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

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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.

<table>
<thead>
<tr>
<th>Firmware</th>
</tr>
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<tbody>
<tr>
<td>dsps_device_531_multi.bin</td>
</tr>
<tr>
<td>For DA14531 SmartBond TINY Module</td>
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</tbody>
</table>

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.
Figure 2. Evaluation Kit Details

- **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)
3. Schematic Diagram

Figure 3. US159-DA14531EVZ Application Schematic Diagram
### 4. Bill of Materials

<table>
<thead>
<tr>
<th>Qty</th>
<th>Reference Designator</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Manufacturer Part Number</th>
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<tr>
<td>1</td>
<td>B1</td>
<td>Bumper, Cylindrical, 0.375” D, 0.19” HSM</td>
<td>Bumper Specialties</td>
<td>BS35CL01X02RP</td>
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<td>1</td>
<td>BT1</td>
<td>Battery Holder, 12mm Coin Cell, CR1220, SM, RoHS</td>
<td>Harwin</td>
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<td>3</td>
<td>C1, C3, C4</td>
<td>Capacitor, 0.1µF, 50V, SM 0603, Multilayer Ceramic, X7R, RoHS</td>
<td>Yageo</td>
<td>CC0603KRX7R9BB104</td>
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<td>D1</td>
<td>LED, Red, Clear, 0805, SM, RoHS</td>
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<td>150080RS75000</td>
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<td>Samtec</td>
<td>FTSH-105-01-L-DV-007-K</td>
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<td>DMP10H4D2S-7</td>
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<td>KOA Speer</td>
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<td>1</td>
<td>SW1</td>
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<td>C&amp;K Components</td>
<td>PTS810 SJG 250 SMTR LFS</td>
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<td>DA14531MOD, Bluetooth Low Energy 5.1 Module, 128kB Flash, 144kB ROM, 48kB RAM, 16-SMD Module, SM, RoHS</td>
<td>Dialog Semiconductor</td>
<td>DA14531MOD-00F01002</td>
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<td>1</td>
<td>U2</td>
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<td>Diodes Inc.</td>
<td>74LVC1G06SE-7</td>
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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
5. Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>US159-DA14531EVZ</td>
<td>DA14531 Pmod Board</td>
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6. Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
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<td>1.01</td>
<td>Sep 8, 2023</td>
<td>Replaced Figure 1 with updated image.</td>
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<tr>
<td>1.00</td>
<td>Jun 27, 2022</td>
<td>Initial release</td>
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