ADC_Background_Scan_1 for KIT_AURIX_TC297_TFT

ADC background scan source

AURIX™ TC2xx Microcontroller Training
V1.0.0

Scope of work

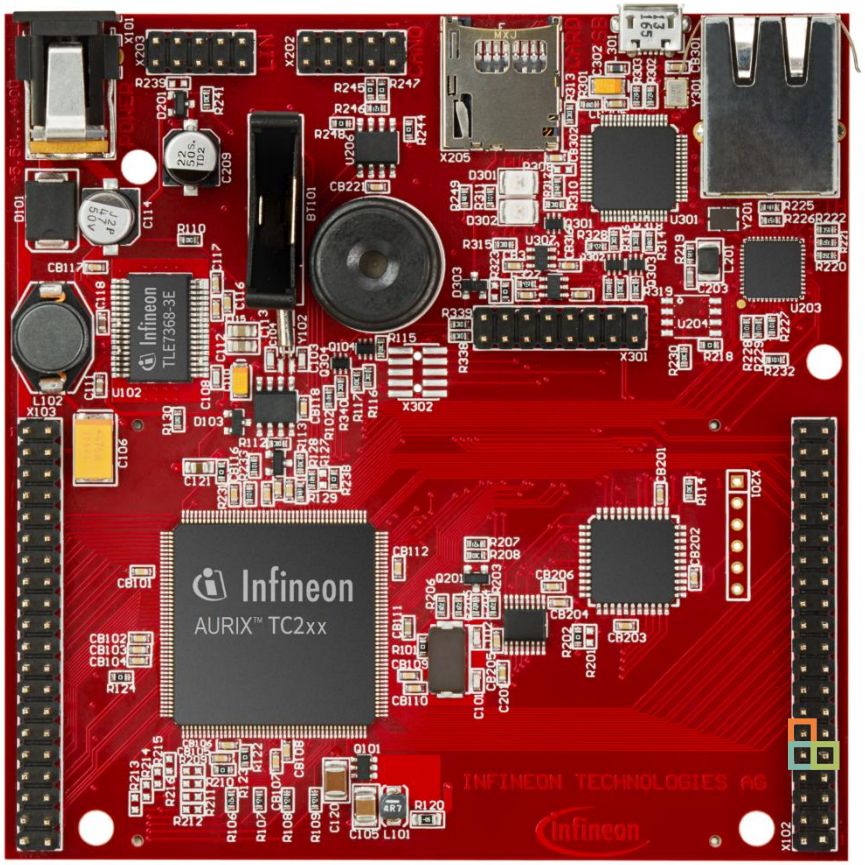
The Versatile Analog-to-Digital Converter (VADC) is configured to measure multiple analog signals in a sequence using background scan request.

The Background Scan mode of the Analog-to-Digital Converter (ADC) module is configured to measure the analog signals applied to the channels 0 to 3 of the group 0.

Introduction

- The Versatile Analog-to-Digital Converter module (VADC) of the AURIX™ TC29x comprises 11 independent analog to digital converters (VADC groups) with up to 8 analog input channels each.
- Each channel can convert analog inputs with a resolution of up to 12-bit.
- Analog/Digital conversions can be requested by several request sources:
  - **Queued request source**, specific to a single group
  - Channel scan request source, which comprises:
    - **Group scan source**, specific to a single group
    - **Background scan source**, which can request all channels of all groups
- The Channel scan request source issues conversion requests for a coherent sequence of input channels, starting with the highest enabled channel number.
- In background scan source (Channel scan request source), each channel is converted once per sequence. A conversion can be requested to be done once or repeatedly.
- A background scan source can access all analog input channels that are not assigned to any group request source. These conversions are executed with low priority.

Hardware setup



This code example has been developed for the board KIT_AURIX_TC297_TFT_BC-Step. The signals to be measured have to be connected to channels 0..3 of the VADC (port pins AN0..AN3).

	X102		
P14.5	40	39	P14.4
P20.10	38	37	P20.9
P15.7	36	35	P15.6
P15.5	34	33	P15.4
P15.3	32	31	P15.2
P22.3	30	29	P22.2
P22.1	28	27	P22.0
P33.11	26	25	P23.4
P23.3	24	23	P23.2
P23.1	22	21	P23.0
P33.6	20	19	P33.8
P33.12	18	17	P33.1
P33.2	16	15	P33.3
P33.4	14	13	P33.5
AN0	12	11	AN8
AN2	10	9	AN3
AN32	8	7	AN33
AN20	6	5	AN21
GND	4	3	GND
V_UC(+5V)	2	1	VCC_IN

Note: The port pin AN1 is not routed to any accessible pin on the KIT_AURIX_TC297_TFT_BC-Step board, thus this pin will read a random analog noise value.

