

# RL78/G1D

User's Manual: Evaluation Board

16-Bit Single-Chip Microcontrollers

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### 2. Processing at Power-on

The state of the product is undefined at the moment when power is supplied.

- ¾ The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.  
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After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

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Usage Notes of Evaluation Board
The regulations of international specifications and Japan's domestic laws restrict the usage of wireless receivers and transmitters. Observe the specifications and laws of the country in which the RF transceiver is used.
Representative specifications for the band of 2.4 GHz are shown below.
Japan: ARIB STD-T66
United States: FCC CFR47 part 15.247 and part 15.249
Europe: EN300 440 and EN300 328

## 1. Overview

This document explains Renesas Electronics' RL78/G1D evaluation board (RTK0EN0001D01001BZ).

Figure 1-1 shows a block diagram of this evaluation board.

This evaluation board consists of a module on which the RL78/G1D is mounted (RTK0EN0002C01001BZ) and an extension board for Bluetooth Low Energy evaluation (R0K3ZBBBDBN00BR) with peripheral functions such as push switches and LEDs.

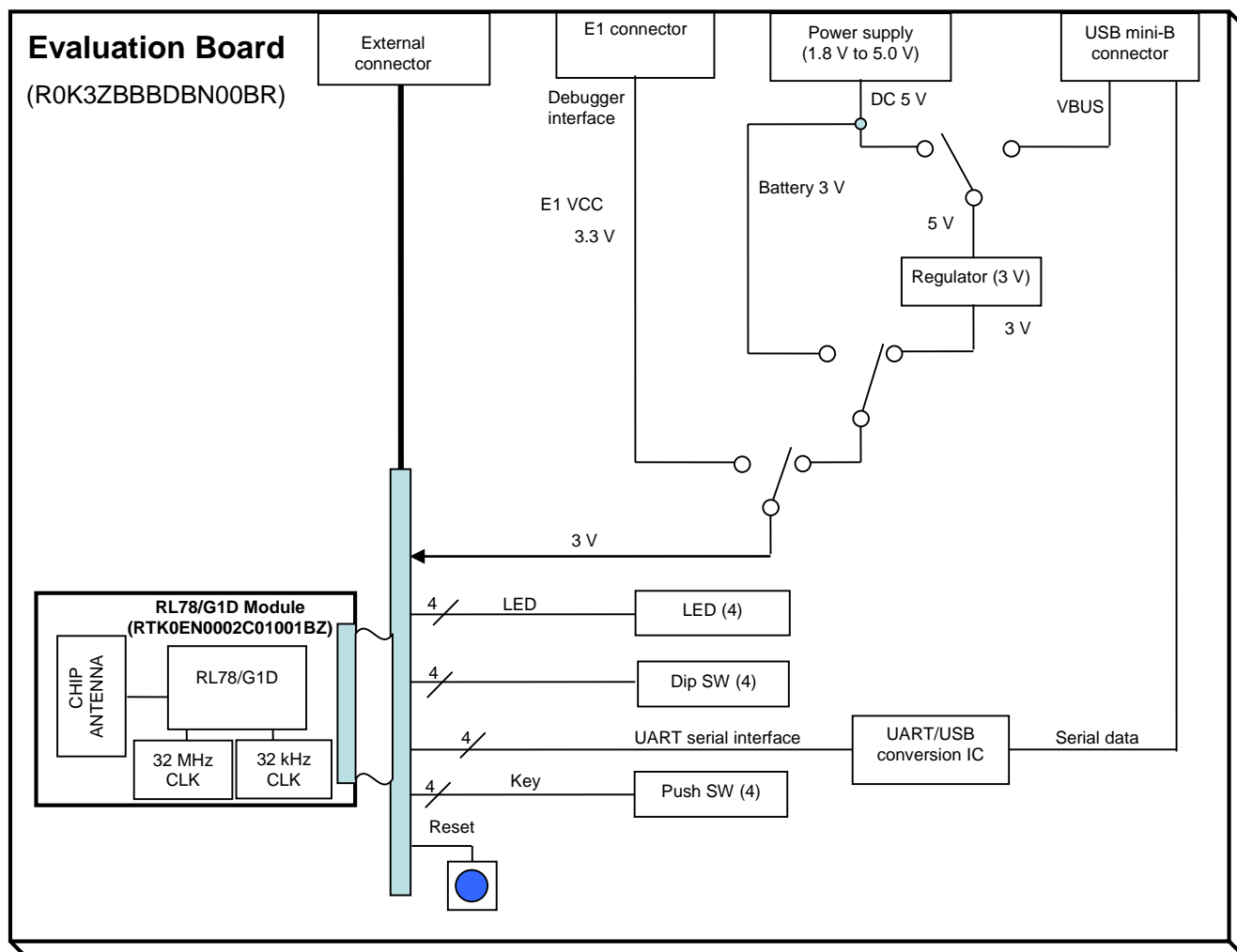


Figure 1-1 RL78/G1D Evaluation Board (RTK0EN0001D01001BZ) Block Diagram

## 1.1 Specification Outline

Table 1-1 shows the specifications of the RL78/G1D evaluation board.

