Specification

40 - Gbps QSFP+ Pluggable

Optical Transceiver Module

40GBASE-PSM4

Ordering Information

T Q S – Q 1 L B 9 – F 1 1

Model Name	Voltage	Category	Device type	Interface	Temperature	Distance	Latch Color
TQS-Q1LB9-F11	3.3V	With DDMI	DFB / PIN	CML/CML	+0°C~+70°C	2m-10km	Blue

Features

- Compliant to QSFP+ MSA (SFF-8436)
- Up to 11.2Gbps data rate peer channel
- MPO optical connector (IEC61754-7-1)
- Transmission length up to 10km
- Transmitter: 4 channel PIN photo detector
- Operating case temperature: 0~70℃
- Low power consumption: 2W max
- I2C interface for management signal
- RoHS compliant

Applications

- Switch Router and HBA's
- 40G Ethernet
- Infiniband QDR, DDR and SDR
- High-performance Backplane
- Datacenter and Enterprise networking

Transceiver Block Diagram

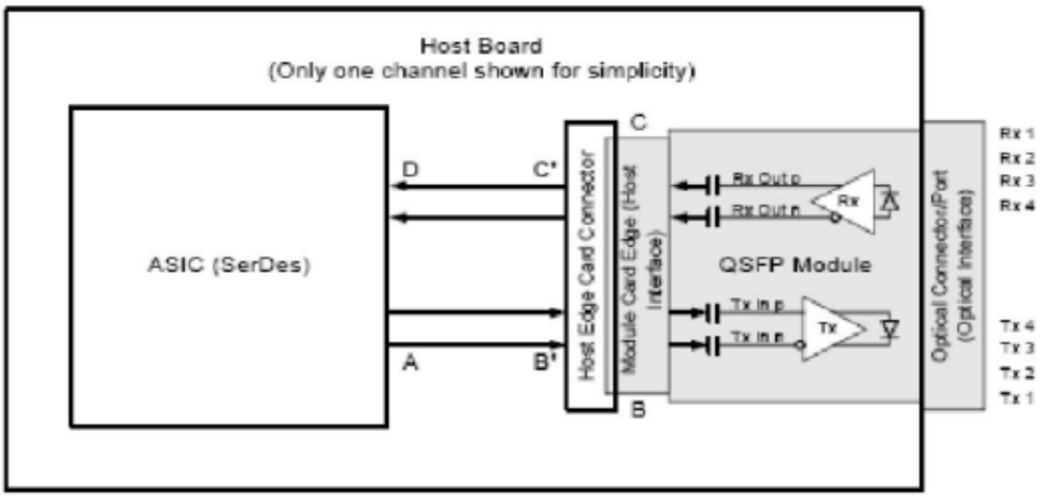
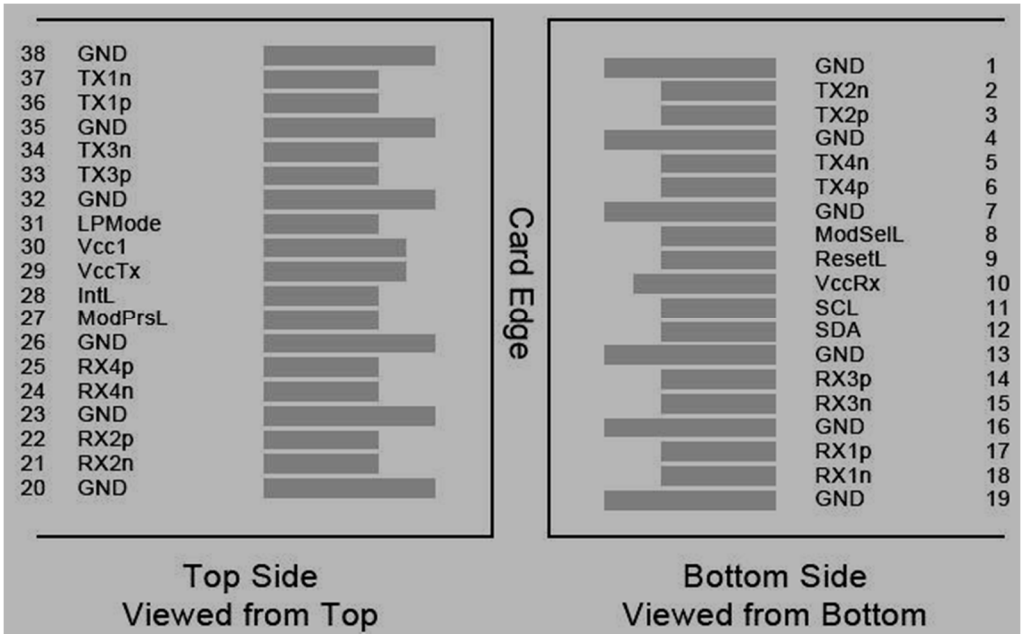


