



10Gbps XFP Optical Transceiver

RTXM226-407

Features

- *Compliant with XFP MSA*
- *Data Rate from 9.95 Gbps to 10.52Gbps*
- *850nm VCSEL TOSA and PIN ROSA*
- *Industry-standard, protocol-independent, XFI interface*
- *Transmission distance up to 300m with OM3 fiber*
- *LC duplex receptacle package*
- *Low power dissipation (Max 1.5W)*
- *Hot Pluggable*
- *Built in digital diagnostic Functions*
- *Operating case temperature range:0°C~ 70°C*
- *RoHS compliant*

Application

- *10GBASE-SR/SW 10Gigabit Ethernet*
- *1200-MX-SN-I 10Gigabit Fiber Channel*

Absolute Maximum Ratings

Table 1 Maximum Operating Conditions

Parameter	Symbol	Unit	Min	Max
Supply Voltage	V_{CC3}	V	-0.5	4.0
Storage Temperature	T_s	°C	-40	85
Operating Case Temperature	T_c	°C	0	70
Relative humidity (Non condensation)	-	%	5	90
Receiver Input Optical Power PIN(Average)	-	dBm	-	3

Recommended Operating Conditions

Table 2 Recommended Operating Conditions

Parameter	Symbol	Unit	Min	Typ	Max
Operating Case Temperature	T_c	°C	0	-	70
Supply Voltage	V_{CC3}	V	3.135	3.3	3.465
Supply Current	I_{CC3}	mA	-	-	430
Power Dissipation	-	W	-	-	1.5

Maxim Supported Distances

Fiber Type	850nm OFL Bandwidth	Symbol	Unit	Max
62.5μm	160 MHz*km	Lmax	m	26
	OM1 200MHz*km			33
	400 MHz*km			66
50μm	OM2 500MHz*km	Lmax	m	82
	OM3 2000MHz*km			300

Electrical Characteristics

(Tested under recommended operating conditions, unless otherwise noted)

Table 3 High Speed Electrical Interface

Parameter	Symbol	Unit	Min	Typ	Max	Note
Transmitter						
Input Differential Impedance	R_{in}	Ω	-	100	-	
Differential Data Input Swing	$V_{in,pp}$	mV	120	-	1000	
Transmit Disable Voltage	VD	V	2.0	-	V_{CC3}	
Transmit Enable Voltage	VEN	V	0	-	+0.8	
Transmit Disable Assert Time	-	us	-	-	10	

Receiver						
Differential Data Output Swing	Vout,pp	mV	400	650	800	
Data Output Rise Time	Tr	ps	24	-		
Data Output Fall Time	Tf	ps	24	-		
LOS Fault	-	V	Vdd3-0.5	-	Vdd3	1
LOS Normal	-	V	0	-	+0.5	

Note1: Vdd3 is host +3.3V power supply.

