40GBASE-LR4 QSFP+ Pluggable Transceiver Module

40GBASE-LR4 in QSFP+ form factor are hot pluggable optical transceiver modules offering a high-density 40 Gigabit Ethernet connectivity solution for data centers, high performance computing networks, enterprise core and distribution layers, and service provider transport applications. Our transceiver modules are designed to meet industrial conditions and to be compliant with all applicable standards.

KEY Features

- Integrated uncooled CWDM TOSA/ROSA with hermetic seal
- Hot pluggable QSFP+ form factor
- 2-wire management interface
- Power dissipation < 3.5W
- RoHS-6 compliant (lead-free)
- Single 3.3V power supply
- Maximum link length of 10km on Single Mode Fiber (SMF)
- Hot pluggable to 38-pin edge connector
- XLAUI electrical interface
- Duplex LC optical receptacles
- Commercial case temperature range 0°C to 70°C

Application

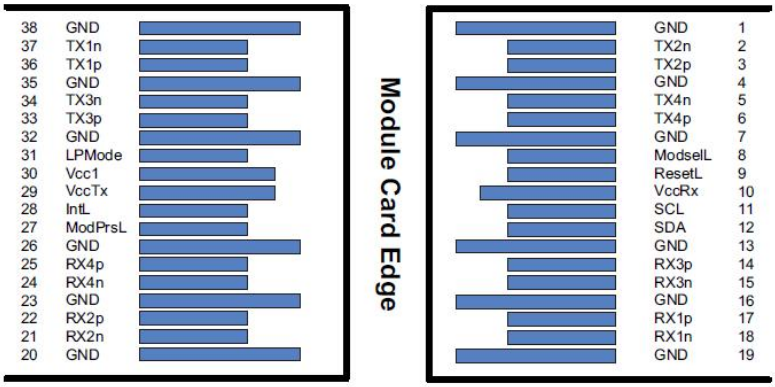
- 40G Ethernet Integrated

ORDERING INFORMATION

iTCQES1 - 40GBASE-LR4 QSFP+ pluggable transceiver module

ELECTRIC PIN DESCRIPTIONS

Figure 1 - QSFP+ MSA-compliant 38-in connector



Top Side Viewed from Top | **Bottom Side Viewed from Bottom**

Pin#	Symbol	Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc Rx	+3.3 V Power Supply Receiver	
11	SCL	2-Wire Serial Interface Clock	
12	SDA	2-Wire Serial Interface Data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vee Tx	+3.3 V Power Supply Transmitter	
30	Vcc1	+3.3 V Power Supply	
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Note:

1. Circuit ground is internally isolated from chassis ground.

PRODUCT CHARACTERISTICS

Param	Value	Unit	Notes
Module form factor	QSFP+		
Maximum aggregate data rate	41.2	Gb/s	
Maximum data rate per lane	10.3	Gb/s	Higher bit rates may be supported. Please contact Irixi.
Electrical interface and pin-out	38-pin edge connector		Pin-out as defined by the QSFP+MSA
Maximum power consumption	3.5	Watts	
Management interface	Serial, I2C-based, 400 kHz maximum frequency		As defined by the QSFP+ MSA

Data Rate Specifications	Symbol	Min.	Typ.	Max.	Units	Ref.
Bit rate per lane	BR			10, 313	Mb/sec	1
Bit error ratio	BER			10^{-12}		2
Link distance on SMF-28	d			10	Kilometers	3

Notes:
1. Compliant with 40GBASE-LR4 and XLPPI per IEEE 802.3ba.
2. Tested with a PRBS 2^{31} -1 test pattern.
3. Per 40GBASE-LR4, IEEE 802.3ba.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Typ	Max.	Units	Ref.
Maximum supply voltage	Vcc1, VccTx, VccRx	-0.5		3.6	V	
Storage temperature	T_S	-40		85	°C	
Case operating temperature	T_{op}	0		70	°C	
Relative humidity	RH	0		85	%	1
Damage threshold, per lane	DT	3.4			dBm	

Note:
1. Non-condensing.

