



PIC32™ DMA Module

© 2008 Microchip Technology Incorporated. All Rights Reserved.

PIC32 DMA Module

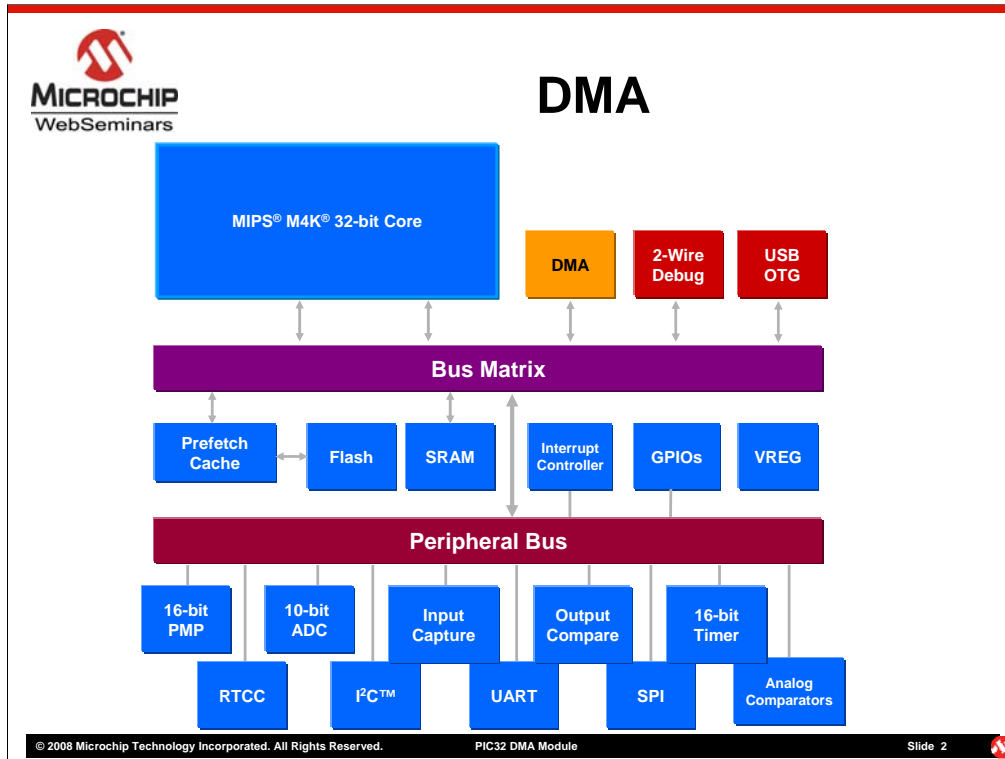
Slide 1

Hello and welcome to the PIC32 DMA Module webinar.

I am Nilesh Rajbharti, Applications Engineering Manager for PIC32 products.

In next few minutes, I will provide a quick overview of the PIC32 DMA Module.

Let's begin.



The PIC32 DMA module is designed to increase the data throughput of PIC32-based embedded systems. In addition to standard data movement modes, the PIC32 DMA module includes integrated programmable CRC engine, channel chaining and pattern matching modes to further reduce the CPU burden and increase overall system performance.

