

US082-HS3001EVZ

The US082-HS3001EVZ board enables quick prototyping for a custom system design with the [HS3001](#), a high-performance relative humidity and temperature sensor. The board provides a standard Pmod™ Type 6A (Extended I<sup>2</sup>C) connection for the on-board sensor to plug into any desired MCU evaluation kit with a matching connector.

The US082-HS3001EVZ features Pmod connectors on both sides of the board allowing additional Type 6/6A boards to be connected in a daisy-chained solution with multiple sensors on the same MCU Pmod connector. Significantly reducing development time, software support present in the Renesas IDE (e<sup>2</sup> studio) generates code that connects the sensor and the MCU. Because of the standard connector and software support, the US082-HS3001EVZ is the best choice to rapidly create an IoT system with the Renesas Quick-Connect IoT.

**Features**

- Relative humidity HS3001 sensor sample mounted:
  - RH accuracy: ±1.5%RH
  - Operating temperature: -40 to 105°C
- Standardized Type 6A Pmod connector supports I<sup>2</sup>C Extended interface
- Dual connectors allow pass-through signals for daisy-chained solutions
- Software support in e<sup>2</sup> studio minimizes development time with one-click code generation

**Board Contents**

- US082-HS3001EVZ Board

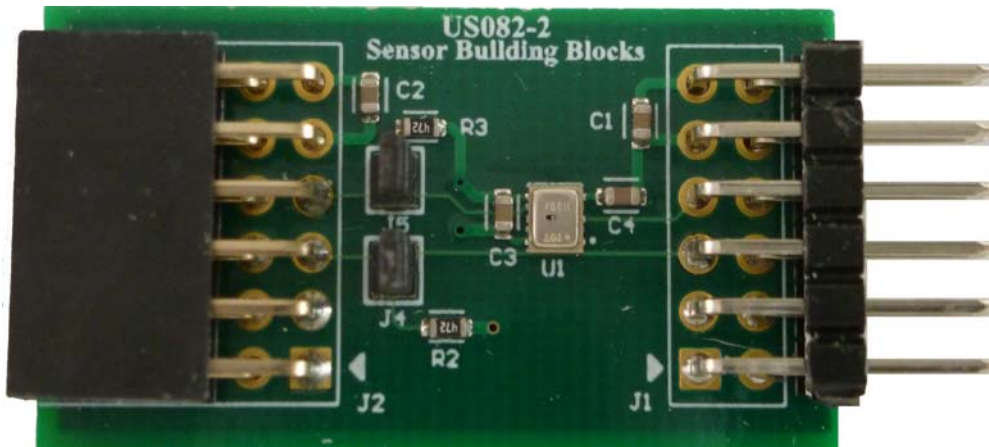


Figure 1. US082-HS3001EVZ Pmod Board

## 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	4
2.3 Kit Hardware Connections	4
<b>3. Programming Interface</b>	<b>5</b>
3.1 Schematic Diagram	6
3.2 Bill of Materials	6
3.3 Board Layout	7
<b>4. Ordering Information</b>	<b>8</b>
<b>5. Revision History</b>	<b>8</b>

# 1. Functional Description

The US082-HS3001EVZ functions as a sensor building block to create a custom system solution. Use the board individually or with a combination of other sensors by using the Pmod Type 6A interface. With this simple hardware connection, the software sensor block in the Renesas software package allows you to generate all the required code between the sensor and the MCU with the simple click of a button. (See the [Renesas Quick-Connect IoT](#) web page for a list of available sensor Pmod boards.)

