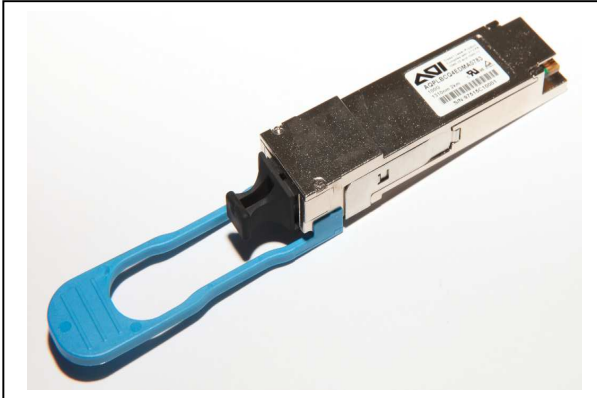


QSFP28 100G SMF 500m Transceiver

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Applications

- 100 Gigabit Ethernet

Features

- Hot-pluggable QSFP28 form factor
- Uncooled DFB Laser (4 x1310 nm)
- PIN Photo Detector
- -5°C to +70°C case operating temperature range
- 500m transmission with SMF
- 3.3V power supply
- Contain clock and recovery (CDR)
- Power consumption < 3.5W
- Compliant with QSFP 28 MSA-SFF-8665
- Compliant with IEEE 802.3bm/100G PSM4 Specification
- Digital diagnostic functions (Via I²C)
- Compliant with RoHS
- Compliant with UL & TUV

Ordering Information

Form Factor	Data Rate	Media	Distance	Wavelength (nm)	TX Power (each lane) (dBm)	Voltage (V)	Coupling	DDM (Y/N)	Temperature (°C)	Part Number
QSFP28 PSM4	100G	SMF	500m	1310 nm	-4.5 ~ 2	3.3	AC/AC	Y	-5 ~ +70	AQPMANQ4EDMA0871



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Absolute Maximum Ratings

Parameter	Symbol	Conditions	Min	Max	Unit
Storage Temperature	T _s	--	-40	+85	°C
Storage Relative Humidity	RH	Non condensing	0	85	%
Supply Voltage # 3.3	V _{CC}	--	0	3.6	V

Recommended Operating Conditions

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating Temperature (Case)	T _c	--	-5	--	70	°C
Supply Voltage	V _{CC}	--	3.13	3.3	3.47	V
Supply Current	I _{CC}	--	--	--	1000	mA
Data Rate	DR	--	--	100	--	Gbps
Distance		--	2	--	500	m

Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Transmitter						
Differential Input Impedance	R _{DI}	--	--	100	--	Ohm
High speed Differential Input Voltage (CML)	V _{CML_DI}	AC-Coupled, peak to peak	0.2	--	1.0	V
Low speed Input Voltage - Low (LVCOMS)	V _{LVCOS_IL}	--	-0.3	--	V _{CC} *0.3	V
Low speed Input Voltage - High (LVCOMS)	V _{LVCOS_IH}	--	V _{CC} *0.7	--	V _{CC} +0.5	V
Low speed Input Voltage - Low (LVTTTL)	V _{LVTTL_IL}	--	-0.3	--	0.8	V
Low speed Input Voltage - High (LVTTTL)	V _{LVTTL_IH}	--	2	--	V _{CC} +0.3	V
Receiver						
Differential Output Impedance	R _{DO}	--	--	100	--	Ohm
High speed Differential Output Voltage (CML)	V _{CML_DO}	AC-Coupled, peak to peak	0.3	--	0.8	V
Low speed Output Voltage - Low (LVCOMS)	V _{LVCOS_OL}	--	0	--	0.4	V
Low speed Output Voltage - High (LVCOMS)	V _{LVCOS_OH}	--	V _{CC} -0.5	--	V _{CC} +0.3	V
Low speed Output Voltage - Low (LVTTTL)	V _{LVTTL_OL}	--	0	--	0.4	V
Low speed Output Voltage - High (LVTTTL)	V _{LVTTL_OH}	--	V _{CC} -0.5	--	V _{CC} +0.3	V



