SFP Single Mode DUAL Fiber Transceiver
1.25Gbps 20KM

Product Features

- Uncooled Laser Diode with MQW Structure
- InGaAs PIN-TIA Photodiode Receiver
- 9/125μm SMF
- BIDI Single Mode Transceiver SFP Footprint
- LC Or SC Optical Interface Are Optional
- Compliant With SFP MSA and SFF-8472
- Digital Diagnostic Monitoring Interface
- Single +3.3V Power Supply
- CML Differential Inputs and Outputs
- LVTTL Signal Detection Output
- Compliant With ITU-T G.957
- Compliant With RoHS and Lead Free
- Metal Enclosure for Lower EMI
- Operating Case Temperature:

  Standard: 0 to +70°C

  Extend: -20 to +85°C

  Industrial: -40 to +85°C

Product Applications

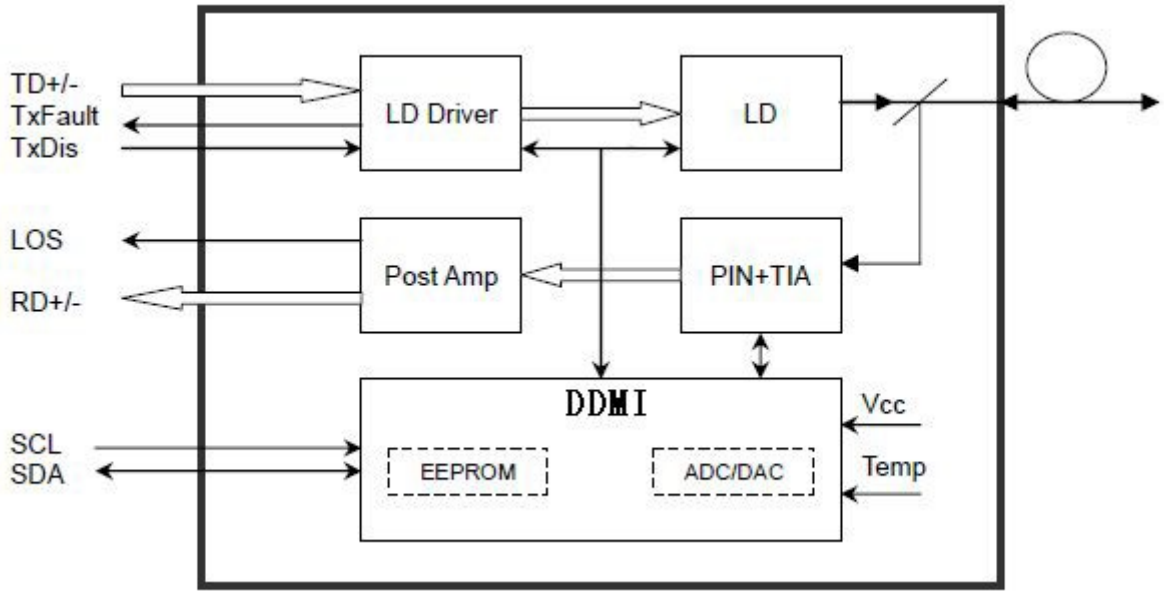
- Fast Ethernet
- ATM/SONET/SDH
- Switch/Router
- Other Optical Transmission Systems

General Description

The SFP transceivers are high performance, cost effective modules supporting data-rate of 1250 Mbps and 20km transmission distance on 9/125μm SMF.

