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April 1st, 2010
Renesas Electronics Corporation

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H8S/2200 Series

A/D Conversion in the Scan Mode

Introduction

Saves A/D conversion results of input voltages of four channels in RAM. A/D conversion is started up by an external trigger.

Target Device

H8S/2215

Contents

1. Specifications

1. As shown in figure 1, this sample task inputs voltages of four channels to the H8S/2215 and stores A/D conversion results in RAM.
2. The A/D converter is started up by an external trigger.

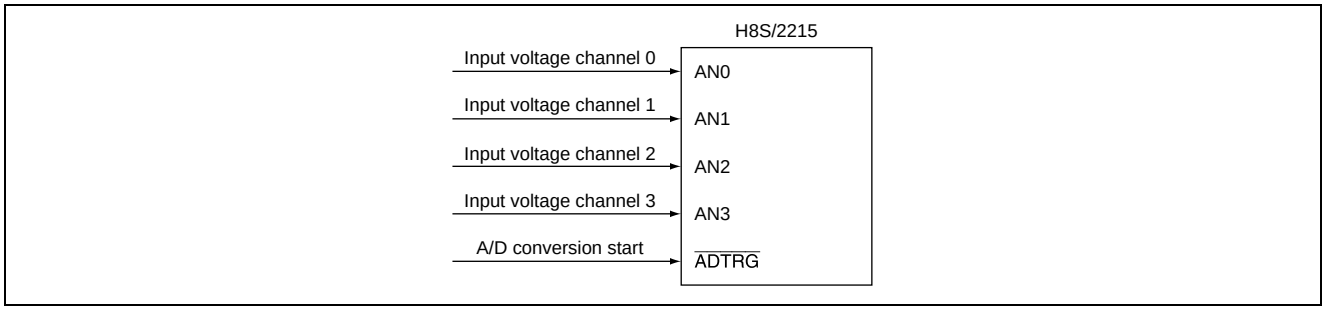


Figure 1 Block Diagram of Voltage Measurement by H8S/2215

2. Description of Functions

1. The block diagram of 4-channel A/D conversion is shown in figure 2. This sample task uses the following functions of the A/D converter:
   A. Function that performs A/D conversion of four channels (voltages on four channels AN0 to AN3) automatically without using software (scan mode)
   B. Function that transfers conversion results to another ADDR after conversion of the channels terminates (buffer operation)
   C. Function that starts A/D conversion by the external trigger pin (ADTRG)
   D. Function that generates an interrupt upon completion of A/D conversion

