

## 6C-CFP-ER4

CFP-40GBASE-ER4, SMF 40KM DDM, 45° LC connector, 0°C to 70°C Transceiver

### Features

- ◆ Supports 41.25Gbps aggregate bit rates
- ◆ CWDM DFB laser and PIN receiver
- ◆ Up to 10km transmission on SMF
- ◆ Single 3.3V Power Supply and Power dissipation <8W
- ◆ Hot-Pluggable CFP Footprint Duplex LC Connector Interface
- ◆ Class 1 FDA and IEC60825-1 Laser Safety Compliant
- ◆ Operating Case Temperature Standard: 0°C~+70°C
- ◆ Compliant with CFP MSA Specification
- ◆ MDIO interface with integrated Digital Diagnostic Monitoring
- ◆ XLAUI electrical interface
- ◆ Safety Certification: TUV/UL/FDA
- ◆ RoHS Compliant



### Applications

- ◆ Extended Reach 40GBASE-LR4 Ethernet

### Absolute Maximum Ratings\*

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	°C
Supply Voltage	Vcc	-0.5	3.6	V
Operating Relative Humidity	RH	5	85	%

\*Exceeding any one of these values may destroy the device immediately.

### Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>c</sub>	EOLC-1640G-20	0		+70	°C
Power Supply Voltage	Vcc		3.135	3.3	3.465	V
Power Supply Current	Icc			1500		mA
Aggregate Bit Rate	BR <sub>AVE</sub>			41.25		Gbps
Lane Bit Rate	BR <sub>LANE</sub>			10.3125		Gbps

## Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
<b>Transmitter</b>						
Input Amplitude (Differential)	V <sub>in</sub>	150		1050	mVpp	AC coupled inputs*(Note6)
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohms	R <sub>in</sub> > 100 kohms @ DC
<b>Receiver</b>						
Output Amplitude (Differential)	V <sub>out</sub>	340		850	mVpp	AC coupled outputs*(Note6)
Output Impedance (Differential)	Z <sub>out</sub>	85	100	115	ohms	
Output Rise/Fall Time	t <sub>r</sub> /t <sub>f</sub>	24			ps	20%~80%

## 1.2V MDIO Interface Specifications

Parameter	Symbol	Min.	Typ.	Max	Unit
Input Voltage	V <sub>IH</sub>	0.84		1.5	V
	V <sub>IL</sub>	-0.3		0.36	V
Input Leak current	I <sub>IN</sub>	-100		100	uA
Output Voltage	V <sub>OH</sub>	1.0		1.5	V
	V <sub>OL</sub>	-0.3		0.2	V
Input Capacitance	C <sub>I</sub>			10	pF
Input MDC Clock	f <sub>MDC</sub>	0.1		4	MHz
MDC Clock Period	T <sub>MDC</sub>	250		10000	ns
MDIO Hold Time	T <sub>hold</sub>	10			ns
MDIO SetupTime	T <sub>setup</sub>	10			ns
GLB_ALM	T <sub>glb_alm_ass</sub>			150	ms
	T <sub>glb_alm_dea</sub>			150	ms

## Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
9μm Core Diameter SMF	L			20	km
Aggregate Bit Rate	BR <sub>AVE</sub>		41.25		Gbps
Lane Bit Rate	BR <sub>LANE</sub>		10.3125		Gbps
<b>Transmitter</b>					
Lane_0 Center Wavelength	λ <sub>C0</sub>	1264.5	1271	1277.5	nm
Lane_1 Center Wavelength	λ <sub>C1</sub>	1284.5	1291	1297.5	nm
Lane_2 Center Wavelength	λ <sub>C2</sub>	1304.5	1311	1317.5	nm
Lane_3 Center Wavelength	λ <sub>C3</sub>	1324.5	1331	1337.5	nm