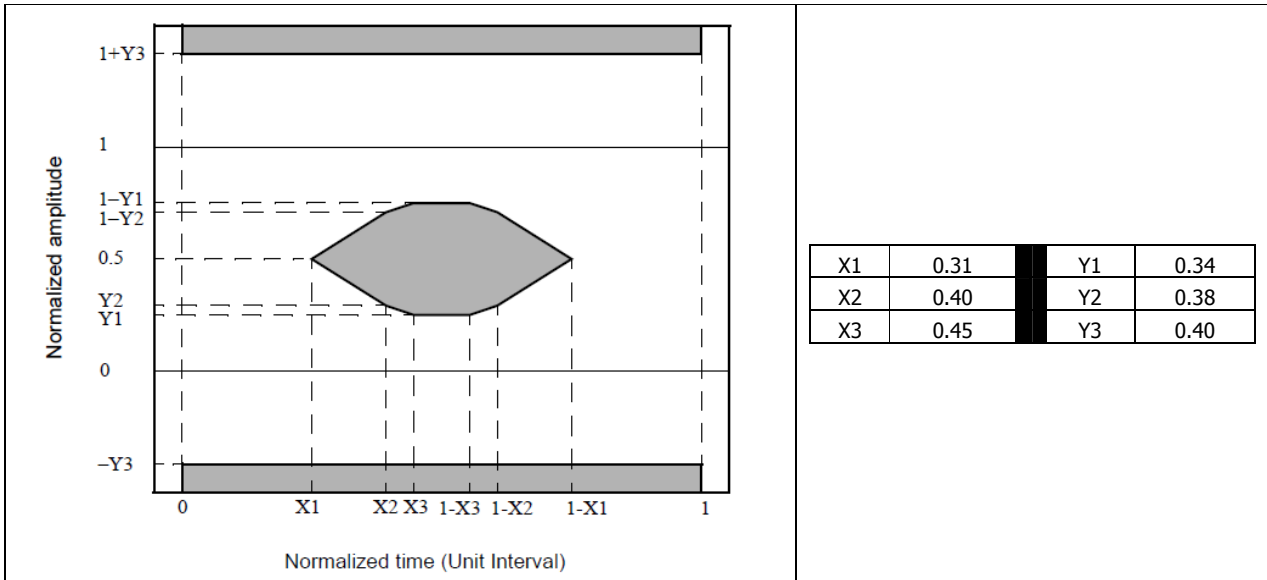
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Optical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Transmitter						
Lane wavelengths (Range)			1295	1310	1325	nm
Side Mode Suppression Ratio	SMSR	--	30	--	--	dB
Output power (OMA), each lane	OMA	CW,ER>3.5dB	-4.5	--	2	dBm
TDP, each lane	TDP	--	--	--	3.8	dB
Average launch power of OFF transmitter, each lane	P _{off}	--	--	--	-30	dBm
Extinction ratio	ER	--	3.5	--	--	dB
Eye mask definition	--	--	Compliance IEEE802.3bm			
Receiver						
Center Wavelength - lane 0- 3	λ_{CO}	--	1295	1310	1325	nm
Damage threshold	--	--	3.0	--	--	dBm
Receiver Power (OMA), each Lane	--	--	--	--	2.2	dBm
Receiver Reflectance	--	--	--	--	-12	dB
Average receive power, each lane	--	--	-12.66	--	2.0	dBm
Receiver sensitivity (OMA), each lane	R _{sens}	assured with PRBS 2 ³¹ -1 at 10 ⁻¹² BER, NRZ	-8.3			dBm
Stress receiver sensitivity (OMA), each lane	--		100G-PSM4 as being defined by 100G PSM4 Specification			dBm

Eye Mask Definition



Pin Descriptions

38	GND
37	TX1n
36	TX1p
35	GND
34	TX3n
33	TX3p
32	GND
31	LPMode
30	Vcc1
29	VccTx
28	IntL
27	ModPrsL
26	GND
25	RX4p
24	Rx4n
23	GND
22	RX2p
21	RX2n
20	GND

