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# 1.25G CSFP 1000BX-D Compact 2CH BiDi Transceiver
# Hot Pluggable, Dual BiDi LC, Tx1550nm DFB / Rx1310nm, SMF 20KM, DDM

## Part Number: FSFP-CC-S53-20D


## Overview

FSFP-CC-S53-20D Small Form Factor Pluggable CSFP transceivers are compliant with the current CSFP Multi-Source Agreement (MSA) Specification. It achieve operational compatibility with conventional SFP and no damage to CSFP/ host board if CSFP transceiver is plugged into a conventional SFP socket. The high performance uncooled 1550nm DFB transmitter and high sensitivity PIN receiver provide superior performance for Gigabit Ethernet 1000BASE-BX10 and Fiber Channel 1GFC applications up to SMF 20km optical links.

## Applications

- Gigabit Ethernet 1000BASE-BX10 @1.25G
- Fiber Channel 1GFC @1.0625G

## Features

- Compliant with IEEE802.3ah 1000BASE-BX10-D
- Compliant with Fiber Channel 100-SM-LZ-L
- Compliant with CSFP MSA Option 2
- Hot Pluggable
- 2CH BiDi unit with 1550nm DFB laser transmitter and 1310nm PIN receiver
- Dual BiDi LC connector
- 2-wire interface for management and diagnostic monitor compliant with SFF-8472
- Single +3.3V power supply
- Link distance 20km over SM fiber for each channel
- RoHS Compliant

## Laser Safety

- This is a Class 1 Laser Product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
- Caution: Use of control or adjustments or performance of procedure other than those specified herein may result in hazardous radiation exposure.



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## Absolute Maximum Ratings

| Parameters | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| Storage Temperature | $T_{ST}$ | -40 | +85 | °C |
| Storage Relative Humidity | RH | 5 | 95 | % |
| Supply Voltage | $V_{CC}$ | -0.5 | +4.0 | V |

## Recommended Operating Conditions

| Parameters | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Case Operating Temp. (FSFP-CC-S53-20D) | $T_{OP}$ | 0 | - | +70 | °C |
| Case Operating Temp. (FSFP-CC-S53-20Di) | $T_{OP}$ | -40 | - | +85 | °C |
| Supply Voltage | $V_{CC}$ | +3.13 | +3.3 | +3.47 | V |
| Supply Current (FSFP-CC-S53-20D) | $I_{CC}$ | | | 450 | mA |
| Supply Current (FSFP-CC-S53-20Di) | $I_{CC}$ | | | 500 | mA |

## Transmitter Electro-optical Characteristics

**$V_{CC}$= 3.13V to 3.47V, $T_{OP}$ = 0 °C to 70 °C** (FSFP-CC-S53-20D); **$T_{OP}$ = -40 °C to 85 °C** (FSFP-CC-S53-20Di)

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Operating Data Rate | DR | 1.0625 | 1.25 | | Gb/s | |
| Optical Launch Power | Po | -8 | | -2 | dBm | 1 |
| Optical Center Wavelength | λc | 1530 | 1550 | 1570 | nm | |
| Spectral Width (-20dB) | Δλ | | | 1 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Optical Extinction Ratio | ER | 9 | | | dB | |
| Optical Eye Mask | | IEEE802.3z | | | | |
| Differential Data Input Swing | $V_{IN}$ | 250 | | 1200 | mV | |
| Tx Disable Input Voltage-Low (Tx ON) | $TDISV_L$ | GND | | 0.8 | V | |
| Tx Disable Input Voltage-High (Tx OFF) | $TDISV_H$ | 2.0 | | Vcc | V | |
| Tx Fault Output Voltage-Low (Tx Normal) | $TFLTV_L$ | GND | | 0.5 | V | |
| Tx Fault Output Voltage-High (Tx Fault) | $TFLTV_H$ | 2.0 | | Vcc | V | |
| Operating Data Rate | DR | 1.0625 | 1.25 | | Gb/s | |

