

40Gb/s 10km QSFP+ Transceiver (STC-40G-LR4) Datasheet



to 70°C

- ▶ Single 3.3V power supply
- ▶ Maximum link length of 10km on Single Mode Fiber (SMF)
- ▶ Uncooled 4x10Gb/s CWDM transmitter
- ▶ XLPPPI electrical interface
- ▶ Duplex LC receptacles
- ▶ Built-in digital diagnostic functions, including Tx/Rx power monitoring

Features:

- ▶ Hot-pluggable QSFP+ form factor
- ▶ Supports 44.8 Gb/s aggregate bit rates
- ▶ Power dissipation < 3.5W
- ▶ RoHS-6 compliant
- ▶ Commercial case temperature range 0°C

Applications:

- ▶ 40GBASE-LR4 40G Ethernet
- ▶ Infiniband 4x SDR, DDR, QDR
- ▶ OTN OUT-3

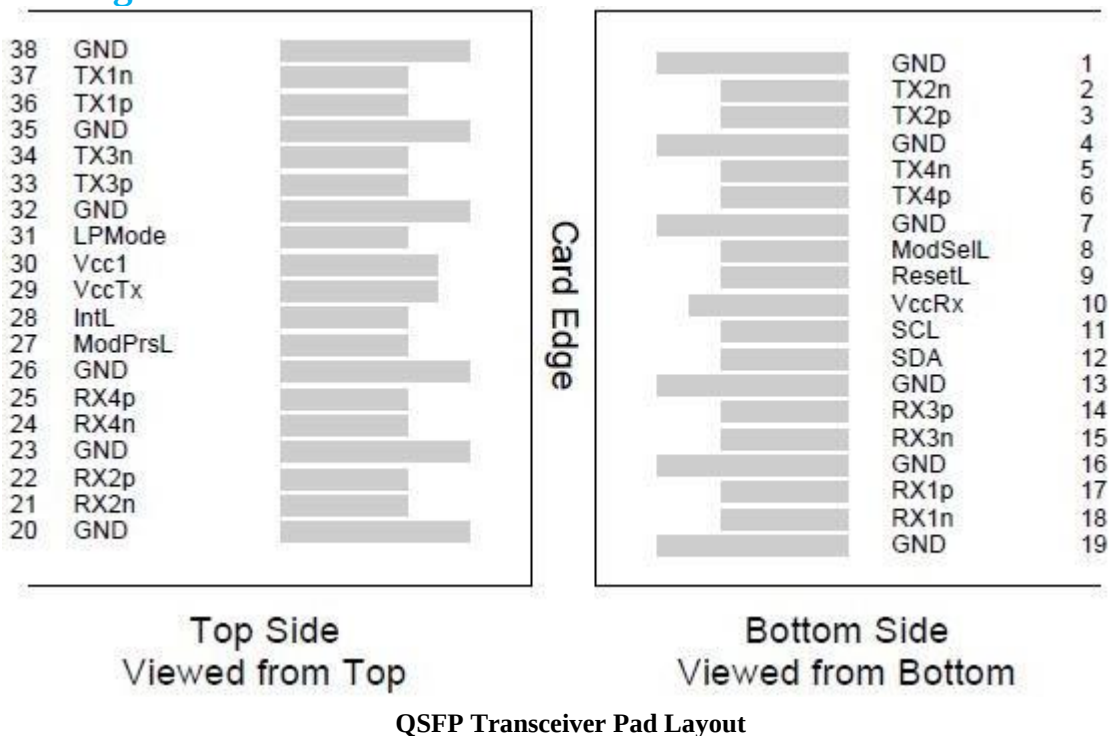
Part Number Ordering Information

STC-40G-LR4	QSFP+ LR4 10km optical transceiver with full real-time digital diagnostic monitoring, 0~70°C
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► Description:

The STC-40G-LR4 transceiver modules is designed for use in 40 Gigabit Ethernet links over single mode fiber. They are compliant with the QSFP+ MSA and IEEE802.3ba 40GBASE-LR4. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP+ MSA. The optical transceiver is compliant per the RoHS Directive 2011/65/EU.