Top Side
Viewed From Top

Module Card Edge

GND	1
TX2n	2
TX2p	3
GND	4
TX4n	5
TX4p	6
GND	7
ModselL	8
ResetL	9
VccRx	10
SCL	11
SDA	12
GND	13
RX3p	14
Rx3n	15
GND	16
RX1p	17
RX1n	18
GND	19

Bottom Side
Viewed From Bottom



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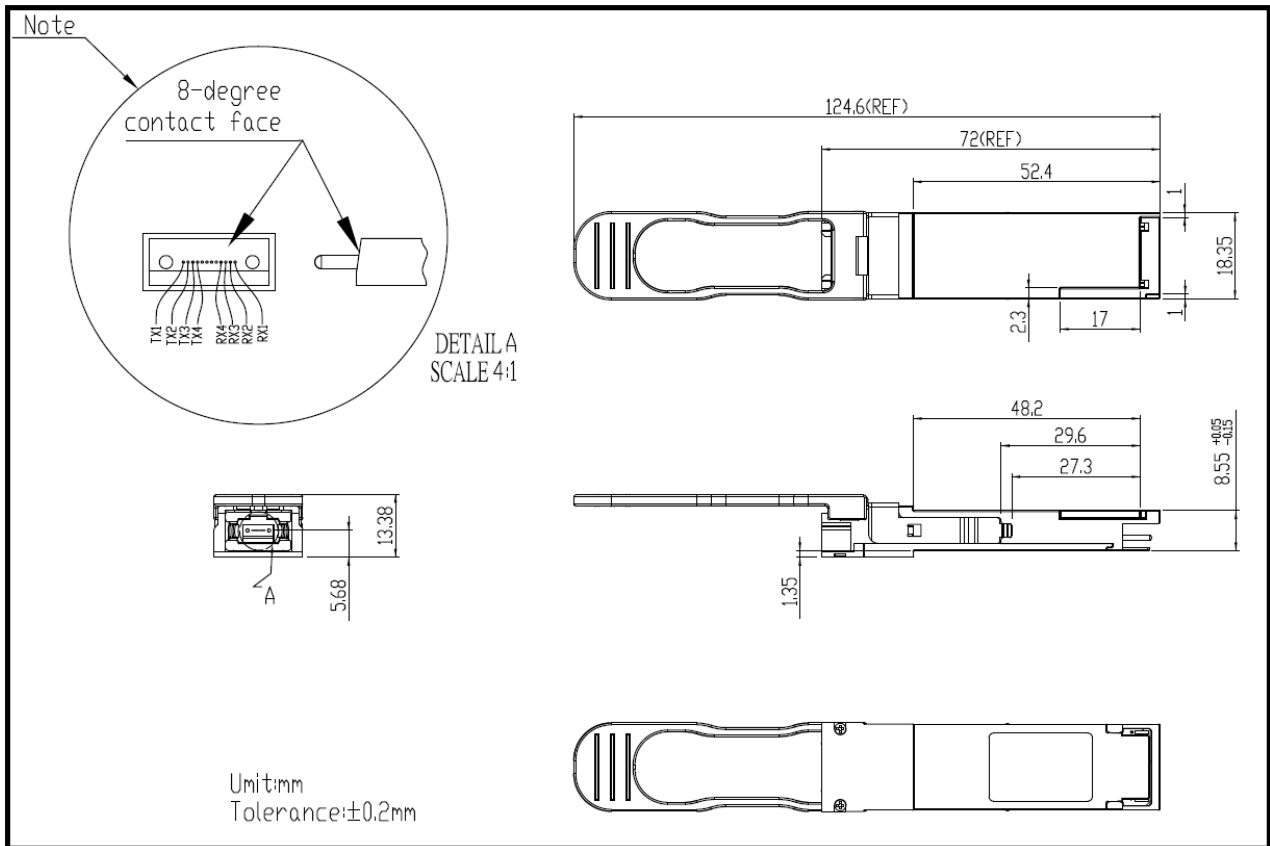
Pin Definition

	Logic	Symbol	Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	
7		GND	Ground	1
8	LVTTL-I	ModSelL	Module Select	
9	LVTTL-I	ResetL	Module Reset	
10		Vcc Rx	+3.3V Power Supply Receiver	2
11	LVC MOS I / O	SCL	2-wire serial interface clock	
12	LVC MOS I / O	SDA	2-wire serial interface data	
13		GND	Ground	1
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	
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		Vcc Tx	+3.3V Power supply transmitter	2
30		Vcc1	+3.3V 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 Input	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Input	
38		GND	Ground	1

Note 1 :
 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.

