

Product Features

- ✧ Four-channel full-duplex transceiver modules
- ✧ Transmission data rate up to 26Gbit/s per channel
- ✧ Up to 2km transmission of single mode fiber
- ✧ Low power consumption <3.5W
- ✧ Operating case temperature 0° C to +70° C
- ✧ 3.3V power supply voltage
- ✧ RoHS 6 compliant
- ✧ Hot Pluggable QSFP form factor
- ✧ LC connector receptacle
- ✧ Built-in digital diagnostic function

Applications

- ✧ 100G Ethernet
- ✧ Proprietary High Speed Interconnections
- ✧ Data center

Ordering Information

Part Number	Output Power	Rec. Sens	Data Rate	Wavelength	Distance
<i>FH-Q28CLR4CDL2</i>	-0.5~+2.3db	-8.6db	100G	1270/1290/1310/1330nm	2KM

General

FH-Q28CLR4CDL2 is a Four-Channel, Pluggable, dual LC, Fiber-Optic QSFP28 Transceiver for 100G Ethernet applications. The QSFP28 full-duplex optical module offers 4 independent transmit and receive channels, each capable of 26Gbps operation for an aggregate data rate of 104Gbps 2km using single mode fiber. These modules are designed to operate over single mode fiber systems using 1310nm DFB laser array. QSFP28 CWDM4 is one kind of transceiver which provides increased port density and total system cost savings. They are compliant with the QSFP28 MSA, CWDM4 MSA and portions of IEEE P802.3bm.

Absolute Maximum Ratings

The operation in excess of any absolute maximum ratings might cause permanent damage to this module

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	TST	-40	$\begin{smallmatrix} 8 \\ 5 \end{smallmatrix}$	degC	
Relative Humidity(non-condensing)	RH	0	$\begin{smallmatrix} 8 \\ 5 \end{smallmatrix}$	%	
Operating Case Temperature	TOPC	0	$\begin{smallmatrix} 7 \\ 0 \end{smallmatrix}$	degC	
Supply Voltage	VCC	-0.3	3.6	V	
Input Voltage	Vin	-0.3	Vcc+0.3	V	

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	TOPC	0		70	degC
Power Supply Voltage	VCC	3.13	3.3	3.47	V
Power Consumption		-		3.5	W
Data Rate	DR		25.78125		Gbps
Data Speed Tolerance	ΔDR	-100		+100	ppm
Link Distance with G.652	D	0		2	km

Electrical Input/Output Characteristics

Parameter	Symbol	Min	Typical	Max	Unit
Differential input impedance	Zin	90	100	110	ohm
Differential input voltage amplitude	ΔVin	300		1100	mVp-p
Differential output voltage amplitude	ΔVout	500		800	mVp-p
Input Logic Level High	VIH	2.0		VCC	V
Input Logic Level Low	VIL	0		0.7	V
Output Logic Level High	VOH	VCC-0.5		VCC	V
Output Logic Level Low	VOL	0		0.4	V

Optical Characteristics

All parameters are specified under the recommended operating conditions with PRBS31 data pattern unless otherwise specified.

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Wavelength Assignment	L	1264.5	1271	1277.5	nm	
	L	1284.5	1291	1297.5	nm	
	L	1304.5	1311	1317.5	nm	
	L	1324.5	1331	1337.5	nm	
RMS Spectral Width	λ_{rms}	-		3.5	nm	1
Average Launch Power, each lane	PAVG	-	-0.5	+2.3	dBm	
Optical Modulation Amplitude (OMA)	POMA	-4	-0.5	+2.5	dBm	1
Difference in Launch Power between any two lanes	Ptx,diff			4.0	dB	
Transmitter and Dispersion Penalty per Lane	TDP			3	dBm	
Rise/Fall Time	Tr/Tf			3	ps	
Extinction Ratio	ER	3.5			d	
Transmitter Reflectance	RT			-12	d	
Transmitter Eye Mask Margin	EMM	10			%	2
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
Transmitter Eye Mask Definition	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}					
{X1, X2, X3, Y1, Y2, Y3}						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Receiver						
Wavelength Assignment	L	1264.5	1271	1277.5	nm	
	L	1284.5	1291	1297.5	nm	

