

## X2-SM31TG-10DC

### X2-10GBASE-LR 1310nm, 10km Reach

#### Features

- Compatible with X2 MSA Rev2.0b
- Support of IEEE 802.3ae 10GBASE-LR at 10.3125Gbps
- Transmission Distance up to 10Km(SMF)
- SC Receptacle 1310nm DFB Laser
- SC Duplex Optical Connector
- Hot Pluggable 70-PIN Connector with XAUI Electrical Interface
- Management and control via MDIO 2-wire interface
- Power Supply :+3.3V, APS(+1.2V)
- Diagnostic Optics Monitoring
- Temperature Range: 0~ 70 °C
- ROHS Compatible



#### Applications

- 10GE Ethernet switches and routers
- 10GE Core-routers
- 10GE Storage
- Other 10Gbps Ethernet Transmission System

#### Product Description

The X2 Module is a highly integrated, Serial optical transponder module for high-speed, 10Gbit/s data transmission applications. 4×3.125Gbps Ethernet Signal Input by XAUI Interface. An integrated Coder / Decoder and multiplexer / demultiplexer (SERDES: Serializer / Deserializer). Designing for 10km Transmission with an uncooled directly modulated 1310nm DFB Laser. Digital diagnostics functions are available via a 2-wire serial interface, as specified in the XENPAK MSA 3.0.

### Absolute Maximum Ratings

| Parameter                         | Symbol   | Min  | Max | Unit | Ref.                       |
|-----------------------------------|----------|------|-----|------|----------------------------|
| Storage Ambient Temperature Range |          | -40  | +85 | °C   | non condensing             |
| Powered case Temperature Range    |          | 0    | +70 | °C   | non condensing             |
| Adaptable Power Supply (APS)      | Vapsense | 0    | 1.5 | V    | Voltage @ Pin<br>APS Sense |
| Supply Voltage Range @ 3.3V       | Vcc3     | -0.5 | 4.0 | V    |                            |

Any stress beyond the maximum ratings can result in permanent damage. The device specifications are guaranteed only under the recommended operating conditions.

### Recommended Operating Conditions

| Parameter                  | Symbol           | Min   | Typical | Max   | Unit |
|----------------------------|------------------|-------|---------|-------|------|
| Operating Case Temperature | Tc               | 0     |         | +70   | °C   |
| Power Supply Voltage       | V <sub>CC3</sub> | 3.14  | 3.0     | 3.47  | V    |
|                            | V <sub>APS</sub> | 1.152 | 1.2     | 1.248 |      |
| Power Dissipation          | PD               |       | 3.5     | 4     | W    |

### XAUI I/O Characteristics

| Parameter                         | Symbol | Min. | Typ.  | Max. | Unit  | Note                         |
|-----------------------------------|--------|------|-------|------|-------|------------------------------|
| XAUI Data Rate                    | DR     |      | 3.125 |      | Gb/s  |                              |
| XAUI Baud Rate Tolerance          |        | -100 |       | +100 | ppm   | Relative Tolerance           |
| Differential Input Voltage Swing  |        | 220  |       | 1600 | mv    | 8B/10B Coded<br>Input Signal |
| Differential Output Voltage Swing |        | 800  |       | 1600 | mVp-p | RLOAD = 100Ω ±<br>5%         |
| Differential Input Impedance      |        | 80   | 100   | 120  | Ω     |                              |
| Total Output Jitter               | TJXAUI |      |       | 0.35 | UI    | no pre-equalization          |
| Total Deterministic Output Jitter | DJXAUI |      |       | 0.17 | UI    | no pre-equalization          |

