# 3G-SDI Video SFP Single-Receiver Optical Modules

## FSSR-3G-xx

**Features**

- HD-SDI SFP Receiver available
- SD-SDI SFP Receiver available
- 3G-SDI SFP Receiver available
- SMPTE 297-2006 Compatible.
- Metal enclosure for Lower EMI
- PIN photodetector
- Supports video pathological patterns for SD-SDI, HD-SDI and 3G-SDI
- SFP Non-MSA Pinout
- Digital Diagnostic functions available through the I2C interface
- Compatible with RoHS
- +3.3V single power supply
- Operating case temperature:
- Standard : 0 to +70°C

### Applications

- SMPTE 297-2006 Compatible Electrical-to-Optical Interfaces.
- HDTV/SDTV Service Interfaces.

### Description

The video series transceivers are high performance, cost effective modules for duplex video transmission application over single mode fiber.

The receiver is designed to receive data rates from 50Mbps to 2.97Gbps and is specifically designed for robust performance in the presence of SDI pathological patterns for SMPTE 259M, SMPTE 344M, SMPTE 292M and SMPTE 424M serial rates. The module is fully compliant with SMPTE 297M-2006.

The receiver is consists of a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The receivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

### Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Supply Voltage | Vcc | -0.5 | 4.5 | V |
| Storage Temperature | Ts | -40 | +85 | °C |
| Operating Humidity | - | 5 | 85 | % |

## Recommended Operating Conditions

| Parameter | | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|---|
| Operating Case Temperature | Standard | Tc | 0 | | +70 | ℃ |
| | I | | | | | ℃ |
| Power Supply Voltage | | Vcc | 3.13 | 3.3 | 3.47 | V |
| Power Supply Current | | Icc | | | 150 | mA |
| Data Rate | | | | 3 | | Gbps |

## Optical and Electrical Characteristics

| Parameter | | Symbol | Min | Typical | Max | Unit | Notes |
|---|---|---|---|---|---|---|---|
| **Receiver** | | | | | | | |
| Rise/Fall Time (20%~80%) | SD-SDI | tr/tf | | | 1500 | ps | 1 |
| | HD-SDI | | | | 270 | | |
| | 3G-SDI | | | | 135 | | |
| Total Output Jitter | PRBS and colour bar SD-SDI | | | 70 | 200 | ps | |
| | PRBS and colour bar HD-SDI | | | 50 | 135 | | |
| | PRBS and colour bar 3G-SDI | | | 70 | 100 | | |
| | pathological SD-SDI | | | 200 | 300 | | |
| | pathological HD-SDI | | | 115 | | | |
| | pathological 3G-SDI | | | 120 | | | |
| Centre Wavelength | | λc | 1260 | | 1580 | nm | |
| Receiver Sensitivity （PRBS） | SD-SDI | | | | -22 | dBm | |
| | HD-SDI | | | | -22 | dBm | |
| | 3G-SDI | | | | -22 | dBm | |
| Receiver Sensitivity （Pathological） | SD-SDI | | | | -20 | dBm | |
| | HD-SDI | | | | -22 | dBm | |
| | 3G-SDI | | | | -22 | dBm | |
| Receiver Overload | | | 0 | | | dBm | 3 |
| LOS De-Assert | | LOSD | | | -20 | dBm | |
| LOS Assert | | LOSA | -30 | | | dBm | |
| LOS Hysteresis | | | 1 | | 4 | dB | |
| Data Output Swing Differential | | Vout | 650 | 800 | 1000 | mV | 2 |
| LOS | | High | 2.0 | | Vcc | V | |
| | | Low | | | 0.8 | V | |

**Notes:**

1. Rise and fall times, 20% to 80%, are measured following a fourth-order Bessel-Thompson filter with a bandwidth of 0.75 x clock frequency corresponding to the serial data rate
2. PECL input, internally AC-coupled and terminated.
3. Internally AC-coupled.

