



xPico® Wi-Fi® SMT Embedded Device Server Integration Guide

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This equipment has to be tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device is intended only for OEM Integrators. The OEM integrator should be aware of the following important considerations.

Labeling of the End Product

The label on the end product incorporating the xPico Wi-Fi SMT module must clearly state that it contains an FCC-approved RF module. Canada and Japan also require a similar statement.

For example, "This product contains RF transmitter ID # (put FCC, IC, and/or Japan module grant numbers here)." The label must include the ID numbers for the regions where the end product is installed. The grant numbers are below.

- ◆ xPico Wi-Fi FCC ID number: R68XPICOW
- ◆ xPico Wi-Fi IC ID number: 3867A-XPICOW
- ◆ xPico Wi-Fi Japan ID numbers: 201-135275

RSS-GEN Sections 7.1.4 and 7.1.5 Statement for Devices with Detachable Antennas

This device has been designed to operate with the antennas listed in the Certificate, and having a maximum gain of 2.88 dBi. Antennas not included in this list or having a gain greater than 2.88 dBi are strictly prohibited for use with this device, unless system level FCC approval is gained. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

Integration Notes

- ◆ This module is to be authorized under limited module approval specified to mobile host equipment. So, the antenna must be installed such that 20cm is maintained between the antenna and users.
- ◆ The transmitter module may not be co-located with any other transmitter or antenna.
- ◆ As long as the two conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end product for any additional compliance requirements required with this module installed (for example, digital device emission, PC peripheral requirements, etc.)
- ◆ In the event that these conditions cannot be met (for example certain laptop configurations, general purpose PCMCIA or similar cards, or co-location with another transmitter) and obtaining a separate FCC authorization will be required, then the

FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product (including the transmitter).

- ◆ Changes or modifications to this device not explicitly approved by Lantronix will void the user's authority to operate this device.

Note: With the purchase of any xPico family product, the OEM agrees to an OEM firmware license agreement that grants the OEM a non-exclusive, royalty-free firmware license to use and distribute the binary firmware image provided, only to the extent necessary to use the xPico hardware. For further details, please see the xPico OEM firmware license agreement.

Note: Please refer to the xPico Wi-Fi SMT data sheet for the full compliance specification and requirements.

Warranty

For details on the Lantronix warranty policy, please go to our Web site at www.lantronix.com/support/warranty.

Revision History

| Date | Rev. | Comments |
|----------------|------|---------------------------------|
| November 2014 | A | Initial document. |
| December 2014 | B | Added Japan ID information. |
| September 2017 | C | Updated compliance information. |

For the latest revision of this product document, please check our online documentation at www.lantronix.com/support/documentation.

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1. Introduction

About the Integration Guide

This user guide provides the information needed to integrate the Lantronix® xPico® Wi-Fi® SMT family of products into customer-printed circuit boards. This manual is intended for engineers responsible for integrating the xPico Wi-Fi SMT module into their product. The scope of this document provides how to connect the various module pin function groups as well as general module placement and mounting. For detailed technical and compliance specifications please refer to the *xPico Wi-Fi SMT Embedded Device Server Data Sheet*.

Note: This document includes support for xPico Wi-Fi SMT embedded device server versions XPCW1002 and XPCW1003.

The table below describes the integration guide sections.

Table 1-1 xPico Wi-Fi SMT Integration Guide Sections

| Section | Description |
|---|--|
| xPico Wi-Fi SMT Features | Provides an overview of the module functions and mechanical drawing |
| xPico Wi-Fi SMT Block Diagram | Shows the module functional blocks |
| Signal Descriptions | Provides signal descriptions and pinout information |
| Antenna Interface | Lists the antennas pre-certified for use with the XPCW1002 and XPCW1003 modules |
| Using the RF1 Signal Pin | Describes the pin connections for routing the antenna trace on the mating PCB (XPCW10002 modules only) |
| Antenna Placement | Provides a general recommendation for antenna placement |
| Serial Interface | Provides an example on how to connect the unit to external RS232/485/422 networks |
| USB Device Port | Provides an example on how to connect the unit up as a USB device port |
| LEDs | Describes the module LED connections |
| General Purpose IO Pins | Describes the module GPIO connections |
| Reset Pins | Describes the module RESET, DEFAULT, and WAKE pins |
| Mounting Instructions and PCB Footprint | Provides the module PCB footprint and solder profile |
| Product Information Label | Provides an image and description of the unit label contents |
| Adapter Schematic | Provides the connections used on the xPico SMT to xPico connector adapter board |
| Evaluation Board Schematic | Provides the xPico Evaluation board schematic. |

Additional Documentation

Visit the Lantronix web site at www.lantronix.com/support/documentation for the latest documentation and the following additional documentation.

| Document | Description |
|--|--|
| <i>xPico Wi-Fi SMT Embedded Device Server Data Sheet</i> | Provides a unit description and all technical and compliance specifications for the XPCW1002 and XPCW1003 modules. |
| <i>xPico Wi-Fi Embedded Device Server User Guide</i> | Provides information needed to configure, use, and update the xPico Wi-Fi firmware. |
| <i>xPico Embedded Device Server Development Kit Quick Start</i> | Provides the steps for getting the xPico and xPico Wi-Fi evaluation kit up and running. |
| <i>xPico Embedded Device Server Development Kit User Guide</i> | Provides a detailed description of the xPico evaluation kit hardware |
| <i>Notification Soldering Profile and Washing</i> | Provides guidance in developing a manufacturing assembly process for various Lantronix embedded products. |

2. Functional Description

Designed for quick integration with minimal engineering effort, the chip-sized xPico Wi-Fi SMT embedded device server provides simplicity and flexibility making it the easiest and fastest networking-enabling module on the market.

xPico Wi-Fi SMT device servers are extremely compact networking solution that enables Ethernet or Wireless connectivity on virtually any device with a serial interface. The included industry-proven Lantronix device server application and full IP stack allow seamless remote access to device data simplifying design integration while providing robust connectivity.

As one of the smallest embedded device servers in the world, xPico Wi-Fi SMT embedded device servers can be utilized in designs typically intended for chip solutions. A key difference with the xPico module is that there is virtually no need to write a single line of code, translating to a much lower development cost and faster time-to-market.

Table 2-1 xPico Part Numbers

| Part Number | Description |
|---------------------|--|
| XPCW1002100B | xPico Wi-Fi SMT with on module U.FL— IEEE 802.11 b/g/n Device Server Module, Extended Temp, Bulk, RoHS |
| XPCW1003100B | xPico Wi-Fi SMT with on module chip antenna— IEEE 802.11 b/g/n Device Server Module, Extended Temp, Bulk, RoHS |
| XPCW1002100K | xPico Wi-Fi SMT — IEEE 802.11 b/g/n Device Server Development Kit w/ on Module U.FL and RF Cable to External Antenna, RoHS |
| XPCW1003100K | xPico Wi-Fi SMT — IEEE 802.11 b/g/n Device Server Development Kit w/ on Module Chip Antenna, RoHS |

xPico Wi-Fi Features

The xPico Wi-Fi SMT device server contains Cortex M3 ARM processor with 128 KB of SRAM and 1 MB of embedded Flash memory. The unit also includes an 802.11 b/g/n WLAN radio.

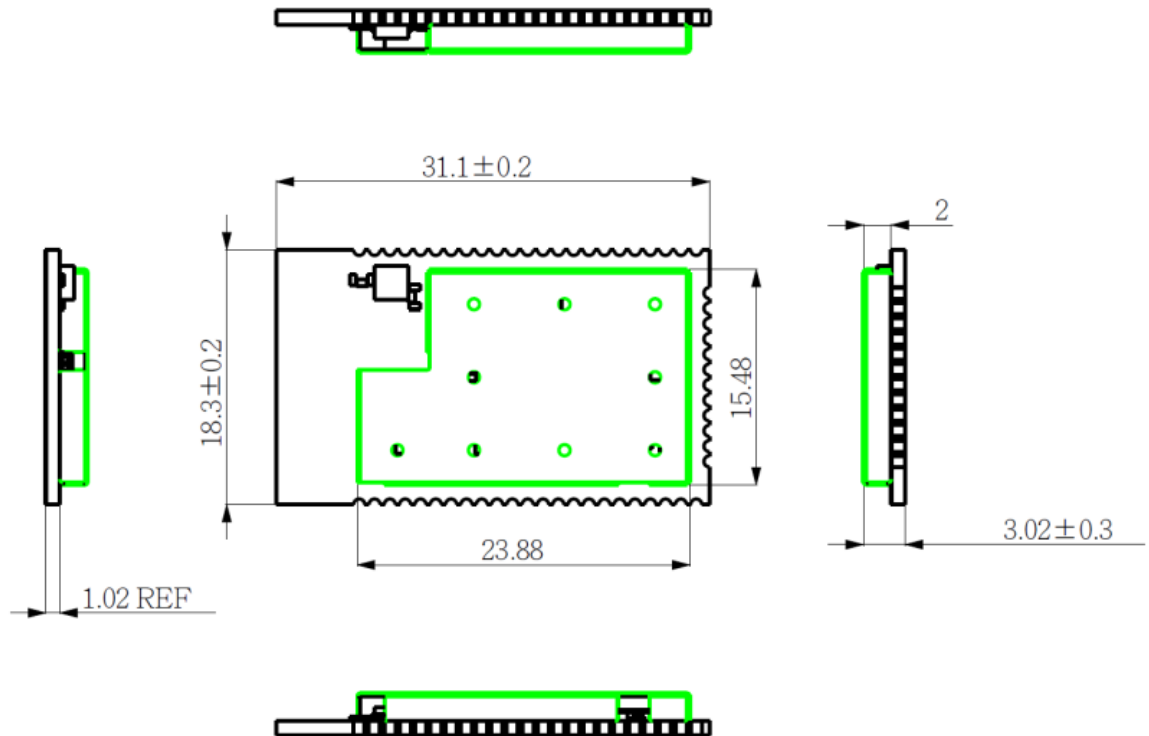
The xPico Wi-Fi embedded device server also supports the following:

- ◆ 3.3-volt serial interface
- ◆ 8 Configurable I/O pins
- ◆ All logic level I/O pins are 5V input tolerant
- ◆ 8-Mbit flash memory (in addition to the 1MByte CPU embedded Flash)
- ◆ Power supply filters
- ◆ Reset circuit
- ◆ Module part number XPCW1002 includes an on module U.FL connector for connection to an external antenna. An external antenna is required for the XPCW1002 series part numbers. There is also an option to route the RF signal to an SMT pad in order to connect to an antenna on the end system PCB.

- ♦ Module part number XPCW1003 includes an on module chip antenna. This module does not require an external antenna.

The xPico Wi-Fi embedded device server requires +3.3-volt power and is designed to operate in an extended temperature range (see xPico Wi-Fi SMT data sheet for all technical specifications).

Figure 2-1 xPico Wi-Fi SMT Dimensions and Views



xPico Wi-Fi SMT Block Diagram

The following drawing is a block diagram of the xPico Wi-Fi SMT embedded device server showing the relationships of the components.

