

GB-Video-TT-2

3Gbps Video SFP Optical Transmitter, 2km Reach

Features

- ◆ HD-SDI SFP Transmitter available
- ◆ SD-SDI SFP Transmitter available
- ◆ 3G-SDI SFP Transmitter available
- ◆ SMPTE 297-2006 Compatible.
- ◆ Metal enclosure for Lower EMI
- ◆ 1310nm FP laser
- ◆ Supports video pathological patterns for SD-SDI, HD-SDI and 3G-SDI
- ◆ Compliant with SFP MSA and SFF-8472 with duplex LC receptacle
- ◆ 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 Transmitter is designed to transmit 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 transmitter is a dual channel optical transmitter module ,one channel consists of two sections: a FP laser transmitter and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers 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 | 0 | | +70 | °C |
| | | | | | °C |
| Power Supply Voltage | Vcc | 3.13 | 3.3 | 3.47 | V |
| Power Supply Current | Icc | | | 500 | mA |
| Data Rate | | | 3 | | Gbps |

Optical and Electrical Characteristics

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|-----------------------------|-------------|------|---------|------|------|-------|
| Transmitter | | | | | | |
| Centre Wavelength | λ_c | 1260 | 1310 | 1360 | nm | |
| Spectral Width (-20dB) | σ | | | 1 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Average Output Power | Pout | -8 | -3 | 0 | dBm | 1 |
| Extinction Ratio | ER | 8 | 10 | | dB | |

| | | | | | | | | |
|-------------------------------|---------------------------|----------|-------|-----|------|----------|----|---|
| Rise/Fall Time (20%~80%) | | SD-SDI | tr/ff | | | 270 | ps | 2 |
| | | HD-SDI | | | | 270 | | |
| | | 3G-SDI | | | | 270 | | |
| Total Output Jitter | PRBS and colour bar | SD-SDI | | 70 | 200 | ps | | |
| | | HD-SDI | | 50 | 135 | | | |
| | | 3G-SDI | | 70 | 100 | | | |
| | pathological | SD-SDI | | 200 | 300 | | | |
| | | HD-SDI | | 115 | | | | |
| | | 3G-SDI | | 120 | | | | |
| Data Input Swing Differential | | V_{IN} | 400 | | 1800 | mV | 3 | |
| Input Differential Impedance | | Z_{IN} | 90 | 100 | 110 | Ω | | |
| TX Disable | Disable | | 2.0 | | Vcc | V | | |
| | Enable | | 0 | | 0.8 | V | | |
| TX Fault | Fault | | 2.0 | | Vcc | V | | |
| | Normal | | 0 | | 0.8 | V | | |

Notes:

1. The optical power is launched into SMF.
2. 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
3. PECL input, internally AC-coupled and terminated.
4. Internally AC-coupled.

Timing and Electrical

| Parameter | Symbol | Min | Typical | Max | Unit |
|---|--------|-----|---------|-----|---------|
| Tx Disable Negate Time | t_on | | | 1 | ms |
| Tx Disable Assert Time | t_off | | | 10 | μ s |
| Time To Initialize, including Reset of Tx Fault | t_init | | | 300 | ms |

| | | | | | |
|----------------------|----------------|----|--|-----------------|-----|
| Tx Fault Assert Time | t_fault | | | 100 | μs |
| Tx Disable To Reset | t_reset | 10 | | | μs |
| Serial ID Clock Rate | f_serial_clock | | | 280 | KHz |
| MOD_DEF (0:2)-High | V _H | 2 | | V _{cc} | V |
| MOD_DEF (0:2)-Low | V _L | | | 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 |
| Bias Current | 0 to 100 | mA | ±10% | Internal / External |
| TX Power | -5 to 0 | dBm | ±3dB | Internal / External |

I2C Bus Interface

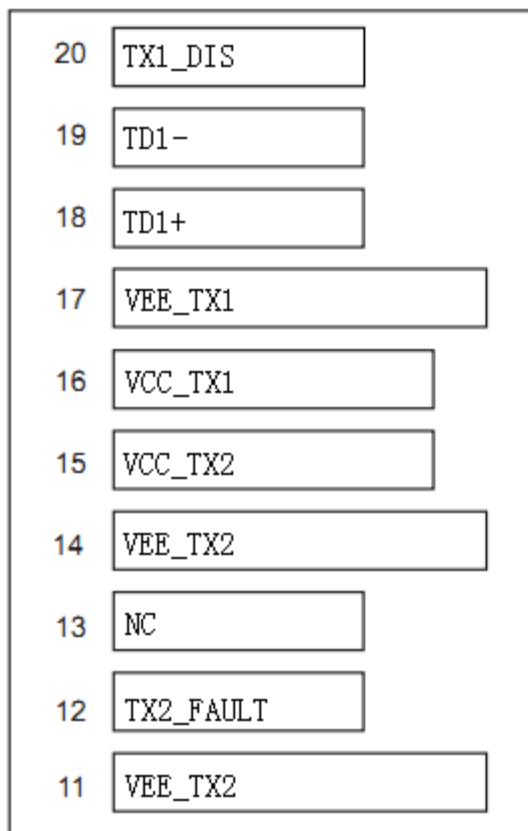
The I2C bus interface uses the 2-wire serial CMOS E2PROM protocol. The serial interface meets the following specifications:

- Support a maximum clock rate of 280Khz.
- 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

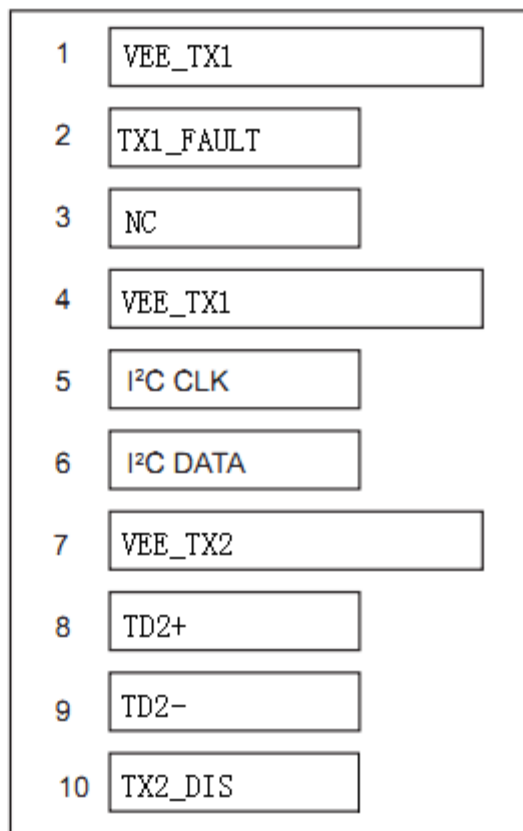
Pin Definitions

Pin Diagram

Top of Board



Bottom of Board
(as viewed through top of board)



Pin Descriptions

| Pin | Signal Name | Description | Plug Seq. | Notes |
|-----|-------------|--------------------------------|-----------|--------|
| 1 | VEE_TX1 | Transmitter 1 Ground | 1 | |
| 2 | TX1_FAULT | Transmitter 1 Fault Indication | 3 | Note 1 |
| 3 | NC | Not Connected | 3 | |
| 4 | VEE_TX1 | Transmitter 1 Ground | 3 | |



| | | | | |
|----|-----------|--------------------------------|---|--------|
| 5 | I2C CLK | SCL Serial Clock Signal | 3 | Note 3 |
| 6 | I2C DATA | SDA Serial Data Signal | 3 | Note 3 |
| 7 | VEE_TX2 | Transmitter 2 Ground | 3 | |
| 8 | TD2+ | Transmit 2 Data In | 3 | Note 4 |
| 9 | TD2- | Inv. Transmit 2 Data In | 1 | Note 4 |
| 10 | TX2_DIS | Transmitter 2 Disable | 1 | Note 2 |
| 11 | VEE_TX2 | Transmitter 2 Ground | 1 | |
| 12 | TX2_FAULT | Transmitter 2 Fault Indication | 3 | Note 1 |
| 13 | NC | Not Connected | 3 | |
| 14 | VEE_TX2 | Transmitter 2 Ground | 1 | |
| 15 | VCC_TX2 | Transmitter Power 2 Supply | 2 | |
| 16 | VCC_TX1 | Transmitter Power 1 Supply | 2 | |
| 17 | VEE_TX1 | Transmitter 1 Ground | 1 | |
| 18 | TD1+ | Transmit 1 Data In | 3 | Note 4 |
| 19 | TD1- | Inv. Transmit 1 Data In | 3 | Note 4 |
| 20 | TX1_DIS | Transmitter 1 Disable | 1 | Note 2 |

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 2) TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:
Low (0 to 0.8V): Transmitter on
(>0.8V, < 2.0V): Undefined
High (2.0 to 3.465V): Transmitter Disabled
Open: Transmitter Disabled
- 3) They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VCC_TX1 or VCC_TX2.
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
- 4) TD1/2-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Serial ID Field Memory Map

The module serial Id and calibration information is stored in the E2PROM of the SFP supervising device using the address map.



