PRELIMINARY Product Specification

10km Duplex SMF 400G CFP8 Optical Transceiver

FTCD1314E1BCL

PRODUCT FEATURES

- Hot-pluggable CFP8 form factor
- Supports 425Gb/s aggregate bit rate
- Power dissipation < 16W
- RoHS-6 compliant
- 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)
- 8x50G PAM4 DFB-based LAN-WDM transmitter
- 16x25G electrical interface
- Duplex LC receptacles
- MDIO management interface

APPLICATIONS

- 400GBASE-LR8 400G Ethernet

Finisar's FTCD1314E1BCL 400G CFP8 transceiver modules are designed for use in 400 Gigabit Ethernet interfaces over single mode fiber. They are compliant with the CFP MSA[1], IEEE P802.3bs 400GBASE-LR8[2] and 400GAUI-16[2]. Digital diagnostics functions are available via the MDIO interface, as specified by the CFP MSA and Finisar Application Note AN-20xx[4]. The transceiver is RoHS compliant per Directive 2011/65/EU[3].

PRODUCT SELECTION

FTCD1314E1BCL

E:	400G Ethernet maximum bit rate (425 Gb/s)
B:	Bail type release
C:	Commercial temperature range
L:	LC receptacles

I. Pin Descriptions

CFP8 pin-out as being defined by CFP MSA[1].

	CFP8 Bottom			CFP8 Top
1	GND		124	GND
2	TX15n		123	TX14n
3	TX15p		122	TX14p
4	GND		121	GND
5	TX13n		120	TX12n
6	TX13p		119	TX12p
7	GND		118	GND
8	TX11n		117	TX10n
9	TX11p		116	TX10p
10	GND		115	GND
11	TX9n		114	TX8n
12	TX9p		113	TX8p
13	GND		112	GND
14	TX7n		111	TX6n
15	TX7p		110	TX6p
16	GND		109	GND
17	TX5n		108	TX4n
18	TX5p		107	TX4p
19	GND		106	GND
20	TX3n		105	TX2n
21	TX3p		104	TX2p
22	GND		103	GND
23	TX1n		102	TX0n
24	TX1p		101	TX0p
25	GND		100	GND
26	GND *(VND_IO_A)*		99	*REFCLKn (VND_IO_E)*
27	3.3V		98	*REFCLKp (VND_IO_D)*
28	3.3V		97	GND
29	3.3V		96	TX_DIS *(PRG_CNTL1)*
30	3.3V		95	RX_LOS *(PRG_ALRM1)*
31	3.3V		94	MOD_LOPWR
32	3.3V		93	MOD_ABS
33	3.3V		92	MDC
34	3.3V		91	MDIO
35	GND		90	MOD_SELn
36	*MCLKn (VND_IO_B)*		89	GLB_ALRMn
37	*MCLKp (VND_IO_C)*		88	MOD_RSTn
38	GND		87	GND
39	RX15n		86	RX14n
40	RX15p		85	RX14p
41	GND		84	GND
42	RX13n		83	RX12n
43	RX13p		82	RX12p
44	GND		81	GND
45	RX11n		80	RX10n
46	RX11p		79	RX10p
47	GND		78	GND
48	RX9n		77	RX8n
49	RX9p		76	RX8p
50	GND		75	GND
51	RX7n		74	RX6n
52	RX7p		73	RX6p
53	GND		72	GND
54	RX5n		71	RX4n
55	RX5p		70	RX4p
56	GND		69	GND
57	RX3n		68	RX2n
58	RX3p		67	RX2p
59	GND		66	GND
60	RX1n		65	RX0n
61	RX1p		64	RX0p
62	GND		63	GND

II. Absolute Maximum Ratings

Module performance is not guaranteed beyond the operating range (see Section VI). Exceeding the limits below may damage the transceiver module permanently.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		3.6	V	
Storage Temperature	T_S	-40		85	°C	
Case Operating Temperature	T_{OP}	0		70	°C	1
Relative Humidity	RH	15		85	%	2
Receiver Damage Threshold, per Lane	P_{Rdmg}	5.5			dBm	

Notes:
1. 48-hour excursions, maximum
2. Non-condensing.

