212.5 LR4 QSFP56 1310nm 10km Optical Transceiver

P/N: QSFP200G-LR4-10

Features

- Hot Pluggable QSFP56 form factor
- Operating data rate 212.5Gbps
- Single +3.3V power supply
- LC connector
- Max power dissipation <8W
- PIN receivers
- Built-in digital diagnostic function
- Commercial temperature range 0°C to 70°C

Compliance

- QSFP56 MSA
- Compliant with QSFP Electrical MSA SFF-8636
- Compliant with QSFP Mechanical MSA SFF-8665
- IEEE 802.3bm
- RoHS

Applications

- Switches with QSFP56 ports
- Router with QSFP56 Ports
- Server or Network Adapter Card
- Optical Transmission System
- Other devices with QSFP56 Ports

Description

The QSFP200G-LR4-10 is a QSFP56 optical transceiver designed for 200G Ethernet longreach applications in data centers and metro networks. It employs 4×50G PAM4 modulation technology, delivering an aggregate data rate of 212.5Gbps over single-mode fiber. Operating at 1310nm wavelength with dual LC connectors, this module achieves transmission distances up to 10km while maintaining compliance with IEEE 802.3bs and QSFP56 MSA standards. Its low-power architecture (<8W) supports hot-pluggable deployment in high-density network environments.

As an evolution of 100G QSFP28 solutions, this module optimizes spectral efficiency through advanced PAM4 encoding, reducing fiber infrastructure costs for 200G network upgrades. Ideal for spine-leaf connections and inter-data-center links, it ensures backward compatibility with existing DDM systems and offers robust performance in temperature-controlled environments. The design prioritizes link reliability with built-in digital diagnostics (DDM) for real-time monitoring.

Product performance Specifications

1、Basic Product Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Storage Temperature	T_S	-40	-	+85	°C
Supply Voltage	V_{CC}	0	-	3.6	V
Relative Humidity	RH	5	-	85	%
Operating Case Temperature	T_C	0	25	70	°C
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Supply Current	Icc-8	-	-	2308.8	mA
Power Dissipation	PD	-	-	8	W
Data Rate	DR	-	212.5	-	Gbps
Supply Voltage Noise Tolerance	PSNR	-	-	66	mV
Instantaneous peak current	Icc_ip_8			3200	mA
DC common mode voltage		-350	-	2850	mV

2、Product Optical and Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
AC Common-mode output voltage (RMS)				17.5	mV
Differential peak-to-peak output voltage				900	mV
Near-end ESMW (Eye symmetry mask width)		0.265			UI
Near-end Eye height, differential		70			mV
Far-end ESMW (Eye symmetry mask width)		0.2			UI
Far-end Eye height, differential		30			mV
Far-end pre-cursor ISI ratio		-4.5		2.5	%
Differential output return loss		Equation(83E-2)			dB
Common to differential mode conversion return loss		Equation(83E-3)			dB
Differential termination mismatch				10	%
Transition time (20% to 80%)		9.5			Ps
Signaling rate per lane (range)		-100ppm	26.5625	+100ppm	GBd
Differential pk-pk input voltage tolerance		900			mV
Differential input return loss		Equation(83E-5)			dB
Differential to common mode input return loss		Equation(83E-6)			dB
Differential termination mismatch				10	%
ESMW (Eye symmetry mask width)		0.22			UI
Applied pk-pk sinusoidal jitter		Table120E–6			MHz,UI
Eye height		32			mV
Single-ended input voltage tolerance range		-0.4		3.3	V
Transmitter					
Center Wavelength	Lane0	1294.53		1296.59	
	Lane1	1299.02		1301.09	
	Lane2	1303.54		1305.63	
	Lane3	1308.09		1310.19	
Total average launch power				11.3	nm
Average launch power, each lane$_1$		-3.4		5.3	dBm
Optical Modulation Amplitude [OMA],each lane$_2$	OMA	-0.4		5.1	dBm
Launch power in OMA minus TDEC		-1.8-1.7			dBm
Transmitter and dispersion eye closure [TDEC],each lane	TDEC			3.2	dB
TDECQ –10log10(Ceq) (max)				3.2	dB

