DEM-DAI1789 EVM

PCM1789 Evaluation Module

User's Guide

Literature Number: SBAU154
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About This Manual

This document provides the information needed to set up and operate the DEM-DAI1789 EVM evaluation module, a test platform for the 24-bit, 192-kHz, differential output, two-channel PCM1789 audio digital-to-analog converter (DAC). For a more detailed description of the PCM1789, refer to the product data sheet available from the Texas Instruments web site at http://www.ti.com. Support documents are listed in the section of this guide entitled ***Related Documentation from Texas Instruments***.

How to Use This Manual

Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the DEM-DAI1789 EVM. The abbreviation *DUT* refers to the PCM1789 device. Unless specifically noted, the information presented in this manual applies to the PCM1789.

Chapter 1 describes the hardware setup guide for the EVM, including the necessary information required to configure the EVM switches and jumpers for product evaluation.

Chapter 2 explains how to use the software provided with the DEM-DAI1789 EVM for controlling the PCM1789.

Chapter 3 includes the EVM electrical schematics, printed circuit board (PCB) layouts, and the bills of material for both the DEM-PCM1789 and the DEM-DAI/DAC_USB evaluation platform motherboard.

Information About Cautions and Warnings

This document contains caution statements.

CAUTION

This is an example of a caution statement. A caution statement describes a situation that could potentially damage your software or equipment.

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

Related Documentation From Texas Instruments

The following document provides information regarding Texas Instruments integrated circuits used in the assembly of the DEM-DAI1789 EVM. These documents are available from the TI web site. The last character of the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the TI web site at http://www.ti.com/ or call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document(s) by both title and literature number.

Data Sheet	Literature Number
PCM1789 Product data sheet	SBAS451A
DIR9001 Product data sheet	SLES198
TUSB3410 Product data sheet	SLLS519G
OPA2134 Product data sheet	SBOS058
MSP430F169 Product data sheet	SLAS368
SN74LVC2G14 Product data sheet	SCES200L
TPS76933 Product data sheet	SLVS203E
REG1117 Product data sheet	SBVS001D
SN74LVC2GU04 Product data sheet	SCES197M
SN74LVC1T45 Product data sheet	SCES515H
SN74LV541 Product data sheet	SCES573A

If You Need Assistance

If you have questions regarding either the use of this evaluation module or the information contained in the accompanying documentation, please contact the Texas Instruments Product Information Center at (972) 644–5580 or visit the TI web site at www.ti.com.

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense is required to take whatever measures may be required to correct this interference.

Trademarks

All trademarks are the property of their respective owners.

Description and Hardware

The DEM-DAI1789 is an evaluation board for the PCM1789, a 24-bit, 192-kHz, differential output, two-channel audio DAC with a digital audio receiver, two-channel second-order post filter, mode control interface to PC, and various switches and jumpers for configuration controls.

The DEM-DAI1789 operates from 5-V and ±15-V analog power supplies with an S/PDIF input signal.

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1.1 Block Diagram

Figure 1-1 shows a block diagram of the DEM-DAI1789, which consists of the DEM-DAI/DAC_USB and the DEM-PCM1789 (the DUT daughterboard).

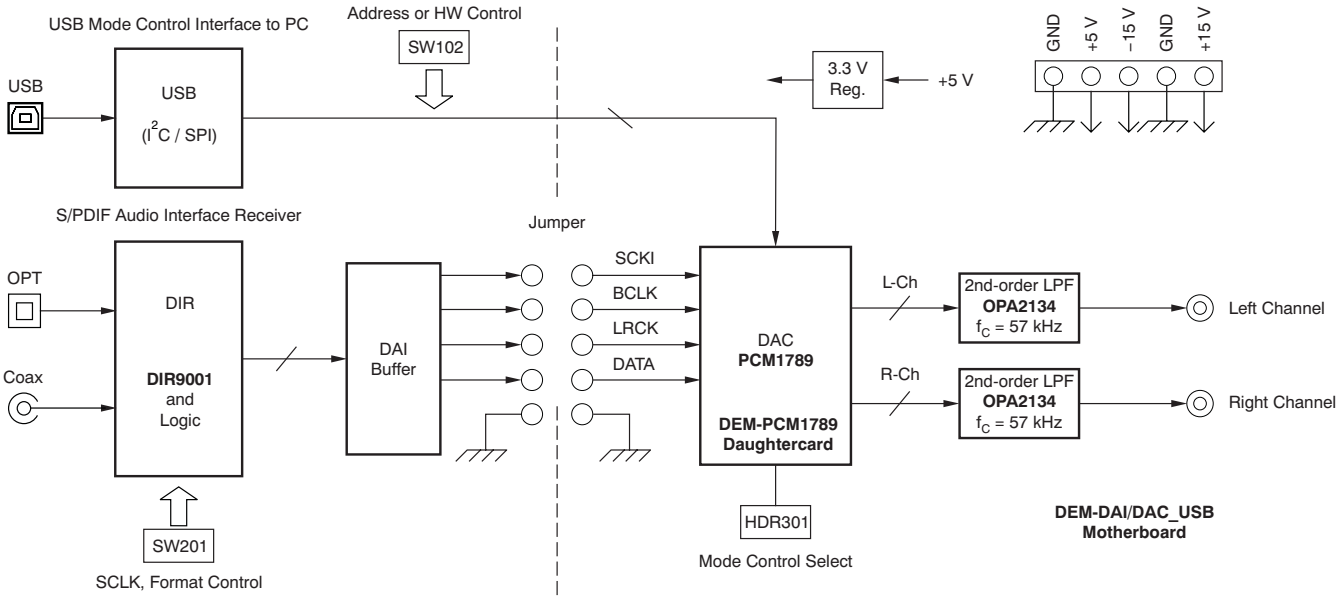

Figure 1-1. DEM-DAI1789 Block Diagram

1.1.1 Electrostatic Discharge Warning

Many of the components on the DEM-DAI1789 EVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

CAUTION

Failure to observe ESD handling procedures may result in damage to EVM components.

1.2 Basic Connections and Operation

Follow these procedures to configure the DEM-DAI1789 for use.

- Set/confirm HDR001/101, JP101/2, and SW102 to set the proper EVM power configuration and mode control interface for the PCM1789.
- Set/confirm HDR202/203 and SW203 to provide the proper system clock and other signals from the digital audio receiver to the PCM1789.
- Set/confirm jumper JP401-408 to select the interface type (differential or single-ended, ac- or dc-coupling) between the DAC outputs and the second-order low-pass filter (LPF) buffer.
- Set/confirm HDR302 to select the PCM1789 mode control type. No change from the default setting is required for general evaluation purposes.
- Connect the +5-V and ±15-V power supplies to V_{CC}, AV_{CC}, $–AV_{CC}$, and GND on connectors CN001 to CN005.
- Connect the S/PDIF signal into CN201 (COAX) or U201 (OPT), and connect the PC USB port to CN101 for mode control if required.
- Set/confirm the input data clock and format using SW201, SW102 (hardware control) or the EVM control software (software SPI™ or I^2C™ control) and power on to EVM.

1.3 EVM Configuration Controls

This section presents the standard parameters for the EVM. For normal operation, configure the EVM as discussed here.

1.3.1 HDR001

This header selects the power-supply source for the control and DIR blocks of the EVM.

- 1–2: Use the power supply provided on CN004/5 (default)
- 2–3: Use a separate power supply provided on 2-3 of HDR001

No change from the default setting is required for general evaluation purposes.

1.3.2 HDR101

HDR101 selects the power-supply configuration of the USB Interface block.

- SELF: Use the EVM power supply for the USB Interface block (default)
- BUS: Use the PC power supply provided via a connected USB cable

No change from the default setting is required for general evaluation purposes.

1.3.3 JP101

This jumper enables the pull-up resistors for the I^2C control mode.

- ON: Enables two 1-kΩ pull-up resistors (one each for SCL and SDA) (default)
- OFF: Disables pull-up resistors (for hardware control mode)

No change from the default setting is required except when using hardware control mode.

1.3.4 JP102

JP102 enables a software control signal to be sent via USB to the DUT (PCM1789) according to the mode control selection of HDR302.

- ON: Enables signal to be sent to DUT in either SPI or I^2C control mode (default)
  - SPI mode: 1-2,5-6,7-8: ON, 3-4: OFF for ADR5 by SW102.
  - I^2C mode: 1-2,5-6: ON, 3-4,7-8: OFF for ADR1/0 by SW102.
- OFF: Disables the signal to be sent to DUT in hardware control mode

No change from the default setting is required except when using hardware control mode.

