Product Features

- Compliant with IEEE Std 802.3cn, 200GBASE-ER4
- Compliant with QSFP56 MSA
- I2C Management interface compliant to CMIS V4.0
- 4 channels 53.1Gb/s PAM4 electrical inputs
- 4 channels cooled 53.1Gb/s LAN-WDM EML Laser
- 4 channels APD photo detector
- Single +3.3V power supply
- Class 1 laser safety certified
- Power consumption less than 8W
- Commercial operating temperature:0oC to +70oC
- Up to 40km on SMF
- RoHS 6/6 Compliant

Applications

- 200GBASE-ER4 Ethernet links
- Data center ， 5G Back-Haul

Ordering Information

Table 1. Ordering Information

Part Number	Transmitter	OMA OutputPower	Receiver	OMA Sensitivity	Reach	Temp	DDM	RoHS
GL2H-Q5SM31LR4C	Cooled LWDM EML	3.4~7.4dBm	APD	< -15.1dBm	40km	0~ 70 °C	Available	Compliant

Descriptions

GL2H-Q5SM31LR4C QSFP56 transceiver modules are designed for 200 Gigabit Ethernet over single mode fiber. They are compliant with the QSFP56 MSA, IEEE 802.3cn 200GBASE-ER4. Digital diagnostics functions are available via the I2C interface, as specified by the CMIS4.0

GL2H-Q5SM31LR4C are compliant with RoHS.

Electrical Pin Description

Table 2. Pin Description

Pin	Name	Function/Description	Notes
1	GND	Transmitter Ground (Common with Receiver Ground)	1
2	Tx2-	Transmitter Inverted Data Input	
3	Tx2+	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground (Common with Receiver Ground)	1
5	Tx4-	Transmitter Inverted Data Input	
6	Tx4+	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground (Common with Receiver Ground)	1
8	ModSelL	Module Select	2
9	ResetL	Module Reset	2
10	VccRx	3.3V Power Supply Receiver	
11	SCL	2-Wire serial Interface Clock	2
12	SDA	2-Wire serial Interface Data	2
13	GND	Transmitter Ground (Common with Receiver Ground)	1
14	Rx3+	Receiver Non-Inverted Data Output	
15	Rx3-	Receiver Inverted Data Output	
16	GND	Transmitter Ground (Common with Receiver Ground)	1
17	Rx1+	Receiver Non-Inverted Data Output	
18	Rx1-	Receiver Inverted Data Output	
19	GND	Transmitter Ground (Common with Receiver Ground)	1
20	GND	Transmitter Ground (Common with Receiver Ground)	1
21	Rx2-	Receiver Inverted Data Output	
22	Rx2+	Receiver Non-Inverted Data Output	
23	GND	Transmitter Ground (Common with Receiver Ground)	1
24	Rx4-	Receiver Inverted Data Output	1
25	Rx4+	Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground (Common with Receiver Ground)	1
27	ModPrsl	Module Present	
28	IntL	Interrupt	2
29	VccTx	3.3V power supply transmitter	
30	Vcc1	3.3V power supply	
31	LPMode	Low Power Mode	2
32	GND	Transmitter Ground (Common with Receiver Ground)	1
33	Tx3+	Transmitter Non-Inverted Data Input	
34	Tx3-	Transmitter Inverted Data Output	
35	GND	Transmitter Ground (Common with Receiver Ground)	1
36	Tx1+	Transmitter Non-Inverted Data Input	
37	Tx1-	Transmitter Inverted Data Output	
38	GND	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. The module signal grounds are isolated from the module case.