RIN15.6OMA				-132	dB/Hz
Optical Power for TX DISABLE				-30	dBm
Extinction Ratio	ER	3.5			dB
Optical Return Loss Tolerance				15.6	dB
Signaling rate,each lane			25.78125		Gbps
Optical eye mask	Compliant with IEEE std 802.3bm-2015				
Receiver					
Transmitter reflectance				-26	dB
Average receive power, each lane		–9.7		5.1	dBm
Receive power (OMAouter), each lane				5.1	dBm
Difference in receive power between any two lanes (OMAouter)				4.2	dB
Receiver reflectance				-26	dB
Receiver sensitivity (OMAouter), each lanec	RS=max(-7.2,SECQ-8.6)				
Stressed receiver sensitivity(OMAouter), each lane	-5.4				dBm
Conditions of stressed receiver sensitivity test					
Stressed eye closure for PAM4 (SECQ), lane under test	SECQ	3.2			dB
SECQ – 10log10(Ceq), lane under test				3.2	dB
OMAouter of each aggressor lane		-1.2			dBm

Note1:.Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance

Note2: Even if the TDECQ < 1.4 dB for an extinction ratio of ≥ 4.5 dB or TDECQ < 1.3 dB for an extinction ratio of < 4.5 dB, the OMAouter (min) must exceed this value

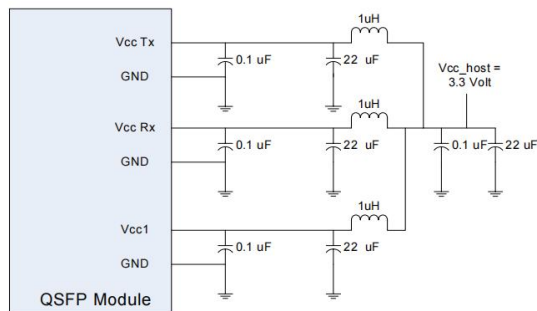# Recommended Host Board Power Supply Circuit

Figure 1: Recommended Host Board Power Supply Circuit
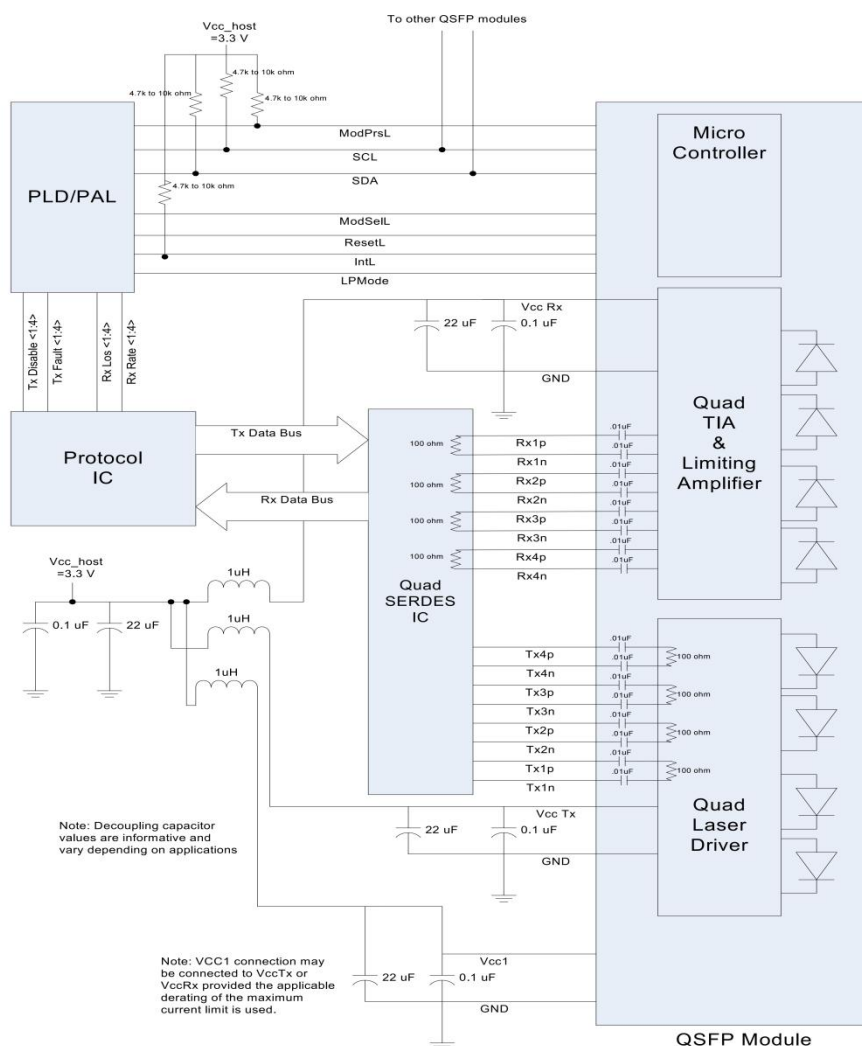
Recommended Interface Circuit

