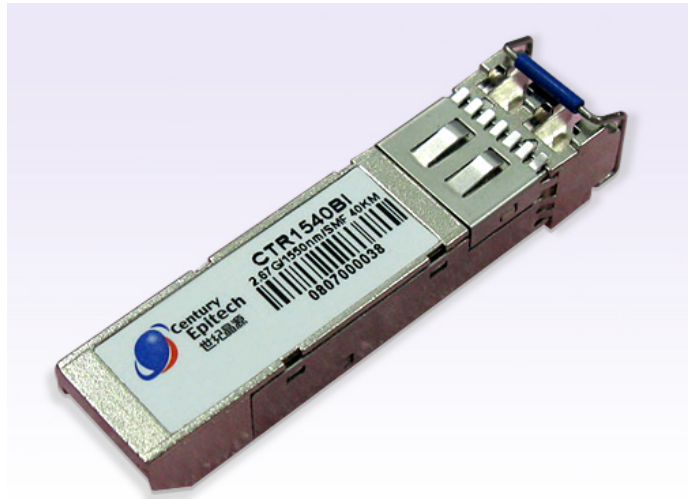


CTR1515** transceiver

REV1.0

Features

- ◆ Up to 2.67Gbps data links
- ◆ Uncooled DFB laser and PIN photo-detector
- ◆ Multi-source package with Duplex LC connector
- ◆ Metal enclosure for lower EMI
- ◆ Hot-pluggable SFP footprint
- ◆ Built-in DDM function compatible with SFF-8472 (No DDM optional)
- ◆ International Class 1 laser safety certified, Compliant with IEC60825-1
- ◆ Single +3.3V power supply, and low power dissipation <600mW typical
- ◆ Operation temperature range: -10°C~+75 °C; or -40°C~+85 °C
- ◆ RoHS Compliance



Applications

- ◆ ATM
- ◆ SONET/SDH
- ◆ 2x Fiber Channel
- ◆ Switch to switch interface
- ◆ Switched backplane applications
- ◆ Other optical transmission system

Standard

- ◆ Compliant with SFP MSA (INF-8074i)
- ◆ Compliant with SFF-8472 v9.3
- ◆ Compliant with IEEE802.3ah
- ◆ ITU-T G.957 S-1.1

Performance Specifications

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|------------------------------------|--------|------|------|------|
| Storage temperature(Non-operating) | Ts | -40 | 85 | °C |
| Power Supply Voltage | Vcc | -0.5 | +4 | V |
| Operating Relative Humidity | | 5 | 85 | % |
| Input Optical Power | Pmax | - | +3 | dBm |

Recommended Operation conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|--|--------|------|------|------|------|
| Operating Case Temperature(CTR15***C) | Tc | 0 | - | 70 | °C |
| Operating Case Temperature(CTR15***E) | | -10 | - | 75 | °C |
| Operating Case Temperature(CTR15***I) | | -40 | - | 85 | - |
| Power Supply Voltage | Vcc | 3.13 | 3.3 | 3.47 | V |
| Power Supply Current | Icc | - | 170 | 300 | mA |
| Data Rate | - | - | 2.67 | - | Gbps |

