

## 1. Description

TM-8663x-243I transceiver is an excellent product, which is a series of high performance optical modules suitable for Operation in Metro Access Network system. It is available in various wavelengths to meet the needs of each customer.

Because of its hot-pluggable capability, TM-8663x-243I SFP transceiver can be installed in or removed from any MSA compliant pluggable small form factor port, regardless of, whether the host equipment is operating or not. Furthermore, TM-8663x-243I SFP transceiver supports the DDM function and detailed product's information that stored for retrieval by host equipment. For further information, please refer to SFP Multi- Source Agreement (MSA).

The transceiver operates up to 1.25Gbps data-rate from a single +3.3 V power supply.

## 2. Feature

- Compliant with SFP MSA
- Compliant with IEEE802.3ah 1000BASE-LX specifications
- Digital Diagnostic SFF-8472 compliant
- 1310nm FP Laser transmitter / Wide dynamic range PIN-PD receiver
- Single +3.3V power supply
- Up to 20km Transmission on 9/125 um Single Mode Fiber
- LC duplex connector
- Two optional operating temperature ranges
- RoHS compliant

## 3. Application

- 1.25 Gb/s 1000Base-LX Ethernet
- Fiber Channel
- Metro/Access Networks
- Other Optical Link

## 4. Specifications

### 4.1 Specifications

Parameter	Specifications	Unit
Electrical interface	SFP MSA Compatible	-
Standard	IEEE 802.3ah, 1000BASE-LX	-
Maximum transmission Distance	20	km
Optical connector type	LC duplex receptacle (IEC61754-4)	-
Laser safety standards	IEC60825-1 Class1	-
Reliability	Per Telcordia GR-468-CORE	-
EMI standards	VCCI Class B	
Optical connector end face standards	IPC-8497-1	
Operating temperature (Ambient)	Option A : 0 to +70 Option B : -40 to 85	°C
Operating current consumption	≤ 300	mA

### 4.2 Absolute maximum ratings

Parameter	Symbol	Ratings	Unit	Conditions
Power Supply Voltage	Vcc	0 to +4	V	
Operating voltage	Vcc	+3.13 to +3.47	V	
Storage Temperature	Tst	-40 to +85	°C	
Operating humidity	Hop	max.85	%RH	

## 5. Optical Characteristics of Transmitter and Receiver

### 5.1 Transmitter Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Bit rate	B	-	1.25	-	Gb/s
Center Wavelength	$\lambda_c$	1270	1360	1330	nm
Output Spectral Width	$\lambda_{rms}$	-	-	3	nm
Average Launch Power	Po	-7	-	-1	dBm
Average Launch Power of Off TX	Poff	-	-	-45	dBm
Extinction Ratio (Note1)	Phi/Plo	9	-	-	dB
Rise Time, Fall Time (Note2)	Tr/Tf	-	0.12	0.2	ns
Common-Mode input	V <sub>CM</sub>	-	1.8	-	V
Transmitter Output Eye	Compliant with IEEE802.3ah standard				

