

STM32G0B0CE/KE/RE/VE device errata

Applicability

This document applies to STM32G0B0CE/KE/RE/VE devices and the device variants as stated in this page. It gives a summary and a description of the device errata, with respect to the device datasheet and reference manual RM0360. Deviation of the real device behavior from the intended device behavior is considered to be a device limitation. Deviation of the description in the reference manual or the datasheet from the intended device behavior is considered to be a documentation erratum. The term “*errata*” applies both to limitations and documentation errata.

Table 1. Device variants

Reference	Silicon revision codes	
	Device marking ⁽¹⁾	REV_ID ⁽²⁾
STM32G0B0CE/KE/RE/VE	A	0x1000
	Z	0x1001

1. Refer to the device datasheet for how to identify this code on different types of package.
2. REV_ID[15:0] bitfield of DBGMCU_IDCODE register.

1 Summary of device errata

The following table gives a quick reference to the STM32G0B0CE/KE/RE/VE device limitations and their status:

A = limitation present, workaround available

N = limitation present, no workaround available

P = limitation present, partial workaround available

“-” = limitation absent

Applicability of a workaround may depend on specific conditions of target application. Adoption of a workaround may cause restrictions to target application. Workaround for a limitation is deemed partial if it only reduces the rate of occurrence and/or consequences of the limitation, or if it is fully effective for only a subset of instances on the device or in only a subset of operating modes, of the function concerned.

Table 2. Summary of device limitations

Function	Section	Limitation	Status	
			Rev. A	Rev. Z
System	2.2.1	Unstable LSI when it clocks RTC or CSS on LSE	P	P
	2.2.2	WUFx wakeup flag wrongly set during configuration	A	A
	2.2.3	Overwriting with all zeros a flash memory location previously programmed with all ones fails	N	N
	2.2.4	Wakeup from Stop not effective under certain conditions	N	N
	2.2.5	PC13 signal transitions disturb LSE	N	N
	2.2.7	Device lock upon mismatch of option bytes	P	-
	2.2.8	Prefetch failure when branching across flash memory banks	N	N
	2.2.9	Corrupted content of the RTC domain due to a missed power-on reset after this domain supply voltage drop	A	A
GPIO	2.3.1	Wakeup capability-enabled GPIOs not configurable after wakeup from Standby	P	-
DMA	2.4.1	DMA disable failure and error flag omission upon simultaneous transfer error and global flag clear	A	A
DMAMUX	2.5.1	SOFx not asserted when writing into DMAMUX_CFR register	N	N
	2.5.2	OFx not asserted for trigger event coinciding with last DMAMUX request	N	N
	2.5.3	OFx not asserted when writing into DMAMUX_RGCFR register	N	N
	2.5.4	Wrong input DMA request routed upon specific DMAMUX_CxCR register write coinciding with synchronization event	A	A
ADC	2.6.1	Overrun flag is not set if EOC reset coincides with new conversion end	P	P
	2.6.2	Writing ADC_CFGR1 register while ADEN bit is set resets RES[1:0] bitfield	A	A
	2.6.3	Out-of-threshold value is not detected in AWD1 Single mode	A	A
	2.6.4	ADC sampling time might be one cycle longer	N	N
	2.6.5	ADC offset may be out of specification	A	-
TIM	2.7.1	One-pulse mode trigger not detected in master-slave reset + trigger configuration	P	P
	2.7.2	Consecutive compare event missed in specific conditions	N	N
	2.7.3	Output compare clear not working with external counter reset	P	P
RTC and TAMP	2.8.1	Calendar initialization may fail in case of consecutive INIT mode entry	A	A
I2C	2.9.1	Wrong data sampling when data setup time (tSU;DAT) is shorter than one I2C kernel clock period	P	P

Function	Section	Limitation	Status	
			Rev. A	Rev. Z
I2C	2.9.2	Spurious bus error detection in master mode	A	A
USART	2.10.1	Data corruption due to noisy receive line	N	N
SPI	2.11.1	BSY bit may stay high when SPI is disabled	A	A
	2.11.2	BSY bit may stay high at the end of data transfer in slave mode	A	A

The following table gives a quick reference to the documentation errata.

