200Gb/s QSFP-DD ER4 40km SMF Optical Transceiver WT-DQ4FNE-N00

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1. Product Overview

General Description

This product is a 200Gb/s Quad Small Form Factor Pluggable-double density (QSFP-DD) optical module designed for optical communication applications. The module converts 8 channels of 25Gb/s (NRZ) electrical input data to 4 channels of LAN-WDM optical signals, and multiplexes them into a single channel for 200Gb/s(PAM4) optical transmission. Reversely, on the receiver side, the module optically de-multiplexes a 200Gb/s(PAM4) optical input into 4 channels of WDM optical signals, and converts them to 8 channels of 25Gb/s (NRZ) electrical output data.

The central wavelengths of the 4 LAN WDM channels are 1295.56, 1300.05, 1304.58 and 1309.14 nm as members of the LAN WDM wavelength grid defined in IEEE802.3ba. It contains a duplex LC connector for the optical interface and a 76-pin connector for the electrical interface. To minimize the optical dispersion in the long-haul system, single-mode fiber (SMF) has to be applied in this module. It can support up to 30km with 200G FEC and 40km with built-in PFEC.

The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP-DD Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

Functional Description

Features

- QSFP-DD MSA compliant
- 4 LWDM lanes MUX/DEMUX design
- Up to 40km transmission on single mode fiber (SMF) with built-in PFEC
- Operating case temperature: 0 to 70oC
- Maximum power consumption 12W
- Duplex LC connector
- RoHS compliant

Applications

- 5G Network
- 200G Ethernet
- Enterprise Networking

2. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	TS	-40	85	degC	
Operating Case Temperature	TOP	0	70	degC	
Power Supply Voltage	VCC	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	
Damage Threshold, each Lane	THd	-5.0		dBm	

3. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature	TOP	0		70	degC	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate, each Lane			26.5625		GBd	PAM4
Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio				2.4x10-4		
Post-FEC Bit Error Ratio				1x10-12		1
Link Distance	D	0.002		30	km	2
Link Distance	D	0.002		40	Km	3

4. Recommended Operating Conditions

Parameter	Symbol	Min	Min	Typical	Max	Units	Notes
Wavelength Assignment	L0	1294.53	1294.53	1295.56	1296.59	nm	
Wavelength Assignment	L1	1299.02	1299.02	1300.05	1301.09	nm	
Wavelength Assignment	L2	1303.54	1303.54	1304.58	1305.63	nm	
Wavelength Assignment	L3	1308.09	1308.09	1309.14	1310.19	nm	
Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter
Data Rate, each Lane		53.125 ± 100 ppm	53.125 ± 100 ppm	53.125 ± 100 ppm	53.125 ± 100 ppm	Gb/s	
Modulation Format		PAM4	PAM4	PAM4	PAM4		
Side-mode Suppression Ratio	SMSR	30	30			dB	
Total Average Launch Power	PT				14.7	dBm	
Average Launch Power, each Lane	PAVG	-0.1	-0.1		5.6	dBm	
Outer Optical Modulation Amplitude (OMAouter), each Lane	POMA	3.4	3.4		6.4	dBm	
Launch Power in OMAouter minus TDECQ, each Lane		3	3			dBm	
Transmitter and Dispersion Eye Closure for PAM4, each Lane	TDECQ				3.2	dB	
Extinction Ratio	ER	6	6			dB	
Difference in Launch Power between any Two Lanes (OMAouter)					4	dB	

Parameter	Symbol	Min	Min	Typical	Max	Units	Notes
RIN15.1OMA	RIN	-132	-132			dB/Hz	
Optical Return Loss Tolerance	TOL				15.1	dB	
Transmitter Reflectance	RT				-26	dB	
Average Launch Power of OFF Transmitter, each Lane	Poff				-30	dBm	
Receiver	Receiver	Receiver	Receiver	Receiver	Receiver	Receiver	Receiver
Data Rate, each Lane		53.125 ± 100 ppm	53.125 ± 100 ppm	53.125 ± 100 ppm	53.125 ± 100 ppm	Gb/s	
Modulation Format		PAM4	PAM4	PAM4	PAM4		
Sensitivity, each lane	Sen1	MAX (-11.1, SECQ-12.5)	MAX (-11.1, SECQ-12.5)	MAX (-11.1, SECQ-12.5)	MAX (-11.1, SECQ-12.5)	dBm	For 30km
Sensitivity, each lane	Sen2	MAX (-14.1, SECQ-15.5)	MAX (-14.1, SECQ-15.5)	MAX (-14.1, SECQ-15.5)	MAX (-14.1, SECQ-15.5)	dBm	For 40km
Stressed Conditions for Stress Receiver Sensitivity	Stressed Conditions for Stress Receiver Sensitivity	Stressed Conditions for Stress Receiver Sensitivity	Stressed Conditions for Stress Receiver Sensitivity	Stressed Conditions for Stress Receiver Sensitivity	Stressed Conditions for Stress Receiver Sensitivity	Stressed Conditions for Stress Receiver Sensitivity	Stressed Conditions for Stress Receiver Sensitivity
Stressed Eye Closure for PAM4 (SECQ), Lane under Test			3.4	3.4		dB	
SECQ – 10*log10(Ceq), Lane under Test						dB	
OMAouter of each Aggressor Lane			-8	-8		dBm	