Electrical/Optical Characteristics

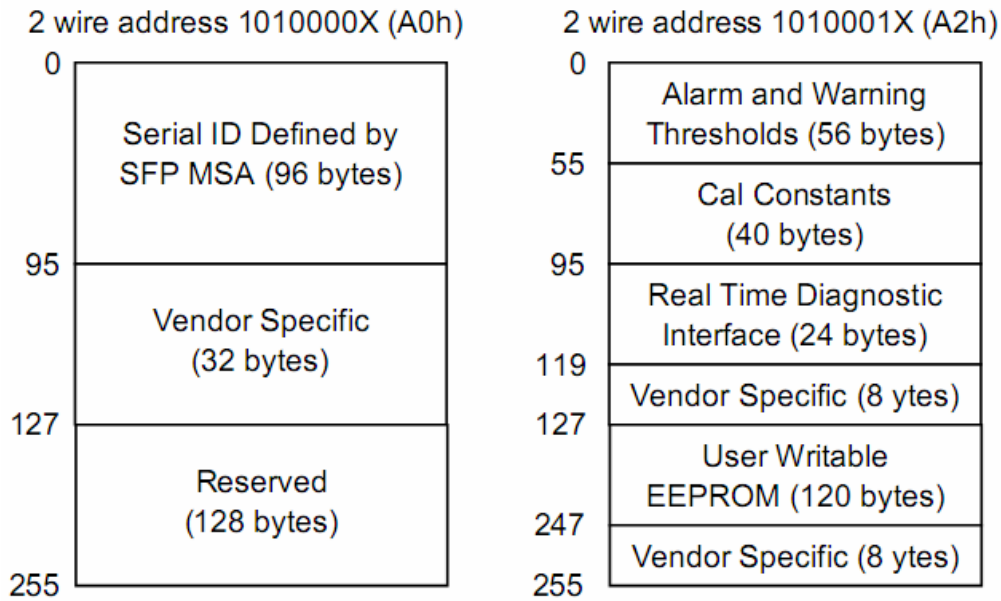
| Parameter | Symbol | Min | Typ | Max | Unit | Ref |
|---|--|----------------------|------|----------------------|------|--------|
| Transmitter | | | | | | |
| Electrical Characteristics | | | | | | |
| Input differential impedance | Z _{in} | 90 | 100 | 110 | Ω | |
| Singe ended data input swing | V _{in,pp} | 150 | - | 800 | mV | |
| Transmit Disable Voltage | VD | V _{cc} -1.3 | - | V _{cc} | V | |
| Transmit Enable Voltage | VEN | V _{ee} | - | V _{ee} +0.8 | V | |
| TX_FAULT High Voltage | V _{Hout} | V _{cc} -1.3 | - | V _{cc} | V | |
| TX_FAULT Low Voltage | V _{Lout} | V _{ee} | - | V _{ee} +0.8 | V | |
| TX Disable Assert Time | T _{off} | - | - | 10 | us | |
| TX Disable Negate Time | T _{on} | - | - | 1 | ms | |
| Time to initialize, include reset of TX_FAULT | T _{init} | - | - | 300 | ms | |
| TX_FAULT Assert Time | T _{fault} | - | - | 100 | us | |
| TX_DISABLE To Start Reset | T _{reset} | 10 | - | - | us | |
| Optical Characteristics | | | | | | |
| Output Opt. Power | P _o | -5 | - | 0 | dBm | |
| P _o @TX Disable Asserted | P _{odis} | - | - | -45 | dBm | Note 1 |
| Optical Wavelength | λ _c | 1261 | 1310 | 1360 | nm | |
| Spectral Width | Δλ | - | - | 1 | nm | |
| Extinction Ratio | Ex | 9 | - | - | dB | |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB | |
| Dispersion Penalty | OPP | - | - | 2 | dB | |
| Optical Rise/Fall Time | Tr/Tf | - | - | 150 | ps | |
| Eye Diagram | Complies with IEEE802.3z eye masks when filtered | | | | | |
| Receiver | | | | | | |
| Electrical Characteristics | | | | | | |
| Single Ended Data Output Swing | V _{out,pp} | 200 | - | 500 | mV | |
| LOS High Voltage | V _{Hout} | V _{cc} -0.5 | - | V _{cc} | V | |
| LOS Low Voltage | V _{Lout} | V _{ee} | - | V _{ee} +0.5 | V | |
| LOS Assert Time | T _{los_on} | - | - | 100 | us | |
| LOS De-Assert Time | T _{los_off} | - | - | 100 | us | |
| Optical Characteristics | | | | | | |
| Receiver Sensitivity | S | - | -21 | -18 | dBm | |
| Overload Input Optical Power | P _{in} | 0 | - | - | dBm | |
| Optical Center Wavelength | λ _c | 1260 | - | 1600 | nm | |
| LOS De-Assert | - | - | - | -21 | dBm | |
| LOS Assert | - | -40 | - | - | dBm | |
| LOS Hysteresis | - | 0.5 | 3 | 5 | dB | Note 3 |

Note 1. The optical power is launched into SMF.