(Note1) 1.25Gb/s, PRBS 2<sup>7</sup>-1  
(Note2) Unfiltered, 20%~80% values

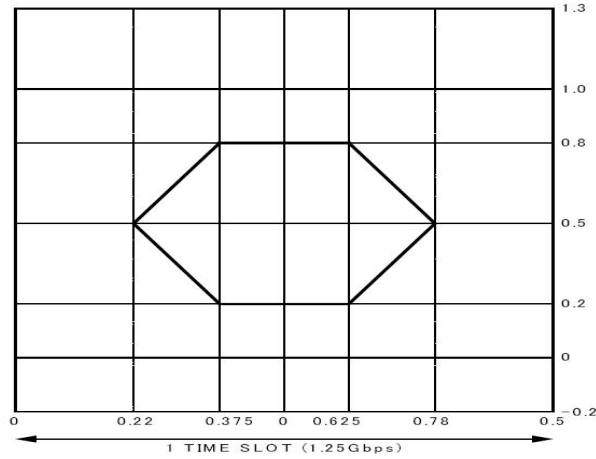


Figure 1. Transmitter Eye Mask

## 5.2 Receiver Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Center Wavelength	$\lambda_c$	1100	-	1620	nm
Bit Error Ratio	BER	-	-	10 <sup>-12</sup>	-
Sensitivity (EOL) (Note1)	P <sub>min</sub>	-	-	-27	dBm
Maximum Input Power(Note1)	P <sub>max</sub>	-3	-	-	dBm
LOS Assert (Note1)	LOS <sub>A</sub>	-35	-	-	dBm
LOS De-Assert (Note1)	LOS <sub>D</sub>	-	-	-28	dBm
Hysteresis	SD Hys	0.5	-	5	dB
Rise Time, Fall Time (No Slew Note2)	T <sub>r</sub> /T <sub>f</sub>	-	90	100	ps
Rise Time, Fall Time (Fast Slew Note2)	T <sub>r</sub> /T <sub>f</sub>	-	160	200	ps

(Note1) Receiving signals is 1.25Gbps, PRBS 2<sup>7</sup>-1, BER=1x10<sup>-12</sup>, ER=9dB, Tx=ON

