

### **SFP-10GB-DW36-80-PA-C**

Palo Alto Networks® Compatible 10GBase-DWDM 50GHz SFP+ Channel 36 Transceiver (SMF, 1548.52nm, 80km, LC, DOM)

#### **Features:**

- SFF-8432 and SFF-8472 Compliance
- Duplex LC Connector
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



#### **Applications:**

- 10x Gigabit Ethernet over DWDM
- 8x/10x Fibre Channel
- Access, Metro and Enterprise

#### **Product Description**

This Palo Alto Networks® SFP+ transceiver provides 10GBase-DWDM throughput up to 80km over single-mode fiber (SMF) using a wavelength of 1548.51nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Palo Alto Networks® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S.-made or designated country end products.")



## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

## Tunable SFP+ Channel Number and Wavelength

| ITU Channel | Frequency (THz) | Center Wavelength (nm) | ITU Channel | Frequency (THz) | Center Wavelength (nm) |
|-------------|-----------------|------------------------|-------------|-----------------|------------------------|
| 1           | 191.35          | 1566.72                | 49          | 193.75          | 1547.32                |
| 2           | 191.40          | 1566.31                | 50          | 193.80          | 1546.92                |
| 3           | 191.45          | 1565.90                | 51          | 193.85          | 1546.52                |
| 4           | 191.50          | 1565.50                | 52          | 193.90          | 1546.12                |
| 5           | 191.55          | 1565.09                | 53          | 193.95          | 1545.72                |
| 6           | 191.60          | 1564.68                | 54          | 194.00          | 1545.32                |
| 7           | 191.65          | 1564.27                | 55          | 194.05          | 1544.92                |
| 8           | 191.70          | 1563.86                | 56          | 194.10          | 1544.53                |
| 9           | 191.75          | 1563.45                | 57          | 194.15          | 1544.13                |
| 10          | 191.80          | 1563.05                | 58          | 194.20          | 1543.73                |
| 11          | 191.85          | 1562.64                | 59          | 194.25          | 1543.33                |
| 12          | 191.90          | 1562.23                | 60          | 194.30          | 1542.94                |
| 13          | 191.95          | 1561.83                | 61          | 194.35          | 1542.54                |
| 14          | 192.00          | 1561.42                | 62          | 194.40          | 1542.14                |
| 15          | 192.05          | 1561.01                | 63          | 194.45          | 1541.75                |
| 16          | 192.10          | 1560.61                | 64          | 194.50          | 1541.35                |
| 17          | 192.15          | 1560.20                | 65          | 194.55          | 1540.95                |
| 18          | 192.20          | 1559.79                | 66          | 194.60          | 1540.56                |
| 19          | 192.25          | 1559.39                | 67          | 194.65          | 1540.16                |
| 20          | 192.30          | 1558.98                | 68          | 194.70          | 1539.77                |
| 21          | 192.35          | 1558.58                | 69          | 194.75          | 1539.37                |
| 22          | 192.40          | 1558.17                | 70          | 194.80          | 1538.98                |
| 23          | 192.45          | 1557.77                | 71          | 194.85          | 1538.58                |
| 24          | 192.50          | 1557.36                | 72          | 194.90          | 1538.19                |
| 25          | 192.55          | 1556.96                | 73          | 194.95          | 1537.79                |
| 26          | 192.60          | 1556.56                | 74          | 195.00          | 1537.40                |
| 27          | 192.65          | 1556.15                | 75          | 195.05          | 1537.00                |
| 28          | 192.70          | 1555.75                | 76          | 195.10          | 1536.61                |
| 29          | 192.75          | 1555.34                | 77          | 195.15          | 1536.22                |
| 30          | 192.80          | 1554.94                | 78          | 195.20          | 1535.82                |
| 31          | 192.85          | 1554.54                | 79          | 195.25          | 1535.43                |
| 32          | 192.90          | 1554.13                | 80          | 195.30          | 1535.04                |
| 33          | 192.95          | 1553.73                | 81          | 195.35          | 1534.64                |
| 34          | 193.00          | 1553.33                | 82          | 195.40          | 1534.25                |
| 35          | 193.05          | 1552.93                | 83          | 195.45          | 1533.86                |
| 36          | 193.10          | 1552.52                | 84          | 195.50          | 1533.47                |
| 37          | 193.15          | 1552.12                | 85          | 195.55          | 1533.07                |

