QSFP+ AOC Series

ETU-LINK
Optical Communication System

QSFP+

EQA4X-343LCDxx

40G QSFP+ Active Optical Cable to 4x double LC connector

QSFP+ AOC end:

➢ Compliant to the 40GBASE-SR4 and XLPPI
   Specification per IEEE 802.3ba-2010 and supporting
   40G-IB-QDR / 20G-IB-DDR / 10G-IB-SDR applications
➢ Compliant to the industry standard SFF-8436
   QSFP+ Specification
➢ Power Level 1: Max Power < 1.5 W
➢ Operate at 10.3125 Gbps per channel with 64b/66b

encoded data for 40GbE application and at 10 Gbps
with 8b/10b compatible encoded data for 40G-IB-QDR application

Each 4× Double LC Connect end:

➢ With double LC Single Mode connect, or double LC Muti-mode connect

Active Optical Cable Assembly:

➢ 0 to 70 C degree case temperature operating range
➢ Proven High Reliability 850 nm technology: Rayoptek VCSEL transmitter and Rayoptek PIN receiver
➢ Hot pluggable for ease of servicing and installation
➢ Two Wire Serial interface
➢ Utilizes optical fiber for high density and thin, lightweight cable management

Applications

➢ 40GbE and 10GbE break-out applications for Datacom switch and router connections

➢ 40G to 4×10G density applications for Datacom and Proprietary protocol applications

➢ Datacenter

Description

The ETU-link EQA4X-343LCDxx is a Four-Channel, Pluggable, Parallel, Fiber-Optic QSFP+ Active Optical Cable (AOC) to 4× double LC connect Cable break-out solution. This Breakout cable is intended for 40G to 4× 10G applications.

This AOC is a high performance cable for short-range multi-lane data communication and interconnect applications. It integrates four data lanes in each direction with 40 Gbps aggregate bandwidth. Each lane can operate at 10.3125 Gbps. These cables also support 4 x 10G InfiniBand QDR applications and are backwards compatible to the 4 × 5G IB DDR and 4 × 2.5G IB single IB SDR applications.

This product is leveraged from ETU-LINK QSFP+ to QSFP+ Active Optical Cable product and SFP+ Active Optical Cable product. Where applicable, consult these respective datasheets

This AOC incorporates ETU-LINK' proven integrated circuit and VCSEL technology to provide reliable long life, high performance, and consistent service.

Absolute Maximum Ratings

The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	TST	-40	85	degC	
Relative Humidity(non-condensing)	RH	0	85	%	
Operating Case Temperature	TOPC	0	70	degC	
Supply Voltage	VCC	-0.3	3.6	V	
Input Voltage	Vin	-0.3	Vcc+0.3	V	

Recommended Operating Conditions and Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	TOPC	0		70	degC
Power Supply Voltage	VCC	3.13	3.3	3.47	V
Data Rate	DR		10.3	11.3	Gbps
Data Speed Tolerance	ΔDR	-100		+100	ppm
Link Distance with OM3 fiber	D	0		100	m
Control* Input Voltage High	Vih	2		VCC+0.3	V
Control* Input Voltage Low	Vil	-0.3		0.8	V
I2C Serial Interface frequence	fs			400k	Hz
Power Supply Noise				50	mVpp
Receiver Differential Data Output Load				100	mVpp

Active Cable-End Electrical Characteristics

The following characteristics are defined over the Recommended Operating Conditions unless otherwise noted. Typical values are for Tc = 40 °C, Vcc = 3.3 V

Parameter	Symbol	Min	Typical	Max	Unit
QSFP+ 40G Active Cable-End Power Consumption				1.5	W
QSFP+ 40G Active Cable-End Power Supply Current				300	mA

QSFP+ AOC-end Electrical Characteristics Electrical Specifications

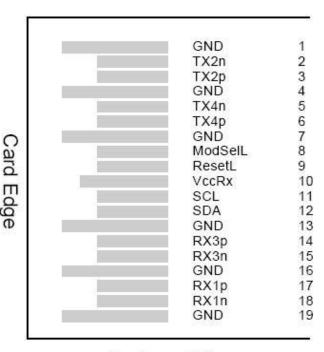| Parameter	Symbol	Min	Typical	Max	Unit
Differential input impedance	Zin	90	100	110	ohm
Differential Output impedance	Zout	90	100	110	ohm
Differential input voltage amplitude	ΔVin	300		1100	mVp-p
Differential output voltage amplitude	ΔVout	400		800	mVp-p
Bit Error Rate	BR			E-12	
Input Logic Level High	VIH	2.0		VCC	V
Input Logic Level Low	VIL	0		0.8	V
Output Logic Level High	VOH	VCC-0.5		VCC	V
Output Logic Level Low	VOL	0		0.4	V

