

**Preliminary DATA SHEET**

**CFORTH-QSFP-40G-SR4**  
***40GBd QSFP+ SR4 Transceiver***

**CFORTH-QSFP-40G-SR4 Overview**

CFORTH-QSFP-40G-SR4 QSFP+ SR4 optical transceiver are base on Ethernet IEEE P802.3ba standard and SFF 8436 standard. QSFP+ SR4 offers 4 independent transmit and receive channels, each capable of 10Gbps for an aggregate bandwidth of 40Gbps.

**Product Features**

- 4 high-speed full duplex channels
- Multi Rate, up to 10.5Gbps
- QSFP+ MSA compliant
- XLPI electrical interface
- Up to 100 meters over OM3 Multimode Fiber and 150meters over OM4 Multimode Fiber.
- Low Power consumption, less than 1.5W
- Reliable VCSEL array technology
- Single 1X12 MPO receptacle
- RoHS Compliance
- Operating temperature range: 0°C to 70°C.

**Applications**

- 40G Ethernet
- Breakout to 10GBASE-SR Ethernet
- Infiniband interconnects

**Ordering Information**

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<i>Part Number</i>	<i>Description</i>
CFORTH-QSFP-40G-SR4	40G QSFP+ 850nm MPO Connectors, Up to 100m over MMF, with DOM function.

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**General Specifications**

<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Bit Error Rate	$BER$			$10^{-15}$		
Operating Temperature	$T_{OP}$	0		70	°C	Case temperature
Storage Temperature	$T_{STO}$	- 40		85	°C	Ambient temperature
Supply Current	$I_S$		300	350	mA	For electrical power interface
Input Voltage	$V_{CC}$	3.15	3.3	3.45	V	
Maximum Voltage	$V_{MAX}$	- 0.5		3.6	V	For electrical power interface

**Link Distances**

<i>Parameter</i>	<i>Fiber Type</i>	<i>Distance Range (m)</i>
40 GBd	MMF	Up to 100

**Optical Characteristics – Transmitter**

<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Average Launch Power(Each Lane)	$P_{TX}$	-7.6		2.4	dBm	
Optical Center Wavelength	$\lambda_C$	840		860	nm	
Extinction Ratio	$ER$	3			dB	
Spectral Width (- 20 dB)	$\Delta\lambda$			0.65	nm	
Relative Intensity Noise	$RIN$			- 128	dB/Hz	
Transmitter Dispersion Penalty	$TDP$			3.5	dB	
Transmitter Eye Mask			According to IEEE 802.3ba			
Launch Power of OFF Transmitter	$P_{OUT\_OFF}$			- 30	dBm	Average

