



# DATENBLATT

## RPC-SFP-10G-ZR

Produktspezifikationen

Stand: 06/2015



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# RPC-SFP-10G-ZR

## 10Gb/s 80Km SFP+ ZR Optical Transceiver

### PRODUCT FEATURES

- 1550nm cooled EML, APD Receiver
- Up to 80km on 9/125um SMF
- SFP+ MSA package with duplex LC connector
- SFI High Speed Electrical Interface
- Very low EMI and excellent ESD protection
- +3.3V single power supply
- Case temperature range: -5°C to 70°C.
- 2-wire interface for management and diagnostic monitor
- 10Gb/s serial optical interface compliant to 802.3ae 10GBASE-ZR/ZW
- Power dissipation < 1.5W

### APPLICATIONS

- 10G Base-ZR/ZW
- 10G Fiber Channel
- 10G Storage system

### STANDARD

- Compliant to SFF-8431 and SFF-8432
- Compliant with SFF-8472
- Compliant with IEEE 802.3ae 10GBASE-ZR and 10GBASE-ZW
- Compliant with IEC 60825-1 Class 1 laser eye safe
- RoHS Compliant

## PRODUCT DESCRIPTION

RAPIDCON SFP+ ZR transceivers is 1550nm cooled EML laser and APD photo-detector receiver based 10Gigabit SFP+ transceiver, which is designed to transmit and receive optical data over single mode optical fiber for link length up to 80km. Digital diagnostics functions are available via a 2-wire serial interface, as specified in the SFF-8472, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage.

### I. Absolute Maximum Ratings

| Parameter                   | Symbol | Min  | Typ | Max | Unit | Ref. |
|-----------------------------|--------|------|-----|-----|------|------|
| Maximum Supply Voltage      | Vcc3   | -0.5 |     | 4.0 | V    |      |
| Storage Temperature         | Ts     | -40  |     | 85  | °C   |      |
| Operating Relative Humidity | RH     |      |     | 85  | %    |      |
| Case Operating Temperature  | Tcase  | -5   |     | 70  | °C   |      |
| Receiver Damage Threshold   |        | 6    |     |     | dBm  |      |
|                             |        |      |     |     |      |      |

## II. Electrical Characteristics (T<sub>case</sub>= -5 to 70 °C, V<sub>CC3</sub> = 3.13 to 3.47 Volts)

| Parameter                       | Symbol                         | Min  | Typ | Max                  | Unit | Ref. |
|---------------------------------|--------------------------------|------|-----|----------------------|------|------|
| Supply Voltage                  | V <sub>CC3</sub>               | 3.13 |     | 3.47                 | V    |      |
| Supply Current                  | I <sub>CC</sub>                |      |     | 450                  | mA   |      |
| Module total power              | P                              |      |     | 1.5                  | W    | 1    |
| <b>Transmitter</b>              |                                |      |     |                      |      |      |
| Input differential impedance    | R <sub>in</sub>                |      | 100 |                      | Ω    | 1    |
| Differential data input swing   | V <sub>in,pp</sub>             | 300  |     | 1200                 | mV   |      |
| Transmit Disable Voltage        | V <sub>D</sub>                 | 2.0  |     | V <sub>CC3</sub>     | V    |      |
| Transmit Enable Voltage         | V <sub>EN</sub>                | GND  |     | GND+ 0.8             | V    |      |
| Transmit Disable Assert Time    |                                |      |     | 10                   | us   |      |
| Transmit Disable De-assert Time |                                |      |     | 2                    | ms   |      |
| <b>Receiver</b>                 |                                |      |     |                      |      |      |
| Differential data output swing  | V <sub>out-pp</sub>            | 500  | 650 | 800                  | mV   | 2    |
| Data output rise and fall time  | T <sub>r</sub> ,T <sub>f</sub> | 30   |     |                      | ps   | 3    |
| LOS Fault                       | V <sub>los-fault</sub>         | 2    |     | V <sub>CC-host</sub> | V    | 4    |
| LOS Normal                      | V <sub>los-nor</sub>           | GND  |     | GND+0.8              | V    | 4    |

