

EPON Triplexer Optical Module

Product Features

- Support IEEE802.3ah EPON Networks with video application
- Single fiber triple directional data links with 1.25Gbps Tx, 1.25Gbps Rx and 807MHz or 1GHz bandwidth analog video Rx
- Up to 20km reach
- 1310nm burst-mode transmitter with FP laser
- 1490nm continuous-mode receiver with PIN-TIA
- 1550 analog video receiver with ACG operation of 47M~870MHz or 47M~1002MHz bandwidth
- 2-wire interface for integrated digital diagnostic Monitoring
- 2x2 inch TRIPLEXER package with SC/APC pigtail optical interface
- Support RX_SD, TX_SD PIN definitions
- RF_out in SMB interface
- +3.3V and +12V power supply
- Operation case temperature -40~85°C for industrial and 0~70°C for commercial
- RoHS6 compliance



Operating Condition

| Parameter | Unit | Min. | Typical | Max. |
|--------------------------------|------|------|---------|------|
| Storage Temperature | °C | -40 | | 85 |
| Operating Case Temp for C-temp | °C | 0 | | 70 |
| Operating Case Temp for I-temp | °C | -40 | | 85 |
| 3.3V Power Supply Voltage | V | 3.15 | 3.3 | 3.45 |
| 3.3V Supply Current | mA | | | 300 |
| 12V Power Supply Voltage | V | 11.4 | 12 | 13.2 |
| 12V Supply Current for Video | mA | | | 200 |
| Analog Video Bandwidth | MHz | 47 | | 1002 |
| Bit Rate for Digital Tx | MHz | | 1250 | |
| Bit Rate for Digital Rx | MHz | | 1250 | |
| Soldering Temperature (10s) | °C | | | 260 |
| HBM ESD Sensitivity | V | 1000 | | |

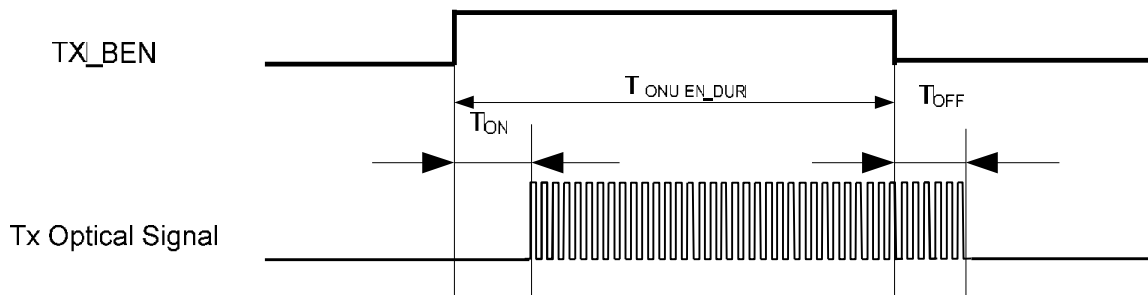
Characteristics

All performance is specified at whole working temperature and conditions

| Parameter | Unit | Min. | Typical | Max. |
|--|-----------------------------|------|---------|------|
| Digital Transmitter | | | | |
| TX Central Wavelength | nm | 1260 | 1310 | 1360 |
| Spectral Width (RMS) | nm | | | 3 |
| Mean Launched Power | dBm | 0 | | 4 |
| Mean Launched Power (TX Off) | dBm | | | -45 |
| Extinction Ratio | dB | 10 | | |
| Optical Return Loss Tolerance | dB | -15 | | |
| Transmitter Mask (PRBS ²⁷ -1 @ 1.25Gbps) | Compliant With IEEE 802.3ah | | | |
| Digital Receiver | | | | |
| Receive Wavelength | nm | 1480 | 1490 | 1500 |
| Sensitivity (PRBS ²⁷ -1 @ 1.25G, ER=10dB, BER<10 ⁻¹²) | dBm | | | -26 |
| Overload | dBm | -3 | | |
| Signal Detected Assert Level | dBm | | | -29 |
| Signal Detected De-assert Level | dBm | -45 | | |
| Signal Detected Hysteresis | dB | 0.5 | | 6 |
| Video Channel Plans (CATV channel plan is 79 analog (NTSC) channels (OMI3.5%) and 79 digital (64 or 256QAM) channels. The equivalent value of the digital channels' RF level is 5dB lower than the analog channels) | | | | |
| Frequency Range (Bandwidth) | MHz | 47 | | 1002 |
| Receiver Wavelength | | 1546 | 1550 | 1554 |
| Responsivity | A/W | 0.8 | | |
| Video Signal Detected Assert Level (Video_SDA) | dBm | | | -11 |
| Video Signal Detected De-assert Level (Video_SDD) | dBm | -13 | | |
| Video Signal Detected Hysteresis (Video_SDH) | dB | | | 2 |
| Analog Channels (OMI = 4.3%/channel) | | | 40 | |
| Digital Channels (OMI = 2.15%/channel) | | | 63 | |
| Total OMI | | | 23.2% | |
| Channel Bandwidth | MHz | | 4 | |
| Channel Spacing | MHz | | 6 | |
| Video PD Monitor Accuracy (input -10~+2dBm) | dB | | | 2 |
| Received Average Optical Power | dBm | -6 | | 2 |