Table 3. Summary of device documentation errata

Function	Section	Documentation erratum
System	2.2.6	Boot select after debug interface connection
USART	2.10.2	USART prescaler feature missing in USART implementation section

2 Description of device errata

The following sections describe the errata of the applicable devices with Arm® core and provide workarounds if available. They are grouped by device functions.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.



2.1 Core

Reference manual and errata notice for the Arm® Cortex®-M0+ core revision r0p1 is available from <http://infocenter.arm.com>.

2.2 System

2.2.1 Unstable LSI when it clocks RTC or CSS on LSE

Description

The LSI clock can become unstable (duty cycle different from 50 %) and its maximum frequency can become significantly higher than 32 kHz, when:

- LSI clocks the RTC, or it clocks the clock security system (CSS) on LSE (which holds when the LSECSSON bit set), and
- the V_{DD} power domain is reset while the backup domain is not reset, which happens:
 - upon exiting Shutdown mode
 - if V_{BAT} is separate from V_{DD} and V_{DD} goes off then on
 - if V_{BAT} is tied to V_{DD} (internally in the package for products not featuring the VBAT pin, or externally) and a short (< 1 ms) V_{DD} drop under V_{DD}(min) occurs

Workaround

Apply one of the following measures:

- Clock the RTC with LSE or HSE/32, without using the CSS on LSE
- If LSI clocks the RTC or when the LSECSSON bit is set, reset the backup domain upon each V_{DD} power up (when the PWRRSTF flag is set). If V_{BAT} is separate from V_{DD}, also restore the RTC configuration, backup registers and anti-tampering configuration.

2.2.2 WUFx wakeup flag wrongly set during configuration

Description

Upon configuring a wakeup pin (WKUPx), the corresponding wakeup flag (WUFx) might spuriously go high depending on the state and configuration of the wakeup pin.

Workaround

After configuring a wakeup pin, clear its corresponding WUFx flag.

2.2.3 Overwriting with all zeros a flash memory location previously programmed with all ones fails

Description

Any attempt to re-program with all zeros (0x0000 0000 0000 0000) a flash memory location previously programmed with 0xFFFF FFFF FFFF FFFF fails and the PROGERR flag of the FLASH_SR register is set.

Note: Flash memory locations in the erased state (that is, not programmed) are not affected by this failure. They can be programmed with any value.

Workaround

None.

2.2.4 Wakeup from Stop not effective under certain conditions

Description

With the HSI clock divider bitfield HSIDIV[2:0] set to a value different from 000, the device fails to enter Stop mode when SYSCLK is set to HSE clock.

With the HSI clock divider bitfield HSIDIV[2:0] set to a value different from 000, peripherals with clock request capability fail to wake the device up from Stop modes.

Workaround

None.

2.2.5 PC13 signal transitions disturb LSE

Description

The PC13 port toggling disturbs the LSE clock.

Workaround

None.

2.2.6 Boot select after debug interface connection

Description

Some revisions of the reference manual may omit the following information.

After connecting the debug interface and until the device power-down, the boot source upon reset or wakeup from a low-power mode is determined by the PA14-BOOT0 pin level before connecting the debug interface (stored by the device), as opposed to the actual PA14-BOOT0 pin level. The device power-up restores the operation of the PA14-BOOT0 pin as direct boot source selector.

This is a documentation issue rather than a device limitation.

Workaround

No application workaround is required or applicable.

2.2.7 Device lock upon mismatch of option bytes

Description

An option byte mismatch (for example, due to its failing modification attempt) detection leads to setting the BOOT_LOCK register bit high and the RDP to Level 1 or higher. This disables the debug interface, which then makes the device reprogramming impossible.

Note: On the latest device versions, an option byte mismatch detection results in setting the device in RDP Level 1 with BOOT_LOCK register bit low. This keeps the debug connection available for reprogramming the device.

Workaround

Ensure a safe environment when modifying the option bytes, to prevent any option byte corruption.