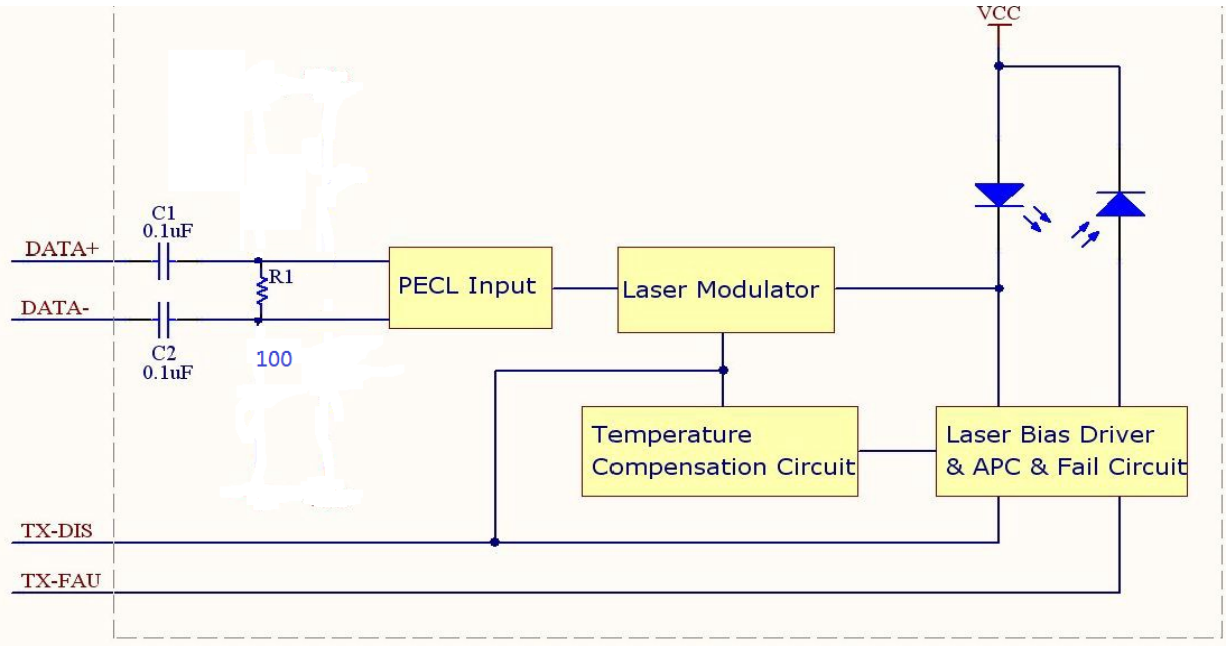
The transceiver consists of three sections: a laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and DDMI control unit. All modules satisfy class I laser safety requirements.

The transceivers are compliant with the Small Form-Factor Pluggable (SFP) Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.



Transmitter Section

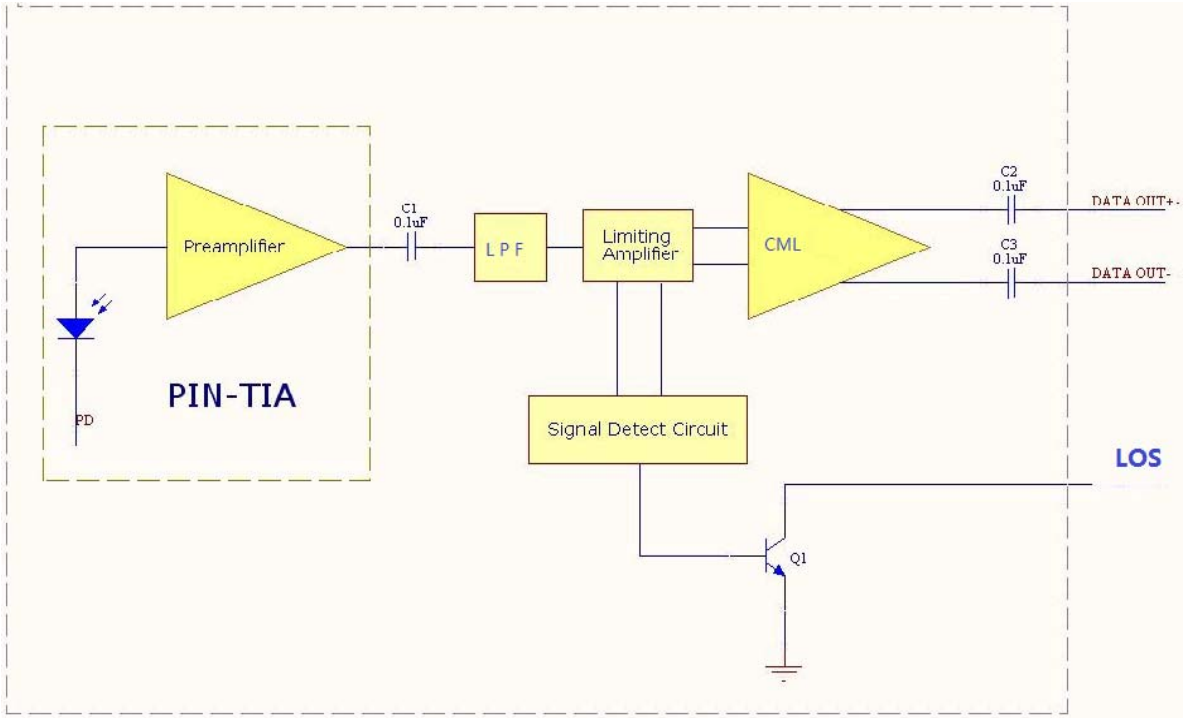
Transmitter is designed for single mode fiber and operates at a nominal wavelength of 1310nm . The transmitter module uses a FP laser diode and full IEC825 and CDRH class 1 eye safety. The output power can be disabled via the single TX-disable pin. Logic LVTTL HIGH level disables the transmitter. It contains APC function, temperature compensation circuit, PECL data inputs, LVTTL TX-disable input and
TX-fault Output interface.



