

## QCIOT-RTC22MPOCZ

The QCIOT-RTC22MPOCZ board features the low power [ISL12022M](#) RTC devices with an embedded temperature sensor and 32.768kHz quartz crystal. The built-in automatic switchover to battery backup for power failure draw only 1.6μA extending battery life while providing continuous power to the 128 byte SRAM, oscillator and RTC registers.

The RTC tracks time with separate registers for hours, minutes and seconds. The calendar registers track date, month, year, and day of the week and are accurate through 2099 with automatic leap year correction.

The board provides a standard Pmod™ Type 6A (Extended I²C) connection for the on-board devices to plug into any MCU evaluation kit with a matching connector. QCIOT- RTC22MPOCZ 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 QCIOT boards on the same MCU Pmod connector.

### Features

- Embedded 32.768kHz quartz crystal in the package
- 10-bit digital temperature sensor output
- 128 bytes battery backed user SRAM
- 1.6μA maximum battery current
- Time stamp for battery switchover
- Calendar and Auto daylight saving
- Standardized Type 6A Pmod™ connector supports Extended I²C interface
- Dual connectors allow pass-through signals for daisy-chained solutions

### Board Contents

- QCIOT-RTC22MPOCZ Board

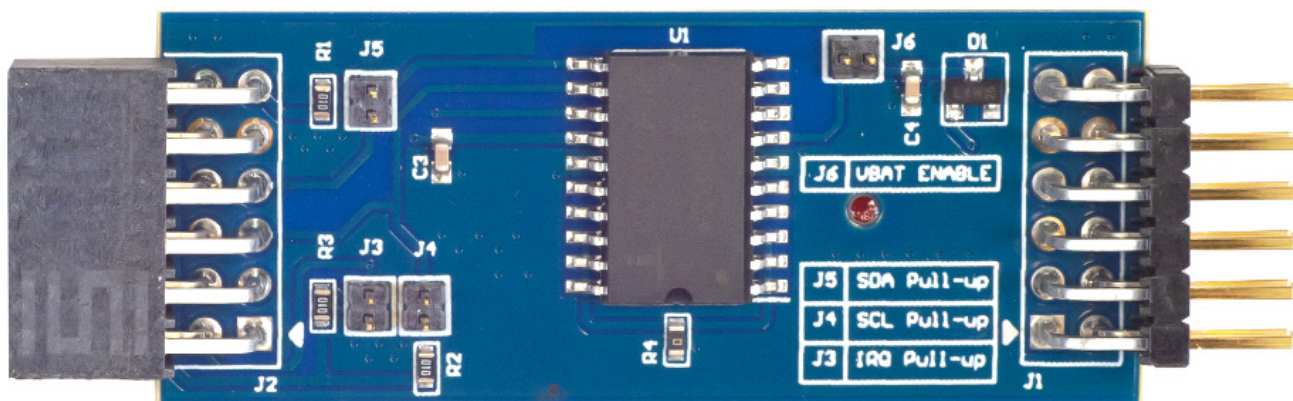


Figure 1. QCIOT-RTC22MPOCZ Board

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# 1. Functional Description

The QCIOT-RTC22MPOCZ board functions as a building block enabling the designer to create a fast prototyping custom system solution. Use the board individually or with a combination of other QCIOT boards by using the Pmod Type 6A interface. For a list of available sensor Pmod boards, visit the Renesas [Quick-Connect IoT](#) web page.

## 1.1 Setup and Configuration

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

- FPB-RA4E1

### 1.1.1 Software Installation and Usage

For more information on creating a full system design, further information on software development, and additional hardware availability, visit the Renesas website for the latest version of the e2 studio [installer](#). The minimum FSP version supporting the QCIOT-RTC22MPOCZ is FSP 5.1.0. For the latest sensor support, ensure that the latest release is used.

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

### 1.1.2 Software Setup

The [US082-INTERPEVZ](#) interposer board is required when using one of the Renesas MCU kits listed in [Table 1](#).