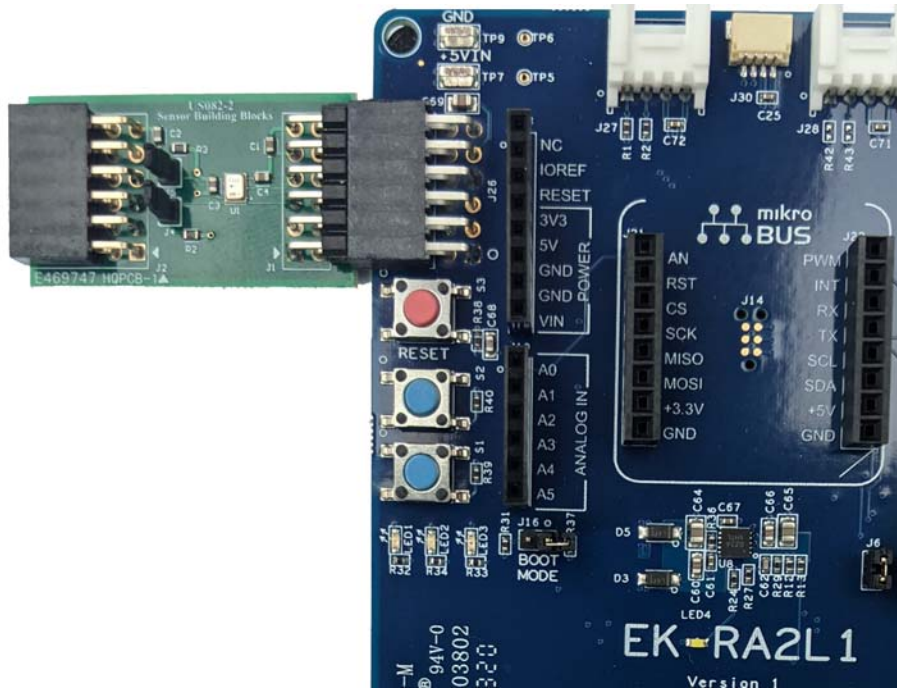


Figure 2. Evaluation Kit Connections using the US082-HS3001EVZ and EK-RA2L1

## 2. Setup

### 2.1 Required or Recommended User Equipment

The following additional lab equipment (sold separately) is required for using the board:

- Any MCU board that supports a Type 6A Pmod.
- The US082-INTERPEVZ interposer board when using one of the Renesas MCU kits shown in [Table 1](#).

Table 1. Renesas MCU Evaluation Kits<sup>[1]</sup> that support a Type 6A Pmod when used with the US082-INTERPEVZ

RA	RX	Synergy
EK-RA4W1	RX111-Starter-Kit	PK-S5D9
EK-RA2A1	RX231-Starter-Kit	DK-S3A7
EK-RA4M1	RX23W-Starter-Kit	DK-S128
EK-RA6M1	RX23T-Starter-Kit	TB-S1JA
EK-RA6M2	RX24T-Starter-Kit	TB-S3A6
EK-RA6M3	RX24U-Starter-Kit	DK-S7G2
EK-RA6M3G		

1. This table is not a comprehensive list of supported MCU Kits. See the evaluation kit hardware manual to confirm Pmod pinout.

## 2.2 Software Installation and Usage

See the Renesas [website](#) for the latest version of the e<sup>2</sup> studio installer. The minimum FSP version supporting sensor blocks is FSP 3.1.0. For the latest sensor support, ensure you are using the latest release.

Visit [Renesas Quick-Connect IoT](#) for more information about creating your customized system solution.

## 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 6A. (If unsure, see the kit hardware manual).
  - a. If no Type 6A Pmod is available, ensure the MCU evaluation kit can use the US082-INTERPEVZ interposer board and insert the board into the MCU connector before adding any sensor boards.
2. Plug in the US082-HS3001EVZ to the Type 6A connector, being careful to align Pin 1 on the sensor board and MCU kit.
3. Connect the J4 and J5 jumpers to place 4.7k pull-up resistors on the I<sup>2</sup>C bus lines.
  - a. Only one set of I<sup>2</sup>C pull-up resistors should be used on the bus. If multiple sensor boards are used, only one board should have the jumpers present.
  - b. MCU kits typically do not have pull-up resistors present on the bus lines, but it is important to check for them.
4. The sensor is now ready to be used in the system. Follow the MCU kit instructions for connecting and powering up the evaluation kit.

