

# μSFP

## **World's smallest hot pluggable optical fibre transceiver The next generation 10G optical transceiver module**

The μSFP pluggable optical fibre transceiver is a compact solution for 1 Gbps to 10 Gbps optical fibre datalinks using a duplex LC connector interface. It comes in a sugar cube size package offering very small footprint (13.5 x 20.5 mm) and low height (10.4 mm).

The μSFP transceiver is fully compliant with 10G Ethernet and 8.5G Fibre Channel standards. Backwards, it supports 1G Ethernet and 1x/2x/4x Fibre Channel communication. Its pinout and electrical interface are fully compatible with SFP/SFP+ specification, enabling seamless integration into existing designs.

μSFP transmitter employs 850 nm vertical cavity surface emitting laser (VCSEL) and a receiver with a PIN photodiode. Data input and output ports employ CML differential signalling with back termination on device. The μSFP transceiver supports full-featured two-wire SFF8472 diagnostic monitoring protocol, offering ability to monitor real-time parameters of the SFP such as optical output power, optical input power, temperature, laser bias current, and transceiver supply voltage. In addition, μSFP offers separate hardware control signals for rate selection and Tx disabling, as well as signal lines for reporting Tx Fault and LOS conditions.

For ease of manufacturing μSFP comes with high-speed connector compatible with standard pick-and-place SMT assembly process. Its PCB metal case ensures smooth sliding and secure latching of transceiver device, even in case of high vibrations. It is possible to remove μSFP transceiver during operation and to replace it just by using simple tool.

Evaluation board with software package is available for those interested in evaluating transceiver performance.

Supported data rates: 1.0625 Gbps – 10.3215 Gbps



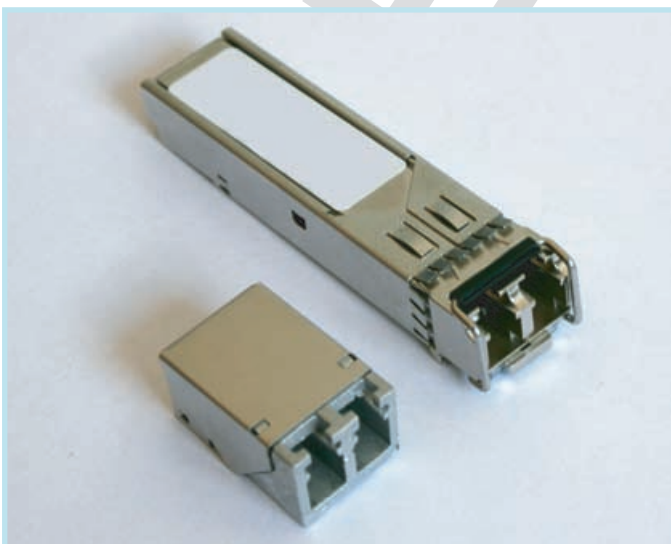
- Data rate up to 10.3215 Gbps
- Duplex LC connector
- Extremely compact (45 % of SFP)
- Hot pluggable
- SFP+ compatible at electrical interface
- SMT mount process compatible
- 10G Ethernet compliant
- 8x Fibre Channel compliant
- 850 nm multimode transmission
- Full SFF8472 diagnostic monitoring
- CML inputs and outputs
- TTL signal detect indicator
- Single 3.3 V power supply
- Class 1 laser product (EN60825-1)
- RoHS compliant

### **Compliance with:**

- IEEE802.3ae 10G BASE-SW/SR
- 8.5G Fiber Channel  
800-M5-SN-I and 800-M6-SN-I standards
- 4.25G Fiber Channel  
400-M5-SN-I and 1400-M6-SN-I standards
- 2.125G Fiber Channel  
200-M5-SN-I and 200-M6-SN-I standards
- 1.06625G Fiber Channel  
100-M5-SN-I and 100-M6-SN-I standards
- IEEE802.3z Gigabit Ethernet Standard
- SFF8472 diagnostic monitoring interface
- Duplex LC connector system

### **Applications & Industries:**

- Rack to rack
- Data Centers
- Premises
- Switches and Routers
- Military
- Avionics
- Oil & Gas
- Broadcast



*μSFP transceiver compared to standard SFP form factor*

# μSFP - 10G miniature optical transceiver datasheet

## Absolute Maximum Ratings

| Parameter                            | Symbol | Min         | Max         | Units |
|--------------------------------------|--------|-------------|-------------|-------|
| Storage Temperature                  | Ts     | -40         | 100         | °C    |
| Optical Input Power (max)            | Pin    |             | +5          | dBm   |
| Supply Voltage                       | Vcc    | -0.3        | 4.0         | V     |
| Input Voltage                        | Vin    | -0.3        | 4.0         | V     |
| Voltage at TX_DISABLE, TX_FAULT, LOS |        | -0.3        | Vcc + 0.3 V | V     |
| Voltage at ROUT+, ROUT-              |        | Vcc - 1 V   | Vcc + 0.3 V | V     |
| Voltage at TIN+, TIN-                |        | Vcc - 2.5 V | Vcc - 0.5 V | V     |
| Current into FAULT, LOS              |        | -1          | 5           | mA    |
| Current into ROUT+, ROUT-            |        |             | 40          | mA    |

