PSoC 4 DMA UART Example Project
1.0

Features

- Data transfer between peripheral (UART) and memory locations
- DMA interrupt generation and servicing

General Description

This example shows how to use DMA to transfer data from a RAM array to the UART TX buffer, and shows how to use DMA to transfer data from the UART RX buffer to a RAM array. UART has a bus interface that only supports 32-bit transfers. The memory has a bus interface that supports 8-bit, 16-bit, and 32-bit transfers. The transfer should be performed between 32-bit UART and 8-bit memory locations.

Development Kit Configuration

This example project is designed to run on a CY8CKIT-044 development kit from Cypress Semiconductor. A full description of the kit, along with more example programs and ordering information, can be found at http://www.cypress.com/go/cy8ckit-044.

The project requires configuration settings changes to run on other kits from Cypress Semiconductor. Table 1 is the list of the supported kits. To switch from CY8CKIT-044 to any other kit, change the project's device with the help of Device Selector called from the project's context menu.

Table 1. Development Kits vs Parts

Development Kit	Device
CY8CKIT-042-BLE	CY8C4248LQI-BL583
CY8CKIT-044	CY8C4247AZI-M485
CY8CKIT-046	CY8C4248BZI-L489
CY8CKIT-048	CY8C4A45LQI-483

The pin assignments for the supported kits are in Table 2.

Table 2. Pin Assignment

Pin Name	Development Kit			
	CY8CKIT-042-BLE	CY8CKIT-044	CY8CKIT-046	CY8CKIT-048
UART:rx	P1[4]	P7[0]	P3[0]	P0[4]
UART:tx	P1[5]	P7[1]	P3[1]	P0[5]

Projects Description

UART receives and buffers characters from a serial terminal program such as HyperTerminal. Once 16 characters are received, UART transmits (echoes) them back to HyperTerminal.

The project uses two DMA channel components – one for data receiving (RxDma) and another for transmitting (TxDma), and two buffers of 16 data elements for double buffering.

The receive DMA uses two descriptors. Both descriptors have the same transfer specifics except destination address locations. Descriptor 0 transfers from UART to buffer 0, when descriptor 1 is configured to transfer from UART to buffer 1. The descriptors are configured to chain to the next descriptor and generate an interrupt on completion.

The transmit DMA uses one descriptor that in turn transfers from buffer 0 and buffer 1 to UART.

At the beginning descriptor 0 of RxDma is enabled and transfers data from UART RX FIFO to buffer 0. Once 16 characters are received, the transfer engine switches to descriptor 1 and generates an interrupt to inform CPU that new data is available for transmission. CPU points TxDma to buffer 0 and enables the transfer. While TxDma is transmitting from buffer 0, the data being received is stored to buffer 1. Once 16 characters are received, the buffers are switched so that new data is received to buffer 0 while previously received data is sent from buffer 1.

Expected Results

Once HyperTerminal is running, click the Reset button on the CY8CKIT-044 kit and see the following lines on the HyperTerminal window.

```
*** PSoC 4 DMA UART Example Project ***
Enter the characters to transmit
```

Note In HyperTerminal the data you are typing is not displayed on the screen, whereas the data that is received is displayed on the HyperTerminal screen. That is, you won't see the data you are typing until 16 characters are sent to UART.

Using UART to communicate with PC Host

This example project communicates with a PC host using UART. A HyperTerminal program is required in the PC to communicate with PSoC 4. If you don't have a HyperTerminal program installed, download and install any serial port communication program. Freeware such as HyperTerminal, Bray's Terminal etc. is available on the web.

Follow these steps to communicate with the PC host.

1. Connect the USB cable between the PC and PSoC 4 Pioneer Kit.
2. Open the device manager program in your PC, find the COM port in which PSoC 4 is connected, and note the port number.
3. Open the HyperTerminal program and select the COM port in which PSoC 4 is connected.
4. Configure port settings in the HyperTerminal configuration window to match the configuration of the PSoC Creator UART component in the project.

- Settings: 19200 bauds, 8 bits, 1 stop bit, no parity, no flow control.

5. Start communicating with the device as explained in the project description.

Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709

Phone : 408-943-2600
Fax : 408-943-4730
Website : www.cypress.com