Product Features

✧ Supports 9.95 to 11.3Gb/s bit rates

✧ Simplex LC Connector

✧ Hot pluggable SFP+ footprint

✧ Cooled 1490nm EML transmitter, 1550nm APD receiver

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✧ Applicable for 100km SMF connection

✧ Low power consumption, < 1.5W

✧ Digital Diagnostic Monitor Interface

✧ Optical interface compliant to IEEE 802.3ae 10GBASE-ZR

✧ Electrical interface compliant to SFF-8431

✧ Operating case temperature:0 to 70 °C

Applications

✧ 10GBASE-BX Ethernet

✧ Other optical link

Ordering Information

Part Number	Output Power	Rec. Sens	Data Rate	Wavelength	Distance
FH-SPB451TCDL100	0 ~ 5 db	-25 db	10.3125G	Tx1490/Rx1550nm	100km
FH-SPB541TCDL100	0 ~ 5 db	-25 db	10.3125G	Tx1550/Rx1490nm	100km

General

FH-SPB45(54)1TCDL100 is hot pluggable 3.3V Small-Form-Factor transceiver module. It designed expressly for high-speed communication applications that require rates up to 10.7Gbps,it designed to be compliant with SFF-8472 and SFP+ MSA. The module data link up to 80km in 9/125um single mode fiber. The optical output can be disabled by a LVTTL logic high-level input of Tx Disable. Tx Fault is provided to indicate that degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Supply Voltage	Vcc	-0.5	4.0	V	
Storage Temperature		-40	85	°C	
Relative Humidity			85	%	

Note: Stress in excess of the maximum absolute ratings can cause permanent damage to the module

General Operating Characteristics

Parameter		Symbol	Min.	Typ	Max.	Unit	Note
Data Rate	Ethernet		9.95	10.3125	11.3	Gb/s	
Supply Voltage		Vcc	3.13	3.3	3.47	V	
		Vcc				V	
Supply Current		Icc_5			450	mA	
		Icc_3			550	mA	
Operating Case Temp.		Tc	0		70	°C	

Electrical Input/Output Characteristics

Parameter		Symbol	Min.	Typ	Max.	Unit	Note
Transmitter							
Diff. input voltage swing			120		820	mVpp	1
Tx Disable input	H	VIH	2.0		Vcc+0.3	V	
	L	VIL	0		0.8		
Tx Fault output	H	VOH	2.0		Vcc+0.3	V	2
	L	VOL	0		0.8		
Input Diff. Impedance		Zin		100		Ω	
Receiver							
Differential data output swing		$V_{out,pp}$	300		850	mVpp	2
Output rise time and fall time		T_r, T_f	28			Ps	3
LOS asserted		V_{LOS_F}	Vcc-0.8		Vcc	V	4
LOS de-asserted		V_{LOS_N}	Vee		Vee+0.8	V	4

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.

2. Into 100Ω differential termination.

3. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative.

4. LOS is an open collector output. Should be pulled up with 4.7kΩ – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.

Optical Characteristics

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Operating Wavelength	λ	1470	1490	1510	nm	
		1530	1550	1565		
Ave. output power (Enabled)	Po	0		5	dBm	2
Extinction Ratio	ER	8.2			dB	2
Rise/Fall time (20%~80%)	Tr/Tf			50	ps	3
Optical modulation amplitude	OMA	-4.8			dBm	
Dispersion penalty				3	dB	
Output Optical Eye	IEEE 802.3-2005 Compliant					
Receiver						
Operating Wavelength	λ	1530	1550	1565	nm	
		1470	1490	1510		
Receiver Sensitivity	P_{SEN1}			-25	dBm	2
Sensitivity over 80Km fiber	P_{SEN2}			-20	dBm	2
Overload	P_{AVE}			-7	dBm	
LOS Assert	Pa	-35			dBm	
LOS De-assert	Pd			-25	dBm	
LOS Hysteresis	Pd-Pa	0.5		4	dB	

Note 1) typical wavelegths 1490nm and 1550nm,1470nm~1610nm transmitter, minimum interval   20nm

Note 2) Measured at 10.3125b/s with PRBS 231 – 1 NRZ test pattern.

Note 3) 20%~80%

Note 4) Under the ER ==>--8.2, measured at 10.3125Gb/s with PRBS 231   - 1 NRZ test pattern for BER   1x10-12

Serial Interface For ID AND DDM

The SFP modules implement   the 2-wire serial communication protocol as defined in the SFP MSA.

The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I2C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information(A0h) And the DDM specification(A2h). For more details of the memory map and byte definitions, please refer to the SFF-8472 (Rev 9.3, Aug. 2002), "Digital Diagnostic Monitoring Interface for Optical Transceivers".

