

QCIOT-ISL3173POCZ PMOD

The QCIOT-ISL3173POCZ board enables the usage of the ISL3173 for RS485 communications. The board provides a standard PMOD™ Type 3 connection to plug into the MCU evaluation kit.

The QCIOT-ISL3173POCZ features a configurable interface that can be used in Half or Full Duplex mode. With its standard connector and software support, the QCIOT-ISL3173POCZ is ideal for Renesas' Quick-Connect IoT to rapidly create an IoT system.

Features

- Configurable half and full duplex modes with jumpers
- Flow control support
- Configurable termination resistors
- High speed RS485 enables long distance communications
- Differential interface for noise immunity
- PMOD type 3 interface for easy connectivity

Board Contents

- QCIOT-ISL3173POCZ Evaluation Board

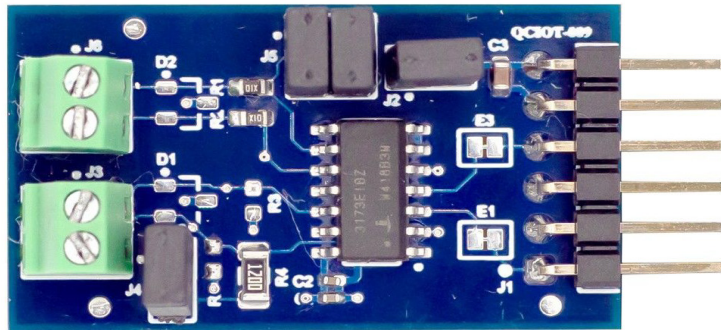


Figure 1. QCIOT-ISL3173POCZ PMOD Board

Contents

1. Functional Description	3
1.1 Setup and Configuration.....	3
1.1.1 Software Installation.....	3
1.1.2 Kit Hardware Connections.....	4
2. Board Design	5
2.1 Schematic Diagram.....	6
2.2 Bill of Materials (BOM).....	7
2.3 Board Layout.....	8
3. Software Design	9
3.1 Project Code Structure.....	9
4. Board Testing	10
4.1 Programming the Board.....	10
4.2 Checking the Output in the Serial Terminal.....	12
5. Ordering Information	13
6. Revision History	13

Figures

Figure 1. QCIOT-ISL3173POCZ PMOD Board.....	1
Figure 2. QCIOT-ISL3173POCZ PMOD Board Block Diagram.....	3
Figure 3. QCIOT-ISL3173POCZ PMOD Board with EK-RA2E1 MCU Kit.....	5
Figure 4. QCIOT-ISL3173POCZ PMOD Board Image (Top).....	5
Figure 5. QCIOT-ISL3173POCZ PMOD Board Image (Bottom).....	6
Figure 6. QCIOT-ISL3173POCZ PMOD Board Schematic.....	6
Figure 7. Top Overlay.....	8
Figure 8. Top Layer.....	8
Figure 9. Layer 2 (GND).....	8
Figure 10. Layer 3 (Signal).....	8
Figure 11. Bottom Layer.....	8
Figure 12. Bottom Overlay.....	8
Figure 13. Project Code Structure.....	9
Figure 14. Stacks Configuration – Hal Common.....	9
Figure 15. Debug Configurations Window.....	10
Figure 16. Starting the Debug Operation.....	11
Figure 17. Code Debugging.....	11
Figure 18. Serial Terminal Window – Output Information.....	12

1. Functional Description

The QCIOT-ISL3173POCZ functions as a connectivity building block to create a custom system solution. The inherent benefits of RS-485 are coupled with the ease of use and configurability of this board to create a highly functional solution. This board is compatible with any evaluation kit with a Type 3 PMOD connector.

Figure 2 highlights the main parts of the system:

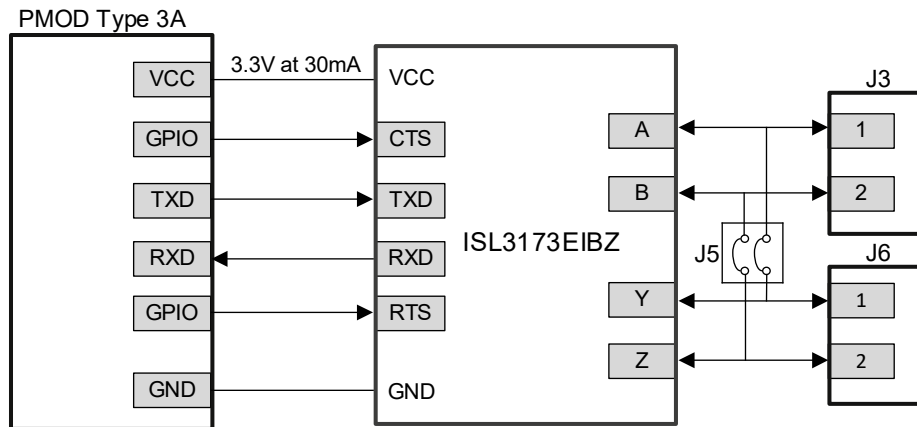


Figure 2. QCIOT-ISL3173POCZ PMOD Board Block Diagram

1.1 Setup and Configuration

Required or recommended user equipment:

- Renesas Evaluation Board: EK-RA2E1
- USB micro-B cable (provided with EK board)
- PC running Windows 10 or 11 with at least two USB ports
- USB-RS485 cable
- RS-485 USB converter plug into laptop

Required or recommended software:

- Renesas Flexible Software Package (FSP) v5.4.0 platform installation
 - Renesas [e2 studio](#) 2024-04 or later
 - FSP v5.4.0 or later
 - GCC Arm Embedded 10.3.1.20210824 or later
- Sample code files (available on the Renesas [webpage](#) for this device)
- Serial port terminal software such as puTTY or Tera Term

1.1.1 Software Installation

Download the latest version of the [e2 studio](#) installer.

