



# TQ1341L-CN

## 40Gb/s QSFP+ LR4 10km Optical Transceiver

### FEATURES

- Compliant with 40G Ethernet IEEE802.3ba and 40GBASE-LR4 Standard
- QSFP+ MSA compliant
- Compliant with QDR/DDR Infiniband data rates
- Up to 11.2Gb/s data rate per wavelength
- 4 CWDM lanes MUX/DEMUX design
- Up to 10km transmission on single mode fiber (SMF)
- Operating case temperature: 0 to 70°C
- Maximum power consumption 3.5W
- LC duplex connector
- RoHS compliant

### APPLICATIONS

- 40GBASE-LR4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Client-side 40G Telecom connections

### ORDERING INFORMATION

Part Number	Form Factor	Data Rate	Media	Distance (km)	Wavelength (nm)	Temperature (°C)
TQ1341L-CN	QSFP+	40G	-	10	-	0~70

### 1. ABSOLUTE MAXIMUM PARAMETERS

Exceeding the limits below may damage the active optical cable permanently.

Parameter	Symbol	Min.	Max.	Unit.
Storage Temperature	TS	-40	85	°C
Operating Case Temperature	TOP	0	70	°C
Power Supply Voltage	VCC	-0.5	3.6	V
Relative Humidity (non-condensation)	RH	0	85	%

Damage Threshold, each Lane	THd	3.4			dBm
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## 2. RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit.
Operating Case Temperature	TOP	0		70	°C
Power Supply Voltage	VCC	3.1	3.3	3.47	V
Data Rate, each Lane			10.3125		Gb/s
Control Input Voltage High		2		VCC	V
Control Input Voltage Low		0		0.8	V
Link Distance with G.652	D			10	km

## 3. ELECTRICAL CHARACTERISTICS

Electrical transmitter Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Power Consumption				3.5	W	
Supply Current	ICC			1.13	A	
Transceiver Power-on Initialization Time				2000	ms	
Single-ended Input Voltage Tolerance (Note 2)		-0.3		4.0	V	
AC Common Mode Input Voltage Tolerance		15			mV	RMS
Differential Input Voltage						
Swing Threshold		50			mVpp	LOSA Threshold
Differential Input Voltage Swing	V <sub>in,pp</sub>	190		700	mVpp	
Differential Input Impedance	Z <sub>in</sub>	90	100	110	ohm	
Differential Input Return Loss		See IEEE 802.3ba 86A.4.11			dB	10MHz- 11.1GHz

J2 Jitter Tolerance	Jt2	0.17			UI	
J9 Jitter Tolerance	Jt9	0.29			UI	
Data Dependent Pulse Width Shrinkage (DDPWS ) Tolerance		0.07			UI	
Single-ended Output Voltage		-0.3		4.0	V	Referred to signal common
AC Common Mode Output Voltage				7.5	mV	RMS
Differential Output Voltage Swing	Vout,pp	300		850	mVpp	
Differential Output Impedance	Zout	90	100	110	ohm	
Termination Mismatch at 1MHz				5	%	
Output Transition Time		28			Ps	20% to 80%
J2 Jitter Output	Jo2			0.42	UI	
J9 Jitter Output	Jo9			0.65	UI	
Differential Output Return Loss		See IEEE 802.3ba 86A.4.2.1			dB	10MHz- 11.1GHz
Common Mode Output Return Loss		See IEEE 802.3ba 86A.4.2.2			dB	10MHz- 11.1GHz
Eye Mask Coordinates {X1, X2, Y1, Y2}		0.29, 0.5, 150, 425			UI mV	Hit Ratio = 5x1E-5

#### 4. OPTICAL CHARACTERISTICS

Optical transmitter Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Wavelength Assignment	L0	1264.5	1270	1277.5	nm	
	L1	1284.5	1290	1297.5	nm	
	L2	1304.5	1310	1317.5	nm	
	L3	1324.5	1330	1337.5	nm	
Side Mode Suppression Ratio	SMSR	30			dB	

Total Average Launch Power	PT			8.3	dBm	
Average Launch Power, each Lane	PAVG	-7		2.3	dBm	
Optical Modulation Amplitude (OMA), each Lane	POMA	-4		3.5	dBm	1
Difference in Launch Power between any Two Lanes (OMA)	Ptx,diff			6.5	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-4.8			dBm	
TDP, each Lane	TDP			2.6	dB	
Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise	RIN			-128	dBc/Hz	12dB reflection
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	RT			-12	dB	
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
<b>Receiver</b>						
<b>Parameter</b>	<b>Symbol</b>	<b>Min</b>	<b>Typical</b>	<b>Max</b>	<b>Unit</b>	<b>Notes</b>
Damage Threshold, eachLane	THd	3.4			dBm	2
Total Average Receive Power				8.3	dBm	
Average Receive Power, each Lane		-13.7		2.3	dBm	