Side Mode Suppression Ratio	SMSR	30			dB
Total Average Output Power*(Note4)	Po	-		8.3	dBm
Transmit OMA per Lane	TX_OMA	-4.0		3.5	dBm
Average Launch Power per Lane	Peach	-3.0		2.3	dBm
Extinction Ratio*(Note5)	ER	3.5			dB
Optical Return Loss Tolerance				20	dB
Output Optical Eye*(Note8)	IEEE 802.3ba-2010 Compliant				
TX Disable Assert Time	t_off			100	us
<b>Receiver</b>					
Lane_0 Center Wavelength	$\lambda_{C0}$	1264.5	1271	1277.5	nm
Lane_1 Center Wavelength	$\lambda_{C1}$	1284.5	1291	1297.5	nm
Lane_2 Center Wavelength	$\lambda_{C2}$	1304.5	1311	1317.5	nm
Lane_3 Center Wavelength	$\lambda_{C3}$	1324.5	1331	1337.5	nm
Average Receive Power per Lane	Rpow	-13.7		+2.3	dBm
Stress Receive Sensitivity in OMA per Lane*(Note7)	SRS			-9.6	dBm
Receive Sensitivity per Lane*(Note7)	Pmin			-13.7	dBm
Receiver Overload	Pmax	2.3			dBm
Optical Return Loss	ORL			-20	dB
LOS Assert	LOSA	-25			dBm
LOS De-Assert	LOSD			-11.5	dBm
LOS Hysteresis*(Note9)		0.5			dB

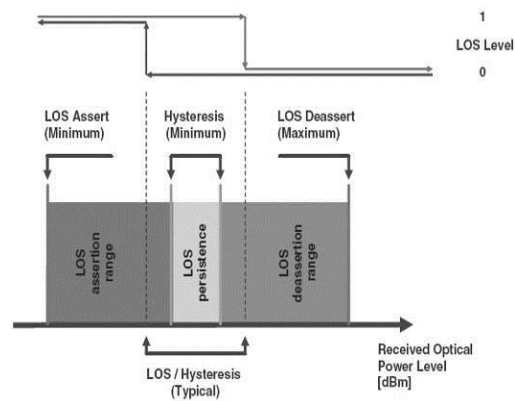
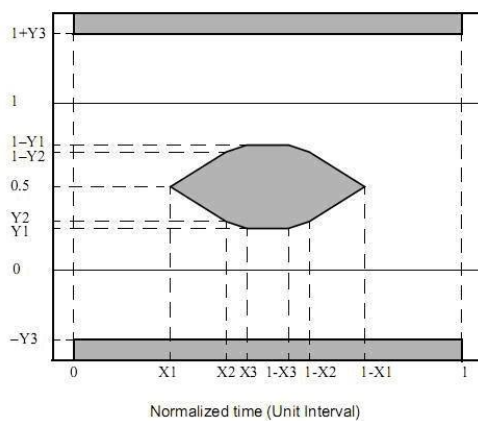
Note4: Output is coupled into a 9/125 $\mu$ m single-mode fiber.

Note5: Filtered, measured with a PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps

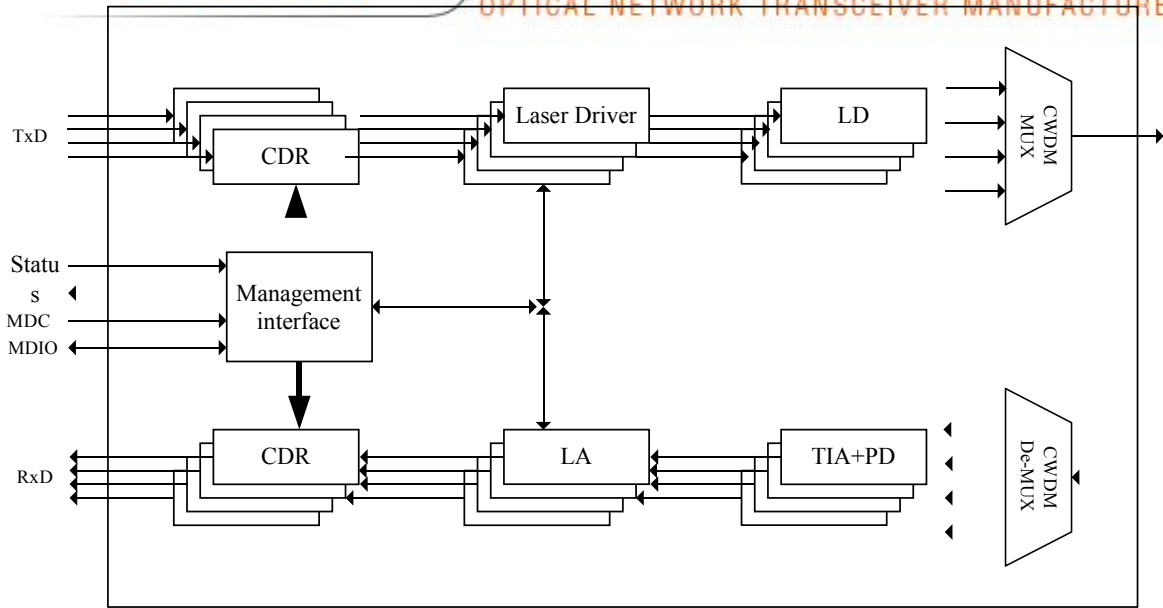
Note6: High speed I/O, internally AC coupled.