1.3.5 CN102

CN102 enables the test and write interface for U104; it is not used in any customer application. Always keep this connector open.

1.3.6 SW101

This switch resets the USB Interface (U102) and Mode Control Interface (U104) operation.

1.3.7 SW102

SW102 enables the user to set (or reset) the address for SPI/I^2C mode, if required, and the control signal for hardware control mode. These functions are defined for the PCM1789; the default setting is OFF.

- 1–8: ADR5(SPI)/ADR1(I^2C)/OFF(H/W) (PCM1789, pin 24)
- 2–7: OFF(SPI)/OFF(I^2C)/DEMP(H/W) (PCM1789, pin 21)
- 3–6: OFF(SPI)/OFF(I^2C)/FMT(H/W) (PCM1789, pin 22)
- 4–5: OFF(SPI)/ADR0(I^2C)/OFF(H/W) (PCM1789, pin 23)

No change from the default setting is required except when using hardware control mode.

1.3.8 HDR202 (with HDR203, CN204 and CN205)

The DEM-DAI1789 supports a flexible PCM audio interface through a DAI bridge, so that the PCM1789 can interface with external devices or equipment in place of the DIR9001 digital receiver through an internal buffer. Interfacing with external components or devices can be done by changing the HDR202 connections of SCKI, BCK, LRCK, DATA, and GND from the left side setting to the right side setting, and SCKI configuration for interfacing with external can be also changed by using HDR203, CN204, and CN205. There is no change required from the default setting for general evaluation.

1.3.9 SW201

SW201 selects the system clock rate and format for U203, the DIR9001 digital receiver. Table 1-1 and Table 1-2 list the system clock rate selection and data format selection options, respectively, for the DIR9001 (U203).

Table 1-1. SW201: System Clock Rate Selection for DIR9001

PSCK1	PSCK0	System Clock Selection
On (H)	On (H)	512 f_S (Default)
On (H)	Off (L)	384 f_S
Off (L)	On (H)	256 f_S
Off (L)	Off (L)	128 f_S

Table 1-2. SW201: Data Format Selection for DIR9001

FMT1	FMT0	Data Format Selection
On (H)	On (H)	16-bit to 24-bit, MSB-first, I^2S™ format (default)
On (H)	Off (L)	16-bit to 24-bit, MSB-first, left-justified format
Off (L)	On (H)	24-bit, MSB-first, right-justified format
Off (L)	Off (L)	16-bit, MSB-first, right-justified format

1.3.10 SW202

This switch selects the S/PDIF input signal for U203.

- OPT: Selects the optical input (default)
- COAX: Selects the coaxial input

1.3.11 SW203

This switch selects the operating mode for U203.

- X'tal: Always output the XTI clock source
- PLL: Always output the recovered clock by PLL
- AUTO: Automatic clock selection by ERROR status (default)

1.3.12 SW204

SW204 resets the DIR (DIR9001) operation.

1.3.13 HDR301

This header selects the input clock and data for DSD signal.

- 1–2: Input terminal for DSD-L signal
- 3–4: Input terminal for DSD-R signal
- 5–6: Input terminal for DSD-BCK signal
- 7–8: Input terminal for DSD-SCK signal

No change from the default setting is required for general evaluation purposes.

1.3.14 HDR302

This header selects the mode control of the PCM1789.

- 1–2 (I^2C): Software (I^2C) control mode
- 3–4 (P/D): Hardware control mode
- 5–6 (P/U): Software (SPI) control mode with ADR6 = 0 (default)
- 7–8 (SPI): Software (SPI) control mode with ADR6 = 1

Either one of these four options must be selected before powering on the EVM; no change from the default setting is required for general evaluation purposes.

1.3.15 SW301

SW301 resets the DUT (PCM1789) operation.

1.3.16 SW302

This switch controls the AMUTE (Analog Mute) function.

1.3.17 JP401/405 (6–4)

These jumpers control the signal flow from the DUT to the post low-pass filter/buffer.

- Open: Differential interface (default)
- Short: Single-ended interface

No change from the default setting is required for general evaluation purposes.

1.3.18 JP402/406 (1–2, 3–4)

These jumpers control the signal flow from the DUT to the post low-pass filter/buffer.

- Open: AC coupling (default)
- Short: DC coupling

No change from the default setting is required for general evaluation purposes.

1.3.19 JP403/404/407/408

These jumpers select the interface type for the DUT to the post low-pass filter/buffer.

- Open: Differential interface (default)
- Short: Single-ended interface

No change from the default setting is required for general evaluation purposes.

Application Software

This chapter describes the functions and use of the DEM-DAI1789 EVM application software. The software provided with the DEM–DAI1789 allows programming of the PCM1789 internal registers. The software operates on computers that are equipped with Microsoft® Windows® 2000 and XP operating systems, and requires connection of the USB port to CN101 of the DEM–DAI1789 using a standard USB cable.

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2.1 Description and Installation

Download the following software tools and documentation from the PCM1789 product folder on the TI web site.

- Virtual COM port driver software (that is, the USB driver software) for the TUSB3410.
- Application software for the DEM-DAI1789

1. **Installation Procedure for Virtual COM Port Driver Software**

   Refer to the documentation in the downloaded file (*Virtual COM Port Driver Installation Instructions.pdf*; also available at http://focus.ti.com/docs/toolsw/folders/print/tusbwinvcp.html)

2. **Installation Procedure for Application Software**

   There is no installer software required. Copy the downloaded application software folder to the desired local folder. To uninstall the software, delete the local folder.

2.2 Software Start-up Procedure

Note: This procedure is very important in order for the DEM-DAI1789 to be properly detected by the PC.

Step 1. Set HDR302 on the DEM-DAI1789 for SPI mode with ADR6 = 0. (If you prefer to use SPI mode with ADR6 = 1 or I^2C mode, set HDR302 to the required position.)

Step 2. Turn on the power supply for the DEM-DAI1789.

Step 3. Connect the USB connector on DEM-DAI1789 to the PC.

Step 4. Launch the application software (that is, *EVM1789.exe*). The default control mode for the application software is SPI with address 00; if you prefer to use I^2C mode or another address, change the control mode setting to I^2C or the address (respectively), and then push the ***Reconnect*** button on the application software interface. After that, the preferred setting is stored on the PC for both the DEM-DAI1789 and the software.

Error Message at Software Start-up

If the DEM-DAI1789 is not correctly detected by the application software, the error message shown in Figure 2-1 appears on the PC. After pushing ***OK***, the application software will launch with an indication of *No EVM* in red, and controlling the DEM-DAI1789 is impossible. In this case, check the USB connection between the DEM-DAI1789 and the PC, and the power-supply connection and voltage; unplug and reconnect these cables as needed, then try launching the software again by pushing the ***Reconnect*** button.

Figure 2-1. Error Message at Software Start-up

2.3 Using the Application Software

This section discusses the various controls available in the application software using screenshots and describing the possible control functions for each tab.

For evaluation of PCM1789 audio performance with EVM default conditions settings, no application software operation and no switch, jumper, or header setting changing on the EVM are required. This application software is used to control the register contents of the PCM1789 to various values necessary for a given application.

The PCM1789 operating mode, including the audio interface format and sampling mode, can be set through the serial control port by this PCM1789 control application software in either I^2C or SPI control mode.

The application software is not required for PCM1789 hardware control mode. Switch SW102 on the EVM is used for limited functions in hardware control mode.

2.3.1 Audio Interface and Sampling Mode Control (SPI Mode)

Figure 2-2 shows the audio interface and sampling mode control tab for SPI mode.

