

### FC9686MS05-PRO

Fujitsu® FC9686MS05 Compatible TAA Compliant 1000Base-DWDM 100GHz SFP Transceiver (SMF, 1556.55nm, 80km, DOM, 0 to 70C, LC)

#### Features

- INF-8074 and SFF-8472 Compliance
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Single-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free



#### Applications:

- Gigabit Ethernet over DWDM
- 1x Fibre Channel
- Access, Metro and Enterprise

#### Product Description

This Fujitsu® FC9686MS05 compatible SFP transceiver provides 1000Base-DWDM throughput up to 80km over single-mode fiber (SMF) using a wavelength of 1556.55nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Fujitsu® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

Proline's transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products.



## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

## Wavelength Guide (100GHz ITU-T Channel)

| ITU Channel # | Frequency (THZ) | Center Wavelength (nm) |
|---------------|-----------------|------------------------|
| 61            | 196.1           | 1528.77                |
| 60            | 196.0           | 1529.55                |
| 59            | 195.9           | 1530.33                |
| 58            | 195.8           | 1531.12                |
| 57            | 195.7           | 1531.90                |
| 56            | 195.6           | 1532.68                |
| 55            | 195.5           | 1533.47                |
| 54            | 195.4           | 1534.25                |
| 53            | 195.3           | 1535.04                |
| 52            | 195.2           | 1535.82                |
| 51            | 195.1           | 1536.61                |
| 50            | 195.0           | 1537.40                |
| 49            | 194.9           | 1538.19                |
| 48            | 194.8           | 1538.98                |
| 47            | 194.7           | 1539.77                |
| 46            | 194.6           | 1540.56                |
| 45            | 194.5           | 1541.35                |
| 44            | 194.4           | 1542.14                |
| 43            | 194.3           | 1542.94                |
| 42            | 194.2           | 1543.73                |
| 41            | 194.1           | 1544.53                |
| 40            | 194.0           | 1545.32                |
| 39            | 193.9           | 1546.12                |
| 38            | 193.8           | 1546.92                |
| 37            | 193.7           | 1547.72                |
| 36            | 193.6           | 1548.51                |
| 35            | 193.5           | 1549.32                |
| 34            | 193.4           | 1550.12                |
| 33            | 193.3           | 1550.92                |
| 32            | 193.2           | 1551.72                |
| 31            | 193.1           | 1552.52                |
| 30            | 193.0           | 1553.33                |
| 29            | 192.9           | 1554.13                |
| 28            | 192.8           | 1554.94                |
| 27            | 192.7           | 1555.75                |
| 26            | 192.6           | 1556.55                |

|    |       |         |
|----|-------|---------|
| 25 | 192.5 | 1557.36 |
| 24 | 192.4 | 1558.17 |
| 23 | 192.3 | 1558.98 |
| 22 | 192.2 | 1559.79 |
| 21 | 192.1 | 1560.61 |
| 20 | 192.0 | 1561.42 |
| 19 | 191.9 | 1562.23 |
| 18 | 191.8 | 1563.05 |
| 17 | 191.7 | 1563.86 |

### Absolute Maximum Ratings

| Parameter                  | Symbol           | Min. | Max. | Unit |
|----------------------------|------------------|------|------|------|
| Maximum Supply Voltage     | V <sub>CC</sub>  | -0.5 | 3.6  | V    |
| Storage Temperature        | T <sub>S</sub>   | -40  | 85   | °C   |
| Operating Case Temperature | T <sub>C</sub>   | 0    | 70   | °C   |
| Operating Humidity         | RH               | 0    | 95   | %    |
| Receiver Power             | R <sub>MAX</sub> |      | -3   | dBm  |
| Maximum Bitrate            | B <sub>max</sub> |      | 1.25 | Gbps |