## Optical Interface

### Transmitter Characteristics

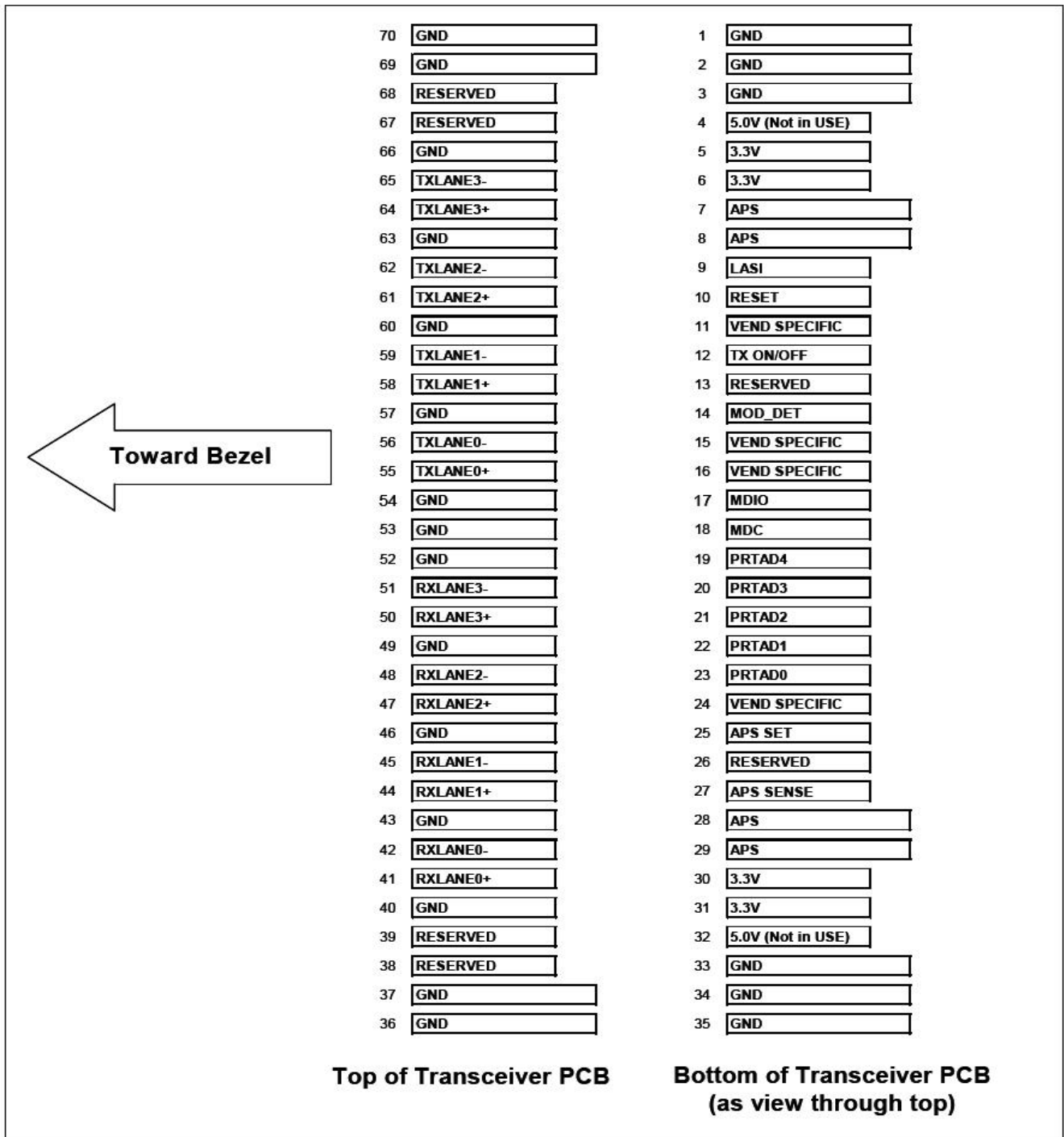
| Parameter                          | Symbol    | Min. | Typ.    | Max. | Unit    | Note |
|------------------------------------|-----------|------|---------|------|---------|------|
| Operating Range                    |           |      |         | 10   | Km      |      |
| Operating Data Rate                |           |      | 10.3125 |      | Gb/s    |      |
| Optical Transmit Power             | Po        | -8.2 |         | 0.5  | dBm     |      |
| Input Centre Wavelength            | $\lambda$ | 1260 | 1310    | 1355 | nm      |      |
| SMSR.                              | SWSR      | 30   |         |      | dB      |      |
| Extinction Ratio                   | ER        | 4.5  | 6       |      |         |      |
| Optical Modulation Amplitude       | OMA       | 500  |         |      | $\mu$ W |      |
| Transmitter and Dispersion Penalty | TDP       |      |         | 3.2  | dB      |      |