Figure 2-2 xPico Wi-Fi SMT XPCW1003 Block Diagram

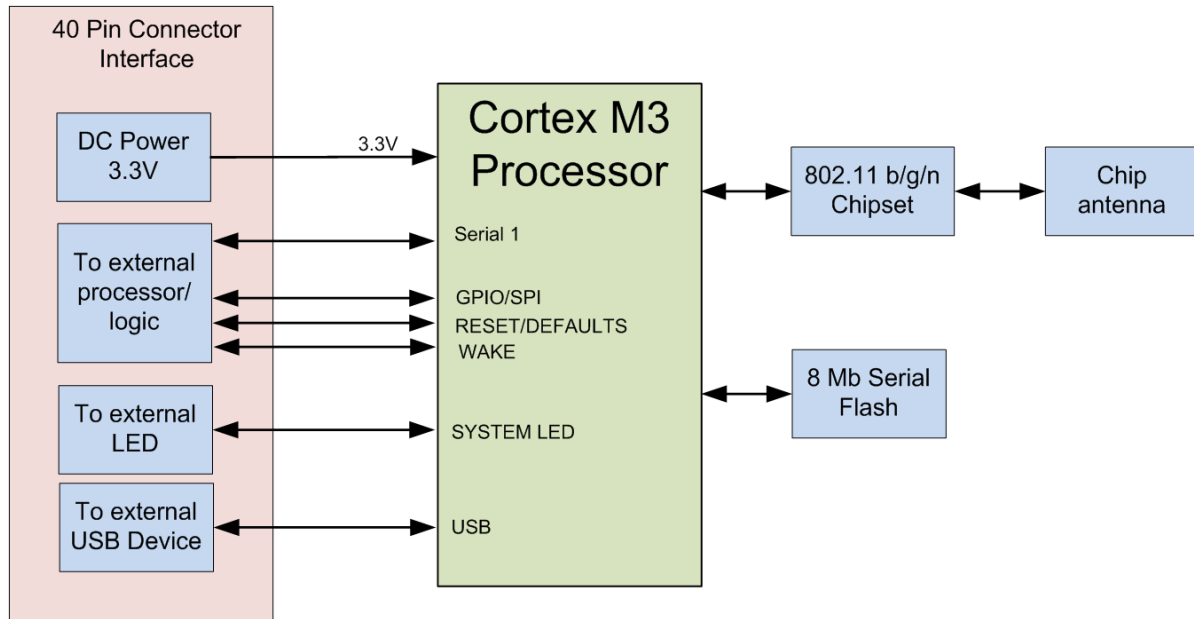
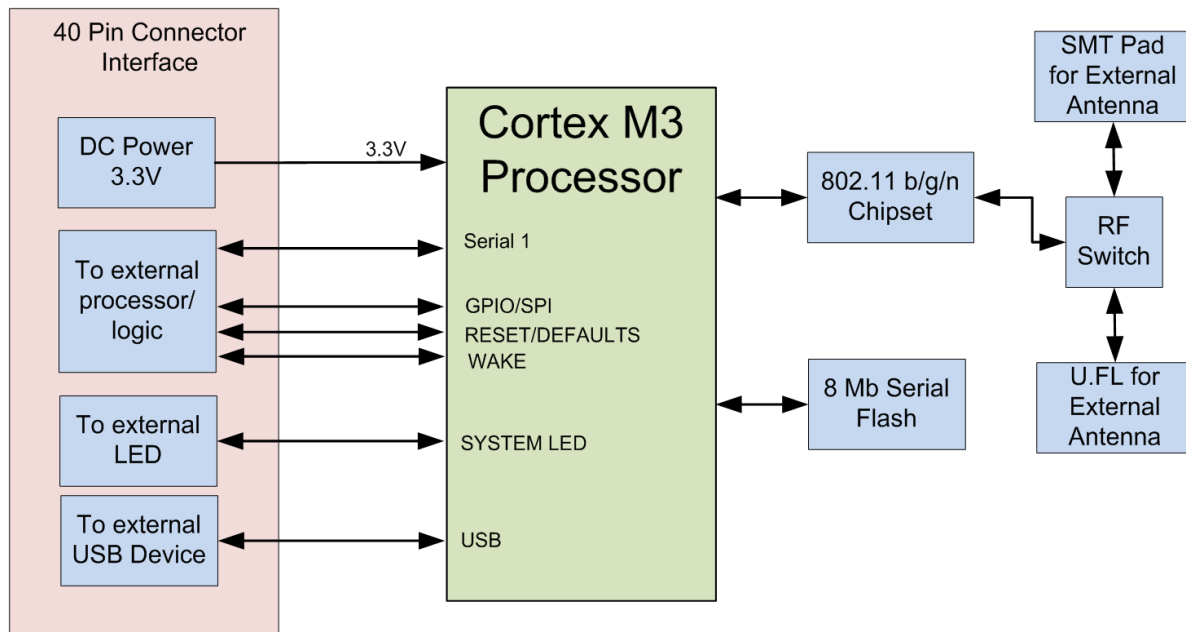


Figure 2-3 xPico Wi-Fi SMT XPCW1002 Block Diagram



Signal Descriptions

The xPico embedded device server has a serial interface compatible with data rates up to 921,600 bps (in high-performance mode). The serial signals (RX, TX, RTS, CTS, and all CPs) are 3.3V CMOS logic level and 5V tolerant. The serial interface pins include +3.3V, ground, and reset. The serial signals usually connect to an internal device, such as a UART. For applications requiring an external cable running with RS-232 or RS422/485 voltage levels, the xPico must interface to a serial transceiver chip. All configurable I/O pins are 3.3V CMOS logic level and 5V input tolerant.

An external antenna is required to connect to an 802.11b/g/n wireless network for the XPCW1002 series parts. The external antenna can be connected either to the on module U.FL or connected via PCB trace to the XPCW1002 RF1 SMT pad. The XPCW1003 series parts have an on module chip antenna.

Table 2-2 xPico Wi-Fi SMT PCB Interface Signals

| Signal Name | xPico Pin # | Primary Function | Reset State | Internal Pull-up /Pull-down | Driver Strength |
|------------------------|-------------|---|-----------------|-----------------------------|-----------------|
| RF1 | 2 | RF signal to PCB trace when RF1_CTL is asserted low (XPCW1002 only) Route to antenna via 50 ohm transmission line. | Floating | | |
| CP3/MISO ¹ | 12 | Configurable GPIO / SPI Master serial data input, SPI Slave serial data output | Input, Floating | 30K to 50K | 8mA |
| CP4/MOSI ¹ | 13 | Configurable GPIO / SPI Master serial data output, SPI Slave serial data input | Input, Floating | 30K to 50K | 8mA |
| CP7/SCK ¹ | 14 | Configurable GPIO / SPI clock | Input, Floating | 30K to 50K | 8mA |
| CP8/CS ¹ | 15 | Configurable I/O, multiplexed with SPI interface Chip Select | Input, Floating | 30K to 50K | 8 mA |
| CP5 | 16 | Configurable GPIO | Input, Floating | 30K to 50K | 8mA |
| CP6 | 17 | Configurable GPIO | Input, Floating | 30K to 50K | 8mA |
| USB+ ² /DDP | 18 | USB (Positive) | | | |
| USB- ² /DDM | 19 | USB (Negative) | | | |
| WAKE | 39 | System Wake Up on Rising Edge | Input, Floating | 30K to 50K | |
| DEFAULT# | 40 | Unit reset to default, active low. | Input, Floating | 30K to 50K | |

| Signal Name | xPico Pin # | Primary Function | Reset State | Internal Pull-up /Pull-down | Driver Strength |
|----------------------|--|--|-----------------|-----------------------------|-----------------|
| | | Drive low to reset unit to default settings. | | | |
| SYS_LED | 41 | System Status LED, Active High | Input, Floating | 30K to 50K | 8mA |
| CP2/INT ¹ | 42 | Configurable GPIO / SPI interrupt External Interrupt input | Input, Floating | 30K to 50K | 8mA |
| CP1 | 45 | Configurable GPIO | Input, Floating | 30K to 50K | 8mA |
| WLAN LED | 47 | LED function for WLAN Link indication, Active Low | Input, Floating | 30K to 50K | 8 mA |
| RESET# | 51 | Unit hardware reset, active low. Drive low to reboot unit | Input Pull up | 30K to 50K | |
| RXD2 | 52 | UART2 serial receive data input | Input, Floating | 30K to 50K | |
| TXD2 | 53 | UART2 serial transmit data output | Input, Floating | 30K to 50K | 8mA |
| CTS1 ⁵ | 54 | UART1 clear to send input | Input, Floating | 30K to 50K | |
| RTS1 ⁵ | 55 | UART1 serial ready to send output | Input, Floating | 30K to 50K | 8mA |
| RXD1 | 56 | UART1 Serial receive data input | Input, Floating | 30K to 50K | |
| TXD1 | 57 | UART1 serial transmit data output | Input, Floating | 30K to 50K | 8mA |
| RF1_CTL | 59 | Antenna Switch control. Pull low to select an external antenna connected to the RF1 pad (pin 2). Note XPCW1002 only. Pull pin high or leave floating to use XPCW1002 on module U.FL. | Input Pull up | 100K | |
| VCC | 48,49,50 | 3.3V Power Input | | | |
| GND | 1,3,5,20,23, 24,27,32,35, 36,58,60,61, 64,65,69,70, 71,72,73,74, 75,76 | Signal Ground | | | |

| Signal Name | xPico Pin # | Primary Function | Reset State | Internal Pull-up /Pull-down | Driver Strength |
|-------------|--|---|-------------|-----------------------------|-----------------|
| RSVD | 4,6,7,8,9,10, 11,21,22,25, 26,28,29,30, 31,33,34,37, 38,43,44,46, 62,63,66,67,68 | Reserved for Future Use. Leave unconnected. | | | |

Note1: The xPico Wi-Fi SMT SPI interface supports master only. Slave mode operation will be supported in a future firmware release.

Note2: The xPico Wi-Fi SMT USB interface is USB 2.0 full speed device. The device interface connector and power interface must be designed into the mating board.

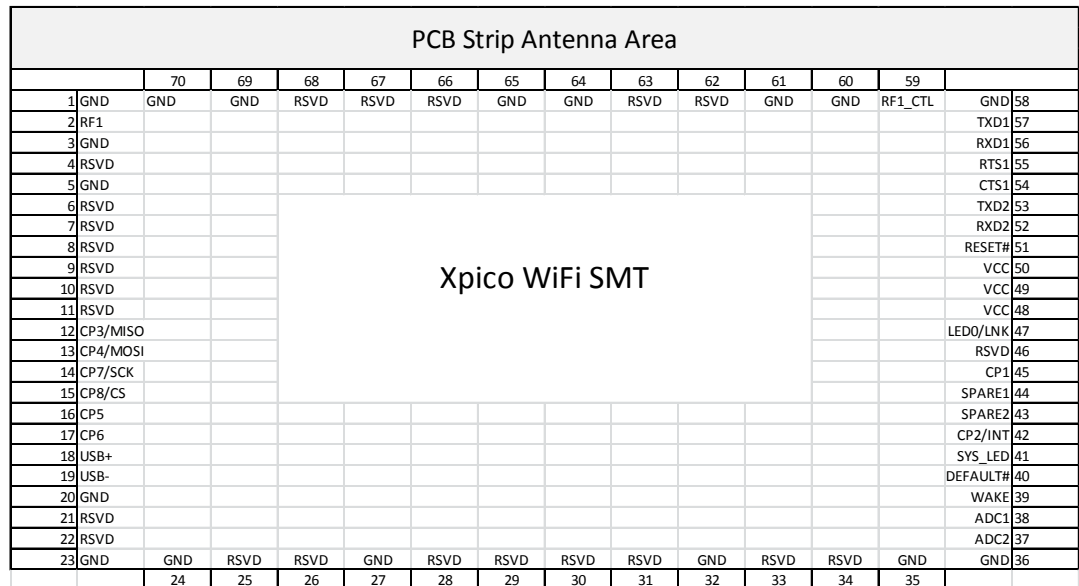
Note 3. The CP pins can be configured as pull-up or pull-down. The WKUP pin is not configurable and is always pull-down.