| | | | | |
|---|------|--------|-----|---------|
| RF Channel Output Power (-6~+2dBm, OMI=3.5%, 450MHz) | dBmV | 18 | 22 | 25 |
| RF Total | dBuV | 92 | | 98 |
| RF Tilt (47M~1002M) | dB | 2 | | 7 |
| S22 Output Return Loss (75Ω) | dB | 14 | | |
| Distortions CSO (+2dBm, OMI=3.5%) | dB | 58 | | |
| Distortions CTB (+2dBm, OMI=3.5%) | dB | 58 | | |
| Carrier to Noise Ratio CNR (-6dBm, OMI=3.5%, 4MHz bandwidth) | dB | 44 | | |
| Electrical Interface Characteristics | | | | |
| Data Input Swing Differential/TX | mV | 200 | - | 2000 |
| Data Output Swing Differential/RX | mV | 400 | | 1600 |
| Date Differential Impedance | Ω | 90 | 100 | 110 |
| LVTTL Output High | V | 2.4 | | Vcc |
| LVTTL Output Low | V | 0 | | 0.4 |
| LVTTL Input High | V | 2.0 | | Vcc+0.3 |
| LVTTL Input Low | V | 0 | | 0.8 |
| Timing Characteristics | | | | |
| Turn On Time at Burst mode (T _{ON}) | ns | | | 30 |
| Turn Off Time at Burst mode (T _{OFF}) | ns | | | 30 |
| TX-SD Assert Time (T _{TXSD_ON}) | ns | | | 100 |
| TX-SD De-assert Time (T _{TXSD_OFF}) | ns | | | 100 |
| RX-SD Assert Time (T _{RXSDA}) | us | | | 100 |
| RX-SD De-assert Time (T _{RXSDD}) | us | | | 100 |
| Isolation and Crosstalk | | | | |
| 1550 external to 1490 nm Rx Isolation | dB | 32 | | |
| 1490nm external to 1550 Rx Isolation | dB | 32 | | |
| 1310nm external to 1550 Video Isolation | dB | 40 | | |
| 1310nm external to 1490nm data Isolation | dB | 30 | | |
| 1310nm Tx to 1490nm Rx Optical Crosstalk | dB | | | -47 |
| 1310nm Tx to 1550 Rx Optical Crosstalk | dB | | | -47 |
| Back Reflection @ 1310nm | dB | | | -6 |
| Back Reflection @ 1550 | dB | | | -32 |
| Back Reflection @ 1490nm | dB | | | -20 |
| Pigtail | | | | |
| Pigtail Length (including connector) | mm | 235 | 255 | 275 |
| Optical Return Loss | dB | 50 | | |
| Connector | | SC/APC | | |

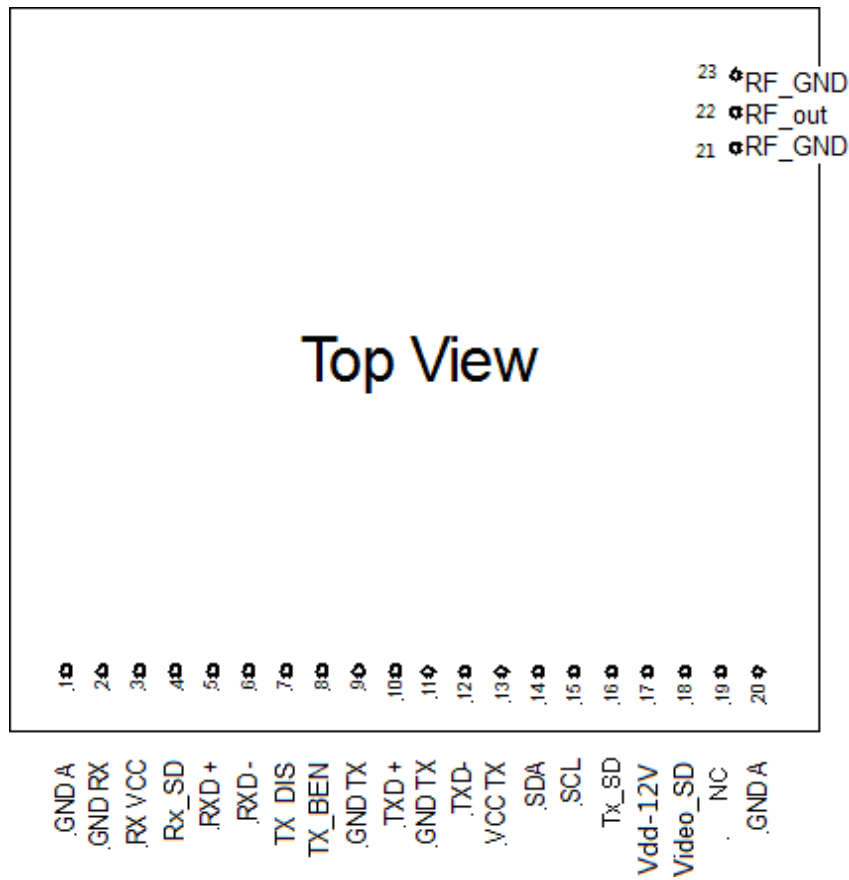
Burst Mode Transmitter Timing (transmitter on when Tx_BEN high)



