

# 100Gbps QSFP28 SR4 Transceiver

## QSFP28-SR4-PLU

### Features

- Hot-pluggable QSFP28 form factor
- Supports 25.78125Gb/s bit rate per channel
- Maximum link length of 70m over OM3 Multimode Fiber (MMF) and 100m over OM4 (MMF)
- 4 channels 850nm VCSEL laser and 4 channels PIN photo detector array
- Single MPO connector receptacle
- Internal CDR circuits on both receiver and transmitter channels
- Case operating temperature range: 0 ~ +70°C
- Single 3.3V power supply
- Power dissipation: <2.5 W
- QSFP28 housing with enhanced EMI shielding

### Applications

- Data center and Cloud services
- 100GBASE-SR4 Ethernet
- Infiniband EDR interconnects
- Servers, Switches, Storage and Host Card Adapters

### Standards

- Compliant with QSFP28 MSA
- Compliant with IEEE 802.3bm
- Compliant with SFF-8636
- RoHS Compliant

## General Description

MQBG1D1-DMC-8VT1 is a Four-Channel, Pluggable, Fiber-Optic QSFP28 SR4 for 100Gigabit Ethernet and Infiniband EDR applications. This transceiver is a high performance module for data communication and interconnect applications. It integrates four data lanes in each direction with 103.1Gbps bandwidth. The length of MNC QSFP28 SR4 is up to 70 meters over OM3 MMF or 100 meters over OM4 MMF. This module is designed to operate over multimode fiber systems using a nominal wavelength of 850nm. The electrical interface uses a 38 contact edge type connector. The optical interface uses a 12 fiber MPO connector.

## Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	Ts	-40	+85	°C	
Operating Humidity	RH	5	95	%	
Power Supply Voltage	Vcc	-0.5	3.6	V	
Signal Input Voltage		Vcc-0.3	Vcc+0.3	V	

## Recommended Operating Environment

Recommended Operating Environment specifies parameters for which the electrical and optical characteristics hold unless otherwise noted.

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Tc	0		+70	°C
Power Supply Voltage	Vcc	3.135	3.3	3.465	V
Power Supply Current	Icc			750	mA
Bit Rate, each channel	BR	25.78125±100ppm			Gbps
Fiber Length on 50/125µm high-bandwidth (OM3) MMF				70	m
Fiber Length on 50/125µm high-bandwidth (OM4) MMF				100	m

## Technical Features

The following Optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter		Symbol	Min	Typical	Max	Unit	Notes
Transmitter Characteristics							
Center Wavelength		$\lambda_c$	840	850	860	nm	
Average Launch Power, each lane		$P_{AVG}$	-8.4		2.4	dBm	
Optical Power OMA, each Lane		$P_{OMA}$	-6.4		3	dBm	
Spectral Width (RMS)		$\sigma$			0.6	dB	
Optical Extinction Ratio		ER	2			dB	
Optical Return Loss Tolerance		ORL			12	dB	
Transmitter Reflectance		$R_T$			-12	dB	
Output Eye Mask coordinates: {X1, X2, X3, Y1, Y2, Y3}		{0.3, 0.38, 0.45, 0.35, 0.41, 0.5}					1,2
Receiver Characteristics							
Receiver Wavelength		$\lambda_{in}$	840	850	860	nm	
Damage Threshold, each lane		THd	3.0			dBm	3
Average Receive Power, each lane		$R_{SENS}$	-10.3		2.4	dBm	
Receiver Sensitivity (OMA), each lane		$P_{sen1}$			-8	dBm	4
LOS	LOS Assert	LOSA	-30			dBm	
	LOS De-Assert	LOSD			-10	dBm	
	LOS Hysteresis	LOSH	0.5	2		dB	
Input Saturation Power (Overload)		$P_{sat}$	2.4			dBm	
Receiver Reflectance		$R_r$			-12	dB	

Notes:

1. Compliant with IEEE 802.3bm.
2. Transmitter hit ratio 5E-5 hits/sample.
3. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
4. Measured with a PRBS 231-1 test pattern, @25.78125Gb/s, BER<5E-5.

## Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Supply Voltage	Vcc	3.135	3.3	3.465	V	
Supply Current	Icc			750	mA	
Transmitter						
Input differential impedance	Z <sub>IN</sub>	90	100	110	Ω	
Differential data input swing	V <sub>in,pp</sub>	180		1000	mVpp	1
Single ended input voltage tolerance	V <sub>inT</sub>	-0.3		4.0	V	
Receiver						
Single ended output voltage tolerance	V <sub>outT</sub>	-0.3		4.0	V	
Differential data output swing	V <sub>out,pp</sub>	300		850	mVpp	2

Notes:

1. Differential data input swing is measured between TxnP and TxnN.
2. Differential data output swing is measured between RxnP and RxnN.

## Digital Diagnostic Monitoring Information

Parameter	Units	Min	Max	Accuracy	Calibration	Notes
Temperature	°C	0	+70	±3°C	Internal	
Voltage	V	3.135	3.465	±3%	Internal	
Bias Current	mA	0	12	±10%	Internal	1
TX Power	dBm	-8.4	2.4	±3dB	Internal	
RX Power	dBm	-10.3	2.4	±3dB	Internal	

Notes:

1. Accuracy of Measured Tx Bias Current is 10% of the actual Bias Current from the laser driver to the laser.

## Pin Assignment

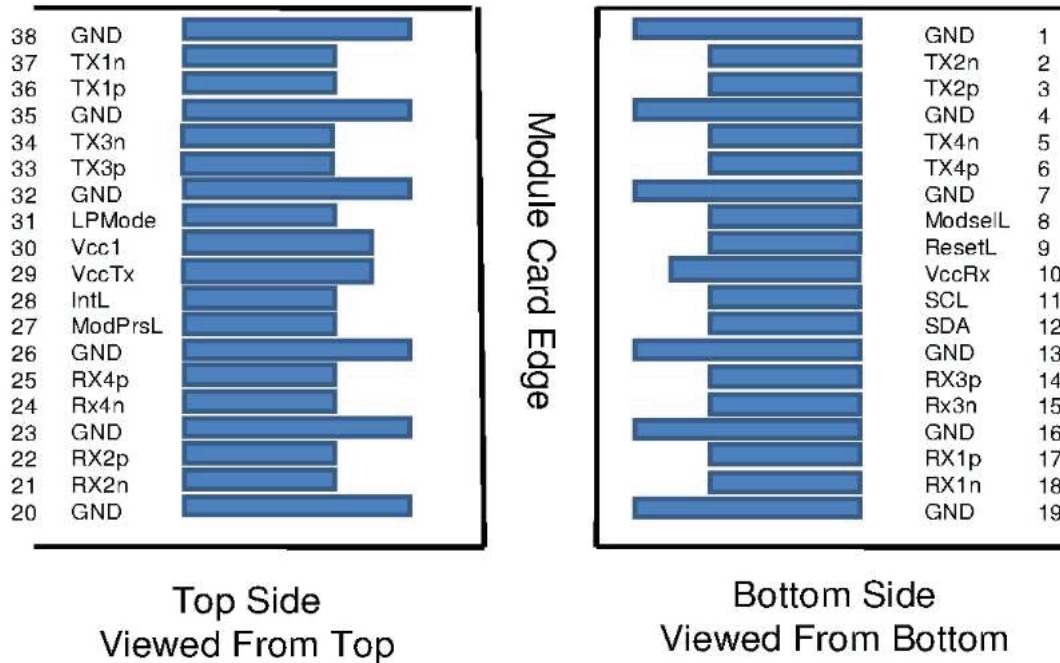


Figure 1 Pinout of Connector Block on Host

Board Table 1 PIN Definition

Pin	Symbol	Name/Description	Notes
1	GND	Transmitter Ground (Common with Receiver Ground)	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground (Common with Receiver Ground)	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground (Common with Receiver Ground)	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	3.3V Power Supply Receiver	2
11	SCL	2-Wire serial Interface Clock	
12	SDA	2-Wire serial Interface Data	
13	GND	Transmitter Ground (Common with Receiver Ground)	

