

## 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

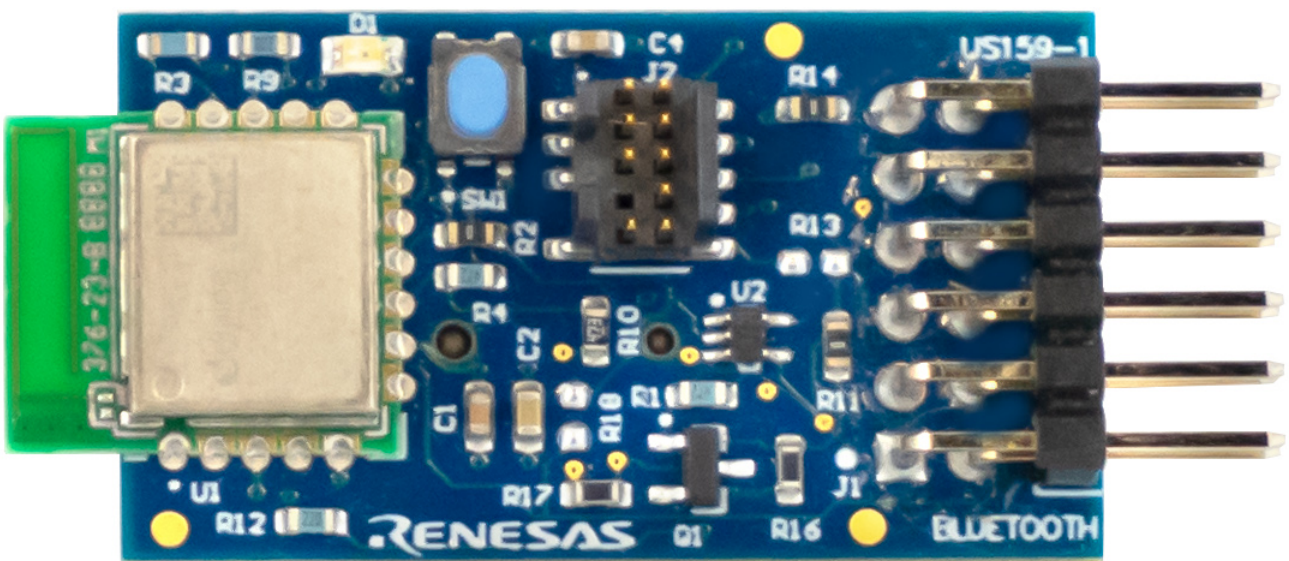


Figure 1. US159-DA14531EVZ Pmod Board (XE Evaluation Board)

## Contents

<b>1. Functional Description</b>	<b>3</b>
<b>2. Setup</b>	<b>3</b>
2.1 Required or Recommended User Equipment	3
2.2 Software Installation and Usage	3
2.3 Kit Hardware Connections	3
<b>3. Schematic Diagram</b>	<b>5</b>
<b>4. Bill of Materials</b>	<b>6</b>
4.1 Board Layout	7
<b>5. Ordering Information</b>	<b>9</b>
<b>6. Revision History</b>	<b>9</b>

# 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

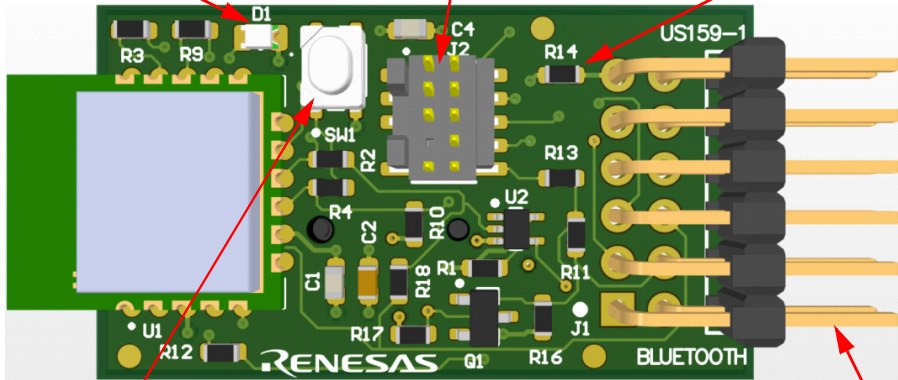
Follow these procedures to set up the kit as shown on [Figure 2](#).

