

Product Features

- ✧ QSFP28 MSA compliant
- ✧ Hot pluggable 38 pin electrical interface
- ✧ 4 LAN-WDM lanes MUX/DEMUX design
- ✧ 4x25G electrical interface
- ✧ Maximum power consumption 6.5W
- ✧ LC duplex connector
- ✧ Supports 103.125Gb/s aggregate bit rate
- ✧ Up to 80km transmission on single mode fiber
- ✧ Operating case temperature: 0°C to 70°C
- ✧ Single 3.3V power supply



Applications

- ✧ 100GBASE-ZR4 100G Ethernet
- ✧ Proprietary High Speed Interconnections
- ✧ Telecom networking

Ordering Information

Part Number	Output Power	Rec. Sens	Data Rate	Wavelength	Distance
<i>FH-Q28LZR4CDL80</i>			103.125G	1295.56/1300.05/1304.58/1309.14NM	80KM

Digital Diagnostic Monitoring Interface

Five transceiver parameter values are monitored. The following table defines the Monitor parameter's accuracy

Parameter	Range	Accuracy	Calibration
Temperature	0 to +70°C	±3°C	Internal
Voltage	2.97 to 3.63V	±3%	Internal
Bias Current	0 to 100mA	±10%	Internal
TX Power	2~+6.5dBm	±3dB	Internal
RX Power	-28 to -7dBm	±3dB	Internal

Absolute Maximum Ratings

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

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	0		+3.6	V	
Storage Temperature	TS	-40		+85	°C	
Operating Humidity	RH	0		85	%	

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Power Supply Voltage	Vcc	3.13	3.30	3.47	V	
Power dissipation	P			6.5	W	
Supply Current	Icc			1.8759	A	
Case Operating Temperature	Tc	0	-	+70	°C	Commercial
9/125um G.652 SMF	Lmax		-	80	km	

Electrical Input/Output Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Transmitter						
Data Rate, each lane			25.78125		Gbps	
Differential Voltage pk-pk	V _{pp}			900	mV	1
Common Mode Voltage	V _{cm}	-350		2850	mV	
Transition time	Trise/Tfall	10			ps	2
Differential Termination Resistance Mismatch				10	%	
Eye width	EW15	0.46			UI	
Eye height	EH15	95			mV	
Receiver						
Data Rate, each lane			25.78125		Gbps	
Differential Termination Resistance Mismatch				10	%	1
Differential output voltage swing	V _{out, pp}			900	mV	
Common Mode Noise, RMS	V _{rms}			17.5	mV	
Transition time	Trise/Tfall	12			ps	2
Eye width	EW15	0.57			UI	
Eye height	EH15	228			mV	

Notes: 1. At 1 MHz 2. 20%~80%

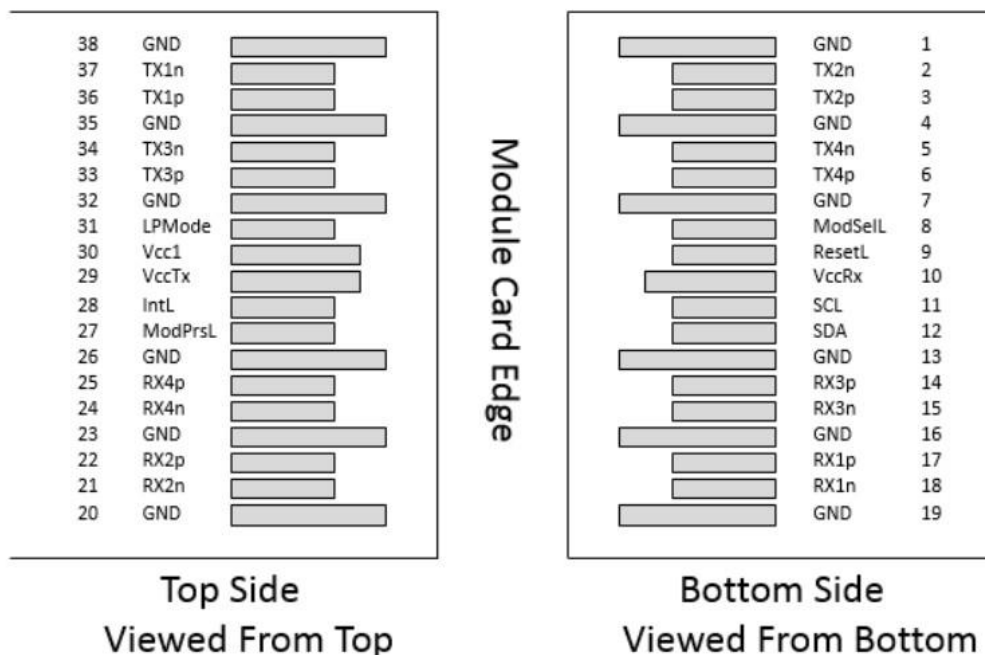
Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Signaling Speed per Lane		25.78125 ± 100 ppm			Gb/s	
Transmit wavelengths		1294.53		1296.59	nm	
		1299.02		1301.09	nm	
		1303.54		1305.63	nm	
		1308.09		1310.19	nm	
Side-mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power		8		12.5	dBm	
Average launch power, each lane		2		6.5	dBm	
Difference in launch power between any two lanes(Average and OMA)				3	dBm	
Average launch power of OFF transmitter, each lane				-30	dBm	
Extinction Ratio	ER	6			dB	
RIN OMA				-130	dB/Hz	
Optical return loss tolerance				20	dB	
Transmitter reflectance				-12	dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}		1		
Mask margin		5			%	
Receiver						
Signaling Speed per Lane		25.78125 ± 100 ppm	Gb/s			

