Features

◎ Supports 25.78125Gb/s optical interface
◎ Maximum link length of 10km on SMF
◎ 1310nm DFB laser and PIN receiver
◎ Hot-pluggable SFP28 footprint
◎ Built-in digital diagnostic functions
◎ Single +3.3V power supply
◎ Power consumption less than 1.2W
◎ Operating case temperature: -5~+70°C
◎ Duplex LC connector
◎ Internal CDR on both transmitter and receiver channel

Applications

◎ 25GBASE-LR Ethernet
◎ 25.78125 Gb/s single lane 100GE LR4

Standard

◎ Compliant with SFF-8402 and SFF-8472
◎ Compliant to SFF-8431 and SFF-8432
◎ Compliant with IEEE 802.3by 25GBASE-LR
◎ Compliant with FCC 47 CFR Part 15, Class B
◎ Compliant with Telcordia GR-468-CORE
◎ RoHS Compliant

Table 1. Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge(ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000V for SFI pins, >2000V for other pins.)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards

Electromagnetic nterference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11	Compatible with Class I laser product
RoHS	2002/95/EC 4.1&4.2 2011/65/EU	Compatible with standards

Product Description

The SFP28 transceivers are high performance, cost effective modules supporting data rate of 25Gbps and Maximum link length of 10km on SMF.

The transceiver consists of three sections: a Un-cooled 1310nm DFB laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.

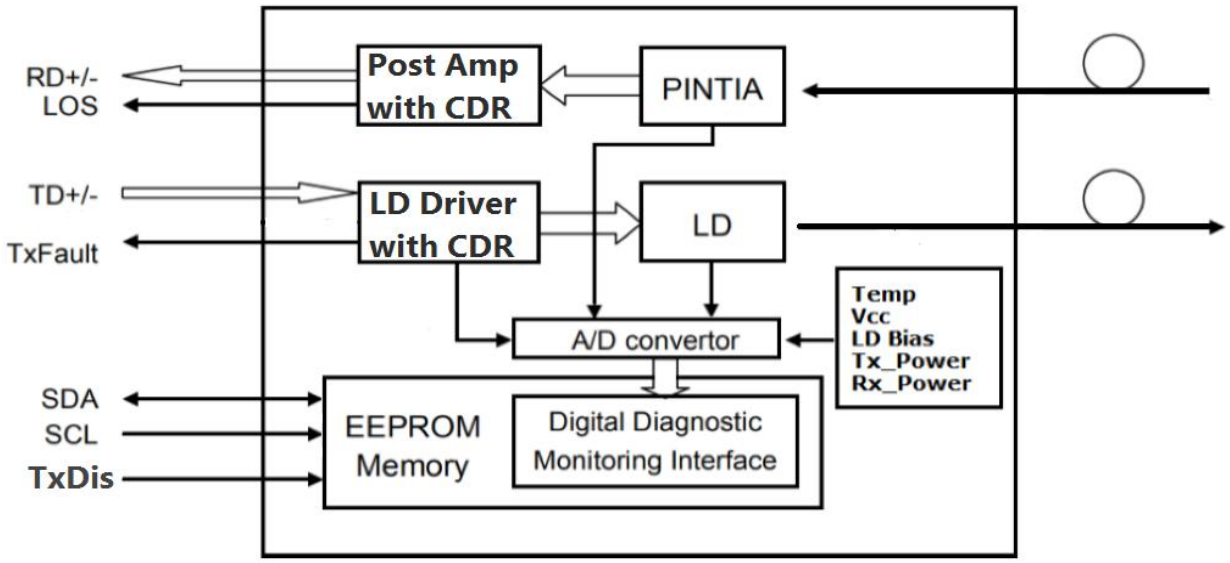

Figure 1.Transceiver functional Block Diagram

Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

(Exceeding the limits below may damage the transceiver module permanently)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Maximum Supply Voltage	VCC	-0.5	-	+4.0	V	
Storage Temperature	TS	-40	-	+85	°C	
Case Operating Temperature	TA	-10	-	+75	°C	
Relative Humidity	RH	5	-	85	%	1

Notes:

