RT600

Errata sheet RT600

Rev. 2.0 — 18 January 2024 **Errata**

Document information

Information	Content
Keywords	MIMXRT685SFFOB, MIMXRT685SFVKB, MIMXRT685SFAWBR, MIMXRT633SFVKB, MIMXRT633SFAWBR
Abstract	RT600 errata

1 Product identification

The MIMXRT6xxSFAWBR WLCSP114 production samples have the following top-side package markings:

- First line: MRT6xxSF
- Second line: AW[R]R
- Third line: xxxxxx xx
- Fourth line: xxxxyyww
  - yyww: Date code with yy = year and ww = week

    Fifth line: xxx-yyy
- Sixth line: NXP

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- Third line: xxyyww
- Fourth line: xxxxx
  - yyww: Date code with yy = year and ww = week

The MIMXRT685SFFOB FOWLP249 production samples have the following top-side package markings:

- First line: MRT6xxSFFOB
- Second line: xxxxxx
- Third line: xxxxxx
- Fourth line: xxxxxyyww
  - yyww: Date code with yy = year and ww = week

Table 1. Device revision table

Revision identifier	Revision description [R]
B	Initial device revision

2 Errata overview

Table 2. Functional problems table

Functional problems	Short description	Revision identifier	Detailed description
FlexSPI	FlexSPI DLL lock status bit not accurate due to timing issue.	B	Section 3.1
GPIO.1	During initial power-up, a brief pull-up pulse could occur on the port pins.	B	Section 3.2
ADC.1	ADC misses software and hardware triggers when there is no ADC clock.	B	Section 3.3
USB.1	For the USB high-speed device controller, the detection handshaking fails when certain full-speed hubs are connected.	B	Section 3.4
USB.2	In USB high-speed device mode, device writes extra byte(s) to the buffer if the NBytes is not multiple of 8 for OUT transfer.	B	Section 3.5
USB.3	In USB high-speed device mode, when device isochronous IN endpoint sends a packet of MaxPacket	B	Section 3.6

Table 2. Functional problems table*...continued*

Functional problems	Short description	Revision identifier	Detailed description
	Size of 1024 bytes in response to IN token from host, the isochronous IN endpoint interrupt is not set and the endpoint command/status list entry for the isochronous IN endpoint is not updated.		
USB.4	In USB high-speed host mode, only one transaction per micro-frame is allowed for isochronous IN endpoints.	B	Section 3.7
ROM.1	Non-Secure Boot ROM API initializes unused FlexSPI0 IO pins.	B	Section 3.8
ROM.3	Non-secure boot ROM: SRAM memory address overwritten by boot ROM.	B	Section 3.9
ROM.4	BOOT_FAIL_PIN does not function properly.	B	Section 3.10
I3C.1	In I2C compatibility controller mode, read transaction does not terminate correctly.	B	Section 3.11

Table 3. AC/DC deviations table

AC/DC deviations	Short description	Product version(s)	Detailed description
n/a	n/a	n/a	n/a

Table 4. Errata notes

Errata notes	Short description	Revision identifier	Detailed description
VDD.1	Leakage path between VDD1V8 and VDDIO_x.	B	Section 5.1
ROM.2	Usage of ROM APIs when trust zone is disabled	B	Section 5.2

3 Functional problems detail

3.1 FlexSPI.1: FlexSPI DLL lock status bit not accurate due to timing issue

Introduction

Based on the sample clock source selection, the DLL control register (DLLxCR) can be used to set the delay line chain, which allows a fixed number of delay cells or auto-adjusted to lock on a certain phase delay to the reference clock.

Problem

After configuring the DLL and setting the lock status bit, data may not be in sync if a read/write is performed immediately from a FLEXSPI based external flash due to timing issues.

Work-around

Add a delay time (100 NOP) again after the DLL lock status is set.

3.2 GPIO.1: During initial power-up, a brief pull-up pulse could occur on the port pins

Introduction

By default (reset state), the GPIO pins are in the high Z state and typically stays high Z until the application code changes its state. The internal pull-up and internal pull-down resistors are disabled by default.