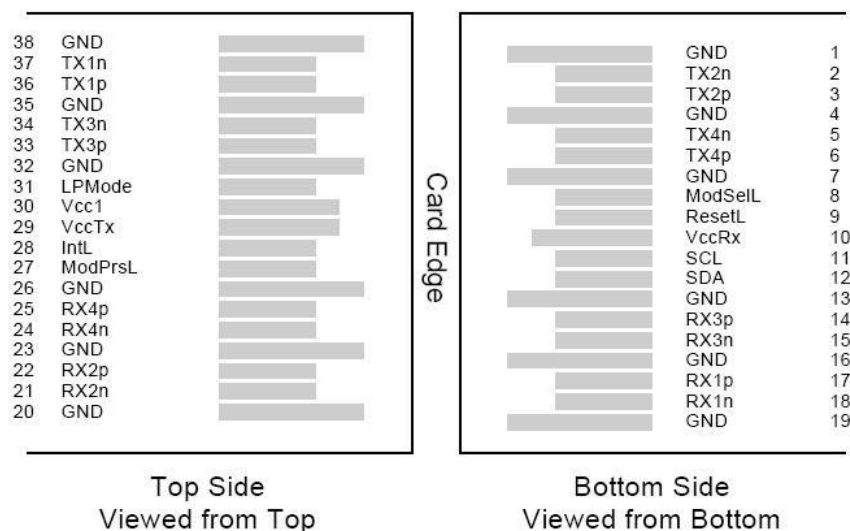
	L	1304.5	1311	1317.5	nm	
	L	1324.5	1331	1337.5	nm	
Damage Threshold	THd	+3			dBm	
Overload, each lane	OVL	+2.5			dBm	
Receiver Sensitivity in OMA, each Lane	SEN			-8.6	dBm	3
Signal Loss Assert Threshold	LOSA	-30			dBm	
Signal Loss Deassert Threshold	LOSD			-12	dBm	
LOS Hysteresis	LOSH	0.5	1.5	6	dB	
Optical Return Loss	ORL			-12	dBm	

Notes: 1. Transmitter wavelength, RMS spectral width and power need to meet the OMA minus TDP specs to guarantee link performance.

2. The eye diagram is tested with 1000 waveform.

3. Sensitivity is specified at 5×10^{-5} BER.

Pin Definitions And Functions



PIN	Logic	Symbol	Name/Description	Note
1		GN	Ground	1
2	CML-I	Tx	Transmitter Inverted Data Input	

3	CML-I	Tx	Transmitter Non-Inverted Data output	
4		GN	Groun	1
5	CML-I	Tx	Transmitter Inverted Data Input	
6	CML-I	Tx	Transmitter Non-Inverted Data output	
7		GN	Groun	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+ 3.3V Power Supply Receiver	2
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GN	Groun	
14	CML-O	Rx3	Receiver Non-Inverted Data Output	
15	CML-O	Rx	Receiver Inverted Data Output	
16		GN	Groun	1
17	CML-O	Rx1	Receiver Non-Inverted Data Output	
18	CML-O	Rx	Receiver Inverted Data Output	
19		GN	Groun	1
20		GN	Groun	1
21	CML-O	Rx	Receiver Inverted Data Output	
22	CML-O	Rx2	Receiver Non-Inverted Data Output	
23		GN	Groun	1
24	CML-O	Rx	Receiver Inverted Data Output	1
25	CML-O	Rx4	Receiver Non-Inverted Data Output	
26		GN	Groun	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		GN	Groun	1
33	CML-I	Tx	Transmitter Non-Inverted Data Input	
34	CML-I	Tx	Transmitter Inverted Data Output	

35		GN	Groun	1
36	CML-I	Tx	Transmitter Non-Inverted Data Input	
37	CML-I	Tx	Transmitter Inverted Data Output	
38		GN	Groun	1

Notes:

1. Module circuit ground is isolated from module chassis ground within the module. GND is the symbol for signal and supply (power) common for QSFP modules.
2. The connector pins are each rated for a maximum current of 500mA.

