Product Specification

10km Duplex SMF 100G CFP4 Optical Transceiver

FTLC1141RDNL

PRODUCT FEATURES

- Hot-pluggable CFP4 form factor
- Supports 103.1Gb/s aggregate bit rate
- Power dissipation < 5W
- RoHS compliant
- Commercial case temperature range of 0°C to 75°C
- Single 3.3V power supply
- Maximum link length of 10km on Single Mode Fiber (SMF)
- 4x25Gb/s DFB-based LAN-WDM transmitter
- 4x25G electrical interface
- Duplex LC receptacles
- MDIO management interface

APPLICATIONS

- 100GBASE-LR4 100G Ethernet

Finisar's FTLC1141RDNL 100G CFP4 transceiver modules are designed for use in 100 Gigabit Ethernet interfaces over single mode fiber. They are compliant with the CFP MSA[1], IEEE 802.3ba 100GBASE-LR4[2] and IEEE 802.3bm CAUI-4[5]. 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

FTLC1141RDxL

R:	100G Ethernet maximum bit rate (103.1 Gb/s)
D:	4x25G LAN-WDM optics
x:	N: Bail type release | P: Pull Tab
L:	LC receptacles

I. Pin Descriptions

Per CFP MSA[1].
Pins views from the top.

	Top Row		Bottom Row
56	GND	1	3.3V_GND
55	TX3n	2	3.3V_GND
54	TX3p	3	3.3V
53	GND	4	3.3V
52	TX2n	5	3.3V
51	TX2p	6	3.3V
50	GND	7	3.3V_GND
49	TX1n	8	3.3V_GND
48	TX1p	9	VND_IO_A
47	GND	10	VND_IO_B
46	TX0n	11	TX_DIS
45	TX0p	12	RX_LOS
44	GND	13	GLB_ALRMn
43	*{REFCLKn}*	14	MOD_LOPWR
42	*{REFCLKp}*	15	MOD_ABS
41	GND	16	MOD_RSTn
40	RX3n	17	MDC
39	RX3p	18	MDIO
38	GND	19	PRTADR0
37	RX2n	20	PRTADR1
36	RX2p	21	PRTADR2
35	GND	22	VND_IO_C
34	RX1n	23	VND_IO_D
33	RX1p	24	VND_IO_E
32	GND	25	GND
31	RX0n	26	*{MCLKn}*
30	RX0p	27	*{MCLKp}*
29	GND	28	GND

Bottom Row Pin Descriptions

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			**3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground**
3	3.3V			3.3V Module Supply Voltage
4	3.3V			3.3V Module Supply Voltage
5	3.3V			3.3V Module Supply Voltage
6	3.3V			3.3V Module Supply Voltage
7	3.3V_GND			**3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground**
8	3.3V_GND			**3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground**
9	VND_IO_A	I/O		Module Vendor I/O A. Do Not Connect!
10	VND_IO_B	I/O		Module Vendor I/O B. Do Not Connect!
11	TX_DIS	I	LVCMOS w/ PUR	Transmitter Disable for all lanes, "1" or NC = transmitter disabled, "0" = transmitter enabled
12	RX_LOS	O	LVCMOS	Receiver Loss of Optical Signal, "1": low optical signal, "0": normal condition
13	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
14	MOD_LOPWR	I	LVCMOS w/ PUR	Module Low Power Mode. "1" or NC: module in low power (safe) mode, "0": power-on enabled
15	MOD_ABS	O	GND	Module Absent. "1" or NC: module absent, "0": module present, Pull Up Resistor on Host
16	MOD_RSTn	I	LVCMOS w/ PDR	Module Reset. "0" resets the module, "1" or NC = module enabled, Pull Down Resistor in Module
17	MDC	I/O	1.2V CMOS	Management Data I/O bi-directional data (electrical specs as per 802.3ae and ba)
18	MDIO	I	1.2V CMOS	Management Data Clock (electrical specs as per 802.3ae and ba)
19	PRTADR0	I	1.2V CMOS	MDIO Physical Port address bit 0
20	PRTADR1	I	1.2V CMOS	MDIO Physical Port address bit 1
21	PRTADR2	I	1.2V CMOS	MDIO Physical Port address bit 2
22	VND_IO_C	I/O		Module Vendor I/O C. Do Not Connect!
23	VND_IO_D	I/O		Module Vendor I/O D. Do Not Connect!
24	VND_IO_E	I/O		Module Vendor I/O E. Do Not Connect!
25	GND			
26	MCLKn			Monitor Clock – Support is TBD
27	MCLKp			Monitor Clock – Support is TBD
28	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		4.0	V	
Storage Temperature	T_S	-40		85	°C	
Case Operating Temperature	T_{OP}	0		75	°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 75 °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			1.9	A	
Module total power	P			5	W	1
Transmitter						
Signaling rate per lane				25.78	Gb/s	2
Differential pk-pk input voltage tolerance	Vin,pp,diff			900	mV	
Single-ended voltage tolerance	Vin,pp	-0.4		+3.3	V	
Module stress input test		Per Section 83E.3.4.1, IEEE 802.3bm				
Receiver						
Signaling rate per lane				25.78	Gb/s	2
Differential output voltage	Vout,pp			900	mV	
Eye width		0.57			UI	
Eye height, differential		228			mV	
Vertical eye closure	VEC	5.5			dB	
Transition time (20% to 80%)	t_r, t_f	12			ps	