III. Electrical Characteristics (EOL, T_{OP} = 0 to 70 °C, V_{CC} = 3.2 to 3.4 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.2		3.4	V	
Supply Current	Icc			5.1	A	1
Module total power	P			16	W	2
Transmitter						
Signaling rate per lane		26.5625± 100 ppm.			Gb/s	
Differential data input voltage per lane	Vin,pp,diff	900			mV	
Differential input return loss		Per equation (83E–5) IEEE802.3bm			dB	
Differential to common mode input return loss		Per equation (83E–6) IEEE802.3bm			dB	
Differential termination mismatch				10	%	
Single-ended voltage tolerance	Vin,pp	-0.35		+3.3	V	
Module stress input test		See 83E.3.4.1 IEEE802.3bm				3
Single-ended voltage tolerance range		-0.4		3.3	V	
DC common mode voltage		-350		2850	mV	4

1. Steady state, calculated at 16W and 3.135V
2. Maximum total power value is specified across the full temperature and voltage range
3. Meets BER specified in IEEE802.3bm 83E.1.1
4. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage

Receiver						
Signaling rate per lane		26.5625± 100 ppm.			Gb/s	
AC common-mode output voltage (RMS)				17.5	mV	
Differential output voltage				900	mV	
Eye width		0.57			UI	
Eye height, differential		228			mV	
Vertical eye closure	VEC			5.5	dB	
Differential output return loss		Per equation 83E-2 IEEE802.3bm				
Common to differential mode conversion return loss		Per equation 83E-3 IEEE802.3bm				
Differential termination mismatch				10	%	
Transition time (min, 20% to 80%)		12			ps	
DC common mode voltage (min)		-350		2850	mV	1

1. DC common mode voltage is generated by the host. Specification includes effects of ground offset voltage

IV. Optical Characteristics (EOL, T_{OP} = 0 to 70°C, V_{CC} = 3.2 to 3.4 Volts)

Meets 400GBASE-LR8 as being defined by IEEE P802.3bs

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Signaling rate (each lane (range)			26.5625 ± 100 ppm		GBd	
Modulation format			PAM4			
Lane wavelengths (range)			1272.55 to 1274.54 1276.89 to 1278.89 1281.25 to 1283.27 1285.65 to 1287.68 1294.53 to 1296.59 1299.02 to 1301.09 1303.54 to 1305.63 1308.09 to 1310.19		nm	
Side-mode suppression ratio (SMSR)		30			dB	
Total average launch power				13.2	dBm	
Average launch power, each lane				5.3	dBm	1
Average launch power, each lane		-2.8			dBm	2
Outer Optical Modulation Amplitude (OMAouter), each lane		0.2		5.7	dBm	3
Difference in launch power between any two lanes (OMAouter)				4	dB	
Launch power in OMAouter minus TDECQ, each lane		-1.1			dBm	
Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane				3.3	dB	
Average launch power of OFF transmitter, each lane				-30	dBm	
Extinction ratio		3.5			dB	
$RIN_{15.1}OMA$				-132	dB/Hz	
Optical return loss tolerance				15.1	dB	
Transmitter reflectance				-26	dB	4

1. As the total average launch power limit has to be met, not all of the lanes can operate at the maximum average launch power, each lane.
2. Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
3. Even if the TDECQ < 1 dB, the OMA_{outer} (min) must exceed this value
4. Transmitter reflectance is defined looking into the transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Receiver						
Signaling rate (each lane (range)			26.5625 ± 100 ppm		GBd	
Modulation format			PAM4			
Lane wavelengths (range)			1272.55 to 1274.54 1276.89 to 1278.89 1281.25 to 1283.27 1285.65 to 1287.68 1294.53 to 1296.59 1299.02 to 1301.09 1303.54 to 1305.63 1308.09 to 1310.19		nm	
Damage threshold, each lane			6.3		dBm	1
Average receive power, each lane				5.3	dBm	
Average receive power, each lane		-8.6			dBm	2
Receive power (OMAouter), each lane				5.7	dBm	
Difference in receive power between any two lanes (OMAouter)				4.5	dBm	
Receiver reflectance				-26	dB	
Receiver sensitivity (OMAouter), each lane				-7.1	dBm	3
Stressed receiver sensitivity (OMAouter), each lane				-4.7	dBm	4
Conditions of stressed receiver sensitivity test:						
Stressed eye closure for PAM4 (SECQ), lane under test			3.3		dB	5
OMAouter of each aggressor lane			-0.2		dBm	

1. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.
2. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
3. Receiver sensitivity (OMA_{outer}), each lane (max) is informative.
4. Measured with conformance test signal at TP3 (see 122.8.9) for the BER specified in 122.1.1.
5. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

V. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate (all wavelengths combined)	BR			425	Gb/s	1
Bit Error Ratio	BER			$2x10^{-4}$		2
Maximum Supported Distances						
Fiber Type						
SMF per G.652	Lmax1			10	km	

Notes:
1. Supports 400GBASE-LR8 per IEEE P802.3bs.
2. As defined by IEEE P802.3bs.

Timing Parameters

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Time for Rx recovery after LOS			0.45	2	S	

VI. Environmental Specifications

Finisar FTCD1314 CFP8 transceivers have a commercial operating case temperature range of 0°C to +70°C.

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T_{op}	0		70	°C	
Storage Temperature	T_{sto}	-40		85	°C	

VII. Regulatory Compliance

Finisar FTCD1314 CFP8 transceivers are Class 1 Laser Products. They are certified per the following standards:

Feature	Agency	Standard	Certificate Number
Laser Eye Safety	FDA/CDRH	CDRH 21 CFR 1040 and Laser Notice 50	TBD
Laser Eye Safety	TÜV	EN 60825-1: 2007 IEC 60825-2: 2004+A1+A2	TBD
Electrical Safety	TÜV	EN 60950	TBD
Electrical Safety	UL/CSA	CLASS 3862.07 CLASS 3862.87	TBD

Copies of the referenced certificates are available at Finisar Corporation upon request. Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

VIII. Digital Diagnostics Functions

FTCD1314 CFP8 transceivers support the MDIO-based diagnostics interface specified in the CFP MSA[1]. See Finisar Application Note AN-20xx (TBD).

IX. Memory Contents

Per the CFP MSA[1]. See Finisar Application Note AN-20xx (TBD).

X. Host PCB Layout and Bezel Recommendations

Per CFP MSA Hardware Specification for CFP8[1].

XI. Mechanical Specifications

Finisar FTCD1314 CFP8 transceivers are compatible with the CFP MSA specification for CFP8 pluggable form factor modules.