- Ensure the MCU evaluation kit being used has a Pmod connector set to Type 3A. (For help, refer to the kit hardware manual.)
- 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.
- 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

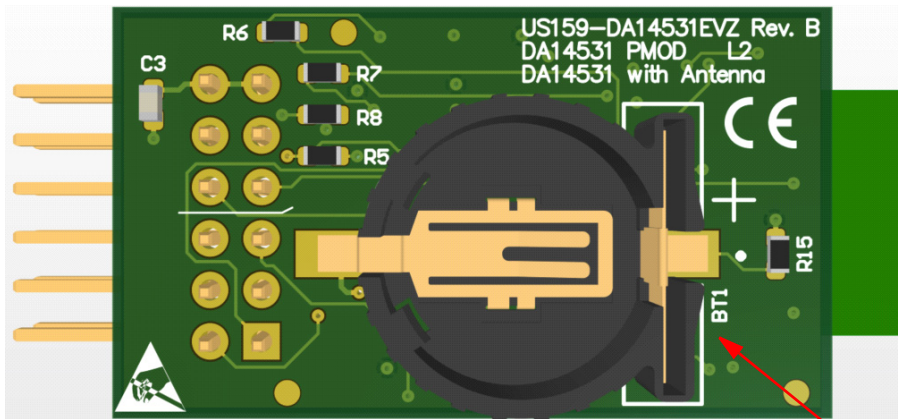
J2 – Arm Cortex-debug connector