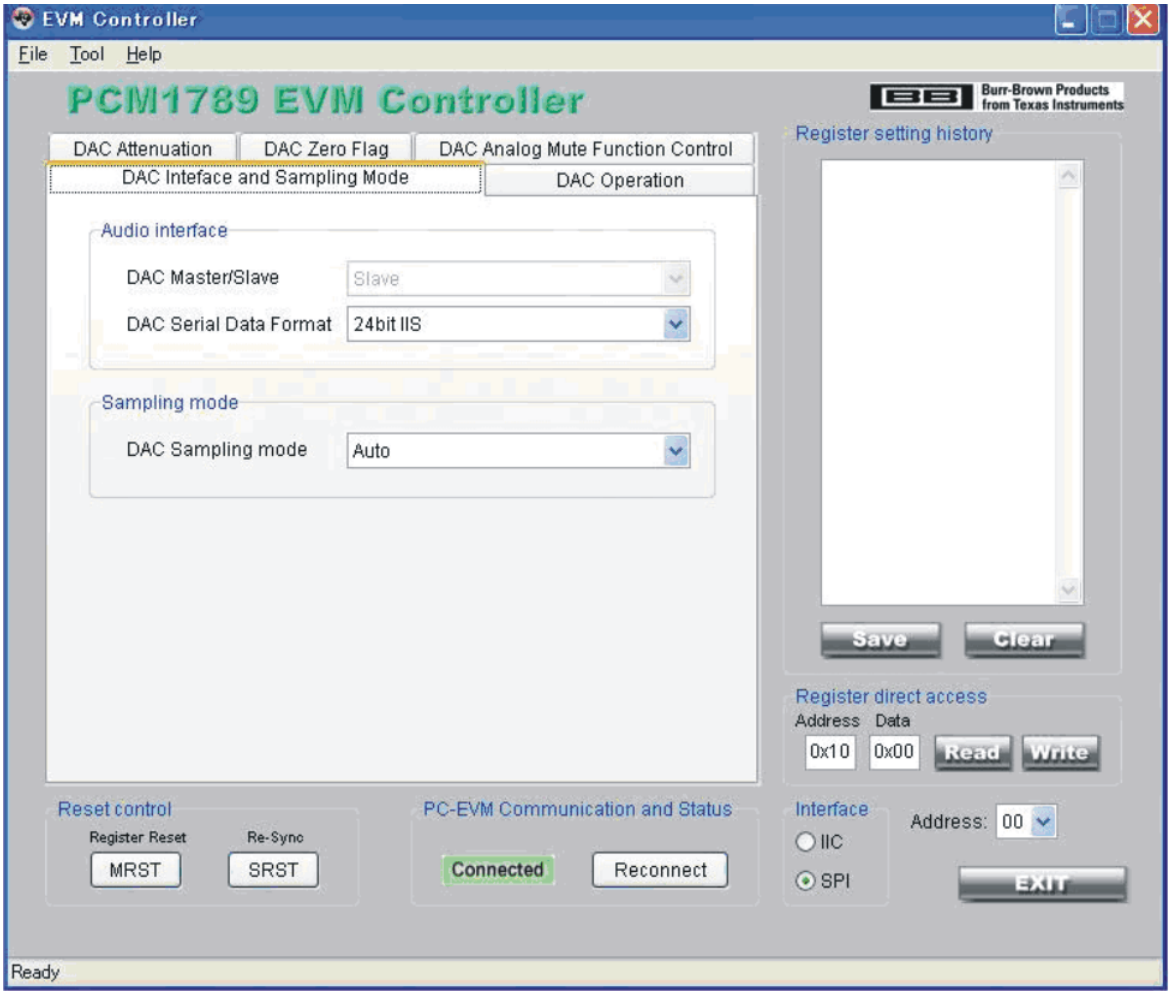


Figure 2-2. Audio Interface and Sampling Mode Control Tab—SPI Mode Recognized

This screen has the following features:

- This tab is the initial window that appears, and indicates that the USB connection with the PC and the EVM is properly recognized; it also shows that SPI serial control is the interface mode.
- PCM1789 audio interface mode and oversampling mode can be set in this window.

Additionally, four important controls are visible in Figure 2-2.

Reconnect

This button performs a reconnect operation between the PC and the EVM. When the interface mode (either I^2C or SPI) or the address for I^2C and SPI changes, pushing this button is required. For system recovery after releasing the USB cable or turning off the EVM power supply, pushing this button is also required.

Exit

This button closes and exits the application software.

MRST (Mode Register Reset)

The MRST button resets all PCM1789 register settings and the application software.

SRST (System Reset)

The SRST button resynchronizes the PCM1789. The register setting is not cleared.

2.3.2 Audio Interface and Sampling Mode Control (I^2C Mode)

Figure 2-3 illustrates the audio interface and sampling mode control tab for I^2C mode.

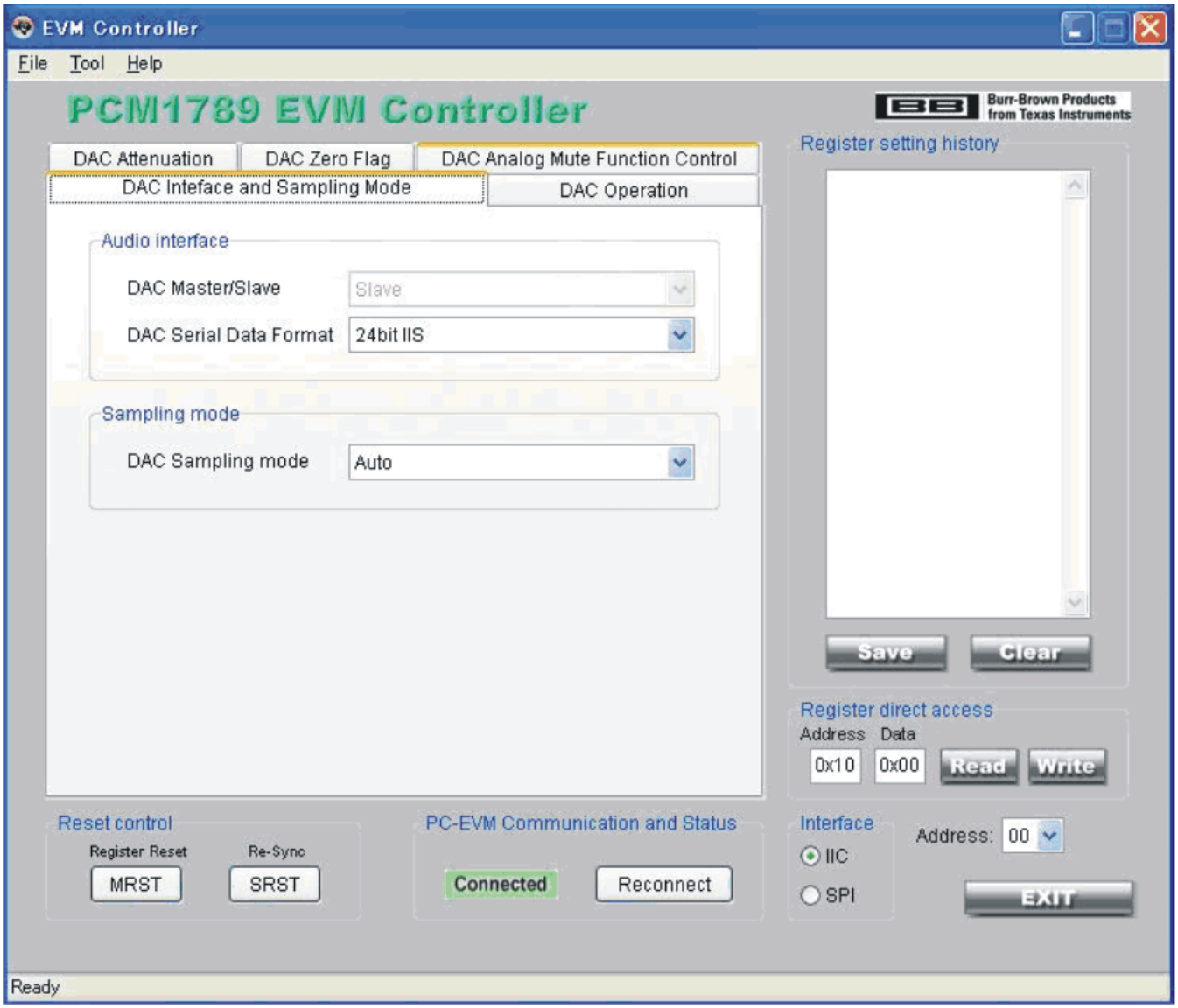


Figure 2-3. Audio Interface and Sampling Mode Control Tab—I^2C Mode Recognized

As with SPI mode (see Section 2.3.1), this initial display screen confirms proper a USB connection with the PC and the EVM, as well as indicates that I^2C serial control mode is properly recognized.

In both SPI and I^2C modes, there is an additional control that becomes active:

Address Setting

This field sets the SPI port address and I^2C slave address for the software. This address must concur with the address registered on the EVM. In other words, the SPI and I^2C address of the EVM and the software must be the same.