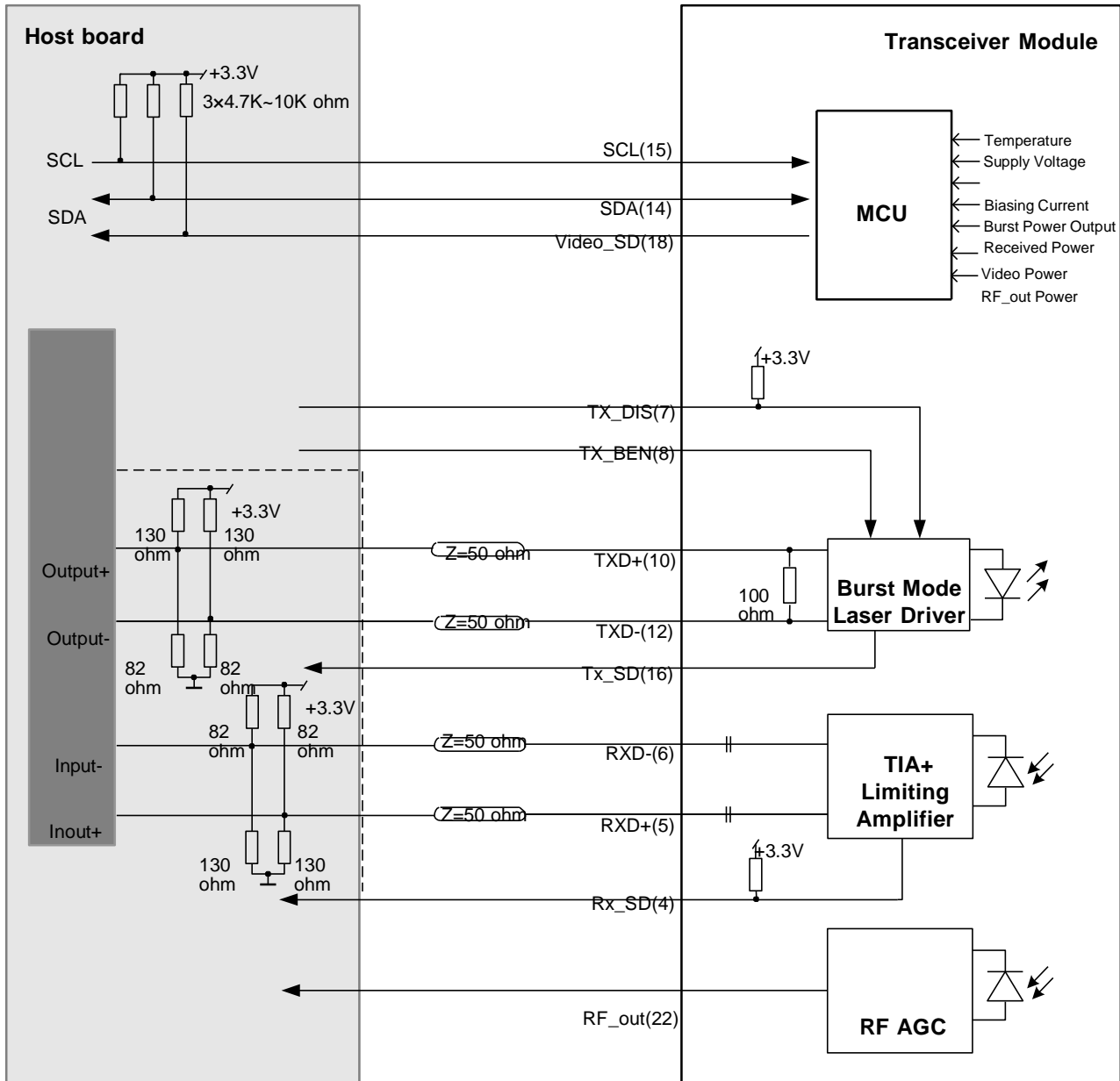
PIN Definition

| Pin No. | Symbol | Level / Logic | Description |
|---------|--------|---------------|---|
| 1 | GND_A | | Common Ground |
| 2 | GND_Rx | | Digital Rx ground |
| 3 | Vcc_Rx | | Digital Rx Vcc |
| 4 | RX_SD | LVTTL-O | 1490nm Rx Signal Detect Indication, active high when received signal |
| 5 | RXD+ | CML-O | Receiver Non-Inverted Data Output, AC-Coupled |
| 6 | RXD- | CML-O | Receiver Inverted Data Output, AC-Coupled |
| 7 | TX_DIS | LVTTL-I | Disable the Laser Diode when the input level is HIGH |
| 8 | TX_BEN | LVTTL-I | Enable the optical signal output when the input level is HIGH |
| 9 | GND_Tx | | Digital Tx ground |
| 10 | TXD+ | LVPECL-I | Transmitter Non-Inverted Data Input, DC-Coupled, 100Ω differential termination |
| 11 | GND_Tx | | |
| 12 | TXD- | LVPECL-I | Transmitter Inverted Data Input, DC-Coupled, 100Ω differential termination |
| 13 | Vcc_Tx | | Digital Tx Vcc, this power supply can be shut down by host when rogue ONU is detected |
| 14 | SDA | LVTTL-I/O | 2-Wire Serial Interface Data Line |
| 15 | SCL | LVTTL-I | 2-Wire Serial Interface Clock |
| 16 | TX_SD | LVTTL/O | transmitter on Indication, Active high when transmitter on |

