



Datasheet

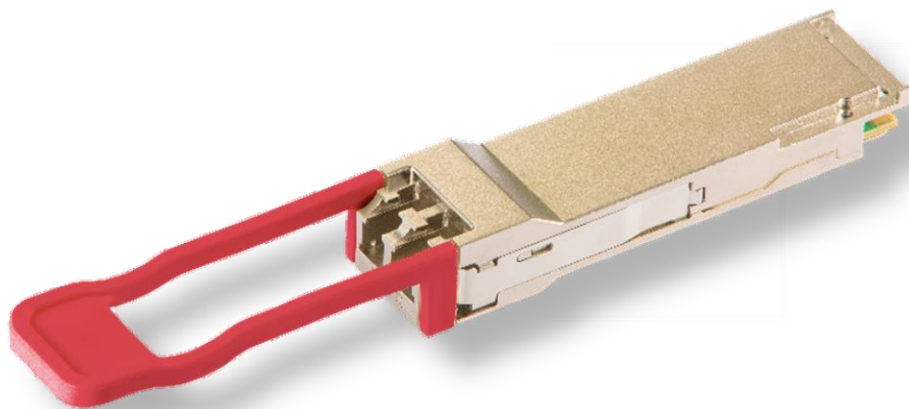
QSFP28, 100GBase-4WDM-40/ER4-Lite | C-Temp
(QSD28A5YB1CT_PT)

Product Features

- QSFP28 MSA compliant
- Hot pluggable 38 pin electrical interface
- 4 LAN-WDM lanes MUX/DEMUX design
- Compliant to 4-Wavelength WDM MSA
- 4 x 25G electrical interface
- Maximum power consumption 4.5 W
- LC duplex connector
- Supports 103.125 Gbps
- Up to 40 km with FEC/ 30km without FEC
- Operating case temperature: 0°C to 70°C
- Single 3.3 V power supply
- RoHS 2 compliant

Applications

- 100G 4WDM-40 Ethernet and ER4 Lite
- Telecom networking
- Data Center interconnect



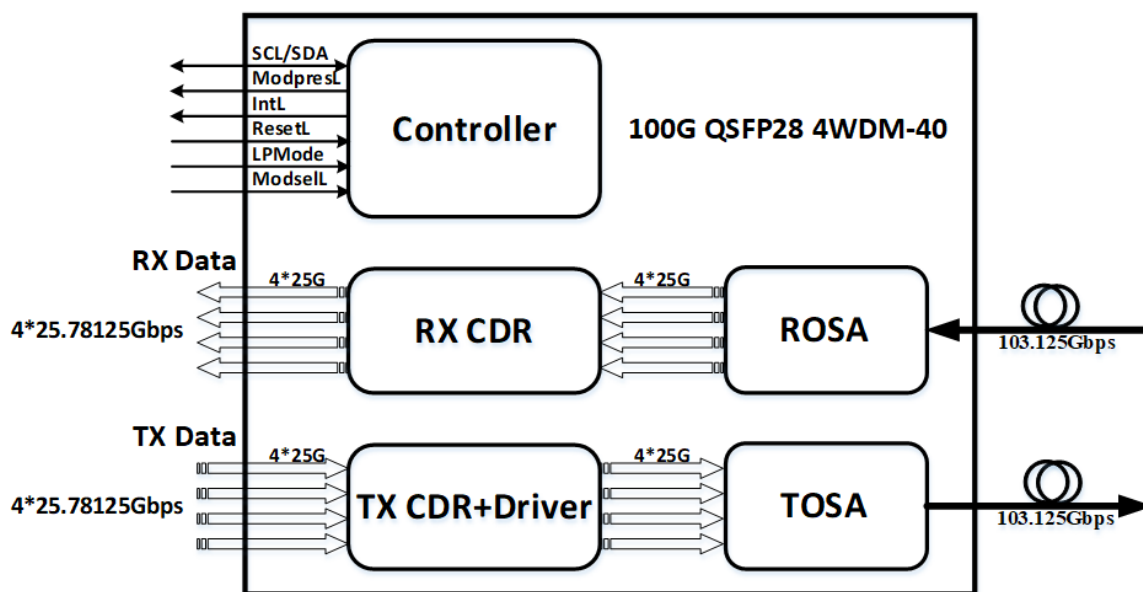
1. Table of Contents

- 2. Product Description 4
- 3. Recommended Operating Environments..... 5
- 4. Pin Descriptions 5
- 5. Absolute Maximum Ratings 7
- 6. Optical Specification..... 7
- 7. Electrical Specifications 9
- 8. Digital Diagnostic Monitoring Functions..... 9
- 9. Mechanical Specifications 10
- 10. Alarm and Warning Threshold 10
- 11. Instructions and Regulatory Compliance 11
- 12. ESD Design..... 12
- 13. Ordering Information 13

