

**SFP+, 16Gbps, CDR, SM, 1310nm, 10km****Особенности:**

- передача данных до 14.025Gb/s
- 1310nm DFB-LD лазер
- передача на расстояние до 10км на SMF
- питание 3.3В
- дуплексный LC коннектор, горячее включение
- встроенная dual CDR
- соответствие MSA SFP+ спецификации SFF-8431
- Power Dissipation < 1.2W

**Область применения:**

- Tri-Rate 4.25/8.5/14.025 Gb/s Fibre Channel

| Part No.          | Data Rate        | Laser      | Fiber Type | Distance | Temp.    | CDR | DDMI |
|-------------------|------------------|------------|------------|----------|----------|-----|------|
| SFP-16G-CDR-SM-10 | Up to 14.025Gb/s | 1310nm DFB | SM         | 10km     | Standard | Yes | Yes  |

**Absolute Maximum Ratings**

| Parameter                   | Symbol          | Min. | Max. | Unit |
|-----------------------------|-----------------|------|------|------|
| Storage Temperature         | T <sub>s</sub>  | -45  | 85   | °C   |
| Supply Voltage              | V <sub>CC</sub> | -0.5 | 4.0  | V    |
| Operating Relative Humidity | RH              | 5    | 95   | %    |

**Recommended Operating Conditions**

| Parameter                  | Sym bol         | Min.  | Typical | Max.  | Unit |
|----------------------------|-----------------|-------|---------|-------|------|
| Operating Case Temperature | T <sub>A</sub>  | 0     |         | 70    | °C   |
| Power Supply Voltage       | V <sub>CC</sub> | 3.135 |         | 3.465 | V    |
| Power Supply Current       | I <sub>CC</sub> |       |         | 340   | mA   |

**Performance Specifications - Electrical**

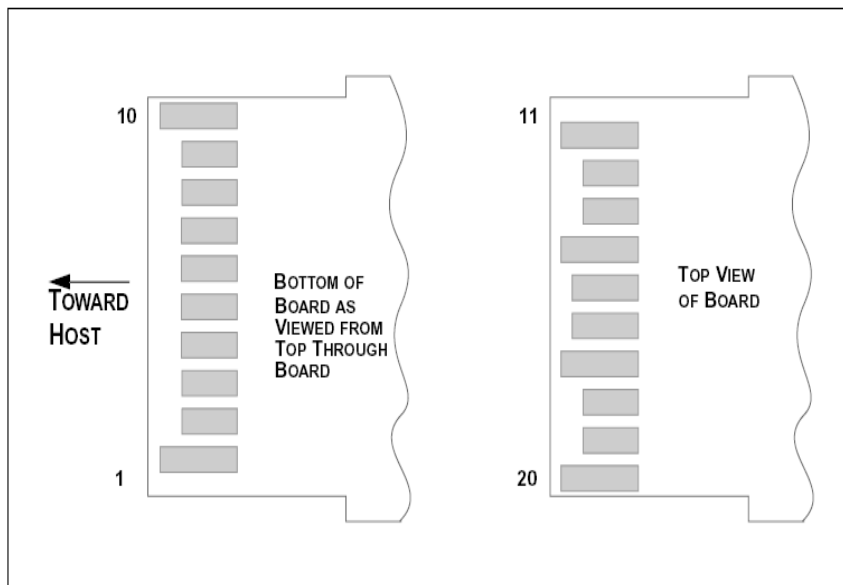
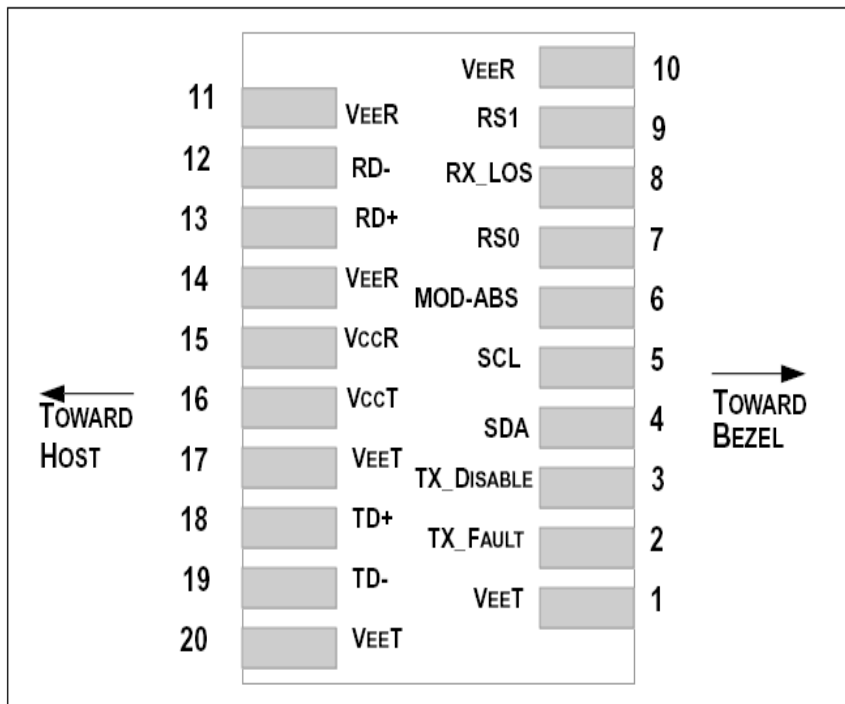
| Parameter                       | Symbol | Min. | Typ. | Max     | Unit | Notes                         |
|---------------------------------|--------|------|------|---------|------|-------------------------------|
| <b>Transmitter</b>              |        |      |      |         |      |                               |
| CML Inputs(Single-ended)        | Vin    | 90   |      | 800     | mVpp | AC coupled inputs             |
| Input Impedance (Differential)  | Zin    |      | 100  |         | ohms | Connected directly to TX pins |
| Tx_DISABLE Input Voltage – High |        | 2    |      | Vcc+0.3 | V    |                               |
| Tx_DISABLE Input Voltage – Low  |        | -0.3 |      | 0.8     | V    |                               |
| <b>Receiver</b>                 |        |      |      |         |      |                               |
| CML Outputs (Single-ended)      | Vout   | 185  |      | 425     | mVpp | AC coupled outputs            |
| Rx_LOS Output Voltage – High    |        | 2    |      | Vcc+0.3 | V    |                               |
| Rx_LOS Output Voltage – Low     |        | -0.3 |      | 0.8     | V    |                               |

