

## 40G QSFP+ Series Multi-Mode 40GBASE-SR4 QSFP+ Transceiver RoHS6 Compliant

### Features

- ü Compliant to the IEEE 802.3ba(40GBASE-SR4)
- ü Support interoperability with IEEE 802.3ae 10GBASE-SR modules of various form factors such as SFP+, XFP, X2
- ü Compliant to the QSFP+ MSA SFF-8436 Specification
- ü Up to 100m on OM3 and 150m on OM4 MMF
- ü VCSEL array transmitter and PIN array receiver
- ü Single 3.3V Power Supply and Power dissipation < 1.5W
- ü Operates at 10.3125Gbps per channel
- ü Operating case temperature: 0°C to +70°C
- ü I<sup>2</sup>C interface with integrated Digital<sup>o</sup>C Diagnostic<sup>o</sup>C Monitoring
- ü Utilizes a standard 12/8 lane optical fiber with MPO connector

### Applications

- ü 40GBE and 10GBE interconnects
- ü Datacom/Telecom switch & router connections
- ü Data aggregation and backplane applications
- ü Proprietary protocol and density application

### Absolute Maximum Ratings

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

Exceeding any one of these values may destroy the device immediately.

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>A</sub> YQS40-8501M	0		+70	°C
Power Supply Voltage	V <sub>cc</sub>	3.15	3.3	3.45	V
Power Supply Current	I <sub>cc</sub>			475	mA
Aggregate Bit Rate	BR <sub>AVE</sub>		41.25		Gbps
Lane Bit Rate	BR <sub>LANE</sub>		10.3125		Gbps

## 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. <u>TüV Certificate</u>
Component Recognition	UL and CUL EN60950-1:2006	UL <u>TüV Certificate</u> (CB scheme )
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards <sup>note</sup>

### Notes:

- 1.For update of the equipments and strict control of raw materials, We has the ability to supply the customized products since Jan 1, 2012, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.
- 2.In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.
- 3.In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for our transceivers, because our transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic

components.

### Performance Specifications - Electrical

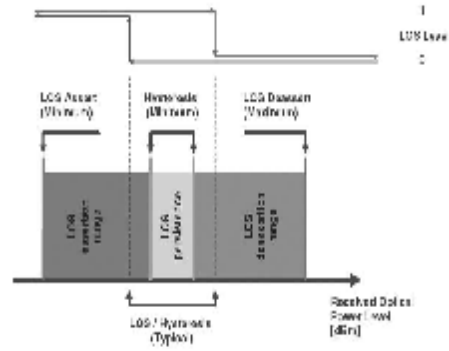
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter Section:</b>						
Single ended input voltage tolerance		-0.3		4	V $\square$	Referred to TP1 signal common $\square$
AC common mode input voltage tolerance		15			mV	RMS
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohms	R <sub>in</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	0.5		
<b>Receiver Section:</b>						
Single ended output voltage		-0.3		4	V $\square$	Referred to signal common $\square$
AC common mode voltage				7.5	mVp-p	RMS
Termination mismatch at 1MHz				5	%	
Output Impedance (Differential)	Z <sub>out</sub>	85	100	115	ohms	
Output Rise/Fall Time	t <sub>r</sub> /t <sub>f</sub>	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	V	