**Table 1. MCU Kits<sup>[1]</sup> Capable of Supporting Type 6A Pmod Boards When Used with US082-INTERPEVZ**

RA	RX	Synergy
<a href="#">EK-RA4W1</a> Evaluation Kit	<a href="#">RSK-RX111</a> Starter Kit	<a href="#">PK-S5D9</a> Promotion Kit
<a href="#">EK-RA2A1</a> Evaluation Kit	<a href="#">RSK-RX231</a> Starter Kit	<a href="#">DK-S3A7</a> Development Kit
<a href="#">EK-RA4M1</a> Evaluation Kit	<a href="#">RSK-RX23W</a> Starter Kit	<a href="#">DK-S128</a> Development Kit
<a href="#">EK-RA6M1</a> Evaluation Kit	<a href="#">RSK-RX23T</a> Starter Kit	<a href="#">TB-S1JA</a> Target Board
<a href="#">EK-RA6M2</a> Evaluation Kit	<a href="#">RSK-RX24T</a> Starter Kit	<a href="#">TB-S3A6</a> Target Board
<a href="#">EK-RA6M3</a> Evaluation Kit	<a href="#">RSK-RX24U</a> Starter Kit	<a href="#">DK-S7G2</a> Development Kit
<a href="#">EK-RA6M3G</a> Evaluation Kit	-	-

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

### 1.1.3 Programming Interface

Programming of the system is accomplished through the Renesas IDE [e2 studio](#). See the MCU evaluation kit documentation to setup the initial project in e2 studio and use the following steps:

1. From the Project Explorer tab, locate and open the **script** folder and double-click on **configuration.xml**.
2. Add the following stack element by clicking the *New Stack* button and editing the configuration values for desired operation (see [Figure 2](#)).
3. Click the *Generate Project Content* icon and the system will generate the code for the MCU to communicate to the RTC Pmod board.