Note7: Minimum average optical power measured at BER less than 1E-12, with a 2<sup>31</sup>-1 PRBS

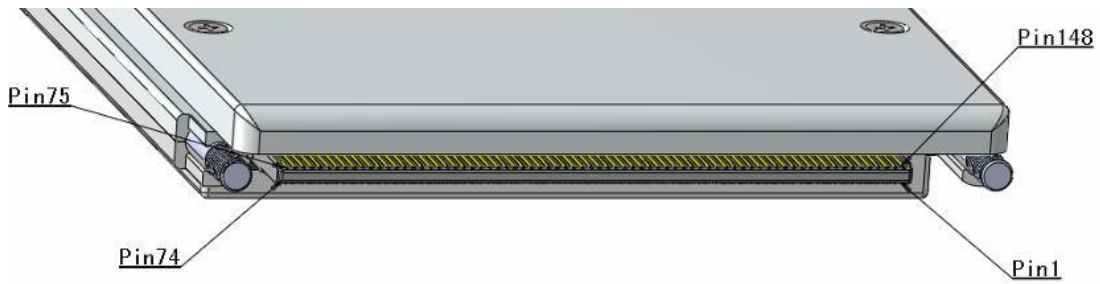
Note8: Eye Pattern Mask      Note9: LOS Hysteresis



## Functional Description of Transceiver



### CFP Transceiver Electrical Pad Layout



## Pin Function Definitions

CFP			
Top Row			
148	GND	111	GND
147	REFCLKn	110	N.C.
146	REFCLKp	109	N.C.
145	GND	108	GND
144	N.C.	107	N.C.
143	N.C.	106	N.C.
142	GND	105	GND
141	N.C.	104	N.C.
140	N.C.	103	N.C.
139	GND	102	GND
138	N.C.	101	N.C.
137	N.C.	100	N.C.
136	GND	99	GND
135	N.C.	98	N.C.
134	N.C.	97	N.C.
133	GND	96	GND
132	N.C.	95	N.C.
131	N.C.	94	N.C.
130	GND	93	GND
129	N.C.	92	N.C.
128	N.C.	91	N.C.
127	GND	90	GND
126	N.C.	89	RX3n
125	N.C.	88	RX3p
124	GND	87	GND
123	TX3n	86	RX2n
122	TX3p	85	RX2p
121	GND	84	GND
120	TX2n	83	RX1n
119	TX2p	82	RX1p
118	GND	81	GND
117	TX1n	80	RX0n
116	TX1p	79	RX0p
115	GND	78	GND
114	TX0n	77	(RX_MCLKn)
113	TX0p	76	(RX_MCLKp)
112	GND	75	GND

