TSQL4-E11GE3C Optical Transceiver

Single-Mode 40GBASE Transceiver, With Diagnostic Monitoring Duplex QSFP+ LR4 10km Transceiver

Features

- XLPPI electrical interface
- Hot pluggable
- Uncooled CWDM DFB lasers, directly modulated
- Fiber connector: SMF LC duplex connector
- Power dissipation < 3.5W
- Distance up to 10km
- 2-wire interface with integrated Digital Diagnostic monitoring
- Operating case temperature: 0°C~+70°C
- RoHS6 compliant (lead free)

Applications

- 40GBASE-LR4 40G Ethernet

Description

The QSFP+ 40G-LR4-10km module is a highly integrated 4x10G transceiver focused on reach, bandwidth, density and cost for high port-count 40G systems, and client-side 40G interfaces. It is compliant with the QSFP+ MSA. It is interoperable with LR4 transceivers over a 10 km reach.

Absolute Maximum Ratings

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	VCC	-0.5	+3.6	V
Storage Temperature	Tc	-40	+85	°C
Relative Humidity	RH	0	85	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Power Supply Voltage	VCC	3.15	3.30	3.45	V

Supply current	Icc	-	-	1060	mA
Operating Case Temperature	Tca	0		70	°C

Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit	Ref.
Transmitter						
Input differential impedance	Rin	-	100	-	Ω	1
Single-ended Input Voltage Tolerance		-0.3	-	4.0	V	
AC Common Mode Input Voltage Tolerance		15		-	mV	
Differential Input Voltage		50	-	-	mV	
Differential Input Voltage swing, per lane	Vin	190		1000	mV	
Receiver						
Output differential impedance	Rout		100		Ω	1
Differential Output Swing, per lane	Vout	300		900	mV	2
AC Common Mode Output Voltage Tolerance				7.5	mV	
Single-ended Output Voltage		-0.3		4.0	V	

Notes:
[1] AC coupled.
[2] Into 100 ohm differential termination.

Transmitter Specifications – Optical

Parameter		Symbol	Min	Typical	Max	Unit	
Center Wavelength	Ch0	λ0	1264.5	1271	1277.5	nm	
	Ch1	λ1	1284.5	1291	1297.5	nm	
	Ch2	λ2	1304.5	1311	1317.5	nm	
	Ch3	λ3	1324.5	1331	1337.5	nm	
Bit Rate per Channel		DR	10.3125±100ppm			Gbps	1
Side Mode Suppression Ratio		SMSR	30	-	-	dB	
Average launch power each lane			-7		2.3	dBm	6
Optical Modulation Amplitude (each lane)		OMA	-4.0		3.5	dBm	
Transmit OMA per Lane @TDP max			-2.0			dBm	2
Transmission & dispersion penalty, each lane		TDP			3.0	dB	3
Transmitter Reflectance					-12	dB	
Extinction Ratio		ER	3.5			dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}					

Average launch power of OFF transmitter, each lane	Poff			-30	dBm	
Optical return loss tolerance	ORL			20	dB	

Receiver Specifications – Optical

Parameter		Symbol	Min	Typical	Max	Unit	
Center Wavelength	Ch0	λ0	1264.5	1271	1277.5	nm	
	Ch1	λ1	1284.5	1291	1297.5	nm	
	Ch2	λ2	1304.5	1311	1317.5	nm	
	Ch3	λ3	1324.5	1331	1337.5	nm	
Bit Rate per Channel		DR	10.3125±100ppm			Gbps	4
Sensitivity (OMA)		OMAin	-	-	-11.5	dBm	5
Receiver Overload		PMAX	2.3				
Optical Return Loss		ORL			-26	dB	
Vertical eye closure penalty, each lane		VECP			1.9	dB	
Damage threshold, each lane			3.5			dB	

Notes:

[1] Transmitter consists of 4 lasers operating at 10.3125Gb/s each.
[2] At maximum TDP.
[3] TDP value does not include MPI penalty.
[4] Receiver consists of 4 photodetectors operating at 10.3125Gb/s each.
[5] Sensitivity is specified at 10-12 BER.
[6] Power value and power accuracy are with all channels on.

