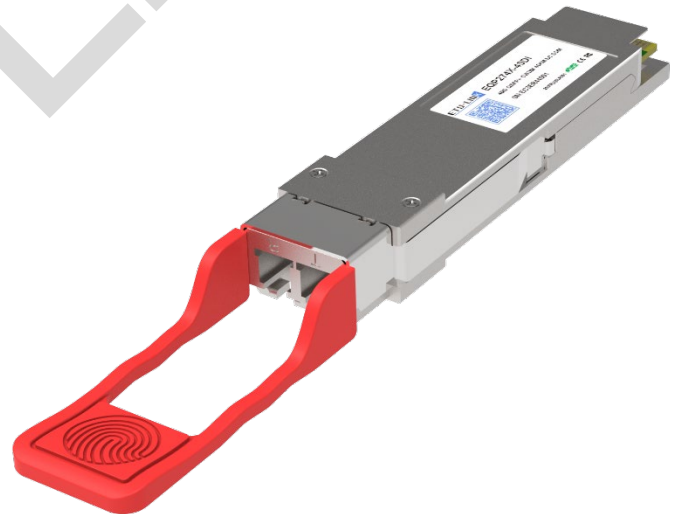


EQP274X-40D(I)-A

40G QSFP+ ER4 40KM Transceiver

PRODUCT FEATURES

- Compliant with 40G Ethernet IEEE802.3bm and 40GBASE-ER4 Standard
- QSFP+ MSA compliant
- CWDM DML laser and APD ROSA
- Compliant with QDR/DDR Infiniband data rates
- Up to 11.2Gb/s data rate per wavelength
- 4 CWDM lanes MUX/ DEMUX design
- Up to 40km transmission on single mode fiber (SMF)
- Operating case temperature: 0 to 70°C
- Maximum power consumption
 - Commercial: < 4.5W
 - Industrial: <5.5W
- LC duplex connector
- RoHS compliant



APPLICATIONS

- 40GBASE-ER4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Client-side 40G Telecom connections

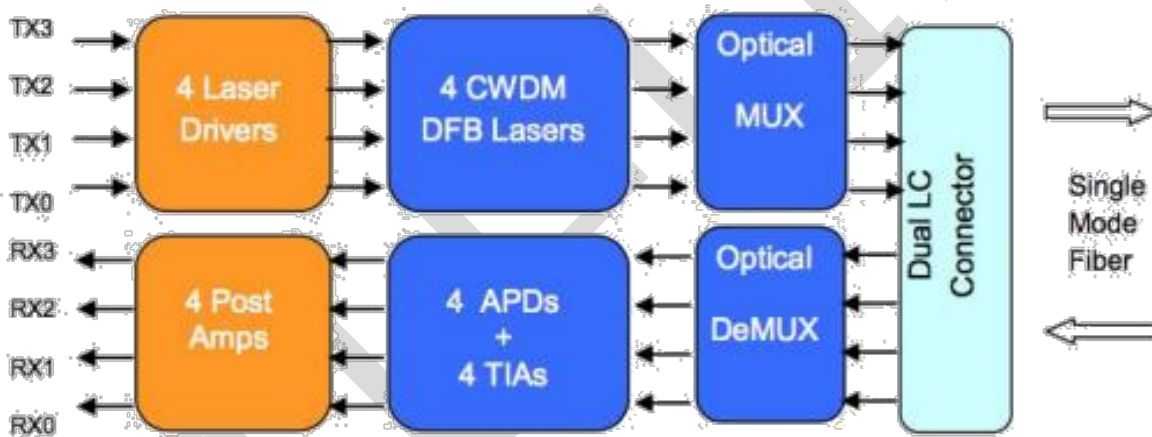
DESCRIPTIONS

This product is a transceiver module designed for 40km optical communication applications. The design is compliant to 40GBASE-ER4 of the IEEE 802.3bm standard. The module converts 4 inputs channels (ch) of 10Gb/s electrical data to 4 CWDM optical signals, and multiplexes them into a single channel for 40Gb/s optical transmission. Reversely, on the receiver side, the module optically de-multiplexes a 40Gb/s input into 4 CWDM channels signals, and converts them to 4 channel output electrical data.

