

## Features

- Compliant with Fiber Channel 100-M5-SN-I and 100-M6-SN-I standard
- Compliant with IEEE802.3z Gigabit Ethernet standard
- Industry standard small form pluggable (SFP) package
- Duplex LC connector
- Up to 1250Mbps data links
- 550m transmission distance with 50/125 $\mu$ m or 62.5/125 $\mu$ m MMF
- Differential LVPECL inputs and outputs
- Single power supply +3.3V
- Operating temperature:  
Standard : 0 to +70°C  
Industrial : -40 to +85°C
- LVTTTL signal detect indicator
- Hot Pluggable
- Class 1 laser product complies with EN 60825-1
- Compliant ROHS and lead free
- Compliant with UL standard
- With pull de-latch

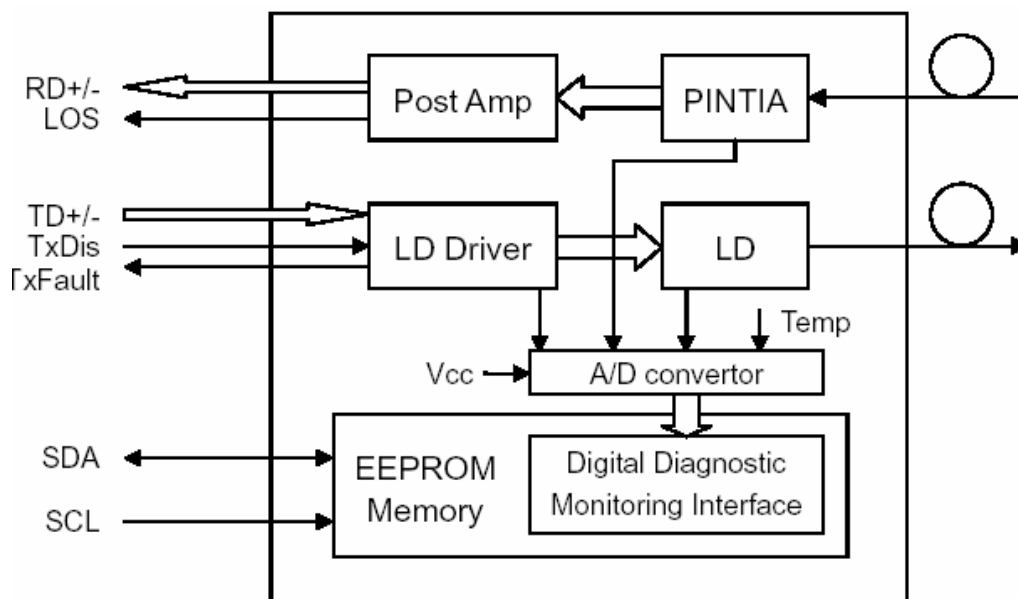


## Applications

- Distributed multi-processing
- Switch to switch interface
- High speed I/O for file server
- Bus extension application
- Channel extender, data storage

## General

The optical transceiver is compliant with the Small Form- Factor Pluggable (SFP) Multi-Source Agreement (MSA) and SFF-8472. It offers previously unavailable system cost, upgrade, and reliability benefits by virtue of being hot-pluggable.



### Transmitter Section

The transmitter section consists of a 850 nm VCSEL in an eye safe optical subassembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current.

### TX\_DISABLE

The TX\_DISABLE signal is high (PECL logic "1") to turn off the laser output. The laser will turn on when TX\_DISABLE is low (PECL logic "0").

### Receiver Section

The receiver utilizes a MSM detector integrated with a trans-impedance preamplifier in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

### Receive Loss (RX\_LOS)

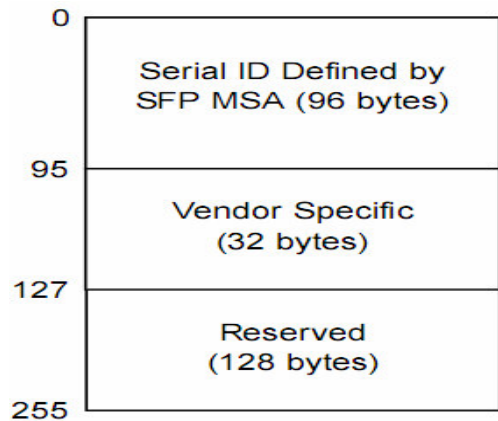
The RX\_LOS is high (logic "1") when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