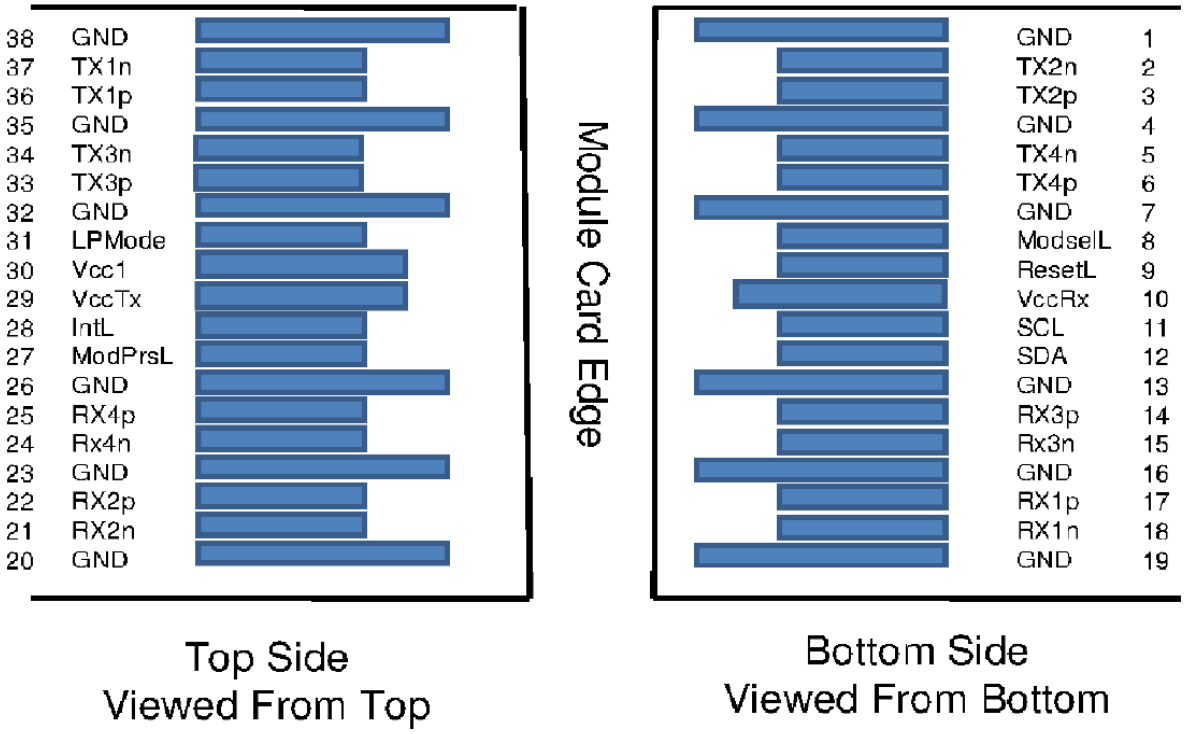
General Specifications

Parameter	Symbol	Min	Typical	Max	Unit	Ref.
Bit Rate (all wavelengths combined)	BR			41.2	Gb/s	
Bit Error Ratio @10.3125Gb/s	BER			10^{-12}		1

Notes:

[1] Tested with a 231 – 1 PRBS.

