

# RL78/G1D BLE Module Expansion Board

User's Manual

16-Bit Single-Chip Microcontrollers

RL78 Family

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## General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

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### 1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

### 2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

### 3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

### 4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

### 5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

### 6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between  $V_{IL}$  (Max.) and  $V_{IH}$  (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between  $V_{IL}$  (Max.) and  $V_{IH}$  (Min.).

### 7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

### 8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

# How to Use This Manual

## 1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the hardware functions of the RL78/G1D BLE Module Expansion Board and electrical characteristics of the MCU.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the RL78/G1D BLE Module Expansion Board. Be sure to refer to the latest versions of these documents. The newest versions of the listed documents are available on the Renesas Electronics Web site.

| Document Type                  | Description   | Document Title   | Document No.                 |
|--------------------------------|---|--|------------------------------|
| User's manual                  | Hardware specifications   | RL78/G1D BLE Module Expansion Board User's Manual                          | R20UT4574EJ<br>(this manual) |
| Circuit schematics             | Circuit schematics  | RL78/G1D BLE Module Expansion Board Circuit Schematics                     | R20UT4576EJ                  |
| Parts list                     | Parts list  | RL78/G1D BLE Module Expansion Board BOM LIST                               | R12TU0069EJ                  |
| Quick start guide              | Simple instructions for setting up the board  | RL78/G1D BLE Module Expansion Board Quick Start Guide                      | R20UT4572EJ                  |
| User's manual for the hardware | Hardware specifications (pin assignments, memory maps, peripheral function specifications, and electrical characteristics)  | RL78/G1D Module (RY7011) User's Manual: Hardware                           | R02UH0004EJ                  |
| User's manual                  | Descriptions of the structures, functions, and usage of the firmware written to the module to be used in the development of application products that use the Renesas RL78/G1D Module | RL78/G1D Module Firmware User's Manual                                     | R01UW0160EJ                  |
| Application note               | A method of sending sensor information via Bluetooth communications with the use of the RL78/G14 Fast Prototyping Board and the RL78/G1D BLE Module Expansion Board                   | Bluetooth® Low Energy Protocol Stack<br>Fast Prototyping Board Host Sample | R01AN4834EJ                  |

Note: Download the documents for the RL78/G1D from the product page for the RL78/G1D.

## 2. List of Abbreviations and Acronyms

| Abbreviation | Full Form  |
|--------------|--|
| Pmod™        | Pmod™ is a trademark of Digilent Inc. The Pmod™ interface specification is the property of Digilent Inc. For the Pmod™ interface specification, refer to the Pmod™ License Agreement page at the Web site of <a href="#">Digilent Inc.</a> |
| RAM          | Random Access Memory   |
| ROM          | Read Only Memory   |
| UART         | Universal Asynchronous Receiver/Transmitter  |

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## 1. Overview

### 1.1 Package Components

Thank you for purchasing the RL78/G1D BLE Module Expansion Board evaluation tool from Renesas (hereinafter referred to as “this product”). This product consists of the following items.

- RL78/G1D BLE Module Expansion Board (RTKYRLG1D0B00000BJ)
- Quick Start Guide

### 1.2 Purpose

This product is an evaluation tool for a Renesas MCU. This user’s manual describes the technical details of hardware of this product.

### 1.3 Features

This product is a board which incorporates the RL78/G1D module (RY7011A0000DZ00) for Bluetooth® Low Energy.

The RL78/G1D module is a small module (8.95 mm x 13.35 mm x 1.7 mm) incorporating the RL78/G1D microcontroller for Bluetooth® Low Energy, a 32-MHz crystal resonator for the RF chip, and an antenna. This module has obtained certificates of compliance with Japan’s Radio Law, the FCC’s module-related standards, IC regulations, CE mark requirements, and the Bluetooth SIG certification.

Ultra-low power consumption technology

- RF transmission: 4.3 mA (TYP.)
- RF reception: 3.5 mA (TYP.)
- RF sleep (POWER\_DOWN mode): 0.3  $\mu$ A (TYP.)

On-chip RF transceiver

- Bluetooth v4.2 Specification (Low Energy Single mode)
- 2.4 GHz ISM band, GFSK modulation, TDMA/TDD frequency hopping (including AES encryption circuit)
- Adaptability (only in slave operation)

### 1.4 Board Specification Table

Table 1-1 shows the board specifications.

**Table 1-1 Board Specification Table**

| Item                 | Specification   |
|----------------------|---|
| RL78/G1D module      | Part No.: RY7011A0000DZ00                                     |
|                      | Package: MLZZ0042ZA-A   |
|                      | On-chip memory: 256-KB ROM, 48-KB RAM, 8-KB data flash memory |
| Board size           | 19 mm x 40 mm   |
| Power-supply voltage | VDD: 1.8 V to 3.6 V   |
| Pmod™ connector      | Connector: Angle type, 12 pins x 1                            |

## 2. Certification of Compliance

### (1) Radio-Related Laws

The RL78/G1D module incorporated in this product has obtained the following certificates of technical compliance. If using the module overseas, you must do so in accord with the regulations of the country where the product is to be delivered.