Implementation

Configuration of the VADC

The configuration of the VADC is done in the ***initADC()*** function in three different steps:

- Configuration of the **VADC module**
- Configuration of the **VADC group**
- Configuration of the **VADC channel**

Configuration of the VADC module

The default configuration of the VADC module, given by the iLLDs, can be used for this example.
This is done by initializing an instance of the ***IfxVadc_Adc_Config*** structure and applying default values to its fields through the function ***IfxVadc_Adc_initModuleConfig()***.
Then, the configuration can be applied to the VADC module with the function ***IfxVadc_Adc_initModule()***.

Implementation

Configuration of the VADC group

The configuration of the VADC group is done by initializing an instance of the ***IfxVadc_Adc_GroupConfig*** structure with default values through the function ***IfxVadc_Adc_initGroupConfig()*** and modifying the following fields:

- ***groupId*** – to select which converters to configure
- ***master*** – to indicate which converter is the master. In this example, only one converter is used, therefore it is also the master
- ***arbiter*** – a structure that represents the enabled request sources, which can be Group scan, Queue and/or Background sources. In this example, it is set to ***arbiter.requestSlotBackgroundScanEnabled***.
- ***backgroundScanRequest*** – a structure that allows to configure the Background Scan Request Source by setting:
  - ***autoBackgroundScanEnabled*** – a parameter to set the autoscan mode (conversions are requested continuously)
  - ***triggerConfig*** – a parameter that specify the trigger configuration

Then, the user configuration is applied through the function ***IfxVadc_Adc_initGroup()***.

Implementation

Configuration of the VADC channel

The configuration of each channel is done by initializing an instance of the ***IfxVadc_Adc_ChannelConfig*** structure with default values through the function ***IfxVadc_Adc_initChannelConfig()*** and modifying the following fields:

- ***channelId*** – to select the channel to configure
- ***resultRegister*** – to indicate the register where the A/D conversion value is stored
- ***backgroundChannel*** – to specify that the selected channel is used as a background channel

Then, the configuration is applied to the channel with the function ***IfxVadc_Adc_initChannel()*** and, as a last step, the channel is added to the background scan sequence through the function ***IfxVadc_Adc_setBackgroundScan()***.

When the VADC module and its groups and channels are configured, the scan sequence is started with the function ***IfxVadc_Adc_startBackgroundScan()***.

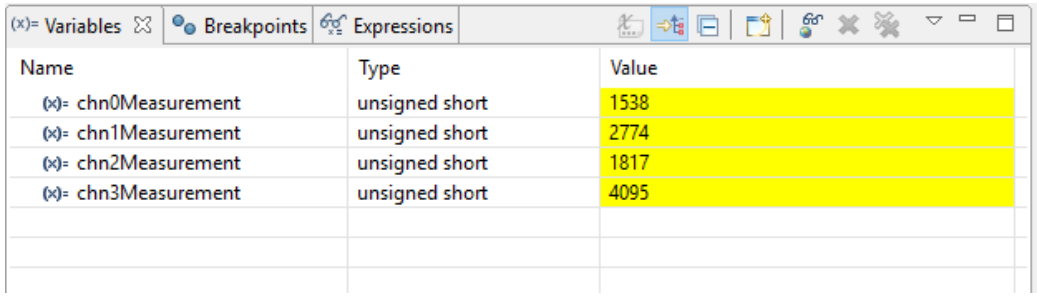
Finally, to read a conversion, the function ***readADCValue()*** is used, which calls the ***IfxVadc_Adc_getResult()*** function from iLLDs until a new measurement is returned.

All the functions used to get a conversion and configuring the VADC module, its group and channels can be found in the iLLD header ***IfxVadc_Adc.h***.

Run and Test

After code compilation and flashing the device, perform the following steps:

- Set a breakpoint in the ***Cpu0_Main.c*** file where the first measurement is requested (***chn0Measurement = readADCValue(CHN_0)***)
- Resume twice the Debug session and check the Variables window where the conversion values can be seen



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

Trademarks
All referenced product or service names and trademarks are the property of their respective owners.

Edition 2020-02
Published by
Infineon Technologies AG
81726 Munich, Germany

Do you have a question about this document?
Email: erratum@infineon.com

Document reference
ADC_Background_Scan_1_
KIT_TC297_TFT

IMPORTANT NOTICE
The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie") .

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (www.infineon.com).

WARNINGS
Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.