200Gb/s QSFP56 FR4 2km Optical Transceiver WT-FX4FNT-H00



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1. Product Overview

General Description

This product is a 200Gb/s transceiver module designed for 2km optical communication applications. The design is compliant to IEEE802.3bs 200GBASE-FR4 standard. The module converts 4 inputs channels (ch) of 50Gb/s (PAM4) electrical data to 4 CWDM 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) input into 4 CWDM channels signals, and converts them to 4 channel output electrical data.

The central wavelengths of the 4 CWDM channels are 1271, 1291, 1311 and 1331 nm as members of the CWDM wavelength grid defined in ITU-T G.694.2. It contains a duplex LC connector for the optical interface and a 38-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. Host FEC is required to support up to 2km fiber transmission.

The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP56 Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

Functional Description

Features

- IEEE802.3bs 200GBASE-FR4 compliant
- QSFP56 MSA compliant
- 4 CWDM lanes MUX/DEMUX design
- Supports 212.5Gb/s aggregate bit rate
- Up to 2km transmission on single mode fiber (SMF) with FEC
- Operating case temperature: 10 to 60°C
- 200GAUI-4 electrical interface
- Maximum power consumption 6.5W
- LC duplex connector
- RoHS compliant

Applications

- Data Center Interconnect
- 200G Ethernet
- Enterprise Networking

2. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	TS	-40	85	degC	
Operating Case Temperature	TOP	10	60	degC	
Power Supply Voltage	VCC	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	

Parameter	Symbol	Min	Max	Units	Notes
Damage Threshold, each Lane	THd	3.5		dBm	

3. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature	TOP	10		60	degC	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate, each Lane			26.5625		GBd	
Data Rate, each Lane			53.125		Gb/s	
Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio				2.4x10-4		
Post-FEC Bit Error Ratio				1x10-12		1
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance with G.652	D	0.002		2	km	2

4. Recommended Operating Conditions

Parameter	Symbol	Min	Min	Typical	Max	Units	Notes
Wavelength Assignment	L0	1264.5	1264.5	1271	1277.5	nm	
Wavelength Assignment	L1	1284.5	1284.5	1291	1297.5	nm	
Wavelength Assignment	L2	1304.5	1304.5	1311	1317.5	nm	
Wavelength Assignment	L3	1324.5	1324.5	1331	1337.5	nm	
Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter
Data Rate, each Lane		26.5625 ±100 ppm	26.5625 ±100 ppm	26.5625 ±100 ppm	26.5625 ±100 ppm	GBd	
Modulation Format		PAM4	PAM4	PAM4	PAM4		
Side-mode Suppression Ratio	SMSR	30	30			dB	Modulated
Total Average Launch Power	PT				10.7	dBm	
Average Launch Power, each Lane	PAVG	-4.2	-4.2		4.7	dBm	1
Outer Optical Modulation Amplitude (OMAouter), each Lane	POMA	-1.2	-1.2		4.5	dBm	2

Parameter	Symbol	Min	Min	Typical	Max	Units	Notes
Launch Power in OMAouter minus TDECQ, each Lane		-2.6	-2.6			dBm	For ER ≥4.5dB
Launch Power in OMAouter minus TDECQ, each Lane		-2.5	-2.5			dBm	For ER <4.5dB
Transmitter and Dispersion Eye Clouser for PAM4, each Lane	TDECQ				3.3	dB	
Extinction Ratio	ER	3.5	3.5			dB	
Difference in Launch Power between any Two Lanes (OMAouter)					4	dB	
RIN16.5OMA	RIN				-132	dB/Hz	
Optical Return Loss Tolerance	TOL				16.5	dB	
Transmitter Reflectance	TR				-26	dB	
Average Launch Power of OFF Transmitter, each Lane	Poff				-20	dBm	
Receiver	Receiver	Receiver	Receiver	Receiver	Receiver	Receiver	Receiver
Data Rate, each Lane		26.5625 ±100 ppm	26.5625 ±100 ppm	26.5625 ±100 ppm	26.5625 ±100 ppm	GBd	
Modulation Format		PAM4	PAM4	PAM4	PAM4		
Damage Threshold, each Lane	THd	5.7				dBm	3
Average Receive Power, each Lane		-8.2			4.7	dBm	4
Receive Power (OMAouter), each Lane					4.5	dBm	
Difference in Receiver Power between any Two Lanes (OMAouter)					4.1	dB	
Receiver Sensitivity (OMAouter), each Lane	SEN				-6.0	dBm	For BER of 2.4E-4
Stressed Receiver Sensitivity (OMAouter), each Lane	SRS				-3.6	dBm	5
Receiver Reflectance	RR				-26	dB	
LOS Assert	LOSA	-30				dBm	
LOS De-assert	LOSD				-12	dBm	
LOS Hysteresis	LOSH	0.5				dB	
Stressed Conditions for Stress Receiver Sensitivity (Note 6)	Stressed Conditions for Stress Receiver Sensitivity (Note 6)	Stressed Conditions for Stress Receiver Sensitivity (Note 6)	Stressed Conditions for Stress Receiver Sensitivity (Note 6)	Stressed Conditions for Stress Receiver Sensitivity (Note 6)	Stressed Conditions for Stress Receiver Sensitivity (Note 6)	Stressed Conditions for Stress Receiver Sensitivity (Note 6)	Stressed Conditions for Stress Receiver Sensitivity (Note 6)

Parameter	Symbol	Min	Min	Typical	Max	Units	Notes
Stressed Eye Closure for PAM4 (SECQ), Lane under Test		0.9			3.4	dB	
OMAouter of each Aggressor Lane			1.5	1.5		dBm	

5. Recommended Operating Conditions

Parameter	Test Point	Min	Typical	Max	Units	Notes
Power Consumption				6.5	W	
Supply Current	Icc			1.96	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	
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	
Output Voltage						
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	

Parameter	Test Point	Min	Typical	Max	Units	Notes
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

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

PIN	Logic	Symbol	Name/Description	Notes
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
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

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