
## Features

- SFP Multi-Source Agreement compliance
- Compliant with Fiber Channel 100-MS-SN-I and 100-M6-SN-I standard
- Compliant with IEEE802.3z Gigabit Ethernet standard
- SONET OC12/SDH STM-4 application
- Industry standard small form pluggable (SFP) package
- Duplex LC connector
- Differential LVPECL inputs and outputs
- Single power supply 3.3V
- TTL signal detect indicator
- Hot Pluggable
- Class 1 laser product complies with EN 60825-1
- RoHS compliant

## Application

- Distributed multi-processing
- Switch to switch interface
- High speed I/O for file server
- Bus extension application
- Channel extender, data storage

## Absolute Maximum Ratings

| *Parameter* | *Symbol* | *Min.* | *Max.* | *Units* | *Note* |
|---|---|---|---|---|---|
| Storage Temperature | $T_S$ | –40 | 85 | °C | |
| Supply Voltage | *Vcc* | –0.5 | 4.0 | V | |
| Input Voltage | $V_{IN}$ | –0.5 | *Vcc* | V | |
| Output Current | $I_o$ | --- | 50 | mA | |
| Operating Current | $I_{OP}$ | --- | 400 | mA | |

## Recommended Operating Conditions

| *Parameter* | *Symbol* | *Min.* | *Max.* | *Units* | *Note* |
|---|---|---|---|---|---|
| Case Operating Temperature | $T_C$ | 0 | 70 | °C | OP6C-M02-13-C |
| | | -40 | 85 | °C | OP6C-M02-13-I |
| Supply Voltage | *Vcc* | 3.1 | 3.5 | V | |
| Supply Current | $I_{TX} + I_{RX}$ | --- | 250 | mA | |

## Transmitter Electro-optical Characteristics

***Vcc* = 3.1 V to 3.5 V, $T_C$ = 0 °C to 70 °C ( -40 °C to 85 °C )**

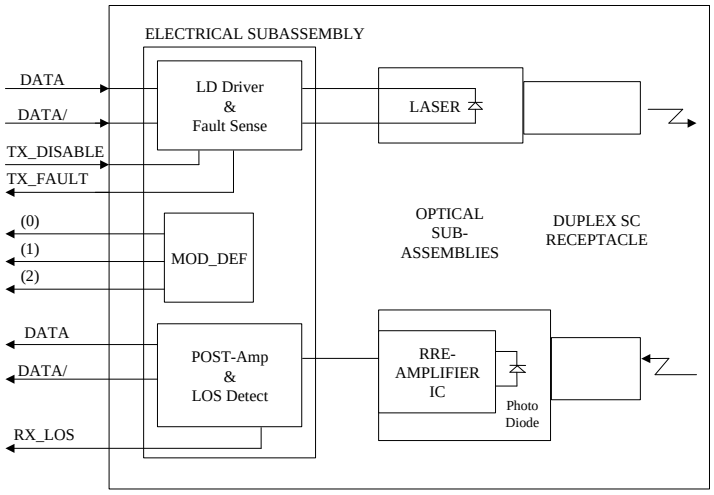
| *Parameter* | *Symbol* | *Min.* | *Typ.* | *Max.* | *Units* | *Note* |
|---|---|---|---|---|---|---|
| Output Optical Power<br>(50/125 $\mu$m fiber, NA=0.20)<br>(62.5/125$\mu$m fiber, NA=0.275) | $P_{out}$ | –9 | --- | -1 | dBm | Average |
| Extinction Ratio | *ER* | 9 | --- | --- | dB | |
| Center Wavelength | $\lambda_C$ | 1270 | 1310 | 1355 | nm | |
| Spectral Width (RMS) | $\Delta\lambda$ | --- | --- | 4 | nm | |
| Rise/Fall Time, (20–80%) | $T_{r,\ f}$ | --- | --- | 260 | ps | |
| Total Jitter | *TJ* | --- | --- | 227 | ps | |
| Output Eye | | | Compliant with IEEE802.3z | | | |
| Max. $P_{out}$ TX-DISABLE Asserted | $P_{OFF}$ | --- | --- | –45 | dBm | |
| Differential Input Voltage | $V_{DIFF}$ | 0.4 | --- | 2.0 | V | |

## Receiver Electro-optical Characteristics

***Vcc* = 3.1 V to 3.5 V, $T_C$ = 0 °C to 70 °C (-40 °C to 85 °C)**

| *Parameter* | *Symbol* | *Min.* | *Typ.* | *Max.* | *Units* | *Note* |
|---|---|---|---|---|---|---|
| Optical Input Power-maximum | $P_{IN}$ | -1 | --- | --- | dBm | BER < $10^{-12}$ |
| Optical Input Power-minimum (Sensitivity) | $P_{IN}$ | --- | --- | –19 | dBm | BER < $10^{-12}$ |
| Operating Center Wavelength | $\lambda_C$ | 1260 | --- | 1610 | nm | |
| Optical Return Loss | *ORL* | 12 | --- | --- | dB | |
| Signal Detect-Asserted | $P_A$ | --- | --- | -19 | dBm | |
| Signal Detect-Deasserted | $P_D$ | –35 | --- | --- | dBm | |
| Differential Output Voltage | $V_{DIFF}$ | 0.5 | --- | 1.2 | V | |
| Data Output Rise, Fall Time (20–80%) | $T_{r,f}$ | --- | --- | 0.35 | ns | |
| Receiver Loss of Signal Output Voltage-Low | $RX\_LOS_L$ | 0 | --- | 0.5 | V | |
| Receiver Loss of Signal Output Voltage-High | $RX\_LOS_H$ | 2.4 | --- | $V_{CC}$ | V | |