2.3.3 USB Connection and EVM Not Recognized

Figure 2-4 displays the audio interface and sampling mode control tab as it appears when the USB connection with the PC and the EVM and/or serial control mode is not properly recognized. Note the red ***No EVM*** button.

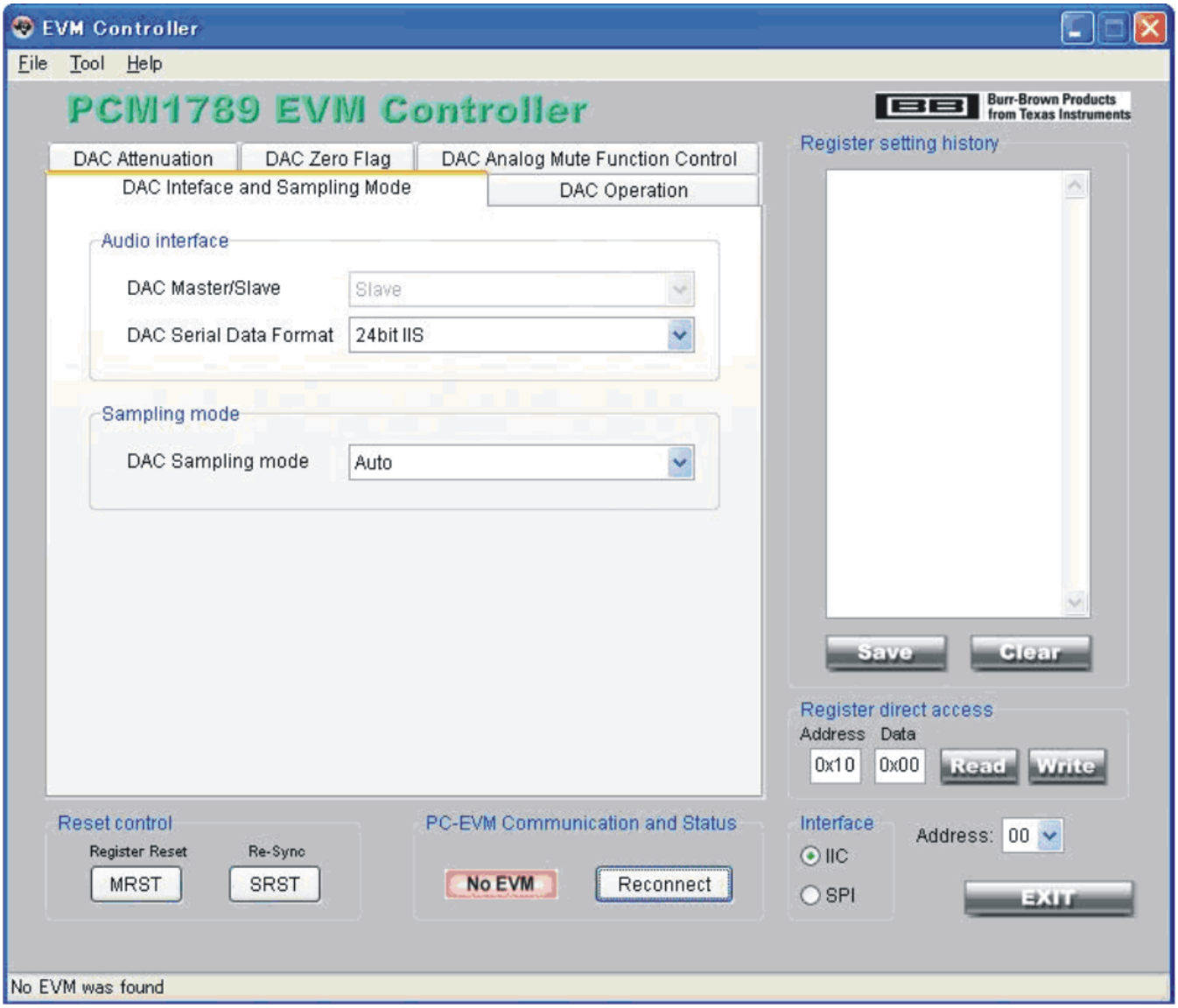


Figure 2-4. Audio Interface and Sampling Mode Control Tab—USB Connection and EVM Not Recognized

Troubleshooting

If there is no change after pushing *Reconnect* button, the following items should be checked:

- Are the power supplies correctly distributed for the EVM?
- Is the EVM properly connected to the PC?
- Is the USB port on the PC activated?
- Is the Virtual COM port driver software (that is, the USB driver software) correctly installed on the PC?
- Is the selection of SPI/I^2C control mode coincident between the application software and the EVM setting for the PCM1789?
- Is the device address the same for the application software and the EVM setting on the PCM1789?

If you have thoroughly reviewed these procedures and there continues to be no change with the ***No EVM*** indication, contact the Texas Instruments product support center nearest you for assistance.

2.3.4 Operation Mode Control

The operation mode control tab is shown in Figure 2-5.

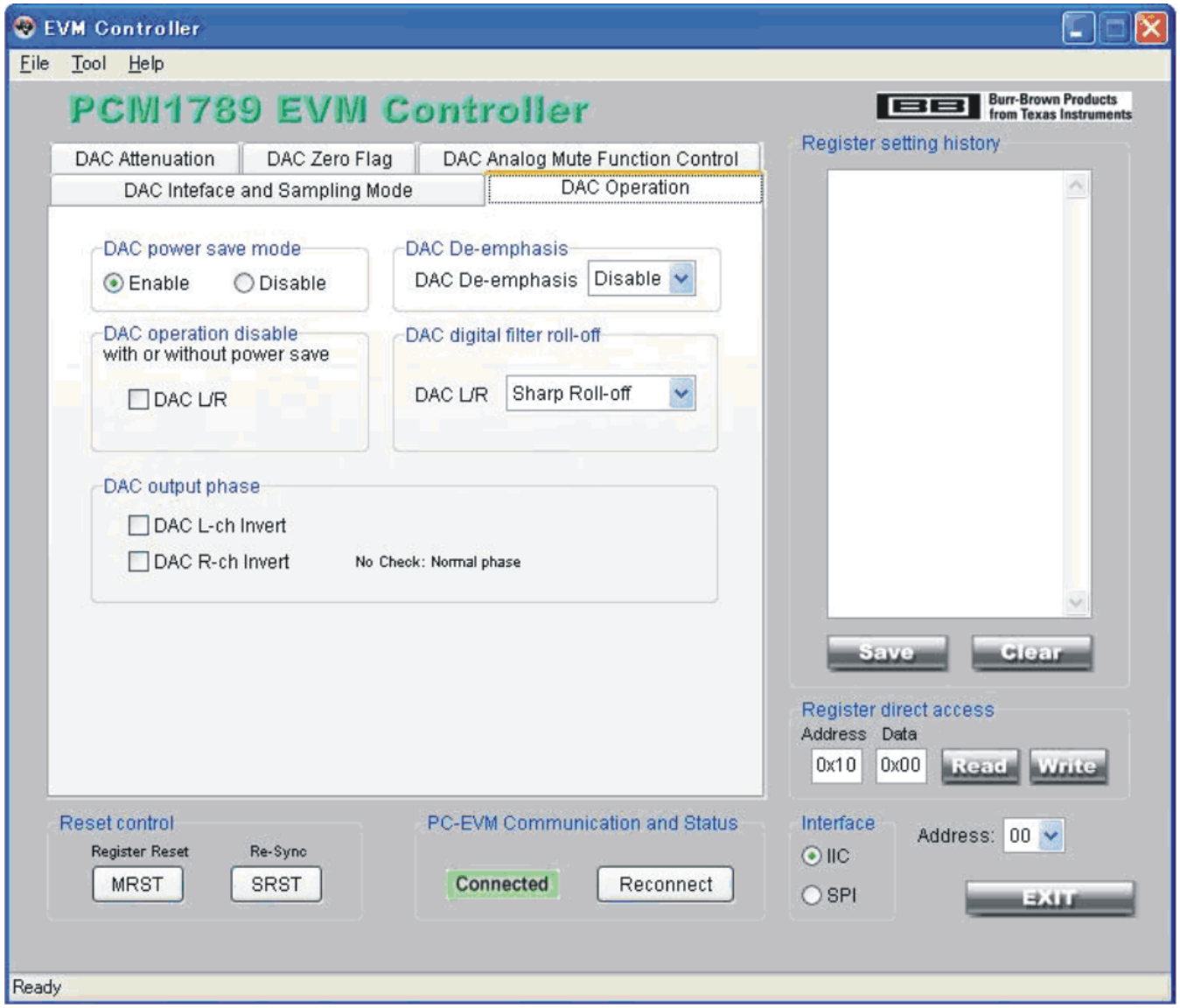


Figure 2-5. Operation Mode Control Tab

This tab has the following features:

- Power-Save Mode
- De-emphasis
- Digital filter roll-off
- Polarity (phase) between input and output

As illustrated in Figure 2-5, these features can be controlled for both left and right channels.