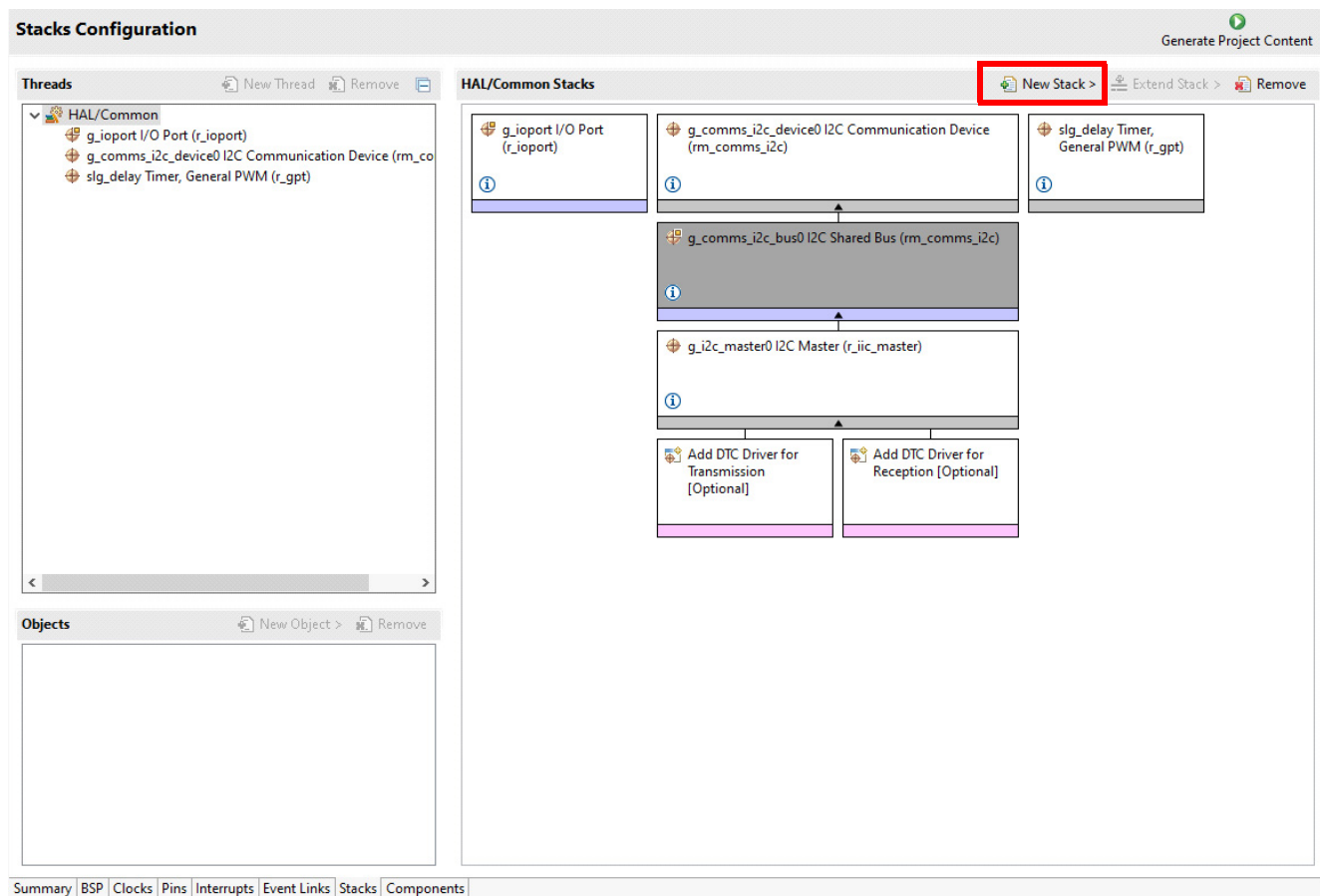


Figure 2. Stacks Configuration Window

### 1.1.4 Kit Hardware Connections

Follow these procedures to set up the kit as shown in [Figure 3](#) and [Figure 4](#).

1. Ensure the MCU evaluation kit being used has a Pmod connector set to Type 6A (refer to the kit's hardware manual for settings).
  - a. If a Type 6A Pmod is unavailable, ensure the MCU evaluation kit can use the US082-INTERPEVZ interposer board. Insert the interposer board into the MCU connector before adding any sensor boards.
2. Plug in the QCIOT-RTC22MPOCZ board to the J26 connector on the EK-RA2L1 MCU evaluation board. Care must be taken when aligning Pin 1 on the MCU connector.
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 pull-up resistors should be used on the I<sup>2</sup>C bus lines. If multiple QCIOT boards are used, only one board should have the jumpers present.
  - b. MCU kits typically do not have pull-up resistors present on these lines, however, ensure to check and verify if resistors are present.

The hardware is now set up and ready to be used in the system.

4. Connect the USB cable from the USB connector on the EKRA2L1 MCU board to an available USB port on the computer.
5. Open the [e2 studio](#) software. Go to *File* → *Import* → *General* → *Existing Projects into Workspace* → *Select archive file*. Click the *Browse* button and select the demo file named **QCIOT\_RTC22POCZ**.
6. Click the *Finish* button.

- To set the time and date, open the **hal\_entry.c** folder and change the hours, minutes, etc. An example is shown in the following image.

```

47 000009dc      uint8_t hoursValue = 11;
48 000009fc      uint8_t minutesValue = 59;
49 000009fe      uint8_t secondsValue = 55;
50 00000a00      uint8_t timeFormat = TIME_FORMAT_PM;
51
52 00000a0a      uint8_t monthsValue = 11;
53              uint8_t dateValue = 29;
54              uint8_t yearValue = 23;
55 00000a0c      uint8_t daysValue = FRIDAY;
    
```

- Click on the *Build* icon, then the *Debug* icon, then click on the *Resume* icon twice.



- Click on the *Renesas Debug Virtual Console* tab to display the time and date.

