

Features:

- ☞ Support 25.78125Gb/s transmission
- ☞ Up to 40km transmission with single-mode fiber
- ☞ CWDM cooling laser is used for transmitting and APD detector is used for receiving
- ☞ Low power consumption, up to 1.2W
- ☞ Working temperature 0 °C ~ 70 °C
- ☞ Low Power Dissipation, Max 1.2W
- ☞ SFF-8419: Low Speed Electrical
- ☞ SFF-8432: Pluggable Module
- ☞ SFF-8472: Management Interface
- ☞ GR-468: Reliability Qualification
- ☞ IEEE 802.3cc: Physical Layer Specifications and Management Parameters
- ☞ ROHS-6: Environment Safety

Applications:

- ☞ Ethernet for 25GBASE-ER
- ☞ InfiniBand EDR
- ☞ Proprietary Interconnections

Specification:

● Electrical and Optical Characteristics: (Condition: T_a=T_{OP})

Parameter	Symbol	Min.	Typical	Max.	Unit
Transmitter Differential Input Voltage	+/-TX_DAT	200		2400	mV p-p
Supply Current	I _{CC}		150	300	mA
Tx_Disable Input Voltage – Low	V _{IL}	0		0.8	V
Tx_Disable Input Voltage – High	V _{IH}	2.0		V _{CC}	V
Tx_Fault Output Voltage – Low	V _{OL}	0		0.8	V
Tx_Fault Output Voltage – High	V _{OH}	2.0		V _{CC}	V
Receiver Differential Output Voltage	+/-RX_DAT	600		1400	mV p-p
Rx_LOS Output Voltage- Low	V _{OL}	0		0.8	V
Rx_LOS Output Voltage- High	V _{OH}	2.0		V _{CC}	V

● PARAMETERS

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Ref.
Supply Voltage	V _{cc}	3.14		3.46	V	
Power Consumption	P _{Con}			1.2	W	
Bit Rate	BR		25.78125		Gb/s	①
Bit Error Ratio	BER			10 ⁻¹²		②
Number of Lanes		1				
Management Interface		Serial, I2C-based, maximum frequency 400 kHz				③
Logic Input Voltage High	V _{ih}	2		V _{cc} +0.3	V	
Logic Input Voltage Low	V _{il}	-0.3		0.8	V	

① Single lane

② PRBS= 2³¹-1 @ 25.78125Gb/s

③ As defined by SFF-8672

● Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref
Transceiver Power Supply Current	I _{cc}			350	mA	
Transceiver Power On Initialization Time	T _{init}			2000	ms	
Transmitter at TP1a						
Differential Data Input Voltage Peak to Peak Swing	V _{in,pp}			900	mV	
Common Mode Noise RMS				17.5	mV	
Differential Input Return Loss	SDD22	Per OIF CEI-28G-VSR and CAUI-4 Requirements			dB	
Common Mode to Differential Conversion and Differential to Common Mode Conversion	SDD22 SCD22				dB	
Common Mode Return Loss	SCC22				dB	

Transition Time, 20% to 80%	T_r, T_f	10			ps	
Common Mode Voltage	V_{cm}	-0.3		2.8	V	
Eye Width @ 1E-15 Probability	EW15	0.46			UI	
Eye Height @ 1E-15 Probability	EH15	94			mv	
Receiver at TP4						
Differential Data Output Voltage Peak to Peak Swing	V_{opp}	300		900	mV	
Differential Output Impedance	Z_{os}	90	100	110	Ohms	
Common Mode Voltage	V_{cm}	-0.35		2.85	V	
Common Mode Noise RMS				17.5	mV	
Differential Output Return Loss	SDD22	Per OIF CEI-28G-VSR and CAUI-4 Requirements			dB	
Common Mode to Differential Conversion and Differential to Common Mode Conversion	SDD22 SCD22					
Common Mode Return Loss	SCC22			-2	dB	
Transition Time, 20% to 80%	T_r, T_f	10			ps	
Eye Width @ 1E-15 Probability	EW15	0.57			UI	
Eye Height @ 1E-15 Probability	EH15	228			mV	