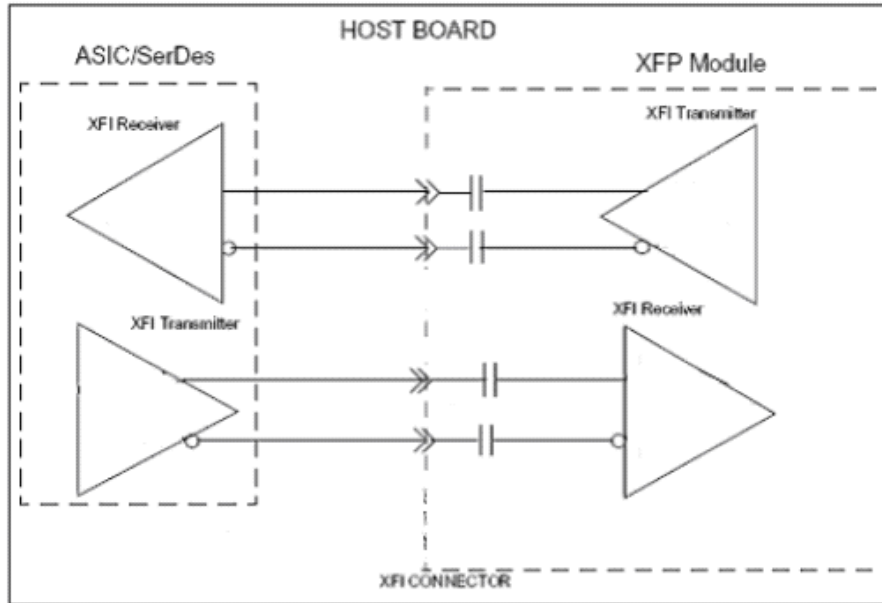


Figure 1 High Speed Electrical Interface

Table4 Low Speed Electrical Interface

Parameter	Symbol	Unit	Min	Max	Note
LVTTL-I (Tx_Dis, P_Down/RST)	V _{IH}	V	2.0	Vcc3+0.3	
	V _{IL}	V	-0.3	0.8	
LVTTL-O (Interrupt, Mod_NR, Rx_Los)	V _{OH}	V	Vdd3-0.5	Vdd3+0.3	1
	V _{OL}	V	0.0	0.4	
SCL, SDA	V _{IH}	V	Vdd3*0.7	Vdd3+0.5	1
	V _{IL}	V	-0.3	Vdd3*0.3	
SCL, SDA	V _{OH}	V	Vdd3-0.5	Vdd3+0.3	
	V _{OL}	V	0.0	0.4	
Leakage Current	I _L	μA	-10	10	
I ² C Clock Rate		KHz		400	

Note1: Vdd3 is host +3.3V power supply.

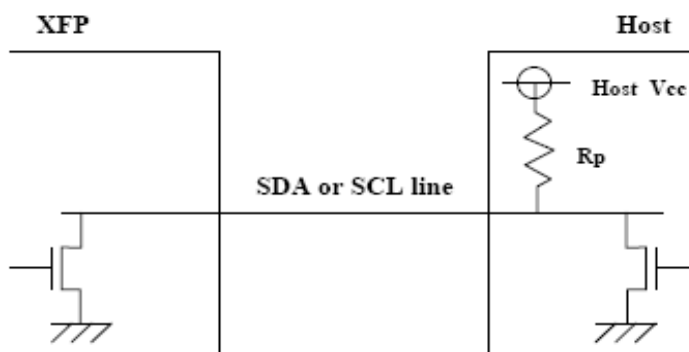


Figure 2 Open Drain Type Connection for I²C

Optical Characteristics

(Tested under recommended operating conditions, unless otherwise noted)

Table 4 Optical Characteristics

Parameter	Symbol	Unit	Min	Typ	Max	Note
Optical Transmitter Characteristics						
Data Rate	-	Gbps	9.95	-	10.52	
Average Optical Power	P _o	dBm	-7.3	-	-1	1, 3
Laser OMA Output Power	P _{OMA}	dBm	-4.3			1, 2
Center Wavelength Range	λ	nm	840	850	860	
Extinction Ratio	ER	dB	3	-	-	1
RMS Spectral Width	-	nm	-	-	0.45	2
Output Power at laser disable	-	dBm		-	-30	
Eye Diagram	Compliant with IEEE802.3ae eye mask					
Dispersion Penalty		dB	-	-	3.9	1
Optical Receive Characteristics						
Data Rate	-	Gbps	9.95	-	10.52	
Receiver Sensitivity (OMA)	-	dBm	-	-	-11.1	
Stressed Receiver Sensitivity(OMA)		dBm			-7.5	1
Overload	-	dBm	-1	-	-	
Optical Return Loss		dB		-	12	
LOS De-Assert	-	dBm	-	-18	-12	
LOS Assert	-	dBm	-30	-20	-	
LOS Hysteresis	-	dB	0.5	-		

Note1: 10GFC 1200-MX-SN-I/IEEE 802.3ae 10GBASE-SR compliant

Note2: Trade-offs are available between spectral width, center wavelength and minimum Optical Modulation Amplitude (OMA). See Figure 3 and Table 6

Note3: The maximum 10GBASE-SR Average Optical Output Power Shall be the lesser of the class 1 safety limits as defined by IEEE802.3ae 52.10.2 or the average receive power maximum defined by IEEE 802.3ae Table 52-9