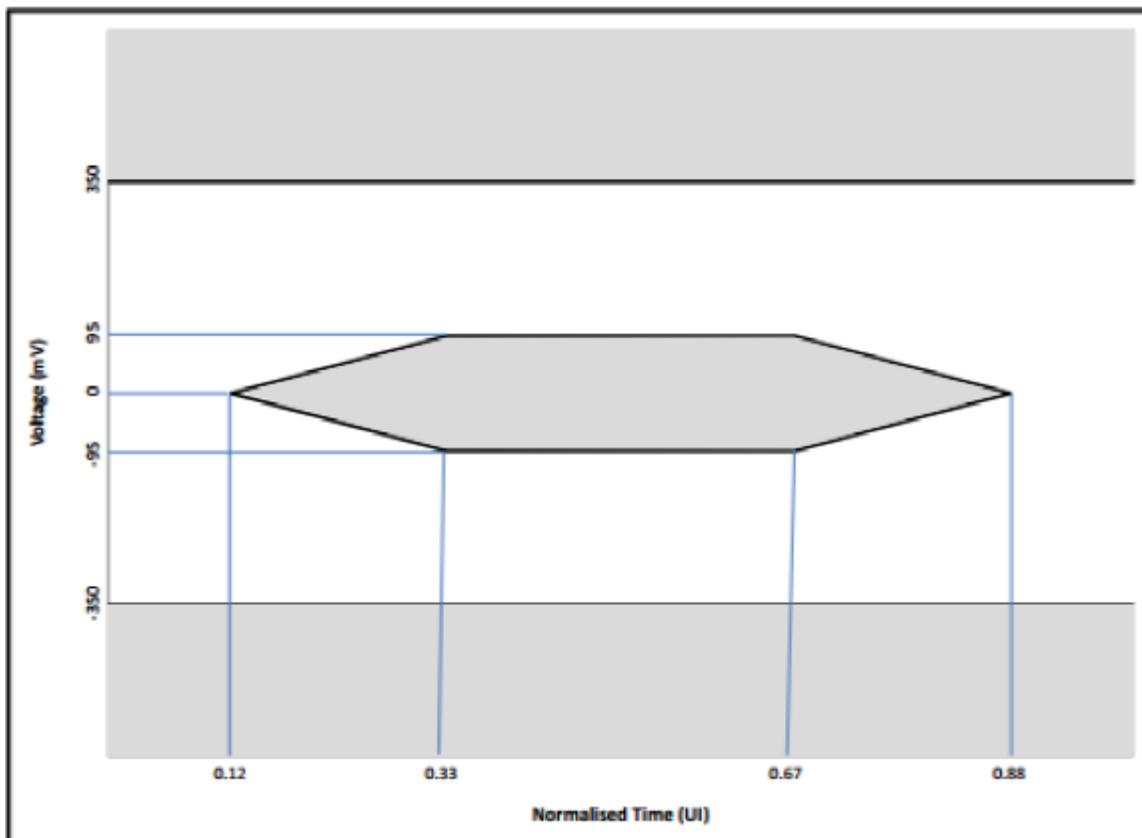
**Optical Characteristics – Receiver**

<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Optical Center Wavelength	$\lambda_C$	840		860	nm	
Optical Input Power, each lane	$P_{IN}$	-9.5		2.4	dBm	Average, Informative
Damage Threshold	$P$	3.3dBm				
Receiver Power (OMA), each lane	$R_X$			3.0	dBm	
Stressed Receiver Sensitivity (OMA), each lane	$R_{X\_SEN}$			-5.4	dBm	
Receiver Reflectance	$TR_{RX}$			- 12	dB	
LOS Assert	$LOS_A$	- 25			dBm	
LOS De-Assert	$LOS_D$			- 12	dBm	
LOS Hysteresis		0.5			dB	

**Electrical Characteristics – Transmitter**

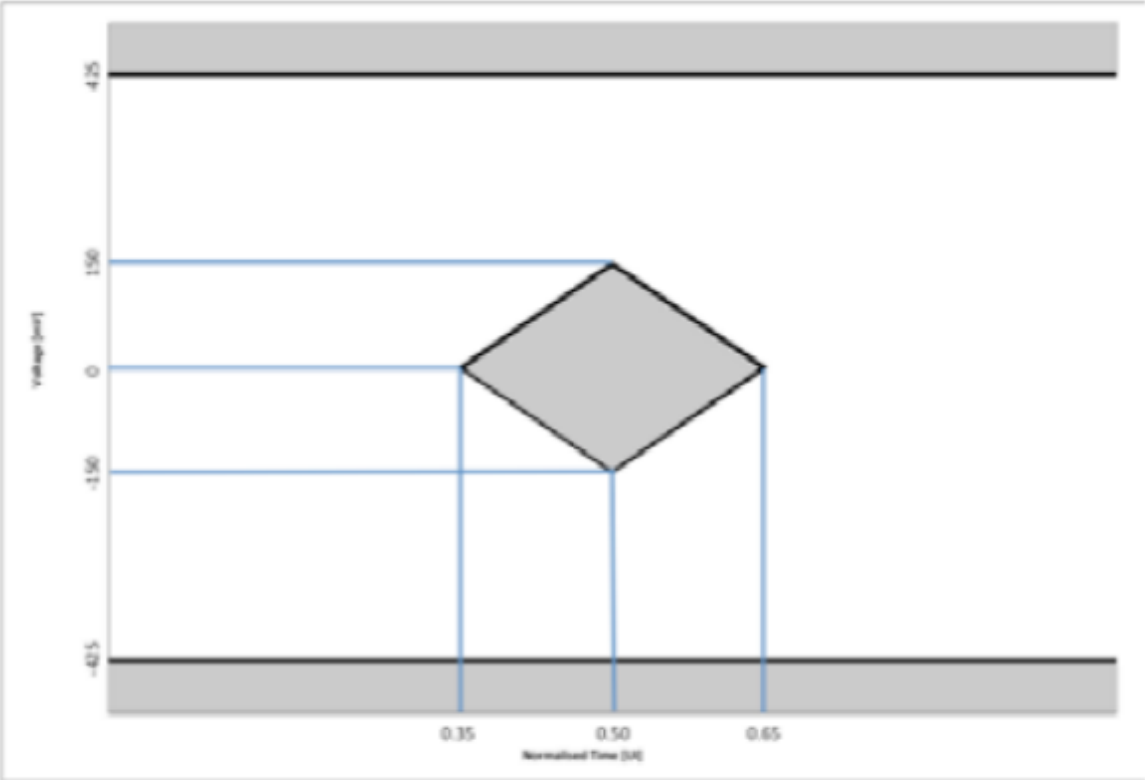
<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Data Rate Per Channel	$D_f$			10.5	GB/s	Non condensing
Single ended data input swing	$V_{IN\_PP}$	300		1200	mV	
Transmit disable voltage	$V_D$	$V_{CC} - 1.3$		$V_{CC}$	V	
Transmit enable voltage	$V_{EN}$	$V_{EE}$		$V_{EE} + 0.8$	V	