Problem

During VDDIO_x power-up, the internal pull-up resistor may not initialize during the early part of the VDDIO_x ramp up, resulting in a brief pull-up current pulse on some port pins that drops to zero before the VDDIO_x supplies reach the minimum operating voltage. Except for PIO1_19 to PIO1_31, PIO2_0 to PIO2_8, PIO0_21, PIO0_22, and PIO_23 pins, all fail-safe GPIOs are affected by this issue.

Typically, for a 20 ms power-up ramp, the pulse width of the glitch is approximately 8 ms and the amplitude is about 1.2 V.

Work-around

As a workaround, a pulldown resistor (~10K) can be added to the GPIO pin(s) to minimize the peak voltage where the application is sensitive to potential pulses.

3.3 ADC.1: ADC misses software and hardware triggers when there is no ADC clock

Introduction

ADC command execution can be initiated from up to 16 trigger sources. These triggers can be generated either via software trigger or hardware trigger.

Problem

When no ADC clock is present, the ADC will not properly capture software or hardware trigger events. The following set of conditions cause this behavior:

- First, the system enters a low-power state (both bus and functional clocks get disabled).
- Then, the system receives a wake-up and, upon exit from the lower power state, the CPU clocks start running.
- Finally, the ADC receives a software or hardware trigger before the functional ADC clock has completed start up and misses the trigger event.

Work-around

To use software or hardware triggers, the ADC must be left powered and the ADC source clock must be kept enabled upon entry into the low-power state. Please note, when exiting the low-power state, a 3 ADC Clock cycle synchronization delay is required between waking up until SWTRIG can be accepted.

3.4 USB.1: For the USB high-speed device controller, the detection handshaking fails when certain full-speed hubs are connected

Introduction

See the USB2.0 specification for details regarding the USB High-speed Detection Handshake protocol.

Problem

As a high-speed device, when certain full-speed hubs are connected, the USB device does not detect the HOST KJ sequence correctly and, as a result, does not recognize the speed of the connected host. In this case, the USB device can act erratically due to the wrong speed detection.

Work-around

There are two workarounds:

1. The software work-around below can be implemented in usb_dev_hid_mouse where the API is called "USB_DeviceHsPhyChirpIssueWorkaround()". In the event handler in USB_DeviceCallback(),
   - On "kUSB_DeviceEventBusReset" event, USB_DeviceHsPhyChirpIssueWorkaround() should be called to identify the speed of the host connected to. If a full-speed host is connected or "isConnectedToFsHostFlag" is set, FORCE_FS (bit 21) of DEVCMDSTAT register should be set to force the device operating in full-speed mode.
   - On "kUSB_DeviceEventDetach" event, FORCE_FS (bit 21) of DEVCMDSTAT register should be cleared.
2. The software workaround below is available in tech note (TN00071) In event handler in USB_DeviceCallback(),
   - On "kUSB_DeviceEventAttach" event, set PHY_RX register trip-level voltage to the highest. USBPHY->RX &= ~(USBPHY_RX_ENVADJ_MASK);USBPHY->RX |= 2;.
   - On "kUSB_DeviceEventBusReset" event, check the DEVCMDSTAT[SPEED] to determine the connected bus speed. (SPEED is bits 22 and 23). If DEVCMDSTAT[SPEED]=FS, FORCE_FS (bit 21) of DEVCMDSTAT should be set to force the device operating in full-speed mode.
   - On "kUSB_DeviceEventGetDeviceDescriptor" event, or the first SETUP packet has arrived, Set the USBPHY_RX[ENVADJ] field back to default 0. Otherwise, USBPHY_RX[ENVADJ] field will remain as 2 unless a disconnect event occurs.
   - On "kUSB_DeviceEventDetach" event, Clear FORCE_FS (bit 21) of DEVCMDSTAT register to zero. Reset USBPHY_RX[ENVADJ] field back to default 0.

3.5 USB.2: In USB high-speed device mode, the device writes extra byte(s) to the buffer if the NBytes is not multiple of 8 for OUT transfer

Introduction

The RT600 device family include a USB high-speed interface (USB1) that can operate in device mode at high-speed. The NBytes value represents the number of bytes that can be received in the buffer.