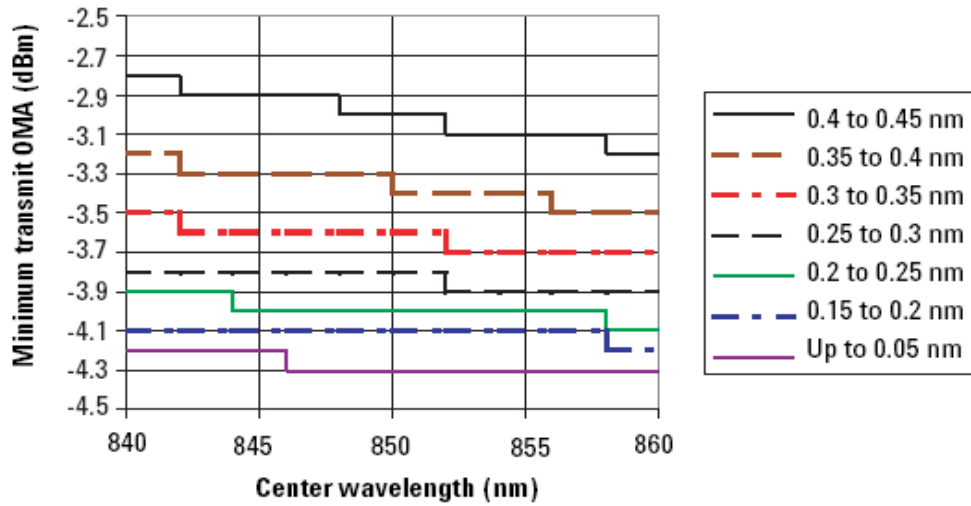


Figure 3 Triple tradeoff curve for 10GBASE-S (informative)

Table 6 Optical Modulation

	Up to 0.05	0.05 to 0.1	0.1 to 0.15	0.15 to 0.2	0.2 to 0.25	0.25 to 0.3	0.3 to 0.35	0.35 to 0.4	0.4 to 0.45
840 to 842	-4.2	-4.2	-4.1	-4.1	-3.9	-3.8	-3.5	-3.2	-2.8
842 to 844	-4.2	-4.2	-4.2	-4.1	-3.9	-3.8	-3.6	-3.3	-2.9
844 to 846	-4.2	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-2.9
846 to 848	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-2.9
848 to 850	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-3.0
850 to 852	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.4	-3.0
852 to 854	-4.3	-4.2	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
854 to 856	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
856 to 858	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.5	-3.1
858 to 860	-4.3	-4.3	-4.2	-4.2	-4.1	-3.9	-3.7	-3.5	-3.2

