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April 1st, 2010
Renesas Electronics Corporation

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78K0R/Kx3 Microcontroller
Sample Program
Operation Manual
(A/D Conversion (A/D Converter), C Source)

This software is for reference only and NEC Electronics does not guarantee its operation.
Thoroughly evaluate this software on your set prior to use.

ZUD-CC-07-0223-E
January, 2008

1st Product Solution Group, Multipurpose Microcomputer Systems Division,
Microcomputer Operations Unit
NEC Electronics Corporation

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M8E 02. 11-1

CONTENTS

1. OVERVIEW

This manual explains the sample program functions of the A/D converter for the 78K0R/Kx3.

In this sample program, analog signals input from analog input pins ANI14 (P156) and ANI15 (P157) are converted into digital signals.

The operation conditions are as follows.

- AV_{REF0} operates at 5 V (conversion time: $264/f_{CLK}$).
- ANI14 and ANI15 are used.
- P20 to P27 and P150 to P155: Digital I/O
- P156 and P157: Analog input
- Analog input from ANI14 (P156) by initial setting
- Analog input from ANI15 (P157) when the channel is changed

2. RESOURCES USED

Resource	Description	Remark
Main clock specification	Internal high-speed oscillator used (8 MHz (TYP.))	Always oscillated
	High-speed system clock used (20 MHz)	Oscillated by initial processing. Supplied to CPU and peripheral hardware
Subclock	XT1 (32.768 kHz)	Oscillated by initial processing
Related hardware	Peripheral enable register 0 (PER0)	Controls supplying and stopping of the input clock supply.
	A/D port configuration register (ADPC)	Digital I/O: P20 to P27, P150 to P155 Analog input: P156, P157
	A/D converter mode register (ADM)	Controls enabling or stopping of the comparator operation.
	Analog input channel specification register (ADS)	Specifies an analog input channel.
	Port mode register (PM2)	Initial setting: 0, 0, 0, 0, 0, 0, 0, 0 (0: Out, 1: In)
	Port mode register (PM15)	Initial setting: 1, 1, 0, 0, 0, 0, 0, 0 (0: Out, 1: In)
I/O	Input: ANI14 (P156), ANI15 (P157)	
Interrupt	AD conversion end interrupt (INTAD)	End of A/D conversion
Others	Not used	

3. SOFTWARE CONFIGURATION

Files

File Name	Processing Outline	Remark
K0R_def.h[Note]	Definition file	
K0R_init.c[Note]	Initialization processing	
K0R_ext.h	External declaration	
K0R_main.c	Main processing	
K0R_sfr_set.c	A/D converter processing	

Note These files are commonly used by the sample programs.

4. FUNCTION EXPLANATIONS

[File name]

K0R_main.c

Function

Function Name	Processing Outline	Argument	Return Value
main	Main routine	None	None

Function explanations

Function name	main
Processing	Main routine
Argument	–
Return value	–
Description	Enables all interrupts. Executes initialization processing and then performs A/D conversion processing.
Remark	–

[File name]

K0R_sfr_set.c

Functions

Function Name	Processing Outline	Argument	Return Value
SAD_INIT	Initializes A/D converter processing.	None	None
SAD_CHAN	Starts A/D converter processing operation.	None	None
SAD_STOP	Stops A/D converter processing operation.	None	None