14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Transmitter Ground (Common with Receiver Ground)	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Transmitter Ground (Common with Receiver Ground)	1
20	GND	Transmitter Ground (Common with Receiver Ground)	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Transmitter Ground (Common with Receiver Ground)	1
24	Rx4n	Receiver Inverted Data Output	1
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground (Common with Receiver Ground)	1
27	ModPrsl	Module Present	
28	IntL	Interrupt	
29	VccTx	3.3V power supply transmitter	2
30	Vcc1	3.3V power supply	2
31	LPMode	Low Power Mode, not connect	
32	GND	Transmitter Ground (Common with Receiver Ground)	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground (Common with Receiver Ground)	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. GND is the symbol for signal and supply (power) common for QSFP28 modules. All are common within the QSFP28 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. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

## EEPROM Memory Map

2-Wire Serial Address 1010000x
Lower Page 00h
0 Identifier
1-2 Statues
3-21 Interrupt Flags
22-33 Free Side Device Monitors
34-81 Chanel Monitors
82-85 Reserved
86-98 Control
99 Reserved
100-104 Hardware Interrupt Pin Masks
105-106 Vendor Specific
107 Reserved
108-110 Free Side Device Properties
111-112 Assigned for use by PCI Express
113 Free Side Device Properties
114-118 Reserved
119-122 Password Change Entry Area(Optional)
123-126 Password Entry Area(Optional)
127 Page Select Byte

	Optional	Optional	Optional	
Upper Page 00h	Page 01h	Page 02h	Page 03h	
128 Identifier	128 CC_APPS	128-255 User EEPROM Data	128-175 Free Side Device Thresholds	
129-191 Base ID Fields	129 AST Table Length (TL)		176-223 Channel Thresholds	
	130-131 Application Code Entry 0		224 TX EQ & RX Emphasis Magnitude ID	
	132-133 Application Code Entry 1		225 RX output amplitude indicators	
192-223 Extended ID	134-253 Others Entries		226-241 Channel Controls	
224-255 Vendor Specific ID	254-255 Application Code Entry TL		242-251 Channel Monitor Masks	
			252-255 Reserved	



