100Gbps ZR4 80Km QSFP28 Optical Transceiver Module

S-QP1ALWL80-CD

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℃ to 70℃
- Single 3.3V power supply
- RoHS 2.0 compliant

Applications

- 100GBASE-ZR4 100G Ethernet
- Telecom networking

Standards

- Compliant to IEEE 802.3ba ,IEEE 802.3bm
- Compliant to SFF-8636

Description

100G QSFP28 ZR4 is designed for 80km optical communication applications. This module contains 4- lane optical transmitter, 4-lane optical receiver and module management block including 2 wire serial inter- face. The optical signals are multiplexed to a single-mode fiber through an industry standard LC connector.

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit
Power Supply Voltage	Vcc	-0.3		3.6	V
Storage Temperature Range	Ts	-40		85	°C
Relative Humidity	RH	15		85	%
Damage Threshold, each lane	THd	6.5			dBm

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Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Case Operating Temperature Range	Tc	0	-	70	°C
Power Supply Voltage	V_{cc}	3.14	3.3	3.47	V
Link Distance with G.652	P	-	-	80	km
Data Rate	BR	-	25.78125	-	Gbps

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Power dissipation				6.5	W	
Supply Current	Icc			1.8759	A	Steady state
Transmitter						
Data Rate, each lane			25.78125		Gbps	
Differential Voltage pk-pk	Vpp			900	mV	At 1 MHz
Common Mode Voltage	Vcm	-350		2850	mV	
Transition time	Trise/Tfall	10			ps	20%~80%
Differential Termination Re-sistance Mismatch				10	%	
Eye width	EW15	0.46			UI	
Eye height	EH15	95			mV	
Receiver						
Data Rate, each lane			25.78125		Gbps	
Differential Termination Re-sistance Mismatch				10	%	At 1 MHz
Differential output voltage swing	Vout, pp			900	mV	
Common Mode Noise, RMS	Vrms			17.5	mV	
Transition time	Trise/Tfall	12			ps	20%~80%
Eye width	EW15	0.57			UI	
Eye height	EH15	228			mV	

ptical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter Characteristics						
Signaling rate per lane			25.78125		GBd	1
Lane center wavelengths(range)	λ	1294.53	1295.56	1296.59	nm	
		1299.02	1300.05	1301.09		
		1303.54	1304.58	1305.63		
		1308.09	1309.14	1310.19		
Side Mode Suppression Ratio	SMSR	30	-	-	dB	

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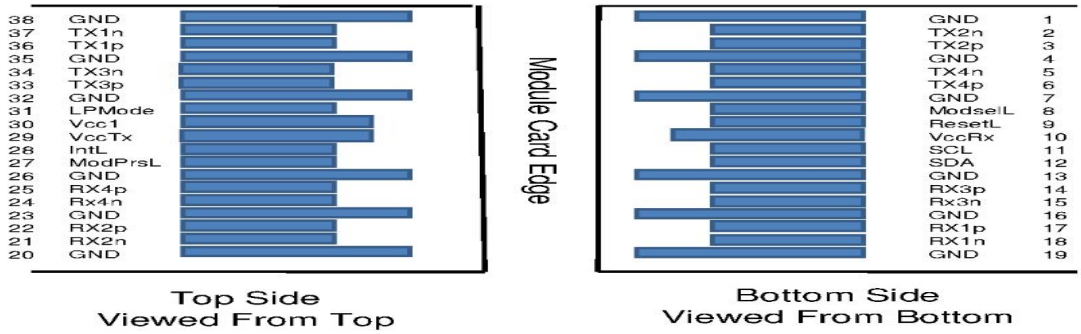
Total Average launch Power	PTOTAL	8.0		12.5	dBm	
Average Launch Power, each lane	POUT	2.0		6.5	dBm	
Difference in launch power between any two lanes(Average and OMA)			-	3	dBm	
Average Launch Power of OFF transmitter, each lane	POFF	-	-	-30	dBm	
Extinction Ratio	ER	6	-	-	dB	
RIN OMA				130	dB/Hz	
Optical return loss tolerance				20	dB	
Transmit Reflectance	RFL	-	-	-12	dB	
Mask margin		5	*	*	%	
Output Eye Mask definition {X1，X2，X3，Y1，Y2，Y3}	{0.25，0.4，0.45，0.25，0.28，0.4}					
Receiver Characteristics						
Signaling rate per lane		25.78125			GBd	
Lane center wavelengths(range)	λ	1294.53	1295.56	1296.59	nm	
		1299.02	1300.05	1301.09		
		1303.54	1304.58	1305.63		
		1308.09	1309.14	1310.19		
Average receiver power, each lane	THd	-28		-7	dBm	1
Receiver power, each lane(OMA)				-7	dBm	
Receiver reflectance	SenOMA1			-26	dB	1
Receiver sensitivity Average, each lane	SenOMA2			-28	dBm	2
Receiver 3 dB electrical upper cutoff frequency, each lane	LOSA			31	GHz	
Damage threshold, each lane	LOSD	6.5			dBm	
LOS Assert	LOSH	-40			dBm	
LOS Deassert				-29	dBm	
LOS Hysteresis		0.5			dB	
Notes						
1. Sensitivity is specified at BER@5E-5 with FEC						

Pin Definitions



Pin	Symbol	Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
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	ModPrsL	Module Present	
28	IntL	Interrupt	
29	Vcc Tx	+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.			