CFP			
Bottom Row			
1	3.3V_GND	38	MOD_ABS
2	3.3V_GND	39	MOD_RSTn
3	3.3V_GND	40	RX_LOS
4	3.3V_GND	41	GLB_ALRMn
5	3.3V_GND	42	PRTADR4
6	3.3V	43	PRTADR3
7	3.3V	44	PRTADR2
8	3.3V	45	PRTADR1
9	3.3V	46	PRTADR0
10	3.3V	47	MDIO
11	3.3V	48	MDC
12	3.3V	49	GND
13	3.3V	50	VND_IO_F
14	3.3V	51	VND_IO_G
15	3.3V	52	GND
16	3.3V_GND	53	VND_IO_H
17	3.3V_GND	54	VND_IO_J
18	3.3V_GND	55	3.3V_GND
19	3.3V_GND	56	3.3V_GND
20	3.3V_GND	57	3.3V_GND
21	VND_IO_A	58	3.3V_GND
22	VND_IO_B	59	3.3V_GND
23	GND	60	3.3V
24	(TX_MCLKn)	61	3.3V
25	(TX_MCLKp)	62	3.3V
26	GND	63	3.3V
27	VND_IO_C	64	3.3V
28	VND_IO_D	65	3.3V
29	VND_IO_E	66	3.3V
30	PRG_CNTL1	67	3.3V
31	PRG_CNTL2	68	3.3V
32	PRG_CNTL3	69	3.3V
33	PRG_ALARM1	70	3.3V_GND
34	PRG_ALARM2	71	3.3V_GND
35	PRG_ALARM3	72	3.3V_GND
36	TX_DIS	73	3.3V_GND
37	MOD_LOPWR	74	3.3V_GND

## Bottom Row Pin Descriptions

Pin Num.	Name	Function	Notes
1	3.3V_GND	Ground	3.3V Module Supply 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	3.3V ± 5%
7	3.3V		
8	3.3V		
9	3.3V		
10	3.3V		
11	3.3V		
12	3.3V		
13	3.3V		
14	3.3V		
15	3.3V		
16	3.3V_GND	Ground	3.3V Module Supply 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, NC
22	VND_IO_B	I/O	Module Vendor I/O, NC
23	GND	Ground	Signal Ground
24	(TX_MCLKn)	Tx Monitor Clock	Not Supported
25	(TX_MCLKp)	O	Not Connected Internally
26	GND	Ground	Signal Ground
27	VND_IO_C	I/O	Module Vendor I/O, NC
28	VND_IO_D	I/O	Module Vendor I/O, NC
29	VND_IO_E	I/O	Module Vendor I/O, NC
30	PRG_CNTL1	I	LVCOMS
31	PRG_CNTL2	I	LVCOMS
32	PRG_CNTL3	I	LVCOMS
33	PRG_ALRM1	O	LVCOMS
34	PRG_ALRM2	O	LVCOMS
35	PRG_ALRM3	O	LVCOMS
36	TX_DIS	Transmitter Disable I	"1" or NC = transmitter disabled, "0" = transmitter enabled



37	MOD_LOPWR	Module Low Power Mode I	"1" or NC: module in low power (safe) mode, "0": power-on enabled
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38	MOD_ABS	Module Absent O	"1" or NC: module absent, "0": module present
39	MOD_RSTn	Module Reset I	"0" resets the module, "1" or NC = module enabled
40	RX_LOS	Loss of Signal O	"1": low optical signal, "0": normal condition
41	GLB_ALRMn	Global Alarm O	"0": alarm condition in any MDIO Alarm register, "1": no alarm condition
42	PRTADR4	1.2V CMOS I	MDIO Physical Port address bit4
43	PRTADR3	1.2V CMOS I	MDIO Physical Port address bit3
44	PRTADR2	1.2V CMOS I	MDIO Physical Port address bit2
45	PRTADR1	1.2V CMOS I	MDIO Physical Port address bit1
46	PRTADR0	1.2V CMOS I	MDIO Physical Port address bit0
47	MDIO	1.2V CMOS I/O	Management Data I/O bi-directional data
48	MDC	1.2V CMOS I	Management Data Clock
49	GND	Ground	Signal Ground
50	VND_IO_F	I/O	Module Vendor I/O, Not Connected Internally
51	VND_IO_G	I/O	Module Vendor I/O, Not Connected Internally
52	GND	Ground	Signal Ground
53	VND_IO_H	I/O	Module Vendor I/O, Not Connected Internally
54	VND_IO_J	I/O	Module Vendor I/O, Not Connected Internally
55	3.3V_GND	Ground	3.3V Module Supply Ground, Internally connected to Signal Ground
56	3.3V_GND		
57	3.3V_GND		
58	3.3V_GND		
59	3.3V_GND		
60	3.3V		
61	3.3V		
62	3.3V		