Receive wavelengths		1294.53		1296.59		
		1299.02		1301.09		
		1303.54		1305.63		
		1308.09		1310.19		
Average receiver power, each lane	SENS	-28		-7	dBm	
Receiver power, each lane (OMA)		-	-	-7	dBm	
Receiver reflectance				-26	dB	
Receiver sensitivity Average, each lane				-28	dBm	1
Receiver 3 dB electrical upper cutoff frequency, each lane				31	GHz	
Damage threshold, each lane		6.5			dBm	
LOS De-Assert	LOSD	-	-	-29	dBm	
LOS Assert	LOSA	-40	-	-	dBm	
LOS Hysteresis	-	0.5	-	-	dB	

Notes: 1, Sensitivity is specified at BER@5E-5 with FEC

Pin Definitions And Functions



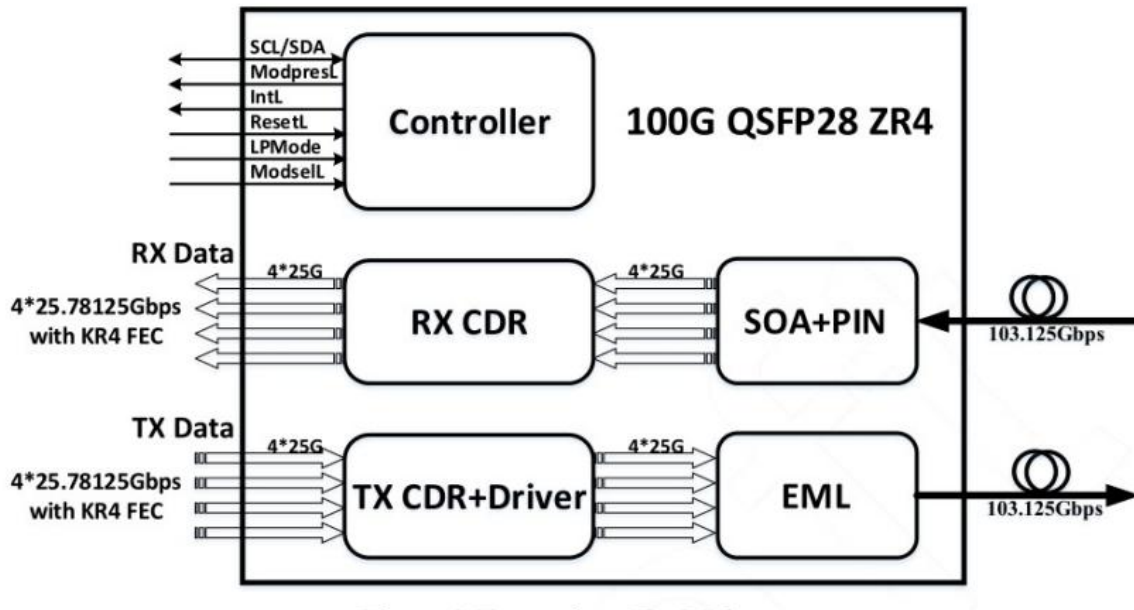
Pin	Symbol	Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data In-put	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data In-put	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc Rx	+3.3V Power Supply Receiver	
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	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Non-Inverted Data Output	
25	Rx4p	Receiver Inverted Data Output	
26	GND	Ground	1
27	Mod- PrsL	Module Present	
28	IntL	Interrupt	
29	VccTx	+3.3V Power supply transmitter	
30	Vcc1	+3.3V Power supply	
31	LPMODE	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	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. Circuit ground is internally isolated from chassis ground.

