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| TITLE 1000BASE-T 100m SFP Copper | DOC No. | DTRX-002215 |
| | REVISION : 05 | AUTHORIZED BY : Mike Sun |
| | DATE : 2021.06.29 | CLASSIFICATION : |

1. Purpose

The 1G copper SFP is a electrical small form factor pluggable (SFP) transceiver module for the high performance integrated full duplex data link at 1.25Gbps over four pair Category 5 UTP. The transceiver module is compliant with the SFP multi source agreement (MSA) and IEEE802.3:2002. With the hot pluggability, the module offers a flexible and easy way to be installed into SFP MSA compliant ports at any time without the interruption of the host equipments operating online

2. General Description

1G Base T SFP Transceiver

| Part Number | Data Rate | Distance | Media | Mode | Connector | Tem. |
|--------------------|------------------|-----------------|--------------|-------------|------------------|-------------|
| P6000FABC001-1 | 1G | 100m | Cat 5 cable | SERDES | RJ45 | C |
| P6000MABC001-1 | 1G | 100m | Cat 5 cable | SGMII | RJ45 | C |
| P6000FABI001-1 | 1G | 100m | Cat 5 cable | SERDES | RJ45 | I |
| P6000MABI001-1 | 1G | 100m | Cat 5 cable | SGMII | RJ45 | I |

3. Feature

- 1.25 Gigabit Ethernet over Cat 5 cable
- Electrical interface specifications per SFF-8431
- Management interface specifications per SFF-8432 and SFF-8472
- 10/100/1000M BASE-T auto-negotiation operation in host systems with SGMII interface
- Up to 100m over Cat 5 cable
- Single +3.3V power supply
- 1.2W maximum power consumption with established link
- Operating temperature Options: 0~85°C
- RoHS Compliant

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4. Applications

- High speed storage area networks
- Switched Backplane Applications
- Switch to Switch Interface

Revision History

| Rev. | Comments | Date | Originator | Approval |
|-------------|----------------------------|-------------|-------------------|-----------------|
| 01 | Preliminary Draft | 2018.01.10 | Mike Sun | Ray Yang |
| 02 | Revise Part Number | 2018.05.14 | Mike Sun | Ray Yang |
| 03 | Added I-temp. Part Number | 2019.12.26 | Mike Sun | Ray Yang |
| 04 | Delete I-temp. Part Number | 2021.05.21 | Mike Sun | Ray Yang |
| 05 | Added I-temp. Part Number | 2021.06.29 | Mike Sun | Ray Yang |

5. Absolute Maximum Rating

| Parameter | Min | Max | Unit | Notes |
|-----------------------------|------------|------------|-------------|----------------------------|
| Operating Temperature | 0 | 70 | °C | Case temperature (C temp.) |
| Operating Temperature | 0 | 85 | °C | Case temperature(I temp.) |
| Storage Temperature | -40 | 85 | °C | Ambient temperature |
| Operating Relative Humidity | 5 | 95 | % | |

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6. Recommended Operating Conditions

| Parameter | Min | Typ | Max | Unit |
|-----------------|------|-----|---------|------|
| Supply Current | - | 320 | 400 | mA |
| Input Voltage | 3.13 | 3.3 | 3.47 | V |
| Maximum Voltage | - | - | 3.8 | V |
| I2C | 0 | - | 100,000 | Hz |

7. +3.3V Electrical Power Interface

| Parameter | Symbol | Min | Typ | Max | Units |
|-----------------|--------|------|-----|------|-------|
| Supply Current | IS | - | 320 | 400 | mA |
| Input Voltage | VCC | 3.13 | 3.3 | 3.47 | V |
| Maximum Voltage | VMAX | - | - | 3.8 | V |

Low-Speed Signals ,Electronic Characteristics

| Parameter | Symbol | Min | Max | Units | Notes |
|-----------------|--------|--------------|--------------|-------|------------------------------------|
| SFP Output LOW | VOL | 0 | 0.5 | V | |
| SFP Output HIGH | VOH | Host_VCC-0.5 | Host_VCC+0.3 | V | 4.7k to 10k pull-up to host_VCC |
| SFP Input LOW | VIL | 0 | 0.8 | V | measured at host side of connector |
| SFP Input HIGH | VIH | 2 | VCC+0.3 | V | |

