

PRODUCT FEATURES

- QSFP-DD MSA compliant
- 8x53.125Gb/s electrical interface
- 4 independent parallel optical channels
- MPO APC optical connector
- Hot Pluggable
- 500m link on single-mode Fiber (SMF)
- Supports 400Gb/s aggregate bit rate
- Maximum power consumption 9 Watts
- Case Operating Temperature: Commercial, 0~70°C

APPLICATIONS

- 400G Ethernet
- InfiniBand interconnects
- Datacenter Enterprise networking

COMPLIANCE

- QSFP-DD MSA
- CMIS 4.0
- IEEE802.3
- RoHS 2.0

Ordering information

Part Number	Data Rate (Gb/s)	Media	Wavelength(nm)	Operating distance(m)	Temperature(°C)
IP-ATMS50E31C	400	SMF	1310	500	0~70

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3. Pin Descriptions

Pin	Symbol	Description	Note
1	GND	Ground	
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	
8	ModselL	Module Select	
9	ResetL	Module Reset	
10	VCC Rx	Receiver +3.3V DC Power Supply	
11	SCL	I2C Serial Clock	
12	SDA	I2C Serial Data	
13	GND	Ground	
14	Rx3p	Receiver Non-Inverted Differential Output	
15	Rx3n	Receiver Inverted Differential Output	
16	GND	Ground	
17	Rx1p	Receiver Non-Inverted Differential Output	
18	Rx1n	Receiver Inverted Differential Output	
19	GND	Ground	
20	GND	Ground	
21	Rx2n	Receiver Inverted Differential Output	
22	Rx2p	Receiver Non-Inverted Differential Output	
23	GND	Ground	
24	Rx4n	Receiver Inverted Differential Output	
25	Rx4p	Receiver Non-Inverted Differential Output	
26	GND	Ground	
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	VCC Tx	Transmitter +3.3V DC Power Supply	
30	VCC1	+3.3V DC Power Supply	
31	Init Mode	Initialization Mode	
32	GND	Ground	
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	
39	GND	Ground	
40	Tx6n	Transmitter Inverted Data Input	
41	Tx6p	Transmitter Non-Inverted Data Input	
42	GND	Ground	

43	Tx8n	Transmitter Inverted Data Input	
44	Tx8p	Transmitter Non-Inverted Data Input	
45	GND	Ground	
46	Reserved	No connect	
47	NC	No connect	
48	VCC Rx1	+3.3V DC Power Supply	
49	NC	No connect	
50	NC	No connect	
51	GND	Ground	
52	Rx7p	Receiver Non-Inverted Differential Output	
53	Rx7n	Receiver Inverted Differential Output	
54	GND	Ground	
55	Rx5p	Receiver Non-Inverted Differential Output	
56	Rx5n	Receiver Inverted Differential Output	
57	GND	Ground	
58	GND	Ground	
59	Rx6n	Receiver Inverted Differential Output	
60	Rx6p	Receiver Non-Inverted Differential Output	
61	GND	Ground	
62	Rx8n	Receiver Inverted Differential Output	
63	Rx8p	Receiver Non-Inverted Differential Output	
64	GND	Ground	
65	NC	No Connect	
66	Reserved	No Connect	
67	VCCTx1	+3.3V DC Power Supply	
68	VCC2	+3.3V DC Power Supply	
69	Reserved	No Connect	
70	GND	Ground	
71	Tx7p	Transmitter Non-Inverted Data Input	
72	Tx7n	Transmitter Inverted Data Input	
73	GND	Ground	
74	Tx5p	Transmitter Non-Inverted Data Input	
75	Tx5n	Transmitter Inverted Data Input	
76	GND	Ground	

4. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	T _S	-40		85	°C	
Storage Ambient Humidity	H _A	0		85	%	
Maximum Supply Voltage	V _{CC}	-0.5		3.6	V	

5. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Note
Operating Case Temperature	T _{case}	0		70	°C	
Supply Voltage	V _{CC}	3.135	3.3	3.465	V	
Relative Humidity	RH	5		85	%	
Power Dissipation	PD			9	W	
Data Rate (Optical)	DRO		8x53.125		Gbps	
Data Rate (Electrical)	DRE		8x53.125		Gbps	
Operating Distance				500	m	

6. Electrical Characteristics

400GBASE-DR4 Operation (EOL, T_{case}=0~70°C, V_{CC}=3.135~3.465V)

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Tx Data Differential Input Voltage	V _{IN}	-	-	900	mV	
Tx Data Differential Input Impedance	Z _{IN}	-	100	-	Ω	
Signaling rate per lane	S	-	26.5625	-	GBd	range: ±100ppm
Receiver						
Rx Data Differential Output Voltage	V _{OUT}	-	-	900	mV	
Rx Data Differential Output Impedance	Z _{OUT}	-	100	-	Ω	
Signaling rate per lane		-	26.5625	-	GBd	range: ±100ppm

7. Optical Characteristics

400GBASE-DR4 Operation (EOL, T_{case}=0~70°C, V_{CC}=3.135~3.465V)