### Electrical Characteristics (TOP=25°C, V<sub>CC</sub>=3.3Volts)

| Parameter                      | Symbol               | Min. | Typ. | Max. | Unit | Notes |
|--------------------------------|----------------------|------|------|------|------|-------|
| Power Supply Voltage           | V <sub>CC</sub>      | 3.15 | 3.30 | 3.45 | V    |       |
| Power Supply Current           | I <sub>CC</sub>      |      |      | 300  | mA   |       |
| <b>Transmitter</b>             |                      |      |      |      |      |       |
| Differential data input swing  | V <sub>in,pp</sub>   | 120  |      | 850  | mV   |       |
| Input differential impedance   | Z <sub>in</sub>      | 80   | 100  | 120  | Ω    |       |
| <b>Receiver</b>                |                      |      |      |      |      |       |
| Differential data output swing | V <sub>out, pp</sub> | 300  |      | 850  | mV   |       |
| Output differential impedance  | Z <sub>in</sub>      | 80   | 100  | 120  | Ω    |       |

## Optical Characteristics

| Parameter                | Symbol     | Min.  | Typ. | Max.  | Unit | Notes |
|--------------------------|------------|-------|------|-------|------|-------|
| <b>Transmitter</b>       |            |       |      |       |      |       |
| Optical Power (average)  | $P_{AVE}$  | 0     |      | 5     | dBm  | 1     |
| Optical Wavelength       | $T\lambda$ | x-0.1 | x    | X+0.1 | nm   |       |
| Optical Extinction Ratio | ER         | 8.2   |      |       | dB   |       |
| Channel Spacing          | $\Delta f$ |       | 100  |       | GHz  |       |
| Insertion loss           | IL         |       | 0.7  |       |      |       |
| <b>Receiver</b>          |            |       |      |       |      |       |
| Receiver Sensitivity     | $P_{min}$  |       |      | -24   | dBm  | 2     |
| Receiver overload        | $P_{max}$  | -10   |      |       | dBm  | 3     |
| Receiver wavelength      | $R\lambda$ | 1260  |      | 1620  | nm   |       |

### Notes:

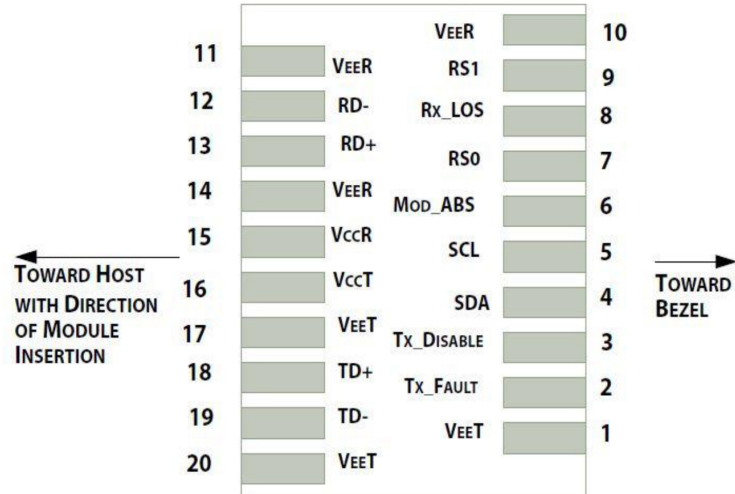
1. Coupled into a Single-mode fibre
2. Minimum average optical power is measured at BER less than  $1E-12$ , with  $2^7-1$  PRBS and ER=9 dB
3. Exceeding the Receiver overload can physically damage the module. Please use appropriate attenuation.

## Pin Descriptions

| Pin | Symbol     | Name/Descriptions  | Ref. |
|-----|------------|--|------|
| 1   | VeeT       | Transmitter Ground (Common with Receiver Ground).                              | 1    |
| 2   | TX Fault   | Transmitter Fault. LVTTTL-O  | 2    |
| 3   | TX Disable | Transmitter Disable. Laser output disabled on high or open. LVTTT-I.           | 3    |
| 4   | SDA        | 2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTTL-I/O. |      |
| 5   | SCL        | 2-Wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i). LVTTTL-I.   |      |
| 6   | MOD_ABS    | Module Absent, Connect to VeeT or VeeR in Module.                              | 4    |
| 7   | RS0        | Rate Select 0. Not used  | 5    |
| 8   | LOS        | Loss of Signal indication. Logic 0 indicates normal operation. LVTTTL-O.       | 2    |
| 9   | RS1        | Rate Select 1. Not used  | 5    |
| 10  | VeeR       | Receiver Ground (Common with Transmitter Ground).                              | 1    |
| 11  | VeeR       | Receiver Ground (Common with Transmitter Ground).                              | 1    |
| 12  | RD-        | Receiver Inverted DATA out. AC Coupled. CML-O.                                 |      |
| 13  | RD+        | Receiver Non-inverted DATA out. AC Coupled. CML-O.                             |      |
| 14  | VeeR       | Receiver Ground (Common with Transmitter Ground).                              | 1    |
| 15  | VccR       | Receiver Power Supply.   |      |
| 16  | VccT       | Transmitter Power Supply.  |      |
| 17  | VeeT       | Transmitter Ground (Common with Receiver Ground).                              | 1    |
| 18  | TD+        | Transmitter Non-Inverted DATA in. AC Coupled. CML-I.                           |      |
| 19  | TD-        | Transmitter Inverted DATA in. AC Coupled. CML-O.                               |      |
| 20  | VeeT       | Transmitter Ground (Common with Receiver Ground).                              | 1    |