Note: The worst case electrical input is defined by the eye mask:

**Electrical Characteristics – Receiver**

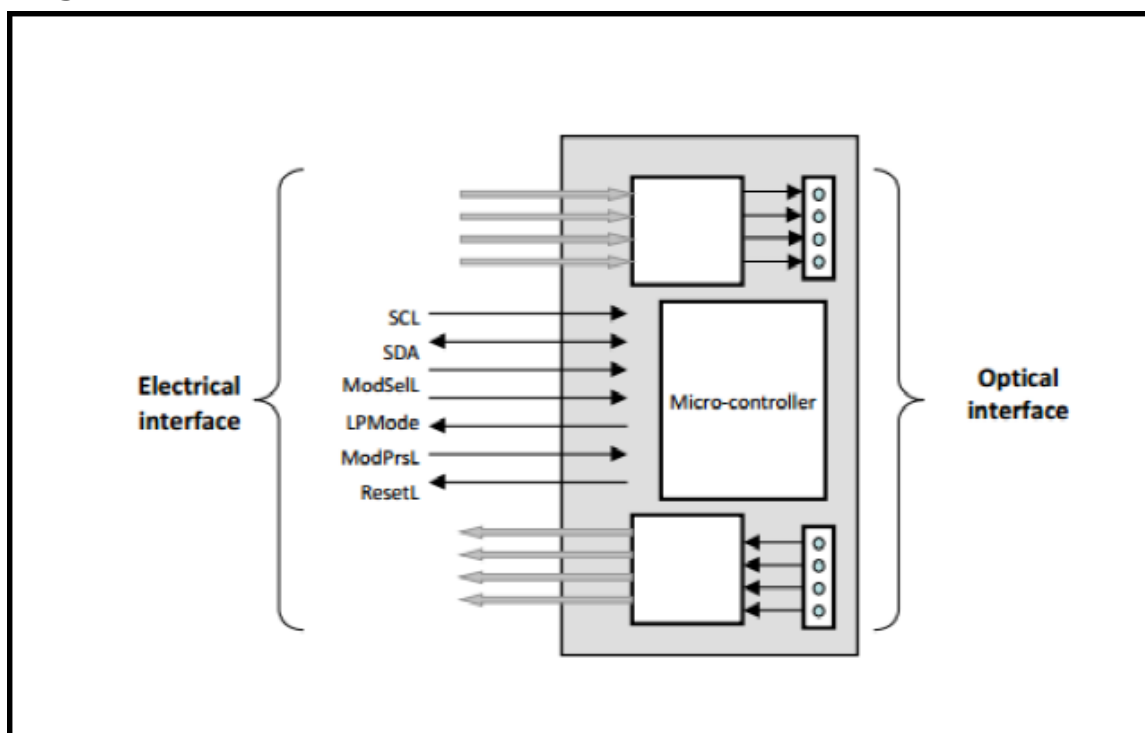
<i>Parameter</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	<i>Remarks</i>
Data Rate Per Channel	$D_f$			10.5	GB/s	Non condensing
Differential Output Amplitude	$V_{OUT\_PP}$	340		700	mV	
Differential Output Amplitude in Squelched state	$V_{OUT\_SQ}$			50	mV	
Single Ended Voltage Tolerance	$V$	-0.3		3.8	V	
Output AC Common Mode Voltage	$V_{cm}$			7.5	mV	RMS
Output Transition Time	$T_r, T_f$	28			ps	
Total Jitter	$T_j$			0.7	$UI_{p-p}$	
Deterministic Jitter	$D_j$			0.4	$UI_{p-p}$	
Eye Mask						See Note