Block Diagram

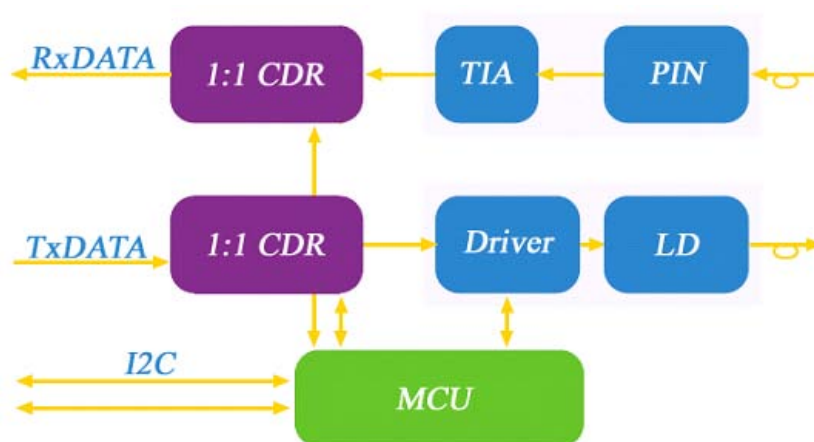


Figure 4 Block Diagram

Pin Description

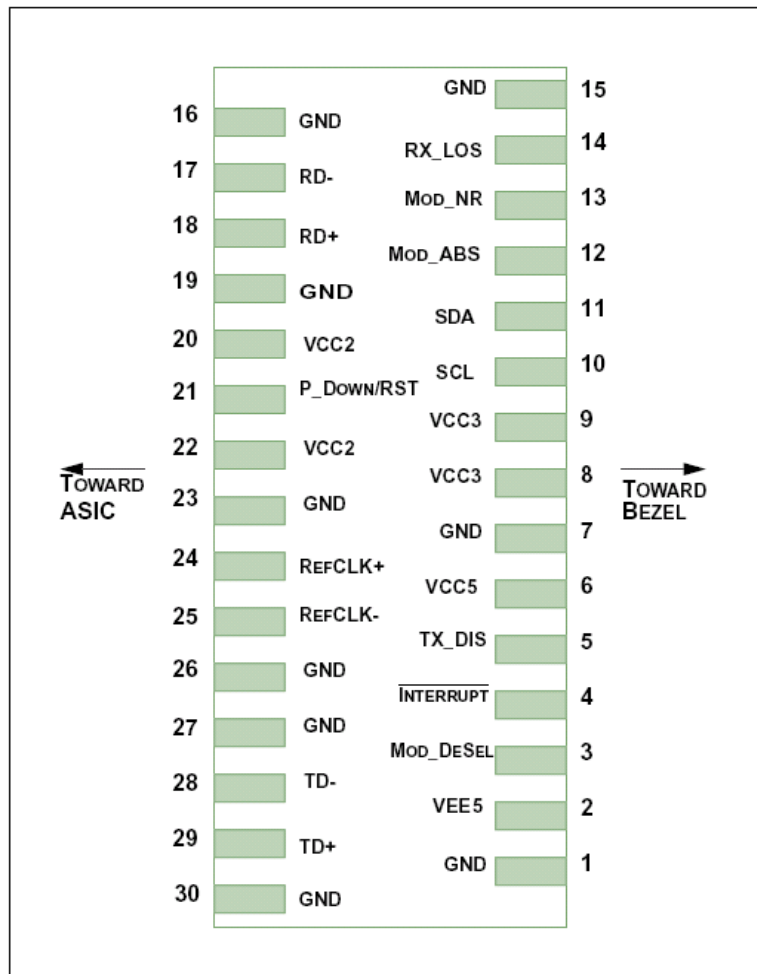


Figure 5 Host PCB XFP Pinout Top View

Table 7 Module Electrical Pin Definition

Pin	Logic	Symbol	Name/Description	Note
1		GND	Module Ground	1
2		VEE5	Optional -5.2V Power Supply (Not Required)	
3	LVTTTL-I	Mod_DeSel	Module De-select; When held low allows module to respond to 2-wire serial interface	
4	LVTTTL-O	Interrupt	Interrupt; Indicates presence of an important condition which can be read over the 2-wire serial interface	2
5	LVTTTL-I	TX_DIS	Transmitter Disable; Turns off transmitter laser output	
6		VCC5	+5V Power Supply (Not Required)	
7		GND	Module Ground	1
8		VCC3	+3.3V Power Supply	
9		VCC3	+3.3V Power Supply	
10	LVTTTL-I/O	SCL	2-Wire Serial Interface Clock	2
11	LVTTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
12	LVTTTL-O	Mod_Abs	Indicates Module is not present. Grounded in the Module	2

13	LVTTTL-O	Mod_NR	Module Not Ready; Indicating Module Operational Fault	2
14	LVTTTL-O	RX_LOS	Receiver Loss Of Signal Indicator	2
15		GND	Module Ground	1
16		GND	Module Ground	1
17	CML-O	RD-	Receiver Inverted Data Output	
18	CML-O	RD+	Receiver Non-Inverted Data Output	
19		GND	Module Ground	1
20		VCC2	+1.8V Power Supply (Not Required)	
21	LVTTTL-I	P_Down/RST	Power down; When high, requires the module to limit power consumption to 1.5W or below. 2-Wire serial interface must be functional in the low power mode. Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22		VCC2	+1.8V Power Supply (Not Required)	
23		GND	Module Ground	1
24	PECL-I	RefCLK+	Reference Clock Non-Inverted Input, AC coupled on the host board (Not Required)	
25	PECL-I	RefCLK-	Reference Clock Inverted Input, AC coupled on the host board (Not Required)	
26		GND	Module Ground	1
27		GND	Module Ground	1
28	CML-I	TD-	Transmitter Inverted Data Input	
29	CML-I	TD+	Transmitter Non-Inverted Data Input	
30		GND	Module Ground	1