Figure 1 – Application Reference Model

Pin Assignment and Pin Description



Pin Definitions

PIN	Logic	Symbol	Name/Description	Note
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	LVTTL-I	ModSelL	Module Select	
9	LVTTL-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	
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

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 receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. VccRx, Vcc1 and VccTx may be internally connected within the QSFP transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	Tst	-40	85	degC	
Relative Humidity (non-condensation)	RH	0	85	%	
Operating Case Temperature	Topc	0	70	degC	
Supply Voltage	VCC	0	3.8	V	

Recommended Operating Environment and Power Supply Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Case Operating Temperature Range	T_C	0	25	70	℃
Power Supply Voltage	V_{CC}	3.15	3.30	3.45	V
Power Supply Current	I_{CC}			600	mA
Power Consumption				2.0	W
Data Rate			10.3125		Gbps
Data Speed Tolerance	∆DR	-100		+100	ppm
Link Distance with G652	D			10	km

Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Transmitter						
Differential Input Impedance		90	100	110	Ω	
Differential Input Swing		200		800	mV	
TP1/TP1a Interface	Compliant to IEEE 802.3ba XLPPI					
Receiver						
Differential Output Impedance		90	100	110	Ω	
Differential Output Swing		400	600	850	mV	
TP4 Interface	Compliant to IEEE 802.3ba XLPPI					

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Center wavelength	λ_c	1260	1310	1360	nm	1
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power, each lane	P_{AVG}	-8.2	-2.5	+0.5	dBm	
Optical Modulation Amplitude (OMA)	P_{OMA}	-5.2	-2.5	+2.0	dBm	1
Difference in Launch Power between any two lanes	$P_{tx,\ diff}$			5.0	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each lane	Tx-TDP	-9.7			dBm	1
Transmitter and Dispersion Penalty	TDP:			3.2	dB	
Extinction ratio	ER	3.5			dB	
Relative intensity Noise	R_{in}			-128	dB/Hz	
Optical Return Loss Tolerance	TOL			12	dB	
Transmitter Eye Mask Margin	EMM	5			%	2
Average Launch Power OFF Transmitter, each lane	P_{off}			-30	dBm	
Transmitter Eye Mask Definition (X1, X2, X3, Y1, Y2, Y3)		0.25, 0.4, 0.45, 0.25, 0.28, 0.4				

Note:

1. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.

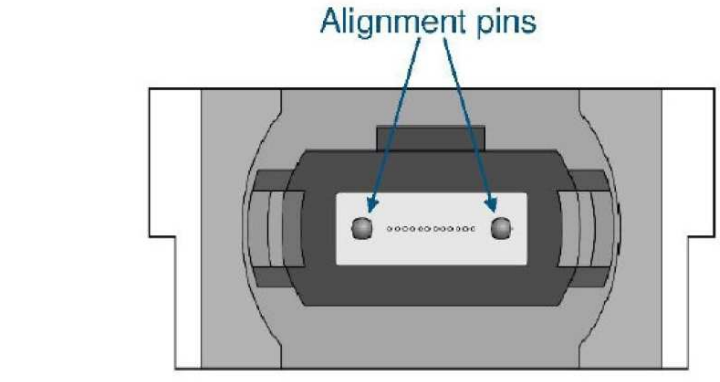
2. Vertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Receiver						
Center wavelength	λ_c	1260	1310	1360	nm	
Damage Threshold	TH_d	+3			dBm	
Overload, each lane	OVL	+0.5			dBm	
Receiver Sensitivity in OMA, each lane	SEN			-12.6	dBm	
Stress receiver sensitivity in OMA	SEN			-10.3	dBm	
Signal Loss Assert Threshold	LOSA	-30			dBm	
Signal Loss Deassert Threshold	LOSD			-15	dBm	
LOS Hysteresis	LOSH	0.5		6	dBm	

