

### Single-Mode 1310nm 10km 40GBASE-LR4 QSFP+ Transceiver QSFP-40G31-10-xx



#### Features

- Compliant to the IEEE 802.3ba(40GBASE-LR4)
- Compliant to the QSFP+ MSA SFF-8436 Specification
- Up to 10 km over SMF
- DFBs and PIN monitor photodiodes array for transmitter section
- PIN detectors and TIAs array for receiver section
- Four 10Gbps CWDM channels in the 1300nm band
- Operating Case Temperature: 0°C to 70°C
- I<sup>2</sup>C interface with integrated Digital Diagnostic Monitoring
- Utilizes two standard LC optical connector

#### Applications

- Extended 40GBASE-LR4 Ethernet links
- Infiniband QDR and DDR interconnects Client-side
- 40G Telecom connections

#### Description

The 40Gbps QSFP+ transceiver is well suited for Infiniband and 40GBASE-SR4 / 40GBASE-LR4 applications. It combines the higher density attractions of parallel modules with some of the key advantages normally associated with SFP+ based modules. It is intended for use short reach applications in switches, routers and data center equipment where it provides higher density and lower cost when compared with standard SFP+ modules.

### Specifications

**Table1 - Absolute Maximum Ratings**

Parameter	Symbol	Min	Typical	Max	Unit
Storage Temperature	T <sub>s</sub>	-40	-	+75	°C
Supply Voltage	V <sub>cc</sub>	-0.5	-	3.6	V
Operating Relative Humidity	RH	5	-	85	%

**Table2-Recommend Operating Condition**

Parameter	Symbol	Min	Typical	Max	Unit
Operating Temperature	T <sub>A</sub>	-10	-	70	°C
Supply Voltage	V <sub>cc</sub>	3.15	3.3	3.45	V
Supply Current	I <sub>cc</sub>	-	-	1000	mA
Module Total Power	P	-	-	3.5	W
Aggregate Bit Rate	BR <sub>AVE</sub>	-	41.25	-	Gbps
Lane Bit Rate	BR <sub>LANE</sub>	-	10.3125	-	Gbps

**Table3-Electrical Characteristics**

Parameter	Symbol	Min	Typical	Max	Unit	Note	
<b>Transmitter</b>							
Single ended input voltage tolerance	-	-0.3	-	4	V	Referred to TP1 signal common	
AC common mode input voltage tolerance	-	15	-	-	mV	RMS	
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohms	R <sub>in</sub> > 100 kohms @ DC	
TX Disable	Disable	V <sub>IH</sub>	2	-	V <sub>cc</sub> +0.3	V	-
	Enable	V <sub>IL</sub>	0	-	0.8		-
TX FAULT	Fault	V <sub>OH</sub>	2.4	-	V <sub>cc</sub> +0.3	V	-
	Normal	V <sub>OL</sub>	0	-	0.8		-
<b>Receiver</b>							
Single ended output voltage	-	-0.3	-	4	V	Referred to TP1 signal common	
AC common mode voltage	-	-	-	7.5	mV	RMS	
Termination mismatch at 1MHz	-	-	-	5	%	-	
Output Impedance (Differential)	Z <sub>out</sub>	85	100	115	ohms		
Output Rise/Fall Time	tr/tf	30	-	-	ps	10%~90%	

RX_LOS	LOS	V <sub>OH</sub>	2.4	-	V <sub>CC</sub> +0.3	V	-
	Normal	V <sub>OL</sub>	0	-	0.8		-

**Table 4 - Optical and Electrical Characteristics**

Parameter	Symbol	Min	Typical	Max	Unit
OM3 MMF	L	0.5		100	
Aggregate Bit Rate	BR <sub>AVE</sub>	-	41.25	-	Gbps
Lane Bit Rate	BRL <sub>LANE</sub>	-	10.3125	-	Gbps
<b>Transmitter</b>					
Channels Wavelength	$\lambda_c$	1264.5	1271	1277.5	nm
		1284.5	1291	1297.5	
		1304.5	1311	1317.5	
		1324.5	1331	1337.5	
-20dB spectral width	$\Delta\lambda$	-	-	1	nm
Average Launch Power, Each Lane*(note3)	P <sub>out/lane</sub>	-7	-	2.3	dBm
Extinction Ratio*(note4)	ER	3.5	-	-	dB
Output Optical Eye*(note4)	IEEE 802.3ba-2010 Compliant				
<b>Receiver</b>					
Channels Wavelength	$\lambda_c$	1264.5	1271	1277.5	nm
		1284.5	1291	1297.5	
		1304.5	1311	1317.5	
		1324.5	1331	1337.5	
Damage Threshold		3.3	-		dB
Stressed receiver sensitivity in OMA,each lane	P <sub>mins</sub>		-	-11.5	dBm
Maximum Receive Power, each lane	P <sub>max</sub>	2.3	-	-	dBm
Average power, each lane	RX/lane	-7.9	-	+1.0	dBm
LOS De-Assert, OMA	LOSD	-	-	-11.5	dBm
Receiver reflectance	R <sub>r</sub>	-	-	-26	dB
LOS Assert	LOSA	-20	-	-	dBm

Note3: Output is coupled into a 9/125µm Single-Mode fiber.