**Note1:** The optical power is launched into a 9/125μm single mode fiber.



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## Receiver Electro-optical Characteristics

**$V_{CC}$= 3.13V to 3.47V, $T_{OP}$ = 0 °C to 70 °C** (FSFP-CC-S53-20D); **$T_{OP}$ = -40 °C to 85 °C** (FSFP-CC-S53-20Di)

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Operating Data Rate | DR | 1.0625 | 1.25 | | Gb/s | |
| Receiver Sensitivity | SEN | | | -23 | dBm | 1 |
| Maximum Receive Power | $P_{Rx-MAX}$ | -3 | | | dBm | 1 |
| Optical Center Wavelength | λc | 1260 | | 1360 | nm | |
| LOS De-Assert | $LOS_D$ | | | -25 | dBm | |
| LOS Assert | $LOS_A$ | -45 | | | dBm | |
| LOS Hysteresis | $LOS_{HY}$ | 0.5 | | | dB | |
| Differential Data Output Swing | $V_{OUT}$ | 400 | | 1600 | mV | |
| Receiver LOS Signal Output Voltage-Low | $LOSV_L$ | GND | | 0.8 | V | |
| Receiver LOS Signal Output Voltage-High | $LOSV_H$ | 2.0 | | Vcc | V | |

**Note1:** Measured with a PRBS $2^7$-1 test pattern @1.25Gbps BER<$10^{-12}$.



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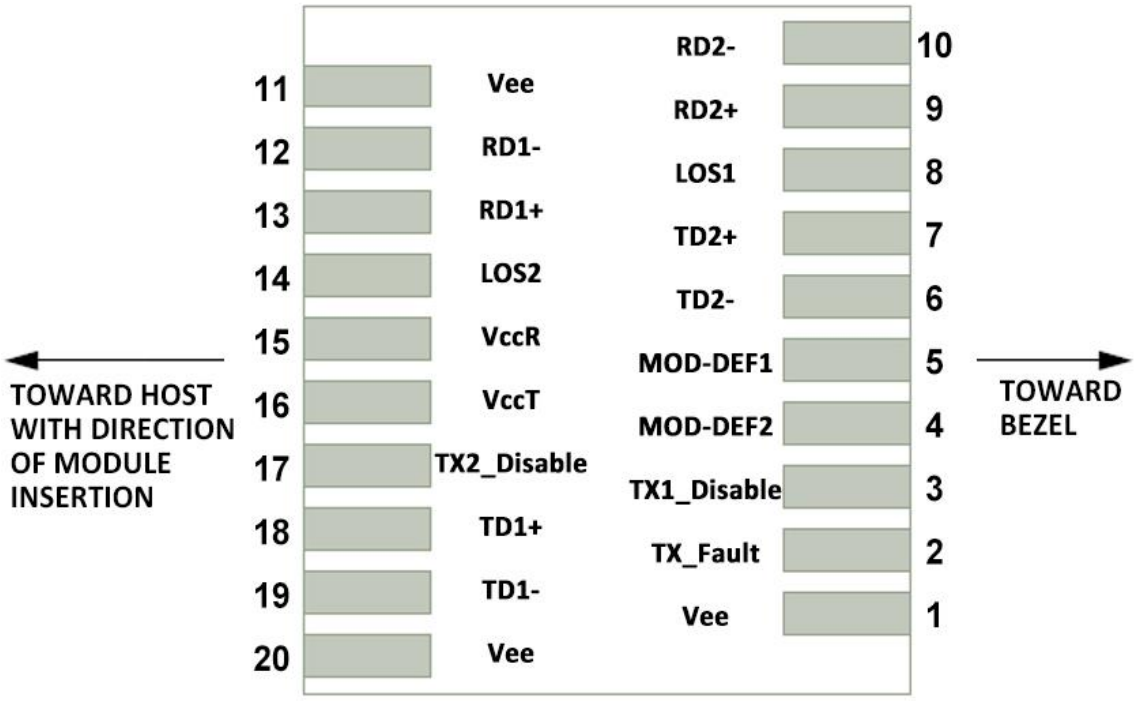
## Pin Assignment




