RL78/G10 Simulator V3.10.00

Release Note

Thank you for using the RL78/G10 simulator.

This document describes restrictions on and points for caution regarding the simulator.

Read this document before using the product.

Contents

Chapter 1. Target Devices and Supported Simulation Functions

The RL78/G10 simulator supports the following target devices.

Device group	Device name
RL78/G10	R5F11B7C
	R5F11BBC
	R5F11BCC
	R5F11BGC
	R5F11BLC
	R5F11B7E
	R5F11BBE
	R5F11BCE
	R5F11BGE
	R5F11BLE

The RL78/G10 simulator is capable of simulating the following items as well as CPU instructions.

- Peripheral modules such as timers, the serial array unit, and the serial interface
- Virtual target board (simulation via the [I/O panel] window)
- MCU pin signal waveforms (simulation via the [Timing chart] window)
- Current drawn

Chapter 2. Changes

This chapter describes changes from V3.09.00 to V3.10.00 of the RL78/G10 simulator.

2.1 Improvements to the RL78/G10 simulator

2.1.1 Improvement to the operation related to the SSR0n registers during UART transmission by the serial array unit

In previous versions of the simulator, writing to the serial data registers 0nL (SDR0nL) during UART transmission by the serial array unit led to the BFF0n bit (the flag indicating the state of the buffer register in the serial status register 0n (SSR0n)) being cleared to 0 rather than set to 1. This has been rectified so that the BFF0n bit is set to 1.

Chapter 3. Points for Caution

This section lists points for caution on using the RL78/G10 simulator. These points for caution are in the following two categories.

• Differences in behavior between the target devices and the simulator due to simulator specifications

• Usage of simulation functions (operations in and configuration of the GUI windows)

CS+ for CC supports the [Virtual Board] panel which is described in those points for caution.

3.1 Differences in behavior between the target devices and the simulator

3.1.1 Peripheral functions not supported by the simulator

The simulator is not capable of simulating the following peripheral functions of the target devices.

- Regulator
- Selectable power-on-reset circuit

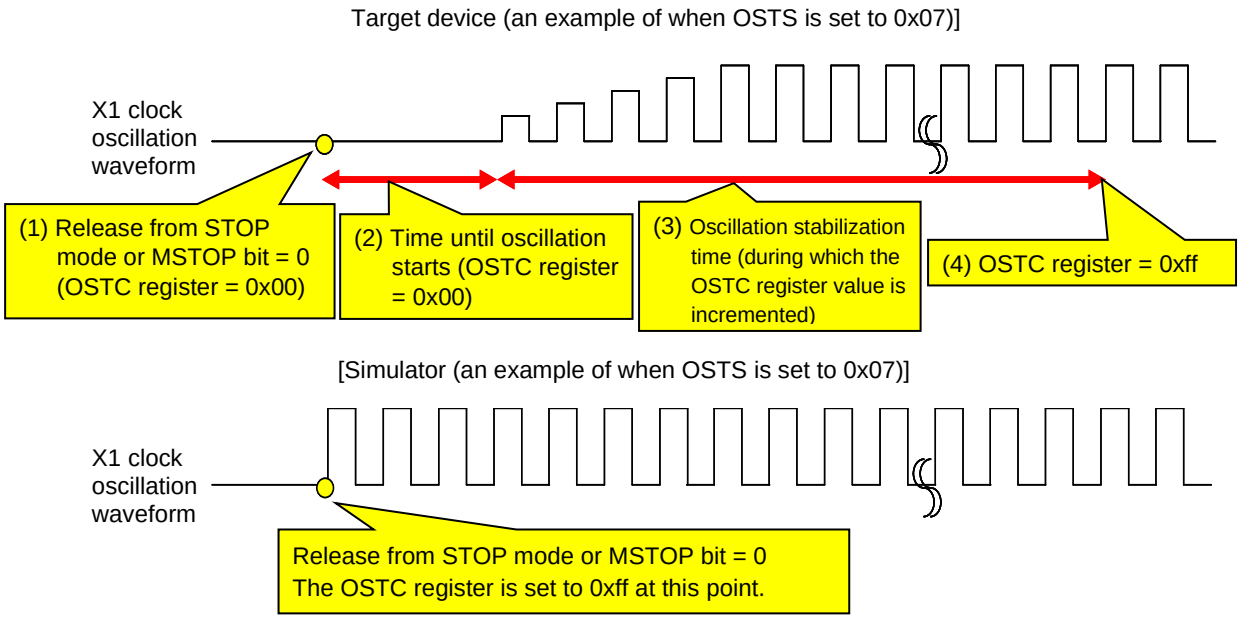
3.1.2 Oscillation stabilization time for the clock generator

Since the simulator does not simulate the clock oscillator oscillation stabilization time, stabilization always takes no time. When the oscillation is started, the OSTC register is set to one of the following values (i.e. not incremented).

