

# RL78/G1C

R01AN1743EG0100

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## Utilising Timer Capture for Cubesuite+

### Introduction

The purpose of this Application Note is to show the user how to add the associated RL78/G1C sample code to a new or existing CubeSuite+ workspace; as well as give an explanation of what the sample code does.

The sample code provided with this Application Note runs on the RL78/G1C RSK and demonstrates usage of the Timer Array Unit's (TAU) ability to count external events. An event is either a rising or falling edge signal. In this sample code, an event is a falling edge signal. The TAU has the capability to filter noises on the signal input.

### Target Device

RL78/G1C

### Development environment

IDE: Cubesuite+

Compiler: CA78K0R

Hardware: Renesas Starter Kit for RL78/G1C

### Contents

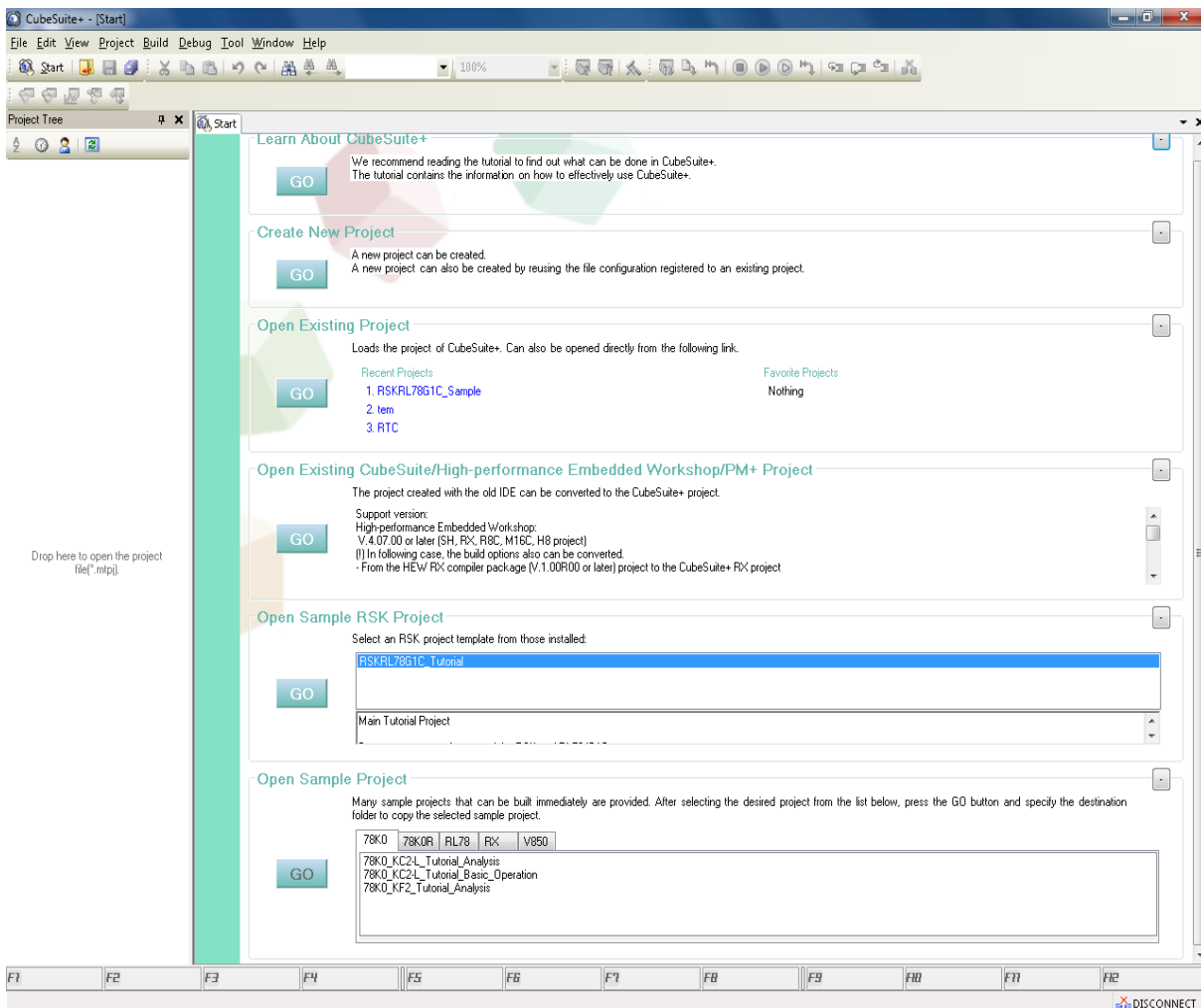
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## 1. Installation