The central wavelengths of the 4 CWDM channels are 1271, 1291, 1311 and 1331 nm as members of the CWDM wavelength grid defined in ITU-T G.694.2. It contains a duplex LC connector for the optical interface and a 38-pin connector for the electrical interface. To minimize the optical dispersion in the long-haul system, single-mode fiber (SMF) has to be applied in this module.

The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP+ Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
EQP274X-40D-A	41.25	CWDM	SMF	40	LC	0~70	Y	Red
EQP274X-40DI-A	41.25	CWDM	SMF	40	LC	-40~85	Y	Red

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T _{stg}	-40		+85	°C	
Relative Humidity - Storage	R _{HS}	5		95	%	
Relative Humidity - Operating	R _{HO}	5		85	%	
DC Supply Voltage	V _{CC}	0		3.6	V	

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Operating Case Temperature	Top	0		+70	°C	1
		-40		+85		2
Operating Case Temperature	VCC	3.14	3.3	3.47	V	
Maximum Power Dissipation	P _D			4.5	W	1
				5.5		2
Lane Bit Rate			10.3125		Gb/s	
Transmission Distance	TD			40	km	
Coupled fiber	Single mode fiber					3

Note :

1. The product name is EQP274X-40D-A.
2. The product name is EQP274X-40DI-A
3. Optical fiber use 9/125um SMF.

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Test Point	Min	Typical	Max	Unit	Notes
Transceiver Power-on Initialization Time				2000	ms	1
Transmitter (each Lane)						
Single-ended Input Voltage Tolerance (Note 2)		-0.3		4.0	V	Referred to TP1 signal common
AC Common Mode Input Voltage Tolerance		15			mV	RMS
Differential Input Voltage Swing Threshold		50			mVpp	LOSA Threshold

Differential Input Voltage Swing	V _{in,pp}	190		700	mVpp	
Differential Input Impedance	Z _{in}	90	100	110	ohm	
Differential Input Return Loss		See IEEE 802.3bm 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	
Eye Mask Coordinates {X1, X2, Y1, Y2}		0.11, 0.31 95, 350			UI mV	Hit Ratio = 5x10-5
Receiver (each Lane)						
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	V _{out,pp}	300		850	mVpp	
Differential Output Impedance	Z _{out}	90	100	110	ohm	
Termination Mismatch at 1MHz				5	%	
Differential Output Return Loss		See IEEE 802.3bm 86A.4.2.1			dB	10MHz-11.1GHz
Common Mode Output Return Loss		See IEEE 802.3bm 86A.4.2.2			dB	10MHz-11.1GHz
Output Transition Time		28			Ps	20% to 80%
J2 Jitter Output	Jo2			0.42	UI	
J9 Jitter Output	Jo9			0.65	UI	
Eye Mask Coordinates {X1, X2, Y1, Y2}		0.29, 0.5, 150, 425			UI mV	Hit Ratio = 5x10-5

Notes:

- 1.Power-on Initialization Time is the time from when the power supply voltages reach and remain above the minimum recommended operating supply voltages to the time when the module is fully functional.
2. The single ended input voltage tolerance is the allowable range of the instantaneous input signals.