OSTS Setting	OSTC Value
0x0 : 2^8/fx	0x80
0x1 : 2^9/fx	0xc0
0x2 : 2^{10}/fx	0xe0
0x3 : 2^{11}/fx	0xf0
0x4 : 2^{13}/fx	0xf8
0x5 : 2^{15}/fx	0xfc
0x6 : 2^{17}/fx	0xfe
0x7 : 2^{18}/fx	0xff

The following figure illustrates this operation.

In the target device, oscillation by the X1 clock starts after operation has passed through states (1) to (4). In the simulator, states (1) through (4) are skipped and oscillation instantly starts.



Therefore, pay attention to the code that waits for oscillation stabilization.

There is no problem if a program is created under the condition that execution proceeds after the oscillation stabilization wait period when the OSTC register value becomes the maximum value, or when the OSTC register value exceeds the specified value, but if a program is created under the condition that execution proceeds after the oscillation stabilization wait period when the OSTC register value becomes a value other than the maximum value, execution will enter an endless loop.

The following shows examples of code that causes and does not cause problems.

The examples are when the OSTS is set to 0x07.

Correct code example (1)

```
while(OSTC != 0xff)
{
NOP();/* wait */
}
```

Correct code example (2)

```
while(OSTC <= 0xf0)
{
NOP();/* wait */
}
```

Example of code that may cause problems

```
while(OSTC != 0xf0)
{
NOP();/* wait */
}
```

3.1.3 AMPH bit of Clock operation mode control register (CMC)

The simulator does not simulate AMPH bit of Clock operation mode control register (CMC). Although read/write access for each register can proceed normally, the operation does not change even if the value is changed.

3.1.4 Operating clock of the timer array unit

Do not specify an operating clock that runs at or below 233 Hz. If the operating clock for the timer array unit runs at or below 233 Hz, then the timer array unit will not work properly (it will behave as if operating with a clock that is faster than the one selected).

3.1.5 Noise filter of the timer array unit

Although the target device's timer array unit has a function to turn the noise filters on and off in order to reduce noise from the timer input pins, the simulator does not simulate this function since there is no noise in the simulator's signals. That is, whether filtering is on or off makes no difference to the behavior.

3.1.6 Clock used in the serial array unit

Do not specify a clock that is 233 Hz or lower in the following cases. If the following clock of the serial array unit is 233 Hz or lower, then the serial array unit will not operate correctly (it will behave as if operating via a clock that is faster than the one selected).

- Operating clock(f_{MCK}) is 233Hz or lower.
- Transfer clock setting by dividing the operation clock (f_{MCK} ÷ (SDR0nH[7:1] + 1)) is 233Hz or lower.

3.1.7 Noise filter of the serial array unit

Although the target device's serial array unit has a function to turn the noise filter on and off in order to reduce noise on the input pin, the simulator does not simulate this function since there is no noise in the simulator's signals. That is, whether filtering is on or off makes no difference to the behavior.

3.1.8 SDR0nH registers of the serial array unit

The values read from the serial data registers (SDR0nH) during serial operation differ between the target device and the simulator.

[Target device]

0 is read.

[Simulator]

The value read is that at the time serial operation starts.

3.1.9 Reset

The behavior differs as follows if a reset signal is input from the RESET pin.

[Target device]

The MCU is reset when the RESET pin goes low. Release from the reset state proceeds when the RESET pin goes high.

[Simulator]

The MCU is not reset when the RESET pin goes low. The simulator is reset momentarily and then released when the RESET pin goes high.

3.1.10 Reset control flag register (RESF)

The simulator only supports the WDTRF bit of the reset control flag register (RESF).

The simulator is not capable of simulating the operations of the other bits (TRAP and SPORF). Only the default values of these bits are indicated.

The reset control flag register (RESF) of the target device is automatically cleared if it is read by an 8-bit memory manipulation instruction; however, this does not clear the register in the case of the simulator.

3.1.11 A/D converter

When no voltage is being applied to the VDD pin, the default reference voltage of the A/D converter is 5.0 V.

To change the reference voltage, input the desired voltage values for VDD via the [Signal Data Editor] window.

3.1.12 Digital filters in the comparators (CMP)

The simulator does not simulate the digital filters in the comparators (CMP).

Bit 0 and bit 1 of COMPFIR register are not operated.

3.1.13 Response delay time of Comparators

The simulator does not simulate the response delay time of Comparator.