## Block Diagram of Transceiver




TOP VIEW (Label side)

**Transmitter Section**

The transmitter section consists of a 1310 nm InGaAsP laser in an eye safe optical subassembly (OSA) which mates to the fiber cable. The laser OSA is driven by a LD driver IC which converts differential input LVPECL logic signals into an analog laser driving current.

**TX_DISABLE**

The TX_DISABLE signal is high (TTL logic “1”) to turn off the laser output. The laser will turn on within 1ms when TX_DISABLE is low (TTL logic “0”).

**Receiver Section**

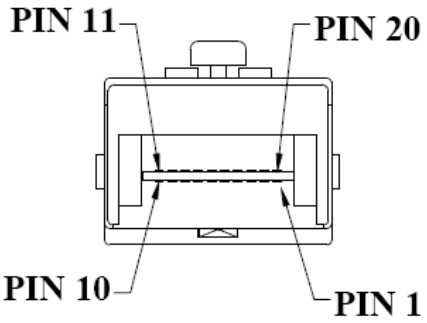
The receiver utilizes a MSM detector integrated with a trans-impedance preamplifier in an OSA. This OSA is connected to a circuit providing post-amplification quantization, and optical signal detection.

**Receive Loss (RX_LOS)**

The RX_LOS is high (logic “1”) when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