Note 2. Measured with a PRBS $2^{23} - 1$ test pattern, @1.25Gb/s, EX=10dB, BER < 10^{-12}

Note 3. The LOS Hysteresis to minimize "chatter" on the output line. In principle, Hysteresis alone does not guarantee chatter-free operation

Digital Diagnostic Memory Map



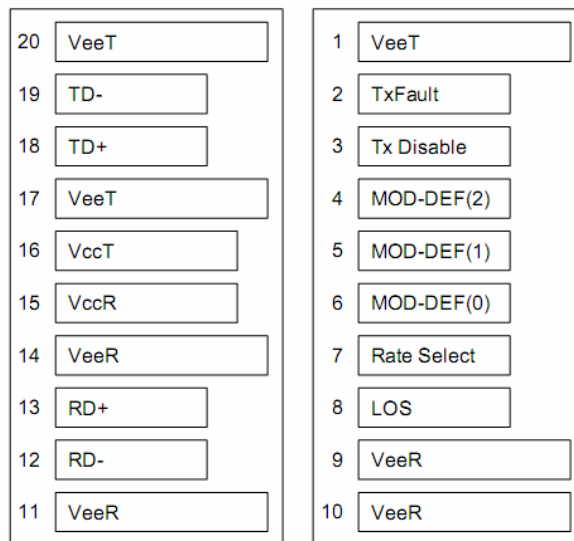
EEPROM Serial ID Memory Contents

Accessing Serial ID Memory uses the 2 wire address 1010000X(A0). Memory Contents of Serial ID are following:

| Data Address | Size(Bytes) | Name of Field | Contents(Hex) | Description |
|---------------------------|-------------|-------------------|--|--|
| BASE ID FIELDS | | | | |
| 0 | 1 | Identifier | 03 | SFP |
| 1 | 1 | Ext. Identifier | 04 | SFP function is defined by serial ID only |
| 2 | 1 | Connector | 07 | LC Connector |
| 3-10 | 8 | Transceiver | | Transceiver Codes |
| 11 | 1 | Encoding | 03 | NRZ |
| 12 | 1 | BR, Nominal | | Data rate |
| 13 | 1 | Reserved | 00 | |
| 14 | 1 | Length (9μm) km | | Transceiver transmit distance |
| 15 | 1 | Length (9μm) 100m | | |
| 16 | 1 | Length (50μm) 10m | | |
| 17 | 1 | Length(62.5μm)10m | | |
| 18 | 1 | Length (Copper) | 00 | Not compliant |
| 19 | 1 | Reserved | 00 | |
| 20-35 | 16 | Vendor name | 43 65 6e 74 75 72 79 32 45 70 69 74 65 63 68 | “Century Epitech”(ASCII) |
| 36 | 1 | Reserved | 00 | |
| 37-39 | 3 | Vendor OUI | | |
| 40-55 | 16 | Vendor PN | | Transceiver part number |
| 56-59 | 4 | Vendor rev | 49 46 48 32 | 1.0 |
| 60-61 | 2 | Wavelength | | Transceiver wavelength |
| 62 | 1 | Reserved | 00 | |
| 63 | 1 | CC_BASE | Check Sum (Variable) | Check code for Base ID Fields |
| EXTENDED ID FIELDS | | | | |
| 64-65 | 2 | Options | 00 1A | TX_DISABLE, TX_FAULT and Loss of Signal implemented. |

| | | | | |
|----------------------------------|-----|---------------------|----------------------------------|--|
| 66 | 1 | BR,max | 00 | |
| 67 | 1 | BR,min | 00 | |
| 68-83 | 16 | Vendor SN | 30 38 30 33 30 30 30 30 30 31 | Serial Number of transceiver (ASCII). For example "0803000001". |
| 84-91 | 8 | Date code | 30 38 30 34 30 35 20 20 | Manufactory date code. For example "080405". |
| 92 | 1 | Diagnostic | | Digital diagnostic monitoring |
| 93 | 1 | Enhanced Options | | Optional Alarm/Warning flags implemented for all monitored quantities, Optional Soft TX_FAULT monitoring implemented, Optional Soft RX_LOS monitoring implemented. |
| 94 | 1 | SFF_8472 Compliance | | Includes functionality described in Rev9.3 SFF-8472. |
| 95 | 1 | CC_EXT | Check Sum (Variable) | Check sum for Extended ID Field. |
| VENDOR SPECIFIC ID FIELDS | | | | |
| 96-127 | 32 | Vendor Specific | Read only | Depends on customer information |
| 128-255 | 128 | Reserved | Read only | Filled by zero |