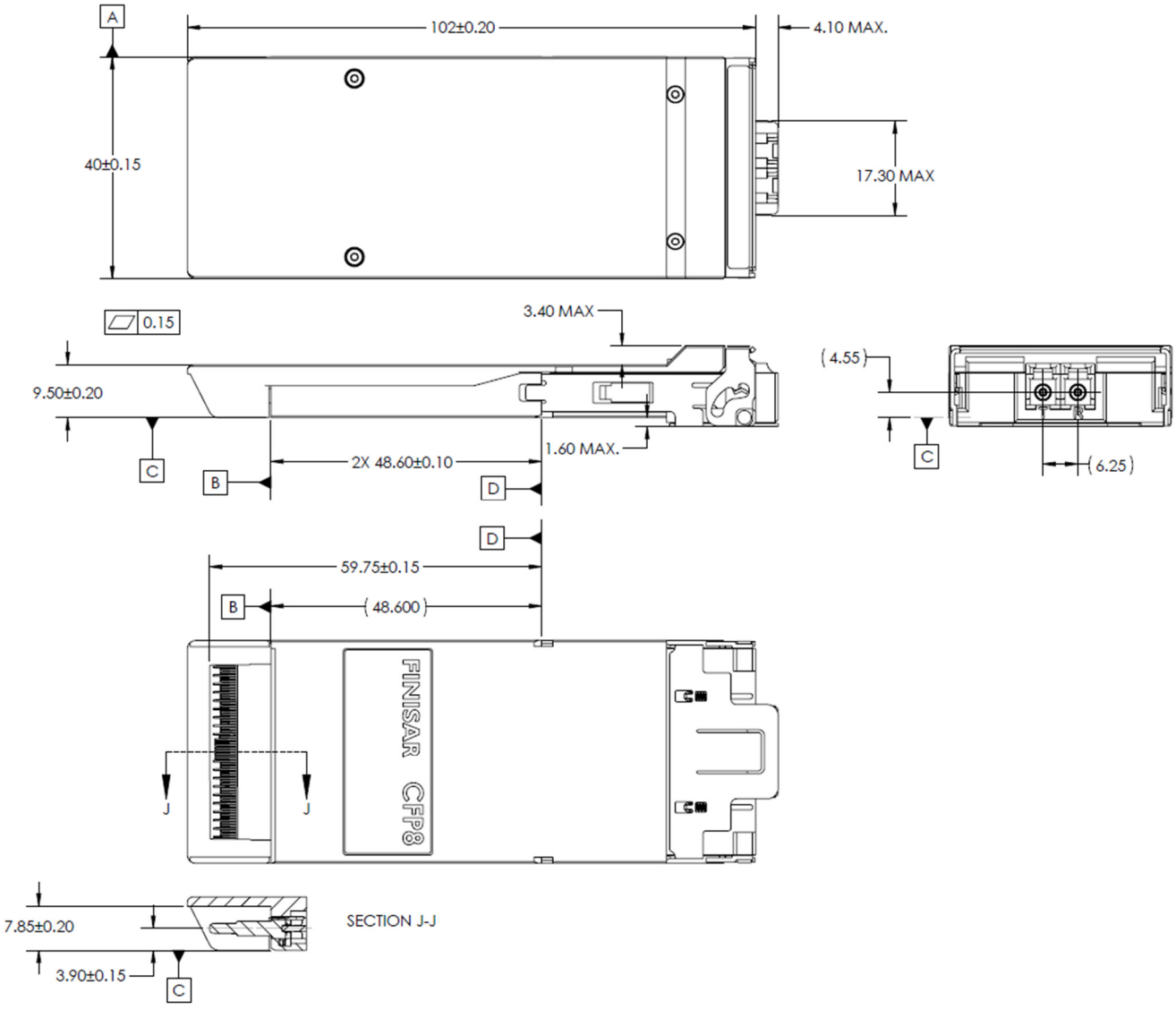

Figure 1. FTCD1314E1BCL Mechanical Dimensions (Bail version)

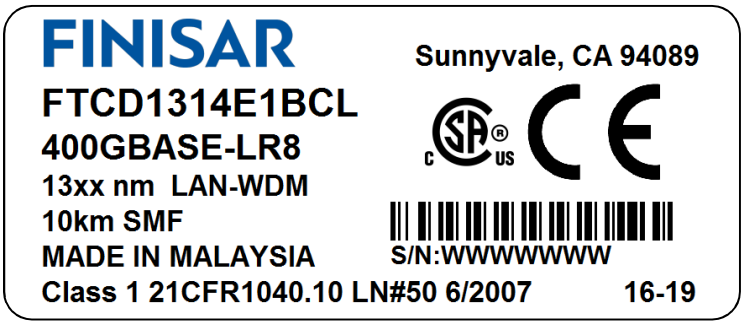

Figure 2. Standard Product Label

XII. References

1. CFP8 Hardware Specification and CFP MSA Management Interface Specifications (MIS), Rev TBD.; CFP MSA, www.cfp-msa.org

2. IEEE P802.3bs, PMD Type 400GBASE-LR8, 400GAUI-16 electrical interface

3. Directive 2011/65/EU of the European Parliament and of the Council, "on the restriction of the use of certain hazardous substances in electrical and electronic equipment." Certain products may use one or more exemption as allowed by the directive.

4. Application Note AN-20xx (TBD), Finisar Corporation.

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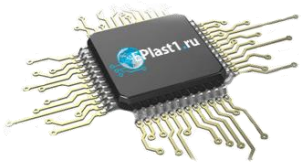

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