The operation of high-speed mode and low-speed mode is same.

3.1.14 Clock output/buzzer output controller

When f_{MAIN} is selected as an output clock, the [Timing chart] window does not show the clock waveform of the PCLBUZn signal.

When $f_{MAIN}/2$ or a slower signal is selected as an output clock, the [Timing chart] window shows the clock waveform.

3.1.15 Executing illegal instructions

If an illegal instruction (instruction code: 0xFF) is executed, the target device will be reset, but the simulator will go into an endless loop (the illegal instruction will be executed repeatedly).

3.1.16 IICA serial interface

IICA supports pin waveform generation and the communications through the [Serial] window. The following functions are not supported.

- Digital filter
- Arbitration
- Detection of transmission errors
- Communication reservation

3.1.17 SS0 register in the serial array unit

During serial communications, when the operation start trigger of channel n (SS0n) in the serial channel start register 0 (SS0) is set to 1, operation of the simulator differs from that of the actual target device in the way stated below.

[Target device]

The target device stops communications and enters the suspended state.

[Simulator]

The simulator does not stop communications. Accordingly, the TSF0n and BFF0n bits in the serial status register 0n (SSR0n) are not cleared to 0.

3.2 Usage of simulation functions

3.2.1 Simulation of current drawn

The following notes apply to the function of measuring current.

- The current is calculated roughly as that drawn by the MCU alone based on the typical values (TYP.) for the actual devices. Note that the current values other than for the MCU are not included.
- The number of change points of measurable current is 200,000. The program stops when the number exceeds 200,000.

3.2.2 Simulation speed

The simulation speed of RL78/G10 simulator depends on the number of operating peripheral functions.

If many peripheral functions are operating, the simulation speed becomes from several to ten times slower than the actual device. Note

With the use of only a few, or even no peripheral functions, the simulation speed may become faster than the actual device.

Note: The measurement environment for simulation speed is as follows.

CPU: 3.20 GHz (Quad-Core); memory: 8 Gbytes; OS: Windows10 64-bit edition

3.2.3 Pin waveforms in the [Timing chart] window

The maximum length of a pin waveform is 4096 signal-level changing points. After reaching this maximum length, the data will be overwritten from the oldest value. If this length is not sufficient, use the following methods.

- Reduce the number of registered pins
- Stop the user program at the place where you want to confirm the waveform by using a breakpoint

3.2.4 Controlling windows

The following keyboard operations are not available in the simulator windows ([Signal Data Editor], [I/O panel], and [Serial]).

- Navigation via tab or arrow keys (←, ↑, →, ↓)
- Deletion via the Del or Backspace keys
- Cut & paste and other operations via the Ctrl + C, V, X, A, or Z keys.

Perform the above operations as follows.

- Navigation: Navigate by using the mouse.
- Deletion: Right-click and perform the action from the context menu.
- Cut & paste, etc.: Right-click and perform the action from the context menu.

3.2.5 Closing the [Simulator GUI] window

The [Simulator GUI] window can only be closed by disconnecting from the debugging tool, or by closing CS+ in proper manner. The [X] button cannot be used.

Additionally, although it appears that the [X] button can be pressed if Aero is enabled in Windows, pressing this button will not close the [Simulator GUI] window.

3.2.6 Disconnecting the debug tool

CS+ may be closed if the debugging tool is disconnected while any of the following dialog boxes is open from the [Simulator GUI] window. Be sure that the following dialog boxes have been closed before disconnecting the simulator.

- Save As
- Open
- New
- Color
- Font
- Customize
- Loop
- Select Pin
- Search Data
- Format (UART)
- Format (CSI)
- Format (IIC)
- Message (e.g. Error)
- Parts Button Properties
- Analog Button Properties
- Parts Key Properties
- Parts Level Gauge Properties
- Parts Led Properties
- Parts Segment LED Properties
- Parts Matrix Led Properties
- Parts Buzzer Properties
- Pull up / Pull down
- Entry Bitmap
- Object Properties

3.2.7 [Serial] window

When using the [Serial] window as the data receiver for the simplified I^2C of the serial array unit or IICA, only ACK can be generated after receiving the data. NACK cannot be generated.

3.2.8 Setting the pins in the simulator GUI or the [Virtual Board] panel

The peripheral I/O redirection register (PIOR) can be manipulated by a program or debugger operations to re-assign specific multiplexed pin functions to alternative port pins in the same way as on the actual device. After re-assigning a given pin function by using the PIOR, be sure to select the name of the pin you are currently using in the [Select Pin] dialog box of the simulator GUI or “Connected To” of the component in the [Virtual Board] panel.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jun.01.24	-	First Edition

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

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