SFP+ 10G Transceiver M10GB-SFP-ZR

PRODUCT FEATURES:

- 10Gb/s serial optical interface compliant to 802.3ae 10GBASE-ZR/ZW
- Electrical interface compliant to SFF-8431specifications for enhanced 8.5 and 10 Gigabit small form factor pluggable module "SFP+"
- 2-wire interface for management specification compliant with SFF 8472 digital diagnostic monitoring interface for optical transceivers Eye Safety Designed to meet Laser Class1 Compliant with IEC60825-1
- Operating case temperature: -5 to 70 °C
- Metal enclosure for low EMI
- Low power consumption advanced firmware allow customer system encryption information to be stored in transceiver
- Single +3.3V Power Supply

Applications:

✧ SONET OC-192 IR-1
✧ Switch to Switch interface
✧ Switched backplane applications
✧ Router/Server interface
✧ Other optical transmission systems

Description:

- MODULELINK's M10G-SFP-ZR 10G SFP+ transceivers are designed for 10G Ethernet 10G BASE-ZR/ZW per 802.3ae , and it can support data-rate from 1.25Gb/s to 11.1Gb/s.Digital diagnostics are available via I2C interface as specified in the SFP+ MSA.

Standard:

- SFP+ MSA compliant
- IEEE802.3ae-2002 compliant
- GR-253-CORE compliant
- RoHS compliant
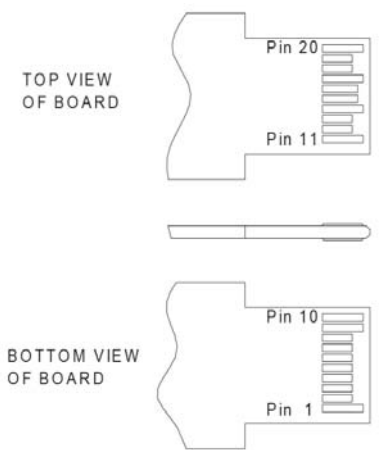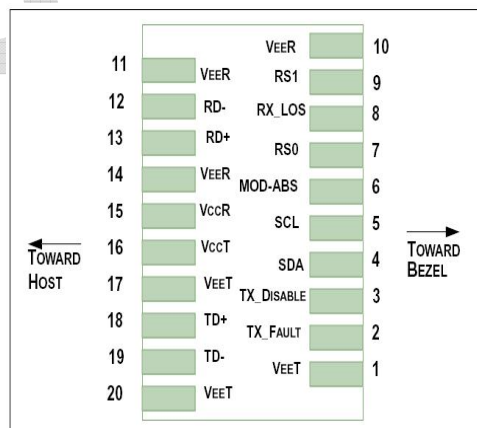
Pin out of Connector Block on Host Board

Pin Description:

Pin	Signal Name	Description	Plug Seq.	Notes
1	VEET	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note1
3	TX DISABLE	Transmitter Disable	3	Note2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note3
6	MOD_DEF(0)	TTL Low	3	Note3
7	Rate Select 0	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	Rate Select 1	Receiver ground	1	
10	VEER	Receiver ground	1	
11	VEER	Receiver ground	1	
12	RX-	Inv. Received Data Out	3	Note 5
13	RX+	Received Data Out	3	Note 5
14	VEER	Receiver ground	1	
15	VCCR	Receiver Power Supply	2	
16	VCCT	Transmitter Power Supply	2	
17	VEET	Transmitter Ground	1	
18	TX+	Transmit Data In	3	Note 6
`19	TX-	Inv. Transmit Data In	3	Note 6
20	VEET	Transmitter Ground	1	

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

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 4.7 ¨C 10 K resistor. Its states are:

Low (0 to 0.8V):   Transmitter on

(>0.8, < 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 to 10K 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 to 10K 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) RD-/+: These are the differential receiver outputs. They are AC coupled 100 differential lines which should be terminated with 100 (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 to 1000 mV single ended) when properly terminated.

6) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 500 to 2400 mV (250 to 1200 mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 to 600 mV single-ended) be used for best EMI performance.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	+85	°C
Power Supply Voltage	VCC3	-0.5	4.0	V
Operating Relative Humidity	RH		85	%

Electrical Characteristics (T$_{OP}$ = -5 to 70 °C)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T$_C$	0		+70	°C	
Power Supply Voltage	VCC3	3.13	3.3	3.47	V	
Power Supply Current	I$_{CC3}$			600	mA	1
Power Dissipation	P$_D$			2	W	1
Transmitter						
Input Differential Impedance	R$_{input}$		100		Ω	2
Differential Data Input Swing	V$_{in,pp}$	120		820	mV	
TX_DIS Voltage	V$_{TX\_DIS}$	2.0		VCC3	V	3
TX_EN Voltage	V$_{TX\_EN}$	0		0.8	V	
TX_DIS Assert Time				10	us	
TX_DIS Deassert Time				2	ms	
Receiver						
Differential Data Output Swing	V$_{out,pp}$	500	650	800	mV	4
Data output Rise/Fall Time(20%~80%)	t$_r$ /t$_f$			45	ps	

Note:

1. Maximum total power value is specified across the full temperature and voltage range and the inrush current is included

2. After internal AC coupling

3. Or open collector

4. Into 100 Ώ termination

Optical Characteristics (T$_{OP}$ = -5 to 70 °C)

Add: 3rd floor Block 2, Tianlong Science Industry Park, Kengzhi Town, Longgang Area, Shenzhen, China.
Tel: 86-755-86101649   Fax: 86-755-86101640   Dec 10 / 2011
E-mail:sales@modulelink.net   Website: www.modulelink.net   Rev.1.3

Modulelink(Shenzhen) Technology Co., Ltd.

Transmitter   (-5~70℃@9.953Gb/s~11.1Gb/s)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Date Rate		9.95		11.1	Gb/s	
Ave. Output Power	Po	-2		3	dBm	
Extinction Ratio	ER	3.5			dB	
Side mode Suppression Ratio		30			dB	

Receiver   (-5~70℃@9.953Gb/s~11.1Gb/s)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Date Rate		9.95		11.1	Gb/s	
Overload	Po	-7			dBm	
Input Centre Wavelength	λ		1550		nm	
Receiver Sensitivity				-23	dBm	
LOS Assert	LosA	-35			dBm	
LOS De-assert	LosD			-25	dBm	
LOS Hysteresis		0.5		3	dB	
Optical Return Loss		27			dB	

Management Interface

SFP+ 2-wire serial interface is specified in the Chapter 4 of the SFP+ MSA specification. The SFP+ 2-wire

serial interface is used for serial ID, digital diagnostics, and certain control functions. The 2-wire serial interface is mandatory for all SFP+ modules. The 2-wire serial interface address of the SFP+ module is 1010000X(A0h). In order to access to multiple modules on the same 2-wire serial bus, the SFP+ has a MOD_DESEL(module deselect pin). This pin (which is pull high or deselected in the module) must beheld low by the host to select of interest and allow communication over 2-wire serial interface. The module must not respond to or accept 2-wire serial bus instructions unless it is selected.

