Datasheet

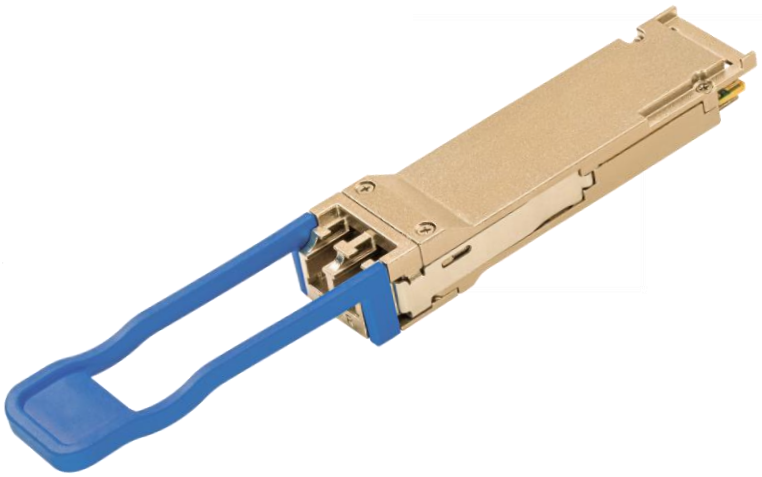
QSFP28, 100GBase-LR4 10 Km (QSD28A2YA1CT_PT)

Product Features

- QSFP28 MSA compliant
- Compliant to IEEE 802.3ba
- Hot pluggable 38 pin electrical interface
- Digital Diagnostic Monitoring
- 4 LAN-WDM Optical lanes MUX/DEMUX design
- Transmitter: cooled LAN-WDM EML TOSA
- Receiver: PIN ROSA
- 4 x 25G electrical interface
- Maximum power consumption 4 W
- LC duplex connector
- Supports 103.125 Gbps
- Up to 10 km transmission on single mode fiber without FEC
- Operating case temperature: 0°C to 70°C
- Single 3.3 V power supply
- RoHS 2 compliant

Applications

- 100GBASE-LR4 100 Ethernet
- Telecom networking
- Data Center interconnect



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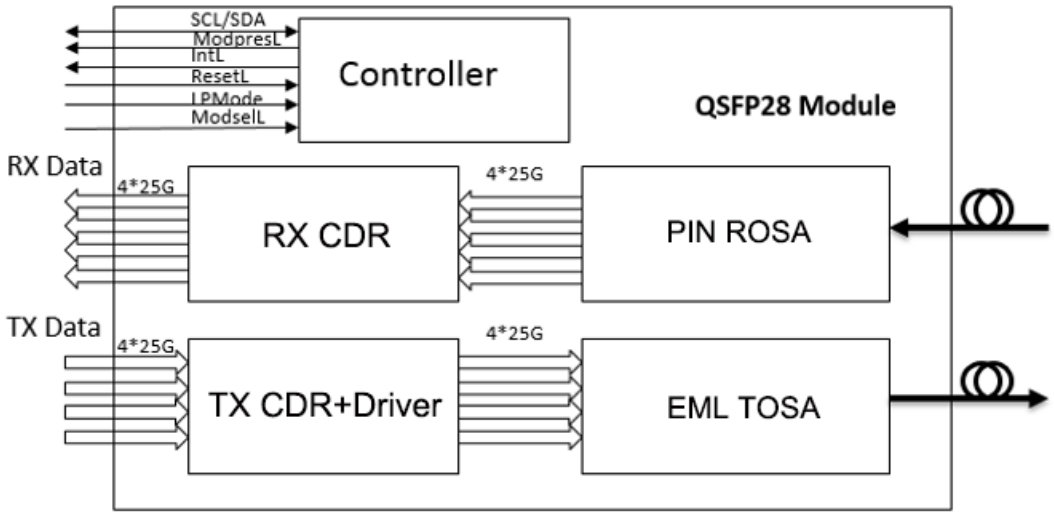
1. Product Description

