ATGBICS® by APPROVED TECHNOLOGY

Technical Datasheet

QD400-QD400AOC-xM

400GBase QSFP-DD Active Optical Cable

0.5m to 100m Lengths, 850nm, Commercial Temperature

FEATURES

- Hot-pluggable QSFP-DD form factor
- VCSEL transmitter and PIN PD receiver
- Support 425Gb/s aggregate bit rate
- Compliant with IEEE 802.3-2022 standard: 400GAUI-8 electrical interface
- Compliant with QSFP-DD MSA HW Rev 7.0 type 2A housing
- Compliant with CMIS Rev 5.0
- Support 0.5m~100m transmission with OM4 MMF
- Case operating temperature 0°C to 70°C
- Two wire serial Interface with digital diagnostic monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant)

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	TS	-40		85	ºC
Supply Voltage	VCC	-0.5		3.6	V
Relative Humidity (non-condensing)	RH	5		95	%
Data Input Voltage Differential	IVDIP-VDINI	-		1	V
Control Input Voltage	VI	-0.3		VCC+0.5	V
Control Output Current	IO	-20		20	mA

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RECOMMENDED OPERATING ENVIRONMENT

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Operating Case Temperature	TOPR	0	-	70	ºC	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Instantaneous peak current at hot plug	ICC_IP	-	-	3600	mA	
Sustained peak current at hot plug	ICC_SP	-	-	2970	mA	
Maximum Power Dissipation	PD	-	-	9	W	
Maximum Power Dissipation, Low Power Mode	PDLP	-	-	1.5	W	
Signalling speed	DRL	-	425	-	Gbd	PAM4
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz	
Module power supply noise tolerance 10 Hz -10 MHz (ptp)	-	-	-	66	mVpp	
Rx Differential Data Output Load	-	-	100	-	Ohm	

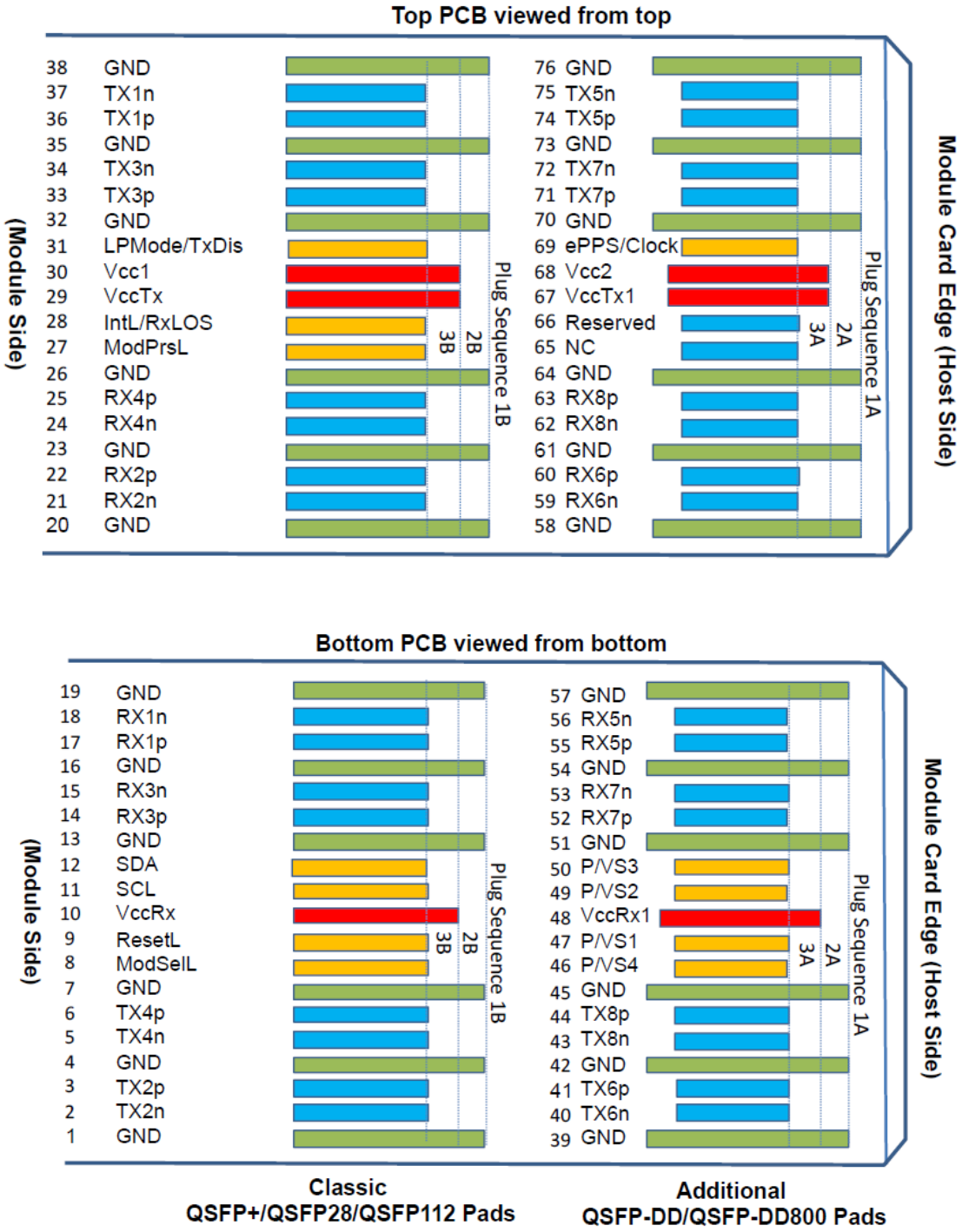
ELECTRICAL CHARACTERISTICS (High Speed Signal – Compliant With IEEE 802.3 400GAUI-8)