1. Non-condensing.

Recommend Operation Environment

Table 3. Recommend Operation Environment

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Data Rate	BR	-	25.78	-	Gbps	
Power Supply Voltage	VCC	3.13	3.3	3.47	V	
Power Supply Current	ICC	-	-	350	mA	
Power Dissipation	PD	-	-	1.2	W	
Case Operating Temperature	TA	-5	-	+70	°C	
Transmission Distance	TD	-	-	10	km	1

Notes:

1. Measured with ITU-T G.652 SMF

Optical Characteristics

Table 4. Optical Characteristics(TOP = -5 to +70 °C, VCC = 3.13 to 3.47 V)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Optical Center Wavelength	λC	1290	1310	1330	nm	
Data Rate	BR	-	25.78	-	Gbps	
Average Output Power	PO	-7	-	+2	dBm	1
Optical Modulation Amplitude	POMA	-4	-	+2.2	dBm	1
Optical Extinction Ratio	ER	3.5	-	-	dB	2

RMS Spectral Width (-20dB)	Δλ	-	-	1	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Relative Intensity Noise	RIN	-	-	-130	dB/Hz	
Average Launch power of Tx OFF	POFF	-	-	-20	dBm	
Optical Return Loss	ORL	-	-	20	dB	
Transmitter Reflectance	TR	-	-	-12	dB	
Optical Eye Mask	Compliant with IEEE 802.3by					2
Receiver						
Center Wavelength Range	λC	1260	-	1620	nm	
Data Rate	BR	-	25.78	-	Gbps	
Receiver Sensitivity(OMA)	RSEN	-	-	-11.3	dBm	3
Receiver Sensitivity	RSEN	-	-	-10.4	dBm	3
Maximum Input Power	PMAX	3	-	-	dBm	3
LOS Assert	LOSA	-30	-	-	dBm	
LOS De-Assert	LOSD	-	-	-14	dBm	
LOS Hysteresis	LOSH	0.5	-	5	dB	
Receiver Reflectance	RR	-	-	-12	dB	

Notes:

1. The optical power is launched into MMF.
2. Measured with worst ER=3.5dB, RPBS 2^31-1 test pattern @25.78125Gbs.
3. Measured with worst ER=3.5dB, RPBS 2^31-1 test pattern @25.78125Gbs BER=<10^-5.

Electrical Characteristics

Table 5. Electrical Characteristics(TOP = -5 to +70 °C, VCC = 3.13 to 3.47 V)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Differential Data Input Amplitude	VIN,P-P	180	-	1200	mVpp	1
Input Differential Impedance	ZIN	80	100	120	Ω	
Transmitter Fault Output-High	VOH	2.0	-	VCC	V	
Transmitter Fault Output-Low	VOL	0	-	0.8	V	
Transmitter Disable Voltage- High	VIH	2.0	-	VCC	V	
Transmitter Disable Voltage- low	VIL	0	-	0.8	V	

Receiver						
Differential output voltage swing	VOUT,P-P	300	-	850	mVpp	1
Output Differential Impedance	ZOUT	80	100	120	Ω	
Data Output Rise/Fall time 20%~80%	Tr/Tf	-	-	-	ps	2
LOS Output Voltage-High	VLOSH	2.0	-	VCC	dBm	3
LOS Output Voltage-Low	VLOSL	-	-	0.8	dBm	3

Notes:
1. CML input/output, internally AC-coupled and terminated.
2. Measured with Module Compliance Test Board and OMA test pattern.
3. LOS is an open collector output. Should be pulled up with 4.7kΩ to 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.

Table 6. Timing Requirements of Control and Status I/0

Parameter	Symbol	Min	Typ	Max	Unit
Tx Disable Negate Time	t_on	-	-	1	ms
Tx Disable Assert Time	t_off	-	-	10	μs
Time To Initialize, including Reset of Tx Fault	t_init	-	-	300	ms
Tx Fault Assert Time	t_fault	-	-	100	μs
Tx Fault To Reset	t_reset	10	-	-	μs
LOS Assert Time	t_loss_on	-	-	100	μs
LOS De-assert Time	t_loss_off	-	-	100	μs
Rate-Select Change Time	t_ratesel	-	-	10	μs
Serial ID Clock Rate	f_serial_clock	-	100	400	KHz
SDA, SCL, MOD_ABS High Level	VH	2.0	-	VCC	V
SDA, SCL, MOD_ABS Low Level	VL	-	-	0.8	V