2. Product Description

This module is designed for optical communication applications, supporting distances of up to 40 km when Forward Error Correction (FEC) is used, or up to 30 km without FEC on the host card. It follows the 4-Wavelength WDM MSA standard and is equipped with components for efficient data transmission and reception. The module includes a 4-lane optical transmitter, a 4-lane optical receiver, and a management block with a 2-wire serial interface. The optical signals are combined and sent through a single-mode fiber using an industry-standard LC connector. A block diagram is shown in Figure 1

Figure 1 Block Diagram



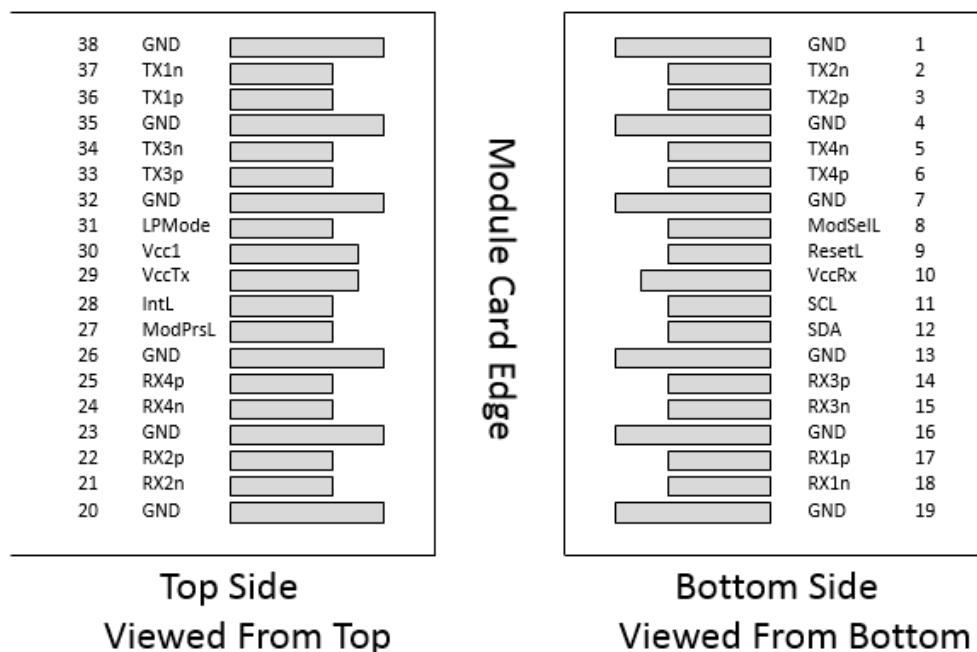
3. Recommended Operating Environments

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 (without FEC)				30	km
Link distance with G.652 (with FEC)				40	Km

4. 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	

¹ Circuit ground is internally isolated from chassis ground

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

5. 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		3.6	V	
Storage temperature	Ts	-40		85	°C	
Relative humidity	RH	5		85	%	Non-condensing
Damage threshold, each lane	THd	-2.5			dBm	

6. Optical Specification

100G 4WDMW-40 Operation (EOL, Temp = 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			12.5	dBm	
Average launch power, each lane	-2.5		6.5	dBm	
Optical Modulation amplitude (OMA), each lane	0.5		6.5	dBm	

Difference in launch power between any two lanes (average and OMA)			3.6	dBm	
Extinction ratio (ER)	4.5			dB	
Side-mode Suppressions ration (SMSR)	30			dB	
Launch Power in OMA minus TDP, each lane			-0.5	dBm	
Transmitter and dispersion penalty (TDP), each lane			3.0	dB	
Transmitter reflectance			-26	dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				2
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		
Damage threshold, each lane	-2.5			dBm	
Average receiver power, each lane	-20.5		-3.5	dBm	
Receiver power, each lane (OMA)			-3.5	dBm	
Receiver sensitivity (OMA), each lane			-18.5	dBm	3
Receiver sensitivity (OMA), each lane			-14.6	dBm	4
Stressed receiver sensitivity (OMA), each lane			-16	dBm	3
LOS assert	-33			dBm	
LOS deassert			-22	dBm	
LOS hysteresis	0.5			dB	
Receiver reflectance			-26	dB	
Vertical eye closure penalty, each lane		2.5		dB	

