



XENPAK-10GB-SR



XENPAK-10GB-SR is programmed to be fully compatible and functional with all intended CISCO switching devices. This XENPAK optical transceiver is designed for IEEE 802.3ae 10GBASE-SR interconnects and is compliant with the XENPAK Multi-Source Agreement (MSA) Specification. This module is designed for multimode fiber and operates at a nominal wavelength of 850nm.

Compliance:

- IEEE 802.3ae
- XENPAK MSA
- RoHS

Features:

- Up to 10 GBd bi-directional bit rates
- 850nm VCSEL laser
- PIN photo-detector
- XAUI electrical interface: 4 lanes @ 3.125 GBd
- MDIO, DOM (Digital Optics Monitoring) support
- Hot-pluggable XENPAK footprint
- Duplex SC Connector
- Up to 300m over multimode fiber
- Adaptable 5V / 3.3V / 1.2V power supply
- Operating Case Temperature: C-Temp: 0° to 70°

Absolute Maximum Ratings

| Parameter | Symbol | Min | Type | Max | Unit |
|-----------------------------|------------|-----|------|-----|------|
| Storage Ambient Temperature | T_s | -40 | | 85 | C |
| Supply Voltage (5V) | V_5 | 0 | | 6 | V |
| Supply Voltage (3.3V) | V_3 | 0 | | 4 | V |
| Supply Voltage (APS) | V_{APS} | 0 | | 1.5 | V |
| Optical Receiver Input | P_{IMAX} | | | 1 | dBm |



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General Specifications

| Parameter | Symbol | Min | Type | Max | Unit | Remarks |
|-------------------------|--------------------|-------|---------|-------|------|---------------|
| Data Rate | DR | | 10.3125 | | GBd | |
| Bit Error Rate | BER | | | 10-12 | | |
| Total Power Consumption | P | | | 2.2 | W | |
| Supply Voltage (5V) | V _{CC5} | 4.75 | 5 | 5.25 | V | Operating Env |
| Supply Voltage (+3.3V) | V _{CC3} | 3.14 | 3.3 | 3.47 | V | Operating Env |
| Supply Voltage (APS) | V _{CCAPS} | 1.152 | 1.2 | 1.248 | V | Operating Env |
| Supply Current (5V) | I _{CC5} | | | 350 | mA | |
| Supply Current (+3.3V) | I _{CC3} | | | 300 | mA | |
| Supply Current (APS) | I _{CCAPS} | | | 1000 | mA | |

Link Distances

| Parameter | Fiber Type | Modal Bandwidth @ 850nm (MHz-km) | Distance Range (m) |
|-----------|----------------|----------------------------------|--------------------|
| 10.3 GBd | 62.5/125um MMF | 160 | 2-26 |
| | 62.5/125um MMF | 200 | 2-33 |
| | 50/125um MMF | 400 | 2-66 |
| | 50/125um MMF | 500 | 2-82 |
| | 50/125um MMF | 2000 | 2-300 |

Optical Characteristics - Transmitter

| Parameter | Symbol | Min | Type | Max | Unit | Remarks |
|--------------------------------|----------------------|------|------|------|-------|---------|
| Optical Wavelength | λ | 840 | 850 | 860 | nm | |
| Launch Power | P _{OUT} | -7.3 | | -1.3 | dBm | Average |
| Launch Power of OFF | P _{OUT_OFF} | | | -30 | dBm | Average |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Spectral Width (-20 dB) | $\Delta\lambda$ | | | 0.45 | nm | |
| Optical Extinction Ratio | ER | 3 | | | dB | |
| Optical Return Loss Tolerance | ORL _T | | | 12 | dB | |
| Relative Intensity Noise | RIN | | | -128 | dB/Hz | |
| Transmitter Dispersion Penalty | TDP | | | 3.9 | dB | |

