Features：

- Support SDH OC-192/STM-64/10GBASE-Ethernet/10G Fiber Channel application
- Compliant to SFP+ Electrical MSA SFF-8431
- Compliant to SFP+ Mechanical MSA SFF-8432
- Multi rate of up to 11.3Gbps
- Transmission distance up to 10km (SMF)
- +3.3V single power supply
- Low power consumption
- Operating case temp : Standard: 0℃~+70℃
- RoHS 6/6 compliant

Applications

- 10GBASE-LR at 10.31Gbps
- SONET OC-192 SR-1，SDH STM I-64.1 at 9.953Gbps
- OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- CPRI rates 9.830 Gb/s,7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s
- OC192 over FEC at 10.709Gbps

Order Information

Table 1-Order Information

Part No.	Bit Rate (Gbps)	Laser (nm)	Distance	Fiber Type	DDMI	Connector	Temp[note1]
GACP-1398-10	10	1310	10km	SMF	YES	LC	0℃~+70℃

Note:1 Case Temperature

Absolute Maximum Ratings

Table2- Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	Vcc_3	-0.5	-	+3.6	V	
Storage Temperature	T_s	-40	-	+85	℃	
Operating Humidity	RH	+5	-	+95	%	

Note2: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Conditions

Table 3- Recommended operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T_C	-5	-	+70	℃	
Power Supply Voltage	Vcc	3.14	3.3	3.47	V	
Power Supply Current	Icc	-	-	300	mA	
Power Dissipation	Pd	-	-	1.0	W	
Bit Rate	BR	-	10.3125	-	Gbps	

Electrical Characteristics

Table 4- Electrical Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Units	Notes
Transmitter							
Differential Data Input Swing		$V_{in,P-P}$	120	-	850	mV_{PP}	
Input Differential Impedance		Z_{IN}	80	100	120	Ω	
Tx_Fault	Normal Operation	V_{OL}	0	-	0.8	V	
	Transmitter Fault	V_{OH}	2.0	-	V_{CC}	V	
Tx_Disable	Normal Operation	V_{IL}	0	-	0.8	V	
	Laser Disable	V_{IH}	2.0	-	V_{CC}+0.3	V	
Receiver							
Differential Date Output		V_{out}	100	-	800	mV	
Output Differential Impedance		Z_D	80	100	120	Ω	
Output Rise Time(20-80%)		T_R	24	-	-	ps	
Output Fall Time (20-80%)		T_F	24	-	-	ps	
Rx_LOS	Normal Operation	V_{OL}	0	-	0.8	V	
	Lose Signal	V_{oH}	2.0	-	V_{CC}	V	

Optical Characteristics

Table 5-Optical Characteristics

Parameter	Symbol	Unit	Min	Typ	Max	Notes
Optical transmitter Characteristics						
Bit Rate	BR	Gbps	9.953	10.3125	11.3	

Center Wavelength Range	λc	nm	1290	1310	1330	
Average Launch power Tx_off	Poff	dBm	-	-	-45	
Launch Optical Power	P_0	dBm	-7.5	-	0	1
Extinction Ratio	ER	dB	3.8	-	-	
Jitter P-P	JP	ps	-	-	27	
Jitter RMS	JR	ps	-	-	5	
Optical Rise/Fall time	Tr/tf	ps	-	-	100	
Eye Diagram	Compliant With IEEE 802.3-2005					
Optical Receiver Characteristics						
Bit Rate	BR	Gbps	9.953	10.3125	11.3	
Receiver Sensitivity	RS	dBm	-	-	-12.6	2
Overload Input Optical Power	P_{IN}	dBm	0	-	-	2
Center Wavelength Range	λc	nm	1270	-	1600	
LOS	LOS_D	dBm	-	-	-18	
	LOS_A		-28	-	-	
LOS Hysteresis		dB	0.5	-	-	

Note:

1. Coupled into 9/125 SMF.
2. Measured with PRBS 2^{31}-1 test pattern @10.3125Gbps.BER=10E-12

Recommended Host Board Power Supply Circuit

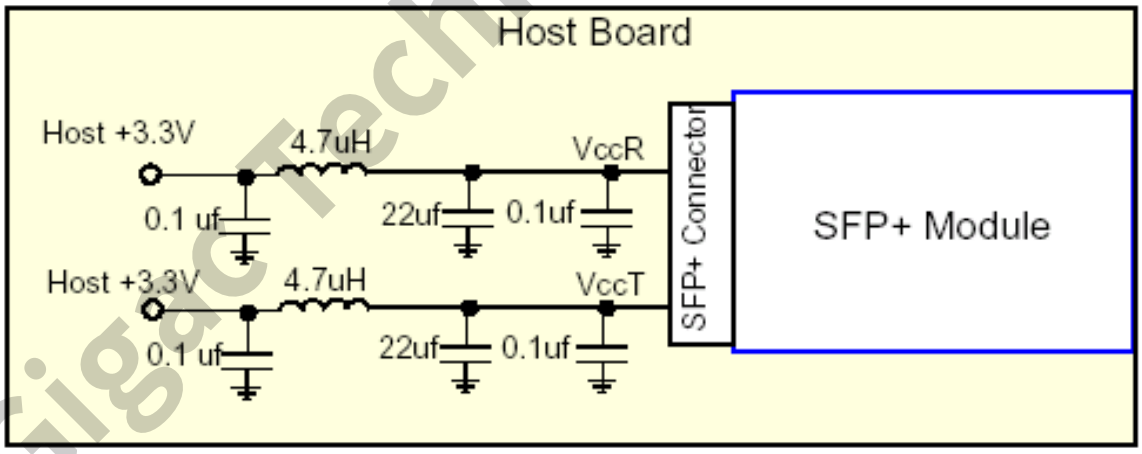

Figure 1, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

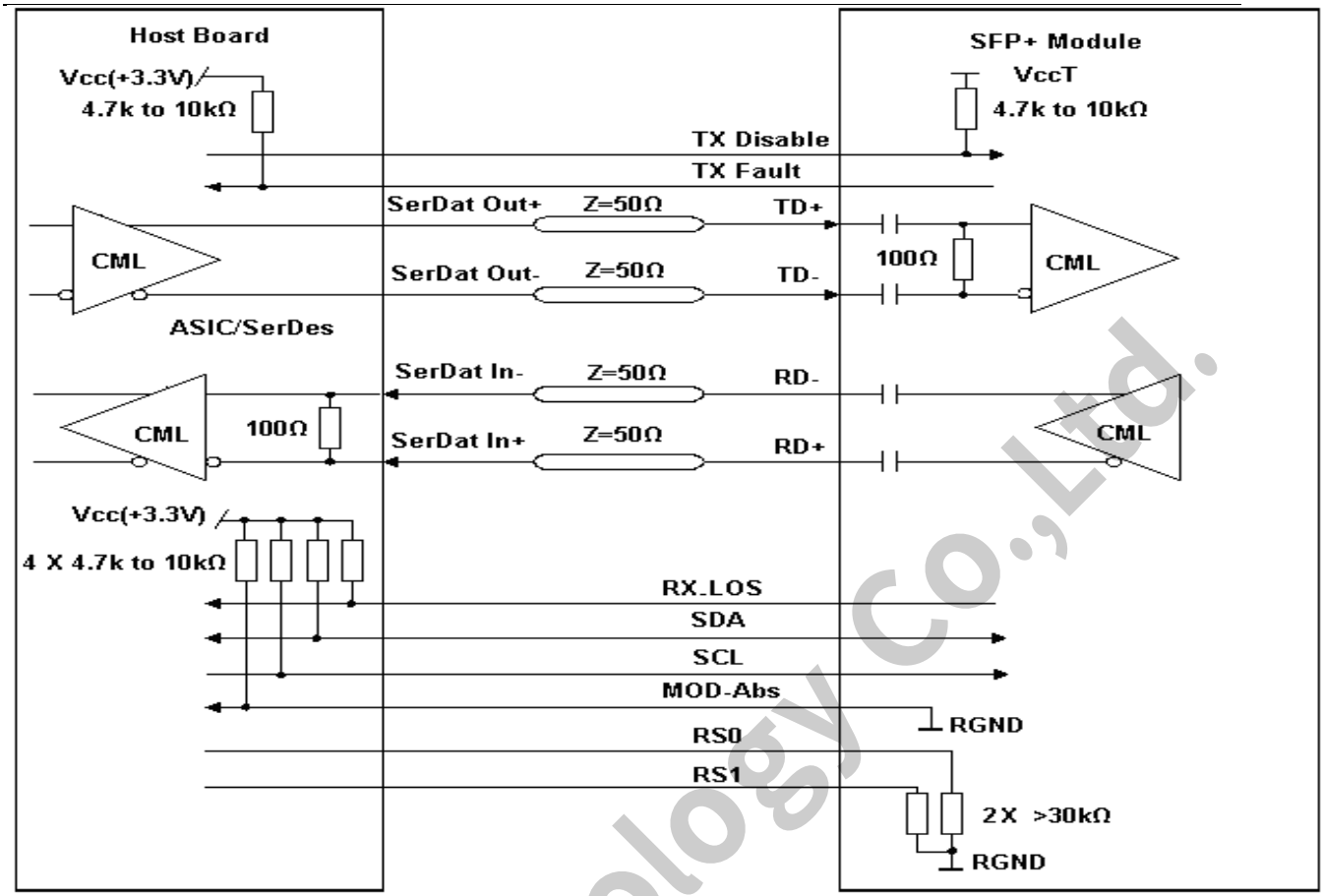

Figure 2, Recommended Interface Circuit

Pin arrangement

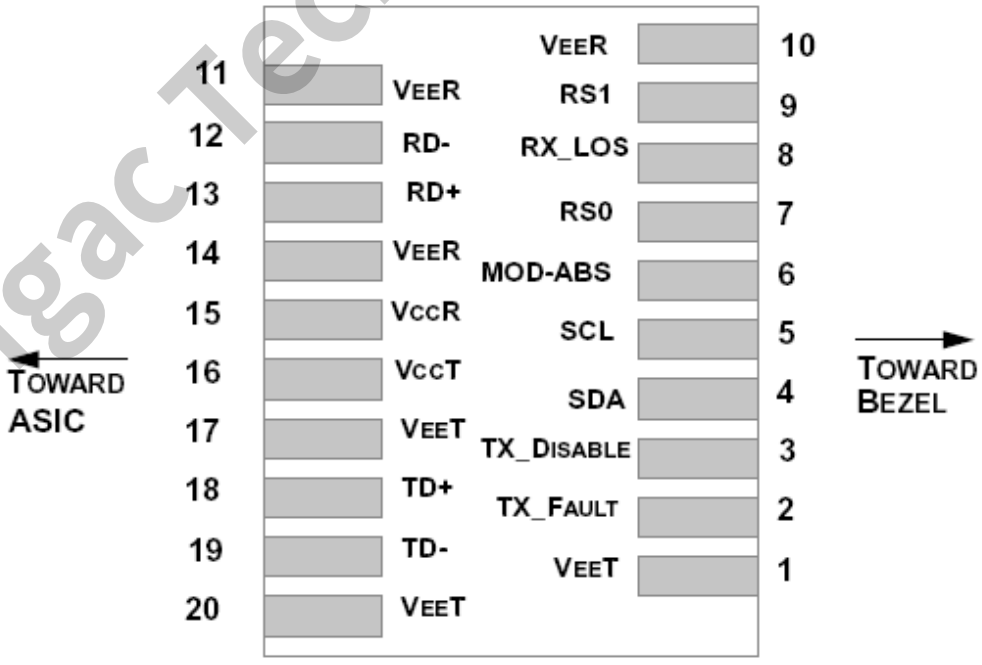

Figure 3, Pin View

Table 5-Pin Function Definitions

Pin	Symbol	Name/Description	Notes

1	$V_{EE}T$	Module Transmitter Ground	1
2	TX_FAULT	Module Transmitter Fault	2
3	TX_DISABLE	Transmitter Disable; Turns off transmitter laser output	3
