200G QSFP56 SR4 Specification

Features

- ✧ QSFP56 Serial Optical Interface
- ◆ 4x50G PAM4 retimed 200GAUI-4 C2M electrical interface
- ◆ MPO-12 connector
- ◆ 4 channel VCSEL array and 4 channels PIN photodetector array >Maximum link length of 70m on OM3 or 100m on OM4

- ✧ QSFP MSA Compliant
- ◆ Hot Pluggable QSFP56 form factor
- ◆ Compliant with SFF8636 Rev 2.10a

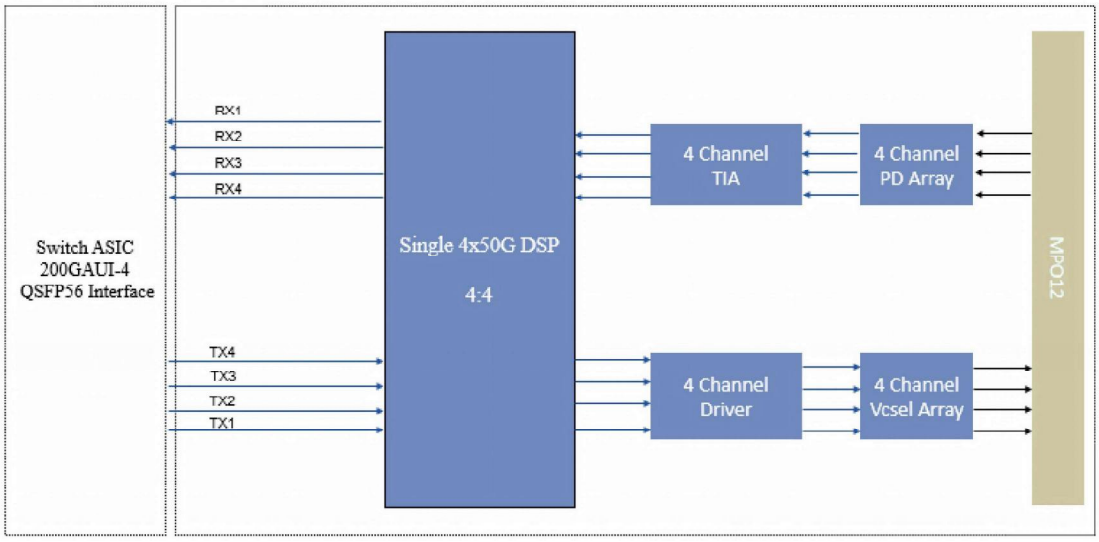
- ✧ Support Protocol
- ◆ Compliant with IEEE 802.3cd

- ✧ Low Power Consumption
- ◆ Less than 5W in temperature range of 0 to 70℃

Applications

- ◆ 200GBASE-SR4200G Ethernet
- ◆ Data center

Functional Block Diagram



1.General Description

200G QSFP56 SR4 Optical Transceiver modules are designed for use in 200Gigabit Ethernet links over OM3/OM4 multimode fiber. They are compliant with the QSFP MSA and with IEEE 802.3cd 200GBASE-SR4 specification. Digital diagnostics functions are available via the I2C interface as specified by SFF-8636.The transceiver is RoHS 2.0 compliant and lead-free per Directive 2011/65/EU.

2.Absolute Maximum Ratings and Recommended Operating Conditions

（Table 2.1 Absolute Maximum Ratings）

Parameter	Symbol	Min	Max	Unit
Storage Temperature	Ts	-40	85	℃
Relative Humidity (non-condensation)	RH		85	%
Supply Voltage	Vcc	-0.5	3.6	V
Receiver Damage Threshold, per Lane	PRdmg	5		dBm

（Table 2.2 Recommended Operating Conditions）

Parameter	Symbol	Min	Max	Unit
Operating Case Temperature	Top	0	70	℃
Power Supply Voltage	Vcc	3.135	3.465	V
Total Power Consumption	Pc		5	W
Bit Rate	BR		212.5	Gbps
Fiber Length on OM3 MMF			70	m
Fiber Length on OM4 MMF			100	m