2. This is an open collector/drain output that on the host board requires a 4.7KΩ to 10KΩ pull-up resistor to VccHost.

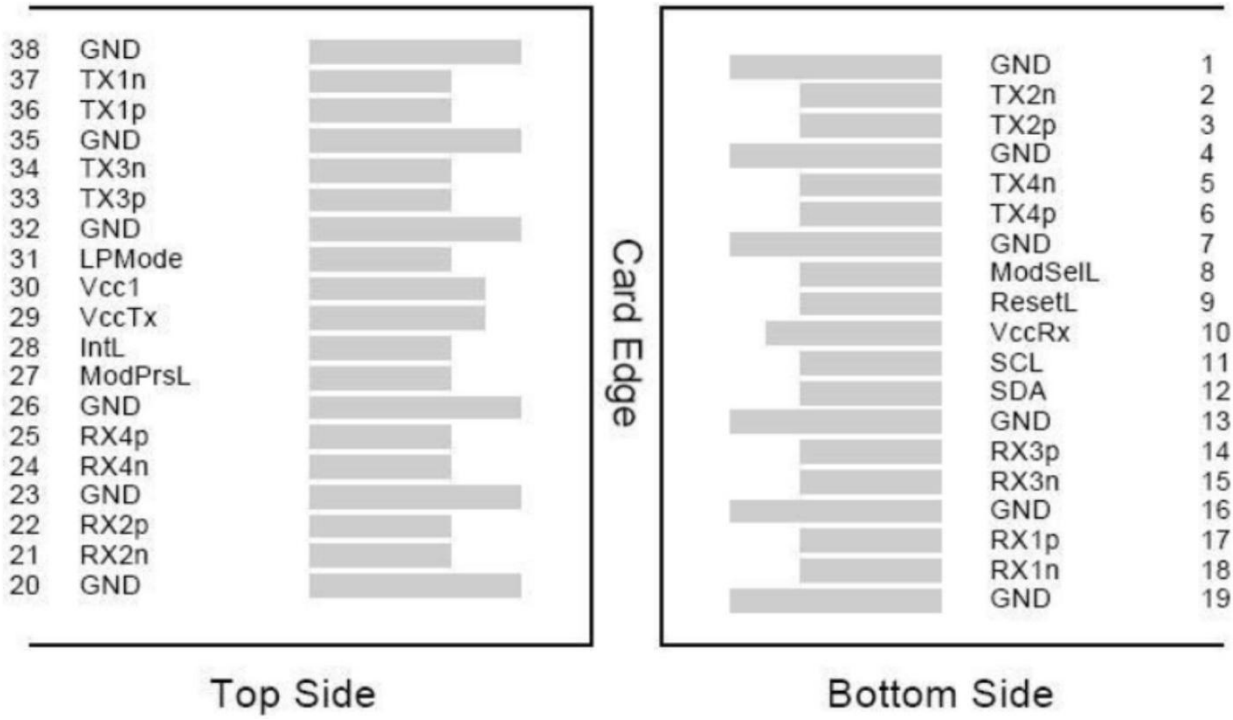

Figure 1. Host PCB QSFP56 pad assignment top view

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet.Exposure to absolute maximum ratings for extended period scan adversely affect device reliability.

Table 3. Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	T_S	-40	85	ºC
Relative Humidity	RH	5	95	%
Supply Voltage	V_{CC}	-0.5	4.0	V

Recommended Operating Conditions

Table 4. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T_C	0	25	70	ºC
Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Data Rate Per Channel	-	-	53.125		Gb/s

Electrical Characteristics

Table 5. Transceiver Electrical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Module Supply Current	Icc	-	-	2.43	A	-
Power Dissipation	P_D	-	-	8	W	-
Transmitter						
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
Differential Data Input Swing	$V_{IN,P-P}$	-	-	900	mV_{P-P}	
DC Common-Mode Input Voltage		-350	-	2850	mV	
Receiver						
Output Differential Impedance	Z_O	90	100	110	Ω	
Differential Data Output Swing	$V_{OUT,P-P}$	-	-	900	mV_{P-P}	1
Data Output Rise Time, Fall Time	t_r/t_f	9.5	-	-	ps	2

Notes:
1. Internally AC coupled, requires an external 100Ω differential load termination.
2. 20 – 80 %.

Transmitter Optical Characteristics

Table 6. Transmitter Optical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
OMA Optical Power per lane	Po	3.4	-	7.4	dBm	1
Average Optical Power per lane	Pav	0.4	-	6.63	dBm	1
Center Wavelength Range	L1	1294.53	1295.56	1296.59	nm	-
	L2	1299.02	1300.05	1301.09	nm	-
	L3	1303.54	1304.58	1305.63	nm	-
	L4	1308.09	1309.14	1310.19	nm	-
Extinction Ratio	EX	6	-	-	dB	2
PAM4 TDECQ				3.2	dB	2
Spectral width(-20dB)	Δλ	-	-	1	nm	-
Side Mode Suppression Ratio	SMSR	30	-	-	dB	-
Optical Return Loss Tolerance	ORLT	-	-	15	dB	-
Pout @TX-Disable Asserted	P_{off}	-	-	-30	dBm	1

Notes:
1. The optical power is launched into SMF.
2. Measured with a SSPRQ test pattern @53.125Gbps PAM4.

