

1310NM VIDEO SFP OPTICAL TRANSCEIVER

TRPV3GELRx000M2G



Product Description

The TRPV3GELRx000M2G is an optical transceiver module designed to transmit and receive electrical and optical serial digital signals as defined in SMPTE 297-2006. The TRPV3GELRx000M2G 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 TRPV3GELRx000M2G contains a PIN photodiode receiver and a 1310nm Fabry-Perot laser transmitter designed to provide error-free transmission of signals from 50Mbps to 3Gbps over single mode fiber (9/125). It is also hot-pluggable.

The TRPV3GELRx000M2G provides extensive operational status monitoring through an I²C interface. Input optical power is monitored in the receiver; output optical power and bias current are monitored in the transmitter. Other operating conditions, such as power supply and operating temperature are also monitored. If a monitored parameter falls outside the pre-defined range, an alarm flag for the parameter is raised



Features

- SFP MSA pin compliant (SFF-8074i)
- Excellent optical receive sensitivity over supported video rates with pathological data
- Robust error-free transmission of signals from 50Mbps to 3Gbps for up to 30km (single-mode fiber)
- Supports video pathological patterns for SD-SDI, HD-SDI and 3G-SDI
- Digital diagnostics and control via I²C interface
- Low power consumption
- RoHS compliant
- Optional operating temperature range of - 40°C to +85°C
- SMPTE 297-2006 compatible

Absolute Maximum Ratings

| Parameter | Symbol | Minimum | Maximum | Units |
|--|--------------|---------|---------|-------|
| Storage Temperature Range | T_{ST} | - 40 | + 85 | °C |
| Case Operating Temperature ¹ | "Commercial" | - 5 | + 70 | °C |
| | "Extended" | - 5 | + 85 | °C |
| | "Industrial" | - 40 | + 85 | °C |
| Operating Relative Humidity ² | RH | 5 | 95 | % |
| Supply Voltage Range | V_{CC} | - 0.5 | + 4 | V |

¹ Measured on top side of SFP module at the front center vent hole of the cage.

² Non condensing

Transmitter Performance Characteristics (Over Operating Case Temperature. $V_{cc} = 3.13$ to $3.47V$)

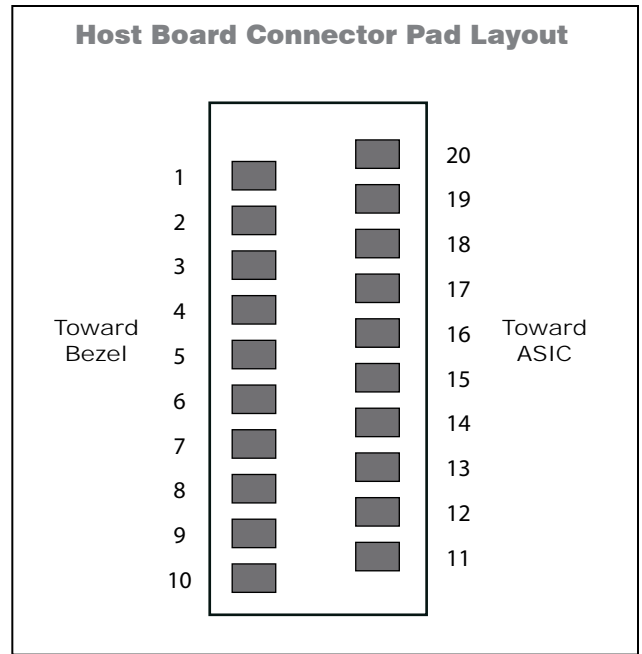
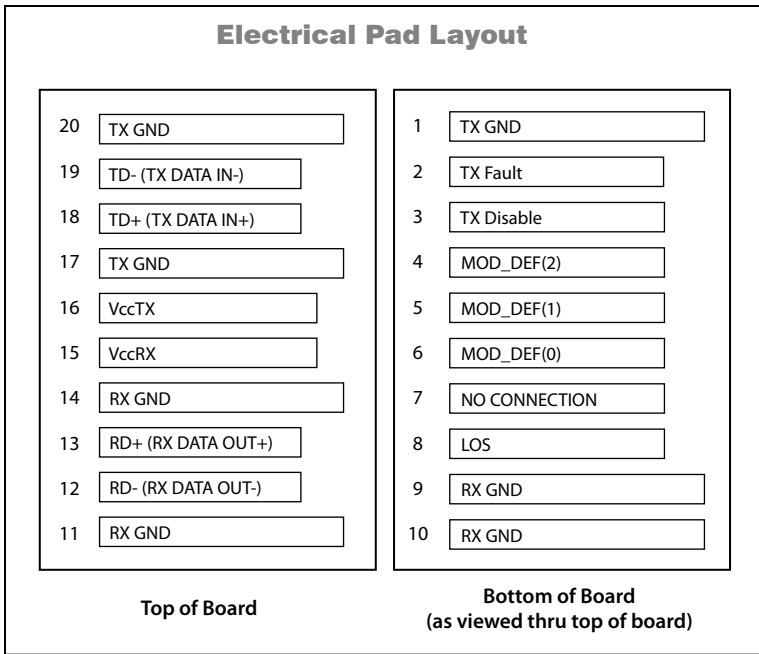
| Parameter | | Symbol | Minimum | Typical | Maximum | Units |
|--|---|-----------------------|---------|---------|---------|-------|
| Data Rate | | B | 0.05 | - | 3 | Gb/s |
| Center Wavelength ¹ | | λ_c | 1280 | 1310 | 1340 | nm |
| Spectral Width ¹ | | $\Delta\lambda_{rms}$ | - | 1.5 | 3 | nm |
| Average Optical Output Power | | P_{Avg} | -5 | -2 | 0 | dBm |
| Extinction Ratio | | ER | 7 | - | - | dB |
| Optical Signal Intrinsic Jitter ² | 2.97Gb/s, 1.485Gb/s, 270Mb/s, PRBS 2 ²³ -1 | - | - | 30 | 60 | ps |
| | 2.97Gb/s SMPTE 424M Pathological | | - | 45 | 70 | |
| | 1.485Gb/s SMPTE 292M Pathological | | - | 60 | 100 | |
| | 270Mb/s, SMPTE 259M Pathological | | - | 110 | 180 | |
| Optical Signal Rise Time (20% to 80%) ³ | SMPTE 424M 2.97Gb/s | tr | - | - | 165 | ps |
| | SMPTE 292M 1.485Gb/s | | - | - | 270 | |
| | SMPTE 259M 270Mb/s | | 400 | - | 1500 | |
| Optical Signal Fall Time (20% to 80%) ³ | SMPTE 424M 2.97Gb/s | tf | - | - | 135 | ps |
| | SMPTE 292M 1.485Gb/s | | - | - | 270 | |
| | SMPTE 259M 270Mb/s | | 400 | - | 1500 | |
| Laser Power Monitoring Accuracy | | - | -2 | - | +2 | dB |

