

## US159-DA14531EVZ

DA14531 Pmod™ Board

The US159-DA14531EVZ is a low power Bluetooth Pmod module that enables you to add a low power Bluetooth™ capability to any evaluation kit or MCU board equipped with a Pmod expansion capability. The board provides a standard Pmod Type 3A (expanded UART) connection for the on-board Bluetooth 5.1 module.

The US159-DA14531EVZ features a Type 3A Pmod connector and incorporates the DA14531 SmartBond TINY™ Module, which uses the efficient Bluetooth 5.1 SoC. With a standard connector and software support, the US159-DA14531EVZ is ideal for the Renesas Quick-Connect IoT to rapidly create an IoT system.

### Kit Contents

- US159-DA14531EVZ Pmod Board

### Features

- DA14531 SmartBond TINY Module
  - Cortex M0+ at 16 MHz
  - Memory: 4kB RAM, 32kB OTP and 1Mb Flash
  - Bluetooth 5.1 core qualified
  - Integrated chip antenna
  - Worldwide certification
  - IoTMark™, BLE score of 18300
  - 3.3V supply voltage
  - +2.2dBm maximum output power
  - -93dBm sensitivity
  - Rx current 2mA at 3.3V
  - Tx current 4mA at 3.3V at 0dBm
- Standardized Type 3A Pmod connector supports an expanded UART interface
- Optional battery operation with on-board CR1220 coin cell
- Momentary pushbutton switch (SW1) to aid in user software debug
- LED (D1) to aid in user software debug
- 10-pin 1.27mm pitch Arm Cortex-Debug connector (J2) for software development and debug support

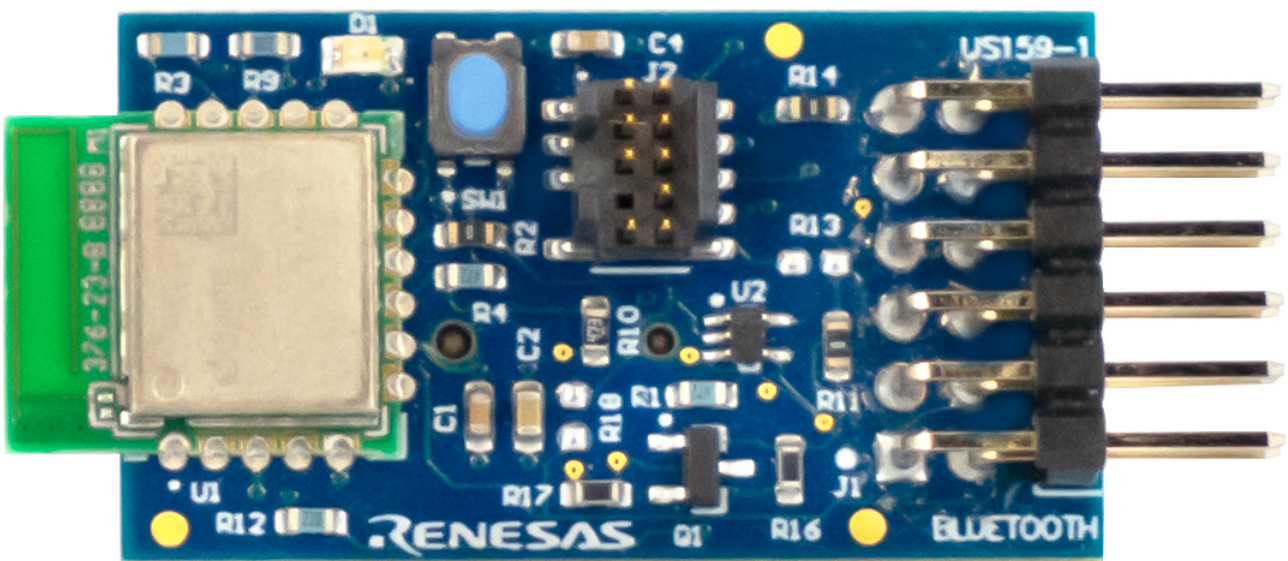


Figure 1. US159-DA14531EVZ Pmod Board (XE Evaluation Board)

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# 1. Functional Description

The US159-DA14531EVZ module functions as a Bluetooth wireless building block to create a custom IoT system solution. This module adds Bluetooth connectivity capability to any IoT system that supports Pmod expansion modules. Visit the Renesas [website](#) for more details on the DA14531 SmartBond TINY Module.

