

# CFP 100GBASE-ER4 1310nm 40km Transceiver Module

100G-CFP-ER4-40KM-LL



## Application

- 100GBASE-ER4

## Features

- Supports multi-rate (100GBASE-100GE and OTU4); from 103.1Gb/s to 111.8Gb/s aggregate
- Lane bit rate 25.78 Gb/s 100GE, 27.95 Gb/s OTU4
- CFP MSA package with duplex LC connector
- Up to 40km transmission on SMF
- LAN WDM EML laser and PIN receiver with SOA
- High speed I/O electrical interface (CAUI-10)
- MDIO interface with integrated Digital Diagnostic monitoring
- Single +3.3V power supply
- Maximum power consumption 16W
- Operating case temperature: -5 to +70 ° C
- Complies with IEEE802.3ba and ITU-T G.959
- Complies with EU Directive 2011/65/EU (RoHS 6/6)

## Product Specifications

### I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Storage Temperature	Ts	-40		+85	°C	
Supply Voltage	Vcc	-0.5		+4.0	V	
Operating Relative Humidity	RH			+85	%	

### II. Recommended Operating Environment

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Operating Case Temperature	TC	-5		+70	°C	
Power Supply Voltage	VCC	3.13	3.3	3.47	V	
Power Supply Current	ICC			5	A	
Maximum Power Dissipation	PD			16	W	
Aggregate Bit Rate	BRAVE		103.125		Gb/s	
Lane Bit Rate	BRLANE		25.78		Gb/s	
Transmission Distance	TD			40	km	Over SMF

### III. Optical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
<b>Transmitter</b>						
Center Wavelength Lane 0	$\lambda_0$	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	$\lambda_1$	1299.02	1300.05	1301.09	nm	

<b>Center Wavelength Lane 2</b>	$\lambda_2$	1303.54	1304.58	1305.63	nm	
<b>Center Wavelength Lane 3</b>	$\lambda_3$	1308.09	1309.14	1310.19	nm	
<b>Total Launch Power, 100GE</b>	PALL			8.9	dBm	1
<b>Average Launch Power per Lane, 100GE</b>	PTX_LANE	-2.9		2.9	dBm	1
<b>OMA per Lane, 100GE</b>	OMA	0.1		4.5	dBm	1
<b>OMA-TDP per Lane, 100GE</b>	OMA_TDP				dBm	
<b>Difference in launch power between lanes</b>	PTX_DELTA_LANE			3.6	dB	
<b>Total Launch Output Power, OTU4</b>	PALL			8.9	dBm	1
<b>Average Launch Power per Lane, OTU4</b>	PTX_LANE	-2.9		2.9	dBm	1
<b>Average Output Power (Laser Turn off)</b>	POUT-OFF			-30	dBm	
<b>Side Mode Suppression Ratio</b>	SMSR	30			dB	
<b>Extinction Ratio, 100GE</b>	ER	8			dB	
<b>Transmitter and Dispersion Penalty</b>	TDP			3.5	dB	2
<b>Optical Return Loss Tolerance</b>	ORLT			20	dB	
<b>Optical Eye Mask, 100GE</b>	Compliant with IEEE 802.3ba					2
<b>Optical Eye Mask, OTU4</b>	Compliant with ITU-T G.959.1					2
<b>Receiver</b>						
<b>Center Wavelength Lane 0</b>	$\lambda_0$	1294.53	1295.56	1296.59	nm	
<b>Center Wavelength Lane 1</b>	$\lambda_1$	1299.02	1300.05	1301.09	nm	
<b>Center Wavelength Lane 2</b>	$\lambda_2$	1303.54	1304.58	1305.63	nm	
<b>Center Wavelength Lane 3</b>	$\lambda_3$	1308.09	1309.14	1310.19	nm	
<b>Average Rx Power per Lane, 100GE</b>	PRX_LANE	-20.9		4.5	dBm	3

<b>OMA Sensitivity per Lane, 100GE</b>	POMA_LANE			-21.4	dBm	3
<b>Average Rx Power per Lane, OTU4</b>	PRX_AVE_LANE	-20.7		4.5	dBm	
<b>Sensitivity per Lane, OTU4</b>	PRX_AVE_LANE			-23.2	dBm	4
<b>Receiver Overload</b>	PIN-OL	4.5			dBm	
<b>Reflectance</b>	Ref			-26	dB	
<b>LOS Assert per lane</b>	LOSA	-40			dBm	
<b>LOS De-assert</b>	LOSD			-26	dBm	
<b>LOS Hysteresis</b>	LOSH	0.5		6	dB	