Pin Assignment

Table 7. Pin Descriptions

Pin	Symbol	Name/Description	Logic	Notes
1	VEET	Module Transmitter Ground		
2	Tx_Fault	Module Transmitter Fault	LVTTL-O	1
3	Tx_Disable	Transmitter Disable, Turns off transmitter laser output	LVTTL-I	2
4	SDA	2 wire serial interface data input/output (SDA)	LVTTL-I/O	1
5	SCL	2 wire serial interface clock input (SCL)	LVTTL-I	1
6	MOD_ABS	Module Absent, connected to VeeT or VeeR in the module		1
7	RS0	Receiver Rate Select, Not Used for this product	LVTTL-I	
8	Rx_LOS	Loss of Signal indication, Logic 0 indicates normal operation	LVTTL-O	3
9	RS1	Transmitter Rate Select, Not Used for this product	LVTTL-I	
10	VEER	Module Receiver Ground		
11	VEER	Module Receiver Ground		
12	RD-	Receiver Inverted Data Output, AC Coupled	CML-O	4
13	RD+	Receiver Non-Inverted Data Output, AC Coupled	CML-O	4
14	VEER	Module Receiver Ground		
15	VCCR	Module Receiver 3.3 V Supply		
16	VCCT	Module Transmitter 3.3 V Supply		
17	VEET	Module Transmitter Ground		
18	TD+	Transmitter Non-Inverted Data Input, AC Coupled	CML-I	5
19	TD-	Transmitter Inverted Data Input, AC Coupled	CML-I	5
20	VEET	Module Transmitter Ground		

Notes:

1. Open collector/drain output, which should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board if intended for use. Pull up voltage should be between 2.0V to 3.6V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
2. Laser output disabled on Tx_Disable >2.0V or open, enabled on Tx_Disable <0.8V.
3. LOS is open collector output. Should be pulled up with 4.7kΩ to 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
4. RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100Ω

differential lines which should be terminated with 100Ω (differential) at the user SERDES.

5. TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Pin Assignment (continued)

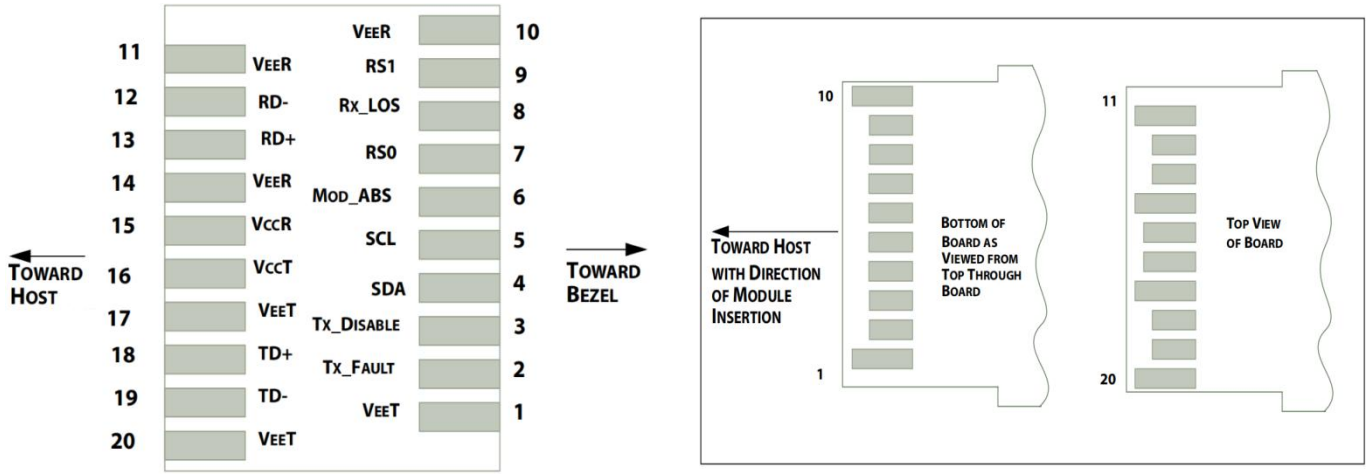

Figure 2. Host PCB SFP+ pad assignment top view and Names.

Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.