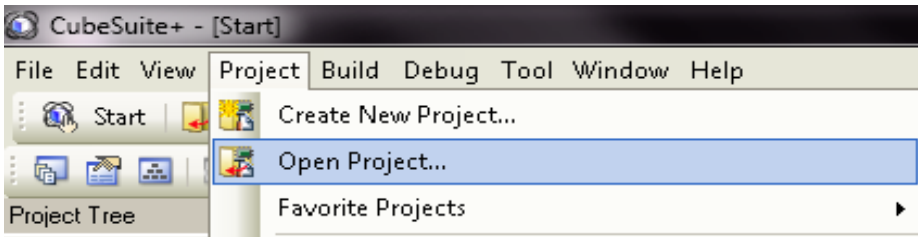
This section assumes CubeSuite+ IDE is already installed on the user's personal computer (PC). Create a new folder and name it as 'RSKRL78G1C\_Workspace'. Copy the zipped file 'an\_r01an1743eg0100\_r178g1c\_timer.zip', available in the Application Note package downloaded from the website, to this folder. Extract the 'an\_r01an1743eg0100\_r178g1c\_timer.zip' file to the RSKRL78G1C\_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...

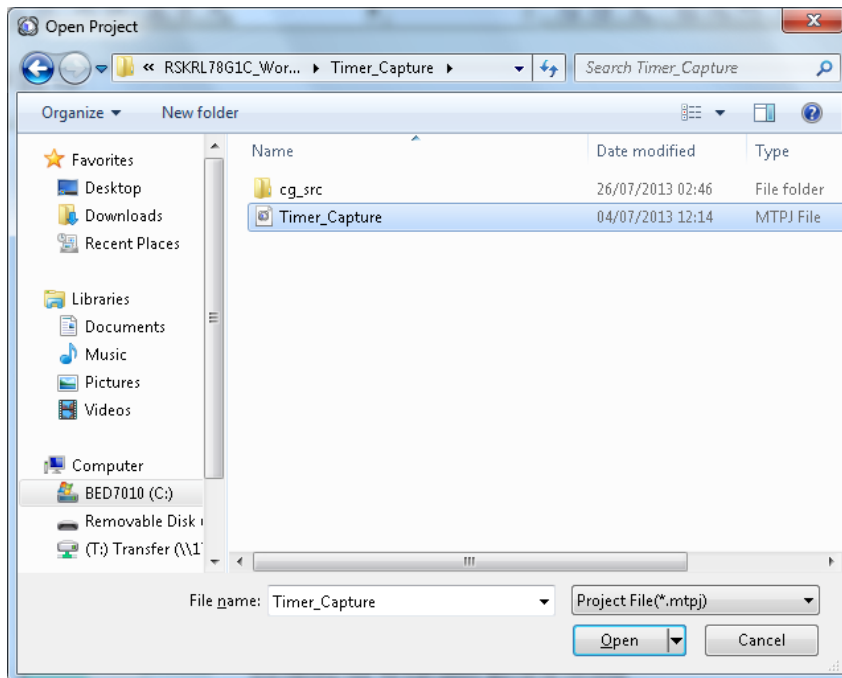


CubeSuite+ will open a dialog.

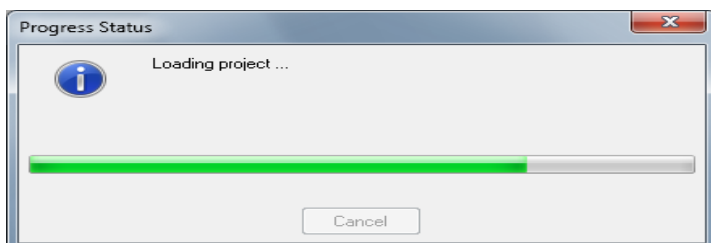
Navigate to the unzipped Timer\_Capture folder located in RSKRL78G1C\_Workspace.

Select the Timer\_Capture.mtpj file.