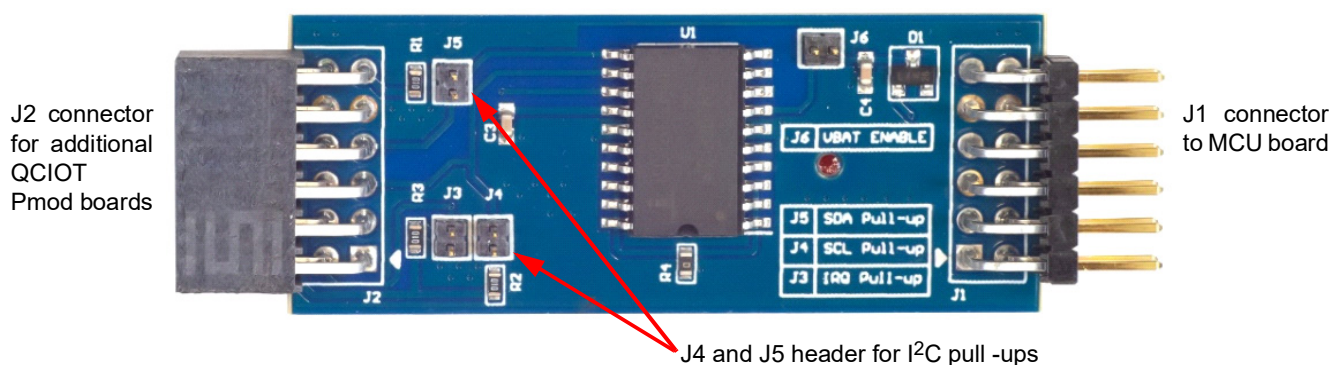
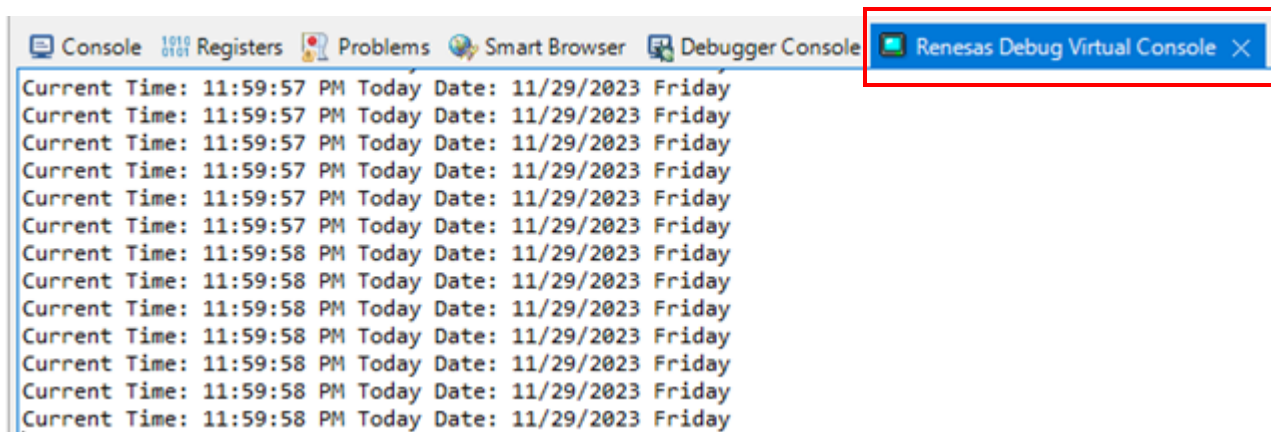