Pin Definitions or Descriptions



Top of Board

Bottom of Board

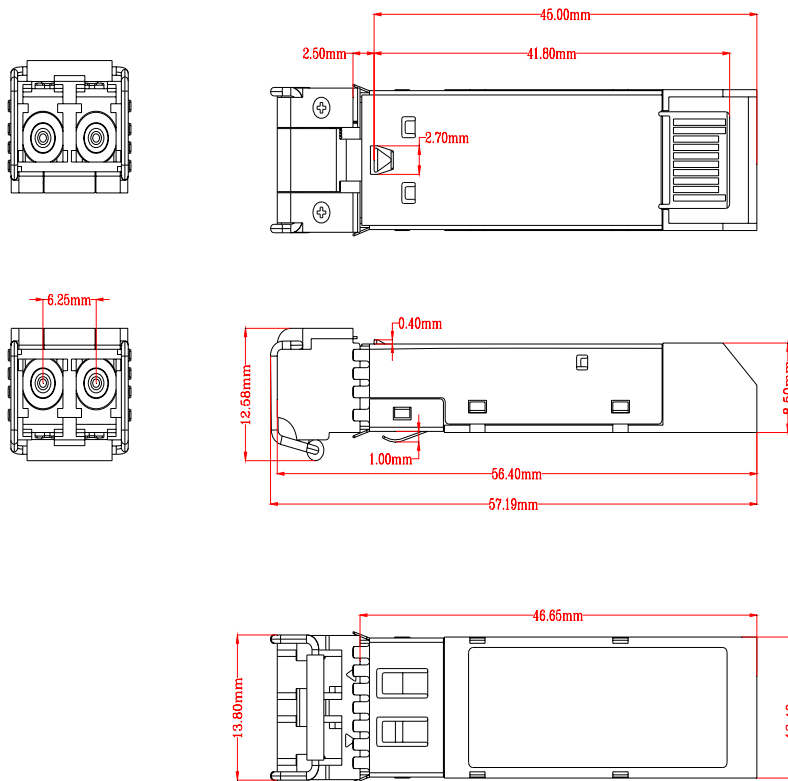
| Pin Num. | Name | Function | Plug Seq. | Notes |
|----------|-------------|------------------------------|-----------|---|
| 1 | VeeT | Transmitter Ground | 1 | |
| 2 | TX Fault | Transmitter Fault Indication | 3 | Note 1 |
| 3 | TX Disable | Transmitter Disable | 3 | Note 2, Module disables on high or open |
| 4 | MOD-DEF2 | Module Definition 2 | 3 | Note 3, 2 wire serial ID interface |
| 5 | MOD-DEF1 | Module Definition 1 | 3 | Note 3, 2 wire serial ID interface |
| 6 | MOD-DEF0 | Module Definition 0 | 3 | Note 3, Grounded in Module |
| 7 | Rate Select | Not Connected | 3 | |
| 8 | LOS | Loss of Signal | 3 | Note 4 |

| | | | | |
|----|------|------------------------|---|--------|
| 9 | VeeR | Receiver Ground | 1 | Note 5 |
| 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 6 |
| 15 | VccR | Receiver Power | 2 | Note 7 |
| 16 | VccT | Transmitter Power | 2 | 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 |