QSFP+ AOC - end Pin Descriptions

PIN	Logic	Symbol	Name/Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+ 3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	

15	CML-O	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTL-I	LPMode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

Notes:

1) Module circuit ground is isolated from module chassis ground within the module. GND is the symbol for signal and supply (power) common for QSFP modules.

2) The connector pins are each rated for a maximum current of 500mA.

```
38  GND                          GND        1
37  TX1n                         TX2n       2
36  TX1p                         TX2p       3
35  GND                          GND        4
34  TX3n                         TX4n       5
33  TX3p                         TX4p       6
32  GND                          GND        7
31  LPMode                       ModSelL    8
30  Vcc1                         ResetL     9
29  VccTx                        VccRx      10
28  IntL                         SCL        11
27  ModPrsL                      SDA        12
26  GND                          GND        13
25  RX4p                         RX3p       14
24  RX4n                         RX3n       15
23  GND                          GND        16
22  RX2p                         RX1p       17
21  RX2n                         RX1n       18
20  GND                          GND        19
```

Card Edge

Top Side
Viewed from Top

Bottom Side
Viewed from Bottom

ModSelL Pin

The ModSelL is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP modules on a single 2-wire interface bus. When the ModSelL is "High", the module will not respond to any 2-wire interface communication from the host. ModSelL has an internal pull-up in the module.

ResetL Pin

Reset. LPMode_Reset has an internal pull-up in the module. A low level on the ResetL pin for longer than the minimum pulse length (t_Reset_init) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time (t_init) starts on the rising edge after the low level on the ResetL pin is released. During the execution of a reset (t_init) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL signal with the Data_Not_Ready bit negated. Note that on power up (including hot insertion) the module will post this completion of reset interrupt without requiring a reset.

LPMode Pin

ETU-LINK QSFP+ SR4 operate in the low power mode (less than 1.5 W power consumption) This pin active high will decrease power consumption to less than 1W.

ModPrsL Pin

ModPrsL is pulled up to Vcc on the host board and grounded in the module. The ModPrsL is asserted "Low" when the module is inserted and deasserted "High" when the module is physically absent from the host connector.

IntL Pin

IntL is an output pin. When "Low", it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt by using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled up to Vcc on the host board.

QSFP+ AOC-end Power Supply Filtering

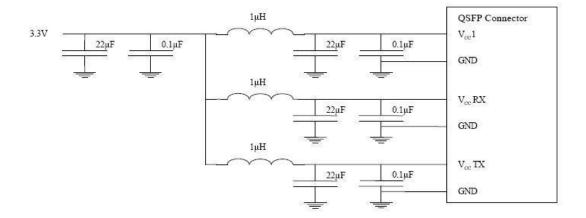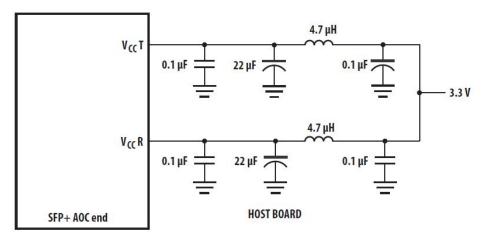The host board should use the power supply filtering shown in Figure1.

Figure1. Host Board Power Supply Filtering

QSFP+ AOC-end EEPROM Serial ID Memory Contents

Compliant to the industry standard SFF-8436 QSFP+ Specification

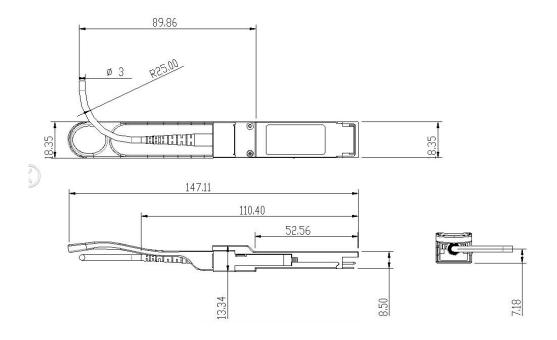## QSFP+ AOC-end Power Supply Filtering

NOTE: INDUCTORS MUST HAVE LESS THAN 1Ω SERIES RESISTANCE TO LIMIT VOLTAGE DROP TO THE SFP MODULE.

