CFP 100G 10KM SMF MULTI-RATE

SLCF-100G-LR4

Features

- Hot-pluggable CFP form factor
- Supports 103.1Gb/s and 112Gb/s aggregate bit rates
- Power dissipation < 18W
- RoHS-6 compliant (lead-free)
- Commercial case temperature range of 0°C to 70°C
- Single 3.3V power supply
- Maximum link length of 10km on Single Mode Fiber (SMF)
- 4x28Gb/s DFB-based LAN-WDM transmitter
- 10x10G MLD electrical interface
- Duplex SC or LC receptacles
- MDIO management interface

Overview

Sourcelight's SLCF-100G-LR4 is designed for use in 100 Gigabit Ethernet links and 4x28G OTN client interfaces over single mode fiber.

They are compliant with the CFP MSA1, IEEE 802.3ba 100GBASE-LR42 and OTU4 4I1-9D1F requirements specified in ITU-T Recommendations G.959.1/G.709 and Supplement 39 (G.sup39).

Digital diagnostics functions are available via the MDIO interface. The transceiver is RoHS-6 compliant and lead-free.

Applications

- OTN OTU4 4I1-9D1F
- 100GBASE-LR4 100G Ethernet

Ordering Information

Part Number	Product Description
SLCF-100G-LR4	CFP 100G LR4 10Km LC straight receptacles on SMF

General Specifications

Parameter	Symbol	Min	Typical	Max	Units	Note
Bit Rate (all wavelengths combined)	BR	103.1		112.0	Gb/s	1
Bit Error Ratio @25.78Gb/s	BER1			10-12		2
Bit Error Ratio @27.95Gb/s	BER2			10-6		3
Maximum Supported Distances	Lmax1			10	Km	SMF G.652

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	4.0	V
Storage Temperature	Tst	-40	85	ºC
Case Operating Temperature	Top	-5	75	ºC
Humidity(non-condensing)	Rh	15		%
Receiver Damage Threshold, per Lane	PRdmg	5.5		dBm

Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Note
Supply Voltage	Vcc	3.2		3.4	V	
Supply Current	Icc			TBD	A	
Module total power	P			18	W	1
Transmitter						
Signaling rate per lane				11.2	Gb/s	2
Input differential impedance	R_{in}		100		Ω	3
Differential data input swing per lane	Vin,pp			760	mV	4
Data input rise time tolerance	t_r	24			ps	5
Data input rise time tolerance	t_f	24			ps	5
Electrical input eye mask definition	{X1, X2} {Y1, Y2}				UI mV	
Receiver						
Signaling rate per lane				11.2	Gb/s	2
Differential data output swing per lane	Vout,pp			760	mV	
Data output rise time	t_r	24			ps	5
Data output fall time	t_f	24			ps	5
Electrical output eye mask definition	{X1, X2} {Y1, Y2}		{0.2, 0.5} {136, 380}		UI mV	
Power Supply Noise Tolerance	Vrip		See Note 5 below			6

Note:

1. Maximum total power value is specified across the full temperature and voltage range.
2. +/- 100ppm
3. After internal AC coupling.
4. Host is expected to be compliant with IEEE 802.3ba, clause 83A.
5. 20% to 80%
6. Per Table 4-1 in the CFP MSA Specification[1].

Optical Characteristics

OTU4 Operation

Parameter	Symbol	Min	Typical	Max	Unit	Note
Transmitter						
Signaling Speed per Channel		27.95		27.95	Gb/s	1
Channel center wavelengths (range)			1294.53 – 1296.59 1299.02 – 1301.09 1303.54 – 1305.63 1308.09 – 1310.19		nm	
Total Average Launch Power	POUT			10.0	dBm	
Average Launch Power per Channel	TXPx	-0.6		4.0	dBm	
Optical Channel Extinction Ratio	ER	4.0		6.5	dB	
Channel Power Difference	ΔPOUT			5	dB	
Optical Return Loss	ORL			20	dB	
Receiver						
Signaling Speed per Channel		27.95		27.95	GBd	2
Channel center wavelengths (range)			1294.53 – 1296.59 1299.02 – 1301.09 1303.54 – 1305.63 1308.09 – 1310.19		nm	
Average Input Power per Channel	RXPx	-6.9		4.0	dBm	
Optical Path Penalty	OPP			1.5	dB	
Equivalent Sensitivity per Channel	Rxsens			-8.4	dBm	3
Total Average Input Power	PIN			10.0	dBm	
Channel Power Difference	ΔPIN			5.5	dB	
LOS De-Assert	LOSD			-11.6	dBm	
LOS Assert	LOSA			-13.6	dBm	
LOS Hysteresis			1		dBm	