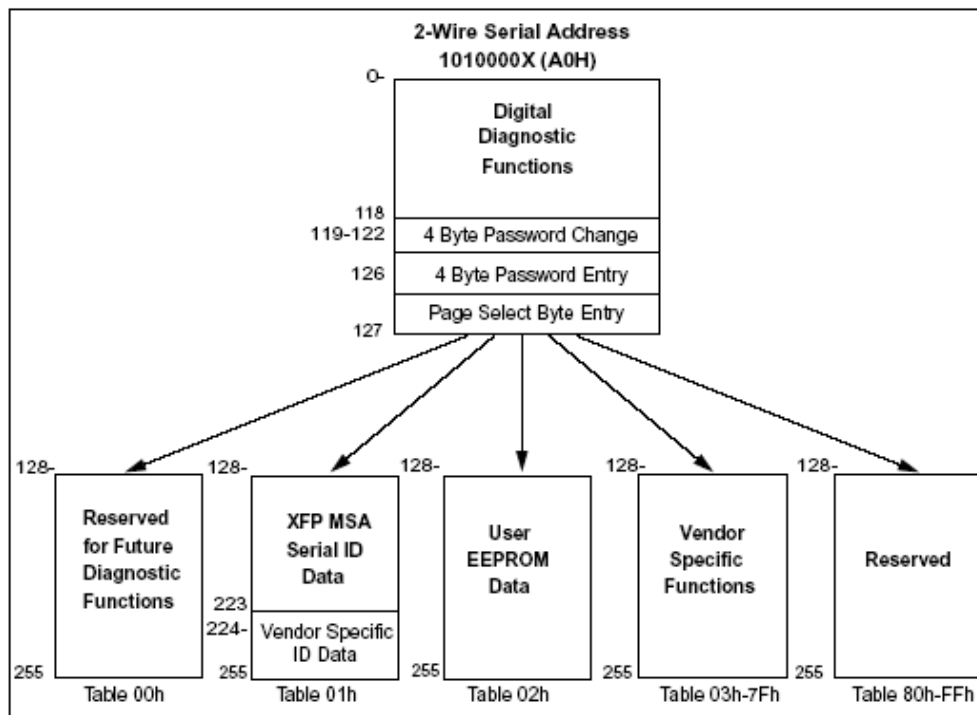
Note1: Module ground pins GND are isolated from the module case and chassis ground within the module.

Note2: Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

Digital Diagnostic Functions

As defined by the XFP MSA, digital diagnostic functions are provided via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver Temperature
- Tx Bias Current
- Tx Optical Power
- RX Received Optical Power
- Transceiver +3.3V Supply Voltage



EEPROM Memory Map

Table 8 EEPROM Memory Map

Table Data Address (Bytes)	Size	Name of Field	Contents (Hex)	Decimal	Description
0	1	Identifier	06		XFP
01	1	Signal Conditioner Control	00		
02-03	2	Temp High Alarm	55 00	85 °C	
04-05	2	Temp Low Alarm	F1 00	-15 °C	
06-07	2	Temp High Warning	50 00	80 °C	
08-09	2	Temp Low Warning	F6 00	-10 °C	
10-17	8	Reserved A/D Flag Thresholds	FF FF FF FF FF FF FF FF		

	18-19	2	Bias High Alarm	17 70	12 mA	
	20-21	2	Bias Low Alarm	00 00	0 mA	
	22-23	2	Bias High Warning	15 7C	11 mA	
	24-25	2	Bias Low Warning	00 00	0 mA	
	26-27	2	TX Power High Alarm	31 2D	1 dBm	
	28-29	2	TX Power Low Alarm	06 31	-8 dBm	
	30-31	2	TX Power High Warning	1F 07	-1 dBm	
	32-33	2	TX Power Low Warning	0C 5A	-5 dBm	Threshold Values used for Alarm and Warning Flags
	34-35	2	RX Power High Alarm	4D F1	3 dBm	
	36-37	2	RX Power Low Alarm	00 0A	-30 dBm	
	38-39	2	RX Power High Warning	31 2D	1 dBm	
	40-41	2	RX Power Low Warning	00 9E	-18dBm	
	42-43	2	AUX 1 High Alarm	9C 40	4 V	
	44-45	2	AUX 1 Low Alarm	6B 6C	2.75 V	
	46-47	2	AUX 1 High Warning	8C A0	3.6 V	
	48-49	2	AUX 1 Low Warning	75 30	3.0 V	
	50-51	2	AUX 2 High Alarm	00 00		
	52-53	2	AUX 2 Low Alarm	00 00		
	54-55	2	AUX 2 High Warning	00 00		
	56-57	2	AUX 2 Low Warning	00 00		
	58-59	2	Optional VPS Control Registers	00 00		
	60-69	10	Reserved	00 00 00 00 00 00 00 00 00 00		
	70-71	2	BER Reporting	00 00		
	72-75	4	Wavelength Control	00 00 00 00		
	76-79	2	FEC control Registers	00 00 00 00		
	80-87	8	Flags			
	88-95	8	Interrupt Control	00 00 00 00 00 00 00 00		
	96-109	14	A/D readout			
	110-111	2	General Control/Status bits			
	112-117	6	Reserved			
	118	1	Serial Interface Read/Write Error Checking			
	119-122	4	New Password entry			
	123-126	4	Password entry			
	127	1	Page Select Byte			
01	128	1	Identifier	06		XFP
	129	1	Ext. Identifier	10		TX Ref Clock input Not Required

