

<b>TITLE</b>  <b>40G LR4 QSFP+ Transceiver</b>	<b>DOC No.</b>	<b>DTRX-000011</b>
	<b>REVISION :</b> <b>02</b>	<b>AUTHORIZED BY :</b> <b>Mike Sun</b>
	<b>DATE :</b> <b>2022.07.29</b>	<b>CLASSIFICATION :</b> <b>Optical Transceiver</b>

## **1. SCOPE**

The transceiver consists of two sections: The transmitter section incorporates four CWDM DFB laser. And the receiver section consists of a PIN photodiode integrated with a TIA. All modules satisfy class I laser safety requirements. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8436 which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and received optical power and transceiver supply voltage.

## **2. PRODUCT FEATURES**

- **Hot Pluggable QSFP+ form factor**
- **Support 41.2 Gb/s aggregate bit rates**
- **Maximum link length of 10km on Singlemode Fiber(SMF)**
- **Duplex LC receptacles**
- **Power dissipation <3.5W**
- **Commercial operating case temperature range: : 0°C to 70°C**
- **RoHS-6 Compliant**
- **Single 3.3V power supply**

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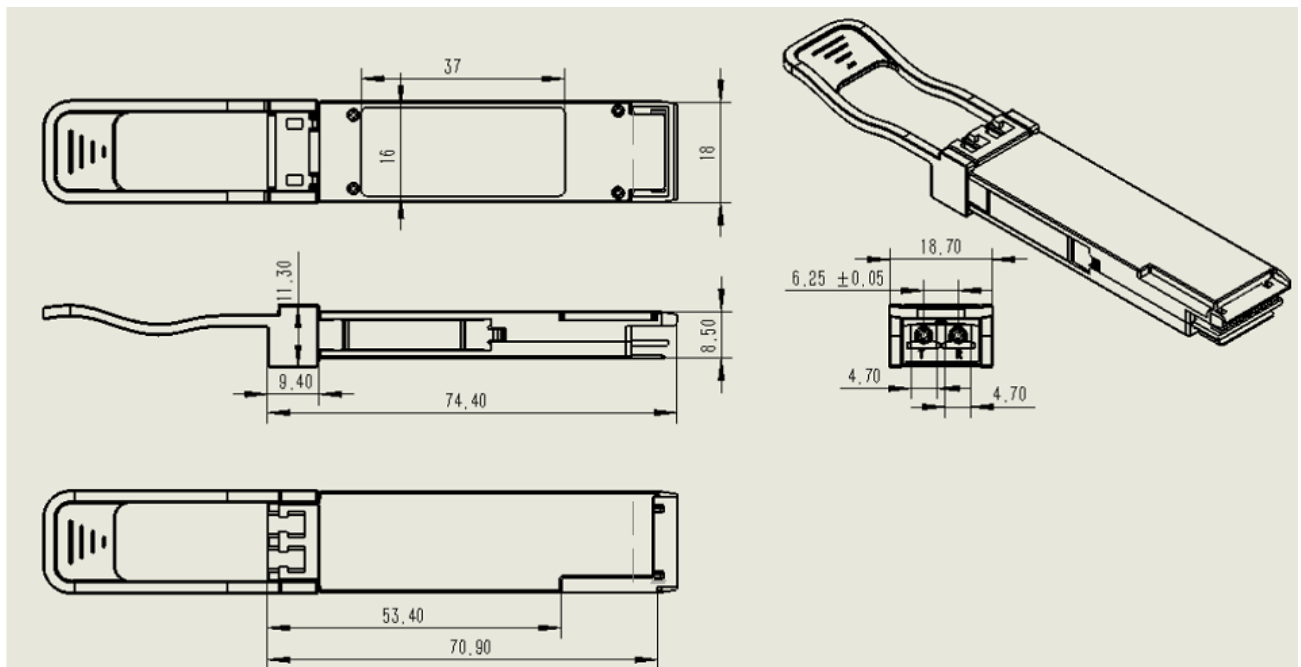
### 3. PRODUCT DESCRIPTION

#### 3.1 PRODUCT NAME AND SERIES NUMBER(S)

##### 40G QSFP+ LR4 Transceiver

Part Number	Data Rate	Wavelength (nm)	Distance	Media	Power (dBm)	Sen. (dBm)	Connector	Tem.
P58000DGCB10-1	40G	1310	10km	SMF	-7 ~ 2.3	-11.5	LC	C

#### 3.2 DIMENSIONS, MATERIALS, PLATINGS AND MARKING



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

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#### **4. APPLICABLE DOCUMENTS AND SPECIFICATIONS**

- QSFP+ MSA compliant
- Compliant with 40G Ethernet IEEE 802.3ba 40GBASE LR4 standard

