



Description

General

This transceiver from QuickTrex® is quad small form-factor pluggable module for serial optical data communications such as IEEE 802.3cu 400GBASE-FR4. It is with the QSFP-DD 38-pin connector to allow hot plug capability. The internally ac coupled high speed serial I/O simplifies interfacing to external circuitry. A serial EEPROM in the transceiver allows the user to access transceiver digital diagnostic monitoring and configuration data via the 2-wire QSFP-DD Management Interface.

Transmitter Section

The transmitter consists of directly modulated uncooled CWDM 4 wavelength 1271, 1291, 1311, and 1331 nm EML lasers and drivers. In addition, this component is also class 1 laser that compliant with International Safety Standard IEC-60825-1:2014. It complies with EN60825-1:2014/A11:2021 and FDA 21 CFR 1040.10 and 1040.11

Receiver Section

The receiver incorporates InGaAs PIN photodiodes integrated with trans-impedance preamplifiers (TIA) and limiting post-amplifier ICs.

QDD-400G-FR4-S Compatible	
400GBASE-FR4 QSFP-DD PAM4 1310nm 2km	
LC Type with DDM	QT-SM-DXLC-QSFPDD-400G-2KM

Features

- Single +3.3V Power Supply
- Lane bit rate 106.25 Gb/s with PAM4
- CWDM4(1271/1291/1311/1331nm) EML laser and PIN receiver
- Up to 2km on SMF
- 8 x53.125Gb/s with PAM4 electrical interface (400GAUI-8)
- Compliant to IEEE 802.3cu & QSFP-DD MSA
- Class 1 Laser International Safety Standard IEC-60825-1:2014 Compliant. Complies with EN60825-1:2014/A11:2021 and FDA 21 CFR 1040.10 nd 1040.11
- Commercial Operation Temp.: 0 °C to +70 °C
- Compliant to QSFP-DD CMIS rev4.0 standard
- Duplex LC Connector
- EU Directive 2015/863/EU Compliant

Applications

- 400GBASE-FR4 400G Ethernet Links
- Data Center and Cloud

Performance Specifications

Absolute Maximum Ratings					
Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V _{CC}	-0.5	-	4	V
Storage Temperature	T _s	-40	-	85	°C
Relative Humidity(non-condensing)	RH	0	-	85	%

Recommended Operating Conditions and Power Supply Requirements					
Parameter	Symbol	Min	Typ	Max	Units
Operating Case Temperature	T _{OP}	0	-	70	°C
Supply Voltage	V _{CC}	3.13	3.3	3.47	V
Supply Current	I _{CC}	-	-	3.45	A
Power Dissipation	PD	-	12	-	W
Aggregate Bit Rate	BR _{AVE}	-	425	-	Gb/s
Lane Bit Rate	BR _{LANE}	-	106.25	-	Gb/s
Operating Distance	L	-	2	-	km





