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H8S/2200 Series

Outputting Voltages by D/A Conversion

Introduction

Data values set in the D/A conversion data registers are D/A converted and output from analog output pins DA0 and DA1.

Target Device

H8S/2215

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1. Overview

The D/A conversion function of the H8S/2215 is used to output analog signals.

2. Configuration

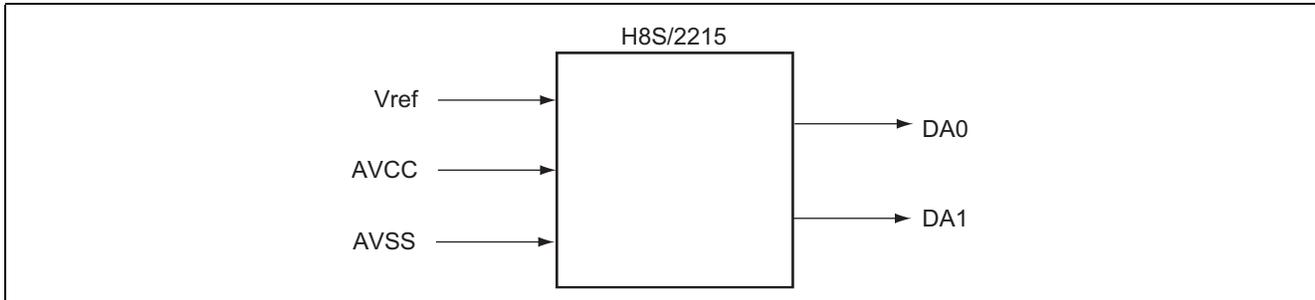


Figure 1 Pins Used for Voltage Output by D/A Conversion

Table 1 Pin Configuration

Pin Name	Symbol	Setting Value	Rating
Analog power supply pin	AVCC	3.3 V	2.7 to 3.6 V
Analog ground pin	AVSS	Ground	
Reference voltage pin	Vref	3.3 V	0 V to AVCC
Analog output pin 0	AN0	0 to Vref	0 to Vref
Analog output pin 1	AN1	0 to Vref	0 to Vref

3. Sample Programs

3.1 Functions

1. Performs D/A conversion on the data set in the D/A data registers and outputs the results from the analog output pins (DA0 and DA1).

3.2 Program Incorporation

1. Incorporate sample program 1-A: #define definitions.
2. Incorporate sample program 1-B: prototype declarations.
3. Add sample program 1-C as a common subroutine.

3.3 Modifications to Sample Programs

Without modifications to the sample program, the system may not run. Modifications must be made according to your program and system environment.

1. The sample programs can be used without further changes if you use the I/O register structure definition file, which is available free of charge from the following Renesas web site:

<http://www.renesas.com/eng/products/mpumcu/tool/crosstool/iodef/index.html>

When you create structure definitions by yourself, modify the I/O register structures used in the sample program as appropriate.

3.4 Using the Sample Programs

1. This subroutine performs D/A conversion on the data set in the D/A data registers and outputs the results from the analog output pins (DA0 and DA1).
- Subroutine name: void com_dac_exec (unsigned char da_ctl, unsigned char da0_data, unsigned char da1_data)

Argument	Description
da_ctl	Enables/disables D/A conversion for D/A converter's channels. DAC_STOP (0x00): Stops DA conversion for DA0 and DA1. DAC_DA0_START (0x40): Enables only DA conversion for DA0 (DA conversion for DA1 is stopped). DAC_DA1_START (0x80): Enables only DA conversion for DA1 (DA conversion for DA0 is stopped). DAC_DA0_1_START (0xC0): Enables DA conversion for DA0 and DA1.
da0_data	Sets data to be output from the analog output pin (DA0). The output value for the set value is expressed by the following formula. Output value = (da0_data/256) * Vref This value is not used when da_ctl = DAC_STOP/DAC_DA1_START.
da1_data	Sets data to be output from the analog output pin (DA1). The output value for the set value is expressed by the following formula. Output value = (da1_data/256) * Vref This value is not used when da_ctl = DAC_STOP/DAC_DA0_START.

Sample usages:

```
// Start DA conversion
com_dac_exec(DAC_DA0_1_START, 32,64);
    // 0.41V and 0.83V are output from the DA0 and DA1 pins, respectively.
// Stop DA conversion
com_dac_exec(DAC_STOP, 0, 0);
    //DA0 and DA1 pins become input pins.
```

Note: The results of conversion will be output from the DA0 and DA1 pins when conversion time (maximum 10 μ s) has been elapsed after execution of this subroutine.

3.5 Description of Operation

When D/A conversion is started by this subroutine, conversion-enabled pins function as output pins. The conversion results are output from these pins after the conversion time (maximum 10 μ s) has been elapsed. Pins not enabled for D/A conversion function as input pins.

The output value is expressed by the following formula.

$$\text{Output value} = (\text{DA setting value}/256) \times V_{\text{ref}}$$

For DA conversion characteristics, refer to the H8S/2215 Hardware Manual.

3.6 List of Registers Used

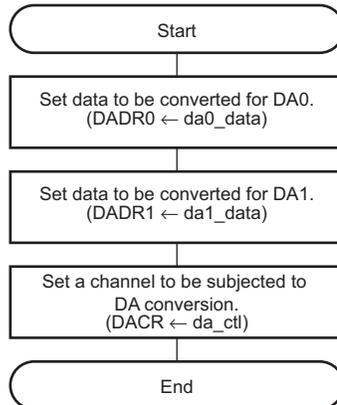
The internal registers of the H8 microcomputer used in the sample program are listed below. For detailed information, refer to the H8S/2215 Hardware Manual.

Name	Summary
D/A data register (DADR)	Stores data for D/A conversion.
D/A control register (DACR)	Selects channels on which D/A conversion is enabled.

3.7 Flowchart

Processing flow of the sample program is shown below.

```
void com_dac_exec (unsigned char da_ctl, unsigned char da0_data, unsigned char da1_data)
: Performs DA conversion
da_ctl: Specifies a channel to be subjected to DA conversion.
da0_data: Specifies data to be converted for DA0.
da1_data: Specifies data to be converted for DA1.
```



4. Reference Document

- H8S/2215 Series Hardware Manual (published by Renesas Technology Corp.)

Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	Mar.16, 2004	—	First edition issued

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