1.1.2 Kit Hardware Connections

See [Figure 3](#) and use the following steps to set up the kit.

1. Ensure that the MCU development kit supports a Type 3 or Type 3A PMOD connector.
 - a. For EK-RA2E1, PMOD2 connector is available.
2. Install J2 jumper to apply power to the board.
3. Install J4 jumper on the first and last nodes to apply termination resistors.
4. The J5 connector configures between half and full duplex mode.
 - a. To use full duplex, disconnect the jumpers.
Note: Full duplex is used for this application.
 - b. To use half duplex, install both of the jumpers on J5.
5. Plug in the QCIOT-ISL3173POCZ board to the top row of the PMOD2 connector of EK-RA2E1. Ensure to align pin 1 on the PMOD board and MCU kit.
6. Using the twisted pair cable, connect the following:
 - a. Connect J6 pin1 (Y) on the ISL3173 PMOD board to pin 3 (RXD+) on the RS-485 USB connector.
Note: The dot next to J6 connector represents pin 1.
 - b. Connect J6 pin2 (Z) on the ISL3173 PMOD board to pin 4 (RXD-) on the RS-485 USB connector.
 - c. Connect J3 pin1 (A) on the ISL3173 PMOD board to pin 1 (TXD+) on the RS-485 USB connector.
 - d. Connect J3 pin2 (B) on the ISL3173 PMOD board to pin 2 (TXD-) on the RS-485 USB connector.
7. Connect the EK-RA2E1 board to the computer with USB Micro-B cable.
8. The device is now ready to be used in the system. For board testing, see [section 4](#).