### Notes:

1. Connected directly to TX data input pins.
2. Input 100Ω differential termination.
3. These are unfiltered 20-80% values
4. LOS is an open collector output. Should be pulled-up with 4.7k Ω-10 k Ω on the host board. Normal operation is logic 0, loss of signal is 1

### III. Optical Characteristics (T<sub>case</sub> = -5 to 70 °C, V<sub>CC3</sub> = 3.13 to 3.45 Volts)

| Parameter                               | Symbol                       | Min  | Typ  | Max   | Unit  | Ref. |
|---|------------------------------|------|------|-------|-------|------|
| <b>Transmitter</b>                      |                              |      |      |       |       |      |
| Average Optical Power                   | P <sub>AVE</sub>             | 0    |      | 5.0   |       | 1    |
| Optical Wavelength                      | λ                            | 1530 | 1550 | 1565  | nm    |      |
| Side-Mode Suppression ratio             | SMSR                         | 30   |      |       | dB    |      |
| Optical Extinction Ratio                | ER                           | 6.0  |      |       | dB    |      |
| Transmitter and Dispersion Penalty      | TDP                          |      |      | 3.0   | dB    |      |
| Average Launch power of OFF transmitter | P <sub>OFF</sub>             |      |      | -40   | dBm   |      |
| Output Eye Mask                         | Compliant with IEEE 0802.3ae |      |      |       |       |      |
| Relative Intensity Noise                | RIN                          |      |      | -128  | dB/Hz |      |
| <b>Receiver</b>                         |                              |      |      |       |       |      |
| Receiver Sensitivity                    | R <sub>SENS</sub>            |      |      | -23.0 | dBm   | 2    |
| Input Saturation Power (Overload)       | Psat                         | -7   |      |       | dBm   |      |
| Wavelength Range                        | λ <sub>C</sub>               | 1260 |      | 1600  | nm    |      |
| Receiver Reflectance                    | R <sub>rx</sub>              |      |      | -27   | dB    |      |
| LOS De-Assert                           | LOS <sub>D</sub>             |      |      | -24   | dBm   |      |
| LOS Assert                              | LOS <sub>A</sub>             | -32  |      |       | dBm   |      |
| LOS Hysteresis                          |                              | 0.5  |      | 4.0   | dB    |      |

**Notes:**

1. Average power figures are informative only, per IEEE 802.3ae.
2. Measured with conformance test signal for BER = 10<sup>-12</sup>. @10.3125Gbps, PRBS=2<sup>31</sup>-1,NRZ

## IV. General Specifications

| Parameter                   | Symbol | Min | Typ     | Max               | Units | Ref. |
|-----------------------------|--------|-----|---------|-------------------|-------|------|
| Bit Rate                    | BR     |     | 10.3125 |                   |       | 1    |
| Bit Error Ratio             | BER    |     |         | 10 <sup>-12</sup> |       | 2    |
| Maximum Supported Distances | Lmax   |     | 80      |                   | km    | 3    |

### Notes:

- 10GBASE-ZR/ZW
- Tested with a 2<sup>31</sup> – 1 PRBS
- SMF fiber, 1550nm wavelength