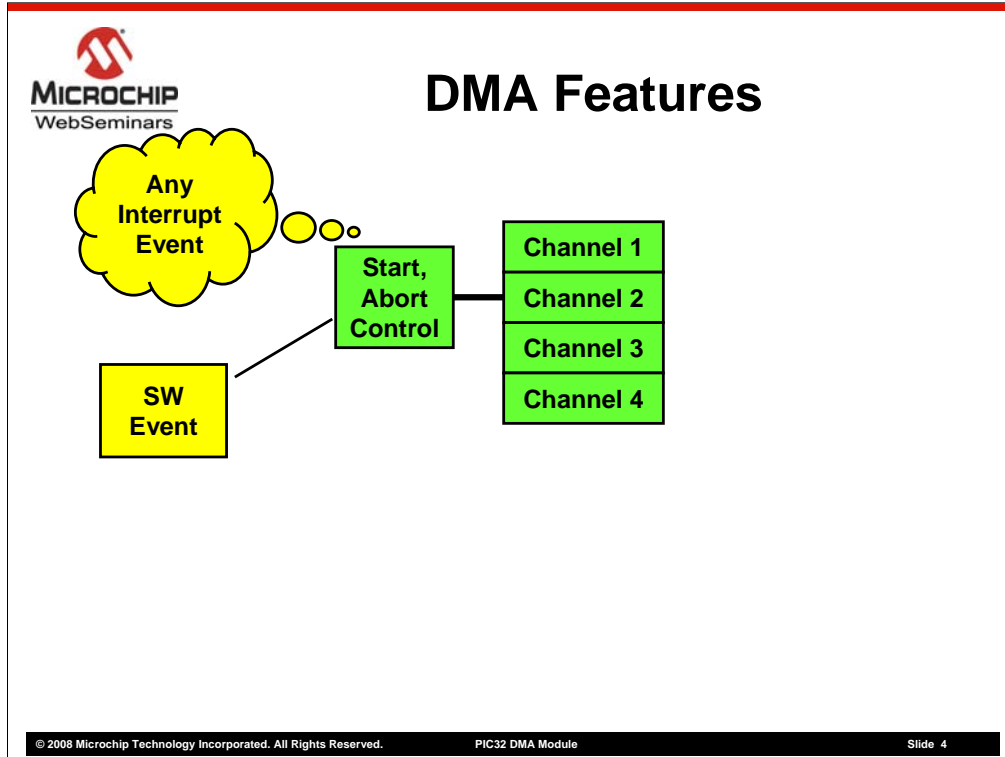
As shown in this block diagram, the DMA module is located on the CPU bus, meaning that it runs at the same speed as the CPU. The DMA module can access any memory-mapped address in the system – may it be SRAM, Flash Memory or Peripheral SFRs.

Now let's look at the DMA module in more detail.