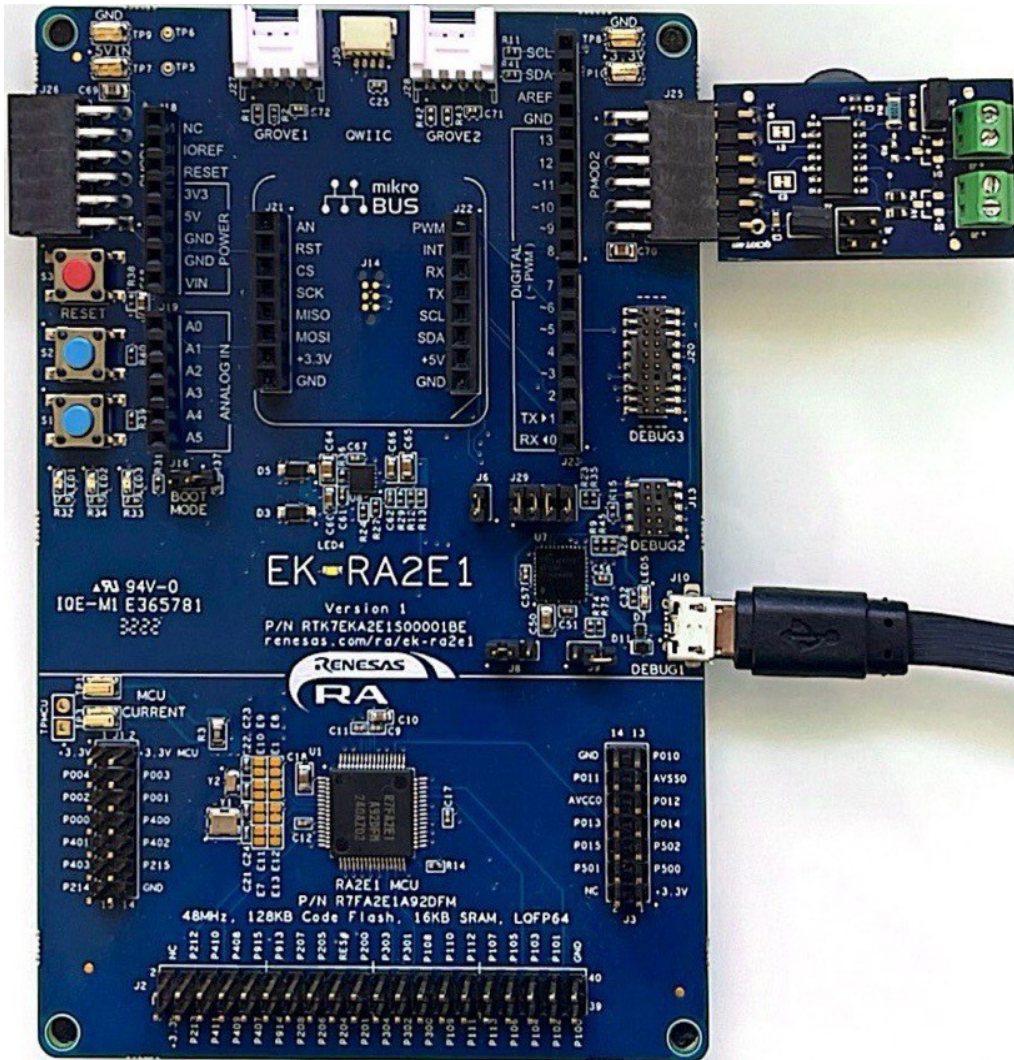


Figure 3. QCIOT-ISL3173POCZ PMOD Board with EK-RA2E1 MCU Kit

2. Board Design

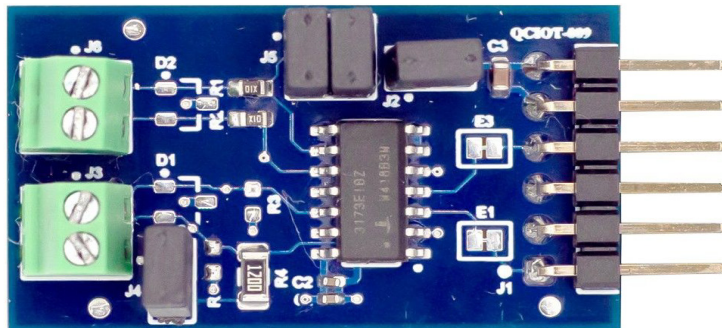


Figure 4. QCIOT-ISL3173POCZ PMOD Board Image (Top)

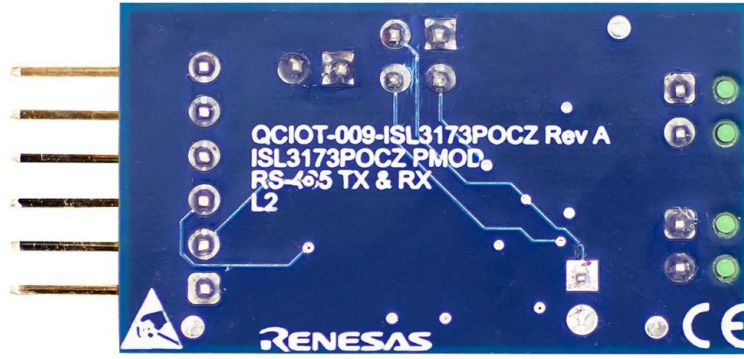


Figure 5. QCIOT-ISL3173POCZ PMOD Board Image (Bottom)

