

Datasheet

QSFP28 100G AOC Active 100mQSFP28 100G AOC Active Optical Cable

QSFP28-AOC-A100M-T

(For Cisco, HP, Aruba, Juniper, PaloAlto, Fortigate and others brand compatible)

TCONNECT



Overview

QSFP28-AOC-A1M-T is a Four-Channel, Pluggable, Parallel, Fiber-Optic QSFP+ AOC for 100 Gigabit Ethernet and Infiniband EDR Applications. This AOC is a high performance module for short-range multi-lane data communication and interconnect applications. It integrates four data lanes in each direction with 100 Gbps bandwidth. Each lane can operate at 25.78125 Gbps up to 70 m using OM3 fiber or 100 m using OM4 fiber.

This module is designed to operate over multimode fiber systems using a nominal wavelength of 850nm. The electrical interface uses a 38 contact edge type connector. The optical interface uses a 12 fiber MTP

(MPO) connector. This module incorporates proven circuit and VCSEL technology to provide reliable long life, high performance, and consistent service.

Features

- ◆ 4 channels full-duplex transceiver modules
- ◆ Supports 100Gbps total data rate
- ◆ Transmission data rate up to 28.05Gbps per channel
- ◆ 4 channels 850nm VCSEL array
- ◆ 4 channels PIN photo detector array
- ◆ Low power consumption <3.5W
- ◆ Hot Pluggable QSFP form factor
- ◆ Maximum link length of 70m on OM3 Multimode Fiber (MMF) and 100m on OM4 MMF
- ◆ Single MPO connector receptacle
- ◆ Built-in digital diagnostic functions
- ◆ Operating case temperature 0°C to +70°C
- ◆ 3.3V power supply voltage
- ◆ RoHS 6 compliant (lead free)

Applications

- ◆ IEEE 802.3bm 100GBASE SR4
- ◆ Infiniband EDR
- ◆ 128G Fibre Channel
- ◆ 4x28Gb/s Multimode OTN

Ordering Information

Part Number	Product Description
QSFP28-AOC-A1M-T	QSFP28 100G AOC Active 1mQSFP28 100G AOC 1m100GAOC1mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A2M-T	QSFP28 100G AOC Active 2mQSFP28 100G AOC 2m100GAOC2mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A3M-T	QSFP28 100G AOC Active 3mQSFP28 100G AOC 3m100GAOC3mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A5M-T	QSFP28 100G AOC Active 5mQSFP28 100G AOC 5m100GAOC5mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A7M-T	QSFP28 100G AOC Active 7mQSFP28 100G AOC 7m100GAOC7mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A10M-T	QSFP28 100G AOC Active 10mQSFP28 100G AOC 10m100GAOC10mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A15M-T	QSFP28 100G AOC Active 15mQSFP28 100G AOC 15m100GAOC15mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A20M-T	QSFP28 100G AOC Active 20mQSFP28 100G AOC 20m100GAOC20mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A25M-T	QSFP28 100G AOC Active 25mQSFP28 100G AOC 25m100GAOC25mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A30M-T	QSFP28 100G AOC Active 30mQSFP28 100G AOC 30m100GAOC30mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A50M-T	QSFP28 100G AOC Active 50mQSFP28 100G AOC 50m100GAOC50mQSFP28 to QSFP280~70°C OM3
QSFP28-AOC-A100M-T	QSFP28 100G AOC Active 100mQSFP28 100G AOC 100m100GAOC100mQSFP28 to QSFP280~70°C OM3

Datasheet

Module Block Diagram

100GBASE-SR4 QSFP28 is one kind of parallel transceiver. VCSEL and PIN array package is key technique, through I2C system can contact with module.

