

## T-10G-X2-SM-80KM

10Gbps X2 Single Mode Transceiver 80km

### Features

- X2 MSA Compliant
- 70-PIN Connector
- SC duplex receptacle package
- Cooled EA-DFB/APD-PD
- Power Supply: +5.0V,+3.3V, APS:+1.2V
- Power Dissipation 4W Maximum
- 0°C to 70°C Operating Case Temperature
- Digital Diagnostic Monitoring
- Management and control with MDIO 2 wire bus
- XAUI electrical interface 4X3.125Gb/s Ethernet
- ≤40km ER ( Extended Range ) 10GBE
- RoHS compliant



### Applications

- 10Gb/s Ethernet transmission systems
- 10Gb/s Ethernet Switched and Routers
- 10GE Core-routers and Storage

### Ordering Information

| Part No.          | Data Rate     | Fiber | Distance       | Interface | Temperature | DDMI |
|-------------------|---------------|-------|----------------|-----------|-------------|------|
| T-10G-X2-SM-80 KM | 9.95~10.3Gbps | SMF   | 1550nm<br>80KM | SC        | Standard    | YES  |

### Regulatory Compliance

| Feature                  | Agency | Standard  | Certificate / Comments |
|--------------------------|--------|---|------------------------|
| Laser Safety             | FDA    | CDRH 21 CFR 1040 and Laser Notice No.50         | 1120292-000            |
| Product Safety           | UL     | UL and CUL EN60950-2:2007                       | WT10093768-D-E-E       |
| Environmental Protection | SGS    | RoHS Directive 2002/95/EC                       | GZ1001008918/CHEM      |
| EMC                      | WALTEK | EN55022:2006+A1:2007<br>EN55024:1998+A1+A2:2003 | WT10093759-D-E-E       |

**Absolute Maximum Ratings**

| Parameter                    | Symbol | Min. | Max. | Unit |
|------------------------------|--------|------|------|------|
| Supply Voltage +5V           | Voc5   |      | 6.0  | V    |
| Supply Voltage +3.3V         | Voc3   |      | 4    | V    |
| Supply Voltage APS           | Vaps   |      | 2    | V    |
| Storage Temperature          | Tst    | -20  | 85   | °C   |
| Optical Input Received Power | PIN    |      | -7   | dBm  |

**Recommended Operating Conditions**

| Parameter                  | Symbol | Min. | Typical | Max. | Unit |
|----------------------------|--------|------|---------|------|------|
| Operating Case Temperature | Tca    | 0    |         | 70   | °C   |
| Supply Voltage +5V         | Voc5   | 4.75 | 5       | 5.25 | V    |
| Supply Current +5V         | Ioc5   |      |         | 500  | mA   |
| Supply Voltage +3.3V       | Voc3   | 3.14 | 3.3     | 3.47 | V    |
| Supply Current +3.3V       | Ioc3   |      |         | 1000 | mA   |
| Supply Voltage APS         | Vaps   | 1.14 | 1.2     | 1.26 | V    |
| Supply Current APS         | Iaps   |      |         | 1100 | mA   |
| Module Power Dissipation   | Pm     |      |         | 4    | W    |

**Transmitter Specifications-Optical**

| Parameter                       | Symbol                 | Min.   | Typical     | Max.   | Unit |
|---------------------------------|------------------------|--------|-------------|--------|------|
| Center Wavelength               | $\lambda_c$            | 1464.5 |             | 1617.5 | nm   |
| Center Wavelength Stability     | $\Delta\lambda_D$      | -6.5   | $\lambda_c$ | 6.5    | nm   |
| Optical Transmit Power          | Po                     | 0      |             | 4      | dBm  |
| Optical Transmit Power(disable) | Ptx-dis                |        |             | -40    | dBm  |
| Extinction Ratio                | ER                     | 9      |             |        | dB   |
| Side Mode Suppression Ratio     | SMSR                   | 30     |             |        | dB   |
| Eye Mask                        | IEEE 802.3ae Compliant |        |             |        |      |

**Receiver Specifications-Optical**

| Parameter                  | Symbol      | Min. | Typical | Max. | Unit |
|----------------------------|-------------|------|---------|------|------|
| Input Operating Wavelength | $\lambda_c$ | 1260 |         | 1600 | nm   |
| Received Power 1           | Rpo         | -24  |         | -7   | dBm  |
| Maximum Input Power        | RX-overload | -7   |         |      | dBm  |
| Reflectance                | Rrx         |      |         | -27  | dB   |