The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

2 wire address 1010000X (A0h)		2 wire address 1010001X (A2h)	
Address	Information	Address	Information
0~95	Serial ID Defined by SFP MSA (96 bytes)	0~55	Alarm and Warning Thresholds (56 bytes)
		56~95	Calibration Constants (40 bytes)
96~127	Vendor Specific (32 bytes)	96~119	Real Time Diagnostic Interface (24 bytes)
		120~127	Vender Specific (8 bytes)
128~255	Reserved,SFF8079 (128 bytes)	128~247	User Writable EEPROM (120 bytes)
		248~255	Vender Specific (8 bytes)

Functional Diagram
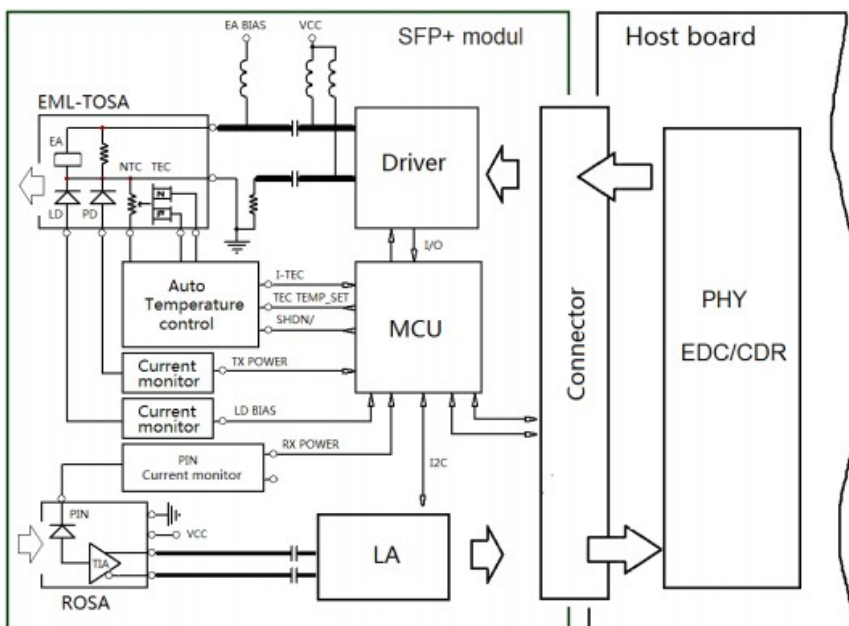
Pin Definitions And Functions
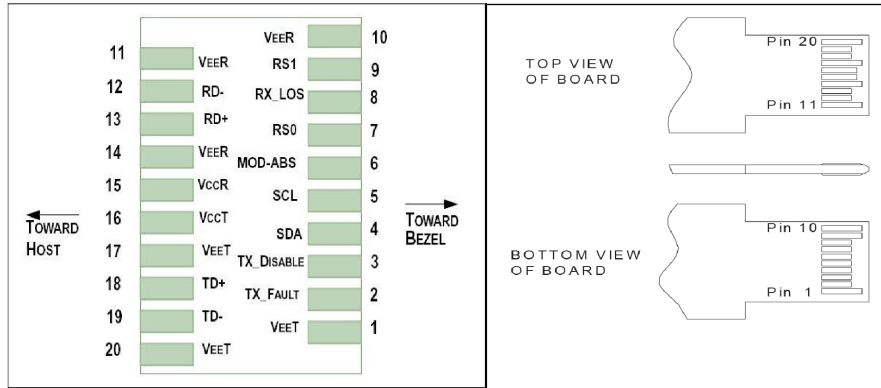
| Pin	Symbol	Name/Description
1	VEET [1]	Transmitter Ground
2	Tx_FAULT [2]	Transmitter Fault
3	Tx_DIS [3]	Transmitter Disable. Laser output disabled on high or open
4	SDA [2]	2-wire Serial Interface Data Line
5	SCL [2]	2-wire Serial Interface Clock Line
6	MOD_ABS [4]	Module Absent. Grounded within the module
7	RS0	Rate Select 0
8	RX_LOS [2]	Loss of Signal indication. Logic 0 indicates normal operation
9	RS1 [5]	Rate Select 1
10	VEER [1]	Receiver Ground
11	VEER [1]	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver DATA out. AC Coupled
14	VEER [1]	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET [1]	Transmitter Ground
18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET [1]	Transmitter Ground

Note 1) Module circuit ground is isolated from module chassis ground within the module.

Note 2) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.
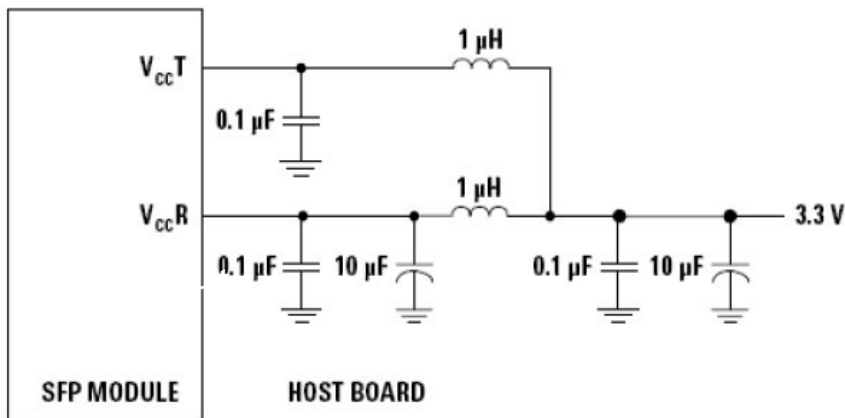
Note 3) This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.

