

ADC_Single_Channel_1 for KIT_AURIX_TC275_LK

ADC single channel conversion

AURIX™ TC2xx Microcontroller Training
V1.0.0



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Scope of work

The Versatile Analog-to-Digital Converter (VADC) is configured to measure an analog signal using background scan request.

An analog input channel is continuously converted using the background scan mode. The input value is determined by the potentiometer on the board. Two LEDs are used to indicate a voltage interval. Thus depending on the conversion value, one or both LEDs are on.

Introduction

- › The AURIX™ microcontrollers provide a series of analog input channels (up to 8 for each ADC) connected to a cluster of Analog/Digital Converters (up to 11) using the Successive Approximation Register (SAR) principle. Each converter of the ADC cluster is represented as a group and can operate independently of the others
- › Analog/Digital conversions can be requested by several request sources such as the Queued, Scan or Background Scan Source
- › Several conversion modes (Fixed Channel Conversion, Auto Scan Conversion or Channel Sequence Conversion), either executed as single or continuous, can be configured and used concurrently by the available request source. An arbiter resolves concurrent conversion requests from different sources

Hardware setup

This code example has been developed for the board KIT_AURIX_TC275_LITE.

In this example, the pin AN0, connected to the board's potentiometer, is used.



Implementation

- › An application data structure defined in ***ADC_Single_Channel.h*** is used in this example, representing configuration values and references to setup and control the VADC
 - A global object called ***g_vadcBackgroundScan*** from type ***ApplicationVadcBackgroundScan*** needs to be instantiated with the following elements:
 - ***vadc*** (from type ***IfxVadc_Adc***): references to the VADC module registers
 - ***adcGroup*** (from type ***IfxVadc_Adc_Group***): references to the VADC group registers
 - ***adcChannelConfig*** (from type ***IfxVadc_Adc_ChannelConfig***): stores the configuration values for the input channel
 - ***adcChannel*** (from type ***IfxVadc_Adc_Channel***): is a subset of ***adcChannelConfig*** and stores the channel id, the result register number and a reference to the VADC group
- › The following functions, defined in ***ADC_Single_Channel.c***, are used:
 - ***vadcBackgroundScanInit()***
 - ***vadcBackgroundScanRun()***
 - ***indicateConversionValue()***
 - ***initializeLEDs()***

Implementation

Configuring the VADC to run in background scan mode, continuously converting the analog input channel values and indicate them by LEDs

- › The initialization is done through the functions ***vadcBackgroundScanInit()*** and ***vadcBackgroundScanRun()***
 - The function ***vadcBackgroundScanInit()***:
 - creates a VADC configuration object ***adcConfig***
 - it is configured with default ADC configuration values using the function ***IfxVadc_Adc_initModuleConfig()***
 - the object is used to initialize the ADC (e.g. enable ADC, set ADC Power Supply, etc.) using the function ***IfxVadc_Adc_initModule()***
 - creates a group configuration object ***adcGroupConfig***
 - the group object is initialized with default values for each request source using the function ***IfxVadc_Adc_initGroupConfig()***
 - **e.g. the ADC to be used is specified, the ADC resolution is set to 12 bit, the sample time is set to 1 us**
 - signal to the arbiter that the group is using background scan
 - the object is used to initialize the group registers

Implementation

- Furthermore, the function ***vadcBackgroundScanRun()*** does the following:
 - initializes the channel configuration object ***adcChannelConfig*** of the global defined application data structure ***g_vadcBackgroundScan*** with default values using the function ***IfxVadc_Adc_initChannelConfig()***
 - specifies the input channel number to be used for conversion by setting ***channelId***
 - specifies the result register to be used by setting the corresponding number to ***resultRegister***
 - specifies the channel as ***backgroundChannel***
 - initializes the channel object of the global defined application data structure ***g_vadcBackgroundScan***
 - starts background scan using the function ***IfxVadc_Adc_startBackgroundScan()***

Implementation

- › The visualization with LEDs is done using the functions ***initializeLEDs()*** and ***indicateConversionValue()***
 - The function ***initializeLEDs()***
 - initializes the port pins 00.5 and 00.6 as push-pull outputs using the function ***IfxPort_setPinMode()***
 - set the port pins 00.5 and 00.6 to high state in order to switch the LEDs off by calling the function ***IfxPort_setPinHigh()***
 - The function ***indicateConversionValue()*** is continuously executed and
 - defines an object ***conversionResult*** from type ***Ifx_VADC_RES***
 - uses the function ***IfxVadc_Adc_getResult()*** to continuously retrieve the result value until the **valid flag** of the object ***conversionResult*** turns to high signaling that a new measurement is available
 - lights up the LED1 (P00.5) if the discrete converted value is smaller than 0x555
 - lights up the LED2 (P00.6) if the discrete converted value is greater than 0xAAA
 - lights up both LEDs if the discrete converted value is part of the interval [0x555, 0xAAA]

Run and Test

After code compilation and flashing the device, verify the behavior of the LEDs:

- Turn the potentiometer on the board and observe LED1 and LED2

Input Voltage X	1 LED1	2 LED2
$X < 1.1\text{ V}$		
$1.1\text{ V} \leq X \leq 2.2\text{ V}$		
$X > 2.2\text{ V}$		

■ LED On ■ LED Off



References



- › AURIX™ Development Studio is available online:
- › <https://www.infineon.com/aurixdevelopmentstudio>
- › Use the „*Import...*“ function to get access to more code examples.



- › More code examples can be found on the GIT repository:
- › https://github.com/Infineon/AURIX_code_examples



- › For additional trainings, visit our webpage:
- › <https://www.infineon.com/aurix-expert-training>



- › For questions and support, use the AURIX™ Forum:
- › <https://www.infineonforums.com/forums/13-Aurix-Forum>

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