#### **5. QUALIFICATION**

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

#### **6. Absolute Maximum Ratings & Recommended Operating Conditions**

<b>Absolute Maximum Ratings</b>				
<b>Parameter</b>	<b>Symbol</b>	<b>Min.</b>	<b>Max.</b>	<b>Unit</b>
Storage Temperature	T <sub>s</sub>	-40	85	degC
Power Supply Voltage	VCC	-0.5	3.6	V
Relative Humidity (non-condensation)	RH	0	85	%
Damage Threshold, per Lane	DT	3.4		

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**Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>CT</sub>	0		70	degC
Operating Case Temperature	T <sub>IT</sub>	-40		85	degC
Power Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V
Data Rate, each Lane			10.3125		Gb/s
Operating Distance	D		10		Km
Power Consumption				1.5	W
Supply Current	I <sub>cc</sub>			1130	mA

**Transmitter Operating Characteristic-Optical, Electrical**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
<b>Optical Characteristics</b>						
Signaling Speed per Lane				10.3125	GBd	6
Center Wavelength	λ <sub>1</sub>	1264.5		1277.5	nm	
	λ <sub>2</sub>	1284.5		1297.5	nm	
	λ <sub>3</sub>	1304.5		1317.5	nm	
	λ <sub>4</sub>	1324.5		1337.5	nm	
Total Average Launch Power	POUT					
Launch Optical Power, each lane	P <sub>o</sub>	-7				

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	Po	-4		3.5		
Extinction Ratio		3.5				
Pout @TX-Disable Asserted	Poff					
Relative Intensity Noise						
Side Mode Suppression Ratio		30				
Optical Return Loss Tolerance	ORLT					
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
<b>Electrical Characteristics</b>						
Single ended input voltage tolerance	VinT	-0.3		4.0	V	
Differential Input Voltage Swing	Vin,pp	120	-	1200	mVpp	3
Differential input threshold			50		mV	
AC common mode input voltage tolerance		15			mV	
Differential input return loss		Per IEEE P802.3ba, Section 86A.4.1.1			dB	4
J2 Jitter Tolerance	Jt2	0.17			UI	
Eye mask coordinates {X1, X2}		0.11, 0.31			UI	5

*Notes:*

1. Minimum value is informative.
2. RIN is scaled by  $10 \cdot \log(10/4)$  to maintain SNR outside of transmitter
3. After internal AC coupling. Self-
4. 10 MHz to 11.1 GHz range.
5. Hit ratio =  $5 \times 10E-5$

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6. Transmitter consists of 4 lasers operating at 10.3Gb/s each

<b>Receiver Operating Characteristic-Optical, Electrical</b>						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Optical Characteristics</b>						
Signaling Speed per Lane				10.3125	GBd	6
Center Wavelength	$\lambda 1$	1264.5		1277.5	nm	
	$\lambda 2$	1284.5		1297.5	nm	
	$\lambda 3$	1304.5		1317.5	nm	
	$\lambda 4$	1324.5		1337.5	nm	
Receiver Sensitivity	S			-11.5	dBm	
Receive power, each lane (OMA)				3.5	dBm	
Average Receive Power per Lane	RXPx	-13.7		2.3	dBm	1
Stressed Receiver Sensitivity (OMA)	SRS			-9.6	dBm	
Damage Threshold per Lane	PMAx			3.4	dBm	
Vertical eye closure penalty, per lane				1.9	dB	
Receive electrical 3 dB upper cutoff frequency, per lane				12.3	GHz	
Optical Return Loss	ORL			-26	dB	
LOS Assert	LOSA	-28			dBm	
LOS Dessert	LOSD			-15	dBm	

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LOS Hysteresis	LOSH	0.5			dBm	
<b>Electrical Characteristics</b>						
Single-ended output voltage		-0.3		4.0	V	
Differential Output Voltage Swing	Vout,pp	200		400	mVpp	4,5
		300		600		
		400	550	800		
		600		1200		
AC common mode output voltage (RMS)				7.5	mV	
5 % Differential output return loss		Per IEEE P802.3ba, Section			dB	2
Common mode output return loss		Per IEEE P802.3ba, Section 86A.4.2.2			dB	2
Output transition time, 20% to 80%		28			ps	
Eye mask coordinates #1 {X1, X2}		0.29, 0.5			UI	3
Power Supply Ripple Tolerance	PSR	50			mVpp	

*Notes:*

1. Minimum value is informative.
2. 10 MHz to 11.1 GHz range.
3. Hit ratio =  $5 \times 10E-5$

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4. AC coupled with 100 differential output impedance
5. Output voltage is settable in 4 discrete steps via I2C. Default is 400 – 800 mV.
6. Receiver consists of 4 photodetectors operating at 10.3Gb/s each