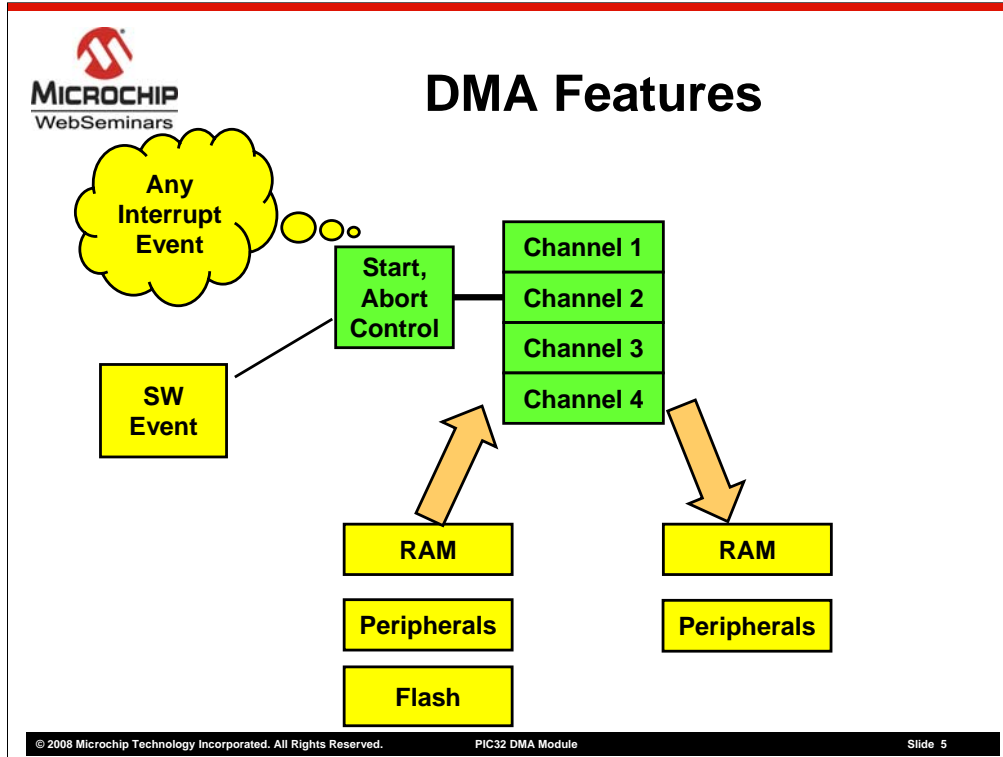
DMA Features

- Channel 1
- Channel 2
- Channel 3
- Channel 4

As you might already know, the primary job of the DMA is to copy data from the source to the destination. The PIC32 DMA module contains multiple channels to simplify transfer management. The DMA module automatically cycles through all channels, and schedules data transfers as resources become available. This slide shows 4 DMA channels. Refer to your device datasheet for available DMA channels.

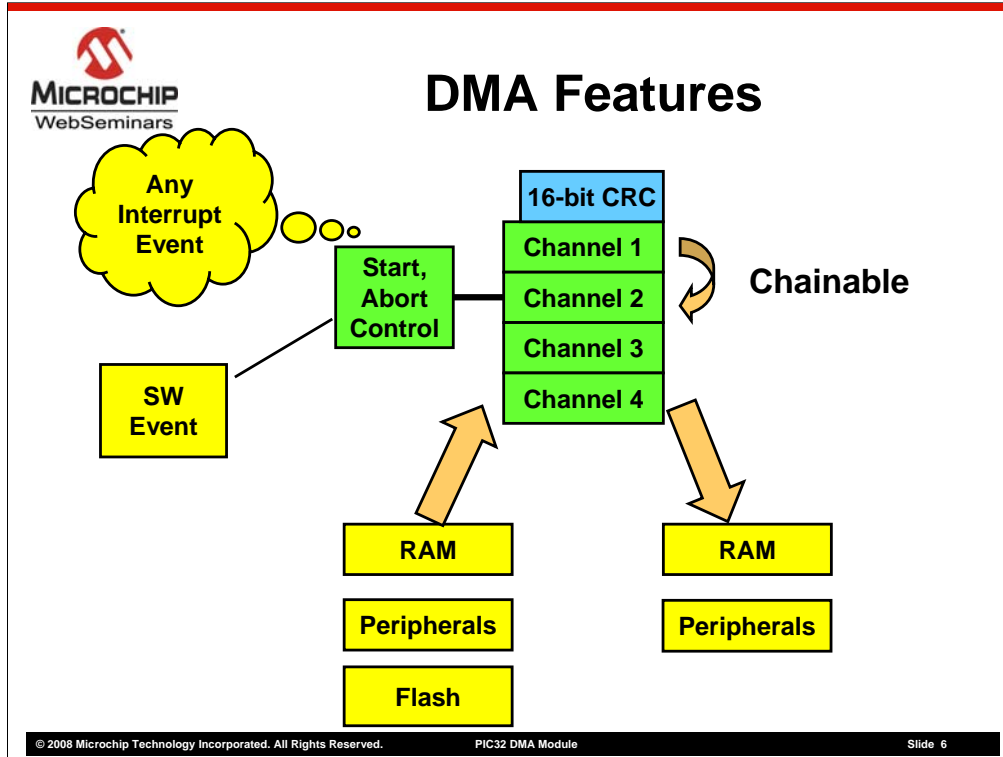


The DMA can be programmed to respond to any interrupt in the system. Any interrupt can start or abort a data transfer. If required, the DMA can also be started or aborted manually under the SW control.