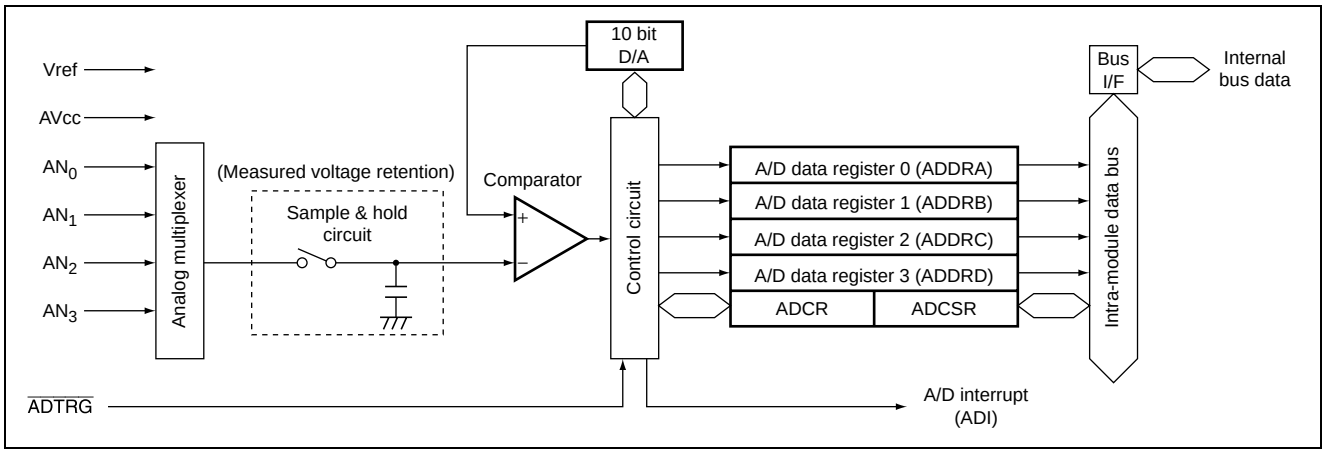


Figure 2 A/D Converter Block Diagram

2. Function allocation of this sample task is shown in table 1. This sample task allocates the H8S/2215 functions as shown in table 1 to perform A/D conversion.

Table 1 Assignment of Functions

Elements	Description
ADCSR	Selects the A/D conversion target channels and displays the status.
ADCR	Selects the start trigger signal and sets the operation mode (scan).
ADDRA to ADDRD	Stores A/D conversion results.
ADTRG	A/D external trigger input pin

3. Principles of Operation

The principles of operations used are shown in figure 3. As shown in figure 3, the A/D converter is started up by external trigger ADTRG and A/D conversion of four channels AN0 to AN3 is repeated. The ADST bit retains 1 until software clears it to 0. During this period of time, A/D conversion of the selected channels is repeated. The A/D conversion results stored in ADDRA to ADDRD are stored in 80-byte RAM SCN0 to SCN3.