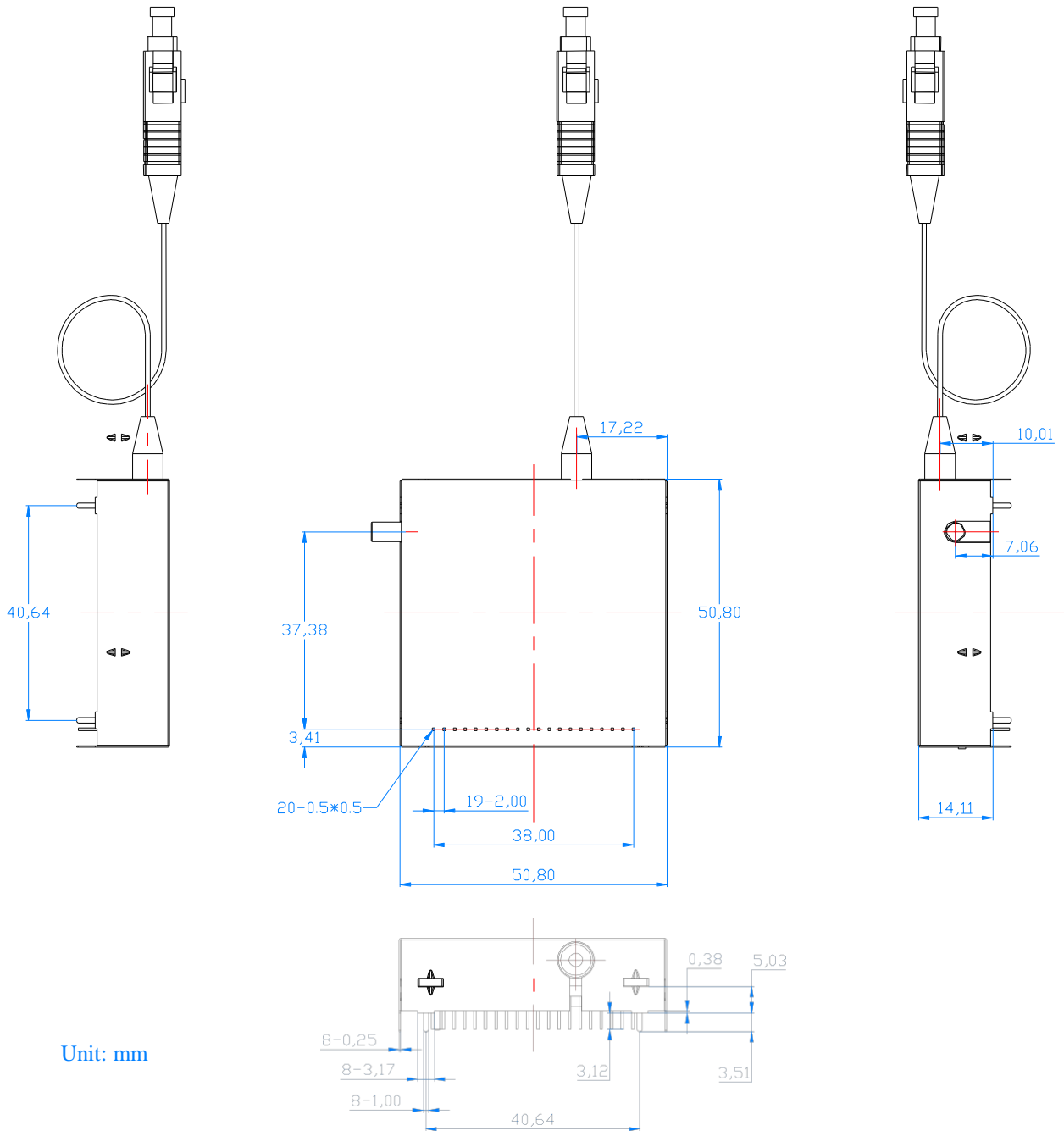
| | | | |
|----|----------|---------|--|
| 17 | Vdd_+12V | | Video Rx 12V Vdd |
| 18 | Video_SD | LVTTL-O | Video Signal Detected Indicator, assert HIGH when analog input optical signal level is above threshold |
| 19 | NC | | Not connected |
| 20 | GND_A | | Common ground |
| 21 | RF_GND | | RF ground |
| 22 | RF_OUT | | RF output signal |
| 23 | RF_GND | | RF ground |



