

Features

- ✧ Compliant with SFP+ MSA(SFF-8431)
- ✧ Monitoring Interface Compliant with SFF-8472
- ✧ Single +3.3V Power Supply
- ✧ Hot-Pluggable
- ✧ Built-in dual CDR
- ✧ Support 25.78 Gb/s Data Links
- ✧ Up to 40Km on 9/125um SMF
- ✧ Very low EMI and excellent ESD protection
- ✧ Operating Case Temperature:0℃~+70℃
- ✧ Power Dissipation < 1.8W
- ✧ RoHS Compliant Products

Applications

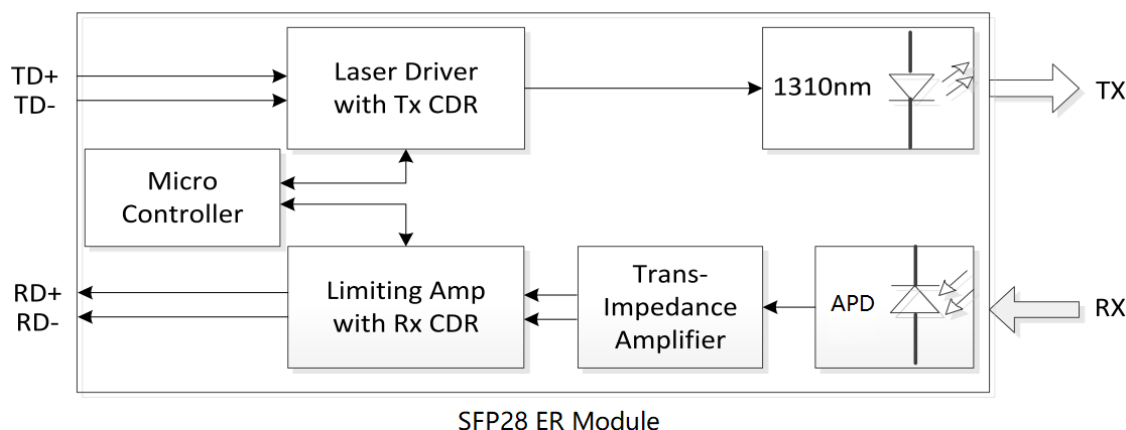
- ✧ 25GbE Ethernet
- ✧ CPRI 10
- ✧ Other Optical Links

Ordering information

PN	Tx/Rx	Wavelength	Media	Transmission Distance(km)
HSFP28-1351	EML/APD	1310nm	Single mode fiber	40

Description

HSFP28-1351 is SFP28 ER module for duplex optical data communications support 25.78 Gb/s 40Km data links. The transmitter section uses a high performance 1310nm EML and the receiver is an Avalanche Photodiode (APD) mounted in an optical header and a limiting post-amplifier IC.



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Specification

Electrical Characteristics: (Condition: $T_a = T_{OP}$)

Parameter	Symbol	Min.	Typical	Max.	Unit
Link Distance with G.652 ^{*Note1}	-	-	-	40	Km
Power Dissipation	-	-	-	1.8	W
Transmitter:					
Transmitter Differential Input Volt ^{*Note2}	+/-TX_DAT	360		1400	mV p-p
Input Impedance (Differential)	Z _{in}		100		Ω
Tx_Disable Input Voltage – Low	V _{IL}	-0.3		0.8	V
Tx_Disable Input Voltage – High	V _{IH}	2.0		V _{CC} +0.3	V
Tx_Fault Output Voltage – Low	V _{OL}	-0.3		0.8	V
Tx_Fault Output Voltage – High	V _{OH}	2.0		V _{CC} +0.3	V
Receiver:					
Receiver Differential Output Volt ^{*Note2}	+/-RX_DAT	400		900	mV p-p
Output Impedance (Differential)	Z _{out}		100		Ω
Rx_LOS Output Voltage- Low	V _{OL}	-0.3		0.8	V
Rx_LOS Output Voltage- High	V _{OH}	2.0		V _{CC} +0.3	V

Note1: This transceiver is targeted for long reach application with high power transmitter. Thus, for optical loopback testing please ensure appropriate optical attenuator is included.