## V. Pin Descriptions

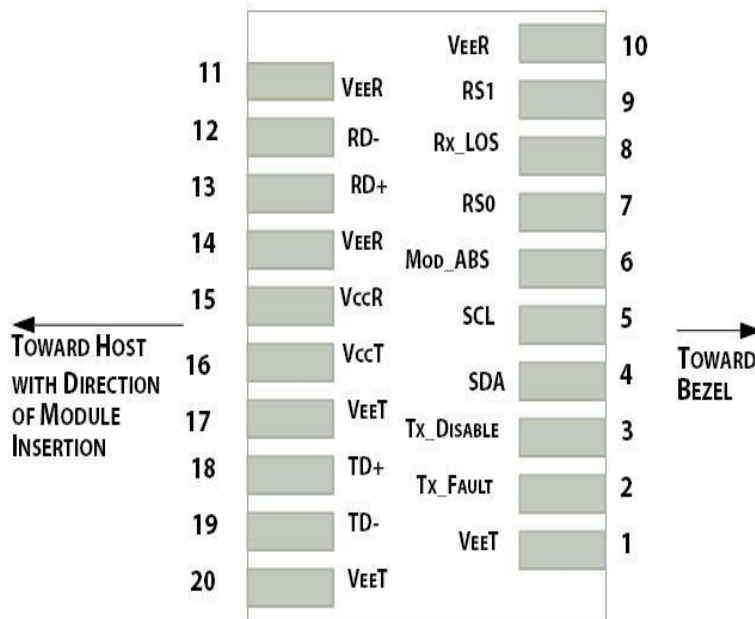


Diagram of Host Board Connector Block Pin Numbers and Name

| Pin | Symbol     | Name/Description  | Ref |
|-----|------------|---|-----|
| 1   | VEET       | Transmitter Ground  | 1   |
| 2   | TX_FAULT   | Transmitter fault   | 2   |
| 3   | Tx_DISABLE | 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                     | 4   |
| 7   | RS0        | No connection required  |     |
| 8   | RX_LOS     | Loss of Signal indication. Logic 0 indicates normal operation | 2   |
| 9   | RS1        | No connection required  |     |
| 10  | VEER       | Receiver Ground   | 1   |
| 11  | VEER       | Receiver Ground   | 1   |
| 12  | RD-        | Receiver Inverted DATA out. AC Coupled                        |     |
| 13  | RD+        | Receiver DATA out. AC Coupled                                 |     |
| 14  | VEER       | Receiver Ground   | 1   |
| 15  | VCCR       | Receiver Power Supply   |     |
| 16  | VCCT       | Transmitter Power Supply                                      |     |
| 17  | VEET       | Transmitter Ground  | 1   |
| 18  | TD+        | Transmitter DATA in. AC Coupled                               |     |
| 19  | TD-        | Transmitter Inverted DATA in. AC Coupled                      |     |
| 20  | VEET       | Transmitter Ground  | 1   |

Notes:

1. Module circuit ground is isolated from module chassis ground within the module.
2. Should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.13V and 3.6V.
3. Tx\_Disable is an input contact with a 4.7 kΩ to 10 kΩ pull-up to VccT inside the module
4. Mod\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc\_Host with a resistor in the range 4.7 kΩ to 10 kΩ. Mod\_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.



## VI. Digital Diagnostic Functions

As defined by the SFP MSA, RAPIDCON SFP+ transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