Japan: Type certification (authentication number: 007-AE0104)

North America: FCC (FCC ID: 2AEMXY7011A00000), IC (20194-Y7011A00000)

Europe: CE (RED)\*

Note: Certificates of compliance with radio-related tests based on RED order.

### European Community Compliance Statement

#### Note:

Hereby, Renesas Electronics Corporation declares that this RTKYRLG1D0B00000BJ is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.



### (2) Bluetooth SIG Certification

QDID : 82194

Name : Renesas Bluetooth Low Energy Module

Model Number : RY7011A0000DZ00

Product Type : End Product

### 3. Board Layout

Figure 3-1 shows the external appearance of the top side of this product.

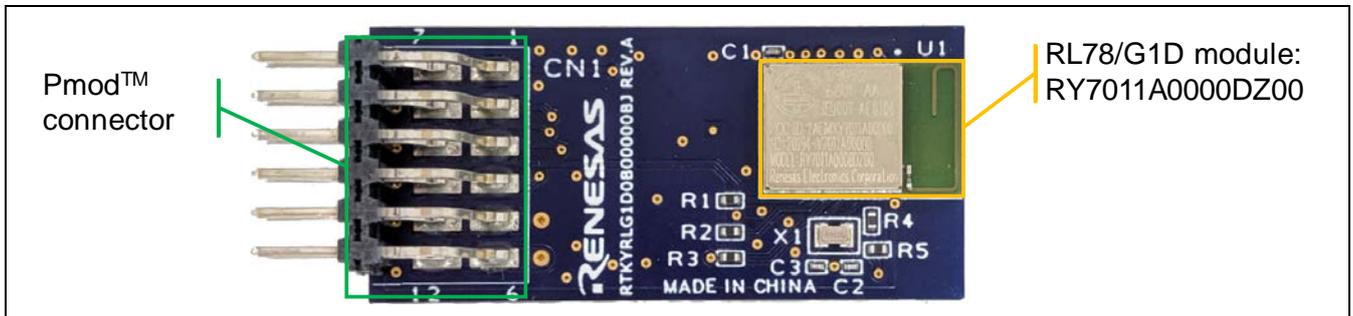


Figure 3-1 Board Layout (Top Side)

## 4. Parts Layout

Figure 4-1 shows the parts layout of this product.

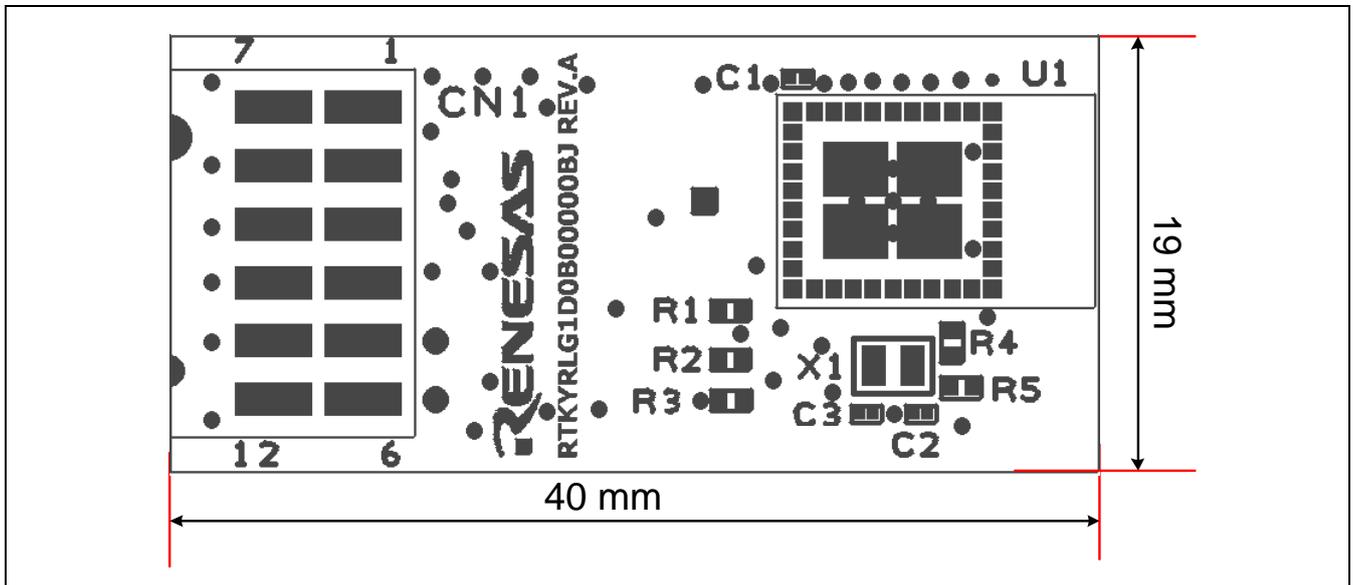


Figure 4-1 Parts Layout

## 5. Pmod™ Connector

A Pmod™ connector is mounted on this product and connected to the RL78/G1D module. Figure 5-1 and Table 5-1 show the pin assignments of the Pmod™ connector.