3.Optical Specification

3.1 Optical Transmitter

（Table 3.1 Transmitter Optical Interface）

Parameter	Symbol	Min	Typical	Max	Unit
Data rate per lane	DR		26.5625		Gbd
Modulation format		PAM4			
Center Wavelength	λ	840	850	868	nm

RMS spectral width	σ			0.65	nm
Average Launch power, each lane	Pavg	-6.5		4	dBm
Optical Power OMA, each Lane	PoMA	-4.5		3	dBm
Launch power in OMA outer minus TDECQ		-5.9			dBm
Transmitter and dispersion eye closure (TDECQ), each lane	TDECQ			4.5	dB
Extinction ratio	ER	3			dB
Optical Return Loss Tolerance	ORLT			12	dB
Optical Power for TX DISABLE				-30	dBm
Encircled fluxb[1]		≥86%at 19 um ≤30%at 4.5 um			

Notes:
1.Measured into type A1a.2 or type A1a.3, or A1a.4,50 um fiber, in accordance with IEC 61280-1-4

3.2 Optical Receiver

（Table 3.2 Receiver Optical Interface）

Parameter		Symbol	Min	Typical	Max	Unit
Data rate per lane		BR		26.5625		Gbd
Modulation format			PAM4			
Damage threshold			5			dBm
Average receive power, each lane			-8.4		4	dBm
Receiver reflectance		Rr			-12	dB
Receiver sensitivity, each lane[1]			RS=max(-6.5, SECQ-7.9)			dBm
Stressed receiver sensitivity, each ane					-3.4	dBm
Rx LOS	Assert		-30			dBm
	De-assert				-9	dBm
	Hysteresis		0.5			dB

Notes:
1.Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ. Measured with conformance test signal at TP3 for BER = 2.4E-4 Pre-FEC.

4. Electrical Specification

（Table 4.1 High speed Electrical Specifications）

Parameters	Min	Typical	Max	Unit
Supply voltage	3.135		3.465	V
Supply Current			1.59	A
Input differential impedance	90	100	110	Ω
Differential pk-pk input Voltage Tolerance	900			mVpp
Differential data output swing			900	mVpp
Bit Error Rate Pre-FEC			2.4E-4	
Input Logic Level High	2		Vcc	V
Input Logic Level Low	0		0.8	V
Output Logic Level High	Vcc-0.5		Vcc	V
Output Logic Level Low	0		0.4	V

5.User Interface

5.1 Management Interface

QSFP56 2-Wire Serial Interface Protocol

QSFP56 2-wire serial interface is specified in the SFF-8636.The QSFP56 2-wire serial interface is used for serial ID, digital diagnostics, and certain control functions. The 2-wire serial interface is mandatory for all QSFP56 modules.

QSFP56 Management Interface

The common memory map for managed external cable interfaces is utilized for serial ID, digital monitoring and control functions. The map is arranged into a single lower page address space of 128 bytes and multiple upper address pages.