Note:
1. Transmitter consists of 4 lasers operating at 27.95Gb/s each.
2. Receiver consists of 4 photodetectors operating at 27.95Gb/s each.
3. Specified at a BER of 10-6 (pre-FEC), per ITU-T G.sup39.

100GbE Operation

Parameter	Symbol	Min	Typical	Max	Unit	Note
Transmitter						
Signaling Speed per Lane		25.78		25.78	Gb/s	1
Lane center wavelengths (range)			1294.53 – 1296.59 1299.02 – 1301.09 1303.54 – 1305.63 1308.09 – 1310.19		nm	
Total Average Launch Power	POUT			10.5	dBm	
Transmit OMA per Lane	TxOMA	-1.3		4.5	dBm	
Average Launch Power per Lane	TXPx	-4.3		4.5	dBm	2
Optical Extinction Ratio	ER	4			dB	
Sidemode Suppression ratio	SSRmin	30			dB	
Average launch power of OFF transmitter, per lane				-30	dBm	
Relative Intensity Noise	RIN			-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}				
Receiver						
Signaling Speed per Lane		25.78		25.78	GBd	3
Lane center wavelengths (range)			1294.53 – 1296.59 1299.02 – 1301.09 1303.54 – 1305.63 1308.09 – 1310.19		nm	
Receive Power (OMA) per Lane	RxOMA			4.5	dBm	
Average Receive Power per Lane	RXPx	-10.6		4.5	dBm	4
Receiver Sensitivity (OMA) per Lane	Rxsens			-8.6	dBm	
Stressed Receiver Sensitivity (OMA) per Lane	SRS			-6.8	dBm	
Return Loss	RL	-26			dB	
Vertical eye closure penalty, per lane				1.8	dB	
Receive electrical 3 dB upper cutoff frequency, per lane				31	GHz	
LOS De-Assert	LOSD			-11.6	dBm	
LOS Assert	LOSA			-13.6	dBm	
LOS Hysteresis			1		dBm	

Note:

1. Transmitter consists of 4 lasers operating at 25.78Gb/s each.
2. Minimum value is informative.
3. Receiver consists of 4 photodetectors operating at 25.78Gb/s each.
4. Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.

Pin Descriptions

	Top Row		Bottom Row
148	GND	1	3.3V_GND
147	REFCLKn	2	3.3V_GND
146	REFCLKp	3	3.3V_GND
145	GND	4	3.3V_GND
144	*N.C.*	5	3.3V_GND
143	*N.C.*	6	3.3V
142	GND	7	3.3V
141	TX9n	8	3.3V
140	TX9p	9	3.3V
139	GND	10	3.3V
138	TX8n	11	3.3V
137	TX8p	12	3.3V
136	GND	13	3.3V
135	TX7n	14	3.3V
134	TX7p	15	3.3V
133	GND	16	3.3V_GND
132	TX6n	17	3.3V_GND
131	TX6p	18	3.3V_GND
130	GND	19	3.3V_GND
129	TX5n	20	3.3V_GND
128	TX5p	21	VND_IO_A
127	GND	22	VND_IO_B
126	TX4n	23	GND
125	TX4p	24	TX_MCLKn
124	GND	25	TX_MCLKp
123	TX3n	26	GND
122	TX3p	27	VND_IO_C
121	GND	28	VND_IO_D
120	TX2n	29	VND_IO_E
119	TX2p	30	PRG_CNTL1
118	GND	31	PRG_CNTL2
117	TX1n	32	PRG_CNTL3
116	TX1p	33	PRG_ALRM1
115	GND	34	PRG_ALRM2
114	TX0n	35	PRG_ALRM3
113	TX0p	36	TX_DIS
112	GND	37	MOD_LOPWR