Note2: AC coupled.

Optical Characteristics: (Condition: $T_a = T_{OP}$)

Transmitter:

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate	B	-	25.78	-	Gb/s
Centre Wavelength	λ_c	1295		1310	nm
Output Spectral Width	$\Delta\lambda(-20dB)$	-	-	1	nm
Average Output Power ^{*Note1}	P _o	-3	-	6	dBm
Extinction Ratio ^{*Note2}	E.R.	4	-	-	dB
Transmitter Dispersion Penalty	TDP	-		2.7	dB
Transmitter eye mask	{0.31,0.4,0.45,0.34,0.38,0.4}				

Receiver:

Parameter	Symbol	Min.	Typical	Max.	Unit
Date Rate	B	-	25.78	-	Gb/s
Operating Wavelength	λ_c	1295	-	1325	nm

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Average Receiver Power ^{*Note3}	P _{avg}	-21	-	-4	dBm
Sensitivity OMA	P _{OMA}	-19	-	-	dBm
Stressed Sensitivity OMA	P _{SOMA}	-16.5	-	-	dBm
Receiver Reflectance	R _r	-	-	-26	dB
Signal Detect Threshold-De-Assert	S _D	-	-	-23	dBm
Signal Detect Threshold-Assert	S _A	-35	-	-	dBm
Hysteresis	-	0.5	-	5	dB

Note1: Measured with 9/125μm single-mode fiber.

Note2: Measured with a PRBS 2³¹-1 test pattern @25.78Gb/s

Note3: Measured with ER=8dB, 2³¹-1 PRBS data pattern, BER less than 5E-5@25GBE.

Absolute Maximum Ratings: (T_C=25℃)

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _{ST}	-40	+85	℃
Operating Temperature	T _{IP}	0	+70	℃
Input Voltage	T _{CC}	0	+4.0	V
Operating Relative Humidity	RH	5	85	%

Note: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Environment:

Parameter	Symbol	Min.	Typical	Max.	Unit
Supply Voltage	V _{CC}	+3.135	+3.3	+3.465	V
Operating Temperature	T _{OP}	0	-	+70	℃

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge(ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>500 V)
Electrostatic Discharge(ESD) To the Duplex Receptacle	IEC61000-4-2	Class 2(>4000V)
Electromagnetic Interference (EMI)	FCC Part 15 Class B	Compatible with standards
Immunity	IEC61000-4-3	Compatible with standards
Laser eye safety	FDA21CFR1040.10and1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product
Component Recognition	UL and CE	Compatible with standards
ROHS	ROHS6	Compatible with standards

Note: For the latest certification information, please check with Hi-Optel.