Optical Characteristics

Transmitter Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Unit	
Center Wavelength Lane 0	λ_0	1264.5	1271	1277.5	nm	
Center Wavelength Lane 1	λ_1	1284.5	1291	1297.5	nm	
Center Wavelength Lane 2	λ_2	1304.5	1311	1317.5	nm	
Center Wavelength Lane 3	λ_3	1324.5	1331	1337.5	nm	
Total Launch Power	$P_{O, Total}$	-	-	9.3	dBm	
Average Launch Power each Lane	$P_{O, AVG}$	-3.3	-	3.5	dBm	
Optical Modulation Amplitude(OMA), each lane	$P_{O, OMA}$	-0.3	-	3.7	dBm	
Launch power in OMAouter minus TDECQ	ER \geq 4.5dB	$P_{O, TDECQ}$	-1.7	-	-	dB
	ER<4.5dB		-1.6	-	-	dB
Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane	TDECQ	-	-	3.4	dB	
Difference in launch power between any two lanes (OMA)	$P_{TX_DELTA_LANE}$	-	-	4	dBm	
Pout@TX Disable Asserted	P_{OFF}	-	-	-20	dBm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Extinction Ratio	ER	3.5	-	-	dB	
Receiver Optical Characteristics						
Parameter	Symbol	Min	Typ	Max	Unit	
Center Wavelength Lane 0	λ_0	1264.5	1271	1277.5	nm	
Center Wavelength Lane 1	λ_1	1284.5	1291	1297.5	nm	
Center Wavelength Lane 2	λ_2	1304.5	1311	1317.5	nm	
Center Wavelength Lane 3	λ_3	1324.5	1331	1337.5	nm	
Damage Threshold, each lane	THd	4.5	-	-	dBm	
Average receive power, each lane	P_{in}	-7.3	-	3.5	dBm	
Difference in receive power between any two lanes (OMA)	$P_{RX_DELTA_LANE}$	-	-	4.1	dBm	
Receiver Power(OMA), each lane	$P_{S, OMA}$	-	-	3.7	dBm	
*Receiver Sensitivity(OMA), each lane	$R_{S, OMA}$	-	-	-4.6	dBm	
*Stressed Receiver Sensitivity(OMA), each lane	$SR_{S, OMA}$	-	-	-2.6	dBm	

*BER<2.4E-4 and PRBS 31Q.



Electrical Characteristics

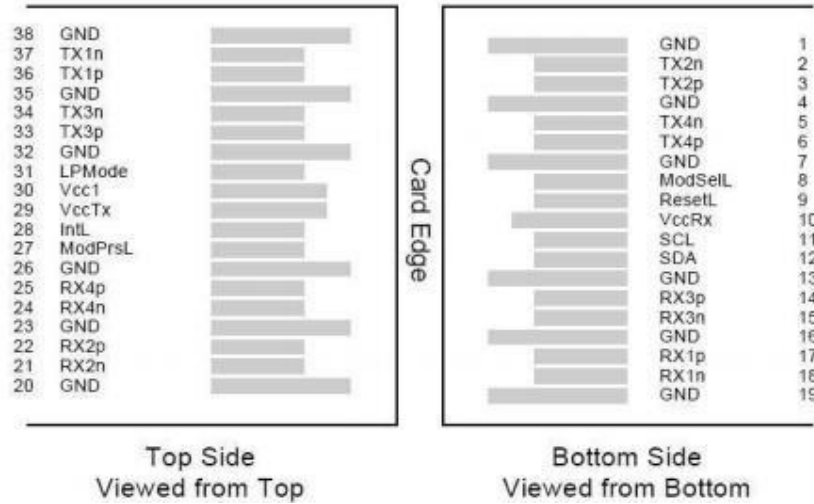
Parameter	Symbol	Min	Typ	Max	Unit
Transmitter(each Lane)					
Differential Data Input Voltage Amplitude	$V_{in,PP}$	900	-	-	mV
Differential Termination Mismatch	-	-	-	10	%
Receiver(each Lane)					
Differential Data Output Voltage Amplitude	$V_{out,PP}$	-	-	900	mV
Differential Termination Mismatch(1MHz)	-	-	-	10	%
Low-speed Electrical Interface					
LPMode, ResetL, ModSelL and ePPS	V_{IL}	-0.3	-	0.8	V
	V_{IH}	2.0	-	$V_{CC}+0.3$	V
ModPrsL	V_{OL}	0	-	0.4	V
	V_{IH}	ModPrsL can be implemented as a short-circuit to GND on the module			
IntL	V_{OL}	0	-	0.4	V
	V_{OH}	$V_{CC}-0.5$	-	$V_{CC}+0.3$	V

Digital Diagnostic Accuracy

Parameter	Typical Value	Note
Transceiver Temperature	$\pm 3^{\circ}\text{C}$	$T_{OP-min} \sim T_{OP-max}$
Power Supply Voltage	$\pm 3\%$	V_{CC}
TX Bias Current	$\pm 10\%$	
TX Optical Power	$\pm 3\text{dB}$	$P_{O,AVG-min} \sim P_{O,AVG-max}$
RX Optical Power	$\pm 3\text{dB}$	$P_{in-min} \sim P_{in-max}$



