

100G DWDM QSFP28 1529.16nm-1560.61nm 80km DOM Transceiver

DW2-QSFP100G80-xxxx



Applications

- High Bandwidth Connectivity for Data Center Interconnection
- 100G Ethernet Metro-Access over DWDM
- P to P Access Network

Features

- Hot Pluggable QSFP28 MSA Form Factor
- Up to 80km Reach for G.652 SMF with Transport White Box
- Single +3.3V Power Supply
- Temperature Range 0 to 85. C
- Transmitter: Cooled EML 2x27.5Gbaud/s DWDM TOSA
- Receiver: 2x27.5Gbaud/s Pin-PD ROSA
- 4x25G CAUI4 Electrical Interface
- Integrated SFEC with High Coding Gain
- PAM4 Modulation Format on 100GHz ITU DWDM Wavelength Grid Compatible
- Dual CS Adaptor
- Compatible with RoHS6

Description

The 100G DWDM PAM4 transceiver supports to multiple 100G links up to 80km using TDCM and EDFA over single-mode fiber (SMF) via an CS connector. PAM4 modulation technology allows for DWDM connectivity in a QSFP28 form factor on the 100G ITU DWDM wavelength grid. This transceiver is compliant with IEEE 802.3bm, QSFP28 MSA, SFF-8636 and SFF-8024 standards. The built-in digital diagnostics monitoring (DDM) allows access to real-time operating parameters.

Product Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Unit	Min.	Max.
Storage Temperature Range	T _s	C	-40	+85
Relative Humidity	RH	%	5	85
Power Supply Voltage	V _{CC}	V	-0.5	+3.6
Operating Case Temperature Range	T _C	C	0	+85
Receiver Damage Threshold Per Lane	P _{dag}	dBm	+2	

II. Recommended Operating Conditions

Parameter	Typ.	Unit	Min.	Max.	Notes
Operating Case Temperature		C	0	+85	
Power Supply Voltage	3.3	V	3.135	3.465	
Control Input Voltage High		V	2	V _{CC} +0.3	
Control Input Voltage Low		V	-0.3	0.8	
Rx Diff Data Output Load	100	Ω			



Parameter	Typ.	Unit	Min.	Max.	Notes
Power Dissipation	7	W			Tc = 85 °C, Vcc = 3.465V, End of Life

III. Optical Characteristics

A. Transmitter (TP2)

Parameter	Unit	Min.	Typ.	Max.	Notes
Optical Output Power	dBm	-1		+4	
Transmitter Rate	Gbps		55.04318		55.04318*2λ
Lane Center Wavelength Spacing	GHz		100		
Center Wavelength	nm	See Wavelength Table			
Extinction Ratio	dB	6			
Side-Mode Suppression Ratio	dB	30			
RIN OMA	dB/Hz			-132	
Optical Return Loss Tolerance	dB			20	
Transmitter Reflectance	dB			-12	
Dispersion Tolerance	ps/nm	-150		50	Amplified Link
		-150		100	Unamplified Link

B. Receiver (TP3)

Parameter	Unit	Min.	Typ.	Max.	Notes
Receive Rate	Gbps		55.04318		55.04318*2λ
Center Wavelength	nm	See Wavelength Table			
Receiver reflectance	dB			-26	
Receiver Sensitivity, each lane	dBm			-13	
Required OSNR	dB	26.5			Receiving Power @0~-7dBm
		29.5			Receiving Power @-7~- 13dBm
RSSI Accuracy	dB	-3		3	

IV. Electrical Characteristics

For electrical characteristics, refer to CAUI-4 chip-to-module draft specifications (IEEE P802.3bm Annex 83E). The CAUI-4 host output shall meet the specifications defined while measured at TP 1 for transmitter, TP4 for receiver.