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

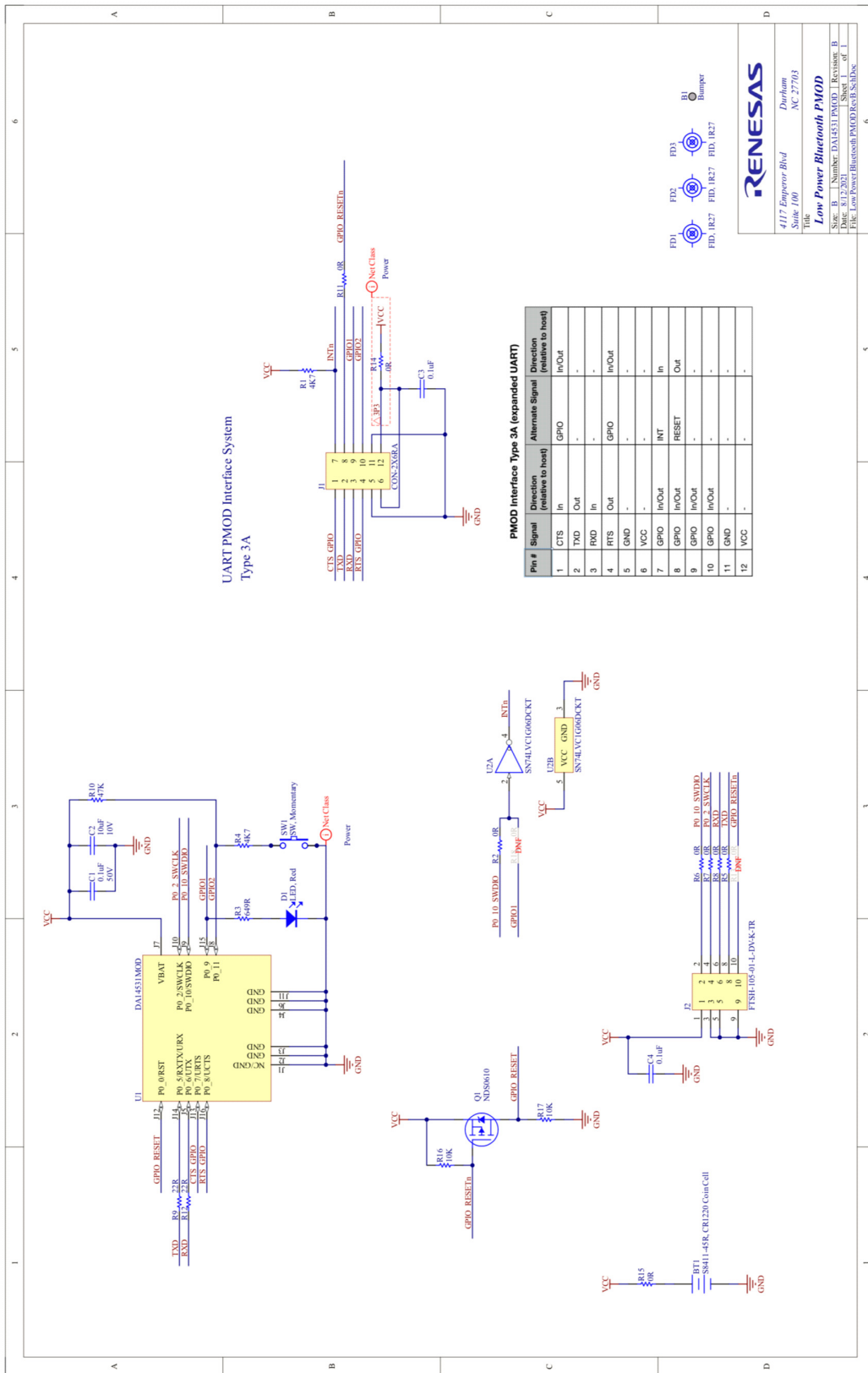


Figure 3. US159-DA14531EVZ Application Schematic Diagram

## 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

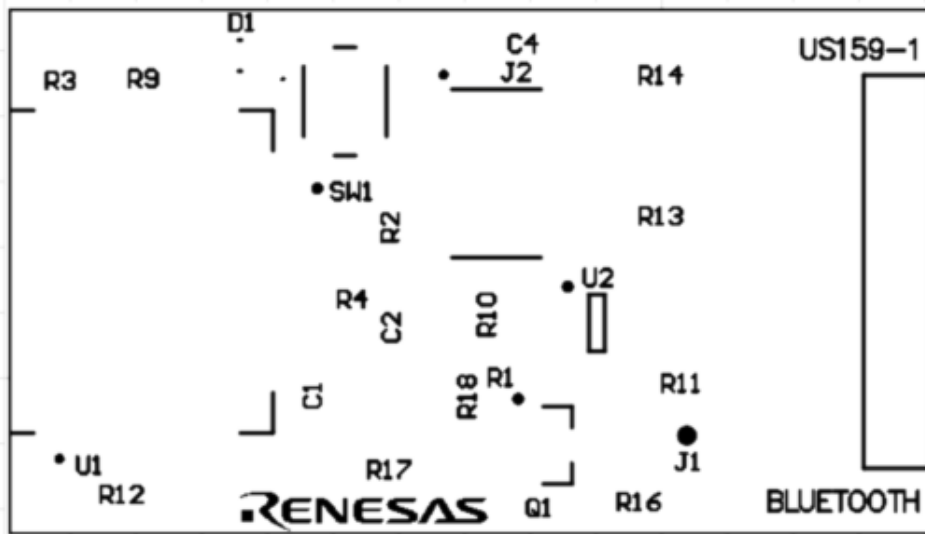


Figure 4. Silkscreen Top