### Receiver Characteristics

| Parameter                   | Symbol | Min. | Typ.    | Max.  | Unit | Note |
|-----------------------------|--------|------|---------|-------|------|------|
| Operating Data Rate         |        |      | 10.3125 |       | Gb/s |      |
| Overload                    | Po     | 0.5  |         |       | dBm  |      |
| Sensitivity in OMA          | OMA0   |      |         | -12.6 | dBm  |      |
| Stressed Sensitivity in OMA | OMAst  |      |         | -10.3 | dBm  |      |
| Sensitivity MINI            | Pmin   |      |         | -14.4 | dBm  | 1    |

Note :1. Measured at 10.3125Gb/s,Non-framed PRBS2^31-1,NRZ

**Electrical PAD Layout**



**Host PCB X2 PINOUT**

|    |                   |          |    |
|----|-------------------|----------|----|
| 1  | GND               | GND      | 70 |
| 2  | GND               | GND      | 69 |
| 3  | GND               | RESERVED | 68 |
| 4  | 5.0V (Not in USE) | RESERVED | 67 |
| 5  | 3.3V              | GND      | 66 |
| 6  | 3.3V              | TXLANE3- | 65 |
| 7  | APS               | TXLANE3+ | 64 |
| 8  | APS               | GND      | 63 |
| 9  | LASI              | TXLANE2- | 62 |
| 10 | RESET             | TXLANE2+ | 61 |
| 11 | VEND SPECIFIC     | GND      | 60 |
| 12 | TX ON/OFF         | TXLANE1- | 59 |
| 13 | RESERVED          | TXLANE1+ | 58 |
| 14 | MOD_DET           | GND      | 57 |
| 15 | VEND SPECIFIC     | TXLANE0- | 56 |
| 16 | VEND SPECIFIC     | TXLANE0+ | 55 |
| 17 | MDIO              | GND      | 54 |
| 18 | MDC               | GND      | 53 |
| 19 | PRTAD4            | GND      | 52 |
| 20 | PRTAD3            | RXLANE3- | 51 |
| 21 | PRTAD2            | RXLANE3+ | 50 |
| 22 | PRTAD1            | GND      | 49 |
| 23 | PRTAD0            | RXLANE2- | 48 |
| 24 | VEND SPECIFIC     | RXLANE2+ | 47 |
| 25 | APS SET           | GND      | 46 |
| 26 | RESERVED          | RXLANE1- | 45 |
| 27 | APS SENSE         | RXLANE1+ | 44 |
| 28 | APS               | GND      | 43 |
| 29 | APS               | RXLANE0- | 42 |
| 30 | 3.3V              | RXLANE0+ | 41 |
| 31 | 3.3V              | GND      | 40 |
| 32 | 5.0V (Not in USE) | RESERVED | 39 |
| 33 | GND               | RESERVED | 38 |
| 34 | GND               | GND      | 37 |
| 35 | GND               | GND      | 36 |