(Note2) 20%~80% values

### 5.3 Block Diagram

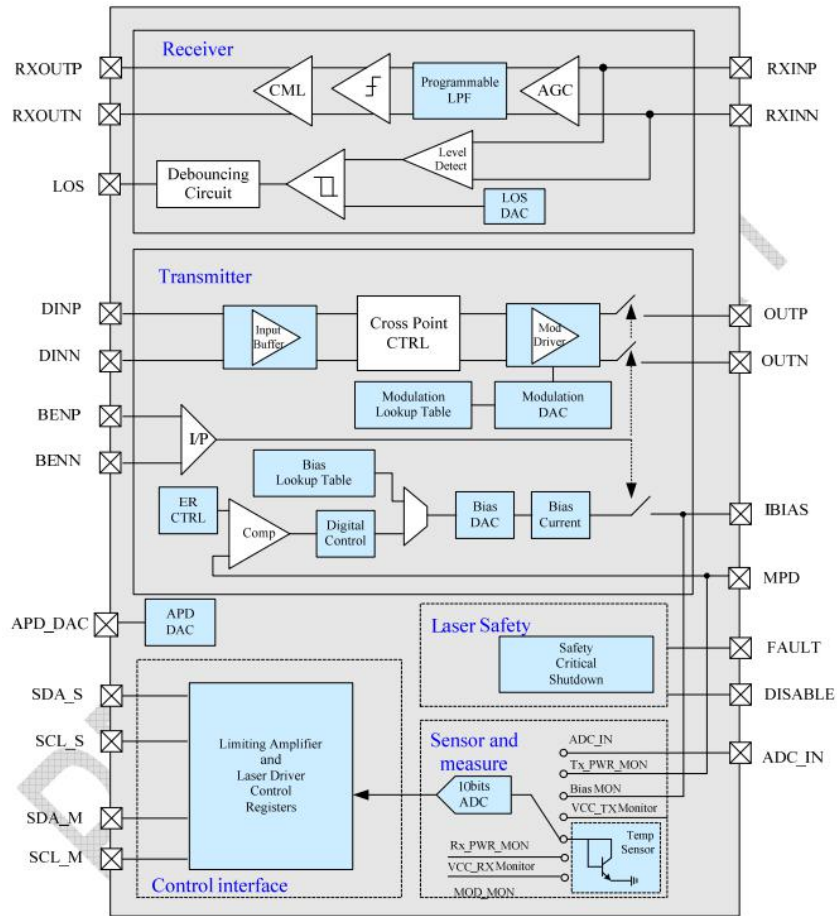


Figure2. Function Block Diagram

### 6. Electrical characteristics of Transmitter and Receiver

Parameter	Symbol	Min	Typ	Max	Unit
Transmitter Differential Input Voltage	$V_{IN, p-p}$	200	-	2400	mVp-p
Tx Disable Input Low Voltage	$V_{IL}$	0	-	0.8	V
Tx Disable Input High Voltage	$V_{IH}$	2.0	-	$V_{CC}$	V
TX Fault Output Low Voltage	$V_{OL}$	0	-	0.4	V
TX Fault Output High Voltage	$V_{OH}$	2.0	-	$V_{CC}$	V
Input differential impedance	$R_{IN}$	-	100	-	$\Omega$
Receiver Differential Output Voltage	$V_{OUT, p-p}$	400	-	1200	mVp-p
RX_LOS Output Voltage-Low	$V_{OL}$	0	-	0.4	V
RX_LOS Output Voltage-High	$V_{OH}$	2.0	-	$V_{CC}$	V

### 7. Timing Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
TX_DISABLE Assert Time	t_off	-	3	10	us
TX_DISABLE Negate Time	t_on	-	0.5	1	ms
Time to Initialize, Including Reset of TX_FAULT	t_int	-	30	300	ms
TX_FAULT Assert Time	t_fault	-	20	100	us
TX_DISABLE to Reset	t_reset	10	-	-	us
RX_LOS Assert Time	t_loss_on	-	-	100	us
RX_LOS Negate Time	t_loss_off	-	-	100	us