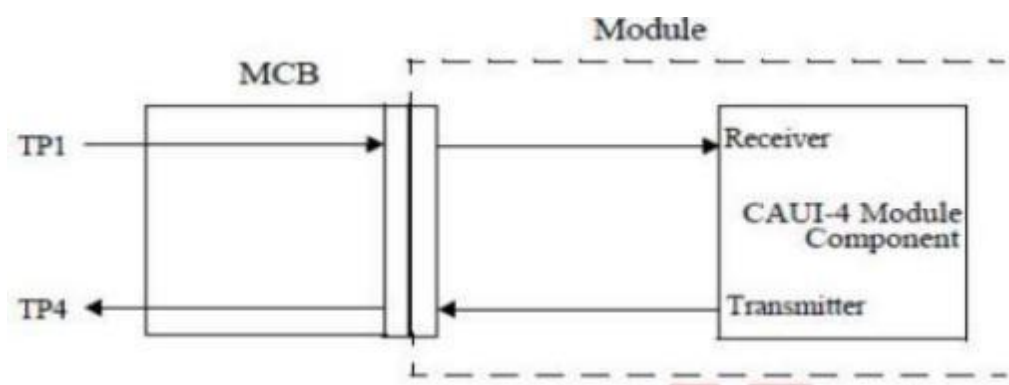


Figure 1: Module CAUI-4 Compliance Test Point

A. Transmitter Electrical Specification (TP1)

Parameter	Unit	Min.	Typ.	Max.	Comment
Signaling Rate, Each Lane	Gb/s	Typ - 100 ppm	25.7813	Typ + 100 ppm	
DC Common Mode Output Voltage	mV	-350		2850	
Differential Return Loss	dB				See Template 1
Common to Differential Mode Conversion Return Loss	dB				See Template2
Differential Termination Mismatch	%			10	At 1 MHz

B. Receiver Electrical Specification (TP4)

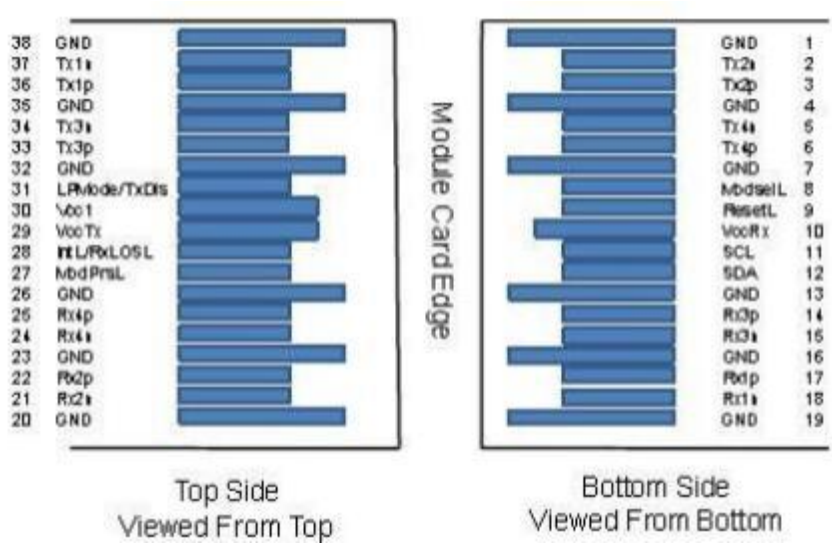
Parameter	Unit	Min.	Typ.	Max.	Comment
Signaling Rate, Each Lane	Gb/s	Typ - 100 ppm	25.7813	Typ + 100 ppm	
Common-Mode AC Output Voltage	mV			17.5	
Differential Pk-pk Output Voltage Swing	mVpp			900	
Eye Width	UI	0.57			EW15 at 10-15 Probability; PR BS 29-1
Eye Height Differential	mV	228			EH15 at 10-15 Probability; PR BS 29-1
Vertical Eye Closure	dB			5.5	
Differential Output Return Loss	dB				See Template 1
Common to Differential Mode Conversion Return Loss	dB				See Template2
Differential Termination Mismatch	%			10	

Parameter	Unit	Min.	Typ.	Max.	Comment
Transition Time (20% to 80%)	ps	12			
DC Common Mode Voltage3	mV	-350		2850	

Note:

- 1. Reference IEEE P802.3bm Annex 83E, Figure 83E-7 for template
- 2. Reference IEEE P802.3bm Annex 83E, Figure 83E-8 for template

V. Pin Definition



VI. Pin Description

Pin	Definition	Description	Note
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	