## EEPROM Serial ID Memory Contents (2-Wire Serial Address A0h Upper Page 00h)

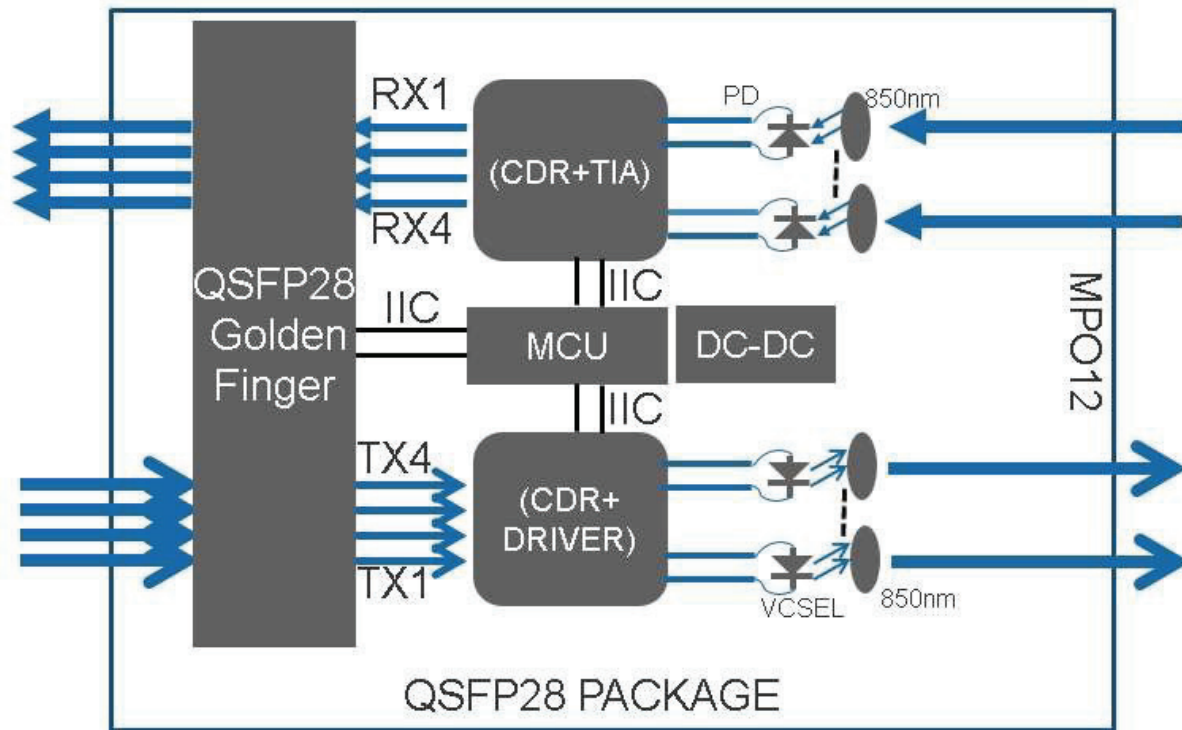
Address	Name of field	Hex	Description
<b>BASE ID Fields</b>			
128	Identifier	11	QSFP28 transceiver
129	Ext. Identifier	8C	Extend Identifier of free side device
130	Connector Type	0C	MPO 1*12 (Multifiber Parallel Optic)
131-138	Specification Compliance	80 00 00 00 00 00 00 00	Code for electronic or optical compatibility
139	Encoding	07	Code for serial encoding algorithm
140	BR, nominal	FF	Nominal bit rate per channel, units of 100Mbps
141	Extended Rate Select Compliance	00	Tags for extended rate select compliance
142	Length(SMF)	00	Transceiver link length support for different fibers
143	Length(OM3 50um)	23	
144	Length(OM2 50um)	00	
145	Length(OM1 62.5um)	00	
146	Length(passive copper or active cable or OM4 50um))	32	
147	Device technology	00	Device technology
148-163	Vendor name	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	(ASCII character)
164	Extended Module	00	
165-167	Vendor OUI	00 00 00	Free side device vendor IEEE company ID
168-183	Vendor PN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	(ASCII character)
184-185	Vendor rev	41 30	"A0"(ASCII character)
186-187	Wavelength or Copper Cable Attenuation	42 68	Nominal laser wavelength or copper cable attenuation in dB at 2.5 GHz and 5.0 GHz
188-189	Wavelength tolerance or Copper Cable Attenuation	07 D0	Guaranteed range of laser wavelength from nominal wavelength or copper cable attenuation in dB at 7.0 GHz and 12 GHz
190	Max case temp.	00	Maximum case temperature in degrees C.
191	CC_BASE	Programmed by Factory	Check code for base ID fields
<b>Extended ID Fields</b>			
192	Link codes	02	100GBASE-SR4
193-195	Options	07 31 DA	,
196-211	Vendor SN	xx.....xx	Serial number provided by vendor(ASCII)
212-219	Date Code	Data Code	Vendor's manufacturing date code
220	Diagnostic Monitoring Type	0C	Indicates which type of diagnostic monitoring is implemented
221	Enhanced Options	00	Indicates which optional enhanced features are implemented in the free side device
222	BR, nominal	67	Nominal bit rate per channel, units of 250 Mbps.
223	CC-EXT	Programmed by Factory	Check code for the Extended ID Fields
<b>Vendor Specific ID Field</b>			
224-255	Vendor Specific	00	Vendor specific EEPROM



