RX140 Group

Fast Prototyping Board for RX140 LED Blink Control Program

Introduction

The LED lighting control program runs on Fast Prototyping Board for RX140. The function of this program performs either the user switch interrupt or the timer interrupt according to the mode selection at startup and controls the lighting of the LED by using the corresponding interrupt.

Target Device

RX140 Group

Confirmed Tool

IDE: e2studio v24.01.1

Compiler: CC-RX v3.06.00

Smart Configurator for RX: v2.20.0

Hardware: Fast Prototyping Board for RX140

Contents

1. Function list

The functions of the LED lighting control program are shown below.

(1) Start-up mode selection
(2) Timer interrupt function
(3) User switch interrupt function

1.1 Mode selection of start-up

After resetting with the power-on reset or RES # pin, it detects whether the user switch is pressed and switches the start mode. If you reset while pressing down the user switch, it transits to manual mode, and if you reset without pressing the user switch it will transition to automatic mode.

1.2 Timer interrupt function (Auto-mode)

After switching to the automatic mode, set the timer interrupt and control the LED by timer interrupt. The setting list of the timer interrupt function and the processing contents are shown below

Timer: CMT0

Count clock: PCLKB / 512

Interrupt interval: 500 ms

Interrupt level: Level 15

Interrupt class: CMI 0

Interrupt processing content: LED 1 (Port: 20), LED 2 (Port: 32) are alternately turned on and off

1.3 User switch interrupt function (Manual-mode)

After manual mode transition, this function is enabled. The setting list and processing contents of the user switch interrupt function are shown below.

Interrupt: IRQ 0 (Port: 31)

Detection type: Falling edge (corresponding to user switch press)

Interrupt level: Level 15

Digital filter: Enable (PCLKB / 64)

Interrupt processing content: LED 1 (Port: 20), LED 2 (Port: 32) are alternately turned on and off

2. LED lighting control program operation flow

Figure 2-1 shows the power-on reset operation flow of the LED lighting control program.

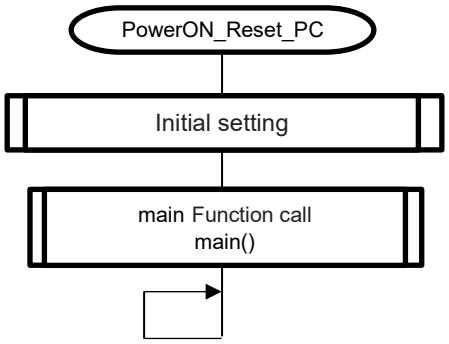


Figure 2-1: Power-on reset operation flow

Figure 2-2 shows the operation flow of the main function of the LED lighting control program.