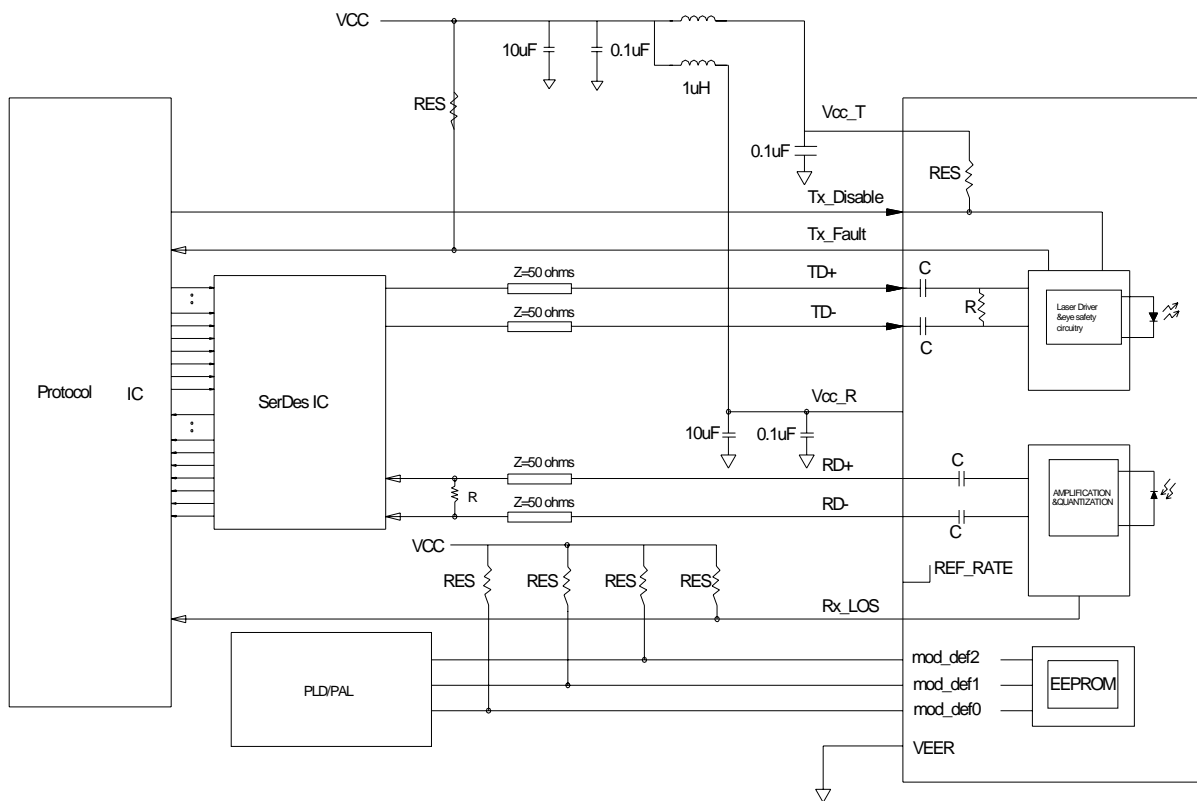
Plug Seq.: Pin engagement sequence during hot plugging.

- TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, 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.
- TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its states are:
 - Low (0 – 0.8V): Transmitter on
 - (>0.8, < 2.0V): Undefined
 - High (2.0 – 3.465V): Transmitter Disabled
 - Open: Transmitter Disable
- Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR (see Section IV for further details).
 - Mod-Def 0 is grounded by the module to indicate that the module is present
 - Mod-Def 1 is the clock line of two wire serial interface for serial ID
 - Mod-Def 2 is the data line of two wire serial interface for serial ID
- LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. 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.
- VeeR and VeeT may be internally connected within the SFP module.
- RD-/+ : These are the differential receiver outputs. They are AC coupled 100 Ω differential lines which should be terminated with 100 Ω (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 370 and 2000 mV differential (185 – 1000 mV single ended) when properly terminated.
- VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300 mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1Ω should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
- TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω 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 500 – 2400 mV (250 – 1200 mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600 mV single-ended) be used for best EMI performance.

Package information



Recommended Circuit



NOTE: 4.7K ohms<RES<10K ohms

Ordering information

| Part No | Specifications | | | | | | | | |
|-----------|----------------|-------------|----------|----------|-----|-----------|-----------|------------|------------|
| | Pack age | Rate (Gbps) | Tx (nm) | Po (dBm) | Rx | Sen (dBm) | Temp (°C) | Reach (Km) | Others |
| CTR1515NC | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | 0~70 | 15 | RoHS,Note1 |
| CTR1515BC | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | 0~70 | 15 | |
| CTR1515DC | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | 0~70 | 15 | |
| CTR1515NE | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | -10~75 | 15 | |
| CTR1515BE | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | -10~75 | 15 | |
| CTR1515DE | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | -10~75 | 15 | |
| CTR1515NI | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | -40~85 | 15 | |
| CTR1515BI | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | -40~85 | 15 | |
| CTR1515DI | SFP | 2.5 | 1310 DFB | -5~0 | PIN | <-18 | -40~85 | 15 | |

Note1:
N: No DDM
B:DDM,User Writable EEPROM
D:DDM,User Writable EEPROM with password