## 2. Setup

### 2.1 Required or Recommended User Equipment

The following additional lab equipment is recommended using the module (and is sold separately):

- Any MCU board that supports Type 3A Pmod.

### 2.2 Software Installation and Usage

For the latest version of the e2 studio, use the Renesas [website](#), and for the latest connectivity support and details on creating customized IoT system solutions, visit the Quick-Connect IoT [site](#).

The Renesas Flexible Software Package ([FSP](#)) is an enhanced software package that provides easy-to-use, scalable, high-quality software for embedded system designs using the Renesas RA family of Arm Microcontrollers. With the support of a new Arm TrustZone and other advanced security features, FSP provides a quick and versatile way to build secure, connected IoT devices using production-ready drivers, Azure RTOS, FreeRTOS, and other middleware stacks.

The firmware for evaluating the functioning of the module with a Renesas EK-RA2L1 evaluation kit and an HS3001 PMOD board (for temperature and humidity) is pre-loaded on the US159-DA14531EVZ Pmod module.

Firmware	
dsp_device_531_multi.bin	For DA14531 SmartBond TINY Module

For details on the application, see the [guide](#), *Quick-Connect IoT BLE Environmental Sensor Hub*.

### 2.3 Kit Hardware Connections

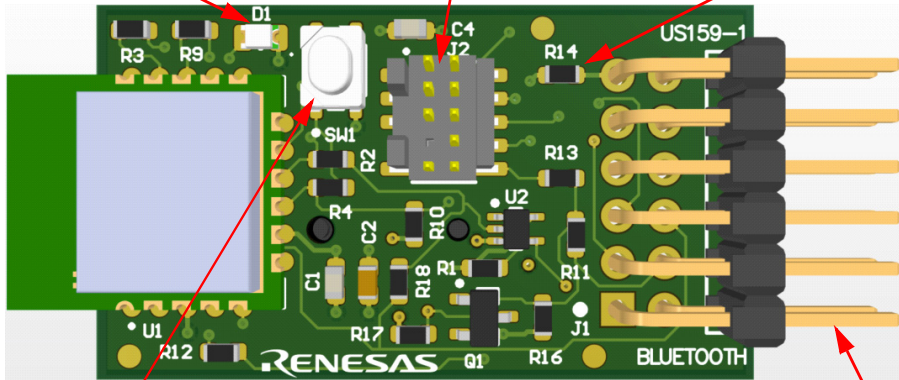
Follow these procedures to set up the kit as shown on [Figure 2](#).

1. Ensure the MCU evaluation kit being used has a Pmod connector set to Type 3A. (For help, refer to the kit hardware manual.)
2. Plug in the US159-DA14531EVZ to the Pmod connector on the MCU evaluation kit, and be careful to align Pin 1 on the module to Pin 1 on the MCU kit.
3. The US159-DA14531EVZ is now ready to be used in the system. Follow the MCU kit instructions for connecting and powering up the evaluation kit.

D1 – LED to aid in user software debug

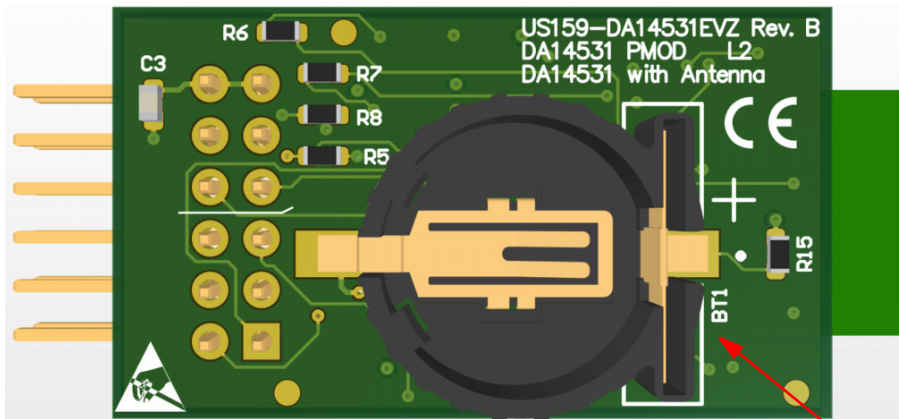
J2 – Arm Cortex-debug connector

R14 – Be sure to remove before installing coin cell



SW1 – Momentary pushbutton switch to aid in user software debug

J1 – Pmod Connector to MCU Board



BT1 – Remove R14 before installing the CR1220 coin cell; be careful to observe polarity (+ on cell facing upwards)