ELECTRICAL CHARACTERISTICS (Top = 0 to 70°C, Vcc = 3.1 to 3.47 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Units	Ref.
Supply voltage	Vccl, VccTx, VccRx	3.1		3.47	V	
Supply current	Icc			1.13	A	
Link turn-on time						
Transmit turn-on time				2000	ms	2
Transmitter (per Lane)						
Single ended input voltage tolerance	VinT	-0.3		4.0	V	
Differential data input swing	Vin,pp	120		1200	mVpp	3
Differential input threshold			50		mV	
AC common mode input voltage tolerance		15			mV	
Differential input return loss		Per IEEE P802.3ba, Section 86A.4.1.1			dB	4
J2 Jitter tolerance	Jt2	0.17			UI	
J9 Jitter tolerance	Jt9	0.29			UI	
Data dependent pulse width shrinkage	DDPWS	0.07			UI	
Eye mask coordinates {X1, X2, Y1, Y2}		0.11, 0.31 95, 350			UI mV	5
Receiver (per Lane)						
Single-ended output voltage		-0.3		4	V	
Differential data output swing	Vout,pp	0		800	mVpp	6
AC common mode output voltage (RMS)				7.5	mV	
Termination mismatch at 1 MHx				5	%	
Differential output return loss		Per IEEE P802.3ba, Section 86A.4.2.1			dB	4
Common mode output return loss		Per IEEE P802.3ba, Section 86A.4.2.2			dB	4
Output transition time, 20% to 80%		28			ps	
J2 Jitter output	Jo2			0.42	UI	
J9 Jitter output	Jo9			0.65	UI	
Eye mask coordinates #1 {Xl, X2 Y1, Y2}		0.29, 0.5 150, 425			UI mV	5
Power supply ripple tolerance	PSR	50			mVpp	

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. From power-on and end of any fault conditions.
3. After internal AC coupling. Self-biasing 1OOΩ differential input.
4. 10 MHz to 11.1 GHz range.
5. Hit ratio = 5 x 10E-5.
6. AC coupled with lOOΩ differential output impedance.

OPTICAL CHARACTERISTICS (Top = 0 to 70°C, Vcc = 3.1 to 3.47 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Units	Ref.
Transmitter						
Signaling speed per lane				10.3125	GBd	1
Lane center wavelengths (range)		1264.5 - 1277.5 1284.5 - 1297.5 1304.5 - 1317.5 1324.5 - 1337.5			nm	
Total average launch power	P_{OUT}			8.3	dBm	
Transmit OMA per lane	TxOMA	-4.0		3.5	dBm	
Average launch power per lane	TXP_X	-7.0		2.3	dBm	2
Optical extinction ratio	ER	3.5			dB	
Sidemode suppression ratio	SSR_{min}	30			dB	
Average launch power of OFF transmitter, per lane				-30	dBm	
Relative intensity noise	RIN			-128	dB/Hz	3
Optical return loss tolerance				20	dB	
Transmitter reflectance				-12	dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
Receiver						
Signaling speed per lane				10.3125	GBd	4
Lane center wavelengths (range)		1264.5 - 1277.5 1284.5- 1297.5 1304.5-1317.5 1324.5- 1337.5			nm	
Receive power (OMA) per lane	RxOMA			3.5	dBm	
Average receive power per lane	RXPx	-13.7		2.3	dBm	5
Receiver sensitivity (OMA) per lane	R_{Xsens}			-11.5	dBm	
Stressed receiver sensitivity (OMA) per lane	SR			-9.6	dBm	
Damage threshold per lane	P_{MAX}			3.3	dBm	
Return loss	RL			-26	dB	
Vertical eye closure penalty, per lane				1.9	dB	
Receive electrical 3 dB upper cutoff frequency, per lane				12.3	GHz	
LOS de-assert	LOS_D			-15	dBm	
LOS assert	LOS_A	-28			dBm	
LOS hysteresis			1		dB	

Notes:

1. Transmitter consists of 4 lasers operating at 10.3Gb/s each.
2. Minimum value is informative.
3. RIN is scaled by 10*log(10/4) to maintain SNR outside of transmitter.
4. Receiver consists of 4 photodetectors operating at I 0.3Gb/s each.
5. Minimum value is informative, equals min TxOMA with infinite ER and max. channel insertion loss.

