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April 1st, 2010
Renesas Electronics Corporation

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78K0R/Kx3 Microcontroller

Sample Program

Operation Manual

(Simplified I^2C Data Transmission

(Serial Array Unit), 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.

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

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CONTENTS

1. OVERVIEW

This manual explains the sample program functions of simplified I^2C (transmission (address field transmission/data transmission)) for the 78K0R/Kx3.

In this sample program, a simplified I^2C (transmission (address field transmission/data transmission)) operation is performed.

The communication conditions are as follows.

- f_{CLK} = 20 MHz
- IIC10 (unit 0, channel 2) is used.
- Transfer rate: 100 kHz
- 8-bit data
- Stop bit: 1 (for ACK reception timing)
- MSB first
- Number of transmit data: 10
- WRITE mode
- Address field value: A0H
- IIC10 transfer end interrupt servicing is used.

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)	
	Serial clock select register 0 (SPS0)	Clock used: CK00 ($1/2^2$ of main clock), 5 MHz (0.2 μs)
	Serial mode register 02 (SMR02)	
	Serial communication operation setting register 02 (SCR02)	Transmission only, data length: 8 bits
	Serial data register 02 (SDR02)	Transfer rate: 100 kHz
	Serial channel start register 0 (SS0)	
	Serial channel stop register 0 (ST0)	
	Serial output register 0 (SO0)	
	Serial output enable register 0 (SOE0)	
	Port output mode register 0 (POM0)	
	Port mode register 0 (PM0)	
	Port register 0 (P0)	
	SIO10 register (SIO10)	
I/O	Data I/O: SDA10 (P03) Clock output: SCL10 (P04)	
Interrupt	INTIIC10 transfer end interrupt	
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	Simplified I²C processing (transmission)	

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	Executes initialization processing and then performs address field transmission and starts data transmission operation.
Remark	–

[File name]

K0R_sfr_set.c

Functions

Function Name	Processing Outline	Argument	Return Value
SER_SICIN	Initializes simplified I²C processing (transmission).	None	None
SER_SICAD	Simplified I²C processing (transmission) address transmission	None	None
SER_SICDT	Simplified I²C processing (transmission) data transmission	None	None
SER_SICSP	Simplified I²C processing (transmission) stop condition	None	None
SER_SICIT	Simplified I²C processing (transmission) data transmission processing	None	None

Function explanations

Function name	SER_SICIN
Processing	Initializes simplified I²C processing (transmission).
Argument	–
Return value	–
Description	Executes initialization.
Remark	–