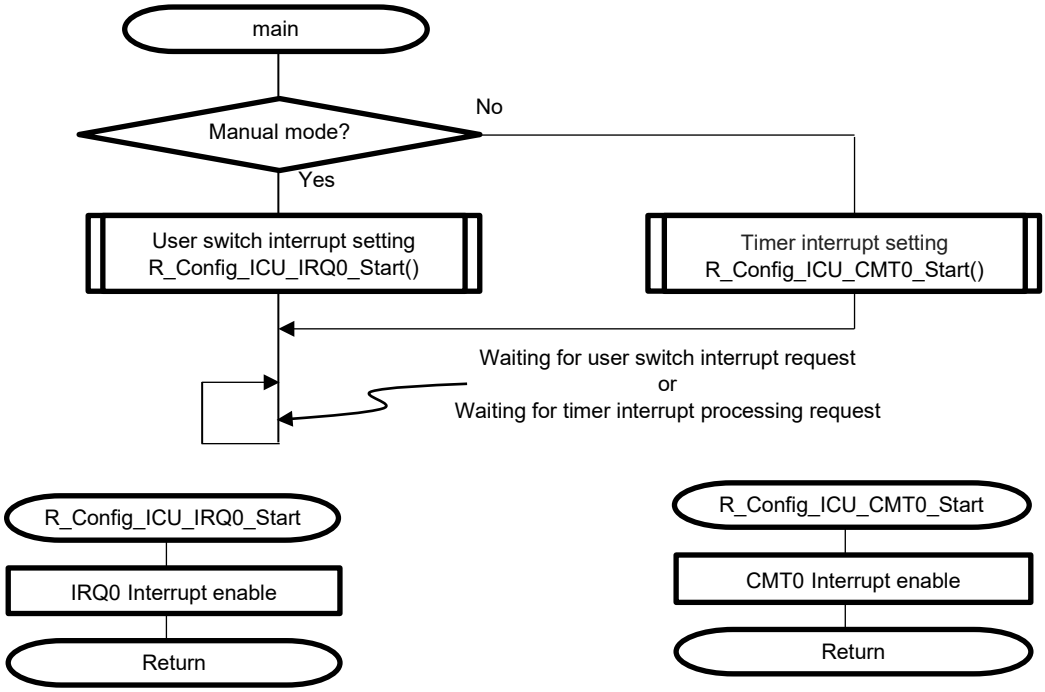


Figure 2-2: LED lighting control program operation flow

Figure 2-3 shows the user switch interrupt operation flow of the LED lighting control program, and **Figure 2-4** shows the timer interrupt operation flow.

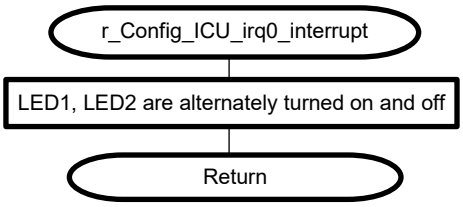


Figure 2-3: User switch interrupt operation flow

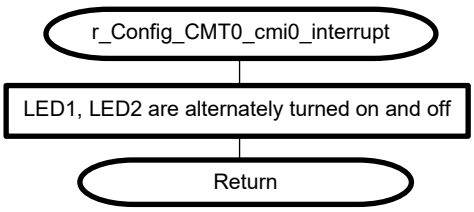


Figure 2-4: Timer interrupt operation flow

3. RX140 Internal block diagram

Figure 3-1 shows the internal block diagram of the RX140 and the used blocks of the LED lighting control program.

