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**Product Specification**

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**200GBASE-FR4 QSFP56**

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**Finisar Transceiver**

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**FTCC1112E2PCL**

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**PRODUCT FEATURES**

- Hot-pluggable QSFP56 form factor
- Supports 212.5Gb/s aggregate bit rate
- 4x50G PAM4 electrical interface (200GAUI-4)
- 4x50Gb/s CWDM transmitter
- 4x50Gb/s retimed electrical interface
- 2km max reach over duplex single mode fiber
- Maximum power dissipation: 6W
- RoHS-6 compliant
- Operating case temperature range: 0°C to 70°C
- Single 3.3V power supply
- Duplex LC receptacles
- I2C management interface

**APPLICATIONS**

- 200GBASE-FR4 Ethernet
- Infiniband HDR

Finisar's FTCC1112E2PCL 200G QSFP56 transceiver modules are designed for use in 200 Gigabit Ethernet interfaces over single mode fiber. They are compliant with the CMIS4.0<sup>4</sup>, QSFP MSA<sup>1</sup> and portions of IEEE P802.3bs<sup>5</sup>. The transceiver is RoHS compliant as described in Application Note AN-2038<sup>3</sup>.

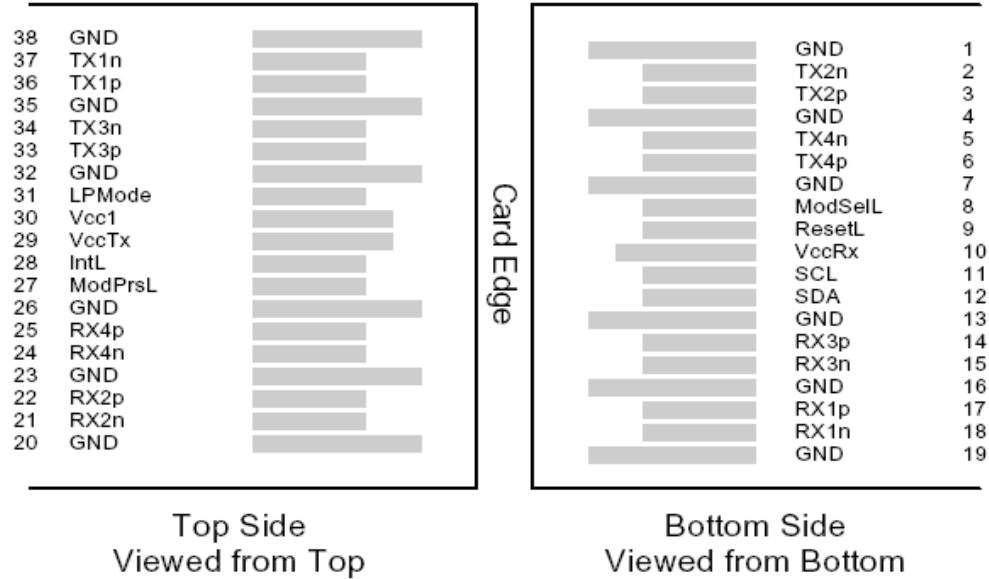
**PRODUCT SELECTION**

<b>FTCC1112E2PCL</b>
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E: Ethernet application  
P: Pull-tab type release  
C: Commercial temperature range (0-70C)  
L: LC receptacles

## I. Pin Descriptions

QSFP56 pin-out as being defined by QSFP MSA<sup>1</sup>.



**Figure 1 – QSFP-compliant 38-pin connector (per SFF-8679)**

Pin	Symbol	Name/Description	Notes
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	Vcc Rx	+3.3 V Power supply receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	

28	IntL	Interrupt	
29	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc1	+3.3 V Power Supply	
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

Notes

1. Circuit ground is internally isolated from chassis ground.

**II. General Product Characteristics**

Parameter	Value	Unit	Notes
Module Form Factor	QSFP56		
Maximum Aggregate Data Rate	212.5	Gb/s	
Protocols Supported	200G Ethernet or Infiniband HDR		
Maximum Power Consumption per End	6	Watts	1
Management Interface	Serial, I2C-based, 400 KHz maximum frequency		

Data Rate Specifications	Symbol	Min	Typ	Max	Units	Notes
Bit Error Ratio	BER			2.4E-4		2
<b>Maximum Supported Distances</b>						
Fiber Type						
SMF per G.652	Lmax1	0.002		2	km	

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. As defined by IEEE P802.3bs.