Note:



Eye Mask for Hit Ratio =  $1 \times 10^{-12}$

## Block Diagram of Transceiver



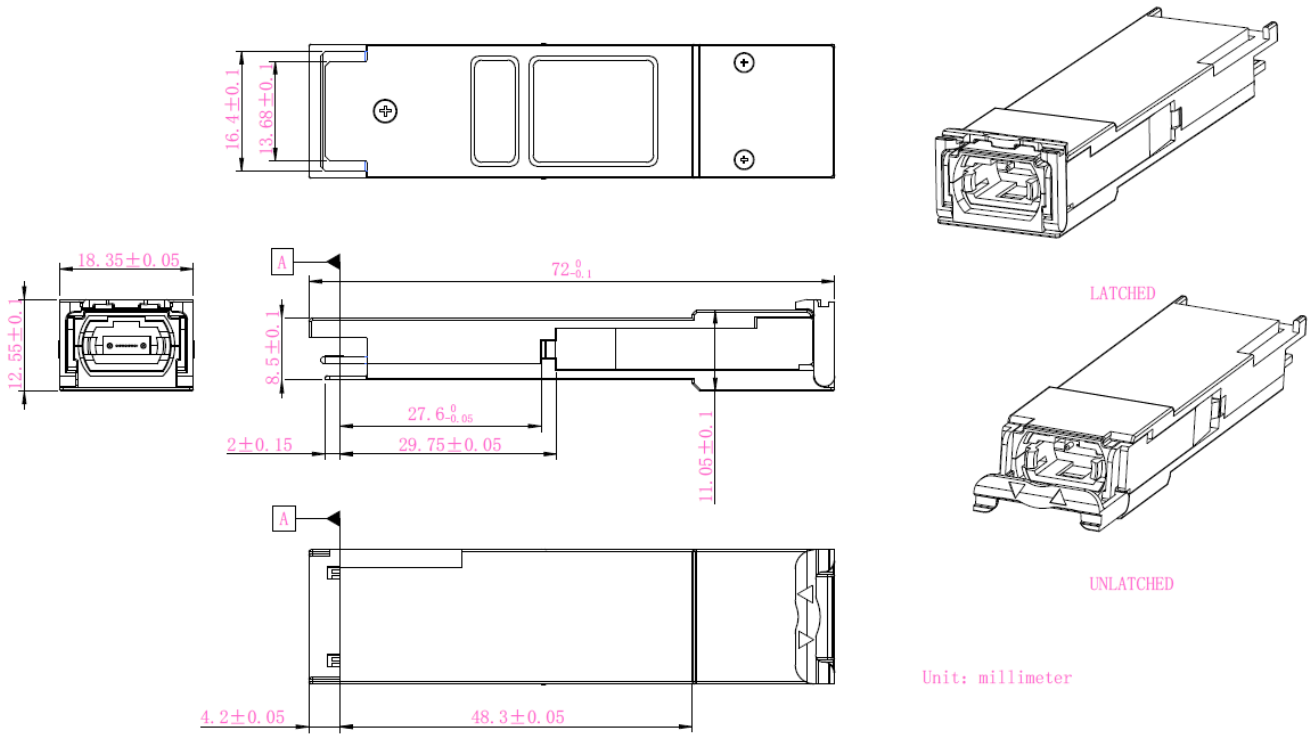
The QSFP-SR4 has miniature optical engine embedded into QSFP module. The engines interconnect 4 independent transmit/receive lanes.

A functional block diagram of the engine is shown in the above Figure. The transmitter sections consists of 4-channel VCSEL array, a 4-channel input buffer and laser driver

An on board micro-controller provides control, diagnostic and monitoring for the cable functions, as well as the external I2C serial communication interface.

The Receiver section consists of a 4-channel PIN photodiode array, a 4-channel TIA array, and a 4-channel output buffer.