|           |        |         |           |        |         |
|-----------|--------|---------|-----------|--------|---------|
| <b>38</b> | 193.20 | 1551.72 | <b>86</b> | 195.60 | 1532.68 |
| <b>39</b> | 193.25 | 1551.32 | <b>87</b> | 195.65 | 1532.29 |
| <b>40</b> | 193.30 | 1550.92 | <b>88</b> | 195.70 | 1531.90 |
| <b>41</b> | 193.35 | 1550.52 | <b>89</b> | 195.75 | 1531.51 |
| <b>42</b> | 193.40 | 1550.12 | <b>90</b> | 195.80 | 1531.12 |
| <b>43</b> | 193.45 | 1549.72 | <b>91</b> | 195.85 | 1530.72 |
| <b>44</b> | 193.50 | 1549.32 | <b>92</b> | 195.90 | 1530.33 |
| <b>45</b> | 193.55 | 1548.91 | <b>93</b> | 195.95 | 1529.94 |
| <b>46</b> | 193.60 | 1548.52 | <b>94</b> | 196.00 | 1529.55 |
| <b>47</b> | 193.65 | 1548.11 | <b>95</b> | 196.05 | 1529.16 |
| <b>48</b> | 193.70 | 1547.72 | <b>96</b> | 196.10 | 1528.77 |

### Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ     | Max. | Unit |
|----------------------------|--------|------|---------|------|------|
| Maximum Supply Voltage     | Vcc    | -0.5 |         | 4.0  | V    |
| Storage Temperature        | TS     | -40  |         | 85   | °C   |
| Operating Case Temperature | Tc     | -40  |         | 85   | °C   |
| Relative Humidity          | RH     | 5    |         | 95   | %    |
| Data Rate                  |        |      | 10.3125 |      | Gb/s |

# Electrical Characteristics (TOP=25°C, Vcc=3.3Volts)

| Parameter                        |                      | Symbol                          | Min.  | Typ. | Max.                | Unit  | Notes |
|----------------------------------|----------------------|---------------------------------|-------|------|---------------------|-------|-------|
| Power Supply Voltage             |                      | V <sub>CC</sub>                 | 3.135 | 3.3  | 3.465               | V     |       |
| Module Supply Current            |                      | I <sub>CC</sub>                 |       | 300  | 550                 | mA    |       |
| Power Dissipation                |                      | P <sub>D</sub>                  |       | 1.0  | 1.8                 | W     |       |
| Transmitter                      |                      |                                 |       |      |                     |       |       |
| Input Differential Impedance     |                      | Z <sub>in</sub>                 |       | 100  |                     | Ω     |       |
| Differential Data Input Swing    |                      | V <sub>IN, P-P</sub>            | 180   |      | 700                 | mVp-p |       |
| TX_FAULT                         | Transmitter Fault    | V <sub>OH</sub>                 | 2.0   |      | V <sub>CCHOST</sub> | V     |       |
|                                  | Normal Operation     | V <sub>OL</sub>                 | 0     |      | 0.8                 | V     |       |
| TX_DISABLE                       | Transmitter Disable  | V <sub>IH</sub>                 | 2.0   |      | V <sub>CCHOST</sub> | V     |       |
|                                  | Transmitter Enable   | V <sub>IL</sub>                 | 0     |      | 0.8                 | V     |       |
| Receiver                         |                      |                                 |       |      |                     |       |       |
| Output differential impedance    |                      | Z <sub>o</sub>                  |       | 100  |                     | Ω     |       |
| Differential Data Output Swing   |                      | V <sub>OUT, P-P</sub>           | 300   |      | 850                 | mVp-p | 1     |
| Data Output Rise Time, Fall Time |                      | t <sub>r</sub> , t <sub>f</sub> | 28    |      |                     | ps    | 2     |
| RX_LOS                           | Loss of signal (LOS) | V <sub>OH</sub>                 | 2.0   |      | V <sub>CCHOST</sub> | V     | 3     |
|                                  | Normal Operation     | V <sub>OL</sub>                 | 0     |      | 0.8                 | V     | 3     |

## Notes:

1. Internally AC coupled, but requires an external 100Ω differential load termination.
2. 20-80%
3. LOS is an open collector output. Should be pulled up with 4.7Ω on the host board.

