

QSFP+ ER Optical Transceiver

Part Number - VQ-40ER4CS-AA

VQ-40ER4CS-AA is an optical transceiver based on Ethernet IEEE 802.3ba standard and SFF-8436 standard. The QSFP+ transceiver converts 4 inputs channels 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 G694.2.

Features

- Compliant with 40G Ethernet IEEE802.3ba and 40GBASE-ER4 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 40km transmission on single mode fiber (SMF)
- 18.5dB link insertion loss budget
- Maximum 3.5W operation power
- LC duplex connector
- RoHS Compliant
- Operating temperature range (Case temperature): C Grade 0°C to 70°C

Applications

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

Ordering Information

Part Number	Description	Bail Color
VQ-40ER4CS-AA	40G QSFP+ CWDM, CML/CML interface, Up to 40km, with DDMI function	Red

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Storage Temperature	T_S	-40		85	C	
Operating Case Temperature	T_{OP}	0		70	C	
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Relative Humidity (non-condensaton)	RH	0		85	%	
Damage Threshold, each lane	DT	3.8			dBm	
Data Rate, each lane			10.3125	11.2	Gb/s	
Control Input Voltage High		2		V_{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance with G.652	D			40	km	

Optical – Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Total Output Optical Power	P_T			10.5	dBm	1
Average Launch Power (each Lane)	P_{TX}	-3.7		4.5	dBm	
Optical Center Wavelength (L0 Lane)	λ_C	1264.5	1271	1277.5	nm	
Optical Center Wavelength (L1 Lane)	λ_C	1284.5	1291	1297.5	nm	
Optical Center Wavelength (L2 Lane)	λ_C	1304.5	1311	1317.5	nm	
Optical Center Wavelength (L3 Lane)	λ_C	1324.5	1331	1337.5	nm	
Optical Modulation Amplitude (each Lane)	OMA	0.3		5	dB	
Extinction Ratio	ER	5.5			dB	
Side Mode Suppression Ratio	SMSR	30			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Transmitter Dispersion Penalty	TDP			2.6	dB	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Eye Mask	Compliant with IEEE 802.3ba					
Launch Power of OFF Transmitter	P_{OUT_OFF}			-30	dBm	1

1. Average

Optical – Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Optical Center Wavelength (L0 lane)	λ_c	1264.5	1271	1277.5	nm	
Optical Center Wavelength (L1 lane)	λ_c	1284.5	1291	1297.5	nm	
Optical Center Wavelength (L2 lane)	λ_c	1304.5	1311	1317.5	nm	
Optical Center Wavelength (L3 lane)	λ_c	1324.5	1331	1337.5	nm	
Optical Input Power (each lane)	P_{RX}	-20.2		-1.5	dBm	1
Damage Threshold (each lane)	P	3.8			dBm	
Receiver Sensitivity (OMA) (each lane)	R_{X_SEN1}			-18	dBm	
Stressed Receiver Sensitivity in OMA (each lane)				-15.8	dBm	
LOS Assert	LOS_A	-35			dBm	
LOS De-Assert	LOS_D			-20	dBm	
LOS Hysteresis	LOS_H	0.5			dB	

1. Average, Informative

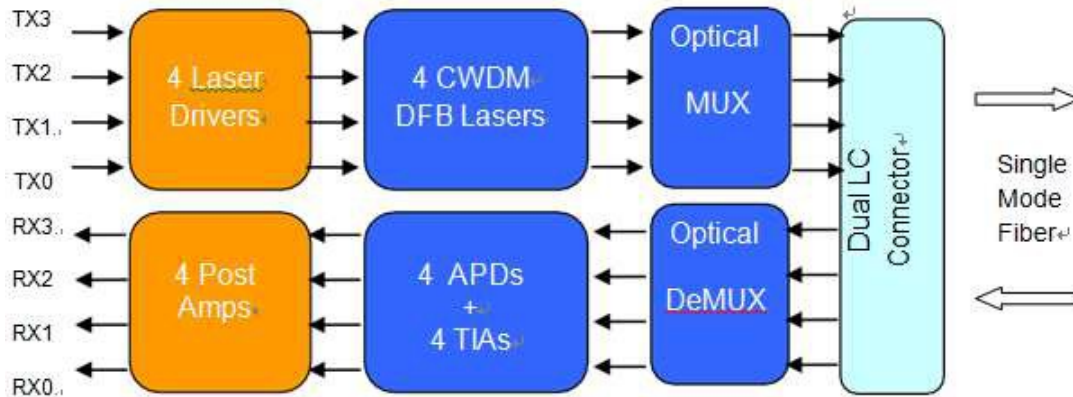
Electrical- Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Input differential impedance	R_{IN}		100		Ω	
Differential data input swing	V_{IN_PP}	190		700	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	