Receiver Optical Characteristics

Table 7. Receiver Optical Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Center Wavelength	L1	1294.53	1295.56	1296.59	nm	-
	L2	1299.02	1300.05	1301.09	nm	-
	L3	1303.54	1304.58	1305.63	nm	-
	L4	1308.09	1309.14	1310.19	nm	-
OMA sensitivity per Channel	S	-	-	-15.1	dBm	1
Average Receiver Overload per Channel	POL	-6	-	-	dBm	1
Optical Reflectanc	ORL	-26	-	-	dB	-
LOS De-Assert	LOSD	-10	-		dBm	-
LOS Assert	LOSA		-	-30	dBm	-
LOS Hysteresis	-	0.5	-	-	dB	-

Notes:
1. Measured with PRBS 2^{31}-1 test pattern, 53.125Gbps, BER<$2.4x10^{-4}$;

Digital Diagnostic Memory Map

Digital diagnostics monitoring is available. A 2-wire serial interface provides users to access module with high clock frequency up to 100 K Hz. The control interface and memory map of the QSFP modules are compliant

with CMIS (Common Management Interface Specification) for plug-gable transceivers. The memory space is arranged into a lower 128 bytes page and multiple upper space pages,as is shown in Figure 2.

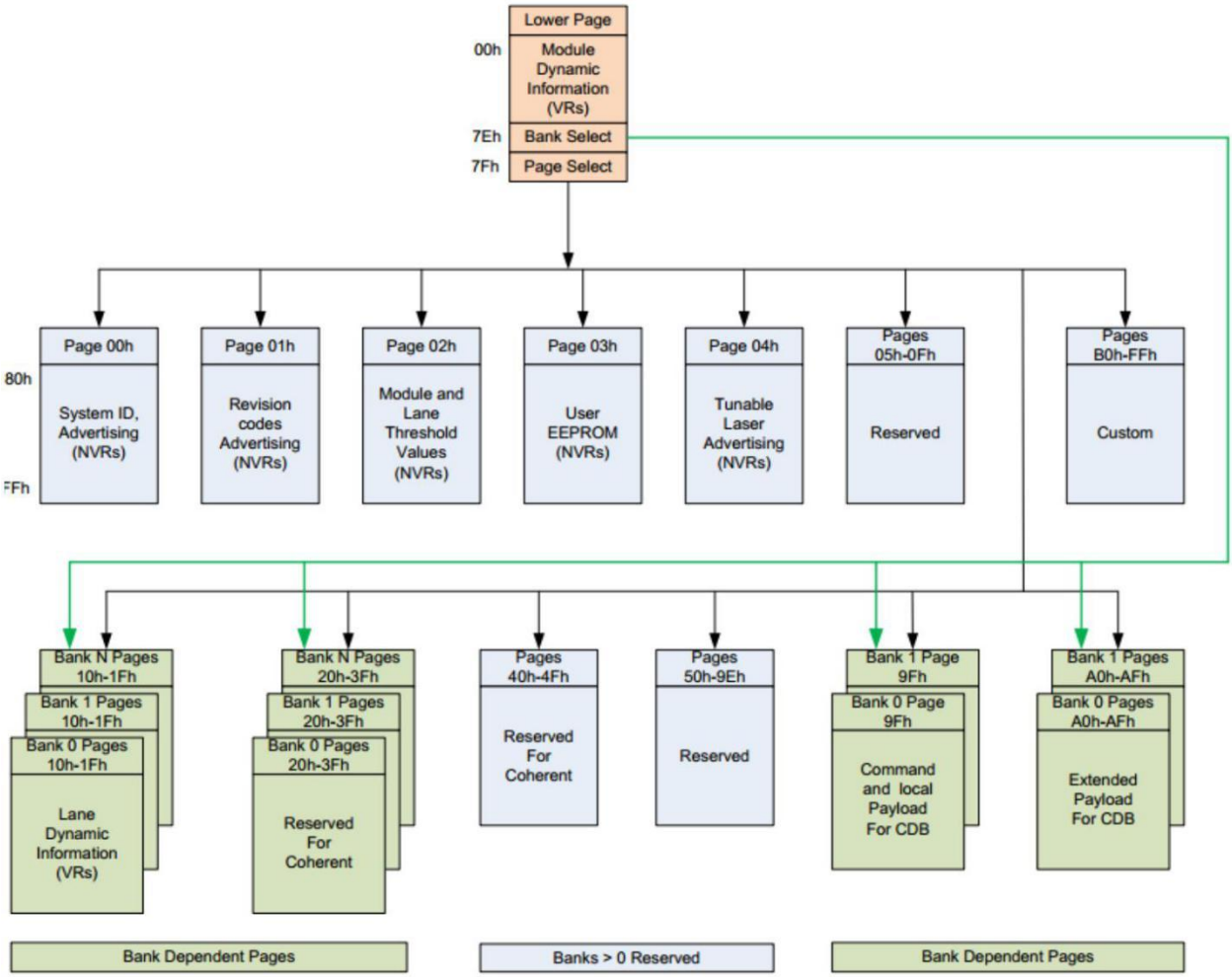

Figure 2. Digital Diagnostic Memory Map Specific Data Field Descriptions

EEPROM Serial ID Memory Contents

The CMIS transceivers defines lower 128 bytes of the two-wire serial bus address space used to access a variety of measurements and diagnostic function, a set of control function, and a means to select which of the various upper memory map pages are accessed on subsequent accesses. This portion of the address space is always directly addressable and thus is chosen for monitoring and control functions that may need to be repeatedly accessed. The lower page is subdivided into several areas as illustrated in figure 3. Table 8 shows the specific advertised and supported applications in the module and the corresponding read-only register values.

Address	Size	Subject Area	Description
0–3	4	ID and Status Area	Module ID from SFF-8024 list, version number, Type and status
			Flat mem indication, CLEI present indicator, Maximum TWI speed, Current state of Module, Current state of the Interrupt signal
4–7	4	Lane Flag Summary	Flag summary of all lane flags on pages 10h-1Fh
8-13	6	Module-Level Flags	All flags that are not lane or data path specific
14-25	12	Module-Level Monitors	Monitors that are not lane or data path specific
26-30	5	Module Global Controls	Controls applicable to the module as a whole