63	3.3V	3.3V Module Supply Voltage	3.3V ± 5%
64	3.3V		
65	3.3V		



66	3.3V		
67	3.3V		
68	3.3V		
69	3.3V		
70	3.3V_GND	Ground	3.3V Module Supply Ground, Internally connected to Signal Ground
71	3.3V_GND		
72	3.3V_GND		
73	3.3V_GND		
74	3.3V_GND		

### Top Row Pin Descriptions

Pin Num.	Name	Function	Notes
148	GND	Ground	Signal Ground
147	REFCLKn	Reference Clock I	Not Required
146	REFCLKp		Not Connected Internally
145	GND	Ground	Signal Ground
144	N.C.		Not Connected Internally
143	N.C.		Not Connected Internally
142	GND	Ground	Signal Ground
141	N.C.		Not Connected Internally
140	N.C.		Not Connected Internally
139	GND	Ground	Signal Ground
138	N.C.		Not Connected Internally
137	N.C.		Not Connected Internally
136	GND	Ground	Signal Ground
135	N.C.		Not Connected Internally
134	N.C.		Not Connected Internally
133	GND	Ground	Signal Ground
132	N.C.		Not Connected Internally
131	N.C.		Not Connected Internally
130	GND	Ground	Signal Ground
129	N.C.		Not Connected Internally
128	N.C.		Not Connected Internally
127	GND	Ground	Signal Ground
126	N.C.		Not Connected Internally
125	N.C.		Not Connected Internally
124	GND	Ground	Signal Ground
123	TX3n	Lane 3 Tx Input I	CML Input
122	TX3p		
121	GND	Ground	Signal Ground
120	TX2n	Lane 2 Tx Input	CML Input

