

Product Specification

40G NRZ VSR Multi-Rate CFP Optical Transceiver Module

FTLQ1381N7NL

PRODUCT FEATURES

- Hot-pluggable CFP form factor
- Supports 39.8 Gb/s to 44.6 Gb/s data rates
- Power dissipation < 8W (class 1)
- RoHS-6 compliant (lead-free)
- Commercial temperature range 0°C to 70°C
- Single 3.3V power supply
- Maximum link length of 2km on Single Mode Fiber (SMF)
- 4x10G MLD electrical interface
- Duplex fiber receptacles
- Built-in digital diagnostic functions



SUPPORTED STANDARDS

- SONET OC-768/ SDH STM-256
- 40GBASE-FR (40G Ethernet)
- OTN (OTU3 short reach)
- OTU3e1 and OTU3e2

Finisar's FTLQ1381N7NL 40G CFP transceiver modules are designed for use in 40 Gigabit links required for router to router client side applications or uplink interconnections to transport networks. Designed to enable optical compatibility with existing carrier client interfaces VSR2000-3R2 per ITU-T G.693, they are compliant with the CFP MSA¹, IEEE 802.3bg 40GBASE-FR² and OTU3 requirements specified in ITU-T G.709. Digital diagnostics functions are available via an MDIO interface, as specified by the CFP MSA. The transceiver is RoHS-6 compliant and lead-free per Directive 2002/95/EC³.

PRODUCT SELECTION

FTLQ1381x7yz

- x: E: Ethernet only (41.25Gb/s)
N: Multi-rate support up to 43.1Gb/s (default)
M: Multi-rate support up to 44.6Gb/s
- 7: 1550nm NRZ optical
- y: N: Flat top (default configuration per MSA)
- z: L: LC straight receptacle (default configuration)
A: LC 45 degree angled receptacle
S: SC straight receptacle

I. General Description

The FTL1381N7NL is based on the CFP Multi-Source Agreement (MSA¹), which defines the form factor of an optical transceiver that can support 40Gbit/s interfaces for Ethernet, Telecommunications standards or other interconnect applications. The nominal signaling lane rate is 10Gbit/s per lane and supports XLAUI, OTL3.4, and STL256.4 electrical interface specifications.

Supported aggregate data rates range from 39.8Gb/s (SONET OC-768/SDH STM-256[†]) up to 44.6Gb/s (OTU3e). The module requires a system reference clock at electrical lane-rate divided by 64 (155MHz) or divided by 16 (622MHz). During power up or hot plug insertion the reference clock must be present in the low power mode to ensure compliant locking behavior upon start up; if the clock is not present or subsequently removed during module provisioning, Finisar recommends performing a module reset. To ensure correct module operation the Tx and Rx reference clock registers must be set to match the supplied reference clock frequency. The module has the option to incorporate a clock jitter filter based on a narrow-band PLL.

This 40G NRZ CFP was designed to support very short reach (VSR) optical networking connections characterized by single mode fiber link lengths from 2m to 2 km. The FTL1381 was developed to support 40GBASE-FR PMD but is also intended to be compliant with application VSR2000-3R2 as defined in ITU-T G.693.

The CFP module is designed to be hot pluggable and the host system or the module shall not be damaged by insertion or removal of the module. The electrical interface consists of a 148-pin connector and support real-time control functions via the hardware pins. The monitoring, alarms^{††} and control functions are supported via an MDIO bus and the module is designed to operate from 0°C to +70°C case temperature. The power consumption meets class 1 power requirements of 8W. The optional loopback functionality defined by the MSA¹ is not supported.

[†] Note: For modules with Hardware Rev 1.2 or lower, the maximum supported lane to lane offset is 2 bytes (32 bytes of lane offset is supported with HW Rev 1.3 or higher); therefore during module operation in SDH mode per G.707 Amendment 2 it is recommended to ensure the framer is set to operate with 0 bytes of time offset between lanes.

^{††}Note: TX_LOSF alarm is defined as the logical OR of TX_FIFO_ERROR, TX_LOCK_ERROR and TX_OUT_OF_ALIGNMENT. The TX_OUT_OF_ALIGNMENT Alarm will be muted when operating on Gigabit Ethernet mode.

II. Pin Description

Per CFP MSA¹, Table 5-6 and 5-7.