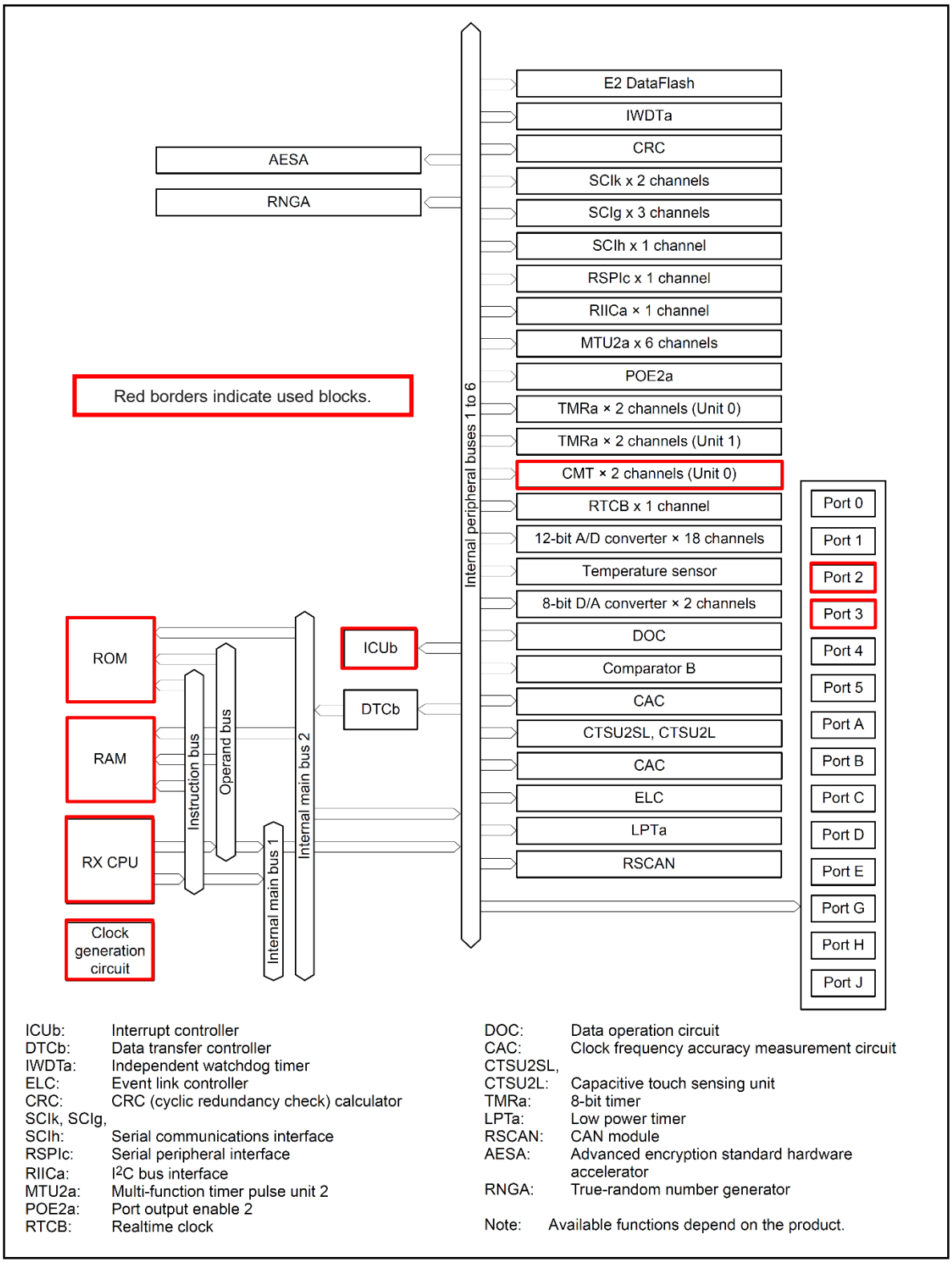
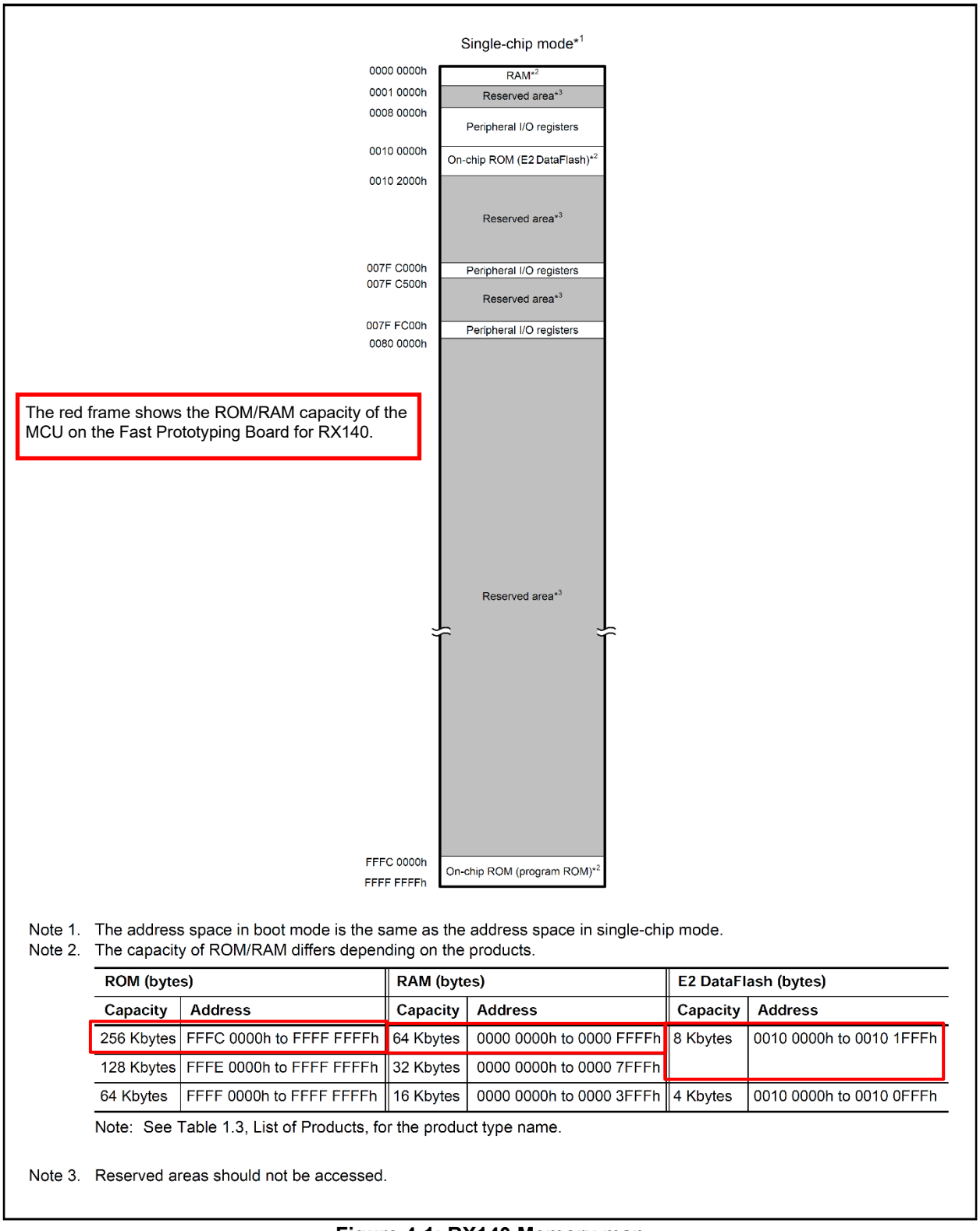