¹ Measured at 25°C
² As specified in SMPTE 259M, SMPTE 344M, SMPTE 292, or SMPTE 424M for the corresponding electrical signal. Test method shall conform to SMPTE RP 184
³ Rise/fall times are measured following a fourth-order Bessel-Thompson filter with a 3dB point at 0.75 x data rate in MHz

Receiver Performance Characteristics (Over Operating Case Temperature. $V_{cc} = 3.13$ to $3.47V$)

| Parameter | | Symbol | Minimum | Typical | Maximum | Units |
|---------------------------------|--|-------------|---------|---------|---------|-------|
| Data Rate | | B | 0.05 | - | 3 | Gb/s |
| Center Wavelength | | λ_c | 1260 | - | 1620 | nm |
| Sensitivity ¹ | SMPTE 259M, SMPTE 344M, SMPTE 292M Pathological, SMPTE 424M Pathological and PRBS 2 ²³ -1 | P_{min} | - | -24 | -21 | dBm |
| Overload | | P_{max} | 0 | - | - | dBm |
| LOS Thresholds ² | Increasing Light Input | P_{los+} | - | - | -23 | dBm |
| | Decreasing Light Input | P_{los-} | -31 | - | - | dBm |
| LOS Hysteresis | | - | 0.5 | - | 6 | dB |
| Maximum Back Reflection | | - | - | - | -27 | dB |
| Input Power Monitoring Accuracy | | - | -2 | - | +2 | dB |

¹ Specified at a BER of 10⁻¹²
² Specified with PRBS 2.97Gb/s signal, ER= 7dB



Application Notes

Electrical Interface: Signal interfaces are compatible with the SFP MSA specification. The high speed DATA interface is differential AC-coupled internally and can be directly connected to a 3.3V SERDES IC. All low speed control and sense output signals are open collector TTL compatible and should be pulled up with a 4.7 - 10kΩ resistor on the host board.

Loss of Signal (LOS): The Loss of Signal circuit monitors the level of the incoming optical signal and generates logic HIGH when an insufficient photocurrent is produced.