	Top Row		Bottom Row
148	GND	1	3.3V_GND
147	REFCLK _n	2	3.3V_GND
146	REFCLK _p	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	N.C.	8	3.3V
140	N.C.	9	3.3V
139	GND	10	3.3V
138	N.C.	11	3.3V
137	N.C.	12	3.3V
136	GND	13	3.3V
135	N.C.	14	3.3V
134	N.C.	15	3.3V
133	GND	16	3.3V_GND
132	N.C.	17	3.3V_GND
131	N.C.	18	3.3V_GND
130	GND	19	3.3V_GND
129	N.C.	20	3.3V_GND
128	N.C.	21	VND_IO_A
127	GND	22	VND_IO_B
126	N.C.	23	GND
125	N.C.	24	TX_MCLK _n
124	GND	25	TX_MCLK _p
123	TX3 _n	26	GND
122	TX3 _p	27	VND_IO_C
121	GND	28	VND_IO_D
120	TX2 _n	29	VND_IO_E
119	TX2 _p	30	PRG_CNTL1
118	GND	31	PRG_CNTL2
117	TX1 _n	32	PRG_CNTL3
116	TX1 _p	33	PRG_ALARM1
115	GND	34	PRG_ALARM2
114	TX0 _n	35	PRG_ALARM3
113	TX0 _p	36	TX_DIS
112	GND	37	MOD_LOPWR

	Top Row		Bottom Row
111	GND	38	MOD_ABS
110	N.C.	39	MOD_RST _n
109	N.C.	40	RX_LOS
108	GND	41	GLB_ALARM _n
107	N.C.	42	PRTADR4
106	N.C.	43	PRTADR3
105	GND	44	PRTADR2
104	N.C.	45	PRTADR1
103	N.C.	46	PRTADR0
102	GND	47	MDIO
101	N.C.	48	MDC
100	N.C.	49	GND
99	GND	50	VND_IO_F
98	N.C.	51	VND_IO_G
97	N.C.	52	GND
96	GND	53	VND_IO_H
95	N.C.	54	VND_IO_J
94	N.C.	55	3.3V_GND
93	GND	56	3.3V_GND
92	N.C.	57	3.3V_GND
91	N.C.	58	3.3V_GND
90	GND	59	3.3V_GND
89	RX3 _n	60	3.3V
88	RX3 _p	61	3.3V
87	GND	62	3.3V
86	RX2 _n	63	3.3V
85	RX2 _p	64	3.3V
84	GND	65	3.3V
83	RX1 _n	66	3.3V
82	RX1 _p	67	3.3V
81	GND	68	3.3V
80	RX0 _n	69	3.3V
79	RX0 _p	70	3.3V_GND
78	GND	71	3.3V_GND
77	RX_MCLK _n	72	3.3V_GND
76	RX_MCLK _p	73	3.3V_GND
75	GND	74	3.3V_GND

Bottom Row Pin Description

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	3.3V_GND			
4	3.3V_GND			
5	3.3V_GND			
6	3.3V			3.3V Module Supply Voltage
7	3.3V			3.3V Module Supply Voltage
8	3.3V			3.3V Module Supply Voltage
9	3.3V			3.3V Module Supply Voltage
10	3.3V			3.3V Module Supply Voltage
11	3.3V			3.3V Module Supply Voltage
12	3.3V			3.3V Module Supply Voltage
13	3.3V			3.3V Module Supply Voltage
14	3.3V			3.3V Module Supply Voltage
15	3.3V			3.3V Module Supply Voltage
16	3.3V_GND			3.3V Module Supply Voltage Return 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 A. Do Not Connect!
22	VND_IO_B	I/O		Module Vendor I/O B. Do Not Connect!
23	GND			
24	TX_MCLKn	O	CML	Tx Monitor clock
25	TX_MCLKp	O	CML	Rx Monitor clock
26	GND			
27	VND_IO_C	I/O		Module Vendor I/O C. Do Not Connect!
28	VND_IO_D	I/O		Module Vendor I/O D. Do Not Connect!
29	VND_IO_E	I/O		Module Vendor I/O E. Do Not Connect!
30	PRG_CNTL1	I	LVC MOS w/ PUR	Programmable Control 1 set over MDIO, Default: TRXIC_RSTn, TX & RX ICs reset, "0": reset; "1" or NC: enabled (i.e., not used).
31	PRG_CNTL2	I	LVC MOS w/ PUR	Programmable Control 2 set over MDIO, Default: Hardware Interlock LSB, "00": ≤8W; "01": ≤16W; "10": ≤24W; "11" or NC: ≤32W (i.e., not used).
32	PRG_CNTL3	I	LVC MOS w/ PUR	Programmable Control 3 set over MDIO, Default: Hardware Interlock MSB, "00": ≤8W; "01": ≤16W; "10": ≤24W; "11" or NC: ≤32W (i.e., not used).
33	PRG_ALARM1	O	LVC MOS	Programmable Alarm 1 set over MDIO, Default: HIPWR_ON, "1": module power up completed; "0": module not high powered up.
34	PRG_ALARM2	O	LVC MOS	Programmable Alarm 2 set over MDIO, Default: MOD_READY, "1": Ready; "0": not Ready.
35	PRG_ALARM3	O	LVC MOS	Programmable Alarm 3 set over MDIO, Default: MOD_FAULT, fault detected, "1": Fault; "0": No Fault.
36	TX_DIS	I	LVC MOS w/ PUR	Transmitter Disable for all lanes, "1" or NC = transmitter disabled, "0" = transmitter enabled
37	MOD_LOPWR	I	LVC MOS w/ PUR	Module Low Power Mode. "1" or NC: module in low power (safe) mode, "0": power-on enabled
38	MOD_ABS	O	GND	Module Absent. "1" or NC: module absent, "0": module present, Pull Up Resistor on Host