Optical and Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
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	

Transmitter						
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	PT			10.5	dBm	
Average Launch Power, each Lane	PAVG	-2.7		4.5	dBm	
Optical Modulation Amplitude (OMA), each Lane	POMA	0.3		5	dBm	1
Difference in Launch Power between any Two Lanes (OMA)	Ptx,diff			4.7	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-0.5			dBm	
TDP, each Lane	TDP			2.6	dB	
Extinction Ratio	ER	5.5			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	12dB reflection
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	RT			-12	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 OFF Transmitter, each Lane	Poff			-30	dBm	
Receiver						
Damage Threshold, each Lane	THd	3.8			dBm	2
Average Receive Power, each Lane		-21.2		-4.5	dBm	
Receiver Reflectance	RR			-26	dB	
Receive Power (OMA), each Lane				-4	dBm	
Receiver Sensitivity (OMA), each Lane	SEN			-18	dBm	3
Difference in Receive Power between any Two Lanes (OMA)	Prx,diff			7.5	dB	
LOS Assert	LOSA	-35			dBm	
LOS Deassert	LOSD			-21	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	FC			12.3	GHz	
Conditions of Stress Receiver Sensitivity Test (Note 5)						
Vertical Eye Closure Penalty, each Lane			2.2		dB	4
Stressed Eye J2 Jitter, each Lane		Per OTL3.4, G.8251			UI	
Stressed Eye J9 Jitter, each Lane		Per OTL3.4, G.8251			UI	

Notes:

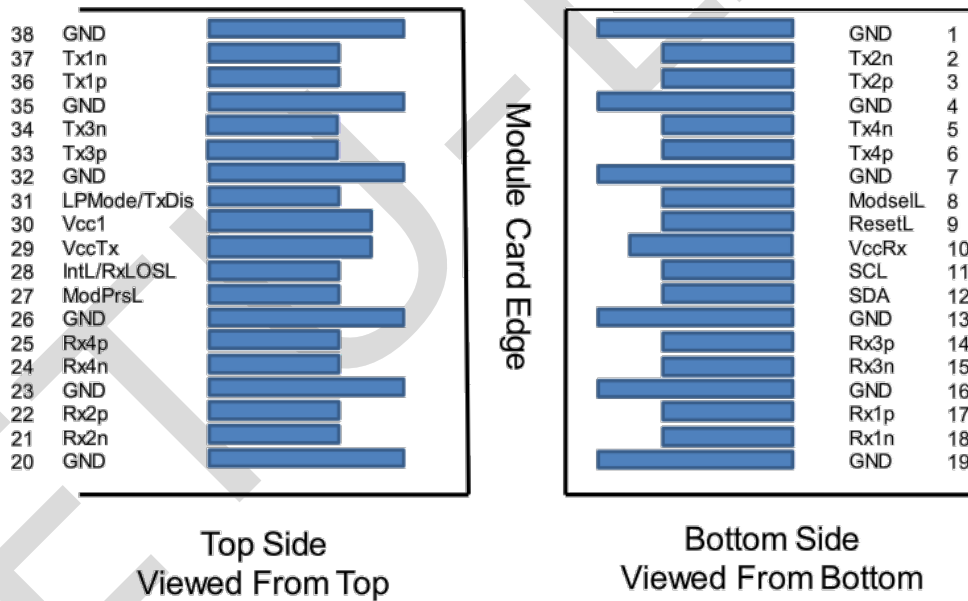
1. Even if the TDP < 0.8 dB, the OMA min must exceed the minimum value specified here.

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 = 1×10^{-12} .
4. MVertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	°C	Internal
Voltage	0 to Vcc	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-2.7 to 4.5	±3	dB	Internal
Rx Input Power	-19 to -4.5	±3	dB	Internal