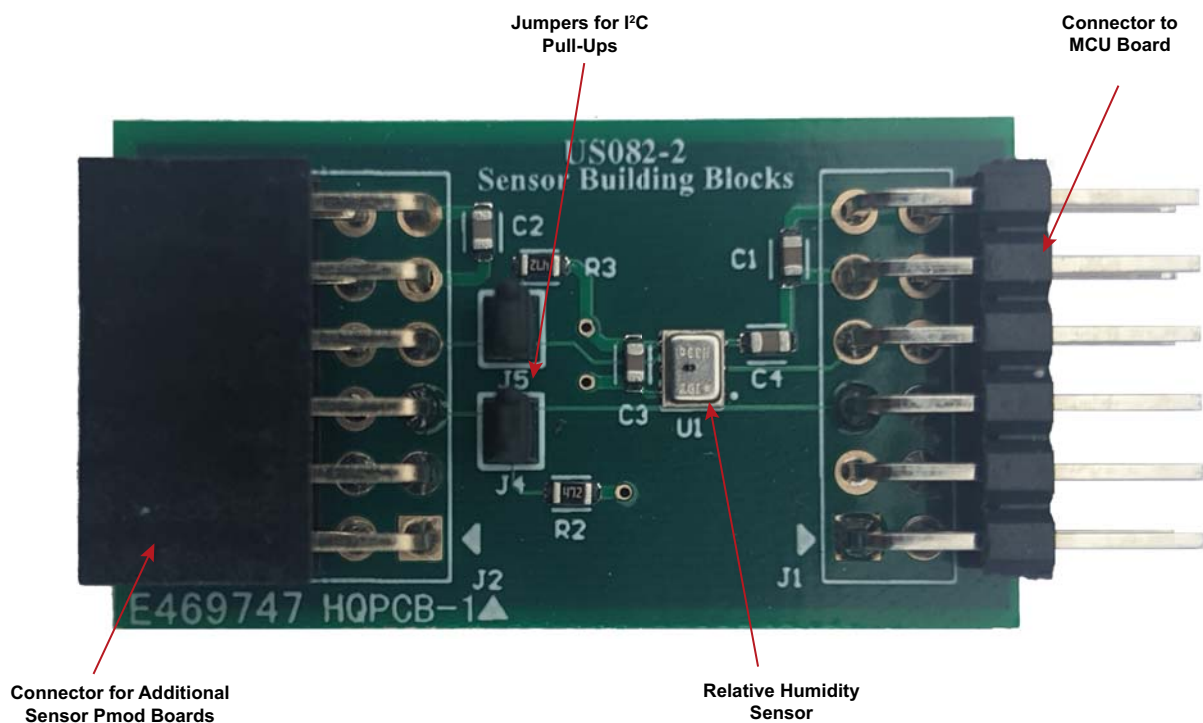


Figure 3. US082-HS3001EVZ Pmod Board

### 3. Programming Interface

Programming of the system can be accomplished through the Renesas IDE, e<sup>2</sup> studio. See the MCU evaluation kit documentation to set up the initial project in e<sup>2</sup> studio. As the project is initialized, adding the HS3001 sensor to the project only takes a few steps.

1. Navigate to the **Components** tab, open the Middleware/Generic folder, and select the desired sensor. For the case shown in [Figure 4](#), select the `r_hs3001_rx`.