2.2.8 Prefetch failure when branching across flash memory banks

Description

In rare cases, the code prefetch may fail upon branching and function calls across flash memory banks, regardless of the DUAL_BANK and nSWAP_BANK option byte settings. The failing prefetch then provides an incorrect data to the CPU, which causes code execution corruption and may lead to HardFault interrupt.

Note: The following uses of the dual bank functionality remain safe:

- EEPROM emulation or other data storage in bank 2
- bank 2 used as a download or backup slot for firmware
- mirroring the code in the banks and using bank swapping upon reset
- branching and function calls across flash memory banks, with the prefetch function deactivated

Workaround

None.

2.2.9 Corrupted content of the RTC domain due to a missed power-on reset after this domain supply voltage drop

Description

The RTC domain reset may be missed upon a power-on following a power-off, if its supply voltage drops during the power-off phase hitting a window, which is few mV wide before it starts to rise again. In this critical window, the flip-flops are no longer able to safely retain the information and the RTC domain reset has not yet been triggered. This window is located in the range between 100 mV and 700 mV, with the exact position depending mainly on the device and on the temperature.

This missed reset results in unpredictable values of the RTC domain registers. This may cause a spurious behavior (such as driving the LSCO output pin on PA2 or influencing RTC functions).

Workaround

Apply one of the following measures:

- In the application, let the V_{DD} and V_{BAT} supply voltages fall to a level below 100 mV for more than 200 ms before a new power-on.
- If the above workaround cannot be applied, and the boot follows a power-on reset, erase the RTC domain by software.

At the very beginning of the boot code, insert the following software sequence:

Check the BORRSTF flag of the RCC_CSR register. If set, the reset is caused by a power on, apply the following sequence:

1. Enable the PWR clock in the RCC, by setting the PWREN bit.
2. Enable the RTC domain access in the PWR, by setting the DBP bit.
3. Reset the RTC domain, by:
 - a. Writing 0x0001 0000 in the RCC_BDCR register, which sets the BDRST bit and clears other register bits that might not be reset.
 - b. reading the RCC_BDCR register, to make the reset time long enough
 - c. writing 0x0000 0000 in the RCC_BDCR register, to clear the BDRST bit
 - d. Clear the BORRSTF flag by setting the RMVF bit of the RCC_CSR register.

2.3 GPIO

2.3.1 Wakeup capability-enabled GPIOs not configurable after wakeup from Standby

Description

After the devices wakes up from Standby mode, GPIOs with the wakeup capability enabled cannot further be configured through the GPIO registers.

Workaround

Disable the wakeup capability of the GPIOs that must remain configurable through the GPIO registers after the wakeup from Standby.

2.4 DMA

2.4.1 DMA disable failure and error flag omission upon simultaneous transfer error and global flag clear

Description

Upon a data transfer error in a DMA channel x, both the specific TEIFx and the global GIFx flags are raised and the channel x is normally automatically disabled. However, if in the same clock cycle the software clears the GIFx flag (by setting the CGIFx bit of the DMA_IFCR register), the automatic channel disable fails and the TEIFx flag is not raised.

This issue does not occur with ST's HAL software that does not use and clear the GIFx flag when the channel is active.

Workaround

Do not clear GIFx flags when the channel is active. Instead, use HTIFx, TCIFx, and TEIFx specific event flags and their corresponding clear bits.

2.5 DMAMUX

2.5.1 SOFx not asserted when writing into DMAMUX_CFR register

Description

The SOFx flag of the DMAMUX_CSR status register is not asserted if overrun from another DMAMUX channel occurs when the software writes into the DMAMUX_CFR register.

This can happen when multiple DMA channels operate in synchronization mode, and when overrun can occur from more than one channel. As the SOFx flag clear requires a write into the DMAMUX_CFR register (to set the corresponding CSOFx bit), overrun occurring from another DMAMUX channel operating during that write operation fails to raise its corresponding SOFx flag.

Workaround

None. Avoid the use of synchronization mode for concurrent DMAMUX channels, if at least two of them potentially generate synchronization overrun.