**Optical and Electrical Characteristics**

| Parameter                              | Symbol           | Min. | Typical | Max. | Unit |
|--|------------------|------|---------|------|------|
| 9um Core Diameter SMF                  |                  |      |         | 10   | km   |
| <b>Transmitter</b>                     |                  |      |         |      |      |
| Centre Wavelength                      | $\lambda_c$      | 1295 | 1310    | 1325 | nm   |
| Spectral Width (-20dB)                 | $\Delta\lambda$  |      |         | 1    | nm   |
| Average Output Power@14.025Gb/s *Note5 | P <sub>out</sub> | -5   |         | 2    | dBm  |
| Extinction Ratio@14.025Gb/s            | ER               | 3.5  |         |      | dB   |
| Transmitter Dispersion Penalty         | TDP              |      |         | 4.4  | dB   |
| <b>Receiver</b>                        |                  |      |         |      |      |
| Centre Wavelength                      | $\lambda_c$      | 1260 |         | 1370 | nm   |
| Sensitivity(OMA)@14.025Gb/s            | P <sub>min</sub> |      |         | -12  | dBm  |
| Receiver Overload                      | P <sub>max</sub> | 2    |         |      | dBm  |
| Optical Return Loss                    | ORL              |      |         | -12  | dB   |
| LOS De-Assert                          | LOS <sub>D</sub> |      |         | -19  | dBm  |
| LOS Assert                             | LOS <sub>A</sub> | -30  |         |      | dBm  |
| LOS Hysteresis                         |                  | 0.5  |         |      | dB   |

Note5: Output is coupled into a 9/125um SMF .