Figure 2. Evaluation Kit Details

### 3. Schematic Diagram

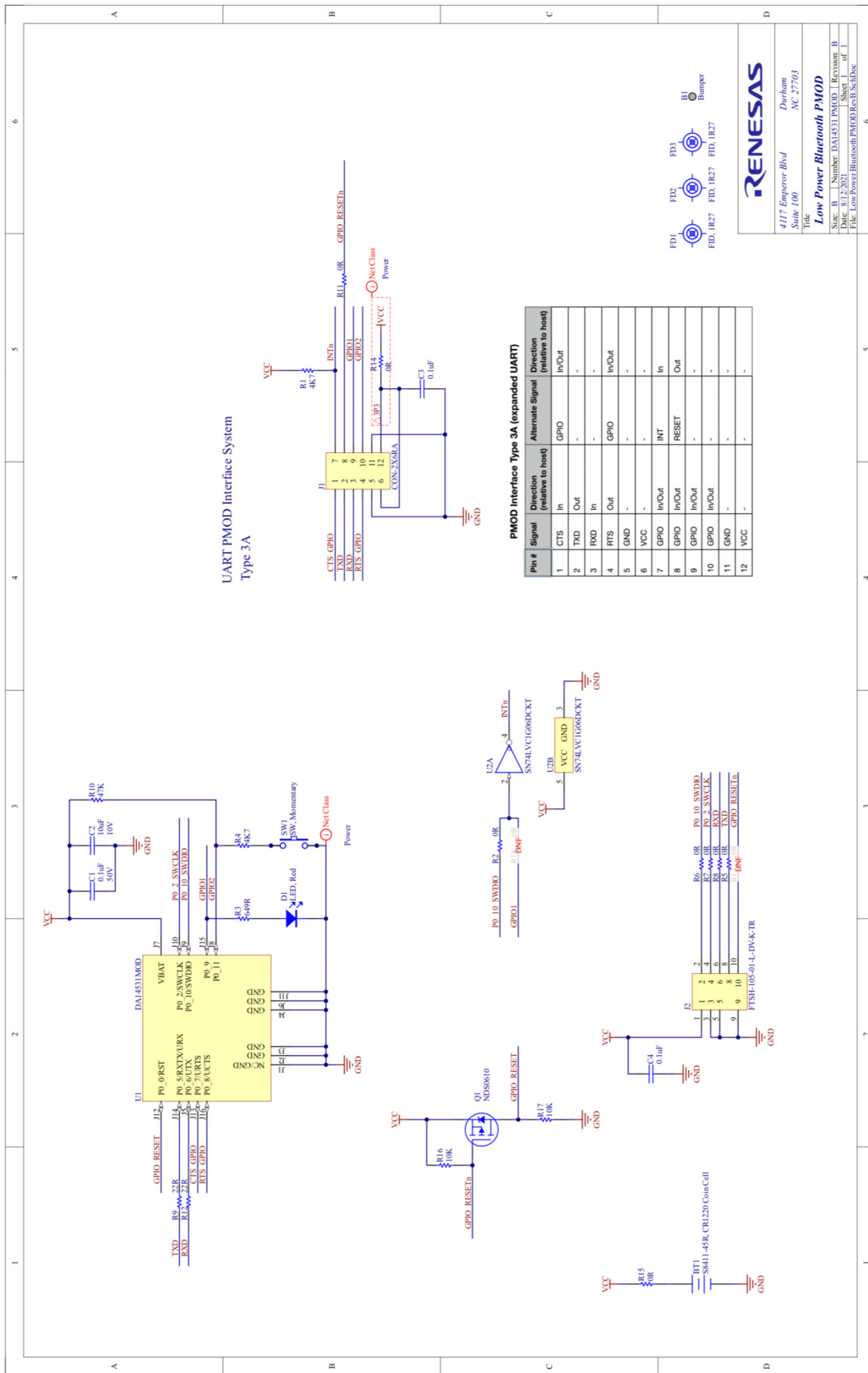


Figure 3. US159-DA14531EVZ Application Schematic Diagram

## 4. Bill of Materials

Qty	Reference Designator	Description	Manufacturer	Manufacturer Part Number
1	B1	Bumper, Cylindrical, 0.375" D, 0.19" HSM	Bumper Specialities	BS35CL01X02RP
1	BT1	Battery Holder, 12mm Coin Cell, CR1220, SM, RoHS	Harwin	S8411-45R
3	C1, C3, C4	Capacitor, 0.1 $\mu$ F, 50V, SM 0603, Multilayer Ceramic, X7R, RoHS	Yageo	CC0603KRX7R9BB104
1	C2	Capacitor, 10 $\mu$ F, 10V, SM 0603, Multilayer Ceramic, X5R, RoHS	Murata	GRM188R61A106KE69D
1	D1	LED, Red, Clear, 0805, SM, RoHS	Würth Elektronik	150080RS75000
1	J1	Connector, 2 $\times$ 6, 0.1", Pmod, Right Angle, Unshrouded, RoHS	Harwin	M20-9950645
1	J2	Connector, 2 $\times$ 5 Header, Vertical, 1.27mm Pitch, Pin 7, SM, RoHS	Samtec	FTSH-105-01-L-DV-007-K
1	Q1	Transistor, P-Ch Mosfet, 60V, 120mA, 10 $\Omega$ , SM, SOT23-3, RoHS	Diodes Inc.	DMP10H4D2S-7