Parameter	Symbol	Min	Typ	Max	Units	Notes
Transmitter						
Average Launch Power, each lane	P _{OUT}	-2.9	-	4	dBm	
Optical Output with Tx OFF, each lane	P _{OFF}	-	-	-15	dBm	
Center Wavelength, each Lane	λ	1304.5-1317.5			nm	
PAM4 Signaling rate, each lane(range)			53.125		GBd	±100ppm
Extinction Ratio	ER	3.5	-	-	dB	
OMA per Channel	OMA	-0.8		4.2	dBm	
Optical RL Tolerance	ORL	-	-	21.4	dB	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	

Transmitter and dispersion eye closure for PAM4, each lane	TDECQ	-	-	3.4	dB	
Transmit Reflectance	RFL	-	-	-26	dB	
Receiver						
Rx sensitivity (OMA)	PIN	-	-	-3.9	dBm	1
Rx Stressed Sensitivity (OMA)	PS	-1.9			dBm	
Average receive power	p	-5.9	-	4	dBm	1
Damage threshold, each Lane		5	-	-	dBm	
Receive Reflectance	RFL	-	-	-26	dB	
Center Wavelength	λ	1304.5-1317.5			nm	each lane
Rx LOS of Signal - Assert	PA	-15	-	-	dBm	
Rx LOS of Signal - Dessert	PD	-	-	-6.5	dBm	
Receive Reflectance	RFL	-	-	26	dB	

Note:

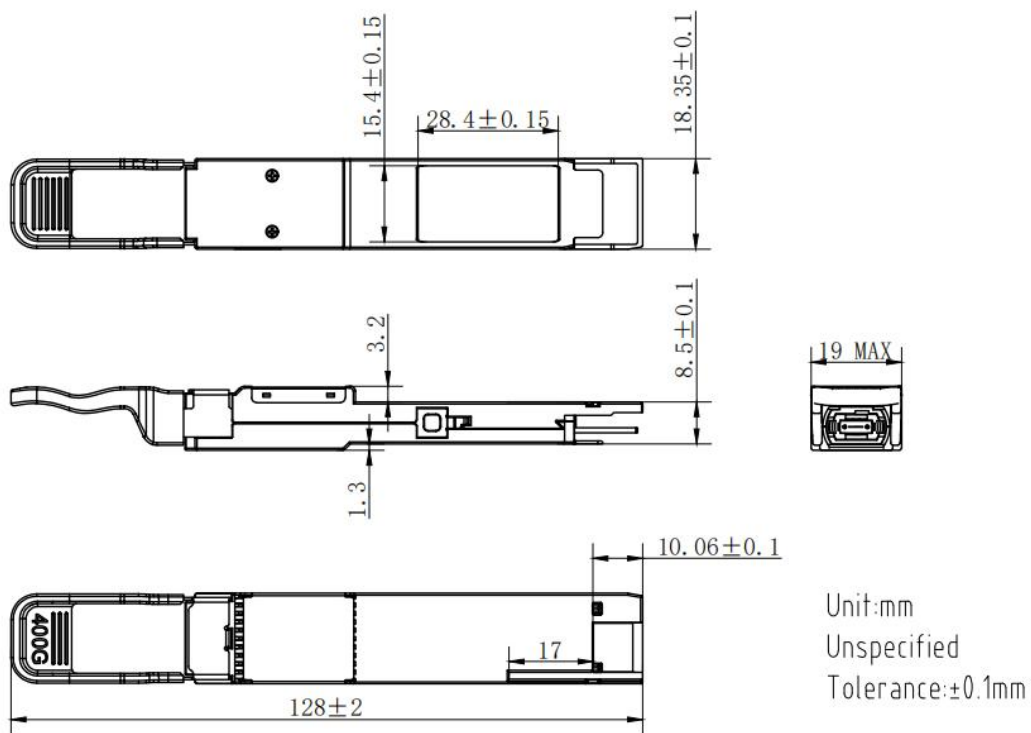
1. BER = 2.4E-4, PAM4 Signaling rate (each lane) 53.125GBd, and SSPRQ.

8. Digital Diagnostic Monitoring Functions

IP-ATMS50E31C support the I2C-based Diagnostic Monitoring Interface (DMI) defined in document CMIS 4.0 The host can access real-time performance of transmitter and receiver optical power, temperature, supply voltage and bias current.

Parameter	Accuracy	Unit
Case Temperature	± 3	$^{\circ}\text{C}$
Supply Voltage	$\pm 3\%$	V
Tx Optical Power	± 3	dB
Rx Optical Power	± 3	dB

9. Mechanical Specifications



10. Regulatory Compliance

Feature	Reference	Performance
EMC	EN61000-3	Compatible with standards
Electrostatic Discharge (ESD)	IEC/EN 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, EC/EN 60825-2	Class 1 laser product
Component Recognition	IEC/EN 60950, L 60950	Compatible with standards
RoHS	2002/95/EC	Compatible with standards

11. Contact Information

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12. Revision History

Version No.	Date	Description
1.0	Feb. 02, 2021	Preliminary datasheet
1.1	Aug.1,2023	Update mechanical specification
1.2	Jun, 17, 2024	Update Power dissipation, Rx LOS of Signal - Dessert and contact information