

PRELIMINARY Product Specification

100m (OM4) Multi-rate 100G CFP4 Optical Transceiver

FTLC9141S

PRODUCT FEATURES

- Hot-pluggable CFP4 form factor
- Supports 103.1Gb/s and 112Gb/s aggregate bit rates
- Power dissipation < 4W
- RoHS-6 compliant (lead-free)
- Commercial case temperature range of -5°C to 75°C
- Single 3.3V power supply
- Maximum link length of 100m on OM4 Multimode Fiber (MMF)
- 4x28Gb/s 850nm VCSEL-based transmitter
- 4x28G electrical interface
- Single MPO12 receptacle
- MDIO management interface



APPLICATIONS

- 100GBASE-SR4 100G Ethernet
- 4x28Gb/s Multimode OTN

Finisar's FTLC9141SENM 100G CFP4 transceiver modules are designed for use in 100 Gigabit Ethernet links and 4x28G OTN client interfaces over multimode fiber. They are compliant with the CFP4 MSA¹ and IEEE 802.3ba 100GBASE-SR4². Digital diagnostics functions are available via the MDIO interface, as specified by the CFP MSA and Finisar Application Note AN-20xx⁵. The transceiver is RoHS-6 compliant and lead-free per Directive 2002/95/EC³, and Finisar Application Note AN-2038⁴.

PRODUCT SELECTION

FTLC9141SENM

- S: OTU4 maximum bit rate (112 Gb/s)
- E: 4x25G/28G parallel optics
- N: Flat top module (no heat sink)
- M: MPO receptacle

I. Pin DescriptionsPer CFP MSA¹.

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	<i>{REFCLKn}</i>	14	MOD_LOPWR
42	<i>{REFCLKp}</i>	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	<i>{MCLKn}</i>
30	RX0p	27	<i>{MCLKp}</i>
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	LVC MOS w/ PUR	Transmitter Disable for all lanes, "1" or NC = transmitter disabled, "0" = transmitter enabled
12	RX_LOS	O	LVC MOS	Receiver Loss of Optical Signal, "1": low optical signal, "0": normal condition
13	GLB_ALRMn	O	LVC MOS	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	LVC MOS 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	LVC MOS 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
27	MCLKp			Monitor Clock
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	V _{CC}	-0.5		4.0	V	
Storage Temperature	T _S	-40		85	°C	
Case Operating Temperature	T _{OP}	-5		75	°C	
Relative Humidity	RH	15		85	%	1
Receiver Damage Threshold, per Lane	P _{Rdmg}	5.5			dBm	

Notes:

1. Non-condensing.

III. Electrical Characteristics (EOL, T_{OP} = -5 to 75 °C, V_{CC} = 3.2 to 3.4 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	V _{CC}	3.2		3.4	V	
Supply Current	I _{CC}			TBD	A	
Module total power	P			4	W	1
Transmitter						
Signaling rate per lane				27.95	Gb/s	2
Input differential impedance	R _{in}	OIF CEI-28G-VSR			Ω	
Differential data input swing per lane	V _{in,pp}				mV	
Data input rise time tolerance	t _r				ps	
Data input fall time tolerance	t _f				ps	
Electrical input eye mask definition	{X1, X2} {Y1, Y2}				UI mV	
Receiver						
Signaling rate per lane				27.95	Gb/s	2
Differential data output swing per lane	V _{out,pp}	OIF CEI-28G-VSR			mV	
Data output rise time	t _r				ps	
Data output fall time	t _f				ps	
Electrical output eye mask definition	{X1, X2} {Y1, Y2}				UI mV	
Power Supply Noise Tolerance	V _{rip}	TBD				

Notes:

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

FTLC9141SENM Clocking Signals

Clock Name	Status	I/O	Value
REFCLK	Not Required	I	Optional
MCLK	Supported	O	N/A

IV. Optical Characteristics (EOL, T_{OP} = -5 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		27.95	Gb/s	1		
Center wavelength		840		860	nm			
RMS Spectral Width	SW	100GBASE-SR4 as being defined by IEEE 802.3bm, scaled to 27.95G			nm			
Average Launch Power per Lane	TXP _x				dBm			
Transmit OMA per Lane	TxOMA				dBm			
Difference in Power between any two lanes [OMA]	DP _x				dB			
Peak Power per Lane	PP _x				dBm			
Launch Power [OMA] minus TDP per Lane	P-TDP				dBm			
TDP per Lane	TDP				dBm			
Optical Extinction Ratio	ER				dB			
Optical Return Loss Tolerance	ORL				dB			
Encircled Flux	FLX				dBm			
Average launch power of OFF transmitter, per lane					dBm			
Relative Intensity Noise	RIN				dB/Hz			
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}								
Receiver								
Signaling Speed per Lane		25.78		27.95	GBd	2		
Center wavelength		100GBASE-SR4 as being defined by IEEE 802.3bm, scaled to 27.95G			nm			
Damage Threshold	DT				dBm			
Average Receive Power per Lane	RXP _x				dBm			
Receive Power (OMA) per Lane	RxOMA				dBm			
Stressed Receiver Sensitivity (OMA) per Lane	SRS				dBm			
Back to Back Receiver Sensitivity (OMA) per Lane	RxSens				dBm			
Peak Power, per lane	PP _x				dBm			
Receiver Reflectance	Rfl				dB			
Vertical eye closure penalty, per lane					dB			
Stressed eye J2 jitter, per Lane					UI			
Stressed eye J9 jitter, per Lane					UI			
OMA of each aggressor lane					dBm			
Receiver jitter tolerance [OMA], per Lane					dBm			
Rx jitter tolerance: Jitter frequency and p-p amplitude					kHz, UI			
					kHz, UI			
LOS De-Assert	LOS _D				dBm			
LOS Assert	LOS _A				dBm			
LOS Hysteresis					dB			

Notes:

1. Transmitter consists of 4 lasers operating at a maximum speed of 27.95Gb/s each.
2. Receiver consists of 4 photodetectors operating at a maximum speed of 27.95Gb/s each.

V. Environmental Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate (all wavelengths combined)	BR	103.1		112.0	Gb/s	1
Bit Error Ratio	BER			10^{-12}		2
Maximum Supported Distances						
Fiber Type						
OM3 MMF	Lmax1			70	m	3
OM4 MMF	Lmax2			100	m	3

Notes:

- Supports 100GBASE-SR4 per IEEE 802.3xx and 4x28G multimode OTN.
- Tested with a $2^{31} - 1$ PRBS. The BER for the OTU4 (112 Gb/s) application code is required to be met only after error correction has been applied. The BER at the input of the FEC decoder can therefore be significantly higher than 10^{-12} .
- Requires KR4 FEC on the host to achieve maximum link distance.

VI. Environmental Specifications

Finisar FTLC9141 CFP4 transceivers have a commercial operating case temperature range of -5°C to $+75^{\circ}\text{C}$.

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T_{op}	-5		75	$^{\circ}\text{C}$	
Storage Temperature	T_{sto}	-40		85	$^{\circ}\text{C}$	

VII. Regulatory Compliance

Finisar FTLC9141 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: 1994+A11:1996+A2:2001 IEC 60825-1: 1993+A1:1997+A2:2001 IEC 60825-2: 2000, Edition 2	TBD
Electrical Safety	TÜV	EN 60950	TBD
Electrical Safety	UL/CSA	CLASS 3862.07 CLASS 3862.87	TBD

Copies of the referenced certificates to be available at Finisar Corporation upon request.

VIII. Digital Diagnostics Functions

FTLC9141 CFP4 transceivers support the MDIO-based diagnostics interface specified in the CFP MSA¹. See Finisar Application Note AN-20xx (TBD).

IX. Memory Contents

Per the CFP MSA¹. See Finisar Application Note AN-20xx (TBD).

X. Host PCB Layout and Bezel Recommendations

Per CFP MSA Hardware Specification for CFP4¹.

XI. Mechanical Specifications

Finisar FTLC9141 CFP4 transceivers are compatible with the CFP MSA specification for CFP4 pluggable form factor modules.