► Pin Assignment:



► Pin Function Definitions

Pin	Symbol	Name/Description	Ref.
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 Output	
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	
11	SCL	2-Wire Serial Interface Clock	
12	SDA	2-Wire Serial Interface Data	
13	GND	Ground	1
14	Rx3p	Receiver Inverted Data Output	
15	Rx3n	Receiver Non-Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Inverted Data Output	
18	Rx1n	Receiver Non-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	VccTx	+3.3V Power Supply Transmitter	
30	Vcc1	+3.3V Power Supply	
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Inverted Data Output	
34	Tx3n	Transmitter Non-Inverted Data Output	
35	GND	Ground	1
36	Tx1p	Transmitter Inverted Data Output	
37	Tx1n	Transmitter Non-Inverted Data Output	
38	GND	Ground	1

Notes:

1. Circuit ground is internally isolated from chassis ground.

► General Product Characteristics

Parameter	Value	Unit	Notes
Module Form Factor	QSFP+		
Maximum Aggregate Data Rate	44.8	Gb/s	
Maximum Data Rate per Lane	11.2	Gb/s	Higher bit rates may be supported.
Protocols Supported	Typical applications include 40G Ethernet, Infiniband, Fibre Channel, SATA/SAS3		
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

Parameter	Symbol	Min.	Typical	Max.	Unit	Ref.
Bit Rate per Lane	BR		10.3	11.2	Gb/s	1
Bit Error Ratio	BER			10 ⁻¹²		2
Link distance on SMF-28	d			10	kilometers	3

Notes:

- Compliant with 40GBASE-LR4 and XLPPi per IEEE 802.3ba. Compatible with 1/10 Gigabit Ethernet and 1/2/4/8/10G Fibre Channel.
- Tested with a PRBS 231-1 test pattern.
- Per 40GBASE-LR4, IEEE 802.3ba.

► Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Ref.
Maximum Supply Voltage	Vcc1, VccTx, VccRx	-0.5		3.6	V	
Storage Temperature	TS	-40		+85	° C	
Case Operating Temperature	TOP	0		70	° C	
Relative Humidity	RH	0		85	%	1
Damage Threshold, per Lane	DT	3.4		dBm		

Notes:

- Non-condensing.

► Electrical Characteristics (T_{OP} = 0 to 70 °C, VCC = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Note
Supply Voltage	Vcc1, 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(RMS)		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	V _{out,pp}	400		800	mV _{pp}	6
AC common mode output voltage (RMS)				7.5	mV	
Termination mismatch at 1 MHz				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				
J2 Jitter output	Jo2			0.42	UI	
J9 Jitter output	Jo9			0.65	UI	
Eye mask coordinates #1 {X1, X2 Y1, Y2}		0.29, 0.5 150, 425			UI mV	5

Note:

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 100 differential input.
4. 10 MHz to 11.1 GHz range.
5. Hit ratio = 5 x 10E-5.
6. AC coupled with 100 differential output impedance.

► Optical Characteristics (TOP = 0 to 70°C, VCC = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Signaling Speed per Lane			10.3		GBd	1
Wavelength Assignment	L0	1264.5	1271	1277.5	nm	
	L1	1284.5	1291	1297.5	nm	
	L2	1304.5	1311	1317.5	nm	
	L3	1324.5	1331	1337.5	nm	
Total Average Launch Power	PT		-	8.3	dBm	
Transmit OMA per Lane	TxOMA	-4.0		3.5	dBm	
Average Launch Power per Lane	TXPx	-7.0		2.3	dBm	2
Extinction Ratio	ER	3.5	-	-	dB	
Side-mode Suppression Ratio	SMSR	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			10.3		GBd	4
Lane center wavelengths (range)	L0	1264.5	1271	1277.5	nm	
	L1	1284.5	1291	1297.5	nm	
	L2	1304.5	1311	1317.5	nm	
	L3	1324.5	1331	1337.5	nm	
Receive Power (OMA) per Lane	RxOMA			3.5	dBm	
Average Receive Power per Lane	RXPx	-13.7		2.3	dBm	
Receiver Sensitivity (OMA) per Lane	Rxsens			-11.5	dBm	5
Stressed Receiver Sensitivity (OMA) per Lane	SRS			-9.6	dBm	
Damage Threshold per Lane	PMAX			3.4	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	LOSD			-15	dBm	
LOS Assert	LOSA	-28			dBm	
LOS Hysteresis		0.5			dB	