### EEPROM Section

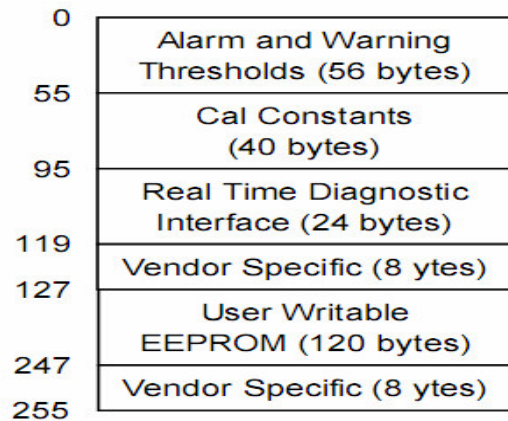
The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C01A/02/04 family of components. 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 define as following.

**Memory Map:**

2 wire address 1010000x (A0h)



2 wire address 1010001x (A2h)

**Performance Specifications****Table 1. Absolute Maximum Ratings**

Parameter	Symbol	Min	Max	Unit	
Storage Temperature	Tst	-40	+100	°C	
Operating Temperature	To	SFP-GE-MM-1005	0	+70	°C
		SFP-GE-MM-1005i	-40	+85	
Input Voltage	-	GND	Vcc	V	
Power Supply Voltage	Vcc-Vee	-0.5	+3.6	V	

**Note:** Stress in excess of maximum absolute ratings can cause permanent damage to the module**Table 2. Operating Environment**

Parameter	Symbol	Min	Max	Unit	
Power Supply Voltage	Vcc	+3.1	+3.5	V	
Ambient Operating Temperature	TA	SFP-GE-MM-1005	0	+70	°C
		SFP-GE-MM-1005i	-40	+85	

**Table 3. Transmitter electrical and optical Characteristics**

Parameter	Symbol	Min	Typ	Max	Unit
Center Wavelength	$\lambda_p$	830	850	870	nm
Spectral Width (RMS)	$\Delta\lambda$	-	-	0.85	nm
Coupled Power Ratio	CPR	9	-	-	-
Average Optical Output Power	Po	-10	-	-3	dBm
Extinction Ratio	EXT	9	-	-	dB
Input Differential Impedance	Z <sub>IN</sub>	90	100	110	$\Omega$
Rise/Fall Time, (20~80%)	Tr, f	-	-	0.28	ns
Relative Intensity Noise	RIN	-	-	117	dB/Hz
Total Jitter	TJ	-	-	227	ps
Max. Pout TX DISABLE Asserted	POFF	-	-	-45	dBm
Differential	Input	0.4	-	2.0	V
Output Eye Diagram	Compliant with ITU-T.G.957				

**Table 4.Receiver optical-electrical characteristics**

Parameter	Symbol	Min	Typ	Max	Unit
Operate Wavelength	-	830	-	870	nm
Sensitivity	Pr	-	-	-17	dBm
Saturation	Ps	0	-	-	dBm
LOS Asserted	-	-35	-	-	dBm
LOS De-Assert	-	-	-	-17	dBm
Optical Return Loss	ORL	12	-	-	dB
Differential Output Voltage	VDIFF	0.5	-	1.2	V
Data Output Rise, Fall Time	T <sub>r, f</sub>	-	-	0.35	ns
Receiver Loss of Signal Output	RX_LOSL	0	-	0.5	V
Receiver Loss of Signal Output	RX_LOSH	2.4	-	VCC	V