31-36	6	Module-Level Flag Masks	Masking bits for the Module-Level flags
37-38	2	CDB Status Area	Status of most recent CDB command
39-40	2	Module Firmware Version	Module Firmware Version.
41-63	23	Reserved Area	Reserved for future standardization
64-82	19	Custom Area	Vendor or module type specific use
83-84	2	Inactive Firmware Version	Version Number of Inactive Firmware. Values of 00h indicates module supports only a single image.
85-117	33	Application Advertising	Combinations of host and media interfaces that are supported by module data path(s)
118-125	8	Password Entry and Change	
126	1	Bank Select Byte	Bank address of currently visible Page
127	1	Page Select Byte	Page address of currently visible Page

Figure 3. Lower Page Overview (Lower Page)

Table 8. Application Advertisement

Option(ApSel) Code	Description	Electrical Interface Code	Media Interface Code	Host Lane Count	Media Lane Count	Byte (Lower Page)	Value
1	4x53.1G	0Fh	41h	4	4	86	0Fh
						87	41h
						88	44h
						89	01h
						176(page 01h)	01h

The upper page 00h consists of read only module identification information. The format of the upper page 00h Memory Map is illustrated in Table 9.

Data Address	Name of Field	Contents (Hex)	Description
128	Identifier	1E	QSFP+
129-144	Vendor name	4C 49 4E 4B 54 45 4C 20 20 20 20 20 20 20 20 20	LINKTEL (ASCII)
145-147	Vendor OUI	68 E8 EB	-
148-163	Vendor PN	4C 58 38 39 30 33 43 44 52 20 20 20 20 20 20 20	“LX8903CDR” (ASCII)

164-165	Vendor REV	31 30	1(ASCII)
166-181	Vendor SN	33 31 38 33 39 31 30 30 30 37 20 20 20 20 20 20	Serial Number of transceiver (ASCII). For example "3183910007".
182-189	Date Code	31 38 31 31 30 39 00 00	Year (2 bytes), Month (2 bytes), Day (2 bytes), For example "181109"
190-199	CLEI Code	00 00 00 00 00 00 00 00 00 00	-
200-201	Module power characteristics	E0 20	8W Maximum
202	Cable assembly length	00	
203	Media Connector Type	07	LC
204-209	Copper Cable Attenuation	00 00 00 00 00 00	-
210-211	Cable Assembly Lane Information	00 00	-
212	Media Interface Technology	06	1310nm EML
213-220	Reserved	00 00 00 00 00 00 00 00	-
221	Custom	00	-
222	Checksum	xx	-
223-255	Custom Info NV	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	-

Note: The "xx" byte should be filled in according to practical case. For more information, please refer to the related document of CMIS transceivers.