**Table 1-1 RL78/G1D Evaluation Board Specifications**

Item	Contents
Wireless module	RL78/G1D module (RTK0EN0002C01001BZ)
USB communication	<ul style="list-style-type: none"> <li>• USB interface</li> <li>USB mini-B connector</li> <li>UART0 on the RL78/G1D can be used as a USB input/output port by using a UART-USB conversion device. When the board is connected to a computer, the computer virtually handles the USB port as a COM port for communication by using a device driver.</li> </ul>
Input functions	<ul style="list-style-type: none"> <li>• RESET switch</li> <li>• DIP switch (4-pole switch)</li> <li>• Push switches (four)</li> </ul>
Display	Four LEDs
Debug interface	2.54 mm pitch male connector with accidental insertion protection for connecting to an E1 emulator
Power supply voltage	<p>One of the following power supplies can be selected by using slide switches. (For the slide switches, see 6. <i>Power Supply</i>.)</p> <ol style="list-style-type: none"> <li>1. AC adapter 5.0 V or DC jack for battery box input Power supply jack: OD <math>\phi</math> 5.5 mm, ID <math>\phi</math> 2.0 mm, outside: minus, inside: plus</li> <li>2. USB VBUS 5 V</li> <li>3. 3.3 V supplied from E1 emulator</li> </ol>
Supply current	1 A or higher
Supply voltage for each part	Power supply for the RL78/G1D module: 1.8 V to 3.6 V
	Power supply for peripherals: 1.8 V to 3.6 V
Dimension	Board size: 55 mm x 90 mm x 18 mm
Operating ambient temperature/humidity	0°C to +60°C, 10% to 80% RH (non condensing)
Storage temperature	-15°C to +60°C, 10% to 80% RH (non condensing)

Note: This evaluation board does not include an AC adapter or battery box.