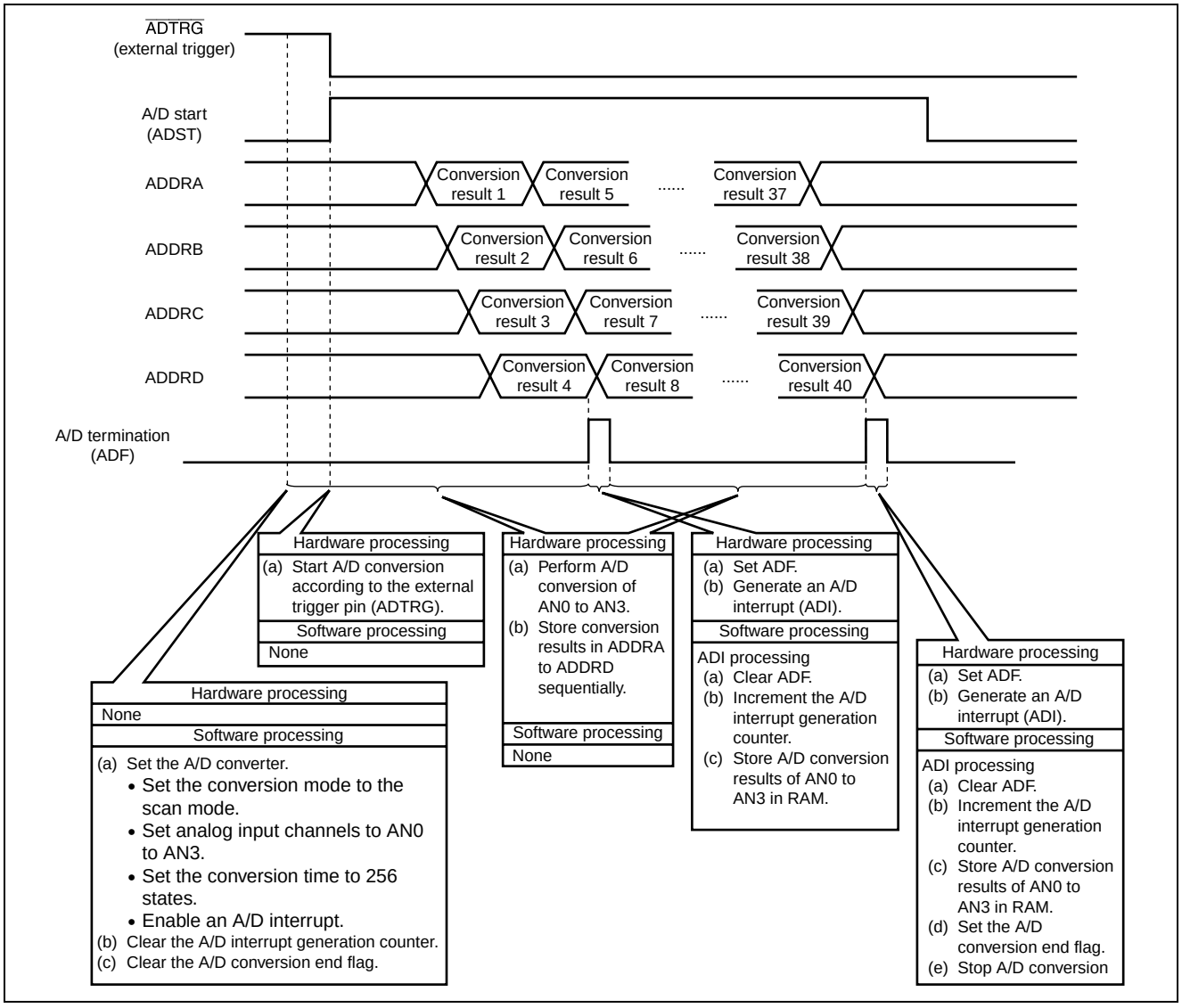


Figure 3 Principles of Operations Used for A/D Conversion in the Scan Mode

4. Description of Software

1. Description of Modules

Module Name	Label Name	Function
Main routine	ADSCNMN	Sets the A/D converter and startup of the A/D converter by an external trigger.
A/D interrupt	SCNEND	Starts up by an ADI, stores A/D conversion results in RAM, and stops A/D conversion.

2. Description of Arguments

Label Name	Function	Data Length	Used in	I/O
scn	Sets the AD/conversion results of four channels. The 10-bit conversion results are set as follows: bit7 … bit0 Upper bytes of SCN_RE0 to SCN_RE6: AD9 AD8 AD7 AD6 AD5 AD4 AD3 AD2 Lower bytes of SCN_RE0 to SCN_RE6: AD1 AD0 AD0 to AD9 indicate the bit numbers of the A/D conversion results.	unsigned short	A/D interrupt	Output
scn_endf	Flag indicating all of the A/D conversion of four channels indicating that are terminated. 1: A/D conversion ended 0: A/D conversion in progress	unsigned char	A/D interrupt	Output
			Main routine	Input

3. Description of Internal Registers Used

Register Name	Function	Used in
ADCSR	Selects the A/D conversion time, analog input channels, A/D interrupt enabled/disabled at termination of A/D conversion.	Main routine
ADCR	Selects the A/D conversion mode (scan mode) and buffer operation.	A/D interrupt
ADDRA to ADDRD	Stores A/D conversion results.	Main routine
MSTPCR	Cancels the A/D converter from module stop mode.	A/D interrupt