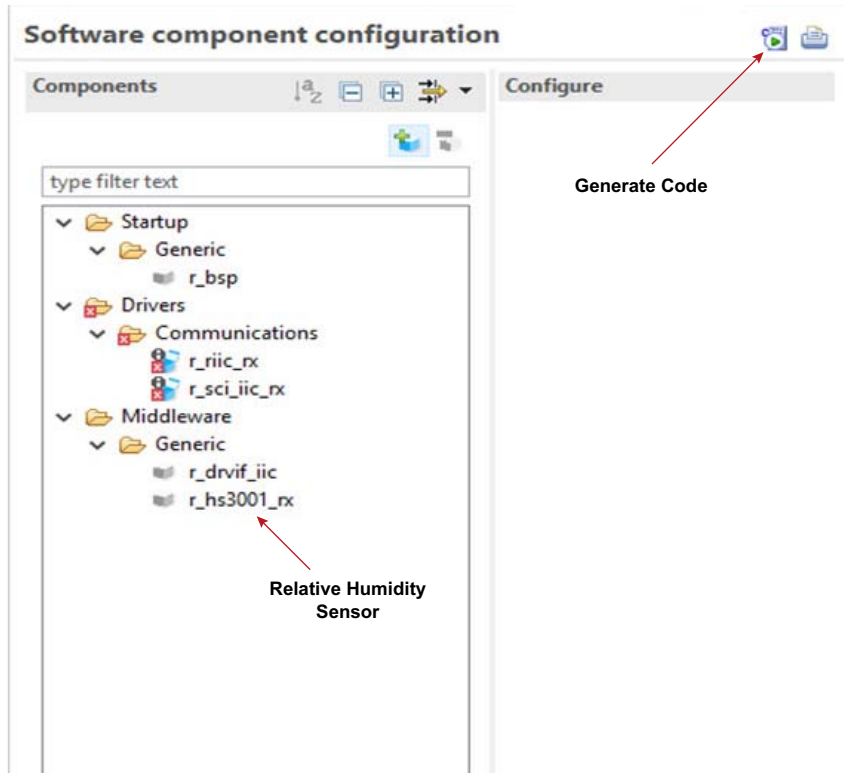


Figure 4. Component Configuration in Renesas e<sup>2</sup> Studio

2. Click the **Generate Code** icon and the system generates the code to configure the sensor with the MCU.
3. Write three to four lines of code to check the version, initialize the sensor, start the measurement cycle, and get the data. Example code to start the sensor after configuration to an RX MCU:

```
R_HS3001_GetVersion(&gs_hs3001_version); // Check version (optional)

err = R_HS3001_Open(&gs_hs3001_ctrl[device_no], &gs_hs3001_cfg[device_no]);
// configure the sensor

err = R_HS3001_IOCTL(&gs_hs3001_ctrl[device_no], &gs_w_buf[0], 0,
HS3001_IOCTL_CMD_START_MEASUREMENT);

err = R_HS3001_Read(&gs_hs3001_ctrl[device_no], &gs_r_buf[0], 4, NULL);
// Get data
```

4. Use the data in your given application. Sample projects are available on the Renesas website as well.

For more information on creating your full system design, further information on software development, and additional hardware availability, visit [Renesas Quick-Connect IoT](#).