## 2. Detailed Specifications

### 2.1 RL78/G1D Evaluation Board Appearance

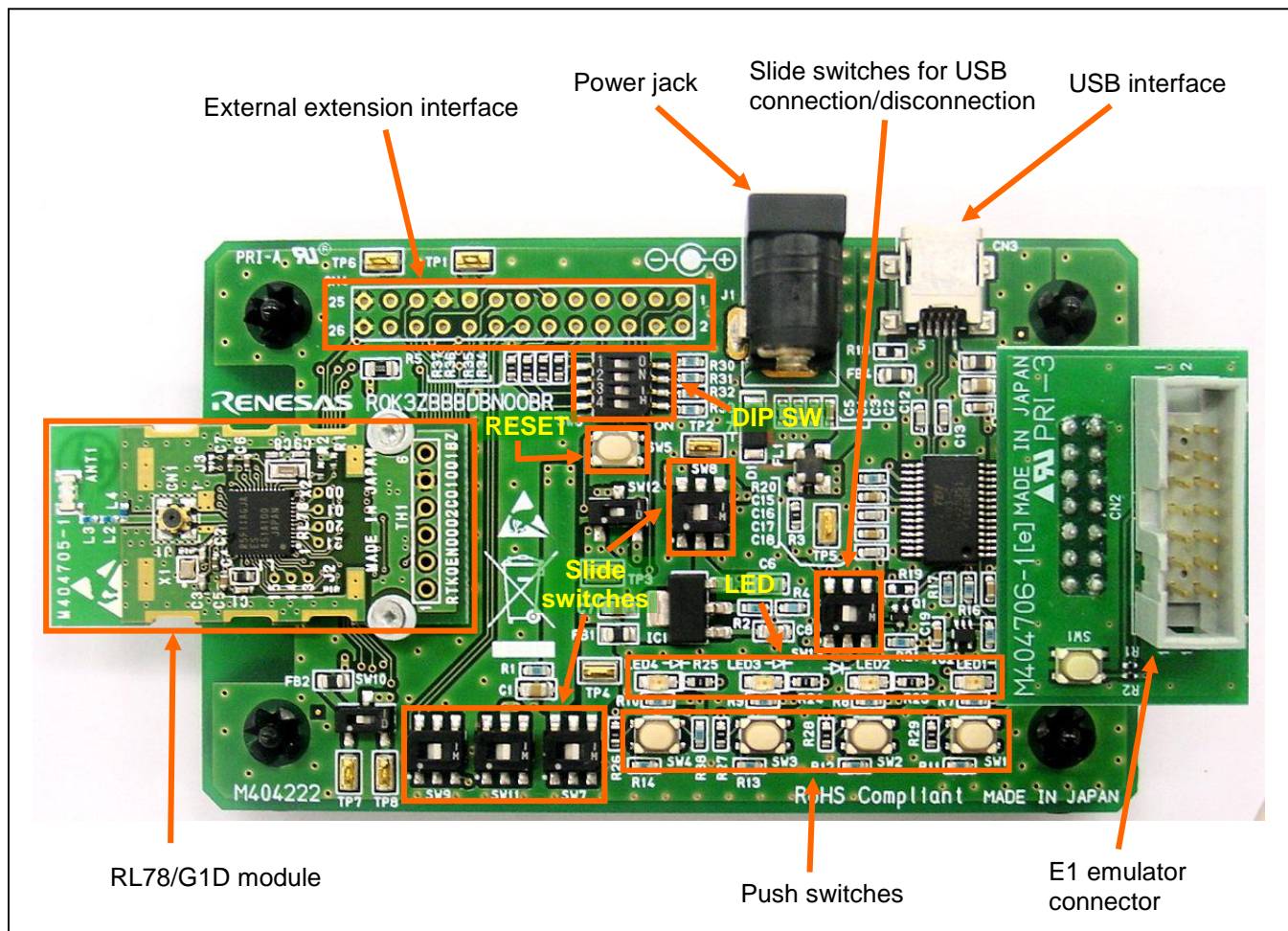


Figure 2-1 Board Appearance

## 2.2 Descriptions of Each Part

### (1) CN1 connector that connects the RL78/G1D module

The RL78/G1D module is connected to CN1 on the extension board for Bluetooth Low Energy evaluation.

Do not remove the module from the extension board. Otherwise, the module or the board might malfunction.

### (2) Slide switches for switching the power supply (SW7, SW8, and SW11)

The power supply for the evaluation board can be selected by using slide switches. Four types of power supplies are provided: AC adapter input (DC 5 V) from the DC jack (J1), battery box input (DC plug 3 V), USB VBUS input (5 V), and E1 input (3.3 V) available when the E1 emulator is connected.

If the AC adapter input (DC 5 V) or USB VBUS input (5 V) is selected, 3.0 V is generated by a regulator.

The AC adapter DC input, VBUS input, and E1 are switched by using the slide switches. Battery box input (3.0 V) and E1 input (3.3 V) can also be switched by using the slide switches.

### (3) I/O

The evaluation board has a USB interface, push switches, a DIP switch (SW6), and LEDs for I/O. The interface of the push switches, DIP switch, and LEDs can be electrically separated from the RL78/G1D module by removing the 0  $\Omega$  resistors.

### (4) E1 emulator connector

The E1 connector is provided to connect the Renesas Electronics on-chip debugging emulator E1 (sold separately).

### (5) RESET

The evaluation board has a RESET switch (SW5). Use this switch to reset the RL78/G1D module.

### (6) External extension interface

External extension interface pins are provided on the evaluation board in order to connect the I/O ports of the RL78/G1D module to an external system.