Note4: Filtered, measured with a PRBS 231-1 test pattern @10.3125Gbps

**Table 5 – Regulatory Compliance**

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)

Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compliant with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	TüV Certificate No. 50135086 (CB scheme )
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards* <sup>note3</sup>

**Table 6– Pin Descriptions**

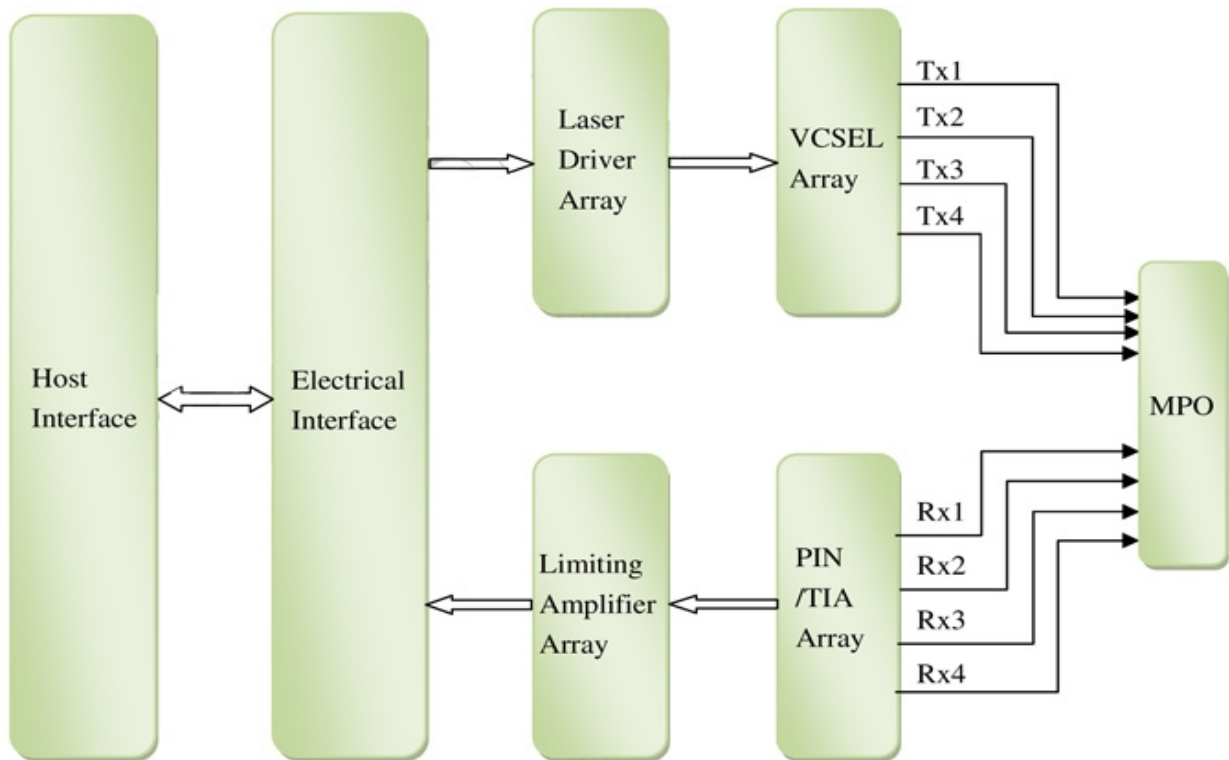
Pin	Logic	Symbol	Description	Plug Sequence	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	1
8	LVTTTL-I	ModSelL	Module Select	3	
9	LVTTTL-I	ResetL	Module Reset	3	
10		VccRx	+3.3V Power Supply Receiver	2	2
11	LVCOS- I/O	SCL	2-wire serial interface clock	3	

12	LVC MOS- I/O	SDA	2-wire serial interface data	3	
13		GND	Ground	1	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	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	Tx2n	Receiver Inverted Data Output	3	
22	CML-O	Tx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Tx4n	Receiver Inverted Data Output	3	
25	CML-O	Tx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LV TTL-O	ModPrsL	Module Present	3	
28	LV TTL-O	IntL	Interrupt	3	
29		VccTx	+3.3V Power supply transmitter	2	
30		Vcc1	+3.3V Power supply	2	
31	LV TTL-I	LPMODE	Low Power Mode	3	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	1