### 3.1 Schematic Diagram

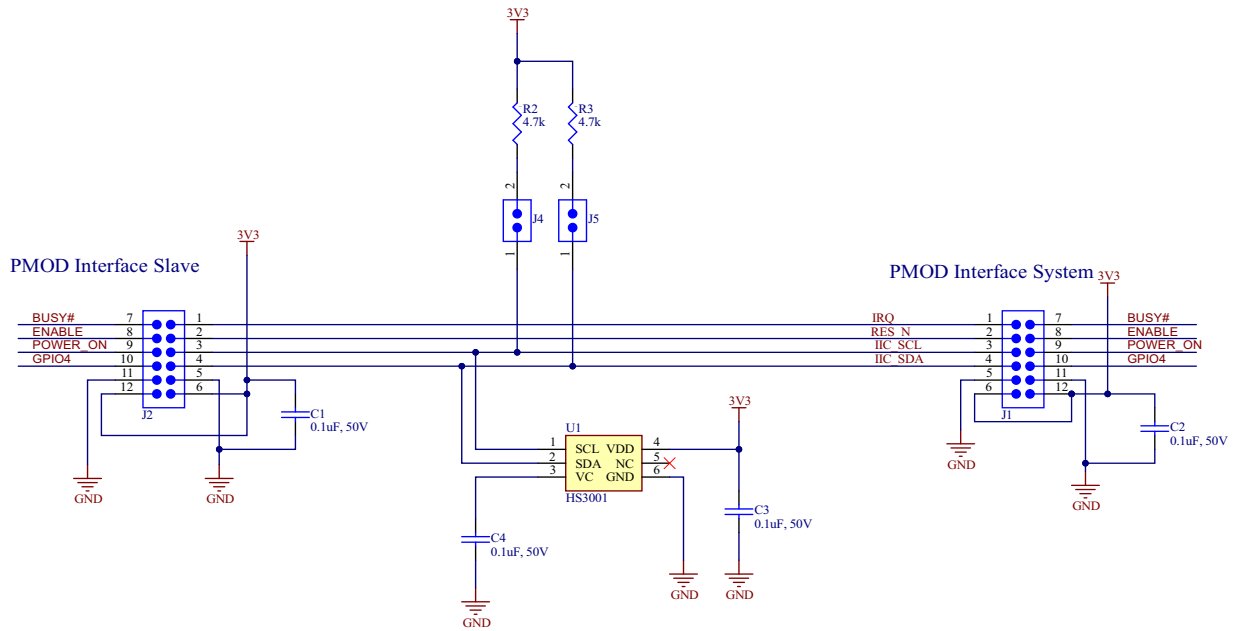


Figure 5. US082-HS3001EVZ Application Schematic

### 3.2 Bill of Materials

Qty	Reference	Description	Value	PCB Footprint	Part Number
4	C1, C2, C3, C4	Capacitor, 0.1µF, 50V, 0603	0.1µF	0603	C0603C104J5RACTU
1	J1	Male Header 0.1" pitch PMOD 2x6 Right Angle	Pmod™	PMOD-MALE-TOP	M20-9950645
1	J2	Female Header 0.1" pitch PMOD 2x6 Right Angle		CON-000050-01	SSW-106-02-F-D-RA
2	J4, J5	CONN HEADER VERT 2POS 1.27 MM		HDR-1X2-FTS	FTS-102-01-L-S
2	R2, R3	Resistor, 4.7k, 0603	4.7k	0603	RC0603JR-074K7L
1	U1	Relative Humidity Sensor		6-LGA_(3x2.41)	HS3001
2	J4, J5	1.27" 1x2 Jumper with Grip, Gold			NPB02SVFN-RC