### 3. Settings

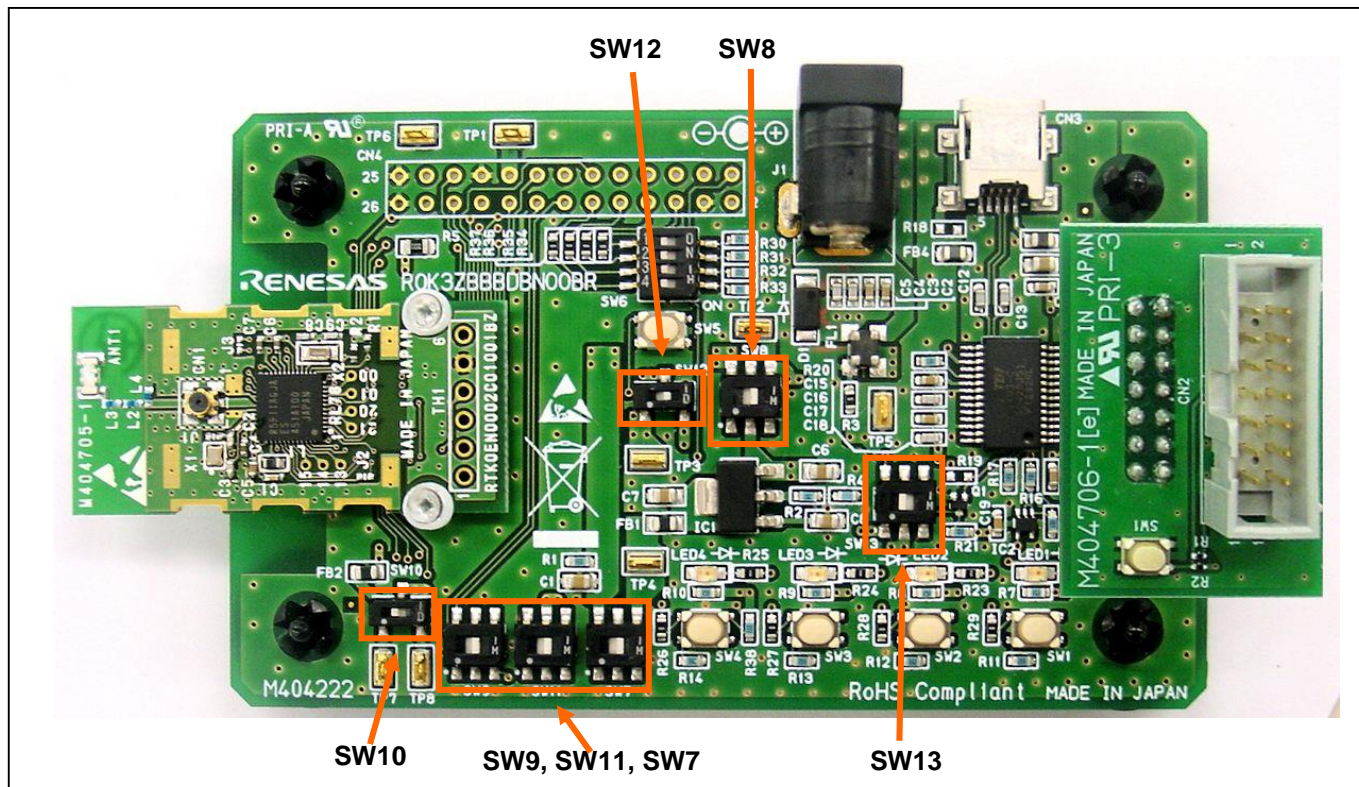
#### 3.1 Slide Switch Settings

Table 3-1 shows the functions implemented by using the slide switches on the evaluation board and their operations. In this table, the factory settings are shown in bold face and italicized. Figure 3-1 shows the positions at which the slide switches are placed, and Figure 3-2 shows the factory setting of the slide switches.

**Table 3-1 Functions of Slide Switches on R0K3ZBTM9D000BR**

No.	Function	1-2 connected (left)	2-3 connected (right)
SW7	Selects DC/VBUS or battery as the power supply.	Power is directly supplied from the battery.	<b><i>Power is supplied from the DC/VBUS via a regulator.</i></b>
SW8	Selects DC 5 V or VBUS as the power supply.	<b><i>Power is supplied from DC 5 V.</i></b>	Power is supplied from USB VBUS.
SW9	Switches between USB and external extension interface.	Connected to an external extension interface.	<b><i>Connected to a USB device.</i></b>
SW10	Switches the power supply line.	<b><i>Power is supplied to the module.</i></b>	The power supply line is left open. (Current consumption can be measured by using TP7 and TP8.)
SW11	Selects the E1 debugger (3.3 V) or another source as the power supply.	3.3 V is supplied directly from the E1 debugger.	<b><i>Power is supplied from a source other than the E1 debugger (3.3 V).</i></b>
SW12	Unused	Do not use this switch.	<b><i>Set this switch to the right.</i></b>
SW13	Connects or disconnects the USB interface. <sup>Note</sup>	<b><i>The USB interface is connected.</i></b>	The USB interface is disconnected.

Note: When not using the USB interface, set SW9 to '1-2 connected' and SW13 to '2-3 connected'; these disconnect the buffer power supply and prevent leak current flowing to the signal level conversion buffer connected between the RL78/G1D and UART-USB conversion IC.



**Figure 3-1 Mounting Positions of Slide Switches**

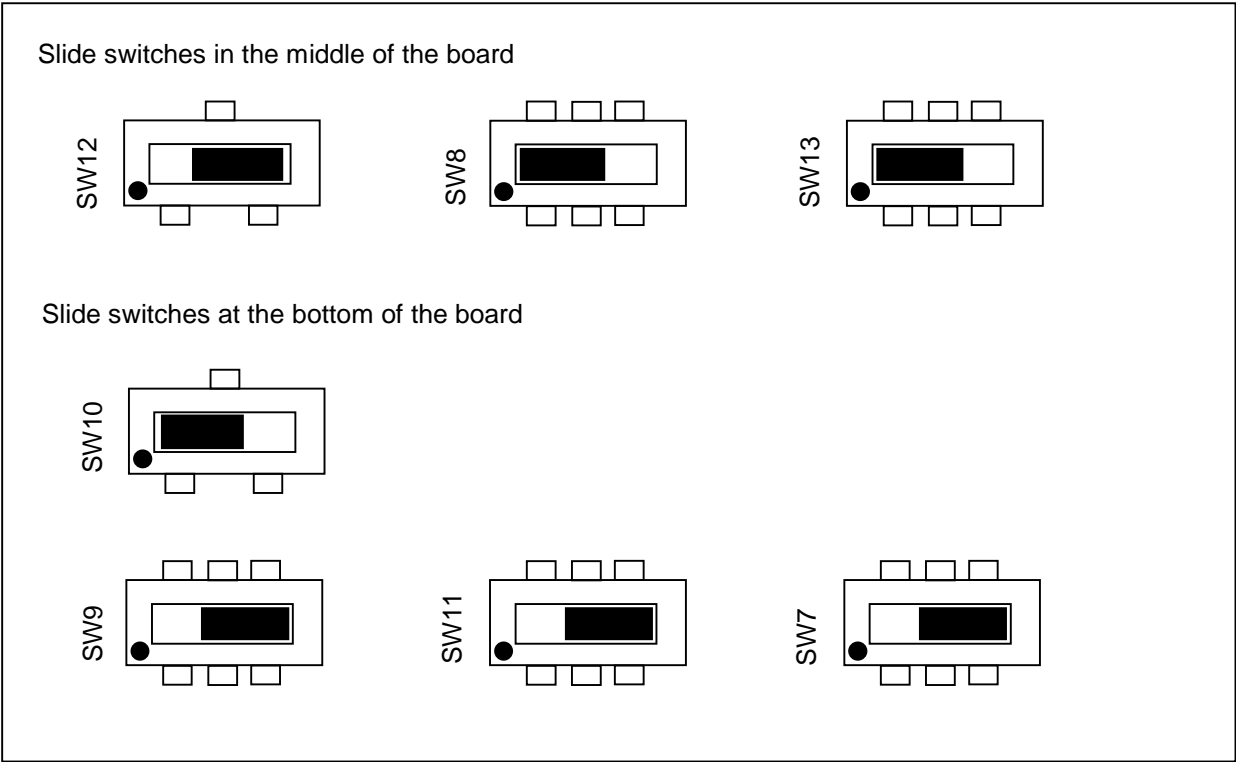


Figure 3-2 Slide Switches Factory Settings

## 4. Connector

### 4.1 RL78/G1D Module Interface

CN1 is used to connect the RL78/G1D module. Table 4-1 shows the assignment of the CN1 connector pins.