Transmitter Block Diagram

Receiver Section

The receiver section uses a hermetic packaged front end receiver (InGaAs PIN and preamplifier). The post amplifier is AC coupled to preamplifier through a capacitor and a low pass filter. The capacitor and LPF are enough to pass the signal from 100Mb/s to 1300Mb/s without significant distortion or performance penalty. The LPF limits the preamplifier bandwidth to improve receiver sensitivity. As the input optical is decreased, LOS will switch from low to high. As the input optical power is increased from very low levels, LOS will switch back from high to low.



Receiver Block Diagram

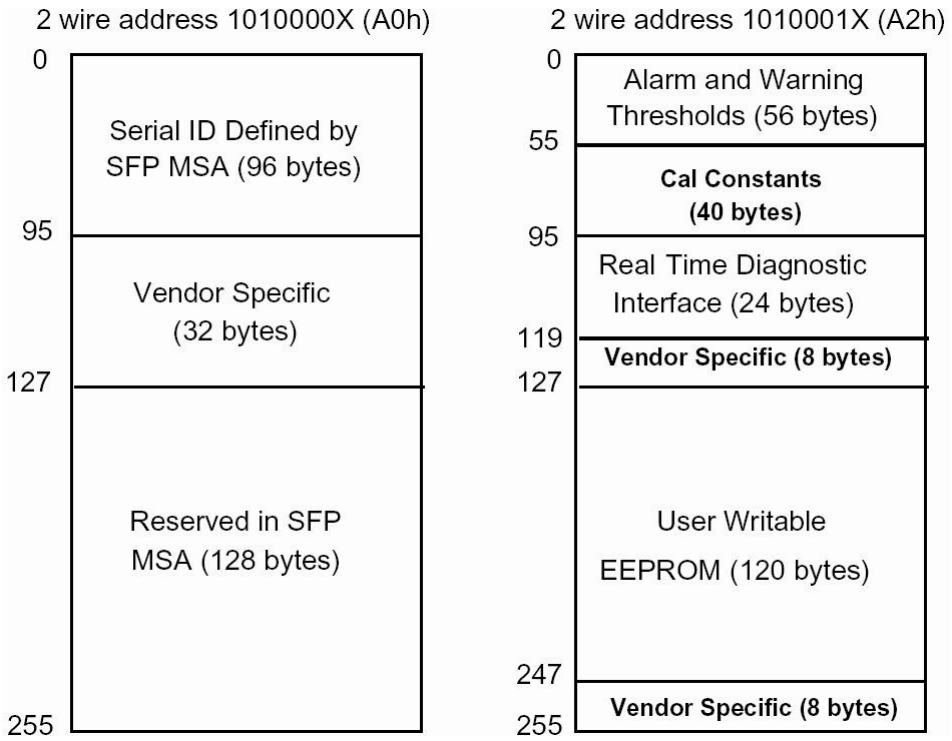
DDMI Section

The DDMI contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the 24C02. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

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 diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field defines as following.

Memory Map



Performance Specifications

Absolute Maximum Ratings

Parameter	Symbol		Min	Max	Unit
Storage Temperature	Tst		-40	+85	°C
Operating Temperature	T_O	DFP1-**24-2C**	0	+70	°C
		DFP1-**24-2E**	-20	+85	°C
		DFP1-**24-2I**	-40	+85	°C
Input Voltage	-		GND	V_{CC}	V
Power Supply Voltage	V_{CC}-V_{EE}		0	+3.6	V

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

Recommended Operating Conditions

Parameter	Symbol		Min	Typ	Max	Unit
Storage Temperature	Tst		-40	-	+85	°C
Operating Case Temperature	T_C	DFP1-**24-2C**	0	-	+70	°C
		DFP1-**24-2E**	-20	-	+85	°C
		DFP1-**24-2I**	-40	-	+85	°C
Power Supply Voltage	V_{CC}		3.1	3.3	3.5	V
Power Supply Current	I_{CC}		-	-	300	mA
Data Rate	DR		-	1250	-	Mbps