## **7. 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
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Over full
Channel RX power monitor absolute error	DMI_RX_Ch	-3	3	dB	
Channel Bias current monitor	DMI_Ibias_Ch	-10%	10%	mA	Ch1~Ch4
Channel TX power monitor absolute error	DMI_TX_Ch	-3	3	dB	

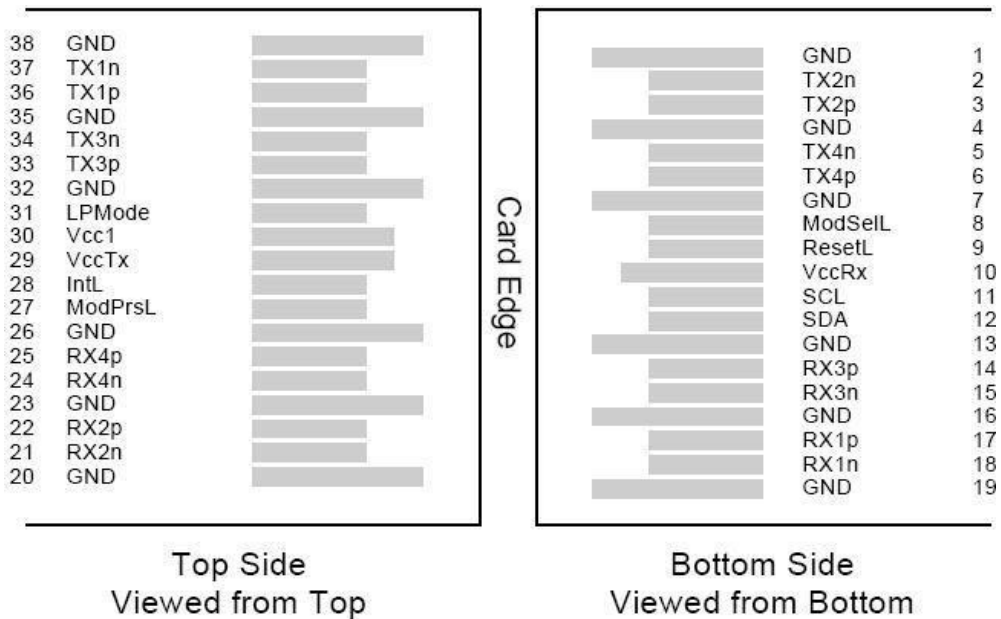
*Notes:*

*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**

**8. 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	

JESS-LINK PRODUCTS CO., LTD  
**PRODUCT SPECIFICATION**

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6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTTLL-I	ModSelL	Module Select	
9	LVTTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
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	LVTTTL-O	ModPrsL	Module Present	

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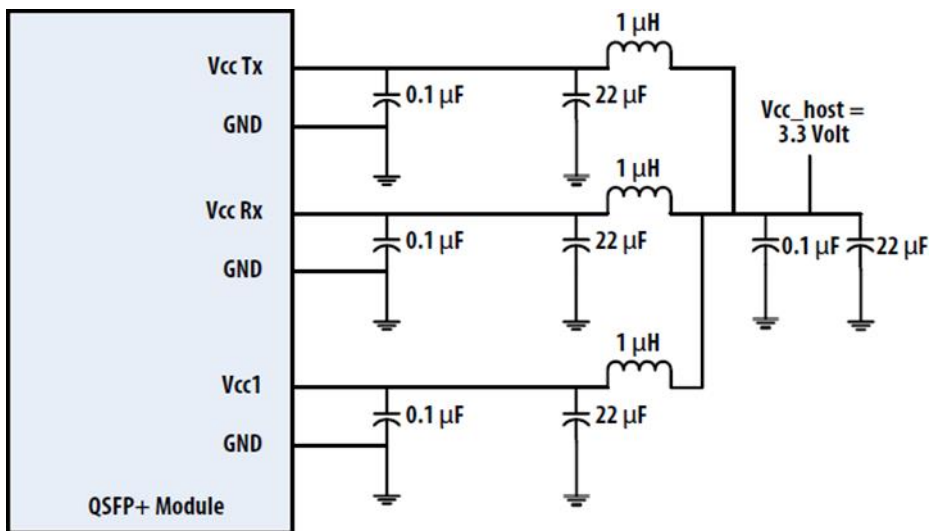
28	LVTTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTTL-I	LPMode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

*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.*

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**Recommended Interface Circuit**



**9. Modification History**

Rev.	Comments	Date	Originator	Approval
01	Preliminary Draft	2018.05.20	Albert Lin	Mike Sun
02	Modify 3.2 Pull-Tab DIMENSIONS	2022.07.29	Albert Lin	Mike Sun