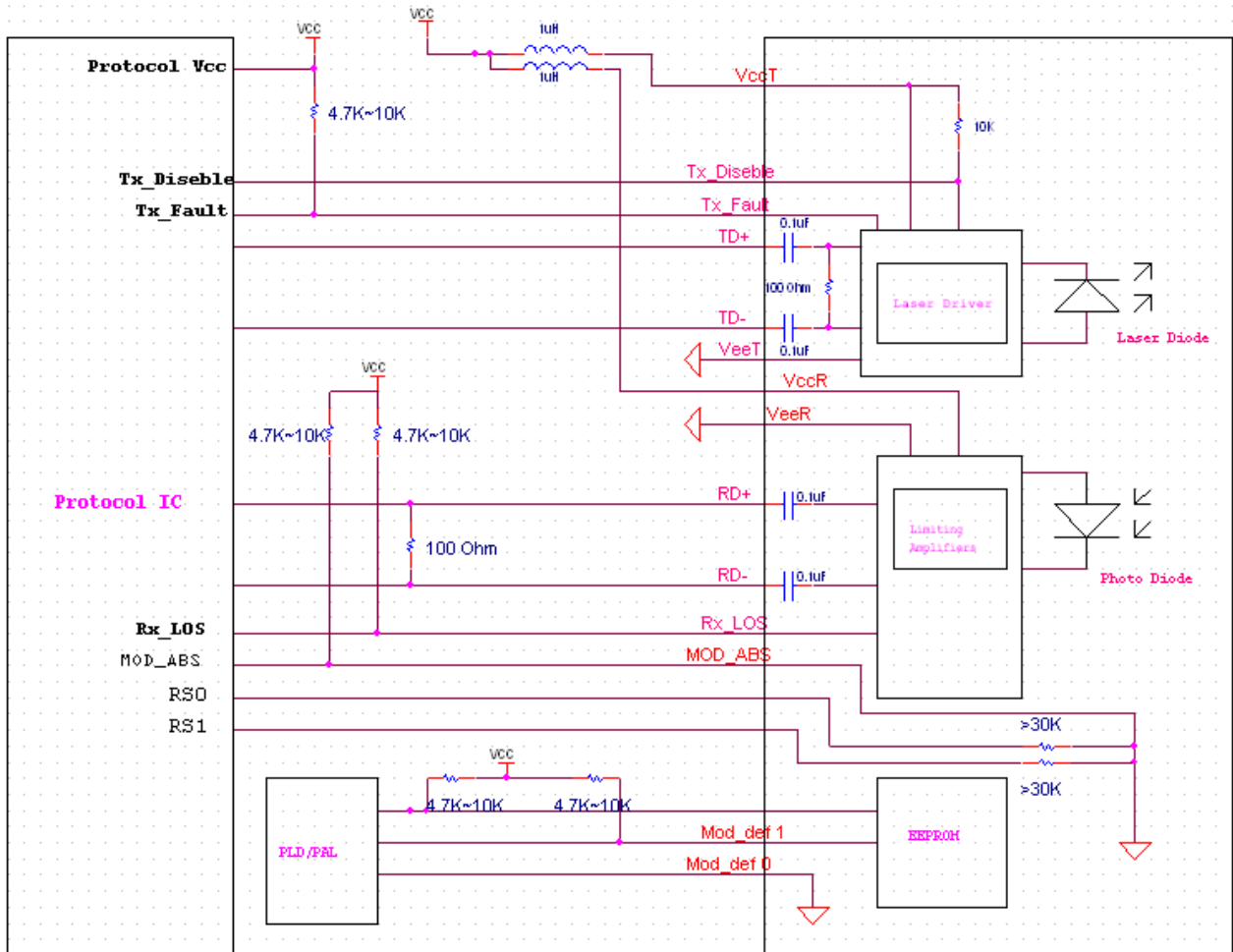
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The SFP MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.



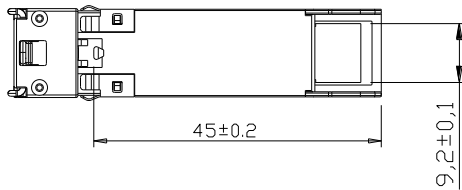
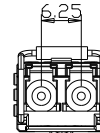
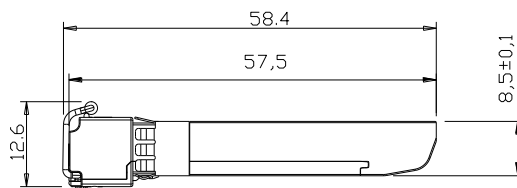
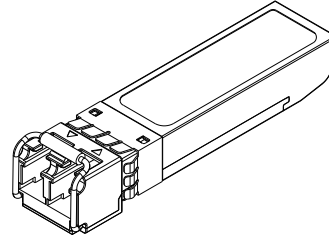
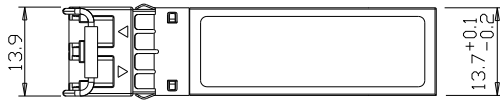
## VII. Host - Transceiver Interface Block Diagram





## VIII. Outline Dimensions

RAPIDCON SFP+ transceivers are compliant with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



Units in mm