**Transmitter Specification-Electrical**

| Parameter                     | Symbol  | Min. | Typ. | Max  | Unit |
|-------------------------------|---------|------|------|------|------|
| Data Rate( TXLINE0-3)         | TX-xaui |      | 3125 |      | Mbps |
| Differential Impedance        | Zo      | 80   | 100  | 120  | Ω    |
| Differential Input Amplitude  | Vin P-P | 160  |      | 2000 | mVpp |
| Input Rise/Fall               | TR /TF  | 60   |      | 130  | ps   |
| Differential Impedance of Zin | Zin     |      | 100  |      | ohm  |

**Receiver Specification-Electrical**

| Parameter                      | Symbol   | Min. | Typ. | Max  | Unit |
|--------------------------------|----------|------|------|------|------|
| Data Rate( TXLINE0-3 )         | RX-xaui  |      | 3125 |      | Mbps |
| Supply Voltage                 | VccRX    | 3.13 | 3.3  | 3.47 | V    |
| Differential Output Amplitude  | Vout P-P | 800  |      | 1600 | mV   |
| Rise / Fall Time               | Tr / Tf  | 50   |      | 90   | ps   |
| Differential Impedance of Zout | Zout     |      | 100  |      | ohm  |

**Signal Specification-Electrical**

| Parameter                   | Symbol     | Min. | Typ. | Max  | Unit |
|-----------------------------|------------|------|------|------|------|
| <b>1.2V CMOS</b>            |            |      |      |      |      |
| Input High Voltage          | VIL( MAX ) |      |      | 0.36 | V    |
| Input Low Voltage           | VIH( MIN)  | 0.84 |      | 1.25 | V    |
| Capacitance                 |            |      |      | 320  | pF   |
| Pull Up Resistance          | Rpull      | 10k  |      | 22k  | ohm  |
| <b>MDIO I/O</b>             |            |      |      |      |      |
| Output Low Voltage          | VOL        | -0.3 |      | 0.2  | V    |
| Output Low Current          | IOL        |      |      | 4    | mA   |
| Input High Voltage          | VIH        | 0.84 |      | 1.5  | V    |
| Input Low Voltage           | VIL        | -0.3 |      | 0.36 | V    |
| Pull-up Supply Voltage      | VPULL      | 1.14 | 1.2  | 1.26 |      |
| Input Capacitance           | CIN        |      |      | 10   | Pf   |
| Load Capacitance            | CLOD       |      |      | 470  | Pf   |
| External Pull-up Resistance | EPULL      | 200  |      |      | Ohm  |

**Pin Definition**

| Pin No | Name          | Dir | Function  | Notes |
|--------|---------------|-----|---|-------|
| 1      | GND           |     | Electrical Ground   | 1     |
| 2      | GND           |     | Electrical Ground   | 1     |
| 3      | GND           |     | Electrical Ground   | 1     |
| 4      | 5.0V          |     | Power   | 2     |
| 5      | 3.3V          |     | Power   | 2     |
| 6      | 3.3V          |     | Power   | 2     |
| 7      | APS=1.2V      |     | Adaptive Power Supply   | 2     |
| 8      | APS=1.2V      |     | Adaptive Power Supply   | 2     |
| 9      | LASI          |     | Open Drain Compatible<br>10K-22K pull up on host.<br>Logic High: Normal Operation<br>Logic Low: LASI Asserted                                   | 4     |
| 10     | RESET         | I   | Open Drain compatible.<br>10-22K pull-up on transceiver<br>Logic high = Normal operation<br>Logic low = Reset<br>Minimum reset assert time 1 ms | 4     |
| 11     | VEND SPECIFIC |     | Vendor Specific Pin.  | 8     |
|        |               |     | Leave unconnected when not in use.  |       |
| 12     | TX ON/OFF     | I   | Open Drain compatible.<br>10-22K pull-up on transceiver<br>Logic high = Transmitter On (capable)<br>Logic low = Transmitter Off (always)        | 4     |
| 13     | RESERVED      |     | Reserved  | 4     |
| 14     | MOD DETECT    | O   | Pulled low inside module through 1k   |       |
| 15     | VEND SPECIFIC |     | Vendor Specific Pin.<br>Leave unconnected when not in use.  | 8     |
| 16     | VEND SPECIFIC |     | Vendor Specific Pin.<br>Leave unconnected when not in use.  | 8     |
| 17     | MDIO          | I/O | Management Data IO  | 4,5   |
| 18     | MDC           | I   | Management Data Clock   | 4,5   |
| 19     | PRTAD4        | I   | Port Address Bit 4 (Low = 0)  | 4     |
| 20     | PRTAD3        | I   | Port Address Bit 3 (Low = 0)  | 4     |
| 21     | PRTAD2        | I   | Port Address Bit 2 (Low = 0)  | 4     |
| 22     | PRTAD1        | I   | Port Address Bit 1 (Low = 0)  | 4     |
| 23     | PRTAD0        | I   | Port Address Bit 0 (Low = 0)  | 4     |
| 24     | VEND SPECIFIC |     | Vendor Specific Pin.<br>Leave unconnected when not in use.  | 8     |
| 25     | APS SET       |     | Feedback input for APS  |       |
| 26     | RESERVED      |     | Reserved for Avalanche Photodiode use.  | 8     |
| 27     | APS SENSE     |     | APS Sense Connection  |       |
| 28     | APS=1.2V      |     | Adaptive Power Supply   | 2     |



