AVR32749: AVR32 UC3 Software Workaround Implementation for the Erratum Flash Read-after-Write for AT32UC3Ax512 Revision E, H and I

AVR®32 UC3 Microcontrollers

AVR32 Application Note

1. Introduction

This application note gives the software workaround implementation of the erratum flash-read-after-write present on AT32UC3Ax512 (x=0 or x=1) revision E, H and I.

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2. Reference

- AVR32 UC3A0512 page
  http://www.atmel.com/dyn/products/product_card.asp?part_id=4117
- AVR32 UC3A1512 page
  http://www.atmel.com/dyn/products/product_card.asp?part_id=4122
- AVR32 UC3 Software Framework
  http://www.atmel.com/dyn/products/tools_card.asp?tool_id=4192

3. Errata Description

The errata description can be found in the section 'Errata' of the device datasheet.

3.1 Errata Extract for AT32UC3Ax512 RevE, H, I

On AT32UC3A0512 and AT32UC3A1512, corrupted read in flash after FLASHC WP, EP, EA, WUP, EUP commands may happen

- After a FLASHC Write Page (WP) or Erase Page (EP) command applied to a page in a given half of the flash (first or last 256 kB of flash), reading (data read or code fetch) the other half of the flash may fail. This may lead to an exception or to other errors derived from this corrupted read access.
- After a FLASHC Erase All (EA) command, reading (data read or code fetch) the flash may fail. This may lead to an exception or to other errors derived from this corrupted read access.
- After a FLASHC Write User Page (WUP) or Erase User Page (EUP) command, reading (data read or code fetch) the second half (last 256 kB) of the flash may fail. This may lead to an exception or to other errors derived from this corrupted read access.

3.2 Fix/Workaround

- The flashc WP, EP, EA, WUP, EUP commands: these commands must be issued from RAM or through the EBI.
- After these commands have completed, read twice one flash page initialized to 00h from both the first and the last half part of the flash.

4. Software Implementation

4.1 Description

The workaround is implemented in the provided flashc.c driver. This file is compliant with GCC and IAR compilers.

The flashc.c is derived from the original Flash software driver, from the AVR32 software framework (found under DRIVERS/FLASHC/). The workaround does not change the API of this software driver.

This file includes:

- Two arrays, each mapped on a flash page and initialized to 00h: one is located in the first 256 kB of the flash, the other in the second 256 kB of the flash.

- The *flashc_issue_command* function is the function that issues all flash commands (including the WP, EP, EA, WUP, EUP commands). The “read-twice” workaround is implemented in this function. This function and all the functions it calls are stored in RAM.

To accurately place each zero-initialized array to its exact location in flash and to store the required functions to RAM, it is necessary to use the provided specific linker script (link_uc3a0512.lds for GCC, lnkuc3a0512.xcl for IAR).

Requirement for IAR compiler only: the file init_ram_code.c contains RAM initialization for functions to be executed from RAM. The function init_ram_code() must be called at the beginning of the main() function of the program.

4.2 Workaround Summary

The following table summarizes the steps to follow to implement the workaround.

Table 4-1. Workaround Summary

GCC Compiler	IAR Compiler
• flashc.c: the flash driver • link_uc3a0512.lds: the GCC linker script	• flashc.c: the flash driver • lnkuc3a0512.xcl: the IAR linker script • init_ram_code.c: this file must be added to the IAR project. • The function init_ram_code() must be called at the beginning of the main() function.

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