Electrical – Receiver

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Differential data output swing	V_{OUT_PP}	300		850	mV	
Data output rise time (20%-80%)	t_r		30		ps	
Data output fall time (20%-80%)	t_f		30		ps	
LOS Fault	V_{LOS_A}	$V_{CC}-1.3$		V_{CC_HOST}	V	
LOS Normal	V_{LOS_D}	V_{EE}		$V_{EE}+0.5$	V	

Block Diagram



Functional Description

VQ-40ER4CS-AA is an optical transceiver module designed for 40km optical communication applications. The design is compliant to 40GBASE-ER4 of the IEEE P802.3ba standard. The module converts 4 inputs channels of 10Gb/s electrical data into 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 channel signals and converts them to 4 channel output electrical data by APD detectors and TIAs.

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 148-pin connector for the electrical interface. To minimize the optical dispersion in the long-haul system, the single-mode fiber (SMF) is to be applied in this module.

A single +3.3V power supply is required to power up this product. Both power supply pins VccTx and VccRx are internally connected and should be applied concurrently. As per MSA specifications the module offers 7 low speed hardware control pins (including the 2-wire serial interface): ModSelL, SCL, SDA, ResetL, LPMode, ModPrsL, and IntL.

Module Select (ModSelL) is an input pin. When held low by the host, this product responds to 2-wire serial communication commands. The ModSelL allows the use of this product on a single 2-wire interface bus – individual ModSelL lines must be used.

Serial Clock (SCL) and Serial Data (SDA) are required for the 2-wire serial bus communication

interface and enable the host to access the QSFP+ memory map.

The ResetL pin enables a complete reset, returning the settings to their default state, when a low level on the ResetL pin is held for longer than the minimum pulse length. During the execution of a reset the host shall disregard all status bits until it indicates a completion of the reset interrupt. The product indicates this by posting an IntL (Interrupt) signal with the Data_Not_Ready bit negated in the memory map. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset.

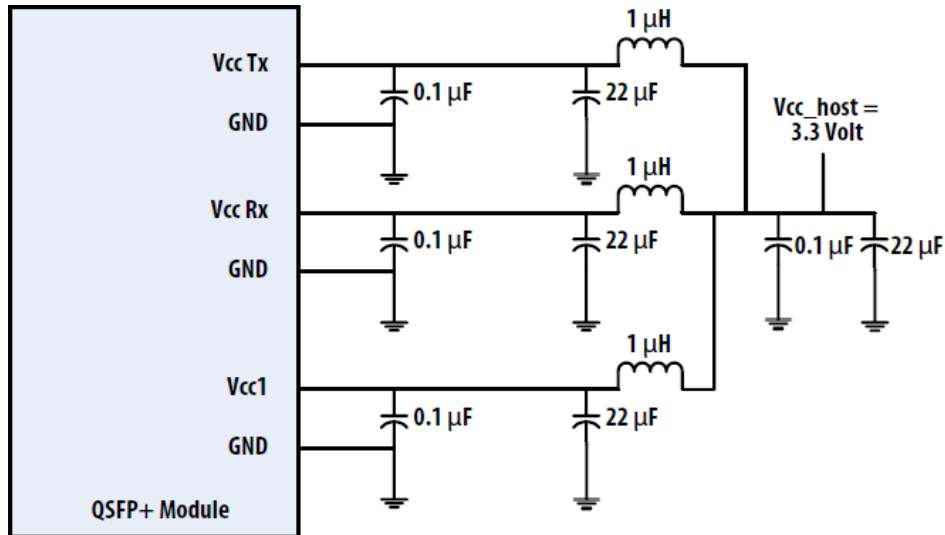
Low Power Mode (LPMode) pin is used to set the maximum power consumption for the product as to protect the hosts that are not capable of cooling higher power modules, should such modules be accidentally inserted.

Module Present (ModPrsL) is a signal local to the host board which, in the absence of a product, is normally pulled up to the host Vcc. When the product is inserted into the connector, it completes the path to ground through a resistor on the host board and asserts the signal.

ModPrsL then indicates its present by setting ModPrsL to a “Low” state.

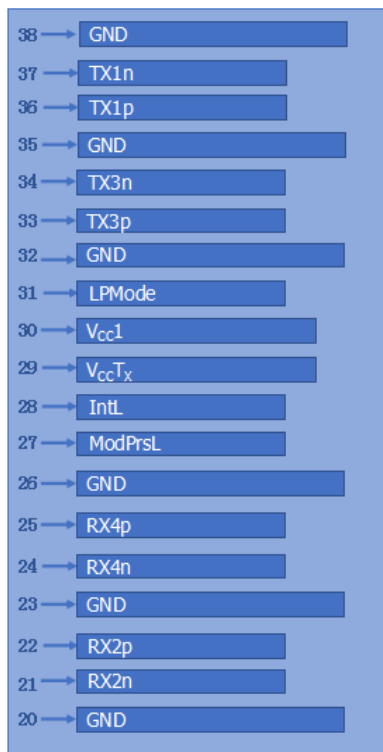
Interrupt (IntL) is an output pin. “Low” indicates a possible operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled to the Host Vcc voltage on the Host board.