Host PCB CSFP Pad Assignment Top View

## Pin Description

| Pin | Name | Function / Description |
|---|---|---|
| 1 | Vee | Transceiver Ground |
| 2 | Tx_Fault | Transmitter Fault Indication (1) |
| 3 | Tx1_Disable | Transmitter Disable of CH1 ( Turns off transmitter laser output of CH1 ) |
| 4 | MOD_DEF2 | 2-wire Serial Interface Data Line (SDA) |
| 5 | MOD_DEF1 | 2-wire Serial Interface Clock Line (SCL) |
| 6 | TD2- | Inverted Transmit Data Input of CH2 |
| 7 | TD2+ | Transmit Data Input of CH2 |
| 8 | LOS1 | Loss of signal for CH1 |
| 9 | RD2+ | Received Data Output of CH2 |
| 10 | RD2- | Inverted Received Data Output of CH2 |
| 11 | Vee | Transceiver Ground |
| 12 | RD1- | Inverted Received Data Output of CH1 |



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| | | |
|---|---|---|
| 13 | RD1+ | Received Data Output of CH1 |
| 14 | LOS2 | Loss of signal for CH2 |
| 15 | VccR | Receiver Power |
| 16 | VccT | Transmitter Power |
| 17 | Tx2_Disable | Transmitter Disable of CH2 ( Turns off transmitter laser output of CH2 ) |
| 18 | TD1+ | Transmit Data Input of CH1 |
| 19 | TD1- | Inverted Transmit Data Input of CH1 |
| 20 | Vee | Transceiver Ground |

**Note1:** Tx_Fault is internally OR output for Tx fault conditions in either Channel 1 or Channel 2. In order to determine which channel is at fault, the Host can read the internal memory bits for status:
- Bit2 in (A2h Byte#110) for Tx1 fault
- Bit2 in (B2h Byte#110) for Tx2 fault

## Digital Diagnostic Functions

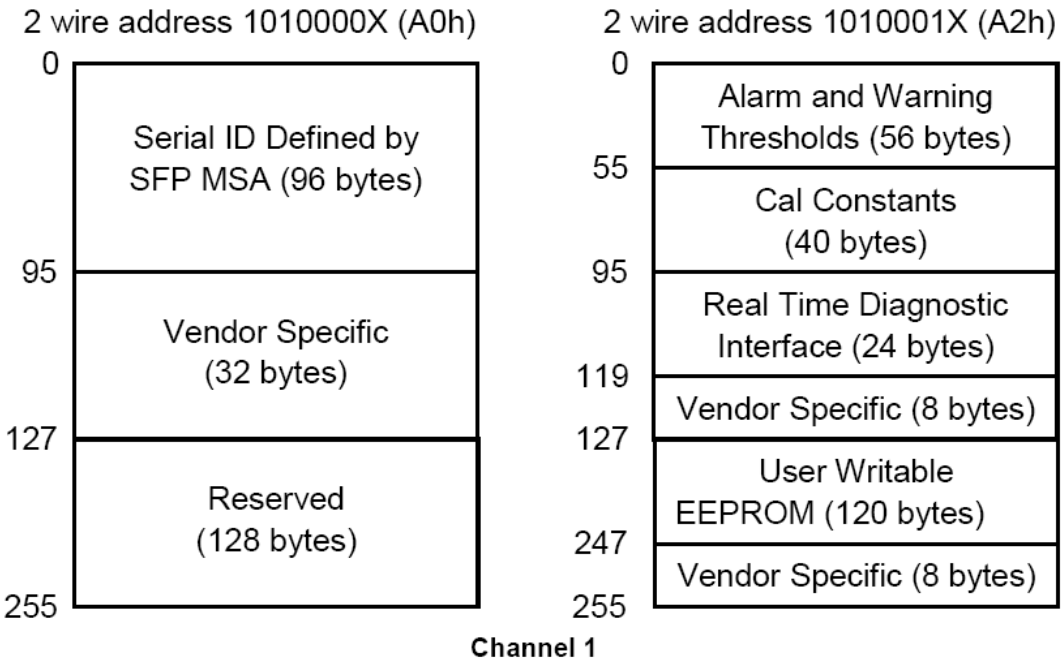
As defined by the SFP MSA (SFF-8472) Ficer's CSFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