SFP+ Management Interface

SFP+ Management interface is specified in the Chapter 5 of the SFP+ MSA specification. The Figure 1 shows the structure of the memory map. The normal 256 Byte address space is divided into lower and upper blocks of 128 Bytes. The lower block of 128 Byte is always directly available and is used for the diagnostics and control functions that must be accessed repeatedly. Multiple blocks of memories are available in the upper 128 Bytes of the address space. These are individually addressed through a table select Byte which the user enters into a location in the lower address space. The upper address space tables are used for less frequently accessed functions and control space for future standards definition.
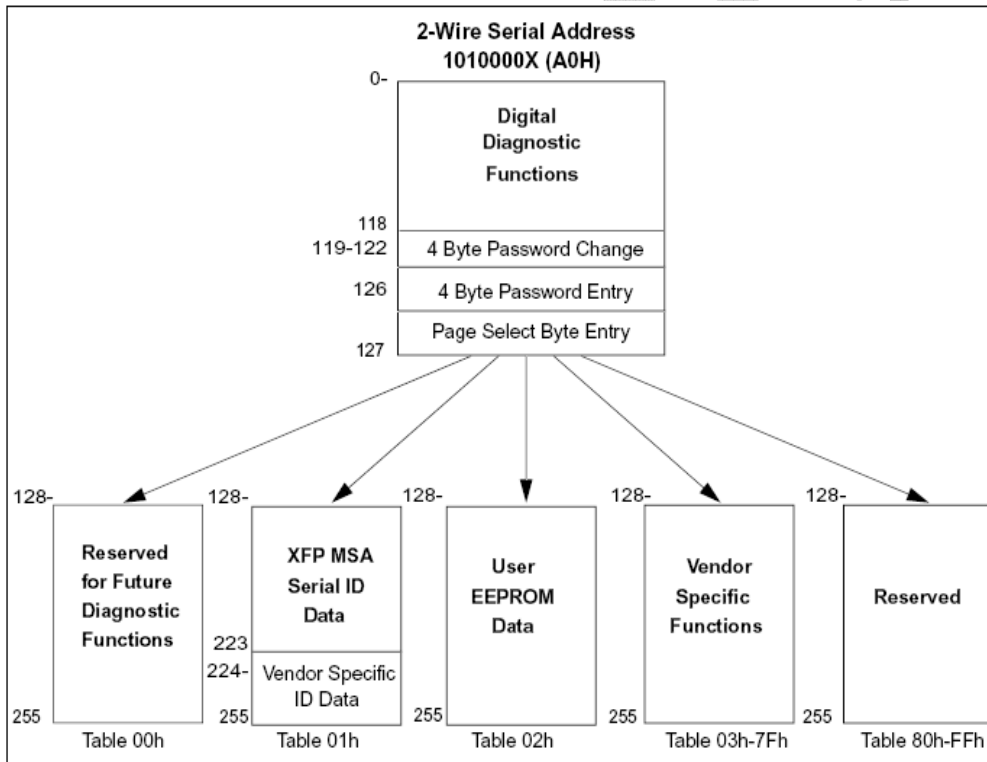
EEPROM Serial ID Memory Contents(A0h):

Data Address	Field Size (Bytes)	Name of Field	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP)
1	1	Ext. Identifier	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07h=LC)
3-10	8	Transceiver	Gigabit Ethernet 1000Base-SX & Fiber Channel
11	1	Encoding	8B10B (01h)
12	1	BR, Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	Reserved	(0000h)
15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name: "MODULELINK" (ASCII)
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "" (ASCII)
56-59	4	Vendor rev	"31 30 20 20" means 1.0 revision (ASCII)
60-62	3	Reserved	
63	1	CC_BASE	Check sum of bytes 0 - 62
Extended ID Fields			
64-65	2	Option	Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	Year(2 bytes), Month(2 bytes), Day (2 bytes)
92	1	Diagnostic type	"58" Diagnostics(Ext.Cal)
93	1	Enhanced option	"80" Diagnostics(Optional Alarm/warning flags)
94	1	SFF-8472	"01" Diagnostics(SFF-8472 Rev 9.3)
95	1	CC_EX	Check sum of bytes 64 - 94
Vendor Specific ID fields			
96-255	160	Readable	Vendor specific

Serial ID Memory Contents: (A2H)

Address	# Bytes	Name	Description	
00-01	2	Temp High Alarm	MSB at low address	
02-03	2	Temp Low Alarm	MSB at low address	
04-05	2	Temp High Warning	MSB at low address	
06-07	2	Temp Low Warning	MSB at low address	
08-09	2	Voltage High Alarm	MSB at low address	
10-11	2	Voltage Low Alarm	MSB at low address	
12-13	2	Voltage High Warning	MSB at low address	
14-15	2	Voltage Low Warning	MSB at low address	
16-17	2	Bias High Alarm	MSB at low address	
18-19	2	Bias Low Alarm	MSB at low address	
20-21	2	Bias High Warning	MSB at low address	
22-23	2	Bias Low Warning	MSB at low address	
24-25	2	TX Power High Alarm	MSB at low address	
26-27	2	TX Power Low Alarm	MSB at low address	
28-29	2	TX Power High Warning	MSB at low address	
30-31	2	TX Power Low Warning	MSB at low address	
32-33	2	RX Power High Alarm	MSB at low address	
34-35	2	RX Power Low Alarm	MSB at low address	
36-37	2	RX Power High Warning	MSB at low address	
38-39	2	RX Power Low Warning	MSB at low address	
40-55	16	Reserved	Reserved for future monitored quantities	