130	1	Connector	07		LC
131-138	8	Transceiver	88 80 00 00 00 00 00 00		
139	1	Encoding	F0		
140	1	BR-Min	63	9.9 Gbps	
141	1	BR-Max	69	10.52 Gbps	
142	1	Length (SMF)–km	00		
143	1	Length (E-50um)	96	300m	
144	1	Length (50um)	52	82m	
145	1	Length (62.5um)	21	33m	
146	1	Length (copper)	00		
147	1	Device Tech	00	850 nm VCSEL	
148-163	16	Vendor		XFP vendor name (ASCII):	
164	1	CDR Support	E0	CDR Rate Support 9.9~10.5Gbs	
165-167	3	Vendor OUI		XFP vendor IEEE company ID	
168-183	16	Vendor PN		Part number provided by XFP vendor (ASCII):	
184-185	2	Vendor rev	31 30	1.0	Revision level for part number provided by vendor (ASCII)
186-187		Wavelength	42 68	850 nm	
188-189		Wavelength Tolerance	07 D0	10 nm	
190		Max Case Temperature	46	70deg	Maximum Case Temperature in Degrees C.
191		CC_BASE			Check code for Base ID Fields (addresses128-190)
EXTENDED ID FIELDS					
192	1	Power Supply	4B	1.5W	Max Power dissipation
193	1		64	1W	Max Power dissipation after power down
194	1		04	400mA	+5V and +3.3V Max current
195	1		00	0	+1.8V and-5.2V Max current
196-211	16		Vendor SN		
212-219	8	Date code			Vendor's manufacturing date code(ASCII)
220	1	Diagnostic Monitoring Type	08		
221	1	Enhanced Options	60		
222	1	Aux Monitoring	72		
223	1	CC_EXT			Check code for the Extended ID Fields(addresses 192 to 222)
VENDOR SPECIFIC ID FIELDS					
224-255	32	Vendor Specific			Vendor Specific EEPROM