2.5.2 OFx not asserted for trigger event coinciding with last DMAMUX request

Description

In the DMAMUX request generator, a trigger event detected in a critical instant of the last-generated DMAMUX request being served by the DMA controller does not assert the corresponding trigger overrun flag OFx. The critical instant is the clock cycle at the very end of the trigger overrun condition.

Additionally, upon the following trigger event, one single DMA request is issued by the DMAMUX request generator, regardless of the programmed number of DMA requests to generate.

The failure only occurs if the number of requests to generate is set to more than two ($GNBREQ[4:0] > 00001$).

Workaround

Make the trigger period longer than the duration required for serving the programmed number of DMA requests, so as to avoid the trigger overrun condition from occurring on the very last DMA data transfer.

2.5.3 OFx not asserted when writing into DMAMUX_RGCFR register

Description

The OFx flag of the DMAMUX_RGSR status register is not asserted if an overrun from another DMAMUX request generator channel occurs when the software writes into the DMAMUX_RGCFR register. This can happen when multiple DMA channels operate with the DMAMUX request generator, and when an overrun can occur from more than one request generator channel. As the OFx flag clear requires a write into the DMAMUX_RGCFR register (to set the corresponding COFx bit), an overrun occurring in another DMAMUX channel operating with another request generator channel during that write operation fails to raise the corresponding OFx flag.

Workaround

None. Avoid the use of request generator mode for concurrent DMAMUX channels, if at least two channels are potentially generating a request generator overrun.

2.5.4 Wrong input DMA request routed upon specific DMAMUX_CxCR register write coinciding with synchronization event

Description

If a write access into the DMAMUX_CxCR register having the SE bit at zero and SPOL[1:0] bitfield at a value other than 00:

- sets the SE bit (enables synchronization),
- modifies the values of the DMAREQ_ID[5:0] and SYNC_ID[4:0] bitfields, and
- does not modify the SPOL[1:0] bitfield,

and if a synchronization event occurs on the previously selected synchronization input exactly two AHB clock cycles before this DMAMUX_CxCR write, then the input DMA request selected by the DMAREQ_ID[5:0] value before that write is routed.

Workaround

Ensure that the SPOL[1:0] bitfield is at 00 whenever the SE bit is 0. When enabling synchronization by setting the SE bit, always set the SPOL[1:0] bitfield to a value other than 00 with the same write operation into the DMAMUX_CxCR register.

2.6 ADC

2.6.1 Overrun flag is not set if EOC reset coincides with new conversion end

Description

If the EOC flag is cleared by an ADC_DR register read operation or by software during the same APB cycle in which the data from a new conversion are written in the ADC_DR register, the overrun event duly occurs (which results in the loss of either current or new data) but the overrun flag (OVR) may stay low.

Workaround

Clear the EOC flag, by performing an ADC_DR read operation or by software within less than one ADC conversion cycle period from the last conversion cycle end, in order to avoid the coincidence with the end of the new conversion cycle.

2.6.2 Writing ADC_CFGR1 register while ADEN bit is set resets RES[1:0] bitfield

Description

Modifying the ADC_CFGR1 register while ADC is enabled (ADEN set in ADC_CR) resets RES[1:0] to 00 whatever the bitfield previous value.

Workaround

Apply the following sequence:

1. Set ADDIS to disable the ADC, and wait until ADEN is cleared.
2. Program the ADC_CFGR1 register according to the application requirements.
3. Set ADEN bit.

2.6.3 Out-of-threshold value is not detected in AWD1 Single mode

Description

AWD1 analog watchdog does not detect that the result of a converted channel has reached the programmed threshold when the ADC operates in Single mode, performs a sequence of conversions, and one of the converted channels other than the first one is monitored by the AWD1 analog watchdog.

Workaround

Apply one of the following measures:

- Use a conversion sequence of one single channel.
- Configure the monitored channel as the first one of the sequence.