Figure 2. MSA compliant Connector

Transceiver Block Diagram



EEPROM Definitions

Lower Memory Map

Address	Type	Size	Name	Description	Value(Hex)
0	R	1	Identifier	Identifier	
1	R	1	Status	Revision Compliance	
2	R	1	Status	Flat_mem/ IntL/Data_Not_Ready	
3	R	1		Latched TX/RX LOS indicator	
4	R	1		Latched TX Adaptive EQ/TX Transmitter/Laser fault indicator	
5	R	1		Latched TX/RX CDR LOL indicator	
6	R	1		Latched temperature A/W / Initialization complete flag	
7	R	1		Latched supply voltage A/W	
8	R	1		Vendor Specific	

9~10	R	2	Interrupt Flags	Latched RX power A/W	
11~12	R	2		Latched TX bias A/W	
13~14	R	2		Latched TX power A/W	
15~18	R	4		Reserved	
19-21	R	2		Vendor Specific	
22-23	R	2	Device moni- tors	Module temperature	
24-25	R	2		Reserved	
26-27	R	2		Supply voltage	
28-29	R	2		Reserved	
30-33	R	4		Vendor Specific	
34-35	R	2	Power moni- tors	RX input power, channel 1	
36-37	R	2		RX input power, channel 2	
38-39	R	2		RX input power, channel 3	
40-41	R	2		RX input power, channel 4	
42-43	R	2	LD Bias Mon-itors	TX bias, channel 1	
44-45	R	2		TX bias, channel 2	
46-47	R	2		TX bias, channel 3	
48-49	R	2		TX bias, channel 4	
50-51	R	2	Power moni- tors	TX power, channel 1	
52-53	R	2		TX power, channel 2	
54-55	R	2		TX power, channel 3	
56-57	R	2		TX power, channel 4	
58-73	R	16		Reserved	
74-81	R	8		Vendor Specific	
82-85	R	4		Reserved	

86	RW	1	Control	Tx Disable	
87	RW	1		Rx_Rate_select	
88	RW	1		Tx_Rate_select	
89~92	RW	4		Rx_Application_Select	
93	RW	1		Power	
94~97	RW	4		Tx_Application_Select	
98	RW	1		TX/RX CDR_control	
99	RW	1		Reserved	
100-104	RW	4	Free Side De-vice and Channel Masks	Module and Channel Masks	
105	RW	1		Vendor Specific	
106	RW	1		Vendor Specific	
107	RW	1		Reserved	
108-109	R	2	Free Side De-vice Properties	Most significant byte of propagation delay	
110	R	1		Advanced Low Power Mode / Far Side Managed / Min Operating Voltage	
111-112	RW	2	Assigned for use by PCI Express	PCI	
113	R	1	Free Side De-vice Properties	End Implementation	
114-118	RW	6		Reserved	

119-122	W	4		Password Change Entry Area	
123-126	W	4		Password Entry Area	
127	RW	1		Page Select Byte	

Upper Memory Map Page 00h

Address	Type	Size	Name	Description	Value(Hex)
128	R	1	Identifier	Identifier Type of serial Module	
129	R	1	Ext. Identifier	Extended Identifier to free side device. Includes power classes, CLEI codes, CDR capability	
130	R	1	Connector	Code for connector type	
131	R	1	Specification compliance	10/40G/100G Ethernet Compliance Codes	
132	R	1		SONET Compliance Codes	
133	R	1		SAS/SATA Compliance Codes	
134	R	1		Gigabit Ethernet Compliant Codes	
135~136	R	1		Fibre Channel link length/Fibre Channel Transmitter Technology	
137	R	1		Fibre Channel transmission media	
138	R	1		Fibre Channel Speed	
139	R	1	Encoding	Code for serial encoding algorithm.	
140	R	1		Nominal bit rate, units of 100Mbps. For BR>25.4G, set this to FFh and use Byte 222.	
141	R	1		QSFP+ Rate Select Version 2.	
142	R	1		Link length supported for SMF fiber in km.	
143	R	1		Length(OM3 50 um)	
144	R	1		Length(OM2 50 um)	

145	R	1	Length	Length(OM1 62.5 um)	
146	R	1		Length(OM5 50um)	
147	R	1	Device technology	Device technology	
148	R	1	Vendor name	Free side device vendor	
149	R	1			
150	R	1			
151	R	1			
152	R	1			
153	R	1			
154	R	1			
155	R	1			
156	R	1			
157	R	1			
158	R	1			
159	R	1			
160	R	1			
161	R	1			
162	R	1			
163	R	1			
164	R	1	Extended Module		
165~167	R	1	Vendor OUI		
168	R	1			
169	R	1			
170	R	1			
171	R	1			