**Table 4-1 Assignment of CN1 Connector Pins**

Pin	Signal name	Pin	Signal name
1	VSS	13	P02/ANI17/ TXD1 / SW6-4
2	VDD	14	P10/SCK00/SCL00 / SW6-1
3	P40/TOOL0	15	GPIO0/TXSELH_RF / SW6-3
4	N.C.	16	P22/ANI2 / SW4
5	RESET	17	GPIO1/TXSELL_RF / SW6-2
6	N.C.	18	P23/ANI3 / SW3
7	P60/SCLA0 / LED4	19	N.C./ SW1
8	P61/SDAA0	20	P16/TI01/TO01/INTP5 / SW2
9	P03/ANI16/ RXD1 / LED3	21	VSS
10	P11/SI00/RXD0/SDA00 / RxD	22	P30/INTP3/RTC1HZ/UPON (VBUS detection)
11	P147/ANI18 / LED2	23	P120/ANI19 / LED1
12	P12/SO00/TXD0/TxD	24	N.C.

### 4.2 E1 Debug Interface

CN2 is used to connect Renesas Electronics on-chip debugging emulator E1 (sold separately) via conversion adapter. Table 4-2 shows the assignment of the CN2 connector pins when a conversion adapter is connected.

**Table 4-2 Assignment of CN2 Connector Pins**

Pin	Signal name	Pin	Signal name
1	N.C.	8	VDD
2	GND	9	VDD
3	N.C.	10	RESET#
4	N.C.	11	N.C.
5	TOOL0	12	GND
6	RESET_IN#	13	RESET#
7	N.C.	14	GND

### 4.3 USB Interface

CN3 is used to communicate with external devices by using the USB interface via a UART-USB conversion device. Table 4-3 shows the assignment of the CN3 connector pins.

**Table 4-3 Assignment of CN3 Connector Pins**

Pin	Signal name	Pin	Signal name
1	VBUS	4	N.C.
2	MD	5	GND
3	MP	6	CH

#### 4.4 External Extension Interface

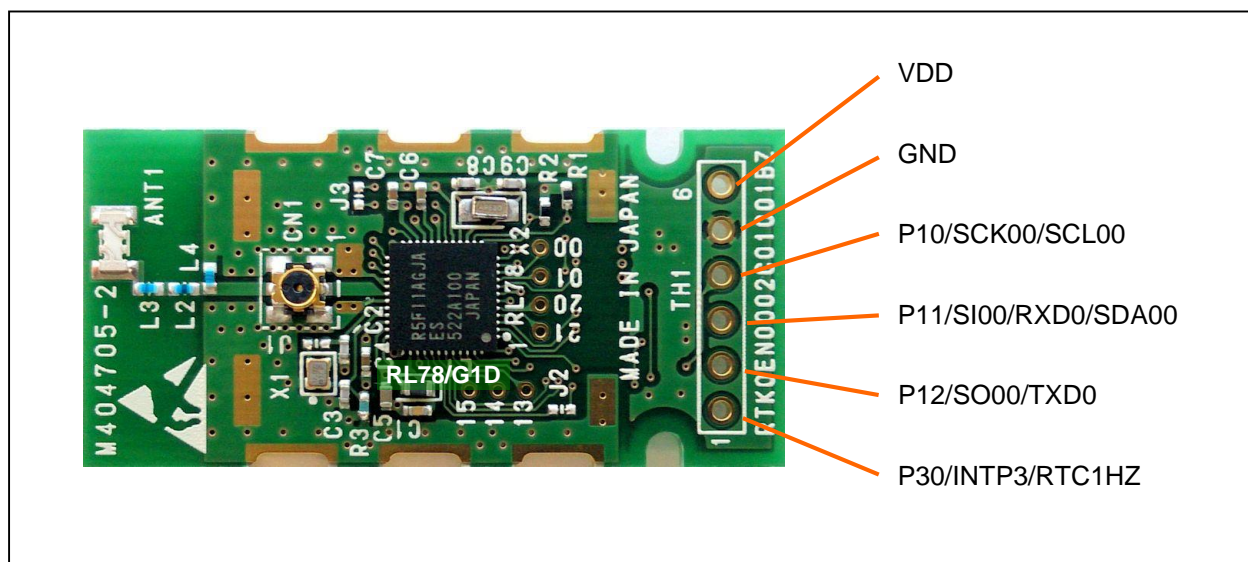
CN4 is provided as an external extension interface for when you want to connect and external device. Table 4-4 shows the assignment of the CN4 connector pins.