### 3.3 Board Layout

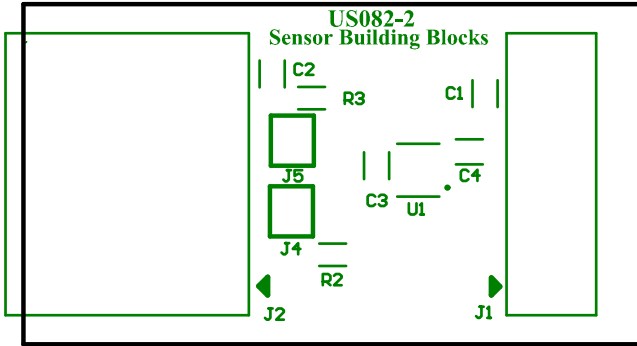


Figure 6. Silkscreen Top

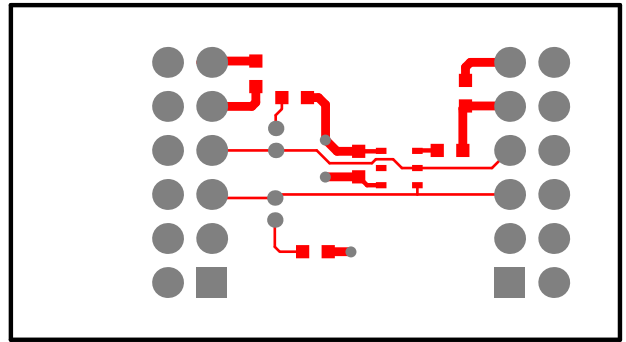


Figure 7. Copper Top

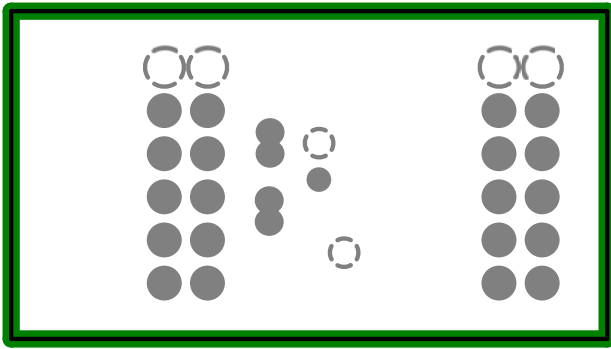


Figure 8. Copper L1 Layer

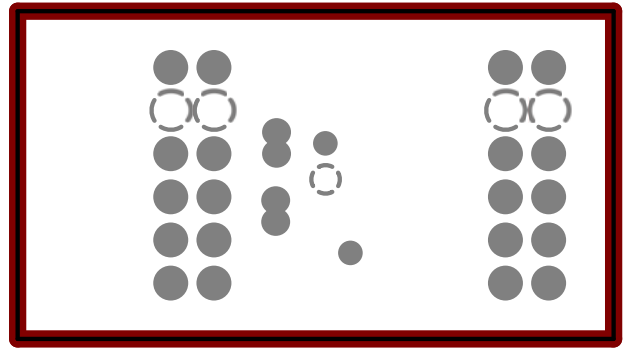


Figure 9. Copper L2 Layer

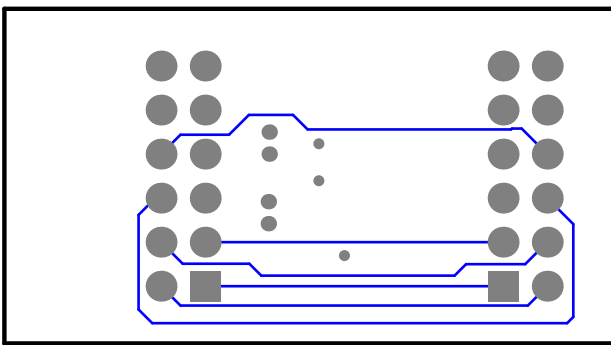


Figure 10. Copper Bottom

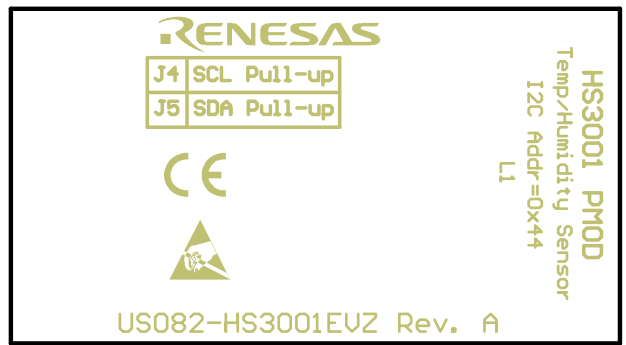


Figure 11. Silkscreen Bottom

## 4. Ordering Information

Part Number	Description
US082-HS3001EVZ	HS3001 Pmod Board
US082-INTERPEVZ	Pmod interposer board to convert Type 2A and 3A to Type 6A on older Renesas MCU kits.

## 5. Revision History

Revision	Date	Description
1.0	Jun 15, 2021	Initial release



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