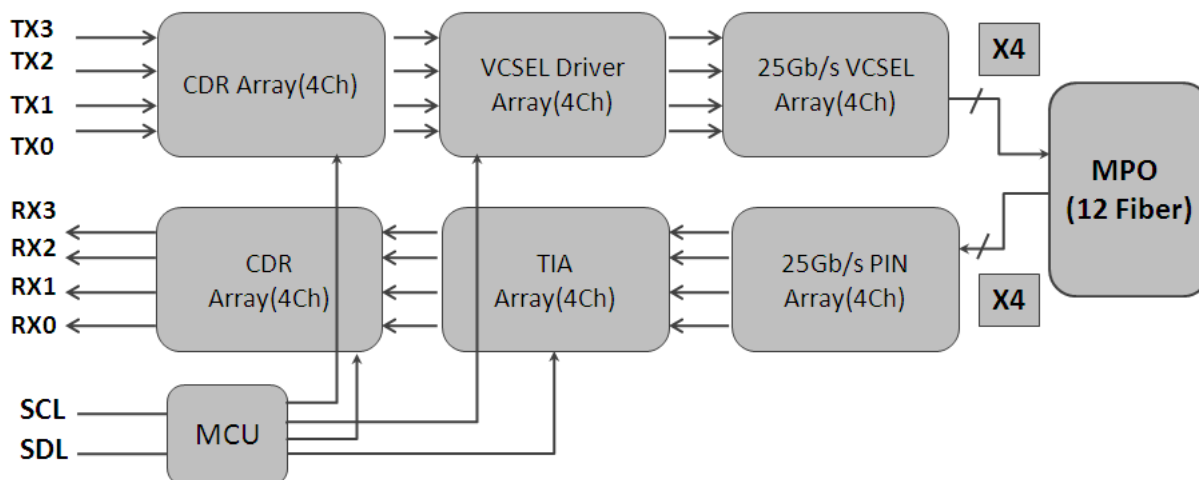


Figure1. Module Block Diagram

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.3	3.6	V
Input Voltage	Vin	-0.3	Vcc+0.3	V
Storage Temperature	Tst	-20	85	°C
Case Operating Temperature	Top	0	70	°C
Humidity (non-condensing)	Rh	5	95	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	Vcc	3.13	3.3	3.47	V
Operating Case temperature	Tca	0		70	°C
Data Rate Per Lane	fd		25.78125		Gbps
Humidity	Rh	5		85	%
Power Dissipation	Pm			3.5	W
Fiber Bend Radius	Rb	3			cm

Datasheet

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	ΔV_{in}	300		1100	mVp-p
Differential output voltage amplitude	ΔV_{out}	500		800	mVp-p
Skew	Sw			300	ps
Bit Error Rate	BER			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

Note:

1. BER=10⁻¹²; PRBS 2³¹-1@10.3125Gbps.
2. Differential input voltage amplitude is measured between TxnP and TxnN
3. Differential output voltage amplitude is measured between RxNP and RxnN

Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Centre Wavelength	λ_c	840	850	860	nm	-
RMS spectral width	$\Delta\lambda$	-	-	0.6	nm	-
Average launch power, each lane	Pout	-8.4	-	2.4	dBm	-
Optical Modulation Amplitude (OMA),each lane	OMA	-6.4		3	dBm	-
Transmitter and dispersion eye closure(TDEC),each lane	TDEC			4.3	dB	
Extinction Ratio	ER	3	-	-	dB	-
Average launch power of OFF transmitter, each lane				-30	dB	-
Eye Mask coordinates: X1, X2, X3, Y1, Y2, Y3	SPECIFICATION VALUES {0.3,0.38,0.45,0.35,0.41,0.5}					Hit Ratio = 5x10-5
Receiver						
Centre Wavelength	λ_c	840	850	860	nm	-
Stressed receiver sensitivity in OMA				-5.2	dBm	1
Maximum Average power at receiver, each lane				2.4	dBm	-

Datasheet

Minimum Average power at receiver , each lane				-10.3	dBm	
Receiver Reflectance				-12	dB	-
LOS Assert		-30			dBm	-
LOS De-Assert – OMA				-7.5	dBm	-
LOS Hysteresis		0.5			dB	-

Note:

1. Measured with conformance test signal at TP3 for BER = 10e-12

Pin Descriptions

Pin	Logic	Symbol	Name/Description	Ref.
1		GND	Module Ground	1
2	CML-I	Tx2-	Transmitter inverted data input	
3	CML-I	Tx2+	Transmitter non-inverted data input	
4		GND	Module Ground	1
5	CML-I	Tx4-	Transmitter inverted data input	
6	CML-I	Tx4+	Transmitter non-inverted data input	
7		GND	Module Ground	1
8	LVTTL-I	MODSEIL	Module Select	2
9	LVTTL-I	ResetL	Module Reset	2
10		VCCR _x	+3.3v Receiver Power Supply	
11	LVC _{MOS} -I	SCL	2-wire Serial interface clock	2
12	LVC _{MOS} -I/O	SDA	2-wire Serial interface data	2
13		GND	Module Ground	1
14	CML-O	RX3+	Receiver non-inverted data output	
15	CML-O	RX3-	Receiver inverted data output	
16		GND	Module Ground	1
17	CML-O	RX1+	Receiver non-inverted data output	
18	CML-O	RX1-	Receiver inverted data output	
19		GND	Module Ground	1
20		GND	Module Ground	1
21	CML-O	RX2-	Receiver inverted data output	
22	CML-O	RX2+	Receiver non-inverted data output	
23		GND	Module Ground	1
24	CML-O	RX4-	Receiver inverted data output	

