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April 1st, 2010
Renesas Electronics Corporation

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M32C/84, 85, 86, 87, 88 Group

D/A Converter Operation

1. Abstract

The D/A converter function allows users to convert values written to the DAi register and output the conversion results externally.

Output analog voltage (V) is calculated from the setting value in the DAi register (0 to 255).

$$\text{Output analog voltage (V)} = \frac{\text{Reference (VREF)} \times \text{(Setting value in the DAi register)}}{256}$$

2. Introduction

The application example described in this document is applied to the following MCUs and parameter(s):

MCUs: M32C/84 Group
M32C/85 Group
M32C/86 Group
M32C/87 Group
M32C/88 Group

This program can be used with other M16C Family MCUs which have the same special function registers (SFRs) as the above MCUs. Check the manual for any additions and modifications to functions. Careful evaluation is recommended before using this application note.

3. Application Example

This section describes how to output an analog voltage from DA0 (P9_3).

3.1 Example Description

(1) Set a value to DAi.
(2) Setting the DAiE bit in the DACON register to 1 causes an analog value to be output from the DAi pin.
(3) Setting the DAiE bit in the DACON register to 0 sets the DAi pin to high-impedance.

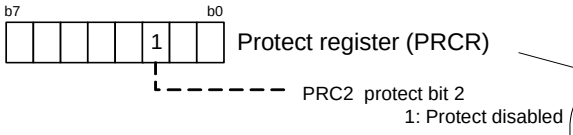
Additional description

- To use the DA0 pin:
  Select DA0 by the PS3_3 bit in the PS3 register or the PSL3_3 bit in the PSL3 register, and set the PD9_3 bit in the PD9 register to input.
- To use the DA1 pin:
  Select DA1 by the PS3_4 bit in the PS3 register or the PSL3_4 bit in the PSL3 register, and set the PD9_4 bit in the PD9 register to input.

3.2 Setup

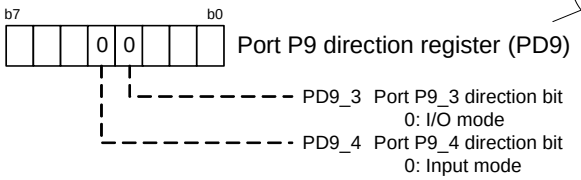
This section shows the setup sequence and values to perform the application example described in **3.1 Example Description**.
Refer to the each MCUs Hardware Manual for details of individual registers.

(1) Set the protect register

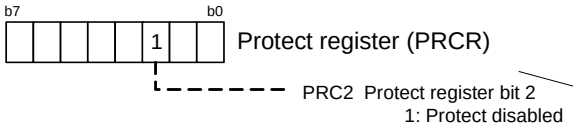


Rewrite to the PD9 register with the next instruction after that used to set the PRC2 bit to 1.
Do not generate an interrupt, DMA transfer, or DMACII transfer between the instruction to set the PRC2 bit to 1 and the instruction to rewrite to the PD9 register.

(2) Set the port P9 direction register

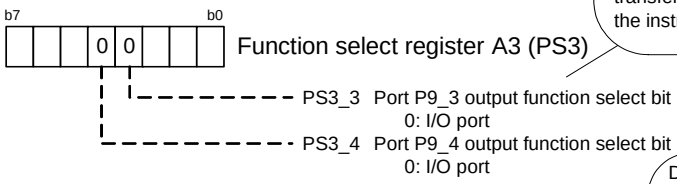


(3) Set the protect register

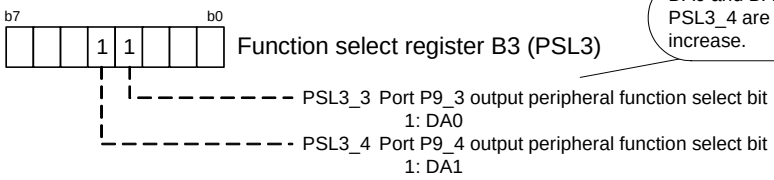


Rewrite to the PS3 register with the next instruction after that used to set the PRC2 bit to 1.
Do not generate an interrupt, DMA transfer, or DMACII transfer between the instruction to set the PRC2 bit to 1 and the instruction to rewrite to the PS3 register.

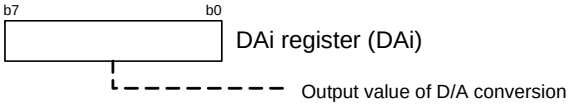
(4) Set the function select registers



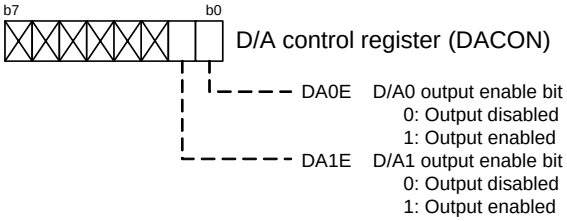
DA0 and DA1 can be used when bits PSL3_3 and PSL3_4 are set to 0, but power supply current may increase.



(5) Set the DAi register



(6) Set the D/A control register



4. Sample Programming Code

A sample program can be downloaded from the Renesas Technology website.
For download, click “Application Notes” in the left-hand side menu of the M16C Family page.

5. Reference Documents

Hardware Manuals
M32C/84 Group Hardware Manual
M32C/85 Group Hardware Manual
M32C/86 Group Hardware Manual
M32C/87 Group Hardware Manual
M32C/88 Group Hardware Manual
The latest version can be downloaded from the Renesas Technology website.

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REVISION HISTORY	M32C/84, 85, 86, 87, 88 Group D/A Converter Operation

Rev.	Date	Description	
		Page	Summary
1.00	Sep 10, 2006	–	First Edition issued

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