Note 2 :
 Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently.

Mechanical Design Diagram (mm)





QSFP28 100G SMF 500m Transceiver

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EEPROM Memory A0h contents Address

	AOI	AQPMANQ4EDMA0871	E130	0.5 Km
Add	Name of field	Description	ACSII	HEX
128	Identifier	11:QSFP28		11
129	Ext. Identifier	QSFP Transceiver ; bit7-6:11 Power Max 3.5W bit3: 1 CDR present in TX bit2: 1 CDR present in RX		CC
130	Connector	0C :MPO 1x12 (Multifiber Parallel Optic) Codes are maintained in the Transceiver Management section of SFF-8024 Table 4-3		0C
131	Transceiver	80: The Extended Specification Compliance Codes are maintained in the Transceiver Management section of SFF-8024 Table 4-4 (The extended information show in Byte 192)		80
132		SONET Compliance codes		00
133		SAS/SATA compliance codes		00
134		Gigabit Ethernet compliance codes		00
135		Fiber Channel Compliant codes		00
136		Fiber Channel link length		00
137		Fiber Channel transmission media		00
138		Fiber Channel Speed		00
139	Encoding	05: 64B/66B (see SFF-8024 Table 4-2)		05
140	BR, Nominal	100Mbps/unit -> HEX FF:25.78125G / each channel (over 25.4G reference Byte 222)		FF
141	Ext. RateSelect	bit7-2:0 reserved bit1:0 no QSFP+ Rate Select Version2 bit0:0 no QSFP+ Rate Select Version1 (see Table 6-18)		00
142	Length(9um, SMF)	1km /unit -> HEX 01 :0.5Km		01
143	Length (50um, OM3)	2m /unit -> HEX		00
144	Length (50um, OM2)	1m /unit -> HEX		00
145	Length (62.5um, OM1)	1m /unit -> HEX		00
146	Length (52um, OM4) / Length (Copper)	2m /unit -> HEX / 1m /unit -> HEX		00
147	Device Tech	Device technology (see Table 6-19, 6-20) 40: 1310nm DFB		40
148	Vendor name	QSFP Vendor Name (ASCII)	A	41
149			O	4F
150			I	49
151				20
152				20
153				20



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154				20
155				20
156				20
157				20
158				20
159				20
160				20
161				20
162				20
163				20
164	Ext. Transceiver	Ext. Transceiver (see Table 6-21) 10:EDR		10
165				00
166	Vendor OUI	QSFP+ Vendor IEEE company ID		00
167				00
168			A	41
169			Q	51
170			P	50
171			M	4D
172			A	41
173			N	4E
174			Q	51
175			4	34
176	Vendor PN	SFP Vendor Part Number (ASCII)	E	45
177			D	44
178			M	4D
179			A	41
180			0	30
181			8	38
182			7	37
183			1	31
184	Vendor rev	Hardware Revision (HEX) Ver B	A	41
185				20
186	Wavelength	Nominal laser wavelength (Wavelength = value / 20 in nm) 6658:1310nm		66
187				58
188	Wavelength Tolerance	Guaranteed range of laser wavelength (+/- value) from Nominal wavelength.		0B
189		(Wavelength Tol. = value/200 in nm) 0BB8:15nm		B8
190	Max Case Temp	Maximum Case Temperature 46:70°C		46



