

## XENPAK CWDM 10G 40Km ER



### Overview

APC XENPAK-10GCWxx-D40 Transceiver is designed for 10GBASE Ethernet transmission systems. It's compliant with the 10GBASE XENPAK Multi-Source Agreement (MSA), XAUI interface, and transmission distance up to 40Km.

- ◆ XENPAK MSA Compliant
- ◆ 70-PIN connector
- ◆ SC duplex receptacle package
- ◆ Wavelength selectable to ITU-T standards covering
- ◆ CWDM grid wavelengths
- ◆ Cooled EA-DFB/PIN-PD
- ◆ Power supply: +5.0 V, +3.3 V, APS:+1.2 V
- ◆ 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 4 x 3.125 Gb/s Ethernet
- ◆ ≤40km ER (Extended Range) 10GBE
- ◆ RoHS compliant and lead free 

### Applications

- ◆ 10 Gb/s Ethernet transmission systems

### Features

### Ordering information

| Part Number        | Product Description                                                           |
|--------------------|-------------------------------------------------------------------------------|
| XENPAK-10GCWxx-D40 | XENPAK CWDM 10Gbps, XX = 47 ~ 61, 40km (ER), 0°C ~ 70°C, Cooled EA-DFB/PIN-PD |

#### Note:

[1] XX = the wavelength support, available from 1470 (47) ~ 1610 (61) nm

### Absolute Maximum Ratings

| Parameter           | Symbol | Min | Max | Unit |
|---------------------|--------|-----|-----|------|
| Supply Voltage+5V   | Vcc5   |     | 6.0 | V    |
| Supply Voltage_3.3V | Vcc3   |     | 4   | V    |
| Supply Voltage APS  | Vaps   |     | 2   | V    |
| Storage Temperature | Tst    | -20 | 85  | °C   |

|                              |     |   |    |     |
|------------------------------|-----|---|----|-----|
| Optical Input Received Power | PIN | - | -1 | dBm |
|------------------------------|-----|---|----|-----|

### Operating Conditions

| Parameter                  | Symbol | Min  | Typical | Max  | Unit |
|----------------------------|--------|------|---------|------|------|
| Operating Case temperature | Tca    | 0    | -       | 70   | °C   |
| Supply Voltage+5V          | Vcc5   | 4.75 | 5       | 5.25 | V    |
| Supply Current+5V          | Icc5   |      |         | 500  | mA   |
| Supply Voltage_3.3V        | VCC3   | 3.14 | 3.3     | 3.47 | V    |
| Supply Current+3.3V        | Icc3   |      |         | 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                     | -1     |             | 2      | dBm  |
| Optical Transmit Power (disabled) | Ptx-dis                | -      | -           | -40    | dBm  |
| Extinction Ratio                  | ER                     | 9      |             | -      | dB   |
| Side Mode Suppression Ratio       | SMSR                   | 30     | -           | -      | dB   |
| Eye Mask                          | IEEE 802.3ae Compliant |        |             |        |      |

### Transmitter Specifications – Electrical

| Parameter                     | Symbol  | Min | Typical | Max  | Unit     |
|-------------------------------|---------|-----|---------|------|----------|
| Data Rate (TXLINE0-3)         | TX-xaui | -   | 3125    | -    | Mbps     |
| Differential impedance        | Zo      | 80  | 100     | 120  | $\Omega$ |
| 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 Specifications – Optical

| Parameter           | Symbol      | Min | Typical | Max | Unit |
|---------------------|-------------|-----|---------|-----|------|
| Received power      | Rpo         | -15 | -       | -3  | dBm  |
| Maximum Input Power | RX-overload | -3  | -       | -   | dBm  |

|                            |           |      |   |      |    |
|----------------------------|-----------|------|---|------|----|
| Input Operating Wavelength | $\lambda$ | 1260 | - | 1565 | nm |
| Reflectance                | Rrx       | -    | - | -27  | dB |

### Receiver Specifications – Electrical

| Parameter                      | Symbol   | Min  | Typical | 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 Specifications – Electrical

| Parameter                   | Symbol   | Min  | Typ | Max  | Units |
|-----------------------------|----------|------|-----|------|-------|
| <b>1.2 V 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   |

**Table 3: Digital Diagnostic Monitoring Accuracy**

| Parameter    | Accuracy | Unit |
|--------------|----------|------|
| Temperature  | ± 5      | °C   |
| Bias Current | ± 10     | %    |
| TX Power     | ± 3      | DBm  |
| RX Power     | ± 3      | DBm  |

