R32C/100 Series

Block Transfer Using DMAC

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Abstract

This document describes a method to use the DMA controller (DMAC) in the R32C/100 Series microcomputer (MCU) to transfer a block of data from one given space to another given space.

Products

MCUs: R32C/116 Group
R32C/117 Group
R32C/118 Group

When using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

Contents

1. Specifications

This application note explains how to use the DMAC to transfer 128 bytes of data from the ROM table to the RAM table. Select the timer A0 interrupt request as the DMA request source, and select incrementing addressing for the transfer source address and transfer destination address.

Table 1.1 lists the Peripheral Functions and Their Applications. Figure 1.1 shows the Table Data Transfer.

Table 1.1 Peripheral Functions and Their Applications

Peripheral Function	Application
DMAC (DMA0)	Data transfer
Timer A0	DMA request source

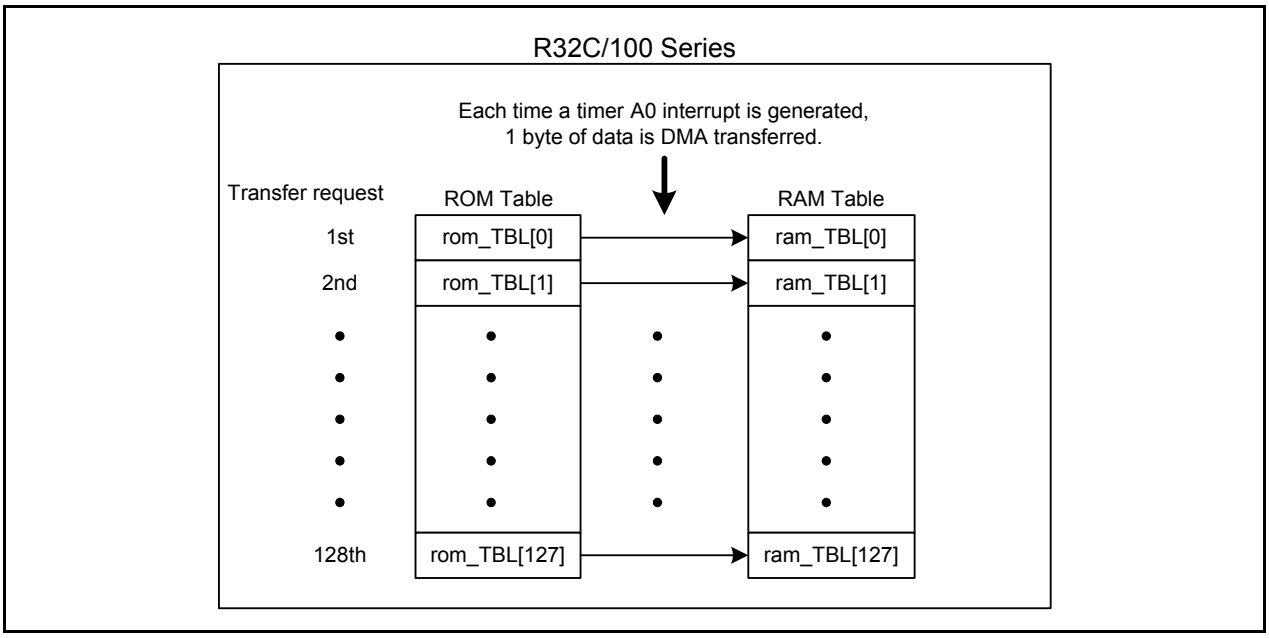

Figure 1.1 Table Data Transfer

2. Operation Confirmation Conditions

The sample code accompanying this application note has been run and confirmed under the conditions below.

Table 2.1 Operation Confirmation Conditions

Item	Contents
MCU used	R5F64189DFD (R32C/118 Group)
Operating frequencies	• Main clock: 16 MHz • PLL clock: 100 MHz • Base clock: 50 MHz • CPU clock: 50 MHz • Peripheral bus clock: 25 MHz • Peripheral function clock source: 25 MHz
Operating voltage	5 V
Integrated development environment	Renesas Electronics Corporation High-performance Embedded Workshop Version 4.07
C compiler	Renesas Electronics Corporation R32C/100 Series C Compiler V.1.02 Release 01
	Compile options -D__STACKSIZE__=0X300 -D__ISTACKSIZE__=0X300 -DVECTOR_ADR=0x0FFFFFBDC -c -finfo -dir "$(CONFIGDIR)" (Default setting is used in the integrated development environment.)
Operating mode	Single-chip mode
Sample code version	Version 1.00
Board used	Renesas Starter Kit for R32C/118 (product name: R0K564189S000BE)

3. Reference Application Notes

Application notes associated with this application note are listed below. Refer to these application notes for additional information.