**Notes:**

- 1.The optical power is launched into SMF.
- 2.Measured with a PRBS 2<sup>31</sup>-1 test pattern @25.78125/27.952 Gb/s, Hit ratio≤5E-5.
- 3.Measured with a PRBS 2<sup>31</sup>-1 test pattern @25.78125 Gb/s, BER≤1E-12.
- 4.Measured with a PRBS 2<sup>31</sup>-1 test pattern @27.952 Gb/s, BER≤1E-12(with FEC)

## IV. Electrical Characteristics

High-Speed Signal: Compliant to CAUI-10 (IEEE 802.3ba)

Low-Speed Signal: Compliant to CFP MSA Hardware Specification v 1.4

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
<b>Transmitter (Module Input)</b>						
<b>Differential Data Input Amplitude</b>	V <sub>IN,P-P</sub>	85		850	mVpp	
<b>Differential Termination Mismatch</b>				5	%	
<b>Tx_Disable</b>	<b>Normal Operation</b>	V <sub>IL</sub>	-0.3	0.8	V	
	<b>Laser Disable</b>	V <sub>IH</sub>	2	VCC+0.3	V	
<b>Receiver (Module Output)</b>						
<b>Differential Data Output Amplitude</b>	V <sub>OUT,P-P</sub>	200		760	mVpp	

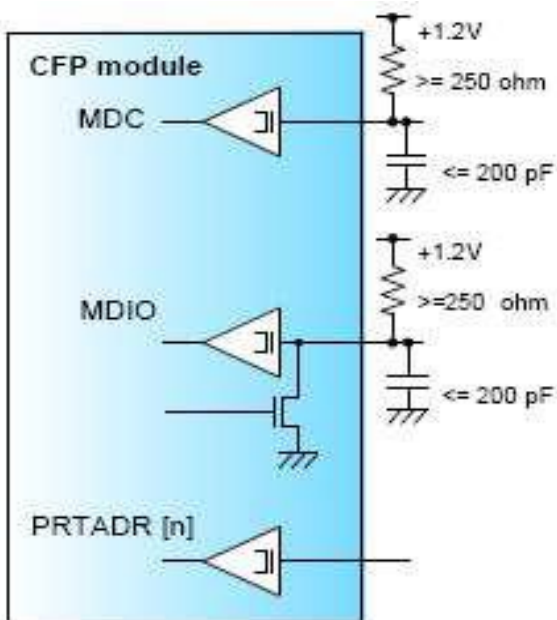
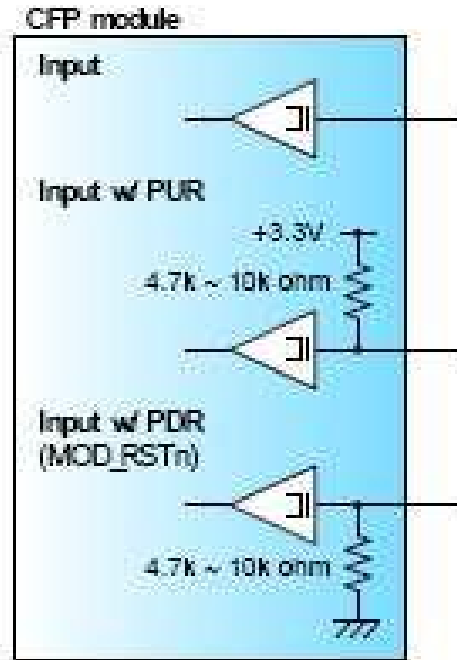
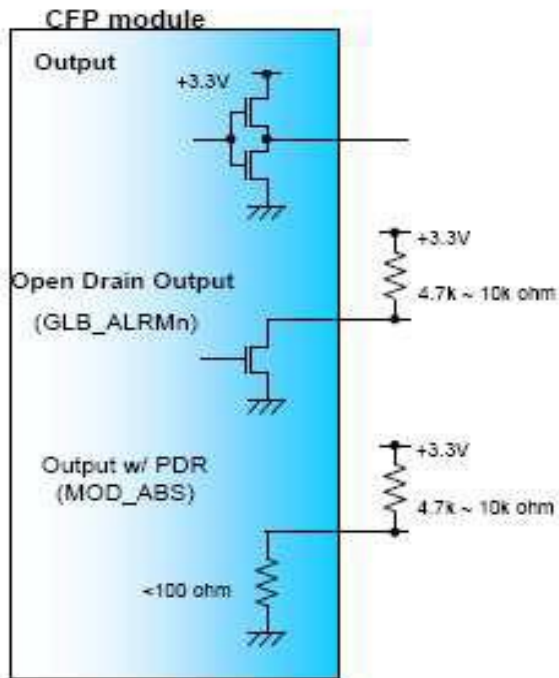
<b>Differential Termination Mismatch</b>					5	%	
<b>Output Rise/Fall Time, 20%~80%</b>		TR	12			ps	
<b>Rx_LOS</b>	<b>Normal Operation</b>	VOL			0.2	V	
	<b>Lose Signal</b>	VOH	VCC-0.2			V	