Optical Characteristics Receiver

| Parameter | Symbol | Min | Type | Max | Unit | Remarks |
|--|---------------------|------|------|-------|------|----------------------|
| Center Wavelength Range | λ_c | 840 | | 860 | nm | |
| Optical Input Power | P _{IN} | -9.9 | | -1 | dBm | Average, Informative |
| Receive Reflectance | TR _{RX} | | | -12 | dB | |
| Stressed Receiver Sensitivity | P _{IN,S} | | | -7.5 | dBm | |
| Receiver Sensitivity in OMA | P _{IN,OMA} | | | -11.1 | dBm | |
| RX electrical 3dB upper cutoff frequency | FR | | | 12.3 | GHz | |



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Electrical Characteristics - DC

| Parameter | Symbol | Min | Type | Max | Unit | Remarks |
|--|-----------------|-------|------|-------|------------|-----------------|
| A) 1.2V COMS I/O DC Characteristics (PRTAD; LASI; RESET; TX_ON/OFF) | | | | | | |
| External Pull-Up Resistor For Open Drain | R_{PU} | 10 | | 22 | k Ω | |
| Output High Voltage | V_{OH} | 1 | | | V | |
| Output Low Voltage | V_{OL} | | | 0.15 | V | |
| Input High Voltage | V_{IH} | 0.84 | | 1.2 | V | |
| Input Low Voltage | V_{IL} | | | 0.36 | V | |
| Input Pull-Down Current | I_{PD} | 20 | | 120 | μ A | VIN=1.2V |
| B) XAUI I/O DC Characteristics (TXLANE[0..3]; RXLANE[0..3]) | | | | | | |
| Differential Input Amplitude | V_{IN_XAUI} | 200 | | 2500 | mV | AC Coupled |
| Differential Output Amplitude | V_{OUT_XAUI} | 800 | | 1600 | mV | AC Coupled |
| C) MDIO I/O DC Characteristics (MDIO; MDC) | | | | | | |
| Output Low Voltage | V_{OL} | | | 0.2 | V | IOL=100 μ A |
| Output Low Current | I_{OL} | | | 4 | mA | |
| Input High Voltage | V_{IH} | 0.84 | | 1.2 | V | |
| Input Low Voltage | V_{IL} | | | 0.36 | V | |
| Pull-Up Supply Voltage | V_{PU} | 1.152 | 1.2 | 1.248 | V | |
| Input Capacitance | C_{IN} | | | 10 | pF | |
| Load Capacitance | C_{LOAD} | | | 470 | pF | |
| External Pull-Up Resistance | R_{PU} | 200 | | | Ω | |

Electrical Characteristics - AC

| Parameter | Symbol | Min | Type | Max | Unit | Remarks |
|---|------------------|------|------|-------|----------|--|
| A) XAUI Input AC Characteristics (TXLANE[0..3]) | | | | | | |
| Baud Rate | BR_{XAUI_IN} | | | 3.125 | GBd | |
| Baud Rate Tolerance | BR_{TOL_XAUI} | -100 | | 100 | ppm | |
| Differential Input Impedance | Z_{IN_XAUI} | 80 | 100 | 120 | Ω | |
| Differential Return Loss | RL_{IN} | 10 | | | dB | 100MHz to 2.5GHz |
| Input Differential Skew | T_{IN_SKEW} | | | 75 | ps | Crossing Point |
| Jitter Amplitude Tolerance | J_{XAUI_TOL} | | | 0.65 | UIPP | IEEE 802.3ae |
| B) XAUI Output AC Characteristics (RXLANE[0..3]) | | | | | | |
| Baud Rate | BR_{XAUI_OUT} | | | 3.125 | GBd | |
| Baud Rate Variation | BR_{XAUI_VAR} | -100 | | 100 | ppm | |
| XAUI Eye Mask (far-end) | | | | | | According to IEEE 802.3ae |
| Output Differential Skew | T_{OUT_SKEW} | | | 15 | ps | |
| Output Differential Impedance | Z_{OUT_XAUI} | 80 | 100 | 120 | Ω | |
| Differential Output Return Loss | RL_{OUT} | 10 | | | dB | 100MHz to 2.5GHz |
| Total Jitter | TJ_{XAUI} | | | 0.35 | UI | Near-end No pre-equalization 1 UI=320 ps |
| Deterministic Jitter | DJ_{XAUI} | | | 0.17 | UI | |
| C) Power-On Reset Characteristics | | | | | | |
| Power-On Reset and TX_ONOFF Characteristics | | | | | | According to XENPAK MSA Issue |
| D) MDIO I/O AC Characteristics (MDIO; MDC) | | | | | | |
| MDIO Data Hold Time | T_{HOLD} | 10 | | | ns | |
| MDIO Data Setup Time | T_{SU} | 10 | | | ns | |
| Delay from MDC Rising Edge to MDIO Data Change | T_{DELAY} | | | 300 | ns | |
| MDC Clock Rate | f_{MAX} | | | 2.5 | MHz | |

