

# 10Gb/s 10km SFP+ Optical Transceiver Module

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## CC-PII221L-xD

### Features

- Hot Pluggable
- LC Duplex optical interface
- 1310nm DFB transmitter, PIN receiver
- Operating case temperature:
  - Commercial: 0 to 70 °C
  - Industrial: -40 to 85 °C
- Low power consumption
- Applicable for 10km SMF connection
- All-metal housing for superior EMI performance
- Advanced firmware allow customer system encryption
- Information to be stored in transceiver
- Cost effective SFP+ solution, enables higher port densities and greater bandwidth
- RoHS compliant (lead free)

### Applications

- 10GBASE-LR/LW
- Other optical links

### Standards

- IEEE 802.3ae 10GBASE-LR/LW
- SFF-8431
- SFF-8472

### Description

This 1310nm DFB 10Gbps SFP+ transceiver is designed to transmit and receive optical data over single mode optical fiber for link length 10km.

The SFP+ 10km module electrical interface is compliant to SFI electrical specifications. The transmitter input and receiver output impedance is 100 Ohms differential. Data lines are internally AC coupled. The module provides differential termination and reduce differential to common mode conversion for quality signal termination and low EMI.

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### Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit
Power Supply Voltage	V <sub>CC</sub>	-0.5		4	V
Storage Temperature Range	T <sub>S</sub>	-40		85	°C
Relative Humidity - Storage	RH <sub>S</sub>	0		95	%
Relative Humidity - Operating	RH <sub>O</sub>	0		85	%

### Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Case Operating Temperature Range	T <sub>C</sub>	-5	-	70	°C
		-40	-	85	
Power Supply Voltage	V <sub>CC</sub>	3.14	3.3	3.46	V
Supply Current	I <sub>CC</sub>	-	-	300	mA
Data Rate	BR	-	10.3125	-	Gbps

### Electrical Characteristics

Transmitter Electrical Characteristics					
Parameter	Symbol	Min	Typ	Max	Unit
Differential Input Voltage Swing	V <sub>IN</sub>	180	-	700	mV
Tx Differential Input Impedance	Z <sub>IN</sub>	-	100	-	Ω
Transmitter Disable Voltage	V <sub>DIS</sub>	2.0	-	V <sub>CC</sub> +0.3	V
Transmitter Enable Voltage	V <sub>EN</sub>	0	-	0.8	V
T <sub>FAULT</sub> Logic High	V <sub>TFH</sub>	2.4	-	V <sub>CC</sub>	V
T <sub>FAULT</sub> Logic Low	V <sub>TFL</sub>	V <sub>EE</sub>	-	V <sub>EE</sub> +0.4	V
Receiver Electrical Characteristics					
Parameter	Symbol	Min	Typ	Max	Unit
Differential output Voltage Swing	V <sub>OUT</sub>	300	-	850	mV
Rx Differential Output Impedance	Z <sub>OUT</sub>	-	100	-	Ω
LOS Assert Voltage	V <sub>LOSA</sub>	2.4	-	V <sub>CC</sub>	V
LOS De-assert Voltage	V <sub>LOSD</sub>	V <sub>EE</sub>	-	V <sub>EE</sub> +0.4	V

