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## Specification

### Quad Small Form-factor Pluggable Plus

### QSFP+ Product



**T Q S - Q 1 L H 8 - X C A x x**

Distance

Part Number	Description
TQS-Q1LH8-XCA01	40Gbps QSFP+ Active Optical Cable 1m
TQS-Q1LH8-XCA03	40Gbps QSFP+ Active Optical Cable 3m
TQS-Q1LH8-XCA05	40Gbps QSFP+ Active Optical Cable 5m
TQS-Q1LH8-XCA07	40Gbps QSFP+ Active Optical Cable 7m
TQS-Q1LH8-XCA10	40Gbps QSFP+ Active Optical Cable 10m
TQS-Q1LH8-XCA20	40Gbps QSFP+ Active Optical Cable 20m

Model Name	Voltage	Category	Device type	Interface	LOS	Temperature
TQS-Q1LH8-XCAxx	3.3V	With DDMI	VCSEL/PIN	CML/CML	LVTTL	0°C~+70°C

## Description

Formerica OptoElectronics Inc. Quad Small Form-factor Pluggable (QSFP) product is a new high speed pluggable I/O interface products. This interconnecting system offers 4 channels and maximum bandwidth of 40Gbps which are based on the proprietary technique Silicon Optical Bench (SiOB). This module provides high performance and excellent efficiency in the optical communication.

## Features

- Compliant with 40G Ethernet IEEE 802.3ae 40GBASE-SR4 standards
- QSFP footprint (Quad small form-factor, pluggable)
- Supports 40 Gbps data rate links of up to 100 m
- Compliant with QDR/DDR Infiniband data rates
- Hot pluggable electrical interface
- RoHS-6 Compliant (lead-free)

## Applications

- 40GBASE-SR4 Ethernet links
- Infiniband QDR and DDR interconnects
- Client-side 40G Telecom connections

## Absolute Maximum Rating

Parameter	Symbol	Min	Typical	Max	Unit	Note
Storage Temperature	Ts	0		70	°C	1
Relative Humidity	RH	5		85	%	2
Data Input Voltage- Single Ended		-0.5		Vcc+0.5		
Center Wavelength	$\lambda$	840		860	nm	

### Notes:

1. Limited by the fiber cable jacket, not the active ends.
2. Non-condensing.

## Recommended Operatin Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Note
Case Temperature	Tc	0	40	70	°C	
3.3 V Power Supply Voltage	Vcc	3.135	3.3	3.465	V	
Signal Rate per Channel		2.5		10.3125	GB/s	1
Control* Input Voltage High	Vih	2		Vcc+0.3	V	
Control* Input Voltage Low	Vil	-0.3		0.8	V	
Two Wire Serial (TWS) Interface Clock Rate			100		kHz	
Power Supply Noise				50	mV	2
Receiver Differential Data Output Load			100		Ohms	
Standard Cable Lengths		3		100	m	
Bit Error Ratio			10 <sup>-12</sup>			3

### Notes:

- Lane speed up to 12.5-Gbps is available upon customer requests.
- Power supply noise is defined as peak-to-peak noise amplitude over 1K to 15 MHz frequency range at host supply side by the recommended power supply filter for module. See Section 10 for the recommended power supply filter.
- Bit-Error-Rate (BER) is tested with PRBS 2<sup>31</sup>-1 pattern.

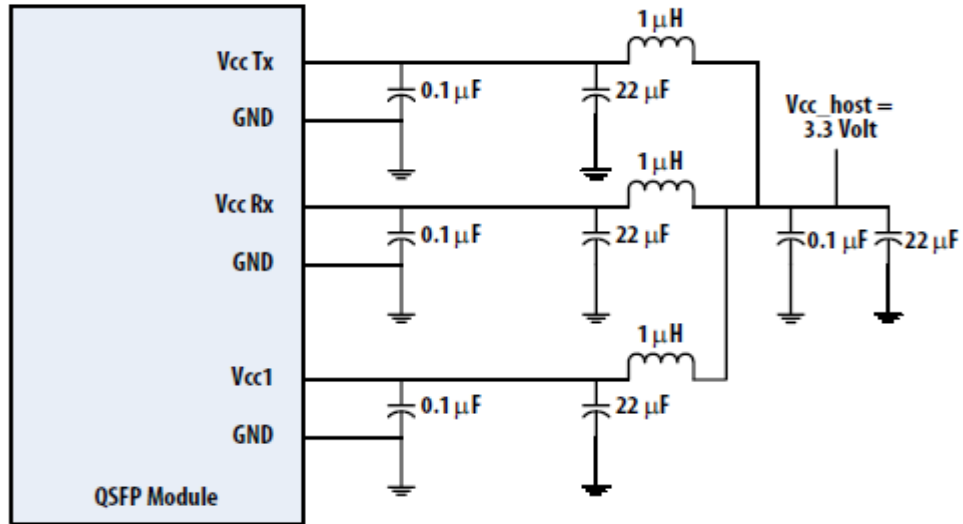
## Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Note
<b>Transceiver</b>						
Power Consumption				1.5	W	
Supply Current				420	mA	
Initialization Time	tpwr init			2000	ms	1
<b>Receiver</b>						
Data Output Differential Peak-to-Peak Voltage Swing	ΔVDO pp	200		900	mVpp	
Output Total Jitter				62	ps	
BER				10 <sup>-12</sup>		PRBS31