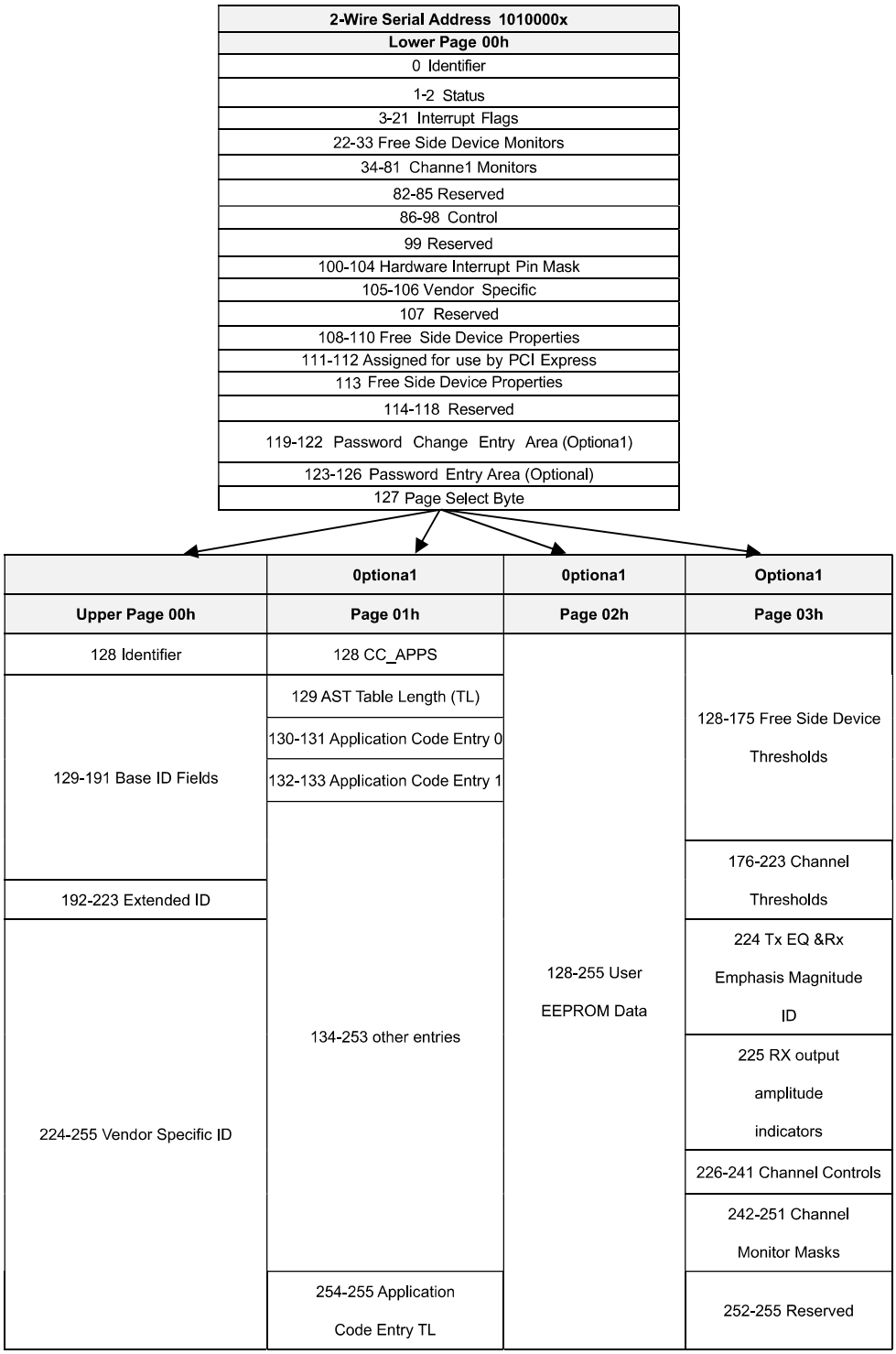


Figure 5.1 QSFP56 Memory Map

5.2 Memory Map in detail

Byte Address	Description	Type
0	identifier (1 Byte)	Read Only
1-2	Status (2 Bytes)	Read Only
3-21	Interrupt Flags (31 Bytes)	Read Only
22-33	Module Monitors (12 Bytes)	Read Only
34-81	Channel Monitors (48 Bytes)	Read Only
82-85	Reserved (4 Bytes	Read Only
86-97	Control (12 Bytes)	Read/Write
98-99	Reserved (2 Bytes)	Read/Write
100-106	Module and Channel Masks (7 Bytes)	Read/Write
107-118	Reserved (12 Bytes	Read/Write
119-122	Reserved (4 Bytes)	Read/Write
123-126	Reserved (4 Bytes)	Read/Write
127	Page Select Byte	Read/Write