Figure 3. QCIOT-RTC22MPOCZ Board Connections



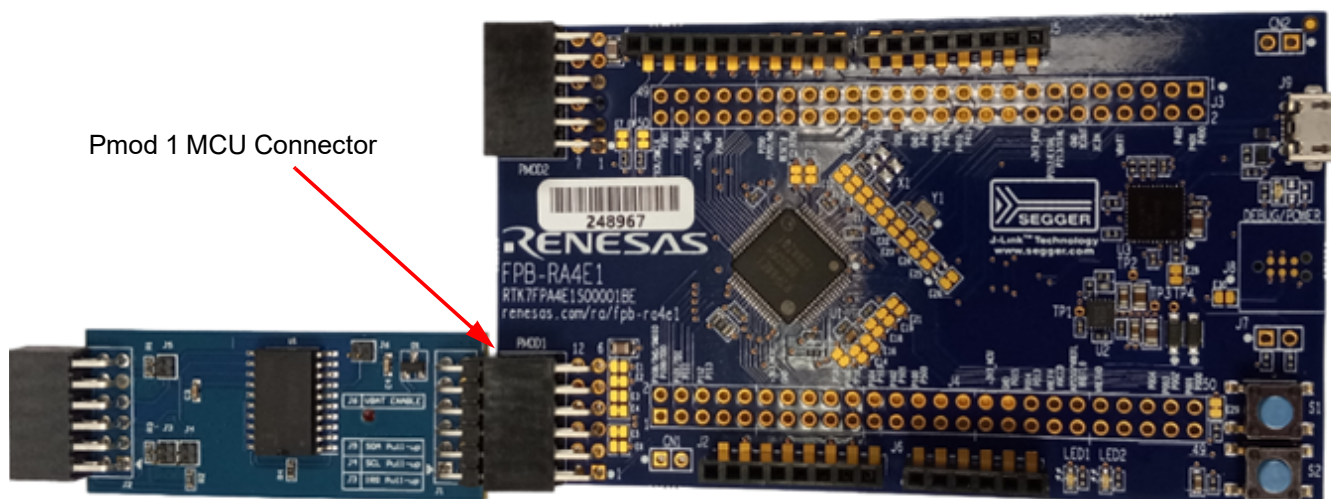


Figure 4. Evaluation Kit Connections

## 2. Board Design

### 2.1 Schematic Diagrams

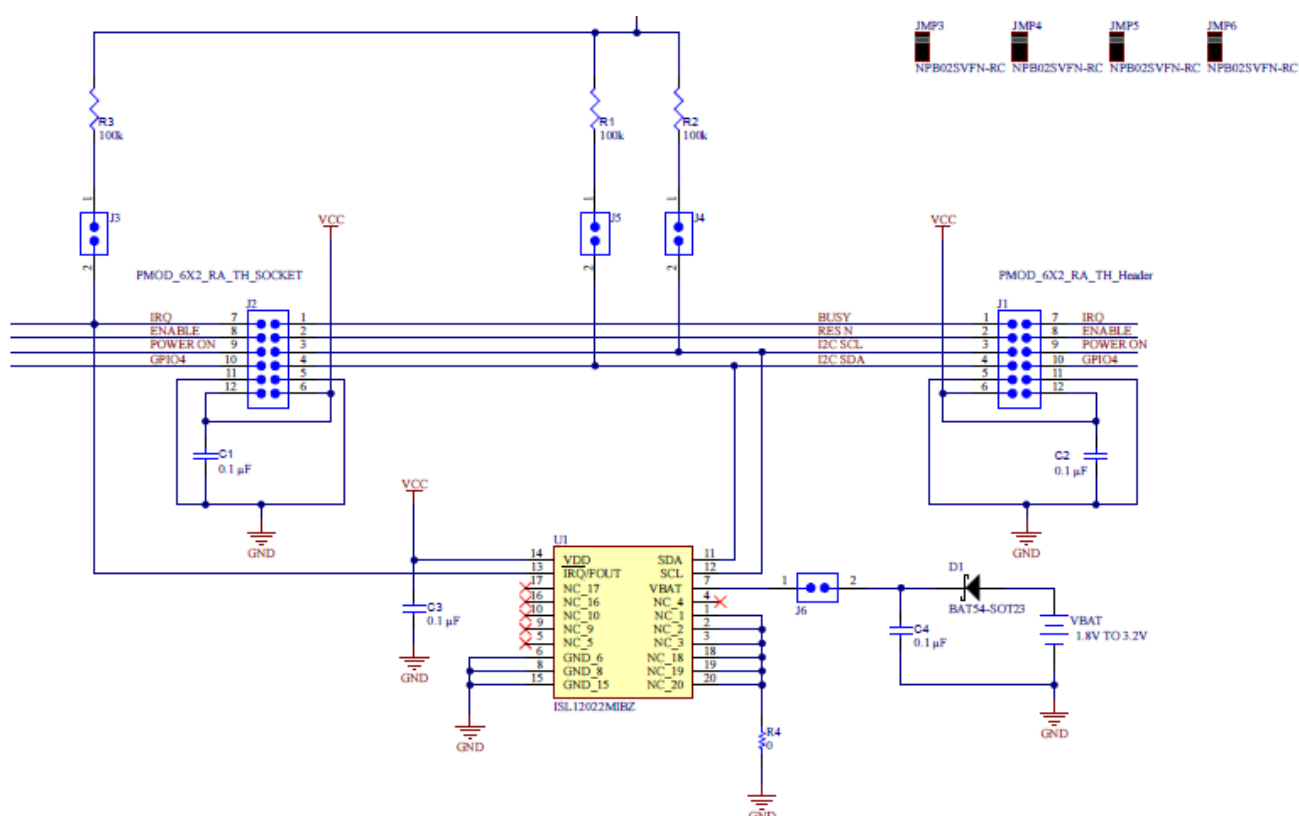


Figure 5. QCIOT-RTC22MPOCZ Application Schematic

## 2.2 Bill of Materials

Qty	Reference Designator	Description	Manufacturer	Part Number
1	C1, C2, C3, C4	0.1 $\mu$ F $\pm$ 10% 50V Ceramic Capacitor X7R 0603 (1608 Metric)	KEMET	C0603C104K5RAC7013
1	D1	Schottky Diodes & Rectifiers BAT54/SOT23/TO-236AB	Nexperia	BAT54
1	J1	Headers & Wire Housings Classic PCB Header Strips, 0.100 pitch	Samtec	TSW-106-08-F-D-RA
1	J2	CONN RCPT 12POS 0.1 GOLD PCB R/A	Samtec	SSW-106-02-F-D-RA
4	J3, J4, J5, J6	Conn Header Vert 2POS 1.27MM	Samtec	FTS-102-01-L-S
3	R1, R2, R3	100kOhms $\pm$ 1% 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Moisture Resistant Thin Film	YAGEO	RT0603FRE13100KL
1	R4	0 Ohms Jumper 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) Automotive AEC-Q200 Thick Film	Stackpole Electronics	RMCF0603ZT0R00
1	U1	Real Time Clock (RTC) IC Clock/Calendar 128B I <sup>2</sup> C, 2-Wire Serial 20-SOIC (0.295", 7.50mm Width)	Renesas	ISL12022MIBZ-T
1	VBAT	SMT coin cell holder CR1220	Harwin	S8411-45R