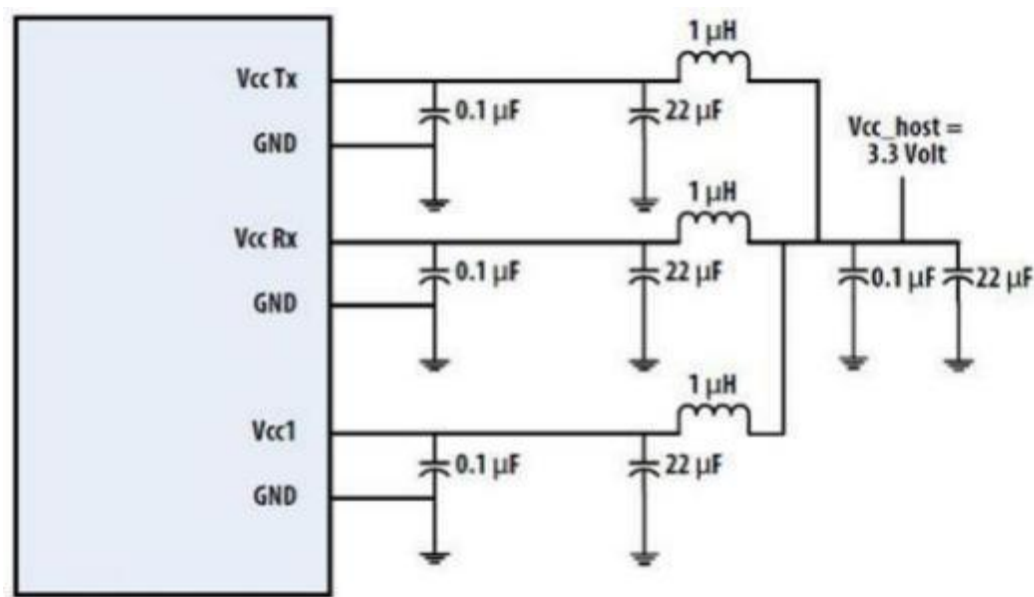
Pin	Definition	Description	Note
4	GND	Ground	1
5	Tx4 n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	Reset L	Module Reset	
10	VccRx	+3.3V Power Supply Receiver	2
11	SCL	2-Wire Serial Interface Clock	
12	SDA	2-Wire Serial Interface 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	

Pin	Definition	Description	Note
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	V _{cc} Tx	+3.3 V Power Supply Transmitter	2
30	V _{cc} 1	+3.3 V Power Supply	2
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3 n	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

Notes:

- 1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
- 2. V_{cc}Rx, V_{cc} 1 and V_{cc}Tx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure below. V_{cc} Rx, V_{cc} 1 and V_{cc}Tx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 2000mA.

VII. Principle Diagram



VIII. Digital Diagnostic Monitoring Specifications

A. DDM Accuracy

Parameter	Unit	Requirements	Note
Temperature	C	± 3	
Voltage	V	± 5%	
Ibias	mA	± 10%	
Rx Power	dB	± 3.0	
Tx Power	dB	± 3.0	

B. DDM Alarm & Warning Threshold

Parameter	Unit	Requirements	Description
Temp Low Warning	C	0	Min. Case Temperature
Temp High Warning	C	83	Max. Case Temperature
Voltage Low Warning	V	3.135	- 5% V _{cc} Target
Voltage High Warning	V	3.465	+ 5% V _{cc} Target
Tx Power Low Warning	dBm	-1.0	Min. Optical Power in DS
Tx Power High Warning	dBm	4	Max. Optical Power+1dBm in DS
Rx Power Low Warning	dBm	-12.5	Sensitivity
Rx Power High Warning	dBm	4.2	Overload
Temp Low Alarm	C	-10	Warning - 10°C
Temp High Alarm	C	+88	Warning + 10°C
Voltage Low Alarm	V	2.97	- 10% V _{cc} Target
Voltage High Alarm	V	3.63	+ 10% V _{cc} Target
Tx Power Low Alarm	dBm	-4.0	Warning -3dB
Tx Power High Alarm	dBm	7	Warning +3dB
Rx Power Low Alarm	dBm	-15.5	Warning -3dB
Rx Power High Alarm	dBm	7.2	Warning +3dB