## Free Side Device and Channel Thresholds (2-Wire Serial Address A0h Page 03h)

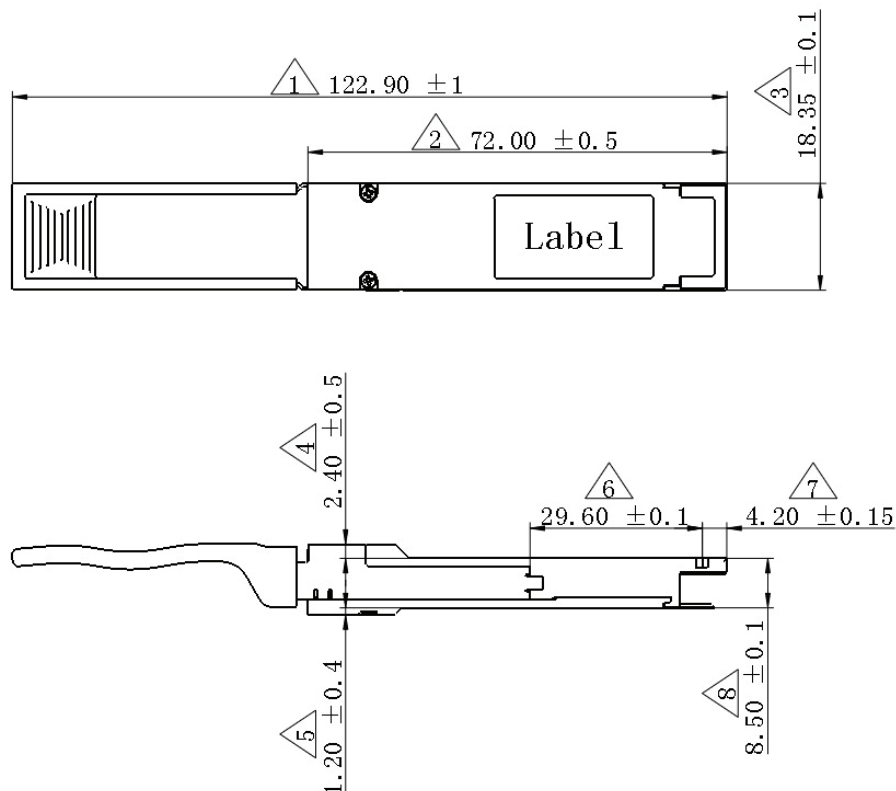
Address	#Bytes	Name of field	Real Value	Unit	Hex
128-129	2	Temp High Alarm	75	°C	
130-131	2	Temp Low Alarm	-5	°C	
132-133	2	Temp High Warning	73	°C	
134-135	2	Temp Low Warning	-3	°C	
136-143	8	Reserved	Reserved		
144-145	2	Vcc High Alarm	3.63	V	
146-147	2	Vcc Low Alarm	2.97	V	
148-149	2	Vcc High Warning	3.46	V	
150-151	2	Vcc Low Warning	3.13	V	
152-159	8	Reserved	Reserved		
160-175	16	Vendor Specific			
176-177	2	RX Power High Alarm	3.4	dBm	
178-179	2	RX Power Low Alarm	-12.3	dBm	
180-181	2	RX Power High Warning	2.4	dBm	
182-183	2	RX Power Low Warning	-10.3	dBm	
184-185	2	TX Bias High Alarm	12	mA	
186-187	2	TX Bias Low Alarm	1	mA	
188-189	2	TX Bias High Warning	11.5	mA	
190-191	2	TX Bias Low Warning	1.5	mA	
192-193	2	TX Power High Alarm	3.4	dBm	
194-195	2	TX Power Low Alarm	-10.4	dBm	
196-197	2	TX Power High Warning	2.4	dBm	
198-199	2	TX Power Low Warning	-8.4	dBm	
200-207	8	Reserved	Reserved		
208-223	16	Vendor Specific			

## Optical Module Block Diagram



## Mechanical Dimensions

Dimensions are in millimeters. (Unit: mm)



## Ordering information

Part. No	Specifications								
	Pack	Rate (Gbps)	Tx (nm)	Po (dBm)	Sen (OMA) (dBm) <sup>1</sup>	Temp (°C)	Reach (m) <sup>2</sup>	Pull Tab Color	DDM
QSFP28-SR4-PLU	QSFP28	103.1	850	-8.4~2.4	<-8	0~+70	100	Beige	Y

### Notes:

1. Measured with a PRBS 231-1 test pattern, @25.78125Gb/s, BER<5E-5.
2. OM3 Cable length =<70m or OM4 Cable length =<100m
3. More detail product selection and cable lengths, please contact C-light.