**Pin Descriptions**

| PIN NO | Name             | Dir | Logic                   | Function  | Notes |
|--------|------------------|-----|-------------------------|---|-------|
| 1      | GND              |     |                         | Electrical Ground   |       |
| 2      | GND              |     |                         | Electrical Ground   |       |
| 3      | GND              |     |                         | Electrical Ground   |       |
| 4      | 5.0V             |     |                         | Power   |       |
| 5      | 3.3V             |     |                         | Power   |       |
| 6      | 3.3V             |     |                         | Power   |       |
| 7      | APS              |     |                         | Adaptive Power Supply   |       |
| 8      | APS              |     |                         | Adaptive Power Supply   |       |
| 9      | LASI             | O   | 1.2V CMOS<br>Open Drain | Link Alarm Status Interrupt, low active, Open Drain Output<br>A pull-up resistor with 10-22KΩ to 1,2V is expected.<br>Logic High: Normal Operation<br>Logic Low: Link Alarm is indicated                          |       |
| 10     | Reset            | I   | 1.2V CMOS<br>Open Drain | Low active Reset Input 10KΩ pull-up on Transceiver<br>Logic high = Normal Operation<br>Logic Low = Reset asserted   |       |
| 11     | VEND<br>SPECIFIC |     |                         | Vendor Specific Pin,. leave unconnected   |       |
| 12     | TX ON/OFF        | I   | 1.2V CMOS<br>Open Drain | High active Transmitter Enable Input<br>10KΩ pull-up on Transceiver<br>Logic high = Transmitter active (normal<br>Operation)<br>And Register Bit 1.9.0 set to low as well<br>Logic Low = shut down of Transmitter |       |
| 13     | RESERVED         |     |                         | RESERVED  |       |
| 14     | MOD<br>DETECT    | O   |                         | 1kΩ to Ground On Transceiver  |       |
| 15     | VEND<br>SPECIFIC |     |                         | Vendor Specific Pin,. leave unconnected   |       |
| 16     | VEND<br>SPECIFIC |     |                         | Vendor Specific Pin,. leave unconnected   |       |
| 17     | MDIO             | I/O | 1.2V CMOS               | Management Data I/O. Requires external 10-22 kΩ pull-<br>up to 1.2 V on host.   |       |
| 18     | MDC              | I   | 1.2V CMOS               | Management Clock Input  |       |
| 19     | PRTAD4           | I   |                         | Port Address Bit 4(LOW=0)   |       |
| 20     | PRTAD3           | I   |                         | Port Address Bit 3(LOW=0)   |       |
| 21     | PRTAD2           | I   |                         | Port Address Bit 2(LOW=0)   |       |
| 22     | PRTAD1           | I   |                         | Port Address Bit 1(LOW=0)   |       |

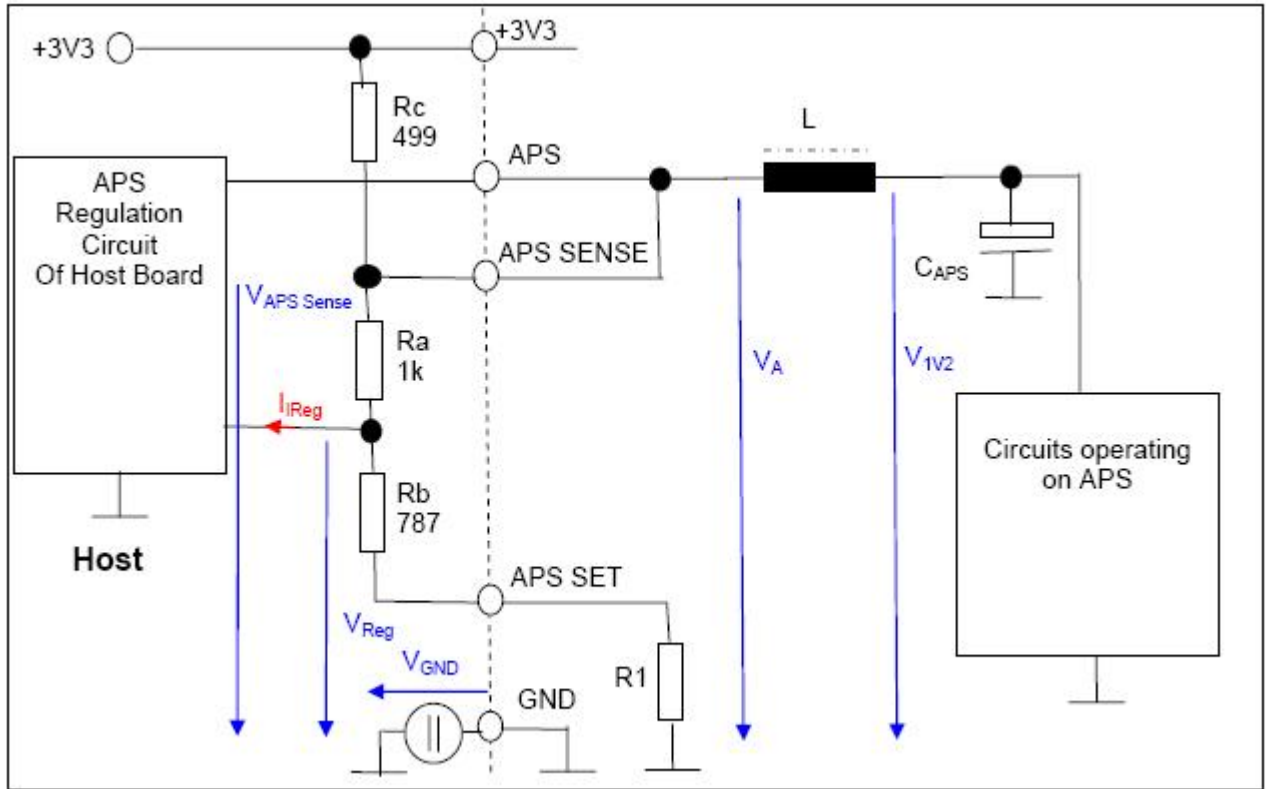
|    |               |   |  |   |  |
|----|---------------|---|--|---|--|
| 23 | PRTAD0        | I |  | Port Address Bit 0(LOW=0)                             |  |
| 24 | VEND SPECIFIC |   |  | Vendor Specific Pin,. leave unconnected               |  |
| 25 | APS SET       | I |  | Feedback Input for APS, Input of APS Setting Resistor |  |
| 26 | RESERVED      |   |  | RESERVED  |  |
| 27 | APS SENSE     | O |  | APS Sense Output for APS Control Circuit              |  |
| 28 | APS           |   |  | Adaptive Power Supply                                 |  |
| 29 | APS           |   |  | Adaptive Power Supply                                 |  |
| 30 | 3.3V          |   |  | Power   |  |
| 31 | 3.3V          |   |  | Power   |  |
| 32 | 5.0V          |   |  | Power   |  |
| 33 | GND           |   |  | Electrical Ground                                     |  |
| 34 | GND           |   |  | Electrical Ground                                     |  |
| 35 | GND           |   |  | Electrical Ground                                     |  |

