

RL78/G13

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Utilising the Snooze Mode Sample Code

Introduction

The purpose of this Application Note is to show the user how to add the associated RL78/G13 sample code to a new or existing CubeSuite+ workspace; as well as give an explanation of what the sample code does.

The sample code demonstrates low power operating mode. The CPU and all peripherals are configured to run off the internal high speed oscillator. The CPU is placed in low power (snooze) mode by executing the STOP instruction which stops the internal high speed oscillator's oscillations. The CPU is woken up from snooze mode by an interrupt request from the interval timer; which in turn triggers an A/D conversion.

Target Device

RL78/G13

Contents

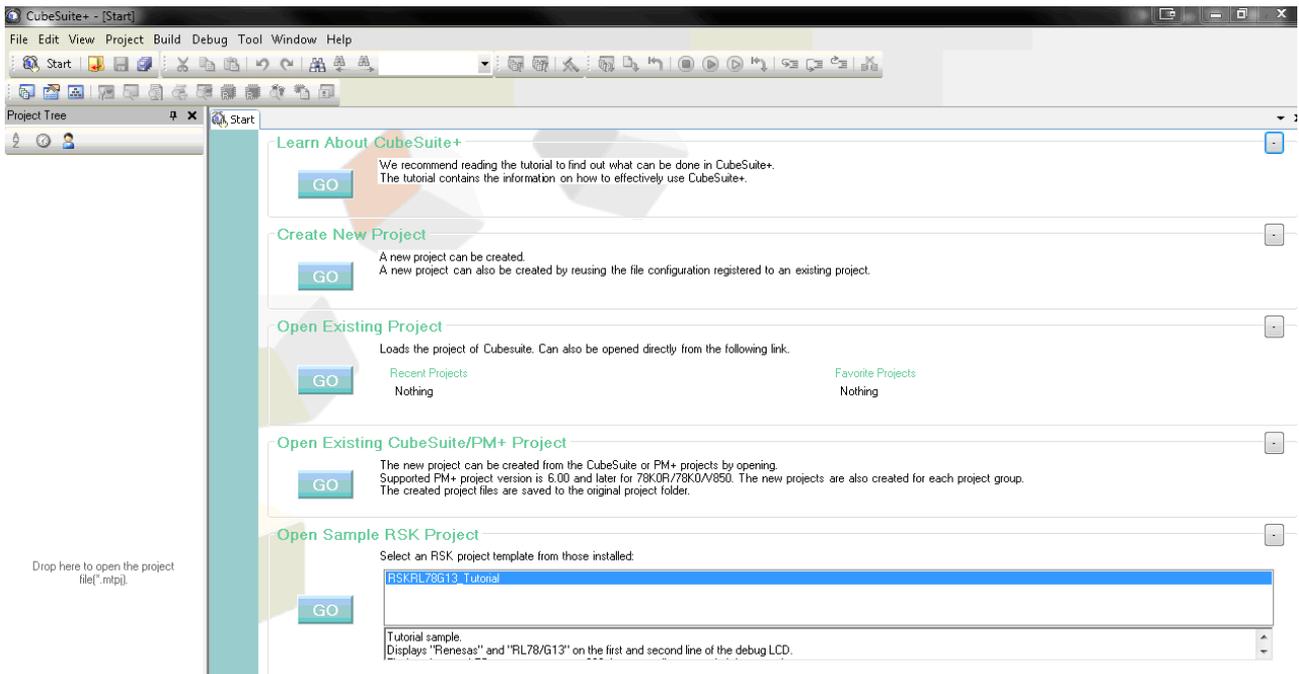
1. Installation	2
2. Creating the Project Workspace	2
3. Opening Sample Code and Source Files	4
4. Source Code Functionality	4
5. Code Execution	5
6. Website, Inquiries and Support	5
7. Revision Record	6

1. Installation

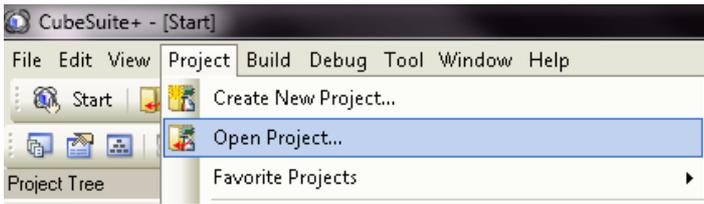
This section assumes CubeSuite+ IDE is already installed on the user's personal computer (PC). Create a new folder and name it as 'RSKRL78G13_Workspace'. Copy the zipped file Snooze.zip, available in the Application Note package downloaded from the website, to this folder. Extract the Snooze.zip file to the RSKRL78G13_Workspace folder.

2. Creating the Project Workspace

Open CubeSuite+ IDE by clicking the Windows Start button, select All Programs > Renesas Electronics CubeSuite+ > CubeSuite+.