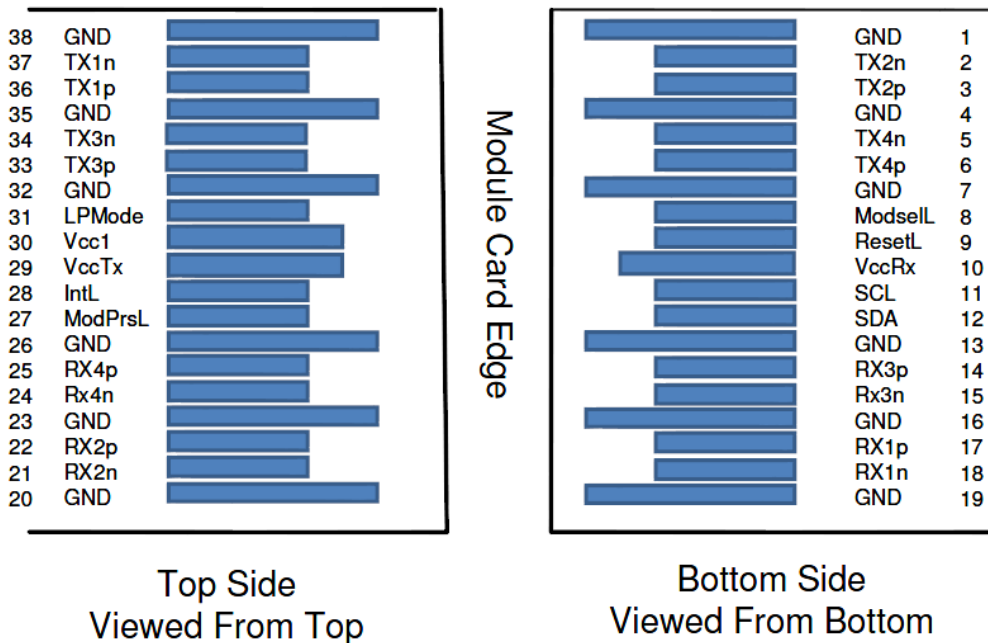
### Notes:

- “Initialization Time” is the time from when the supply voltages reach and remain above the minimum “Recommended Operating Conditions” to the time when the module enables TWS access. The module at that point is fully functional.

**Recommended Host Board POWER Supply Circuit**



**QSFP+ Module Pad Assignments and Descriptions**



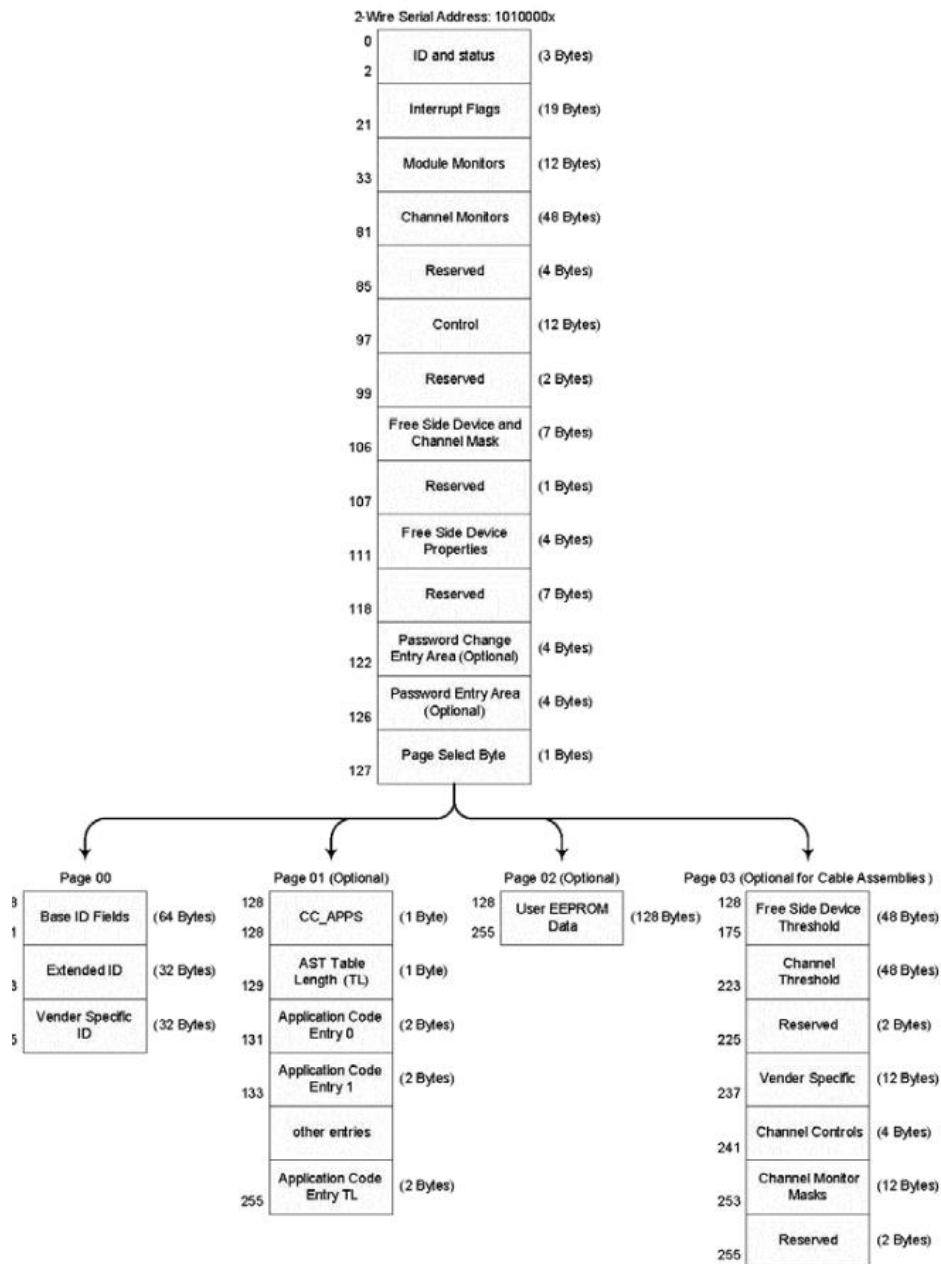
Pin	Logic	Symbol	Description	Plug Sequence	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1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