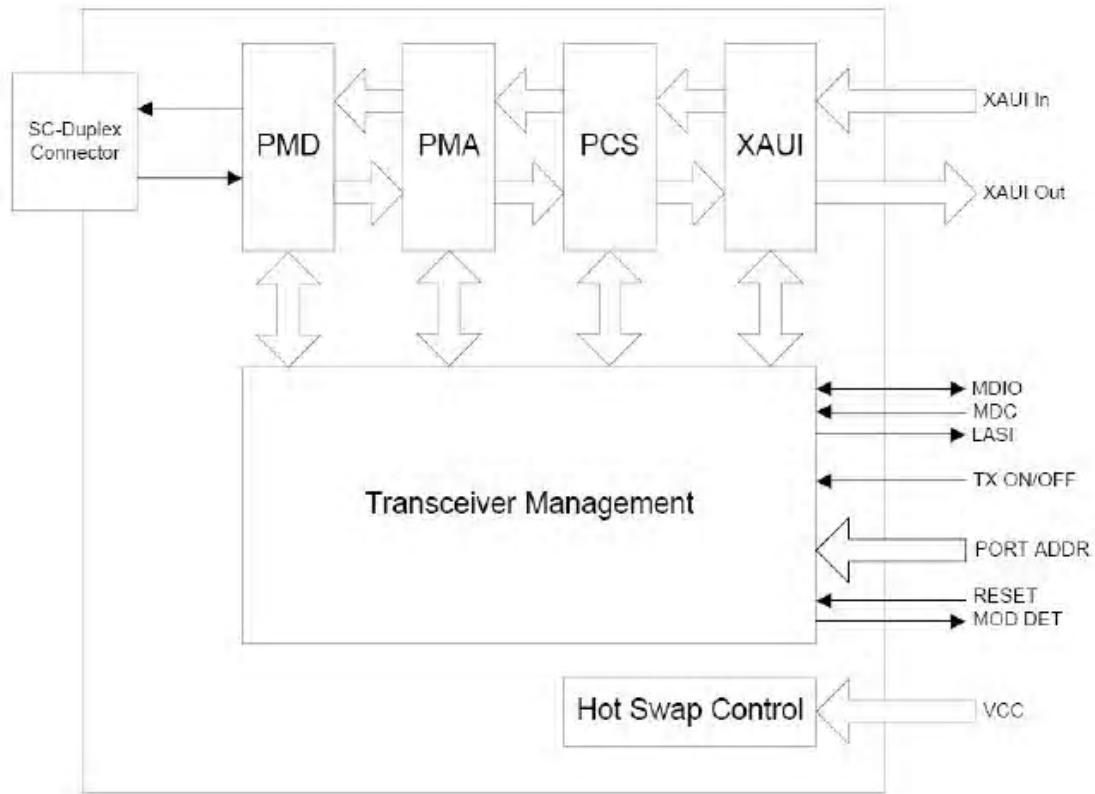
|    |            |   |                            |   |
|----|------------|---|----------------------------|---|
| 29 | APS=1.2V   |   | Adaptive Power Supply      | 2 |
| 30 | 3.3V       |   | Power                      | 2 |
| 31 | 3.3V       |   | Power                      | 2 |
| 32 | 5.0V       |   | Power                      | 2 |
| 33 | GND        |   | Electrical Ground          | 1 |
| 34 | GND        |   | Electrical Ground          | 1 |
| 35 | GND        |   | Electrical Ground          | 1 |
| 36 | GND        |   | Electrical Ground          | 1 |
| 37 | GND        |   | Electrical Ground          | 1 |
| 38 | RESERVED   |   | Reserved                   |   |
| 39 | RESERVED   |   | Reserved                   |   |
| 40 | GND        |   | Electrical Ground          | 1 |
| 41 | RX LANE0+  | O | Module XAUI Output Lane 0+ | 7 |
| 42 | RX LANE0-  | O | Module XAUI Output Lane 0- | 7 |
| 43 | GND        |   | Electrical Ground          | 1 |
| 44 | RX LANE1+  | O | Module XAUI Output Lane 1+ | 7 |
| 45 | RX LANE1-  | O | Module XAUI Output Lane 1- | 7 |
| 46 | GND        |   | Electrical Ground          | 1 |
| 47 | RX LANE2+  | O | Module XAUI Output Lane 2+ | 7 |
| 48 | RX LANE2-  | O | Module XAUI Output Lane 2- | 7 |
| 49 | GND        |   | Electrical Ground          | 1 |
| 50 | RX LANE3+  | O | Module XAUI Output Lane 3+ | 7 |
| 51 | RX LANE3-  | O | Module XAUI Output Lane 3- | 7 |
| 52 | GND        |   | Electrical Ground          | 1 |
| 53 | GND        |   | Electrical Ground          | 1 |
| 54 | GND        |   | Electrical Ground          | 1 |
| 55 | TX LANE 0+ | I | Module XAUI Input Lane 0+  | 7 |
| 56 | TX LANE 0- | I | Module XAUI Input Lane 0-  | 7 |
| 57 | GND        |   | Electrical Ground          | 1 |
| 58 | TX LANE 1+ | I | Module XAUI Input Lane 1+  | 7 |
| 59 | TX LANE 1- | I | Module XAUI Input Lane 1-  | 7 |
| 60 | GND        |   | Electrical Ground          | 1 |
| 61 | TX LANE2+  | I | Module XAUI Input Lane 2+  | 7 |
| 62 | TX LANE2-  | I | Module XAUI Input Lane 2-  | 7 |
| 63 | GND        |   | Electrical Ground          | 1 |
| 64 | TX LANE3+  | I | Module XAUI Input Lane 3+  | 7 |
| 65 | TX LANE3-  | I | Module XAUI Input Lane 3-  | 7 |
| 66 | GND        |   | Electrical Ground          | 1 |
| 67 | RESERVED   |   | Reserved                   |   |
| 68 | RESERVED   |   | Reserved                   |   |
| 69 | GND        |   | Electrical Ground          | 1 |
| 70 | GND        |   | Electrical Ground          | 1 |