IX. Wavelength Table

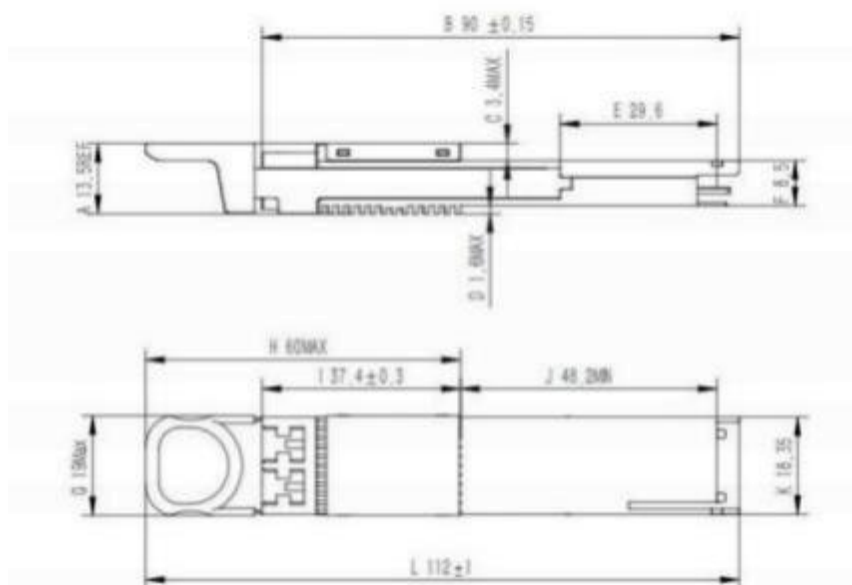
Product Code	TX1			TX2		
	Ch. No.	Frequency (THz)	Center Wavelength (nm)	Ch. No.	Frequency (THz)	Center Wavelength (nm)
DWDM2-9813	C 13	191.30	1567.13	C 14	191.40	1566.31
DWDM2-9814	C 13+	191.35	1566.72	C 14+	191.45	1565.90
DWDM2-9815	C 15	191.50	1565.50	C 16	191.60	1564.68
DWDM2-9816	C 15+	191.55	1565.09	C 16+	191.65	1564.27
DWDM2-9817	C 17	191.70	1563.86	C 18	191.80	1563.05
DWDM2-9818	C 17+	191.75	1563.45	C 18+	191.85	1562.64
DWDM2-9819	C 19	191.90	1562.23	C 20	192.00	1561.42
DWDM2-9820	C 19+	191.95	1561.83	C 20+	192.05	1561.01
DWDM2-9821	C 21	192.10	1560.61	C 22	192.20	1559.79
DWDM2-9822	C 21+	192.15	1560.20	C 22+	192.25	1559.39
DWDM2-9823	C 23	192.30	1558.98	C 24	192.40	1558.17
DWDM2-9824	C 23+	192.35	1558.58	C 24+	192.45	1557.77
DWDM2-9825	C 25	192.50	1557.36	C 26	192.60	1556.55
DWDM2-9826	C 25+	192.55	1556.96	C 26+	192.65	1556.15
DWDM2-9827	C 27	192.70	1555.75	C 28	192.80	1554.94
DWDM2-9828	C 27+	192.75	1555.34	C 28+	192.85	1554.54

Product Code	TX1			TX2		
	Ch. No.	Frequency (THz)	Center Wavelength (nm)	Ch. No.	Frequency (THz)	Center Wavelength (nm)
DWDM2-9829	C29	192.90	1554.13	C30	193.00	1553.33
DWDM2-9830	C29+	192.95	1553.73	C30+	193.05	1552.93
DWDM2-9831	C31	193.10	1552.52	C32	193.20	1551.72
DWDM2-9832	C31+	193.15	1552.12	C32+	193.25	1551.32
DWDM2-9833	C33	193.30	1550.92	C34	193.40	1550.12
DWDM2-9834	C33+	193.35	1550.52	C34+	193.45	1549.72
DWDM2-9835	C35	193.50	1549.32	C36	193.60	1548.51
DWDM2-9836	C35+	193.55	1548.91	C36+	193.65	1548.11
DWDM2-9837	C37	193.70	1547.72	C38	193.80	1546.92
DWDM2-9838	C37+	193.75	1547.32	C38+	193.85	1546.52
DWDM2-9839	C39	193.90	1546.12	C40	194.00	1545.32
DWDM2-9840	C39+	193.95	1545.72	C40+	194.05	1544.92
DWDM2-9841	C41	194.10	1544.53	C42	194.20	1543.73
DWDM2-9842	C41+	194.15	1544.13	C42+	194.25	1543.33
DWDM2-9843	C43	194.30	1542.94	C44	194.40	1542.14
DWDM2-9844	C43+	194.35	1542.54	C44+	194.45	1541.75
DWDM2-9845	C45	194.50	1541.35	C46	194.60	1540.56

