

DAC: Digital to Analog Converter

XMC™ microcontrollers
September 2016



Agenda

1

Overview

2

Key feature: 12-bit DAC with 2 MHz

3

Key feature: user defined pattern in dedicated RAM

4

Key feature: direct DMA feed with FIFO

5

System integration

6

Application examples

Agenda

1

Overview

2

Key feature: 12-bit DAC with 2 MHz

3

Key feature: user defined pattern in dedicated RAM

4

Key feature: direct DMA feed with FIFO

5

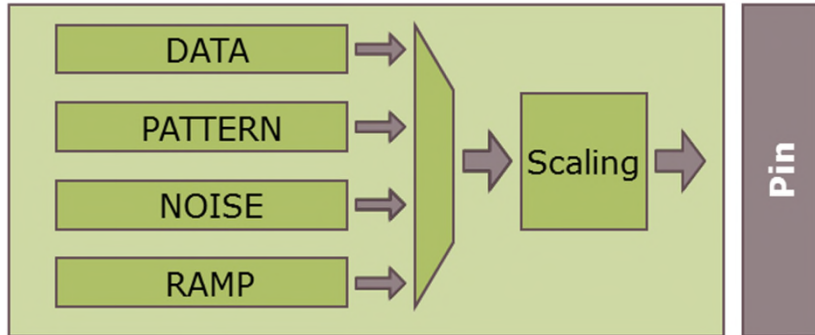
System integration

6

Application examples

DAC

Digital to Analog Converter



Highlights

XMC™4000 provides two digital to analog converters. Each can output one analog value. Additional multiple analog waves can be generated without CPU load.

Key feature

- › 12-bit DAC with 2 MHz
- › User defined pattern in dedicated RAM
- › Direct DMA feed with FIFO

Customer benefits

- › Precise analog output generation with high dynamic
- › Flexible pattern with zero CPU load
- › Very accurate high dynamic waveform generation with less CPU load

Agenda

1

Overview

2

Key feature: 12-bit DAC with 2 MHz

3

Key feature: user defined pattern in dedicated RAM

4

Key feature: direct DMA feed with FIFO

5

System integration

6

Application examples

- › 12-bit resolution
 - 12-bit resolution from 0.3 to 2.5 V
 - 540 μV steps ± 1 LSB
 - No additional reference voltage necessary
- › Up to 5 mega samples per second (MS/s)
 - 2 MS/s with full accuracy 5 MS/s with reduced accuracy

Agenda

1

Overview

2

Key feature: 12-bit DAC with 2 MHz

3

Key feature: user defined pattern in dedicated RAM

4

Key feature: direct DMA feed with FIFO

5

System integration

6

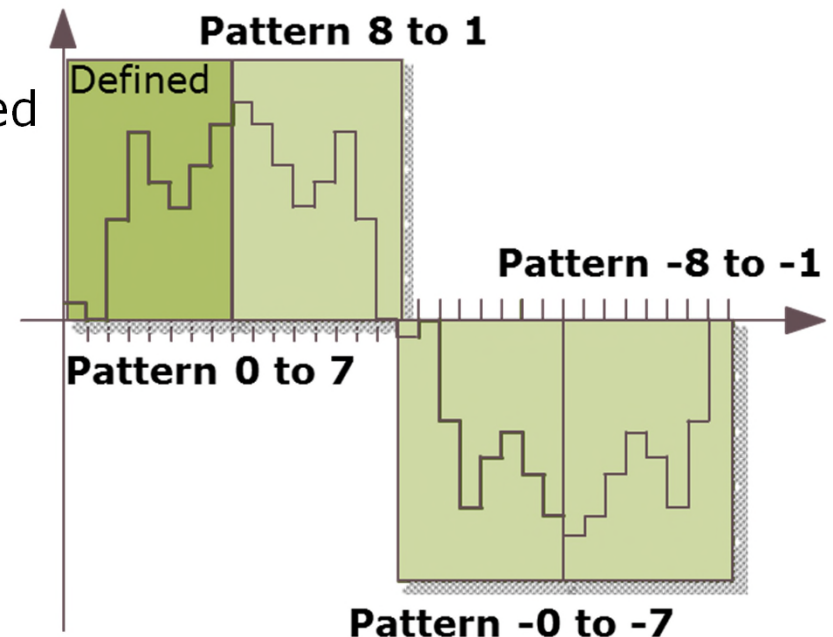
Application examples

User defined pattern in dedicated RAM

- › Pattern generation independent from CPU
 - Set points defined in dedicated RAM
 - Supports 10 different clock sources: internal clock, SW trigger and 8 external clocks from port or peripherals