	Top Row		Bottom Row
111	GND	38	MOD_ABS
110	*N.C.*	39	MOD_RSTn
109	*N.C.*	40	RX_LOS
108	GND	41	GLB_ALRMn
107	RX9n	42	PRTADR4
106	RX9p	43	PRTADR3
105	GND	44	PRTADR2
104	RX8n	45	PRTADR1
103	RX8p	46	PRTADR0
102	GND	47	MDIO
101	RX7n	48	MDC
100	RX7p	49	GND
99	GND	50	VND_IO_F
98	RX6n	51	VND_IO_G
97	RX6p	52	GND
96	GND	53	VND_IO_H
95	RX5n	54	VND_IO_J
94	RX5p	55	3.3V_GND
93	GND	56	3.3V_GND
92	RX4n	57	3.3V_GND
91	RX4p	58	3.3V_GND
90	GND	59	3.3V_GND
89	RX3n	60	3.3V
88	RX3p	61	3.3V
87	GND	62	3.3V
86	RX2n	63	3.3V
85	RX2p	64	3.3V
84	GND	65	3.3V
83	RX1n	66	3.3V
82	RX1p	67	3.3V
81	GND	68	3.3V
80	RX0n	69	3.3V
79	RX0p	70	3.3V_GND
78	GND	71	3.3V_GND
77	RX_MCLKn	72	3.3V_GND
76	RX_MCLKp	73	3.3V_GND
75	GND	74	3.3V_GND

Figure1. Pin Descriptions

Bottom Row Pin Function Definition

The CFP connector has 148 pins which are arranged in Top and Bottom rows. The pin map is shown in Table below. The detailed description of the Bottom row ranges from pin 1 through pin 74 and is shown below. The pin orientation is shown below:

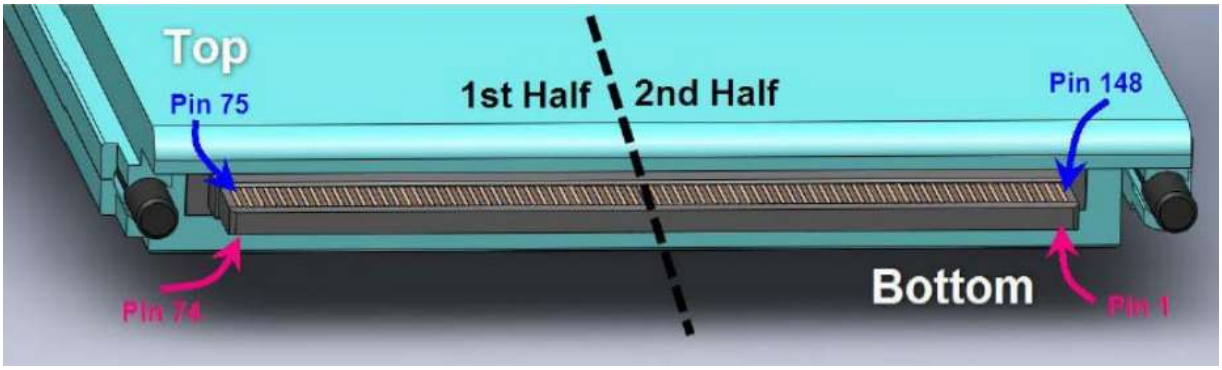

Figure2. CFP Pin Map Orientation

Bottom Row Pin Function Definition

PIN	Name	I/O	Logic	Description
1	3.3V_GND			3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground
2	3.3V_GND			
3	3.3V_GND			
4	3.3V_GND			
5	3.3V_GND			
6	3.3V			3.3V Module Supply Voltage
7~15	3.3V			
16	3.3V_GND			3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground
17	3.3V_GND			
18	3.3V_GND			
19	3.3V_GND			
20	3.3V_GND			
21	VND_IO_A	I/O		Module Vendor I/O A. Do Not Connect!
22	VND_IO_B	I/O		Module Vendor I/O B. Do Not Connect!
23	GND			
24	TX_MCLKn	O		Freq = Optical rate/32. Utilized for optical waveform testing. Not for normal use.
25	TX_MCLKp	O		Freq = Optical rate/32. Utilized for optical waveform testing. Not for normal use.
26	GND			
27	VND_IO_C	I/O		Module Vendor I/O C. Do Not Connect!
28	VND_IO_D	I/O		Module Vendor I/O D. Do Not Connect!