### Notes:

- 1) Ground connections are common for TX and RX.
- 2) All connector contacts are rated at 0.5A nominal.
- 4) 1.2V CMOS compatible.
- 5) MDIO and MDC timing must comply with IEEE802.3ae, Clause 45.3

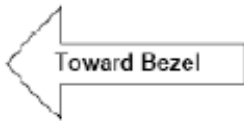
- 7) XAUI output characteristics should comply with IEEE802.3ae Clause 47.
- 8) Transceivers will be MSA compliant when no signals are present on the vendor specific pins.

## Functional Diagram of Typical X2 Style Transceiver

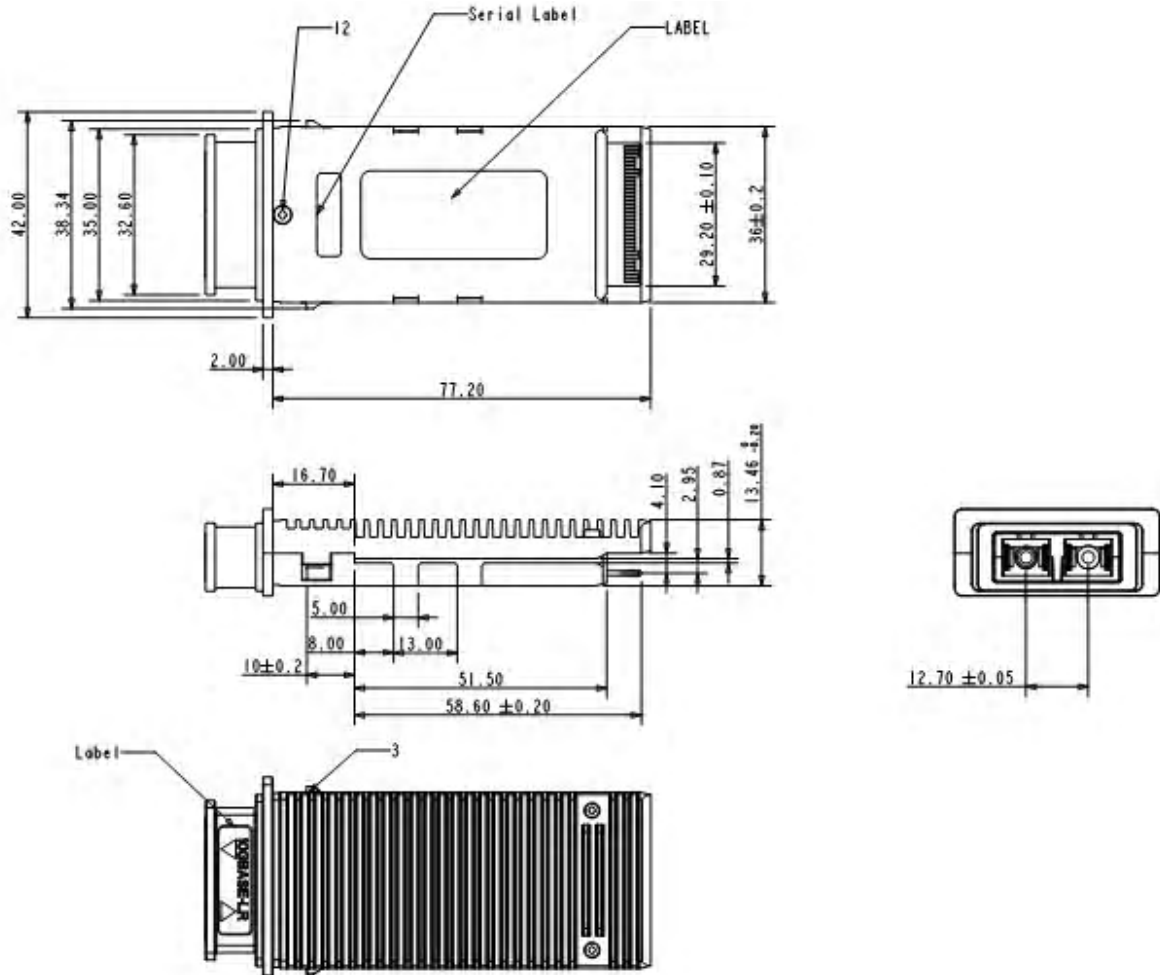


## Electrical Pin-out Details

|    |           |    |               |
|----|-----------|----|---------------|
| 70 | GND       | 1  | GND           |
| 80 | GND       | 2  | GND           |
| 88 | RESERVED  | 3  | GND           |
| 87 | RESERVED  | 4  | 5.0V          |
| 88 | GND       | 5  | 3.3V          |
| 86 | TX LANE2  | 8  | 3.3V          |
| 84 | TX LANE2+ | 7  | APS           |
| 83 | GND       | 9  | APS           |
| 82 | TX LANE2- | 0  | LAS1          |
| 81 | TX LANE2+ | 10 | RESET         |
| 80 | GND       | 11 | VEND SPECIFIC |
| 79 | TX LANE1- | 12 | TX ON/OFF     |