2.3.5 Digital Attenuation and Soft Mute Control

Figure 2-6 shows the digital attenuation and soft mute control tab.

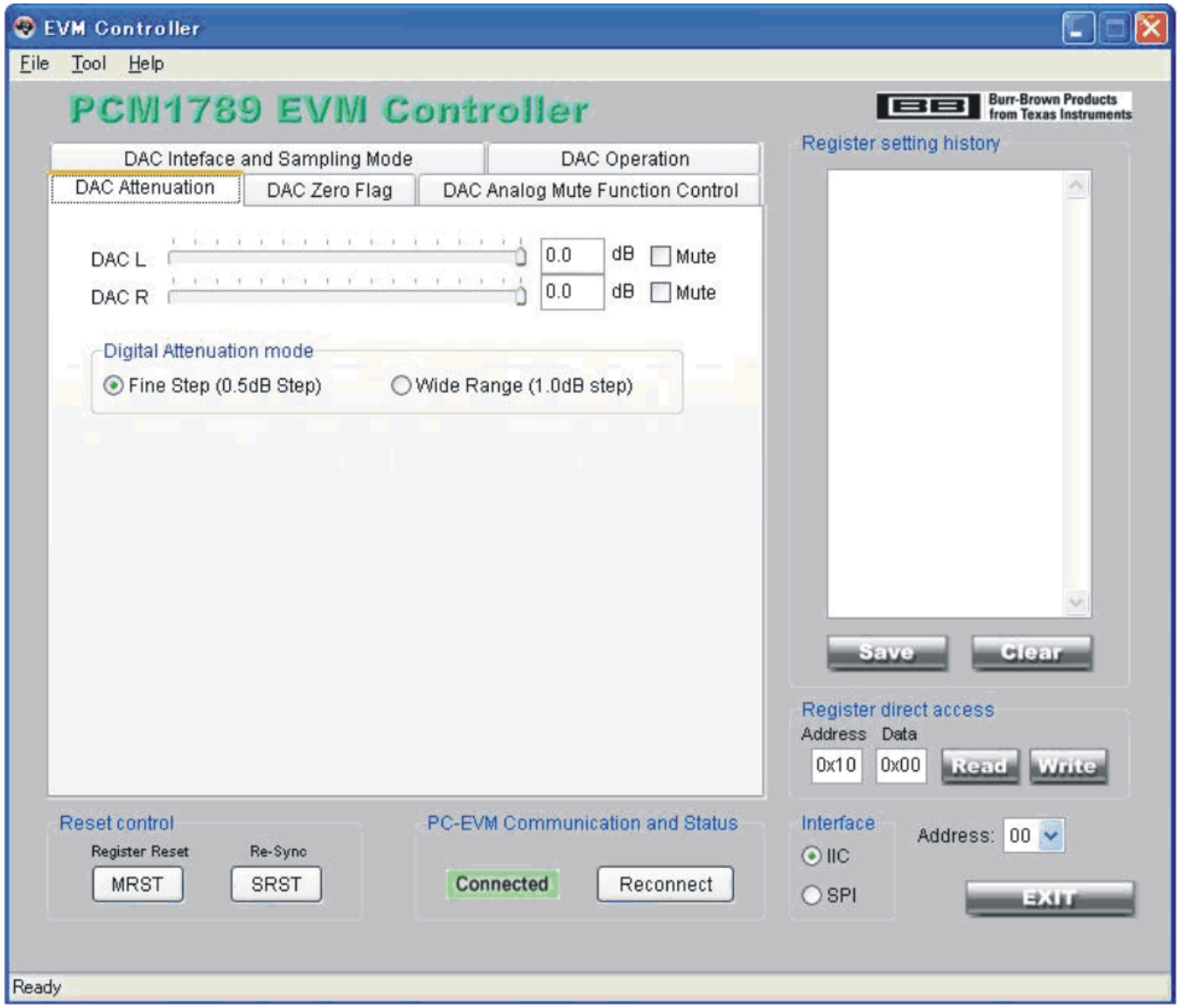


Figure 2-6. Digital Attenuation and Soft Mute Control Tab

Digital attenuation can be controlled for each channel by either changing the slider location or directly entering a target number in 0.5- or 1-dB increments.

- Soft mute on or off using digital attenuation can be also controlled for each channel; operation of digital attenuation control is ignored while the mute is on.
- Choose between *Fine* or *Wide* digital attenuation mode (fine control extends to 63 dB with 0.5-dB steps; wide control covers a 100-dB range with 1.0-dB steps),

2.3.6 Zero Flag Control and Monitor

Figure 2-7 shows the zero flag control and monitor tab.

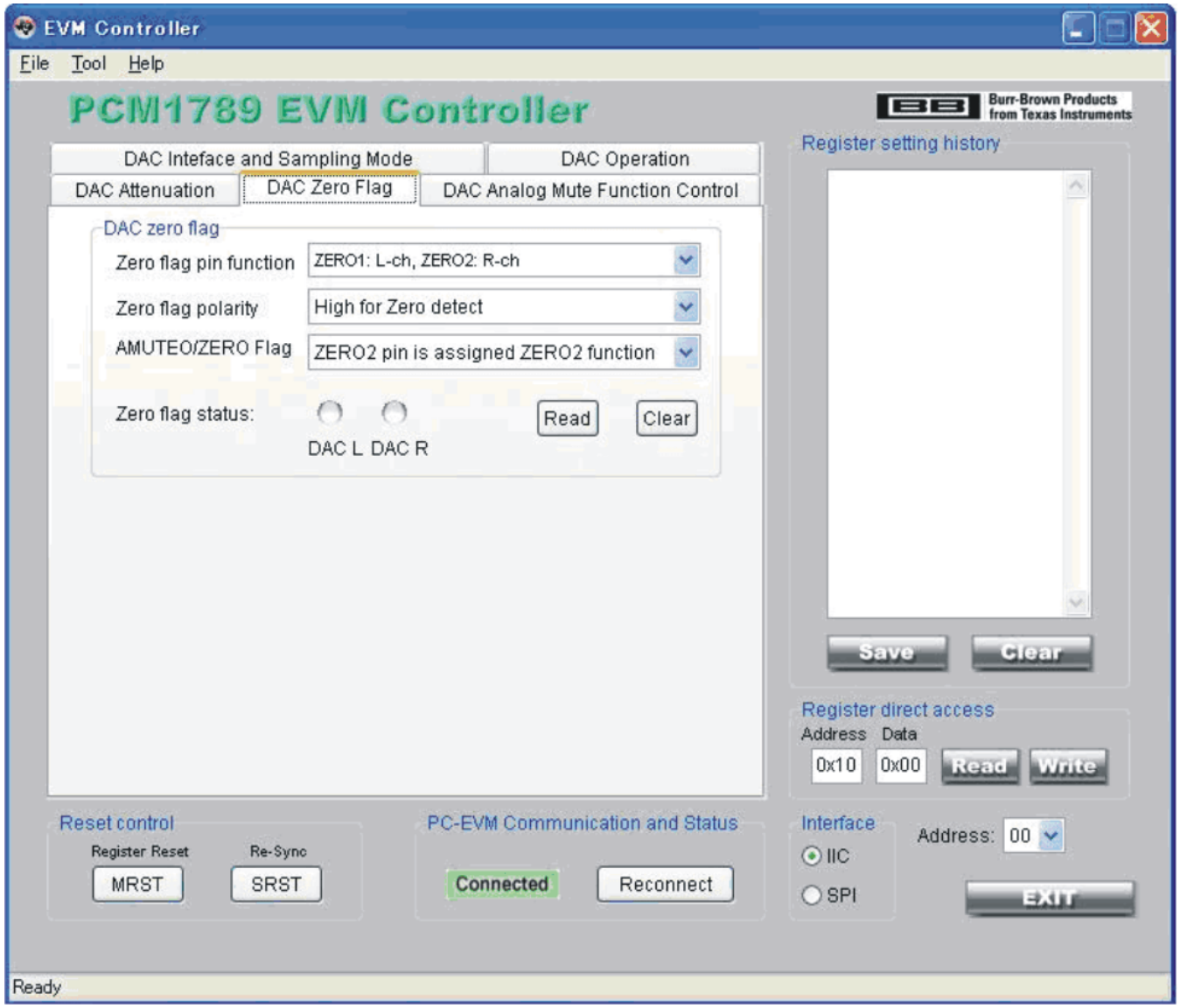


Figure 2-7. Zero Flag Control and Monitor Tab

Both the function and the signal polarity of the zero flag pins (PCM1789 pins 19 and 18) can be controlled, as well as the selection of the Zero Flag function or AMUTEO Function for the ZERO2 pin. The status of zero input detection is updated by channel when a Read command is performed; a zero flag indication is cleared by pushing the *Clear* button.