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

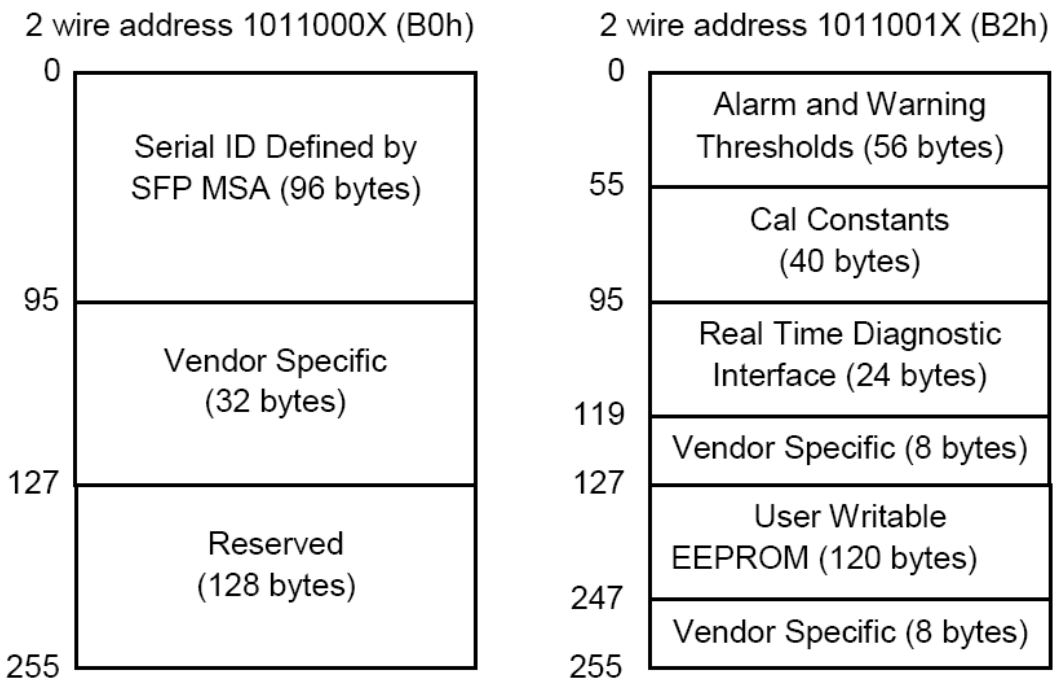
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Controller (DDC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.
For more detailed information including memory map definitions, please see the SFP MSA (SFF-8472) Specification.