**Table 4-4 Assignment of CN4 External Extension Connector Pins**

Pin	Signal name	Pin	Signal name
1	P30/INTP3/RTC1HZ / UPON (VBUS detection)	14	P12/SO00/TXD0 / TxD
2	VCC3 (3V)	15	P120/ANI19 / LED1
3	P61/SDAA0	16	P11/SI00/RXD0/SDA00 / RxD
4	GND	17	VCC3
5	P23/ANI3 / SW3	18	N.C./ SW1
6	P10/SCK00/SCL00 / SW6-1	19	GND
7	P147/ANI18 / LED2	20	P16/TI01/TO01/INTP5 / SW2
8	GPIO1/TXSELL_RF / SW6-2	21	P40/TOOL0
9	P03/ANI16 /RXD1 LED3	22	RESET
10	GPIO0/TXSELH_RF / SW6-3	23	N.C.
11	P60/SCLA0 / LED4	24	5.0 V
12	P02/ANI17/SIO/TXD1 / SW6-4	25	GND
13	P22/ANI2 / SW4	26	GND

#### 4.5 Extension Interface of RL78/G1D Module

Through-holes are provided as an extension interface if you want to use the module as a standalone device. Figure 4-1 shows the pin assignment of the through-hole. Use the pins of CN1 and the through-hole exclusively.



**Figure 4-1 Assignment of Through-hole Pins**

## 5. I/O

General-purpose ports on the RL78/G1D module are connected to the extension board for Bluetooth Low Energy evaluation via connectors. This section describes the interface for each I/O.

### 5.1 Push Switches

To use the push switches, enable the pull-up resistors incorporated in the RL78/G1D module. The level of the corresponding general-purpose ports becomes high when the switches are off and low when the switches are on.

Table 5-1 shows the relationship between the push switch ports and the RL78/G1D module.

**Table 5-1 Push Switches**

	Pin No.	Port
SW1	CN1-19	N.C.
SW2	CN1-20	P16
SW3	CN1-18	P23
SW4	CN1-16	P22

Remark: Enable the on-chip pull-up resistor connected to P16 (in input mode) on the RL78/G1D. P22 is pulled up on the extension board for Bluetooth Low Energy evaluation. Connect a resistor of 100 kΩ to CN4 to pull up P23.

### 5.2 DIP Switch

To use the DIP switch, enable the pull-up resistors on the RL78/G1D module. The level of the corresponding general-purpose ports becomes high when the switch is set to off and low when the switch is set to on. At shipment, SW6-1 to SW6-4 are set to off. Table 5-2 shows the relationship between the DIP switch and the RL78/G1D module ports.

**Table 5-2 DIP Switch**

	Pin No.	Port
SW6-1	CN1-14	P10
SW6-2	CN1-17	—
SW6-3	CN1-15	—
SW6-4	CN1-13	P02

### 5.3 LEDs

The LEDs on the evaluation board are turned off when a high level is output to the corresponding general-purpose port and turned on when a low level is output.

Table 5-3 shows the relationship between the LEDs and the RL78/G1D module ports.

**Table 5-3 LED**

	Pin No.	Port
LED1	CN1-23	P120
LED2	CN1-11	P147
LED3	CN1-9	P03
LED4	CN1-7	P60

Remark: The LEDs become dim when the voltage is 2.2 V or lower.

### 5.4 USB Interface

By using a UART-USB conversion device, the evaluation board can use UART0 on the RL78/G1D to communicate with an external device. To communicate with a computer, connect a USB cable (A type male or mini-B male) to the CN3 connector. Communication with a computer does not require flow control.

A circuit to detect connection to a computer is also provided. When a low level is input to general-purpose port P30 on the RL78/G1D module, it indicates that the evaluation board is connected to the computer. When a high level is input, it indicates that the evaluation board is not connected.

When not using the USB interface, set the slide switch SW9 to '1-2 connected' and SW13 to '2-3 connected'; these disconnect the buffer power supply and prevent leak current flowing from the signal level conversion buffer between the RL78/G1D and UART-USB conversion IC.

Table 5-4 shows the relationship between the USB interface and the RL78/G1D module ports.

**Table 5-4 USB Interface**

	Pin No.	Port
UPON (VBUS detection)	CN1-22	P30
TxD	CN1-12	P12
RxD	CN1-10	P11

To communicate with an external device via the USB interface by using UART0 of RL78/G1D, a UART-USB conversion device driver must be installed in the computer. Install the driver referring to the appendix in this document.

For detailed specifications of UART-USB conversion, see the manual of the UART-USB conversion IC FT232RL (manufactured by Future Technology Devices International Ltd. in the UK).

## 6. Power Supply

### 6.1 Power Line System

The evaluation board operates on the power supply selected by using the slide switches: AC adapter input (DC 5 V) from the jack (J1), battery box input (DC plug 3 V), USB VBUS input (5 V), or E1 input (3.3 V; when the E1 emulator is connected). Do not select 5 V when connection is established by E1 emulator software.

When the AC adapter input (DC 5 V) or USB VBUS input (5 V) is selected, 3.0 V is generated by the regulator. Figure 6-1 shows the power line system.