| Byte Addr | Bit Size | Name | Description | Value (hex) |
|-----------|----------|----------------------|---|-------------|
| 0 | 1 | Identifier | Type of transceiver | 82 |
| 1 | 1 | Ext. Identifier | Extended identifier of type of transceiver | 04 |
| 2 | 1 | Connector | Code for connector type | 07 |
| 3 | 1 | Standards Compliance | For SMPTE259M/344M/292M/424M and SMPTE 207M | 41 |
| 4 | 7 | Transceiver | Code for electronic or optical compatibility, Not applicable. | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | 1 | Encoding | Code for serial encoding algorithm | 30 |
| 12 | 1 | BR, Nominal | Nominal signalling rate, units of 100MBd. | 1E |
| 13 | 1 | Rate Identifier | Type of rate select functionality, Not applicable | |
| 14 | 1 | Length(SMF,km) | Link length supported for single mode fiber, units of km | 14 |
| 15 | 1 | Length (SMF) | Link length supported for single mode fiber, units of 100 m | 00 |
| 16 | 1 | Length (50um) | Link length supported for 50 um OM2 fiber, units of 10 m | 00 |
| 17 | 1 | Length (62.5um) | Link length supported for 62.5 um OM1 fiber, units of 10 m | 00 |
| 18 | 1 | Length (cable) | Link length supported for copper or direct attach cable, units of m | 00 |
| 19 | 1 | Length (OM3) | Link length supported for 50 um OM3 fiber, units of 10 m | 00 |
| 20 | 16 | Vendor name | SFP vendor name (ASCII) | X |
| 21 | | | | X |
| 22 | | | | X |



| | | | | |
|----|----|------------|--|----|
| 23 | | | | X |
| 24 | | | | X |
| 25 | | | | X |
| 26 | | | | X |
| 27 | | | | X |
| 28 | | | | X |
| 29 | | | | X |
| 30 | | | | X |
| 31 | | | | X |
| 32 | | | | X |
| 33 | | | | X |
| 34 | | | | X |
| 35 | | | | X |
| 36 | 1 | Reserved | Reserved | 00 |
| 37 | | | | 00 |
| 38 | 3 | Vendor OUI | SFP vendor IEEE company ID | 00 |
| 39 | | | | 00 |
| 40 | 16 | Vendor PN | Part number provided by SFP vendor (ASCII) | X |
| 41 | | | | X |
| 42 | | | | X |
| 43 | | | | X |
| 44 | | | | X |
| 45 | | | | X |
| 46 | | | | X |
| 47 | | | | X |
| 48 | | | | X |
| 49 | | | | X |
| 50 | | | | X |
| 51 | | | | X |
| 52 | | | | X |
| 53 | | | | X |



| | | | | |
|----|----|-------------|--|----|
| 54 | | | | X |
| 55 | | | | |
| 56 | 4 | Vendor rev | Revision level for part number provided by vendor (ASCII) | X |
| 57 | | | | |
| 58 | | | | |
| 59 | | | | |
| 60 | 2 | Wavelength | Laser wavelength (Passive/Active Cable Specification Compliance) | |
| 61 | | | | |
| 62 | 1 | Unallocated | | |
| 63 | 1 | CC_BASE | Check code for Base ID Fields | |
| 64 | 2 | Options | Indicates which optional transceiver signals are implemented | |
| 65 | | | | |
| 66 | 1 | BR, max | Upper bit rate margin, units of % | 05 |
| 67 | 1 | BR, min | Lower bit rate margin, units of % | 5F |
| 68 | 16 | Vendor SN | Serial number provided by vendor (ASCII) | X |
| 69 | | | | X |
| 70 | | | | X |
| 71 | | | | X |
| 72 | | | | X |
| 73 | | | | X |
| 74 | | | | X |
| 75 | | | | X |
| 76 | | | | X |
| 77 | | | | X |
| 78 | | | | X |
| 79 | | | | X |
| 80 | | | | X |
| 81 | | | | X |
| 82 | | | | X |
| 83 | | | | X |
| 84 | 8 | Date code | Vendor's manufacturing date code | |
| 85 | | | | |