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191	CC_BASE	Check Sum (128-190)		89
192	Options (see Table 6-22)	Reference Extended: The Extended Specification Compliance Codes are maintained in the Transceiver Management section of SFF-8024 (see Table 6-17) 10G/40G/100G Ethernet 07:100G PSM4 Parallel SMF (see Table 4-4)		07
193		bit7-4:0 reserved bit3:0 no TX Input Equalization Auto Adaptive Capable bit2:0 no TX Input Equalization Fixed Programmable Settings bit1:0 no RX Output Emphasis Fixed Programmable Settings bit0:0 no RX Output Amplitude Fixed Programmable Settings		00
194		bit7:1 TX CDR On/Off Control bit6:1 RX CDR On/Off Control bit5:1 Tx CDR Loss of Lock (LOL) Flag bit4:1 Rx CDR Loss of Lock (LOL) Flag bit3:1 Rx Squelch Disable bit2:0 no Rx Output Disable capable bit1:0 no Tx Squelch Disable bit0:0 no Tx Squelch		F8
195		bit7:1 memory page02 bit6:0 no memory page01 bit5:0 no RATE_SELECT bit4:1 TX_DISABLE bit3:1 TX_FAULT bit2:0 no TX Squelch bit1:0 no TX Loss bit0:0 reserved		98
196	Vendor SN	Vendor SN (ASCII)		XX
197				XX
198				XX
199				XX
200				XX
201				XX
202				XX
203				XX
204				XX
205				XX
206				XX
207				XX
208				XX
209				XX
210		XX		
211		XX		
212	Date code	Year (ASCII)		XX
213				XX



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214		Month (ASCII)		XX
215				XX
216		Day (ASCII)		XX
217				XX
218		Blank		20
219				20
220	Diagnostic Monitoring Type	bit3:1 = Average power / 0 = OMA bit2:1 Transmitter power measurement others:0 reserved (see Table 6-24)		0C
221	Enhanced Options	bit7-4:0 Reserved bit3:0 no Rate Select bit2:0 no Application select bit1-0:0 reserved (see Table 6-25)		00
222	BR, Nominal	250Mbps/unit -> HEX 67: 25.78125G / each channel		67
223	CC_EXT	Check Sum 64 to 94 byte		XX
224	Read-only			00
225				00
226				00
227				00
228				00
229				00
230				00
231				00
232				00
233				00
234				00
235				00
236				00
237				00
238				00
239				00
240				00
241				00
242				00
243				00
244				00
245				00
246				00
247			Manufacturing site	
248		N		4E



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249				00
250				00
251				00
252		FW Check sum		A1
253				62
254	FW Version	03 00 = V3 .00		03
255				00



Regulatory Compliance

Item	Standard
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B
Electrostatic Discharge to the Electrical Pins (ESD)	MIL-STD-883 ^E Method 3015.7
Electrostatic Discharge to the Receptacle (ESD)	IEC 61000-4-2
RoHS	2011/65/EU
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11
Component Recognition	UL and TUV

Laser Safety Information

All versions of this laser are Class 1 laser products per IEC1/EN2 60825-1. Users should observe safety precautions such as those recommended by ANSI³ Z136.1, ANSI Z36.2 and IEC 60825-1.

This product conforms to FDA (CDRH) 21 CFR 1040.10 and 1040.11 except for deviations of laser safety class designation pursuant to ['Laser Notice No.50'](#)

Product labeling:

Class 1 Laser Product
Compliance with 21 CFR
1040.10 and 1040.11

If labeling is not affixed to the module due to size constraints; then rather, labeling is placed on the outside of the shipping box.

This product is not shipped with a power supply.

Caution: use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Certifications

UL	60950-1 (E243407)
TUV	EN60950-1, EN 60825-1, EN 60825-2

Documentation is available upon request.

(1) IEC is a registered trademark of the International Electrotechnical Commission

(2) Within Europe the IEC standard has been adopted as a European Normative standard known as EN 60825, and each European country will have its own version of this standard, for example, the British Standards version known as BS EN 60825. There can be small differences between the different countries versions of EN 60825, and these are in part caused by the process of translating the standard into the native language of that country.

(3) ANSI is a registered trademark of the American National Standards Institute

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