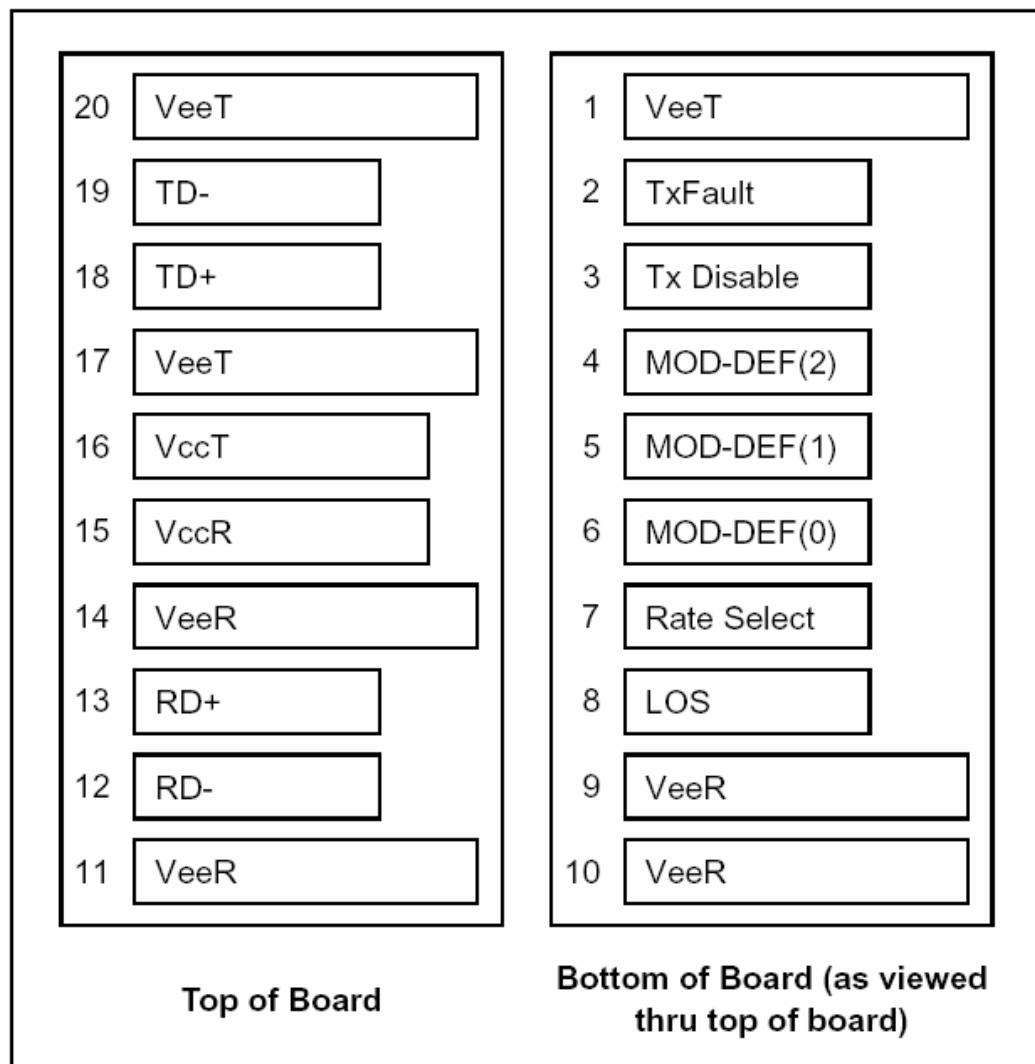
**Pin Definition****Pin Out Diagram**

Table 5.Pin Function Definitions

Pin#	Name	Description
1	VeeT	Transmitter Ground
2	TX Fault	Transmitter Fault Indication
3	TX Disable	Transmitter Disable
4	MOD-DEF2	Module Definition 2
5	MOD-DEF1	Module Definition 1
6	MOD-DEF0	Module Definition 0
7	Rate Select	Not use
8	LOS	Loss of Signal
9	VeeR	Receiver Ground
10	VeeR	Receiver Ground
11	VeeR	Receiver Ground
12	RD-	Inv. Received Data Out
13	RD+	Receiver Data out
14	VeeR	Receiver Ground
15	VccR	Receiver Power
16	VccT	Transmitter Power
17	VeeT	Transmitter Ground
18	TD+	Transmit Data In
19	TD-	Inv. Transmit Data In
20	VeeT	Transmitter Ground