Problem

The RT600 USB device controller writes extra bytes to the receive data buffer if the size of the transfer is not a multiple of 8 bytes since the USB device controller always writes 8 bytes. For example, if the transfer length is 1 byte, 7 extra bytes will be written to the receive data buffer. If the transfer length is 7 bytes, 1 extra byte will be written to the receive data buffer.

Work-around

Reserve an additional, intermediary buffer along with the buffer used by the application for USB data. After the USB data transfer into the intermediary buffer has been completed, use memcpy to move the data from the intermediary buffer into the application buffer, skipping the extraneous extra byte. This software work-around is implemented on the SDK software platform.

3.6 USB.3: In USB high-speed device mode, when device isochronous IN endpoint sends a packet of MaxPacketSize of 1024 bytes in response to IN token from host, the isochronous IN endpoint interrupt is not set and the endpoint command/status list entry for the isochronous IN endpoint is not updated

Introduction

The RT600 device family include a USB high-speed interface (USB1) that can operate in device mode at high-speed. The isochronous IN endpoint supports a MaxPacketSize of 1024 bytes.

Problem

When a device isochronous IN endpoint sends a packet of MaxPacketSize of 1024 bytes in response to IN token from the host, the isochronous IN endpoint interrupt is not set and the endpoint command/status list entry for the isochronous IN endpoint is not updated.

Work-around

Restrict the isochronous IN endpoint MaxPacketSize to 1023 bytes in the device descriptor.

3.7 USB.4: In USB high-speed host mode, only one transaction per micro-frame is allowed for isochronous IN endpoints

Introduction

The RT600 device family include a USB high-speed interface, which can operate in host mode. Up to three high-speed transactions are allowed in a single micro-frame to support high-bandwidth endpoints. This mode is enabled by setting the Mult (Multiple) field in the Proprietary Transfer Descriptor (PTD) and is used to indicate to the host controller the number of transactions that should be executed per micro-frame. The allowed bit settings are:

00b Reserved. A zero in this field yields undefined results.

01b One transaction to be issued for this endpoint per micro-frame.

10b Two transactions to be issued for this endpoint per micro-frame.

11b Three transactions to be issued for this endpoint per micro-frame.

Problem

For High-bandwidth mode, using multiple packets (MULT = 10b or 11b) in a frame causes unreliable operation. Only one transaction (MULT = 01b) can be issued per micro-frame.

Work-around

There is no software workaround. Only one transaction can be issued per micro-frame.

3.8 ROM.1: Non-secure Boot ROM API initializes unused FlexSPI0 IO pins

Introduction

Each port IO pin has a dedicated control register in the IOPCTL module that allows control of various functions and characteristics. By default, the port IO pins have their input buffer disabled. This keeps pins that may be left floating from causing excess current leakage.

During the FlexSPI boot flow, the ROM API IAP_FlexspiNorAutoConfig() is called, for initialization of the FlexSPI module before accessing the Flash memory. The ROM configures the FLEXSPI0 pins (PIO1_18 - PIO1_28) enabling the input buffers for those respective pins regardless of what memory device is used.

Problem

If the application does not use these FlexSPI0 pins as inputs, it should disable the input buffers for these pins in the IOPCTL registers via bit 6 (IBENA).

Work-around

None.

3.9 ROM.3: Non-secure Boot ROM: SRAM memory address overwritten by boot ROM

Introduction

SRAM memory address partition 0 is the only partition that remains powered through a reset and therefore is the only partition that supports RAM retention. The addresses for partition 0 include Non-secure/Secure address ranges, and Code/Data Bus address ranges.

Problem

During each boot, the Boot ROM writes a 32-bit value, 0x3CC35AA5, to 0x00000FD0 located in SRAM partition 0. This has no adverse effect on Boot ROM operation.

Work-around

SRAM locations 0x00000FD0 – 0x00000FD3 cannot be used for retention RAM. These address locations can be used as standard SRAM memory but should not be used to store any data/code that needs to be retained beyond warm resets (SYSRESET, WDT_RESET).

3.10 ROM.4: BOOT_FAIL_PIN does not function properly

Introduction

The Boot ROM provides the ability to define a GPIO as a BOOT_FAIL_PIN where this pin can be used to power cycle the system. It is driven high to indicate boot failure prior to locking up the chip on error conditions. This functionality is controlled through an OTP Fuse Map.