## Optical Characteristics

| Parameter                                | Symbol                                                  | Min.    | Typ. | Max.    | Unit  | Notes |
|------------------------------------------|---------------------------------------------------------|---------|------|---------|-------|-------|
| Transmitter                              |                                                         |         |      |         |       |       |
| Launch Optical Power                     | P <sub>o</sub>                                          | 0       |      | 5       | dBm   | 1     |
| Center Wavelength Range                  | λ <sub>c</sub>                                          | 1528.77 |      | 1563.86 | nm    |       |
| Center Wavelength Spacing                |                                                         |         | 50   |         | GHz   |       |
| Extinction Ratio                         | EX                                                      | 9.0     |      |         | dB    | 2     |
| Side Mode Suppression Ratio              | SMSR                                                    | 30      |      |         | dB    |       |
| Spectral Width (-20dB)                   |                                                         |         |      | 1       | nm    |       |
| Transmitter and Dispersion Penalty       | TDP                                                     |         |      | 3.0     | dB    |       |
| Relative Intensity Noise                 | RIN                                                     |         |      | -128    | dB/Hz |       |
| Optical Return Loss Tolerance            | ORLT                                                    |         |      | 21      | dB    |       |
| Pout @TX-Disable Asserted                | P <sub>off</sub>                                        |         |      | -30     | dBm   | 1     |
| Tx Power Monitor Accuracy                |                                                         |         |      | ±3      | dB    |       |
| Eye Diagram                              | IEEE Std 802.3-2005 10Gb Ethernet 10GBASE-ZR compatible |         |      |         |       |       |
| Receiver                                 |                                                         |         |      |         |       |       |
| Center Wavelength                        | λ <sub>c</sub>                                          | 1528    |      | 1565    | nm    |       |
| Receiver Sensitivity (P <sub>avg</sub> ) | S                                                       |         |      | -23     | dBm   | 3     |
| Receiver overload (P <sub>avg</sub> )    | P <sub>OL</sub>                                         | -8      |      |         | dBm   | 3     |
| Optical Return Loss                      | ORL                                                     |         |      | -27     | dB    |       |
| Chromatic Dispersion                     | CD                                                      |         |      | 1600    | ps/nm |       |
| OSNR                                     |                                                         | 27      |      |         | dB    | 4     |
| Max OSNR Path Penalty                    |                                                         |         |      | 4       | dB    | 4     |
| Optical Power Path Penalty               |                                                         |         |      | 3       | dB    |       |
| Rx Power Monitor Accuracy                |                                                         |         |      | ±3      | dB    |       |
| Dispersion Limited Distance              |                                                         |         |      | 80      | km    |       |
| Attenuation Limited Distance             |                                                         |         |      | 80      | km    |       |
| LOS De-Assert                            | LOSD                                                    |         |      | -25     | dBm   |       |
| LOS Assert                               | LOSA                                                    | -35     |      |         | dBm   |       |
| LOS Hysteresis                           |                                                         | 0.5     |      |         | dB    |       |

### Notes:

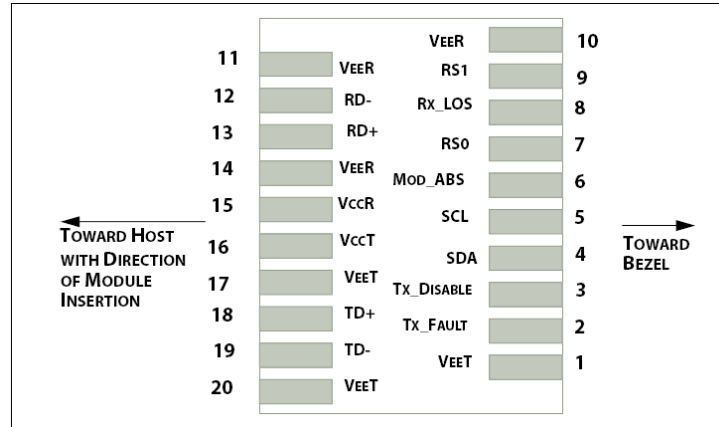
1. The optical power is launched into 9/125μm SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps.
3. Measured with PRBS 2<sup>31</sup>-1 test pattern, 10.3125Gb/s, BER<10<sup>-12</sup>.
4. Receiver power @ -7 ~-18dBm, 10.3125Gb/s, BER<10<sup>-12</sup>.