ModSelL Pin

The ModSelL is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP modules on a single 2-wire interface bus. When the ModSelL is “High”, the module will not respond to any 2-wire interface communication from the host. ModSelL has an internal pull-up in the module.

ResetL Pin

Reset. LPMoDe_Reset has an internal pull-up in the module. A low level on the ResetL pin for longer than the minimum pulse length ($t_{\text{Reset_init}}$) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time (t_{init}) starts on the rising edge after the low level on the ResetL pin is released. During the execution of a reset (t_{init}) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by posting an IntL signal with the Data_Not_Ready bit negated. Note that on power up (including hot insertion) the module will post this completion of reset interrupt without requiring a reset.

LPMoDe Pin

QSFP28 CWDM4 operate in the low power mode (less than 1.5 W power consumption) This pin active high will decrease power consumption to less than 1W.

ModPrsL Pin

ModPrsL is pulled up to Vcc on the host board and grounded in the module. The ModPrsL is asserted “Low” when the module is inserted and deasserted “High” when the module is physically absent from the host connector.

IntL Pin

IntL is an output pin. When “Low”, it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt by using the 2-wire serial interface. The IntL pin is an open collector output and must be pulled up to Vcc on the host board.

Power Supply Filtering

The host board should use the power supply filtering shown in Figure1

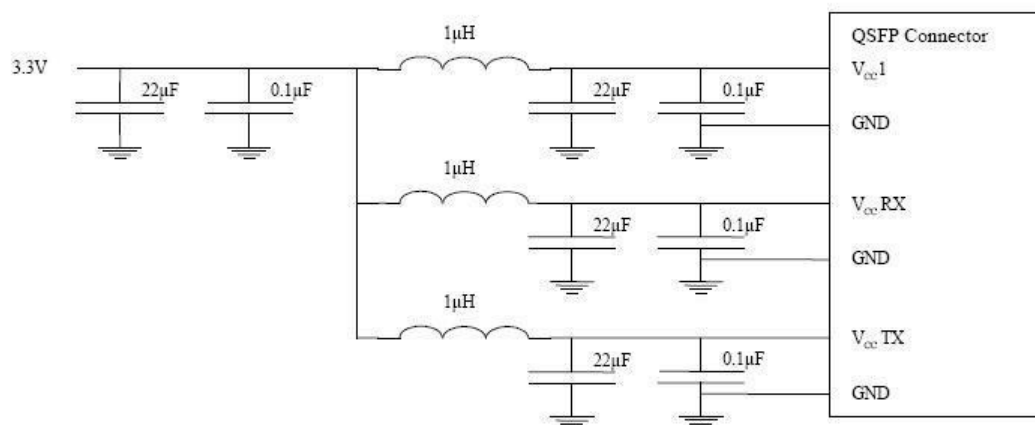


Figure1. Host Board Power Supply Filtering

Diagnostic Monitoring Interface

Digital diagnostics monitoring function is available on all QSFP28 CWDM4. A 2-wire serial interface provides user to contact with module. The structure of the memory is shown in Figure 3. The memory space is arranged into a lower, single page, address space of 128 bytes and multiple upper address space pages. This structure permits timely access to addresses in the lower page, such as Interrupt Flags and Monitors. Less time critical time entries, such as serial ID information and threshold settings, are available with the Page Select function. The interface address used is A0xh and is mainly used for time critical data like interrupt handling in order to enable a one-time-read for all data related to an interrupt situation. After an interrupt, IntL, has been asserted, the host can read out the flag field to determine the affected channel and type of flag.