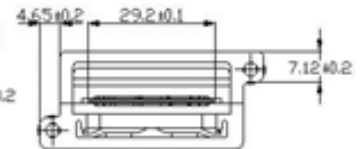
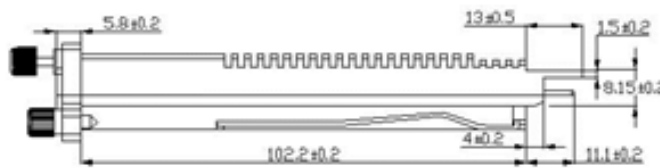
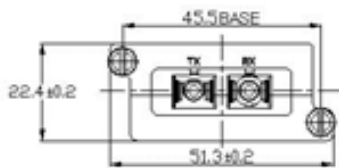
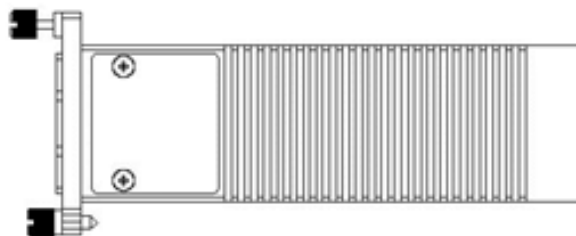


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Digital Diagnostic

| Parameter | Symbol | Min | Type | Max | Unit | Remarks |
|---------------------|------------------|-----|------|-----|------|---------|
| Temperature Monitor | T _{MON} | -5 | | +5 | °C | |
| Laser Bias Monitor | I _{MON} | -10 | | +10 | % | |
| TX Power Monitor | P _{TX} | -3 | | +3 | dBm | |
| RX Power Monitor | P _{RX} | -3 | | +3 | dBm | |



