iND86201
Application Notes

8/30/17 iND86201 Application Note

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3.0 KNOWN ISSUES AND WORKAROUND

3.1 PIN WAKE-UP FAIL ONCE USB CONNECTED TO A PC

Function:

By setting the PIN, Ernie can wake up from deep sleep when status of the IO is changed.

Issue:

PIN wake-up does not work if Ernie's USB is connected to a PC.

Issue Workaround:

"USBF" flag in PMURST register has to be cleared before system goes into deep sleep.

3.2 GPIO READ/WRITE FAILURE

Function:

GPIO Read/Write

Issue:

The read operation on GPIOC and GPIOD might return invalid results, it will also affect the read-modify-write operation where invalid result results get programmed into the port register.

Issue Workaround:

Additional read operation on GPIOB is required to allow consistently correct result to be propagated to the port register.

For a read operation:

```
uint8_t GPIOD_PortRead(uint8_t mask)
{
    uint8_t data;
    /* Additional read operation on GPIOB is placed before the read operation on GPIOD. */
    data = GPIOB_SFRS->PORT;
    return GPIOD_SFRS->PORT & mask;
}
```

For a write operation:

```
void GPIOD_PortSet(uint8_t val, uint8_t mask)
```

```
{
    uint8_t readen;
    uint8_t data;

    readen = GPIOD_SFRS->READEN;
    GPIOD_SFRS->READEN = 0xFF;
    /* Additional read operation on GPIOB is placed before the read operation on GPIOD. */
    data = GPIOB_SFRS->PORT;
    data = GPIOD_SFRS->PORT;
    GPIOD_SFRS->PORT = (val & mask) | (data & ~mask);
    GPIOD_SFRS->READEN = readen;
}
```

3.3 WAKE-UP ISSUE

Function:

Wake-Up

Issue:

In very rare instances, Ernie enters deep sleep mode forever during the intensive sleep and wakeup test triggered by GPIO interrupts. The root cause is that if a GPIO interrupt is fired when Ernie is in the transition to deep sleep mode, the system will enter an undefined mode where no wakeup event can be fired till the system going through a full power cycle.

Typically, these GPIOs are designed as default pull-up, a pull-down to GND will generate a wakeup event.

Issue Workaround:

Block all GPIO events from being generated during the transition from active mode to deep sleep mode.

From hardware side, capacitors of 100nF are required to be placed between GPIO pins and GND. This configuration will introduce a delay for any GPIO hardware to generate edge transitions.

From software side, before entering deep sleep mode, software sets those GPIO pins as output and clear them to 0 to discharge these signals completely. Then set them back to input interrupt mode. Since these pins are being slowly pulled-up due to the high pull-up resistors and the external capacitors added (from previous paragraph) thus a certain minimum delay is inserted here. Before the signals are to be pulled high enough to cross the threshold, the end user will not be able to fire any pull-down interrupts.

Here is the example code to enter deep sleep mode, in this example, GPIOB.0 and GPIOB.1 are design as interrupt sources for system wakeup.

```
 static void enter_sleep_mode(void)
{
    /* Block GPIO falling edge interrupts during the transition to deep sleep mode.
    It is achieved by adding a 100nF capacitor on each GPIO with interrupt enabled */
    GPIOB_EnablePortOutput(1, 0x03);
    GPIOB_PortSet(0, 0x03);
    GPIOB_EnablePortOutput(0, 0x03);
    /* Request to enter deep sleep mode */
    PMU_devSleepLowPwrReboot(PMU_WAKEUP_TIME_MAX);
    while(1);
}
```

3.4 ADC CURRENT DRAIN

Function: ADC

Issue: Current Drain

Issue Workaround:

In order to put ADC in minimum current drain in deep sleep mode, ADC channel selection needs to be 0x3F so that non-channel is selected. In our example code:

```
int32_t ADC_devExit(ADC_Device_t *dev)
{
    if (!dev)
        return -EFAULT;
    /* Set ADC channel to NONE */
    dev->SelectChannel(E_ADC_CHANNEL_NONE);
    ADC_SFRS->TRIM2.ADCENABLE = 0;

    return 0;
}
```

3.5 SEQUENCE FOR BAND GAP STARTUP

Function: Bandgap startup

Issue:

Normally a band gap can be enabled by setting all the enable bits in the register for analog power control (0x50000058) at the same time. In rare instances in Ernie, startup might be delayed or failed. The worse cases are observed at lower battery level and lower temperature.

Issue Workaround:

In order to guarantee a solid startup of bandgap, the following sequence shall be followed:

1. Enable BG, wait 1 ms
2. Enable BG and enable BG_BUF, wait 1 ms
3. Enable BG and enable BG_BUF and enable V2I, wait 1 ms

4.0 REFERENCES

[1] iND86201 data sheet

5.0 REVISION HISTORY

Rev #	Date	Action	
0.1	8/16/2017	Initial version	

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