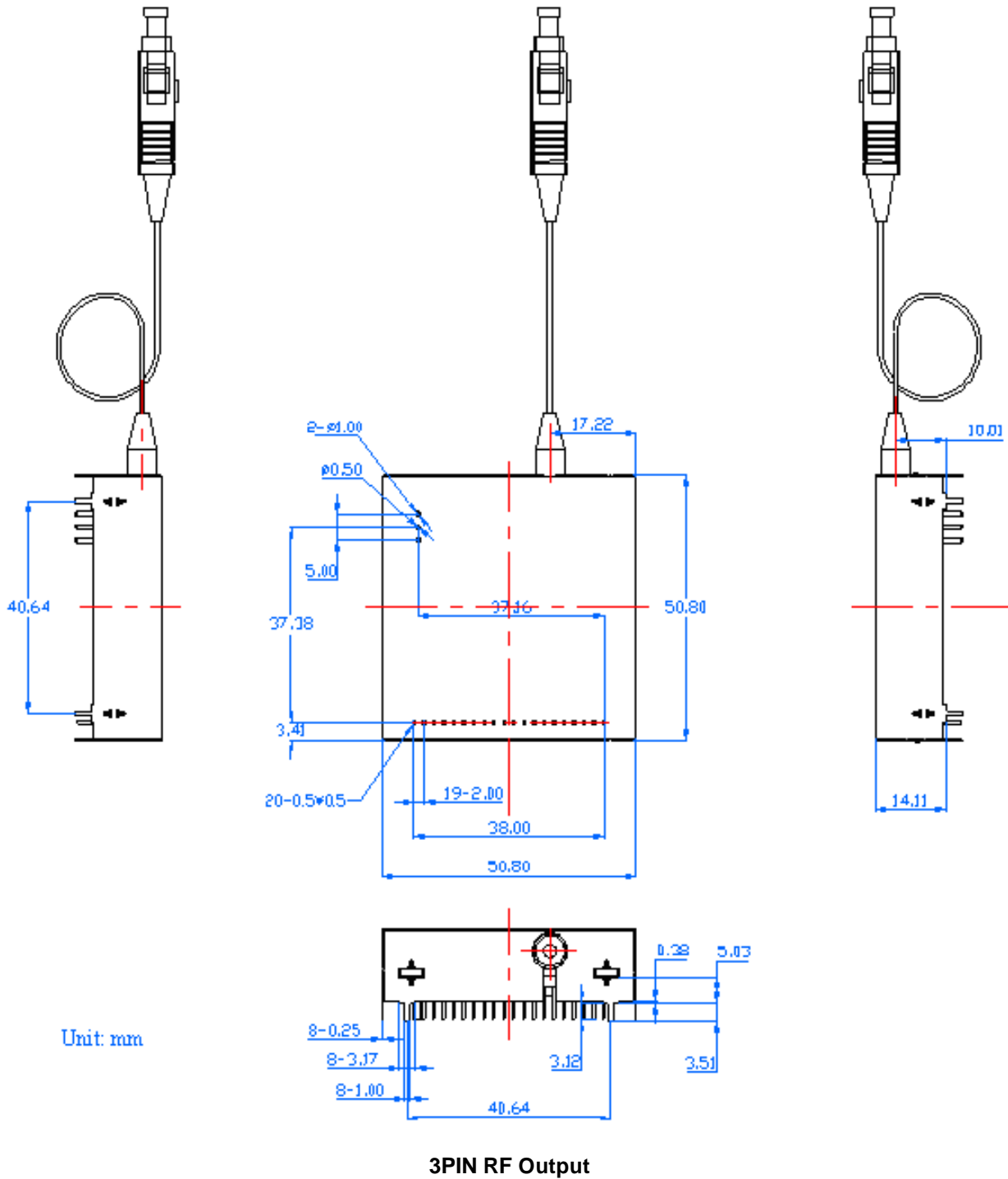
Typical Interface Circuit



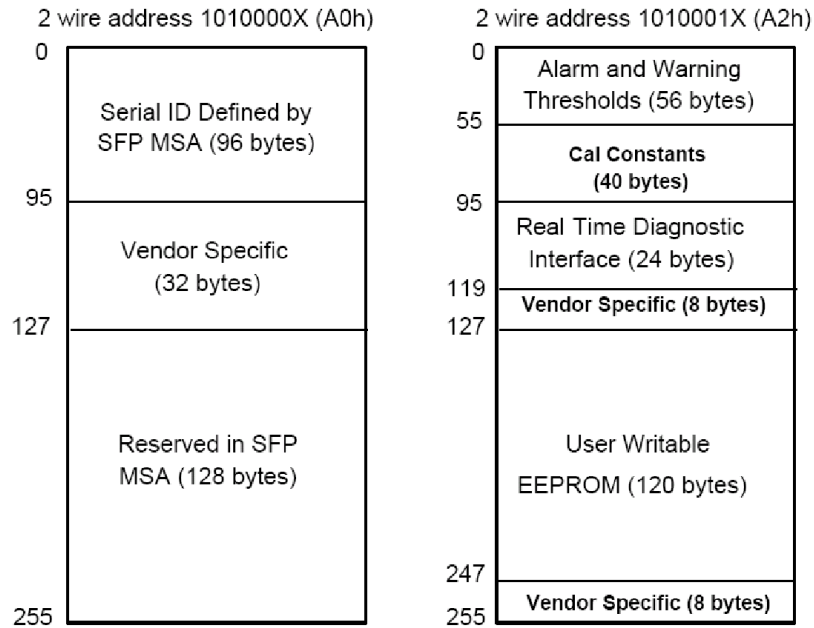
Mechanical Diagram



SMB RF Output



EEPROM Memory Map



| Address | Name of Field | Value | Description |
|---------|-------------------|-------|---|
| A0.00 | Identifier | 0x02 | 2X2 inch type device (soldered device) |
| A0.01 | Ext. Identifier | 0x04 | Serial ID module supported |
| A0.02 | Connector | 0x0B | Optical pigtail |
| A0.03 | Transceiver Codes | 0x00 | Undefined for PON |
| A0.04 | | 0x00 | Undefined for PON |
| A0.05 | | 0x00 | Undefined for PON |
| A0.06 | | 0x00 | Undefined for PON |
| A0.07 | | 0x00 | Undefined for PON |
| A0.08 | | 0x00 | Undefined for PON |
| A0.09 | | 0x00 | Undefined for PON |
| A0.10 | | 0x00 | Undefined for PON |
| A0.11 | Encoding | 0x03 | Compatible with NRZ encoding code |
| A0.12 | BR, Nominal | 0x0C | Nominal 1244Mbps (indicate transmitter data rate) |
| A0.13 | Reserved | 0x00 | Reserved |
| A0.14 | Length (9um)-km | 0x14 | 20km @9/125um fiber |
| A0.15 | Length (9um)-100m | 0xC8 | 20000m @9/125um fiber |
| A0.16 | Length for MMF | 0x00 | Undefined for PON |
| A0.17 | | 0x00 | |
| A0.18 | | 0x00 | |
| A0.19 | Reserved | 0x00 | Reserved |

| | | | |
|-------|------------------|------|--------------------|
| A0.20 | Vendor Name | 0x44 | DIPPEROPTICSLTD. |
| A0.21 | | 0x49 | |
| A0.22 | | 0x50 | |
| A0.23 | | 0x50 | |
| A0.24 | | 0x45 | |
| A0.25 | | 0x52 | |
| A0.26 | | 0x4F | |
| A0.27 | | 0x50 | |
| A0.28 | | 0x54 | |
| A0.29 | | 0x49 | |
| A0.30 | | 0x43 | |
| A0.31 | | 0x53 | |
| A0.32 | | 0x4C | |
| A0.33 | | 0x54 | |
| A0.34 | | 0x44 | |
| A0.35 | | 0x2E | |
| A0.36 | Channel Spacing | 0x00 | Undefined |
| A0.37 | Vendor OUI | 0x00 | Undefined |
| A0.38 | | 0x00 | Undefined |
| A0.39 | | 0x00 | Undefined |
| A0.40 | Vendor P/N | 0x44 | T342033A-xMx |
| A0.41 | | 0x32 | |
| A0.42 | | 0x33 | |