Note 4. The GPIO pins on xPico Wi-Fi SMT are configured as floating-input on reset until configured by firmware. For applications requiring a high signal on power up, an external pull-up may be required.

Note 5. It is highly recommended to connect RTS and CTS for serial port 1.

Note 6. For 5V tolerant systems the internal pull ups/ pull downs should be disabled.

Figure 2-4 xPico Wi-Fi SMT Pin locations



Note: Pins 71 to 76 are the large pads under the module. Pins 71 to 76 should be connected to GND.

Antenna Interface

The xPico Wi-Fi module has been certified using the external antennas listed below. Per FCC guidelines, the xPico Wi-Fi certification remains valid if using an antenna of similar type to the antennas below. If using an antenna of similar type to one of the antennas below, but from a different manufacturer part number the antenna gain must be equal to or less than specified in the table. Refer to the xPico Wi-Fi SMT Embedded Device Server Data Sheet for full compliance instructions and information. Consult with your certification lab for more details.

The XPCW1003 series has been certified with its on module antenna.

Table 2-3 xPico Wi-Fi On Module Antenna (XPCW1003 series)

| Antenna Type | Peak Gain Typical | Lantronix Part Number | Vendor | Vendor Part Number |
|-----------------|-------------------|-----------------------|--------|--------------------|
| Multilayer chip | 2.5 dBi | N/A | N/A | N/A |

Table 2-4 xPico Wi-Fi External Antenna Options (XPCW1002 series)

| Antenna Type | Peak Gain Typical | Lantronix Part Number | Vendor | Vendor Part Number |
|---|--|--|---------------|--------------------|
| PCB Strip Antenna with 50mm cable to U.FL connector With tape backing | 1.5 to 2.5dBi, 2.39 Ghz to 2.49 Ghz | XPW100A0 03-01-B 50 piece bulk pack | Ethertronics® | 1001077 |
| PCB Strip Antenna with 50mm cable to U.FL connector Without tape backing | 1.5 to 2.5dBi, 2.39 Ghz to 2.49 Ghz | | Ethertronics | 1000668 |
| Swivel type antenna, with RP-SMA(M) connector | 2 dBi, 2.4 Ghz to 2.5 Ghz, 2 dBi, 5.15 Ghz to 5.85 Ghz | 930-033-R-ACC 50 piece bulk pack | Wanshih | WSS002 |

Note: The PCB strip antenna is available from Ethertronics with or without adhesive tape backing for mounting to a plastic case. The antennas Lantronix supplies include an adhesive backing. For the component without tape backing a non-conductive double sided adhesive tape can be used to fix the antenna in place. The Ethertronics part numbers listed above come with a 50mm U.FL cable attached to the PCB strip antenna. The 50mm cable length is the minimum allowed cable length for use with the xPico Wi-Fi embedded device server. For similar PCB strip antennas with longer cables consult with Ethertronics (www.ethertronics.com).

Note: In order to use the XPCW1002 on module U.FL connector signal RF1_CTL (pin 59) should be pulled high or left floating.

Lantronix provides a U.FL to Reverse SMA antenna cable in with the evaluation board and sample kits for development work. These cables can be purchased from Lantronix for production or supplied by an RF cable manufacturer. External antennas can be purchased from an antenna vendor. Components for cable design should be selected for low loss over the entire 2.4Ghz to 5.9Ghz signal range. The cable target impedance should be 50 ohms.

Figure 2-5 Reverse-SMA to U.FL (long) (Lantronix Part Number 500-180-R-ACC)

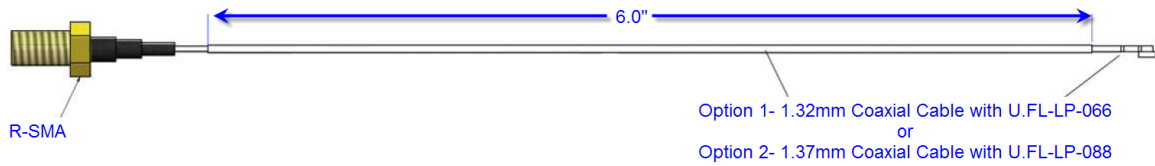


Figure 2-6 U.FL to U.FL Cable (Lantronix Part Number 500-181-R-ACC)

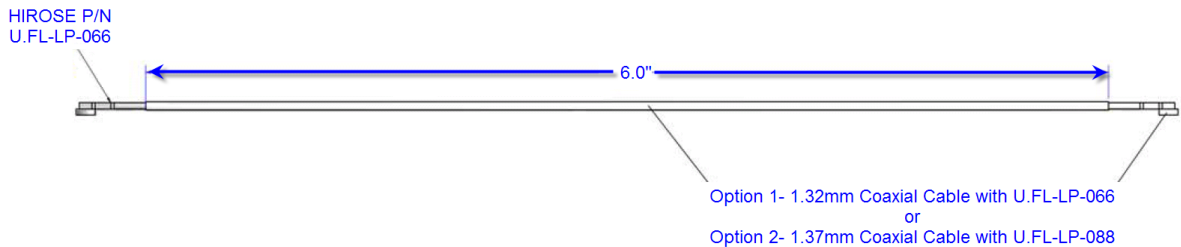
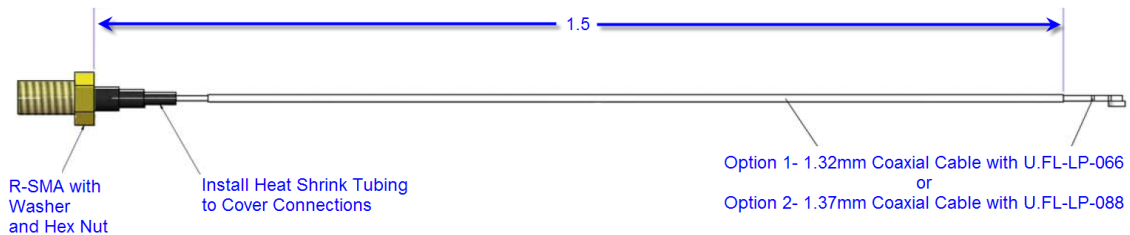


Figure 2-7 Reverse-SMA to U.FL (short) (Lantronix Part Number 500-182-R-ACC)



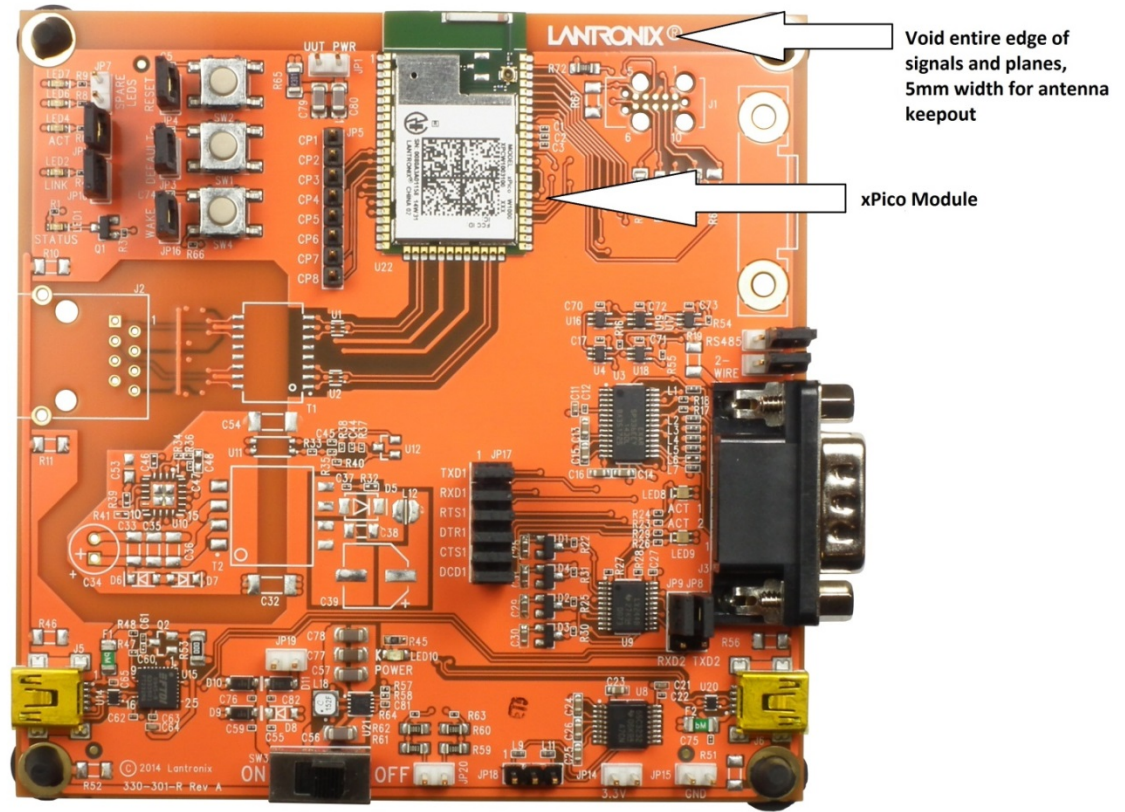
Antenna Placement

When designing the xPico Wi-Fi module to a mating board, it is important to consider the final installation of the unit and its location with respect to connecting access points. The antenna should be placed so that it has as clear as possible path to the connecting access point for maximum range. Avoid placing the antenna such that it is blocked by metal walls or ground planes of adjacent circuit boards.

When using the XPCW1003 series with the on board chip antenna it is recommended to place the module such that the antenna region is along the edge of the board or extending outward from the edge of the board. If the chip antenna region is placed such that the mating PCB is under the region, that portion of the mating PCB should be void of all signals and planes.

See the figure images below showing recommended placement with the XPCW1003 module chip antenna.

Figure 2-8 XPCW1003 Module with chip antenna board edge mounting



Note: The chip antenna region of the module shown above is at the top edge of the PCB. The entire top edge of the PCB should be voided to optimize antenna performance. The width of the keep out region is 5mm.