| PIN NO | Name       | Dir | Logic | Function                   | Notes |
|--------|------------|-----|-------|----------------------------|-------|
| 36     | GND        |     |       | Electrical Ground          |       |
| 37     | GND        |     |       | Electrical Ground          |       |
| 38     | RESERVED   |     |       | RESERVED                   |       |
| 39     | RESERVED   |     |       | RESERVED                   |       |
| 40     | GND        |     |       | Electrical Ground          |       |
| 41     | RX LANE 0+ |     |       | Module XAUI Output Lane 0+ |       |
| 42     | RX LANE 0- |     |       | Module XAUI Output Lane 0- |       |
| 43     | GND        |     |       | Electrical Ground          |       |
| 44     | RX LANE 1+ |     |       | Module XAUI Output Lane 1+ |       |
| 45     | RX LANE 1- |     |       | Module XAUI Output Lane 1- |       |
| 46     | GND        |     |       | Electrical Ground          |       |
| 47     | RX LANE 2+ |     |       | Module XAUI Output Lane 2+ |       |
| 48     | RX LANE 2- |     |       | Module XAUI Output Lane 2- |       |
| 49     | GND        |     |       | Electrical Ground          |       |
| 50     | RX LANE 3+ |     |       | Module XAUI Output Lane 2+ |       |
| 51     | RX LANE 3- |     |       | Module XAUI Output Lane 2- |       |