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Pin Assignment

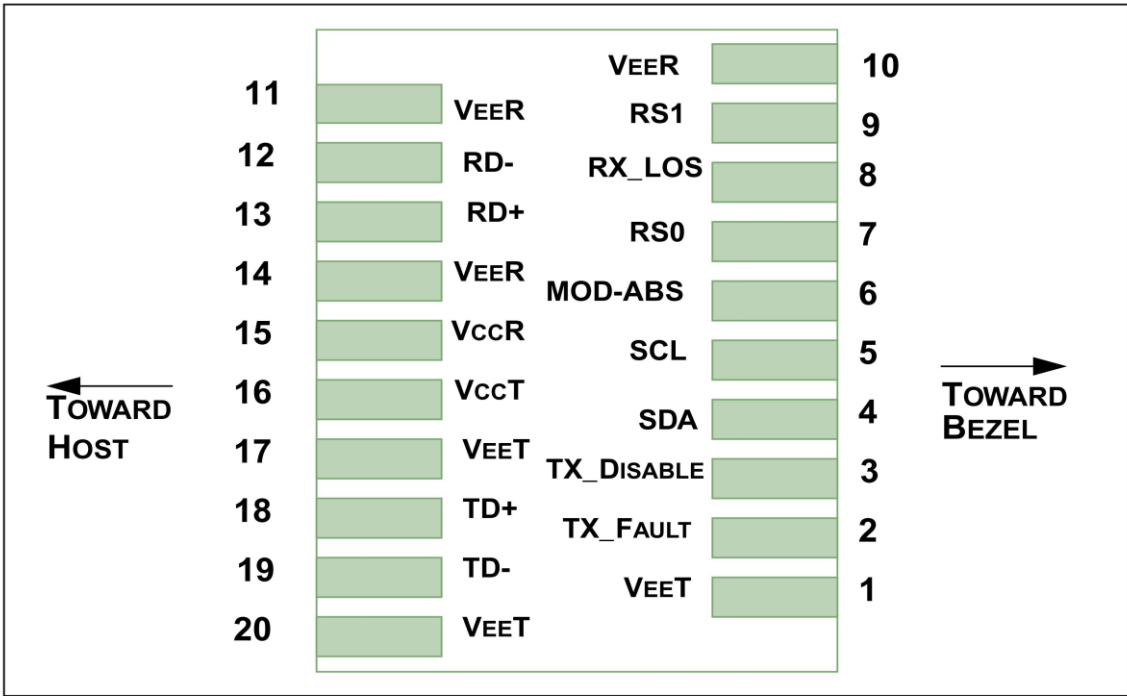


Figure 1 Host PCB SFP+ Pad Pinout Top View

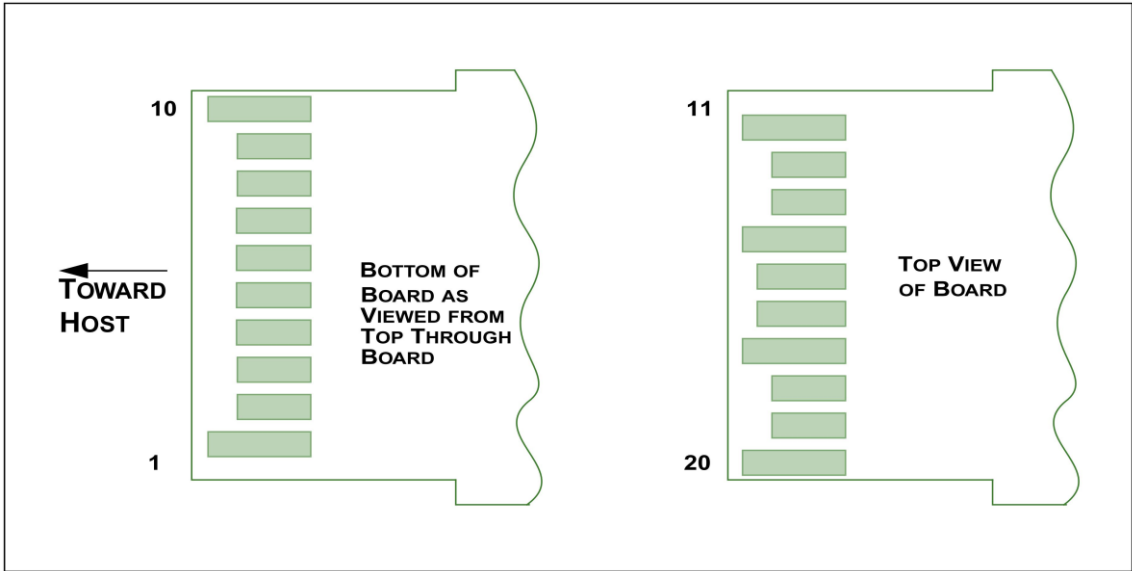


Figure 2 SFP+ Module PCB Pinout

Pin Description

Pin	Symbol	Name/Description	Ref
1	VeeT	Transmitter Ground(Common with Receiver Ground)	1
2	Tx Fault	Transmitter Fault. Low normal operation, High Fault indication	
3	Tx Disable	Transmitter Disable. Laser output disabled on high or open	2
4	SDA	Module Definition 2.Data line for Serial ID	3
5	SCL	Module Definition 1.Clock line for Serial ID	3
6	MOD-ABS	Module Definition 0.Grounded within the module	
7	RS0	Rate Select 0, optionally controls SFP28 module receiver. LVTTL Logic.	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	4
9	RS1	Rate Select 1, optionally controls SFP28 module transmitter. LVTTL Logic.	5
10	VeeR	Receiver Ground(Common with Transmitter Ground)	1
11	VeeR	Receiver Ground(Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out.AC Coupled	