Unit: millimeter

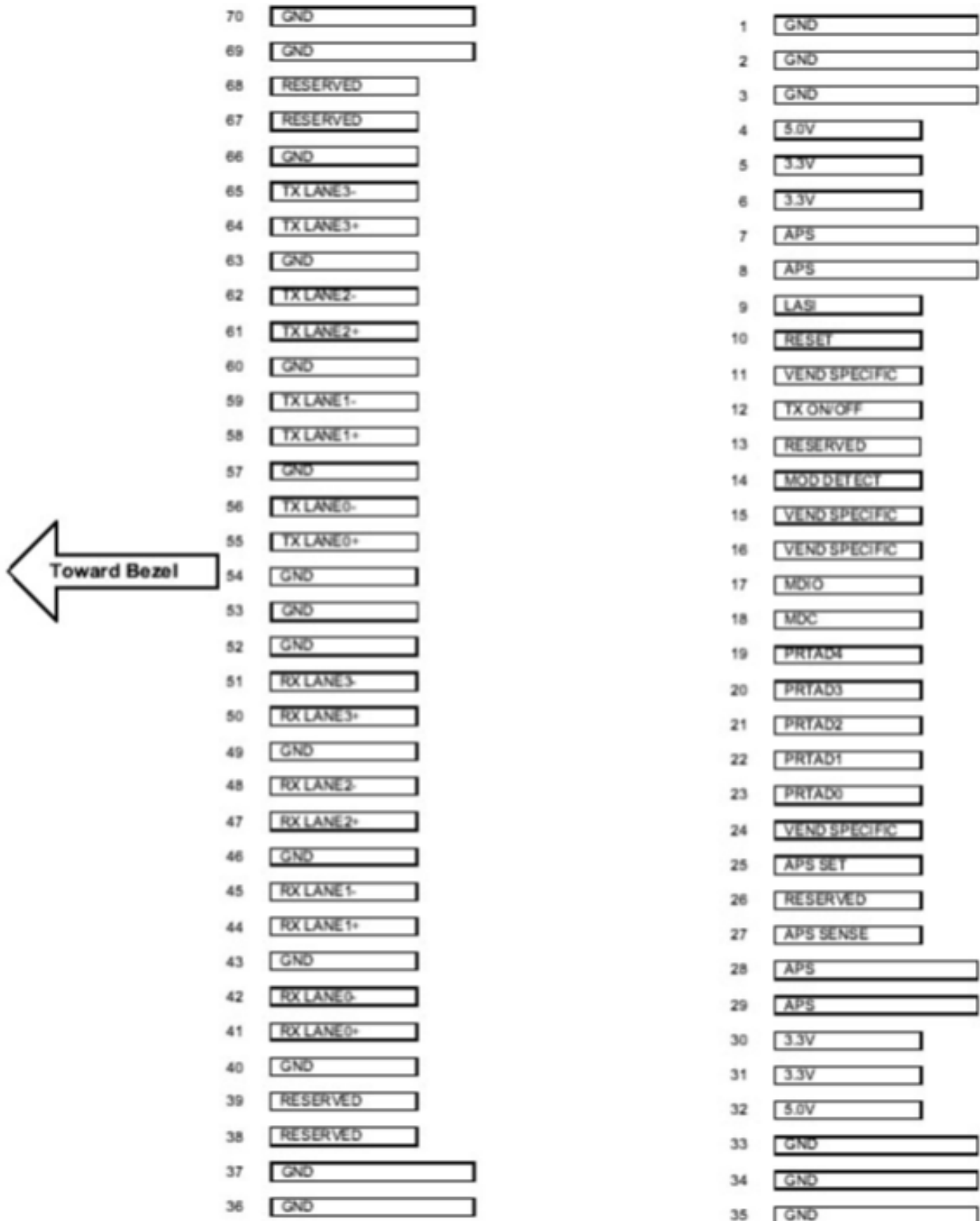




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Electrical Pad Layout





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Pin Assignment - Pin 1 to Pin 35:

| PIN # | Symbol | I/O | Logic | Description |
|-------|---------------|-----|------------|---|
| 1 | GND | I | Supply | Electrical ground |
| 2 | GND | I | Supply | Electrical ground |
| 3 | GND | I | Supply | Electrical ground |
| 4 | 5.0V | I | Supply | Power |
| 5 | 3.3V | I | Supply | Power |
| 6 | 3.3V | I | Supply | Power |
| 7 | APS | I | Supply | Adaptive Power Supply |
| 8 | APS | I | Supply | Adaptive Power Supply |
| 9 | LASI | O | Open Drain | Link Alarm Status Interrupt. 10-22k ohm pull up on host |
| 10 | RESET | I | 1.2V CMOS | TX OFF when MDIO RESET |
| 11 | VEND SPECIFIC | | | Vendor Specific Pin. Leave unconnected |
| 12 | TX ON/OFF | I | 1.2V CMOS | Transmitter ON/OFF |
| 13 | RESERVED | | | Reserved |
| 14 | MOD DETECT | O | | Pulled low inside module through 1k ohm |
| 15 | VEND SPECIFIC | | | Vendor Specific Pin. Leave unconnected |
| 16 | VEND SPECIFIC | | | Vendor Specific Pin. Leave unconnected |
| 17 | MDIO | I/O | Open Drain | Management Data IO |
| 18 | MDC | I | 1.2V CMOS | Management Data Clock |
| 19 | PRTAD4 | I | 1.2V CMOS | Port Address bit 4 (Low=0) |
| 20 | PRTAD3 | I | 1.2V CMOS | Port Address bit 3 (Low=0) |
| 21 | PRTAD2 | I | 1.2V CMOS | Port Address bit 2 (Low=0) |
| 22 | PRTAD1 | I | 1.2V CMOS | Port Address bit 1 (Low=0) |
| 23 | PRTAD0 | I | 1.2V CMOS | Port Address bit 0 (Low=0) |
| 24 | VEND SPECIFIC | | | Vendor Specific Pin. Leave unconnected |
| 25 | APS SET | O | | Feedback output for APS |
| 26 | RESERVED | | | Reserved for Avalanche Photodiode use |
| 27 | APS SENSE | O | Analog | APS Sense Connection |
| 28 | APS | I | Supply | Adaptive Power Supply |
| 29 | APS | I | Supply | Adaptive Power Supply |
| 30 | 3.3V | I | Supply | Power |
| 31 | 3.3V | I | Supply | Power |
| 32 | 5.0V | | Supply | Power |
| 33 | GND | I | Supply | Electrical Ground |
| 34 | GND | I | Supply | Electrical Ground |
| 35 | GND | I | Supply | Electrical Ground |