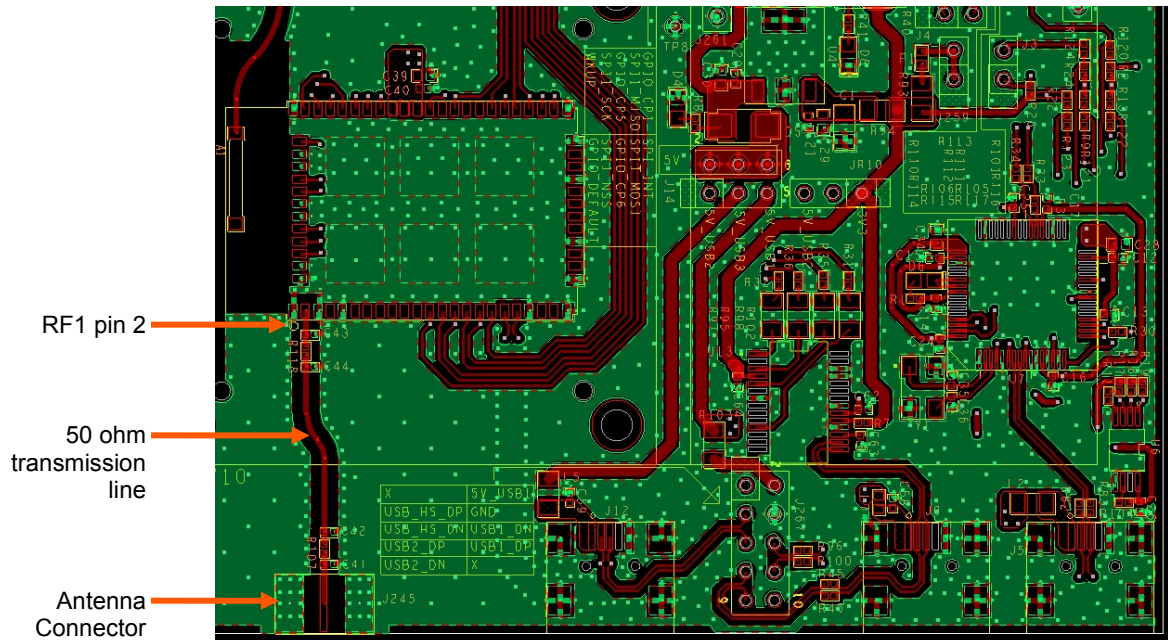
Using the RF1 Signal Pin

The XPCW1002 series module has an option to allow routing of the RF antenna trace on the mating PCB. Signal RF1 (pin 2) is the module Wi-Fi RF when signal RF1_CTL (pin 59) is driven or pulled low using a low ohm resistor.

Note: When using the off module PCB RF trace from pin 2, use of a different antenna or different routing than shown in the routing reference below and xPico Wi-Fi External Antenna Options (XPCW1002 series) table will require recertification.

The signal line between RF1 (pin 2) and the chip antenna should be routed using a 50 ohm transmission line referenced to ground. Avoid the use of vias on the RF trace. It is recommended the 50 ohm transmission line be routed with as wide of a trace as possible.

Figure 2-9 Layout Example



The passive components in the figure above should be 0201 size. Care should be taken during routing to minimize the deviation from the 50 ohm transmission line impedance due to the component pad dimensions. Stubs should be avoided and signals should be routed through the component pads. The resistor and two capacitor combinations in the schematic represent a PI network that is used to tune the RF line for matching purposes. The layout above is based on a 4-layer stack up with the outer layers for signal routing. The RF trace is routed on layer 1, ground on layer 2, power on layer 3, and other signals on layer 4. The outer layers should be flooded with ground. Ground stitching vias should be used to guard band the RF trace and provide thermal relief throughout the board. Gerbers and the Allegro board file for the above layout are available on request.

Serial Interface

The xPico Wi-Fi SMT embedded device server has two external serial interfaces. The signal levels on the serial interface are 3.3V logic level with 5V tolerant inputs. The serial interfaces require an external transceiver in order to connect to external RS232, RS485, or RS422 networks. The signals of Serial Port 1 may be connected as shown in the reference schematic, [Figure 2-10 Serial Port Example](#), below. The transceiver shown in the reference schematic is of type Exar, part number SP336. This transceiver is a multiprotocol RS232, RS485, RS422 transceiver. Single protocol transceivers may be used as required. The xPico interface may also be directly connected to the UART interface of an external CPU. Serial Port 2 is a two wire interface only. It operates like Serial Port 1, except it does not have dedicated hardware Flow Control (i.e. no RTS/CTS) and Modem control (i.e. no DTR/DCD). It is possible to configure the GPIO to provide hardware Flow control for Serial Port 2 if necessary. It is highly recommended to connect RTS and CTS for serial port 1.

Table 2-5 xPico and xPico Wi-Fi Serial Port Signals

| Signal | Module Pin | Description |
|--------|------------|---|
| TXD1 | 57 | Serial Transmit Data output |
| RTS1 | 55 | Serial Ready-to-Send / Serial Transmit enable |
| RXD1 | 56 | Serial Receive Data input |
| CTS1 | 54 | Serial Clear-to-Send |
| TXD2 | 53 | Serial Transmit Data output 2 |
| RXD2 | 52 | Serial Receive Data input 2 |

Figure 2-10 Serial Port Example

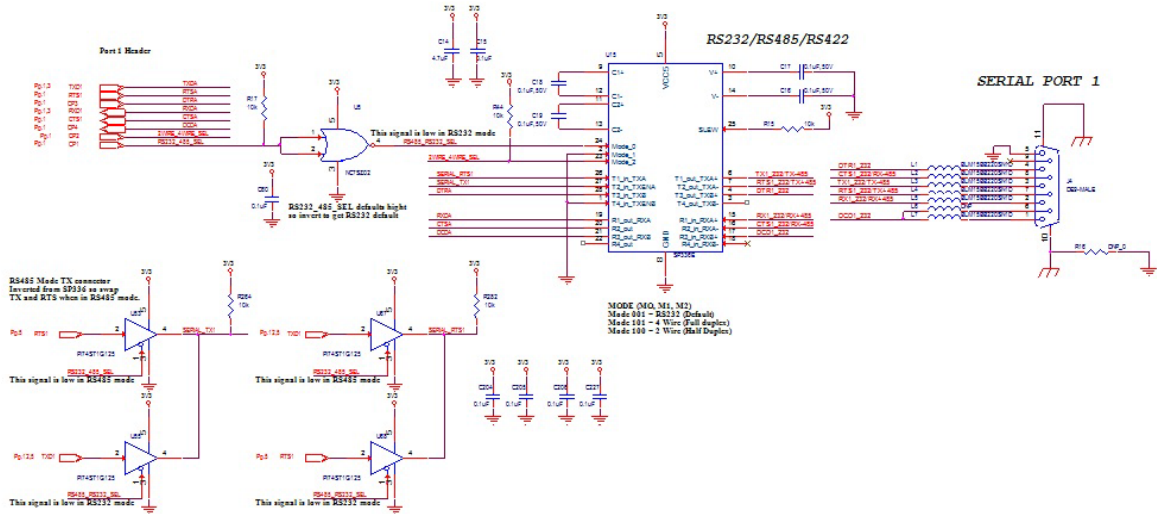


Table 2-6 Example RS232 Connections (Serial Transceiver Required)

| xPico Signal | | DTE Connector | | | DCE Connector | | |
|----------------|-------------------------|---------------|------|--------|---------------|------|--------|
| Signal (Logic) | Description | DB9 | DB25 | Signal | DB9 | DB25 | Signal |
| RXDx | Data In | 2 | 3 | RXDx | 3 | 2 | TXDx |
| TXDx | Data Out | 3 | 2 | TXDx | 2 | 3 | RXDx |
| RTSx | H/W Flow Control Output | 7 | 4 | RTSx | 8 | 5 | CTSx |
| CTSx | H/W Flow Control Input | 8 | 5 | CTSx | 7 | 4 | RTSx |
| CPx | Modem Control Input | 1 | 8 | DCDx | 4 | 20 | DTRx |
| CPy | Modem Control Output | 4 | 20 | DTRx | 1 | 8 | DCDx |

Table 2-7 Example RS422/485 Connections (Serial Transceiver Required)

| xPico Signal (logic) | Description | RS485 Signal | DB25 4 Wire | DB25 2 Wire | DB9 4 wire | DB9 2 wire |
|----------------------|--------------|--------------|-------------|-------------|------------|------------|
| TXDx | Data Out | TX+485 | 14 | 14 | 7 | 7 |
| TXDx | Data Out | TX-485 | 15 | 15 | 3 | 3 |
| RXDx | Data In | RX+485 | 21 | 14 | 2 | 7 |
| RXDx | Data In | RX-485 | 22 | 15 | 8 | 3 |
| RTSx | TX Enable | | | | | |
| CPx | RS485 Select | | | | | |
| CPy | RS485 2-wire | | | | | |

Note: The IO pins for xPico Wi-Fi SMT unit are set to floating input on power up until configured by unit firmware. An external 100K ohm pull-up may be required on the serial transmit signal to prevent downstream UART devices from detecting false characters on initial power up. For xPico Wi-Fi 5V tolerant pins, in order to sustain a voltage higher than $V_{cc}+0.3$, the internal pull-up/ pull-down resistors must be disabled.

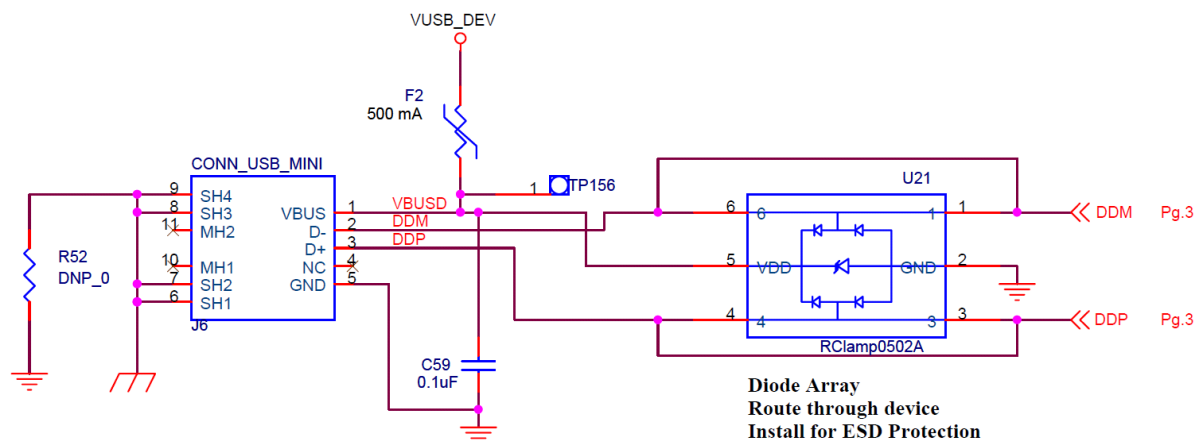
USB Device Port

The xPico Wi-Fi SMT embedded device server has one USB 2.0 device port interface for connection to an upstream USB device. The port consists of a differential pair, signals DDP and DDM. These signals should be routed as a 90 ohm differential pair on a signal layer next to the signal ground plane. The use of vias should be minimized on these signals. The USB signals can be connected to a USB Mini Type B USB port (as shown in [Table 2-8](#)) or directly to an IC with a USB host port. If connecting to an external port that is user accessible it is recommended to add a TVS diode array to the signal nets for ESD protection. The ESD array shown in the figure is of type SEMTECH RClamp0502A. This device features through pin routing to minimize trace impedance changes and simplify routing. The footprint for the TVS array can be added to the PCB and the part can be depopulated if it is not needed. It is recommended that the power drawn off the USB Mini Type B connector be limited to less than 500mA per USB requirements. If the USB device port is unused the DDP and DDM pins may be left unconnected.

Table 2-8 USB Device Port Signals

| Pin Name | Description | Module Pins | Signal Requirement | Mini Type B USB Device connector pin |
|----------|------------------------------|-------------|---|--------------------------------------|
| USB+/DDP | USB Device Port Positive pin | 18 | Route as 90 ohm differential pair with DDM signal | 3 |
| USB-/DDM | USB Device Port Negative pin | 19 | Route as 90 ohm differential pair with DDP signal | 2 |
| 5V | 5V power from USB cable | | Current limit to 500 mA per port | 1 |
| Ground | Signal Ground | Ground | Ground plane | 5 |

Figure 2-11 USB Device Interface Example (xPico Wi-Fi only)



LEDs

The xPico Wi-Fi embedded device server contains several external signals that are intended to drive external status LEDs. The LEDs are listed below. The signals may be connected as shown in the reference schematic figure below.