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.

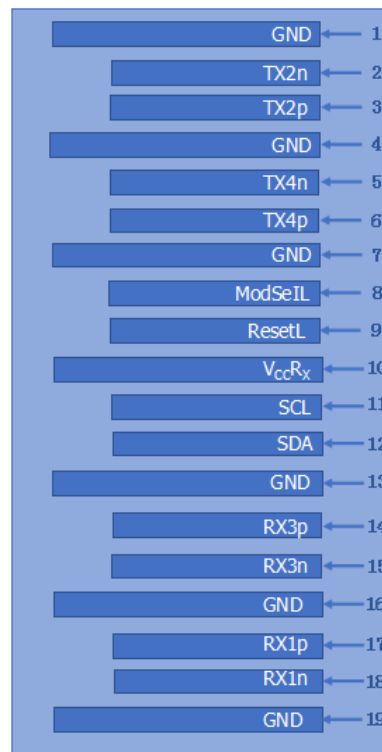


Recommended Power Supply Filter

Electrical Connector Layout



Top of Board



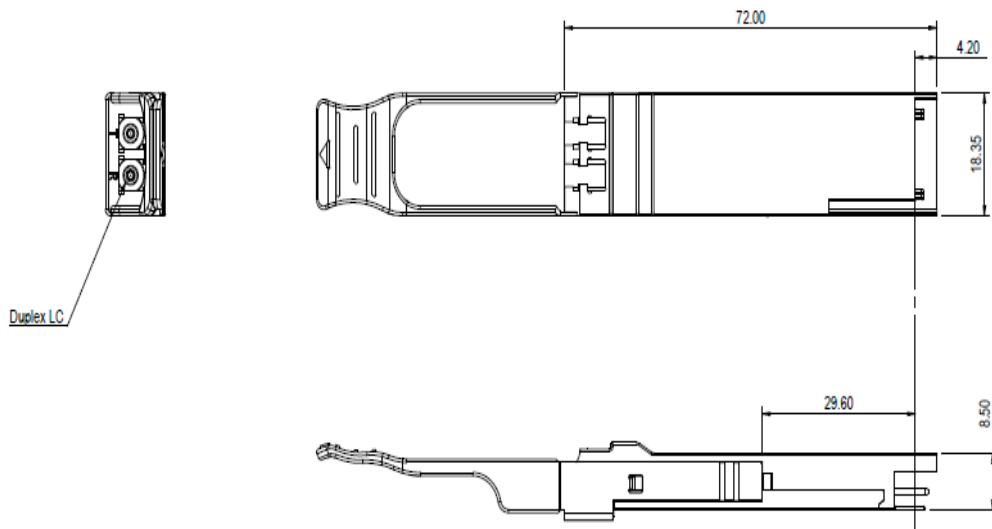
Bottom of Board

Electrical Pin Definition

PIN #	Symbol	Description	Remarks
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input, LAN2	
3	Tx2p	Transmitter Non-Inverted Data Input, LAN2	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input, LAN4	
6	Tx4p	Transmitter Non-Inverted Data Input, LAN4	
7	GND	Ground	1
8	ModSelL	Module select	
9	ResetL	Module Reset	
10	V _{CC} R _X	+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, LAN3	
15	Rx3n	Receiver Inverted Data Output, LAN3	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output, LAN1	
18	Rx1n	Receiver Inverted Data Output, LAN1	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output, LAN2	
22	Rx2p	Receiver Non-Inverted Data Output, LAN2	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output, LAN4	1
25	Rx4p	Receiver Non-Inverted Data Output, LAN4	
26	GND	Ground	1
27	ModPrsL	Module Present	
29	IntL	Interrupt	
29	V _{CC} T _X	+3.3V Power Supply transmitter	2
30	V _{CC} 1	+3.3V Power Supply	2
31	LPMODE	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input, LAN3	
34	Tx3n	Transmitter Inverted Data Input, LAN3	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input, LAN1	
37	Tx1n	Transmitter Inverted Data Input, LAN1	
38	GND	Ground	1

1. Ground is the symbol and supply (power) common for QSFP+ modules. All are common within the QSFP+ module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1, and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering. VccRx, Vcc1, and VccTx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

Mechanical Dimensions



ALL DIMENSIONS ARE ± 0.2 mm UNLESS OTHERWISE SPECIFIED
UNIT: mm

Contact Information

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