GigaDevice Semiconductor Inc.

Device limitations of GD32E11x&C11x

Errata Sheet

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1. Introduction

This document applies to GD32E11x&C11x product series, as shown in ***Table 1-1. Applicable products***. It provides the technical details that need to be paid attention to in the process of using GD32 MCU, as well as solutions to related problems.

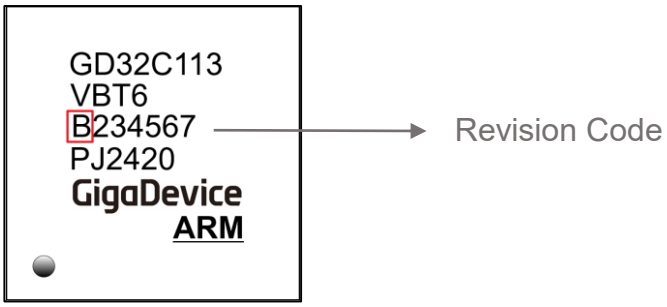
Table 1-1. Applicable products

Type	Part Numbers
MCU	GD32E113xx series
	GD32C113xx series

1.1. Revision identification

The device revision can be determined by the mark on the top of the package. The 1st code on the line 3 of the mark represents product revision code. As the picture shown in ***Figure 1-1. Device revision code of GD32E11x&C11x***.

Figure 1-1. Device revision code of GD32E11x&C11x



1.2. Summary of device limitations

The device limitations of GD32E11x&C11x are shown in ***Table 1-2. Device limitations***, please refer to section 2 for more details.

Table 1-2. Device limitations

Module	Limitations	Workaround	
		Rev. Code A	Rev. Code B
FMC	*When performing double-word programming, if one of the words at the programming address is 0xFFFFFFFF, then executing the double-word programming operation at that address will not cause the PGERR bit to be set*	Y	Y
PMU	*Standby mode cannot be waked up due to frequent wakeup signals before or after entering standby mode*	N	N
RCU	*MCU cannot be waked up after entering deep-sleep mode when DSLP_HOLD bit is set*	Y	Y
	The LXTALSTB bit cannot be cleared by disabling LXTAL when LXTAL stops unexpectedly	Y	Y
ADC	*ADC data acquisition error occurs when the ADC clock is much slower than the PCLK clock*	Y	Y
DAC	*In the DAC noise mode, when the value (DH+DWBW) is configured more than 4095, the DAC output voltage will have an abnormal break point*	Y	Y
I2C	*Read one more data because the BTC flag was not cleared*	Y	Y
Core	*VDIV or VSQRT instructions might not complete correctly when very short ISRs are used*	Y	Y

Note:

Y = Limitation present, workaround available

N = Limitation present, no workaround available

'--' = Limitation fixed

2. Descriptions of device limitations

2.1. FMC

2.1.1. When performing double-word programming, if one of the words at the programming address is 0xFFFFFFFF, then executing the double-word programming operation at that address will not cause the PGERR bit to be set

Description & impact

When performing double-word programming, if one of the words at the programming address is 0xFFFFFFFF, then executing the double-word programming operation at that address will not cause the PGERR bit to be set, but the programmed data will be incorrect.For example, if the value at address 0x08001000 is 0xFFFFFFFF A55AA55A, then performing a double-word programming operation at 0x08001000 next time will not cause the PGERR bit to be set.

Workarounds

Ensure that the data at the address is emptybefore programming.Before programming the same address, programme need to perform an erase operation on that address area.

2.2. PMU

2.2.1. Standby mode cannot be waked up due to frequent wakeup signals before or after entering standby mode

Description & impact

When reset the internal signal STBY_CTL to enter to standby mode, if the Tglitch is smaller than 100ns, which will cause the mcu cannot be waked up. The narrow glitch will result in incorrect Vcore voltage.

Note: The T_{glitch} is the time between STBY_CTL low level and the wakeup signal (PA0 high level).

Workarounds

Not available.

2.3. RCU

2.3.1. MCU cannot be waked up after entering deep-sleep mode when DSLP_HOLD bit is set

Description & impact

When DSLP_HOLD bit is set and debug the mcu in deep-sleep mode, the mcu will not be waked up.

Workarounds

When the DSLP_HOLD bit is set to enable low power debugging, the application programme need switch the system clock to IRC8M before entering the deep-sleep mode.

2.3.2. The LXTALSTB bit cannot be cleared by disabling LXTAL when LXTAL stops unexpectedly

Description & impact

When LXTAL stops unexpectedly, the LXTALSTB bit cannot be cleared by disabling the LXTAL, which prevents the LXTAL from restarting.