Table 8. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

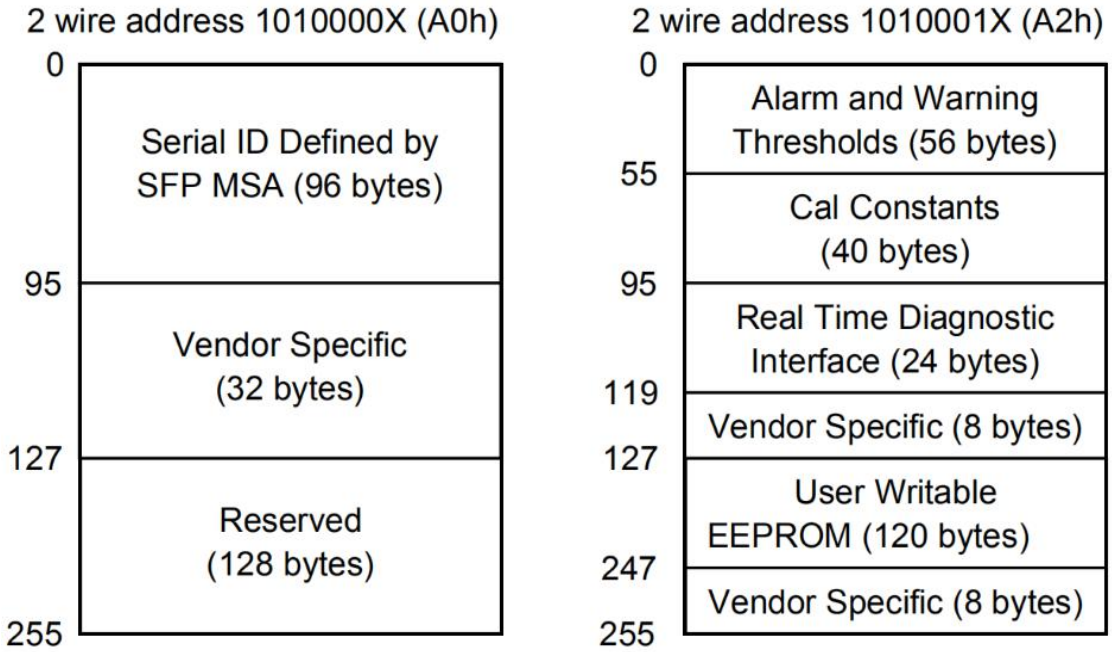

Table 9. Digital Diagnostic Monitor Characteristics

Parameter	Calibration	Range	Accuracy	Unit
Transceiver Internal Temperature	Internal	-5 to +70°C	±3.0	°C
VCC3 Internal Supply Voltage	Internal	3.0 to 3.6V	±3.0	%
Laser Bias Current	Internal	0 to 90mA	±10	%
Tx Output Power	Internal	-7to +3dBm	±3.0	dBm
Rx Input Power	Internal	-14 to +3dBm	±3.0	dBm