Wave Generation

- › 32 free configurable set points
 - Only first quarter have to be defined
 - 6-bit resolution



Agenda

1

Overview

2

Key feature: 12-bit DAC with 2 MHz

3

Key feature: user defined pattern in dedicated RAM

4

Key feature: direct DMA feed with FIFO

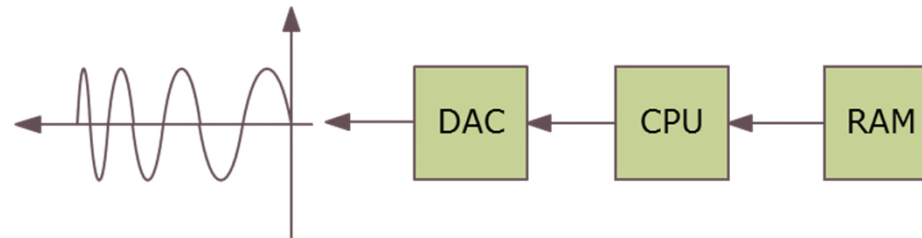
5

System integration

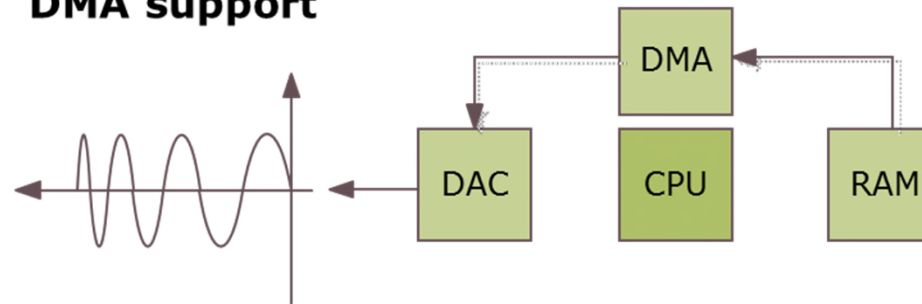
6

Application examples

No DMA used



DMA support



- › DMA support for DAC
 - 12-bit DAC sequence can be defined
 - FIFO reduce interrupt rate
 - Zero or low CPU load

Agenda

1

Overview

2

Key feature: 12-bit DAC with 2 MHz

3

Key feature: user defined pattern in dedicated RAM

4

Key feature: direct DMA feed with FIFO

5

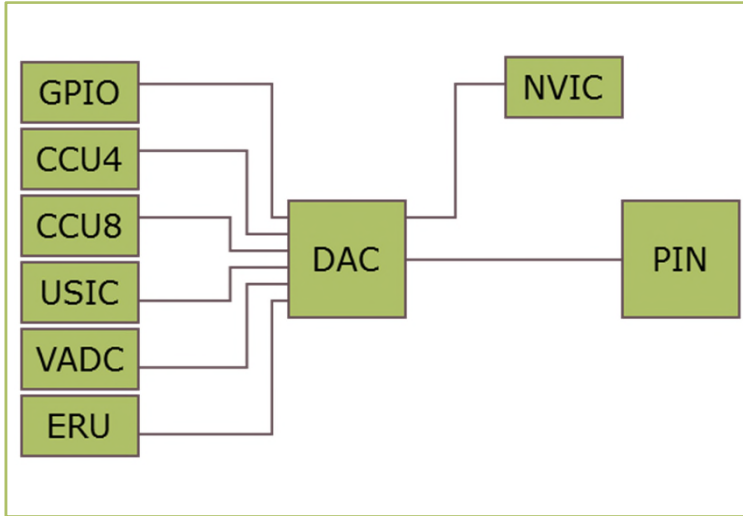
System integration

6

Application examples

DAC

System integration



XMC™4100	XMC™4200	XMC™4400	XMC™4500
●	●	●	●

Up to 10 different trigger sources from 6 different type of peripherals integrate the DAC into the system.

The interconnections enable the user to change the analog output depending on a peripheral trigger.