Pin Diagram



Pin Definitions

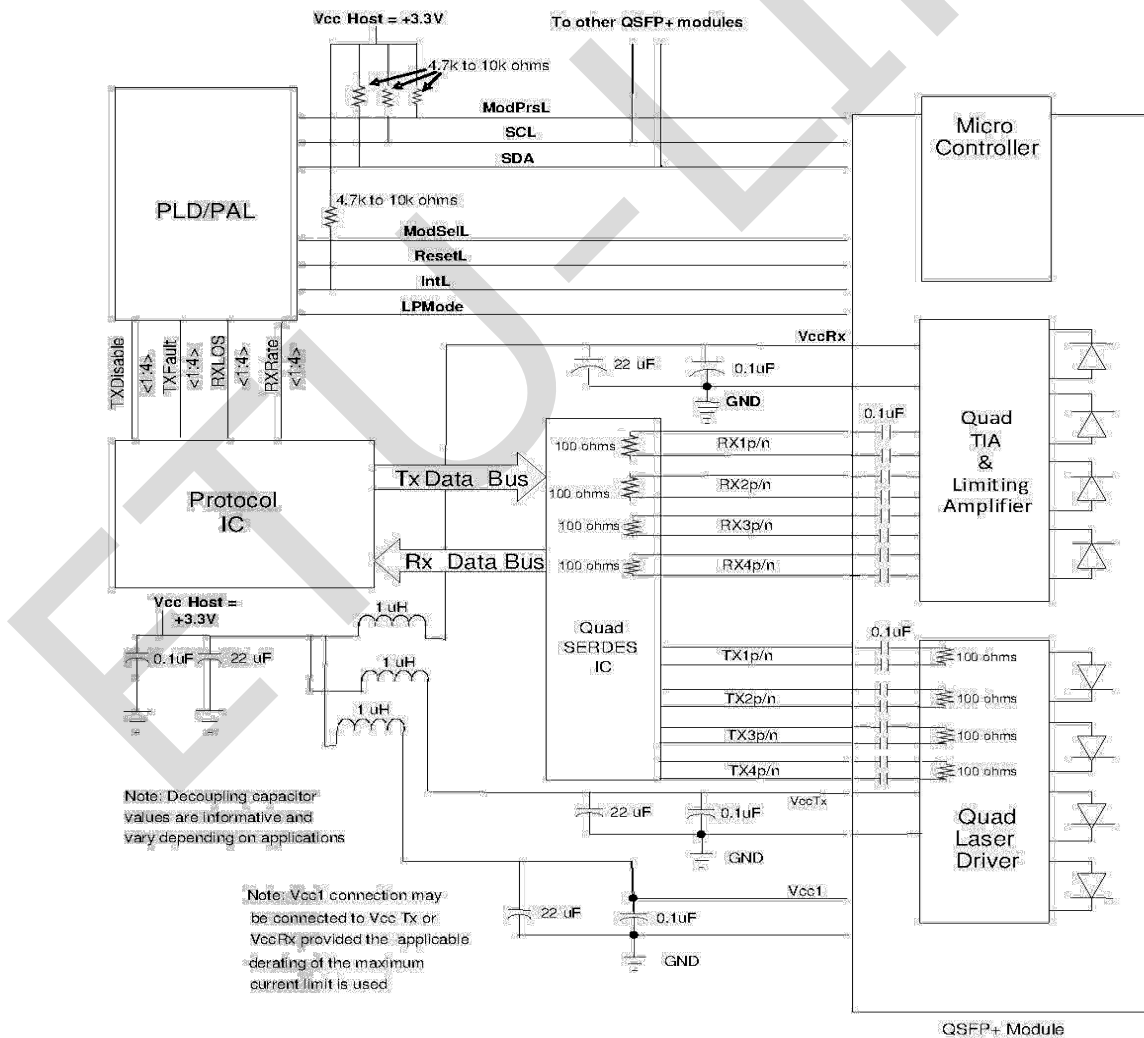
PIN	Logic	Symbol	Description	Plug Seq.	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	3	
7		GND	Ground	1	1
8	LVTTLL-I	ModSelL	Module Select	3	
9	LVTTLL-I	ResetL	Module Reset	3	
10		VccRx	+ 3.3V Power Supply Receiver	2	2
11	LVCNOS-I/O	SCL	2-Wire Serial Interface Clock	3	
12	LVCNOS-I/O	SDA	2-Wire Serial Interface Data	3	
13		GND	Ground	1	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTTL-O	ModPrsL	Module Present	3	
28	LVTTTL-O	IntL/Rx_LOS	Interrupt/Rx_LOS	3	
29		VccTx	+3.3 V Power Supply transmitter	2	2
30		Vcc1	+3.3 V Power Supply	2	2
31	LVTTTL-I	LPMODE/TxDIS	Low Power Mode/Tx_Disable	3	

