Interfacing the DAC8806 and DAC8820 to TMS320 DSPs

Tom Hendrick

ABSTRACT
This application report presents a method for interfacing the DAC8806 and DAC8820 — single-channel, current-output, 14-/16-bit multiplying digital-to-analog converters — to the TMS320 series of digital signal processors. The software developed for this application report creates a 256-point sine table, and then continuously writes values from the sine table to the DAC8806/20EVM to create a ±10-V sine wave. In an effort to reduce development time, the source code for this application report can be found on the Texas Instruments Web site at http://www.ti.com. Search for document number SLAA346 from the home page and follow the links to this application report. Project collateral discussed in this application report can be downloaded from the following URL: www.ti.com/lit/SLAA346.

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Trademarks
Code Composer Studio is a trademark of Texas Instruments.

1 Introduction
The DAC8806 and DAC8820 are single-channel, 14- and 16-bit multiplying digital-to-analog converters (DAC), offering 1.66-mA full-scale and a parallel input interface. These converters operate from +2.7 V to +5.5 V and can interface directly to the TMS320 series of digital signal processors (DSP). For development of this application report, the TMS430C6713DSK and the TMS430VC5416DSK along with the DAC8806/20EVM were used to implement a sine function output with variable frequency and an amplitude of up to ±10 V.

2 Hardware
The combination of the TMS320 series DSKs and the DAC8806/20EVM is a convenient way of experimenting with the DAC8806 and DAC8820. The DAC8806/20EVM plugs onto the 5-6K Interface Board which in turn plugs into the 80-pin daughtercard interface found on the DSK. The DAC8806/20EVM also contains an SN74LVC138A address decoder which implements the write (WR), reset (RST), and load DAC (LDAC) functions. The address decoder allows for the possibility to stack up to three DAC8806/20EVMs together using a common data bus.
2.1 5-6K Interface Board

The 5-6K Interface Board is a tool developed by the Data Acquisition Products group at TI for evaluating various data converters on the TMS320C5000 and TMS320C6000 series digital starter kits (DSK). The tool is available through the TI eStore at www.ti-estore.com. This board provides convenient access to a variety of analog EVMs from Texas Instruments, including A2D converters and amplifier modules. A complete data acquisition system can be built using modular boards that plug directly onto the various DSK platforms.

3 DAC8806/20EVM

The DAC8806 and DAC8820 are two of the multiplying series of parallel DACs available from Texas Instruments. The DAC8806/20EVM provides a platform to demonstrate the functionality of the DAC8806 and DAC8820 devices with various Texas Instruments DSPs and microcontrollers, 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 SLAU190 from the main page of the Texas Instruments Web site at http://www.ti.com.

3.1 Hardware Interface

The RST, WR, and LDAC control functions are realized with a simple 3-wire connection between the DAC and the output of an SN74LVC138A address decoder. The SN74LVC183A input is connected to the address bus of the DSP. The RST and WR functions have jumper options on the EVM to allow the stacking of up to three boards. The LDAC function is fixed to a single address to allow simultaneous DAC output updates. A header file is included in the sample program which defines the possible addresses of the DAC8806/20EVM.

The hardware connections are shown in Figure 1 via the 5-6K Interface Board. In an embedded system, the LDAC, WR, and RST pins from the DAC8806 and DAC8820 could be connected directly to any I/O address space available in the system.

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**Figure 1. Basic Hardware Interface**
4 Software Interface

The code archive associated with this application report (slaa346.zip) contains example code for the DSK version of Code Composer Studio™ (CCS). Extract the archive to any convenient folder of your CCS installation and locate the SLAA346 folder. Two different projects can be found within the SLAA346 folder. One project is specific to the C6713DSK; the other is for the VC5416DSK. Open the associated project, load the .out file, and run the code. The output sine wave is available on connector J2 pins 2, 4, or 6, depending on the location of the jumper found on J3 (see the schematic drawing at the end of the DAC8806/20EVM User's Guide, SLAU190). Note that a single main() function contains #define statements for the associated DSP. Be sure to set the appropriate parameter 'true' (1) before attempting to re-compile the code.

4.1 Software Flow

The software presented in this application report creates a 256-point sine table. The software initializes the sine table with 16-bit values and then writes the values to the DSP data bus. The main function initializes the sine values, configures the LDAC, WR, RST functions of the DAC8806_20EVM, and then enters an endless loop. The values from the sine table are transferred to the DAC, creating a sine wave output on J2 of the EVM.

![Software Flow Chart](image)

Figure 2. Software Flow Chart

5 References

1. DAC8806, 14-Bit, Parallel Input Multiplying Digital-to-Analog Converter data sheet (SBAS385)
2. DAC8820, 16-Bit, Parallel Input Multiplying Digital-to-Analog Converter data sheet (SBAS358)
3. TMS320 Cross-Platform Daughtercard Specification, Revision 1.0 application report (SPRA711)
4. DAC8806/20EVM User's Guide (SLAU190)
5. Designing Modular EVMs for Data Acquisition Products application report (SLAA185)
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