Optical Specification

Transmitter							
Parameter		Symbol	Min	Typ	Max	Unit	Note
Center Wavelength	1310 DFB	λ_c	1261	1310	1360	nm	
Spectral Width		$\Delta\lambda$	-	-	1	nm	-
Average Optical Output Power		Po	-9.5	-	-3	dBm	
Extinction Ratio		ER	9	-	-	dB	-
Optical Rise/Fall Time(20%-80%)		Tr/Tf	-	-	0.26	ns	-
Output Eye Diagram		Compliant with ITU-T G.957					
Receiver							
Parameter		Symbol	Min	Typ	Max	Unit	Note
Operate Wavelength		-	1100	1310	1600	nm	DFP1-3124-4***
Receiver Sensitivity		R_{SENS}	-	-	-22	dBm	1
Receiver Saturation		P_{RS}	-3	-	-	dBm	1
LOS Assert		-	-36	-	-	dBm	Alarm: High-level
LOS De-Assert		-	-	-	-26	dBm	
LOS Hysteresis		-	0.5	-	5	dBm	-

Note: 1. Minimum Sensitivity and saturation levels for a 2^7-1 PRBS test pattern @1250Mbps.

Electrical Specification

Transmitter							
Parameter		Symbol	Min	Typ	Max	Unit	Note
Power Supply Current		I_{CCT}	-	70	150	mA	2
Input Differential Impedance		Z_{IN}	90	100	110	Ω	-
Input Swing Differential Voltage		V_{IN}	500	-	2400	mV	3
TX-Disable Voltage	Disable	-	2.0	-	V_{CC}	V	-
	Enable	-	0	-	0.8	V	-
TX-Fault Voltage	Fault	-	2.0	-	V_{CC}	V	-
	Normal	-	0	-	0.8	V	-
Receiver							
Parameter		Symbol	Min	Typ	Max	Unit	Note
Power Supply Current		I_{CCR}	-	70	140	mA	2
Output Swing Differential Voltage		V_{OUT}	600	-	2000	mV	4
LOS Voltage	High	-	2.0	-	V_{CC}	V	-
	Low	-	0	-	0.8	V	-

Note: **2. The current excludes the output load current.**

3. CML input, internally AC-coupled and terminated.

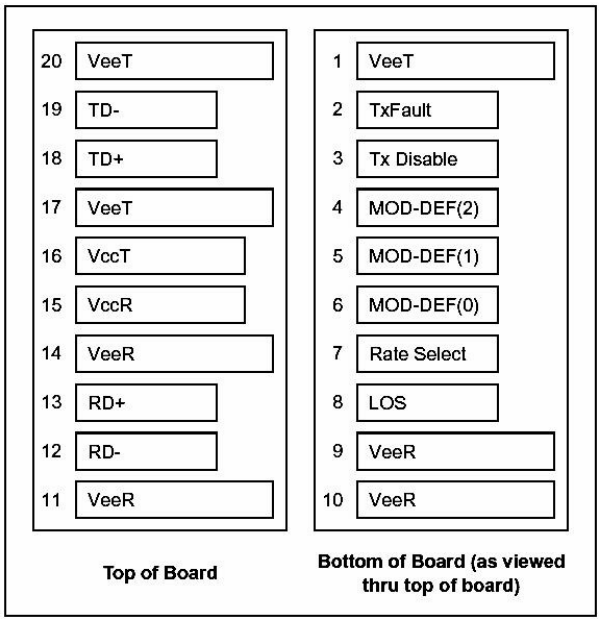
4. Internally AC-coupled.

Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3	Internal/External
	-40 to +85			Internal/External
Voltage	3.0 to 3.6	V	±3%	Internal/External
Bias Current	0 to 100	mA	±10%	Internal/External
TX Power	-9.5 to -3	dBm	±3	Internal/External
RX Power	-22 to -3	dBm	±3	Internal/External

Pin Definitions

PIN Diagram



PIN Description

PIN	Name	Description	Notes
1	$V_{EE}T$	Transmitter Ground	-
2	TX FAULT	Transmitter Fault Indication	Note 1
3	TX DISABLE	Transmitter Disable	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	Note 3
6	MOD_DEF(0)	Module Absent. Grounded within the module	Note 3
7	Rate Select	Not Connected	-
8	LOS	Loss of Signal	Note 4
9	$V_{EE}R$	Receiver ground	-
10	$V_{EE}R$	Receiver ground	-
11	$V_{EE}R$	Receiver ground	-
12	RD-	Inv. Received Data Out	Note 5
13	RD+	Received Data Out	Note 5
14	$V_{EE}R$	Receiver ground	-
15	$V_{CC}R$	Receiver Power Supply	3.3V±5%
16	$V_{CC}T$	Transmitter Power Supply	3.3V±5%
17	$V_{EE}T$	Transmitter Ground	-
18	TD+	Transmit Data In	Note 6
19	TD-	Inv. Transmit Data In	Note 6
20	$V_{EE}T$	Transmitter Ground	-

Notes:

1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.

2) TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:

Low (0 to 0.8V): Transmitter on

(>0.8V, < 2.0V): Undefined

High (2.0 to 3.465V): Transmitter Disabled

Open: Transmitter Disabled

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.

Mod-Def 0 is grounded by the module to indicate that the module is present

Mod-Def 1 is the clock line of two wire serial interface for serial ID

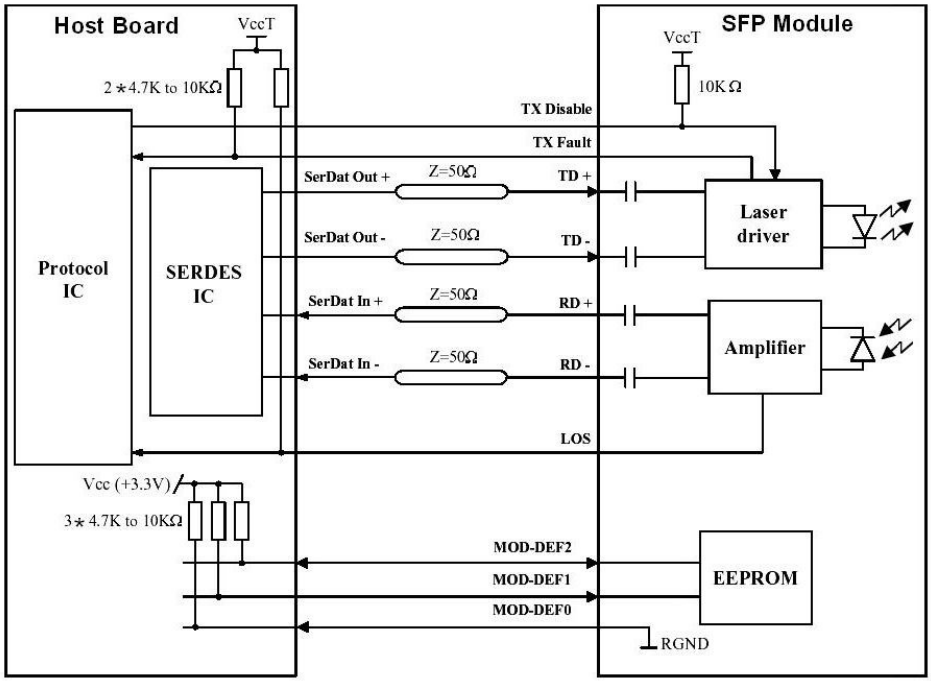
Mod-Def 2 is the data line of two wire serial interface for serial ID

4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.

5) 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.