Recommended Host Board Power Supply Filter Network

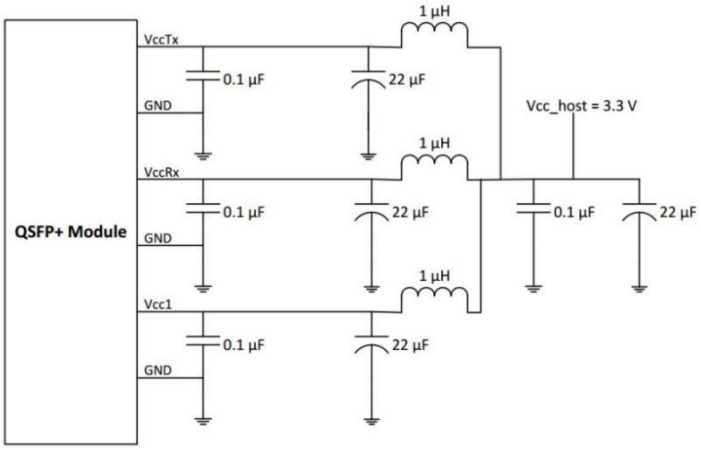

Figure 4. Recommended Host Board Power Supply Filter Network

Recommended Application Interface Block Diagram

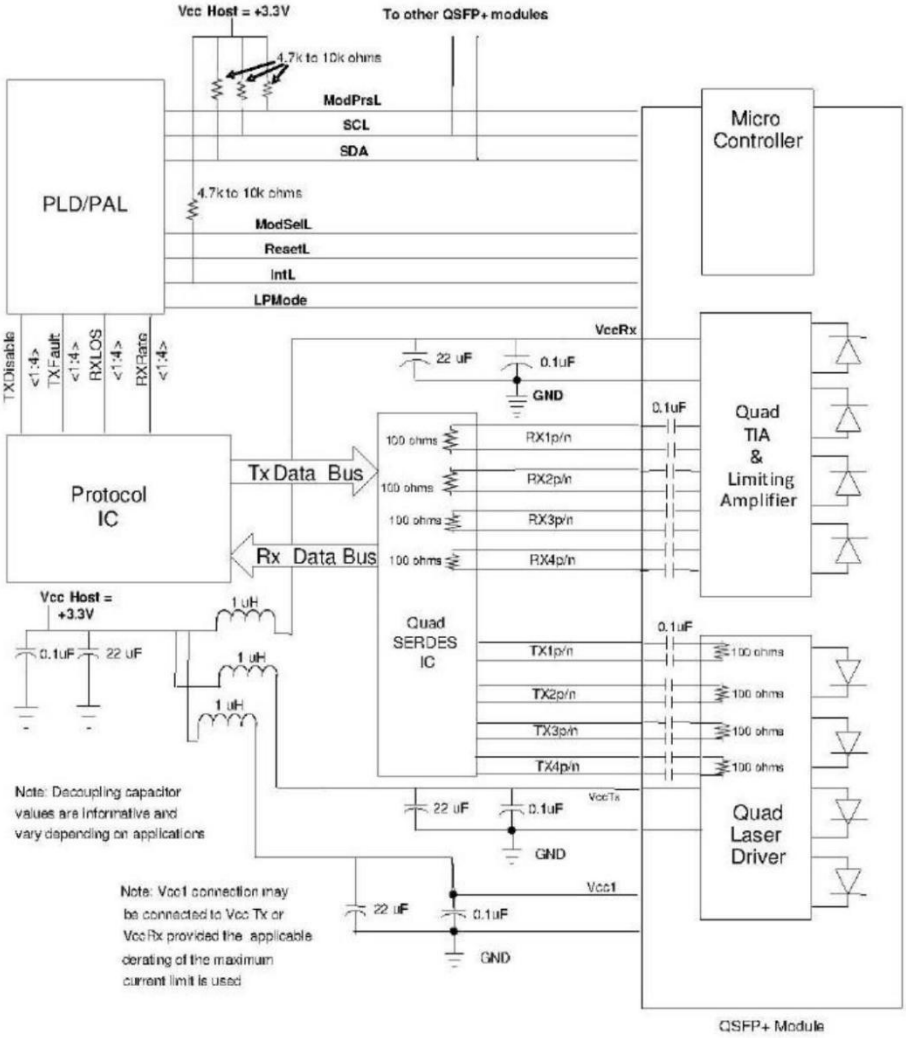

Figure 5. Recommended Application Interface Block Diagram