## Optical and Electrical Characteristics

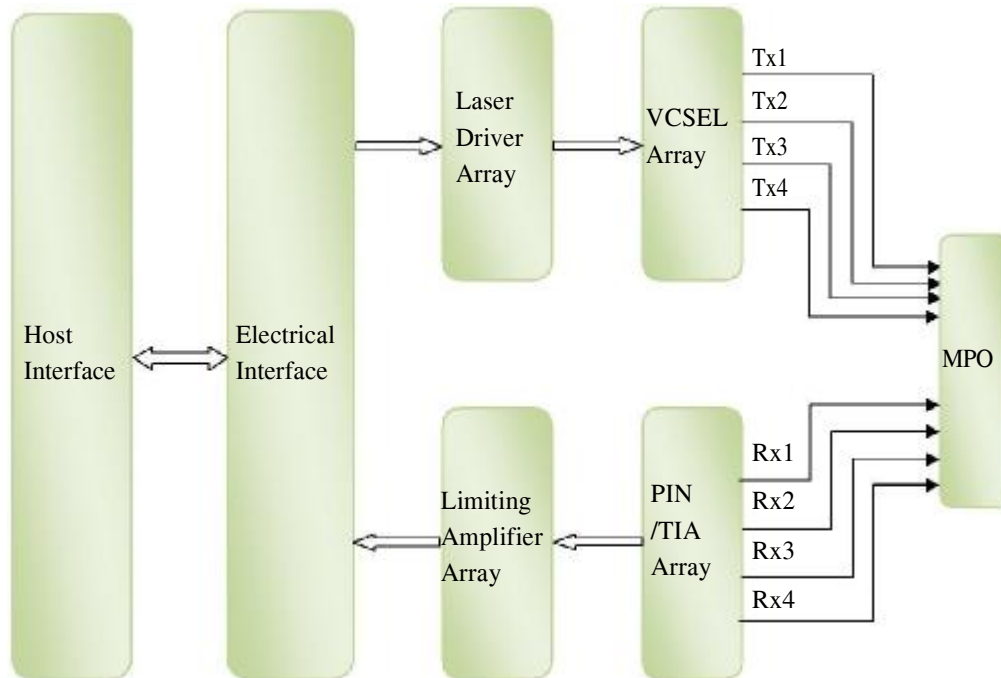
Parameter	Symbol	Min.	Typical	Max.	Unit
OM3 MMF	L	0.5	-	100	m
Aggregate Bit Rate	BR <sub>AVE</sub>	-	40	-	Gbps
Per Lane Bit Rate	BR <sub>LANE</sub>	-	10.3125	-	Gbps
<b>Transmitter Section:</b>					
Center Wavelength	$\lambda_c$	840	850	860	nm
RMS Spectral Width	RMS	-	-	0.65	nm
Average Launch Power, Each Lane <sup>*(note1)</sup>	P <sub>out/lane</sub>	-7.6	-	2.4	dBm
Transmit OMA, per Lane	TX_OMA/lane	-5.6	-	3	dBm
Difference in launch power between any two lanes(OMA)		-	-	4	dB
Peak power, each lane		-	-	4	dBm
Transmitter and dispersion penalty, each lane	TDP/lane	-	-	3.5	dB
Extinction Ratio <sup>*(note2)</sup>	ER	3	-	-	dB
Optical Return Loss Tolerance		-	-	12	dB
Average launch power of OFF, each lane		-	-	-30	dBm
Output Optical Eye <sup>*(note3)</sup>	IEEE 802.3ba-2010 Compliant				
TX Disable Assert Time	t <sub>off</sub>	-	-	100	us
<b>Receiver Section:</b>					
Center Wavelength	$\lambda_c$	840	850	860	nm
Damage Threshold		3.4	-	-	dB
Stressed receiver sensitivity in OMA, each lane	P <sub>mins</sub>	-	-	-5.4	dBm
Maximum Receive Power, each lane	P <sub>max</sub>	-	-	2.4	dBm
Average power, each lane	RX/lane	-7.9	-	1.0	dBm
LOS De-Assert, OMA	LOSD	-	-	-7.5	dBm
Receiver Reflectance	R <sub>r</sub>	-	-	-12	dB
LOS Assert	LOSA	-30	-	-	dBm
LOS Hysteresis <sup>*(note4)</sup>		0.5	-	-	dB