Electrical Pad Layout

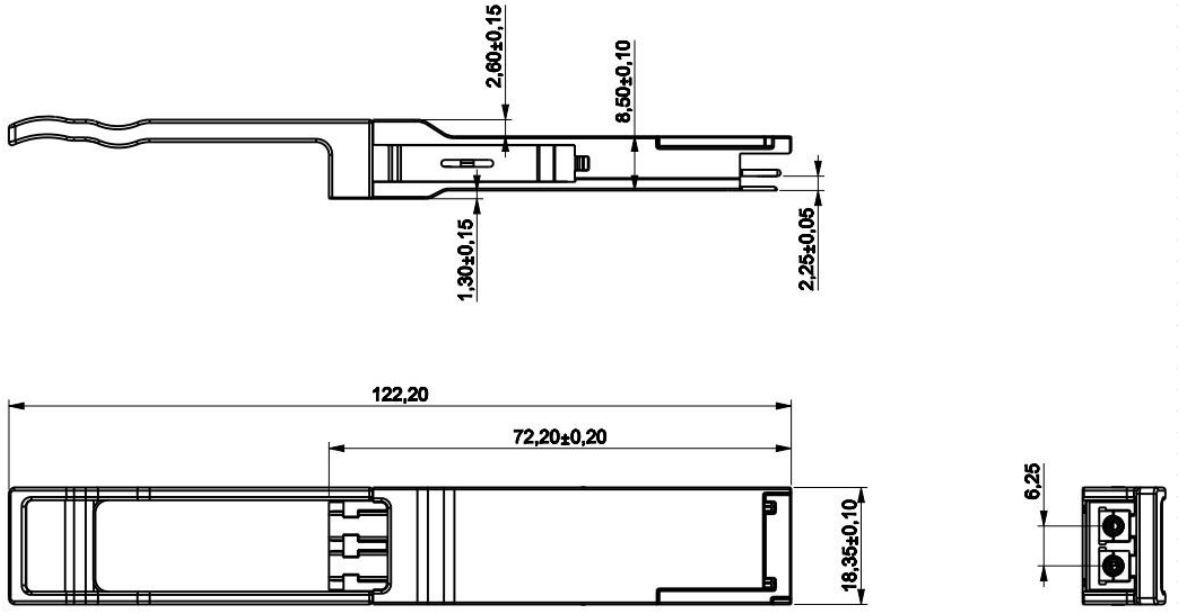


Pin Definition

Pin	Symbol	Name/Description
1	GND	Ground
2	Tx2n	Transmitter Inverted Data Input
3	Tx2p	Transmitter Non-Inverted Data Input
4	GND	Ground
5	Tx4n	Transmitter Inverted Data Input
6	Tx4p	Transmitter Non-Inverted Data Input
7	GND	Ground
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
14	Rx3p	Receiver Non-Inverted Data Output
15	Rx3n	Receiver Inverted Data Output
16	GND	Ground
17	Rx1p	Receiver Non-Inverted Data Output
18	Rx1n	Receiver Inverted Data Output
19	GND	Ground
20	GND	Ground

21	Rx2n	Receiver Inverted Data Output
22	Rx2p	Receiver Non-Inverted Data Output
23	GND	Ground
24	Rx4n	Receiver Inverted Data Output
25	Rx4p	Receiver Non-Inverted Data Output
26	GND	Ground
27	ModPrsL	Module Present
28	IntL	Interrupt
29	VCC Tx	+3.3 V Power supply transmitter
30	VCC1	+3.3 V Power Supply
31	LPMode	Low Power Mode
32	GND	Ground
33	Tx3p	Transmitter Non-Inverted Data Input
34	Tx3n	Transmitter Inverted Data Input
35	GND	Ground
36	Tx1p	Transmitter Non-Inverted Data Input
37	Tx1n	Transmitter Inverted Data Input
38	GND	Ground

Mechanical



Unit: mm

Ordering Information

Part Number	Product Description
TSQL4-E11GE3C	40Gbps QSFP+ LR4 10km 0°C ~ +70°C

References

1. INF-8438i – Specification for QSFP
2. SFF-8436 – Specification for QSFP+ Copper and Optical Transceiver IEEE 802.3bm.
3. IEEE 802.3ba – PMD Type 40GBASE-LR4.

Important Notice

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