Figure5.2 Low Page 00H Memory Map

Address	Name	Description
128	identifier (1 Byte)	identifier Type of seral transceiver
129	Ext. Identifier (1 Byte)	Extended identifier of serial transceiver
130	Connector (1 Byte)	Code for corrector type
131-138	Transceiver (8 Bytes	Code for electronic compatibility or optical compatibility
139	Encoding (1 Byte)	Code for sendal encoding algorithm
140	BR, nominal (1 Byte)	Nominal bit rate, units of 100 Meets/s
141	Extended Rate Select Compliance (1 Byte)	Tags for Extended Rate Select compliance
142	Length SMF (1 Byte)	Link length supported for SM fiber in km
143	Length E-50μm(1 Byte)	Link length supported for EBW 50/125 μm fiber, units of 2m
144	Length 50μm (1 Byte)	Link length supported for 50/125 μm fiber, units of 1 m
145	Length 625μm (1 Byte)	Link length supported for 62.5/125μm fiber, units of 1 m
146	Length copper (1 Byte)	Link length supported for copper, units of 1 m
147	Device Tech (1 Byte)	Device technology
148-163	Vendor name (16 Bytes	QSFP vendor name (ASCII)
164	Extended Transceiver (1 Byte)	Extended Transceiver Codes for InfiniBand
165-167	Vendor OUI (3 Bytes	QSFP vendor EEE vendor company ID
168-183	Vendor PN (16 Bytes)	Part number provided by QSFP vendor (ASCil)

184-185	Vendor rev (2 Bytes)	Revision level for part number provided by vendor (ASCII)
186-187	Wavelength (2 Bytes	Nominal laser wavelength (Wavelength =value/20 in nm)
188-189	Wavelength Tolerance (2 Bytes	Guaranteed range of laser wavelength (+|-value) from Nominal wavelength (Wavelength ToL =value /200 in nm)
190	Max Case Temp (1 Byte)	Maximum Case Temperature in Degrees C
191	CC_BASE (1 Byte)	Check code for Base ID fields (addresses 128-190
192-195	Options (4 Bytes)	Rate Select, TX Disable, TX Fault, LOS
196-211	Vendor SN (16 Bytes	Seral number provided by vendor (ASCII)
212-219	Date code (8 Bytes)	Vendor's manufacturing date code
220	Diagnostic Mentoring Type (1 Byte)	Indicates which type of diagnostic monitoring is implemented
221	Enhanced Options (1 Byte)	Indicates which optional enhanced features are implemented
222	Reserved (1 Byte)	Reserved
223	CC_EXT	Check code for the Extended ID Fields (addresses 192-222)
224-255	Vendor Specific (32 Bytes)	Vendor Specific EEPROM

Figure5.3 Upper page 00H Memory Map

Byte Address	Description	Type
128-175	Module Thresholds (48 Bytes)	Read Only
176-223	Reserved (48 Bytes)	Read Only
224-225	Reserved (2 Bytes	Read Only
226-239	Reserved (14 Bytes)	Read/Write
240-241	Channel Controls (2 Bytes	Read/Write
242-253	Reserved (12 Bytes)	Read/Write
254-255	Reserved (2 Bytes	Read/Write

Figure5.4 Upper Page 03H Memory Map

This structure permits timely access to addresses in the lower page such as interrupt flags and monitors. Less time critical entries such as serial ID information and threshold settings are available with the page select function. Data used for interrupt handling is located in Lower Page 00h to enable single block read operations for time critical data.

Upper Page 01h and Upper Page 02h are optional. Upper Page 01h allows implementation of application select table while Upper Page 02h provides a user read/write space. Implementation of these two pages is optional. Lower- and Upper-Page OOh are always implemented. Page 03h is required if Page 0Oh Byte 2 bit 2 is low. Pages 20-7Fh are reserved for future use. Writing the value of a non-supported page shall not be accepted by the transceiver. The Page Select byte shall revert to O and read/write operations shall be to Upper Page 00h.Pages 04-1Fh and 80-FFh are for vendor specific functions.

Page02 is user EEPROM, and its format dedicated by user. The detail description of low memory and Page00.Page03 upper memory please see SFF-8636 document.

5.3 Digital Diagnostic Monitor Accuracy

The following characteristics are defined over recommended operating conditions.