## 2.3 Board Layout

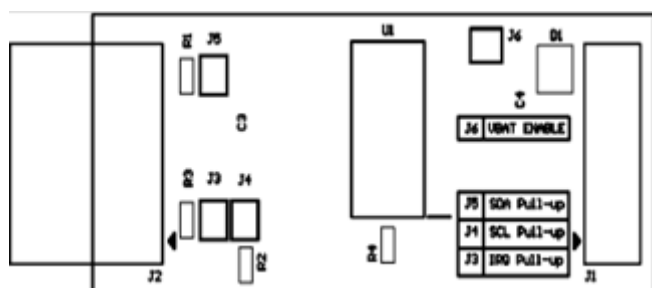


Figure 6. Silkscreen Top

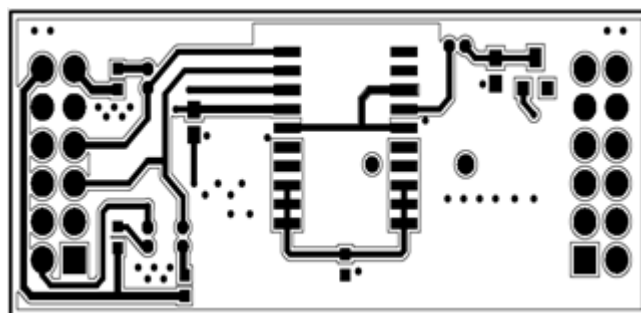


Figure 7. Copper Top

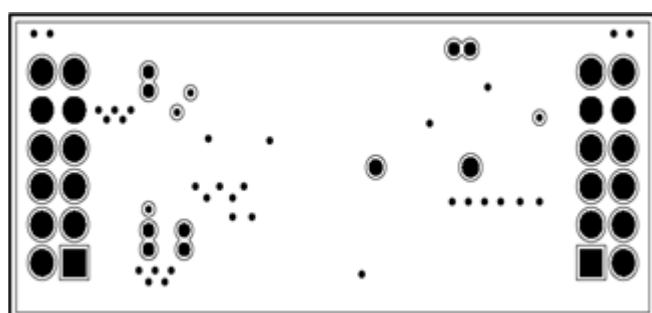


Figure 8. Copper L1 Layer

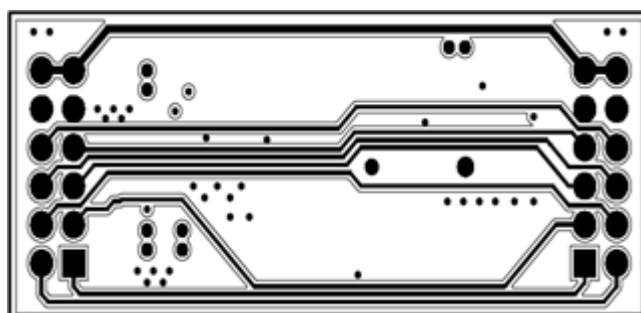


Figure 9. Copper L2 Layer

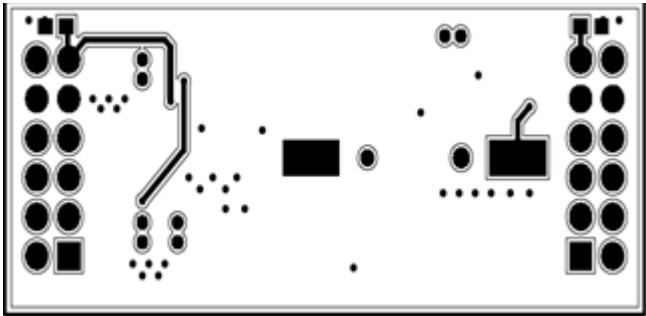


Figure 10. Copper Bottom

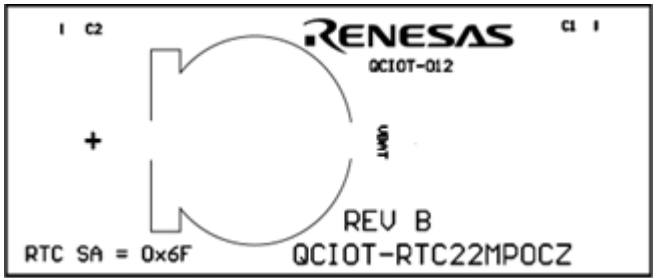


Figure 11. Silkscreen Bottom

### 3. Ordering Information

Part Number	Description
QCIOT-RTC22MPOCZ	RTC Pmod Board
US082-INTERPEVZ	Pmod interposer board to convert Type 2A and 3A to Type 6A on older Renesas MCU kits.

### 4. Revision History

Revision	Date	Description
1.00	Apr 3, 2024	Initial release.



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