2.1 Schematic Diagram

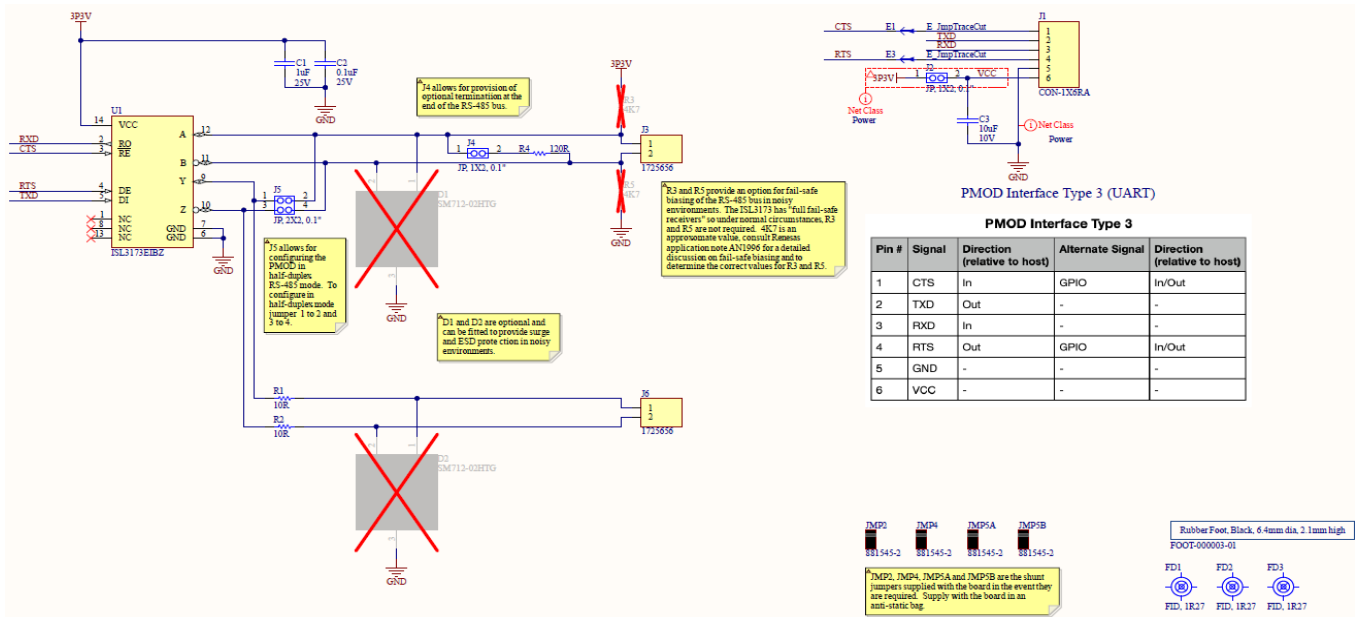


Figure 6. QCIOT- ISL3173POCZ PMOD Board Schematic

2.2 Bill of Materials (BOM)

QTY	Reference Designator	Description	Value	PCB Footprint	Manufacturer Part Number
1	C1	Capacitor, 1 μ F, 25V, SM	1 μ F	CAPC1005X06N	TMK105BJ105KV-F
1	C2	Capacitor, 0.1 μ F, 25V, SM	0.1 μ F	CAPC1005X06N	TMK105B7104KVHF
1	C3	Capacitor, 10 μ F, 10V, SM	10 μ F	CAPC1608X10N	GRM188R61A106KE69D
1	FOOT1	Foot, Rubber, Self-adhesive, Black, 6.4mm diameter, 2.1mm tall	FOOT-000003-01	FD_ML_1R27	BS25BL07X30RP
1	J1	Connector, 1 \times 6, 0.1", PMOD, Header, Right Angle, Unshrouded	CON-1X6RA	HWN_M20-9960645_PMOD	M20-9960645
2	J2, J4	Jumper, 1 \times 2, 0.1" Pitch	JP, 1X2, 0.1"	SLN_HDR1X2	PBC02SAAN
2	J3, J6	Connector, 1 \times 2, 2.54mm, RA, Terminal Block, TH	1725656	PHX_MPT0,5/2-2,54	1725656
1	J5	Jumper, 2 \times 2, 0.1" Pitch	JP, 2X2, 0.1"	SLN_HDR2X2	PBC36DAAN
4	JMP2, JMP4, JMP5A, JMP5B	Post Shunt; 2; 3; 1000; Phosphor Bronze; Gold over Nickel; Open Top; Black	881545-2	881545-2-Footprint-1	881545-2
2	R1, R2	Resistor, 10ohms, 1/3W, 1%, High Power, SM	10R	RESC1608X06HPN	CRCW060310R0FKEAHP
1	R4	Resistor, 120ohms, 1/4W, 1%, SM	120R	RESC3216X07N	RK73H2BTDD1200F
1	U1	Transceiver, RS-485/RS-422, Full Duplex, SM	ISL3173EIBZ	SOIC127P600X175-14N	ISL3173EIBZ

2.3 Board Layout

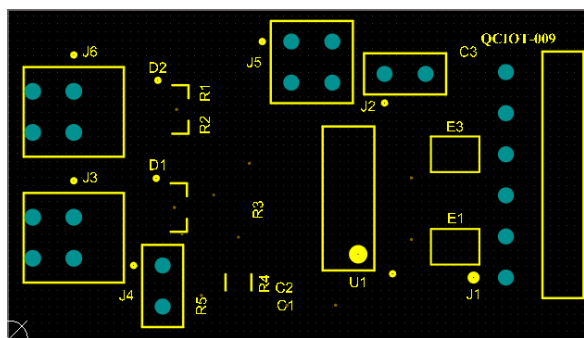


Figure 7. Top Overlay

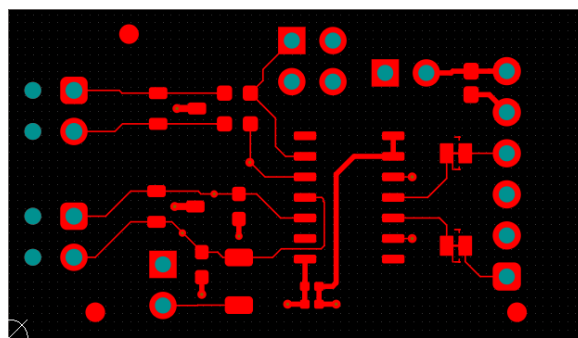


Figure 8. Top Layer

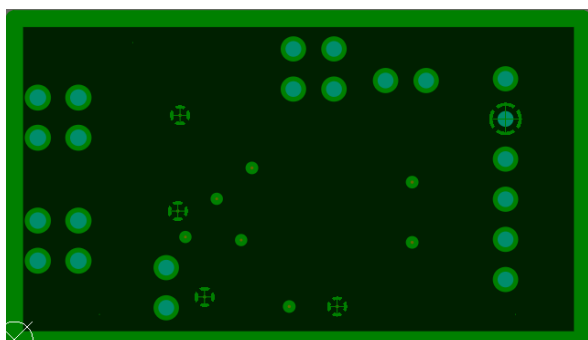


Figure 9. Layer 2 (GND)

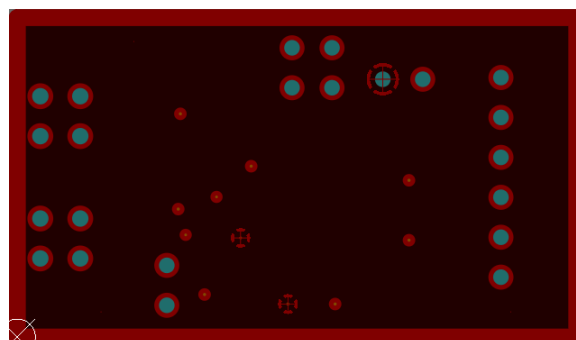


Figure 10. Layer 3 (Signal)