² Eye mask hit ratio 5×10^{-5} ³ Sensitivity is specified at BER@5E-5⁴ Sensitivity is specified at BER@1E-12

Stressed eye J2 Jitter, each lane		0.33		UI	
Stressed eye J4 Jitter each lane		0.48		UI	

7. Electrical Specifications

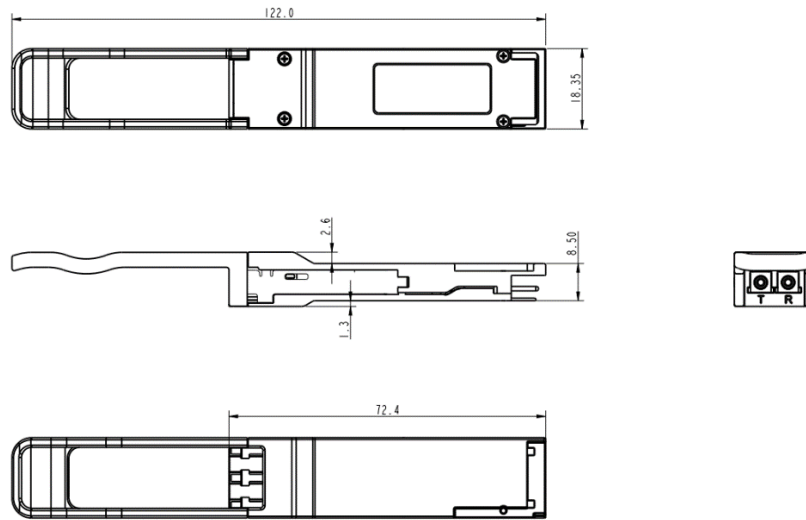
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power dissipation				4.5	W	
Supply current	I _{cc}			1.1987	A	Steady state
Transmitter						
Data rate, each lane			25.78125		Gbps	
Differential voltage pk-pk	V _{pp}			900	mV	At 1 MHz
Transition time	Trise/Tfall	10			ps	20%~80%
Differential termination resistance 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	V _{out} , pp			900	mV	
Common mode noise, RMS	V _{rms}			17.5	mV	
Transition time	Trise/Tfall	12			ps	20%~80%
Eye width	EW15	0.57			UI	
Eye height	EH15	228			mV	

8. Digital Diagnostic Monitoring Functions

The QSD28A5YB1CT_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	^{5, 6}
Module voltage	26 to 27	< 3%	6
LD bias current	42 to 49	< 10%	6
Transmitter optical power	50 to 57	< 3 dB	6
Receiver optical power	34 to 41	< 3 dB	6

9. Mechanical Specifications



10. Alarm and Warning Threshold

The QSD28A5YB1CT_P 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	-5.5	8.2
TX Power Warning	196 to 199	dBm	-2.5	6.5

⁵ Actual temperature test point is fixed on module case around laser

⁶ Full operating temperature range.

RX Power Alarm	176 to 179	dBm	-23.5	-0.5
RX Power Warning	180 to 183	dBm	-20.5	-3.5

11. Instructions, Safety and Regulatory Compliance

The QSD28A5YB1CT_P uses transmitters with **CLASS 1 LASER PRODUCT** thus below instructions shall be strictly followed:

10.1 Preparation:

- Check if the optical module is compatible with your equipment.
- Check if the equipment is in proper state.
- Check if the optical module slot on the equipment is clean and free of dust.
- Check if the surface of the optical module is clean and free of dust.

10.2 Insertion:

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

- After powering on, check if the indicator lights of the optical module are working properly.
- Perform necessary performance tests to ensure the functionality of the optical module.

10.4 Maintenance and Cleaning

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

- Use only compatible optical fiber cables and accessories.
- The switch needs to be fastened to the corresponding guide rails on the rack using screws and wrench.
- 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
--------	-----	---	--------------------------

12. 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	

13. Ordering Information

Part Number	Description
QSD28A5YB1CT_P	QSFP28 100GBase-4WDM-40/ER4-Lite

Copyright © ESTEL SRL 2024. All rights reserved.

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of E-S-TEL SRL.

Trademarks and Permissions

 **estel** is a trademark of E-S-TEL SRL.

All other trademarks and trade names mentioned in this document are the property of their respective owners.

Notice

The purchased products, services and features are stipulated by the contract made between E-S-TEL SRL and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