## Timing and Electrical

| Parameter | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| LOS Assert Time | t_loss_on | | | 100 | μs |
| LOS De-assert Time | t_loss_off | | | 100 | μs |
| Serial ID Clock Rate | f_serial_clock | | | 280 | KHz |
| MOD_DEF (0:2)-High | VH | 2 | | Vcc | V |
| MOD_DEF (0:2)-Low | VL | | | 0.8 | V |

## Diagnostics Specification

| Parameter | Range | Unit | Accuracy | Calibration |
|---|---|---|---|---|
| Temperature | 0 to +70 | °C | ±3°C | Internal / External |
| Voltage | 3.0 to 3.6 | V | ±3% | Internal / External |
| RX Power | -20 to -6 | dBm | ±3dB | Internal / External |

## I2C Bus Interface

The I2C bus interface uses the 2-wire serial CMOS E2PROM protocol. The serial interface meets the following specifications:

1. Support a maximum clock rate of 280Khz.
2. Input/Output levels comply with LVCMOS/LVTTL or compatible logics.

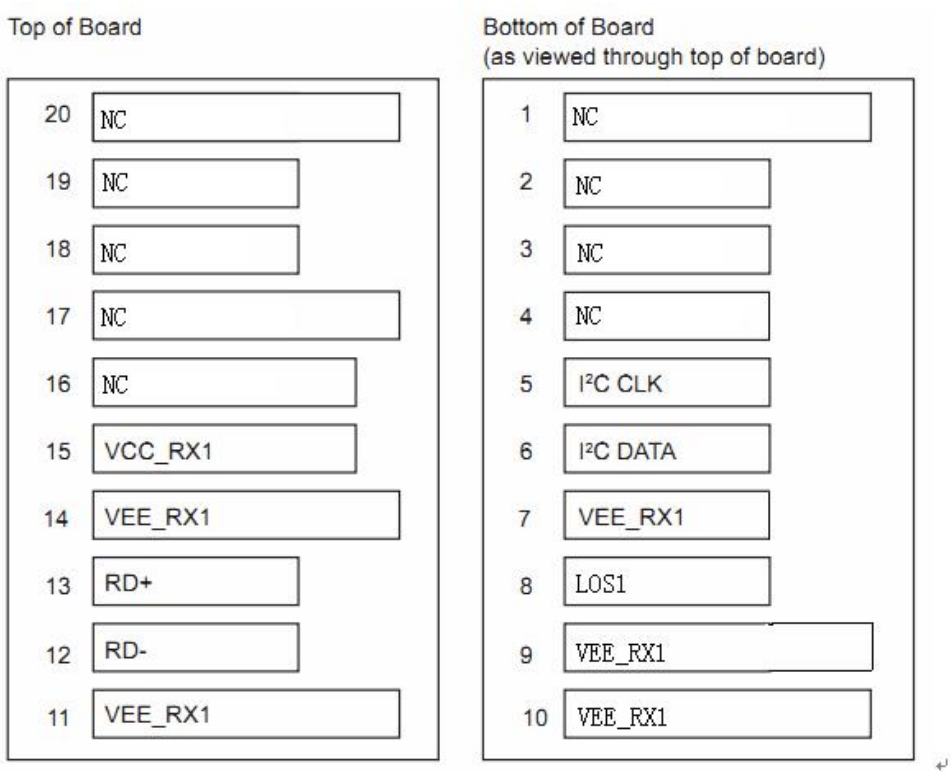
Low: 0 – 0.8 V

High: 2.0 – 3.3 V

Undefined: 0.8 – 2.0 V

## Pin Definitions (Non-MSA)

## Pin Diagram



## Pin Descriptions

| Pin | Signal Name | Description | Plug Seq. | Notes |
|---|---|---|---|---|
| 1 | NC | Not Connected | 1 | |
| 2 | NC | Not Connected | 3 | |
| 3 | NC | Not Connected | 3 | |
| 4 | NC | Not Connected | 3 | |
| 5 | I2C CLK | SCL Serial Clock Signal | 3 | Note 1 |
| 6 | I2C DATA | SDA Serial Data Signal | 3 | Note 1 |
