TITLE	DOC No.	DTRX-160001
40G QSFP+ SR4 Transceiver	REVISION：02	AUTHORIZED BY：Mike Sun
	DATE：2021.10.26	CLASSIFICATION：CONFIDENTIAL

1. SCOPE

This product is a parallel 40Gb/s Quad Small Form-factor Pluggable (QSFP+) optical module. It provides increased port density and total system cost savings. The QSFP+ full-duplex optical module offers 4 independent transmit and receive channels, each capable of 10Gb/s operation for an aggregate data rate of 40Gb/s on 100 meters of OM3 multi-mode fiber. An optical fiber ribbon cable with an MTP/MPO connector can be plugged into the QSFP+ module receptacle.

2. PRODUCT FEATURES

- Four-channel full-duplex transceiver module
- Hot Pluggable QSFP+ form factor
- Maximum link length of 100m on OM3 Multimode Fiber(MMF) and 150m on OM4 MMF for P59000DCCA01-1
- Maximum link length of 300m on OM3 Multimode Fiber(MMF) and 400m on OM4 MMF for P59000DCCAS3-1
- Multirate capability: 1 Gb/s to 10.5 Gb/s per channel
- Unretimed XLPPI electrical interface
- Maximum power dissipation <1.5W
- Reliable VCSEL array technology
- Commercial operating case temperature range: : 0℃ to 70℃
- RoHS-6 Compliant

3. PRODUCT DESCRIPTION

3.1 PRODUCT NAME AND SERIES NUMBER(S)

40G QSFP+ SR4 Transceiver

Part Number	Data Rate	Wavelength (nm)	Distance	Media	Power (dBm)	Sen. (dBm)	Connector	Tem.
P59000DCCA01-1	40G	850	100m	MMF	-7.6 ~ 1	-9.5	MPO	C
P59000DCCAS3-1	40G	850	300m	MMF	-7.6 ~ 1	-9.5	MPO	C

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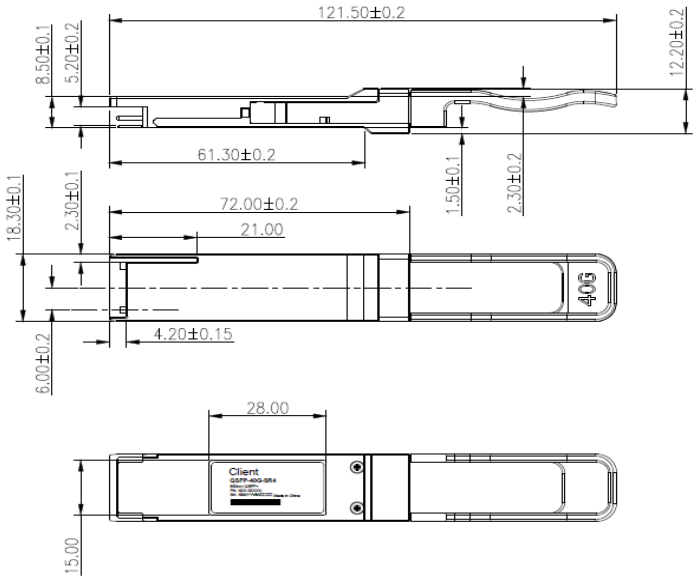
3.2 DIMENSIONS,MATERIALS,PLATINGS AND MARKING



Unit is millimeter. All dimensions are ±0.1mm unless otherwise specified.

4. APPLICABLE DOCUMENTS AND SPECIFICATIONS

- QSFP+ MSA compliant

5. QUALIFICATION

- Electrostatic Discharge (ESD) to the Electrical Pins
- Electrostatic Discharge (ESD) to the MPO Connector
- RoHS compliance

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6. Absolute Maximum Ratings & Recommended Operating Conditions

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Temperature	T_S	-40	85	degC	
Operating Case Temperature	T_{OP}	0	70	degC	
Power Supply Voltage	V_{CC}	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	1
Receiver Damage Threshold per Lane	P_{IND}	3.4		dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T_{OP}	0		70	degC	
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Data Rate, each Lane			10.3125	11.2	Gb/s	
Link Distance (OM3)	D			100	m	
Power Consumption				1.5	W	
Supply Current	Icc			450	mA	
Transceiver Power-on Initialization Time				2000	ms	2

Notes:
1. *Non-condensing.*
2. *From power-on and end of any fault conditions.*

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Transmitter Operating Characteristic-Optical, Electrical