2.3.7 Analog Mute Function Control

Figure 2-8 illustrates the analog mute function control tab.

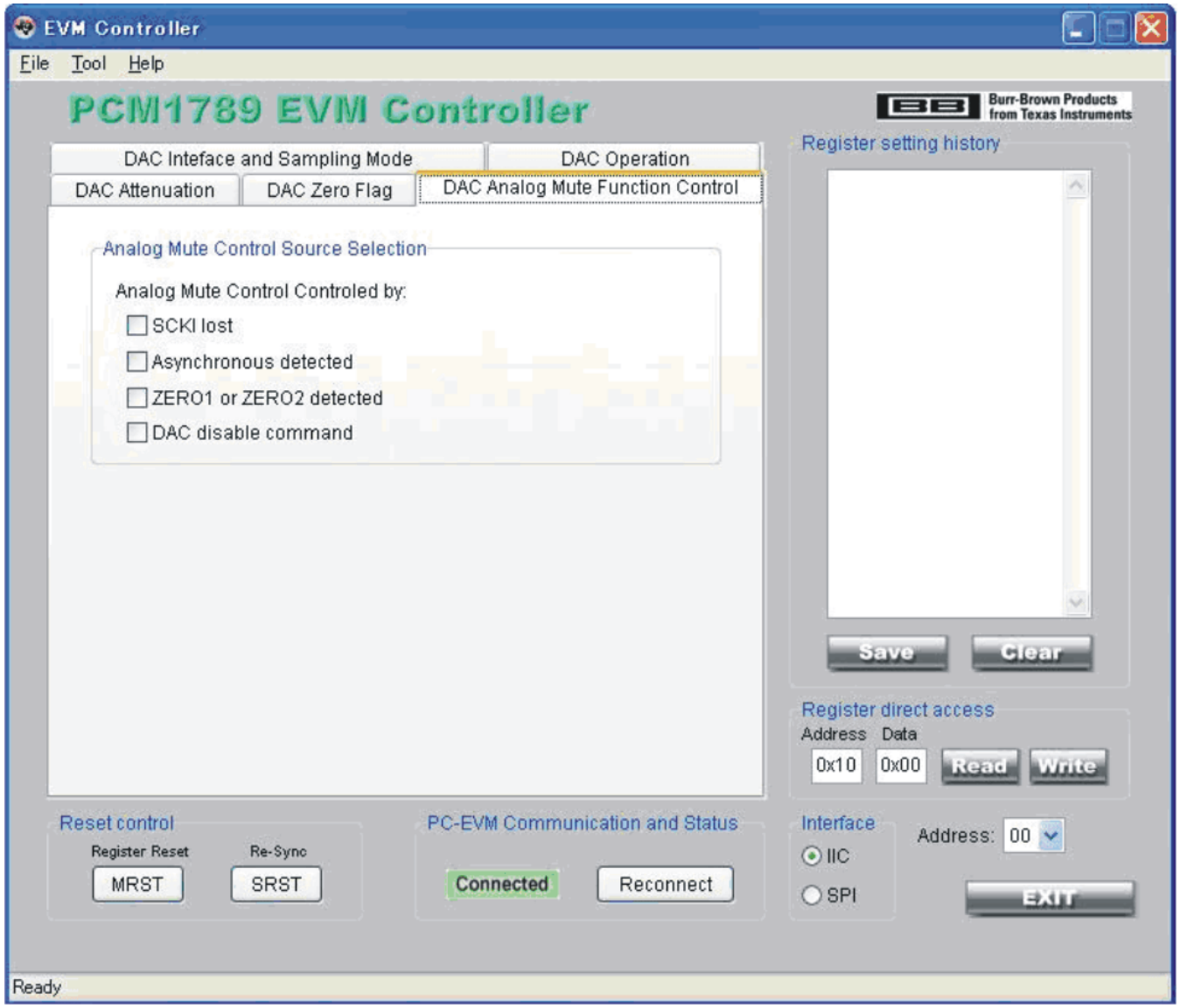


Figure 2-8. Analog Mute Function Control Tab

This window enables the user to select a source event for the analog mute control function of the PCM1789. Four source events can be selected independent of each other:

- SCKI lost
- Asynchronous clocks
- ZERO1 or ZERO2 detection
- DAC disable command

2.3.8 Register Setting History, Register Direct Access

The Register Setting History and Register Direct Access area of the software interface is shown in Figure 2-9.

Figure 2-9. Register Setting History, Register Direct Access Area

Register Setting History

The register setting history is shown as *Register Address, Register Data* in hexadecimal. This history can be downloaded as a comma-separated value (.csv) file by pressing the ***Save*** button. An upload function is also available from the File menu. The ***Clear*** button clears this history.

Register Direct Access

Both read and write functions (read and write any data to or from any address) are available.

Open Script from File Menu

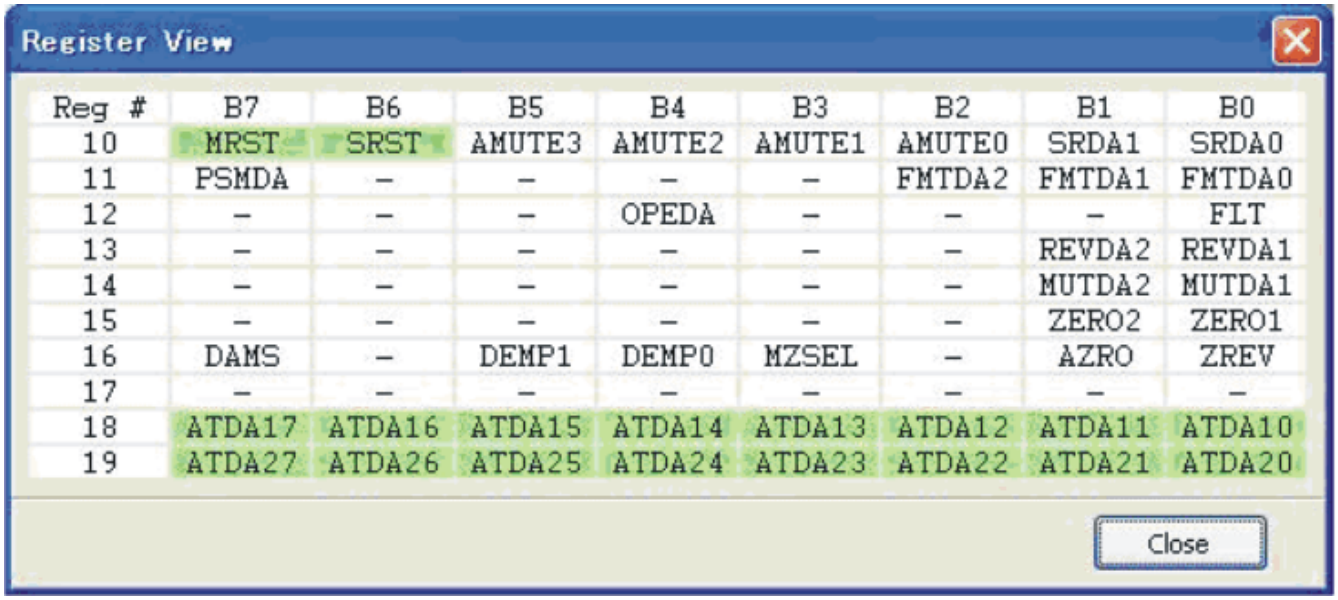
This menu uploads a previously saved register setting snapshot from a stored .csv file.