PIN #	Name	I/O	Logic	Description
39	MOD_RSTn	I	LVC MOS w/ PDR	Module Reset. "0" resets the module, "1" or NC = module enabled, Pull Down Resistor in Module
40	RX_LOS	O	LVC MOS	Receiver Loss of Optical Signal, "1": low optical signal, "0": normal condition
41	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
42	PRTADR4	I	1.2V CMOS	MDIO Physical Port address bit 4
43	PRTADR3	I	1.2V CMOS	MDIO Physical Port address bit 3
44	PRTADR2	I	1.2V CMOS	MDIO Physical Port address bit 2
45	PRTADR1	I	1.2V CMOS	MDIO Physical Port address bit 1
46	PRTADR0	I	1.2V CMOS	MDIO Physical Port address bit 0
47	MDIO	I/O	1.2V CMOS	Management Data I/O bi-directional data (electrical specs as per 802.3ae and ba)
48	MDC	I	1.2V CMOS	Management Data Clock (electrical specs as per 802.3ae and ba)
49	GND			
50	VND_IO_F	I/O		Module Vendor I/O F. Do Not Connect!
51	VND_IO_G	I/O		Module Vendor I/O G. Do Not Connect!
52	GND			
53	VND_IO_H	I/O		Module Vendor I/O H. Do Not Connect!
54	VND_IO_J	I/O		Module Vendor I/O J. Do Not Connect!
55	3.3V_GND			3.3V Module Supply Voltage Return 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			3.3V Module Supply Voltage
61	3.3V			
62	3.3V			
63	3.3V			
64	3.3V			
65	3.3V			
66	3.3V			
67	3.3V			
68	3.3V			
69	3.3V			
70	3.3V_GND			3.3V Module Supply Voltage Return Ground, internally connected to Signal Ground
71	3.3V_GND			
72	3.3V_GND			
73	3.3V_GND			
74	3.3V_GND			

III. Absolute Maximum Ratings

Exceeding the limits below may damage the transceiver module permanently.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	V _{CC}	-0.5		3.6	V	
Storage Temperature	T _S	-40		85	°C	
Case Temperature	T _{Case}	-10		75	°C	1
Relative Humidity	RH	0		85	%	2
Static discharge voltage (human body model)	ESD			500	V	
Receiver Damage Threshold (PIN/TIA)	P _{Rdmg}			+6	dBm	
Module initialization time (MDIO)	T _{initialize}			2.5	s	3,4

Notes:

- See section VII for Operating conditions.
- Non-condensing.
- Initialization time from cold start or module reset (MOD_RSTn). Maximum time for module to enter Low-Power state.
- During power up or hot plug insertion the reference clock must be present in low power mode to ensure compliant module power-up.