Figure 3-1: RX140 Internal block diagram

4. RX140 Memory map

This MCU has a 4-Gbyte address space, consisting of the range of addresses from 0000 0000h to FFFF FFFFh. That is, linear access to an address space of up to 4-Gbytes is possible, and this contains both program and data areas. **Figure 4-1** shows the memory maps in the respective operating modes. Accessible areas will differ according to the operating mode and states of control bits.



Note 1. The address space in boot mode is the same as the address space in single-chip mode.
Note 2. The capacity of ROM/RAM differs depending on the products.

ROM (bytes)		RAM (bytes)		E2 DataFlash (bytes)	
Capacity	Address	Capacity	Address	Capacity	Address
256 Kbytes	FFFC 0000h to FFFF FFFFh	64 Kbytes	0000 0000h to 0000 FFFFh	8 Kbytes	0010 0000h to 0010 1FFFh
128 Kbytes	FFFE 0000h to FFFF FFFFh	32 Kbytes	0000 0000h to 0000 7FFFh		
64 Kbytes	FFFF 0000h to FFFF FFFFh	16 Kbytes	0000 0000h to 0000 3FFFh	4 Kbytes	0010 0000h to 0010 0FFFh

Note: See Table 1.3, List of Products, for the product type name.

Note 3. Reserved areas should not be accessed.

Figure 4-1: RX140 Memory map

5. RX140 Clock generation block diagram

Figure 5-1 shows the clock generation route of the RX140 clock generation block diagram and the LED lighting control program.