Parameter	Symbol	Min.	Typical	Max.	Unit
TRANSMITTER					
Differential pk-pk input Voltage tolerance		900	-	-	mV
Differential termination mismatch		-	-	10	%
Single-ended voltage tolerance range		-0.4	-	3.3	V
DC common mode Voltage		-350	-	2850	mV
RECEIVER					
AC common-mode output Voltage (RMS)		-	-	17.5	mV
Differential output Voltage		-	-	900	mV
Near-end Eye height, differential		70	-	-	mV
Far-end Eye height, differential		30	-	-	mV
Far end pre-cursor ISI ratio		-4.5	-	2.5	%
Differential Termination Mismatch		-	-	10	%
Transition Time (min, 20% to 80%)		9.5	-	-	ps
DC common mode Voltage		-350	-	2850	mV

ELECTRICAL CHARACTERISTICS (Low Speed Signal)

Parameter	Symbol	Min.	Max.	Unit
Module output SCL and SDA	VOL	0	0.4	V
Module Input SCL and SDA	VIL	-0.3	VCC*0.3	V
	VIH	VCC*0.7	VCC+0.5	V
InitMode, ResetL and ModSelL	VIL	-0.3	0.8	V
	VIH	2	VCC+0.3	V
IntL	VOL	0	0.4	V
	VOH	VCC-0.5	VCC+0.3	V