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

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Voltage Power Supply						
Supply Voltage	V _{CC}	3.2		3.4	V	
Supply Current	I _{CC}			2.5	A	
Module total power	P			8	W	1
Low Power mode Dissipation	P _{LOW}			2	W	
Inrush Current (class 1)	I _{INRUSH}			50	mA/usec	
Turn-off current (class 1)	I _{TURNOFF}	-50				
Power Supply Ripple	V _{RIP}			2% 3%	DC-1MHz 1-10MHz	
Optical Transmitter Direction						
Signaling rate per lane		9.95		11.15	Gb/s	
Min AC Common-mode voltage		20			mV	
Input differential impedance	R _{in}	80	100	120	Ω	2
Data input rise and fall time tolerance	t _r /t _f	24			ps	3
Minimum total Jitter tolerance		0.62			UI	
Minimum deterministic Jitter tolerance		0.42			UI	
Module Electrical input eye mask definition	{X1, X2} {Y1, Y2}	{0.31, 0.5} {42.5, 425}			UI mV	5
Optical Receiver Direction						
Signaling rate per lane		9.95		11.15	Gb/s	
Max AC Common-mode voltage				15	mV	
Differential data output swing per lane	V _{out,pp}			760	mV	4
Data output rise and fall time	t _r /t _f	24			ps	3
Maximum total Jitter				0.4	UI	
Maximum deterministic Jitter				0.25	UI	
Module Electrical output eye mask definition	{X1, X2} {Y1, Y2}	{0.2, 0.5} {136, 380}			UI mV	5

Notes:

- Maximum total power value is specified across the full temperature and voltage range.
- After internal AC coupling.
- 20% to 80%.
- Host is expected to be compliant with IEEE 802.3bg, clause 83A.
- Pre-emphasis must be turned off for jitter and eye mask measurements (section 83A.3.3.5 of IEEE 802.03bg).

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

All specifications are EOL (End of Life) and will be met over the range of standard operating conditions unless otherwise specified.

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Signaling Speed	BR	39.8		44.6	Gb/s	1
Lane center wavelengths (range)	λ_c	1530		1565	nm	
Spectral width	SW			1	nm	
Average Launch Power	P _{OUT}	0		3.0	dBm	
Optical Extinction Ratio	ER	8.2			dB	
Eye crossing		40		60	%	
Side Mode Suppression Ratio	SMSR	35			dB	
Average launch power (transmitter OFF)				-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	2
Transmitter Return Loss		27			dB	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4} / ITU G.693 Complaint				3
Jitter Generation compliance	J _{GEN}	Conforms to G.783 and G.8251			UI _{PP}	

Parameter	Symbol	Min	Max	Min	Max	Unit	Ref.
Receiver							
Applicable Data Rate	BR	39.8 to 41.25		43.1 to 44.6		Gb/s	1
Wavelength input range	λ	1520	1580	1520	1580	nm	4
Receiver Sensitivity at 10 ⁻¹² , B2B	S		-7	N/A	N/A	dBm	
Receiver Sensitivity at 10 ⁻⁷ , B2B	S	N/A	N/A		-7	dBm	
Dispersion Penalty (40ps/nm) at 10 ⁻¹²	D _P		2	N/A	N/A	dB	
Dispersion penalty (40ps/nm) at pre-FEC BER 10 ⁻⁷	D _P	N/A	N/A		2	dB	
Receiver Overload	P _{MAX}		3		3	dBm	
Maximum Reflectance of Receiver	RL	27		27		dB	
Jitter Tolerance compliance		ITU-T G.825		ITU-T G.8251			
RX_LOS Assert level	LOS _A	-15	-12	-15	-12	dBm	5, 6
RX_LOS Hysteresis		0.4	2.0	0.4	2.0	dB	5

Notes:

- Consult product ordering guide for data rate selection. Supports 40GBASE-FR and XLAUI per IEEE 802.3bg, OTU3 per ITU-T Rec. G.695 and G.709, STL256.4/OTL3.4 (MLD), and OTU3e1/OTU3e2 per ITU-T G-Series Rec. Supplement 43.
- RIN is scaled by 10*log(10/4) to maintain SNR outside of transmitter.
- Eye mask measured with 1000 waveforms.
- The receiver responsivity range supports 1310nm but the module is not tested at 1310nm and the performance cannot be guaranteed if operated at 1310nm.
- Measured based on received optical power for accuracy (default). Can be configured based on Rx Lock Error for fast response time; optical power levels in the table will be not applicable in this configuration.
- Output termination of the RX_LOS hardware pin is an active push-pull. There is no internal pull-up or pull-down.