Notes:
1. Maximum total power value is specified across the full temperature and voltage range.
2. +/- 100ppm

FTLC1141RDNL Clocking Signals

Clock Name	Status	I/O	Value
REFCLK	Not Required	I	N/A (terminated internally)
MCLK	Supported	O	1/8 of host lane rate

IV. Optical Characteristics (EOL, T_{OP} = 0 to 75°C, V_{CC} = 3.2 to 3.4 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
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	P_{OUT}			10.5	dBm	
Transmit OMA per Lane	TxOMA	-1.3		4.5	dBm	
Average Launch Power per Lane	TXP_x	-4.3		4.5	dBm	2
Optical Extinction Ratio	ER	4			dB	
Sidemode Suppression ratio	SSR_{min}	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	RXP_x	-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	LOS_D			-11.6	dBm	
LOS Assert	LOS_A			-13.6	dBm	
LOS Hysteresis			1		dBm	

Notes:
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.

V. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate (all wavelengths combined)	BR			103.1	Gb/s	1
Bit Error Ratio @25.78Gb/s	BER1			10^{-12}		2
Maximum Supported Distances						
Fiber Type						
SMF per G.652	Lmax1			10	km	

Notes:
1. Supports 100GBASE-LR4 per IEEE 802.3ba.
2. Tested with a $2^{31} – 1$ PRBS.

VI. Environmental Specifications

Finisar FTLC1141 CFP4 transceivers have a commercial operating case temperature range of 0°C to +75°C.

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T_{op}	0		75	°C	
Storage Temperature	T_{sto}	-40		85	°C	

VII. Regulatory Compliance

Finisar FTLC1141 CFP4 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	9210176
Laser Eye Safety	TÜV	EN 60825-1: 2007 IEC 60825-2: 2004+A1+A2	R72130387
Electrical Safety	TÜV	EN 60950	R72130387
Electrical Safety	UL/CSA	CLASS 3862.07 CLASS 3862.87	190993-2375840

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

FTLC1141 CFP4 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 CFP4[1].

XI. Mechanical Specifications

Finisar FTLC1141 CFP4 transceivers are compatible with the CFP MSA specification for CFP4 pluggable form factor modules.