## Digital Diagnostic Memory Map




**Channel 1**




**Channel 2**



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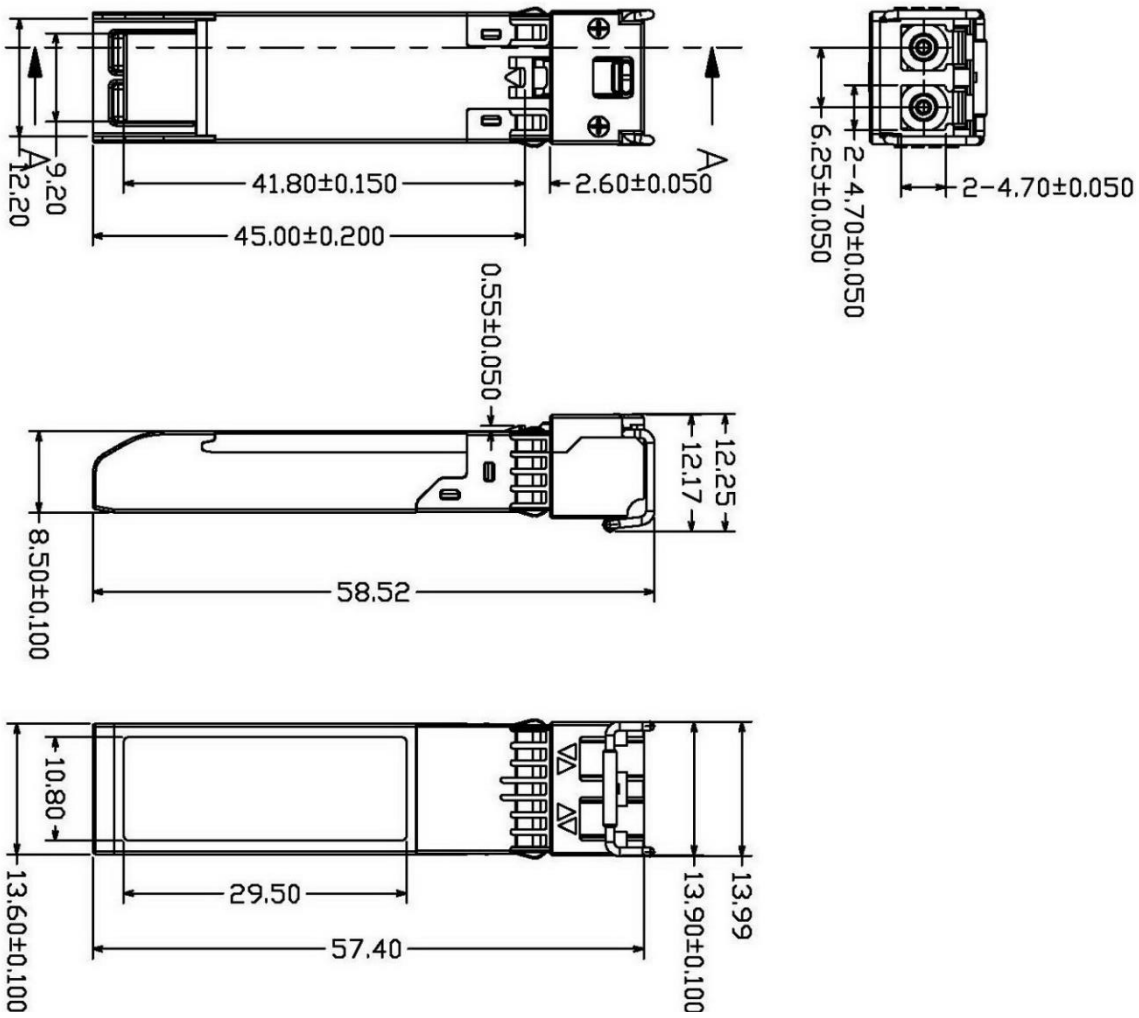
## Digital Diagnostic Monitoring Characteristics

| Parameter | Accuracy | Unit | Note |
|---|---|---|---|
| Temperature | ±3 | °C | Internal Calibration |
| Supply Voltage | ±0.1 | V | Internal Calibration |
| Tx Bias Current | ±5 | mA | Internal Calibration |
| Tx Output Power | ±3 | dB | Internal Calibration |
| Rx Received Optical Power | ±3 | dB | Internal Calibration |

## Mechanical Dimensions




**(All Dimensions are ±0.20mm Unless Otherwise Specified, Unit: mm)**

## Ordering Information

| Part No. | Tx | Rx | Link | DDM | Temp. |
|---|---|---|---|---|---|
| FSFP-CC-S53-20D | 1550nm | 1260nm ~ 1360nm | SMF 20km | Yes | 0~70°C |
| FSFP-CC-S53-20Di | | | | | -40~85°C |

**NOTE:** Distances are indicative only. To calculate a more precise link budget based on specific conditions in your application, please refer to the optical characteristics.



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