Application Report
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Interfacing the DAC8803EVM to TMS470 Processors

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ABSTRACT

This application note presents a method for interfacing the DAC8803; a four channel, low power, 14-bit serial digital-to-analog converter to the TMS470R1B1M processor using the TMS-FET470R1B1M Kickstart Development Kit from IAR Systems. The software developed creates a 256 point sine table, and then continuously writes values from the sine table to the DAC8803. In an effort to reduce development time, the source code for this application note can be found on the Texas Instruments web site at http://www.ti.com. Search for document number SLAA316 from the home page and follow the links to this application note. Project collateral discussed in this application report can be downloaded from the following URL: www.ti.com/lit/zip/SLAA316.

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1 Introduction

The DAC8803 is a four channel, 14-bit Digital-to-Analog Converter (DAC), offering 2 mA full scale current output and a flexible 3-wire serial interface. The converter is able to gluelessly interface to the TMS470 series of Micro Controllers. For development of this application note, the TMS-FET470R1B1M Kickstart Development Kit along with the DAC8803EVM and HPA-MCU Interface Board were used to implement an SPI interface.

2 Hardware

The combination of the TMS-FET470R1B1M Kickstart Development Kit and the DAC8803EVM is a convenient way of experimenting with the TMS470 series micro controller and the DAC8803. The DAC8803EVM and TMS-FET470R1B1M Kickstart Development Kit carrier board can be plugged directly on to the HPA-MCU Interface Board to implement a serial peripheral interface to the TMS470R1B1M.

2.1 TMS-FET470R1B1M Kickstart Development Kit

The TMS-FET470R1B1M Kickstart Development Kit is a Third Party tool used for evaluation of the TMS470R1B1M device. The TMS-FET470 tool, along with the DAC8803EVM and HPA-MCU Interface Board are available through the Texas Instruments website at www.ti-eStore.com.

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3 DAC8803EVM

The DAC8803 is one of a series of Multiplying DACs with serial inputs available from Texas Instruments. The DAC8803EVM provides a platform to demonstrate the functionality of the DAC8803 device with various Texas Instruments DSPs and Micro Controllers, while allowing easy access to all analog and digital signals for customized end-user applications. For more information on the EVM, search for document number SLAU184 from the main page of the Texas Instruments website at http://www.ti.com.

3.1 Hardware Interface

The hardware interface is a simple 3-wire serial connection between the DAC and one of the SPI ports of the TMS470R1B1M.

The hardware connections are shown in Figure 1 via the TMS-FET470R1B1M Kickstart Development Kit. The CLK, $\overline{CS}$, and SDI pins from the DAC8803 are connected to SPISCLK, SPISTE, and SPIMOSI pins of the TMS470R1B1M. While this application note refers specifically to the TMS470R1B1M, any of the TMS470 family of micro controllers containing at least one SPI peripheral can be used.

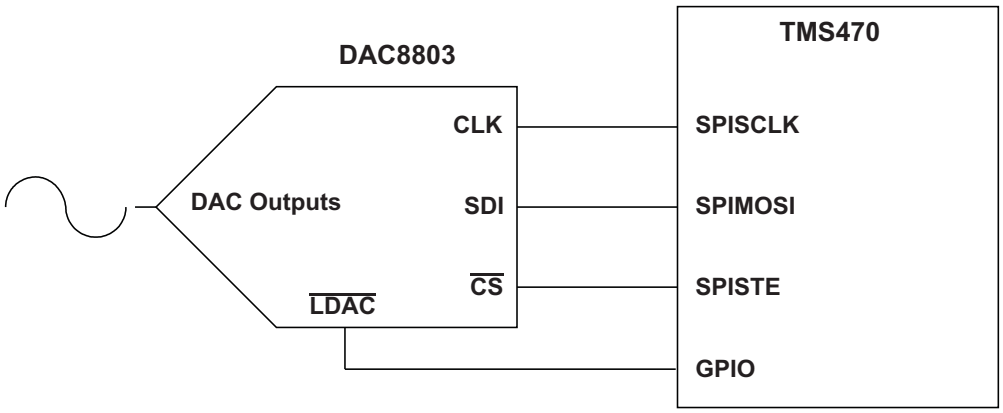

Figure 1. Basic Hardware Interface

4 Software Interface

The code archive associated with this application note (SLAA316) contains a workspace and associated project for the TMS470 KickStart version of Embedded Workbench from IAR Systems. Extract the archive to any convenient folder of your Embedded Workbench installation and locate the DAC8803 folder. Open the associated workspace and project, debug and run the code.

