

## Single-Mode 40GBASE-ER4 QSFP+ Transceiver RoHS6 Compliant

### Features

- ü Compliant to the IEEE 802.3ba
- ü Compliant to the QSFP+ MSA SFF-8436 Specification
- ü Up to 40km over SMF
- ü DFB monitor photodiodes array for transmitter section
- ü APD detectors for receiver section
- ü Four 10Gbps CWDM channels in the 1300nm band
- ü I2C interface with integrated Digital Diagnostic Monitoring
- ü Utilizes two standard LC optical connector
- ü Operating Case Temperature: -10°C~+70°C

### Applications

- ü 40GBASE-ER4 Ethernet links
- ü InfiniBand QDR and DDR interconnects Client-side
- ü 40G Telecom connections

### Absolute Maximum Ratings

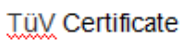

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+75	°C
Supply Voltage	Vcc	-0.5	3.6	V
Operating Relative Humidity	RH	5	85	%

Exceeding any one of these values may destroy the device immediately

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	Tc YQS40-3140	-10		70	°C
Power Supply Voltage	Vcc	3.15	3.3	3.45	V
Power Supply Current	Icc			1000	mA
Power Dissipation	Pd			3.5	W
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. 
Component Recognition	UL and CUL EN60950-1:2006	UL  Certificate (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, BSD 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 BSD's transceivers, because BSD's 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	mV	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	

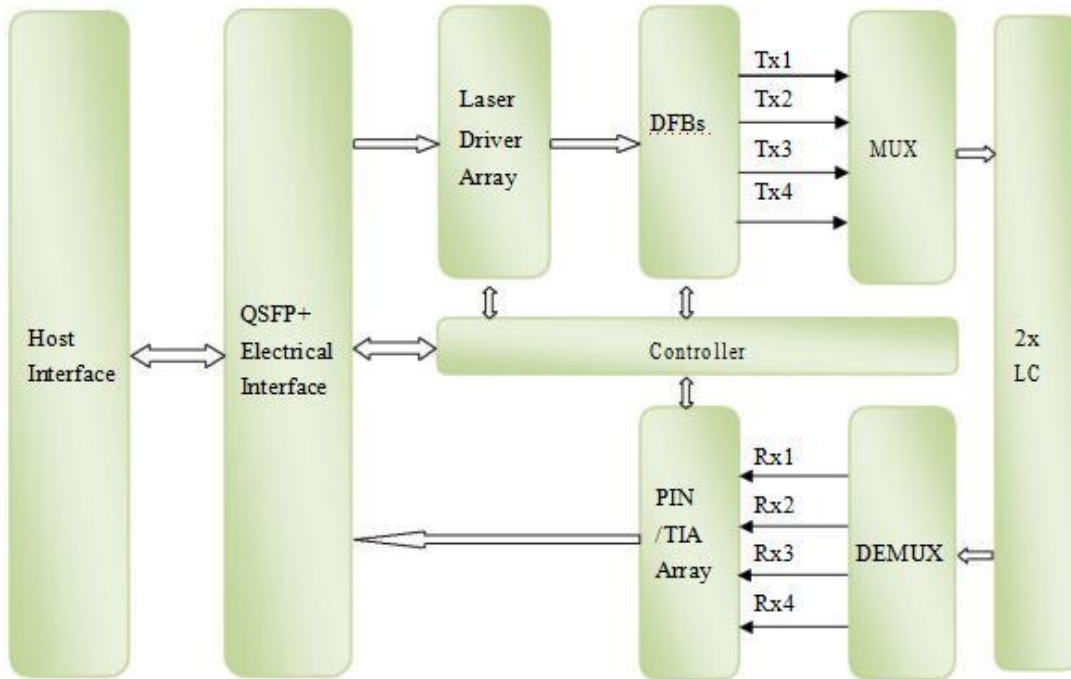
### Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
SMF	L	-	40	-	km
Aggregate Bit Rate	BR <sub>AVE</sub>	-	41.25	-	Gbps
Per Lane Bit Rate	BR <sub>LANE</sub>	-	10.3125	-	Gbps
<b>Transmitter Section:</b>					
Center 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 <sup>(note1)</sup>	P <sub>out/lane</sub>	-2.7	-	4.5	dBm
Transmit OMA, per Lane	TX_OMA/lane	0.3	-	5.0	dBm
Extinction Ratio	ER	5.5	-	-	dB
Output Optical Eye <sup>(note2)</sup>	IEEE 802.3ba-2010 Compliant				
<b>Receiver Section:</b>					
Center 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	-	-	dBm
Receiver Sensitivity (OMA) per Lane	R <sub>x</sub> sens			-19	dBm
Stressed receiver sensitivity in OMA, each lane	P <sub>mins</sub>	-	-	-16.8	dBm
Maximum Receive Power, each lane	P <sub>max</sub>		-	-4.0	dBm
Receiver Reflectance	R <sub>r</sub>	-	-	-26	dB
LOS De-Assert	LOSD	-	-	-11.5	dBm
LOS Assert	LOSA	-20	-	-	dBm