- R32C/100 Series Configuring PLL Mode (REJ05B1221-0100)
- R32C/100 Series Configuring DMAC (REJ05B1220-0100)

4. Software

Set the timer A0 interrupt request as the DMA request source. Each time a timer A0 interrupt request is generated, 128 bytes of data are transferred from the ROM table to the RAM table 1 byte at a time.

4.1 Operation Overview

The sample program operates as follows:

(1) Initial setting
The DMAC and timer A0 are initialized.

(2) Timer A0 count starts
The TA0S bit in the TABSR register is set to 1 (start counter).

(3) DMA transfer starts
After a timer A0 interrupt is generated, data is transferred from the ROM table to the RAM table 1 byte at a time.

Figure 4.1 shows the Timing Diagram.

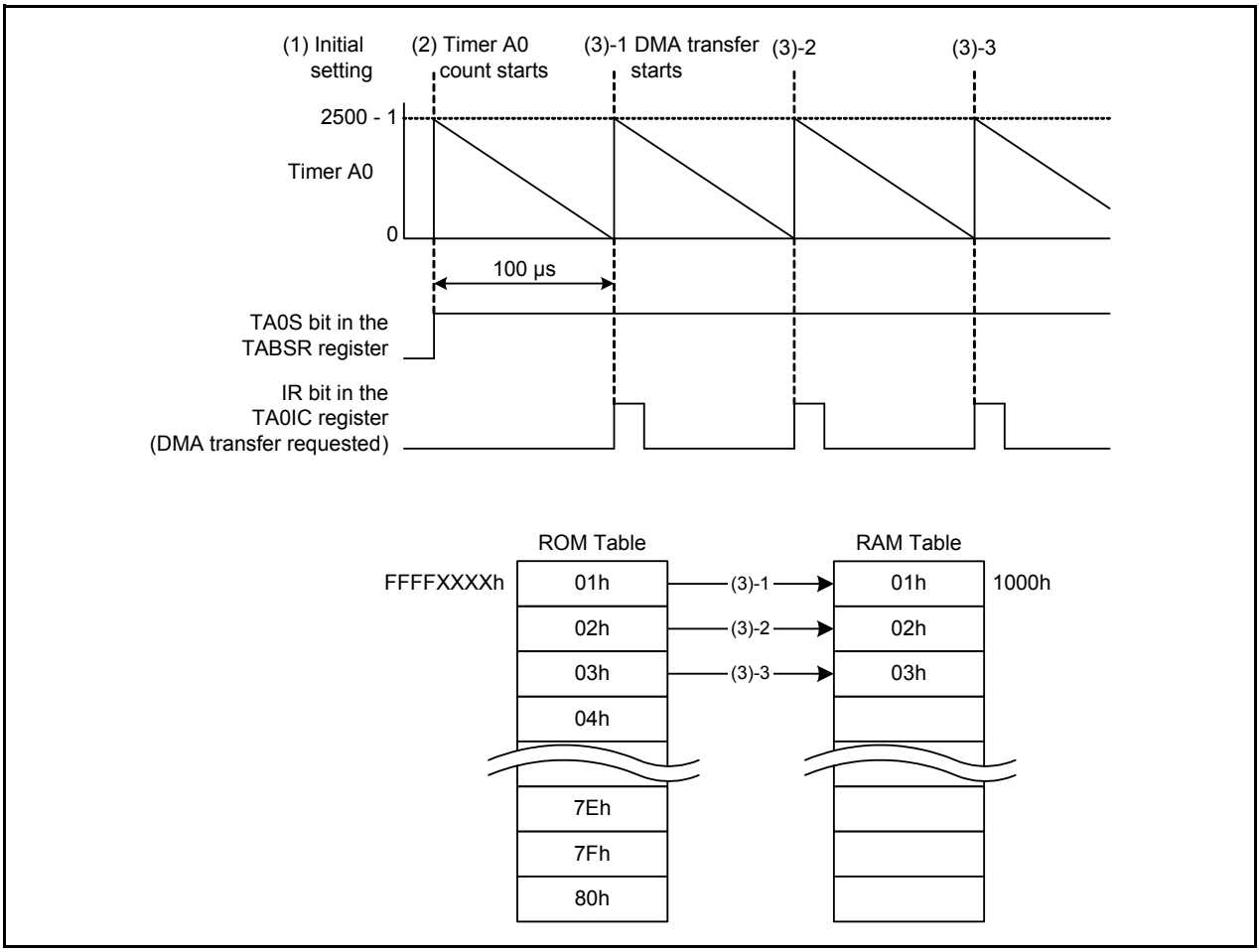

Figure 4.1 Timing Diagram

4.2 Constants

Table 4.1 lists the Constants Used in the Sample Code.