Note:

1. Transmitter consists of 4 lasers operating at 10.3Gb/s each.
2. Minimum value is informative.
3. RIN is scaled by $10 \cdot \log(10/4)$ to maintain SNR outside of transmitter.
4. Receiver consists of 4 photodetectors operating at 10.3Gb/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

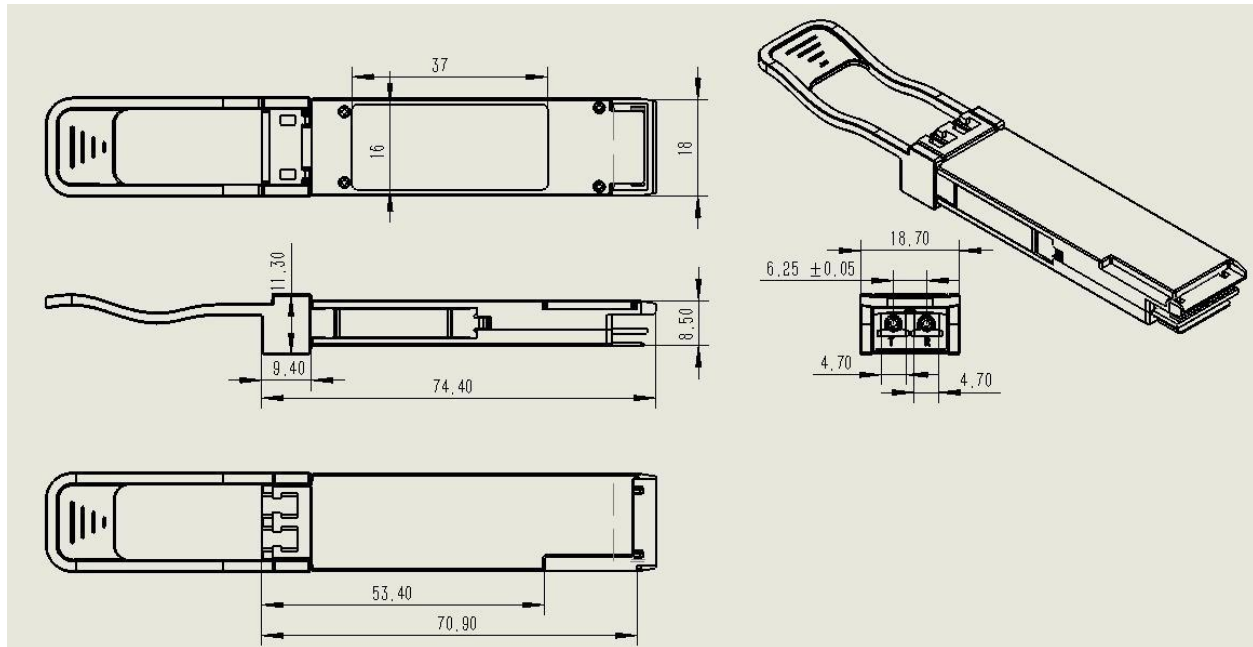
The OPQC10 transceiver modules have an operating temperature range from 0°C to +70°C case temperature.

Parameter	Symbol	Min.	Typical	Max.	Unit	Ref.
Case Operating Temperature	Top	0		70	°C	
Storage Temperature	TS	0		70	°C	

► Regulatory Compliance

OPQC10 transceivers are RoHS-6 Compliant. Copies of certificates are available OPQC10 transceiver modules are Class 1 laser eye safety compliant per IEC 60825-1.

● Mechanical Dimensions:



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