

100Gbps ZR4 80Km QSFP28 Optical Transceiver Module

S-QP1AL4L80-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°C to 70°C
- 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

Springtek 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 interface. 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	I _{cc}			1.8759	A	Steady state
Transmitter						
Data Rate, each lane			25.78125		Gbps	
Differential Voltage pk-pk	V _{pp}			900	mV	At 1 MHz
Common Mode Voltage	V _{cm}	-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	V _{out, pp}			900	mV	
Common Mode Noise, RMS	V _{rms}			17.5	mV	
Transition time	Trise/Tfall	12			ps	20%~80%
Eye width	EW15	0.57			UI	
Eye height	EH15	228			mV	

Optical 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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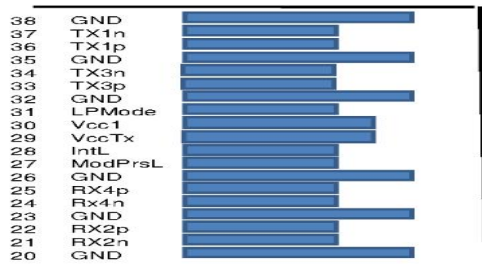
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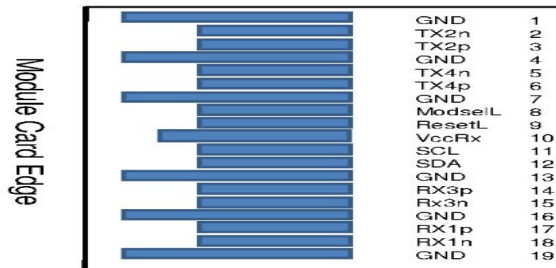
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Total Average launch Power	PTOTAL	8.0		12.5	dBm	
Average Launch Power, each lane	POUT	2.0		6.5	dBm	
Difference in launch power between any two lanes(Average and OMA)			-	3	dBm	
Average Launch Power of OFF transmitter, each lane	POFF	-	-	-30	dBm	
Extinction 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



Top Side
Viewed From Top



Bottom Side
Viewed From Bottom

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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	

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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 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		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		Module temperature			
24-25	R	2		Reserved			
26-27	R	2		Device monitors	Supply voltage		
28-29	R	2		Reserved			
30-33	R	4	Vendor Specific				
34-35	R	2	Power monitors	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 Monitors	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 monitors	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				

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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)	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		

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				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	Wavelength	Nominal laser wavelength (wavelength=value/20 in nm)		
186	R	1				
187	R	1	Wavelength tolerance	Guaranteed range of laser wavelength(+/-value) from nominal wavelength. (wavelength Tol.=value/200 innm)		
188	R	1				
189	R	1				

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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 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	Date Code	Vendor's manufacturing date code		
209	R	1				
210	R	1				
211	R	1				
212	R	1				
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		

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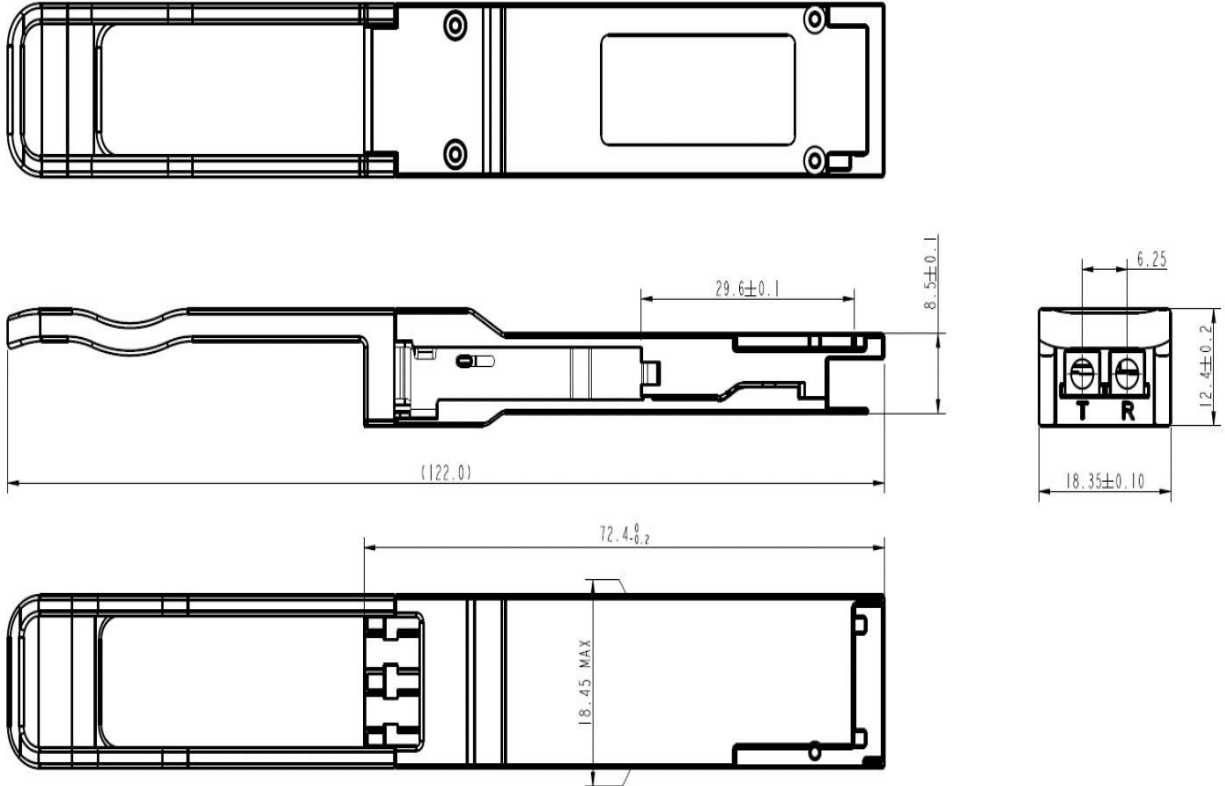
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221	R	1	Enhanced Op- tions	Indicates which optional enhanced fea- tures are implemented (if any) in the free side device.		
222	R	1	BR, nominal	Nominal bit rate per channel, units of 250Mbps.		
223	R	1	CC_EXT	Check Code for Address 192 to 222		
224	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-QP1AL4L80-CD	QSFP28, 100Gbps,ZR4,1294-1310nm, SM, LC,80km, ,0°C~+70°C, With DDM