR Part 15, Class B
- Compliant with MSA SFF-8472
- Compliant with MSA SFF-8431

Description

The SFP-25G-ER transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the DFB laser and the APD photo-detector .The module data link up to 40km in 9/125um single mode fiber.

The module optical connection is duplex LC and shall be compatible with SFP+ 28Gbps and backward compatible with legacy 10G SFP+ pluggable. The SFP28 LR module is a dual directional device with a transmitter and receiver plus a control management interface (2-wire interface) in the same physical package. 2-wire interface is used for serial ID, digital diagnostics and module control function.

The transmitter converts 25Gbit/s serial PECL or CML electrical data into serial optical data compliant with the 25GBASE-ER 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.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _S	-40	85	°C
Power Supply Voltage	V _{CC}	-0.5	3.6	V
Relative Humidity(non-condensing)	RH	5	95	%
Damage Threshold	TH _d	-3		dBm

Table1-Absolute Maximum Ratings

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T _{op}	0		+70	°C
Power Supply Voltage	V _{CC}	3.135	3.3	3.465	V
Data Rate			25.78		Gb/s
Control Input Voltage High		2		V _{CC}	V
Control Input Voltage Low		0		0.8	V
Link Distance (SMF)	D			40	km

Electrical Characteristic

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

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Power Consumption	p			1.75	W	
Supply Current	I _{CC}			520	mA	
Transmitter						
Single-ended Input Voltage Tolerance	V _{CC}	-0.3		4.0	V	
Common mode voltage tolerance		15			mV	
Differential Input Voltage Swing	V _{in,pp}	180		700	mV _{pp}	
Differential Input Impedance	Z _{in}	90	100	110	Ohm	1
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	V _{dis}	V _{CC} -1.3		V _{CC}	V	
Transmit Enable Voltage	V _{en}	V _{EE}		V _{EE} +0.8	V	2
Receiver						
Single-ended Input Voltage Tolerance	V _{CC}	-0.3		4.0	V	
Differential Output Voltage Swing	V _{out,pp}	300		900	mV _{pp}	
Differential Output Impedance	Z _{out}	90	100	110	Ohm	3
Data output rise/fall time	Tr/Tf	9.5			ps	4
LOS Assert Voltage	V _{losH}	V _{CC} -1.3		V _{CC}	V	5
LOS De-assert Voltage	V _{losL}	V _{EE}		V _{EE} +0.8	V	5
Single-ended Input Voltage Tolerance	V _{CC}	-0.3		4.0	V	

Notes:

- [1] Connected directly to TX data input pins. AC coupled thereafter.
- [2] Or open circuit.
- [3] Input 100 ohms differential termination.
- [4] These are unfiltered 20-80% values.
- [5] Loss of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Optical Characteristic

Table4-Optical Characteristic						
Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter						
Center Wavelength	λ_c	1295	1310	1325	nm	
Optical Spectral Width	$\Delta \lambda$			1	nm	
Average Optical Power	P_{AVG}	-3		6	dBm	1
Side Mode Suppression Ratio	SMSR	20			dB	
Optical Extinction Ratio	ER	3.5			dB	
Transmitter OFF Output Power	P_{off}			-30	dBm	
Transmitter and Dispersion Penalty	TDP			2.7	dB	
Optical Return Loss Tolerance	ORLT			20	dB	
Transmitter Eye Mask	Compliant with IEEE802.3ae					
Receiver						
Center Wavelength	λ_c	1295	1310	1325	nm	
Receiver Sensitivity (OMA)	Sen.			-14	dBm	2
Stressed Receiver Sensitivity (OMA)				-11.5	dBm	2
Average Receive Power		-20		-4	dBm	
Input Saturation Power (overload)	P_{sat}	-8			dBm	
LOS Assert	LOSA	-30			dBm	
LOS De-assert	LOSD			-21	dBm	
Damage Threshold	TH_d	-3			dBm	
LOS Hysteresis	LOSH	0.5			dB	

[1] Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.

[2] Measured with Light source 1310nm, ER=3.5dB; BER = $<10^{-12}$ @ PRBS=2³¹-1 NRZ.