2	R1, R4	Resistor, 4.7k $\Omega$ , 1/8W, 1%, 100ppm, SM, 75WV, 100OV, Thick Film, 0603, RoHS	KOA Speer	RK73H1JTDD4701F
8	R2, R5, R6, R7, R8, R11, R14, R15	Resistor, 0 $\Omega$ , 1/8W, 1%, 100ppm, SM, 75WV, 100OV, Thick Film, 0603, RoHS	KOA Speer	RK73Z1JTDD
1	R3	Resistor, 649 $\Omega$ , 1/8W, 1%, 100ppm, SM, 75WV, 100OV, Thick Film, 0603, RoHS	KOA Speer	RK73H1JTDD6490F
2	R9, R12	Resistor, 22 $\Omega$ , 1/8W, 1%, 100ppm, SM, 75WV, 100OV, Thick Film, 0603, RoHS	KOA Speer	RK73H1JTDD22R0F
1	R10	Resistor, 47k $\Omega$ , 1/8W, 1%, 100ppm, SM, 75WV, 100OV, Thick Film, 0603, RoHS	KOA Speer	RK73H1JTDD6802F
2	R16, R17	Resistor, 10k $\Omega$ , 1/8W, 1%, 100ppm, SM, 75WV, 100OV, Thick Film, 0603, RoHS	KOA Speer	RK73H1JTDD1002F
1	SW1	Switch, Pushbutton, Top Actuated, SM, RoHS	C&K Components	PTS810 SJG 250 SMTR LFS
1	U1	DA14531MOD, Bluetooth Low Energy 5.1 Module, 128kB Flash, 144kB ROM, 48kB RAM, 16-SMD Module, SM, RoHS	Dialog Semiconductor	DA14531MOD-00F01002
1	U2	IC, Digital, Buffer, Inverting, Open Drain, SM, SC-70-5, RoHS	Diodes Inc.	74LVC1G06SE-7