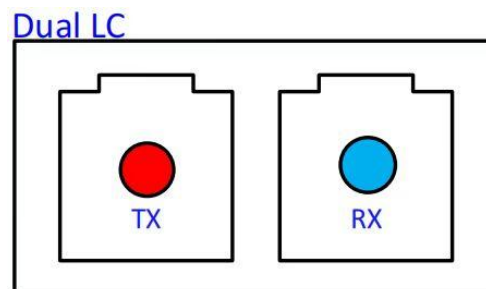**Figure2:**Recommended Interface Circuit

Optical Interface

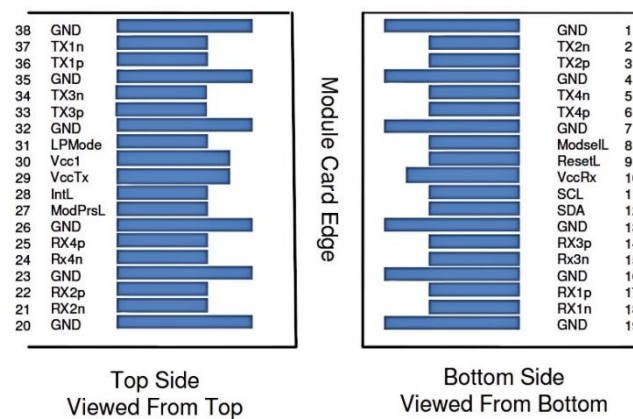

Figure3: Optical Lane Sequence

Pin-out Definition

Figure4: Pin view

Pin Function Definitions

Pin	Logic	Symbol	Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3
7		GND	Ground	1
8	LVTTL-I	ModSelL	Module Select	4
9	LVTTL-I	ReSelL	Module Select	4
10		Vcc Rx	+3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-wire serial interface clock	4
12	LVCMOS-I/O	SDA	2-wire serial interface data	4
13		GND	Ground	1

14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3
15	CML-O	Rx3n	Receiver Inverted Data Output	3
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3
18	CML-O	Rx1n	Receiver Inverted Data Output	3
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3
25	CML-O	Rx4p	Receiver Non-Inverted Data Output Ground	3
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	4
28	LVTTL-O	IntL	Interrupt	4
29		Vcc Tx	+3.3V Power supply transmitter	2
30		Vcc1	+3.3V Power supply	2
31	LVTTL-I	LPMode	Low Power Mode	4
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3
34	CML-I	Tx3n	Transmitter Inverted Data Input	3
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3
37	CML-I	Tx1n	Transmitter Inverted Data Input	3
38		GND	Ground	1

Note1:GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

Note2: Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in Table. Recommended host board power supply filtering is shown in Host board power supply circuit. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP module in any combination. The connector pins are each rated for a maximum current of 500 mA.

Note3: High-speed signal interfaces require differential pairs (e.g. TX1+/TX1-) with tightly matched impedances (typically 100Ω).