Address	# Bytes	Name	Description
56-59	4	Rx_PWR(4)	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 56 is MSB. Bit 0 of byte 59 is LSB.
60-63	4	Rx_PWR(3)	Single precision floating point calibration data - Rx optical power. Bit 7 of byte 60 is MSB. Bit 0 of byte 63 is LSB.
64-67	4	Rx_PWR(2)	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 64 is MSB, bit 0 of byte 67 is LSB.
68-71	4	Rx_PWR(1)	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 68 is MSB, bit 0 of byte 71 is LSB.
72-75	4	Rx_PWR(0)	Single precision floating point calibration data, Rx optical power. Bit 7 of byte 72 is MSB, bit 0 of byte 75 is LSB.
76-77	2	Tx_I(Slope)	Fixed decimal (unsigned) calibration data, laser bias current. Bit 7 of byte 76 is MSB, bit 0 of byte 77 is LSB.

78-79	2	Tx_I(Offset)	Fixed decimal (signed two's complement) calibration data, laser bias current. Bit 7 of byte 78 is MSB, bit 0 of byte 79 is LSB
80-81	2	Tx_PWR(Slope)	Fixed decimal (unsigned) calibration data, transmittercoupled output power. Bit 7 of byte 80 is MSB, bit 0 of byte81 is LSB.
82-83	2	Tx_PWR(Offset)	Fixed decimal (signed two's complement) calibration data, transmitter coupled output power. Bit 7 of byte 82 is MSB, bit 0 of byte 83 is LSB.
84-85	2	T(Slope)	Fixed decimal (unsigned) calibration data, internal module temperature. Bit 7 of byte 84 is MSB, bit 0 of byte 85 is LSB.
86-87	2	T(Offset)	Fixed decimal (signed two's complement) calibration data, internal module temperature. Bit 7 of byte 86 is MSB, bit 0 of byte 87 is LSB.
88-89	2	V(Slope)	Fixed decimal (unsigned) calibration data, internal module supply voltage. Bit 7 of byte 88 is MSB, bit 0 of byte 89 is LSB.
90-91	2	V(Offset)	Fixed decimal (signed two's complement) calibration data, internal module supply voltage. Bit 7 of byte 90 is MSB. Bit 0 of byte 91 is LSB.
92-95	4	Reserved	Reserved

Converted analog values. Calibrated 16 bit data			
96	All	Temperature MSB	Internally measured module temperature.
97	All	Temperature LSB	
98	All	Vcc MSB	Internally measured supply voltage in transceiver.
99	All	Vcc LSB	
100	All	TX Bias MSB	Internally measured TX Bias Current.
101	All	TX Bias LSB	
102	All	TX Power MSB	Measured TX output power.
103	All	TX Power LSB	
104	All	RX Power MSB	Measured RX input power.
105	All	RX Power LSB	
106	All	Reserved MSB	Reserved for 1st future definition of digitized analog input
107	All	Reserved LSB	Reserved for 1st future definition of digitized analog input
108	All	Reserved MSB	Reserved for 2nd future definition of digitized analog input
109	All	Reserved LSB	Reserved for 2nd future definition of digitized analog input
Optional Status/Control Bits			
110	7	TX Disable State	Digital state of the TX Disable Input Pin. Not supported.
110	6	Soft TX Disable	Read/write bit that allows software disable of laser. Not supported.
110	5	Reserved	

110	4	RX Rate Select State	Digital state of the SFP RX Rate Select Input Pin. Not supported.
110	3	Soft RX Rate Select	Read/write bit that allows software RX rate select.
			Not supported.
110	2	TX Fault	Digital state of the TX Fault Output Pin.
110	1	LOS	Digital state of the LOS Output Pin.
110	0	Data Ready	Indicates transceiver has achieved power up and data is ready
111	7-0	Reserved	Reserved.