**III. Absolute Maximum Ratings**

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

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Maximum Supply Voltage	Vcc	-0.3		3.6	V	
Storage Temperature	T <sub>S</sub>	-40		+85	°C	
Case Operating Temperature	T <sub>OP</sub>	15		65	°C	
Relative Humidity	RH	15		85	%	1
Receiver Damage Threshold, per Lane	P <sub>Rdmg</sub>	5.7			dBm	

Notes:

1. Non-condensing.

**IV. Electrical Characteristics (EOL, T<sub>OP</sub> = 0 to +70 °C, V<sub>CC</sub> = 3.135 to 3.465 Volts)**

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V	
Supply Current	I <sub>CC</sub>			1.914	A	
Power consumption	P <sub>I</sub>			6	W	1
<b>Transmitter</b>						
Signaling rate per lane		26.5625± 100 ppm.			Gbd	
Differential data input voltage per lane	V <sub>in,pp,diff</sub>	900			mV	2
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	%	
Module stress input test		Per 120E.3.4.1 IEEE802.3bs				3
Single-ended voltage tolerance range		-0.4		3.3	V	
DC common mode voltage		-350		2850	mV	4
<b>Receiver</b>						
Signaling rate per lane		26.5625± 100 ppm.			Gbd	
AC common-mode output voltage (RMS)				17.5	mV	
Differential output voltage				900	mV	
Near-end ESMW (Eye symmetry mask width)		0.265			UI	
Near-end Eye height, differential (min)		70			mV	
Far-end ESMW (Eye symmetry mask width)		0.2			UI	
Far-end Eye height, differential (min)		30			mV	
Far-end pre-cursor ISI ratio		-4.5		2.5	%	
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%)		9.5			ps	
DC common mode voltage (min)		-350		2850	mV	4

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. With the exception to 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
3. Meets specified BER
4. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

**V. Optical Characteristics (EOL, T<sub>OP</sub> = 0 to +70 °C, V<sub>CC</sub> = 3.135 to 3.465 Volts)**

Meets 200GBASE-FR4 as being defined by IEEE P802.3bs

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
<b>Transmitter</b>						
Signaling rate (each lane (range))		26.5625± 100 ppm			GBd	
Modulation format		PAM4				
Lane wavelength (range)		1264.5 1284.5 1304.5 1324.5	1271 1291 1311 1331	1277.5 1297.5 1317.5 1337.5	nm	
Side-mode suppression ratio (SMSR)		30			dB	
Total average launch power				10.7	dBm	
Average launch power, each lane				4.7	dBm	
Average launch power, each lane		-4.2			dBm	1
Difference in launch power between any two lanes (OMA <sub>outer</sub> ) max				4	dB	
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each lane		-1.2		4.5	dBm	2
Launch power in OMA <sub>outer</sub> minus TDECQ, each lane		-2.5			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 <sub>17.1OMA</sub>				-132	dB/Hz	
Optical return loss tolerance				17.1	dB	
Transmitter reflectance				-26	dB	3

**Notes:**

1. 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.
2. Even if the TDECQ < 1.4 dB for an extinction ratio of ≥4.5 dB or TDECQ < 1.3 dB for an extinction ratio of < 4.5 dB, the OMA<sub>outer</sub> (min) must exceed this value.
3. Transmitter reflectance is defined looking into the transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
<b>Receiver</b>						
Signaling rate (each lane (range))		26.5625± 100 ppm			GBd	
Modulation format		PAM4				
Lane wavelength (range)		1264.5 1284.5 1304.5 1324.5	1271 1291 1311 1331	1277.5 1297.5 1317.5 1337.5	nm	
Damage threshold, each lane		5.7			dBm	1
Average receive power, each lane				4.7	dBm	
Average receive power, each lane		-8.2			dBm	2
Receive power (OMA <sub>outer</sub> ), each lane				4.5	dBm	
Difference in receive power between any two lanes (OMA <sub>outer</sub> )				4.1	dB	
Receiver reflectance				-26	dB	
Receiver sensitivity (OMA <sub>outer</sub> ), each lane				-6.5	dBm	3

Stressed receiver sensitivity (OMA <sub>outer</sub> ), each lane				-3.6	dBm	4
Conditions of stressed receiver sensitivity test: (note 5)						
Stressed eye closure for PAM4 (SECQ), lane under test			3.3		dB	
OMA <sub>outer</sub> of each aggressor lane			0.5		dBm	
LOS De-Assert				-9	dBm	
LOS Assert		-22		-12	dBm	
LOS Hysteresis		0.5			dB	

**Notes:**

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<sub>outer</sub>), each lane (max) is informative and is defined for a transmitter with SECQ up to 1.4 dB.
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.

