To our customers,

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

M16C/80 Series

Converting from Floating-point Number to Binary Number

1.0 Abstract

This program converts a single-precision, floating- point number into a 32-bit singed binary number.

2.0 Introduction

This program converts a single-precision, floating- point number into a 32-bit singed binary number. Set the single-precision, floating-point number in R2 and R0. A signed binary number is output to R3 and R1 beginning with the upper half.

In this program, after confirming that the single- precision, floating-point number is convertible, the data is loaded into the registers while shifting the mantissa data left, and this operation is repeated as many times as dictated by the exponent to create a binary number. Finally, the resulting data is adjusted to make it matched to the sign bit of the input data.

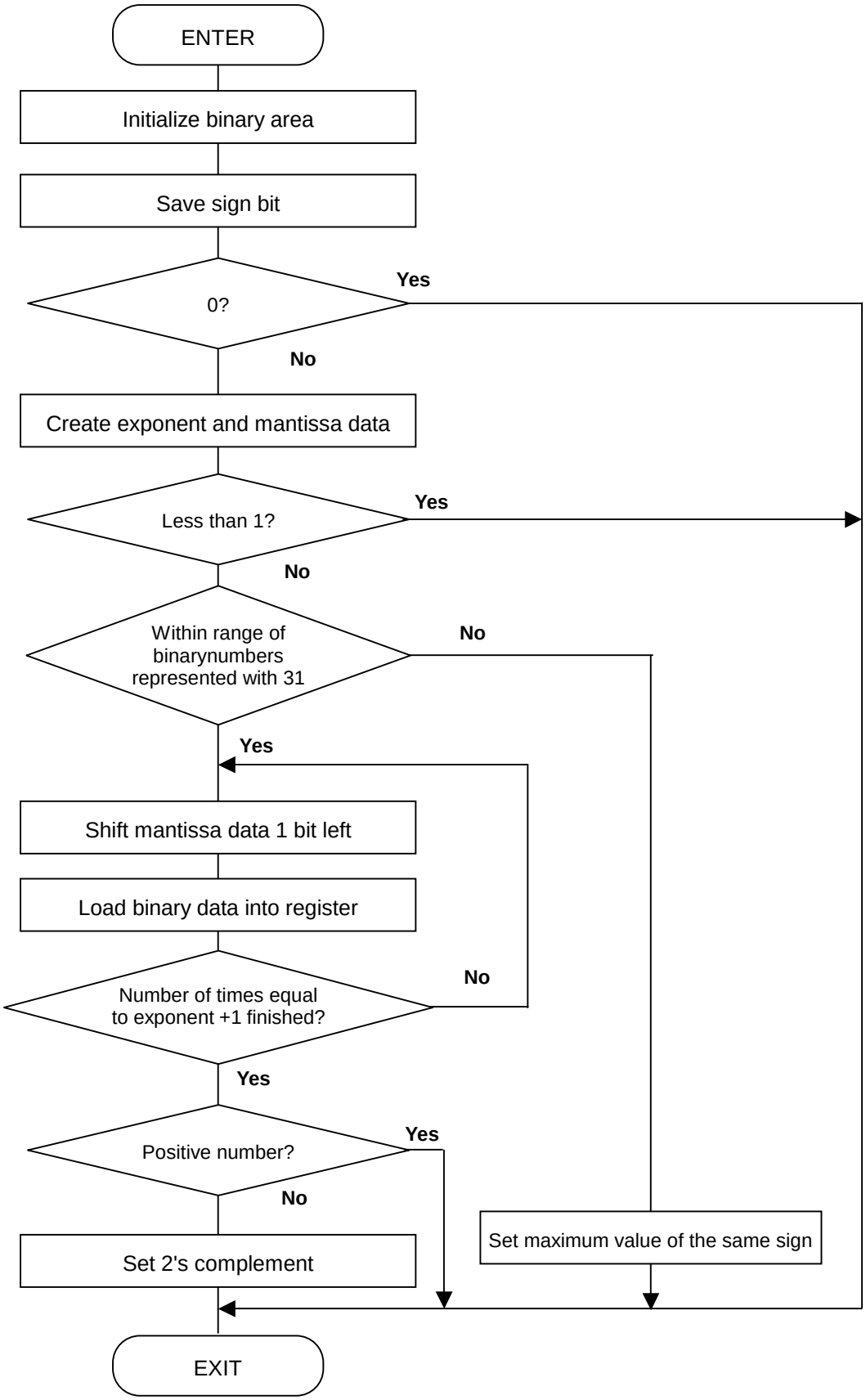
If the magnitude of a single-precision, floating-point number is equal to or greater than "2^{31}", the program outputs the maximum value of the same sign; if less than "1", the program outputs a "0". In either case, the result is output to R3 and R1.