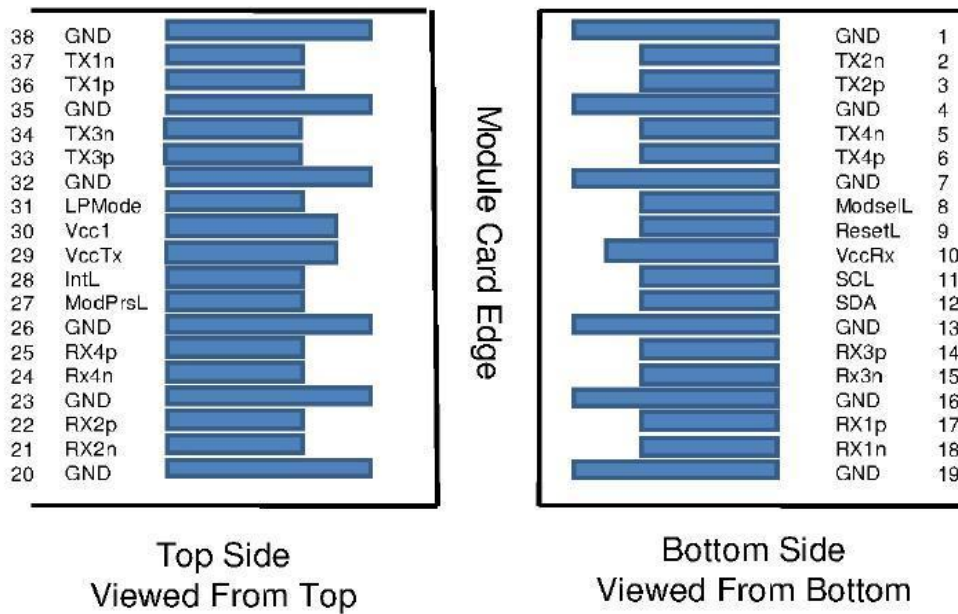
**Notes:**

1. Output is coupled into a 9/125 $\mu$ m Single-Mode fiber.
2. Filtered, measured with a PRBS 231-1 test pattern @10.3125Gbps

Functional Description of Transceiver



QSFP+ Transceiver Electrical Pad Layout



### Pin Arrangement and Definition

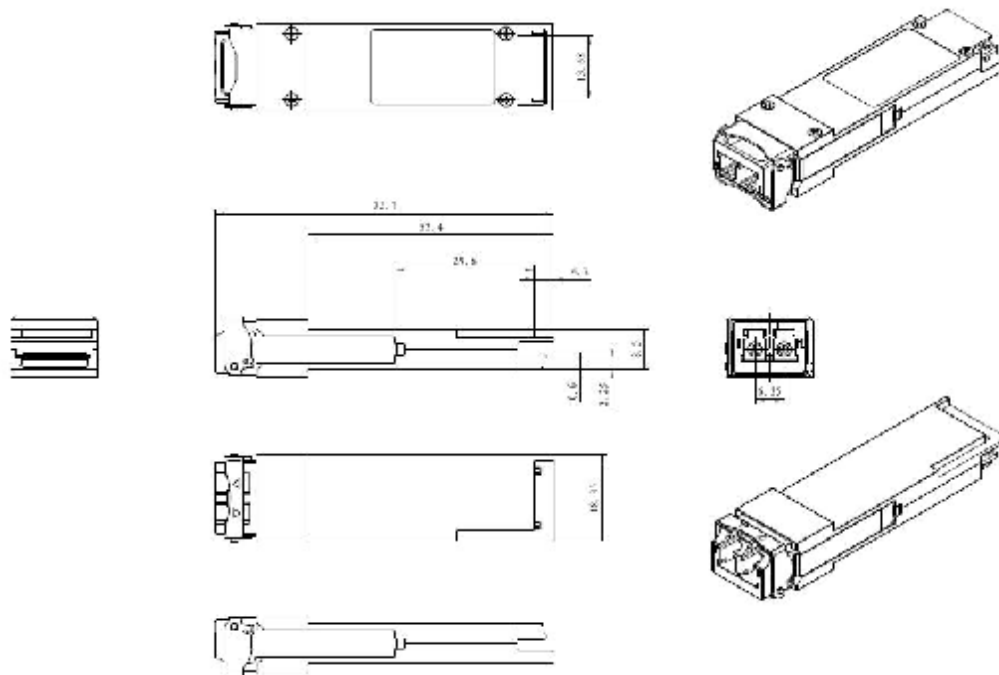
Pin	Logic	Symbol	Description	Plug Sequence	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	1
8	LVTTTL-I	ModSelL	Module Select	3	
9	LVTTTL-I	ResetL	Module Reset	3	
10		VccRx	+3.3V Power Supply Receiver	2	2
11	LVCMOS- I/O	SCL	2-wire serial interface clock	3	
12	LVCMOS- 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	LVTTTL-O	ModPrsL	Module Present	3	
28	LVTTTL-O	IntL	Interrupt	3	
29		VccTx	+3.3V Power supply transmitter	2	2
30		Vcc1	+3.3V Power supply	2	2
31	LVTTTL-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

Notes:

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





## 40G QSFP+ Series

PN: BSD-QSFP-40G-ER4

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### Ordering information

Part Number	Data Rate	Fiber	Distance	Interface	Temp	DDMI
BSD-QSFP-40G-ER4	40Gbps	SMF	40Km	LC	-10 to +70°C	Yes

### Important Notice

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