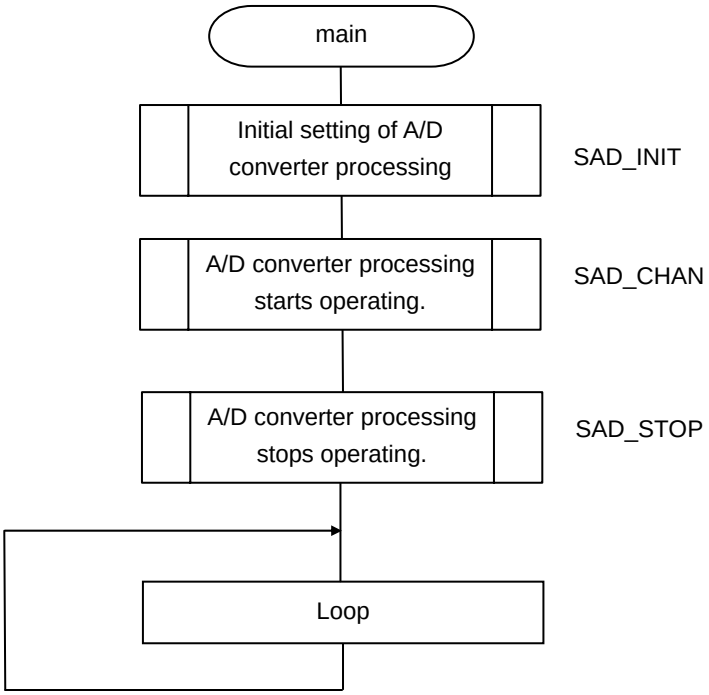
Function explanations

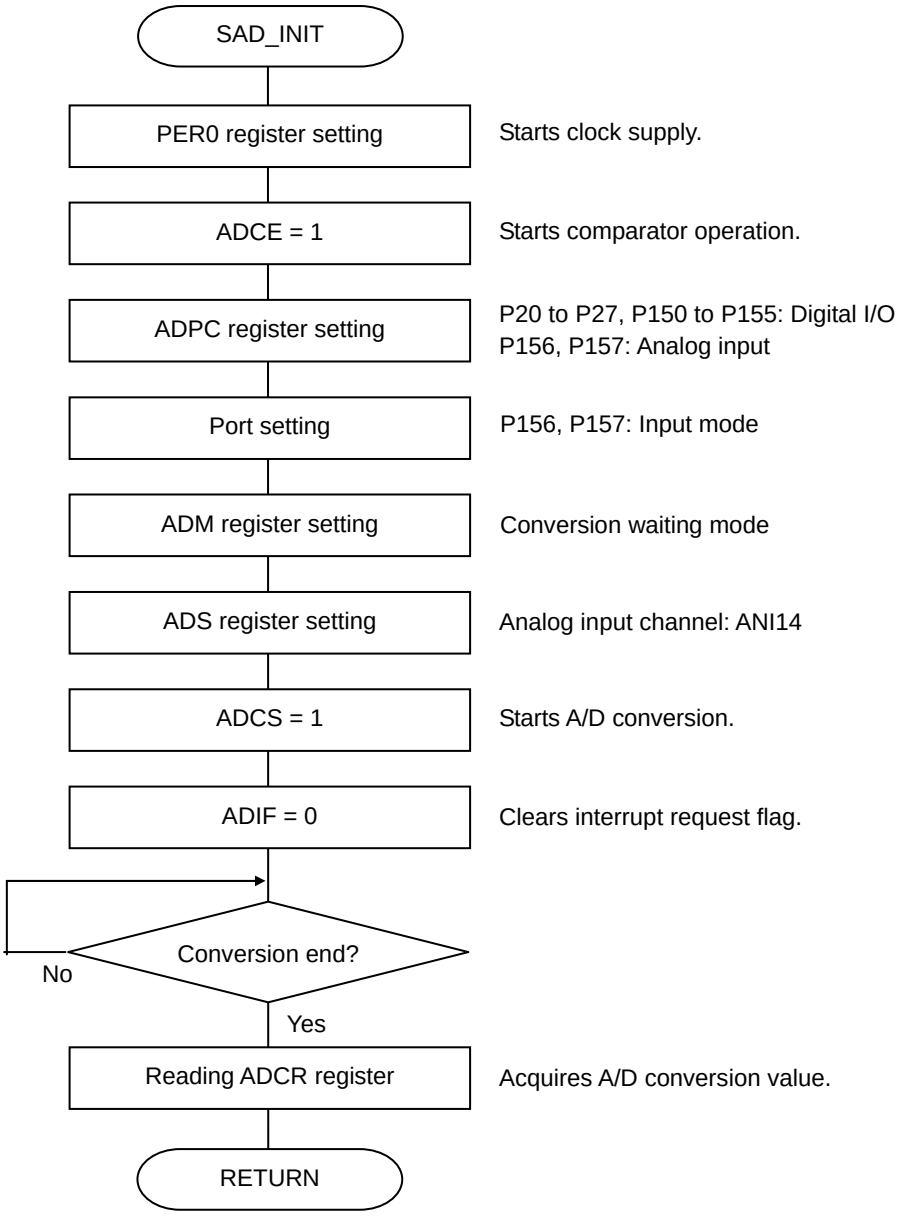
Function name	SAD_INIT
Processing	Initializes A/D converter processing.
Argument	–
Return value	–
Description	Starts supplying an input clock to the peripheral hardware. Starts comparator operation. Sets the A/D port configuration register (ADPC). • Sets P20 to P27 and P150 to P155 to digital I/O mode, and P156 and P157 to analog input mode. • Sets the I/O modes of PM2 and PM15. Sets the A/D converter mode register. • Conversion time: 264/f_{CLK} • Input source: P156/ANI14 pin Starts A/D conversion. Clears the interrupt request flag (ADIF = 0).
Remark	–