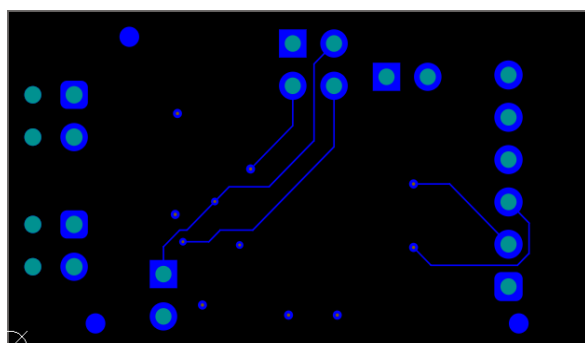


Figure 11. Bottom Layer



Figure 12. Bottom Overlay

3. Software Design

The following sections describe the software implementation for the QCIOT-ISL3173POCZ PMOD board based on the Renesas RA Family's Flexible Software Package (FSP). This includes the project's code structure, the system's software modules, and the main system flow.

3.1 Project Code Structure

The Quick Connect project is designed to be a highly modular solution that can be easily configured independently of other modules (if required) or ported to other end applications. Figure 13 shows the project's code structure in e2 studio.

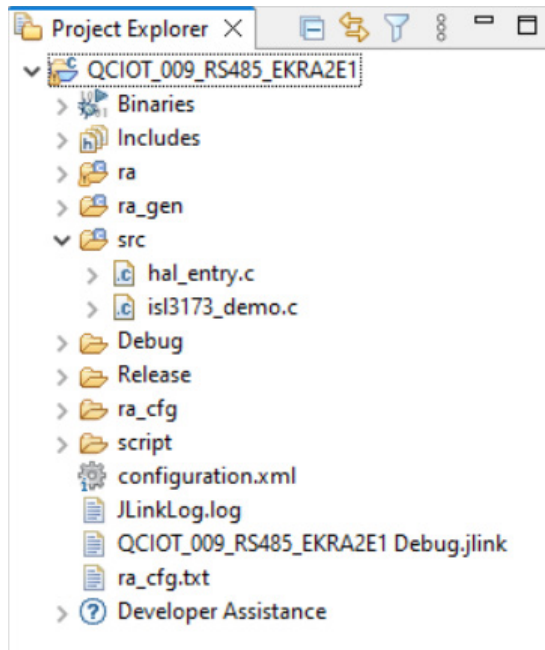


Figure 13. Project Code Structure

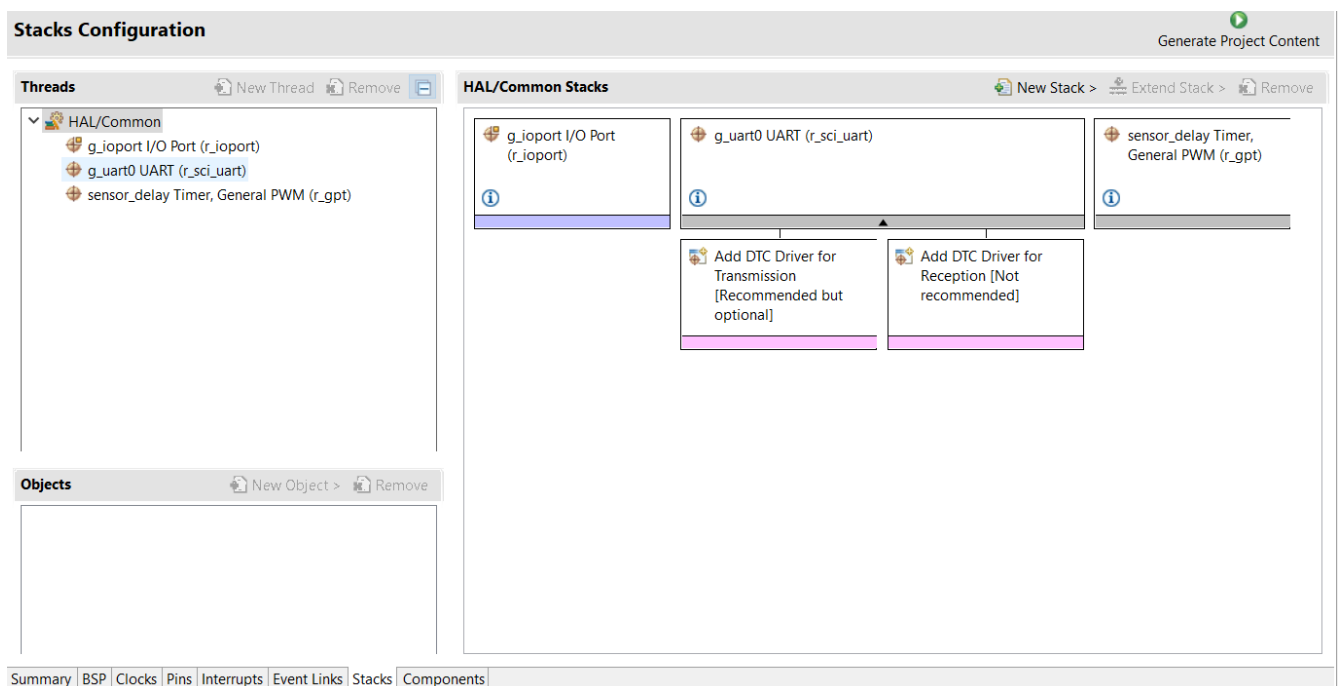


Figure 14. Stacks Configuration – Hal Common

4. Board Testing

4.1 Programming the Board

1. Open the sample project code in Renesas e2 studio IDE.
2. From the Menu bar, select **Run** → **Debug Configurations** (see Figure 15).

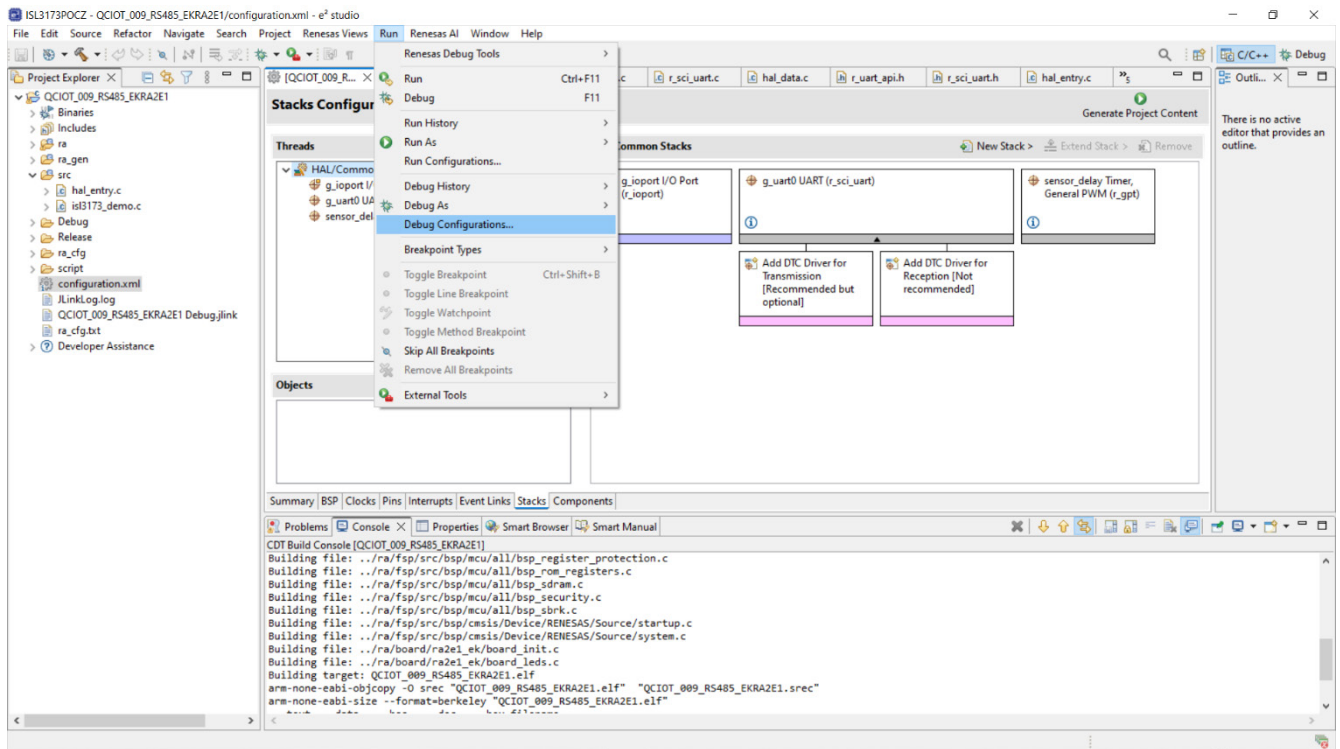


Figure 15. Debug Configurations Window

3. Select **QCIOT_009_RS485_EKRA2E1_Debug** under Renesas GDB Hardware Debugging. Click on the *Debug* button (see Figure 16).

