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H8SX Family

8-Bit Absolute Address Space Switching

Introduction

With an H8SX CPU, any 8-bit absolute address space is selectable as desired.

For all CPUs of the conventional H8S Family, the 8-bit absolute address space is fixed to the range from H’FFFF00 to H’FFFFFF. In the H8SX, the 256-byte area from a desired address specified by the SBR is set as the 8-bit absolute address space.

Target Device

H8SX Family

Contents

1. Overview

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2. Applicable Conditions

Table 1 Applicable Condition

Item	Contents
Development tool	High-performance Embedded Workshop Ver.4.00.03
C/C++ compiler	H8S, H8/300 Series, C/C++ Compiler Ver.6.01.01
H8SX compiler options	-cpu = h8sxa:24:md, -code = machinecode, -optimize = 1, -regparam = 3, -speed = (register,shift,struct,expression) -sbr = FF2000

Table 2 Section Settings

Address	Section Name	Description
H'001000	P	Program area

3. Configuration

3.1 Short Address Base Register (SBR)

The SBR is a 32-bit register in which the 24 higher-order bits are valid and specify the higher-order address bits for 8-bit absolute addresses. The eight lower-order bits are reserved and read as 0s. The initial value is H’FFFFFF00. The contents of the SBR are changed by using LDC and STC instructions.

	31 … 12	11 … 0
SBR		(Reserved)

3.2 Setting the SBR

The address space is set by having assembly instructions directly write to the SBR, or by an assembler or compiler option. The following describes how to set the range from H’FF2000 to H’FF20FF as the 8-bit absolute address space.

1. Writing to the SBR by using assembly instructions

```
MOV.L  H'FF2000,  ER1
LDC.L  ER1,       SBR
```

2. Setting the SBR by a compiler option (-SBR)

```
E.g. ch38 sample.c -sbr=FF2000
```

3.3 Absolute Addresses for the H8SX CPU

The operand value is the contents of a memory location which is pointed to by an absolute address included in the instruction code. The absolute address used to access the data area consists of 8, 16, or 32 bits. Table 3 shows the accessible absolute address ranges.

Table 3 Ranges for Access by Absolute Addresses

Absolute address in the data area	Ranges for access in advanced mode
8 bits (@aa:8)	Any contiguous 256-byte area (the higher-order address bits are set in SBR) The 24 higher-order bits are specified by SBR.
16 bits (@aa:16)	H’000000 to H’007FFF, H’FF8000 to H’FFFFFF The 16 higher-order bits are sign-extended.
32 bits (@aa:32)	H’000000 to H’FFFFFF A 32-bit absolute address can access any location in the overall address space.

3.4 Example of Operation

Figure 1 shows an example of operation when the SBR is set to select the on-chip RAM (from H'FF2000 to H'FF20FF).

1. Conventional, with no SBR setting

```
MOV.B #imm8,    R0L          ; 2 bytes/2 cycles
MOV.B R0L,      @H'FF2000:32; 8 bytes/2 cycles
                      Total 10 bytes/4 cycles
```

2. With an SBR setting (SBR = H'FF2000)

```
MOV.B #imm8,    R0L          ; 2 bytes/2 cycles
MOV.B R0L,      @H'FF2000:8 ; 2 bytes/1 cycle
                       Total 4 bytes/3 cycles
```