## Pin Definitions

| 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                                   | 3     |
| 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 | 3     |
| 11     | VEND SPECIFIC |     | Vendor Specific Pin.<br>Leave unconnected when not in use.                                                                                      | 6     |
| 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)        | 3     |
| 13     | RESERVED      |     | Reserved                                                                                                                                        | 3     |
| 14     | MOD DETECT    | O   | Pulled low inside module through 1k                                                                                                             |       |
| 15     | VEND SPECIFIC |     | Vendor Specific Pin.<br>Leave unconnected when not in use.                                                                                      | 6     |
| 16     | VEND SPECIFIC |     | Vendor Specific Pin.<br>Leave unconnected when not in use.                                                                                      | 6     |
| 17     | MDIO          | I/O | Management Data IO                                                                                                                              | 3, 4  |
| 18     | MDC           | I   | Management Data Clock                                                                                                                           | 3, 4  |
| 19     | PRTAD4        | I   | Port Address Bit 4 (Low = 0)                                                                                                                    | 3     |
| 20     | PRTAD3        | I   | Port Address Bit 3 (Low = 0)                                                                                                                    | 3     |
| 21     | PRTAD2        | I   | Port Address Bit 2 (Low = 0)                                                                                                                    | 3     |
| 22     | PRTAD1        | I   | Port Address Bit 1 (Low = 0)                                                                                                                    | 3     |
| 23     | PRTAD0        | I   | Port Address Bit 0 (Low = 0)                                                                                                                    | 3     |
| 24     | VEND SPECIFIC |     | Vendor Specific Pin.<br>Leave unconnected when not in use.                                                                                      | 6     |
| 25     | APS SET       |     | Feedback input for APS                                                                                                                          |       |
| 26     | RESERVED      |     | Reserved for Avalanche Photodiode use.                                                                                                          | 6     |
| 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+ | 5 |
| 42 | RX LANE0- | O | Module XAUI Output Lane 0- | 5 |
| 43 | GND       |   | Electrical Ground          | 1 |
| 44 | RX LANE1+ | O | Module XAUI Output Lane 1+ | 5 |
| 45 | RX LANE1- | O | Module XAUI Output Lane 1- | 5 |
| 46 | GND       |   | Electrical Ground          | 1 |
| 47 | RX LANE2+ | O | Module XAUI Output Lane 2+ | 5 |
| 48 | RX LANE2- | O | Module XAUI Output Lane 2- | 5 |
| 49 | GND       |   | Electrical Ground          | 1 |
| 50 | RX LANE3+ | O | Module XAUI Output Lane 3+ | 5 |
| 51 | RX LANE3- | O | Module XAUI Output Lane 3- | 5 |
| 52 | GND       |   | Electrical Ground          | 1 |
| 53 | GND       |   | Electrical Ground          | 1 |
| 54 | GND       |   | Electrical Ground          | 1 |
| 55 | TX LANE0+ | I | Module XAUI Input Lane 0+  | 5 |
| 56 | TX LANE0- | I | Module XAUI Input Lane 0-  | 5 |
| 57 | GND       |   | Electrical Ground          | 1 |
| 58 | TX LANE1+ | I | Module XAUI Input Lane 1+  | 5 |
| 59 | TX LANE1- | I | Module XAUI Input Lane 1-  | 5 |
| 60 | GND       |   | Electrical Ground          | 1 |
| 61 | TX LANE2+ | I | Module XAUI Input Lane 2+  | 5 |
| 62 | TX LANE2- | I | Module XAUI Input Lane 2-  | 5 |
| 63 | GND       |   | Electrical Ground          | 1 |
| 64 | TX LANE3+ | I | Module XAUI Input Lane 3+  | 5 |
| 65 | TX LANE3- | I | Module XAUI Input Lane 3-  | 5 |

|    |          |  |                   |   |
|----|----------|--|-------------------|---|
| 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.
- 3) 1.2V CMOS compatible.
- 4) MDIO and MDC timing must comply with IEEE802.3ae, Clause 45.3
- 5) XAUI output characteristics should comply with IEEE802.3ae Clause 47.
- 6) Transceivers will be MSA compliant when no signals are present on the vendor specific pins.