- › Target applications
 - Debugging
 - Waveform generation
 - Audio

Agenda

1

Overview

2

Key feature: 12-bit DAC with 2 MHz

3

Key feature: user defined pattern in dedicated RAM

4

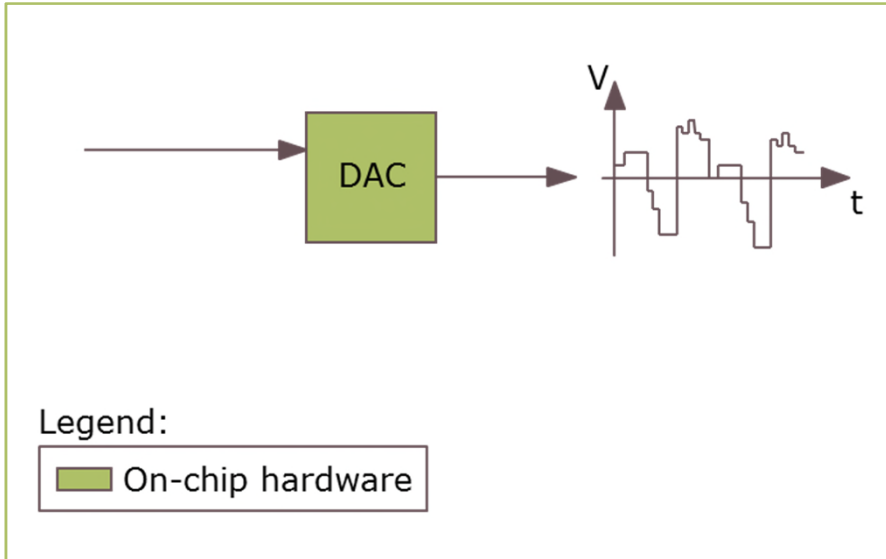
Key feature: direct DMA feed with FIFO

5

System integration

6

Application examples



Overview

This feature can be used for debugging to compare internal values with other external values. E.g. the output of a control loop and the reaction on hardware.

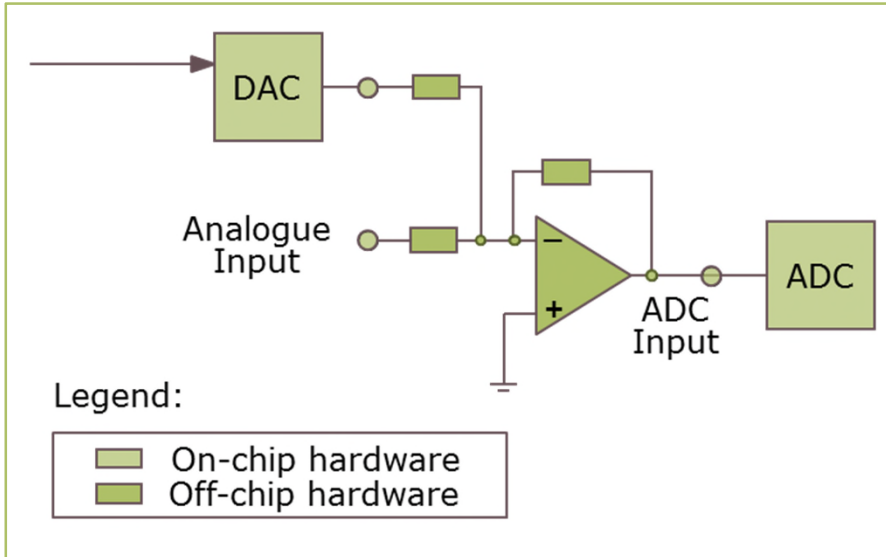
Both signals can be monitored via an external oscilloscope.

In brief

The general use case is the conversion of a digital value coming from the software into an analogue value.

Application example

Measurement adjustment



Overview

E.g. in some current measurement applications positive and negative currents have to be measured. For a negative current an offset is needed.