**VI. Memory Map and Control Registers**

The module should implement and be compliant to Common Management Interface Specification (CMIS) Rev. 4.0.

**VII. Environmental Specifications**

Finisar FTCC1112E2PCL QSFP56 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 <sub>op</sub>	0		70	°C	
Storage Temperature	T <sub>sto</sub>	-40		85	°C	

**VIII. Regulatory Compliance**

Finisar FTCC1112E2PCL QSFP56 transceivers are Class 1 Laser Products. They are certified per the following standards:

Feature	Agency	Standard
Laser Eye Safety	FDA/CDRH	CDRH 21 CFR 1040.10 and Laser Notice 56
Laser Eye Safety	UL/CSA/TÜV	IEC/EN 60825-1:2014 IEC/EN 60825-2: 2004+A1+A2
Electrical Safety	UL/CSA/TÜV	IEC/UL/CSA/EN 62368-1:2014

CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

## IX. Mechanical Specifications

Finisar FTCC1112E2PCL QSFP56 transceivers are compatible with the QSFP MSA specification for QSFP pluggable form factor modules.

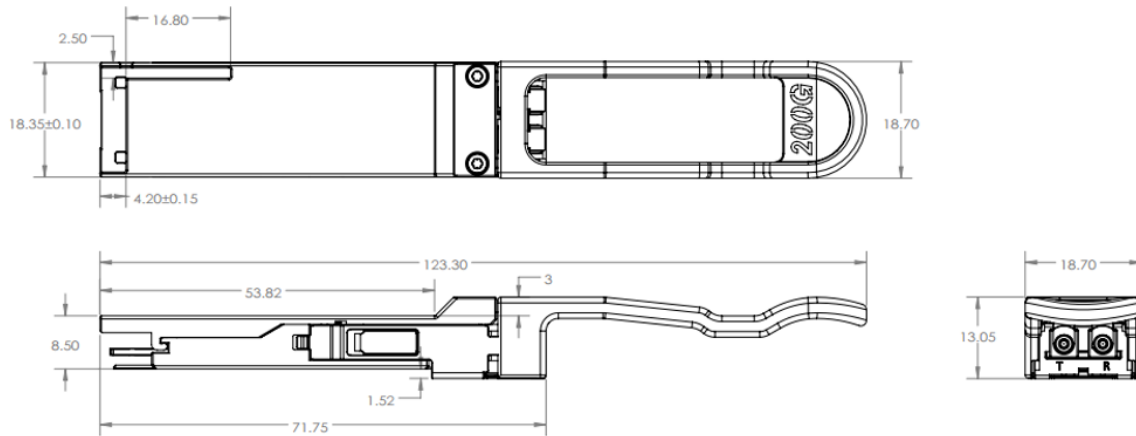


Figure 2. FTCC1112E2PCL Mechanical Dimensions (Pull Tab version)

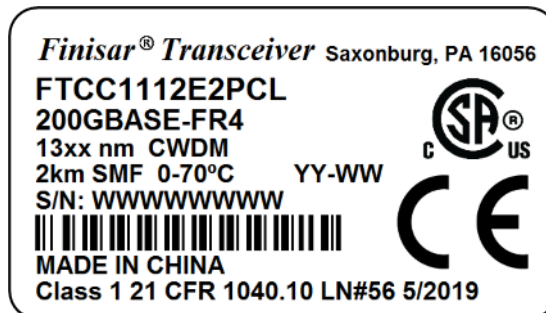


Figure 3. Product Label – FTCC1112E2PCL (Not to Scale)

## **X. References**

1. SFF-8665: “QSFP+ 28Gb/s 4X Pluggable Transceiver Solution (QSFP28)”, Rev 1.9, June 29, 2015 and associated SFF documents referenced therein:
  - i. SFF-8661
  - ii. SFF-8679
  - iii. SFF-8662
  - iv. SFF-8663
  - v. SFF-8672
2. 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,” July 1, 2011.
3. “Application Note AN-2038: Finisar Implementation Of RoHS Compliant Transceivers”, January 21, 2005.
4. Common Management Interface Specification (CMIS) Rev 4.0.
5. IEEE P802.3bs, 200GAUI-4 Interface.

## **XI. For More Information**

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