PIN ASSIGNMENT



Pin	Logic	Symbol	Definition	Pin	Logic	Symbol	Definition
1		GND	Ground	**39**		GND	Ground
2	CML-I	Tx2n	Transmitter Inverted Data Input	**40**	CML-I	Tx6n	Transmitter Inverted Data Input
3	CML-I	Tx2p	Transmitter Non-inverted Data Input	**41**	CML-I	Tx6p	Transmitter Non-inverted Data Input
4		GND	Ground	**42**		GND	Ground
5	CML-I	Tx4n	Transmitter Inverted Data Input	**43**	CML-I	Tx8n	Transmitter Inverted Data Input
6	CML-I	Tx4p	Transmitter Non-inverted Data Input	**44**	CML-I	Tx8p	Transmitter Non-inverted Data Input
7		GND	Ground	**45**		GND	Ground
8	LVTTL-I	ModSelL	Module Select	**46**	LVCMOS/CML-I LVCMO	P/VS4	Programmable/Module Vendor Specific 4
9	LVTTL-I	ResetL	Module Reset	**47**	S /CML-I	P/VS1	Programmable/Module Vendor Specific 1
10		VccRx	+3.3V Power Supply Receiver	**48**		VccRx1	3.3V Power Supply
11	LVCMOS-I/O	SCL	TWI serial interface clock	**49**	LVCMOS/CML-O	P/VS2	Programmable/Module Vendor Specific 2
12	LVCMOS-I/O	SDA	TWI serial interface data	**50**	LVCMOS/CML-O	P/VS3	Programmable/Module Vendor Specific 3
13		GND	Ground	**51**		GND	Ground
14	CML-O	Rx3p	Receiver Non-inverted Data Output	**52**	CML-O	Rx7p	Receiver Non-inverted Data Output
15	CML-O	Rx3n	Receiver Inverted Data Output	**53**	CML-O	Rx7n	Receiver Inverted Data Output
16		GND	Ground	**54**		GND	Ground
17	CML-O	Rx1p	Receiver Non-inverted Data Output	**55**	CML-O	Rx5p	Receiver Non-inverted Data Output
18	CML-O	Rx1n	Receiver Inverted Data Output	**56**	CML-O	Rx5n	Receiver Inverted Data Output
19		GND	Ground	**57**		GND	Ground
20		GND	Ground	**58**		GND	Ground
21	CML-O	Rx2n	Receiver Inverted Data Output	**59**	CML-O	Rx6n	Receiver Inverted Data Output
22	CML-O	Rx2p	Receiver Non-inverted Data Output	**60**	CML-O	Rx6p	Receiver Non-inverted Data Output
23		GND	Ground	**61**		GND	Ground
24	CML-O	Rx4n	Receiver Inverted Data Output	**62**	CML-O	Rx8n	Receiver Inverted Data Output
25	CML-O	Rx4p	Receiver Non-inverted Data Output	**63**	CML-O	Rx8p	Receiver Non-inverted Data Output
26		GND	Ground	**64**		GND	Ground
27	LVTTL-O	ModPrsL	Module Present	**65**		NC	Not connected
28	LVTTL-O	IntL/ RxLOS	Interrupt/optional RxLOS	**66**		Reserved	