Datasheet

25	CML-O	RX4+	Receiver non-inverted data output	
26		GND	Module Ground	1
27	LVTTL-O	ModPrsL	Module Present, internal pulled down to GND	
28	LVTTL-O	IntL	Interrupt output, should be pulled up on host board	2
29		VCCTx	+3.3v Transmitter Power Supply	
30		VCC1	+3.3v Power Supply	
31	LVTTL-I	LPMODE	Low Power Mode	2
32		GND	Module Ground	1
33	CML-I	Tx3+	Transmitter non-inverted data input	
34	CML-I	Tx3-	Transmitter inverted data input	
35		GND	Module Ground	1
36	CML-I	Tx1+	Transmitter non-inverted data input	
37	CML-I	Tx1-	Transmitter inverted data input	
38		GND	Module Ground	1

Notes:

1. Module circuit ground is isolated from module chassis ground within the module
2. Open collector; should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V

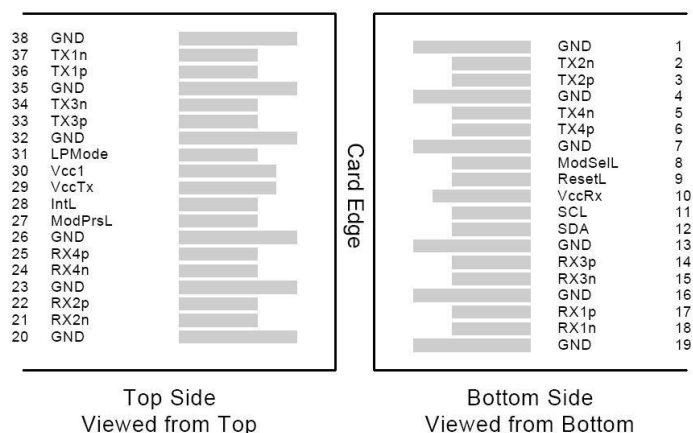


Figure2. Electrical Pin-out Details

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

Datasheet

minimum pulse length ($t_{\text{Reset_init}}$) 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

QSFP28 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.

Power Supply Filtering

The host board should use the power supply filtering shown in Figure3.