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Ref.
Transmitter						
Signaling Speed lane		25.78125 ± 100ppm			Gb/s	
Optical wavelength	λ	$\lambda-6.5$	λ	$\lambda+6.5$	nm	
Average launch power	P_{avg}	+2.5		+6	dBm	①
Optical Modulation Amplitude	OMA	-4		+2.5	dBm	①
Optical Extinction Ratio	ER	3.5			dB	

Transmitter and Dispersion Penalty	TDP			2.7	dB	
Average Launch Power of OFF Transmitter	P _{OFF}			-30	dBm	
Relative Intensity Noise	RIN _{12OM} A			-130	dB/Hz	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	EMM	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}				②
Receiver						
Signaling Speed lane		25.78125 ± 100ppm			Gb/s	
Optical wavelength	λ	1260		1375	nm	
Damage threshold				3	dBm	③
Average receiver power		-13.3		2.5		
Receiver Sensitivity in OMA	RxSen.			-19	dBm	④

① Class 1 Laser Safety limit per FDA/CDRH, and EN (IEC) 60825 laser safety standards.

② Hit ratio 5×10⁻⁵ hits per sample.

③ The receiver should be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.

④ Receiver sensitivity (OMA), (max) is informative. Measured with conformance test signal for BER=5×10⁻⁵.

● Absolute Maximum Ratings: (T_C=25°C)

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _{ST}	-40	+85	°C
Operating Temperature	T _{IP}	0(-40)	+70(+85)	°C
Input Voltage	T _{CC}	0	+5	V

● Recommended Operating Environment:

Parameter	Symbol	Min.	Typical	Max.	Unit
Supply Voltage	V _{CC}	+3.0	+3.3	+3.6	V
Operating Temperature	T _{OP}	0	-	+70	°C

● **Timing Characteristics:**

Parameter	Symbol	Min.	Typical	Max.	Unit
TX_DISABLE Assert Time	t _{off}		3	10	usec
TX_DISABLE Negate Time	t _{on}		0.5	1	msec
Time to Initialize Include Reset of TX_FAULT	t _{int}		30	300	msec
TX_FAULT from Fault to Assertion	t _{fault}		20	100	usec
TX_DISABLE Time to Start Reset	t _{reset}	10			usec
Receiver Loss of Signal Assert Time (Off to On)	T _{A,RX_LOS}			100	usec
Receiver Loss of Signal Assert Time (On to Off)	T _{d,RX_LOS}			100	usec

● **Serial ID Memory Contents:**

Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP28)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	Gigabit Ethernet 1000Base-SX & Fiber Channel
11	1	Encoding	8B10B (01h)
12	1	BR,Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	Reserved	(0000h)
15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP28 vendor name
36	1	Reserved	
37-39	3	Vendor OUI	SFP28 transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number
56-59	4	Vendor rev	Revision level for part number
60-62	3	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
Extended ID Fields			
64-65	2	Option	Indicates which optical SFP28 signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)

84-91	8	Date code	Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	specific date, read only

● Digital Diagnostic Monitoring Functions

2-wire serial bus address 1010001X (A2h) is used to access measurement of transceiver temperature, internally measured supply voltage, TX bias current, TX optical output power and RX optical input power which are shown in table 1. Each diagnostic parameter has a corresponding high alarm, low alarm, high warning and low warning threshold which are shown in table 2.