13	RD+	Receiver Non-inverted DATA out.AC Coupled	
14	VeeR	Receiver Ground(Common with Transmitter Ground)	1
15	VccR	Receiver Power Supply	
16	VccT	Transmitter Power Supply	
17	VeeT	Transmitter Ground(Common with Receiver Ground)	1
18	TD+	Transmitter Non-inverted DATA in.AC Coupled	
19	TD-	Transmitter Inverted DATA in.AC Coupled	
20	VeeT	Transmitter Ground(Common with Receiver Ground)	1

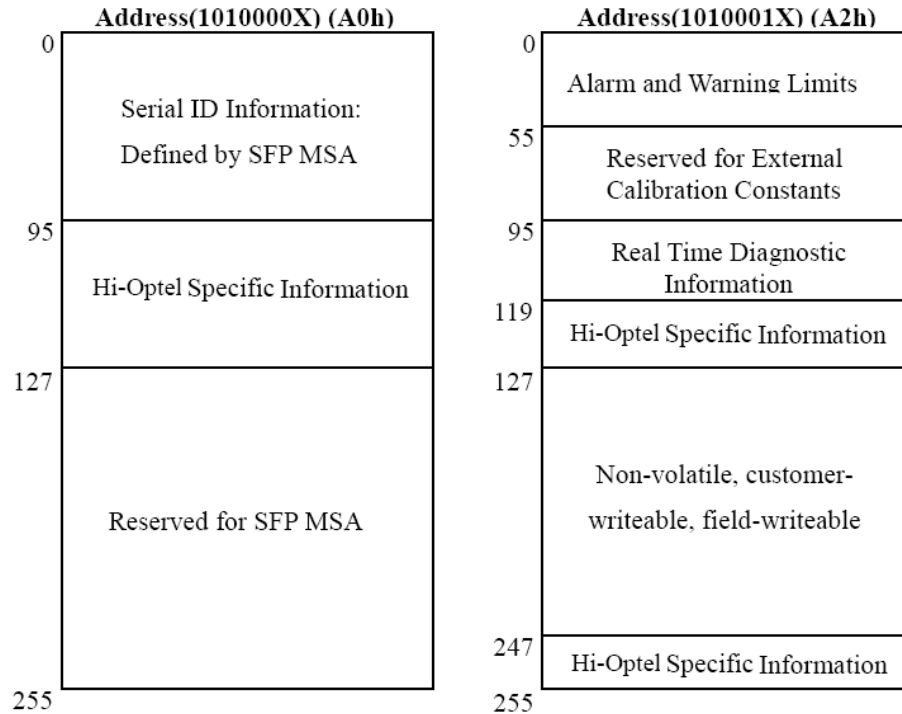
Notes:

1. Circuit ground is internally isolated from chassis ground. VeeR and VeeT may be internally connected within the SFP28 module.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V.
4. LOS is open collector output. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
5. Pulled low to VeeR or VeeT with a >30K resistor within the SFP28 module.

Data Field Descriptions

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented.

The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 11.4.