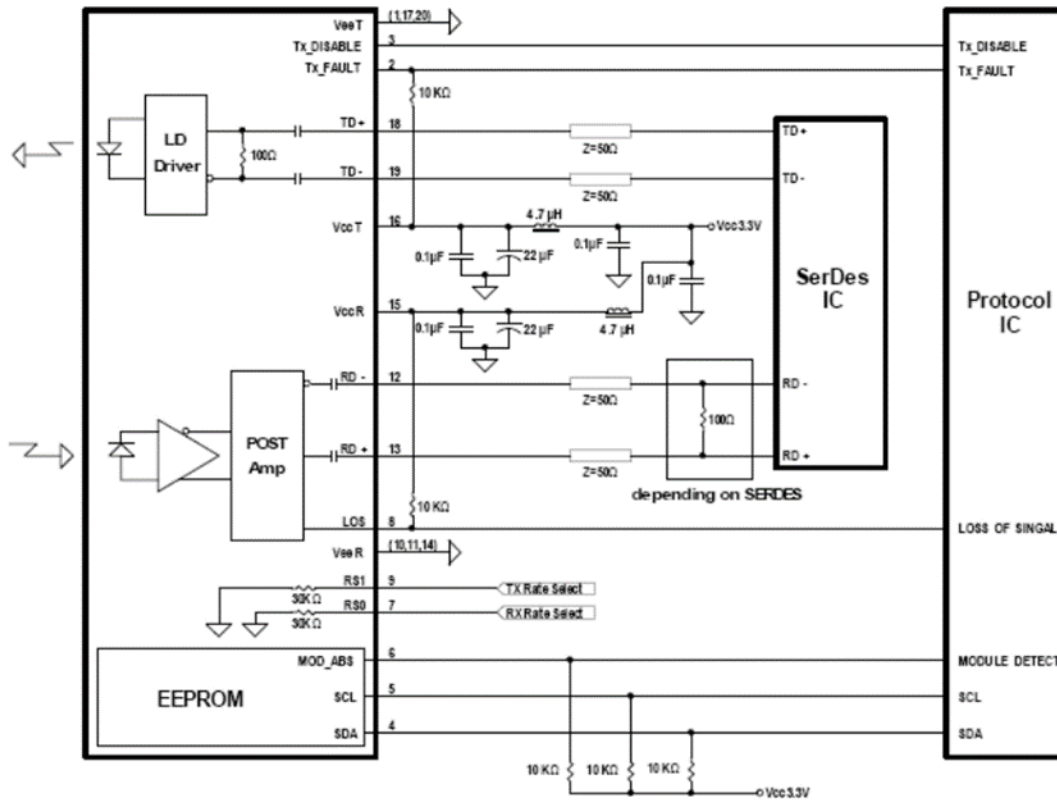
### Notes:

1. The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
2. This contact is an open collector/drain output and should be pulled up to the Vcc\_Host with resistor in the range 4.7KΩ to 10KΩ. Pull ups can be connected to one or several power supplies, however the host board design shall ensure that no module contract has voltage exceeding module VccT/R +0.5.V.
3. Tx\_Disable is an input contact with a 4.7KΩ to 10KΩ pull-up resistor to VccT inside module.
4. Mod\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull the contract up to Vcc\_Host with a resistor in the range from 4.7KΩ to 10KΩ. Mod\_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.
5. Internally pulled down per SFF-8431