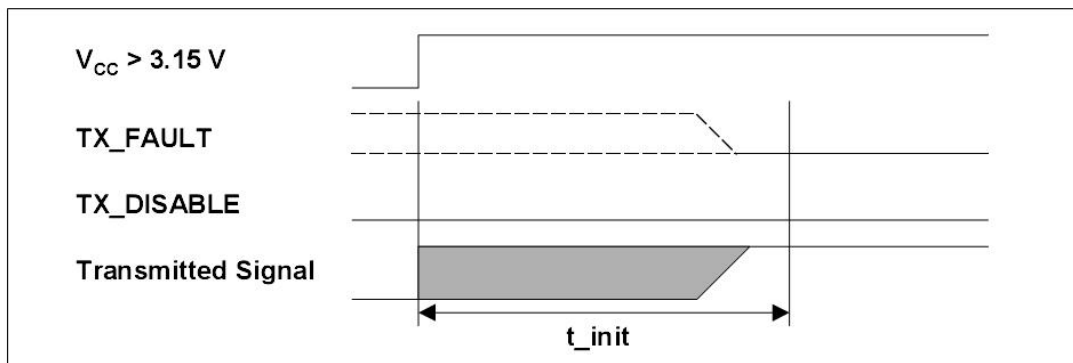


Figure 3. Power on initialization of SFP transceiver, TX\_DISABLE negated

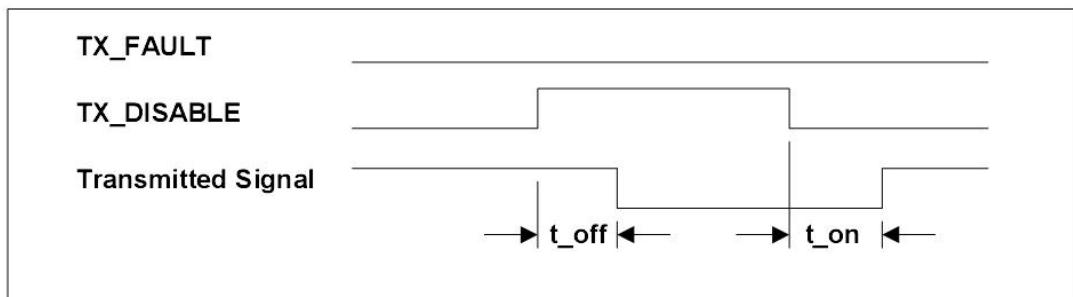


Figure 4. SFP TX\_DISABLE timing during normal operation

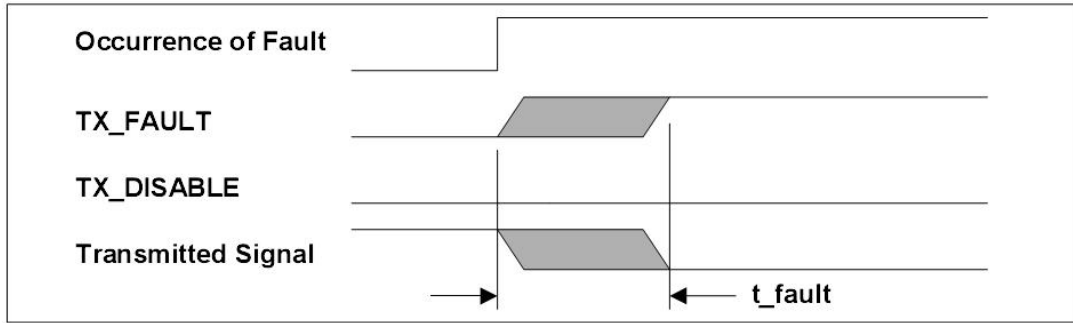


Figure 5. Detection of transmitter safety fault condition

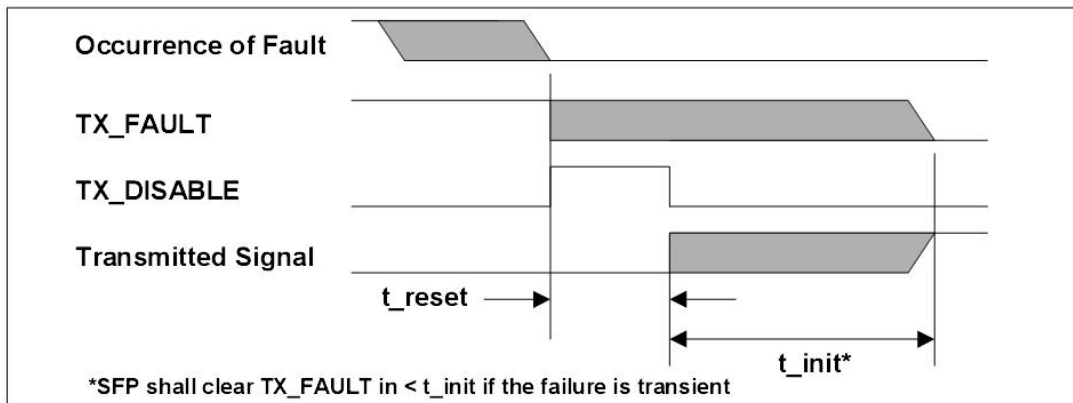


Figure 6. Successful recovery from transient safety fault condition

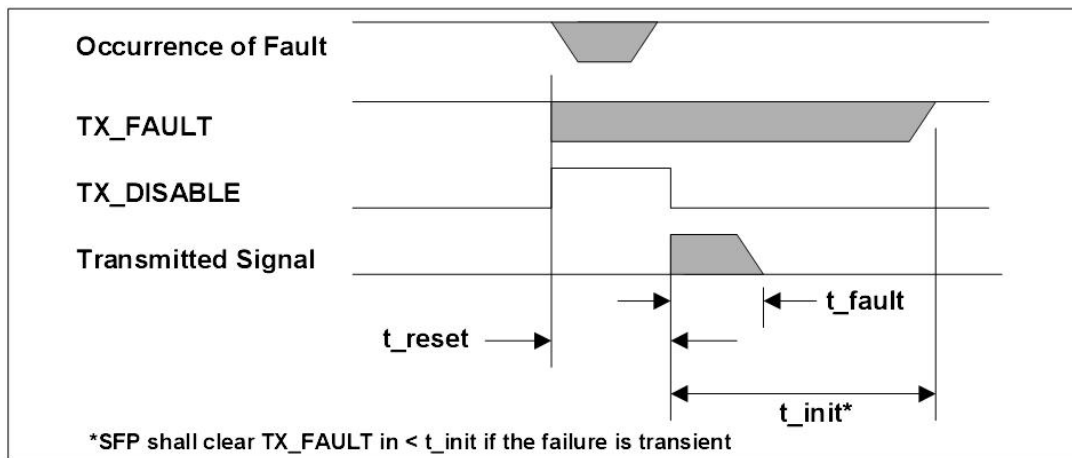


Figure 7. Unsuccessful recovery from safety fault condition

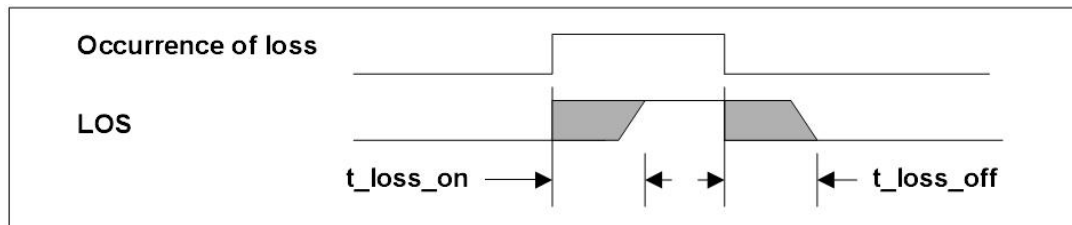


Figure 8. Timing of RX\_LOS detection

## 8. Pin Descriptions

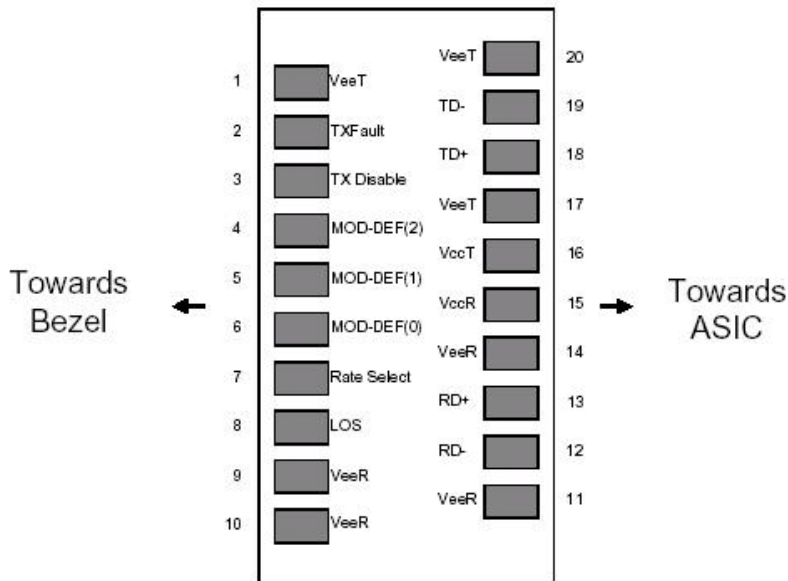


Figure 9. Pin out of Connector Block on Host Board

Pin	Symbol	Description	Note	Plug Seq. *
1	V <sub>EET</sub>	Transmitter ground (Common with receiver ground)	1	1
2	TX <sub>Fault</sub>	Transmitter Fault.	-	3
3	TX <sub>Disable</sub>	Transmitter Disable	2	3
4	MOD_DEF(2)	SDA Serial Data Signal	3	3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	3
6	MOD_DEF(0)	Grounded within the module	3	3
7	Rate Select	No connection required	-	3
8	LOS	Loss of Signal indication (TTL Output)	4	3
9	V <sub>EER</sub>	Receiver ground (Common with transmitter ground)	1	1
10	V <sub>EER</sub>	Receiver ground (Common with transmitter ground)	1	1
11	V <sub>EER</sub>	Receiver ground (Common with transmitter ground)	1	1
12	RD <sub>-</sub>	Receiver inverted Data out. AC Coupled	-	3
13	RD <sub>+</sub>	Receiver Non-inverted Data out. AC Coupled	-	3
14	V <sub>EER</sub>	Receiver ground	1	1
15	V <sub>CCR</sub>	Receiver Power Supply	-	2