Receiver Reflectance	RR			-26	dB	
Receiver Sensitivity (OMA), each Lane	SEN			-11.5	dBm	
Stressed Receiver Sensitivity (OMA), each Lane				-9.6	dBm	3
Difference in Receive Power between any Two Lanes (OMA)	Prx,diff			7.5	dB	
LOS Assert	LOSA	-28			dBm	
LOS Deassert	LOSD			-15	dBm	
LOS Hysteresis			1		dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	FC			12.3	GHz	

**Notes:**

1. Even if the TDP < 0.8 dB, the OMA min must exceed the minimum value specified here
2. 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
3. Measured with conformance test signal at receiver input for BER = 1x1E-12
4. MVertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of thereceiver

## 5. PIN DESCRIPTIONS

Pin	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Ground	1
8	ModSelL	Module Select	

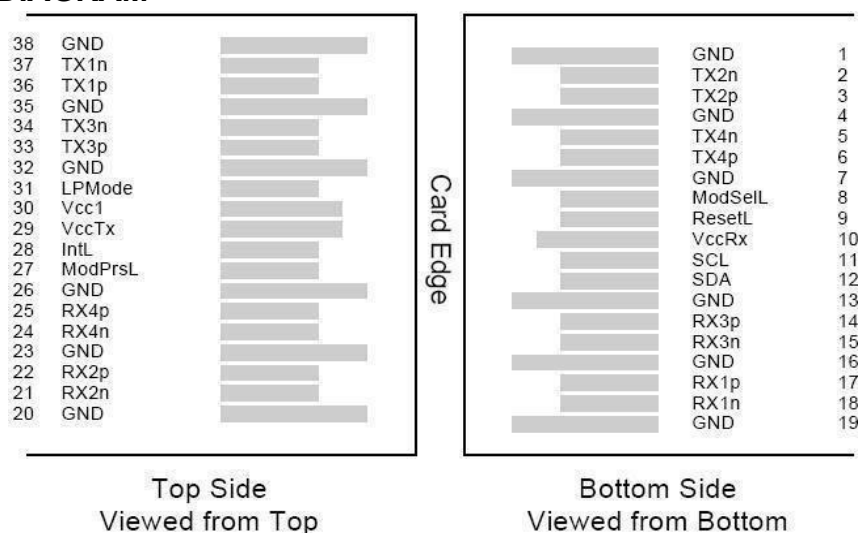
9	ResetL	Module Reset	
10	VccRx	+3.3V Power Supply Receiver	2
11	SCL	2-Wire Serial Interface Clock	
12	SDA	2-Wire Serial Interface Data	
13	GND	Ground	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	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	1
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	VccTx	+3.3 V Power Supply transmitter	2
30	Vcc1	+3.3 V Power Supply	2
31	LPMODE	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	

37	Tx1n	Transmitter Inverted Data Output	
38	GND	Ground	1

**NOTE:**

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 groundplane
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 in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA

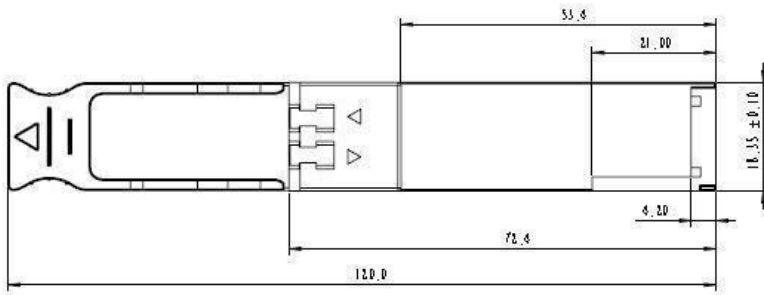
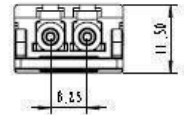
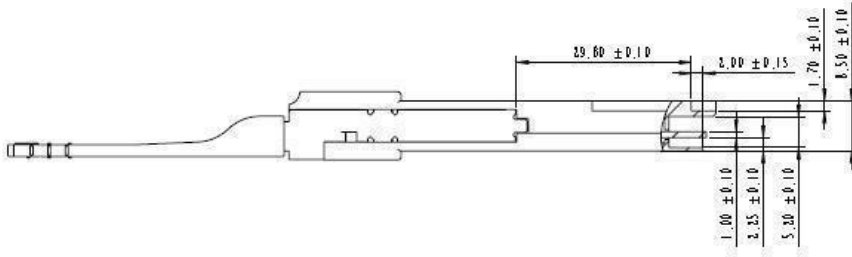
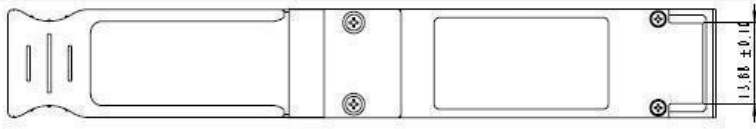
**6. PIN DIAGRAM**



Version	Change Description	Changed by	Date
A0	Initial Release	Qian Shi Jun	2019/03/15



## 7. Mechanical Design Diagram (mm)





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