Click <Open>

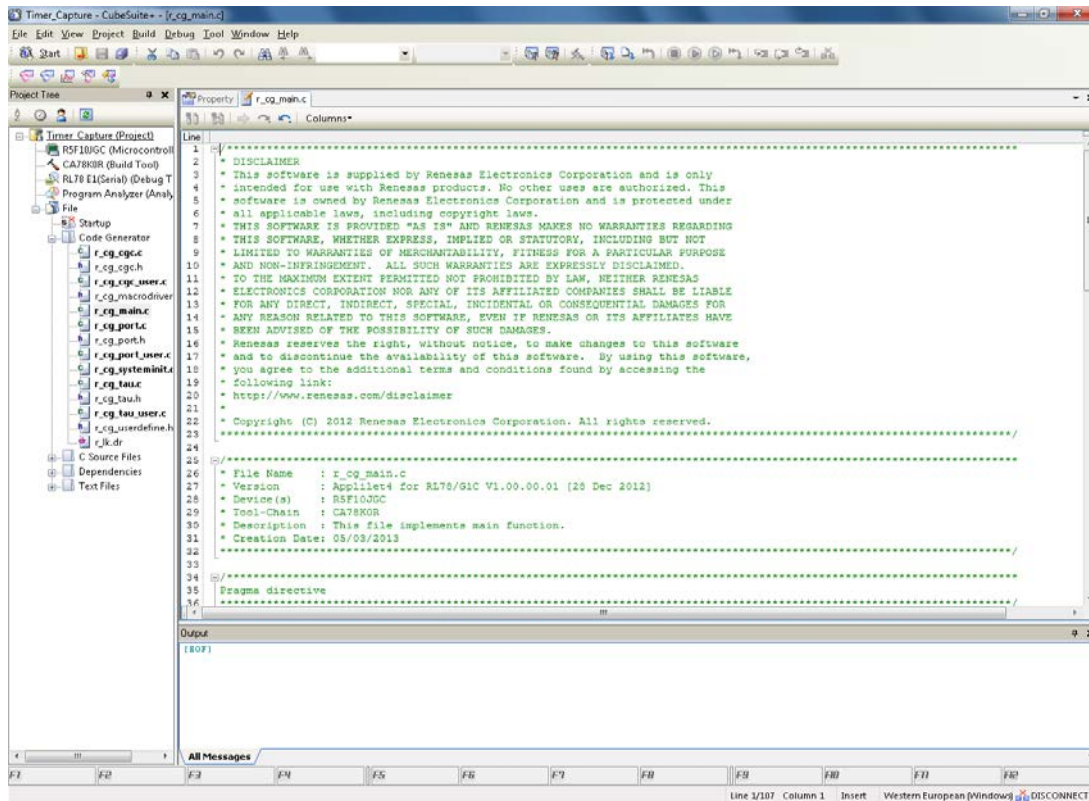


A Progress Status dialog will appear briefly whilst CubeSuite+ loads the project.



### 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\_cg\_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 Application Leading Tool.

## 5. Code Execution

The sample code demonstrates usage of the Timer Array Unit's (TAU) ability to count external events. An event is either a rising or falling edge signal. In this sample code, an event is a falling edge signal. The TAU has the capability to filter noises on the signal input.

### Modifications:

External Device/Component: Connect a wire between INTP4\_TI03 (J1, pin 5) and KR0 (SW3) (J1, pin 11).

### Instructions:

1. Compile the sample code and download to the RSK. Click the 'Go' button to start program execution.
2. The string "Capture will appear on the 1st line of the LCD. Thee string "Push SW3" will appear on the 2nd line of the LCD.
3. Press and hold switch SW3 for a period of less than 99 seconds. The captured time will be displayed on the LCD panel in the following format 'xxxxx ms'.

If the switch is held for a period equal to or greater than 99 seconds, the display will show

" >99 sec ", indicating an overflow.

4. The user may view the captured timer value by right-clicking on the variable named 'g\_tau0\_ch3\_width' in r\_cg\_tau\_user.c and selecting 'Register to Watch1'.

5. Got to step 2 to repeat the test.

### Timer Information:

Timer channel 3 is used to capture the pulse width. The CPU clock is 12 MHz, and the prescaler used is  $2^{14} = 16384$ . So the clock frequency to the timer counter =  $12M/16384 = 732.42$  Hz (1.365 mS). With this period, the longest period that can be measured =  $131072 \times 1.365mS = 178.95$  seconds. Since five digits are used in the format xxxxx ms, the overflow is specified at 99 seconds.

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**Revision History**

<b>Rev.</b>	<b>Date</b>	<b>Description</b>	
		<b>Page</b>	<b>Summary</b>
1.00	Nov 11, 2013	—	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 document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

### 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 a product with a different part number, confirm that the change will not lead to problems.

- The characteristics of an MPU or MCU in the same group but having a different part number may differ in terms of the 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.



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