Table 4.1 Constants Used in the Sample Code

Constant Name	Setting Value	Contents
DEST_ADDRESS	1000h	DMA transfer destination address
TRANS_COUNT	128	Number of DMA transfers

4.3 Variable

Table 4.2 lists the const Variable.

Table 4.2 const Variable

Type	Variable Name	Contents	Function Used
const static unsigned char	trans_data[]	128 bytes of DMA transfer source data (01h, 02h,...7Fh, 80h)	Not used with functions

4.4 Flowcharts

4.4.1 Main Processing

Figure 4.2 shows the Main Processing.

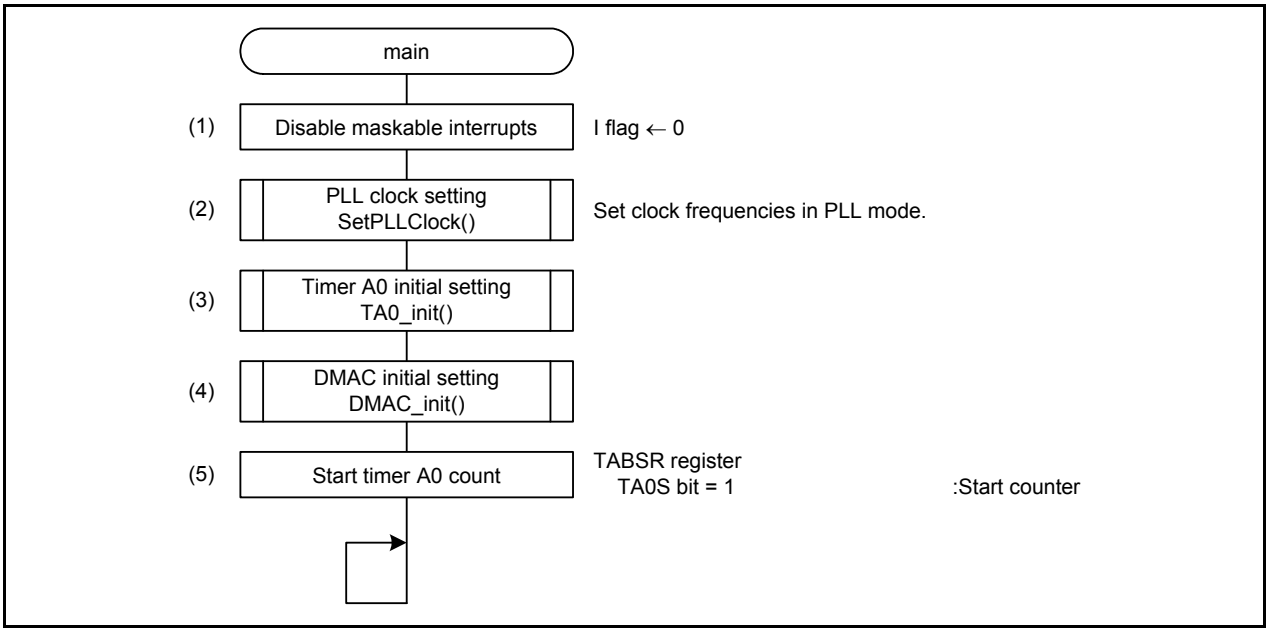

Figure 4.2 Main Processing

4.4.2 Timer A0 Initial Setting

Figure 4.3 shows the Timer A0 Initial Setting.

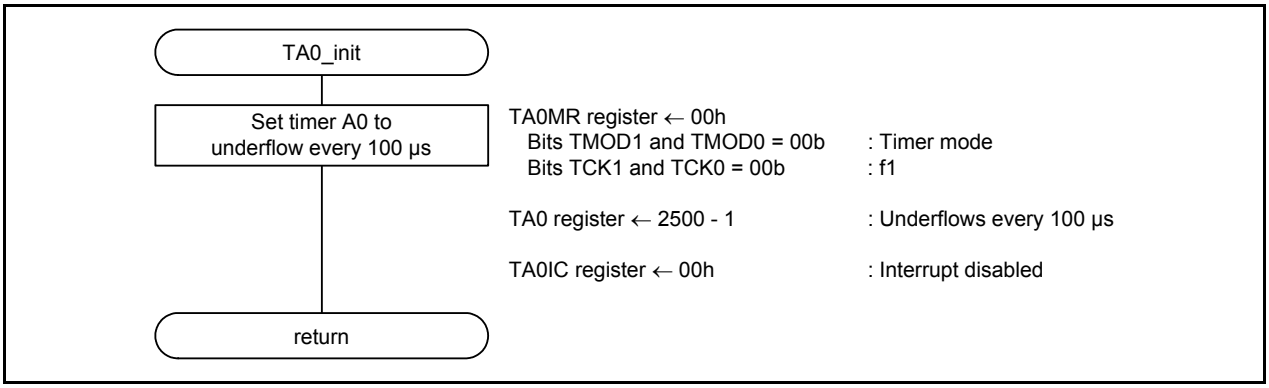

Figure 4.3 Timer A0 Initial Setting

4.4.3 DMAC Initial Setting

Figure 4.4 shows the DMAC Initial Setting.