Recommended Circuit

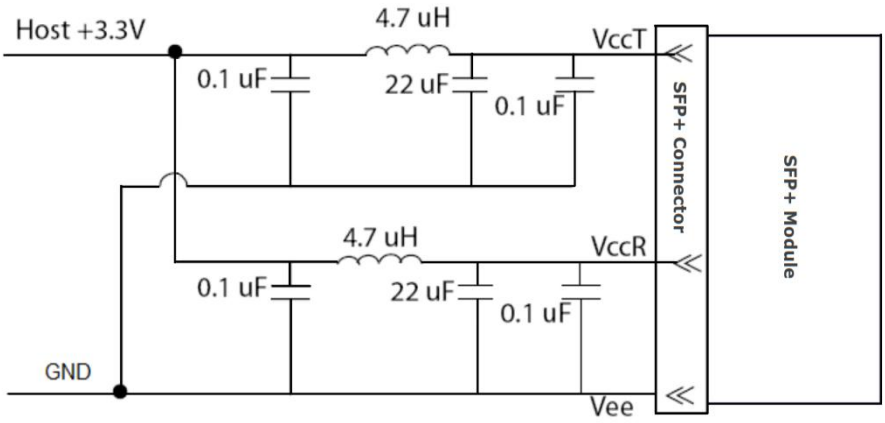

Figure 3, Recommended Host Board Power Supply Circuit

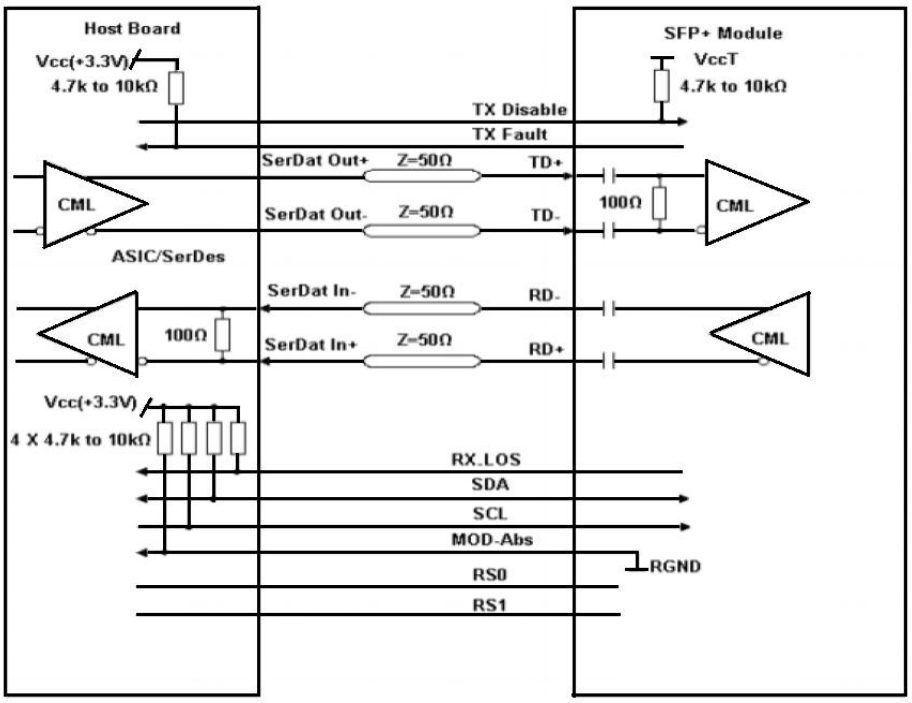

Figure 4, Recommended Interface Circuit

Mechanical Dimensions

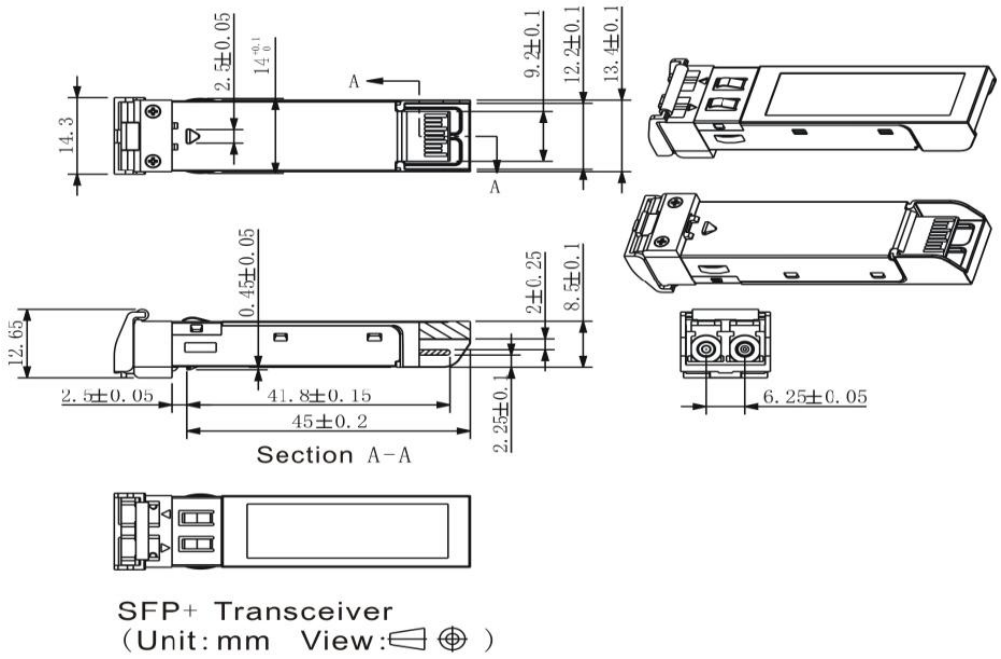

Figure 5, Mechanical Dimensions

Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.