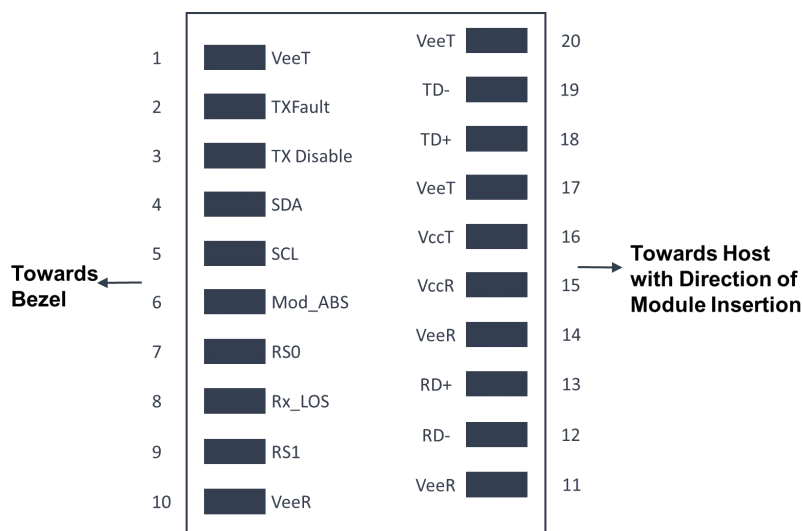
Table 1. Diagnostic Parameters

Diagnostic Parameter	Range		LSB	Accuracy	Address	Note
	Min	Max				
Transceiver Temperature (Temp)	-50[°C]	+80[°C]	1/256[°C]	±3[°C]	96-97	A 16bit signed two's complement value
Supply Voltage (Voltage)	+3.0[V]	+3.6[V]	100[μV]	±3[%]	98-99	A 16bit unsigned integer
TX Bias Current (Bias)	3[mA]	95[mA]	2.0[μA]	±10[%]	100-101	A 16bit unsigned integer
TX Optical Output Power (TX Power)	+2.5[dBm]	+6[dBm]	0.1[μW]	±3 [dB]	102-103	A 16bit unsigned integer
RX Optical Input Power (RX Power)	-19[dBm]	+0[dBm]	0.1[μW]	±3 [dB]	104-105	A 16bit unsigned integer

Table 2. Alarm and Warning Thresholds

Parameter	Warning		Alarm		Unit
	Low	High	Low	High	
Transceiver Temperature (Temp)	-10	+80	-20	+90	°C
Supply Voltage (Voltage)	+3.13	+3.47	+3.0	+3.6	V
TX Bias Current (Bias)	5	85	3	95	mA
TX Optical Output Power (TX Power)	+2.5	+6	+1.5	+7	dBm
RX Optical Input Power (RX Power)	-18	+1	-19	+2	dBm

Pin Assignment



Pin out of Connector Block on Host Board

● Pin Description:

PIN	Symbol	Description	Ref.
1	VeeT	Module Transmitter Ground	①
2	TX_Fault	Module Transmitter Fault	②
3	TX_Disable	Transmitter Disable, turns off the laser output	
4	SDA	2-wire Serial Interface Data Lane	
5	SCL	2-wire Serial Interface Clock	
6	Mod_ABS	Module Absent, connected To VeeT or VeeR in the module	
7	RS0	Rate Select 0, optionally controls SFP+ module Receiver	
8	RX_LOS	Receiver Loss of Signal Indication	
9	RS1	Rate Select 1, optionally controls SFP+ module transmitter	
10	VeeR	module receiver ground	①
11	VeeR	module receiver ground	①
12	RD-	Receiver inverted Data Output	
13	RD+	Receiver Non-inverted Data Output	
14	VeeR	Module Receiver ground	①
15	VccR	Module Receiver 3.3V Supply	

16	VccT	Module Transmitter 3.3V Supply	
17	VeeT	Module Transmitter Ground	①
18	TD+	Transmitter Non-inverted Data Input	
19	TD-	Transmitter Inverted Data Input	
20	VeeT	Module Transmitter Ground	①