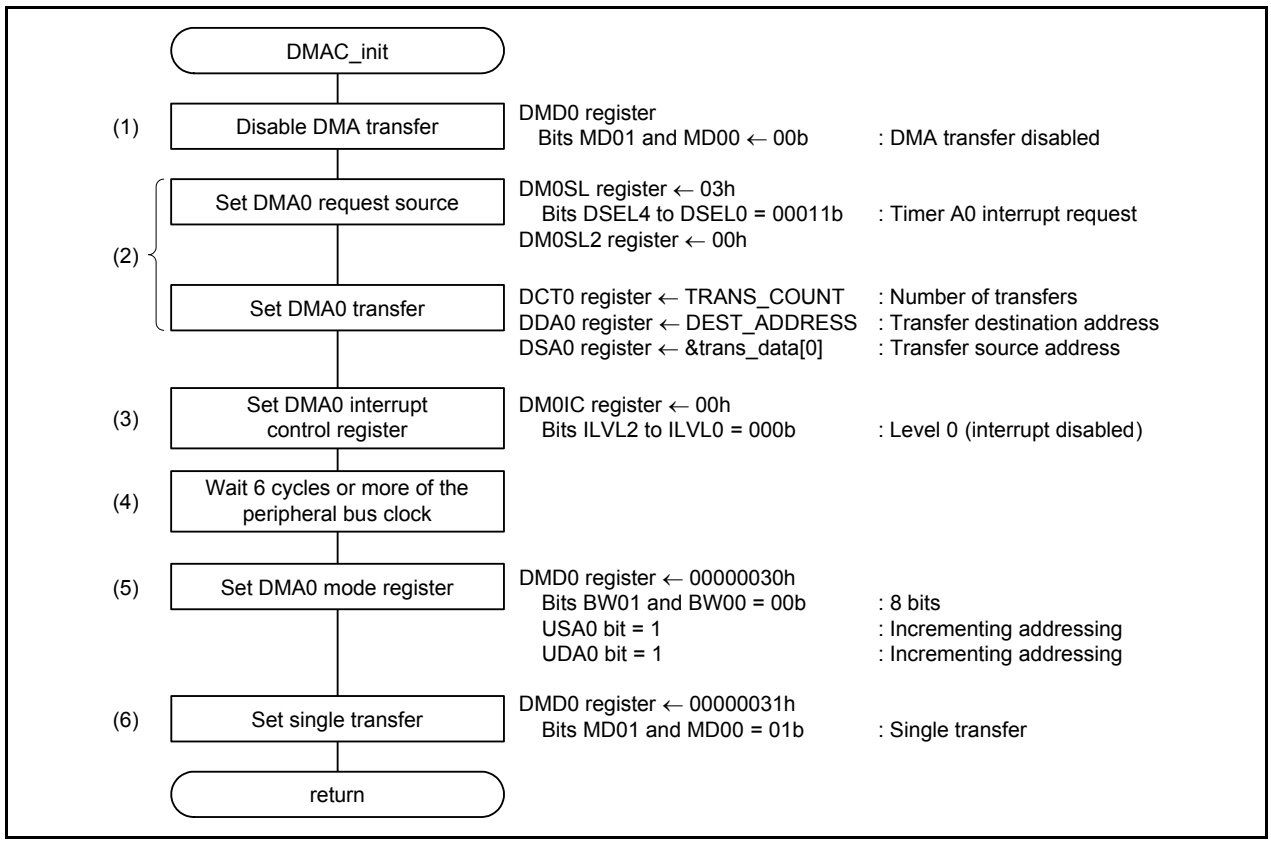

Figure 4.4 DMAC Initial Setting

5. Sample Code

Sample code can be downloaded from the Renesas Electronics website.

6. Reference Documents

R32C/116 Group User's Manual: Hardware Rev.1.10
R32C/117 Group User's Manual: Hardware Rev.1.10
R32C/118 Group User's Manual: Hardware Rev.1.10
The latest versions can be downloaded from the Renesas Electronics website.

Technical Update/Technical News
The latest information can be downloaded from the Renesas Electronics website.

C Compiler Manual
R32C/100 Series C Compiler Package V.1.02
C Compiler User's Manual Rev.2.00
The latest version can be downloaded from the Renesas Electronics website.

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Revision History	R32C/100 Series Block Transfer Using DMAC

Rev.	Date	Description	
		Page	Summary
1.00	June 30, 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 part number, confirm that the change will not lead to problems.

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

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