Note4: The management and control signals are based on LVTTL level logic and are used for functions such as module selection and reset.
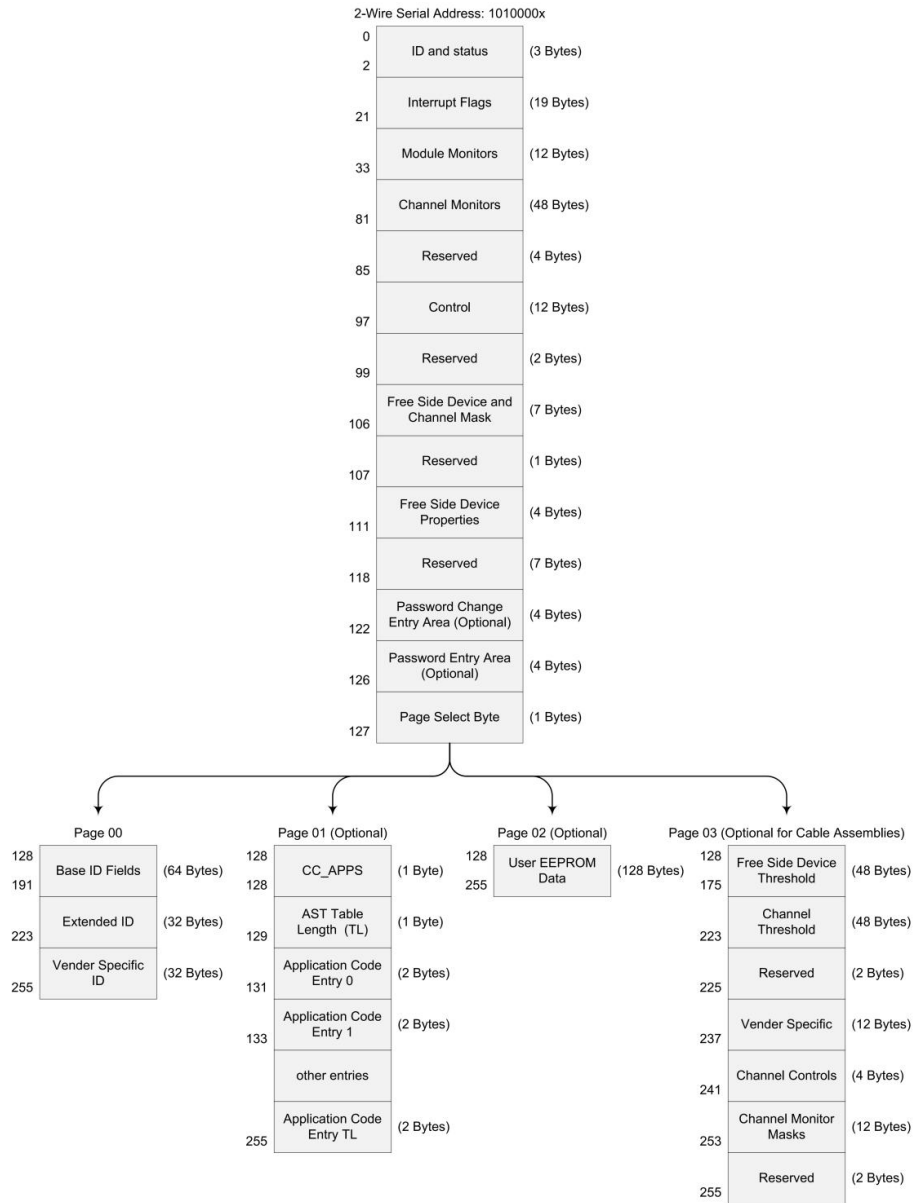
Monitoring Specification

Figure5: Memory map

Memory map Table

Byte	Unit	Name	Description
Lower Page 00h			
0	1	Identifier	Type of transceiver,Page 00h Byte 0 and Page 00h Byte 128 shall contain the same parameter values.
1	1	Status	Revision Compliance
2	1	Status	Status indicators