4	SDA	2-Wire Serial Interface Data Line (MOD-DEF2)	
5	SCL	2-Wire Serial Interface Clock (MOD-DEF1)	
6	MOD_ABS	Module Absent, connected to $V_{EE}T$ or $V_{EE}R$ in the module	2
7	RS0	Rate Select 0, optionally controls SFP+ module receiver as the following when HIGH input Bit Rate>4.25 Gbps and when LOW input Bit Rate ≤4.25 Gbps.	
8	RX_LOS	Receiver Loss of Signal Indication (in FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated as NOT Signal Detect)	2
9	RS1	Rate Select 1, optionally controls SFP+ module transmitter as the following when HIGH input Bit Rate>4.25 Gbps and when LOW input Bit Rate ≤4.25 Gbps.	
10	$V_{EE}R$	Module Receiver Ground	1
11	$V_{EE}R$	Module Receiver Ground	1
12	RD-	Receiver Inverted Data Output	
13	RD+	Receiver Non-Inverted Data Output	
14	$V_{EE}R$	Module Receiver Ground	1
15	$V_{CC}R$	Module Receiver 3.3 V Supply	
16	$V_{CC}T$	Module Transmitter 3.3 V Supply	
17	$V_{EE}T$	Module Transmitter Ground	1
18	TD+	Transmitter Non-Inverted Data Input	
19	TD-	Transmitter Inverted Data Input	
20	$V_{EE}T$	Module Transmitter Ground	1

Note:

1. **The module ground pins are isolated from the module case.**
2. **The pins shall be pulled up with 4.7K-10Kohms to a voltage between 3.14V and 3.46V on host board.**
3. **The pin is pulled up to VCCT with a 4.7K-10KΩ resistor in the module.**