2.6.4 ADC sampling time might be one cycle longer

Description

For sampling time set to 1.5 or 3.5 cycles, the sampling in a single ADC conversion or in the first conversion of a sequence takes one extra cycle.

Workaround

None.

2.6.5 ADC offset may be out of specification

Description

When the V_{REF+} voltage is lower than 3.0 V, the ADC hardware calibration may not fully compensate for the offset error caused by the diffusion process variation. When this occurs, the CALFACT register value is either 0x00 or 0x7F and the EO parameter is out of the maximum stated in the device data sheet. To reflect this, the following specification substitutes the one in the device datasheet:

Symbol	Parameter	Condition	Min	Typ	Max	Unit
EO	Offset error	$2\text{ V} < V_{DDA} = V_{REF+} < 3\text{ V}$ $f_{ADC} = 35\text{ MHz}, f_s \leq 2.5\text{ Msps}$ $T_A = \text{entire range}$	-	1.5	31	LSB
ET	Total unadjusted error	$2\text{ V} < V_{DDA} = V_{REF+} < 3\text{ V}$ $f_{ADC} = 35\text{ MHz}, f_s \leq 2.5\text{ Msps}$ $T_A = \text{entire range}$	-	3	33	

Workaround

Apply one of the following measures:

- Use V_{DDA} and V_{REF+} higher than 3V.
- Use the ADC for measuring a difference between two DC voltages or for measuring AC voltages with a head room to V_{REF+} and V_{SSA} greater than the voltage corresponding to $EO(max)$.
- In the hardware application, make V_{REF+} and V_{SSA} available on the ADC GPIO inputs. Then if CALFACT register value indicates 0x00 or 0x7F after the hardware calibration, compensate A/D conversions by software for the ADC offset remaining after the hardware compensation as follows:
 - For CALFACT equal to 0x00:
 1. With the ADC, measure the V_{REF+} voltage through the GPIO channel. Subtract the A/D conversion result from the full-scale value plus one (4096 for a 12-bit ADC), to obtain the offset value. For example, if the A/D conversion result is 4093, the offset value is 3 (3 LSBs).
 2. Add the offset value to any further A/D conversion result. For example, if the A/D conversion result is 1550, the result after this compensation is 1553.
 - For CALFACT equal to 0x7F:
 1. With the ADC, measure the V_{SSA} voltage through the GPIO channel, to obtain the offset value, for example 4 (4 LSBs).
 2. Subtract the offset value from any further A/D conversion result. For example, if the A/D conversion result is 1550, the result after this compensation is 1546.

Note: For better accuracy of the remaining offset measurement, it is recommended to use an average of multiple (for example eight) A/D conversions.

Note: The compensation for the offset remaining after the hardware calibration reduces the effective ADC conversion range.

2.7 TIM

2.7.1 One-pulse mode trigger not detected in master-slave reset + trigger configuration

Description

The failure occurs when several timers configured in one-pulse mode are cascaded, and the master timer is configured in combined reset + trigger mode with the MSM bit set:

$OPM = 1$ in TIMx_CR1, $SMS[3:0] = 1000$ and $MSM = 1$ in TIMx_SMCR.

The MSM delays the reaction of the master timer to the trigger event, so as to have the slave timers cycle-accurately synchronized.

If the trigger arrives when the counter value is equal to the period value set in the TIMx_ARR register, the one-pulse mode of the master timer does not work and no pulse is generated on the output.

Workaround

None. However, unless a cycle-level synchronization is mandatory, it is advised to keep the MSM bit reset, in which case the problem is not present. The $MSM = 0$ configuration also allows decreasing the timer latency to external trigger events.

