

STM32U073xx and STM32U083xx device errata

Applicability

This document applies to the part numbers of STM32U073xx and STM32U083xx 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 RM0503.

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 summary

Reference	Part numbers
STM32U073x8/B/C	STM32U073K8, STM32U073H8, STM32U073C8, STM32U073R8, STM32U073M8, STM32U073KB, STM32U073HB, STM32U073CB, STM32U073RB, STM32U073MB, STM32U073KC, STM32U073HC, STM32U073CC, STM32U073RC, STM32U073MC
STM32U083xC	STM32U083KC, STM32U083HC, STM32U083CC, STM32U083RC, STM32U083MC

Table 2. Device variants

Reference	Silicon revision codes	
	Device marking ⁽¹⁾	REV_ID ⁽²⁾
STM32U073/83xx	A	0x1000

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 STM32U073xx and STM32U083xx 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 3. Summary of device limitations

Function	Section	Limitation	Status
			Rev. A
System	2.1.1	PC13 signal transitions disturb LSE	N
	2.1.2	Internal voltage reference calibration value not programmed during production	A
DMA	2.2.1	DMA disable failure and error flag omission upon simultaneous transfer error and global flag clear	A
ADC	2.3.1	Overrun flag is not set if EOC reset coincides with new conversion end	P
DAC	2.4.1	Invalid DAC channel analog output if the DAC channel MODE bitfield is programmed before DAC initialization	A
	2.4.2	DMA underrun flag not set when an internal trigger is detected on the clock cycle of the DMA request acknowledge	N
TIM	2.5.1	One-pulse mode trigger not detected in master-slave reset + trigger configuration	P
	2.5.2	Consecutive compare event missed in specific conditions	N
	2.5.3	Output compare clear not working with external counter reset	P
LPTIM	2.6.1	Device may remain stuck in LPTIM interrupt when entering Stop mode	A
	2.6.2	ARRM and CMPM flags are not set when APB clock is slower than kernel clock	P
	2.6.3	Interrupt status flag is cleared by hardware upon writing its corresponding bit in LPTIM_DIER register	N
RTC	2.7.1	Alarm flag may be repeatedly set when the core is stopped in debug	N
I2C	2.8.1	Wrong data sampling when data setup time ($t_{SU, DAT}$) is shorter than one I2C kernel clock period	P
	2.8.2	Spurious bus error detection in master mode	A
USART	2.9.1	Data corruption due to noisy receive line	A
	2.9.2	Wrong data received in smartcard mode and 0.5 stop bit configuration	A
	2.9.3	Received data may be corrupted upon clearing the ABREN bit	A
	2.9.4	Noise error flag set while ONEBIT is set	N
LPUART	2.10.1	Possible LPUART transmitter issue when using low BRR[15:0] value	P
SPI	2.11.1	BSY bit may stay high when SPI is disabled	A
	2.11.2	BSY bit may stay high at the end of data transfer in slave mode	A
USB	2.12.1	False wakeup detection for last K-state not terminated by EOP or reset before suspend	A
	2.12.2	ESOF interrupt timing desynchronized after resume signaling	A

Function	Section	Limitation	Status
			Rev. A
USB	2.12.3	Incorrect CRC16 in the memory buffer	N
	2.12.4	Buffer description table update completes after CTR interrupt triggers	A

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 System

2.1.1 PC13 signal transitions disturb LSE

Description

The PC13 port toggling disturbs the LSE clock. It may not be usable when LSE is used.

Workaround

None.

2.1.2 Internal voltage reference calibration value not programmed during production

Description

The VREFINT_CAL value is not programmed during production. Reading returns 0xFFFF instead of the calibration value.

The impacted devices are all the devices in LQFP80, LQFP64, LQFP48 and UFQFPN48 packages, with date codes ranging from 333 to 345. It includes the devices assembled on the first batch of Nucleo board and Discovery kit.

The functionality of the internal voltage reference is not impacted.

Workaround

If the VREFINT_CAL value is needed in the application, perform your own calibration and store the value in user memory.

2.2 DMA

2.2.1 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.

2.3 ADC

2.3.1 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.