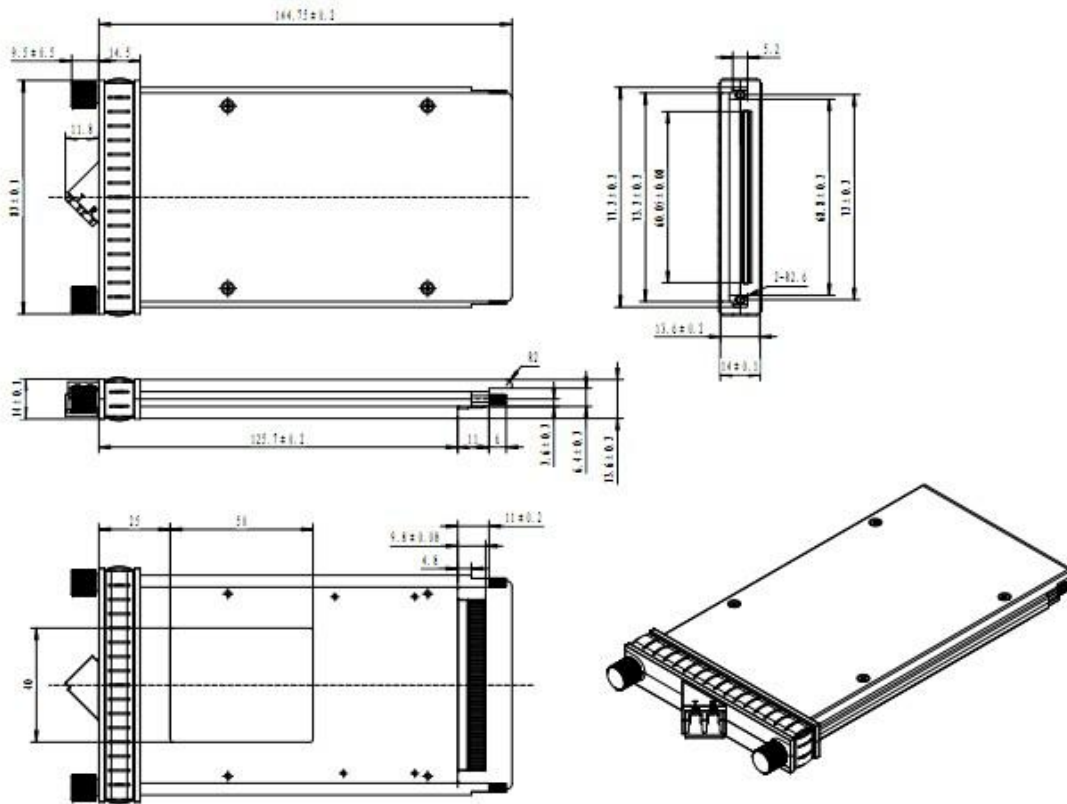


119	TX2p	I	
118	GND	Ground	Signal Ground
117	TX1n	Lane 1 Tx Input	CML Input
116	TX1p	I	
115	GND	Ground	Signal Ground
114	TX0n	Lane 0 Tx Input	CML Input
113	TX0p	I	
112	GND	Ground	Signal Ground
111	GND	Ground	Signal Ground
110	N.C.		Not Connected Internally
109	N.C.		Not Connected Internally
108	GND	Ground	Signal Ground
107	N.C.		Not Connected Internally
106	N.C.		Not Connected Internally
105	GND	Ground	Signal Ground
104	N.C.		Not Connected Internally
103	N.C.		Not Connected Internally
102	GND	Ground	Signal Ground
101	N.C.		Not Connected Internally
100	N.C.		Not Connected Internally
99	GND	Ground	Signal Ground
98	N.C.		Not Connected Internally
97	N.C.		Not Connected Internally
96	GND	Ground	Signal Ground
95	N.C.		Not Connected Internally
94	N.C.		Not Connected Internally
93	GND	Ground	Signal Ground
92	N.C.		Not Connected Internally
91	N.C.		Not Connected Internally
90	GND	Ground	Signal Ground
89	RX3n	Lane 3 Rx Output	CML Output
88	RX3p	O	
87	GND	Ground	Signal Ground
86	RX2n	Lane 2 Rx Output	CML Output
85	RX2p	O	
84	GND	Ground	Signal Ground
83	RX1n	Lane 1 Rx Output	CML Output
82	RX1p	O	
81	GND	Ground	Signal Ground
80	RX0n	Lane 0 Rx Output	CML Output
79	RX0p	O	
78	GND	Ground	Signal Ground

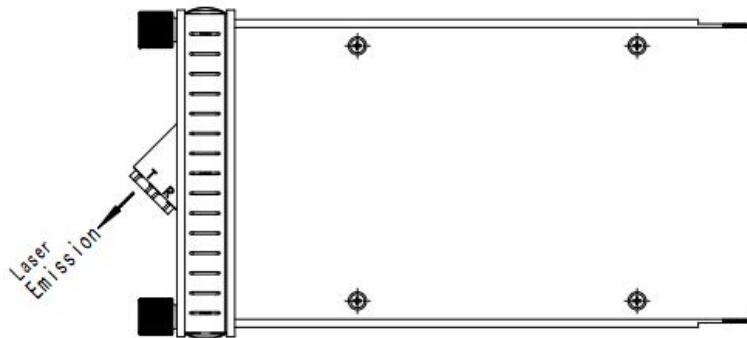


77	(RX_MCLKn)	Rx Monitor Clock	Not Supported
76	(RX_MCLKp)	O	Not Connected Internally
75	GND	Ground	Signal Ground

## Mechanical Specifications



## Laser Emission



## Ordering Information

Part No.	Data Rate	Fiber	Distance <sup>*(note3)</sup>	Interface	Temp.	DDMI
6C-CFP-ER4	40Gbps	SMF	40km	LC	Standard	Yes