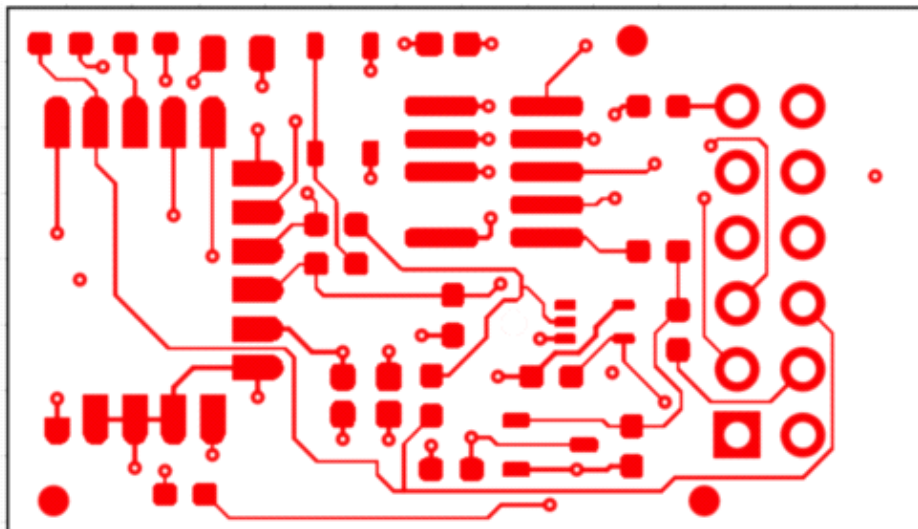


Figure 5. Copper Top

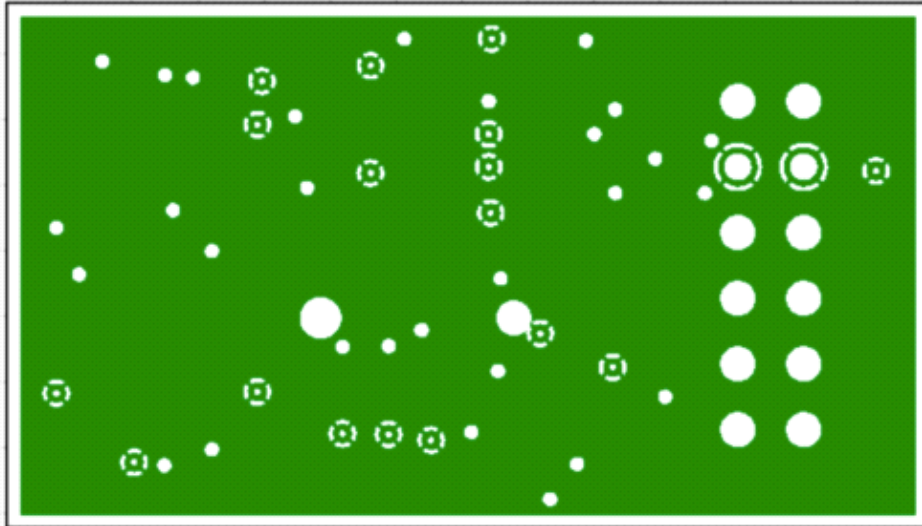


Figure 6. Copper L1 Layer

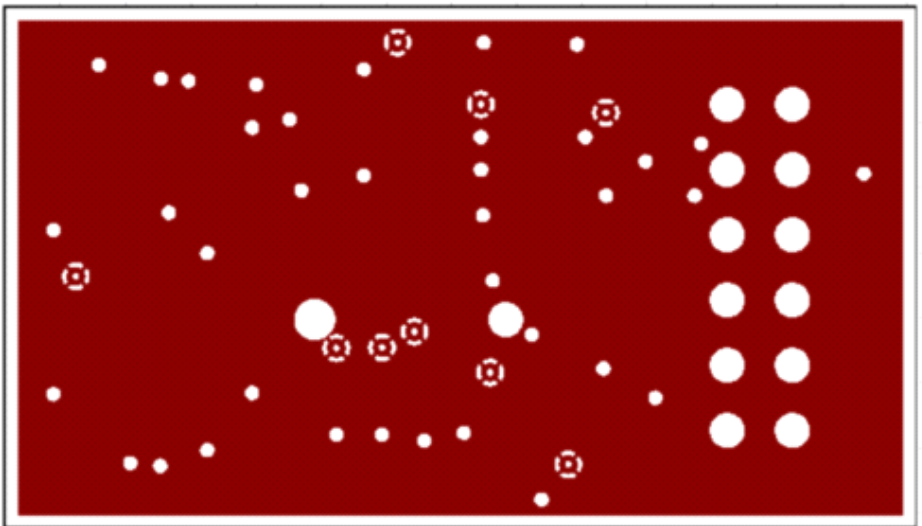


Figure 7. Copper L2 Layer

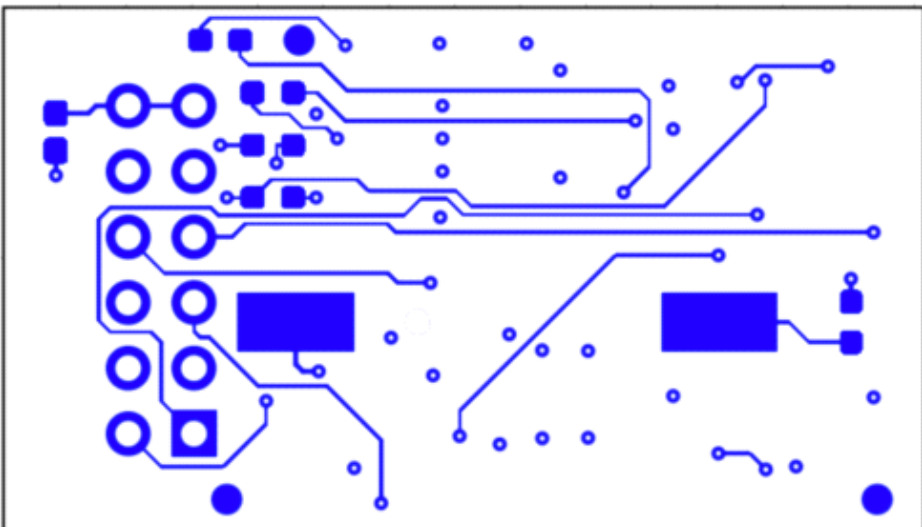


Figure 8. Copper Bottom