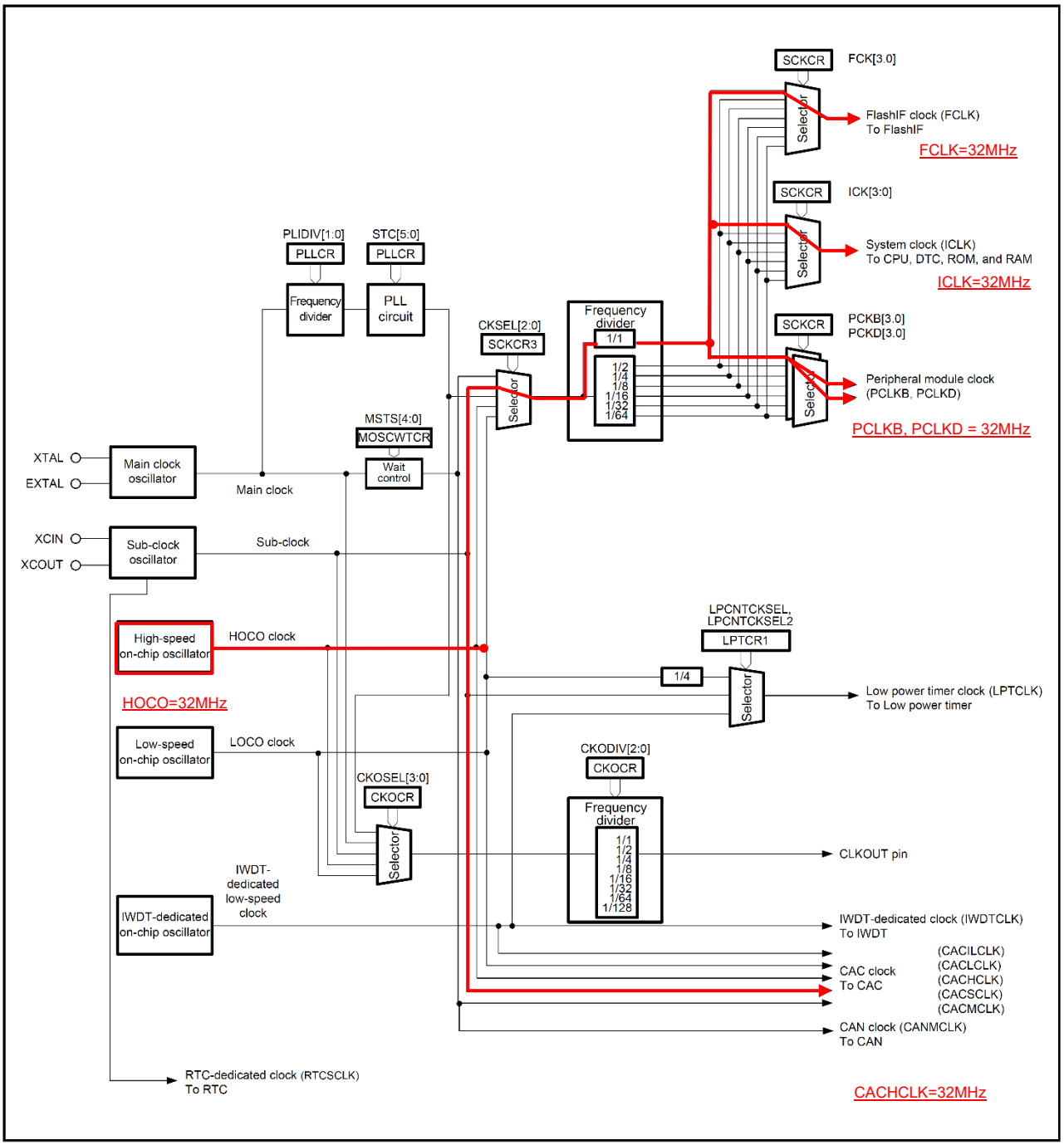


Figure 5-1: RX140 Clock generation block diagram

6. Precautions

Please do not incorporate this program into your product. This program does not guarantee the operation. When using it, please check the operation at your own risk.

Website and Support

Renesas Electronics Website
https://www.renesas.com/us/en

Inquiries
https://en-support.renesas.com/dashboard

Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	Apr.1.2024	-	First edition issued

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit 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. Precaution against Electrostatic Discharge (ESD)
   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on
   The state of the product is undefined at the time 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 time 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 time 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 time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state
   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins
   Handle unused pins in accordance 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 the 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.
5. Clock signals
   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is 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. Additionally, 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.
6. Voltage application waveform at input pin
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses
   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products
   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of 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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