

# 10GBASE-LR X2 1310nm 10km DOM Transceiver Module

X2-10GB-LR-LL



## Application

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

## 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 1310 DFB Laser
- 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 compliant

## Description

The X2 LR 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 300m Transmission with a vertical cavity surface emitting laser (VCSEL). Digital diagnostics functions are available via a 2-wire serial interface, as specified in the XENPAK MSA 3.0.

## I. Absolute Maximum Ratings

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

## II. Recommended Operating Conditions

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

## III. XAUI I/O Characteristics

| Parameter                                | Symbol | Min  | Typ.  | Max  | Unit  | Note                      |
|--|--------|------|-------|------|-------|---------------------------|
| <b>XAUI Data Rate</b>                    | DR     |      | 3.125 |      | Gb/s  |                           |
| <b>XAUI Baud Rate Tolerance</b>          |        | -100 |       | +100 | ppm   | Relative Tolerance        |
| <b>Differential Input Voltage Swing</b>  |        | 220  |       | 1600 | mv    | 8B/10B Coded Input Signal |
| <b>Differential Output Voltage Swing</b> |        | 800  |       | 1600 | mVp-p | RLOAD = 100Ω ± 5%         |

|  |        |    |     |      |          |                     |
|--|--------|----|-----|------|----------|---------------------|
| <b>Differential Input Impedance</b>      |        | 80 | 100 | 120  | $\Omega$ |                     |
| <b>Total Output Jitter</b>               | TJXAUl |    |     | 0.35 | UI       | no pre-equalization |
| <b>Total Deterministic Output Jitter</b> | DJXAUl |    |     | 0.17 | UI       | no pre-equalization |

## IV. Optical Interface

### Transmitter Characteristics

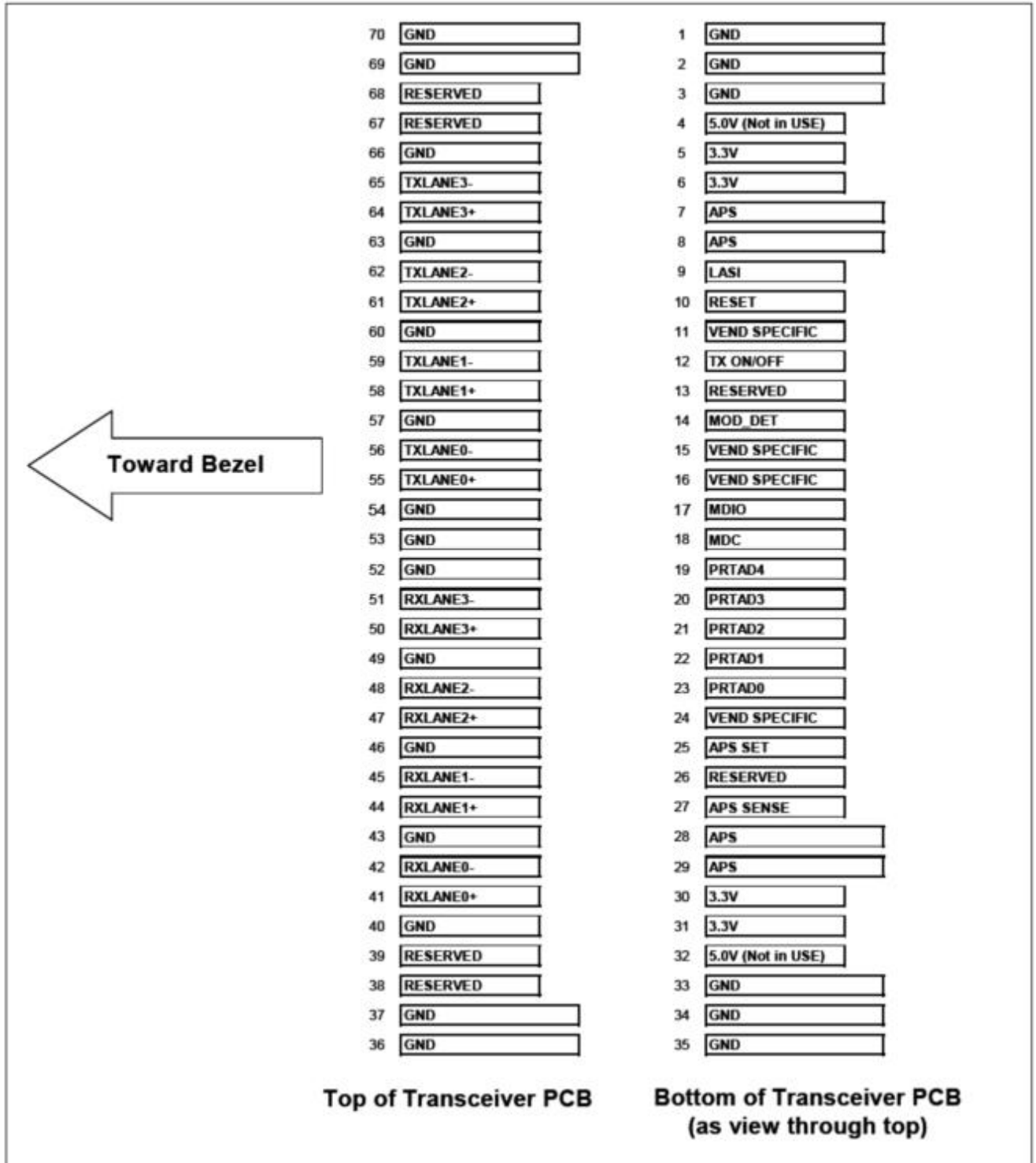
| Parameter                                 | Symbol    | Min  | Typ.    | Max  | Unit    | Note |
|---|-----------|------|---------|------|---------|------|
| <b>Operating Range</b>                    |           |      |         | 10   | Km      |      |
| <b>Operating Data Rate</b>                |           |      | 10.3125 |      | Gb/s    |      |
| <b>Overload</b>                           | Po        | -8.2 |         | 0.5  | dBm     |      |
| <b>Input Centre Wavelength</b>            | $\lambda$ | 1260 | 1310    | 1255 | nm      |      |
| <b>SMSR.</b>                              | SWSR      | 30   |         |      | dB      |      |
| <b>Extinction Ratio</b>                   | ER        | 3.5  | 6       |      |         |      |
| <b>Optical Modulation Amplitude</b>       | OMA       | 500  |         |      | $\mu$ W |      |
| <b>Transmitter and Dispersion Penalty</b> | TDP       |      |         | 3.2  | dB      |      |