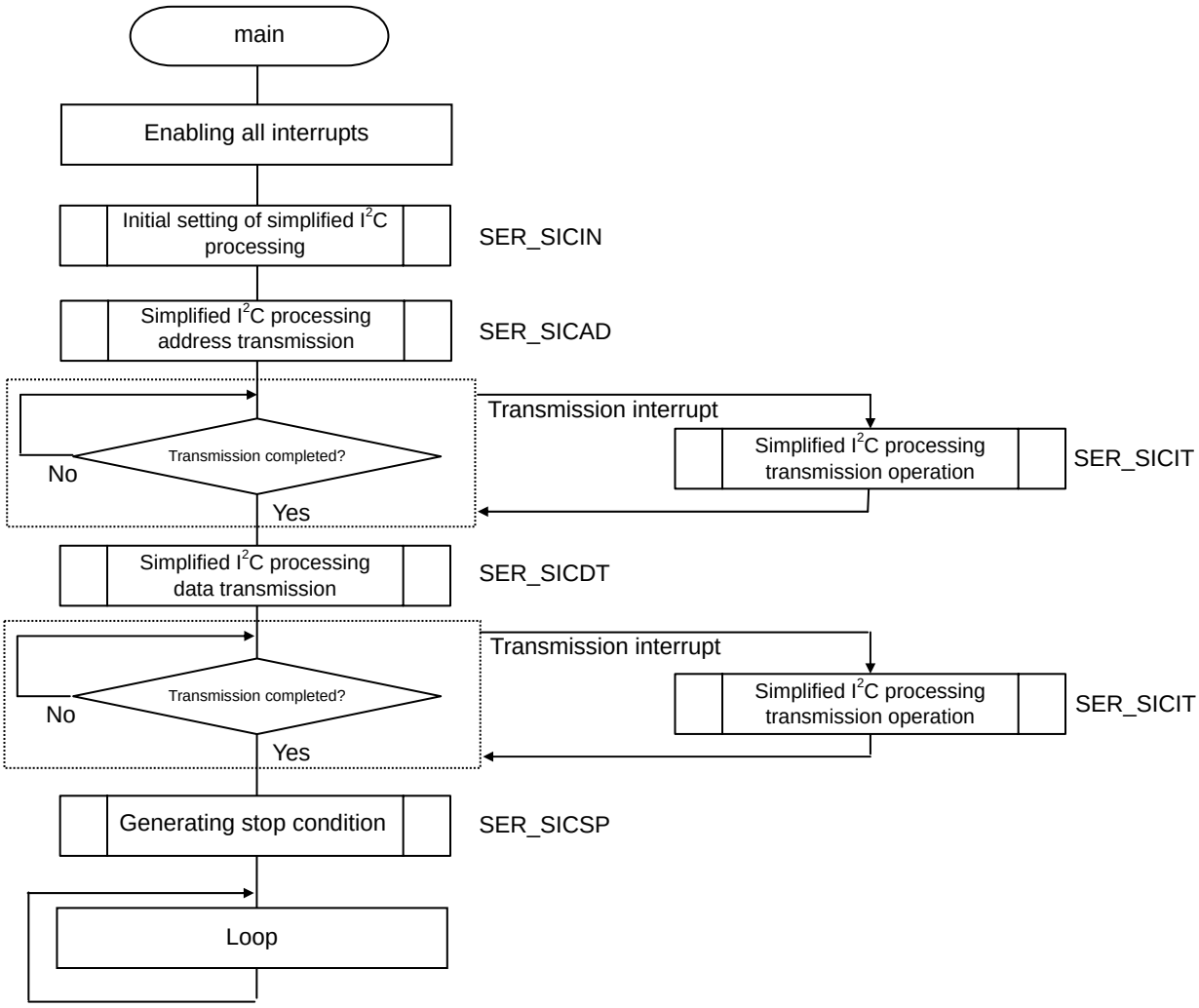
Function name	SER_SICAD
Processing	Simplified I²C processing (transmission) address transmission
Argument	–
Return value	–
Description	Starts address field transmission.
Remark	–

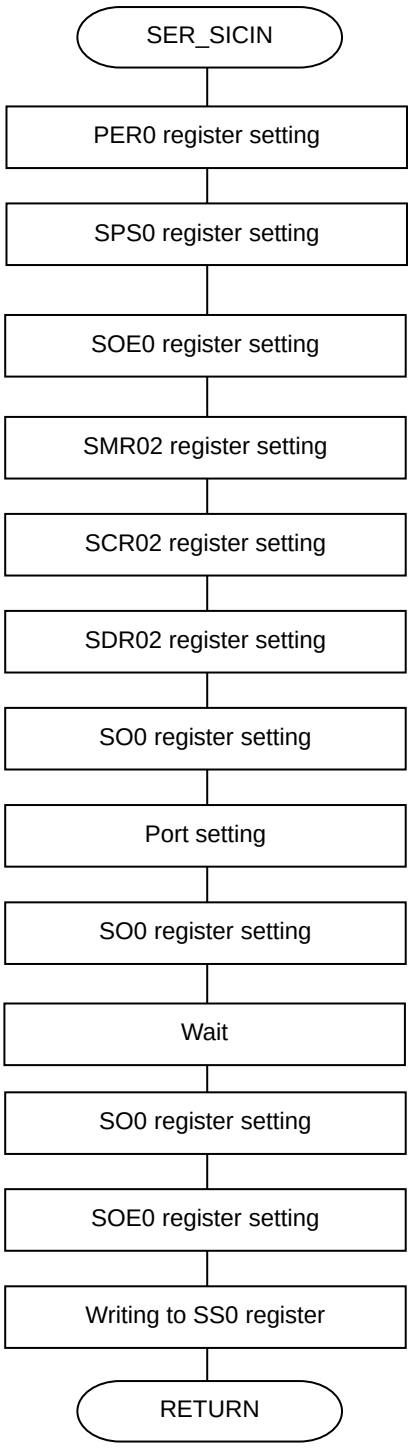
Function name	SER_SICDT
Processing	Simplified I²C processing (transmission) data transmission
Argument	–
Return value	–
Description	Starts data transmission.
Remark	–