QSFP-DD Transceiver Electrical Pad Layout



Pinout Table

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 Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Ground	1
8	ModSel	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	Tx 1p	Transmitter Non-Inverted Data Input	
37	Tx 1n	Transmitter Inverted Data Output	
38	GND	Ground	1

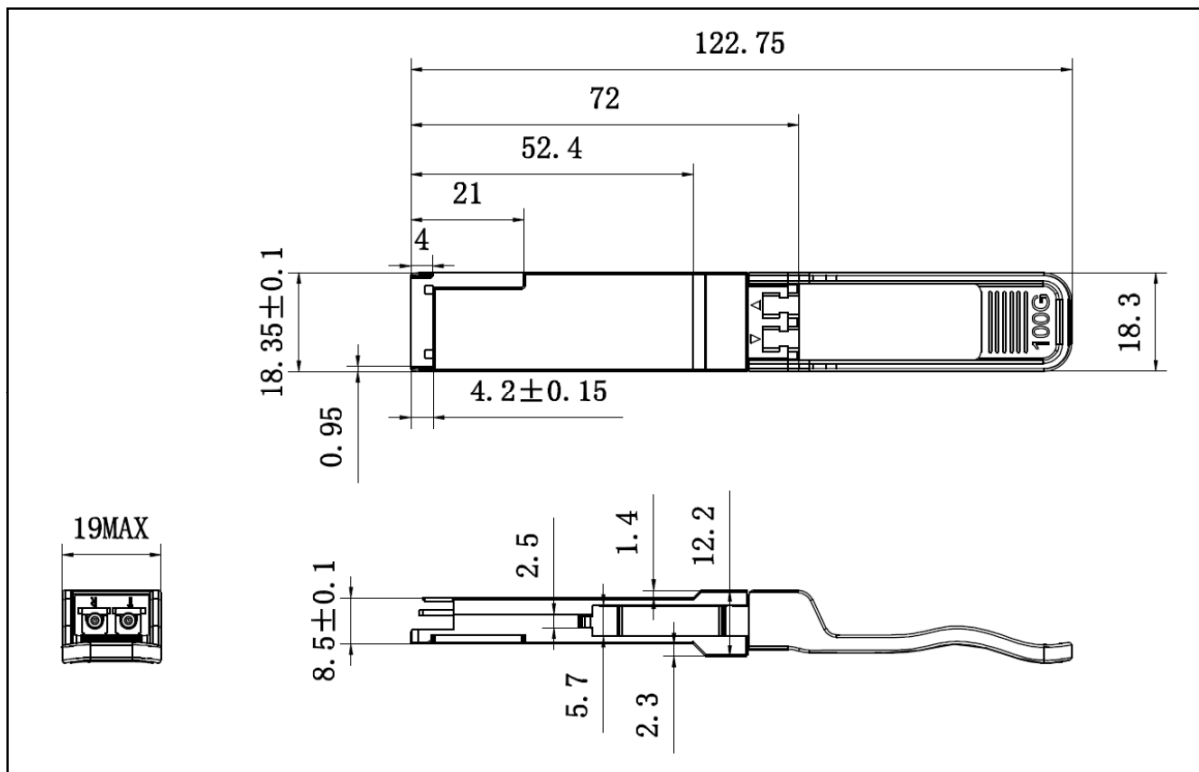
Notes:

1. Module ground pins GND are isolated from the module case and chassis ground within the module.
2. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP+ module in any combination.

Package Outline Drawing

LC Type (SQ Series)

DIMENSIONS ARE IN MILLIMETERS (unit:mm)



Eye Safety

The transceiver is a class 1 laser product. It complies with EN60825-1:2014/A11:2021 and FDA 21 CFR 1040.10 and 1040.11. In order to meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.

Caution

All adjustments have been done at the factory before the shipment of the devices. No maintenance and user serviceable part is required. Tampering with and modifying the performance of the device will result in voided product warranty.