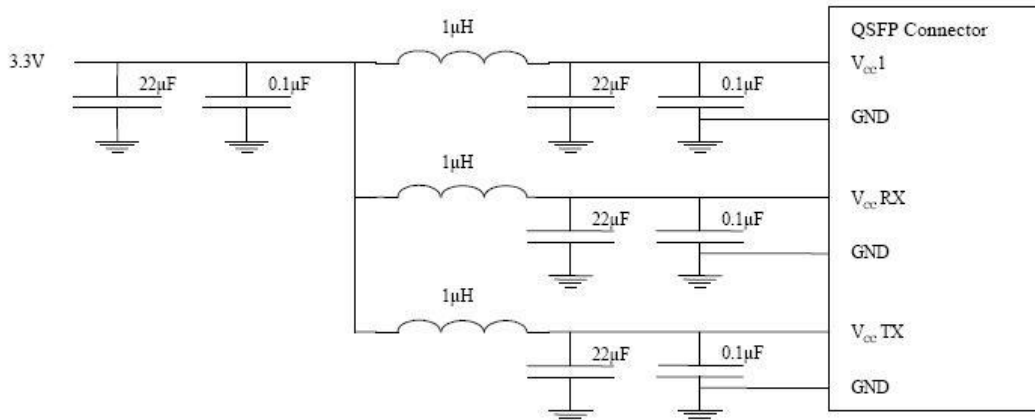


Figure3. Host Board Power Supply Filtering

Datasheet

Timing for Soft Control and Status Functions

Parameter	Symbol	Max	Unit	Conditions
Initialization Time	t_init	2000	ms	Time from power on ¹ , hot plug or rising edge of Reset until the module is fully functional ²
Reset Init Assert Time	t_reset_init	2	μs	A Reset is generated by a low level longer than the minimum reset pulse time present on the ResetL pin.
Serial Bus Hardware Ready Time	t_serial	2000	ms	Time from power on ¹ until module responds to data transmission over the 2-wire serial bus
Monitor Data Ready Time	t_data	2000	ms	Time from power on ¹ to data not ready, bit 0 of Byte 2, deasserted and IntL asserted
Reset Assert Time	t_reset	2000	ms	Time from rising edge on the ResetL pin until the module is fully functional ²
LPMODE Assert Time	ton_LPMODE	100	μs	Time from assertion of LPMODE (Vin:LPMODE = Vih) until module power consumption enters lower Power Level
IntL Assert Time	ton_IntL	200	ms	Time from occurrence of condition triggering IntL until Vout:INTL = Vol
IntL Deassert Time	toff_IntL	500	μs	Time from clear on read ³ operation of associated flag until Vout:INTL = Voh. This includes deassert times for Rx LOS, Tx Fault and other flag bits.
Rx LOS Assert Time	ton_los	100	ms	Time from Rx LOS state to Rx LOS bit set and IntL asserted
Tx Fault Assert Time	ton_Txfault	200	ms	Time from Tx Fault state to Tx Fault bit set and IntL asserted
Flag Assert Time	ton_flag	200	ms	Time from occurrence of condition triggering flag to associated flag bit set and IntL asserted
Mask Assert Time	ton_mask	100	ms	Time from mask bit set ⁴ until associated IntL assertion is inhibited
Mask Deassert Time	toff_mask	100	ms	Time from mask bit cleared ⁴ until associated IntL operation resumes
ModSelL Assert Time	ton_ModSelL	100	μs	Time from assertion of ModSelL until module responds to data transmission over the 2-wire serial bus
ModSelL Deassert Time	toff_ModSelL	100	μs	Time from deassertion of ModSelL until the module does not respond to data transmission over the 2-wire serial bus
Power_over-ride or Power-set Assert Time	ton_Pdown	100	ms	Time from P_Down bit set ⁴ until module power consumption enters lower Power Level
Power_over-ride or Power-set Deassert Time	toff_Pdown	300	ms	Time from P_Down bit cleared ⁴ until the module is fully functional ³

Note:

1. Power on is defined as the instant when supply voltages reach and remain at or above the minimum specified value.
2. Fully functional is defined as IntL asserted due to data not ready bit, bit 0 byte 2 deasserted.
3. Measured from falling clock edge after stop bit of read transaction.
4. Measured from falling clock edge after stop bit of write transaction.

Datasheet

Mechanical Dimensions

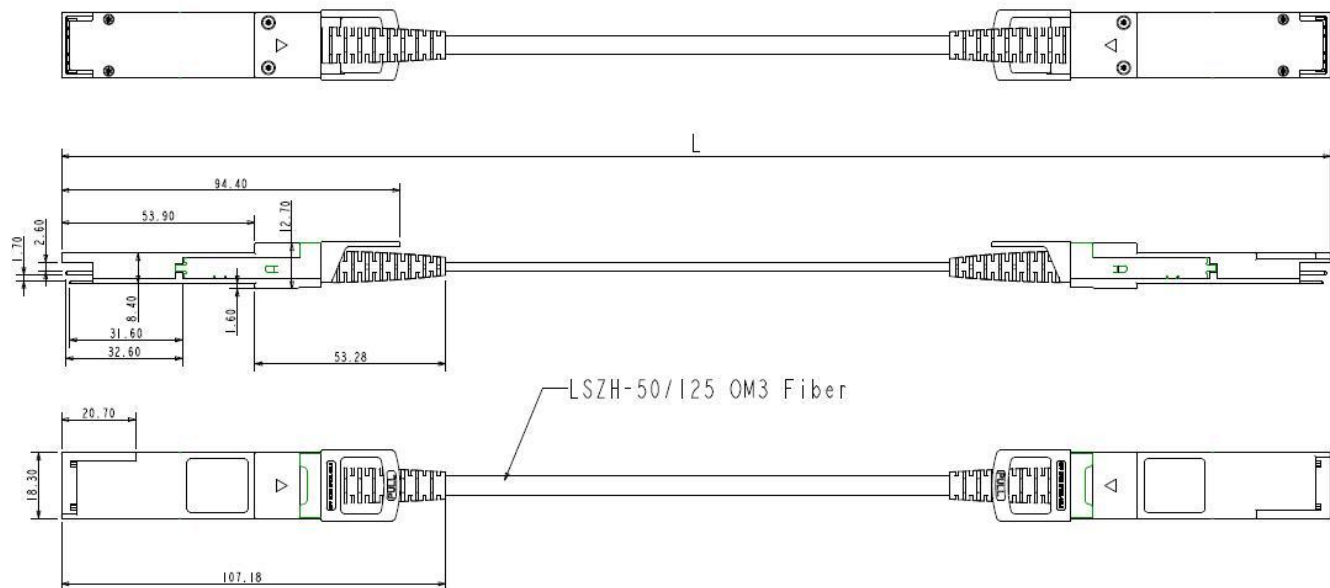


Figure8. Mechanical Specifications

References

1. SFF-8436 QSFP+
2. Ethernet 100GBASE-SR4

ITK Connecting Co.,Ltd.

ITK Connecting reserves the right to make changes to or discontinue any optical link product or service identified in this document without notice in order to improve design and/or performance. If you have any question regarding this specification sheet, please contact our sales representative or send email to sales@itk.co.th