16	V <sub>CCT</sub>	Transmitter Power Supply	-	2
17	V <sub>EET</sub>	Transmitter ground (Common with receiver ground)	1	1
18	TD+	Transmitter Non-inverted Data in. AC Coupled	-	3
19	TD-	Transmitter inverted Data in. AC Coupled.	-	3
20	V <sub>EET</sub>	Transmitter ground (Common with receiver ground)	1	1

\*Plug Seq. : Pin engagement sequence during hot plugging

(Note1) Circuit ground is internally isolated from chassis ground.

(Note2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.

(Note3) Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 3.6V.

MOD\_DEF(0) pulls line low to indicate module is plugged in.

(Note4) 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.

## 9. Digital Diagnostic Monitoring Functions

2-wire serial bus address 1010001X (A2h) is used to access measurement of transceiver temperature, internally measured supply voltage, TX bias current, TX optical output power and RX optical input power which are shown in table 1. Each diagnostic parameter has a corresponding high alarm, low alarm, high warning and low warning threshold which are shown in table 2.

**Table 1. Diagnostic Parameters**

Diagnostic Parameter	Range		LSB	Accuracy	Address	Note
	Min	Max				
Transceiver Temperature (Temp) Option A	-10[°C]	+80[°C]	1/256[°C]	±3[°C]	96-97	A 16bit signed two's complement value
Transceiver Temperature (Temp) Option B	-50[°C]	+95[°C]	1/256[°C]	±3[°C]	96-97	
Supply Voltage (Voltage)	+3.0[V]	+3.6[V]	100[μV]	±3[%]	98-99	A 16bit unsigned integer
TX Bias Current (Bias)	3[mA]	95[mA]	2.0[μA]	±10[%]	100-101	A 16bit unsigned integer
TX Optical Output Power (TX Power)	-8[dBm]	-0[dBm]	0.1[μW]	±3 [dB]	102-103	A 16bit unsigned integer
RX Optical Input Power (RX Power)	-22[dBm]	+0[dBm]	0.1[μW]	±3 [dB]	104-105	A 16bit unsigned integer



Table 2. Alarm and Warning Thresholds

Parameter	Warning		Alarm		Unit
	Low	High	Low	High	
Transceiver Temperature (Temp) Option B	-10	+80	-20	+90	°C
Transceiver Temperature (Temp) Option A	-45	+95	-50	110	
Supply Voltage (Voltage)	+3.13	+3.47	+3.0	+3.6	V
TX Bias Current (Bias)	5	85	3	95	mA
TX Optical Output Power (TX Power)	-8	+0	-9	+1	dBm
RX Optical Input Power (RX Power)	-22	-2	-23	-1	dBm