Digital Diagnostic Functions

Table5-Digital Diagnostic Functions					
Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-3	3	dB	

Pin Description

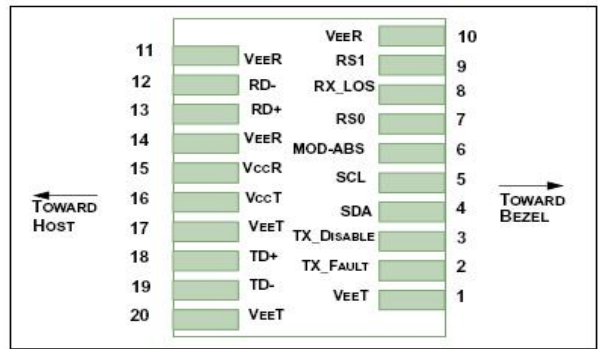


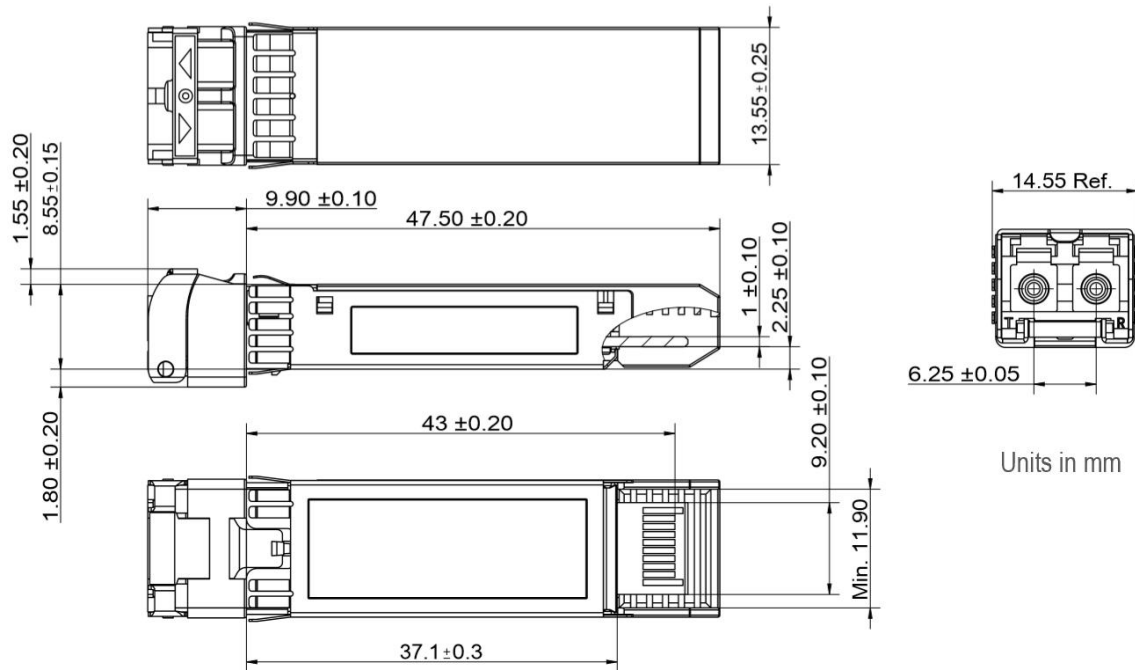
Figure1 Pin view

Pin Function Definitions

Table6-Pin Function Definitions				
Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	
3	LVTTL-I	TX_Disable	Transmitter Disable; Turns off transmitter laser output	
4	LVTTL-I/O	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i)	2
5	LVTTL-I/O	SCL	2-wire Serial Interface Clock (Same as MOD-DEF1 as defined in the INF-8074i)	2
6		MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	
7	LVTTL-I	RS0	Rate Select 0, optionally controls SFP+ module receiver.	
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated at Signal Detect)	
9	LVTTL-I	RS1	Rate Select 1, optionally controls SFP+ module transmitter	
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 Non-Inverted 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

- [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 3.47V on the host board.

Mechanical Dimensions



Units in mm

Figure2 Mechanical Outline

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