Note: The System LED usually remains **on**. When the **Default** button is pressed for 5-6 seconds, the System LED starts blinking every second to indicate the default button can be released to complete resetting the unit to factory default. The unit reboots after release of the **Default** button. A lit WLAN LED indicates the STA interface is associated with an access point.

Table 2-9 xPico Wi-Fi Status LED Output Signals

| Signal | Pin | Description |
|-----------|-----|--------------------------------|
| WI-FI LED | 47 | WI-FI Status LED, active low |
| SYS_LED | 41 | System status LED, active high |

General Purpose I/O Pins

xPico Wi-Fi SMT unit contains eight pins which may be used as configurable inputs or outputs. Listed below are the configurable I/O pins. These pins are 3.3V CMOS logic level and 5V input tolerant.

Table 2-10 Ethernet Interface xPico Serial Port Signals

| Signal | Pin | Description xPico Wi-Fi | Reset State |
|---------|-----|--------------------------------------|----------------|
| CP1 | 45 | Configurable I/O | Input |
| CP2/INT | 42 | Configurable I/O-SPI interrupt input | Input |
| CP3 | 12 | Configurable I/O- SPI MISO | Input |
| CP4 | 13 | Configurable I/O-SPI MOSI | Input |
| CP5 | 16 | Configurable I/O | Input |
| CP6 | 17 | Configurable I/O | Input |
| CP7 | 14 | Configurable I/O-SPI Clock | Input |
| CP8 | 15 | Configurable I/O-SPI Chip Select | Input |

Note 1. For xPico Wi-Fi 5V tolerant pins, in order to sustain a voltage higher than $V_{cc}+0.3$, the internal pull-up/pull-down resistors must be disabled.

Reset Pins

xPico Wi-Fi SMT embedded device servers have two signals for use as reset signals. Signal EXT_RESET# is a hardware controlled input signal that will reboot the xPico processor when asserted low. Signal DEFAULT# is polled by the xPico Wi-Fi software. When DEFAULT# is asserted low for six seconds, the unit will reset the system to the default manufacturing settings and reboot the unit. xPico Wi-Fi SMT has an additional signal on pin 14 that can be used to wake up the unit processor when the unit is in a sleep or power down state.

Table 2-11 xPico Wi-Fi SMT Reset Signals

| Signal | Pin | Description | Reset State |
|------------|-----|--|-------------|
| EXT_RESET# | 51 | Unit hardware reset, active low. Drive low for 50ms to reboot unit. Signal should be driven high or left floating after reset. | Input |
| DEFAULT# | 40 | Unit reset to default, active low. Drive low for 5 to 6 seconds to reset unit to default settings. | Input |
| WAKE | 39 | Toggle signal from low to high to WAKE from SLEEP or Power down state | Input |

3. PCB Footprint and Module Dimensions

The module recommended footprint for XPCW1003 is shown below. The XPCW1002 module without the chip antenna is the same except does not have the 5x18.3mm section shown in red. The section shown in red is the region where the on module chip antenna resides. This region should ideally be placed on the edge of the board. The area under the antenna region should be void of all signals and planes. It is recommended to have the 5x18.3mm region extend over the edge of the board to eliminate interaction with the board planes. The antenna location inside of the end unit and installation should be chosen such that the antenna has as clear as possible line of site to the connecting WLAN devices. The antenna path should be as clear as possible from metal, ground and power planes from adjacent PCBs and other objects that can interfere with the signal path to the connecting WLAN devices.

To Access CAD Files

1. Go to <http://www.lantronix.com/products/cad-visio.html>.
2. Click **Download CAD files here** to access the **Registration Form**.