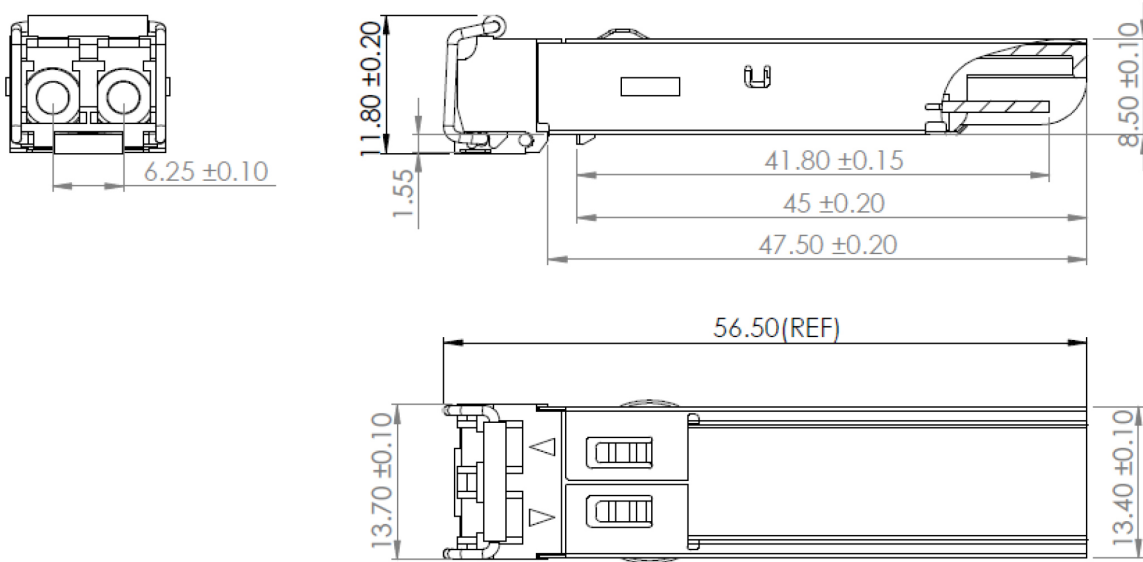
Pin-out of connector Block on Host board

Recommended Circuit Schematic



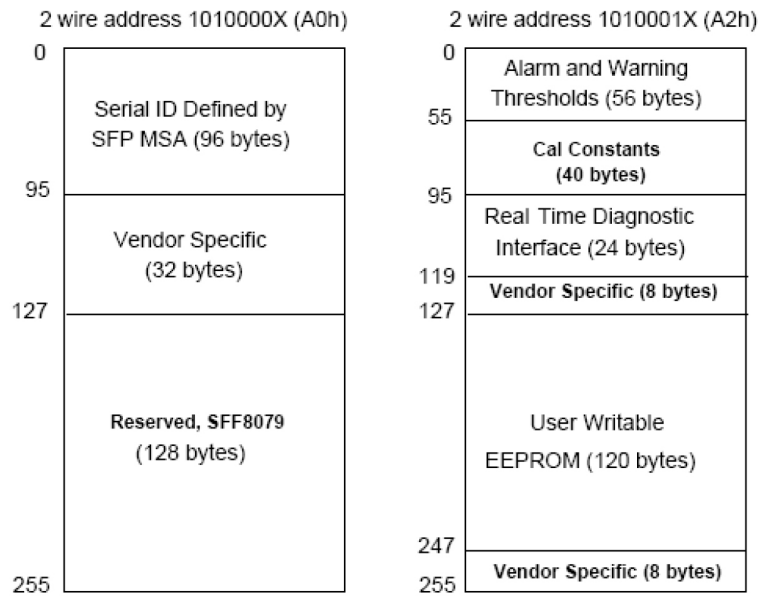
### Mechanical Specifications

Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



### EEPROM Information

EEPROM memory map specific data field description is as below:



**About Us:**

Proline Options is one of North America's leading providers of transceivers and high speed cabling. With a reputation for quality, tested products that cover the connectivity spectrum, Proline Options has a solution for you regardless of the specification.

At Proline Options, every product is tested in its intended application - never batch or spec tested only. We run bandwidth, distance and IOS network tests. We have documented an impressive 0.03% failure rate over the last 10 years. To continue this rate of success we invest millions annually in our own on-site testing lab.



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