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8. Low-Speed Signals ,Electronic Characteristics

| Parameter | Symbol | Min | Typ | Max | Units | Conditions / Notes |
|---------------------|---------|-----|-----|-----|-------|---------------------------------|
| Line Frequency | Lf | - | 125 | - | MHz | 5-level encoding, per IEEE802.3 |
| Tx Output Impedance | ZOUT,TX | | 100 | | Ohm | |
| Rx Input Impedance | ZIN,RX | - | 100 | - | Ohm | |

High-Speed Electrical Interface, Host-SFP

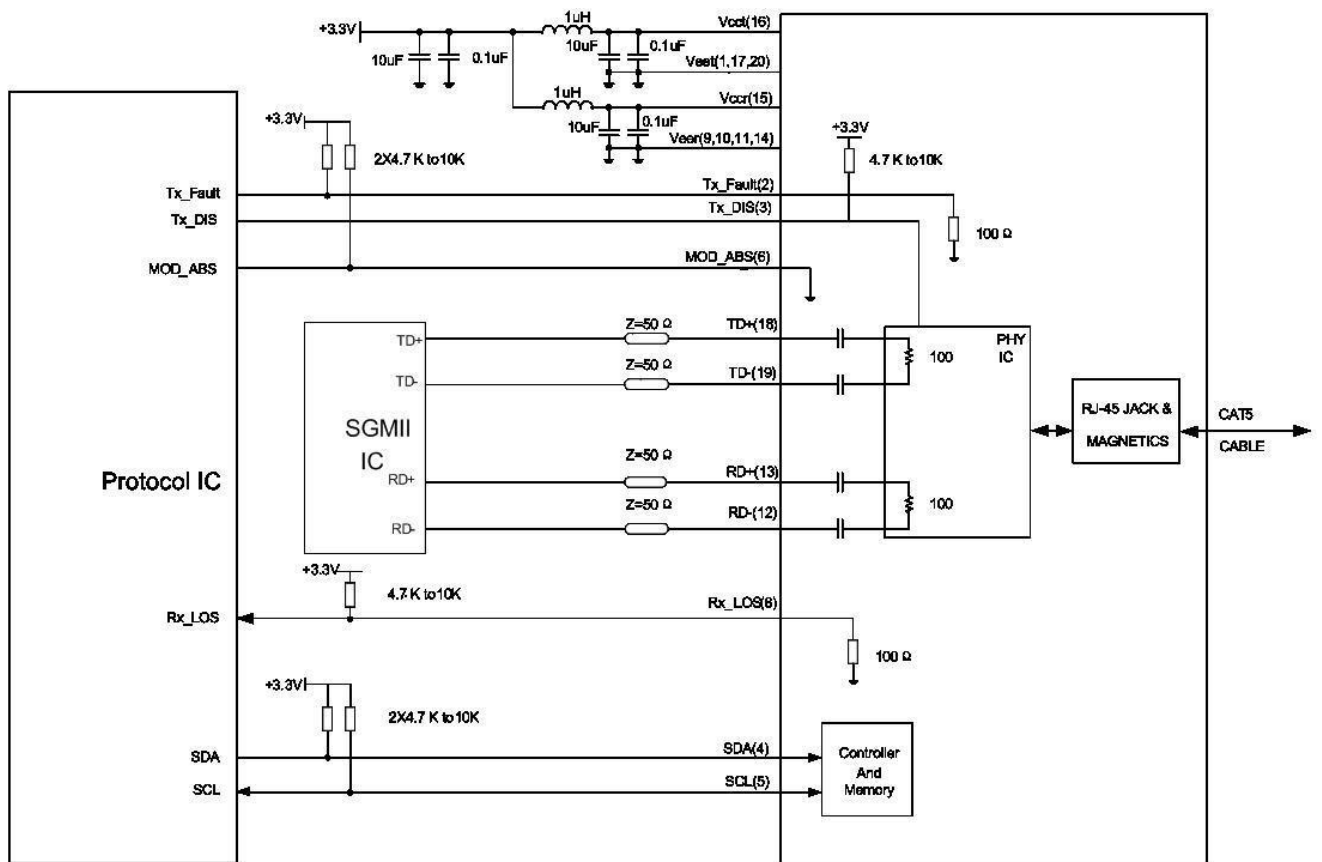
| Parameter | Symbol | Min | Typ | Max | Units | Conditions / Notes |
|--|---------|-----|-----|------|-------|-----------------------------|
| Transmitter Differential Input Voltage | VIN | 500 | - | 2400 | mV | Differential voltage swings |
| Receiver Differential Output Voltage | VOUT | 700 | - | 1600 | mV | Differential voltage swings |
| Rise and Fall Time | tr / tf | - | 175 | - | ps | 20% - 80% |
| Tx Input Impedance | ZIN | - | 50 | - | Ohm | Single ended |
| Rx Output Impedance | ZOUT | - | 50 | - | Ohm | Single ended |