Product Code	TX1			TX2		
	Ch. No.	Frequency (THz)	Center Wavelength (nm)	Ch. No.	Frequency (THz)	Center Wavelength (nm)
DWDM2-9846	C45+	194.55	1540.95	C46+	194.65	1540.16
DWDM2-9847	C47	194.70	1539.77	C48	194.80	1538.98
DWDM2-9848	C47+	194.75	1539.37	C48+	194.85	1538.58
DWDM2-9849	C49	194.90	1538.19	C50	195.00	1537.40
DWDM2-9850	C49+	194.95	1537.79	C50+	195.05	1537.00
DWDM2-9851	C51	195.10	1536.61	C52	195.20	1535.82
DWDM2-9852	C51+	195.15	1536.22	C52+	195.25	1535.43
DWDM2-9853	C53	195.30	1535.04	C54	195.40	1534.25
DWDM2-9854	C53+	195.35	1534.64	C54+	195.45	1533.86
DWDM2-9855	C55	195.50	1533.47	C56	195.60	1532.68
DWDM2-9856	C55+	195.55	1533.07	C56+	195.65	1532.29
DWDM2-9857	C57	195.70	1531.90	C58	195.80	1531.12
DWDM2-9858	C57+	195.75	1531.51	C58+	195.85	1530.72
DWDM2-9859	C59	195.90	1530.33	C60	196.00	1529.55
DWDM2-9860	C59+	195.95	1529.94	C60+	196.05	1529.16

Notes:
The two channels of the transceiver meet above wavelength table. And other channel wavelength configurations are acceptable for customize design.
All the specification is designed by single wavelength.

X. Mechanical Dimensions



XI. ESD

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4/JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected Environment.

Test Center

I. Compatibility Testing

Each fiber optical transceiver has been tested in host device on site in FS Assured Program to ensure full compatibility with over 200 vendors.



Cisco Catalyst C9500-24Y4C



Cisco MS425-16



Brocade VDX 6940-144S



Dell EMC Networking Z9100-ON



Force@tm S60-44T

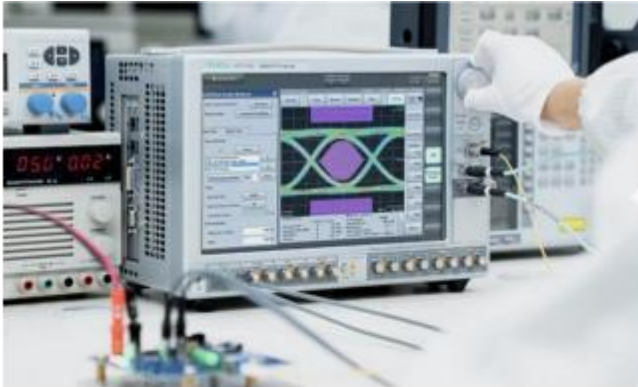


HUAWEI S6720-30L-HI-24S

Above is part of our test bed network equipment. For more information, please click the Test Bed PDF. It will be updated in realtime as we expand our portfolio.

II. Performance Testing

Each fiber optical transceiver has been fully tested in FS Assured Program equipped with world's most advanced analytical equipment to ensure that our transceivers work perfectly on your device.



1. TX/RX Signal Quality Testing

Equipped with the all-in-one tester integrated 4ch BERT & sampling oscilloscope, and variable optical attenuator to ensure the input and output signal quality.

- Eye Pattern Measurements: Jitter, Mask Margin, etc
- Average Output Power
- OMA
- Extinction Ratio
- Receiver Sensitivity
- BER Curve

2. Reliability and Stability Testing

Subject the transceivers to dramatic changes in temperature on the thermal shock chamber to ensure reliability and stability of the transceivers.

- Commercial: 0 °C to 70 °C
- Extended: -5 °C to 85 °C
- Industrial: -40 °C to 85 °C



3. Transfer Rate and Protocol Testing

Test the actual transfer data rate and the transmission ability under different protocols with Network Master Pro.

- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI

4. Optical Spectrum Evaluation

Evaluate various important parameters with the Optical Spectrum Analyzer to meet the industry standards.

- Center Wavelength, Level
- OSNR
- SMSR
- Spectrum Width



Order Information

Part Number	Description
DW2-QSFP100G80-xxxx	100G QSFP28 DWDM PAM4 80km (Require EDFA and TDCM) DOM Transceiver