Note 4) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board. In FC designated as RX_LOS, inSONET designated as LOS, and in Ethernet designated at Signal Detect.

Typical Interface Circuit
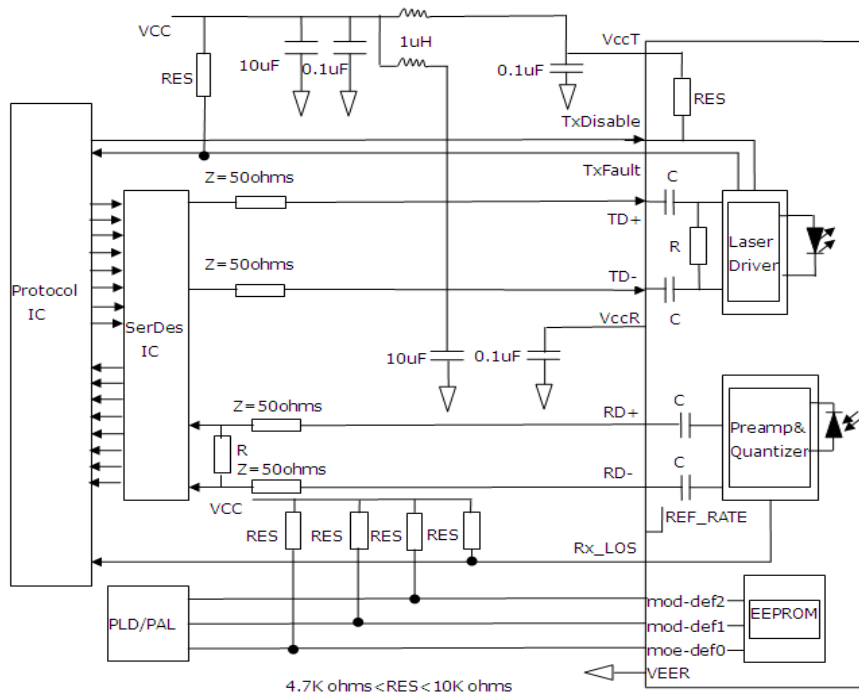
Recommended power supply filter

Note: Inductors with DC resistance of less than 1 should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommendedΩ supply filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value

Package Dimensions

Unit: mm
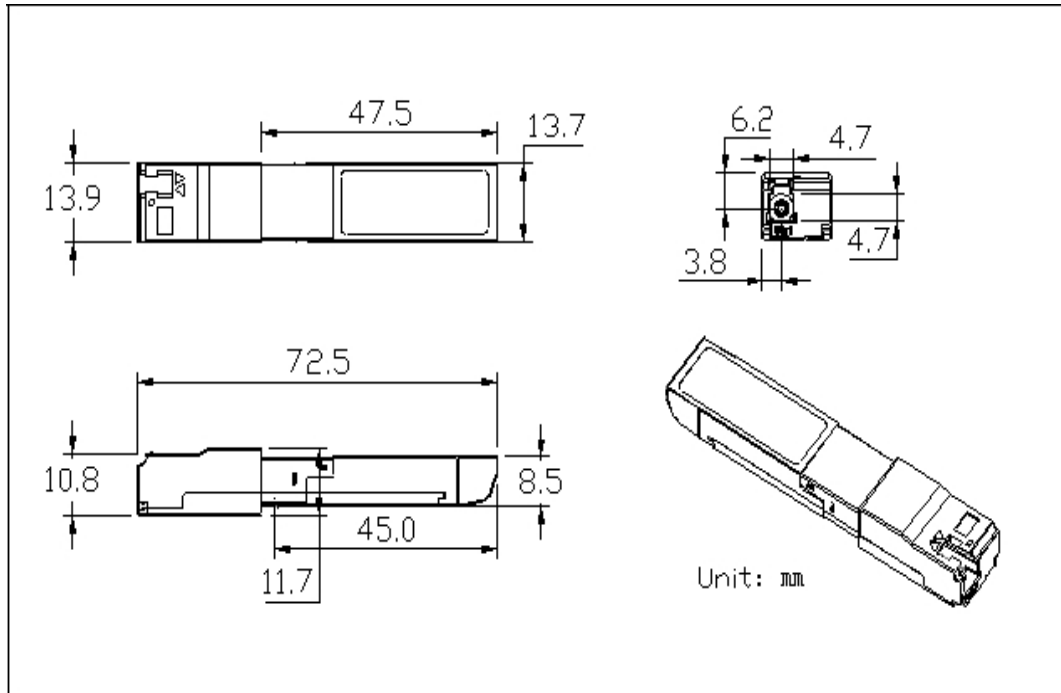
For More Information

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