## 10. Power Supply Information

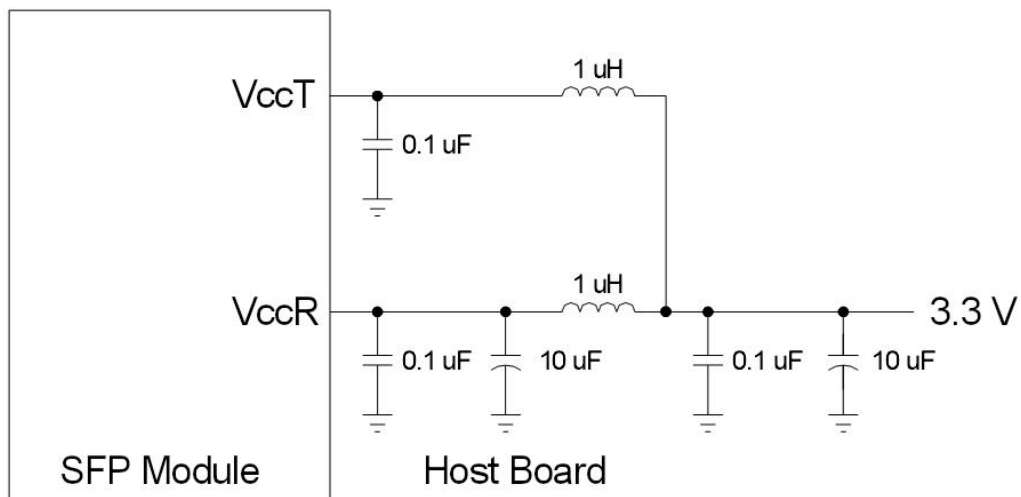
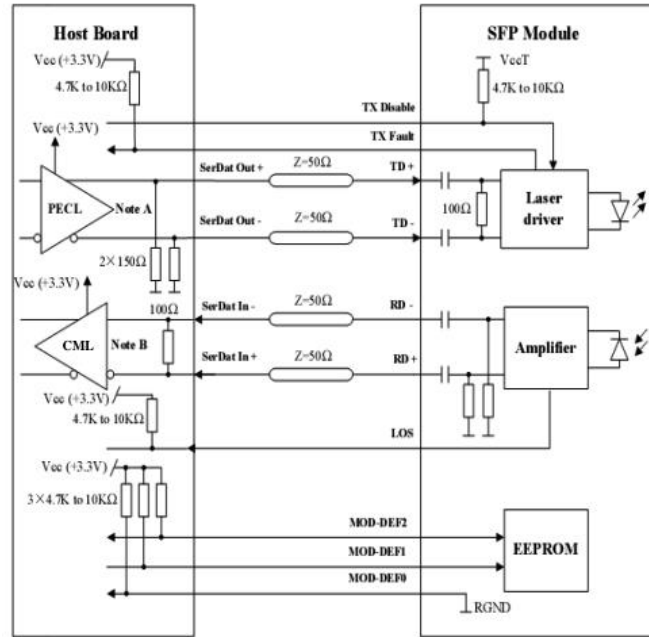


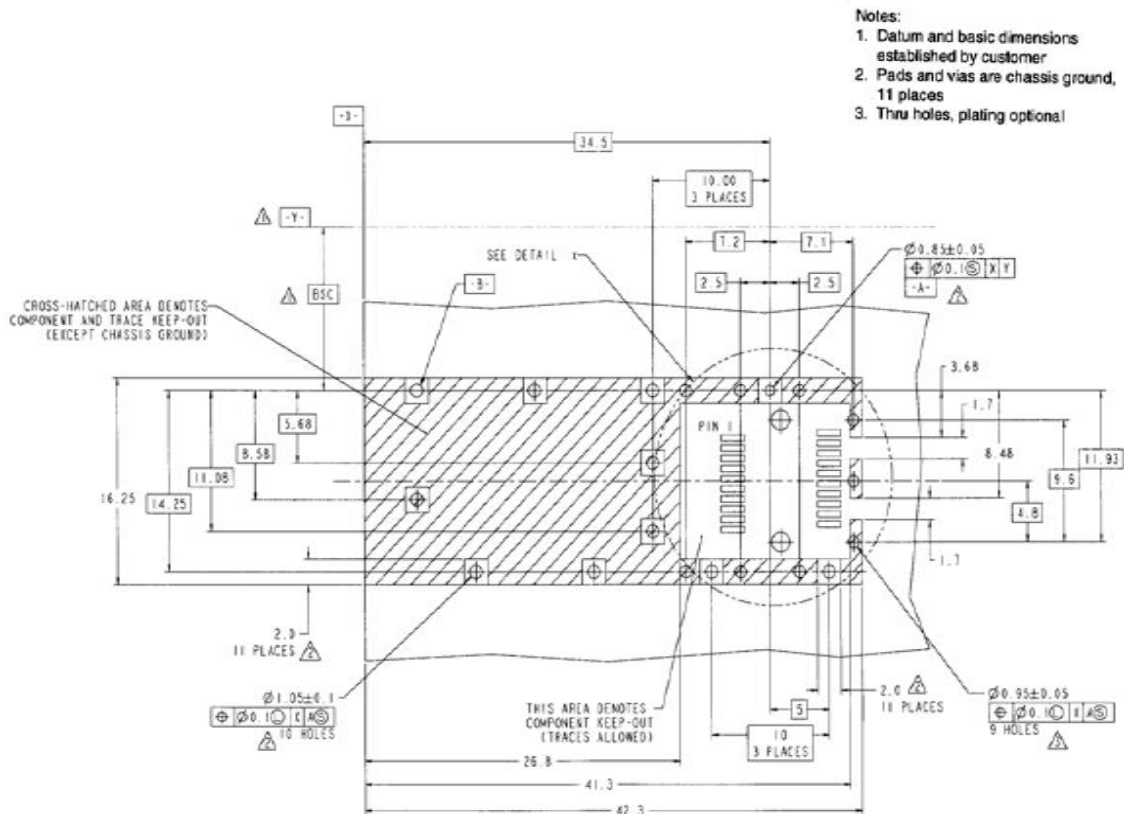
Figure 10. Recommended Host Board Supply Filtering Network