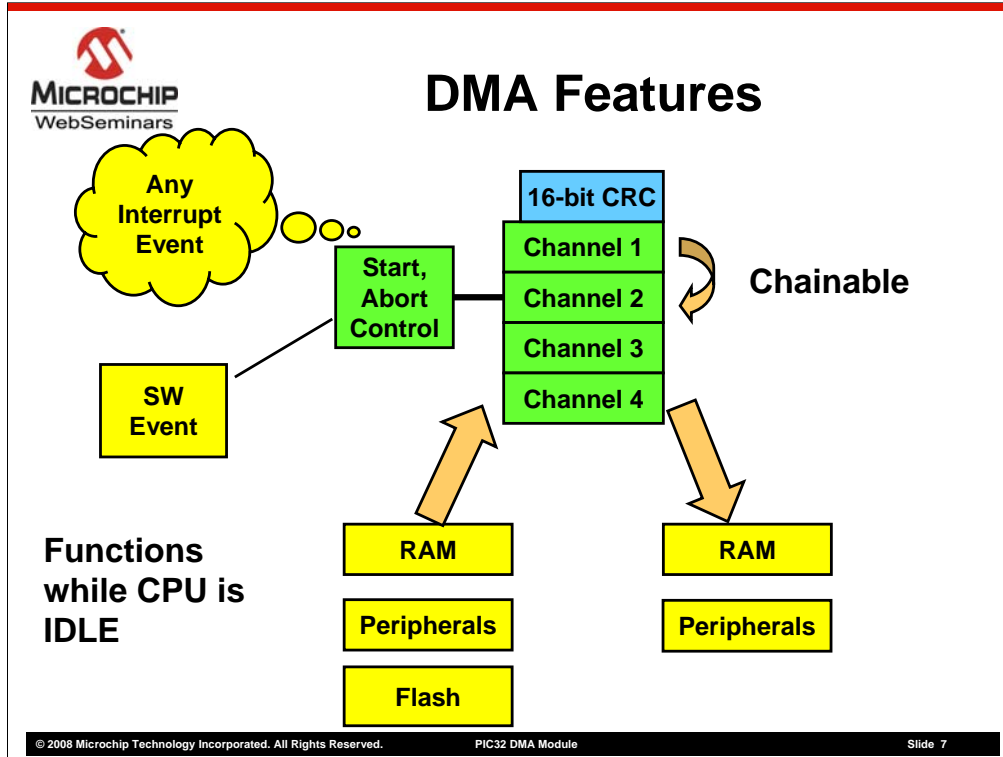


You can program the DMA to read data from RAM, Flash or any of the peripherals and write to RAM or peripherals.

As the DMA operates on the data, it can also calculate 16-bit CRC. The CRC engine is a programmable module - you can specify a 16-bit polynomial of your choice. With respect to CRC, the DMA provides two modes of operations – 1) transfer data AND calculate CRC at the same time, or 2) calculate CRC on a block of data without transferring any data.



If you have a very large block of data to transfer or want to process the data as they are transferred, you may program the DMA module to “chain” two or more channels. In this configuration, one DMA channel will trigger the next channel upon completion.



All of these features continue to function even while the CPU is in IDLE mode. With this feature, you may put the CPU to IDLE and have the DMA wake up the CPU upon completion. This is a very useful feature for power-conscious applications.

Other Uses of PIC32 DMA

- **Virtual peripherals – UART, PWM, etc.**
- **Connect to camera chips**
- **Generate arbitrary waveforms**
- **Speed up CRC of Flash memory**

Because of the fast I/O capability of PIC32 and CRC engine, the PIC32 DMA can be used for various other purposes than just the data movement within the MCU. Here are some ideas:

You may use two DMA channels and a pair of GPIO pins to create a full duplex virtual UART. With additional logic and GPIO pins, you may even create more UARTs, without consuming any more DMA channels.

The DMA module can also be useful in interfacing with camera chips. Given that most camera chips output continuous data, a DMA channel can be triggered to an appropriate edge of the camera clock and have it read the image data via a set of GPIO pins and copy it into SRAM.

You may even generate an arbitrary waveform by preparing a memory bitmap of the waveform and using one DMA channel to write it down to a GPIO port at a regular interval based on a timer interrupt.

Finally, you may significantly decrease the time to perform CRC of on-chip flash memory by using the DMA CRC calculate mode.

We will explain these ideas in more detail in other webinars.



Where to Get More Information

- Visit www.microchip.com/pic32
- “DMA” Chapter in PIC32 Datasheet and Family Reference Manual
- DMA Examples in MPLAB C32 and on the Microchip web site

So, you now have a high level understanding of PIC32 DMA Module. To learn more, visit www.microchip.com/pic32. This site contains PIC32 Datasheet, Family Reference Manual and various other resources. This site also provides DMA Module specific code examples using MPLAB C32 C Compiler. These same code examples are also available in the C32 compiler distribution.

Thanks for your time.