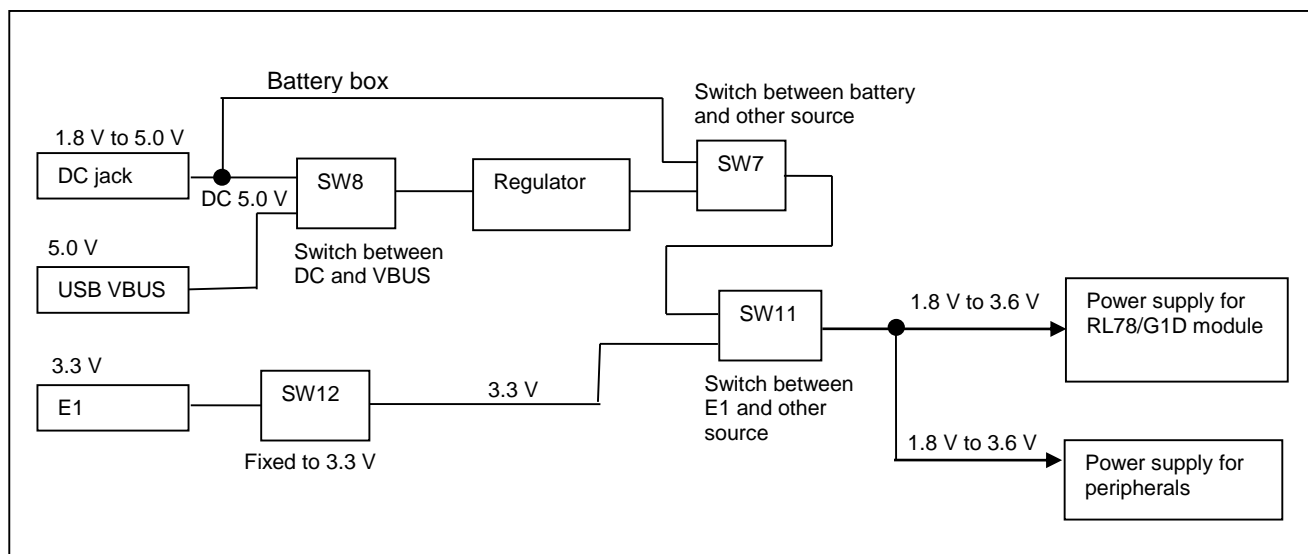


Figure 6-1 Power Line System



Table 6-1 shows operating modes and the settings of the slide switches for power supply input.

**Table 6-1 Major Blocks Using Power Supply**

Operating mode		Settings of slide switches			Host interface connection (P3_0)
		SW11	SW7	SW8	
Host interface used	DC 5 V power supply input	Pin 3 side (other power supply)	Pin 3 side (DC/VBUS)	Pin 1 side (DC 5 V)	L
	VBUS power supply input	Pin 3 side (other power supply)	Pin 3 side (DC/VBUS)	Pin 3 side (VBUS)	L
	Battery box input	Pin 3 side (other power supply)	Pin 1 side (battery)	–	L
	E1 power supply 3.3 V	Pin 3 side (E1 (3.3 V))	–	–	L
Host interface not used	DC 5 V power supply input	Pin 3 side (other power supply)	Pin 3 side (DC/VBUS)	Pin 1 side (DC 5 V)	H
	Battery box input	Pin 3 side (other power supply)	Pin 1 side (battery)	–	H
	E1 power supply (3.3 V)	Pin 1 side (E1 (3.3 V))	–	–	H

–: Setting not specified.

For SW12, see 3.1.

## 6.2 DC Jack Input Power

Table 6-2 shows the specifications of the power input from the DC jack on the evaluation board.

**Table 6-2 DC Jack Input Power**

Item	Specification
Plug	OD $\phi$ 5.5 mm, ID $\phi$ 2.0 mm
Polarity of plug	Outside: minus, inside: plus
Input voltage	1.8 V to 5.0 V
Supply current	1 A or higher



## 7. Notes

This evaluation board includes the extension board for Bluetooth Low Energy evaluation and the RL78/G1D module, which are connected together via a connector and attached by screws and washers. Note that neither the extension board nor the module is covered by warranty if they are detached from each other.

### Direction on WEEE (Waste Electrical and Electronic Equipment Directive)



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### CAUTION

This equipment should be handled like a CMOS semiconductor device. The user must take all precautions to avoid build-up of static electricity while working with this equipment. All test and measurement tool including the workbench must be grounded. The user/operator must be grounded using the wrist strap. The connectors and/or device pins should not be touched with bare hands.

EEDT-ST-004-10

## 8. Circuit Diagrams

### 8.1 Diagram of RL78/G1D Module Connection

A diagram of the RL78/G1D module (RTK0EN0002C01001BZ) connection is shown on the next page.



## 8.2 Circuit Diagrams of Extension Board for Bluetooth Low Energy Evaluation

Circuit diagrams of the extension board for Bluetooth Low Energy evaluation (R0K3ZBBDBN00BR) are shown on the following pages.