Dimensions

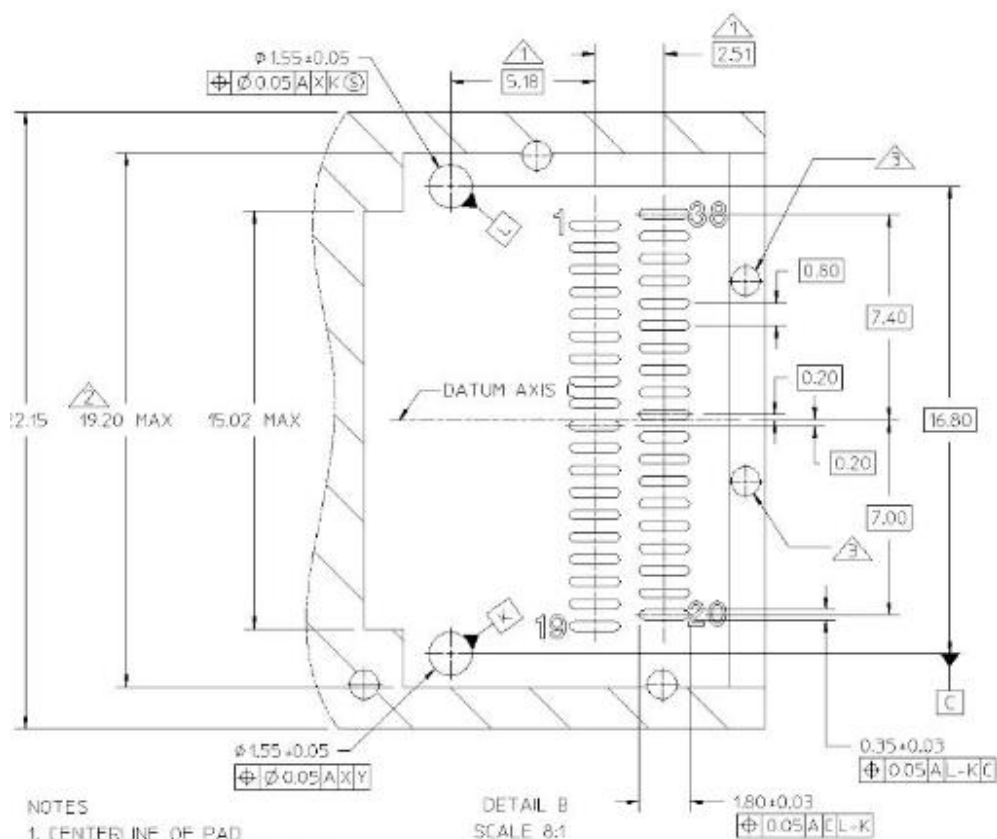
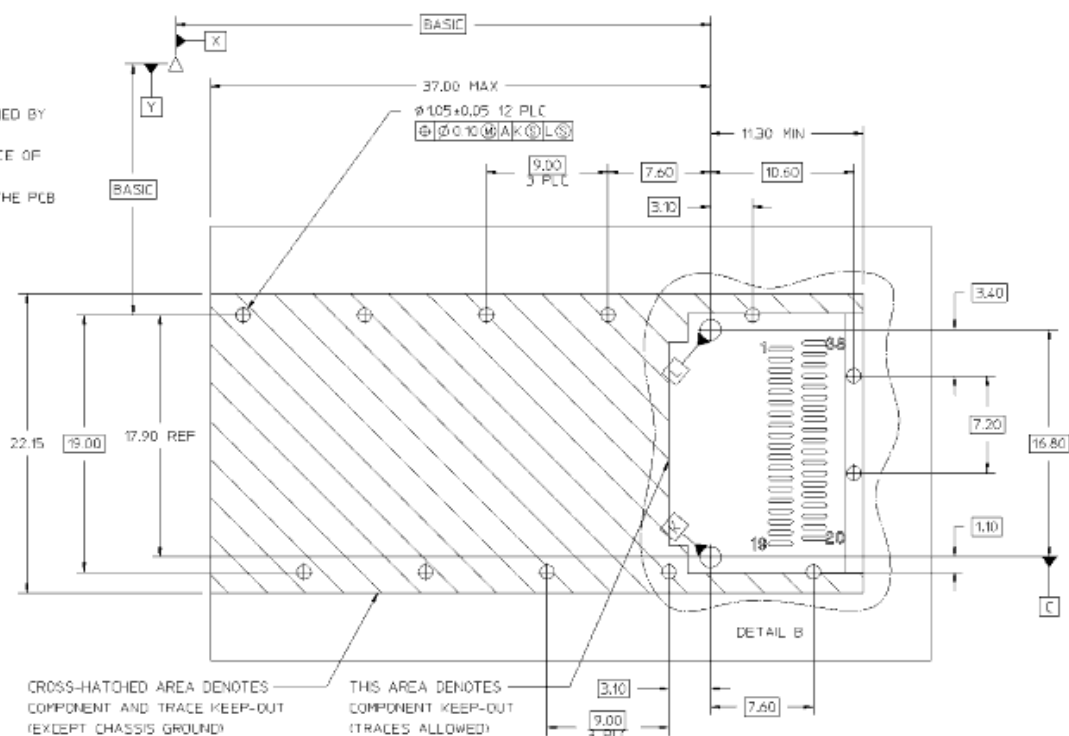