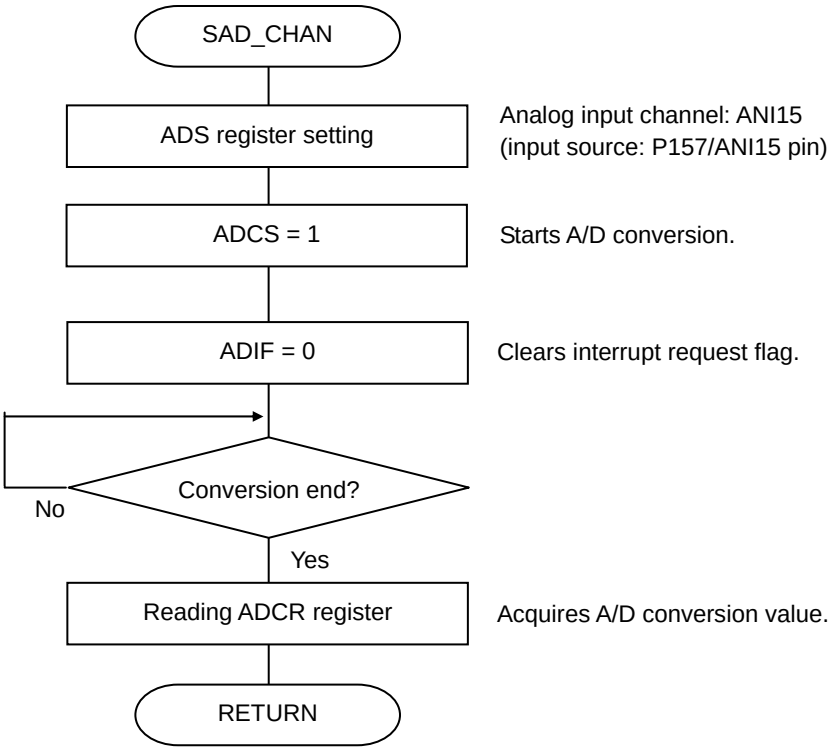
Function name	SAD_CHAN
Processing	Starts A/D converter processing operation.
Argument	–
Return value	–
Description	Sets an analog input channel. • Input source: P157/ANI15 pin Starts A/D conversion. Clears the interrupt request flag (ADIF = 0).
Remark	–

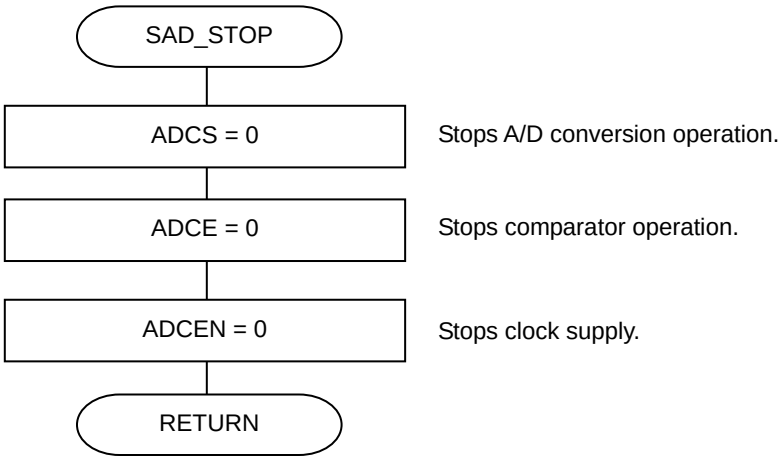
Function name	SAD_STOP
Processing	Stops A/D converter processing operation.
Argument	–
Return value	–
Description	Stops A/D converter processing operation. Stops comparator operation. Stops clock supply.
Remark	–

5. FLOWCHARTS




SAD_INIT
PER0 register setting
Starts clock supply.
ADCE = 1
Starts comparator operation.
ADPC register setting
P20 to P27, P150 to P155: Digital I/O
P156, P157: Analog input
Port setting
P156, P157: Input mode
ADM register setting
Conversion waiting mode
ADS register setting
Analog input channel: ANI14
ADCS = 1
Starts A/D conversion.
ADIF = 0
Clears interrupt request flag.
Conversion end?
No
Yes
Reading ADCR register
Acquires A/D conversion value.
RETURN


SAD_CHAN
ADS register setting
Analog input channel: ANI15
(input source: P157/ANI15 pin)
ADCS = 1
Starts A/D conversion.
ADIF = 0
Clears interrupt request flag.
Conversion end?
No
Yes
Reading ADCR register
Acquires A/D conversion value.
RETURN


SAD_STOP
ADCS = 0
Stops A/D conversion operation.
ADCE = 0
Stops comparator operation.
ADCEN = 0
Stops clock supply.
RETURN