EEPROM Definitions

Lower Memory Map

Address	Type	Size	Name	Description	Value(Hex)	Remarks
0	R	1	Identifier	Identifier		
1	R	1	Status	Revision Compliance		
2	R	1	Status	Flat_mem/ IntL/Data_Not_Ready		
3	R	1	Interrupt Flags	Latched TX/RX LOS indicator		
4	R	1		Latched TX Adaptive EQ/TX Transmit- ter/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		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 de-lay		
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)	Remarks
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	Length(OM3 50 um)		
144	R	1		Length(OM2 50 um)		
145	R	1		Length(OM1 62.5 um)		
146	R	1		Length(OM5 50um)		
147	R	1	Device tech-nology	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	Vendor PN	Part number provided by free side device vendor		
169	R	1				
170	R	1				
171	R	1				
172	R	1				
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	Wavelength tolerance	Guaranteed range of laser wave- length(+/- value) from nominal wave- length. (wavelength Tol.=value/200 innm)		
189	R	1				

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 Program- mable Settings implemented, RX Output Emphasis Fixed Programma- ble Settings implemented, RX Output Amplitude Fixed Program- mable 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 up- per memory table is required to change rates, Tx_DISABLE and serial output imple- mented, Tx_FAULT signal implemented, Tx Loss of Signal implemented		
196	R	1	Vendor SN	Serial number provided by vendor		
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				
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 sup- ported		

221	R	1	Enhanced Op- tions	Indicates which optional enhanced fea- tures 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	Vendor Spe- cific			
225	R	1				
226	R	1				
227	R	1				
228	R	1				
229	R	1				
230	R	1				
231	R	1				
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 Spe- cific			
241	R	1				
242	R	1	Vendor Spe- cific			
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	Vendor Spe- cific			
252	R	1				
253	R	1				
254	R	1				
255	R	1				

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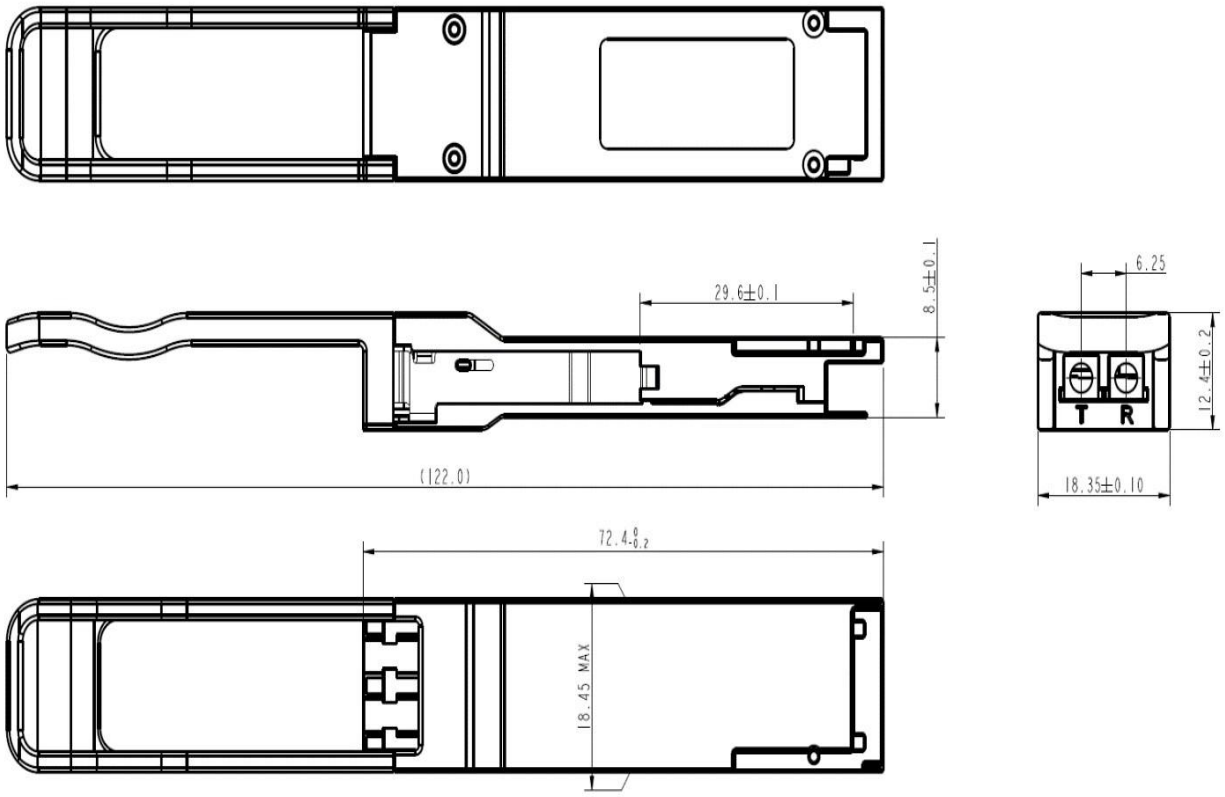
Mechanical Dimensions



Ordering information

Part Number	Product Description
S-QP1ALWL80-CD	QSFP28, 100Gbps,ZR4,1294-1310nm, SM, LC,80km, ,0ºC~+70ºC, With DDM