Note A: Circuit assumes open emitter output  
Note B: Circuit assumes high impedance internal bias @ Vcc-1.3V

Figure 11. Recommended Circuit

## 11. Mechanical Dimensions



- Notes:
1. Datum and basic dimensions established by customer
  2. Pads and vias are chassis ground, 11 places
  3. Thru holes, plating optional

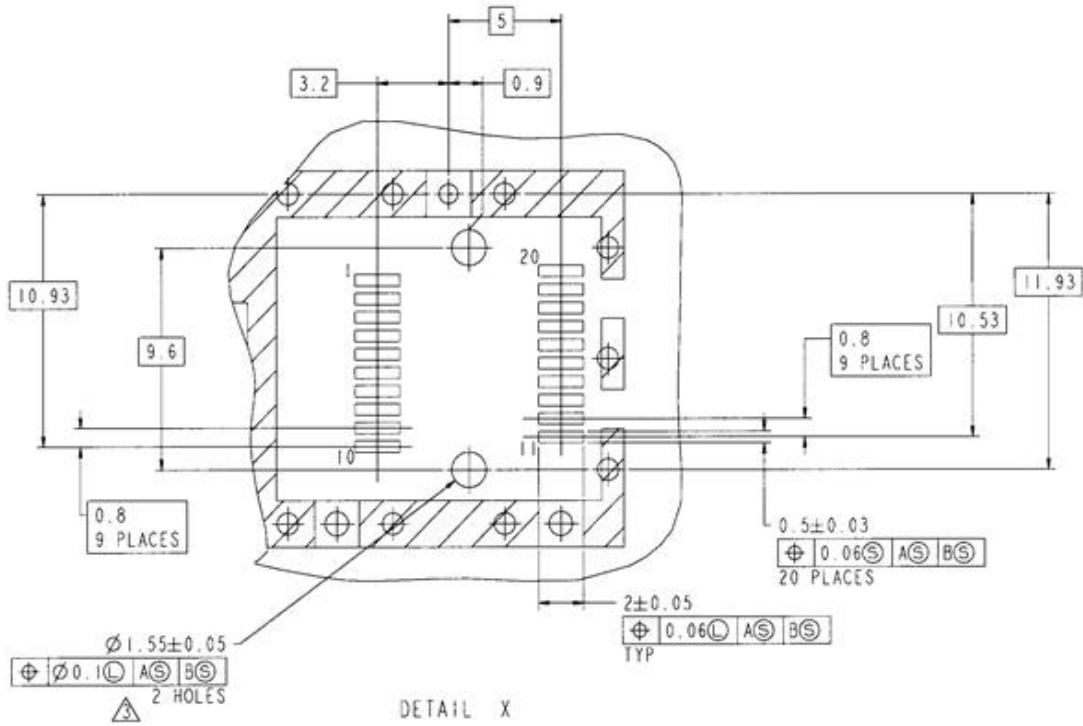


Figure 12. SFP Hot Board Mechanical Layout