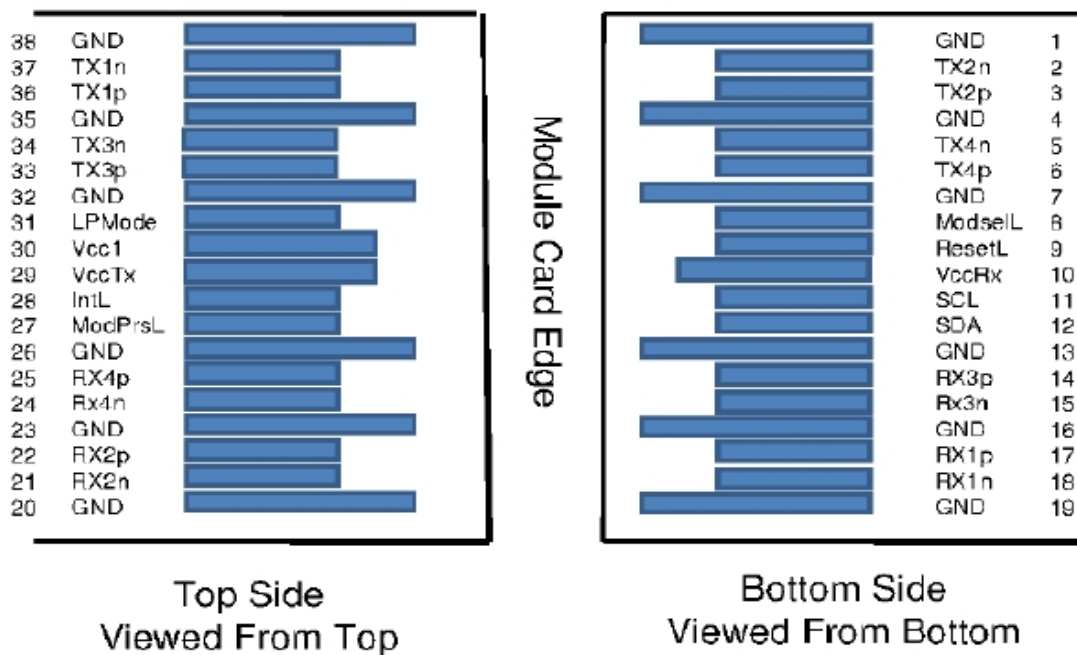
1: GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

2: 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 6. Recommended host board power supply filtering is shown in Figures 3 and 4. 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 500mA.

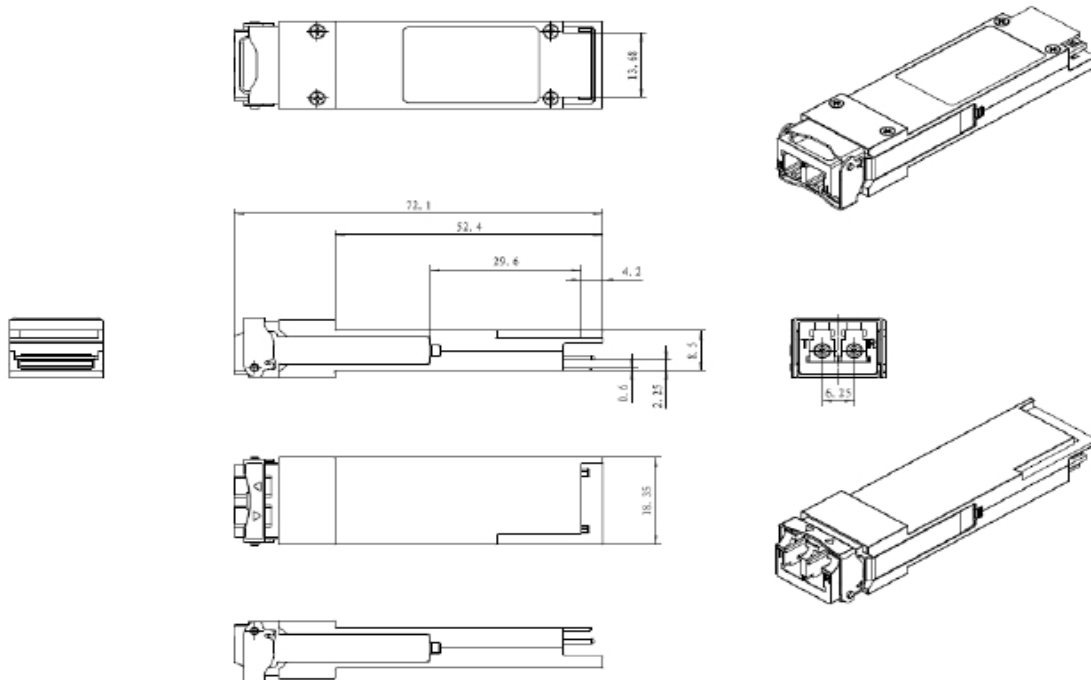
### Functional Description of Transceiver



### QSFP+ Transceiver Electrical Pad Layout



## Mechanical Specifications



## Ordering Information

Part No.	Data Rate (Gbps)	Wavelength (nm)	Transmission Distance	Fiber Type	Connector Type	Temp. Range	Digital Diagnostics
QSFP-40G31-10-xx	40G	1310nm	20km	SMF	LC/LC	0~70	Yes

### Notes:

xx means compatible brand. (For example: CO= Cisco, JU=Juniper, FD=Foundry, EX=Extreme, NE=Netgear,etc.)

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