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Energy Mode 2 with RTC

AN0005 - Application Note

Introduction

This application note demonstrates how to repeatedly enter energy mode 2 (EM2) and wake up at a specific time using the Real Time Counter (RTC).

This application note includes:

- This PDF document
- Source files (zip)
  - Example C-code
  - IAR EW project
  - Keil MDK project

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1 Energy Mode 2 and RTC

1.1 General

Many microcontroller applications include long time intervals in which almost no activity is required. In order to save energy, these intervals should be spent in an appropriate sleep mode. The EFM32G features several such modes, including energy mode 2 (EM2). In this mode the MCU core and high-speed peripherals are shut down, whereas low-energy peripherals such as LCD, LEUART and RTC may be enabled. These peripherals run on a low-frequency oscillator, hence their current consumption is very low.

1.2 Real Time Counter (RTC)

The RTC increments a counter on each positive edge of it's clock. When the value of the counter is equal to either of it's compare registers, an interrupt is triggered (if enabled). This interrupt can wake up the EFM32G from EM2, and code execution is resumed. The RTC can also issue an interrupt upon overflow.

It is possible to set up a compare register (RTC_COMP0) to be the top value. In this mode, the RTC will reset when reaching the value of the compare register.

For further details on the RTC please refer to the EFM32G reference manual.

1.3 Example Info

The main operation in this example is to repeatedly enter energy mode 2 (EM2) and wake up 100ms later using the RTC.

The 32.768 kHz crystal oscillator (LFXO) is used as source for the RTC. This oscillator features higher accuracy than the internal RC oscillator.

The RTC is first set up to issue an interrupt after 100ms. The following wake up times will be set by the RTC interrupt routine.

After the initialization, the main program will enter EM2 repeatedly. The RTC interrupt will wake up the EFM32G from EM2.

Upon wake up, the RTC interrupt handler is run. It clears the RTC interrupt and sets the next time to wake up by reading out the current RTC counter value, adding the equivalent of 100ms and writes the result to the compare register.

Please refer to the source code found in the zip-file for further details.

1.4 Interfacing Low Energy (LE) Peripherals

When writing data to an LE Peripheral such as the RTC, it may take up to four low frequency clock cycles before the data can be used by the LE Peripheral. This process is called synchronization, and in every LE Peripheral there is a register indicating whether synchronization is in progress (SYNCBUSY).

In some cases it is desirable that the data written to an LE Peripheral is not updated immediately. For example, there may be several registers which are to be updated simultaneously, in order to have precise control of the state of the Peripheral. In this case the REGFREEZE bit in the FREEZE register can be used. When set, this bit prevents synchronization of the registers of the LE Peripheral. When cleared, synchronization of all written registers will take place at once. This way the new register values are updated at the same time.

2 Revision History

2.1 Revision 1.03

2012-04-20

Adapted software projects to new peripheral library naming and CMSIS_V3.

2.2 Revision 1.02

2012-03-14

Fixed makefile-error for CodeSourcery projects.

2.3 Revision 1.01

2010-11-16

Changed example folder structure, removed build and src folders.

Added chip-init function.

2.4 Revision 1.00

September 20th, 2010.

Initial revision.

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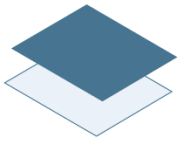

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