3-21	19	Interrupt Flags	Consist of interrupt flags for LOS, Tx Fault, warnings and alarms. The non-asserted state shall be 0b.
22	1	Temperature MSB	Internally measured temperature (MSB)
23	1	Temperature LSB	Internally measured temperature (LSB)
24-25	2	Reserved	Reserved
26	1	Supply Voltage MSB	Internally measured supply voltage (MSB)
27	1	Supply Voltage LSB	Internally measured supply voltage (LSB)
28-29	2	Reserved	Reserved
30-33	4	Vendor Specific	Vendor Specific
34	1	Rx1 Power MSB	Internally measured Rx1 input power
35	1	Rx1 Power LSB	
36	1	Rx2 Power MSB	Internally measured Rx2 input power
37	1	Rx2 Power LSB	
38	1	Rx3 Power MSB	Internally measured Rx3 input power
39	1	Rx3 Power LSB	
40	1	Rx4 Power MSB	Internally measured Rx4 input power
41	1	Rx4 Power LSB	
42	1	Tx1 Bias MSB	Internally measured Tx1 bias
43	1	Tx1 Bias LSB	
44	1	Tx2 Bias MSB	Internally measured Tx2 bias
45	1	Tx2 Bias LSB	
46	1	Tx3 Bias MSB	Internally measured Tx3 bias
47	1	Tx3 Bias LSB	
48	1	Tx4 Bias MSB	Internally measured Tx4 bias
49	1	Tx4 Bias LSB	
50	1	Tx1 Power MSB	Internally measured Tx1 Power
51	1	Tx1 Power LSB	
52	1	Tx2 Power MSB	Internally measured Tx2 Power
53	1	Tx2 Power LSB	
54	1	Tx3 Power MSB	Internally measured Tx3 Power
55	1	Tx3 Power LSB	
56	1	Tx4 Power MSB	Internally measured Tx4 Power
57	1	Tx4 Power LSB	
58-65	8	Reserved	Reserved channel monitor set 4
66-73	8	Reserved	Reserved channel monitor set 5
74-81	8	Vendor Specific	Vendor Specific
82-85	4	Reserved	Reserved
86-99	14	Control	Control
100-106	7	Free Side Device and Channel Masks	Free Side Device and Channel Masks
107-110	4	Free Side Device Properties	Free Side Device Properties

111-112	2	Assigned for use by PCI Express	Used for:
			- The PCI Express External Cable Specification
			- The PCI Express OCuLink Specification
113-117	4	Free Side Device Properties	Free Side Device Properties
118	1	Reserved	Reserved
119-122	4	Password Change Entry Area	Password Change Entry Area
123-126	4	Password Entry Area	Password Entry Area
127	1	Page Select Byte	Page Select Byte
Upper Page 00h			
128	1	Identifier	Identifier Type of free side device.(See SFF-8024 Transceiver Management)
129	1	Ext. Identifier	Extended Identifier of free side device. Includes power classes, CLEI codes, CDR capability.
130	1	Connector Type	Code for media connector type. (See SFF-8024 Transceiver Management)
131-138	8	Specification Compliance	Code for electronic or optical compatibility.
139	1	Encoding	Code for serial encoding algorithm. (See SFF-8024 Transceiver Management)
140	1	Signaling rate, nominal	Nominal signaling rate, units of 100 MBd. For rate > 25.4 GBd, set this to FFh and use Byte 222.
141	1	Extended Rate Select Compliance	Tags for extended rate select compliance.
142	1	Length (SMF)	Link length supported at the signaling rate in byte 140 or page 00h byte 222, for SMF fiber in km *. A value of 1 shall be used for reaches from 0 to 1 km.
143	1	Length (OM3 50 um)	Link length supported at the signaling rate in byte 140 or page 00h byte 222, for EBW 50/125 um fiber (OM3), units of 2 m *
144	1	Length (OM2 50 um)	Link length supported at the signaling rate in byte 140 or page 00h byte 222, for 50/125 um fiber (OM2), units of 1 m *
145	1	Length (OM1 62.5 um) or Copper Cable Attenuation	Link length supported at the signaling rate in byte 140 or page 00h byte 222, for 62.5/125 um fiber (OM1), units of 1 m *, or copper cable attenuation in dB at 25.78 GHz.
146	1	Length (passive copper or active cable or OM4 50 um)	Length of passive or active cable assembly (units of 1 m) or link length supported at the signaling rate in byte 140 or page 00h byte 222, for OM4 50/125 um fiber (units of 2 m) as indicated by Byte 147. See 6.3.12.
147	1	Device technology	Device technology
148-163	16	Vendor name	Free side device vendor name (ASCII)
164	1	Extended Module	Extended Module codes for InfiniBand.
165-167	3	Vendor OUI	Free side device vendor IEEE company ID.
168-183	16	Vendor PN	Part number provided by free side device vendor(ASCII)
184-185	2	Vendor rev	Revision level for part number provided by the vendor(ASCII)