| 7 | VEE_RX1 | Receiver1 Ground | 3 | |
| 8 | LOS1 | Loss of Signal | 3 | Note 2 |
| 9 | VEE_RX1 | Receiver1 Ground | 1 | |
| 10 | VEE_RX1 | Receiver1 ground | 1 | |
| 11 | VEE_RX1 | Receiver1 ground | 1 | |
| 12 | RD- | Inv. Received Data Out | 3 | Note 3 |
| 13 | RD+ | Received Data Out | 3 | Note 3 |
| 14 | VEE_RX1 | Receiver1 ground | 1 | |
| 15 | VCC_RX1 | Receiver1 Power Supply | 2 | |
| 16 | NC | Not Connected | 2 | |
| 17 | NC | Not Connected | 1 | |
| 18 | NC | Loss of Signal | 3 | |
| 19 | NC | Not Connected | 3 | |
| 20 | NC | Not Connected | 1 | |

**Notes:**

Plug Seq.: Pin engagement sequence during hot plugging.

1. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccR.

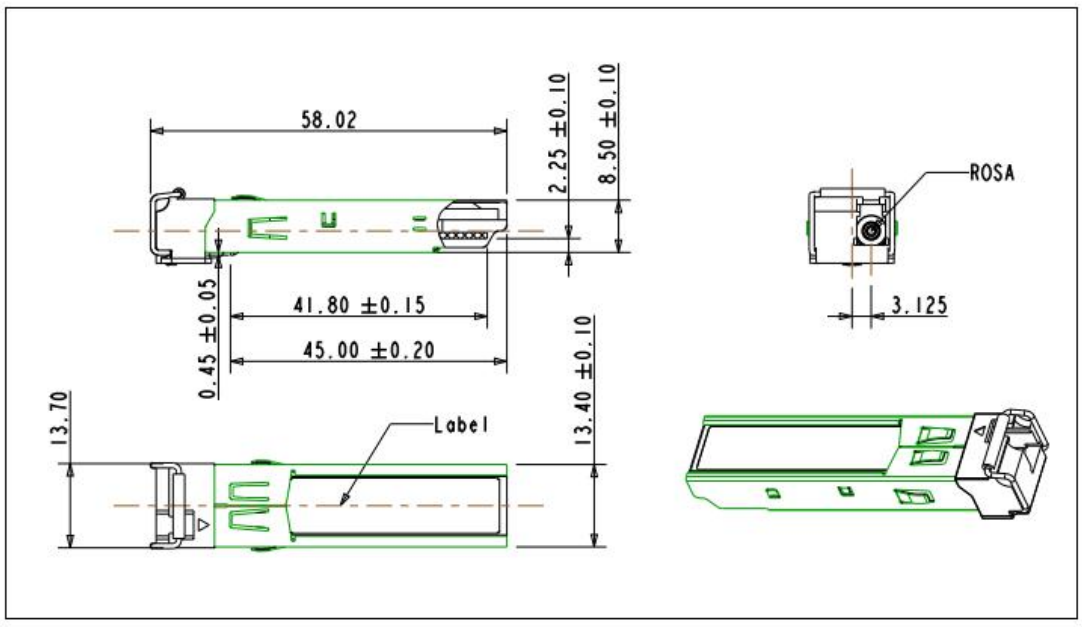
I2C CLK is the clock line of two wire serial interface for serial ID

I2C DATA is the data line of two wire serial interface for serial ID

2. LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.

3. RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

## Mechanical Dimensions




## Ordering information

| Part Number | Product Description |
|---|---|
| FSSR-3G-02 | 3G-SDI Video SFP Single-Receiver Optical Module, 2km |
| FSSR-3G-20 | 3G-SDI Video SFP Single-Receiver Optical Module, 20km |
| FSSR-3G-40 | 3G-SDI Video SFP Single-Receiver Optical Module, 40km |

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