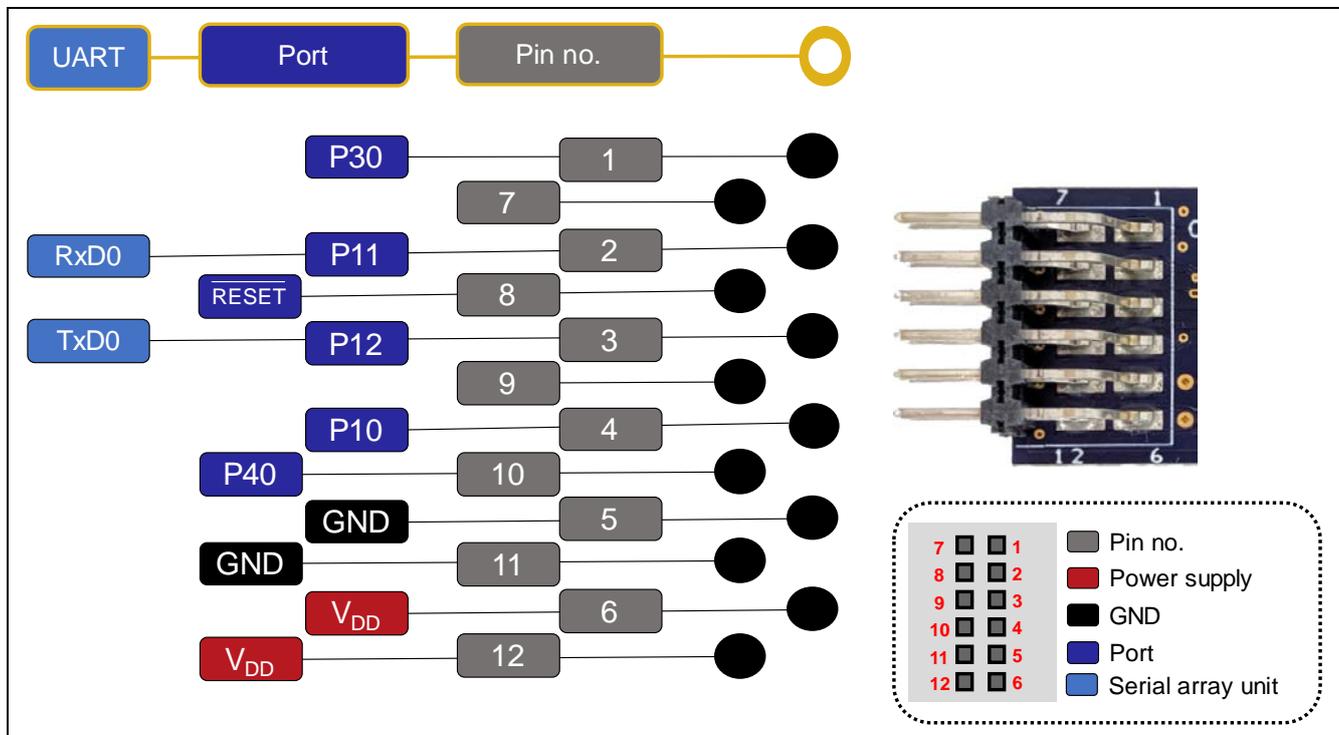


Figure 5-1 Pin Assignments of the Pmod™ Connector

Table 5-1 Pin Assignments of Pmod™

| Pin No. of Pmod™ | RL78/G1D Module |                 |       |      |
|------------------|-----------------|-----------------|-------|------|
|                  | Pin             | Power Supply    | Port  | UART |
| 1                | 2               | —               | P30   | —    |
| 2                | 8               | —               | P11   | RxD0 |
| 3                | 7               | —               | P12   | TxD0 |
| 4                | 9               | —               | P10   | —    |
| 5                | —               | GND             | —     | —    |
| 6                | —               | V <sub>DD</sub> | —     | —    |
| 7                | —               | —               | —     | —    |
| 8                | 24              | —               | RESET | —    |
| 9                | —               | —               | —     | —    |
| 10               | 23              | —               | P40   | —    |
| 11               | —               | GND             | —     | —    |
| 12               | —               | V <sub>DD</sub> | —     | —    |

## 6. Additional Information

### Technical Support

For details on the R78/G1D module, refer to the RL78/G1D Module User's Manual: Hardware.

### Technical Contact Details

America: [techsupport.america@renesas.com](mailto:techsupport.america@renesas.com)

Europe: <https://www.renesas.com/en-eu/support/contact.html>

Global & Japan: <https://www.renesas.com/support/contact.html>

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