Save Register Snapshot from File Menu

This menu downloads a register setting snapshot in .csv file format. The saved register setting snapshot can then be uploaded by the File/Open Script command.

2.3.9 Register Contents View

Figure 2-10 illustrates a view of the register contents. This option shows all registers of the PCM1789 in a register map format.



Reg #	B7	B6	B5	B4	B3	B2	B1	B0
10	MRST	SRST	AMUTE3	AMUTE2	AMUTE1	AMUTE0	SRDA1	SRDA0
11	PSMDA	–	–	–	–	FMTDA2	FMTDA1	FMTDA0
12	–	–	–	OPEDA	–	–	–	FLT
13	–	–	–	–	–	–	REVDA2	REVDA1
14	–	–	–	–	–	–	MUTDA2	MUTDA1
15	–	–	–	–	–	–	ZERO2	ZERO1
16	DAMS	–	DEMP1	DEMP0	MZSEL	–	AZRO	ZREV
17	–	–	–	–	–	–	–	–
18	ATDA17	ATDA16	ATDA15	ATDA14	ATDA13	ATDA12	ATDA11	ATDA10
19	ATDA27	ATDA26	ATDA25	ATDA24	ATDA23	ATDA22	ATDA21	ATDA20

Figure 2-10. Register Contents View

The Register View window has three options (available in the application software):

Open Register View Window

Select *Tools* → *Register Map*. This window indicates latest entire register settings of PCM1789.

Register View Window Color Indicators

Green shaded cells (as shown in Figure 2-10) indicate a register value of '1'. White shaded cells indicate a register value of '0'.

Register View Window Operation

After updating a register setting for the PCM1789 through the application software, the update is reflected in this register view.

Typical Performance and Example Data

This chapter presents typical PCM1789 performance and example measurement data when measured with the DEM-PCM1789.

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3.1 Typical Performance Data

This section illustrates baseline PCM1789 performance on the DEM-PCM1789 with the default configuration. These data include typical performance versus sampling rate and system clock, and FFT results for full-scale, –60 dB, –120 dB, and bipolar zero at 48 kHz/512 f_S. As a result of a performance limitation of the differential to single-ended converter followed by the PCM1789 output, the reading performance is shown with 1-dB to 1.5-dB degradation in dynamic range, signal-to-noise ration (SNR), and channel separation.

3.1.1 Typical Performance vs Sampling Rate and System Clock

Figure 3-1 shows typical PCM1789 performance versus the sampling rate and system clock.

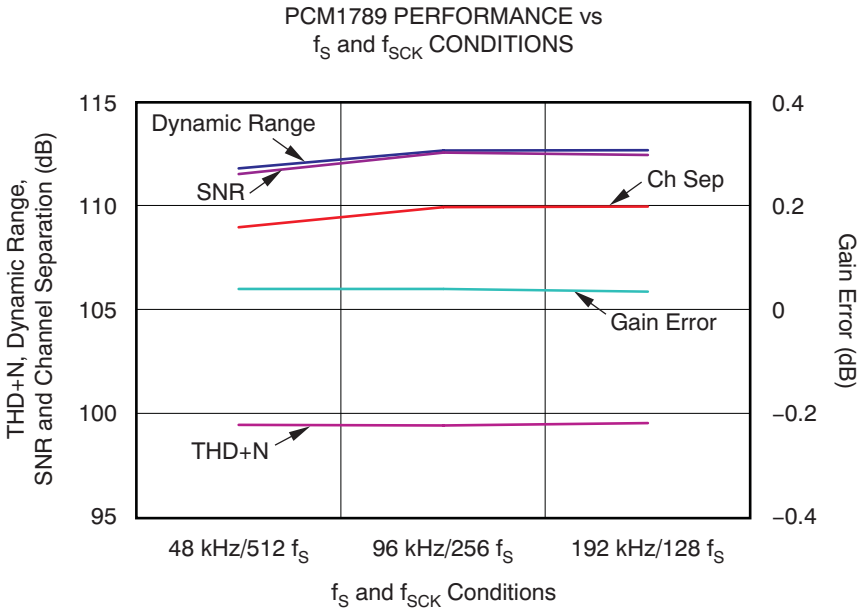

Figure 3-1. Typical Performance vs f_S and f_{SCK}

3.2 Example Measurement Data

Figure 3-2 through Figure 3-5 show the dynamic performance of the PCM1789 in a variety of FFT graphs.

3.2.1 FFT: 0-dB Output

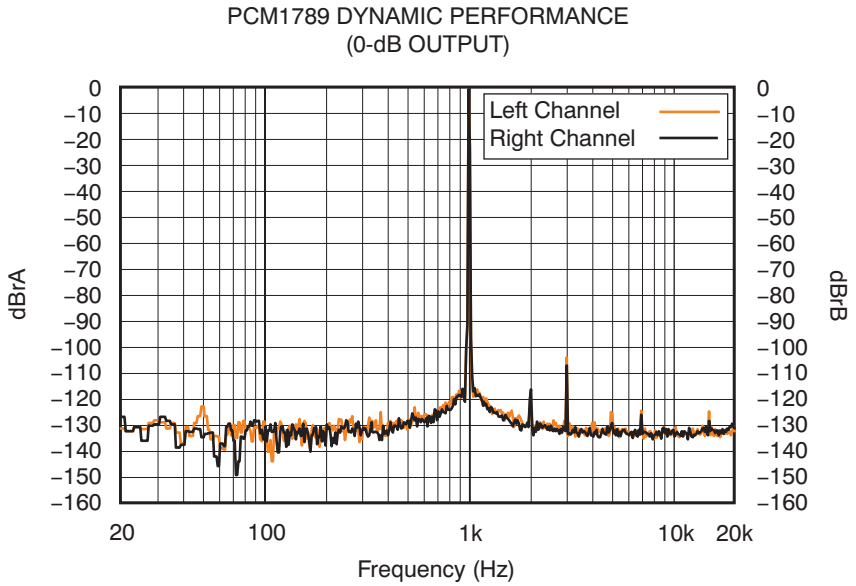

Figure 3-2. FFT (0 dB)

3.2.2 FFT: –60-dB Output

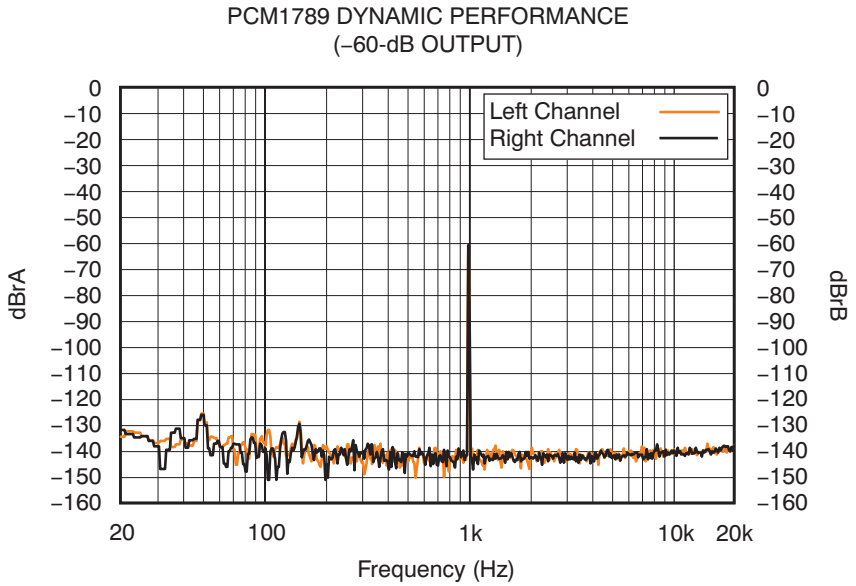

Figure 3-3. FFT (–60 dB)