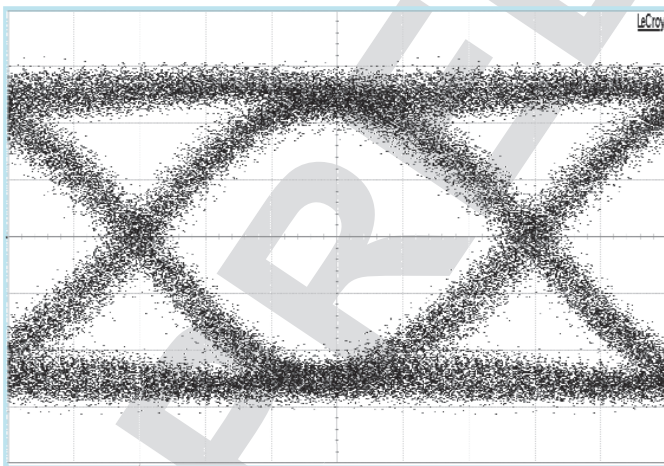
## Recommended Operating Conditions

| Parameter                  | Symbol | Min  | Max | Units |
|----------------------------|--------|------|-----|-------|
| Case Operating Temperature | Tc     | -5   | 75  | °C    |
| Supply Voltage             | Vcc    | 2.97 | 3.6 | V     |
| Supply Current             | Icc    |      | 230 | mA    |

## Receiver Electro-Optical Characteristics

| Parameter                                | Symbol    | Min | Typ | Max | Units |
|--|-----------|-----|-----|-----|-------|
| Optical Overload                         | Pov       | 1.5 |     |     | dBm   |
| Receiver Sensitivity (@ 10.32 Gbps, OMA) | Pthr      |     | -13 | -12 | dBm   |
| Operating Center Wavelength              | λc        | 840 |     | 860 | nm    |
| Differential Output Voltage              | Vdiff     |     |     | 285 | mV    |
| LOS Assert Time                          | tA,RX_LOS | 2.3 |     | 80  | μs    |
| LOS Deassert Time                        | tD,RX_LOS | 2.3 |     | 80  | μs    |

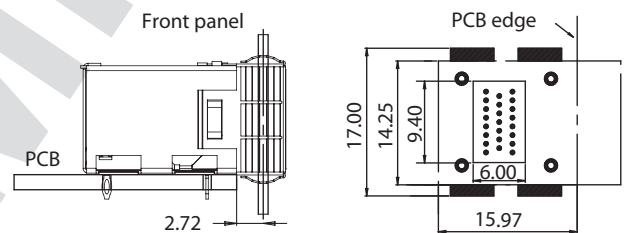
Orderable part number: TO-USFP-SX-10G-P



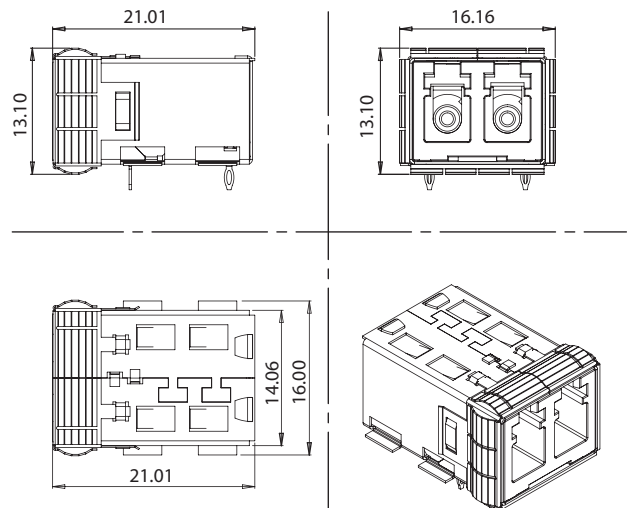
Eye opening diagram @ 10.3125 Gbps (73 mV/16.2 ps per division)

## Transmitter Electro-Optical Characteristics

| Parameter   | Symbol | Min   | Typ | Max  | Units |
|---|--------|-------|-----|------|-------|
| Output Optical Power (50/125 μm fiber, NA=0.20) (62.5/125 μm fiber, NA=0.275) | Pout   | -9    |     | -1.4 | dBm   |
| Center Wavelength   | λc     | 840   | 850 | 860  | nm    |
| Spectral Width (RMS) (Pout=0.5 mW, 10.3125 Gbps)                              | Δλ     |       |     | 0.4  | nm    |
| Relative Intensity Noise (@ 10.3125 Gbps)                                     | RIN    |       |     | -130 | dB/Hz |
| Differential Input Voltage (1.0625 Gbps to 4.25 Gbps)                         | Vdiff  | 0.2   |     | 2.4  | V     |
| Differential Input Voltage (4.25 Gbps to 10.3125 Gbps)                        | Vdiff  | 0.075 |     | 0.8  | V     |
| TX_DISABLE Assert Time  | tOFF   |       |     | 1    | μs    |
| TX_DISABLE Deassert Time  | tON    |       |     | 500  | μs    |
| TX_FAULT Assert Time  | tFAULT |       |     | 10   | μs    |
| Time to initialize, including reset of TX_FAULT                               | tINIT  |       |     | 100  | ms    |
| TX_DISABLE high time to reset fault condition                                 | tRESET | 5     |     |      | μs    |



μSFP front panel mechanical positioning and PCB footprint



Overall dimensions of μSFP connector with casing

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