The QSD28A2YA1CT_PT module is meticulously engineered for applications in 10 km optical communication. This comprehensive module includes a 4-lane optical transmitter, a 4-lane optical receiver, and a module management block featuring 2 wire serial interfaces. Multiplexing optical signals into a single-mode fiber is effortlessly achieved through the use of an industry standard LC connector. A block diagram is shown in Figure 1

Figure 1 Block Diagram



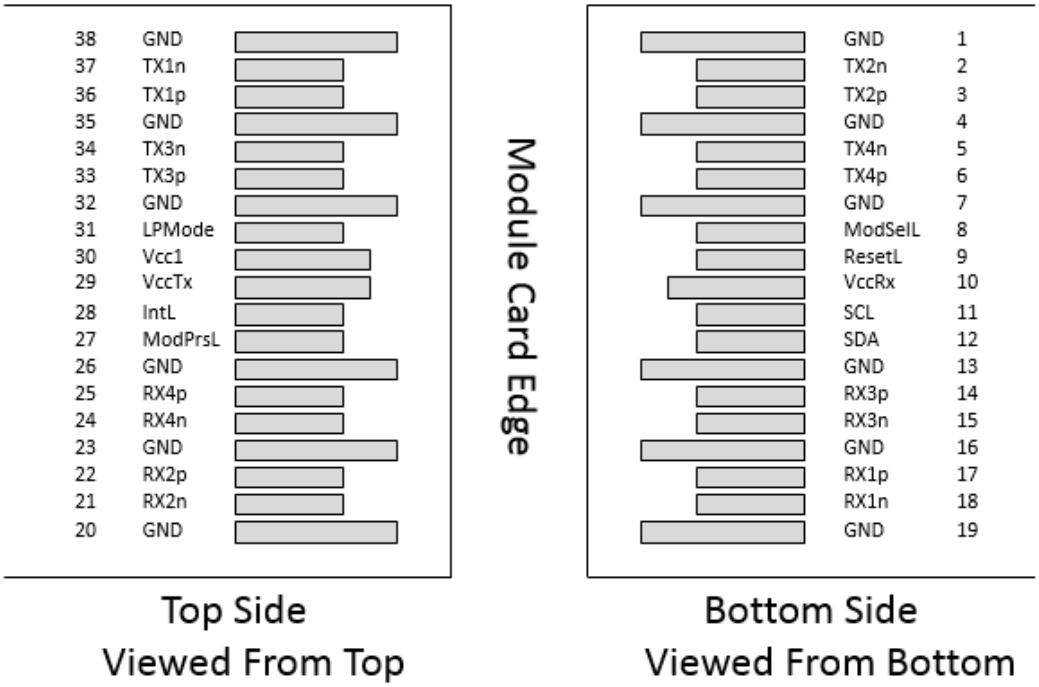
2. Recommended Operating Environments

Unless specifically noted, the electrical and optical characteristics mentioned are measured within the given operating conditions.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Vcc	3.135	3.3	3.465	V
Case temperature	Top	0		70	°C
Link distance with G.652		0.002		10	km

3. Pin Descriptions

Figure 2 MSA Compliant Connector



Pin	Symbol	Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	

7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc Rx	+3.3 V Power Supply Receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc1	+3.3 V Power supply	
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

[1] Circuit ground is internally isolated from chassis ground.

4. Absolute Maximum Ratings

Please be aware that exceeding the absolute maximum ratings specified for this module can result in permanent damage.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Maximum supply voltage	Vcc	-0.5	3.3	3.6	V	
Storage temperature	Ts	–40		85	°C	
Relative humidity	RH	5		85	%	Non-condensing
Damage threshold, each lane	THd	5.5			dBm	

5. Optical Specification

100GBASE-LR4 Operation (EOL, TOP = 0 to +70°C, VCC = 3.135 to 3.465 Volts)