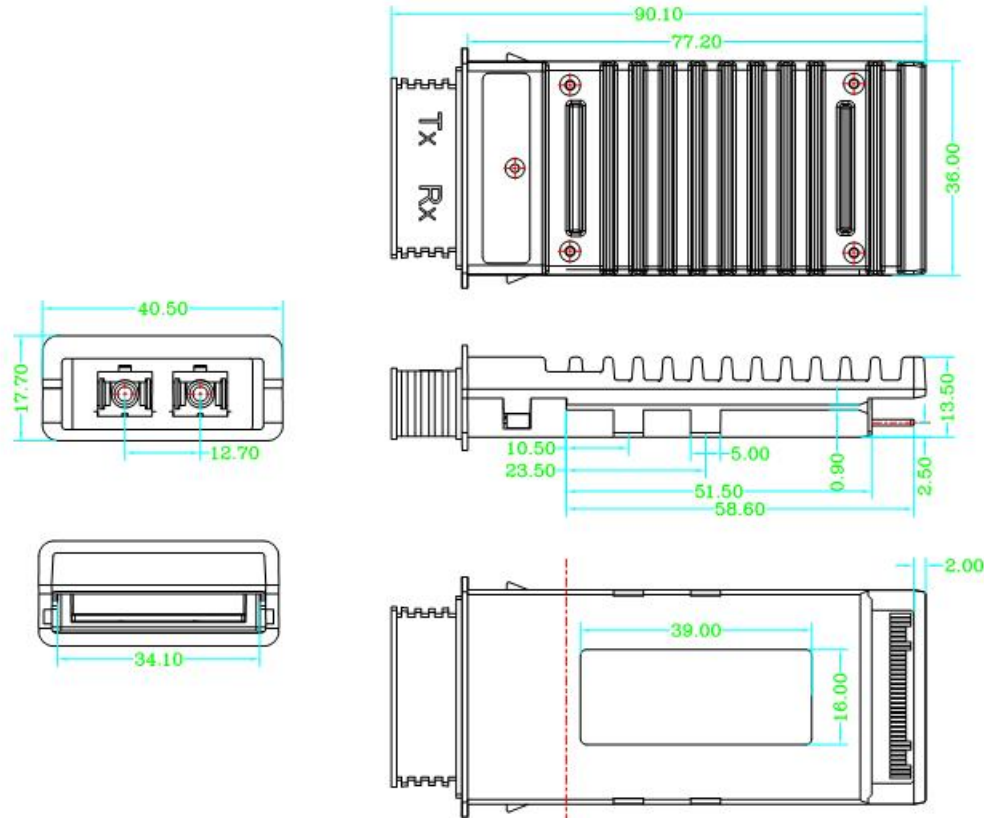
|    |            |  |  |                            |  |
|----|------------|--|--|----------------------------|--|
| 52 | GND        |  |  | Electrical Ground          |  |
| 53 | GND        |  |  | Electrical Ground          |  |
| 54 | GND        |  |  | Electrical Ground          |  |
| 55 | RX LANE 0+ |  |  | Module XAU1 Output Lane 0+ |  |
| 56 | RX LANE 0- |  |  | Module XAU1 Output Lane 0- |  |
| 57 | GND        |  |  | Electrical Ground          |  |
| 58 | TX LANE 1+ |  |  | Module XAU1 Output Lane 1+ |  |
| 59 | TX LANE 1- |  |  | Module XAU1 Output Lane 1- |  |
| 60 | GND        |  |  | Electrical Ground          |  |
| 61 | TX LANE 2+ |  |  | Module XAU1 Output Lane 2+ |  |
| 62 | TX LANE 2- |  |  | Module XAU1 Output Lane 2- |  |
| 63 | GND        |  |  | Electrical Ground          |  |
| 64 | TX LANE 3+ |  |  | Module XAU1 Output Lane 2+ |  |
| 65 | TX LANE 3- |  |  | Module XAU1 Output Lane 2- |  |
| 66 | GND        |  |  | Electrical Ground          |  |
| 67 | RESERVED   |  |  | RESERVED                   |  |
| 68 | RESERVED   |  |  | RESERVED                   |  |
| 69 | GND        |  |  | Electrical Ground          |  |
| 70 | GND        |  |  | Electrical Ground          |  |



**Block Diagram of Adapter Power Supply Circuit**



## Package Dimensions



## Ordering information

| Part Number    | Product Description                    |
|----------------|--|
| X2-SM31TG-10DC | 1310nm, 10.3125Gbps, 10Km, 0°C ~ +70°C |

## For More Information

Tel: +86-755-23301665

E-mail : [sales@fibertoptech.com](mailto:sales@fibertoptech.com)

Web: <http://www.fibertoptech.com>