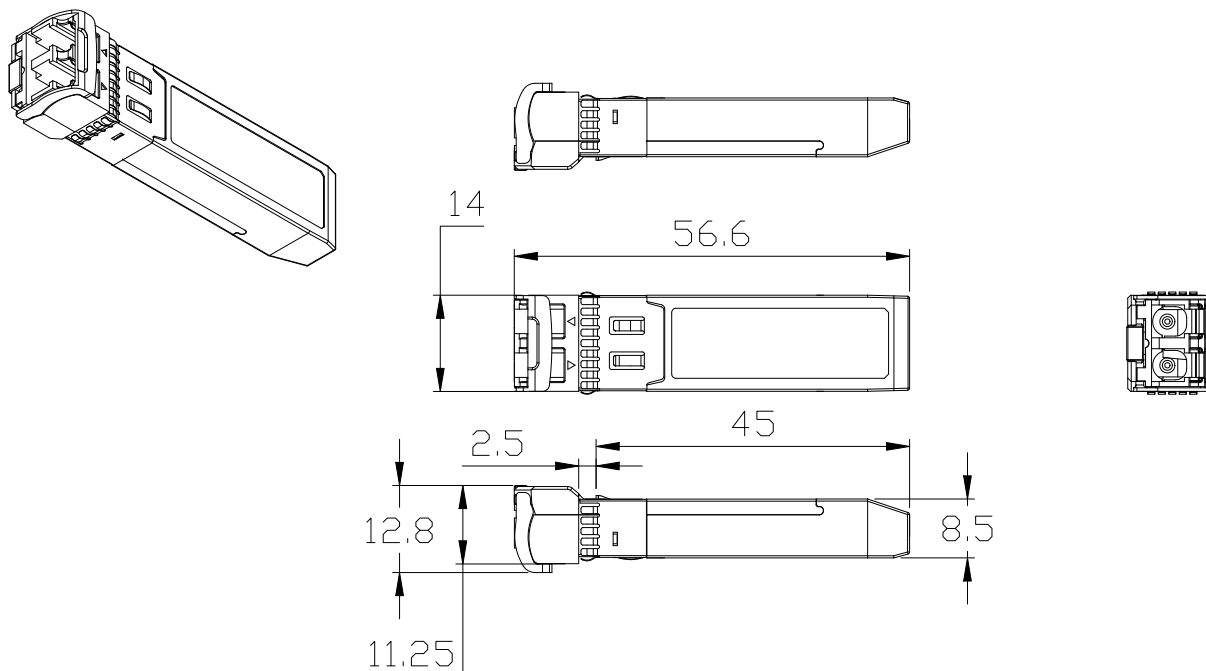
- ① GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are reference to this potential unless otherwise noted. Module circuit ground is isolated from module chassis ground within the module.
- ② Open collector, should be pulled up with 4.7~10K ohms on the host board to a voltage between 3.15V and 3.6V

● Ordering information:

Part Number	Package	Rate	Fiber type	Distance	Wavelength (nm)	Temperature (°C)
TM-PEEDx -443E(I)	SFP28	25Gbps	SMF	40km	1270	0/+70
TM-PEEEx -443E(I)	SFP28	25Gbps	SMF	40km	1290	0/+70
TM-PEEFx -443E(I)	SFP28	25Gbps	SMF	40km	1310	0/+70
TM-PEEGx -443E(I)	SFP28	25Gbps	SMF	40km	1330	0/+70
TM-PEEHx -443E(I)	SFP28	25Gbps	SMF	40km	1350	0/+70
TM-PEEJx -443E(I)	SFP28	25Gbps	SMF	40km	1370	0/+70
TM-PEEKx -443E(I)	SFP28	25Gbps	SMF	40km	1390	0/+70
TM-PEELx -443E(I)	SFP28	25Gbps	SMF	40km	1410	0/+70
TM-PEEMx -443E(I)	SFP28	25Gbps	SMF	40km	1430	0/+70
TM-PEENx -443E(I)	SFP28	25Gbps	SMF	40km	1450	0/+70
TM-PEEOx -443E(I)	SFP28	25Gbps	SMF	40km	1470	0/+70
TM-PEEPx -443E(I)	SFP28	25Gbps	SMF	40km	1490	0/+70
TM-PEEQx -443E(I)	SFP28	25Gbps	SMF	40km	1510	0/+70
TM-PEERx -443E(I)	SFP28	25Gbps	SMF	40km	1530	0/+70
TM-PEESx -443E(I)	SFP28	25Gbps	SMF	40km	1550	0/+70

TM-PEET _x -443E(I)	SFP28	25Gbps	SMF	40km	1570	0/+70
TM-PEEU _x -443E(I)	SFP28	25Gbps	SMF	40km	1590	0/+70
TM-PEEV _x -443E(I)	SFP28	25Gbps	SMF	40km	1610	0/+70

● **Mechanical Dimensions:**



● RECOMMENDED HOST BOARD SCHEMATIC