(Table 5.3 Digital Diagnostic Monitor Accuracy)

Parameter	Accuracy	Unit
Internally measured transceiver temperature	+/-3	℃
Internally measured transceiver supply voltage	+/-3%	V
Measured Tx bias current	+1-10%	mA
Measured Tx output power	+/-3	dB
Measured Rx received average optical power	+/-3	dB

6. Pin Assignment and Description

6.1 PIN Definitions

QSFP56 pin-out as being defined by QSFP MSA, PIN Descriptions are as follows:

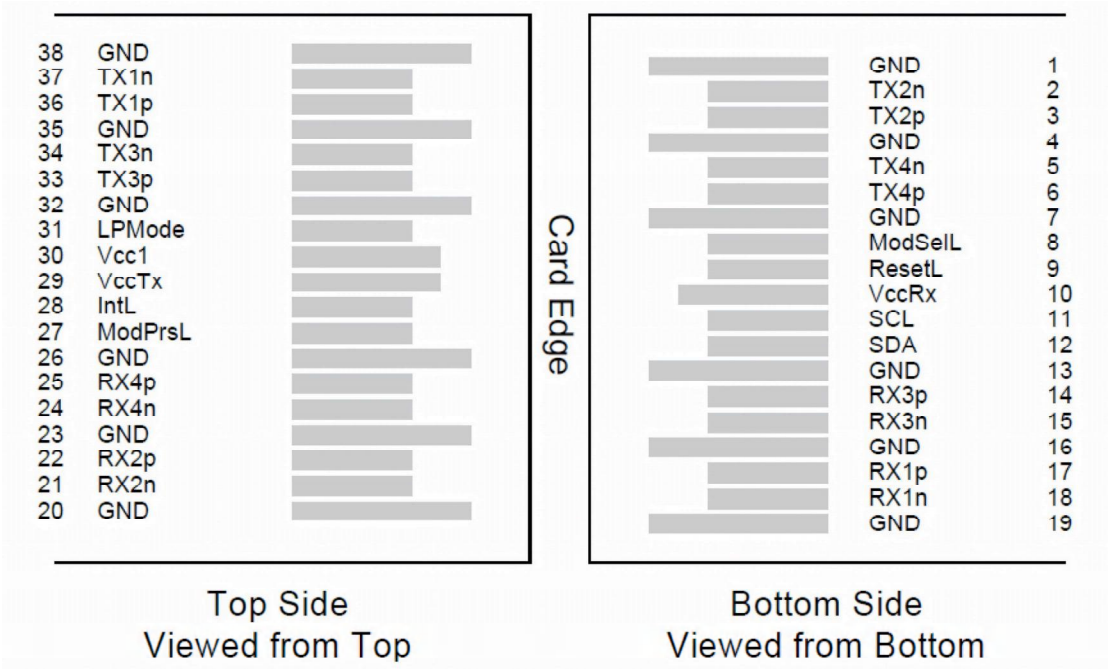


Figure 6.1 QSFP56 Transceiver Electrical Pad Layout

6.2 Pin Description

(Table 6.2 Pin Description)

Pin	Logic	Symbol	Description	Plug Sequence	Notes
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	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Inpu	3	3
7		GND	Ground	1	
8	LVTTL-I	Modse1L	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		Vcc Rx	+3.3V Power Supply Receiver	2	2
11	LVCMOS-I/O	SCL	2-wire serial interface clock	3	
12	LVCMOS-I/O	SDA	2-wire serial interface data	3	
13		GND	Ground	1	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	3
15	CML-O	Rx3n	Receiver Inverted Data Output	3	3
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	3
26		GND	Ground		1
27	LVTTL-0	ModPrsL	Module Present	3	
28	LVTTL-O	IntL	Interrup	3	

Note:

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

[2] Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently.

7. Mechanical Dimensions

7.1 Package dimensions

Figure 7.1 shows the package dimensions of the module. Package dimensions are specified in QSFP MSA.