MEMORY MAP AND CONTROL REGISTERS

Compatible with SFF-8436 (QSFP+).

ENVIRONMENTAL SPECIFICATIONS

iTCQES1 transceivers have an operating temperature range from 0°C to +70 °C case temperature.

Environmental Specifications	Symbol	Min.	Typ.	Max.	Units	Ref.
Case operating temperature	T_{op}	0		70	°C	
Storage temperature	T_{sto}	-40		85	°C	

REGULATORY COMPLIANCE

iTCQES1 transceiver mechanical specifications are compliant to the QSFP+ MSA transceiver module specifications. Specifications are in mm unless otherwise noted.

MECHANICAL SPECIFICATIONS

iTCQES1 transceivers are RoHS-6 compliant. Copies of certificates are available upon request.

iTCQES1 transceiver modules are Class 1 laser eye safety compliant per IEC 60825-1.

Dimension (Unit:mm)

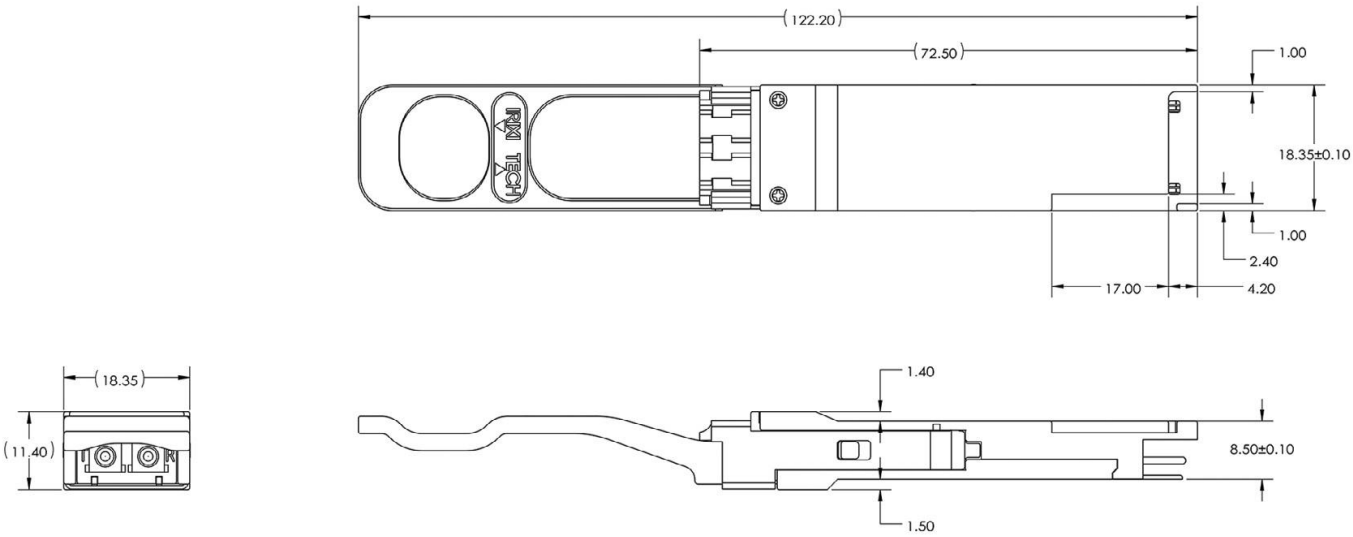


Figure 2 - Mechanical Drawing

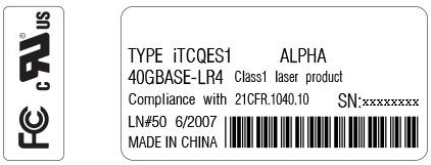


Figure 3 - Production Label