| A0.43 | | 0x34 | |
| A0.44 | | 0x35 | |
| A0.45 | | 0x35 | |
| A0.46 | | 0x2D | |
| A0.47 | | 0x54 | |
| A0.48 | | 0x41 | |
| A0.49 | | 0x43 | |
| A0.50 | | 0x41 | |
| A0.51 | | 0x20 | |
| A0.52 | | 0x20 | |
| A0.53 | | 0x20 | |
| A0.54 | | 0x20 | |
| A0.55 | | 0x20 | |
| A0.56 | Vendor P/N Rev. | 0x30 | 000A |
| A0.57 | | 0x30 | |
| A0.58 | | 0x30 | |
| A0.59 | | 0x41 | |
| A0.60 | Laser Wavelength | 0x05 | 1310nm in Hex byte |
| A0.61 | | 0x1E | |

| | | | |
|-------|----------------------------|------|---|
| A0.62 | DWDM Wavelength Fraction | 0x00 | Undefined |
| A0.63 | CC_BASE | XX | Check sum of bytes 0-62 |
| A0.64 | Options | 0x00 | TX_Disable, Tx_FAULT, Rx_SD |
| A0.65 | | 0x1C | |
| A0.66 | BR, Max. | 0x00 | Undefined |
| A0.67 | BR, Min. | 0x00 | Undefined |
| A0.68 | Vendor SN | 0x30 | Vendor serial number in ASCII character |
| A0.69 | | 0x30 | |
| A0.70 | | 0x30 | |
| A0.71 | | 0x30 | |
| A0.72 | | 0x30 | |
| A0.73 | | 0x30 | |
| A0.74 | | 0x30 | |
| A0.75 | | 0x30 | |
| A0.76 | | 0x30 | |
| A0.77 | | 0x30 | |
| A0.78 | | 0x30 | |
| A0.79 | | 0x30 | |
| A0.80 | | 0x30 | |
| A0.81 | | 0x30 | |
| A0.82 | | 0x30 | |
| A0.83 | 0x30 | | |
| A0.84 | Date Code | 0x30 | Vendor date code in ASCII character |
| A0.85 | | 0x30 | |
| A0.86 | | 0x30 | |
| A0.87 | | 0x30 | |
| A0.88 | | 0x30 | |
| A0.89 | | 0x30 | |
| A0.90 | | 0x20 | |
| A0.91 | | 0x20 | |
| A0.92 | Diagnostic Monitoring Type | 0x68 | Implemented with internal calibration and received power measurement type by Avg. power |
| A0.93 | Enhanced options | 0xF0 | Alarm/Warning flags monitor are implemented |
| A0.94 | SFF-8472 compliant | 0x02 | SFF-8472 compliant with revision 9.5 |
| A0.95 | CC_EXT | XX | Check sum of bytes 64-94 |

| Address | Name of Field | Value(HEX) | Real Value |
|---------|-----------------|------------|------------|
| A2.00 | Temp High Alarm | 0x5F | 95 |
| A2.01 | | 0x00 | |