29	VND_IO_E	I/O		Module Vendor I/O E. Do Not Connect!
30	PRG_CNTL1	I	LVCMOS w/ PUR	Programmable Control 1 set over MDIO, Default: TRXIC_RSTn, TX & RX ICs reset, "0": reset; "1" or NC: enabled (i.e., not used).
31	PRG_CNTL2	I	LVCMOS w/ PUR	Programmable Control 2 set over MDIO, Default: Hardware Interlock LSB, "00": ≤8W; "01": ≤16W; "10": ≤24W; "11" or NC: ≤32W (i.e., not used).
32	PRG_CNTL3	I	LVCMOS w/ PUR	Programmable Control 3 set over MDIO, Default: Hardware Interlock MSB, "00": ≤8W; "01": ≤16W; "10": ≤24W; "11" or NC: ≤32W (i.e., not used).
33	PRG_ALRM1	O	LVCMOS	Programmable Alarm 1 set over MDIO, Default: HIPWR_ON, "1": module power up completed; "0": module not high powered up.
34	PRG_ALRM2	O	LVCMOS	Programmable Alarm 2 set over MDIO, Default: MOD_READY, "1": Ready; "0": not Ready.
35	PRG_ALRM3	O	LVCMOS	Programmable Alarm 3 set over MDIO, Default: MOD_FAULT, fault detected, "1": Fault; "0": No Fault.
36	TX_DIS	I	LVCMOS w/ PUR	Transmitter Disable for all lanes, "1" or NC = transmitter disabled, "0" = transmitter enabled
37	MOD_LOPWR	I	LVCMOS w/ PUR	Module Low Power Mode. "1" or NC: module in low power (safe) mode, "0": power-on enabled
38	MOD_ABS	O	GND	Module Absent. "1" or NC: module absent, "0": module present, Pull Up Resistor on Host
39	MOD_RSTn	I	LVCMOS w/ PDR	Module Reset. "0" resets the module, "1" or NC = module enabled, Pull Down Resistor in Module
40	RX_LOS	O	LVCMOS	Receiver Loss of Optical Signal, "1": low optical signal, "0": normal condition
41	GLB_ALRMn	O	LVCMOS	Global Alarm. "0": alarm condition in any MDIO Alarm register, "1": no alarm condition, Open Drain, Pull Up Resistor on Host
42	PRTADR4	I	1.2V CMOS	MDIO Physical Port address bit 4
43	PRTADR3	I	1.2V CMOS	MDIO Physical Port address bit 3
44	PRTADR2	I	1.2V CMOS	MDIO Physical Port address bit 2
45	PRTADR1	I	1.2V CMOS	MDIO Physical Port address bit 1
46	PRTADR0	I	1.2V CMOS	MDIO Physical Port address bit 0
47	MDIO	I/O	1.2V CMOS	Management Data I/O bi-directional data (electrical specs as per 802.3ae and ba)
48	MDC	I	1.2V CMOS	Management Data Clock (electrical specs as per 802.3ae and ba)
49	GND			
50	VND_IO_F	I/O		Module Vendor I/O F. Do Not Connect!
51	VND_IO_G	I/O		Module Vendor I/O G. Do Not Connect!
52	GND			
53	VND_IO_H	I/O		Module Vendor I/O H. Do Not Connect!
54	VND_IO_J	I/O		Module Vendor I/O J. Do Not Connect!
55	3.3V_GND			3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground
56~59	3.3V_GND			
60	3.3V			3.3V Module Supply Voltage
61~69	3.3V			
70~74	3.3V_GND			3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground