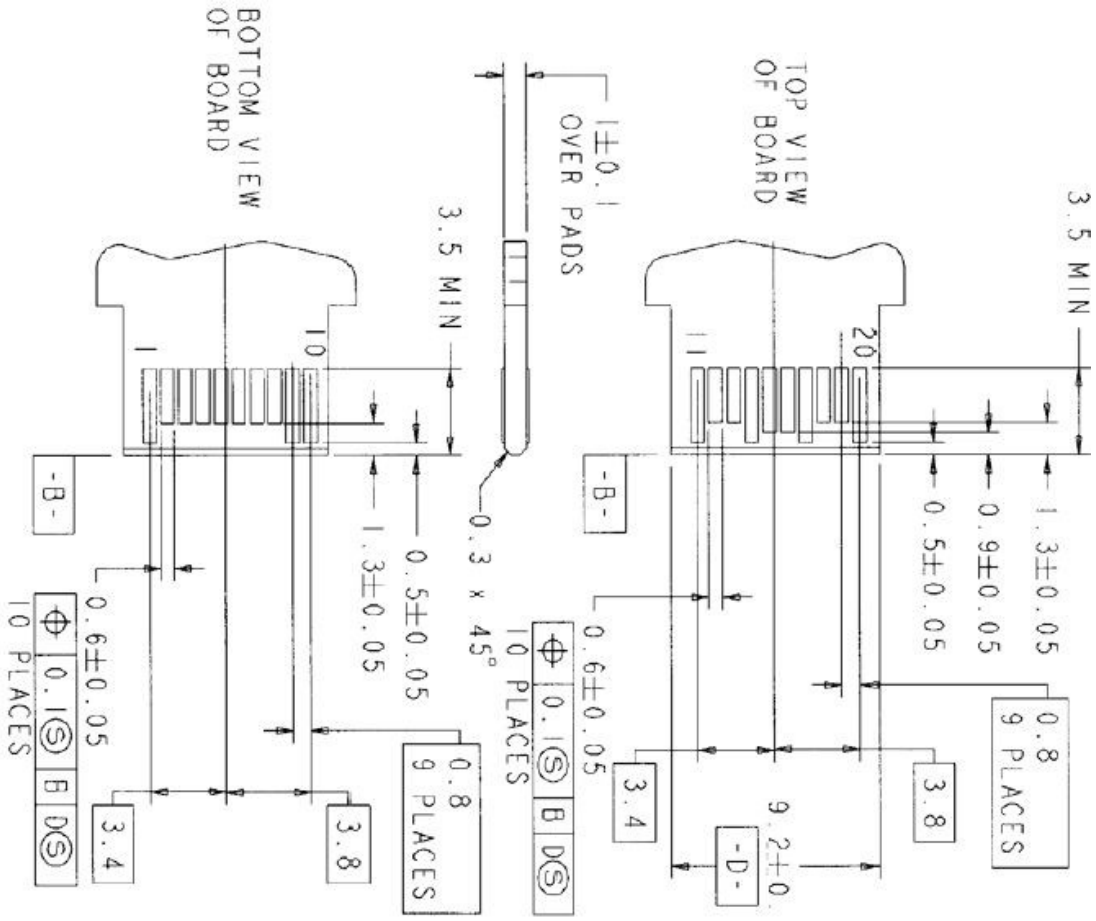
6) TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Circuit

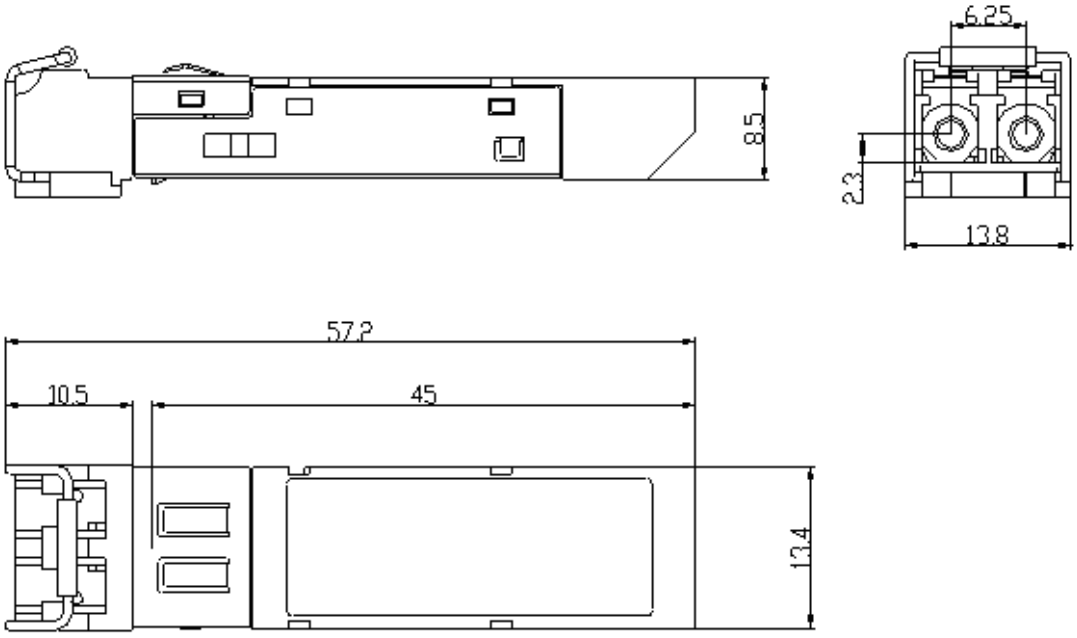


Package Diagram

Board Layout Hole Pattern



LC Side Interface



SC Side Interface