

GigaDevice Semiconductor Inc.

Arm[®] Cortex[®]-M3/4 32-bit MCU

应用笔记

AN008

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1. 简介

GD32 系列 MCU 当前版本产品在使用 Deep-sleep 模式时有一个限制。

如果用户使能了一些非唤醒源的中断，当用户使用 Deep-sleep 模式时，无论使用 WFI 指令还是 WFE 指令，都会存在一个比较严重的风险，当 MCU 进入 Deep-sleep 模式后，可能永远无法被目标唤醒信号（中断或事件）唤醒。

2. 解决方案

为了规避这个风险,用户需要替换[表 2-1. GD 标准库中的原始函数](#)中 pmu_to_deepsleepmode 函数中字体加粗的代码,这个函数一般在 GD32 标准中命名为“gd32fxxx_pmu.c”方式。

用户需要根据使用的 MCU 型号,用下面对应的代码替换。

表 2-1. GD 标准库中的原始函数

```

/*!
  \brief      PMU work at deep sleep mode
  \param[in]  ldo
              \arg      PMU_LDO_NORMAL: LDO normal work when pmu enter deepsleep mode
              \arg      PMU_LDO_LOWPOWER: LDO work at low power mode when pmu enter
deepsleep mode
  \param[in]  deepsleepmodecmd:
              \arg      WFI_CMD: use WFI command
              \arg      WFE_CMD: use WFE command
  \param[out] none
  \retval     none
*/
void pmu_to_deepsleepmode(uint32_t ldo,uint8_t deepsleepmodecmd)
{
    /* clear stbmod and ldolp bits */
    PMU_CTL &= ~((uint32_t)(PMU_CTL_STBMOD | PMU_CTL_LDOLP));

    /* set ldolp bit according to pmu_ldo */
    PMU_CTL |= ldo;

    /* set sleepdeep bit of Cortex-M4 system control register */
    SCB->SCR |= SCB_SCR_SLEEPDEEP_Msk;

    /* select WFI or WFE command to enter deepsleep mode */
    if(WFI_CMD == deepsleepmodecmd){
        __WFI();
    }else{
        __SEV();
        __WFE();
        __WFE();
    }

    /* reset sleep deep bit of Cortex-M4 system control register */
    SCB->SCR &= ~((uint32_t)SCB_SCR_SLEEPDEEP_Msk);
}

```

2.1. 用于 GD32F10x / F20x / F30x / F403 系列库的替换代码

表 2-2. 用于 GD32F10x / F20x / F30x / F403 系列的替换代码

```
{
    static uint32_t reg_snap[4];

    reg_snap[0] = REG32(0xE000E010);
    reg_snap[1] = REG32(0xE000E100);
    reg_snap[2] = REG32(0xE000E104);
    reg_snap[3] = REG32(0xE000E108);

    REG32(0xE000E010) &= 0x00010004;
    REG32(0xE000E180) = 0xFF7FF83D;
    REG32(0xE000E184) = 0xBFFFF8FF;
    REG32(0xE000E188) = 0xFFFFFFFF;

    /* select WFI or WFE command to enter deepsleep mode */
    if(WFI_CMD == deepsleepmodecmd){
        __WFI();
    }else{
        __SEV();
        __WFE();
        __WFE();
    }
    REG32(0xE000E010) = reg_snap[0] ;
    REG32(0xE000E100) = reg_snap[1] ;
    REG32(0xE000E104) = reg_snap[2] ;
    REG32(0xE000E108) = reg_snap[3] ;
}
```

2.2. 用于 GD32F1x0 / F3x0 系列库的替换代码

表 2-3. 用于 GD32F1x0 / F3x0 系列的替换代码

```
{
    static uint32_t reg_snap[4];

    reg_snap[0] = REG32(0xE000E010);
    reg_snap[1] = REG32(0xE000E100);
    reg_snap[2] = REG32(0xE000E104);
    reg_snap[3] = REG32(0xE000E108);

    REG32(0xE000E010) &= 0x00010004;
    REG32(0xE000E180) = 0XB7FFEF19;
    REG32(0xE000E184) = 0XFFFFFFBFF;
    REG32(0xE000E188) = 0XFFFFFFFF;

    /* select WFI or WFE command to enter deepsleep mode */
    if(WFI_CMD == deepsleepmodecmd){
        __WFI();
    }else{
        __SEV();
        __WFE();
        __WFE();
    }

    REG32(0xE000E010) = reg_snap[0] ;
    REG32(0xE000E100) = reg_snap[1] ;
    REG32(0xE000E104) = reg_snap[2] ;
    REG32(0xE000E108) = reg_snap[3] ;
}
```

2.3. 用于 GD32F40x 系列库的替换代码

表 2-4. 用于 GD32F40x 系列的替换代码

```
{
    static uint32_t reg_snap[4];

    reg_snap[0] = REG32(0xE000E010);
    reg_snap[1] = REG32(0xE000E100);
    reg_snap[2] = REG32(0xE000E104);
    reg_snap[3] = REG32(0xE000E108);

    REG32(0xE000E010) &= 0x00010004;
    REG32(0xE000E180) = 0xFF7FF83D;
    REG32(0xE000E184) = 0xBFFFF8FF;
    REG32(0xE000E188) = 0xFFFFFFFF;

    /* select WFI or WFE command to enter deep sleep mode */
    if(WFI_CMD == deepsleepmodecmd){
        __WFI();
    }else{
        __SEV();
        __WFE();
        __WFE();
    }

    REG32(0xE000E010) = reg_snap[0] ;
    REG32(0xE000E100) = reg_snap[1] ;
    REG32(0xE000E104) = reg_snap[2] ;
    REG32(0xE000E108) = reg_snap[3] ;
}
```


3. 版本历史

表 3-1. 版本历史

版本号.	说明	日期
1.0	首次发布	2021 年 11 月 30 日

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