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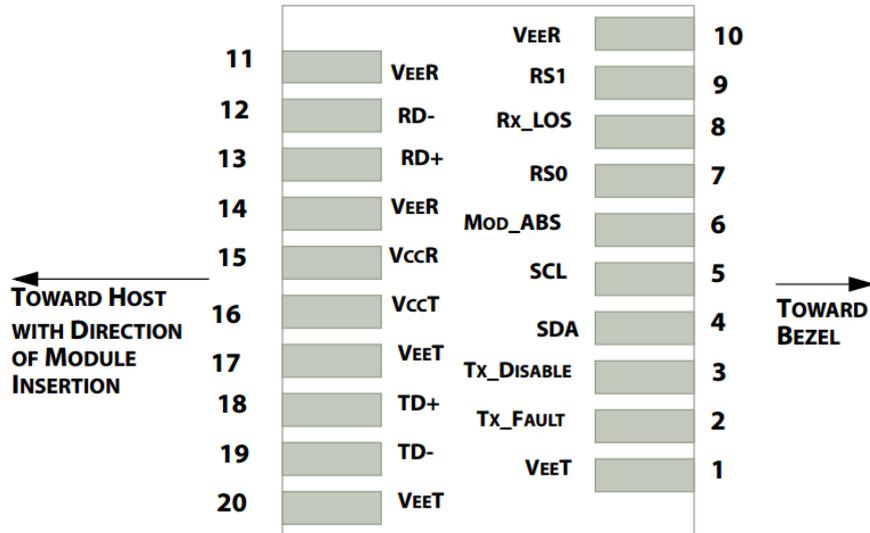
### Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
<b>Transmitter Characteristics</b>						
Laser Type		DFB				
Center Wavelength Range	$\lambda$	1260	1310	1355	nm	
Spectral Width@-20dB	$\Delta\lambda$	-	-	1	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Launch Optical Power	P <sub>out</sub>	-8.2	-	0.5	dBm	1
Extinction Ratio	ER	3.5	-	-	dB	
Relative Intensity Noise	RIN	-	-	-128	dB/Hz	
Eye Diagram	Complies with IEEE802.3ae eye masks when filtered					
<b>Receiver Characteristics</b>						
Receiver Type		PIN				
Operating Central Wavelength	$\lambda$	1260	-	1610	nm	
Receiver Sensitivity	Sen	-	-	-14.4	dBm	2
Receiver Overload	P <sub>SAT</sub>	0.5	-	-	dBm	
Receiver Reflectance	RFL	-	-	-12	dB	
LOS Assert	LOSA	-30	-	-	dBm	
LOS De-Assert	LOSD	-	-	-17	dBm	
LOS Hysteresis	LOSH	0.5	3	5	dB	
<b>Notes</b>						
1. Average power figures are informative only, per IEEE 802.3ae.						
2. Measured with 2 <sup>31</sup> -1 PRBS@10.3125Gbps, BER<10 <sup>-12</sup>						

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### Pin Definitions



Pin	Symbol	Description	Notes
1	V <sub>EET</sub>	Transmitter Ground	1
2	T <sub>FAULT</sub>	Transmitter Fault	2
3	T <sub>DIS</sub>	Transmitter Disable. Laser output disabled on high or open	3
4	SDA	2-wire Serial Interface Data Line	2
5	SCL	2-wire Serial Interface Clock Line	2
6	MOD_ABS	Module Absent. Grounded within the module	
7	RS0	Rate Select 0. Not Used.	4
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation	2
9	RS1	Rate Select 1. Not Used.	4
10	V <sub>EER</sub>	Receiver Ground	1
11	V <sub>EER</sub>	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	V <sub>EER</sub>	Receiver Ground	1
15	V <sub>CCR</sub>	Receiver Power Supply	
16	V <sub>CCT</sub>	Transmitter Power Supply	
17	V <sub>EET</sub>	Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V <sub>EET</sub>	Transmitter Ground	1

#### Notes

1. Circuit ground is internally isolated from chassis ground.
2. Shall be pulled up with 4.7k-10k Ohms to a voltage between 3.15V and 3.6V on the host board.
3. Laser output disabled on T<sub>DIS</sub> >2.0V or open, enabled on T<sub>DIS</sub> <0.8V.
4. Internally pulled down per SFF-8431 Rev 4.1.