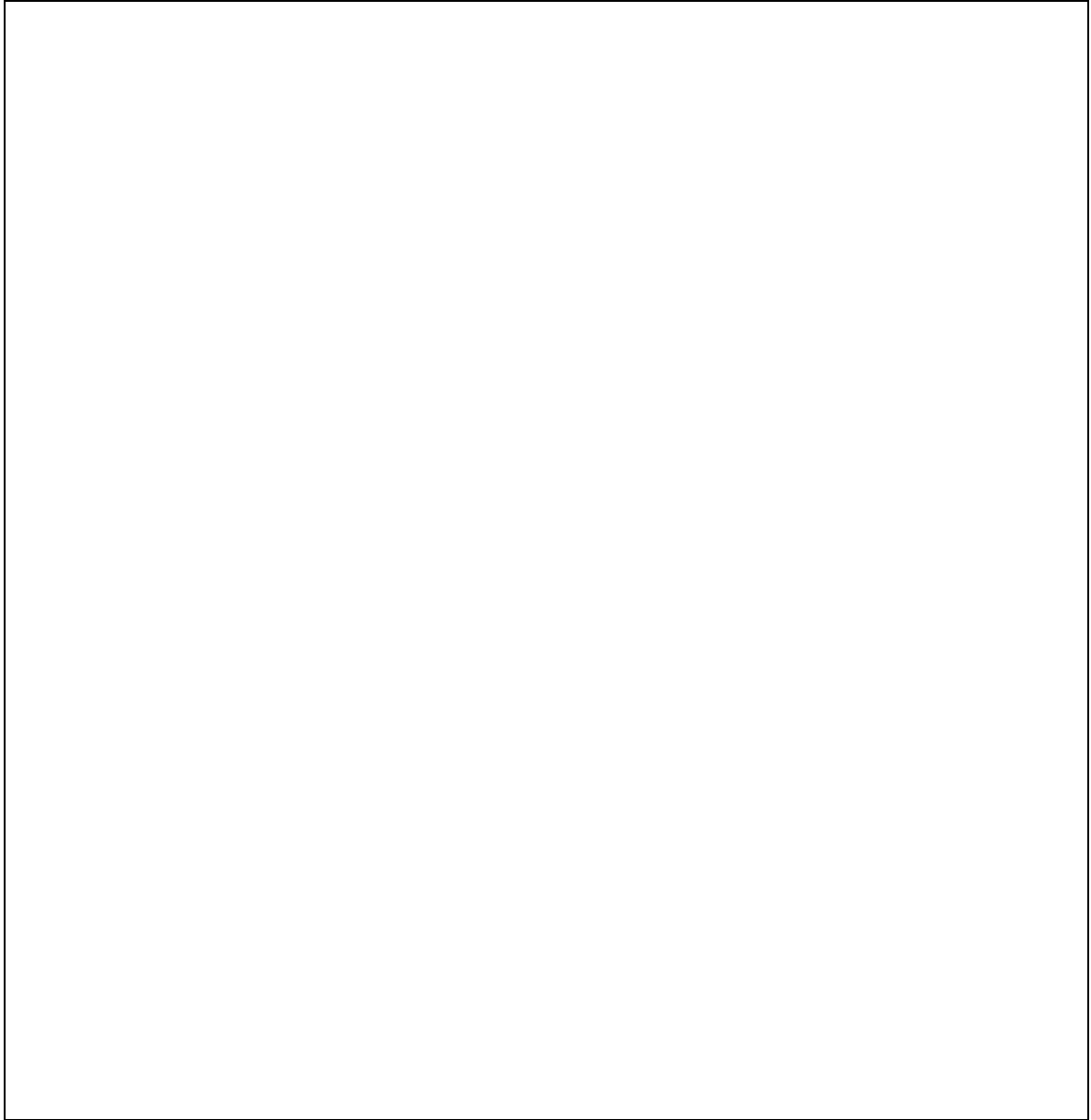


Figure 1. FTLC9141SENM Mechanical Dimensions.

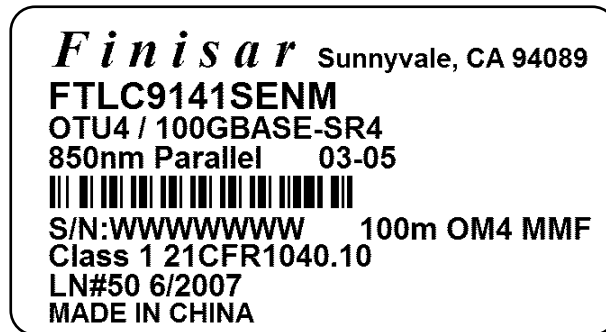


Figure 3. Standard Product Label

XII. References

1. CFP MSA Hardware Specification for CFP4 and Management Interface Specifications, Rev 2.2., www.cfp-msa.org
2. IEEE 802.3bm, PMD Type 100GBASE-SR4 (Draft).
3. Directive 2002/95/EC of the European Council Parliament and of the Council, “on the restriction of the use of certain hazardous substances in electrical and electronic equipment”. January 27, 2003.
4. “Application Note AN-2038: Finisar Implementation Of RoHS Compliant Transceivers”, Finisar Corporation, January 21, 2005.
5. Application Note AN-20xx (TBD), Finisar Corporation.

XIII. Revision History

Revision	Date	Description
A1	8/22/2012	<ul style="list-style-type: none">• Preliminary document released.
A2	9/12/2013	<ul style="list-style-type: none">• Added monitor clock support; updated maximum power dissipation specification to 3.5W; added product photo.
A3	6/30/2014	<ul style="list-style-type: none">• Updated maximum power dissipation specification to 4W; added maximum link distance on OM3 MMF; added CDRH number; added product label.

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