### Notes:

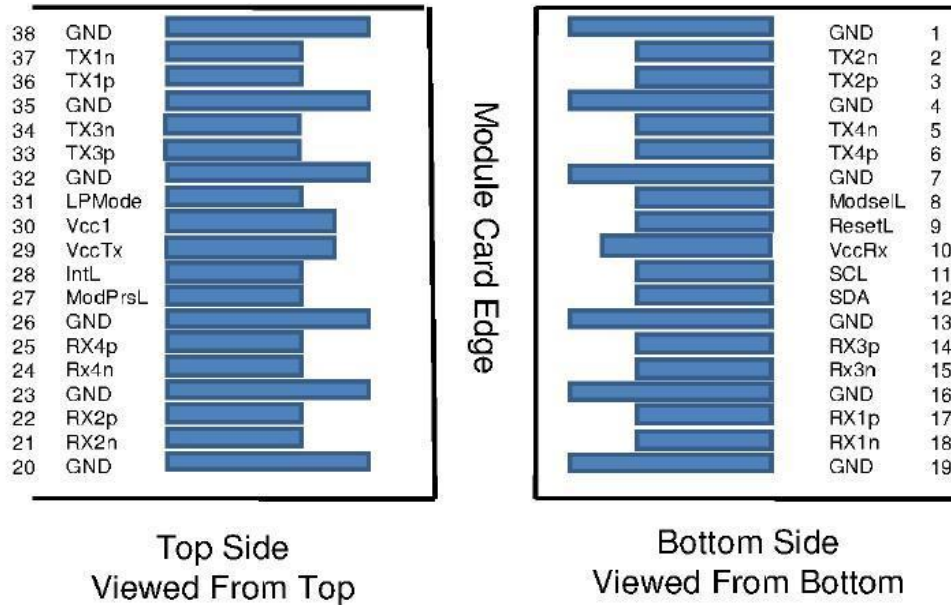
1. Output is coupled into a 50/125 $\mu$ m multi-mode fiber.
2. Filtered, measured with a PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps
3. High speed I/O, internally AC coupled.
4. Minimum average optical power measured at BER less than 1E-12, with a 2<sup>31</sup>-1 PRBS.
5. LOS Hysteresis



### Functional Description of Transceiver



### QSFP+ Transceiver Electrical Pad Layout



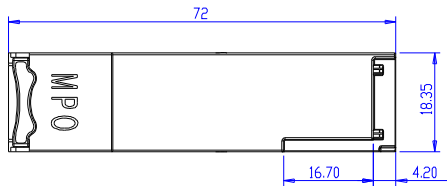
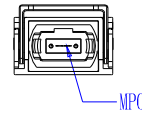
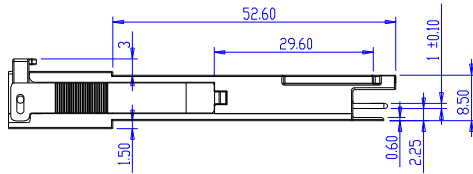
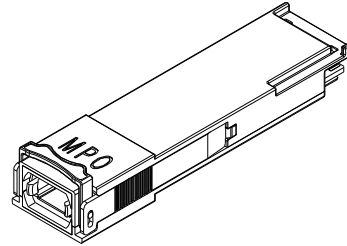
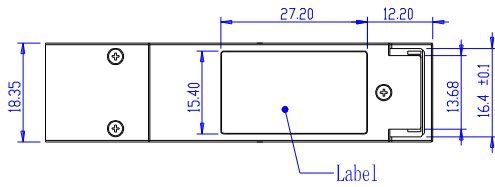
### Pin Arrangement and Definition

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	LVTTL-I	ModSelL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		VccRx	+3.3V Power Supply Receiver	2	2
11	LVC MOS- 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	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	
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL	Interrupt	3	
29		VccTx	+3.3V Power supply transmitter	2	2
30		Vcc1	+3.3V Power supply	2	2
31	LVTTL-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.

### Mechanical Specifications



Units in mm