From the menu bar select File > Project > Open Project...

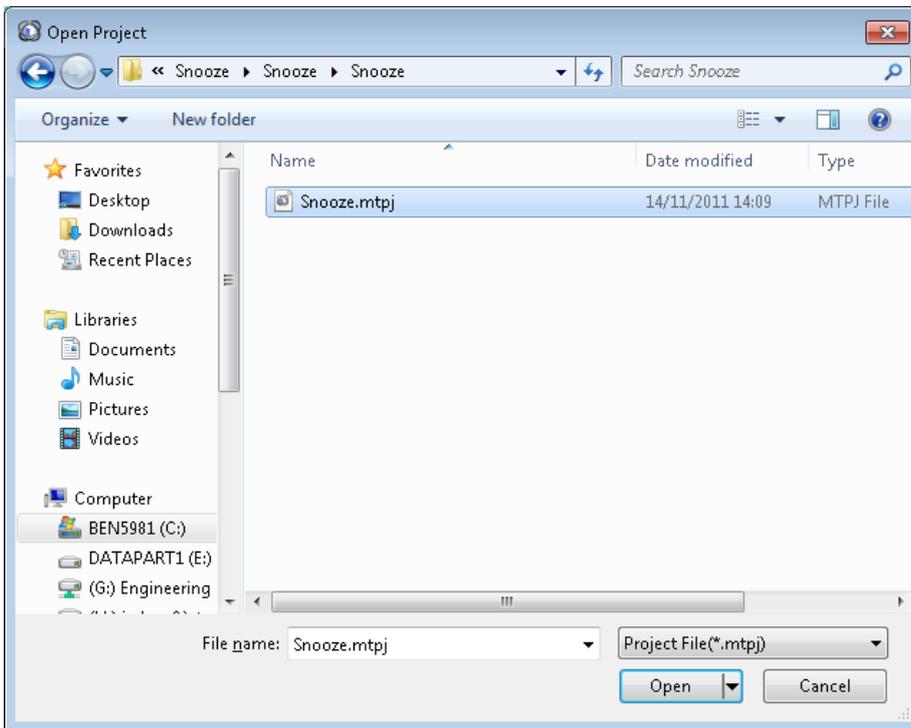


CubeSuite+ will open a dialog.

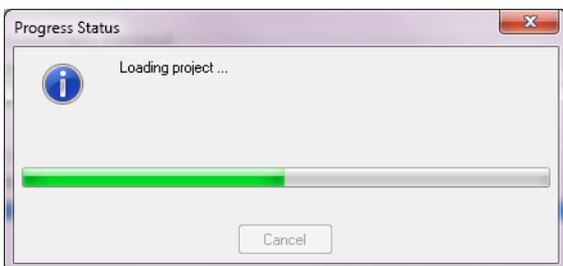
Navigate to the unzipped Snooze folder located in RSKRL78G13_Workspace.

Select the Snooze.mtpj file.

Click <Open>.