Workarounds

By repeatedly setting and resetting the LXTALBPS more than ten times to clear the LXTALSTB bit, and then reconfiguring the LXTAL. The reference code for clearing LXTALSTB bits is as follows:

```
void lxtal_stb_clear(void)
{
    volatile  uint32_t i = 0U;
    /* close LXTAL clock */
    rcu_osci_off(RCU_LXTAL);
    for(i = 0; i < 10; i++) {
        /* enable the LXTAL bypass mode */
        rcu_osci_bypass_mode_enable(RCU_LXTAL);
        /* disable the LXTAL bypass mode */
        rcu_osci_bypass_mode_disable(RCU_LXTAL);
    }
}
```

2.4. ADC

2.4.1. ADC data acquisition error occurs when the ADC clock is much slower than the PCLK clock

Description & impact

When the ADC clock is much slower than the PCLK clock,the ADC_RDATA register is read immediately after the EOC is set and a data acquisition error occurs.

Workarounds

When the delay between reading EOC flag and reading ADC_RDATA is no more than two ADC clocks, after the EOC flag is set, software need to delay two ADC clocks before reading the ADC_RDATA register.

2.5. DAC

2.5.1. In the DAC noise mode, when the value (DH+DWBW) is configured more than 4095, the DAC output voltage will have an abnormal break point

Description & impact

When the DAC is configured in noise mode and the DAC output value is set to a large value, the superimposed value (DH+DWBW) will exceed the maximum value of 4095, resulting in an abnormal break point of zero voltage in the DAC output signal.

Workarounds

When the DAC output value and the noise wave peak value are configured, avoid the superimposed value (DH+DWBW) overflow.

2.6. I2C

2.6.1. Read one more data because the BTC flag was not cleared

Description & impact

If an interrupt occurs before reading I2C_DATA register when RBNE flag is set and BTC flag is reset, I2C will read an additional data if BTC flag is set during the interrupt processing because the read data operation cannot clear the BTC flag.

Workarounds

Use one of the following solutions:

1) Using interrupt method to read the I2C_DATA register (need higher interrupt priority).
2) Using DMA method to read the I2C_DATA register (recommend).

2.7. Core

2.7.1. VDIV or VSQRT instructions might not complete correctly when very short ISRs are used

This limitation refers to Arm ID number 776924 in “Cortex-M4 & Cortex-M4 with FPU Software Developers Errata Notice”.

Description & impact

The VDIV and VSQRT instructions take 14 cycles to execute. When an interrupt is taken a VDIV or VSQRT instruction is not terminated, and completes its execution while the interrupt stacking occurs. If lazy context save of floating point state is enabled then the automatic stacking of the floating point context does not occur until a floating point instruction is executed inside the interrupt service routine.

Lazy context save is enabled by default. When it is enabled, the minimum time for the first instruction in the interrupt service routine to start executing is 12 cycles. In certain timing conditions, and if there is only one or two instructions inside the interrupt service routine, then the VDIV or VSQRT instruction might not write its result to the register bank or to the FPSCR.

The failure occurring conditions are as follows:

1) The floating point unit is enabled.
2) Lazy context saving is not disabled.
3) A VDIV or VSQRT is executed.
4) The destination register for the VDIV or VSQRT is one of s0 - s15.
5) An interrupt occurs and is taken.
6) The interrupt service routine being executed does not contain a floating point instruction.
7) Within 14 cycles after the VDIV or VSQRT is executed, an interrupt return is executed.

A minimum of 12 of these 14 cycles are utilized for the context state stacking, which leaves 2 cycles for instructions inside the interrupt service routine, or 2 wait states applied to the entire stacking sequence (which means that it is not a constant wait state for every access).

In general, this means that if the memory system inserts wait states for stack transactions then this erratum cannot be observed.

The implications of this limitation is that the VDIV or VQSRT instruction does not complete correctly and the register bank and FPSCR are not updated, which means that these registers hold incorrect, out of date, data.

Workarounds

A workaround is only required if the floating point unit is enabled. A workaround is not required if the stack is in external memory.

There are two possible workarounds:

1) Disable lazy context save of floating point state by clearing LSPEN to 0 (bit 30 of the FPCCR at address 0xE000EF34).
2) Ensure that every interrupt service routine contains more than 2 instructions in addition to the exception return instruction.

3. Revision history

Table 3-1. Revision history

Revision No.	Description	Date
1.0	Initial Release	Aug.22 2024

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