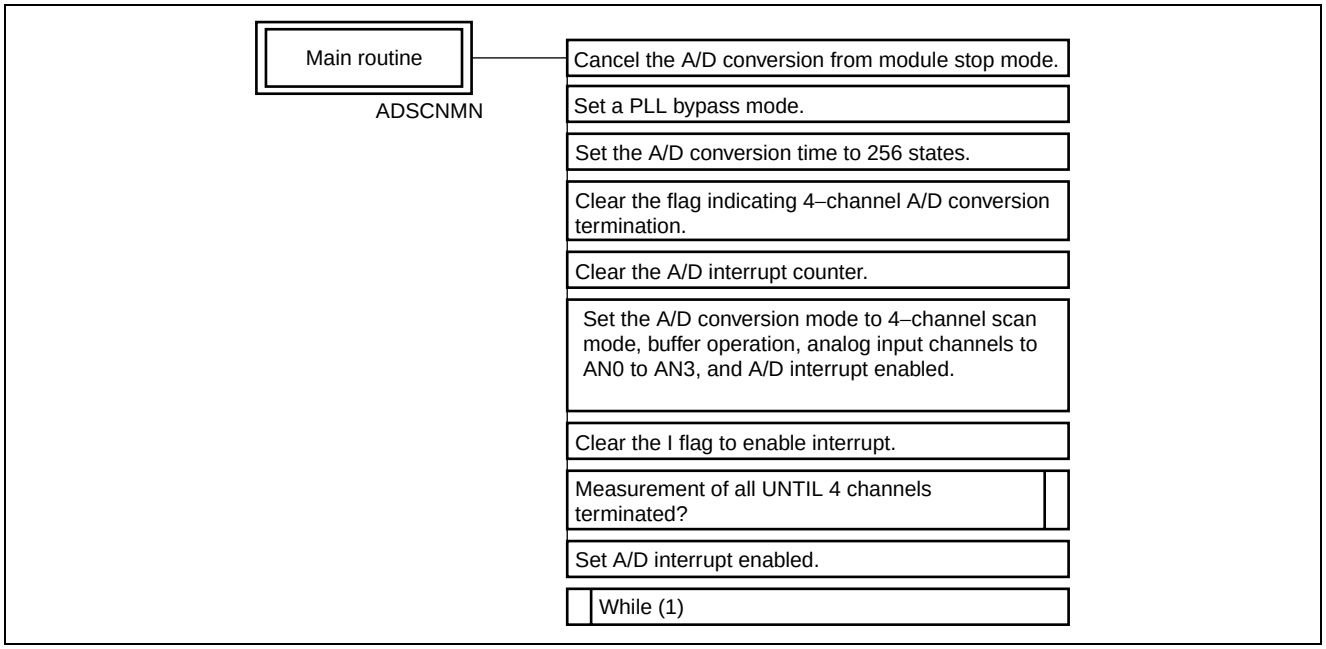
4. RAM Usage

Table below describes RAM usage in this sample task.

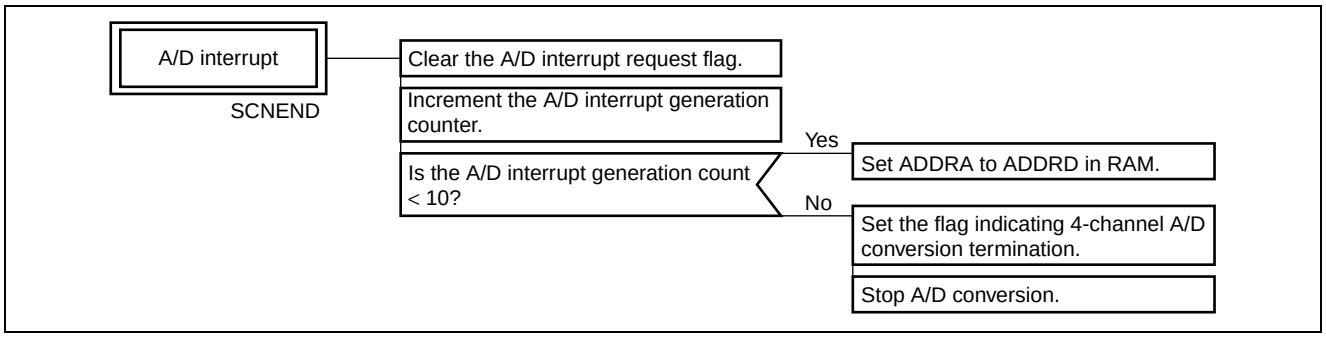
Used in	Label Name	Function
A/D interrupt	adicnt	Counts the A/D interrupt generation times.
A/D interrupt	scn_cnt	Counter used for saving data in RAM from the start address.

5. PAD

1. Main Routine



2. A/D Interrupt



Revision Record

		Description	
Rev.	Date	Page	Summary
1.00	Mar.16.04	—	First edition issued

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