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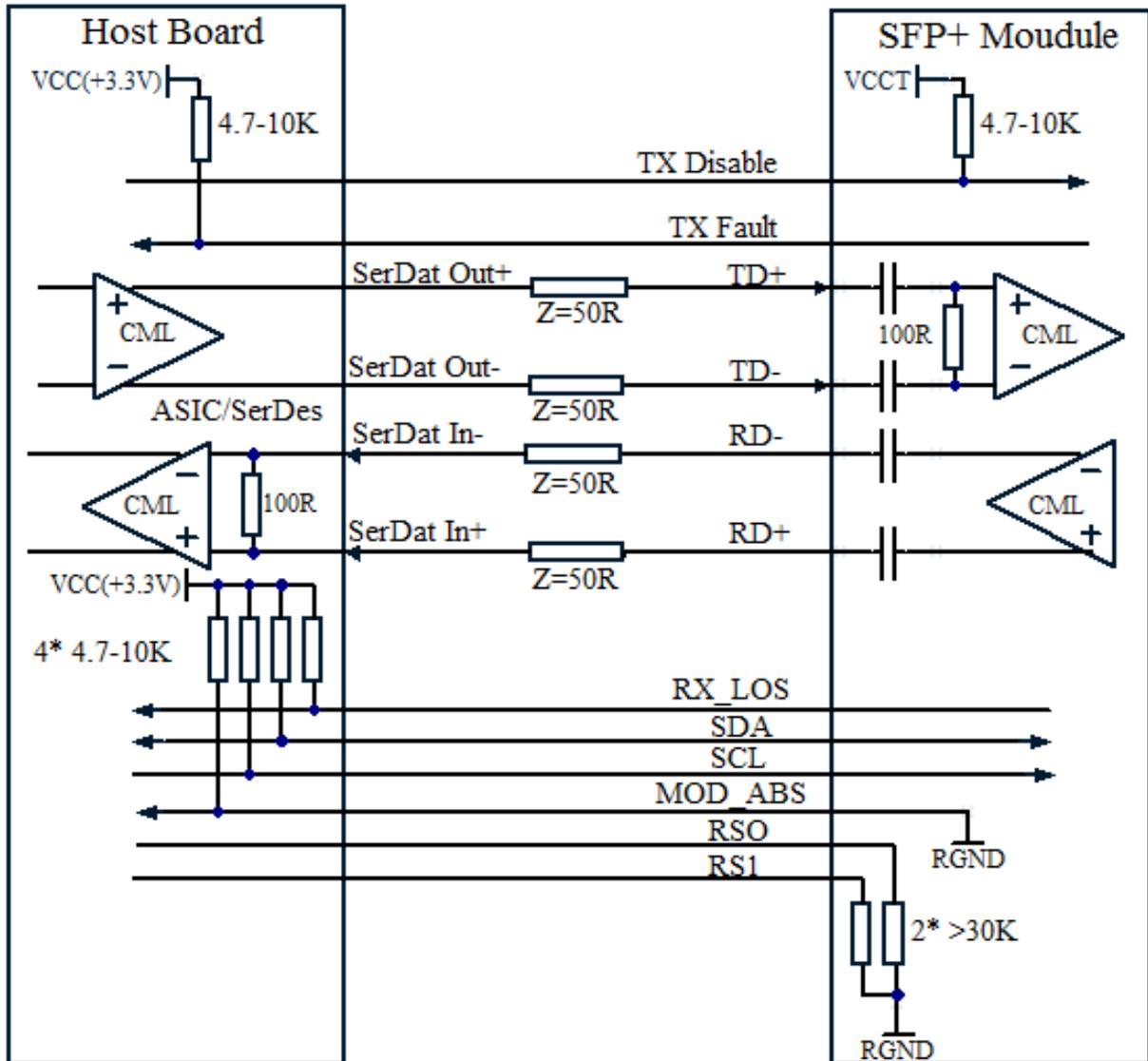
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### Recommended Interface Circuit

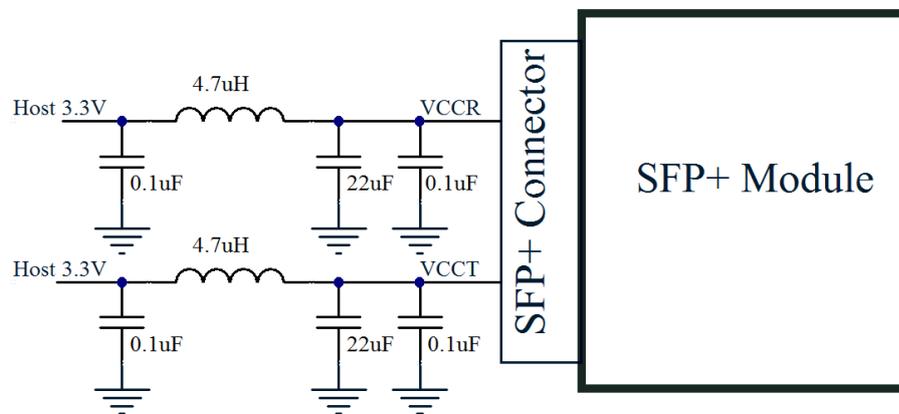


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### Recommended Host Board Supply Filtering Circuit

The Transceiver includes internal circuit components to filter power supply noise. Under some conditions of EMI and power supply noise, external power supply filtering may be necessary. If receiver sensitivity is found to be degraded by power supply noise, the filter network illustrated in the following figure may be used to improve performance. The values of the filter components are general recommendations and may be changed to suit a particular system environment. Shielded inductors are recommended.