| | | | | |
|-----|----|----------------------------|---|----|
| 86 | | | | |
| 87 | | | | |
| 88 | | | | |
| 89 | | | | |
| 90 | | | | |
| 91 | | | | |
| 92 | 1 | Diagnostic Monitoring Type | Indicates which type of diagnostic monitoring is implemented(if any) in the transceiver | 68 |
| 93 | 1 | Enhanced Options | Indicates which optional enhanced features are implemented(if any) in the transceiver | 90 |
| 94 | 1 | SFF-8472Compliance | Indicates which revision of SFF-8472 the transceiver complies with. | XX |
| 95 | 1 | CC_EXT | Check code for the Extended ID Fields | |
| 96 | 32 | Vendor Specific | Vendor Specific EEPROM | 0 |
| 97 | | | | 0 |
| 98 | | | | 0 |
| 99 | | | | 0 |
| 100 | | | | 0 |
| 101 | | | | 0 |
| 102 | | | | 0 |
| 103 | | | | 0 |
| 104 | | | | 0 |
| 105 | | | | 0 |
| 106 | | | | 0 |
| 107 | | | | 0 |
| 108 | | | | 0 |
| 109 | | | | 0 |
| 110 | | | | 0 |
| 111 | | | | 0 |
| 112 | | | | 0 |
| 113 | | | | 0 |
| 115 | | | | 0 |
| 116 | | | | 0 |
| 117 | | | | 0 |
| 118 | | | | 0 |
| 119 | | | | 0 |



| | | | | |
|-----|--|--|--|---|
| 120 | | | | 0 |
| 121 | | | | 0 |
| 122 | | | | 0 |
| 123 | | | | 0 |
| 124 | | | | 0 |
| 125 | | | | 0 |
| 126 | | | | 0 |
| 127 | | | | 0 |

Digital Diagnostic Monitoring Interface (2-Wire Address A2H)

| Byte Addr | Bit Size | Name | Description and Value of the Field |
|-----------|----------|------------------------|------------------------------------|
| 00-01 | 2 | Temp High Alarm | MSB at lower address. 100°C |
| 02-03 | 2 | Temp Low Alarm | MSB at lower address. -50°C |
| 04-05 | 2 | Temp High Warning | MSB at lower address. 95°C |
| 06-07 | 2 | Temp Low Warning | MSB at lower address. -45°C |
| 08-09 | 2 | Voltage High Alarm | MSB at lower address. 3.7V |
| 10-11 | 2 | Voltage Low Alarm | MSB at lower address. 2.9V |
| 12-13 | 2 | Voltage High Warning | MSB at lower address. 3.6V |
| 14-15 | 2 | Voltage Low Warning | MSB at lower address. 3.0V |
| 16-17 | 2 | Bias High Alarm | MSB at lower address. 70mA |
| 18-19 | 2 | Bias Low Alarm | MSB at lower address. 8mA |
| 20-21 | 2 | Bias High Warning | MSB at lower address. 65mA |
| 22-23 | 2 | Bias Low Warning | MSB at lower address. 9mA |
| 24-25 | 2 | TX1 Power High Alarm | MSB at lower address. -1dBm |
| 26-27 | 2 | TX1 Power Low Alarm | MSB at lower address. -10dBm |
| 28-29 | 2 | TX1 Power High Warning | MSB at lower address. 0dBm |
| 30-31 | 2 | TX1 Power Low Warning | MSB at lower address. -9dBm |