## 4.1 Board Layout

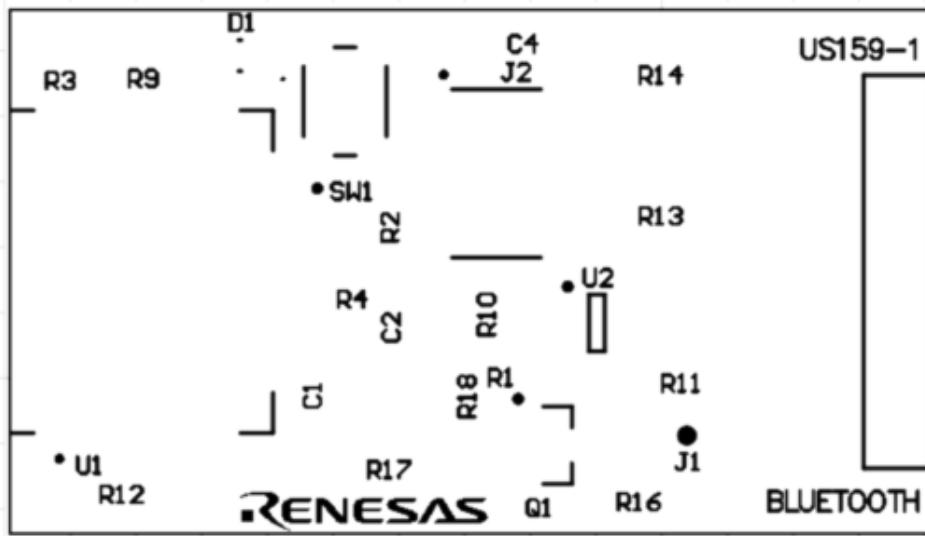


Figure 4. Silkscreen Top

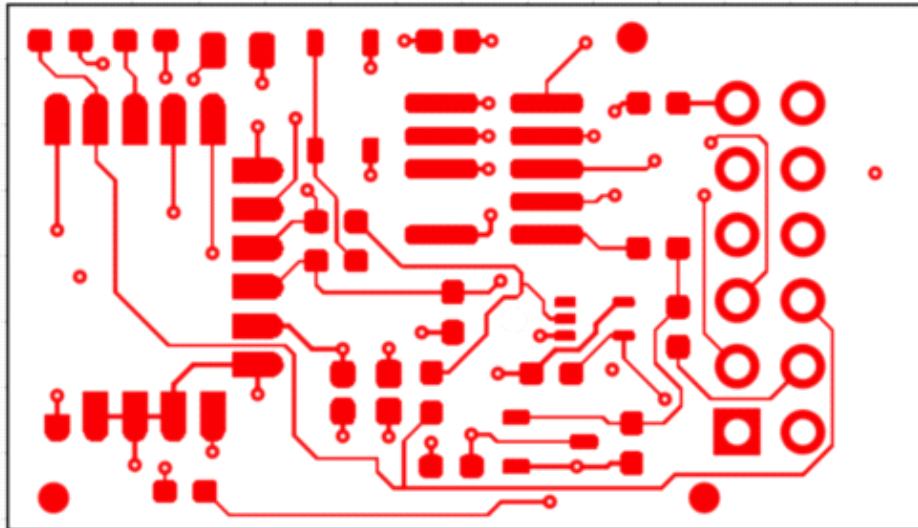


Figure 5. Copper Top

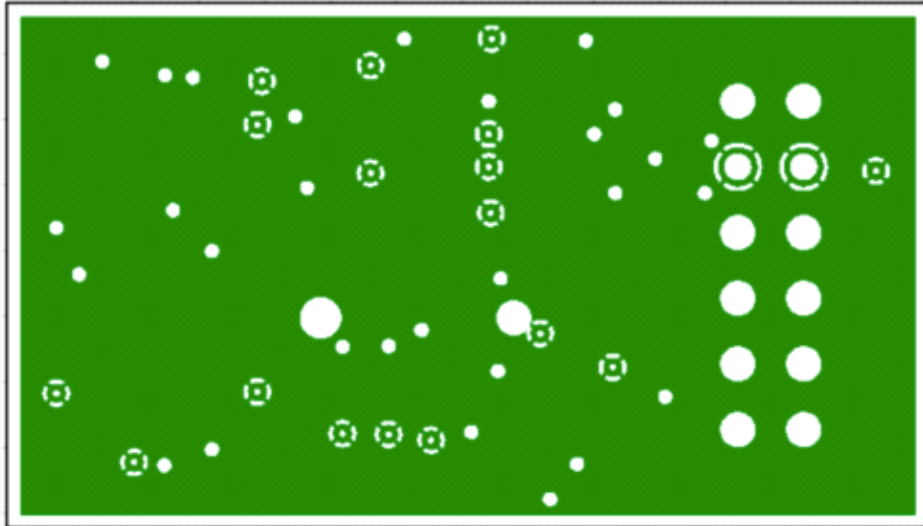


Figure 6. Copper L1 Layer

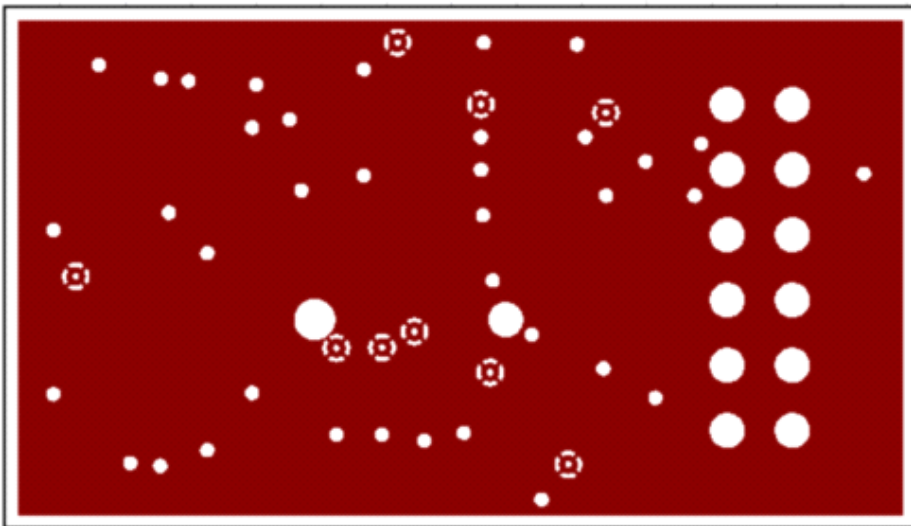


Figure 7. Copper L2 Layer

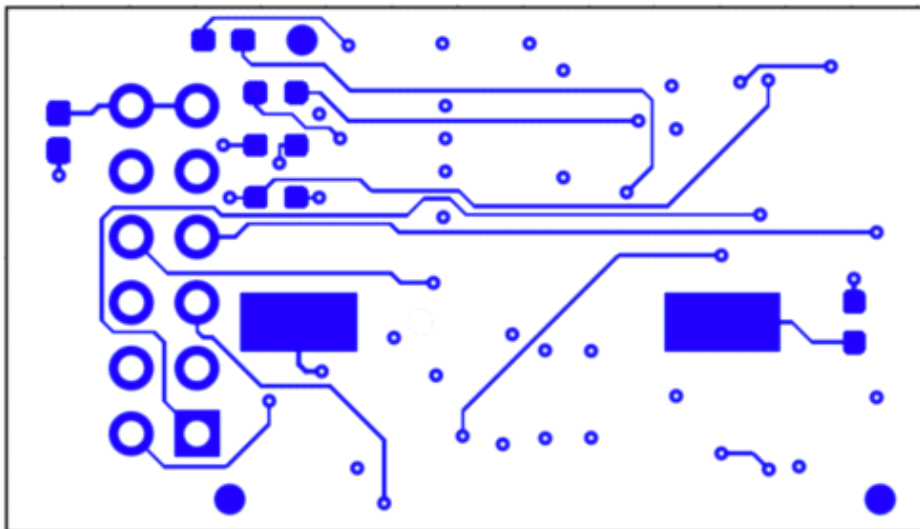


Figure 8. Copper Bottom