**SFP28 Transceiver Electrical Pad Layout**



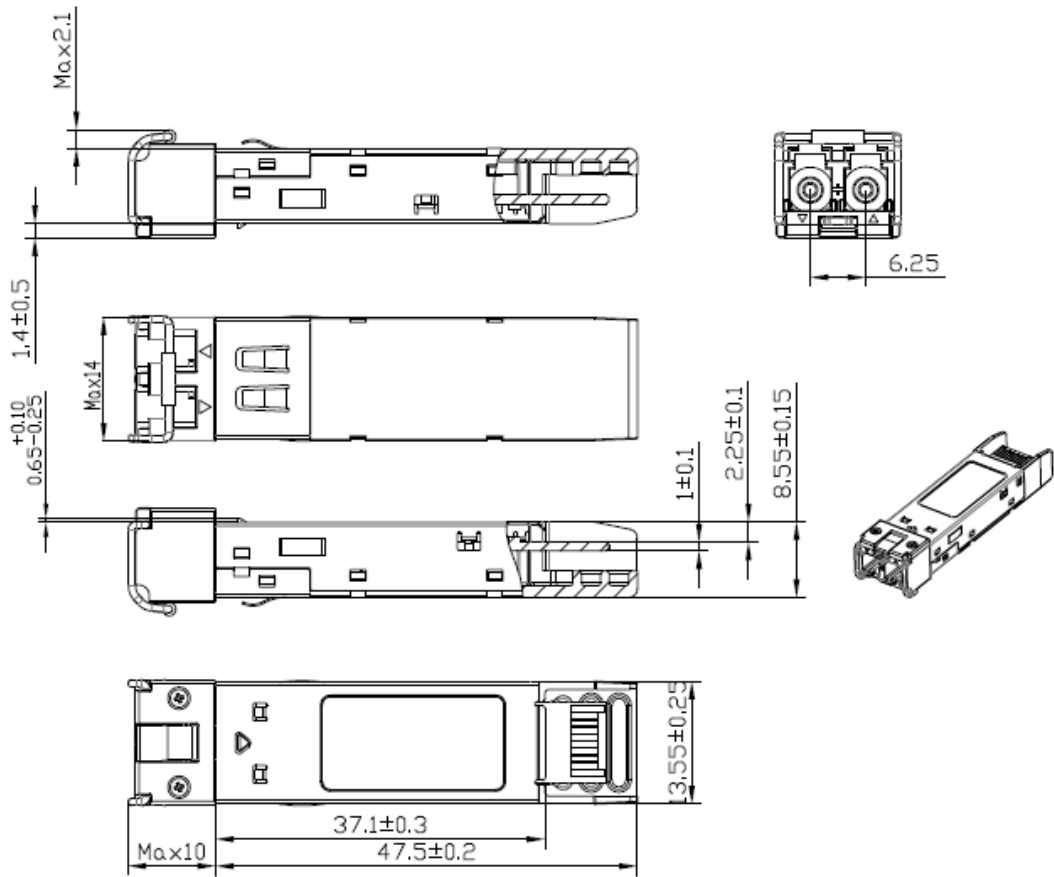
## Pin Function Definitions

| Pin Num. | Name       | Function                     | Plug Seq. | Notes   |
|----------|------------|------------------------------|-----------|---|
| 1        | VeeT       | Transmitter Ground           | 1         |   |
| 2        | TX Fault   | Transmitter Fault Indication | 3         | Note 1  |
| 3        | TX Disable | Transmitter Disable          | 3         | Note 2, Module disables on high or open   |
| 4        | SDA        | Module Definition 2          | 3         | Data line for Serial ID.  |
| 5        | SCL        | Module Definition 1          | 3         | Clock line for Serial ID.   |
| 6        | MOD-ABS    | Module Definition 0          | 3         | Note 3  |
| 7        | RS0        | RX Rate Select (LVTTTL).     | 3         | Rate Select 0, optionally controls SFP28 module receiver. This pin is pulled low to VeeT with a >30K resistor..   |
| 8        | LOS        | Loss of Signal               | 3         | Note 4  |
| 9        | RS1        | TX Rate Select (LVTTTL).     | 1         | Rate Select 1, optionally controls SFP28 module transmitter. This pin is pulled low to VeeT with a >30K resistor. |
| 10       | VeeR       | Receiver Ground              | 1         | Note 5  |
| 11       | VeeR       | Receiver Ground              | 1         | Note 5  |
| 12       | RD-        | Inv. Received Data Out       | 3         | Note 6  |
| 13       | RD+        | Received Data Out            | 3         | Note 6  |
| 14       | VeeR       | Receiver Ground              | 1         | Note 5  |
| 15       | VccR       | Receiver Power               | 2         | 3.3V ± 5%, Note 7   |
| 16       | VccT       | Transmitter Power            | 2         | 3.3V ± 5%, Note 7   |
| 17       | VeeT       | Transmitter Ground           | 1         | Note 5  |
| 18       | TD+        | Transmit Data In             | 3         | Note 8  |
| 19       | TD-        | Inv. Transmit Data In        | 3         | Note 8  |
| 20       | VeeT       | Transmitter Ground           | 1         | Note 5  |

**Notes:**

- 1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10K $\Omega$  resistor on the host board. Pull up voltage between 2.0V and  $V_{ccT/R}+0.3V$ . When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- 2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K~10 K  $\Omega$  resistor. Its states are:  
Low (0 – 0.8V): Transmitter on (>0.8, < 2.0V): Undefined  
High (2.0 – 3.465V): Transmitter Disabled Open: Transmitter Disabled
- 3) Module Absent, connected to VeeT or VeeR in the module.
  
- 4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10K $\Omega$  resistor. Pull up voltage between 2.0V and  $V_{cc\_Host}$ . When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- 5) VeeR and VeeT may be internally connected within the SFP28 module.
  
- 6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100 $\Omega$  differential lines which should be terminated with 100 $\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 185 and 425 mV differential (92.5 –212.5 mV single ended) when properly terminated.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V  $\pm$ 5% at the SFP+ connector pin. Maximum supply current is 340mA. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP28 input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP28 transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP28 transceiver module.
- 8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 $\Omega$  differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 90 – 800 mV (45 – 400 mV single-ended), though it is recommended that values between 90 and 800 mV differential (45 – 400 mV single-ended) be used for best EMI performance.

Mechanical Specifications



Unremarked tolerances ±0.2mm