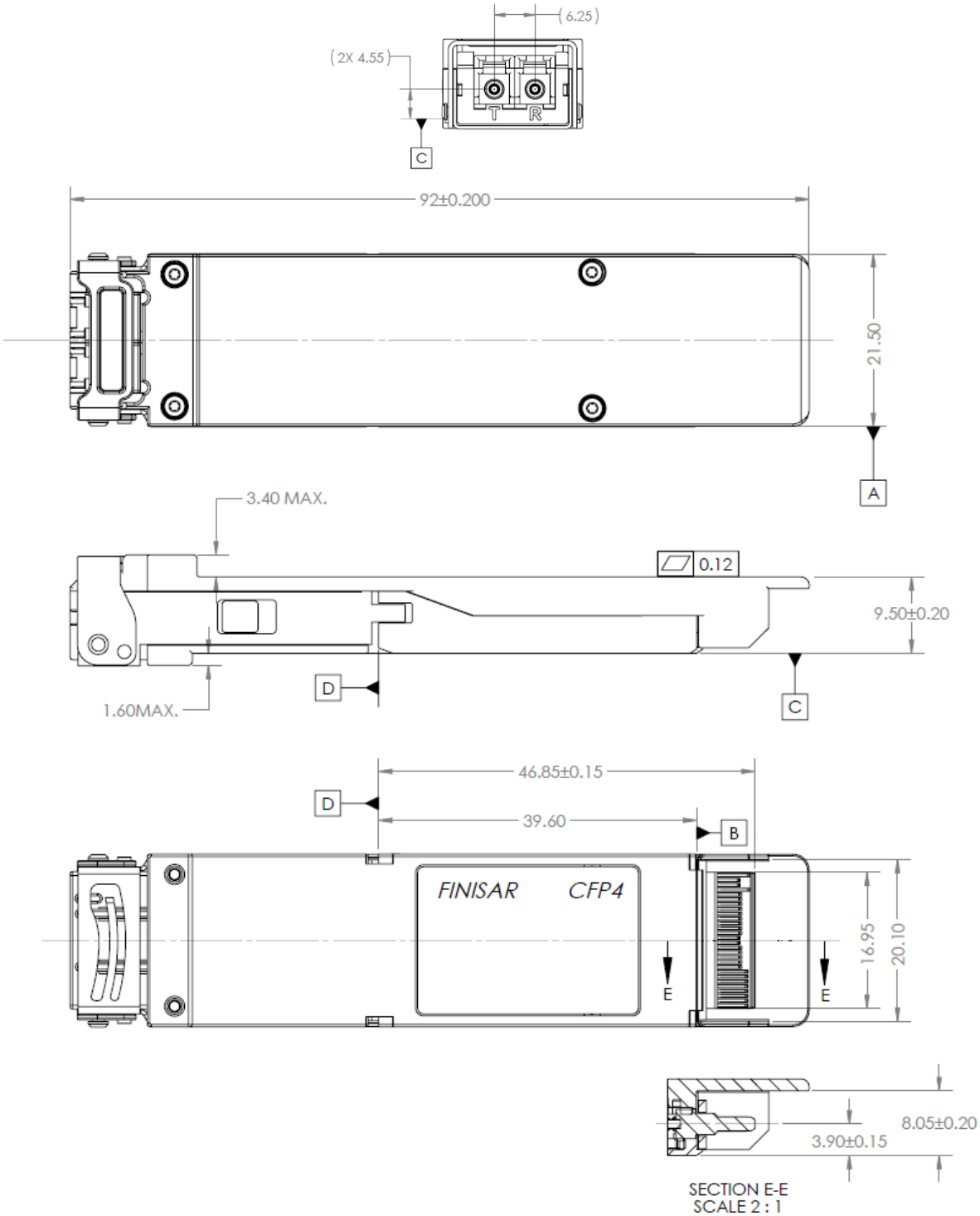

Figure 1. FTLC1141RDNL Mechanical Dimensions.

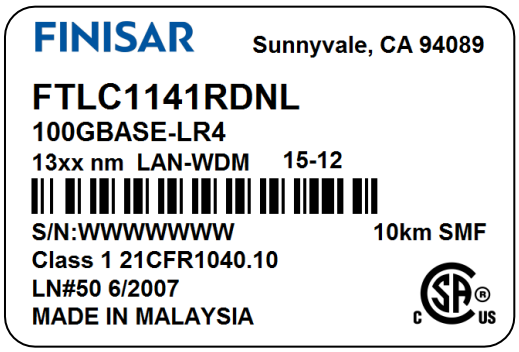

Figure 2. Standard Product Label

XII. References

1. CFP4 Hardware Specification and CFP MSA Management Interface Specifications (MIS), Rev 2.4.; CFP MSA, www.cfp-msa.org

2. IEEE 802.3ba, PMD Type 100GBASE-LR4.

3. Directive 2011/65/EU of the European Council Parliament and of the Council, "on the restriction of the use of certain hazardous substances in electrical and electronic equipment," June 8, 2011.

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

5. IEEE 802.3bm, Annex 83E, CAUI-4 Interface.

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