2.4 DAC

2.4.1 Invalid DAC channel analog output if the DAC channel MODE bitfield is programmed before DAC initialization

Description

When the DAC operates in Normal mode and the DAC enable bit is cleared, writing a value different from 000 to the DAC channel MODE bitfield of the DAC_MCR register before performing data initialization causes the corresponding DAC channel analog output to be invalid.

Workaround

Apply the following sequence:

1. Perform one write access to any data register.
2. Program the MODE bitfield of the DAC_MCR register.

2.4.2 DMA underrun flag not set when an internal trigger is detected on the clock cycle of the DMA request acknowledge

Description

When the DAC channel operates in DMA mode (DMAEN of DAC_CR register set), the DMA channel underrun flag (DMAUDR of DAC_SR register) fails to rise upon an internal trigger detection if that detection occurs during the same clock cycle as a DMA request acknowledge. As a result, the user application is not informed that an underrun error occurred.

This issue occurs when software and hardware triggers are used concurrently to trigger DMA transfers.

Workaround

None.

2.5 TIM

2.5.1 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.

2.5.2 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.

2.5.3 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).

2.6 LPTIM

2.6.1 Device may remain stuck in LPTIM interrupt when entering Stop mode

Description

This limitation occurs when disabling the low-power timer (LPTIM).

When the user application clears the ENABLE bit in the LPTIM_CR register within a small time window around one LPTIM interrupt occurrence, then the LPTIM interrupt signal used to wake up the device from Stop mode may be frozen in active state. Consequently, when trying to enter Stop mode, this limitation prevents the device from entering low-power mode and the firmware remains stuck in the LPTIM interrupt routine.

This limitation applies to all Stop modes and to all instances of the LPTIM. Note that the occurrence of this issue is very low.

Workaround

In order to disable a low power timer (LPTIMx) peripheral, do not clear its ENABLE bit in its respective LPTIM_CR register. Instead, reset the whole LPTIMx peripheral via the RCC controller by setting and resetting its respective LPTIMxRST bit in the relevant RCC register.

2.6.2 ARRM and CMPM flags are not set when APB clock is slower than kernel clock

Description

When LPTIM is configured in one shot mode and APB clock is lower than kernel clock, there is a chance that ARRM and CMPM flags are not set at the end of the counting cycle defined by the repetition value REP[7:0]. This issue can only occur when the repetition counter is configured with an odd repetition value.

Workaround

To avoid this issue the following formula must be respected:

$$\{ARR, CMP\} \geq KER_CLK / (2 * APB_CLK),$$

where APB_CLK is the LPTIM APB clock frequency, and KER_CLK is the LPTIM kernel clock frequency. ARR and CMP are expressed in decimal value.

Example: The following example illustrates a configuration where the issue can occur:

- APB clock source (MSI) = 1 MHz , Kernel clock source (HSI) = 16 MHz
- Repetition counter is set with REP[7:0] = 0x3 (odd value)

The above example is subject to issue, unless the user respects:

$$\{CMP, ARR\} \geq 16 \text{ MHz} / (2 * 1 \text{ MHz})$$

→ ARR must be ≥ 8 and CMP must be ≥ 8

Note: REP set to 0x3 means that effective repetition is REP+1 (= 4) but the user must consider the parity of the value loaded in LPTIM_RCR register (=3, odd) to assess the risk of issue.

2.6.3 Interrupt status flag is cleared by hardware upon writing its corresponding bit in LPTIM_DIER register

Description

When any interrupt bit of the LPTIM_DIER register is modified, the corresponding flag of the LPTIM_ISR register is cleared by hardware.

Workaround

None.

2.7 RTC

2.7.1 Alarm flag may be repeatedly set when the core is stopped in debug

Description

When the core is stopped in debug mode, the clock is supplied to subsecond RTC alarm downcounter even when the device is configured to stop the RTC in debug.

As a consequence, when the subsecond counter is used for alarm condition (the MASKSS[3:0] bitfield of the RTC_ALRMASR and/or RTC_ALRMBSSR register set to a non-zero value) and the alarm condition is met just before entering a breakpoint or printf, the ALRAF and/or ALRBF flag of the RTC_SR register is repeatedly set by hardware during the breakpoint or printf, which makes any attempt to clear the flag(s) ineffective.