R30UZ0048EJ0130 Rev.1.30  
Dec. 1, 2015

[illegible]

## Appendix A. The UART- USB Conversion Device Driver

To communicate with an external device via the USB interface by using UART0 of the RL78/G1D, a UART-USB conversion device (FT232RL) driver must be installed in the computer.

Before connecting the evaluation board to the computer, download the UART-USB conversion IC (FT232RL) driver from the website of FTDI (Future Technology Devices international Ltd.) and install it on your computer.

## Appendix B. Conformity Assessment

RL78/G1D evaluation board (RTK0EN0001D01001BZ) conforms to the laws and regulations that are described in the following.

### FCC/IC Regulatory

Since this module is not sold to general end users directly, there is no user manual of module.

For the details about this module, please refer to the specification sheet of module.

This module should be installed in the host device according to the interface specification (installation procedure).

The following information must be indicated on the host device of this module;

Contains FCC ID: 2AEMX-G1DEVA

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Contains IC: 20194-G1DEVA

The following statements must be described on the user manual of the host device of this module;

[for FCC]

#### FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person's body.

[for IC]

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes : 1) l'appareil ne doit pas produire de brouillage; 2)

l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement émet une énergie RF très faible qui est considérée conforme sans évaluation de l'exposition maximale autorisée. Cependant, il est souhaitable qu'il devrait être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.



**Korea Radio Regulations**

MSIP-CRM-R5E-G1DEVA

해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없습니다.

**China SRRC**

1.

- 使用频率: 2.4 - 2.4835 GHz
- 等效全向辐射功率 (EIRP):  
天线增益 < 10dBi 时:  $\leq 100 \text{ mW}$  或  $\leq 20 \text{ dBm}$
- 最大功率谱密度:  
天线增益 < 10dBi 时:  $\leq 20 \text{ dBm} / \text{MHz}$  (EIRP)
- 载频容限: 20 ppm
- 带外发射功率 (在 2.4-2.4835GHz 频段以外)  
 $\leq -80 \text{ dBm} / \text{Hz}$  (EIRP)
- 杂散发射 (辐射) 功率 (对应载波  $\pm 2.5$  倍信道带宽以外):  
 $\leq -36 \text{ dBm} / 100 \text{ kHz}$  (30 - 1000 MHz)  
 $\leq -33 \text{ dBm} / 100 \text{ kHz}$  (2.4 - 2.4835 GHz)  
 $\leq -40 \text{ dBm} / 1 \text{ MHz}$  (3.4 - 3.53 GHz)  
 $\leq -40 \text{ dBm} / 1 \text{ MHz}$  (5.725 - 5.85 GHz)  
 $\leq -30 \text{ dBm} / 1 \text{ MHz}$  (其它 1 - 12.75 GHz)

2. 不得擅自更改发射频率、加大发射功率 (包括额外加装射频功率放大器), 不得擅自外接天线或改用其它发射天线;
3. 使用时不得对各种合法的无线电通信业务产生有害干扰; 一旦发现有干扰现象时, 应立即停止使用, 并采取措施消除干扰后方可继续使用;
4. 使用微功率无线电设备, 必须忍受各种无线电业务的干扰或工业、科学及医疗应用设备的辐射干扰;
5. 不得在飞机和机场附近使用。

**R&TTE Directive**

We hereby declare that this product is in compliance with the essential requirements and other EC relevant provisions of Directive 1999/5/EC.

Declaration of Conformity (DoC) is shown on the next page.



**Renesas Electronics Corporation**  
3-2-24, Toyosu, Koto-ku, Tokyo, 135-0061, Japan

## DECLARATION of CONFORMITY For



Product: RL78/G1D Evaluation Board  
Model: RTK0EN0001D01001BZ

**Supplied by**  
Renesas Electronics Corporation  
3-2-24 Toyosu Koto-ku Tokyo 135-0061  
Japan

**Technical File held by**  
Renesas Electronics Corporation  
3-2-24 Toyosu Koto-ku Tokyo 135-0061  
Japan

**Notified Body - R&TTE Directive**  
N/A N/A

<b>R&amp;TTE Directive</b> <b>(Article 3.1(a) Safety)</b>	<b>Standard used for comply</b> EN 60950-1: 2006 + Amd.11: 2009 + Amd.1: 2010 + Amd.12: 2011 + Amd.2: 2013 EN 62479: 2010 EN 62311: 2008
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<b>R&amp;TTE Directive</b> <b>(Article 3.1(b) EMC)</b>	EN 301 489-1 V1.9.2 EN 301 489-17 V2.2.1
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<b>R&amp;TTE Directive</b> <b>(Article 3.2 Spectrum)</b>	EN 300 328 V1.8.1
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### Means of Conformity

We declare under our sole responsibility that the Product (s) is conformity with the essential requirements and other relevant requirements of the Radio and Telecommunication Terminal Equipment (R&TTE) Directive (1999/5/EC).

**Date of issue:** August 28, 2015

**Signature of Responsible Person:**

Koji Oba  
Expert  
2nd Solution Business Unit Mass Market &  
Emerging Country Business Division General  
Purpose Solution Department



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RL78/G1D User's Manual: Evaluation Board

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Refer to "<http://www.renesas.com/>" for the latest and detailed information.

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