

Product Specification

200GBASE-FR4 QSFP56

Finisar® Optical Transceiver Module

FTCC1112E2PCL: 2km 200GBASE-FR4 QSFP56

FTCC1122E2PCL: 500m 200GBASE-FR4 QSFP56

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
- 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

Finisar® FTCC11x2E2PCL 200G QSFP56 transceiver modules are designed for use in 200 Gigabit Ethernet interfaces over single mode fiber. They are compliant with the CMIS4.0⁴, QSFP MSA¹ and portions of IEEE P802.3bs⁵. The transceiver is RoHS compliant per Directive 2011/65/EU².

PRODUCT SELECTION

FTCC11x2E2PCL

- x: 1 for 2km FR4; 2 for 500m FR4 Lite
- 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 MSA¹.

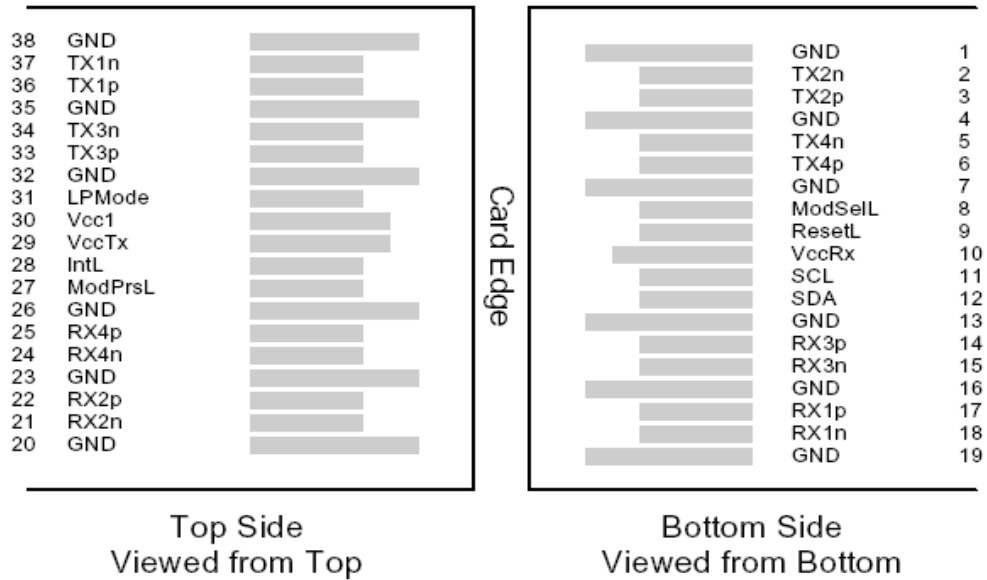


Figure 1 – QSFP-compliant 38-pin connector (per SFF-8679)

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. 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		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}	5.7			dBm	

Notes:

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

III. Electrical Characteristics (EOL, T_{OP} = 0 to +70 °C, V_{CC} = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	V _{CC}	3.135	3.3	3.465	V	
Supply Current	I _{CC}			1.914	A	
Module total power	P			6.0	W	1
Transmitter						
Signaling rate per lane		26.5625 ± 100 ppm.			Gbd	
Differential data input voltage per lane	V _{in,pp,diff}	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				3

		IEEE802.3bs				
Single-ended voltage tolerance range		-0.4		3.3	V	
DC common mode voltage		-350		2850	mV	4
Receiver						
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.

IV. Optical Characteristics (EOL, T_{OP} = 0 to +70 °C, V_{CC} = 3.135 to 3.465 Volts)

Meets 200GBASE-FR4 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 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 _{outer}) max				4	dB	
Outer Optical Modulation Amplitude (OMA _{outer}), each lane		-1.2		4.5	dBm	2
Launch power in OMA _{outer} 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 _{17.1} OMA				-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_{outer} (min) must exceed this value.
3. 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 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 _{outer}), each lane				4.5	dBm	
Difference in receive power between any two lanes (OMA _{outer})				4.1	dB	
Receiver reflectance				-26	dB	
Receiver sensitivity (OMA _{outer}), each lane				-6.5	dBm	3
Stressed receiver sensitivity (OMA _{outer}), 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 _{outer} 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_{outer}), 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.