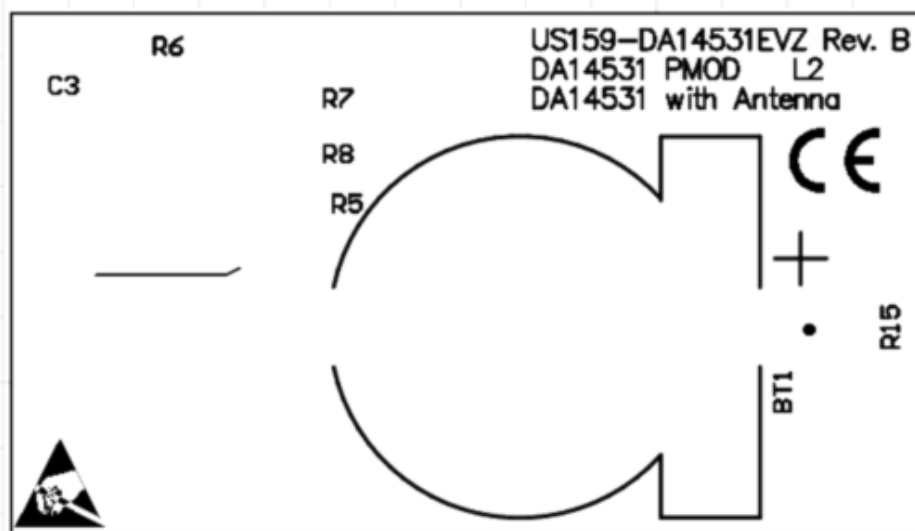


Figure 9. Silkscreen Bottom

## 5. Ordering Information

Part Number	Description
US159-DA14531EVZ	DA14531 Pmod Board

## 6. Revision History

Revision	Date	Description
1.01	Sep 8, 2023	Replaced <a href="#">Figure 1</a> with updated image.
1.00	Jun 27, 2022	Initial release

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