Parameters	Min.	Typ.	Max.	Unit	Notes
Transmitter					
Signaling speed per lane	25.78125 ± 100 ppm			Gbps	
Transmit wavelengths	1294.53		1296.59	nm	
	1299.02		1301.09		
	1303.54		1305.63		
	1308.09		1310.19		
Total average launch power			10.5	dBm	
Average launch power, each lane	-4.3		4.5	dBm	
Optical Modulation amplitude (OMA), each lane	-1.3		4.5	dBm	
Extinction ratio (ER)	4			dB	
Side mode suppression ratio (SMSR)	30			dB	
Launch power in OMA minus, TDP, each lane	-2.3			dBm	
Transmitter and dispersion penalty (TDP), each lane			2.2	dB	
Transmitter reflectance			–12	dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				2

[2] Hit ratio $5x10^{-5}$

Receiver					
Signaling speed per lane	25.78125 ± 100 ppm			Gbps	
Receive wavelengths	1294.53		1296.59	nm	
	1299.02		1301.09		
	1303.54		1305.63		
	1308.09		1310.19		
Average receiver power, each lane	-10.6		4.5	dBm	
Receiver power, each lane (OMA)			4.5	dBm	
Channel power difference			5.5	dBm	
Damage threshold, each lane (OMA)	5.5			dBm	
Receiver sensitivity (OMA), each lane			-8.6	dBm	3
Stressed receiver Sensitivity (OMA), each lane			-6.8	dBm	3
LOS assert	-26			dBm	
LOS deassert			-13	dBm	
LOS hysteresis	0.5			dB	
Receiver reflectance			-26	dBm	
Vertical eye closure penalty, each lane		1.8		dB	
Stressed eye J2 Jitter, each lane		0.3		UI	
Stressed eye J9 Jitter, each lane		0.47		UI	

6. Electrical Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power dissipation				4	W	
Supply current	Icc			1.1544	A	Steady state
Transmitter						
Data rate, each lane			25.78125		Gbps	
Differential voltage swing	Vin, pp			900	mV	At 1 MHz

[3] Specified at a BER of 10^{-12}, PRBS31

Transition time	Trise/Tfall	10			ps	20%~80%
Differential termination resistance mismatch				10	%	
Eye width	EW15	0.46			UI	
Eye height	EH15	95			mV	
Receiver						
Data rate, each lane			25.78125		Gbps	
Differential termination resistance mismatch				10	%	At 1 MHz
Differential output voltage swing	Vout, pp			900	mV	
Common mode noise, RMS	Vrms			17.5	mV	
Transition time	Trise/Tfall	12			ps	20%~80%
Eye width	EW15	0.57			UI	
Eye height	EH15	228			mV	

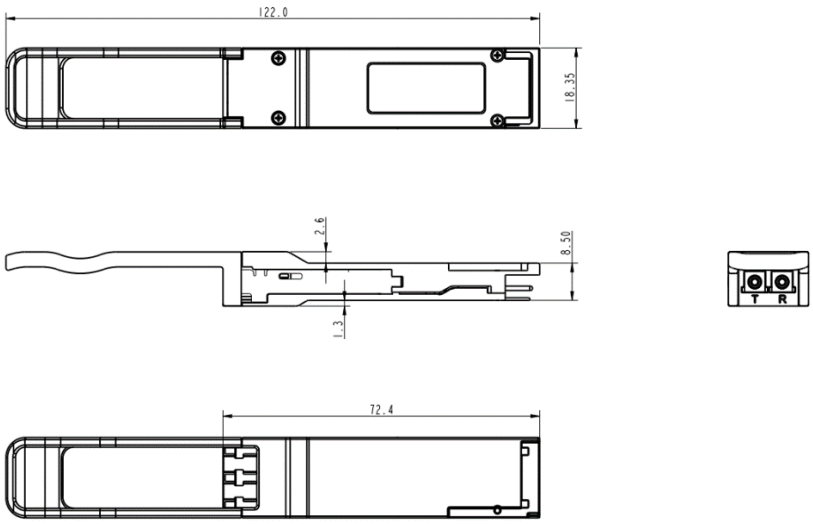
7. Digital Diagnostic Monitoring Functions

The QSD28A2YA1CT_PT supports the I2C-based Diagnostic Monitoring Interface (DMI) that follows the guidelines outlined in the SFF-8636 document. This allows users to monitor the real-time performance metrics such as transmitter and receiver optical power, temperature, supply voltage, and bias current directly from the host.