## V. Digital Diagnostic Monitoring Information

Parameter	Range	Accuracy	Unit	Calibration
<b>Temperature</b>	-5 to 70	$\pm 3$	$^{\circ}\text{C}$	Internal
<b>Voltage</b>	0 to VCC	0.1	V	Internal
<b>Tx Bias Current Per Lane</b>	0 to 100	10%	mA	Internal
<b>SOA Bias Current</b>	0 to 130	10%	mA	Internal
<b>Tx Output Power Per Lane</b>	-3 to 3	$\pm 3$	dBm	Internal
<b>Rx Power (Each Lane)</b>	-25 to 5	$\pm 3$	dBm	Internal

## VI. Hardware Signal Pin Electrical Specification

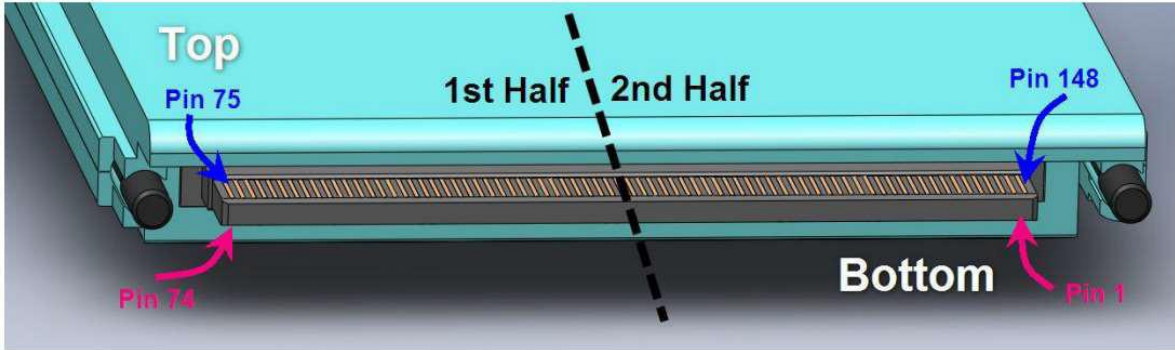
### Reference 3.3V LVCOMS output/input termination Reference MDIO Interface Termination



#### Notes:

The MSA recommends host termination resistor value of 560 Ohms, which provides the best balance of performance for both open-drain and active tri-state driver in the module.

## VII. Pin Assignment



Top Row (2nd Half)		Bottom Row (2nd Half)	
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_ALARM1
115	GND	34	PRG_ALARM2
114	Tx0n	35	PRG_ALARM3
113	Tx0p	36	TX_DIS
112	GND	37	MOD_LOPWR

Top Row (1st Half)		Bottom Row (1st Half)	
111	GND	38	MOD_ABS
110	N.C.	39	MOD_RSTn
109	N.C.	40	RX_LOS
108	GND	41	GLB_ALRMn
107	Tx9n	42	PRTADR4



106	Tx9p	43	PRTADR3
105	GND	44	PRTADR2
104	Tx8n	45	PRTADR1
103	Tx8p	46	PRTADR0
102	GND	47	MDIO
101	Tx7n	48	MDC
100	Tx7p	49	GND
99	GND	50	VND_IO_F
98	Tx6n	51	VND_IO_G
97	Tx6p	52	GND
96	GND	53	VND_IO_H
95	Tx5n	54	VND_IO_J
94	Tx5p	55	3.3V_GND
93	GND	56	3.3V_GND
92	Tx4n	57	3.3V_GND
91	Tx4p	58	3.3V_GND
90	GND	59	3.3V_GND
89	Tx3n	60	3.3V
88	Tx3p	61	3.3V
87	GND	62	3.3V
86	Tx2n	63	3.3V
85	Tx2p	64	3.3V
84	GND	65	3.3V
83	Tx1n	66	3.3V
82	Tx1p	67	3.3V
81	GND	68	3.3V

80	Tx0n	69	3.3V
79	Tx0p	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

## VIII. Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge(ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.