### Ordering information

Part Number	Product Description
CC-PII221L-ID	SFP+, 10.3125Gbps, 1310nm, SM, 10km, -40°C~+85°C, With DDM
CC-PII221L-SD	SFP+, 10.3125Gbps, 1310nm, SM, 10km, 0°C~+70°C, With DDM

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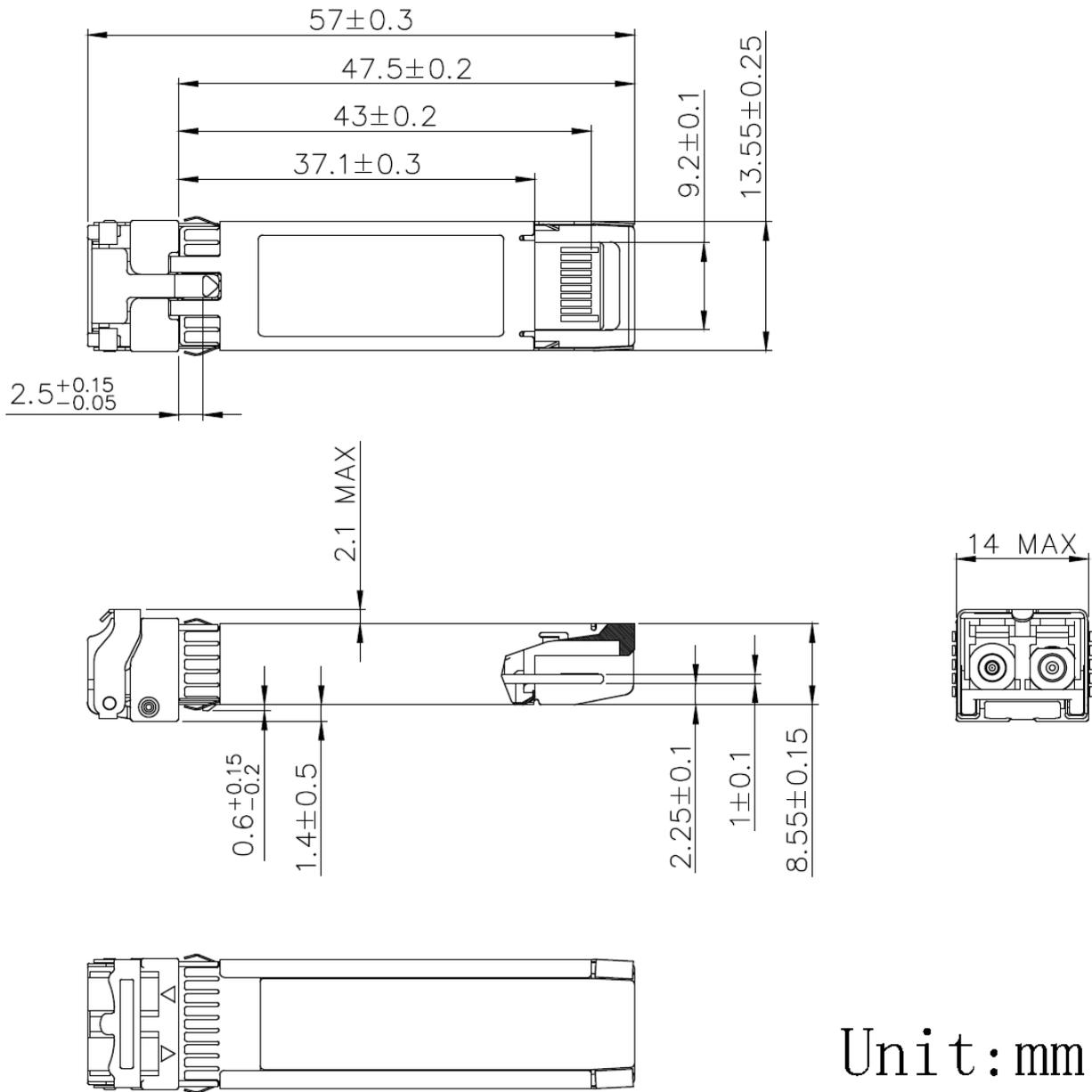
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### Mechanical Dimensions



Unit: mm

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### Regulatory Compliance

Ccloud's transceiver is designed to be Class 1 Laser safety compliant and is certified per the following standards.

Agency	Standard	Certificate /Comments
ISO9001	GB/T 19001-2016/ISO 9001:2015	SW21Q20855R1M
ISO14001	ISO 14001:2015	SW19E20246ROS
UL	UL 60950-1 CAN/CSA C22.2 No. 60950-1-07	20170123-E489408
TUV-MARK	IEC62368_1B	No.B 110644 0001 Rev.00
CE-EMC	EN 60825-1:2014,EN 60825-2:2004+A2:2010(LVD)	M:2018.201.N6868 AE 50372175 0001
	EN 55032: 2015 EN 55024: 2010+A1	
REACH	REACH 211	AGC 10204210401-001
FCC	FCC Rules and Regulations Part 15 Subpart B Class B	MTi190422E141C
RoHS	2011/65/EU and amendment (EU) 2015/863	68.420..21.1117.01