Performance Item	Related Bytes (A0[00] memory)	Monitor Error	Notes
Module temperature	22 to 23	+/–3°C	4,5
Module voltage	26 to 27	< 3%	5
LD bias current	42 to 49	< 10%	5
Transmitter optical power	50 to 57	< 3 dB	5
Receiver optical power	34 to 41	< 3 dB	5

[4] Actual Temperature test point is fixed on module case around laser Array.
[5] Full operating temperature range

8. Mechanical Specifications



9. Alarm and Warning Threshold

The QSD2817TB1CT_PT is equipped with an alarm feature that alerts users when the basic performance metrics fall below or exceed set thresholds.

Performance Item	Alarm Threshold Bytes (A0[03] Memory)	Unit	Low Threshold	High Threshold
Temp Alarm	128 to 131	°C	-10	80
Temp Warning	132 to 135	°C	0	70
Voltage Alarm	144 to 147	V	2.97	3.63
Voltage Warning	148 to 151	V	3.135	3.465
TX Power Alarm	192 to 195	dBm	-7.3	7.5
TX Power Warning	196 to 199	dBm	-4.3	4.5
RX Power Alarm	176 to 179	dBm	-13.6	7.5
RX Power Warning	180 to 183	dBm	-10.6	4.5

10. Instructions, Safety and Regulatory Compliance

The **QSD28A2YA1CT_PT** uses transmitters with **CLASS 1 LASER PRODUCT** thus below instructions shall be strictly followed:

10.1 Preparation:

a. Check if the optical module is compatible with your equipment.

b. Check if the equipment is in proper state.

c. Check if the optical module slot on the equipment is clean and free of dust.

d. Check if the surface of the optical module is clean and free of dust.

10.2 Insertion:

a. Gently insert the optical module into the corresponding slot on the equipment, ensuring it aligns with the slot's positioning pin. A slight "click" sound indicates that the optical module has been correctly installed.

b. Ensure that the connection between the optical module and the equipment is secure and there is no looseness.

c. Don’t look directly on the open optical interface of the module when it is already plugged in and powered on to prevent eye damage.

10.3 Link check:

a. After powering on, check if the indicator lights of the optical module are working properly.

b. Perform necessary performance tests to ensure the functionality of the optical module.

10.4 Maintenance and Cleaning

a. Regularly check the optical module and connecting cables to ensure there is no damage or looseness.

b. In case of dirty, gently clean the surface of the optical module with a clean dust-free cloth, avoiding the use of any chemical cleaning agents.

Note:

a. Use only compatible optical fiber cables and accessories.
b. The switch needs to be fastened to the corresponding guide rails on the rack using screws and wrench.
c. Switch locations normally installed in a **restricted access area**. Please follow safety instructions from switch vendor.

Feature	Agency	Standard	Performance
Safety	**TUV**	**Laser Class 1, EN60825:2014 + A1:2021 Laser Class 1, EN60825:2014 + A1:2021 and IEC 60825-1:2014**	TUV tested and qualified

11. ESD Design

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and otherwise handled in an ESD protected environment utilizing standard grounded benches, floor mats, and wrist straps.

Parameter	Threshold Value	Notes
ESD of high-speed pins	1 kV	Human body model
ESD of low-speed pins	2 kV	Human body model
Air discharge during operation	15 kV	
Direct contact discharges to the case	8 kV	

12. Ordering Information

Part Number	Description
QSD28A2YA1CT_PT	**QSFP28 100GBase-LR4 10 km**

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