Mechanical specifications

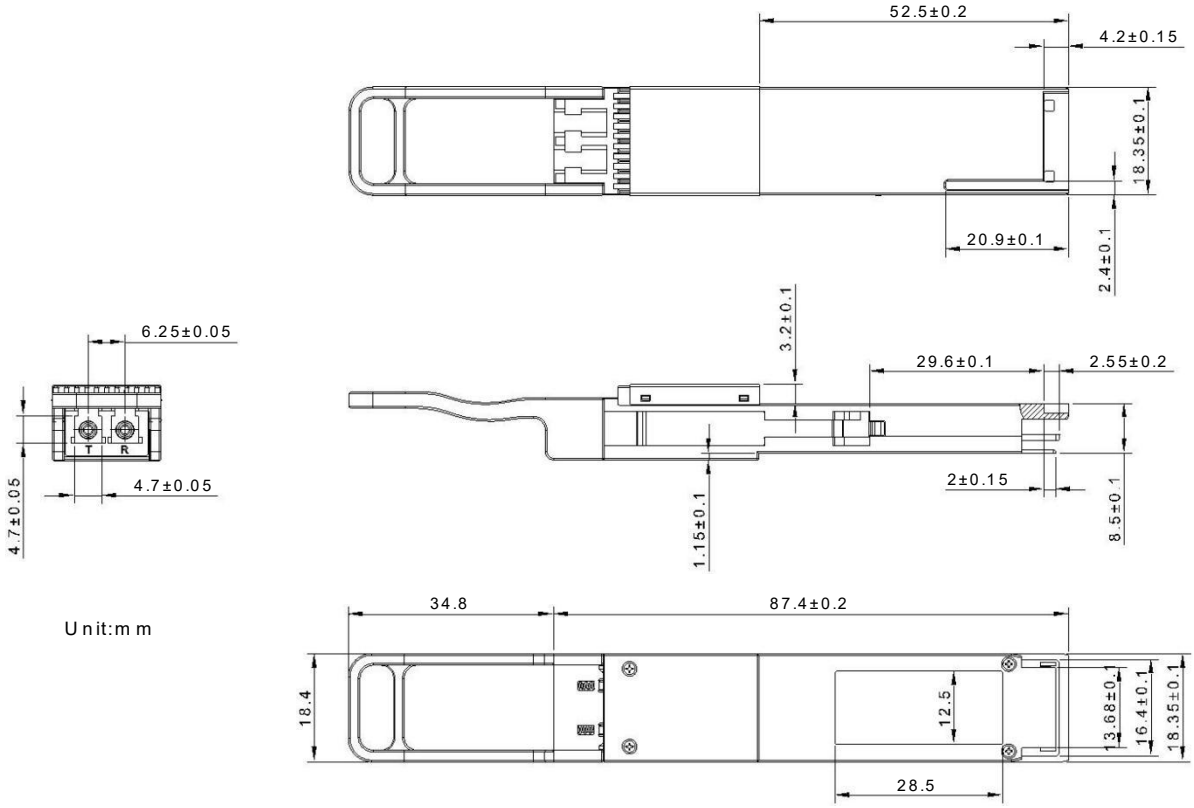

Figure 6. Outline Drawing

Revision History

Date	Rev	Description	Modified By
06/23/2020	1.0	Initial Draft	Chao He
08/14/2020	1.1	Fix the power consumption from 12W to 10W	Chao He
12/11/2020	1.2	Update templet，Power consumption，EEPROM，picture	Chao He