**Note:**

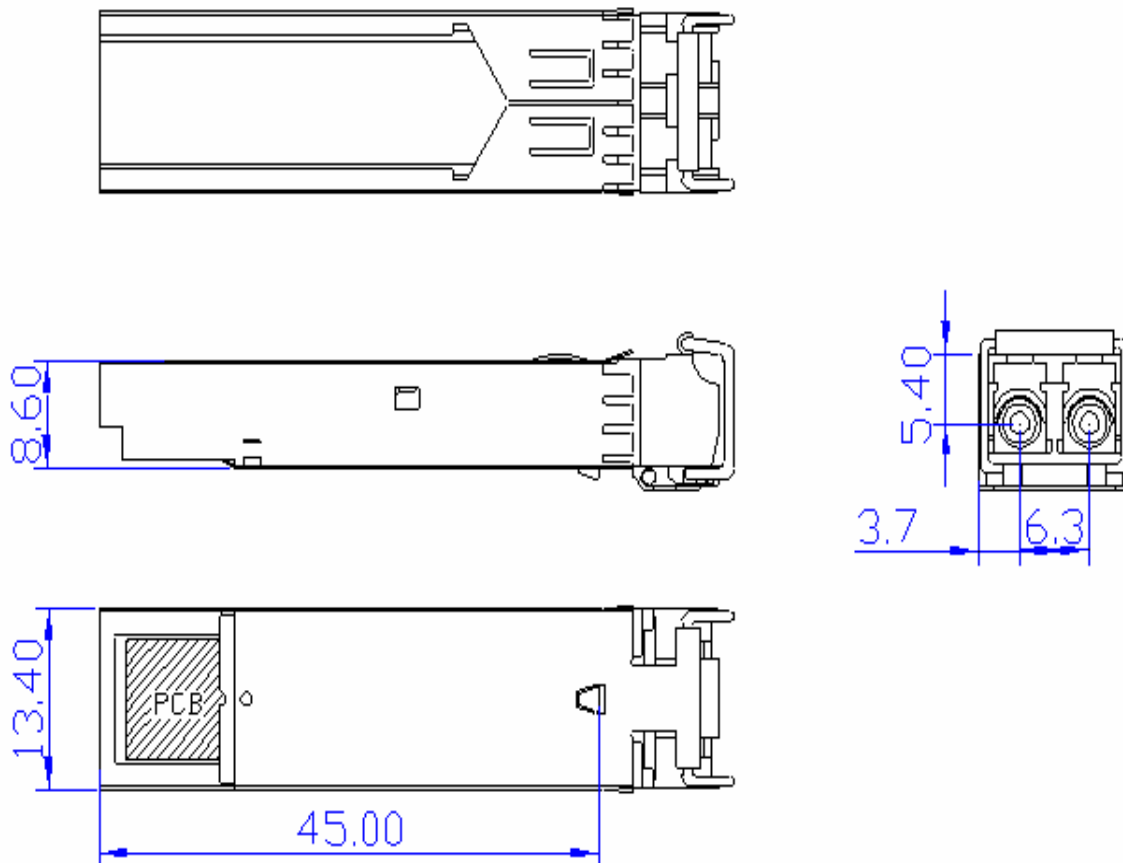
- TX Fault is an open collector/drain output, which should be pulled up with a 4.7K–10K $\Omega$  resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.**
- TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7–10 K $\Omega$  resistor. Its states are:**
  - Low (0 – 0.8V): Transmitter on**
  - (>0.8, < 2.0V): Undefined**
  - High (2.0 – 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 – 10K  $\Omega$  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 (Loss of Signal)** is an open collector/drain output, which should be pulled up with a 4.7K – 10K $\Omega$  resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity(as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
5. **VeeR and VeeT** may be internally connected within the SFP module.
6. **RD-/+: These are the differential receiver outputs.** They are AC coupled 100 $\Omega$  differential lines which should be terminated with 100 $\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
7. **VccR and VccT** are the receiver and transmitter power supplies. They are defined as 3.3V  $\pm$ 5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 $\Omega$  should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply filtering network is used, hotplugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
8. **TD-/+: These are the differential transmitter inputs.** They are AC-coupled, differential lines with 100 $\Omega$  differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