All of the software was written and compiled using IAR Embedded Workbench version 4.3. The most involved portion of writing the code for this interface is programming the serial peripheral interface (SPI).

4.1 SPI Settings

In the TMS-FET470R1B1M sample code, the DAC8803 is updated at a 1.2-MHz rate, with a serial clock of 30 MHz. The serial clock is set for CPOL = 0 and CPHA = 1 in order to maintain proper communication with the DAC8803.

The serial port is set for SPI master mode and configured for 16-bit transfers. On each data transfer, 14-bit sine values are sent along to the DAC8803, with channel selection inserted in the two MSBs. Each DAC output is updated with transmission of its particular channel data. To facilitate simultaneous updates, a GPIO could be used to toggle the $\overline{LDAC}$ line after all four channels have been loaded with data.

4.2 Software Flow

The software presented in this application report creates a 256 point sine table. The software initializes the sine table then writes the values to the serial port. The main function initializes the sine values, enables the SPI port and then enters an endless loop. The values from the sine table transmitted to the DAC, creating four sine wave outputs on J1 of the EVM.

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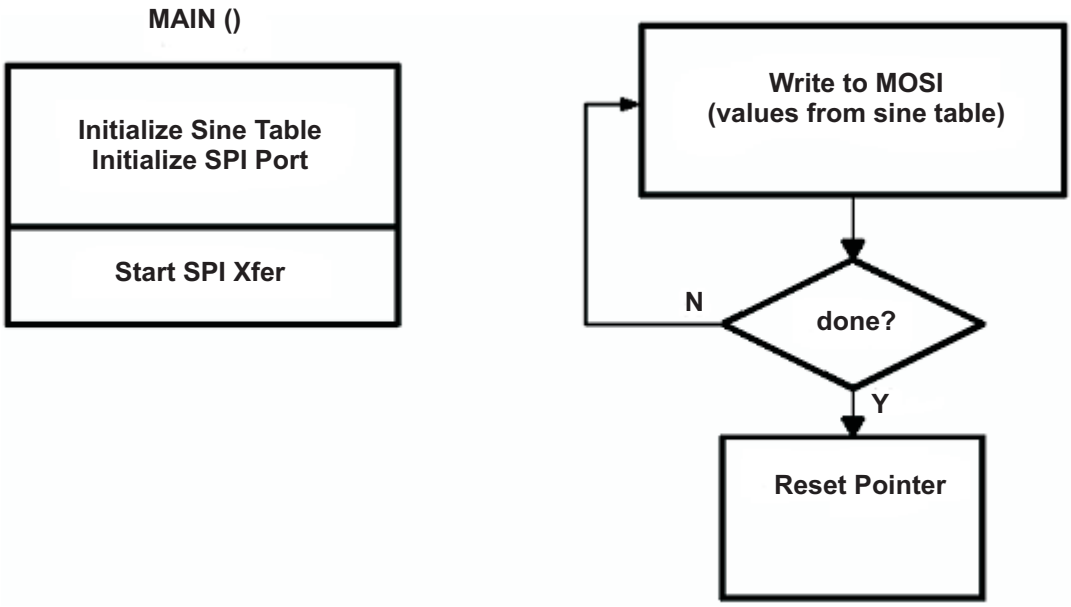

Figure 2. Software Flow Chart

5 References

1. DAC8803 Data Sheet (SBAS340)
2. TMS470R1x Serial Peripheral Interface (SPI) Reference Guide (SPNU195)
3. DAC8803EVM Users Guide (SLAU184)
4. HPA-MCU Interface Board Users Guide (SLAU106)
5. Designing Modular EVMs for Data Acquisition Products (SLAA185)

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