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Pin Assignment - Pin 36 to Pin 70:

| PIN # | Symbol | I/O | Logic | Description |
|-------|------------|-----|--------|----------------------------|
| 36 | GND | I | Supply | Electrical ground |
| 37 | GND | I | Supply | Electrical ground |
| 38 | RESERVED | | | Reserved |
| 39 | RESERVED | | | Reserved |
| 40 | GND | I | Supply | Electrical ground |
| 41 | RX LANE 0+ | O | AC | Module XAUI Output Lane 0+ |
| 42 | RX LANE 0- | O | AC | Module XAUI Output Lane 0- |
| 43 | GND | I | Supply | Electrical ground |
| 44 | RX LANE 1+ | O | AC | Module XAUI Output Lane 1+ |
| 45 | RX LANE 1- | O | AC | Module XAUI Output Lane 1- |
| 46 | GND | I | Supply | Electrical ground |
| 47 | RX LANE 2+ | O | AC | Module XAUI Output Lane 2+ |
| 48 | RX LANE 2- | O | AC | Module XAUI Output Lane 2- |
| 49 | GND | I | Supply | Electrical ground |
| 50 | RX LANE 3+ | O | AC | Module XAUI Output Lane 3+ |
| 51 | RX LANE 3- | O | AC | Module XAUI Output Lane 3- |
| 52 | GND | I | Supply | Electrical ground |
| 53 | GND | I | Supply | Electrical ground |
| 54 | GND | I | Supply | Electrical ground |
| 55 | TX LANE 0+ | O | AC | Module XAUI Input Lane 0+ |
| 56 | TX LANE 0- | O | AC | Module XAUI Input Lane 0- |
| 57 | GND | I | Supply | Electrical ground |
| 58 | TX LANE 1+ | O | AC | Module XAUI Input Lane 1+ |
| 59 | TX LANE 1- | O | AC | Module XAUI Input Lane 1- |
| 60 | GND | I | Supply | Electrical ground |
| 61 | TX LANE 2+ | O | AC | Module XAUI Input Lane 2+ |
| 62 | TX LANE 2- | O | AC | Module XAUI Input Lane 2- |
| 63 | GND | I | Supply | Electrical ground |
| 64 | TX LANE 3+ | O | AC | Module XAUI Input Lane 3+ |
| 65 | TX LANE 3- | O | AC | Module XAUI Input Lane 3- |
| 66 | GND | I | Supply | Electrical ground |
| 67 | RESERVED | | | Reserved |
| 68 | RESERVED | | | Reserved |
| 69 | GND | I | Supply | Electrical Ground |
| 70 | GND | I | Supply | Electrical Ground |