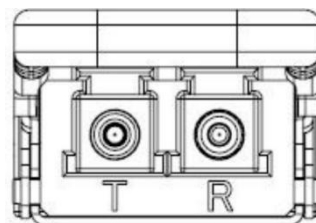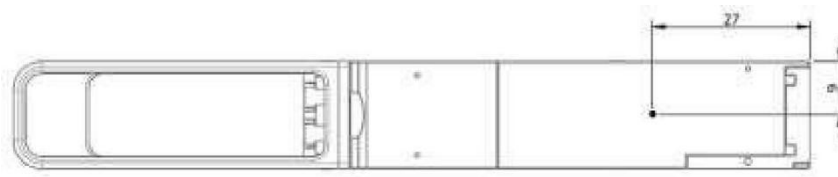|				
186-187	2	Wavelength or Copper Cable Attenuation	Nominal laser wavelength (wavelength=value/20 in nm) or copper cable attenuation in dB at 2.5 GHz (Byte 186) and 5.0 GHz (Byte 187)	
188-189	2	Wavelength tolerance or Copper Cable Attenuation	The range of laser wavelength (+/- value) from nominal wavelength. (wavelength Tol. =value/200 in nm) or copper cable attenuation in dB at 7.0 GHz (Byte 188) and 12.9 GHz (Byte 189)	
190	1	Max case temp	Maximum case temperature	
191	1	CC_BASE	Check code for base ID fields (Bytes 128-190)	
192	1	Link codes	Extended Specification Compliance Codes (See SFF-8024)	
193-195	3	Options	Optional features implemented.	
196-211	16	Vendor SN	Serial number provided by vendor.(ASCII)	
212-219	8	Date Code	Vendor's manufacturing date code.	
220	1	Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented (if any) in the free side device. Bit 1,0 Reserved.	
221	1	Enhanced Options	Indicates which optional enhanced features are implemented in the free side device.	
222	1	CC_EXT	Check code for the Extended ID Fields (Bytes 192-222)	
224-255	32	Vendor Specific	Vendor Specific EEPROM	
Page 02h (Optional)				
128-255	128	User EEPROM Data		
Page 03h (Optional)				
128-129	2	Temp High Alarm	MSB at lower byte address	
130-131	2	Temp Low Alarm	MSB at lower byte address	
132-133	2	Temp High Warning	MSB at lower byte address	
134-135	2	Temp Low Warning	MSB at lower byte address	
136-143	8	Reserved	Reserved	
144-145	2	Vcc High Alarm	MSB at lower byte address	
146-147	2	Vcc Low Alarm	MSB at lower byte address	
148-149	2	Vcc High Warning	MSB at lower byte address	
150-151	2	Vcc Low Warning	MSB at lower byte address	
152-159	8	Reserved	Reserved	
160-175	16	Vendor Specific	Vendor Specific	
176-177	2	Rx Power High Alarm	MSB at lower byte address	
178-179	2	Rx Power Low Alarm	MSB at lower byte address	
180-181	2	Rx Power High Warning	MSB at lower byte address	
182-183	2	Rx Power Low Warning	MSB at lower byte address	
184-185	2	Tx Bias High Alarm	MSB at lower byte address	
186-187	2	Tx Bias Low Alarm	MSB at lower byte address	
188-189	2	Tx Bias High Warning	MSB at lower byte address	
190-191	2	Tx Bias Low Warning	MSB at lower byte address	
192-193	2	Tx Power High Alarm	MSB at lower byte address	
194-195	2	Tx Power Low Alarm	MSB at lower byte address	
196-197	2	Tx Power High Warning	MSB at lower byte address	