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Optical Characteristics						
Signaling Speed per Lane			10.5		GBd	1
Center Wavelength	λC	840	850	860	nm	
RMS Spectral Width	Δλrms			0.65	nm	
Average Launch Power, each Lane	PAVG	-7.6		1.0	dBm	
Optical Modulation Amplitude (OMA), each Lane	POMA	-5.6		3.0	dBm	2
Difference in Launch Power between any Two Lanes (OMA)	Ptx,diff			4.0	dB	
Peak Power, each Lane	PPT			4.0	dBm	
Extinction Ratio	ER	3.0			dB	
Average launch power of OFF transmitter, per lane				-30	dBm	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		0.23, 0.34, 0.43, 0.27, 0.35, 0.4				
Electrical Characteristics						
Single ended input voltage tolerance	VinT	-0.3		4.0	V	
Differential data input swing	Vin,pp	180		1200	mVpp	3
Eye mask colordinates {X1, X2 Y1, Y2}		0.11, 0.31 95, 350			UI mV	4

Notes:

1. *Transmitter consists of 4 lasers operating at a maximum rate of 10.5Gb/s each.*
2. *Even if TDP is <0.9dB, the OMA min must exceed this value*
3. *After internal AC coupling. Self-biasing 100 differential input.*
4. *Hit ratio = 5 x 10E-5*

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Receiver Operating Characteristic-Optical, Electrical

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Optical Characteristics						
Signaling Speed per Lane			10.5		GBd	1
Center wavelength		840	850	860	nm	
Damage Threshold	DT	3.4			dBm	
Average Receive Power per Lane	RXP_X	-9.5		2.4	dBm	
Receive Power (OMA) per Lane	RxOMA			3.0	dBm	
Peak Power, per lane	PP_X			4	dBm	
LOS De-Assert	LOSD			-12	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis	LOSH	0.5			dBm	
Electrical Characteristics						
Single-ended output voltage		-0.3		4.0	V	
Differential data output swing	Vout,pp	0		800	mVpp	4,5
Output transition time, 20% to 80%		28			ps	
Eye mask coordinates #1 {X1, X2 Y1, Y2}		0.29, 0.5 150, 425			UI mV	3

Notes:

1. *Receiver consists of 4 photodetectors operating at a maximum rate of 10.5Gb/s each.*
2. *10 MHz to 11.1 GHz range*
3. *Hit ratio = 5 x 10E-5.*
4. *AC coupled with 100 differential output impedance.*
5. *Settable in 4 discrete steps via the I2C interface.*

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6. Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8436.

Parameter	Symbol	Min	Max	Units	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temperature range
Supply voltage monitor absolute error	DMI _VCC	-0.1	0.1	V	Over full operating range
Channel RX power monitor absolute error	DMI_RX_Ch	-3	3	dB	1
Channel Bias current monitor	DMI_Ibias_Ch	-10%	10%	mA	Ch1~Ch4
Channel TX power monitor absolute error	DMI_TX_Ch	-3	3	dB	1

Notes:

1. Due to measurement accuracy of different single mode fibers, there could be an additional +/-1 dB fluctuation, or a +/- 3 dB total accuracy.

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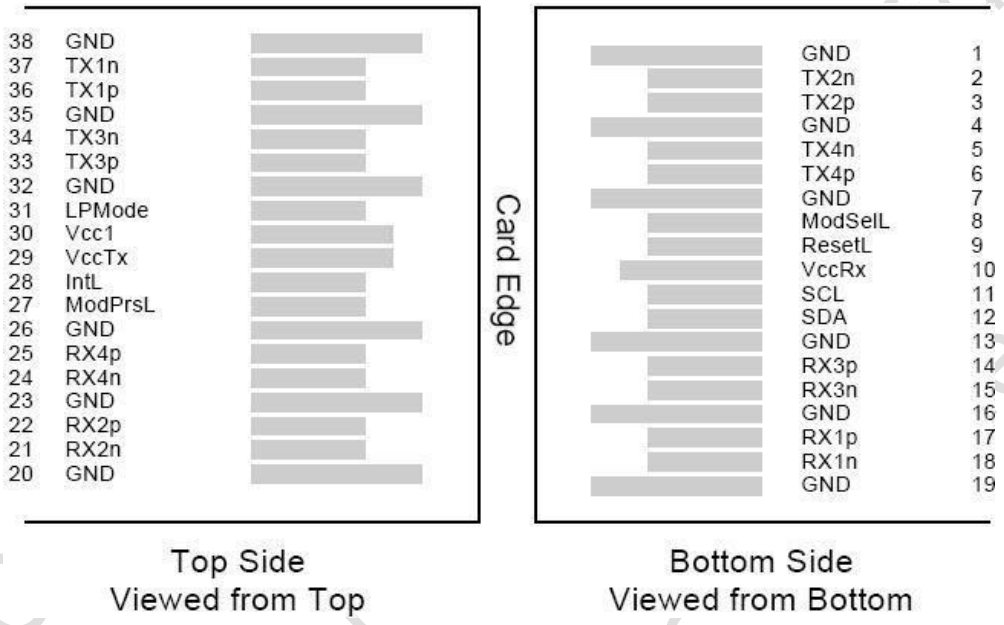