### Receiver Characteristics

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

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

## V. Electrical PAD Layout



## VI. 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 |

## VII. Pin Function Definitions

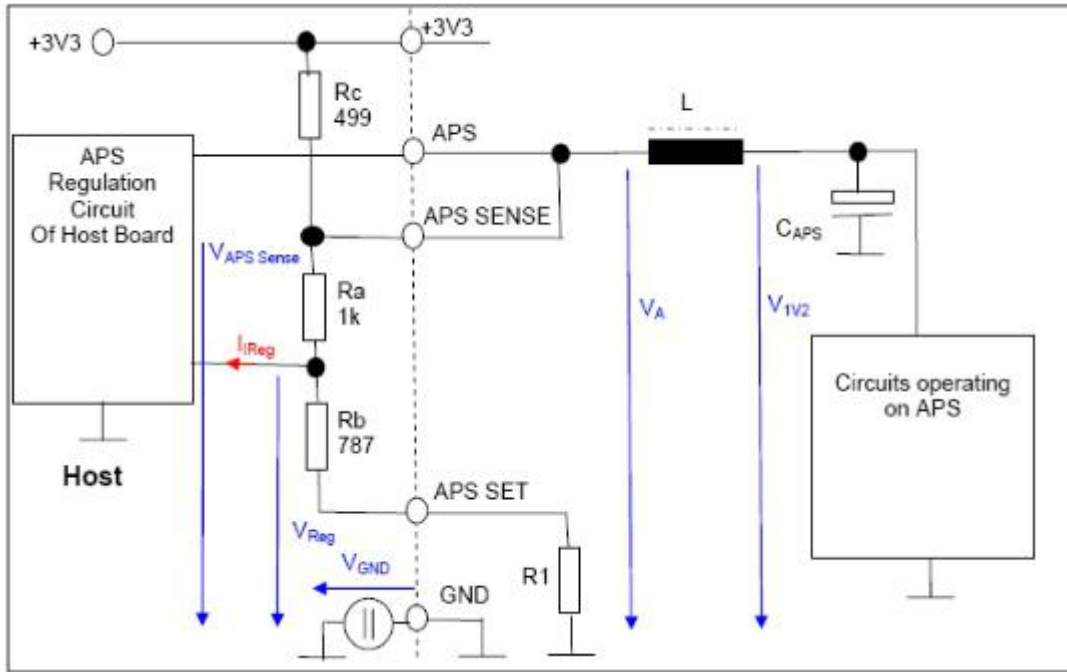
| PIN NO | Name          | Dir | Logic                | Function   | Notes |
|--------|---------------|-----|----------------------|--|-------|
| 1      | GND           |     |                      | Electrical Ground  |       |
| 2      | GND           |     |                      | Electrical Ground  |       |
| 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 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 Open Drain | Low active Reset Input 10KΩ pull-up on Transceiver<br>Logic high = Normal Operation<br>Logic Low = Reset asserted  |       |
| 11     | VEND SPECIFIC |     |                      | Vendor Specific Pin,, leave unconnected  |       |
| 12     | TX ON/OFF     | I   | 1.2V CMOS Open Drain | High active Transmitter Enable Input<br>10KΩ pull-up on Transceiver<br>Logic high = Transmitter active (normal 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 DETECT    | O   |                      | 1kΩ to Ground On Transceiver   |       |
| 15     | VEND SPECIFIC |     |                      | Vendor Specific Pin,, leave unconnected  |       |
| 16     | VEND SPECIFIC |     |                      | Vendor Specific Pin,, leave unconnected  |       |
| 17     | MDIO          | I/O | 1.2V CMOS            | Management Data I/O. Requires external 10-22 kΩ pull-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 SPECI<br>FIC |   |  | 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                                     |  |
| 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-                            |  |

|           |            |  |  |                            |  |
|-----------|------------|--|--|----------------------------|--|
| <b>49</b> | GND        |  |  | Electrical Ground          |  |
| <b>50</b> | RX LANE 3+ |  |  | Module XAUI Output Lane 2+ |  |
| <b>51</b> | RX LANE 3- |  |  | Module XAUI Output Lane 2- |  |
| <b>52</b> | GND        |  |  | Electrical Ground          |  |
| <b>53</b> | GND        |  |  | Electrical Ground          |  |
| <b>54</b> | GND        |  |  | Electrical Ground          |  |
| <b>55</b> | RX LANE 0+ |  |  | Module XAUI Output Lane 0+ |  |
| <b>56</b> | RX LANE 0- |  |  | Module XAUI Output Lane 0- |  |
| <b>57</b> | GND        |  |  | Electrical Ground          |  |
| <b>58</b> | TX LANE 1+ |  |  | Module XAUI Output Lane 1+ |  |
| <b>59</b> | TX LANE 1- |  |  | Module XAUI Output Lane 1- |  |
| <b>60</b> | GND        |  |  | Electrical Ground          |  |
| <b>61</b> | TX LANE 2+ |  |  | Module XAUI Output Lane 2+ |  |
| <b>62</b> | TX LANE 2- |  |  | Module XAUI Output Lane 2- |  |
| <b>63</b> | GND        |  |  | Electrical Ground          |  |
| <b>64</b> | TX LANE 3+ |  |  | Module XAUI Output Lane 2+ |  |
| <b>65</b> | TX LANE 3- |  |  | Module XAUI Output Lane 2- |  |
| <b>66</b> | GND        |  |  | Electrical Ground          |  |
| <b>67</b> | RESERVED   |  |  | RESERVED                   |  |
| <b>68</b> | RESERVED   |  |  | RESERVED                   |  |
| <b>69</b> | GND        |  |  | Electrical Ground          |  |
| <b>70</b> | GND        |  |  | Electrical Ground          |  |



### VIII. Block Diagram of Adapter Power Supply Circuit



### IX. Package Dimensions