Byte	Bit	Name	Description
Reserved Optional Alarm and Warning Flag Bits			
112	7	Temp High Alarm	Set when internal temperature exceeds high alarm level.
112	6	Temp Low Alarm	Set when internal temperature is below low alarm level.
112	5	Vcc High Alarm	Set when internal supply voltage exceeds high alarm level.
112	4	Vcc Low Alarm	Set when internal supply voltage is below low alarm level.
112	3	TX Bias High Alarm	Set when TX Bias current exceeds high alarm level.
112	2	TX Bias Low Alarm	Set when TX Bias current is below low alarm level.
112	1	TX Power High Alarm	Set when TX output power exceeds high alarm level.
112	0	TX Power Low Alarm	Set when TX output power is below low alarm level.
113	7	RX Power High Alarm	Set when Received Power exceeds high alarm level.
113	6	RX Power Low Alarm	Set when Received Power is below low alarm level.
113	5	Reserved Alarm	
113	4	Reserved Alarm	
113	3	Reserved Alarm	
113	2	Reserved Alarm	
113	1	Reserved Alarm	
113	0	Reserved Alarm	
114	All	Reserved	
115	All	Reserved	
116	7	Temp High Warning	Set when internal temperature exceeds high warning level.

116	6	Temp Low Warning	Set when internal temperature is below low warning level.
116	5	Vcc High Warning	Set when internal supply voltage exceeds high warning level.
116	4	Vcc Low Warning	Set when internal supply voltage is below low warning level.
116	3	TX Bias High Warning	Set when TX Bias current exceeds high warning level.
116	2	TX Bias Low Warning	Set when TX Bias current is below low warning level.
116	1	TX Power High Warning	Set when TX output power exceeds high warning level.
116	0	TX Power Low Warning	Set when TX output power is below low warning level.
117	7	RX Power High Warning	Set when Received Power exceeds high warning level.
117	6	RX Power Low Warning	Set when Received Power is below low warning level.
117	5	Reserved Warning	
117	4	Reserved Warning	
117	3	Reserved Warning	
117	2	Reserved Warning	
117	1	Reserved Warning	
117	0	Reserved Warning	
118	All	Reserved	
119	All	Reserved	