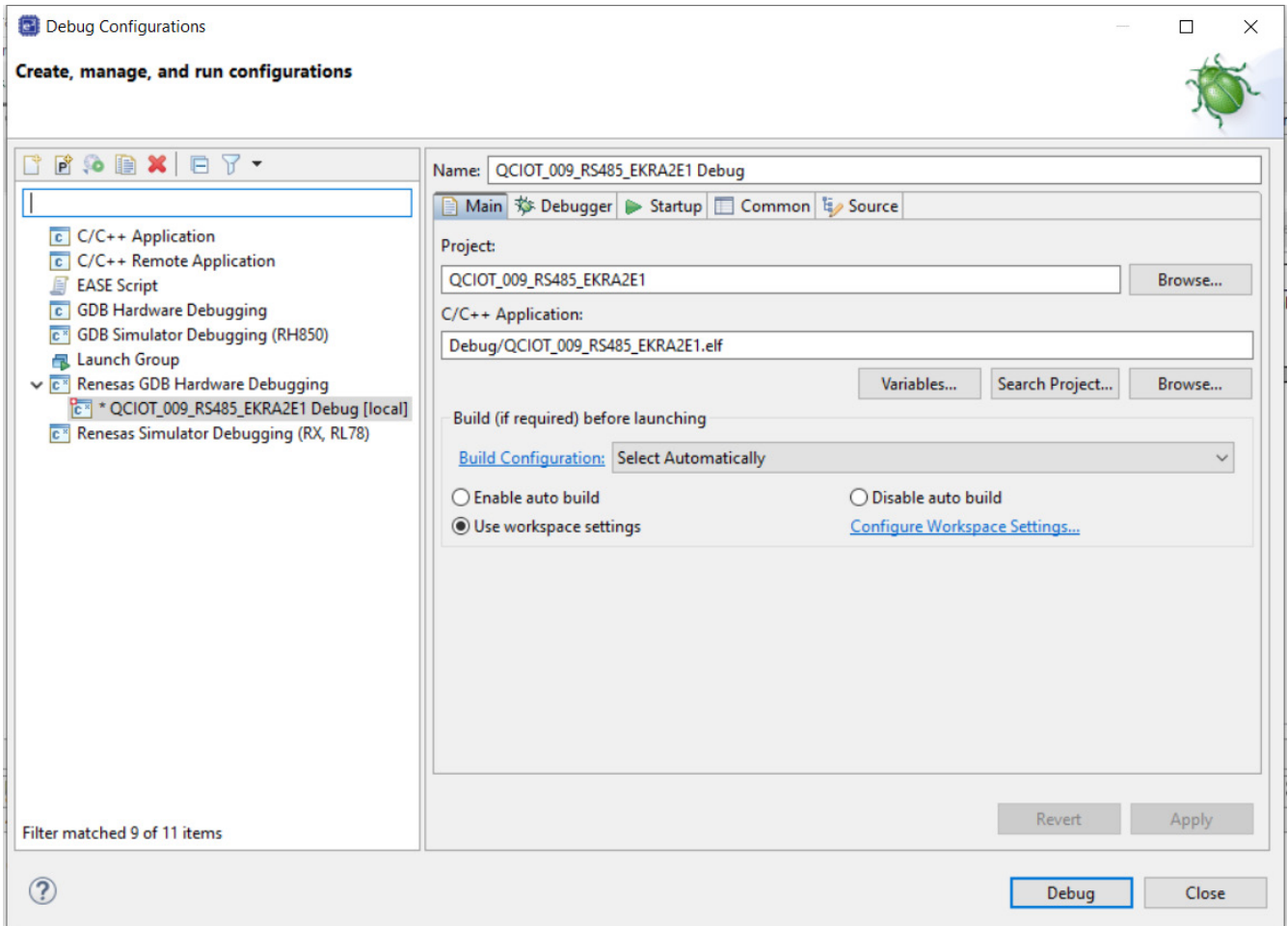


Figure 16. Starting the Debug Operation

4. The code enters debug mode as shown in Figure 17.

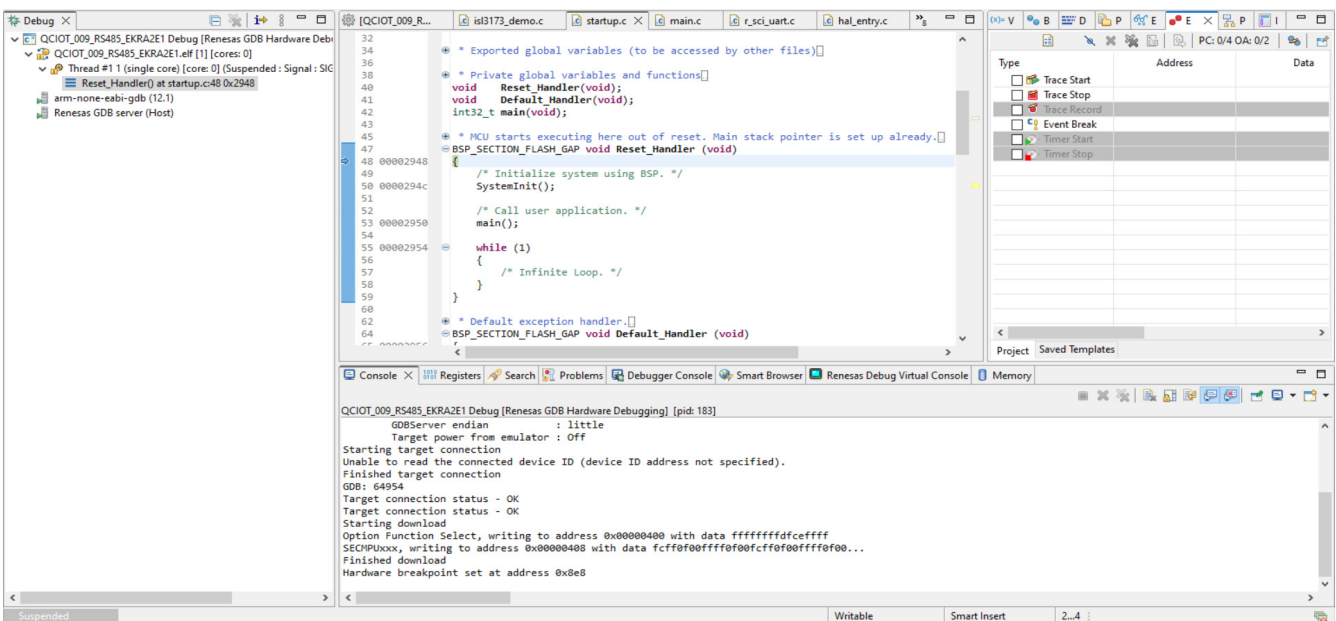



Figure 17. Code Debugging

5. Press the F8 function key or click on the resume  icon to run the demo code.

4.2 Checking the Output in the Serial Terminal

1. Open the serial terminal using the following settings:

Baud Rate	115200
Data bits	8
Stop bits	1
Parity	none
Flow control	none