Problem

The Boot ROM code does not set the BOOT_FAIL_PIN high and as a result, this feature is not available.

Work-around

None.

3.11 I3C.1: In I2C compatibility controller mode, the read transaction does not terminate correctly

Introduction

The I3C module can operate in I2C compatibility mode to support I2C devices.

Problem

When operating in I2C compatibility controller mode, the end of any read transaction may terminate with a repeated START followed by the STOP instead of only a STOP.

Work-around

In I2C compatibility mode, the use of no skew should be avoided and must be set to MCONFIG[SKEW] = 1.

4 AC/DC deviations detail

5 Errata notes detail

5.1 Leakage path between VDD1V8 and VDDIO_x

On RT600, the power sequencing specification in the datasheet mentions that the VDDIO_x rail can be optionally powered after the VDD1V8 and the delta voltage between VDDIO_x and VDD1V8 must be 1.89 V or less.

Before the VDDIO_x is powered, there is a leakage path between the VDD1V8 and VDDIO_x domain. The leakage is approximately 1.5 mA (VDD1V8 - VDDIO / 800 ohm). This leakage does not cause any reliability issues. There is no leakage once the VDDIO_x rail is above VDD1V8 - 0.4 V.

5.2 ROM.2: Usage of ROM APIs when trust zone is disabled

On RT600, ROM APIs are not available only when the trust zone is disabled using OTP setting or image header, and when the user image boots in non-secure mode. TrustZone can be disabled via OTP (BOOT_CFG, word 96, bits 14:13 = 0b01), or by setting the image header type, bit 14. Under these settings, execution of the ROM API functions will result in the device being locked.

Note: *This errata applies to devices with boot ROM patch revision 6 or greater. The boot ROM rev can be read using the ISP get-property 24 command. If the device responds with "Target Version = T2.0.6" or greater, the device is affected by the ROM API restriction when TrustZone is disabled. See the user manual for further details on the target version number format.*

6 Revision history

Table 5. Revision history

Document ID	Release date	Description
ES_RT600 v. 2.0	18 January 2024	• Added remark to ROM.2 errata,Section 5.2 • Added Section 3.9, Section 3.10, Section 3.11
ES_RT600 v. 1.9	31 March 2022	Added Section 5.2"ROM.2: Usage of ROM APIs when trust zone is disabled"
ES_RT600 v. 1.8	11 November 2021	Added ROM.1 errata, Section 3.8 "ROM.1: Non-secure Boot ROM API initializes unused FlexSPI0 IO pins"
ES_RT600 v. 1.7	20 April 2021	• Added USB.3 errata, Section 3.6 "USB.3: In USB high-speed device mode, when device isochronous IN endpoint sends a packet of MaxPacketSize of 1024 bytes in response to IN token from host, the isochronous IN endpoint interrupt is not set and the endpoint command/status list entry for the isochronous IN endpoint is not updated" • Added USB.4 errata, Section 3.7 "USB.4: In USB high-speed host mode, only one transaction per micro-frame is allowed for isochronous IN endpoints"
ES_RT600 v. 1.6	25 February 2021	Added USB.2 errata, Section 3.5 "USB.2: In USB high-speed device mode, the device writes extra byte(s) to the buffer if the NBytes is not multiple of 8 for OUT transfer"
ES_RT600 v. 1.5	18 December 2020	Includes Section 5.1 "Leakage path between VDD1V8 and VDDIO_x"
ES_RT600 v. 1.4	14 December 2020	Includes Section 3.4 "USB.1: For the USB high-speed device controller, the detection handshaking fails when certain full-speed hubs are connected"
ES_RT600 v. 1.3	29 July 2020	Updates Section 3.2 "GPIO.1: During initial power-up, a brief pull-up pulse could occur on the port pins" and adds Section 3.3 "ADC.1: ADC misses software and hardware triggerswhen there is no ADC clock"
ES_RT600 v. 1.2	6 July 2020	Adds Section 3.2 "GPIO.1: During initial power-up, a brief pull-up pulse could occur on the port pins"
ES_RT600 v. 1.1	8 May 2020	Added FlexSPI DLL lock status timing issue and addressed part marking.
ES_RT600 v. 1.0	13 February 2020	Initial version.

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