| | | | |
|-------|-------------------------------|------|-----|
| A2.02 | Temp Low Alarm | 0xF6 | -10 |
| A2.03 | | 0x00 | |
| A2.04 | Temp High Warning | 0x55 | 85 |
| A2.05 | | 0x00 | |
| A2.06 | Temp Low Warning | 0xFB | -5 |
| A2.07 | | 0x00 | |
| A2.08 | Voltage High Alarm | 0x8C | 3.6 |
| A2.09 | | 0xA0 | |
| A2.10 | Voltage Low Alarm | 0x75 | 3 |
| A2.11 | | 0x30 | |
| A2.12 | Voltage High Warning | 0x88 | 3.5 |
| A2.13 | | 0xB8 | |
| A2.14 | Voltage Low Warning | 0x79 | 3.1 |
| A2.15 | | 0x18 | |
| A2.16 | Bias High Alarm | 0xAF | 90 |
| A2.17 | | 0xC8 | |
| A2.18 | Bias Low Alarm | 0x05 | 3 |
| A2.19 | | 0xDC | |
| A2.20 | Bias High Warning | 0x9C | 80 |
| A2.21 | | 0x40 | |
| A2.22 | Bias Low Warning | 0x07 | 4 |
| A2.23 | | 0xD0 | |
| A2.24 | TX Power High Alarm | 0x9B | 6 |
| A2.25 | | 0x82 | |
| A2.26 | TX Power Low Alarm | 0x18 | -2 |
| A2.27 | | 0xA5 | |
| A2.28 | TX Power High Warning | 0x7B | 5 |
| A2.29 | | 0x86 | |
| A2.30 | TX Power Low Warning | 0x1F | -1 |
| A2.31 | | 0x07 | |
| A2.32 | RX Power High Alarm | 0x09 | -1 |
| A2.33 | | 0xCF | |
| A2.34 | RX Power Low Alarm | 0x00 | -28 |
| A2.35 | | 0x0A | |
| A2.36 | RX Power High Warning | 0x07 | -2 |
| A2.37 | | 0xCB | |
| A2.38 | RX Power Low Warning | 0x00 | -27 |
| A2.39 | | 0x0C | |
| A2.40 | Threshold_VideoPWR_Alarm_High | 0x3D | 4 |
| A2.41 | | 0xE8 | |
| A2.42 | Threshold_VideoPWR_Alarm_Low | 0x04 | -7 |
| A2.43 | | 0xEA | |

| | | | |
|-------|---------------------------------|------|-----|
| A2.44 | Threshold_VideoPWR_Warning_High | 0x4D | 3 |
| A2.45 | | 0xF0 | |
| A2.46 | Threshold_VideoPWR_Warning_Low | 0x03 | -8 |
| A2.47 | | 0xE8 | |
| A2.48 | Threshold_RFPWR_Alarm_High | 0x03 | 99 |
| A2.49 | | 0xD4 | |
| A2.50 | Threshold_RFPWR_Alarm_Low | 0x03 | 91 |
| A2.51 | | 0x8E | |
| A2.52 | Threshold_RFPWR_Warning_High | 0x03 | 100 |
| A2.53 | | 0xE8 | |
| A2.54 | Threshold_RFPWR_Warning_Low | 0x03 | 89 |
| A2.55 | | 0x7A | |
| A2.56 | Rx_PWR(4) | 0x00 | 0 |
| A2.57 | | 0x00 | |
| A2.58 | | 0x00 | |
| A2.59 | | 0x00 | |
| A2.60 | Rx_PWR(3) | 0x00 | 0 |
| A2.61 | | 0x00 | |
| A2.62 | | 0x00 | |
| A2.63 | | 0x00 | |
| A2.64 | Rx_PWR(2) | 0x00 | 0 |
| A2.65 | | 0x00 | |
| A2.66 | | 0x00 | |
| A2.67 | | 0x00 | |
| A2.68 | Rx_PWR(1) | 0x3F | 1 |
| A2.69 | | 0x80 | |
| A2.70 | | 0x00 | |
| A2.71 | | 0x00 | |
| A2.72 | Rx_PWR(0) | 0x00 | 0 |
| A2.73 | | 0x00 | |
| A2.74 | | 0x00 | |
| A2.75 | | 0x00 | |
| A2.76 | Tx_I(Slope) | 0x01 | 1 |
| A2.77 | | 0x00 | |
| A2.78 | Tx_I(Offset) | 0x00 | 0 |
| A2.79 | | 0x00 | |
| A2.80 | Tx_PWR(Slope) | 0x01 | 1 |
| A2.81 | | 0x00 | |
| A2.82 | Tx_PWR(Offset) | 0x00 | 0 |
| A2.83 | | 0x00 | |
| A2.84 | T (Slope) | 0x01 | 1 |
| A2.85 | | 0x00 | |