R3,R1	ROM capacity : 41byte
7FFFFFFFH	Magnitude of a single-precision, floating-point number is equal to or greater than "2^{31}" (sign +)
80000000H	Magnitude of a single-precision, floating-point number is equal to or greater than "2^{31}" (sign -)
00000000H	Magnitude of a single-precision, floating-point number is less than "1"

Subroutine name : FLOATINGtoBIN	ROM capacity : 69byte
Interrupt during execution:Accepted	Number of stacks used : None

Register/memory	Input	Output	Usage condition
R0	Mid and lower parts of mantissa	Indeterminate	←
R1	-	Lower half of signed binary	←
R2	Exponent, upper part of mantissa	Indeterminate	←
R3	-	Upper half of signed binary	←
A0	-	Indeterminate	Used to save sign bit
A1	-	-	Unused
Usage precautions	If the magnitude of a single-precision, floating-point number is equal to or greater than "2^{31}", the program outputs the maximum value of the same sign; if less than "1", the program outputs a "0". The floating-point data is destroyed as a result of program execution.		

3.0 Flowchart



4.0 Programming Code

```
;*****************************************************************
; *
;       M16C Program Collection
;       CPU : M16C/80 series
; *
;*****************************************************************
VromTOP     .EQU        0FE0000H                ; Declares start address of ROM
;=====================================================================
;   Title: Converting from single-precision, floating-point number to binary number
;   Outline: Converts single-precision, floating-point number into 32-bit signed binary number
;   Input:      ------------------------------>     Output:
;   R0(Mid and lower parts of mantissa)     R0(Indeterminate)
;   R1()                                    R1(Lower half of signed binary)
;   R2(Exponent, upper part of mantissa)    R2 (Indeterminate)
;   R3()                                    R3(Upper half of signed binary)
;   A0()                                    A0(Indeterminate)
;   A1()                                    A1(Unused)
;   Stack amount used: None
;   Notes:
;=====================================================================
            .SECTION    PROGRAM,CODE
            .ORG        VromTOP                 ; ROM area
FLOATINGtoBIN:                                  ;
  XCHG.W    R0,R2                               ; Changes registers
  MOV.L     #0,R3R1                             ; Initializes binary area
  MOV.B     R0H,A0                              ; Saves sign bit
  BCLR      7,R0H                               ; Clears sign
  CMP.W     #0,R0                               ;
  JNE       FLOATINGtoBIN_10                    ;
  CMP.W     #0,R2                               ;
  JEQ       FLOATINGtoBIN_EXIT                  ; --> Zero
FLOATINGtoBIN_10:                               ;
  BTSTS     7,R0                                ; Sets LSB of exponent to C flag
                                                ; and adds 1.0 to mantissa
  ROLC.B    R0H                                 ; Creates exponent
  SUB.B     #7FH,R0H                            ; Determines whether magnitude is less than 1
  JNC       FLOATINGtoBIN_EXIT                  ; --> Sets 0 because magnitude is less than 1
  CMP.B     #31,R0H                             ; Determines whether number is within representation range
  JLTU      FLOATINGtoBIN_20                    ; --> Number is within binary representation range
  OR.W      #08000H,R3                          ; Initial sets maximum value of the same sign
  BTST      7,A0                                ; Checks sign bit
  JNE       FLOATINGtoBIN_EXIT                  ; --> Negative number (80000000)
  NOT.W     R1                                  ; Positive number (7FFFFFFF)
  NOT.W     R3                                  ;
  JMP.B     FLOATINGtoBIN_EXIT                  ;
FLOATINGtoBIN_20:                               ;
  INC.B     R0H                                 ; Adjusts loop count
FLOATINGtoBIN_30:                               ;
  SHL.W     #1,R2                               ; Pushes mantissa data
  ROLC.B    R0L                                 ;
  ROLC.W    R1                                  ; Loads result into register
  ROLC.W    R3                                  ;
  ADJNZ.B   #-1,R0H,FLOATINGtoBIN_30            ; --> Conversion loop
  BTST      7,A0                                ; Checks sign bit
  JEQ       FLOATINGtoBIN_EXIT                  ; --> Positive number
  NOT.W     R1                                  ; Takes 2's complement
  NOT.W     R3                                  ;
  ADD.L     #1,R3R1                             ;
```

```
FLOATINGtoBIN_EXIT:                                    ;
   RTS                                                 ;
   ;                                                   ;
                  .END ;
```

5.0 Reference

MCU Technical Information Homepage

http://www.infomicom.maec.co.jp/indexe.htm
(or http://www.mdece.com/ , http://www.mitsubishichips.com/products/mcu/index.html or your local Web Site.)

Technical Support

E-mail: support@apl.maec.co.jp
(or your local support E-mail address. A private e-mail address should NOT be used.)

Data Sheet

M16C/80 group
(Use the latest version on the Homepage: http://www.infomicom.maec.co.jp/indexe.htm)

User's Manual

M16C/80 group
(Use the latest version on the Homepage: http://www.infomicom.maec.co.jp/indexe.htm)

RENESAS
Renesas Technology Corp.

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