**Table 6. Diagnostics Specification**

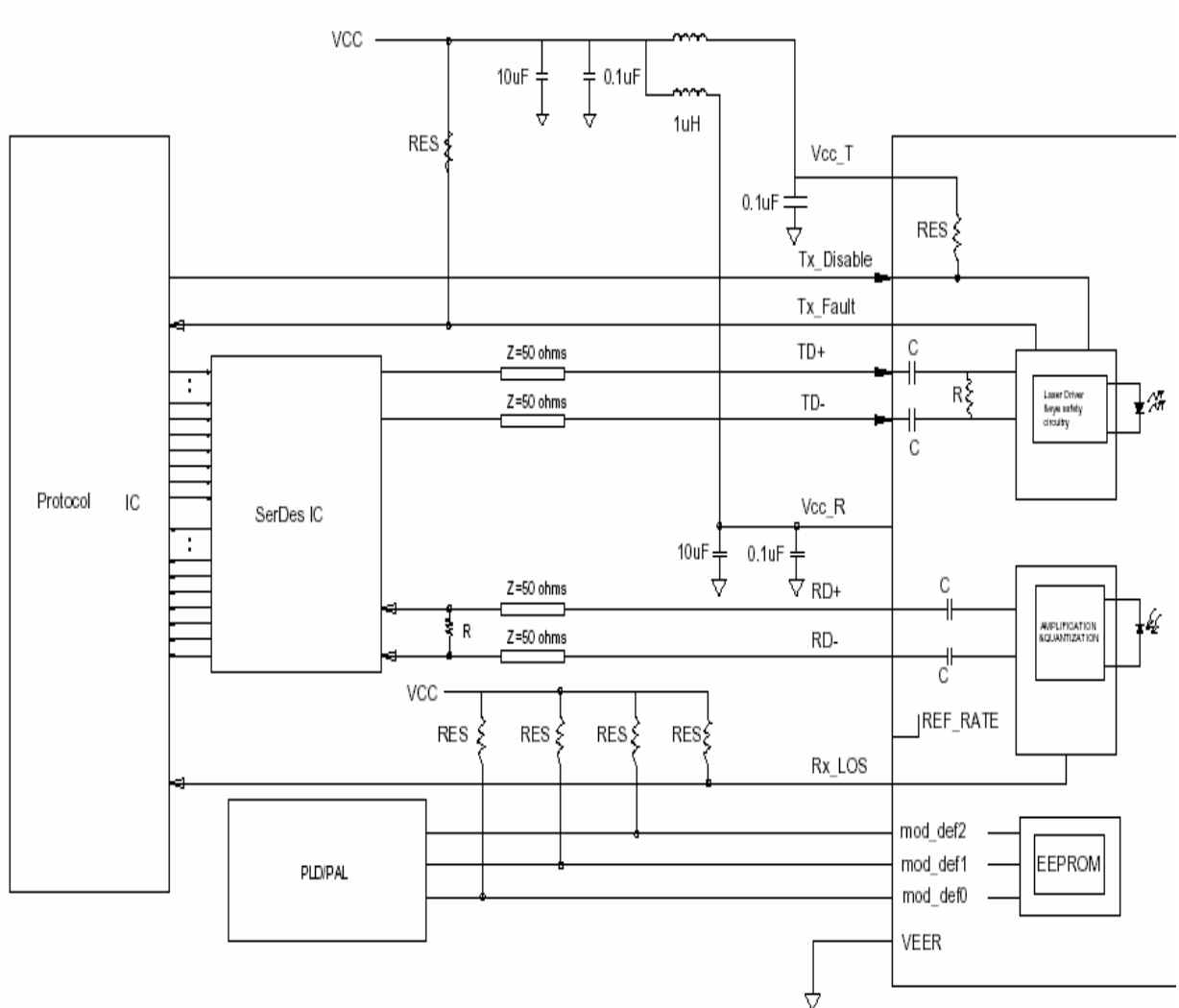
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	$^{\circ}$ C	$\pm$ 3	Internal / Ext
	-40 to +85			
Voltage	3.0 to 3.6	V	$\pm$ 3%	Internal / External
Bias Current	0 to 100	mA	$\pm$ 10%	Internal / External
TX Power	-10 to -3	dBm	$\pm$ 3	Internal / Exte
RX Power	-20 to 0	dBm	$\pm$ 3	Internal / External