2.7.2 Consecutive compare event missed in specific conditions

Description

Every match of the counter (CNT) value with the compare register (CCR) value is expected to trigger a compare event. However, if such matches occur in two consecutive counter clock cycles (as consequence of the CCR value change between the two cycles), the second compare event is missed for the following CCR value changes:

- in edge-aligned mode, from ARR to 0:
 - first compare event: $CNT = CCR = ARR$
 - second (missed) compare event: $CNT = CCR = 0$
- in center-aligned mode while up-counting, from ARR-1 to ARR (possibly a new ARR value if the period is also changed) at the crest (that is, when $TIMx_RCR = 0$):
 - first compare event: $CNT = CCR = (ARR-1)$
 - second (missed) compare event: $CNT = CCR = ARR$
- in center-aligned mode while down-counting, from 1 to 0 at the valley (that is, when $TIMx_RCR = 0$):
 - first compare event: $CNT = CCR = 1$
 - second (missed) compare event: $CNT = CCR = 0$

This typically corresponds to an abrupt change of compare value aiming at creating a timer clock single-cycle-wide pulse in toggle mode.

As a consequence:

- In toggle mode, the output only toggles once per counter period (squared waveform), whereas it is expected to toggle twice within two consecutive counter cycles (and so exhibit a short pulse per counter period).
- In center mode, the compare interrupt flag does not rise and the interrupt is not generated.

Note: The timer output operates as expected in modes other than the toggle mode.

Workaround

None.

2.7.3 Output compare clear not working with external counter reset

Description

The output compare clear event (`ocref_clr`) is not correctly generated when the timer is configured in the following slave modes: Reset mode, Combined reset + trigger mode, and Combined gated + reset mode.

The PWM output remains inactive during one extra PWM cycle if the following sequence occurs:

1. The output is cleared by the `ocref_clr` event.
2. The timer reset occurs before the programmed compare event.

Workaround

Apply one of the following measures:

- Use BKIN (or BKIN2 if available) input for clearing the output, selecting the Automatic output enable mode ($AOE = 1$).
- Mask the timer reset during the PWM ON time to prevent it from occurring before the compare event (for example with a spare timer compare channel open-drain output connected with the reset signal, pulling the timer reset line down).

2.8 RTC and TAMP

2.8.1 Calendar initialization may fail in case of consecutive INIT mode entry

Description

If the INIT bit of the `RTC_ICSR` register is set between one and two `RTCCLK` cycles after being cleared, the `INITF` flag is set immediately instead of waiting for synchronization delay (which should be between one and two `RTCCLK` cycles), and the initialization of registers may fail. Depending on the INIT bit clearing and setting instants versus the `RTCCLK` edges, it can happen that, after being immediately set, the `INITF` flag is cleared during one `RTCCLK` period then set again. As writes to calendar registers are ignored when `INITF` is low, a write occurring during this critical period might result in the corruption of one or more calendar registers.

Workaround

After exiting the initialization mode, clear the BYPSHAD bit (if set) then wait for RSF to rise, before entering the initialization mode again.

Note: It is recommended to write all registers in a single initialization session to avoid accumulating synchronization delays.

2.9 I2C

2.9.1 Wrong data sampling when data setup time ($t_{\text{SU, DAT}}$) is shorter than one I2C kernel clock period

Description

The I²C-bus specification and user manual specify a minimum data setup time ($t_{\text{SU, DAT}}$) as:

- 250 ns in Standard mode
- 100 ns in Fast mode
- 50 ns in Fast mode Plus

The device does not correctly sample the I²C-bus SDA line when $t_{\text{SU, DAT}}$ is smaller than one I2C kernel clock (I²C-bus peripheral clock) period: the previous SDA value is sampled instead of the current one. This can result in a wrong receipt of slave address, data byte, or acknowledge bit.

Workaround

Increase the I2C kernel clock frequency to get I2C kernel clock period within the transmitter minimum data setup time. Alternatively, increase transmitter's minimum data setup time. If the transmitter setup time minimum value corresponds to the minimum value provided in the I²C-bus standard, the minimum I2CCLK frequencies are as follows:

- In Standard mode, if the transmitter minimum setup time is 250 ns, the I2CCLK frequency must be at least 4 MHz.
- In Fast mode, if the transmitter minimum setup time is 100 ns, the I2CCLK frequency must be at least 10 MHz.
- In Fast-mode Plus, if the transmitter minimum setup time is 50 ns, the I2CCLK frequency must be at least 20 MHz.