CONTINUED

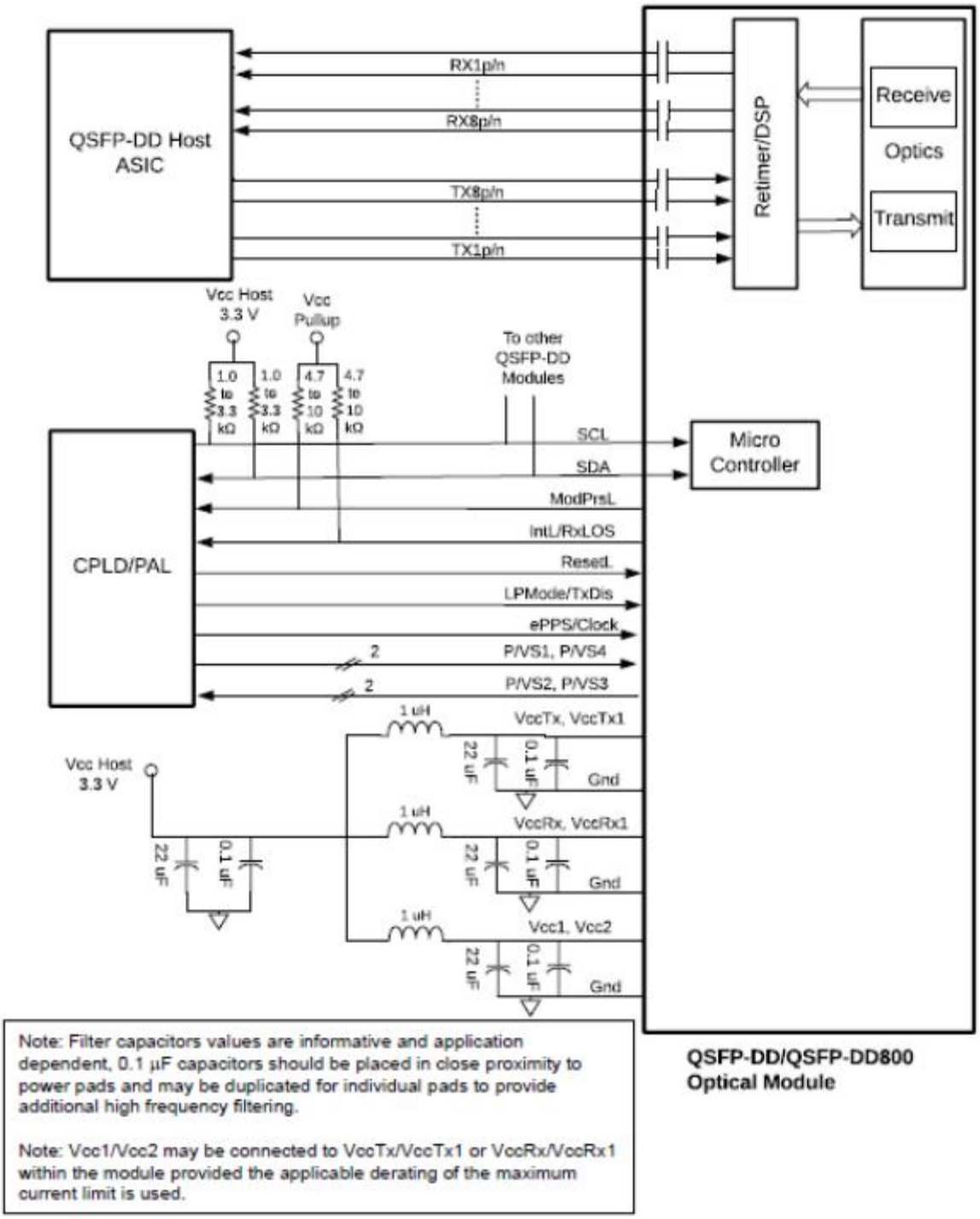
29		VccTx	+3.3V Power Supply Transmitter	**67**		VccTx1	3.3V Power Supply
30		Vcc1	+3.3V Power Supply	**68**		Vcc2	3.3V Power Supply
31	LVTTL-I	LPMode/ TxDis	Low Power mode/optional TX Disable	**69**	LVCMOS-I	ePPS/Clock	1PPS PTP clock or reference clock input
32		GND	Ground	**70**		GND	Ground
33	CML-I	Tx3p	Transmitter Non-inverted Data Input	**71**	CML-I	Tx7p	Transmitter Non-inverted Data Input
34	CML-I	Tx3n	Transmitter Inverted Data Input	**72**	CML-I	Tx7n	Transmitter Inverted Data Input
35		GND	Ground	**73**		GND	Ground
36	CML-I	Tx1p	Transmitter Non-inverted Data Input	**74**	CML-I	Tx5p	Transmitter Non-inverted Data Input
37	CML-I	Tx1n	Transmitter Inverted Data Input	**75**	CML-I	Tx5n	Transmitter Inverted Data Input
38		GND	Ground	**76**		GND	Ground

Pin Definitions

DIGITAL DIAGNOSTIC MONITOR

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	ºC	Internal
Voltage	3.135 to 3.465	±3%	V	Internal