VI. General Specifications

Monitor Accuracy, Timing parameters and Clock characteristics

Parameter	Symbol/ Measurement Range	Min	Max	Units	Ref.	
Maximum Supported Distances						
Fiber type SMF	L_{max}		2.4	km		
Monitor Accuracy						
Receiver Power Monitor (RxPowMon)	-10 to +4dBm	-0.5	+0.5	dB		
Receiver Power Monitor (RxPowMon)	-14 to -10dBm	-1.0	+1.0	dB		
Transmitter Power Monitor (TxPowMon)	-1 to +4dBm	-0.5	+0.5	dB		
Laser Bias Monitor (LsBiasMon)	+20 to +100mA	-10	+10	mA		
Temperature measurements (internal)	-5 to 75C	-3	+3	C		
Power supply voltage	+3.1 to +3.5V	-100	+100	mV		
Timing Parameters						
Rx LOS Assert time	t_{loss_assert}		500	us	1	
Rx LOS De-Assert time	$t_{loss_deassert}$		500	us	1	
Tx Disable time (TX_DIS)	t_{assert}		100	us	2	
Tx Enable time (TX_DIS)	$t_{deassert}$		100	ms	2	
Laser output ready from low power state	L_{Ready}		30	s	3	
Global Alarm Assert delay time	GLB_ALRMn		150	ms	4	
Global Alarm De-Assert delay time	GLB_ALRMn		150	ms	4	
Hardware MOD-LOPWR Assert	$t_{mod_lopwr_assert}$		10	ms	7	
CML Reference Clock Characteristics						
Impedance	Z_D	80	120	Ω		
Clock duty Cycle		40	60	%		
Output Differential Voltage (p-p)	V_{DIFF}	400	1200	mV		
Frequency	1/64 Electrical lane rate 1/16 Electrical lane rate	F_{REF}	155.47 621.87	174.22 696.88	MHz	5
Frequency Stability	Δf (XLAUI)	-100	+100	ppm		
	Δf (STL256.4/OTL3.4)	-20	+20	ppm		
Coupling		AC Coupled				
CML Tx/Rx Monitor Characteristics						
Impedance	Z_D	80	120	Ω		
Clock duty Cycle		40	60	%		
Output Differential Voltage (p-p)	V_{DIFF}	400	1200	mV		
Frequency	1/64 Optical lane rate 1/16 Optical lane rate 1/64 Network lane rate	F_{REF}	621.87 2.487 155.47	696.88 2.787 174.22	MHz GHz MHz	6
Coupling		AC Coupled				

Notes:

1. Measured based on received optical power for accuracy (default). Can be configured based on Rx Lock Error for speed.
2. From laser steady state condition.
3. Laser output power enabled from low-power state (Typically under 10s at room temperature).
4. Logical “or” of associated MDIO alarm and status registers.
5. Selectable via MDIO; default rate set at 1/16 of Electrical lane rate per MSA Rev 1.4.
6. Selectable via MDIO; default rate set at 1/16 of Optical lane rate.
7. MSA specification is 1ms.

Alarm/Warning Levels for Threshold Registers

Parameter	Operating Range	Low	High	Units	Ref.
Monitor Alarm/Warning threshold levels					
Module Temperature Alarm		-4	74	°C	
Module Temperature Warning		0	70	°C	
Power supply voltage Alarm		3.135	3.465	V	
Power supply voltage Warning		3.200	3.400	V	
SOA Bias current Alarm	Not applicable				
SOA Bias current Warning	Not applicable				
Laser bias current Alarm		15	80	mA	
Laser bias current Warning		20	75	mA	
Tx Output Power Alarm		-1	+4	dBm	
Tx Output Power Warning		0	+3	dBm	
Laser Temperature Alarm		10	50	°C	
Laser Temperature Warning		20	40	°C	
Rx Optical Power Alarm		-14	+3.5	dBm	
Rx Optical Power Warning		-10	+3	dBm	

VII. Environmental Specifications

Finisar FTLQ1381 CFP transceivers have a commercial operating temperature range from 0°C to +70°C case temperature.

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T _{op}	0		70	°C	1
Storage Temperature	T _{sto}	-40		85	°C	

1. Performance is not guaranteed when operating outside specified range. Performance between 70°C and 75°C is not guaranteed.