Serial Identification and Monitoring: The module definition of SFP is indicated by the MOD_ABS pin and the 2-wire serial interface. Upon power up, the 2-wire interface appears as NC (no connection), and MOD_ABS is TTL LOW. When the host system detects this condition, it activates the serial protocol (standard two-wire I²C serial interface) and generates the

serial clock signal (SCL). The positive edge clocks data into the EEPROM segments of the device that are not write protected, and the negative edge clocks data from the device. The serial data signal (SDA) is for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The supported monitoring functions are temperature, voltage, average receiver signal, all alarms and warnings, and software monitoring of LOS. The device is internally calibrated.

The data transfer protocol and the details of the mandatory and vendor specific data structures are defined in the SFP MSA, and SFF-8472, Rev. 9.4.

Power Supply and Grounding: The power supply line should be well-filtered. All power supply bypass capacitors should be as close to the transceiver module as possible.

Laser Safety:

All transceivers are Class I Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions.



Oplink Communications, Inc.
DATE OF MANUFACTURE:

This product complies with
21 CFR 1040.10 and 1040.11

Meets Class I Laser Safety Requirements

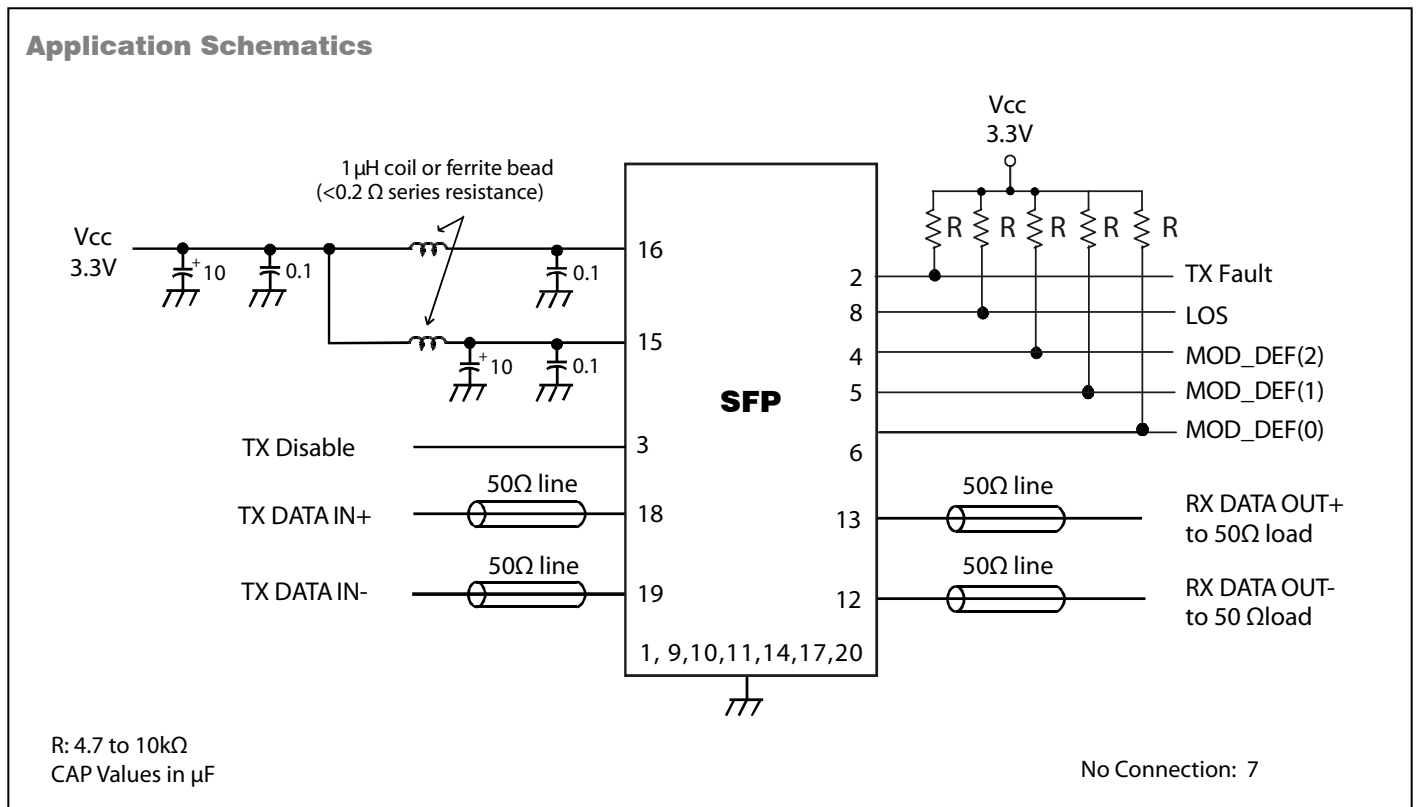