Parameter	Symbol	Min	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	+3	degC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Full operating range

Channel RX power monitor absolute error	DMI_RX	-3	3	dB	Per channel
Channel Bias current monitor	DMI_Ibias	-10%	10%	mA	Per channel
Channel TX power monitor absolute error	DMI_TX	-3	3	dB	Per channel

EEPROM Serial ID Memory Contents

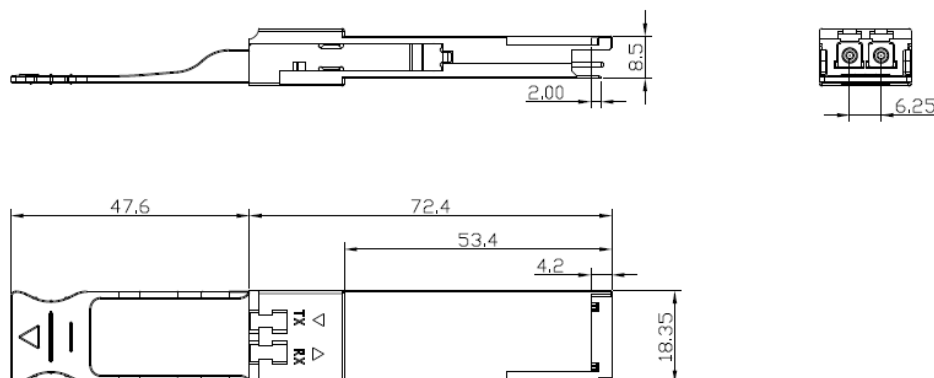
Data Address (Dec)	Name of Field	Description	Value(Hex)
Base ID Fields			
128	Identifier	QSFP28	0E
129	Extended Identifier	3.5W max. power consumption	CC
130	Connector type	LC Connector	0C
131	Transceiver Application supported	Re	8
132		0	
133		0	
134		Re	0
135		Intermediate distance	2
136		Shortwave laser w/o OFC (SN)	1
137		Single Mode (SM)	0
138		1200 Mbytes/Sec	8
139	Encoding	N	0
140	BR, nominal	Nominal bit rate	6
141	Rate Select	QSFP Rate Select Version 1	0
142	Link Length(Standard SM Fiber)	2KM	2
143	Link Length(OM3)	Not	0
144	Link Length(OM2)	Not	0
145	Link Length(OM1)	Not	0
146	Link Length(Cooper)	Not supported	0

147	Device Tech	Uncooled transmitter device;1310nm DFB; No wavelength control; PIN detector; Transmitter not tunable	40
148	Vendor Name	FANG HANG	5
149			4
150			5
151			4F
152			5
1			5
1			4
1			4
1			
1			
1			
1			
1			
1			
1			
1			
1			
1 6 4	Electronic or optical interfaces for InfiniBand	4xSDR Speed(2.5Gb/s), DDR Speed(5.0Gb/s), QDR Speed(10Gb/s).	7
1	Vendor OUI	0	0
1		0	0
1		0	0
1			
1			
1			
1			
1			
1			
1			

1	Vendor PN		
1			
1			
1			
1			
1			
1			
1			
1			
1			
1	Vendor Rev	REV.1A	3
1			4
1	Wavelength	1310nm	6
1			5
1	Wavelength Tolerance	±50	0
1			B8
1	Max Case Temp	Max Case Temp 70°C	4
1	Check Sum	Address 128-190	
Extended ID Fields			
192	Options	Rate Select, TX Disable, TX Fault, LOS, Warning indicators for: Temperature, VCC, RX power, TX Bias	0
193			0
194			0
195			DE
196	Vendor SN	Serial number provided by vendor(ASCII)	
197			
198			
199			
200			
201			
202			
203			
204			
205			

206			
207			
208			
209			
210			
211			
212	Date Code	Programmed with manufacturing date	
213			
214			
215			
216			
217			
218	Lot Number	Programmed with manufacturing lot	
219			
220	Diagnostic Monitoring Type		8
221	Enhanced Options		0
222	Reserved	Reserv	Reserved
223	CC_EXT	Address 192-222	
Vendor Specific ID Fields			
224-255	Vendor Specific EEPROM		

Package Dimensions



ESD

This transceiver is specified as ESD threshold 1KV for high speed data pins and 2KV for all others 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.

Laser Safety

This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007)

For More Information

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