**ALL DIMENSIONS ARE  $\pm 0.2\text{mm}$  UNLESS OTHERWISE SPECIFIED**  
**UNIT: mm**

PCB Layout Recommendation

NOTES

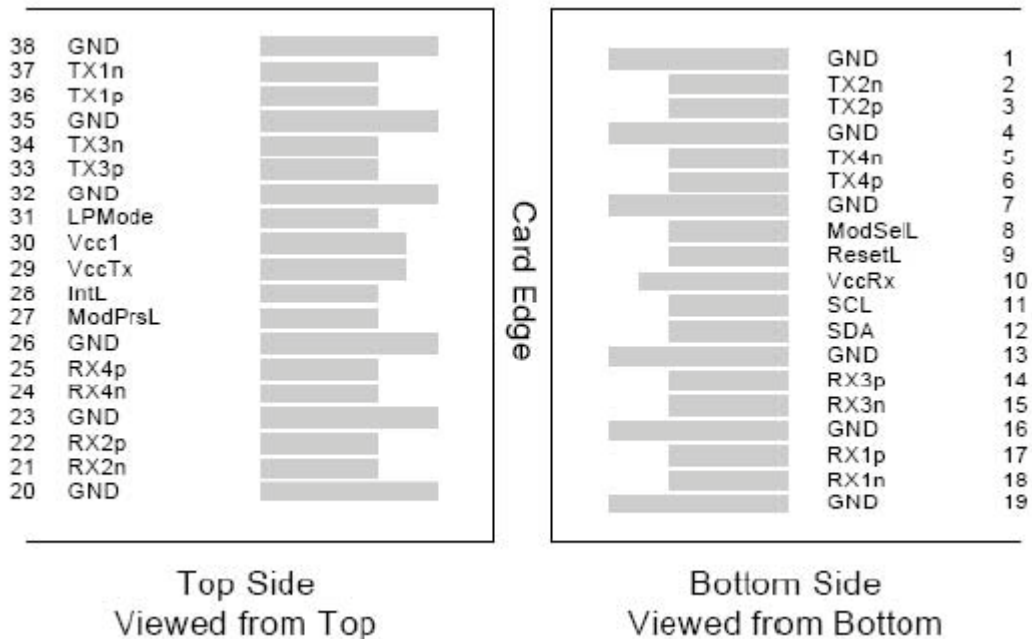
1. DATUM X & Y ARE ESTABLISHED BY THE CUSTOMER'S FIDUCIAL
2. DATUM A IS THE TOP SURFACE OF THE HOST BOARD
3. LOCATION OF THE EDGE OF THE PCB IS APPLICATION SPECIFIC
4. FINISHED PTH HOLE SIZE



NOTES

1. CENTERLINE OF PAD
2. SURFACE TRACES PERMITTED WITHIN THIS LENGTH
3. INDICATED HOLES ARE OPTIONAL

Electrical Pad Layout





<b>Pin Assignment</b>			
<i><b>PIN #</b></i>	<i><b>Symbol</b></i>	<i><b>Description</b></i>	<i><b>Remarks</b></i>
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	V <sub>cc</sub> RX	+3.3V 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	V <sub>cc</sub> TX	+3.3V Power Supply transmitter	
30	V <sub>cc1</sub>	+3.3V 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	

## References

1. IEEE standard 802.3ba. IEEE Standard Department, 2010.
2. QSFP+ 10Gbs 4X PLUGGABLE TRANSCEIVER – SFF-8436