**Note :**

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.

- 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. Recommended host board power supply filtering is shown in Host board power supply circuit. 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 500 mA.

## Memory Map



Contentin 2-Wire Address A0H

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Address	Description	Default/Typical value	Description
128	Identifier	0D	QSFP+
129	Ext. Identifier	00	Power Class 1 Module; No CLEI code present in Page 02h; No CDR in TX and RX;
130	Connector	23	No separable connector
131	Specification Compliance	04	40GBASE-SR4
132		00	OC 48 short reach
133		00	Not compliant
134		01	1000BASR-SX
135		40	Short distance (S)
136		40	Shortwave laser w/o OFC (SN)
137		02	Multi-mode 50um (OM3)
138		00	Not compliant
139	Encoding	05	64B66B
140	BR, nominal	64	10G x 4
141	Extended rate select Compliance	00	Not compliant
142	Length(SMF)	00	Not compliant
143	Length(OM3 50 um)	00	Not compliant
144	Length(OM2 50 um)	00	Not compliant
145	Length(OM1 62.5 um)	00	Not compliant
146	Length(Copper or active cable)	xx	AOC Length "xx" by AOC length
147	Device tech	00	850nm VCSEL; No wavelength control; Uncooled transmitter device; Pin detector; Transmitter not tunable;
148-163	Vendor name	46,4F,52,4D,45,52,49,43, 41,4F,45,20,20,20,20,20	FORMERICA OE
164	Extended Module	04	QDR
165-167	Vendor OUI	00, 00, 00	Unspecified
168-183	Vendor PN	54,51,53,2D,51,31,4C,48, 38,2D,58,43,41,xx,xx,20	TQS-Q1LH8-XCAxx "XX" by AOC length
184-185	Vendor rev	00,00	Unspecified
186-187	Wave length or Copper cable Attenuation	42, 68	850nm
188-189	Wavelength tolerance	07, D0	10nm
190	Max case temp.	46	70°C
191	CC_BASE		
192-195	Options	00,00,00,00	No implemented
196-211	Vendor SN		
212-219	Date Code		



220	Diagnostic Monitoring Type	08	Receiver power measurements: Average Power
221	Enhanced Options	00	Not compliant
222	Reserved	00	
223	CC_EXT		
224-255	Vendor Specific		

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Address	Description	Hex	Real Value
128-129	Temp high alarm	50, 00	80°C
130-131	Temp low alarm	FB, 00	-5°C
132-133	Temp high warning	4B, 00	75°C
134-135	Temp low warning	00, 00	0°C
144-145	Vcc high alarm	8C, A0	3.6V
146-147	Vcc low alarm	75, 30	3.0V
148-149	Vcc high warning	88, B8	3.5V
150-151	Vcc low warning	79, 18	3.1V
176-177	Rx power high alarm	61, A8	4.0dBm
178-179	Rx power low alarm	08, FC	-6.4dBm
180-181	Rx power high warning	55, 28	3.4dBm
182-183	Rx power low warning	0B, 40	-5.4dBm
184-185	Tx bias high alarm	30, D4	25mA
186-187	Tx bias low alarm	03, E8	2mA
188-189	Tx bias high warning	2C, EC	23mA
190-191	Tx bias low warning	07, D0	4mA

### Module Outline

Unit: mm