General

| Parameter | Symbol | Min | Typ | Max | Units | Conditions / Notes |
|--------------|--------|-----|-----|------|--------|----------------------------|
| Data Rate | BR | 10 | | 1000 | Mb/sec | IEEE802.3 compatible. |
| Cable Length | L | - | - | 100 | m | Category 5 UTP. BER <1E-12 |

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9. Power supply and voltage detection circuitry



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Serial Communication Protocol

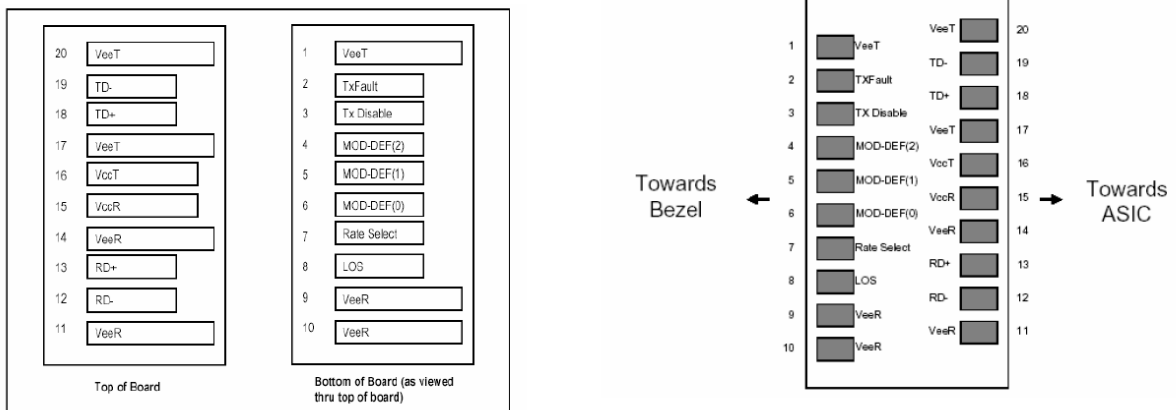
EEPROM Serial ID Memory Contents at address A0

All JPC SFP support the 2-wire serial communication protocol outlined in the SFP MSA. These SFP use an 128 byte E2PROM with an address of A0h.

Internal ASIC Registers

The 1000BASE-T physical layer IC can also be accessed via the 2-wire serial bus at address A0h.

10. Pin Description



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11. Module Pin Definitions

| Pin No. | Pin Name | Function | Plug Seq. | Notes |
|---------|-------------|------------------------------|-----------|-------|
| 1 | VeeT | Transmitter Ground | 1 | |
| 2 | TX Fault | Transmitter Fault Indication | 3 | 1 |
| 3 | TX Disable | Transmitter Disable | 3 | 2 |
| 4 | MOD_DEF 2 | Module Definition 2 | 3 | 3 |
| 5 | MOD_DEF 1 | Module Definition 1 | 3 | 3 |
| 6 | MOD_DEF 0 | Module Definition 0 | 3 | 3 |
| 7 | Rate Select | Not connected 3 4 | 3 | 4 |
| 8 | RX_LOS | Receiver Loss of Signal | 3 | 5 |
| 9 | VeeR | Receiver Ground | 1 | 6 |
| 10 | VeeR | Receiver Ground | 1 | 6 |
| 11 | VeeR | Receiver Ground | 1 | 6 |
| 12 | RD - | Inv. Received Data Out | 3 | 7 |
| 13 | RD + | Received Data Out | 3 | 7 |
| 14 | VeeR | Receiver Ground | 1 | 6 |
| 15 | VccR | Receiver Power | 2 | 8 |
| 16 | VccT | Transmitter Power | 2 | 8 |
| 17 | VeeT | Transmitter Ground | 1 | 6 |
| 18 | TD + | Transmit Data In | 3 | 9 |
| 19 | TD - | Inv. Transmit Data In | 3 | 9 |
| 20 | VeeT | Transmitter Ground | 1 | 6 |

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Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

1.TX Fault is not supported.

2.TX disable, an input used to reset the transceiver module, is pulled up within the module with a 4.7 – 10 K. resistor. Its states are: Low (0 – 0.8V): transceiver module on. (>0.8, < 2.0V): Undefined. High (2.0 – 3.465V): transceiver module disabled.