2. When the serial terminal window is opened, press 't' on the keyboard to see the data packet "ISL3173 TEST COMPLETED #" sent by the PMOD ISL3173POCZ board.

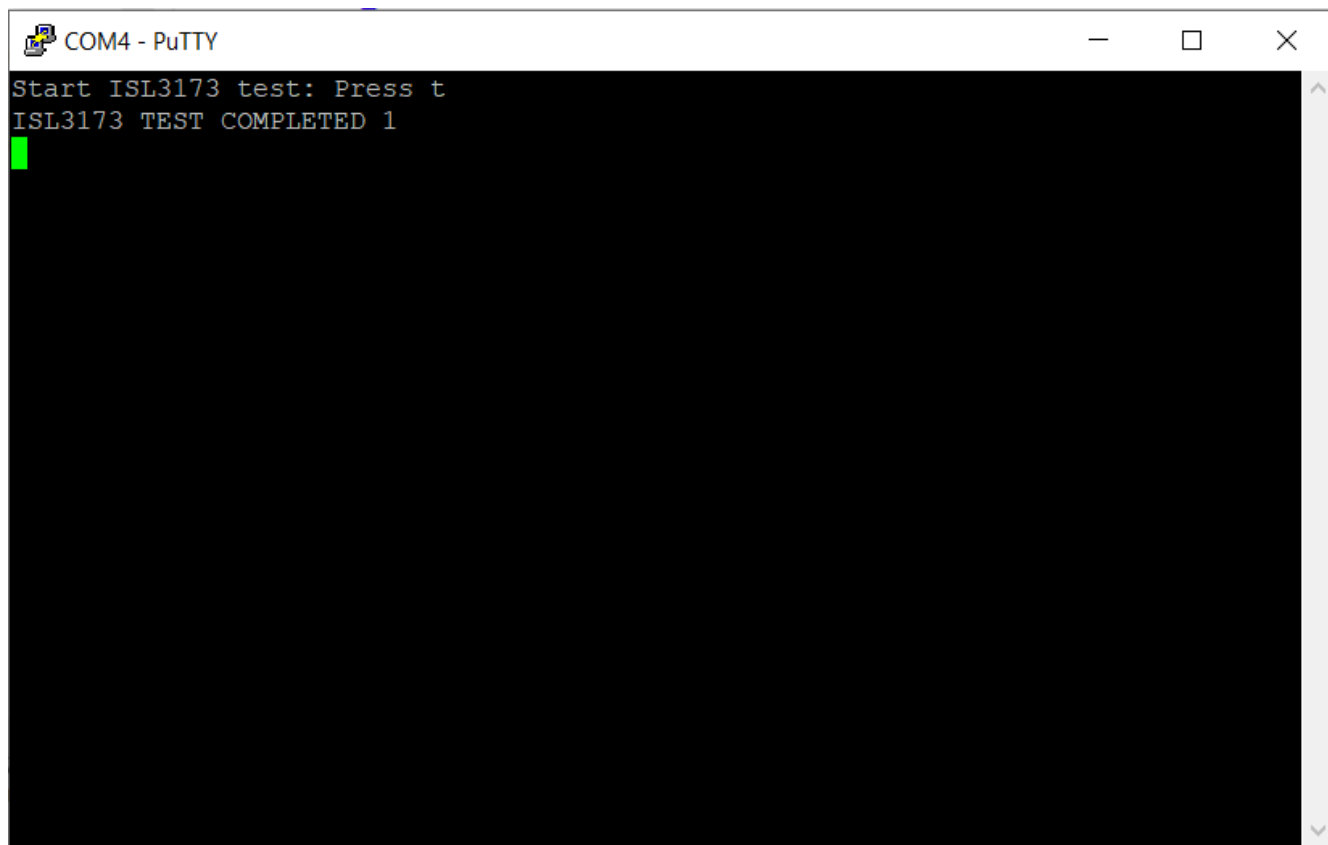


Figure 18. Serial Terminal Window – Output Information

5. Ordering Information

Orderable Part Number	Description
QCIOT-ISL3173POCZ	ISL3173 PMOD Board

6. Revision History

Revision	Date	Description
1.00	Oct 8, 2024	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)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
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/.