Function name	SER_SICSP
Processing	Simplified I²C processing (transmission) stop condition
Argument	–
Return value	–
Description	Generates a stop condition.
Remark	–

Function name	SER_SICIT
Processing	Simplified I²C processing (transmission) data transmission processing
Argument	–
Return value	–
Description	INTIIC10 transfer end interrupt servicing An interrupt is generated when transmission has been completed. When this interrupt is generated, the next 1-byte data is transmitted. The transmission interrupt ends when processing of the transmit data has been completed.
Remark	–

5. FLOWCHARTS





Releases the serial array unit from the reset status and starts clock supply.

Sets the transfer rate, sets the SPS0 register at least 4 clocks after the PER0 register has been set to 1.

Sets 0 to the SOE02 bit and disables data output of the target channel.

Communication setting (communication operation)

Communication setting (transmission only, 8-bit data, MSB)

Transfer rate setting

Sets the initial output level.

Validates data output and clock output of the target channel by setting the port register and port mode register.

Sets 0 to the SO02 bit and generates a start condition.

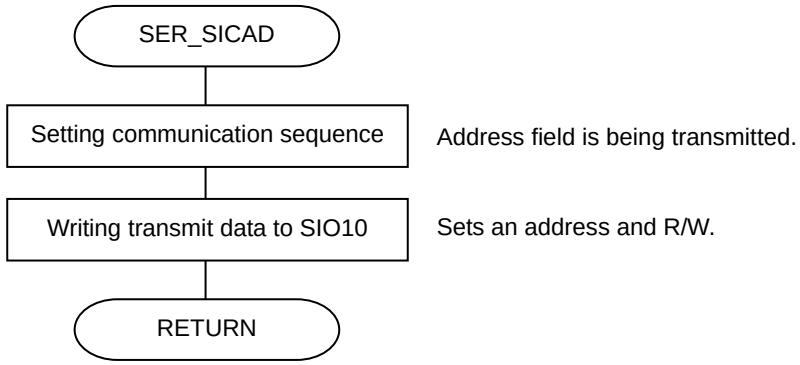
Secures a wait time to satisfy the specifications of I^2C of the slave.

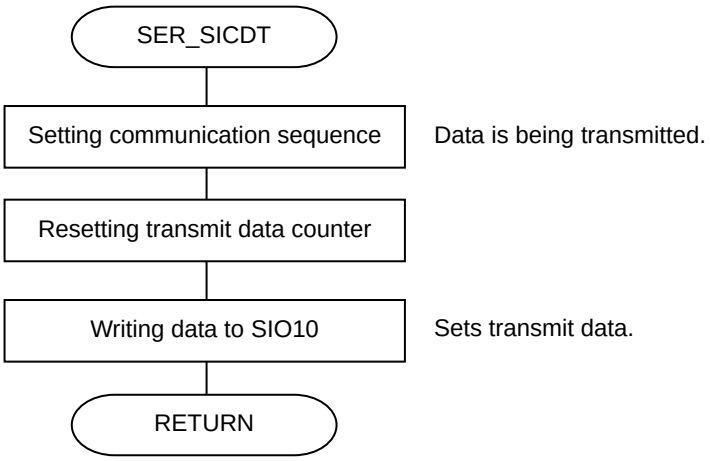
Sets 0 to the CKO02 bit and sets the clock output to low level.

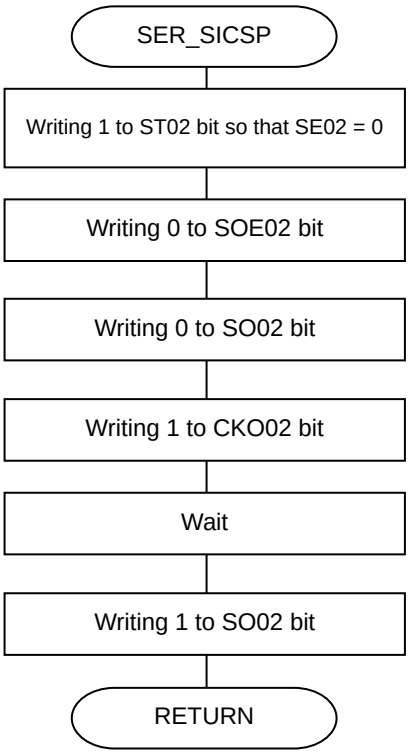
Sets 1 to the SOE02 bit and enables data output of the target channel.