VIII. Regulatory Compliance

Finisar FTLQ1381 CFP 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	R72102454
Electrical Safety	TÜV	EN 60950	R72102454
Electrical Safety	UL/CSA	CLASS 3862.07 CLASS 3862.87	2375840 (LR 115314)

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

IX. Digital Diagnostic Functions

The FTLQ1381CFP transceivers support the MDIO-based diagnostics interface specified in the CFP MSA¹. See Finisar Application Note AN-2078.

X. Memory Contents and Supported Functionality

Per the CFP MSA¹.

Please see Finisar Application Note AN-2091 for details of non-volatile registers (NVR) and supported MDIO functions.

XI. Host PCB Layout and Bezel Recommendations

Per CFP MSA Hardware Specification, Rev 1.4¹.

XII. Mechanical Specifications

Finisar FTLQ1381 CFP transceivers are compatible with the CFP MSA specification for 40G/100G pluggable form factor modules.

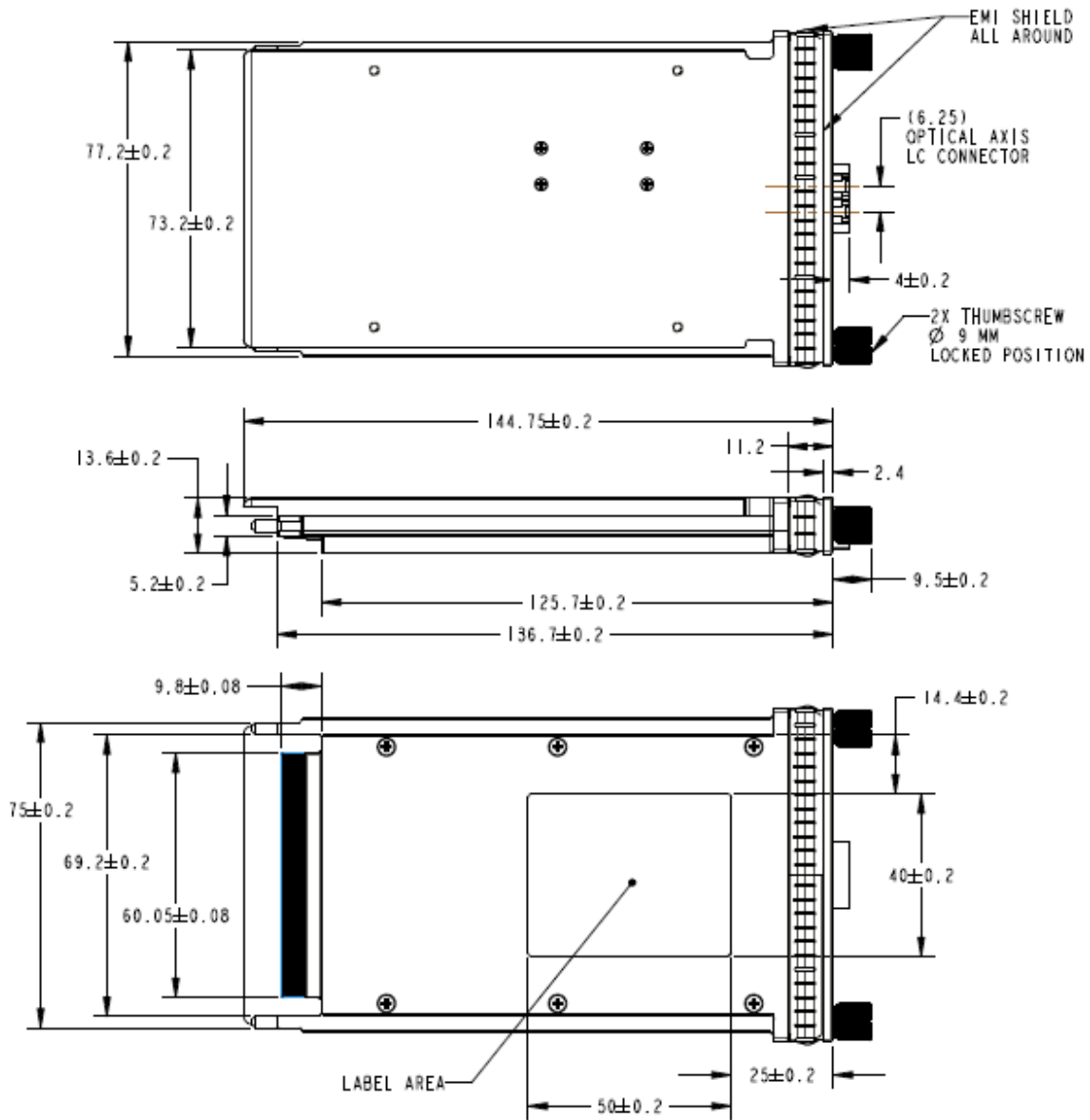


Figure 1. FTLQ1381 Outline Mechanical Dimensions (LC-straight connector).