Workaround

None.

2.8 I2C

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

Description

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

2.8.2 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.

2.9 USART

2.9.1 Data corruption due to noisy receive line

Description

In all modes, except synchronous slave mode, 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

Apply one of the following measures:

- Either use a noiseless receive line, or
- add a filter to remove the glitches if the receive line is noisy.

2.9.2 Wrong data received in smartcard mode and 0.5 stop bit configuration

Description

The USART receiver reads wrong data in smartcard mode and 0.5 stop bit configuration.

Workaround

Use the 1.5 stop bit configuration.

2.9.3 Received data may be corrupted upon clearing the ABREN bit

Description

The USART receiver may miss data or receive corrupted data when the auto baud rate feature is disabled by software (ABREN bit cleared in the USART_CR2 register) after an auto baud rate detection, while a reception is ongoing.

Workaround

Do not clear the ABREN bit.

2.9.4 Noise error flag set while ONEBIT is set

Description

When the ONEBIT bit is set in the USART_CR3 register (one sample bit method is used), the noise error (NE) flag must remain cleared. Instead, this flag is set upon noise detection on the START bit.

Workaround

None.

Note: Having noise on the START bit is contradictory with the fact that the one sample bit method is used in a noise free environment.

2.10 LPUART

2.10.1 Possible LPUART transmitter issue when using low BRR[15:0] value

Description

The LPUART transmitter bit length sequence is not reset between consecutive bytes, which could result in a jitter that cannot be handled by the receiver device. As a result, depending on the receiver device bit sampling sequence, a desynchronization between the LPUART transmitter and the receiver device may occur resulting in data corruption on the receiver side.

This happens when the ratio between the LPUART kernel clock and the baud rate programmed in the LPUART_BRR register (BRR[15:0]) is not an integer, and is in the three to four range. A typical example is when the 32.768 kHz clock is used as kernel clock and the baud rate is equal to 9600 baud, resulting in a ratio of 3.41.

Workaround

Apply one of the following measures:

- On the transmitter side, increase the ratio between the LPUART kernel clock and the baud rate. To do so:
 - Increase the LPUART kernel clock frequency, or
 - Decrease the baud rate.
- On the receiver side, generate the baud rate by using a higher frequency and applying oversampling techniques if supported.

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.

2.12 USB

2.12.1 False wakeup detection for last K-state not terminated by EOP or reset before suspend

Description

If a USB K-state is detected outside of a suspend state, the device generates *RESUME RECEIVED* signal and keeps it pending until:

- an EOP is detected on the USB, or
- a USB reset is detected on the USB, or
- a software reset is generated by setting the FRES bit.

It may happen that none of the above events occurs before the USB peripheral sets the suspend interrupt (after 3 ms idling), and the software decides to enter Suspend mode (by setting the FSUSP bit). The USB peripheral then immediately generates a wakeup interrupt (WKUP = 1) because it still detects the pending *RESUME RECEIVED* signal. This has a negative impact to the device power consumption.

A workaround is available for applications requiring to minimize the power consumption.

Workaround

Apply software reset prior to setting the FSUSP bit. This clears any spurious *RESUME RECEIVED* condition.

2.12.2 ESOF interrupt timing desynchronized after resume signaling

Description

Upon signaling resume, the device is expected to allow full 3 ms of time to the host or hub for sending the initial SOF (start of frame) packet, without triggering SUSP interrupt. However, the device only allows two full milliseconds and unduly triggers SUSP interrupt if it receives the initial packet within the third millisecond.

Workaround

When the device initiates resume (remote wakeup), mask the SUSP interrupt by setting the SUSPM bit for 3 ms, then unmask it by clearing SUSPM.

2.12.3 Incorrect CRC16 in the memory buffer

Description

Memory buffer locations are written starting from the address contained in the ADDRn_RX for a number of bytes corresponding to the received data packet length, CRC16 inclusive (that is, data payload length plus two bytes), or up to the last allocated memory location defined by BL_SIZE and NUM_BLOCK, whichever comes first. In the former case, the CRC16 checksum is written wrongly, with its least significant byte going to both memory buffer byte locations expected to receive the least and the most significant bytes of the checksum.