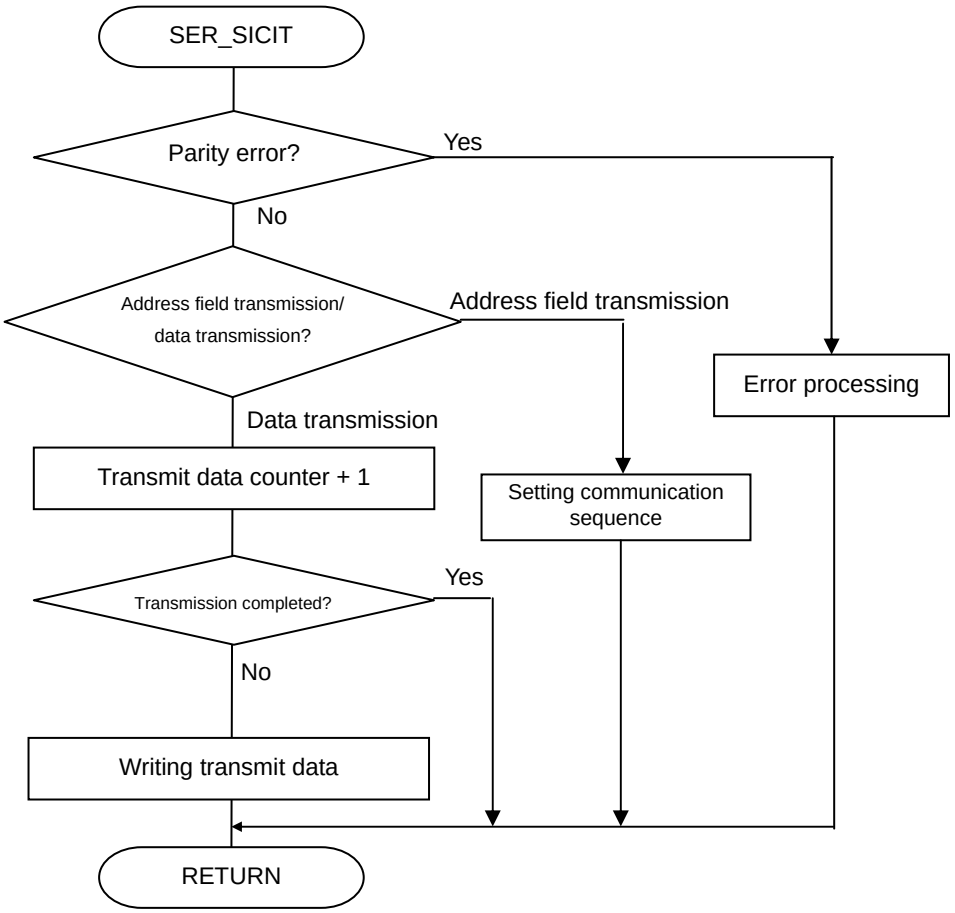
Sets 1 to the SS0 bit of the target channel and sets SE02 to 1.

Sets an address and R/W to the SIO10 register (bits 7 to 0 of the SDR02 register) and starts communication.


SER_SICAD
Setting communication sequence
Address field is being transmitted.
Writing transmit data to SIO10
Sets an address and R/W.
RETURN


SER_SICDT
Setting communication sequence
Data is being transmitted.
Resetting transmit data counter
Writing data to SIO10
Sets transmit data.
RETURN


SER_SICSP
Writing 1 to ST02 bit so that SE02 = 0
Writing 0 to SOE02 bit
Writing 0 to SO02 bit
Writing 1 to CKO02 bit
Wait
Writing 1 to SO02 bit
RETURN


SER_SICIT
Parity error?
Yes
No
Address field transmission/
data transmission?
Address field transmission
Error processing
Data transmission
Transmit data counter + 1
Setting communication
sequence
Transmission completed?
Yes
No
Writing transmit data
RETURN