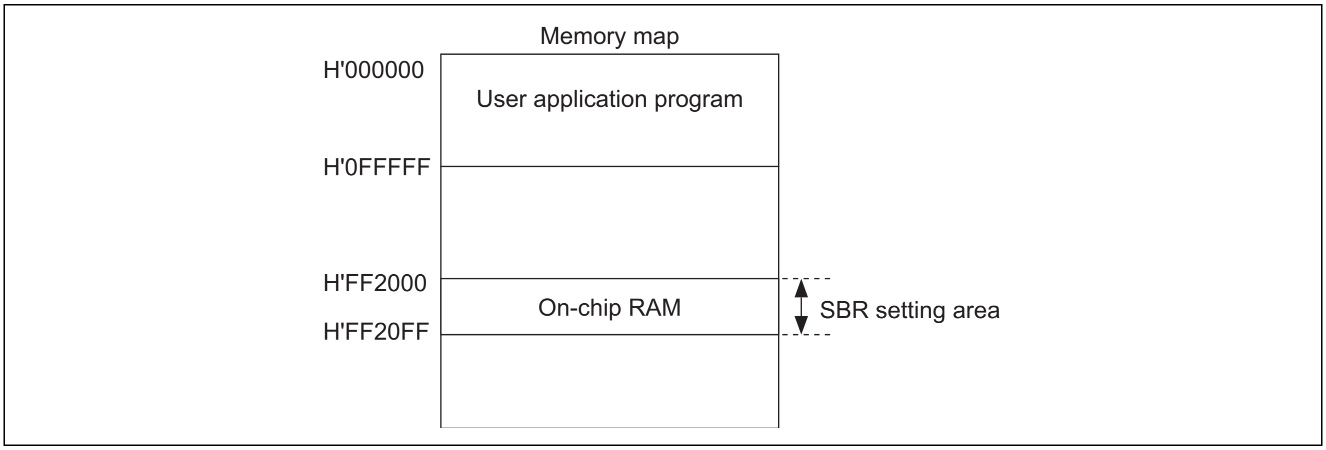
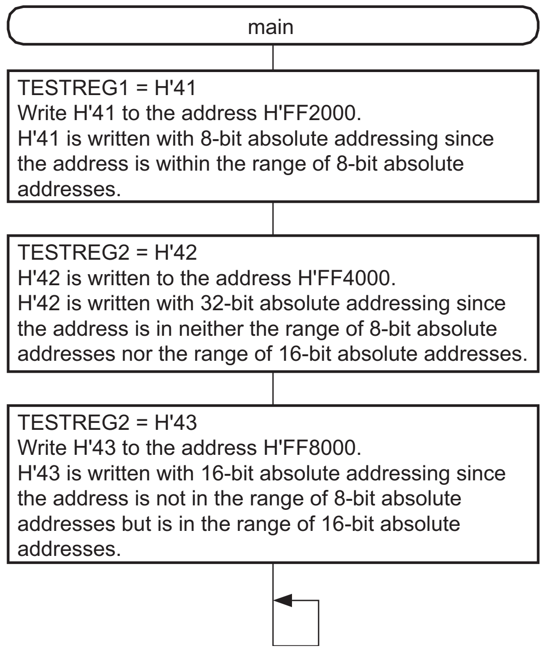


Figure 1 Example of SBR Usage

4. Sample Program

4.1 Flowchart

Set SBR to H'FF2000, then confirm access to 8/16/32-bit absolute addresses from the results of compilation.



4.2 Program Listing

A source program written in the C language is given below. This source program was compiled under the conditions described in “2. Applicable Conditions” and the results of compilation are described in section 4.3.

```
/************************************************************/
/*  Application Note                                        */
/************************************************************/

#include    <machine.h>

/************************************************************/
/*  Internal I/O register symbol definition                 */
/************************************************************/
#define TESTREG1    *(volatile unsigned char  *)0xFF2000
#define TESTREG2    *(volatile unsigned char  *)0xFF4000
#define TESTREG3    *(volatile unsigned char  *)0xFF8000

/************************************************************/
/*  Function prototype declaration                          */
/************************************************************/
void main ( void );

/************************************************************/
/*  Vector Address                                          */
/************************************************************/
#pragma entry main(sp=0xFFC000,vect=0)                /* H'0000 : Reset     */

#pragma section                                       /* P                  */
/************************************************************/
/*  Main Program                                            */
/************************************************************/
void main ( void )
{
    TESTREG1 = 0x41;    // Access to 8-bit absolute address space
    TESTREG2 = 0x42;    // Access to 32-bit absolute address space
    TESTREG3 = 0x43;    // Access to 16-bit absolute address space

    while(1);
}
```

4.3 Results of Compilation

Assembly code when "-sbr = FF2000" has been specified as a compiler option is shown below. The changes in the number of bytes under CODE with access to 8-, 16-, and 32-bit absolute addresses can be confirmed at values 0010, 0012, and 001A under OFFSET.

```
SCT OFFSET CODE                 LABEL     INSTRUCTION OPERAND    COMMENT
P                                                                    ; section
  00000000                      _main:                               ; function: main
  00000000 7A0700FFC000             MOV.L      #H'00FFC000,SP
  00000006 7A0300FF2000             MOV.L      #H'00FF2000,ER3
  0000000C 0373                     LDC.L      ER3,SBR
  0000000E F841                     MOV.B      #H'41:8,R0L
  00000010 3800                     MOV.B      R0L,@H'00FF2000:8
  00000012 017D484200FF4000         MOV.B      #H'42:8,@H'00FF4000:32
  0000001A 017D40438000             MOV.B      #H'43:8,@H'00FF8000:16
  00000020                      L16:
  00000020 4000                     BRA        L16:8
```

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