Introduction

This document represents Solution Kit’s Activity Module. The document describes hardware platform information such as connection interface, RL78/G1D-SK Bluetooth® module interface and its Bluetooth® connectivity, and schematics.

Target Device

RL78/G1D Group and Synergy® Device

This Solution Kit's Activity Module includes power supply, user interface like vibrator, LED, LCD and buttons, accelerometer, light sensor, temperature sensor. The RL78/G1D-SK Target Board or Synergy Module can be added to develop and/or demo the Solution Kit functions.
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1. Overview

Activity Module contains two sections: Sensing and processing. This Activity Module has peripheral sensors as well as provides three board-to-board connectors for interfacing to processing board such as RL78/G1D Target Board [3] and Synergy Board S3 Target Board.

Figure 1 shows top view of the Activity Module and its dimension.

![Activity Module](image)

**Figure 1 Activity Module**

1.1 Specification Outline

The specification of Activity Module is described as below Table 1.

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
<td>56 mm x 64 mm</td>
</tr>
<tr>
<td>Operation Power Supply Voltage</td>
<td>3.3 V</td>
</tr>
<tr>
<td>Maximum Power Supply Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Operating Ambient Temperature/Humidity</td>
<td>0°C to +60°C, 10% to 80% RH (non condensing)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−15°C to +60°C, 10% to 80% RH (non condensing)</td>
</tr>
</tbody>
</table>
2. Activity Module System

The Activity Module is designed to use with RL78/G1D Solution Kit Target Board or PMOD™ module, which includes RL78/G1D-SK Bluetooth® module. There are three board-to-board connectors to plug in to this Activity Module for Target Board and one right angle 12-pin connector for PMOD module. This module has user interface like LCD, LEDs, switch buttons and vibrator motor; power supply with battery, battery charger, and Fuel Gauge; various sensors such as accelerometer, ambient temperature sensor and Light sensor. Figure 2 shows system block diagram of the Activity Module. Its functionality and interface with RL78/G1D target board are listed in Table 2.

![Activity Module system block diagram](image)

Table 2 Activity Module Functionality and Interface

<table>
<thead>
<tr>
<th>Functionality</th>
<th>RL78/G1D Peripherals</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Not in use</td>
<td>Display buffer transferred over SPI via DTC ending in interrupt; minimizes CPU involvement</td>
</tr>
<tr>
<td>Display VCOM</td>
<td>Not in use</td>
<td>Display requires 1 Hz signal at all times; RTCOUT operates across all MCU low power modes</td>
</tr>
<tr>
<td>Vibrator Motor</td>
<td>TO04, PWM output</td>
<td>Timer array unit configured to drive PWM signal; lower power to vibrator motor, vary intensity</td>
</tr>
<tr>
<td>Backlight for Display</td>
<td>Not in use</td>
<td>Multi-Function timer unit configured to drive PWM signal; lower power to LEDs; vary intensity</td>
</tr>
<tr>
<td>LEDs</td>
<td>P40, Output</td>
<td>The LEDs for application indicator</td>
</tr>
<tr>
<td>Buttons</td>
<td>P30, P147</td>
<td>Interrupt input P30 and general-purpose input P147 are used as key input active low level.</td>
</tr>
<tr>
<td>Ambient Temperature &amp; Light Sensor</td>
<td>SCLA0, IFC</td>
<td>Dedicated I2C peripheral operating as master</td>
</tr>
<tr>
<td>Functionality</td>
<td>RL78/G1D Peripherals</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Accelerometer</td>
<td>CSI00, and control Input, output</td>
<td>BMX055 configured with FIFO so all data transmitted from FIFO by DMA to MCU RAM in data blocks representing X, Y, Z data; 3 programmable interrupts; minimal CPU involvement and overhead</td>
</tr>
<tr>
<td>Qi Charger</td>
<td>Not in use</td>
<td>Interrupt indicating battery charging</td>
</tr>
<tr>
<td>Fuel Gauge</td>
<td>SCL20, I2C</td>
<td>Smart single cell fuel gauge to report battery conditions; interrupt or battery low condition</td>
</tr>
<tr>
<td>Watch / Clock</td>
<td>RTC</td>
<td>RTC used to update watch as well as trigger alarm events</td>
</tr>
</tbody>
</table>

Note: “Not in use” means that the peripheral is reserved for add-on feature. For detail, refer Electrical Specifications of RL78/G1D User’s Manual: Hardware, R01UH0515EJ0110 [1].
3. Operating Activity Module

This Activity Module can be used as development platform with either RL78/G1D Solution Kit- Target board or Synergy S3 target board. When use with Synergy target board, use PMOD module for Bluetooth® communication. The RL78/G1D target board has adaptor with 14-pin E1 programmer/debugger connector. Using E1, you can debug or program to the target board. Refer Renesas website for using E1 programmer/debugger tool and detail project development.

- **Power Supply**
  The Activity Module has Qi wireless charging system, USB Battery charger and Fuel Gauge along with Lithium-ion Battery. It can detect the target board’s power supply whether supports 5 volt or 3.3 volt. If the target processing board is available 5-volt power supply, the onboard 3.3-volt power supply will shut down automatically.

- **User Interface**
  The Activity Module has two active low push buttons; one dual-color LED (Blue and Red), one LCD and one vibrator for user interface system. The LCD display is add-on feature.

- **Sensor**
  For ambient sensing, the Activity Module includes accelerometer for gyroscope and triaxial geomagnetic sensing, one sensor for temperature and humidity sensing, one light sensor, and one pressure sensor.
4. Circuit Diagrams
Appendix A - References

[3] RL78/G1D Solution Kit-Target Board Hardware Manual, R01AN2958EU0100_RL78G1D Rev.1.00, July 31, 2016
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Renesas Electronics Website
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# Revision History

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Page</th>
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<tbody>
<tr>
<td>1.00</td>
<td>July 31, 2016</td>
<td>—</td>
<td>First edition issued</td>
</tr>
</tbody>
</table>
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   The state of the product is undefined at the moment when power is supplied.
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   - 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

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   Access to reserved addresses is prohibited.
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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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