Digital Diagnostic Memory Map

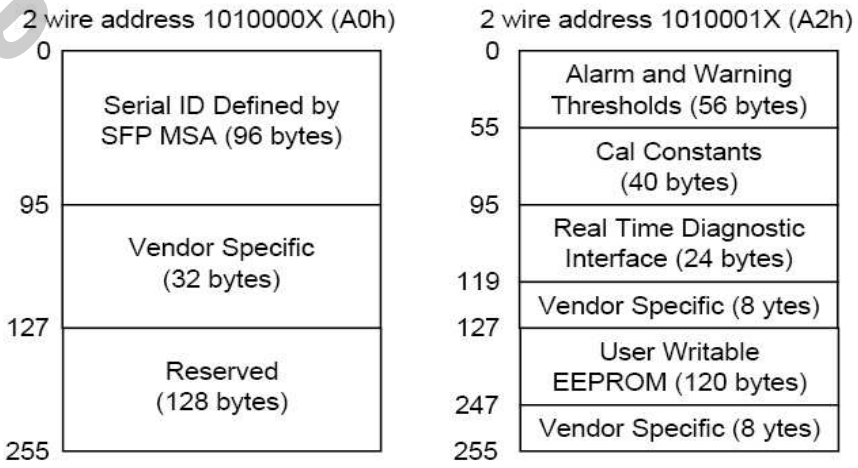

Figure 4, Memory Map

Mechanical

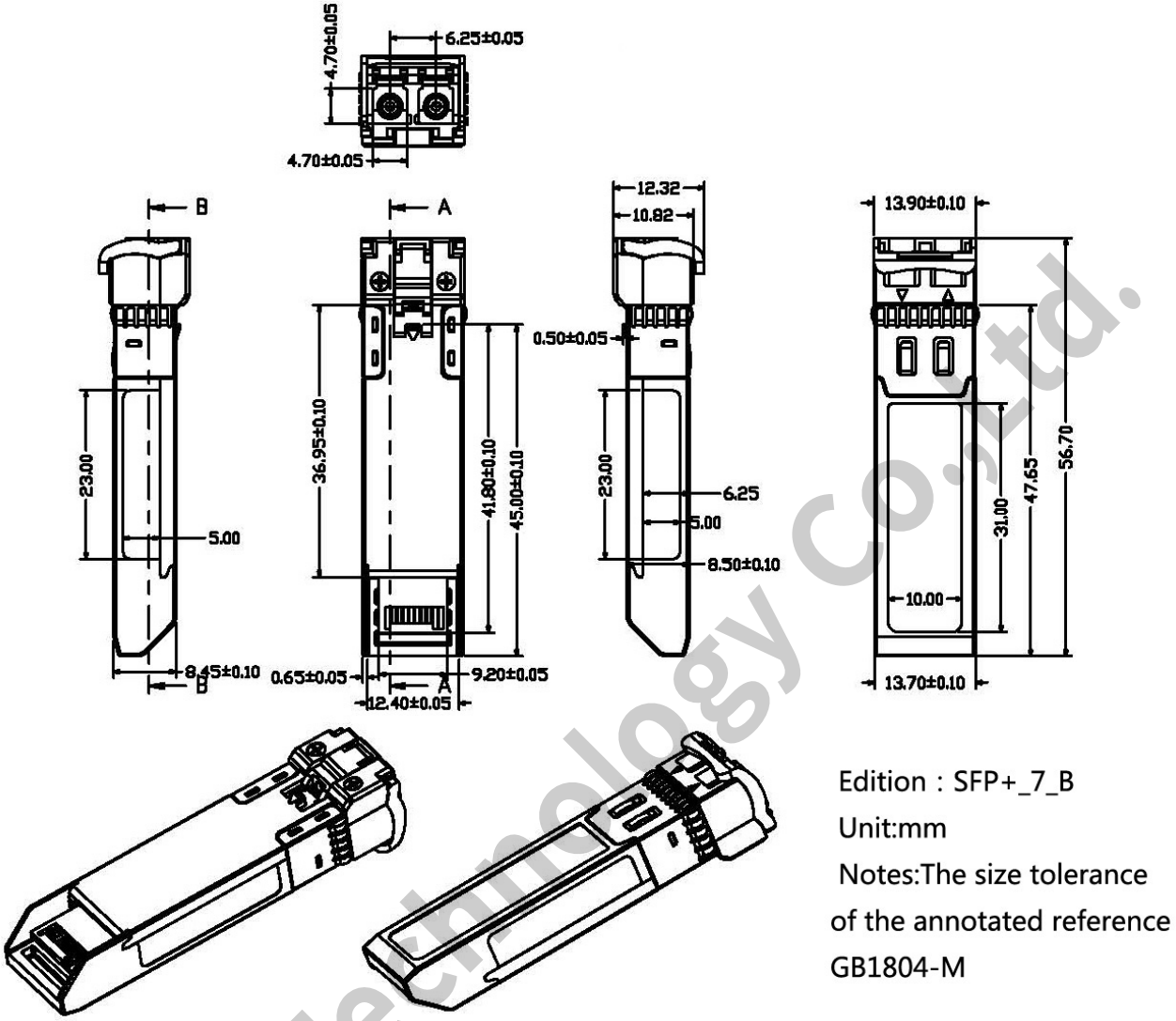

Figure 5, Mechanical Diagram（Rev SFP+_7_b）

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compatible with standards Noise frequency range: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compatible with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.

Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	UL file E317337 TüV Certificate No. 50135086 (CB scheme)
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards*note2

Note1: For update of the equipment and strict control of raw materials, Gigac has the ability to supply the customized products since Jan 1, 2007, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.
In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.
In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Gigac's transceivers, because Gigac's transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Notice

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Revision history

Version	Initiated	Reviewed	Revision History	Release Date
A0	Simon	Smith	Initialization	2011-06-08
A1	Code	Smith	Updated output power value.	2013-03-28
A2	Code	smith	Update case temp. symbol.	2014-06-24
A3	code	Denny	Add the extended temperature range	2015-03-18

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