5. Recommended Operating Conditions

Parameter	Test Point	Min	Typical	Max	Units	Notes	
Power Consumption				12	W		
Supply Current	Icc			3.64	A		
Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	Transmitter (each Lane)	
Signaling Rate, each Lane	TP1	26.5625 ± 100 ppm	26.5625 ± 100 ppm	26.5625 ± 100 ppm	GBd		
Differential pk-pk Input Voltage Tolerance	TP1a	900			mVpp	1	
Differential Termination Mismatch	TP1			10	%		
Differential Input Return Loss	TP1	IEEE 802.3-2015 Equation (83E-5)			dB		
Differential to Common Mode Input Return Loss	TP1	IEEE 802.3-2015 Equation (83E-6)			dB		
Module Stressed Input Test	TP1a	See IEEE 802.3bs 120E.3.4.1	See IEEE 802.3bs 120E.3.4.1	See IEEE 802.3bs 120E.3.4.1		2	
Single-ended Voltage Tolerance Range (Min)	TP1a	-0.4 to 3.3	-0.4 to 3.3	-0.4 to 3.3	V		

Parameter	Test Point	Min	Typical	Max	Units	Notes	
DC Common Mode Input Voltage	TP1	-350		2850	mV	3	
Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	Receiver (each Lane)	
Signaling Rate, each lane	TP4	26.5625 ± 100 ppm	26.5625 ± 100 ppm	26.5625 ± 100 ppm	GBd		
Differential Peak-to-Peak	TP4			900	mVpp		
AC Common Mode Output Voltage, RMS	TP4			17.5	mV		
Differential Termination Mismatch	TP4			10	%		
Differential Output Return Loss	TP4	IEEE 802.3- 2015 Equation (83E-2)					
Common to Differential Mode Conversion Return Loss	TP4	IEEE 802.3- 2015 Equation (83E-3)					
Transition Time, 20% to 80%	TP4	9.5			ps		
Near-end Eye Symmetry Mask Width (ESMW)	TP4		0.265		UI		
Near-end Eye Height, Differential	TP4	70			mV		
Far-end Eye Symmetry Mask Width (ESMW)	TP4		0.2		UI		
Far-end Eye Height, Differential	TP4	30			mV		
Far-end Pre-cursor ISI Ratio	TP4	-4.5		2.5	%		
Common Mode Output Voltage (Vcm)	TP4	-350		2850	mV	3	

6. 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	-0.1	0.1	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	
Channel TX power monitor absolute error	DMI_TX_Ch	-2	2	dB	1

7. Pin Descriptions

37	CML-I	Tx1n	Transmitter Inverted Data Input	3B	
38		GND	Ground	1B	1
39		GND	Ground	1A	1
40	CML-I	Tx6n	Transmitter Inverted Data Input	3A	
41	CML-I	Tx6p	Transmitter Non-Inverted Data Input	3A	
42		GND	Ground	1A	1
43	CML-I	Tx8n	Transmitter Inverted Data Input	3A	
44	CML-I	Tx8p	Transmitter Non-Inverted Data Input	3A	
45		GND	Ground	1A	1
46		Reserved	For future use	3A	3
47		VS1	Module Vendor Specific 1	3A	3
48		VccRx1	3.3V Power Supply	2A	2
49		VS2	Module Vendor Specific 2	3A	3
50		VS3	Module Vendor Specific 3	3A	3
51		GND	Ground	1A	1
52	CML-O	Rx7p	Receiver Non-Inverted Data Output	3A	
53	CML-O	Rx7n	Receiver Inverted Data Output	3A	
54		GND	Ground	1A	1
55	CML-O	Rx5p	Receiver Non-Inverted Data Output	3A	
56	CML-O	Rx5n	Receiver Inverted Data Output	3A	
57		GND	Ground	1A	1
58		GND	Ground	1A	1
59	CML-O	Rx6n	Receiver Inverted Data Output	3A	
60	CML-O	Rx6p	Receiver Non-Inverted Data Output	3A	
61		GND	Ground	1A	1
62	CML-O	Rx8n	Receiver Inverted Data Output	3A	
63	CML-O	Rx8p	Receiver Non-Inverted Data Output	3A	
64		GND	Ground	1A	1
65		NC	No Connect	3A	3

37	CML-I	Tx1n	Transmitter Inverted Data Input	3B	
66		Reserved	For future use	3A	3
67		VccTx1	3.3V Power Supply	2A	2
68		Vcc2	3.3V Power Supply	2A	2
69		Reserved	For Future Use	3A	3
70		GND	Ground	1A	1
71	CML-I	Tx7p	Transmitter Non-Inverted Data Input	3A	
72	CML-I	Tx7n	Transmitter Inverted Data Input	3A	
73		GND	Ground	1A	1
74	CML-I	Tx5p	Transmitter Non-Inverted Data Input	3A	
75	CML-I	Tx5n	Transmitter Inverted Data Input	3A	
76		GND	Ground	1A	1

8. Revision History

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