WTQ40-100-SR-BIDI-100C 40/100G QSFP28 SR BiDi Optical Transceiver

Product Overview 3 / Applications 4

1. Product Overview

General Description

This product can support both 40Gb/s and 100Gb/s bit rates. It is a parallel Quad Small Form-factor Pluggable (QSFP28) Bi-Direction optical module. The module integrates four host electrical data into two optical lanes (by Dual Wavelength VCSEL Bi-Directional Optical Interface, 850nm and 900nm) to allow optical communication over a 2-fiber duplex LC optical multi-mode fiber. Reversely, on the receiver side, the module de-multiplexes 2 sets of optical input signal and converts them to 4 channels of electrical data.

An optical fiber ribbon cable with an LC connector can be plugged into the QSFP28 module receptacle. Proper alignment is ensured by the guide pins inside the receptacle. The cable usually cannot be twisted for proper channel to channel alignment. Electrical connection is achieved through an MSA-compliant 38-pin edge type connector.

The module operates by a single +3.3V power supply. LVCMOS/LVTTL global control signals, such as Module Present, Reset, Interrupt and Low Power Mode, are available with the modules. A 2-wire serial interface is available to send and receive more complex control signals, and to receive digital diagnostic information. Individual channels can be addressed and unused channels can be shut down for maximum design flexibility.

The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP28 Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference. The module offers very high functionality and feature integration, accessible via a two-wire serial interface.

Features

- QSFP28 MSA compliant
- Support 40GE and 100GE dual aggregate rates
- Compliant to IEEE 802.3bm 100GBASE-SR
- Four independent full-duplex channels
- Up to 100m OM4 MMF transmission
- Operating case temperature:
- 0 to 70°C at 40G and 100G
- Single 3.3V power supply
- Maximum power consumption 3.5W
- LC optical connector
- RoHS-6 compliant

Applications

- Data Center
- InfiniBand QDR, DDR and SDR
- 40G & 100G Ethernet

2. Ordering Information

Part No.	Bit Rate (Gbps)	Laser (nm)	Distance（km）	Fiber Type	DDMI	Connector	Temp

3. Recommended Operating Conditions

Parameter	Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature	Operating Case Temperature	TOP	0		70	degC	
Power Supply Voltage	Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate Accuracy	Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio(@100G)	Pre-FEC Bit Error Ratio(@100G)				2.4x10-4		
Post-FEC Bit Error Ratio(@100G)	Post-FEC Bit Error Ratio(@100G)				1x10-12		1
Bit Error Ratio (@40G)	Bit Error Ratio (@40G)				1x10-12		
Control Input Voltage High	Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low	Control Input Voltage Low		0		0.8	V	
Link Distance （@100G）	OM3	D1			70	m	2
Link Distance （@100G）	OM4	D2			100	m	2
Link Distance （@100G）	OM5	D3			150	m	2
Link Distance (@40G, OM3&OM4&OM5)	Link Distance (@40G, OM3&OM4&OM5)	D1			100	m	2

4. Recommended Operating Conditions

Parameter	Test Point	Min	Typical	Max	Units	Notes
Power Consumption				3.5	W	
Supply Current	Icc			1.06	A	
Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)
Overload Differential Voltage pk-pk	TP1a	900			mV	
Common Mode Voltage (Vcm)	TP1	-350		2850	mV	1
Differential Termination Resistance Mismatch	TP1			10	%	At 1MHz
Differential Return Loss (SDD11)	TP1			See CEI- 28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)	TP1			See CEI- 28G-VSR Equation 13-20	dB	
Stressed Input Test	TP1a	See CEI- 28G-VSR Section 13.3.11.2.1				

Parameter	Test Point	Min	Typical	Max	Units	Notes
Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)
Differential Voltage, pk-pk	TP4			900	mV	
Common Mode Voltage (Vcm)	TP4	-350		2850	mV	1
Common Mode Noise, RMS	TP4			17.5	mV	
Differential Termination Resistance Mismatch	TP4			10	%	At 1MHz
Differential Return Loss (SDD22)	TP4			See CEI- 28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)	TP4			See CEI- 28G-VSR Equation 13-21	dB	
Common Mode Return Loss (SCC22)	TP4			-2	dB	2
Transition Time, 20 to 80%	TP4	9.5			ps	
Vertical Eye Closure (VEC)	TP4			5.5	dB	
Eye Width at 10-15 probability (EW15)	TP4	0.57			UI	
Eye Height at 10-15 probability (EH15)	TP4	228			mV	

5. Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units	Notes
Temperature monitors absolute error	DMI_Temp	-3	3	degC	Over operating temperature range
Supply voltage monitor absolute error	DMI _VCC	-0.15	0.15	V	Over full operating range
Channel RX power monitor absolute error	DMI_RX_Ch	-2	2	dB	1
Channel Bias current monitor	DMI_Ibias_Ch	-10%	10%	mA	Ch1~Ch4
Channel TX power monitor absolute error	DMI_TX_Ch	-2	2	dB	1

6. Optical Parameters

Parameter	Symbol	Min	Typica l	Max	Units	Notes
Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter
Center Wavelength Line0	λC	832		868	nm	

Parameter	Symbol	Min	Typica l	Max	Units	Notes
Center Wavelength Line1	λC	882		918	nm	
RMS Spectral Width	Δλrms			0.59	nm	
Average Launch Power, each Lane	PAVG	-4		5	dBm	
Optical Modulation Amplitude (OMA), each Lane	POMA	-1		5	dBm	1
OMA @max TDP, each Lane		-1.1			dBm	2
Launch power in OMA minus TDP, lane1		-4.5			dBm	
Launch power in OMA minus TDP, lane2		-5.2			dBm	
Transmitter Dispersion Penalty, lane 1	TDP			3.4	dB	3
Transmitter Dispersion Penalty,lane 2	TDP			4.1	Db	4
Transmitter Rise /Fall Time (80%-20%), each lane			21		ps	
Extinction Ratio	ER	3.0			dB	
RIN12 OMA				-130	dB/Hz	
Optical Return Loss Tolerance	TOL	12			dB	
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
Encircled Flux		≥ 86% at 19 μm ≤ 30% at 4.5 μm	≥ 86% at 19 μm ≤ 30% at 4.5 μm	≥ 86% at 19 μm ≤ 30% at 4.5 μm		5
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.23, 0.34, 0.43, 0.27, 0.35, 0.4}	{0.23, 0.34, 0.43, 0.27, 0.35, 0.4}	{0.23, 0.34, 0.43, 0.27, 0.35, 0.4}		
Receiver	Receiver	Receiver	Receiver	Receiver	Receiver	Receiver
Signaling rate, each lane		20.625± 100ppm	20.625± 100ppm	20.625± 100ppm	Gbps	
Center Wavelength Lane0	λC	832		868	nm	
Center Wavelength Lane1	λC	882		918	nm	
Damage Threshold, each Lane	THd	7			dBm	
Average Receive Power, each Lane		-6		5	dBm	6
Peak power, each lane				7	dBm	
Receive Power (OMA), each Lane				3.0	dBm	
Receiver Sensitivity (OMA), Lane1	SEN			-6.4	dBm	for BER = 1x10-12