Open: transceiver module disabled.

3.Mod-Def 0,1,2, are the module definition pins, which should be pulled up with a 4.7K - 10K resistor on the host board. The pull-up voltage shall be VccT or VccR. Mod-Def 0 is grounded in 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..

4.Rate select is not required for connection.

5.RX_LOS (Loss of Signal): LVTTTL compatible with a maximum voltage of 2.5V.

6.VeeR and VeeT may be internally connected within the SFP module.

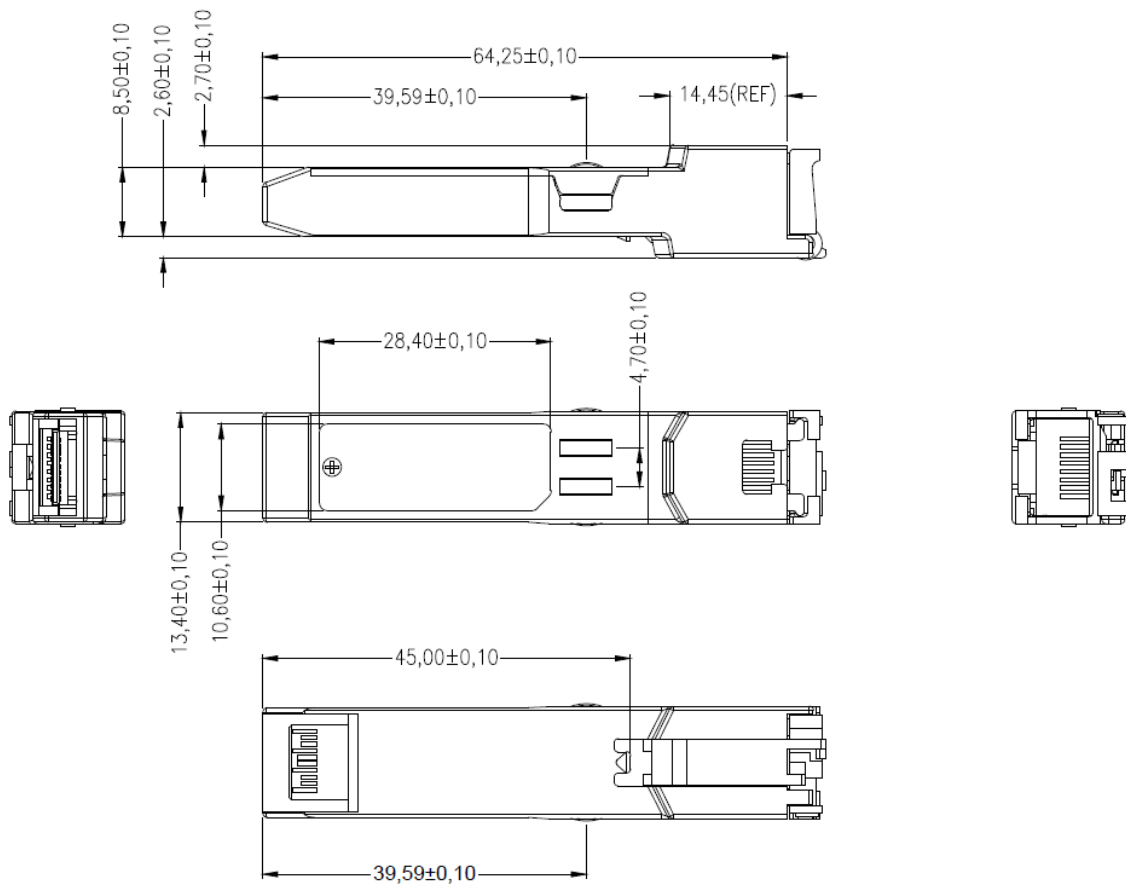
7.RD-/+ , the differential receiver outputs, are AC coupled 100Ω differential lines which should be terminated with 100 M differential at the user SerDes.

8.VccR and VccT are the receiver and transmitter power supplies defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 400 mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 M 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.

9.TD-/+ , the differential transmitter inputs, are AC-coupled differential lines with 100M differential termination inside the module. The AC coupling is done inside the module, thus not required on the host board. The inputs will accept differential swings of 500 – 2400mV (250 mV - 1200 mV single ended), though it is recommended that values between 500 and 1200mV differential (250 – 600mV single ended) be used for best EMI performance.

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12. Mechanical Design Diagram



Units: mm