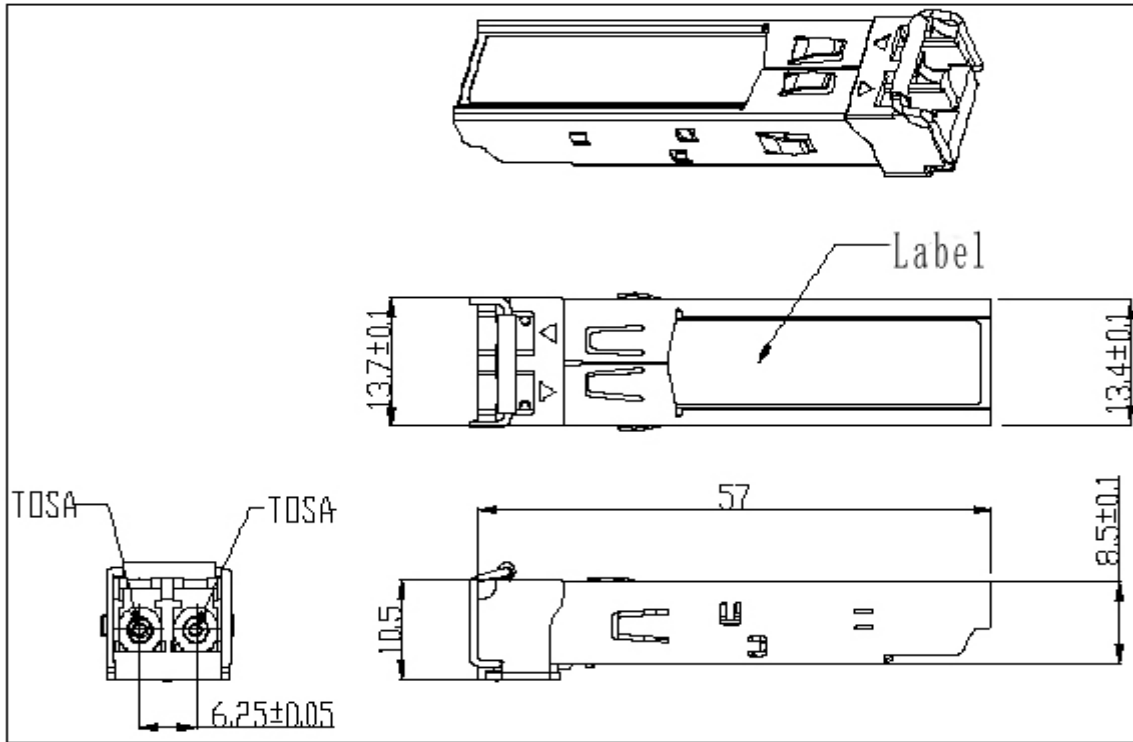


| | | | |
|-------|----|------------------------|--|
| 32-33 | 2 | TX2 Power High Alarm | MSB at lower address. -1dBm |
| 34-35 | 2 | TX2 Power Low Alarm | MSB at lower address. -10dBm |
| 36-37 | 2 | TX2 Power High Warning | MSB at lower address. 0dBm |
| 38-39 | 2 | TX2 Power Low Warning | MSB at lower address. -9dBm |
| 40-55 | 16 | Reserved | Reserved |
| 56-59 | 4 | | |
| 60-63 | 4 | | |
| 64-67 | 4 | | |
| 68-71 | 4 | | |
| 72-75 | 4 | | |
| 76-77 | 2 | TX_I (Slope) | Set to 1 for “internally calibrated” devices. Value is 01 00. |
| 78-79 | 2 | TX_I (Offset) | Set to zero for “internally calibrated” devices. Value is 00 00. |
| 80-81 | 2 | TX_PWR (Slope) | Set to 1 for “internally calibrated” devices. Value is 01 00. |
| 82-83 | 2 | TX_PWR (Offset) | Set to zero for “internally calibrated” devices. Value is 00 00. |
| 84-85 | 2 | T (Slope) | Set to 1 for “internally calibrated” devices. Value is 01 00. |
| 86-87 | 2 | T (Offset) | Set to zero for “internally calibrated” devices. Value is 00 00. |
| 88-89 | 2 | V (Slope) | Set to 1 for “internally calibrated” devices. Value is 01 00. |
| 90-91 | 2 | V (Offset) | Set to zero for “internally calibrated” devices. Value is 00 00. |
| 92-94 | 3 | Reserved | Reserved |
| 95 | 1 | Checksum | Checksum of bytes 0 – 94. |
| 96-97 | 2 | Temperature (MSB,LSB) | Internally measured module temperature |



| | | | |
|---------|-----------|--------------------------|--|
| 98-99 | 2 | Supply Voltage (MSB,LSB) | Internally measured supply voltage in module |
| 100-101 | 2 | Bias 1 (MSB, LSB) | Internally measured module bias1 |
| 102-103 | 2 | Tx1 Power(MSB, LSB) | Internally measured Tx1 Power Current |
| 104-105 | 2 | Tx2 Power (MSB, LSB) | Internally Measured Tx2 Power Current |
| 106-107 | 2 | Bias 2 (MSB, LSB) | Internally measured module bias2 |
| 108-109 | 2 | Reserved | Reserved |
| 110 | Bit7 | Tx Disable State | Digital state of the TX Disable Input Pin. |
| 110 | Bit6 | Soft Tx Disable | Bit 6 |
| 110 | Bit5-Bit3 | Reserved | |
| 110 | Bit2 | Tx Fault | Bit 2 |
| 110 | Bit1 | | |
| 110 | Bit0 | Data_Ready | Bit 0 |
| 111 | 1 | Reserved | Reserved |
| 112 | 1 | | |
| 113 | 1 | | |
| 114-115 | Reserved | | Reserved |
| 116 | 1 | | |
| 117 | 1 | 1 | |
| 118-119 | 2 | Reserved | Reserved |
| 120-127 | 8 | Vendor specific | |
| 128-247 | 120 | User EEPROM | User writable EEPROM |
| 248-255 | 8 | Vendor Specific | Vendor specific control functions |

Mechanical Dimensions



Ordering information

| Part Number | Product Description |
|---------------|---|
| GB-Video-TT-2 | 1310nm, 3Gbps, 2km, 0°C ~ +70°C, With Digital Diagnostic Monitoring |

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