Digital Diagnostic Monitor Characteristics

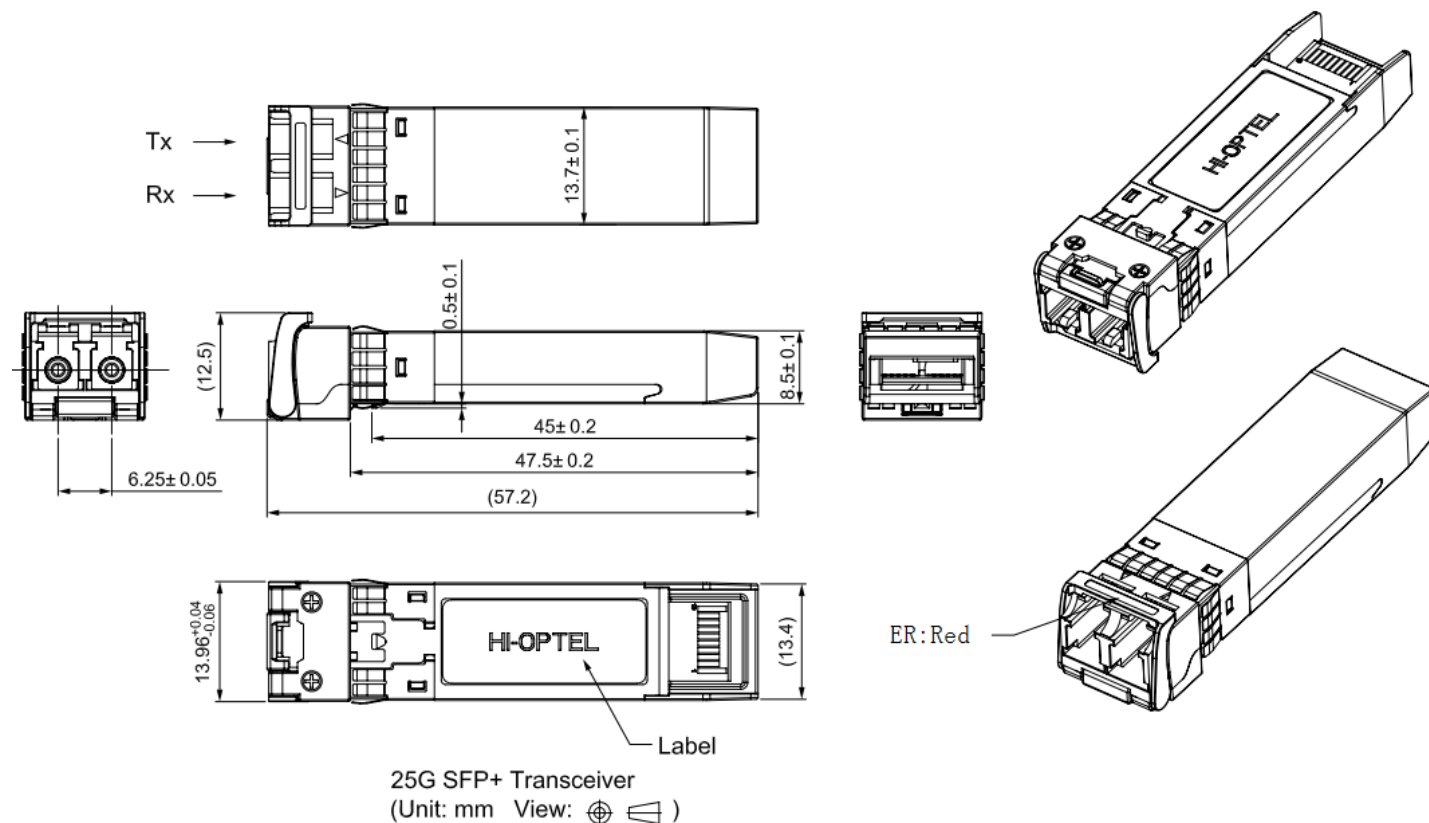
A2h address	Parameter	Calibration	Range	Unit	Accuracy
96-97	Temperature	Internal	Note 1	℃	±5℃
98-99	Vcc	Internal	3.13 to 3.47	V	±3%
100-101	Tx bias	Internal	Note 2	mA	±10%
102-103	Tx power	Internal	-4 to 4	dBm	±3dB
104-105	Rx Power	Internal	-6 to -22	dBm	±3dB

Note: 1) Junction temperature of temperature sensing device.
2) Specified by nominal value

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Mechanical Dimensions:



Release history:

Version No.	Data	Description
Preliminary	2020.9.2	Preliminary datasheet
1.0	2020.11.24	Formally issued
1.1	2021.4.27	Revised according to IEEE802.3cc