Parameter	Symbol	Min	Typica l	Max	Units	Notes
Receiver Sensitivity (OMA), Lane2	SEN			-7.0	dBm	for BER = 1x10-12
Receiver Sensitivity (OMA) to meet FCoE support, Lane1	SEN			-7.1	dBm	for BER = 1x10-12
Receiver Sensitivity (OMA) to meet FCoE support, Lane2	SEN			-7.7	dBm	for BER = 1x10-12
1e-12 RX sensitivity in OMA w/ real TX to meet FCoE support24, lane1				-5.3		
1e-12 RX sensitivity in OMA w/ real TX to meet FCoE support25, lane2				-5.9		
Receiver Reflectance	RR			-15	dB	
Receive electrical 3dB upper cutoff frequency				15.5	GHz	
Stressed receiver sensitivity in OMA, Lane1				-3.86	dBm	7
Stressed receiver sensitivity in OMA, Lane2				-3.83	dBm	7
Receiver jitter tolerance in OMA29, each lane				-5	dBm	8
Receiver jitter tolerance in OMA29, each lane 1e-12 RX sensitivity in OMA w/ real TX and Fiber to meet FCoE, each lane				-3.6	dBm	
LOS Assert	LOSA			-7.5	dBm	
LOS Deassert	LOSD			-7	dBm	
LOS Hysteresis	LOSH				dB	
Conditions of Stress Receiver Sensitivity Test (Note 5)	Conditions of Stress Receiver Sensitivity Test (Note 5)	Conditions of Stress Receiver Sensitivity Test (Note 5)	Conditions of Stress Receiver Sensitivity Test (Note 5)	Conditions of Stress Receiver Sensitivity Test (Note 5)	Conditions of Stress Receiver Sensitivity Test (Note 5)	Conditions of Stress Receiver Sensitivity Test (Note 5)
Stressed Eye Closure (SEC), Lane under Test			4.3		dB	
Stressed Eye J2 Jitter, Lane under Test			0.39		UI	
Stressed Eye J4 Jitter, Lane under Test				0.53	UI	
OMA of each Aggressor Lane			3		dBm	
Stressed Receiver Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3},		{0.28, 0.5, 0.5, 0.33, 0.33, 0.4}	{0.28, 0.5, 0.5, 0.33, 0.33, 0.4}	{0.28, 0.5, 0.5, 0.33, 0.33, 0.4}		

Parameter	Symbol	Min	Typica l	Max	Units	Notes
Hit ratio 5x10-5 hits per sample						

7. Optical Parameters

Parameter	Symbol	KP4 FEC Mode	KP4 FEC Mode	KP4 FEC Mode	Unit	Notes
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter
Center Wavelength Line0	λC	844		863	nm	
Center Wavelength Line1	λC	900		918	nm	
RMS Spectral Width	Δλrms			λ1: 0.6 λ2: 0.65	nm	
Average Launch Power, each Lane	PAVG	-6.2		4	dBm	
Optical Modulation Amplitude (OMA), each Lane	POMA	-4.2		3	dBm	1
Peak Power, each lane				--	dBm	
Launch power in OMA minus TDP, each lane		-5.6			dBm	
TDECQ, each lane				4.5	dB	
Extinction Ratio	ER	3.0			dB	
Transmitter transition time, each lane (max)				31	ps	
RIN12 OMA				-128	dB/Hz	
Optical Return Loss Tolerance	TOL			12	dB	
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
Encircled Flux		≥ 86% at 19 μm ≤ 30% at 4.5 μm	≥ 86% at 19 μm ≤ 30% at 4.5 μm	≥ 86% at 19 μm ≤ 30% at 4.5 μm		2
Signaling rate, each lane		26.5625± 100ppm	26.5625± 100ppm	26.5625± 100ppm	GBd	
Center Wavelength Lane0	λC	844	850	863	nm	
Center Wavelength Lane1	λC	900	910	918	nm	
Damage Threshold, each Lane	THd	5			dBm	3
Average Receive Power, each lane		-8.2			dBm	4
Average power at receiver input, each lane (overload)				4	dBm	
Receiver Reflectance	RR			-12	dB	

Parameter	Symbol	KP4 FEC Mode	KP4 FEC Mode	KP4 FEC Mode	Unit	Notes
Stressed receiver sensitivity in OMA, Lane2				-3.5	dBm	5

8. Pin Descriptions

PIN	Logic	Symbol	Name/Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
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	1

PIN	Logic	Symbol	Name/Description	Notes
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		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V 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 Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

9. Additional Specifications

Receiver sensitivity OMA outer), each lane				Max (- 6.6, SECQ – 8) as per IEEE cl 150	dBm	
LOS Assert	LOSA				dBm	
LOS Deassert	LOSD				dBm	
LOS Hysteresis	LOSH				dB	

10. Additional Specifications

Stressed eye closure (SECq), each lane	4.5	dB
OMA of each aggressor, each lane	3	dBm

11. Revision History

Version	Date	Description	Prepared by
V6	2025	Unified WincoTek datasheet format	WincoTek
V6.1	2026-10-23	Engineering and format review	WincoTek