Mechanical Dimensions

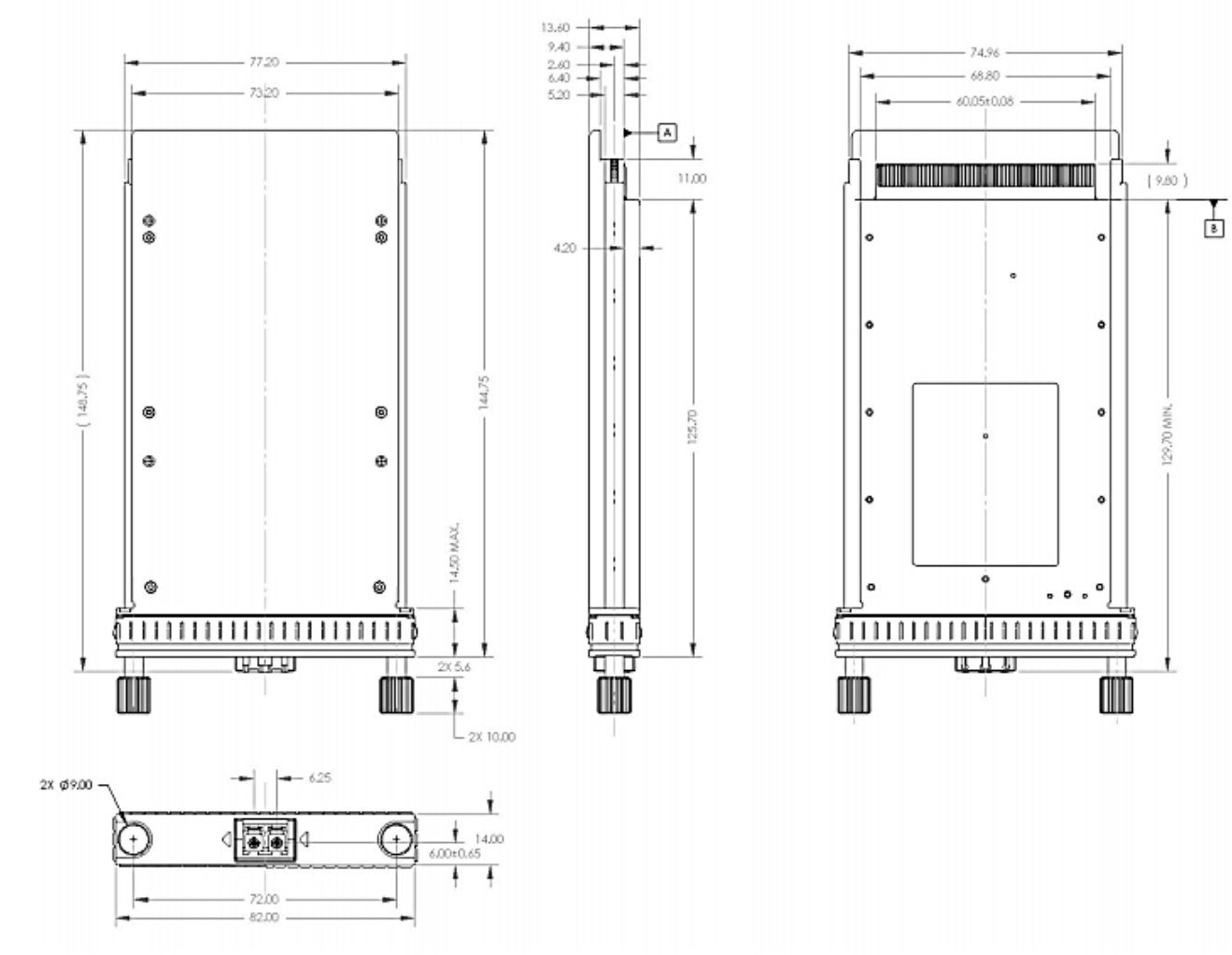

Figure3. Mechanical Specifications

References

1. CFP MSA Management Interface Specification Draft 1.4
2. Compliant to IEEE 802.3ba specification for 100GBASE-LR4