Digital Diagnostic Monitor Functions

Parameter	Symbol	Min.	Max.	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	+3	degC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Full operating range
Channel RX power monitor absolute error	DMI_RX_Ch	-3	+3	dB	Ch1~Ch4
Channel Bias current monitor	DMI_Ibias_Ch	-10%	+10%	mA	Ch1~Ch4
Channel TX power monitor absolute error	DMI_TX_Ch	-3	+3	dB	Ch1~Ch4

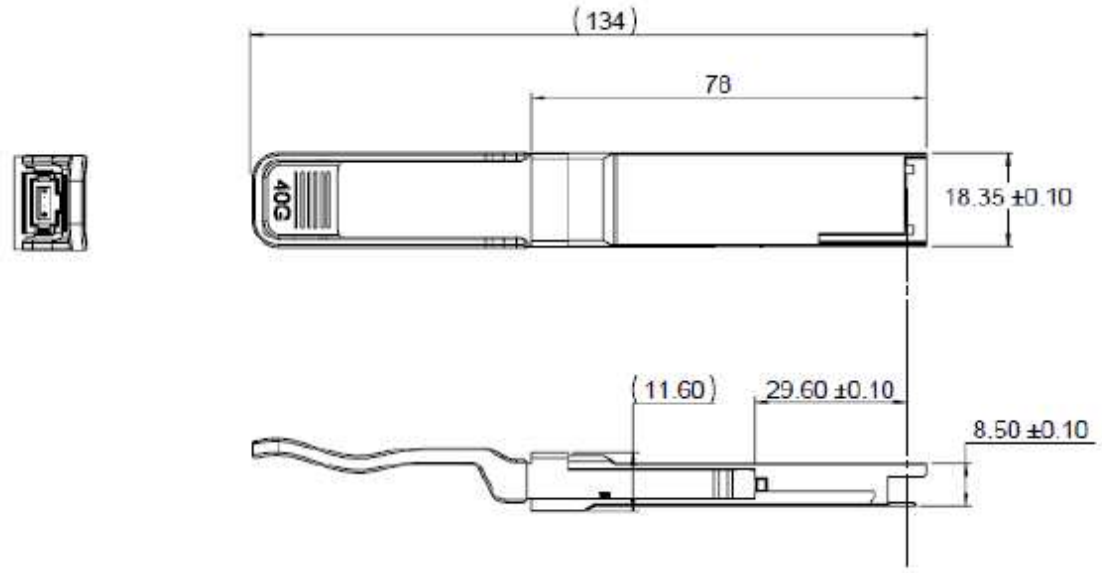
MPO Fiber Definitions



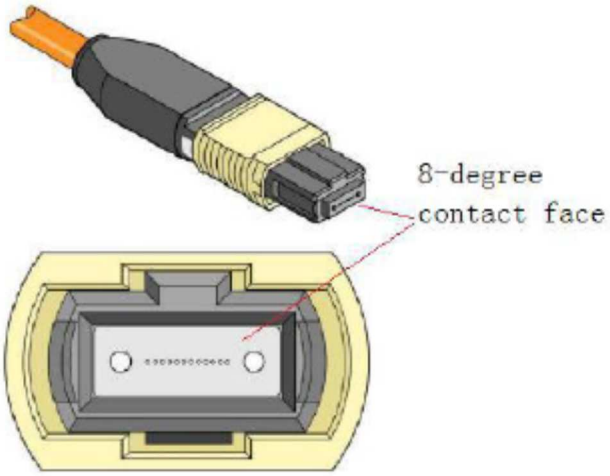
Transmit Channels: 1 2 3 4
Unused positions: x x x x
Receive Channels: 4 3 2 1

Mechanical Design Diagram

Unit: mm



Attention: To minimize MPO connection induced reflections, an MPO receptacle with 8-degree angled end-face is utilized for this product. A male MPO connector with 8-degree end-face should be used with this product as illustrated in below.



ESD

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

This is a Class 1 Laser Product according to IEC / EN 60825-1: 2014 (Third Edition). This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007)

Contact Information

Formerica OptoElectronics Inc.
5F-11, No.38, Taiyuan St., Zhubei City,
Hsinchu County 30265, Taiwan
Tel: +886-3-5600286
Fax: +886-3-5600239

San Diego, CA
Tel: 1-949-466-8069

inquiry@formericaoe.com
www.formericaoe.com

Revision History

Date	Version	Description
06/28/2018	4.0	Adjustment Specification. Change product picture and Latch Color.
05/13/2019	4.1	Change product picture and Latch Color.