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MESC TECHNICAL NEWS

No.M32R-02-9805

M32000D3FP, M32000D4AFP USAGE NOTES for power management function

A note on using the power management function is given below:

1. RELEVANT DEVICES

M32000D3FP
M32000D4AFP

2. PROBLEM

The power supply current in the low power consumption mode (standby mode or CPU sleep mode) may exceed the rated value under some operating conditions. When this is the case, the current is in the range several mA to several tens of mA at 3.3 V and room temperature.

This condition is established by the instruction immediately following the instruction which initiates switching to low power consumption mode and affects only the current limiting function. Even if the current flow is higher than the designed value, it does not cause the M32000D3FP/M32000D4AFP to run in an undesirable manner nor does it affect the physical reliability of the device and the life of the product. Unwanted current increase can be prevented by a program written in the way shown below.

3. SOLUTION

To put the device into low power consumption mode (standby mode or CPU sleep mode), use the source code shown on the following page. In the example, switching to low power consumption mode is executed by the function `go-standby-mode()`. This is written as a C language source program using in-line assembler code.

Note: The example given is for switching to standby mode. To enter CPU sleep mode, change the value to be set in MPMR to "PM0,PM1 = 10".

The SOLUTION offered under the title "M32000D3FP, M32000D4AFP USAGE NOTES on standby mode operation" in MESC TECHNICAL NEWS No. M32R-01-97 12 may lead to the unwanted condition described above. This note supersedes that advice.

[Example of source code for switching to low power consumption mode]

```

-----
#ifdef __GNUC__          /* In the case that GNU-C compiler is used*/
#else

#ifdef __M32R__          /* In the case that CC32R compiler is used*/

#pragma keyword asm on /* Enable asm statement*/
/* Note:
 * Use of the asm statement disables a portion of the CC32R optimization function.
 * Do not include any other function in this file.
 */

#endif          /* __M32R__ // In the case that CC32R compiler is used */
#endif          /* __GNUC__ */
/*
 * [Function] go_standby_mode()
 *   Argument: none; returned value: none (never returns to the called function)

 * [Operation]
 * Operate the power management control register (MPMR) to switch M32R/D to
 * standby mode.
 */
void
go_standby_mode(void)
{
    asm( " ld24 r0,#-0xfffffb\n" /*forces 32-bit word boundary alignment*/
        " neg r0,r0\n" /*the address of R0=MPMR is entered*/
        " ldi r1,#3\n" /*R1=3, PM0,PM1="11" standby mode*/

        " stb r1,@r0\n" /*write to MPMR*/
        " ldb r2,@r0\n" /*read out MPMR*/

        " nop\n"
        " nop\n"
        " nop\n"
        " nop\n"
        " nop\n"
        " nop\n"
        " nop\n"
        " nop\n"
        " nop\n" );
}
-----

```