Package information



Unit: mm

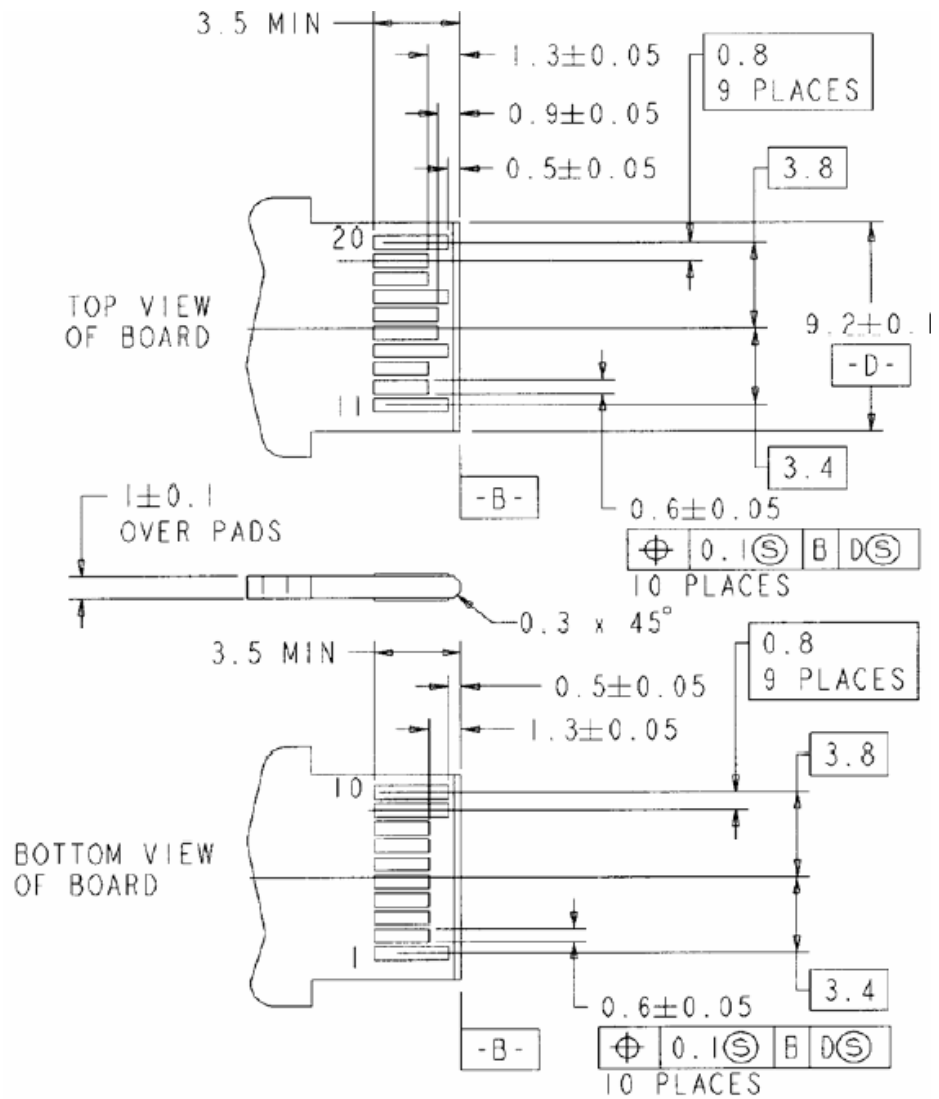
Recommended Circuit



**Note: 4.7K ohms < RES < 10K ohms**



Recommended Board Layout Hole Pattern



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**Ordering Information**

产品型号	速率	传输距离	发射波长	接收波长	光功率	灵敏度	电压	接口	DDMI
SFP-GE-SM-1005	1.25Gbps	0.5km	850nm	850nm	-9~-3dbm	< -17dbm	3.3V	LC	Y
SFP-GE-SM-1010	1.25Gbps	10km	1310nm	1310nm	-9~-3dbm	< -22dbm	3.3V	LC	Y
SFP-GE-SM-1020	1.25Gbps	20km	1310nm	1310nm	-9~-3dbm	< -23dbm	3.3V	LC	Y
SFP-GE-SM-1040	1.25Gbps	40km	1310nm	1310nm	-5~0dbm	< -23dbm	3.3V	LC	Y
SFP-GE-SM-1060	1.25Gbps	60km	1550nm	1550nm	-2~-3dbm	< -23dbm	3.3V	LC	Y
SFP-GE-SM-1080	1.25Gbps	80km	1550nm	1550nm	0~5dbm	< -26dbm	3.3V	LC	Y
SFP-GE-SM-1100	1.25Gbps	100km	1550nm	1550nm	0~5dbm	< -32dbm	3.3V	LC	Y