## Pin Descriptions

| Pin | Symbol     | Name/Descriptions                                                     | Ref. |
|-----|------------|-----------------------------------------------------------------------|------|
| 1   | VeeT       | Transmitter Ground                                                    | 1    |
| 2   | TX_Fault   | Transmitter Fault (LVTTL-O) - High indicates a fault condition        | 2    |
| 3   | TX_Disable | Transmitter Disable (LVTTL-I) – High or open disables the transmitter | 3    |
| 4   | SDA        | Two wire serial interface Data Line (LVCMOS-I/O) (MOD-DEF2)           | 4    |
| 5   | SCL        | Two wire serial interface Clock Line (LVCMOS-I/O) (MOD-DEF1)          | 4    |
| 6   | MOD_ABS    | Module Absent (Output), connected to VeeT or VeeR in the module       | 5    |
| 7   | RS0        | Rate Select 0 – Not used, Presents high input impedance               |      |
| 8   | RX_LOS     | Receiver Loss of Signal (LVTTL-O)                                     | 2    |
| 9   | RS1        | Rate Select 1 – Not used, Presents high input impedance               |      |
| 10  | VeeR       | Receiver Ground                                                       | 1    |
| 11  | VeeR       | Receiver Ground                                                       | 1    |
| 12  | RD-        | Inverse Received Data out (CML-O)                                     |      |
| 13  | RD+        | Received Data out (CML-O)                                             |      |
| 14  | VeeR       | Receiver Ground                                                       |      |
| 15  | VccR       | Receiver Power - +3.3V                                                |      |
| 16  | VccT       | Transmitter Power - +3.3 V                                            |      |
| 17  | VeeT       | Transmitter Ground                                                    | 1    |
| 18  | TD+        | Transmitter Data In (CML-I)                                           |      |
| 19  | TD-        | Inverse Transmitter Data In (CML-I)                                   |      |
| 20  | VeeT       | Transmitter Ground                                                    | 1    |

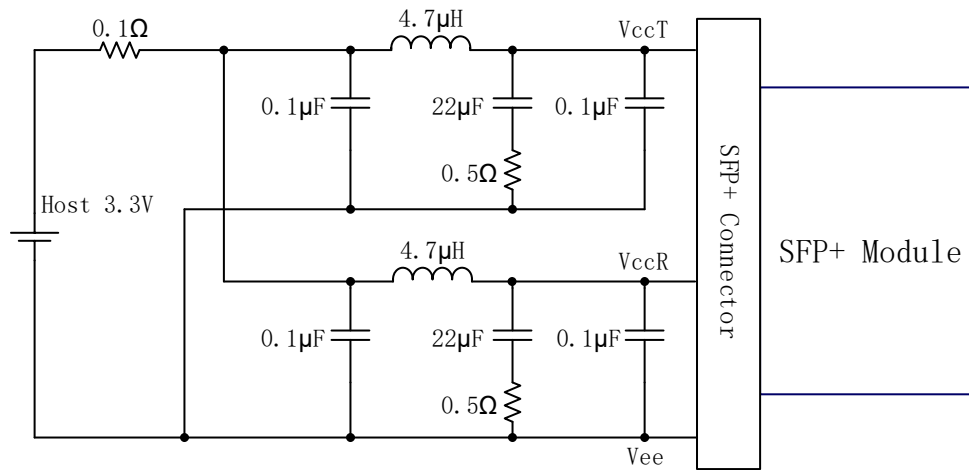
### Notes:

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that on the host board requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.
3. This input is internally biased high with a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccT.
4. Two-Wire Serial interface clock and data lines require an external pull-up resistor dependent on the capacitance load.
5. This is a ground return that on the host board requires a 4. 7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.