Figure 3-1 xPico Wi-Fi SMT XPCW1002 Module Dimensions

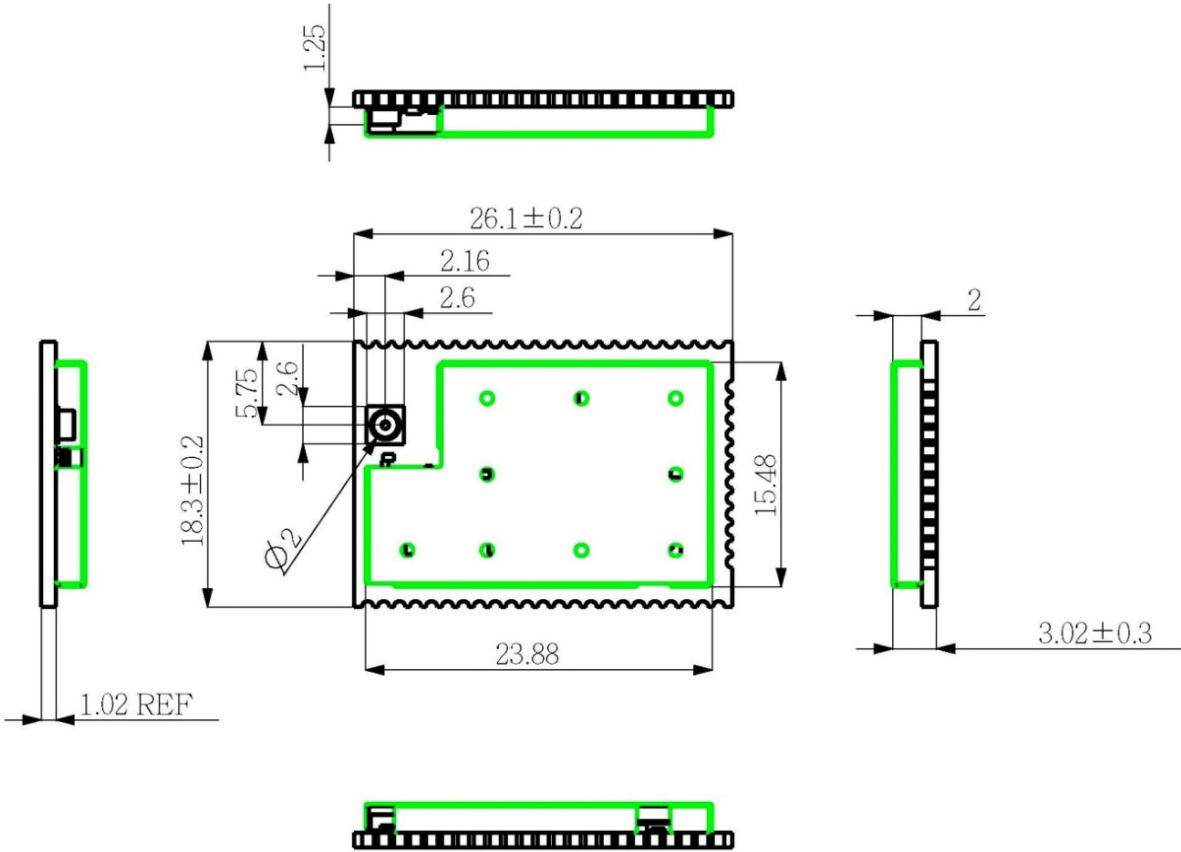


Figure 3-2 xPico Wi-Fi SMT XPCW1002 Recommended Footprint

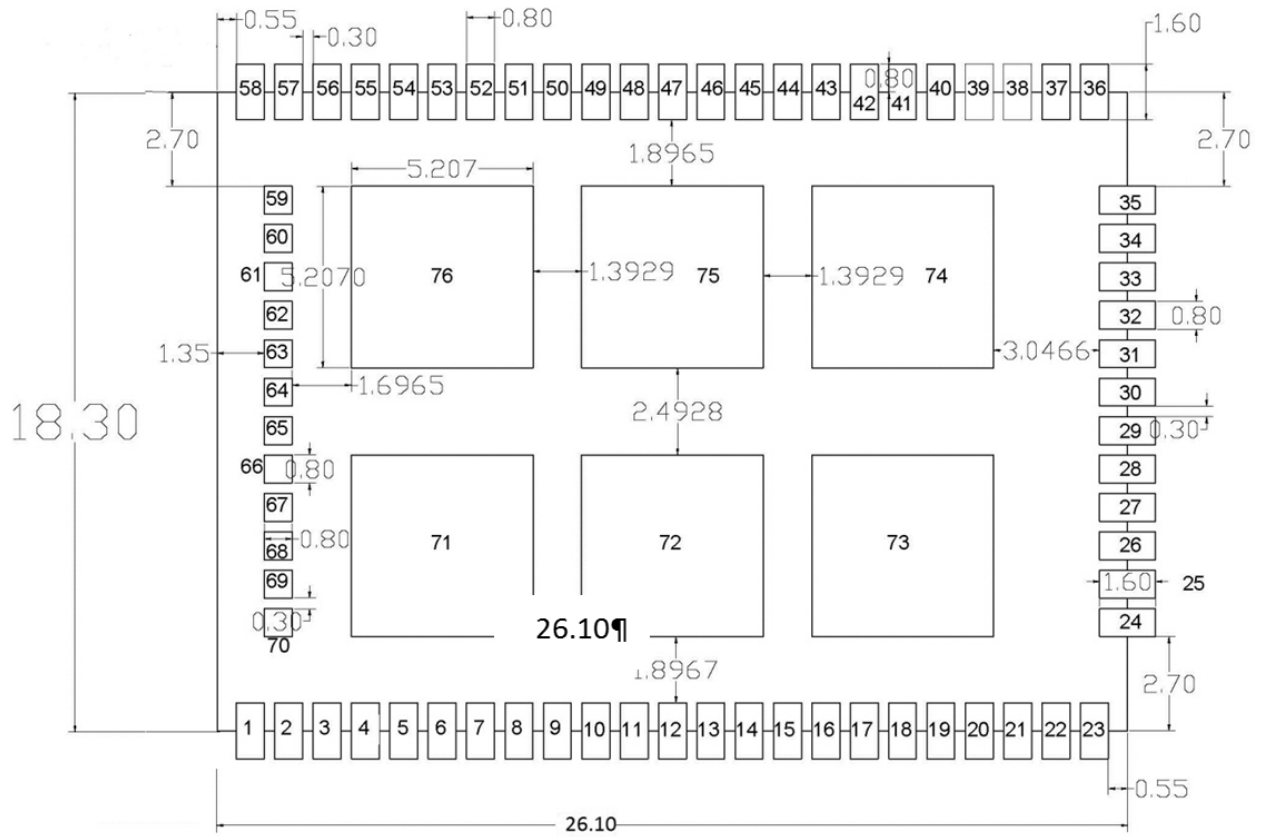


Figure 3-3 xPico Wi-Fi SMT XPCW1003 Module Dimensions

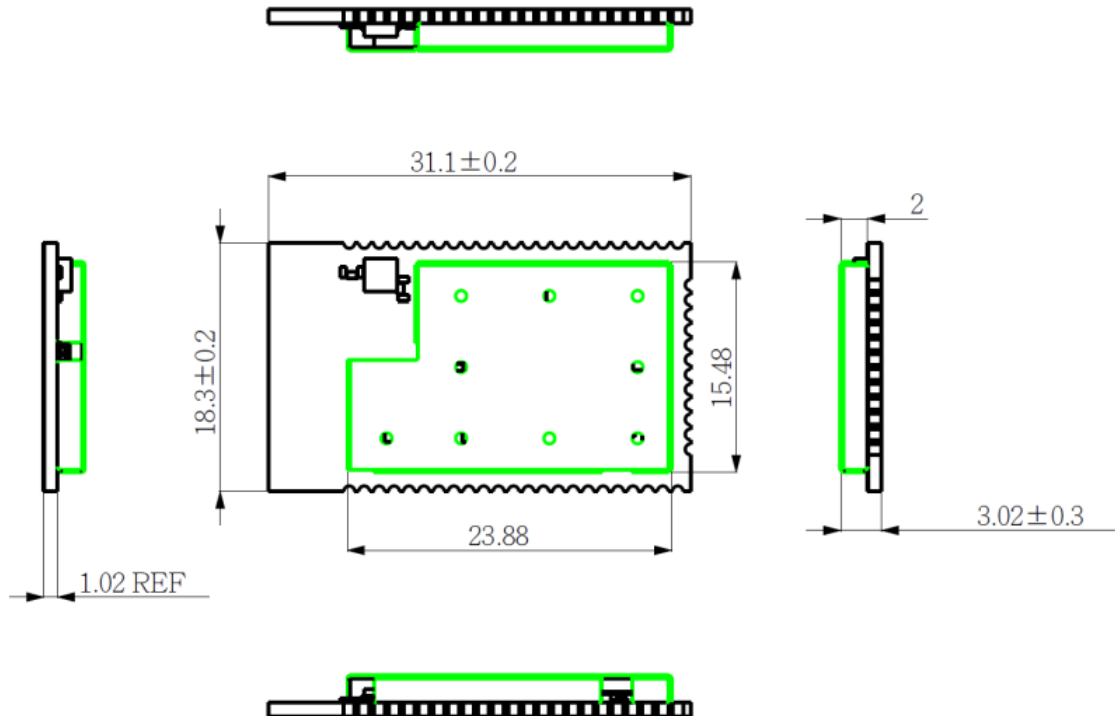
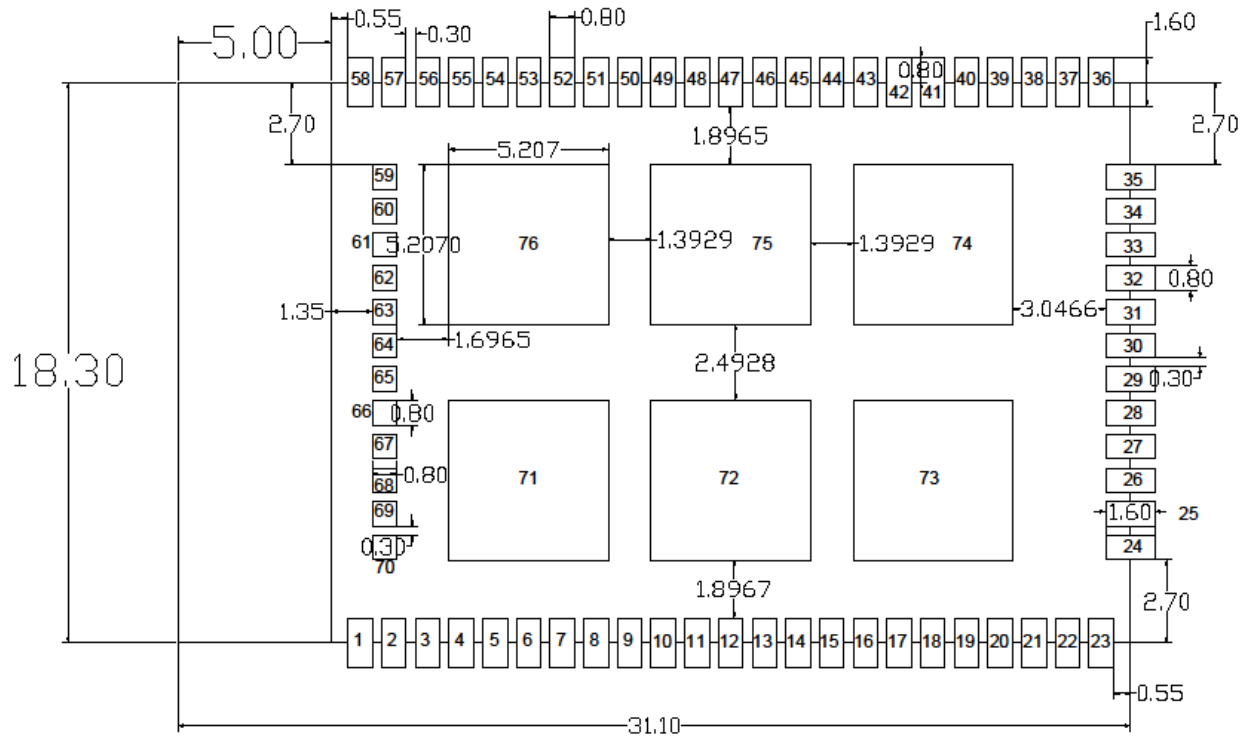


Figure 3-4 xPico Wi-Fi SMT XPCW1003 Recommended Footprint

The six internal ground pads are used for module signal ground and thermal relief. The outer layers should be flooded with ground and the ground pads should have many vias to the internal ground layers.

Soldering coverage should be maximized and checked via x-ray for proper design. There is a trade-off between providing enough soldering for conductivity and applying too much, which allows the module to “float” on the pads creating reliability issues. Lantronix recommends 60% or more full contact solder coverage on each of the internal ground pads after reflow. In addition, Lantronix recommends that the solder wicks up at least 50% of the external castellation pads for proper signal connection.

Solder Profile and Wash Instructions

The reflow profile is dependent on many factors including flux selection, solder composition, and the capability of user's reflow equipment.

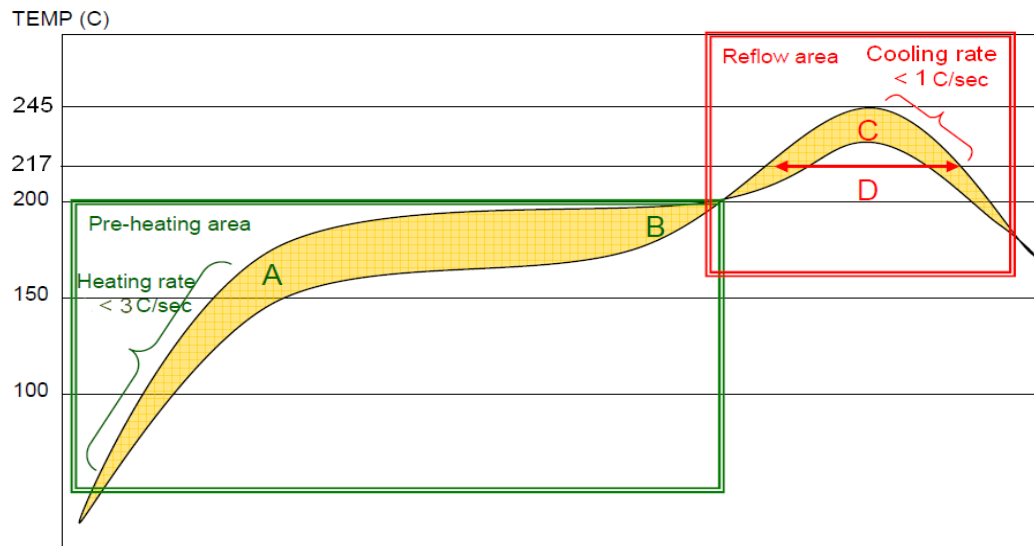
General guidelines are as follows:

- ◆ The solder composition typically sets the peak temperatures of the profile. Recommend lead free solder pastes SAC305: Type 4, water soluble or no clean are acceptable.
- ◆ Reflow equipment needed at least nine heater zones. Recommend forced air type reflow oven with nitrogen.
- ◆ It is recommended that the peak temperature at the solder joint be within 235°C ~ 245°C and the maximum component temperature should not exceed 245°C.
- ◆ It is recommended that time above 217°C for the solder joints is between 40-90 seconds, and with a minimum of 40 seconds.

- ◆ Excessive ramp/cooling rates $>3^{\circ}\text{C}$ per second should be avoided.
- ◆ To develop the reflow profile, it is recommended that the user place thermocouples at various locations on the assembly to confirm that all locations meet the profile requirements. The critical locations are the solder joints of SiP Module.

When developing the reflow profile, it is recommended that the actual fully loaded assembly be used to make sure that the total thermal mass is accounted for.

Figure 3-5 Recommended Reflow Profile



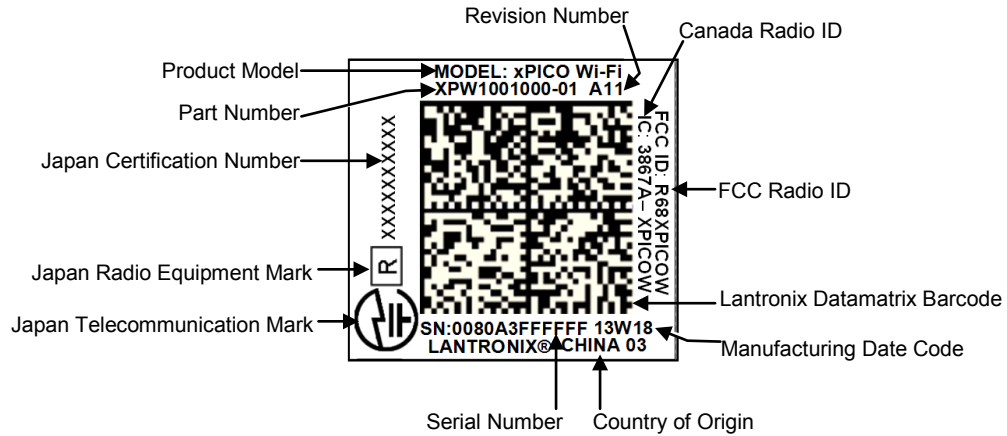
- (1) Solder paste alloy: SAC305(Sn96.5/Ag3.0/Cu0.5)(Lead free solder paste is recommended.)
- (2) A-B. Temperature (pre-heat): $150\sim 200^{\circ}\text{C}$; soak time: 60~120 seconds
- (3) C. Peak temperature: 245°C
- (4) D. Time above 217°C : 40~90 seconds
- (5) Suggestion: Optimal cooling rate is 1°C per second from peak to 217°C
- (6) Nine heater zones at least for reflow equipment.
- (7) Nitrogen usage is recommended and the oxygen concentration is controlled less than 1500 parts per million.

Note: Need to inspect solder joint by X-ray post reflow.

Product Information Label

The product information label contains important information about your specific unit, such as its part number, revision, manufacturing date code, product model, country of origin, datamatrix barcode and MAC address.