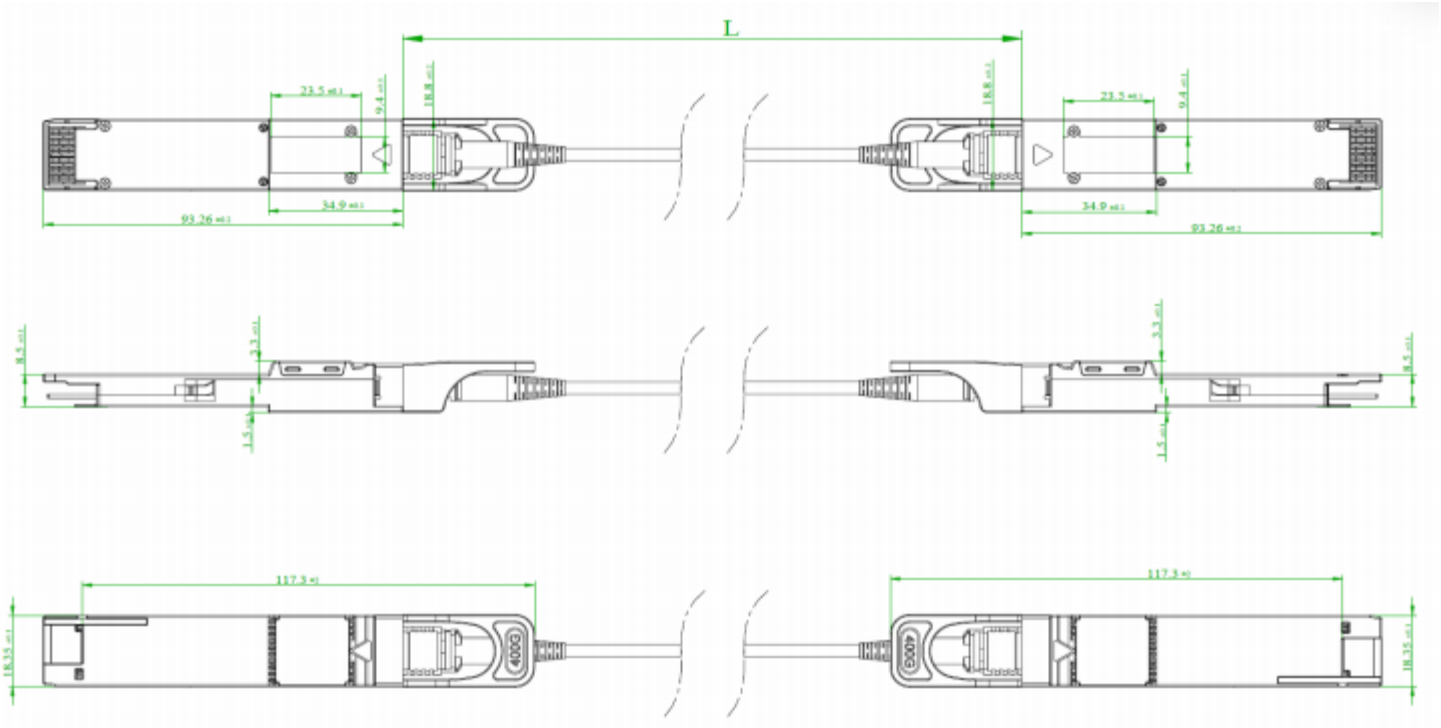
RECOMMENDED HOST BOARD



Note: Filter capacitors values are informative and application dependent, 0.1 µF capacitors should be placed in close proximity to power pads and may be duplicated for individual pads to provide additional high frequency filtering.

Note: Vcc1/Vcc2 may be connected to VccTx/VccTx1 or VccRx/VccRx1 within the module provided the applicable derating of the maximum current limit is used.

MECHANICAL DIMENSIONS (UNITS: mm)



WARNINGS

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Class 1 Laser Product. Complies with FDA performance standards for laser products except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019. Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.