172	R	1	Vendor PN	Part number provided by free side device vendor	
173	R	1			
174	R	1			
175	R	1			
176	R	1			
177	R	1			
178	R	1			
179	R	1			
180	R	1			
181	R	1			
182	R	1			
183	R	1			
184	R	1	Vendor rev	Revision level for part number provided by vendor	
185	R	1			
186	R	1	Wavelength	Nominal laser wavelength (wave- length=value/20 in nm)	
187	R	1			
188	R	1		Guaranteed range of laser wave-	
189	R	1	Wavelength tolerance	length(+/- value) from nominal wave- length. (wavelength Tol.=value/200 in nm)	
190	R	1	Max case temp	Maximum case temperature in degrees C	
191	R	1	C_BASE	Check code for base ID fields	
192	R	1	Link codes	Extended Specification Compliance Codes	

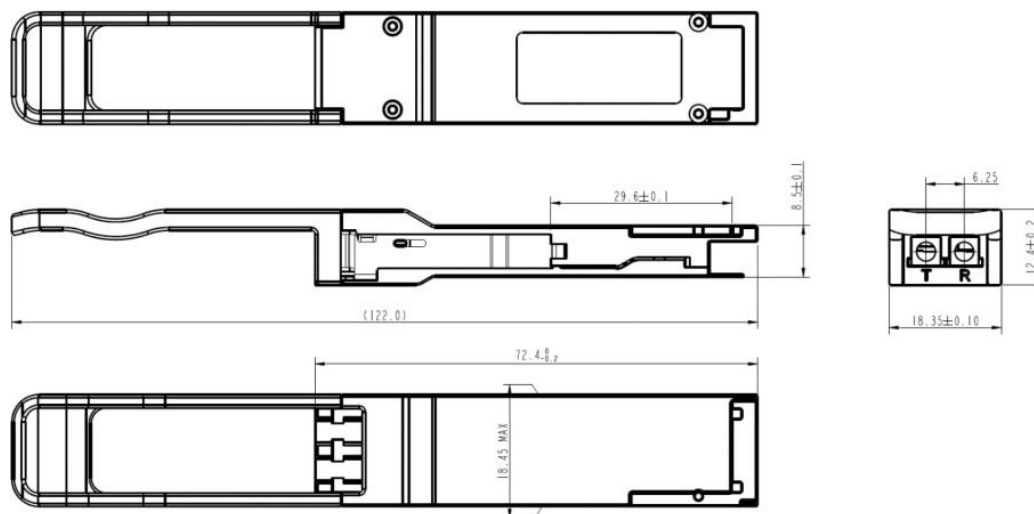
193	R	1	Options	TX Input Equalization Auto Adaptive Capable not implemented, TX Input Equalization Fixed Programmable Settings implemented, RX Output Emphasis Fixed Programmable Settings implemented, RX Output Amplitude Fixed Programmable Settings implemented	
194	R	1		Tx CDR LOL Flag, Rx CDR LOL Flag, RX Squelch Disable, RX Output Disable, TX Squelch Disable, TX Squelch	
195	R	1		Memory page 02h implemented, Memory page 01h implemented, Active control of the select bits in the upper memory table is required to change rates, Tx_DISABLE and serial output implemented, Tx_FAULT signal implemented, Tx Loss of Signal implemented	
196	R	1			
197	R	1			
198	R	1			
199	R	1			
200	R	1			
201	R	1			
202	R	1			
203	R	1			
204	R	1			
205	R	1			

206	R	1	Vendor SN	Serial number provided by vendor	
207	R	1			
208	R	1			
209	R	1			
210	R	1			
211	R	1			
212	R	1	Date Code	Vendor's manufacturing date code	
213	R	1			
214	R	1			
215	R	1			
216	R	1			
217	R	1			
218	R	1			
219	R	1			
220	R	1	Diagnostic Monitoring Type	Average RX power measurement, Transmitter power measurement supported	
221	R	1	Enhanced Options	Indicates which optional enhanced features are implemented (if any) in the free side device.	
222	R	1	BR, nominal	Nominal bit rate per channel, units of 250Mbps.	
223	R	1	CC_EXT	Check Code for Address 192 to 222	
224	R	1			
225	R	1			
226	R	1			
227	R	1			
228	R	1			

229	R	1			
230	R	1			
231	R	1	Vendor Specific		
232	R	1			
233	R	1			
234	R	1			
235	R	1			
236	R	1			
237	R	1			
238	R	1			
239	R	1			
240	R	1	Vendor Specific		
241	R	1			
242	R	1	Vendor Specific		
243	R	1		Reserved	
244	R	1			
245	R	1			
246	R	1			
247	R	1			
248	R	1			
249	R	1			
250	R	1	Checksum		
251	R	1			
252	R	1			
253	R	1			

254	R	1	Vendor Specific		
255	R	1			

Package Dimensions



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