120-127	8	Vendor Specific	00h.
128-255	128		Writable Memory

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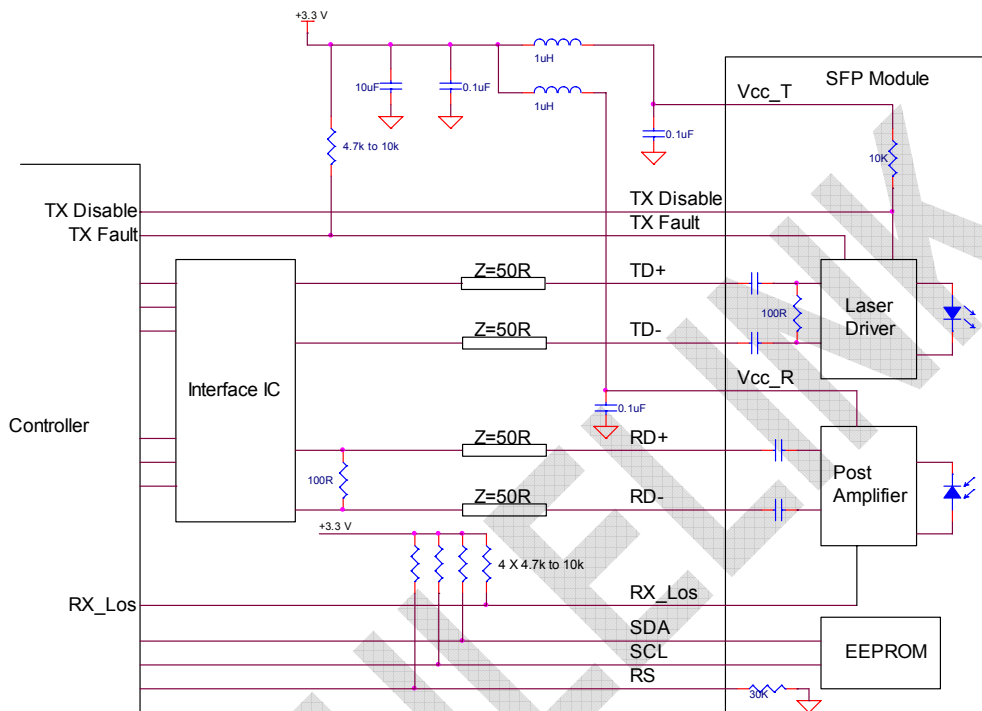
Recommended power supply filter
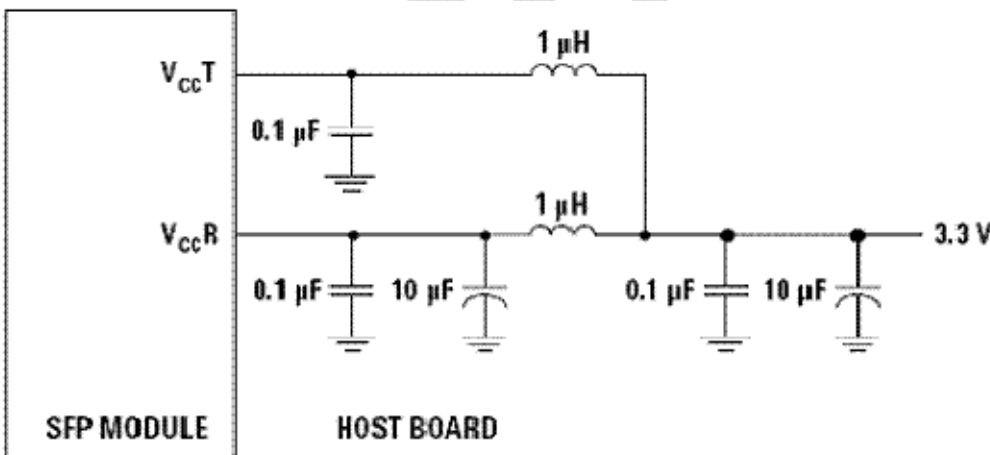
Note: Inductors with DC resistance of less than 1Ω should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than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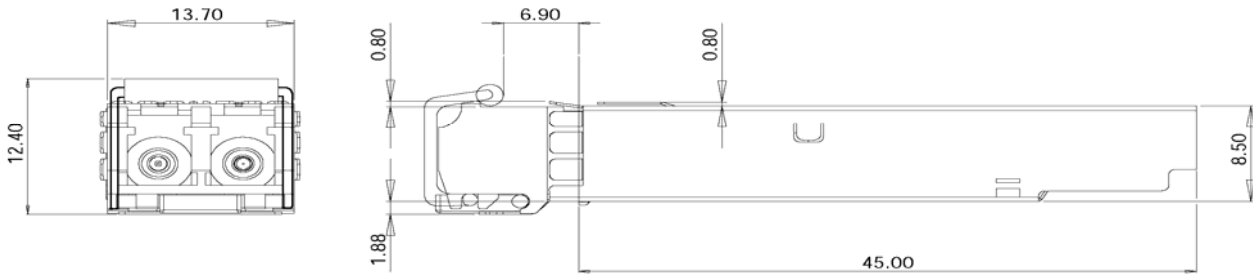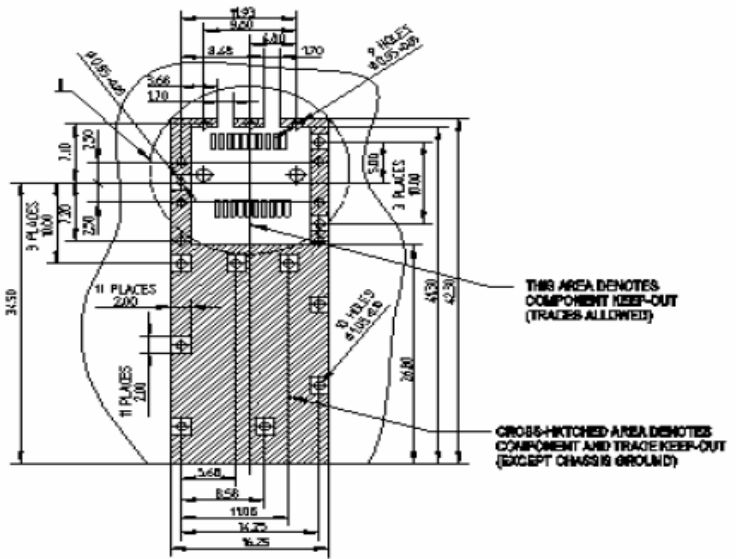
Package Dimensions