| 78 | TX LANE1+ | 13 | RESERVED      |
| 77 | GND       | 14 | MOD DETECT    |
| 76 | TX LANE1- | 15 | VEND SPECIFIC |
| 75 | TX LANE1+ | 16 | VEND SPECIFIC |
| 74 | GND       | 17 | MDIO          |
| 73 | GND       | 18 | MDC           |
| 72 | GND       | 19 | PRTAD4        |
| 71 | RX LANE3- | 20 | PRTAD3        |
| 70 | RX LANE3+ | 21 | PRTAD2        |
| 49 | GND       | 22 | PRTAD1        |
| 48 | RX LANE1- | 23 | PRTADC        |
| 47 | RX LANE1+ | 24 | VEND SPECIFIC |
| 46 | GND       | 25 | APS SET       |
| 45 | RX LANE1- | 26 | RESERVED      |
| 44 | RX LANE1+ | 27 | APS SENSE     |
| 43 | GND       | 28 | APS           |
| 42 | RX LANE0- | 29 | APS           |
| 41 | RX LANE0+ | 30 | 3.3V          |
| 40 | GND       | 31 | 3.3V          |
| 39 | RESERVED  | 32 | 5.0V          |
| 38 | RESERVED  | 33 | GND           |
| 37 | GND       | 34 | GND           |
| 36 | GND       | 35 | GND           |



**Mechanical Specification**



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**Contact:**

E-mail: [sales@t-techvip.com](mailto:sales@t-techvip.com)  
<http://www.t-techvip.com>