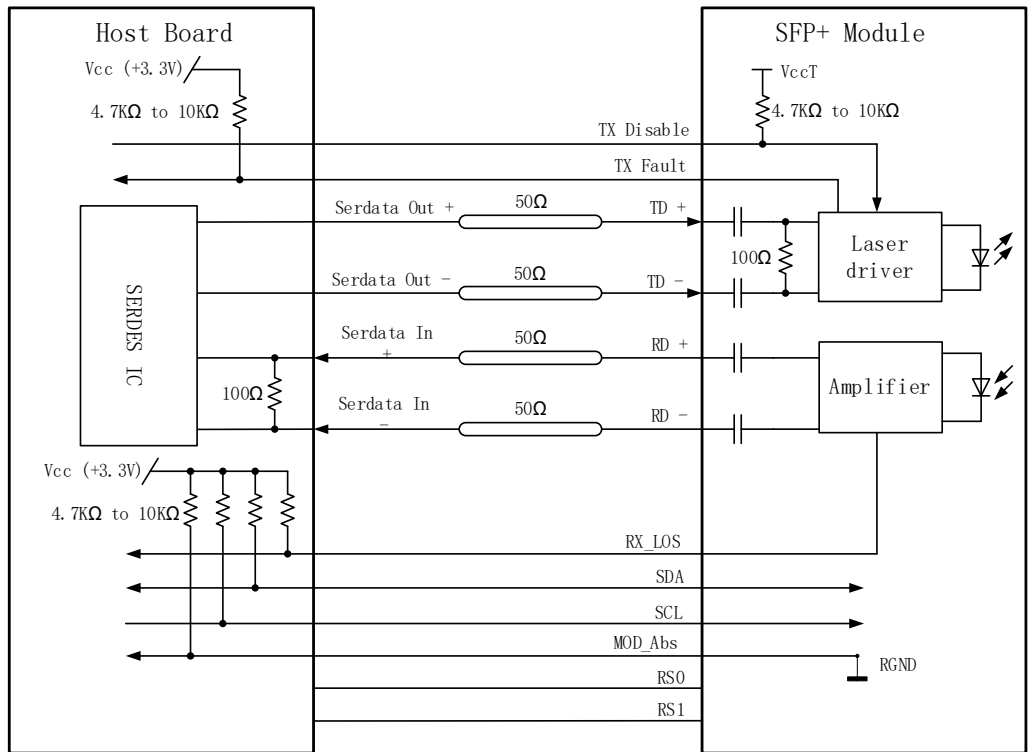


Pin-out of connector Block on Host board

### Recommended Host Board Power Supply Filter Network

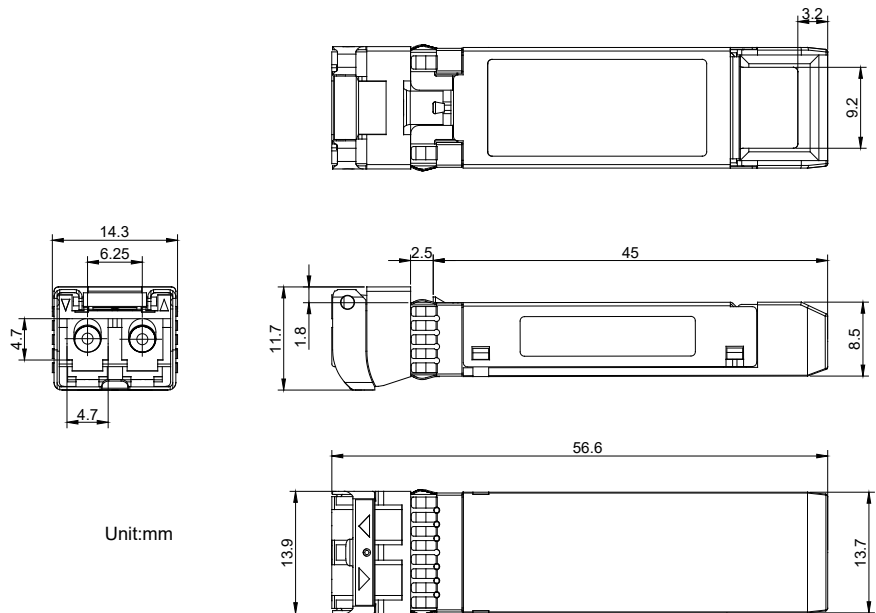


**Recommend Application Interface Block Diagram**



**Mechanical Specifications**

Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



## About ProLabs

Our experience comes as standard; for over 15 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with over 90 optical switching and transport platforms.

## Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 400G while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



## Contact Information

ProLabs US

Email: [sales@prolabs.com](mailto:sales@prolabs.com)

Telephone: 952-852-0252

ProLabs UK

Email: [salesupport@prolabs.com](mailto:salesupport@prolabs.com)

Telephone: +44 1285 719 600