Typical Application Circuit For Power Supply

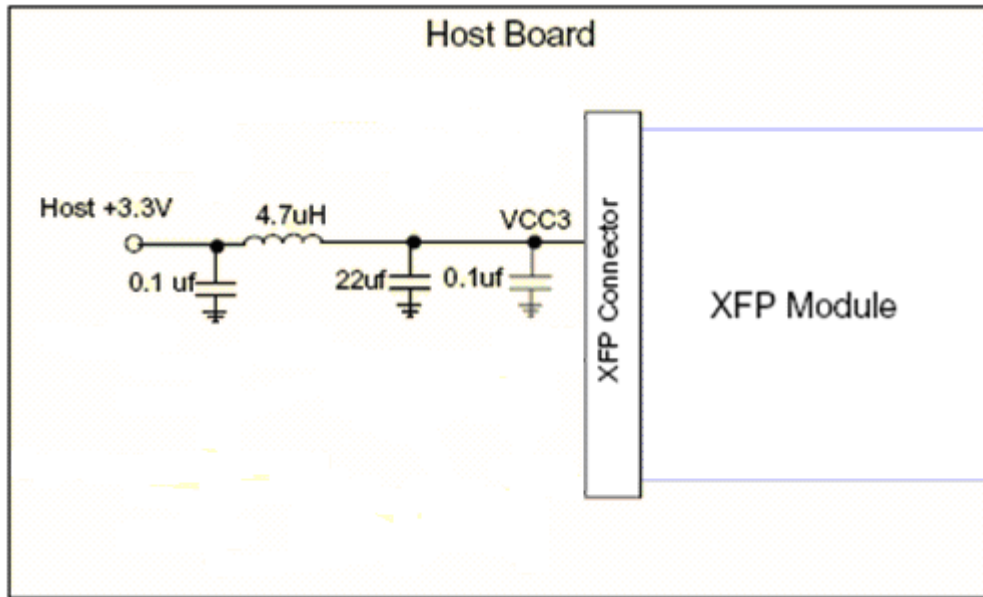


Figure 6 Example of Host Board Supply Filtering Network

Package Outline

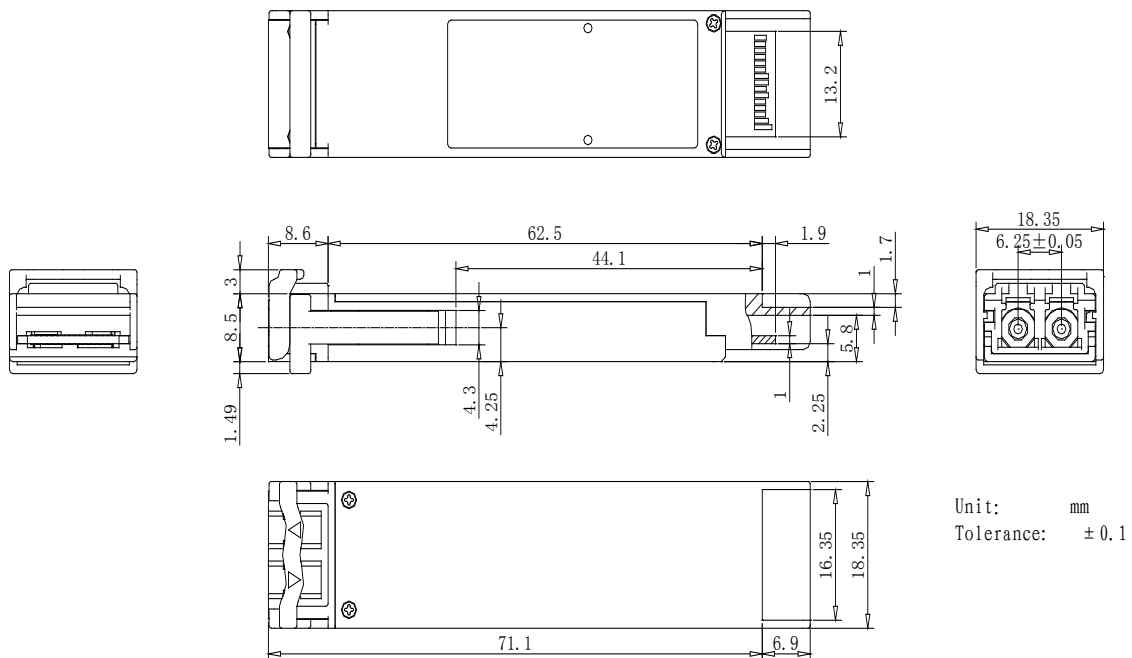


Figure 7 Package Outline

Regulatory Compliance

Table 9 Regulatory Compliance

Feature	Test Method	Performance
Laser Eye Safety	FDA 21 CFR 1040.10 and 1040.11	Compliant with Class 1 laser product
	IEC 60825-1: 1994+ A11: 1996+ A2: 2001	
	IEC 60825-2: 2004 + A1: 2006	
	EN 60825-1:1994+A1:2002+A2:2001	
	EN 60825-2: 2004	
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7 Human Body Model	Class 1 (>1.5kV)
Electrostatic Discharge (ESD) Immunity	IEC 61000-4-2: 2001	Class 2 (>4.0kV)
Electromagnetic Interference (EMI)	FCC Part 15 Subpart J Class B	Compliant with standards
	CISPR22:1997+A1:2000+A2:2002, Class B	
	EN55022:1998+A1:2000+A2:2003, Class B	

Ordering Information

Part No.	Specifications								Application	
	Package	Data Rate	Laser	Optical Power	Detector	Sensitivity	Temp	Reach		Other
RTXM226-407	XFP	9.95	850nm	-7.3	PIN	< -11.1dBm	0~70°C	300m	DDM	1200-MX-SN-I, 10GBASE-SR/SW
		~10.52G	VCSEL	~-1dBm						

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