M10G-SFP-ZR

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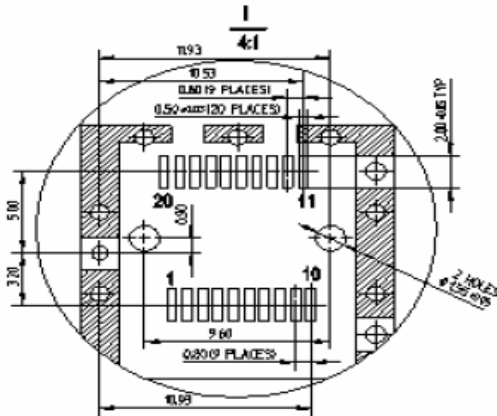
Notes:
1. Datum and basic dimensions established by customer
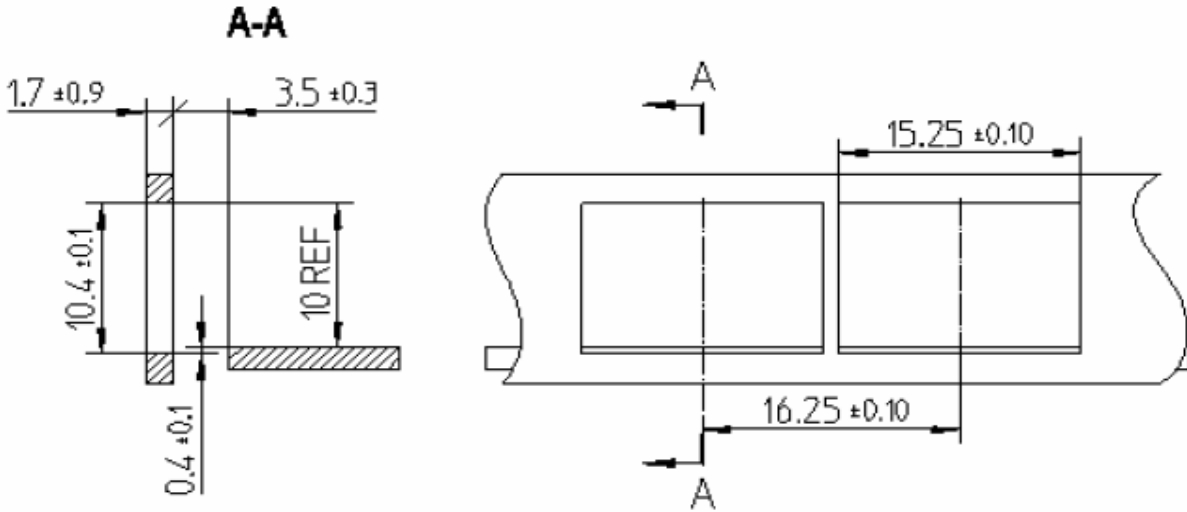2. Pads and vias are chassis ground, 11 places
3. Thru holes, plating optional

THIS AREA DENOTES COMPONENT KEEP-OUT (TRACES ALLOWED)

CROSS-HATCHED AREA DENOTES COMPONENT AND TRACE KEEP-OUT (EXCEPT CHASSIS GROUND)

Recommended Front Panel Layout Opening for LC

A-A

Add: 3rd floor Block 2, Tianlong Science Industry Park, Kengzhi Town, Longgang Area, Shenzhen, China.
Tel: 86-755-86101649   Fax: 86-755-86101640   Dec 10 / 2011
E-mail:sales@modulelink.net   Website: www.modulelink.net   Rev.1.3