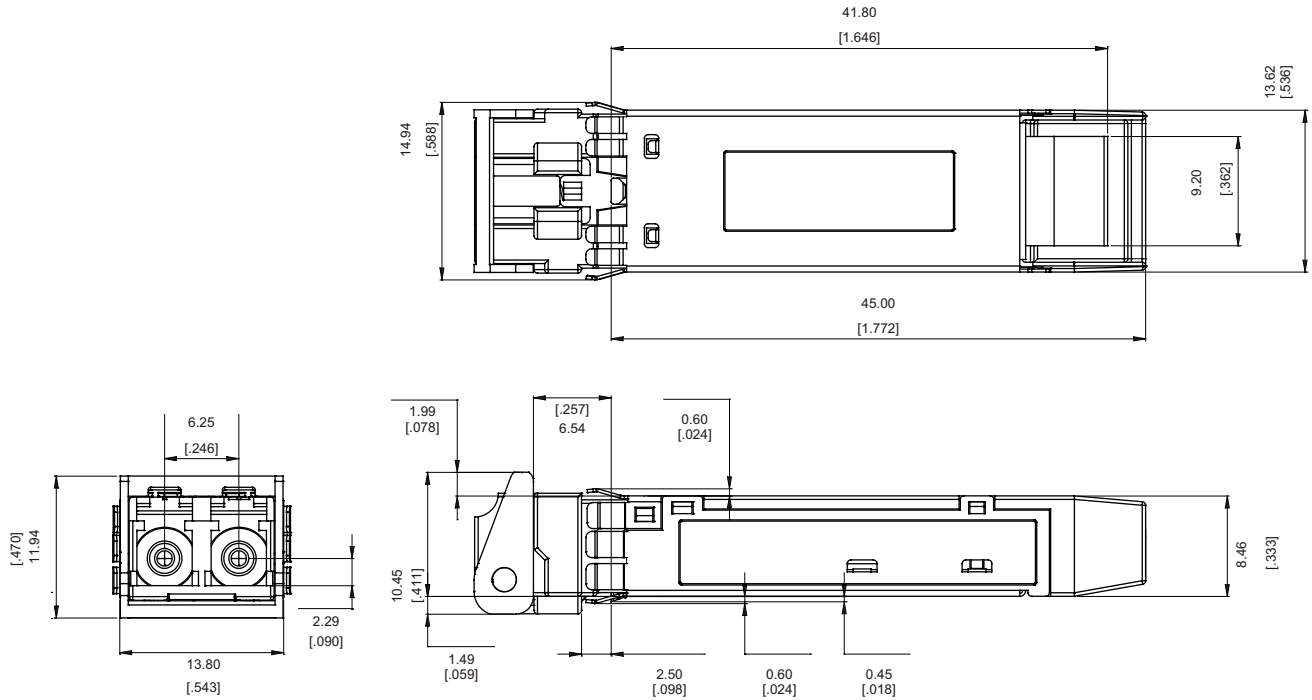
Interfacing the Transceivers

Communication is via a serial 2-wire serial interface. As described in the document SFF-8472 (REV. 9.4) there are two distinct address spaces:

| Base Address A0(hex) | |
|----------------------|---|
| Byte Address | Content |
| 0 – 95 | Serial Transceiver ID as defined in SFP MSA |
| 96 – 127 | OPLINK Specific |
| 128 – 255 | Reserved |

| Base Address A2(hex) | |
|----------------------|---|
| Byte Address | Content |
| 0 - 55 | Alarm & Warnings thresholds & limits |
| 56 - 95 | External calibration constants (not used) |
| 96 – 119 | Values from real time diagnostic monitoring |
| 120 – 127 | Not used |
| 128 – 247 | Customer specific, writable area |
| 248 - 255 | Not used |



Package Outline


All dimensions shown are in [inches] and Millimeters. Millimeters are the primary units. Tolerances are in accordance with SFF-8432 Rev.5.

Ordering Information

| Model Name | Operating Temperature | | Nominal Wavelength | Latch Color | Distance ¹ |
|------------------|-----------------------|------------|--------------------|-------------|-----------------------|
| TRPV3GELRC000M2G | - 5°C to +70°C | Commercial | 1310nm | Blue | 10km - 30km |
| TRPV3GELRE000M2G | - 5°C to +85°C | Extended | | | |
| TRPV3GELRI000M2G | - 40°C to +85°C | Industrial | | | |

¹ These are target distances to be used for classification and not for specification.