32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Output	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Output	3	
38		GND	Ground	1	1

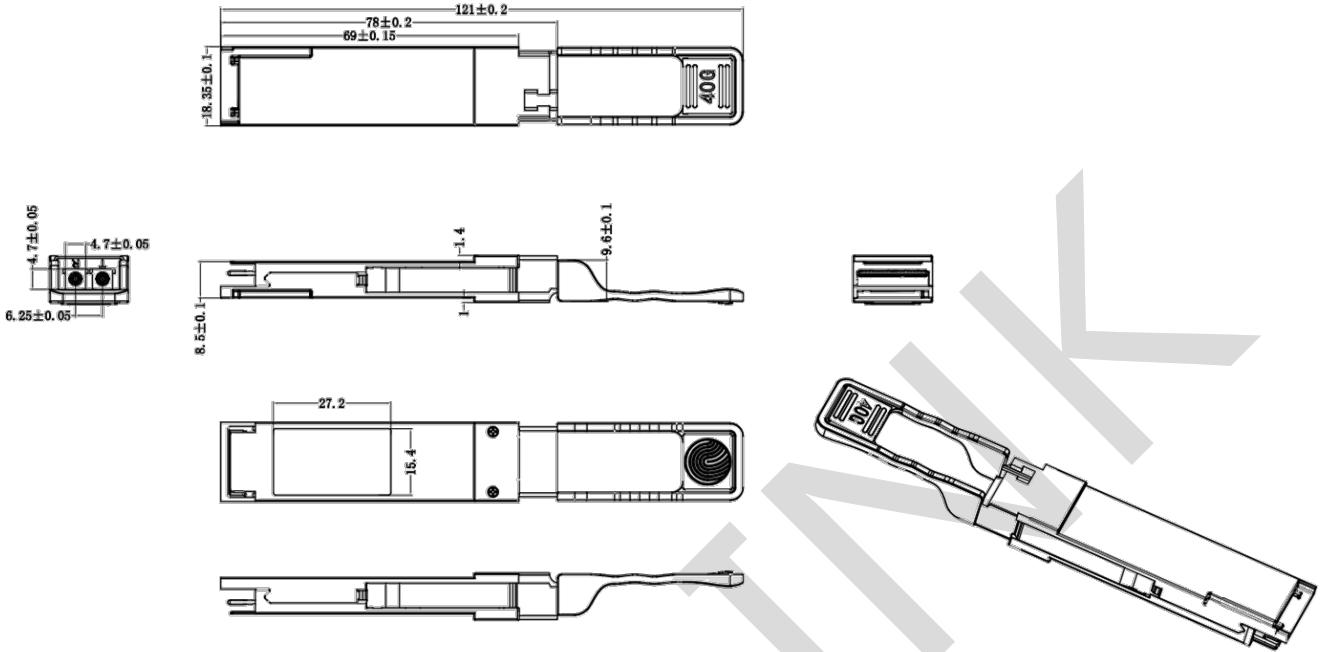
Notes:

- GND is the symbol for signal and supply (power) common for the QSFP+ module. 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 ground plane.
- Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in MSA. The connector pins are each rated for a maximum current of 1000 mA.

Recommended Interface Circuit



Mechanical Diagram



Revision History

Version No.	Date	Description
1.0	February 8, 2020	Preliminary datasheet
2.0	October 11, 2023	Product upgrades
3.0	July 28, 2024	Format change

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