## Pin Assignment

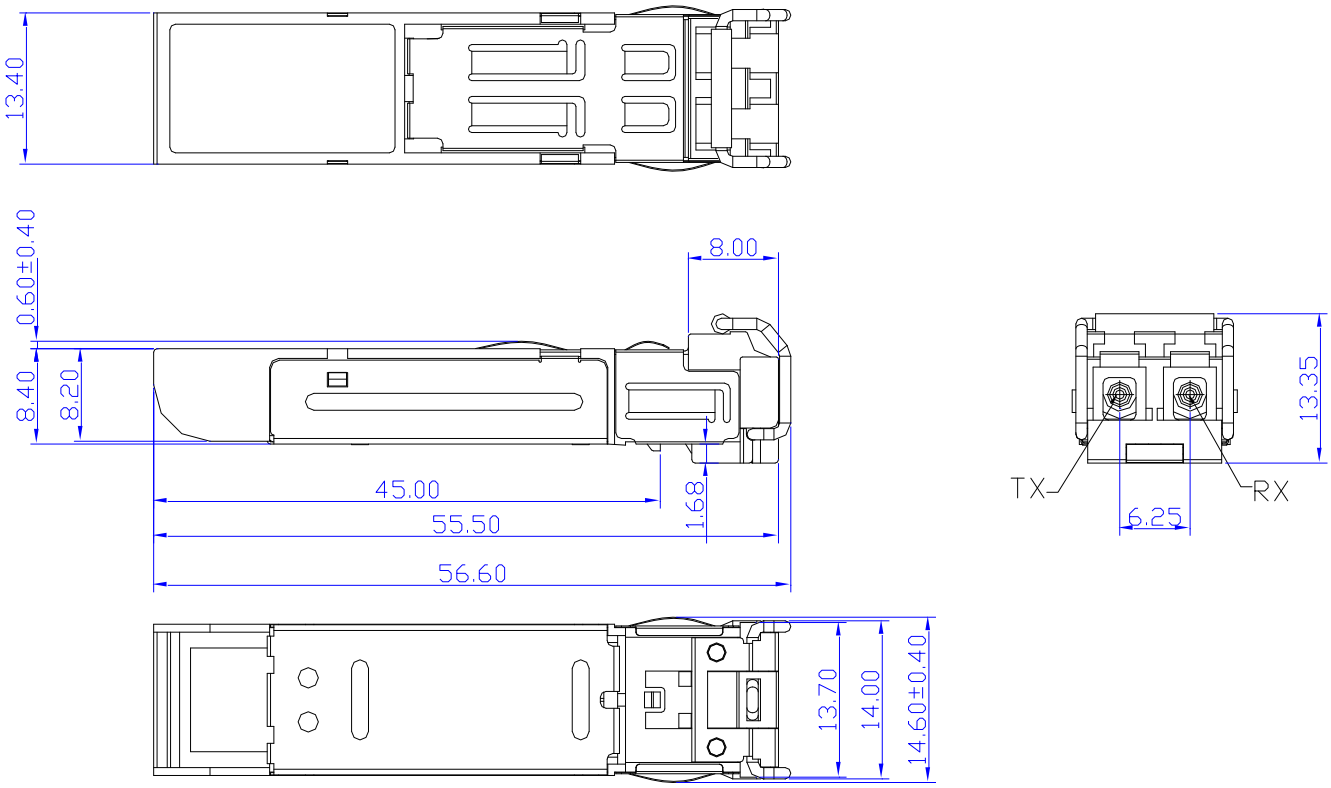
Pin-Out




## Pin Descriptions

| Pin | Signal Name | Description |
|---|---|---|
| 1 | $T_{GND}$ | Transmitter Ground |
| 2 | TX_FAULT | Transmit Fault |
| 3 | TX_DISABLE | Transmit Disable |
| 4 | MOD_DEF(2) | SDA Serial Data Signal |
| 5 | MOD_DEF(1) | SCL Serial Clock Signal |
| 6 | MOD_DEF(0) | TTL Low |
| 7 | RATE SELECT | Open Circuit |
| 8 | RX_LOS | Receiver Loss of Signal, TTL High, Open collector |
| 9 | $R_{GND}$ | Receiver Ground |
| 10 | $R_{GND}$ | Receiver Ground |
| 11 | $R_{GND}$ | Receiver Ground |
| 12 | RX- | Receive Data Bar, Differential PECL, ac coupled |
| 13 | RX+ | Receive Data, Differential PECL, ac coupled |
| 14 | $R_{GND}$ | Receiver Ground |
| 15 | $V_{CCR}$ | Receiver Power Supply |
| 16 | $V_{CCT}$ | Transmitter Power Supply |
| 17 | $T_{GND}$ | Transmitter Ground |
| 18 | TX+ | Transmit Data, Differential PCEL, ac coupled |
| 19 | TX- | Transmit Data Bar, Differential PCEL, ac coupled |
| 20 | $T_{GND}$ | Transmitter Ground |

## Dimensions




**DIMENSIONS ARE IN MILLIMETERS**

**ALL DIMENSIONS ARE ± 0.2mm UNLESS OTHERWISE SPECIFIED**

## Ordering Information

**OP 6 C - S 10 - 13 - C M**

**Product Code:**
5=GBIC;
6=SFP-LC;
7=XFP;
8=XENPAK;
9=X2;
A=SFP+;
C=QSFP;
P=SFP-SC;
Q=SFP-MTRJ

**Data Rate:**
A=155Mb/s;
B=622Mb/s;
C=1.25Gb/s;
D=2.125Gb/s;
E=2.5Gb/s;
F=4.25Gb/s;
G=3.1Gb/s;
J=2.97G
P=6.144G:
Q=7.37G;
H=8.5Gb/s;
K=10Gb/s;
R=20Gb/s;
S=40Gb/s;
M=100Base-X SGMII;
N=100/1000Base-X SGMII;

**Type:**
S=Single-mode;
M=Multi-mode;
W=BWDM;
C=CWDM;
D=DWDM;
T=Copper-T (RJ-45)
E=GEPON ONU;
F=GEPON OLT;
G=GPON ONU;
H=GPON OLT

**Reach:**
Normal:
X1=Under 150m;
X3=300m;
X5=550m;
02=2km,
10=10km;
70=70km;
A0=100km;
C0=120km
CWDM:
20=20dB;
24=24dB;
28=28dB

**Wavelength:**
Normal:
85=850nm;
13=1310nm;
15=1550nm;
00=Copper T (RJ-45)
CWDM:
27=1270nm;
47=1470nm;
61=1610nm
BWDM:
B3=Tx1310/Rx1550; B5=Tx1550/Rx1310;
B4=Tx1310/Rx1490; B9=Tx1490/Rx1310;
51=Tx1510/Rx1570; 57=Tx1570/Rx1510;
27=Tx1270/Rx1330; 33=Tx1330/Rx1270;
B2=Tx1270/Rx1577; B7=Tx1577/Rx1270
T2=2TX1310nm; T3=TX1310nm;
T5=TX1550nm

DWDM:
17=Channel 17
34= Channel 34

**Operating Temperature:**
C=Commercial Purpose
(0~70℃);
I= Industrial Purpose
(Extended Range)

**Additional Feature:**
M=Digital Optical Monitoring
(DOM)
(RX_LOS for Copper TX);
F=with Fiber Stub;
I=with Isolator;
S=Customized Style

| *Model Number* | *Part Number* | *Reach* | *Input/Out* | *Signal Detect* | *Voltage* | *Temperature* |
|---|---|---|---|---|---|---|
| SFP-MLX | OP6C-M02-13-C | 2km | AC/AC | TTL | 3.3V | 0°C to 70 °C |
| SFP-MLX-I | OP6C-M02-13-I | 2km | AC/AC | TTL | 3.3V | -40°C to 85 °C |

Note: The guarantee transmit distance is as below,

Multimode 62.5/125 Corning fiber: 2km

Multimode 50/125 Corning fiber: 1km

**Note: All information contained in this document is subject to change without notice.**