2.9.2 Spurious bus error detection in master mode

Description

In master mode, a bus error can be detected spuriously, with the consequence of setting the BERR flag of the I2C_SR register and generating bus error interrupt if such interrupt is enabled. Detection of bus error has no effect on the I²C-bus transfer in master mode and any such transfer continues normally.

Workaround

If a bus error interrupt is generated in master mode, the BERR flag must be cleared by software. No other action is required and the ongoing transfer can be handled normally.

2.10 USART

2.10.1 Data corruption due to noisy receive line

Description

In UART mode with oversampling by 8 or 16 and with 1 or 2 stop bits, the received data may be corrupted if a glitch to zero shorter than the half-bit occurs on the receive line within the second half of the stop bit.

Workaround

None.

2.10.2 USART prescaler feature missing in USART implementation section

Description

Some reference manual revisions may omit the information that the USART prescaler is not present in all USART instances. This information is provided in the USART implementation section of the corresponding reference manual.

This is a documentation issue rather than a product limitation.

Workaround

No application workaround is required or applicable.

2.11 SPI

2.11.1 BSY bit may stay high when SPI is disabled

Description

The BSY flag may remain high upon disabling the SPI while operating in:

- master transmit mode and the TXE flag is low (data register full).
- master receive-only mode (simplex receive or half-duplex bidirectional receive phase) and an SCK strobing edge has not occurred since the transition of the RXNE flag from low to high.
- slave mode and NSS signal is removed during the communication.

Workaround

When the SPI operates in:

- master transmit mode, disable the SPI when TXE = 1 and BSY = 0.
- master receive-only mode, ignore the BSY flag.
- slave mode, do not remove the NSS signal during the communication.

2.11.2 BSY bit may stay high at the end of data transfer in slave mode

Description

BSY flag may sporadically remain high at the end of a data transfer in slave mode. This occurs upon coincidence of internal CPU clock and external SCK clock provided by master.

In such an event, if the software only relies on BSY flag to detect the end of SPI slave data transaction (for example to enter low-power mode or to change data line direction in half-duplex bidirectional mode), the detection fails.

As a conclusion, the BSY flag is unreliable for detecting the end of data transactions.

Workaround

Depending on SPI operating mode, use the following means for detecting the end of transaction:

- When NSS hardware management is applied and NSS signal is provided by master, use NSS flag.
- In SPI receiving mode, use the corresponding RXNE event flag.
- In SPI transmit-only mode, use the BSY flag in conjunction with a timeout expiry event. Set the timeout such as to exceed the expected duration of the last data frame and start it upon TXE event that occurs with the second bit of the last data frame. The end of the transaction corresponds to either the BSY flag becoming low or the timeout expiry, whichever happens first.

Prefer one of the first two measures to the third as they are simpler and less constraining.

Alternatively, apply the following sequence to ensure reliable operation of the BSY flag in SPI transmit mode:

1. Write last data to data register.
2. Poll the TXE flag until it becomes high, which occurs with the second bit of the data frame transfer.
3. Disable SPI by clearing the SPE bit mandatorily before the end of the frame transfer.
4. Poll the BSY bit until it becomes low, which signals the end of transfer.

Note: The alternative method can only be used with relatively fast CPU speeds versus relatively slow SPI clocks or/and long last data frames. The faster is the software execution, the shorter can be the duration of the last data frame.

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Revision history

Table 4. Document revision history

Date	Version	Changes
12-Jan-2021	1	Initial release.
11-Apr-2022	2	Added device variant Z. Added Important security notice. Added errata: <ul style="list-style-type: none"> • Device lock upon mismatch of option bytes • Prefetch failure when branching across flash memory banks • ADC offset may be out of specification Modified errata: <ul style="list-style-type: none"> • Unstable LSI when it clocks RTC or CSS on LSE (BORRSTF corrected to PWRRSTF) • Overwriting with all zeros a flash memory location previously programmed with all ones fails (a note added)
13-Oct-2022	3	Added: Section 2.2.9 Corrupted content of the RTC domain due to a missed power-on reset after this domain supply voltage drop

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