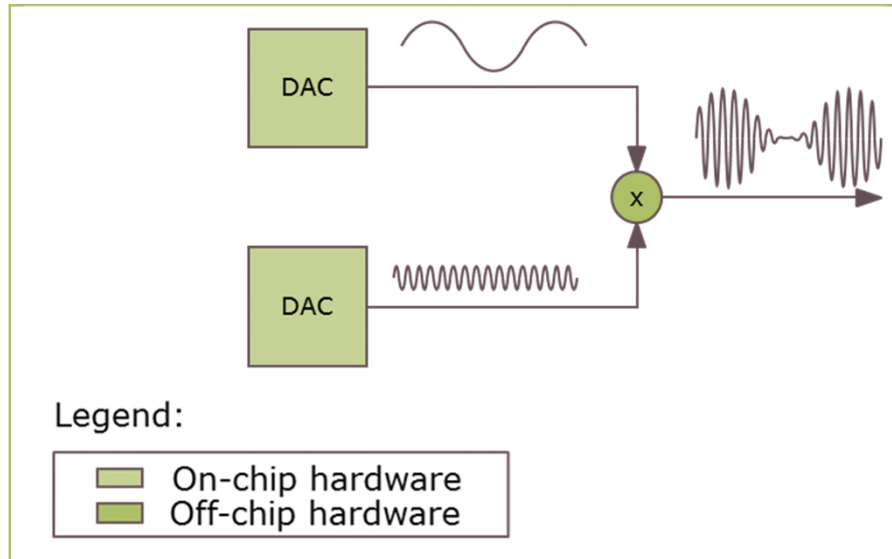
In this case a software controlled variable offset can be added to increase the range of the measurement.

In brief

In standard application an amplifier is used to adjust a measured voltage to the ADC input. These configurations are fixed. With the DAC a software controlled adjustment can be done.

Application example

Complex waveform generation

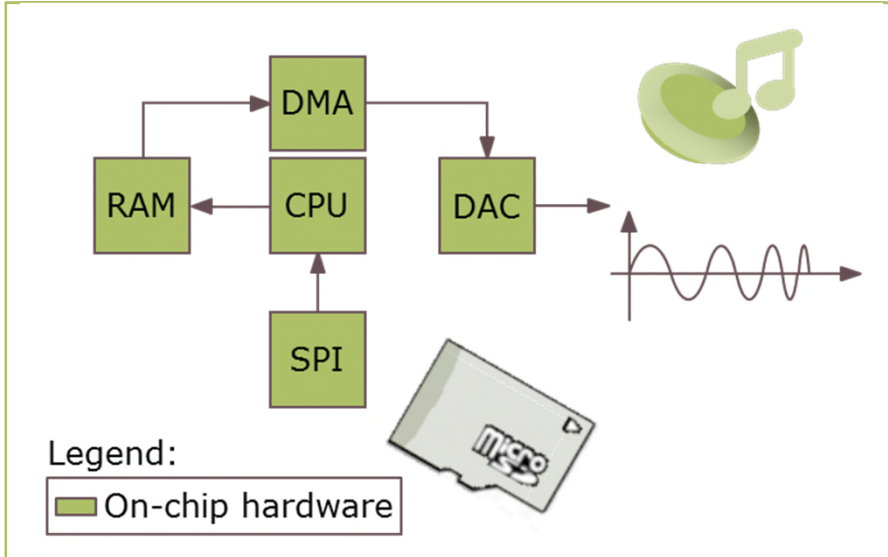


Overview

Each of the DAC channels can generate an independent waveform. These waveforms can then be externally applied to each other. E.g. both signals can be multiplied or accumulated to overlap a signal with a defined noise.

In brief

In some applications complex waveforms generated by two waveforms are needed.



Overview

A file which holds the audio information on a external SD card. After read and storing a part of the file into RAM the DMA is updating the DAC value.

In brief

DAC enables to interface with external audio speaker. Together with SPI interface and DMA an audio system which reads from external SD card can be build.

General information

- › For latest updates, please refer to:

www.infineon.com/xmc4000

- › For support:

<http://www.infineonforums.com/forums/8-XMC-Forum>

Support material

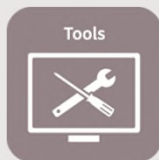
Collaterals and Brochures



- Product Briefs
- Selection Guides
- Application Brochures
- Presentations
- Press Releases, Ads

- www.infineon.com/XMC

Technical Material



- Application Notes
- Technical Articles
- Simulation Models
- Datasheets, MCDS Files
- PCB Design Data

- www.infineon.com/XMC

- [Kits and Boards](#)

- [DAVE™](#)

- [Software and Tool Ecosystem](#)

Videos



- Technical Videos
- Product Information Videos

- [Infineon Media Center](#)

- [XMC Mediathek](#)

Contact



- Forums
- Product Support

- [Infineon Forums](#)

- [Technical Assistance Center \(TAC\)](#)

Disclaimer

The information given in this training materials is given as a hint for the implementation of the Infineon Technologies component only and shall not be regarded as any description or warranty of a certain functionality, condition or quality of the Infineon Technologies component.

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) with respect to any and all information given in this training material.



Part of your life. Part of tomorrow.