Pin Definitions

7. Applications Note :

Pin Assignment

PIN	Logic	Symbol	Name/Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data	

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

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Notes:

1. GND is the symbol for signal and supply (power) common for QSFP+ modules. 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.
2. VccRx, Vcc1 and VccTx are the receiver and transmitter power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 4 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

Optical Interface Lanes and Assignment

Figure 3 shows the orientation of the multi-mode fiber facets of the optical connector. Table 1 provides the lane assignment.

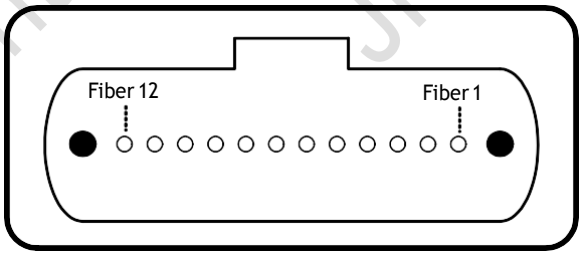

Figure 3. Outside View of the QSFP+ Module MPO

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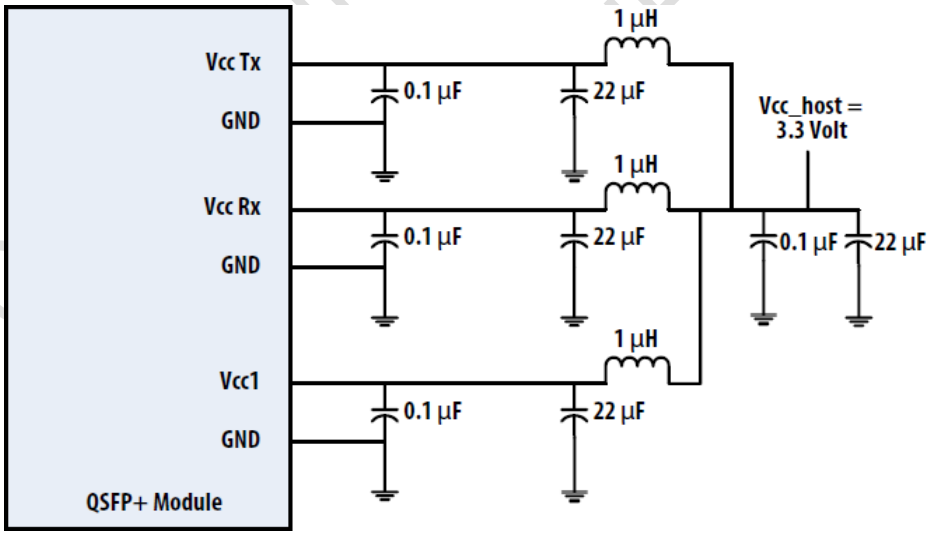
Table 1: Lane Assignment

Fiber #	Lane Assignment
1	RX0
2	RX1
3	RX2
4	RX3
5,6,7,8	Not used
9	TX3
10	TX2
11	TX1
12	TX0

Recommended Interface Circuit



TITLE **40G SR4 QSFP+ Transceiver**	**DOC No.**	**DTRX-000009**
	REVISION：02	**AUTHORIZED BY：Mike Sun**
	DATE：2021.10.26	**CLASSIFICATION：Optical Transceiver**

8. Modification History

Rev.	Comments	Date	Originator	Approval
01	Preliminary Draft	2018.12.05	Mike Sun	Ray Yang
02	Add **Distance** 300m	2021.10.26	Mike Sun	Ray Yang