Although the checksum written in the memory buffer is wrong, the underlying CRC checking mechanism in the USB peripheral is fully functional.

Workaround

Ignore the CRC16 data in the memory buffer.

2.12.4 Buffer description table update completes after CTR interrupt triggers

Description

During OUT transfers, the correct transfer interrupt (CTR) is triggered a little before the last USB SRAM accesses have completed. If the software responds quickly to the interrupt, the full buffer contents may not be correct.

Workaround

Software should ensure that a small delay is included before accessing the SRAM contents. This delay should be 800 ns in Full Speed mode and 6.4 μ s in Low Speed mode.

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Revision history

Table 4. Document revision history

Date	Version	Changes
2-May-2023	1	Initial release.
02-Feb-2024	2	SYSTEM <ul style="list-style-type: none"> Added Internal voltage reference calibration value not programmed during production (2.1.2) LPTIM: <ul style="list-style-type: none"> Updated Device may remain stuck in LPTIM interrupt when entering Stop mode (2.6.1) USART: <ul style="list-style-type: none"> Updated Data corruption due to noisy receive line (2.9.1) SPI: <ul style="list-style-type: none"> Added BSY bit may stay high when SPI is disabled (2.11.1) and BSY bit may stay high at the end of data transfer in slave mode (2.11.2)
13-Feb -2024	3	Removed all of internal information.

Contents

1	Summary of device errata	2
2	Description of device errata	4
2.1	System	4
2.1.1	PC13 signal transitions disturb LSE	4
2.1.2	Internal voltage reference calibration value not programmed during production	4
2.2	DMA	4
2.2.1	DMA disable failure and error flag omission upon simultaneous transfer error and global flag clear	4
2.3	ADC	5
2.3.1	Overrun flag is not set if EOC reset coincides with new conversion end	5
2.4	DAC	5
2.4.1	Invalid DAC channel analog output if the DAC channel MODE bitfield is programmed before DAC initialization	5
2.4.2	DMA underrun flag not set when an internal trigger is detected on the clock cycle of the DMA request acknowledge	5
2.5	TIM	5
2.5.1	One-pulse mode trigger not detected in master-slave reset + trigger configuration	5
2.5.2	Consecutive compare event missed in specific conditions	6
2.5.3	Output compare clear not working with external counter reset	6
2.6	LPTIM	7
2.6.1	Device may remain stuck in LPTIM interrupt when entering Stop mode	7
2.6.2	ARRM and CMPM flags are not set when APB clock is slower than kernel clock	7
2.6.3	Interrupt status flag is cleared by hardware upon writing its corresponding bit in LPTIM_DIER register	7
2.7	RTC	8
2.7.1	Alarm flag may be repeatedly set when the core is stopped in debug	8
2.8	I2C	8
2.8.1	Wrong data sampling when data setup time ($t_{SU,DAT}$) is shorter than one I2C kernel clock period	8
2.8.2	Spurious bus error detection in master mode	8
2.9	USART	9
2.9.1	Data corruption due to noisy receive line	9
2.9.2	Wrong data received in smartcard mode and 0.5 stop bit configuration	9
2.9.3	Received data may be corrupted upon clearing the ABREN bit	9
2.9.4	Noise error flag set while ONEBIT is set	9
2.10	LPUART	9
2.10.1	Possible LPUART transmitter issue when using low BRR[15:0] value	9

2.11	SPI	10
2.11.1	BSY bit may stay high when SPI is disabled	10
2.11.2	BSY bit may stay high at the end of data transfer in slave mode	10
2.12	USB	11
2.12.1	False wakeup detection for last K-state not terminated by EOP or reset before suspend ..	11
2.12.2	ESOF interrupt timing desynchronized after resume signaling	11
2.12.3	Incorrect CRC16 in the memory buffer	11
2.12.4	Buffer description table update completes after CTR interrupt triggers	12
	Important security notice	13
	Revision history	14

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