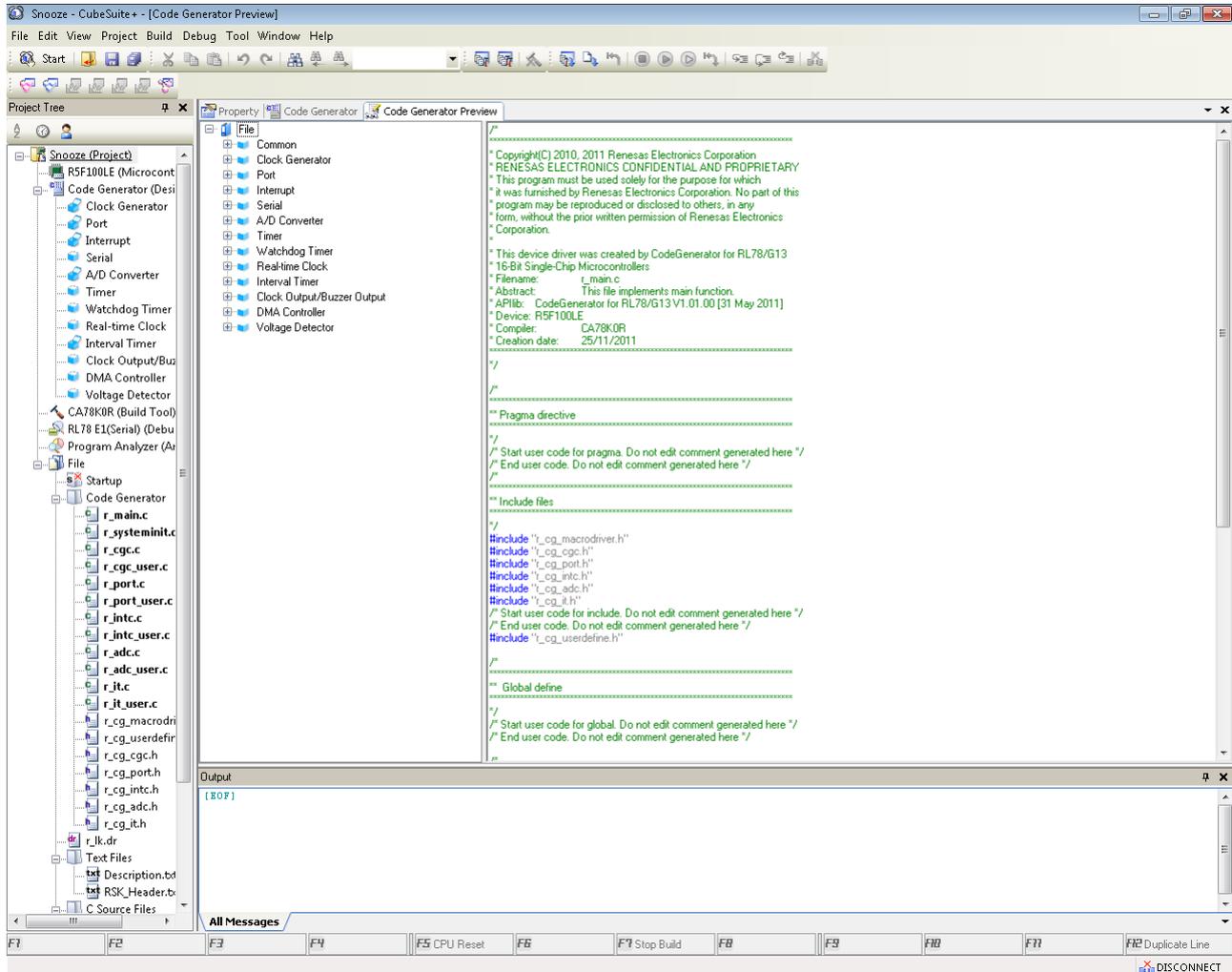


A Progress Status dialog will appear briefly whilst CubeSuite+ loads the project.



3. Opening Sample Code and Source Files

Once the project has been opened, the source code and all dependant files can be opened in the editor by expanding the folders in the Project Tree window and double clicking the files listed. All files have been grouped according to their file type.



4. Source Code Functionality

The source code project is specifically written to run on the appropriate RSK. However this source code can be useful as an example even without the RSK.

The project was written using source files containing API functions generated using Code Generator. The project will contain a C source file 'r_main.c'. This source file includes the C function main(). All source files and dependant files whose filenames are prefixed with 'r_' were generated using Code Generator.

5. Code Execution

By default the debug LCD is not used and should not be connected to the LCD header as it increases the current consumption. If the user wishes to use the LCD, open the `r_cg_userdefine.h` header file and uncomment the following line:

```
///#define USE_LCD
```

1. Remove R22 and connect an ammeter at J6. Make sure the ammeter is turned on and set for current sensing mode.
2. Compile the sample code, and download to the RSK. Click the 'Restart' button to start the program execution.
3. Press switch SW1 to do an A/D conversion based on the current potentiometer's position. LED0 will turn on to indicate normal operating mode. Observe the result on the ebug LCD. Adjust the potentiometer shaft, press SW1 and observe the new result. Make note of the current consumption.
4. Press SW2 to execute a STOP instruction and send the CPU into snooze mode. LED0 will turn off and LED1 will turn on to indicate snooze mode. The current consumption will decrease whilst in snooze mode.
5. Adjust the potentiometer shaft. Press SW3 to start the interval timer. The timer's interrupt signal wakes the CPU from snooze mode and triggers an A/D conversion. The result is displayed on the LCD. LED1 will turn off. The CPU returns to normal operating mode. The current consumption should be the same as the one noted in Step 3.
6. Go to Step 3 to repeat the demonstration.

6. Website, Inquiries and Support

Renesas Electronics Website

<http://www.renesas.com/>

Inquiries

<http://www.renesas.com/inquiry>

Support

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7. Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	Nov 23, 2011	—	First edition issued

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

1. Handling of Unused Pins

Handle unused pins in accord 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

The state of the product is undefined at the moment 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 moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

Access to reserved addresses is prohibited.

- The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

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.

- 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. Moreover, 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.

5. Differences between Products

Before changing from one product to another, i.e. to one with a different type number, confirm that the change will not lead to problems.

- The characteristics of MPU/MCU in the same group but having different type numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different type numbers, implement a system-evaluation test for each of the products.

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Renesas Electronics America Inc.

2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited

1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.

7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.

Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited

Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852-2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.

13F, No. 363, Fu Shing North Road, Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886-2-8175-9670

Renesas Electronics Singapore Pte. Ltd.

1 HarbourFront Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001

Renesas Electronics Malaysia Sdn.Bhd.

Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.

11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141