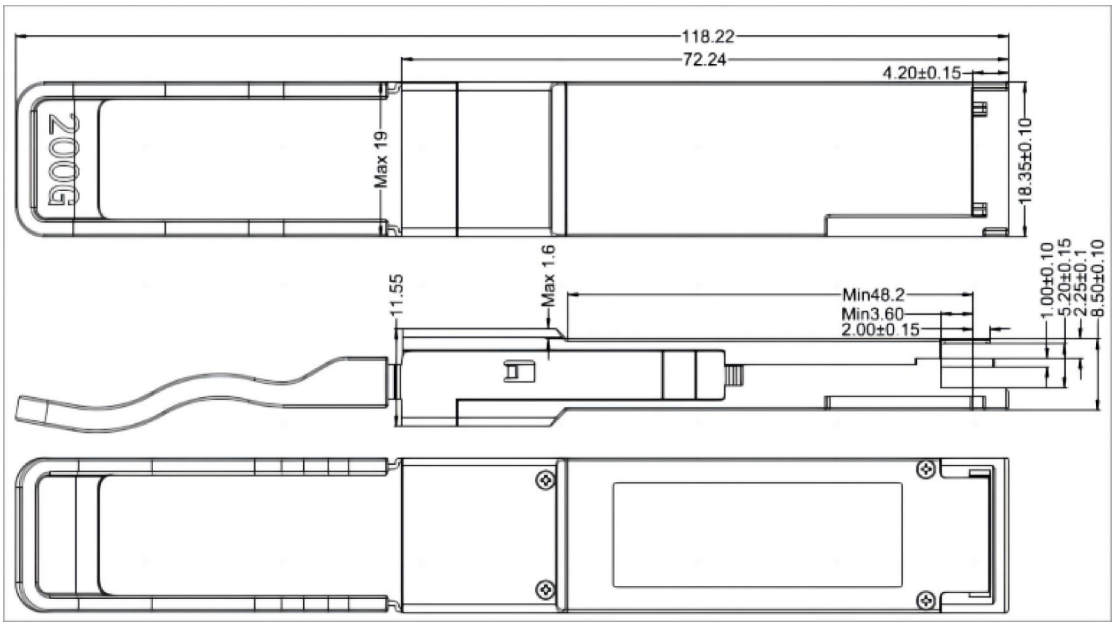


Figure 7.1 Package dimensions

7.2 Pull-tab Color

Pull-tab color is Pantone 475U (Beige)

7.3 Optical interface requirement

The optical port is MPO 12 APC optical interface as shown in Figure 7.3

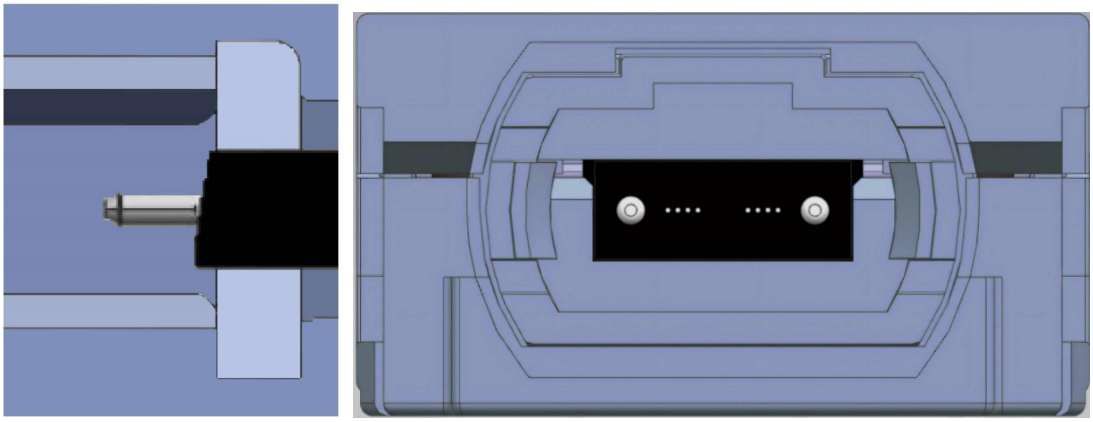


Figure 7.3 MPO12 APC interface

8. Laser safety and Electromagnetic Compatibility

8.1 Laser safety

The 200G QSFP56 SR4 are Class 1 Laser products according to FDA/CDRH、IEC-60825-1 and IEC60825-2 standards. They must be operated under the specified operating conditions

8.2 Electromagnetic Compatibility

The 200G QSFP56 SR4 are designed to meet FCC Class B limits.

9. Ordering Information

Part Number	Temperature Range	Distance	Fiber Type	E/O	O/E
RQ56-200G-SR4	0 to 70℃	100m	MMF	VCSEL 850nm	PIN