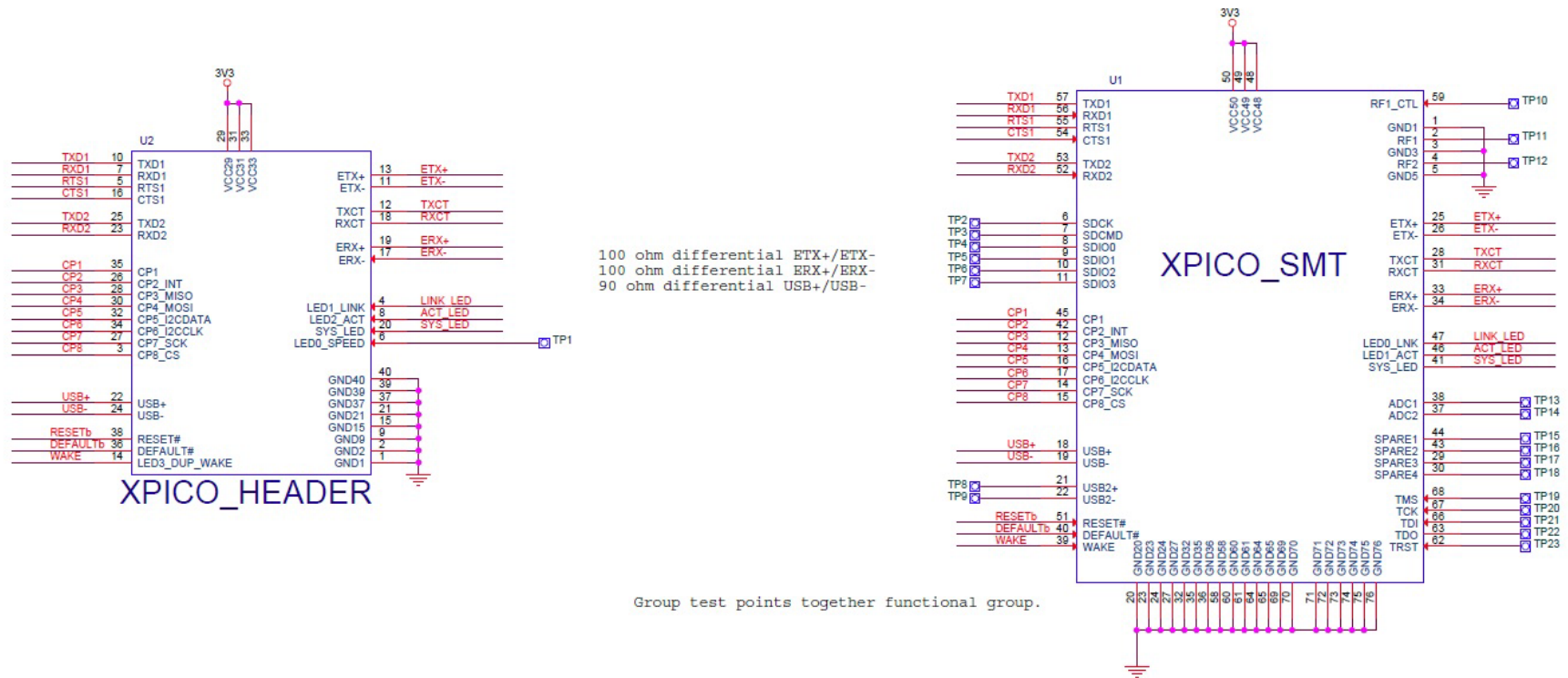
Figure 3-6 xPico Wi-Fi Product Label



Adapter Schematic

The xPico evaluation board was designed for the xPico module with a 40-pin connector. The xPico Wi-Fi SMT device attaches to the evaluation board via an xPico SMT to xPico connector adapter board (XPCW1002000CB-K). The figure below shows the adapter board schematic connections.