V. General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Bit Rate (all wavelengths combined)	BR			212.5	Gb/s	1
Bit Error Ratio	BER			2.4x10 ⁻⁴		2
Maximum Supported Distances						
Fiber Type						

SMF per G.652	200GBASE-FR4	L _{max1}			2000	m	
	200GBASE-FR4 Lite	L _{max2}			500	m	

Notes:

1. Supports 200GBASE-FR4 per IEEE P802.3bs.
2. As defined by IEEE P802.3bs.

VI. Environmental Specifications

Finisar® FTCC11x2 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 _{op}	0		70	°C	
Storage Temperature	T _{sto}	-40		85	°C	

VII. Regulatory Compliance

Finisar® FTCC11x2 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/EN 62368-1:2014

Copies of the referenced certificates are available at II-VI Incorporated upon request. Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 56.

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

VIII. Digital Diagnostics Functions

FTCC11x2 QSFP56 transceivers support the I2C-based diagnostics interface.

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Reported case temperature accuracy	T _{case_Err}	-3		3	°C	
Reported voltage accuracy	V _{cc_Err}	-100		100	mV	
Reported Tx output power accuracy	P _{out_Err}	-3		3	dB	
Reported Rx input power accuracy	P _{in_Err}	-3		3	dB	
Reported Tx bias current accuracy	I _{bias_Err}	-10		10	%	

IX. Management Interface

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

X. Mechanical Specifications

Finisar® FTCC11x2 QSFP56 transceivers are compatible with the QSFP MSA specification for QSFP pluggable form factor modules.

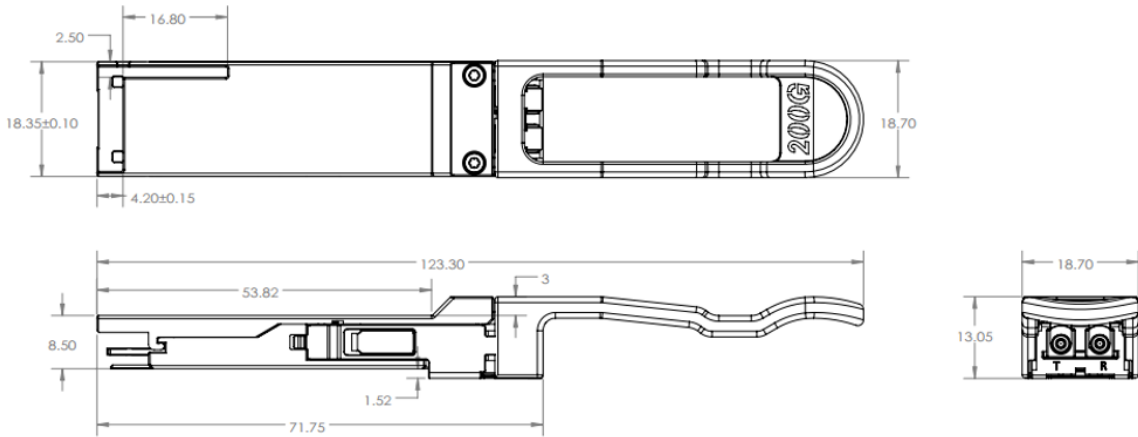


Figure 2. FTCC11x2 Mechanical Dimensions (Pull Tab version)

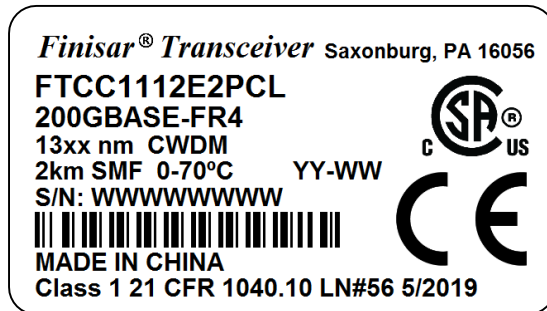


Figure 3. Standard Product Label – FTCC1112E2PCL (not to scale)

XI. 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.

For More Information:

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