| | | | |
|--------|-----------------------------------|------|---|
| A2.86 | T (Offset) | 0x00 | 0 |
| A2.87 | | 0x00 | |
| A2.88 | V (Slope) | 0x01 | 1 |
| A2.89 | | 0x00 | |
| A2.90 | V (Offset) | 0x00 | 0 |
| A2.91 | | 0x00 | |
| A2.92 | RF_OFFSET | 0x00 | 0 |
| A2.93 | reserved | 0x00 | |
| A2.94 | reserved | 0x00 | |
| A2.95 | CC_EXT | XX | |
| A2.96 | RT_TEMP | 0xFF | |
| A2.97 | | 0xFF | |
| A2.98 | RT_VCC | 0xFF | |
| A2.99 | | 0xFF | |
| A2.100 | RT_TXBIAS | 0xFF | |
| A2.101 | | 0xFF | |
| A2.102 | RT_TXPWR | 0xFF | |
| A2.103 | | 0xFF | |
| A2.104 | RT_RXPWR | 0xFF | |
| A2.105 | | 0xFF | |
| A2.106 | RT_VideoPWR | 0xFF | |
| A2.107 | | 0xFF | |
| A2.108 | RT_RFPWR | 0xFF | |
| A2.109 | | 0xFF | |
| A2.110 | status/control | 0xFF | |
| A2.111 | reserved | 0xFF | |
| A2.112 | Alarm1 | 0xFF | |
| A2.113 | Alarm2 | 0xFF | |
| A2.114 | Inerrupt Alarm Mask for A2[112] | 0xFF | |
| A2.115 | Inerrupt Alarm Mask for A2[113] | 0xFF | |
| A2.116 | Warning1 | 0xFF | |
| A2.117 | Warning2 | 0xFF | |
| A2.118 | Inerrupt Warning Mask for A2[116] | 0xFF | |
| A2.119 | Inerrupt Warning Mask for A2[117] | 0xFF | |

| Address | Type | Name of Field | Description |
|---------|-------|---------------|--|
| 92 | FLASH | RF_OFFSET | R/W. RF AGC control (0.1dB / LSB), 8bit signed integer, password protected |
| 93-94 | FLASH | | reserved |
| 95 | FLASH | Checksum | Checksum of A2[0..94] |

| | | | |
|---------|-----|----------------|---|
| 96-97 | RAM | Temperature | Case temperature monitoring value (1/256°C / LSB) |
| 98-99 | RAM | Voltage | +3.3V Voltage monitoring value (0.1mV / LSB) |
| 100-101 | RAM | Bias Current | Bias Current monitoring value (2uA / LSB) |
| 102-103 | RAM | 1310nm_power | 1310nm Transmitter power monitoring value (0.1uW / LSB) |
| 104-105 | RAM | 1490nm_power | 1490nm Receiver power monitoring value (0.1uW / LSB) |
| 106-107 | RAM | 1550nm_power | 1550nm Video power monitoring value (0.1uW / LSB) |
| 108-109 | RAM | RF_out_power | RF_output power monitoring value (0.1dBuV / LSB) |
| 110 | RAM | status/control | bit7: TX_DIS_STATE, high means the transmitter output disabled bit6: soft_TX_disable, high disable the transmitter output bit5: Interrupt status indicator bit4: Video_en, high active video AGC amplifier in default bit3: Video_SD, Video Signal detect status bit2: TX_fault status, high indicate the Tx fault bit1: RX_SD status, high indicate the 1490nm signal detected bit0: Data-Ready |
| 111 | RAM | reserved | |
| 112 | RAM | Alram1 | bit7: TEMP Alarm HI bit6: TEMP Alarm LO bit5: VCC Alarm HI bit4: VCC Alarm LO bit3: TX_Bias Alarm HI bit2: TX_Bias Alarm LO bit1: TX_Power Alarm HI bit0: TX_Power Alarm LO |
| 113 | RAM | Alram2 | bit7: RX_Power Alarm HI bit6: RX_Power Alarm LO bit5: Video_Power Alarm HI bit4: Video_Power Alarm HI bit3: RF_Power Alarm HI bit2: RF_Power Alarm LO bit1: reserved bit0: reserved |

Ordering Information

| Ordering P/Ns | Description |
|---------------|--|
| T342033A-CMA | EPON Triplexer, 1.25Gbps Tx 1310nm, 1.25Gbps Rx 1490nm, 1G Bandwidth Video Rx 1550, Single-ended LVTTTL TX_BEN signal high active transmitter on, 2*2 inch form-factor, SC/APC pigtail connector, RF_out in SMB interface, 0~70°C Commercial temperature |
| T342033A-IMA | EPON Triplexer, 1.25Gbps Tx 1310nm, 1.25Gbps Rx 1490nm, 1G Bandwidth Video Rx 1550, Single-ended LVTTTL TX_BEN signal high active transmitter on, 2*2 inch form-factor, SC/APC pigtail connector, RF_out in SMB interface, -40~85°C Industrial temperature |
| T342033A-CMB | EPON Triplexer, 1.25Gbps Tx 1310nm, 1.25Gbps Rx 1490nm, 870M Bandwidth Video Rx 1550, Single-ended LVTTTL TX_BEN signal high active transmitter on, 2*2 inch form-factor, SC/APC pigtail connector, RF_out in SMB interface, 0~70°C Commercial temperature |
| T342033A-IMB | EPON Triplexer, 1.25Gbps Tx 1310nm, 1.25Gbps Rx 1490nm, 870M Bandwidth Video Rx 1550, Single-ended LVTTTL TX_BEN signal high active transmitter on, 2*2 inch form-factor, SC/APC pigtail connector, RF_out in SMB interface, -40~85°C Industrial temperature |