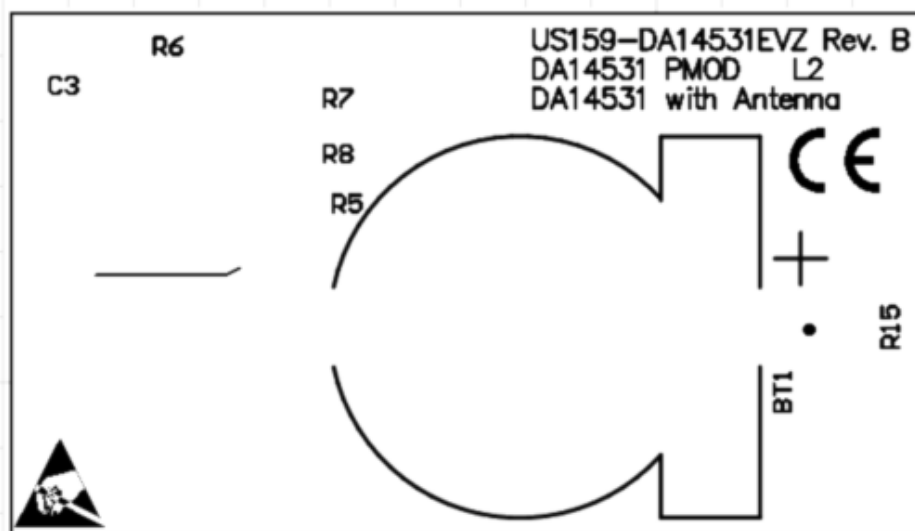


Figure 9. Silkscreen Bottom

## 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

## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01 Jan 2024)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit [www.renesas.com/contact-us/](http://www.renesas.com/contact-us/).