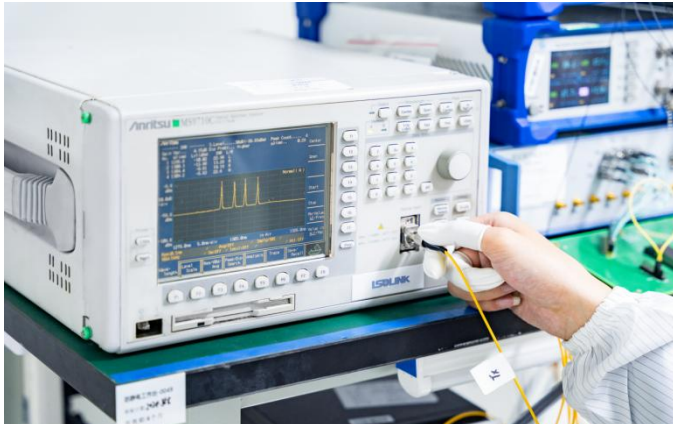| 198-199	2	Tx Power Low Warning	MSB at lower byte address
200-207	8	Reserved	Reserved thresholds for channel parameter set 4
208-215	8	Reserved	Reserved thresholds for channel parameter set 5
216-223	8	Vendor Specific	Vendor Specific
224	1	Tx EQ & Rx Emphasis Magnitude ID	Tx EQ & Rx Emphasis Magnitude ID
225	1	Rx output amplitude support indicators	Rx output amplitude support indicators
226-229	4	Control options advertising	Control options advertising
230-241	12	Optional Channel Controls	Optional Channel Controls
242-247	6	Channel Monitor Masks	Channel Monitor Masks
248-249	2	Reserved	Reserved channel monitor masks set 4
250-251	2	Reserved	Reserved channel monitor masks set 5
252-255	4	Reserved	Reserved

Mechanical Dimension

Test Center

1、Performance Testing

Every fiber optic transceiver is thoroughly tested by the   Assurance Program, which is equipped with the world's most advanced analytical equipment to ensure that our transceivers meet the industry's international public protocol standards while still functioning flawlessly in your facility.

Optical Spectrum Inspection

Using the industry's leading optical spectrum analyser to check in real time that the parameters of the optical transceiver's laser comply with industry standards.

- **Peak:** Peak wavelength and peak level
- **2nd Peak:** Side-mode wavelength and level
- **Mean WI:** Center wavelength
- **Total Power:** Total power of spectrum
- **SMSR:** Side-Mode Suppression Ratio

Optical Signal Quality Inspection

Using highly efficient sampling oscilloscopes and BERT testers, equipped with an automated test platform to accurately test the signal quality of the transceiver, test records are kept for up to 5 years to ensure the traceability of each transceiver.

- **Eye Mask Margin(NRZ)**
- **TDECQ(PAM4):** transmitter dispersion eye closure
- **OMA:** Optical modulation amplitude
- **BER:** Bit error rate
- **ER:** Extinction Ratio

Flow Pressure Test

Using multi-protocol network traffic analyser with various brands of switches to test the transceiver's ability to transmit at full speed.

- **Bandwidth:** Actual transceiver bandwidth on the port
- **Packet Loss**
- **Packet Errors:** CRC Errors/PCS Errors/Symbol Errors
- **LinkDown Counts**
- **latency**

Aboveis part of our test bed network equipment. For more information, Please click download for optical transceiver performance test report.

2、Quality Control

We adopt advanced quality management solutions. Each transceiver is self-inspected, including:20x microscope inspection, 200x microscope inspection, and QC process inspection.

visual inspection

Microscopic inspection: 20X

Microscopic inspection: 200X

Reliability Verification

Optical endface inspection

OQC Inspection

Order Information

Part Number	Description
QSFP200G-SR4-100	200GBASE-SR4 QSFP56 200G 850nm 100m DOM MTP/MPO-12 UPC MMF Transceiver Module
QSFP200G-FR4-2	200GBASE-FR4 QSFP56 200G 1310nm 2km DOM LC SMF Transceiver Module
QSFP200G-LR4-10	200GBASE-LR4 QSFP56 1310nm 10km DOM Duplex LC SMF Optical Transceiver Module