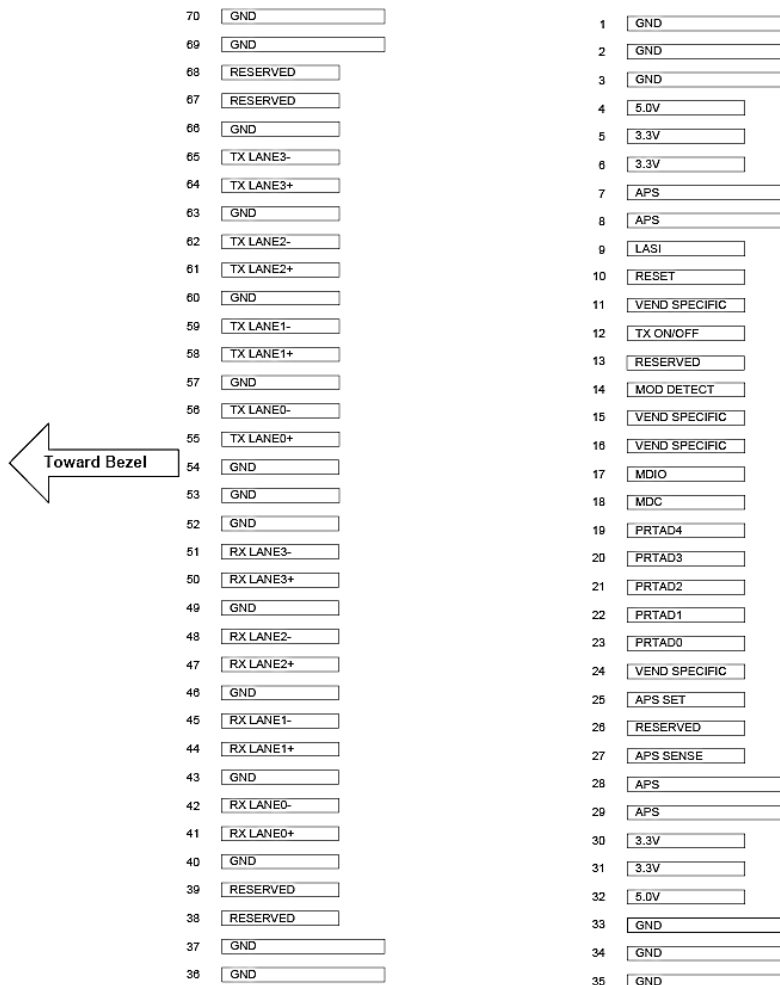


Figure 1: Electrical Pin-out Details

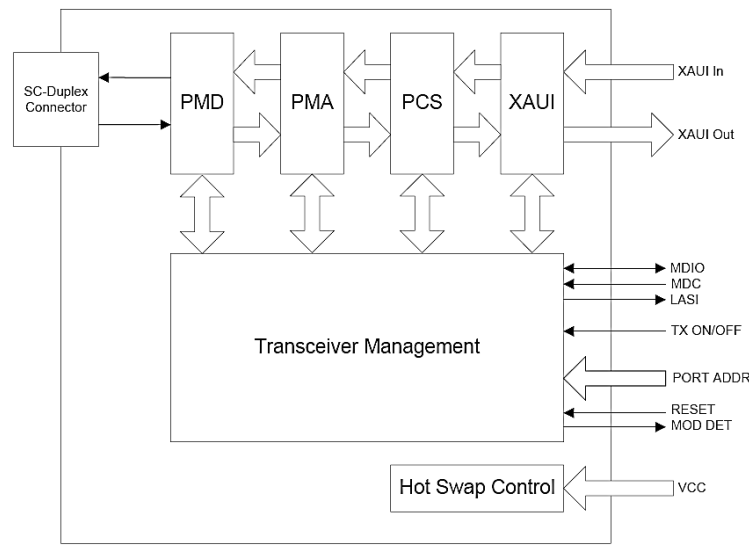


Figure 2: Functional Diagram of Typical XENPAK Style Transceiver

## Mechanical Specifications

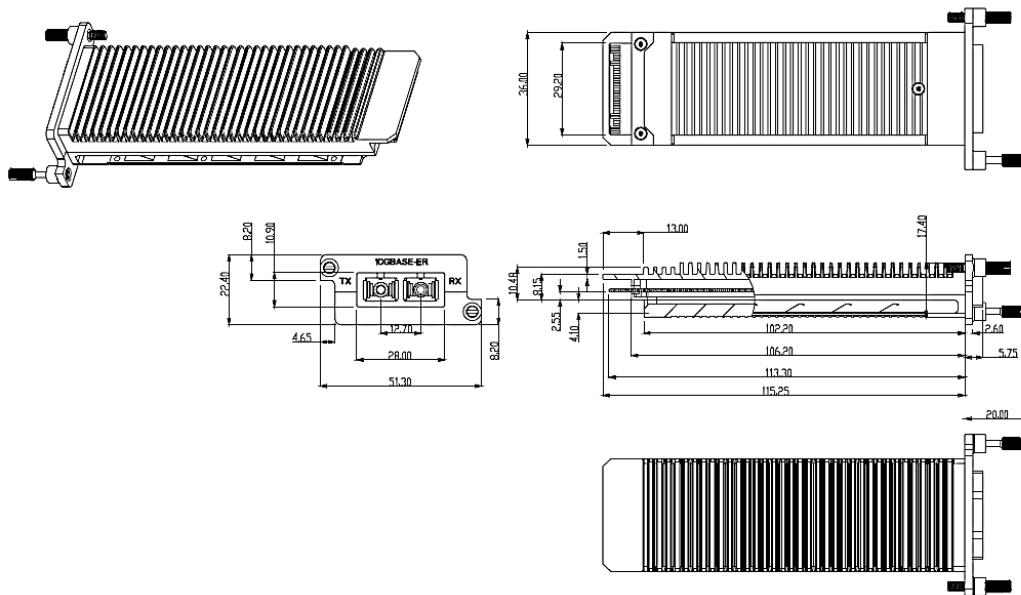


Figure 3: Mechanical Dimensions (Dimensions in mm)