Optical Fiber Specifications

Parameter	Specification
Tight buffer color	Blue
Tight buffer material	PVC
Fiber type	62.5/125 (OFS) Bandwith:160 MHz.km @ 850 nm
Jacket material	PVC
Cable diameter mm	3.0 ± 0.1
Cable weight Kg/km	7.0
Min. bending radius mm	30
Attenuation dB/km	≤ 3.5 at 850 nm ≤ 1.5 at 1300 nm
Short tension N	120
Operation temperature °C	-20~70

QSFP+ AOC end Mechanical Specifications

ESD

This transceiver is specified as ESD threshold 1KV for high speed data pins and 2KV for all others electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM).   However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

This is a Class 1 Laser Product according to IEC 60825-1:2007.   This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007)

Order Information

Part Number	Product Description
EQA4X-343LCDxx	40Gb/s QSFP+ – 4xdouble LC SM/MM Connector

Notes:
where "xx" denotes cable length in meters. Examples are as follows:
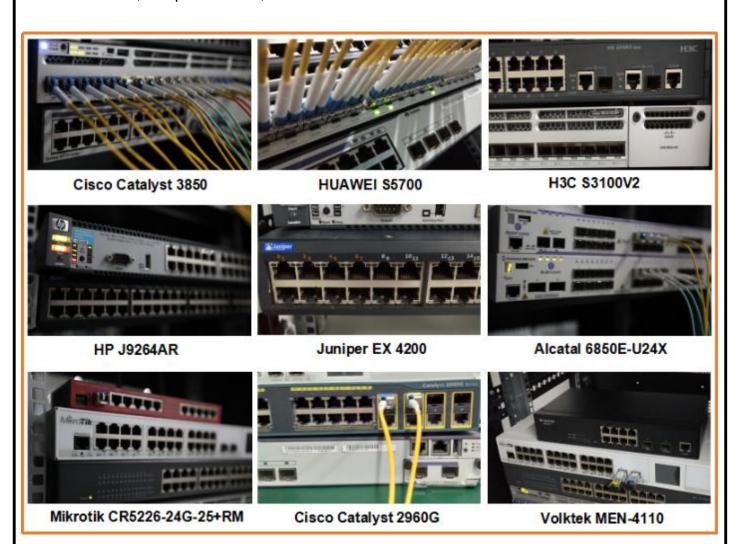xx = 03 for 3m,   xx = 10 for 10m,   xx = 50 for 50m,   xx = A0 for 100m

Performance figures, data and any illustrative material provided in this data sheet are typical and must be specifically confirmed in writing by ETU-LINK before they become applicable to any particular order or contract. In accordance with the
ETU-LINK policy of continuous improvement specifications may change without notice. The publication of information in this data sheet does not imply freedom from patent or other protective rights of ETU-LINK or others. Further details are available from any ETU-LINK sales representative.

Compatibility Test

In order to ensure the product compatibility, our products will be tested on the switch before shipment. Our modules can compatible with many mainstream brand switches, such as Cisco, Juniper, Extreme, Brocade, IBM, H3C, HP, Huawei, D-Link, Mikrotik, ZTE, TP-Link...

Our test equipment: VOLKTEK MEN-4110, HP 2530-8G, CRS226-24G-25+RM, Catalyst 2960G Series, Catalyst 3850 XS 10G SFP+, Catalyst 3750-E Series, HUAWEI S5700Series, H3C S3100V2 Series, Juniper-EX4200, etc.

Cisco Catalyst 3850

HUAWEI S5700

H3C S3100V2

HP J9264AR

Juniper EX 4200

Alcatal 6850E-U24X

Mikrotik CR5226-24G-25+RM

Cisco Catalyst 2960G

Volktek MEN-4110

Product Production Process

Quality Assurance

Continuous introduction of new equipment, produced by strict standards, strict quality inspection, to guarantee the high quality standard of each product.

Standardized Production Line

Professional Welding

Assembling

Aging Testing

Distance Testing

Cleaning end face

Product Initial Test

Switch Testing

Product Final Test

Packaging

Individual package.

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