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M16C/29

Periodic Data Sample using A/D Trigger Timer Mode

Introduction

This application note illustrates the use of timer underflow from timer B2 to start A/D conversion. Setting timer B2 in "A/D trigger" mode allows starting an A/D conversion at a fixed period. The A/D converter is operated in "simultaneous sample sweep" mode in which allows reading through several analog inputs. After A/D conversion is completed the A/D interrupt will be triggered.

Target Device

Applicable MCU: M16C/28, M16C/29

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Program Description

We will implement a program for RSKM16C29 board that triggers A/D conversion at a fixed period. Each conversion converts multiple of analog signals into digital codes and saves them into a buffer for further use by the user. Also, we will implement a system clock by updating a system time variable every interrupt. The system clock, displaying time elapsed since the program starts, will be displayed on the LCD screen with the ADC conversion results.

Timer B2

For this application, we need one timer operating in timer mode to maintain the time interval between the starting points of each A/D conversion. For this purpose, we set timer B2 to count down and cause timer underflow every 500 usec. Since timer B2 has a special mode for A/D trigger, we can link the timer underflow event to start A/D conversion. Note that only timer B2 can be used in this synergy because any other timers cannot operate in A/D trigger mode.

A/D converter

We use A/D converter in simultaneous sample sweep mode because this mode allows us to use timer underflow from timer B2 to start the conversion. Therefore, we can maintain an accurate time interval between ADC samples. In this mode the A/D converter reads two or more pins consecutively with only one software start command. It is different from one shot mode in which only one analog pin can be read at a time. Also, it is different from repeat sweep mode in which the A/D conversion runs continuously but the time interval between two reads at the same pin cannot be accurately controlled.

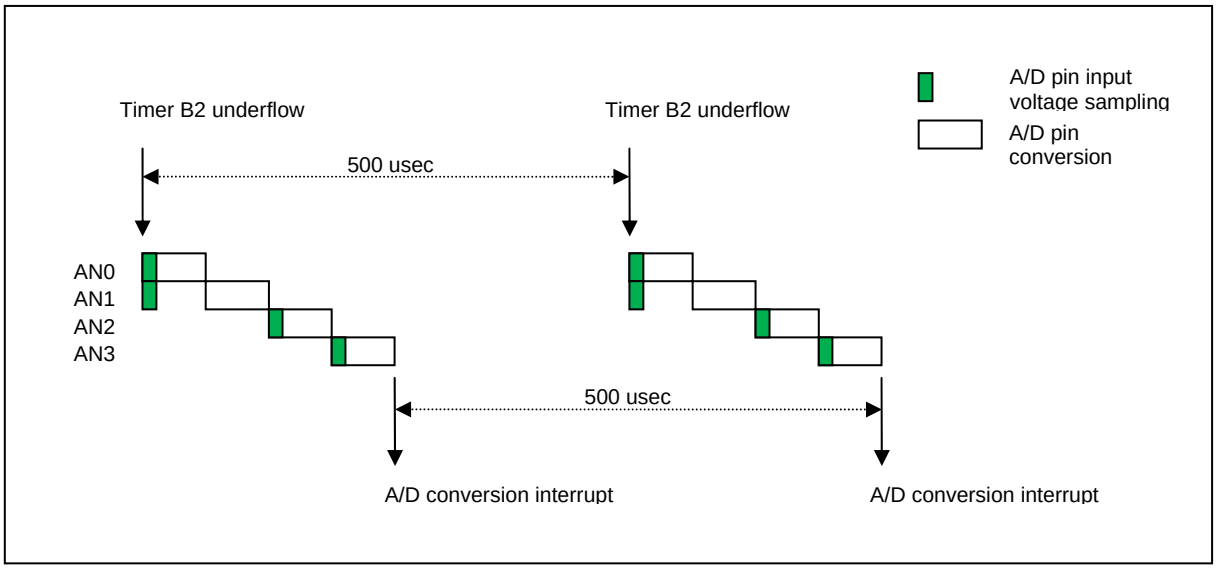

Figure 1 A/D conversion in simultaneous sample sweep mode with timer B2 A/D trigger

Result

The result of using timer B2 to regulate the A/D conversion is illustrated in Figure 1. Note that timer B2 has timer underflow every 500 usec which also starts the A/D conversion every 500 usec. Because of the A/D converter using simultaneous sample sweep mode, the voltage sampling of AN0 and AN1 happen at the same time. (This simultaneous sampling can be useful for some applications like motor control.) The other analog input channels are then sampled sequentially. After the conversion is completed the A/D conversion interrupt is triggered. In this application, this interrupt trigger is used to read out the ADC conversion results as well as update the system timer.

After the program is started it shows the system clock and the converted digital codes of AN0 and AN1 on the LCD screen which is updated every 0.2 sec.

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