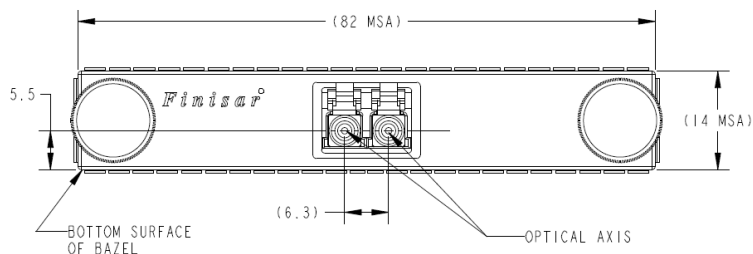


Figure 2. FTLQ1381 Mechanical Dimensions of LC-Straight connector.

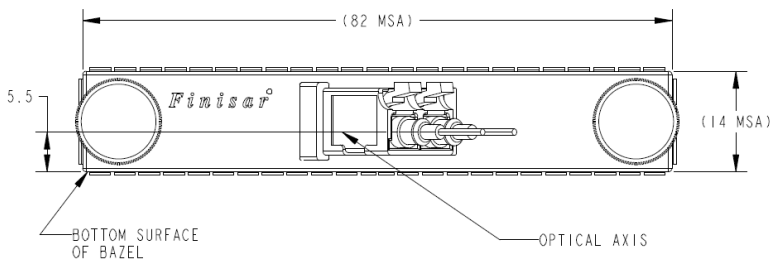


Figure 3. FTLQ1381 Mechanical Dimensions of LC-Angled connector.

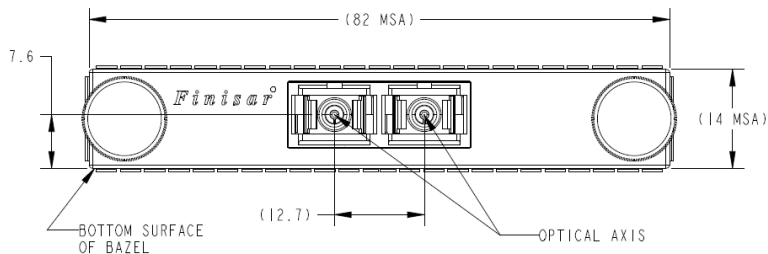


Figure 4. FTLQ1381 Mechanical Dimensions of SC-Straight connector.

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FTLQ1381N7NL
40GBASE-FR
15XX nm VSR SMF 2km
S/N: N05H8HX9



Class 1 21CFR1040.10 LN#50 6/2007
 ASSEMBLED IN USA

Figure 5. Product Label example.

XIII. References

1. CFP MSA Hardware Specification, Rev 1.4 and Management Interface Specifications, Rev 2.2., www.cfp-msa.org
2. IEEE 802.3bg, PMD Type 40GBASE-FR.
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-2091: NVR1 and MDIO Compatibility List, 40GE Base FR (FTLQ1381), Finisar Corporation, Rev 04, February 2013.

XIV. Revision History

Revision	Date	Description
A00	Apr 28, 2011	Draft document created.
A01	Feb 1, 2012	Initial document (Limited release – product not yet released for production)
A02	July 15, 2012	Page 2, added footnote on TX_LOSF alarm definition. Page 6, change rise/fall time to correct column (Min). Page 8, change measurement range of Tx optical power to -1 to +4dBm. Page 8, added timing for Hardware MOD_LOPWR Assert time. Page 9, Rx optical power alarm changed to +3.5dBm. Page 12, added figure with SC connector.
A03	October 31, 2012	Page 2, updated definition of lane offset in footnote. Page 7, changed LOS Hysteresis value from 0.25dB to 0.4dB. Page 10, updated certificate numbers. Page 13, updated Application note AN-2091 release date to October 31. Page 13, updated Management interface specification to 2.2.
A04	April 25, 2013	Page 7, clarification on RX_LOS output circuit in foot note.
A05	August 25, 2014	Footer, removed “Confidential” label.

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