Figure 3-7 xPico SMT to xPico Connector Adapter Schematic



Evaluation Board Schematic

Figure 3-8 Evaluation Board Schematic (XPCW1002100K), Part 1 of 5

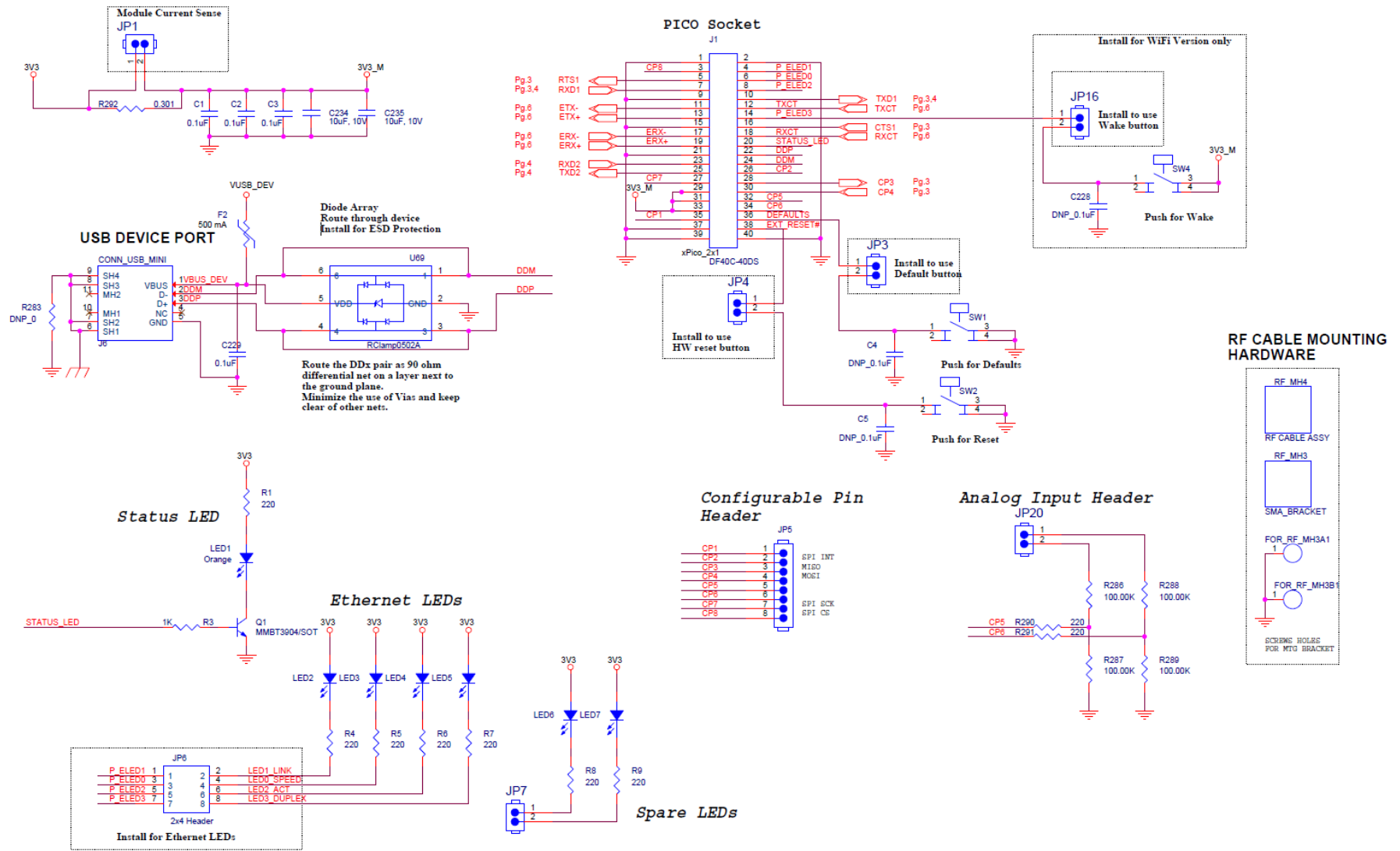


Figure 3-9 Evaluation Board Schematic(XPCW1002100K), Part 2 of 5

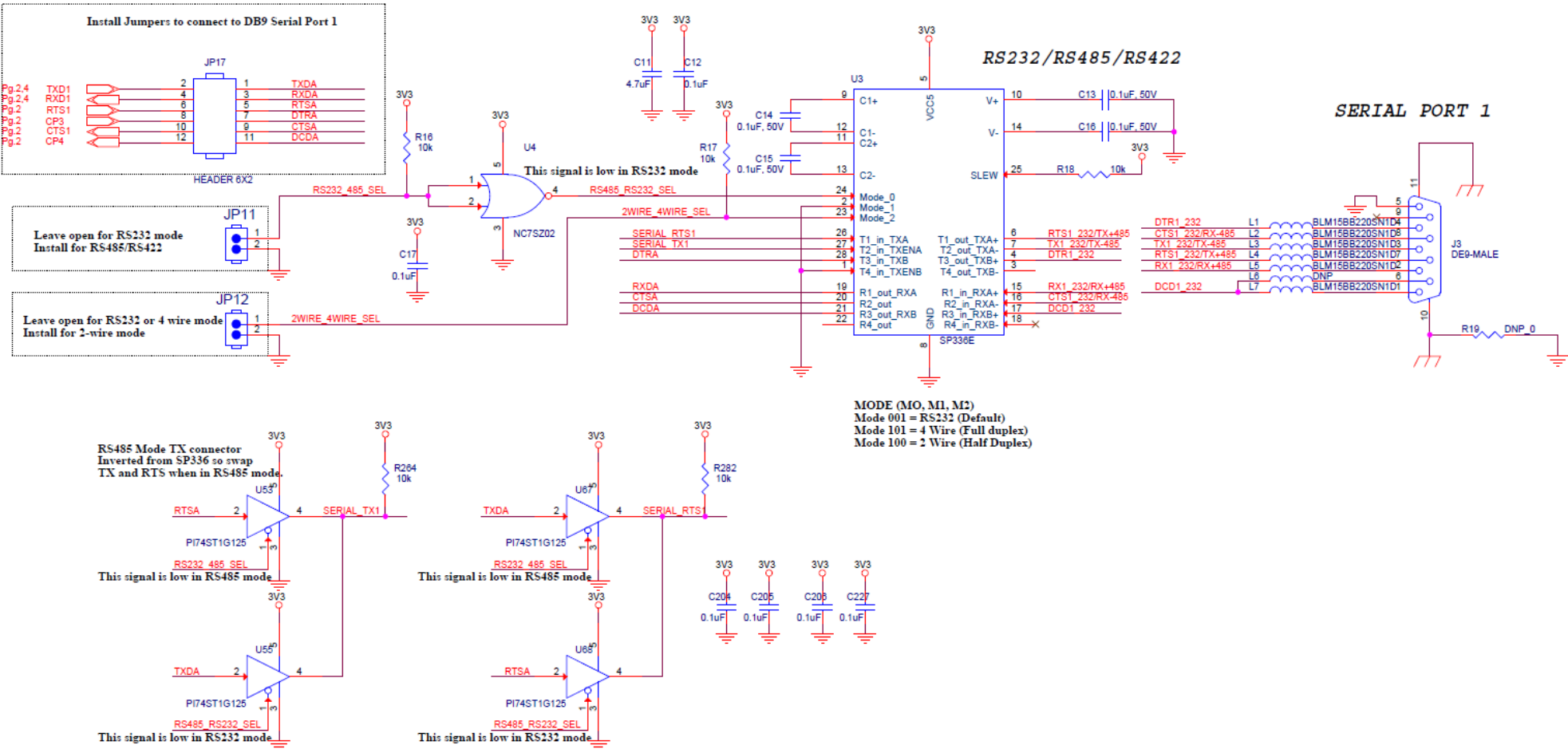


Figure 3-10 Evaluation Board Schematic (XPCW1002100K), Part 3 of 5

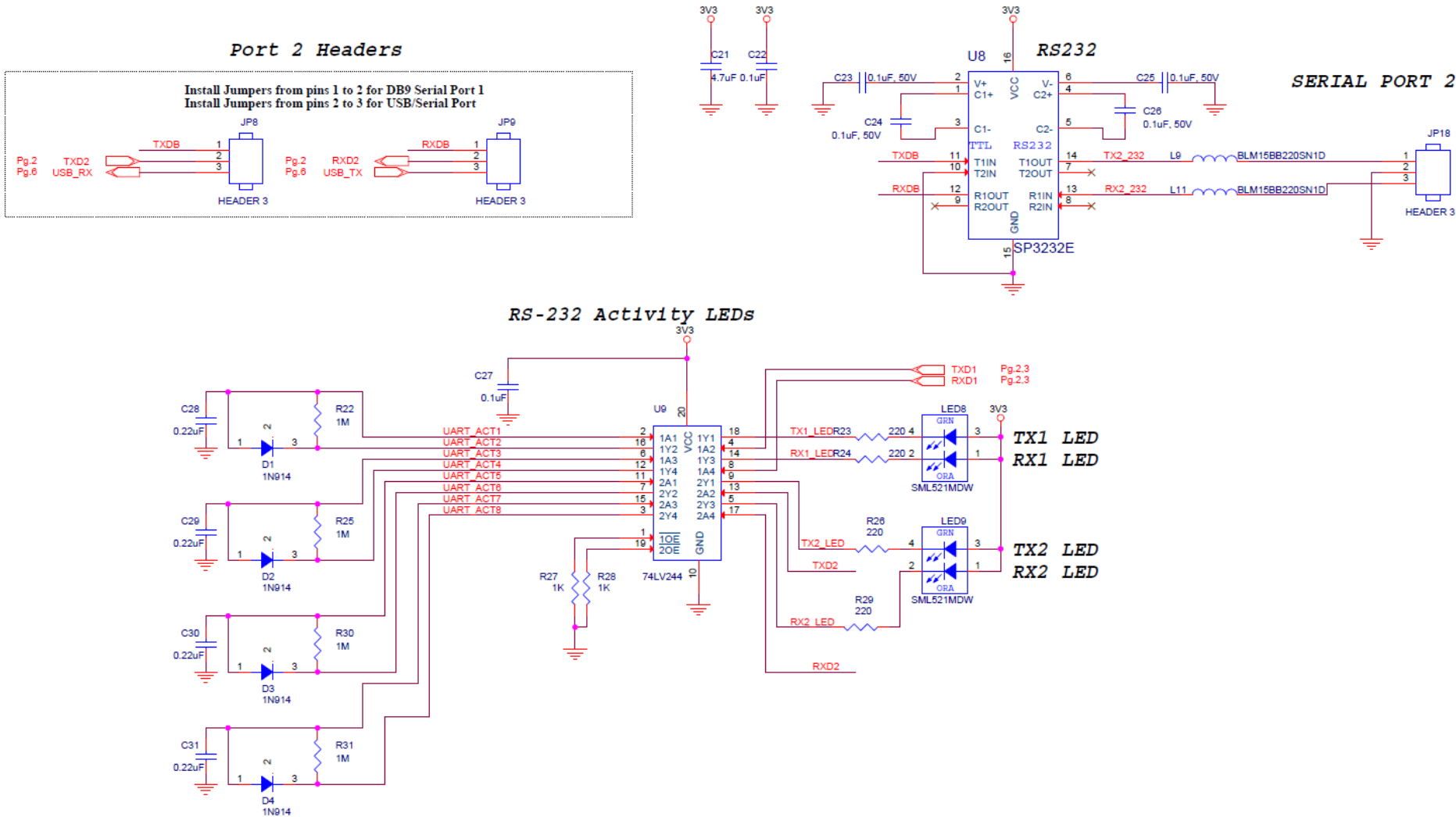


Figure 3-11 Evaluation Board Schematic(XPCW1002100K), Part 4 of 5

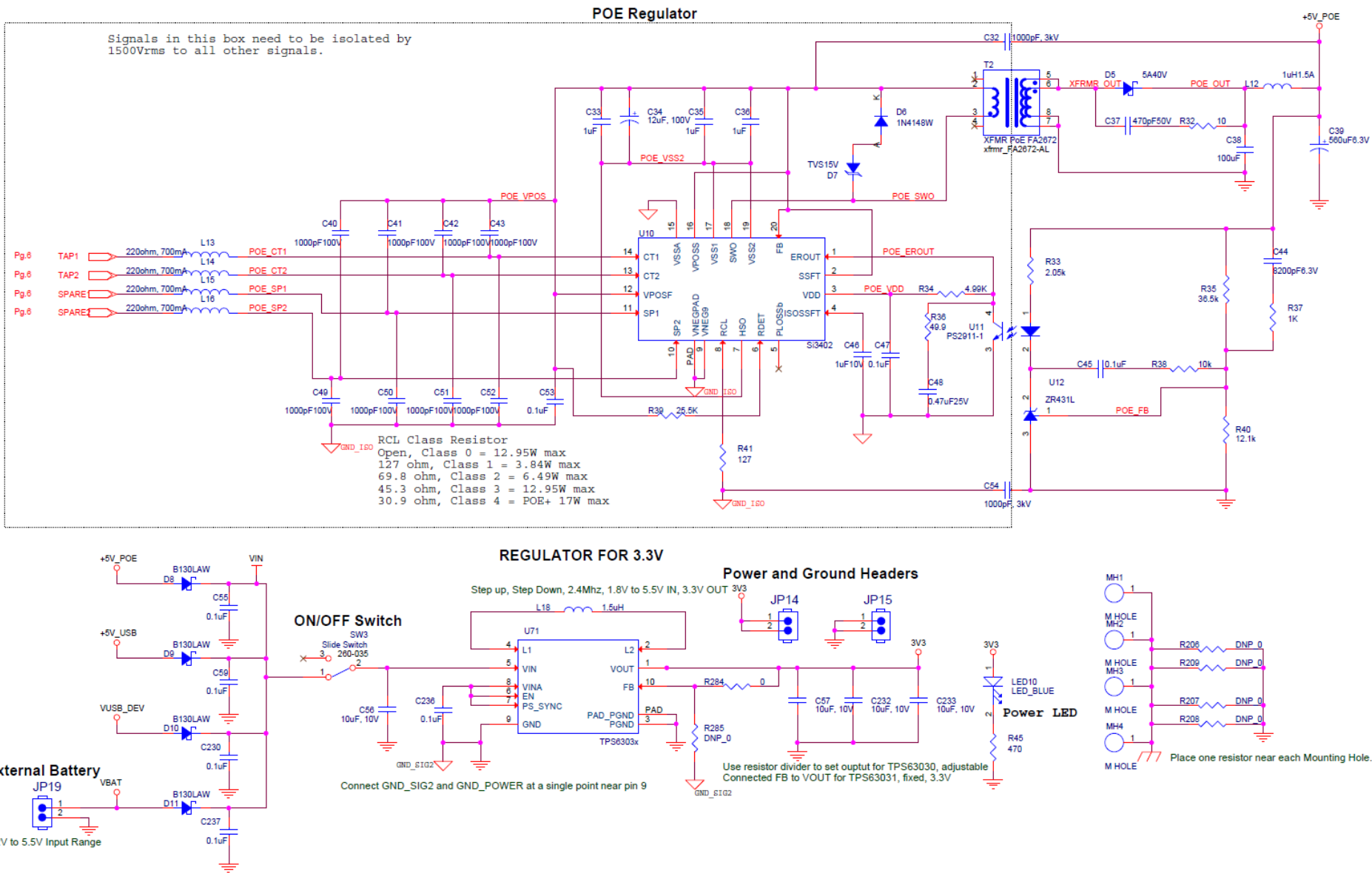
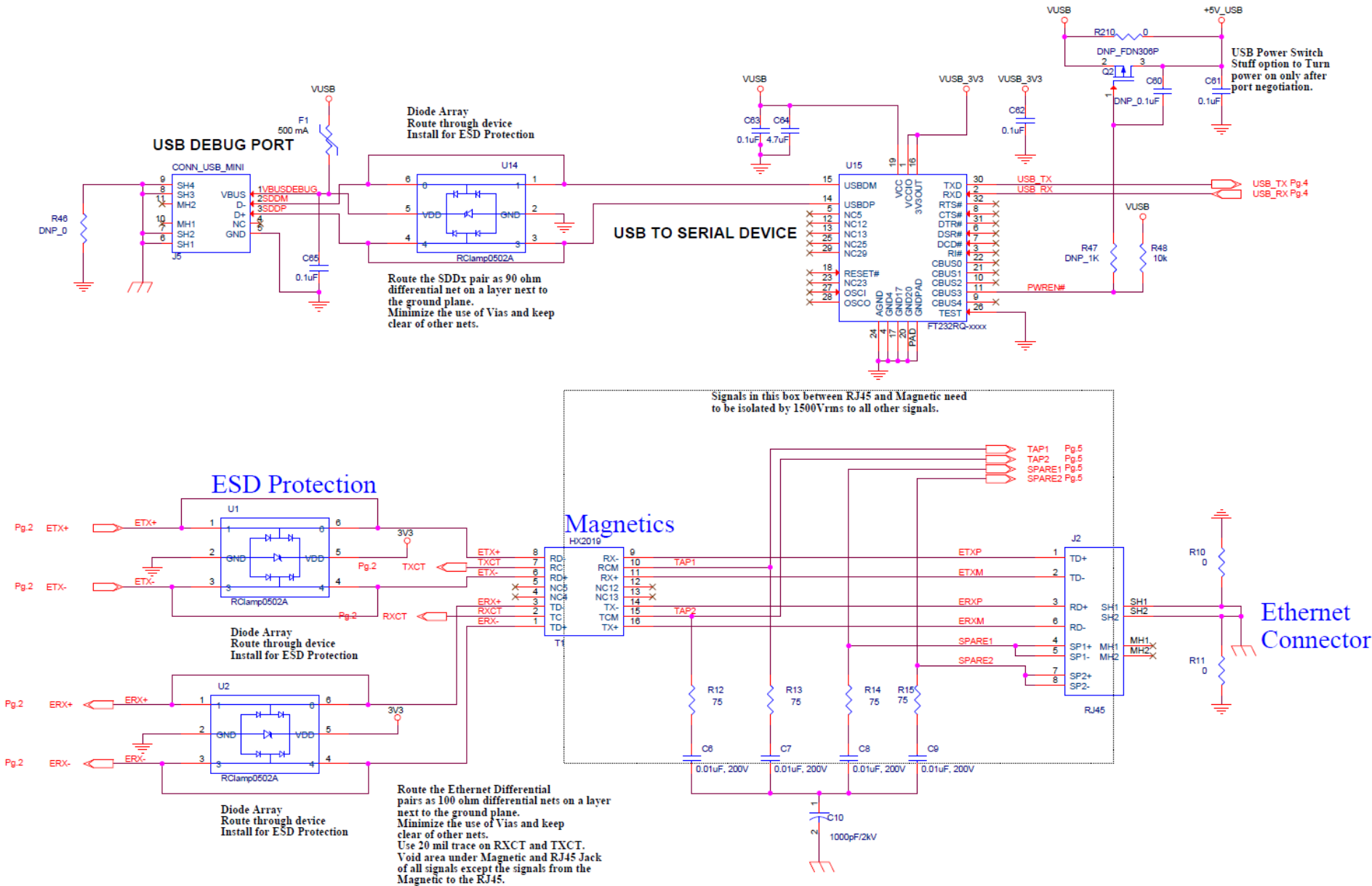


Figure 3-12 Evaluation Board Schematic(XPCW1002100K), Part 5 of 5



A. Compliance

xPico Wi-Fi and xPico Wi-Fi SMT compliance information can be found in the [*xPico Wi-Fi Embedded Device Server User Guide*](#). Visit the Lantronix Web site at <https://www.lantronix.com/support/documentation> for the latest Lantronix documentation.