3.2.3 FFT: –120-dB Output

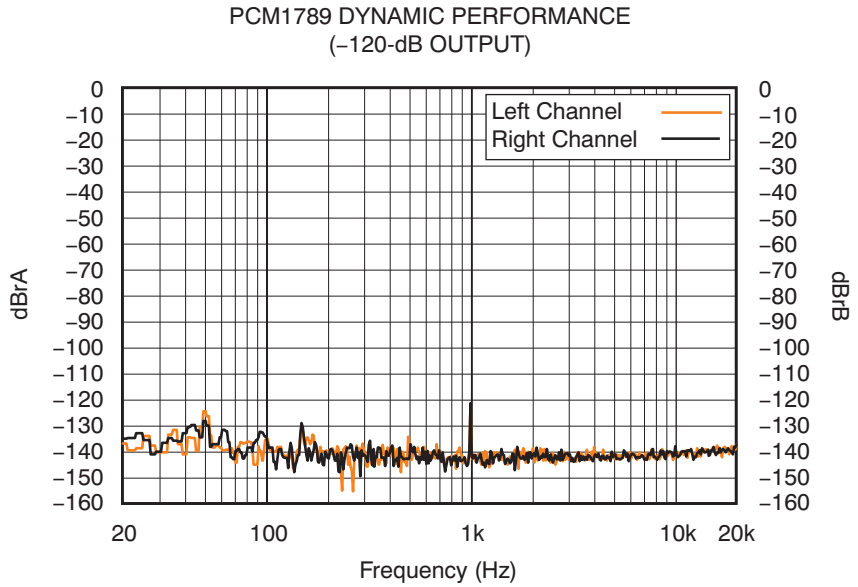

Figure 3-4. FFT (–120 dB)

3.2.4 FFT: Bipolar Zero Output

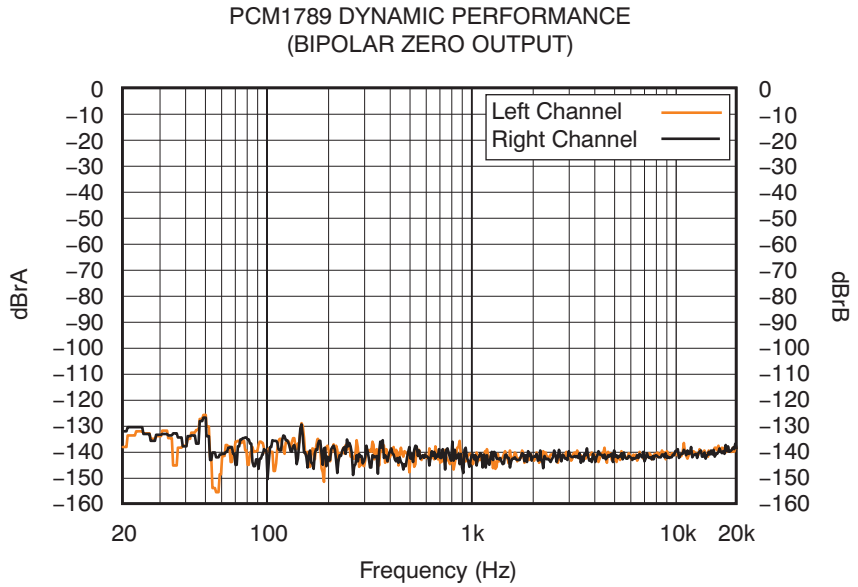

Figure 3-5. FFT of BPZ Output

Schematics and Printed Circuit Board Layouts

This chapter presents the schematics, printed circuit board (PCB) layouts, and bills of material (BOMs) of the DEM-DAI/DAC_USB and the DEM-PCM1789.

Topic **Page**

4.1 DEM-DAI/DAC_USB Schematics

4.1.1 DEM-DAI/DAC_USB Power Supply

The power-supply section is shown in Figure 4-1.

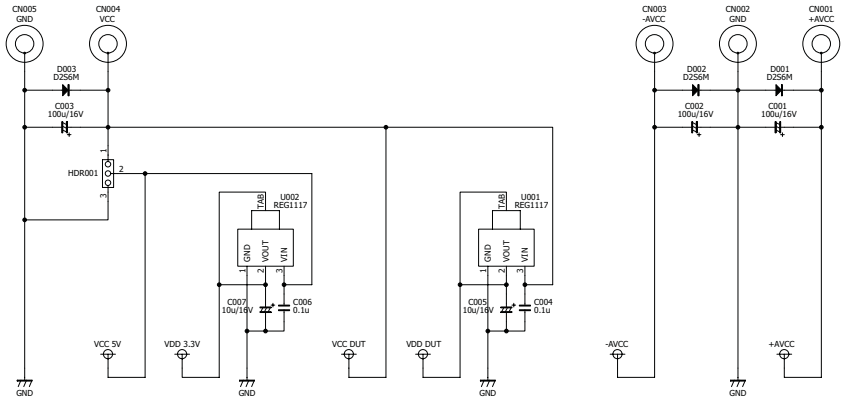

Figure 4-1. Power-Supply Section

4.1.2 DEM-DAI/DAC_USB USB and MCU

The USB and MCU section is illustrated in Figure 4-2.

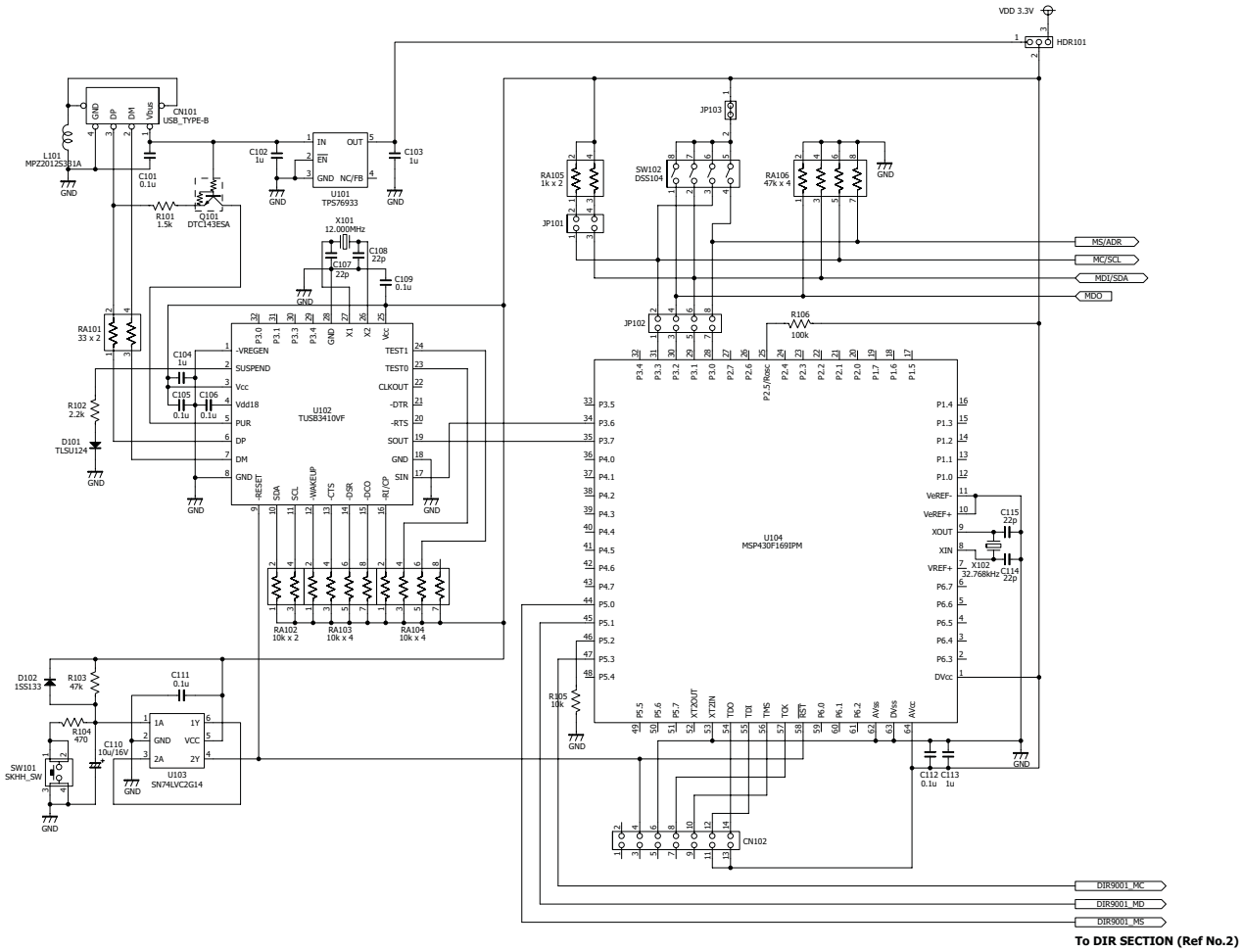

Figure 4-2. USB and MCU Sections

4.1.3 DEM-DAI/DAC_USB DIR

Figure 4-3 shows the DIR section.

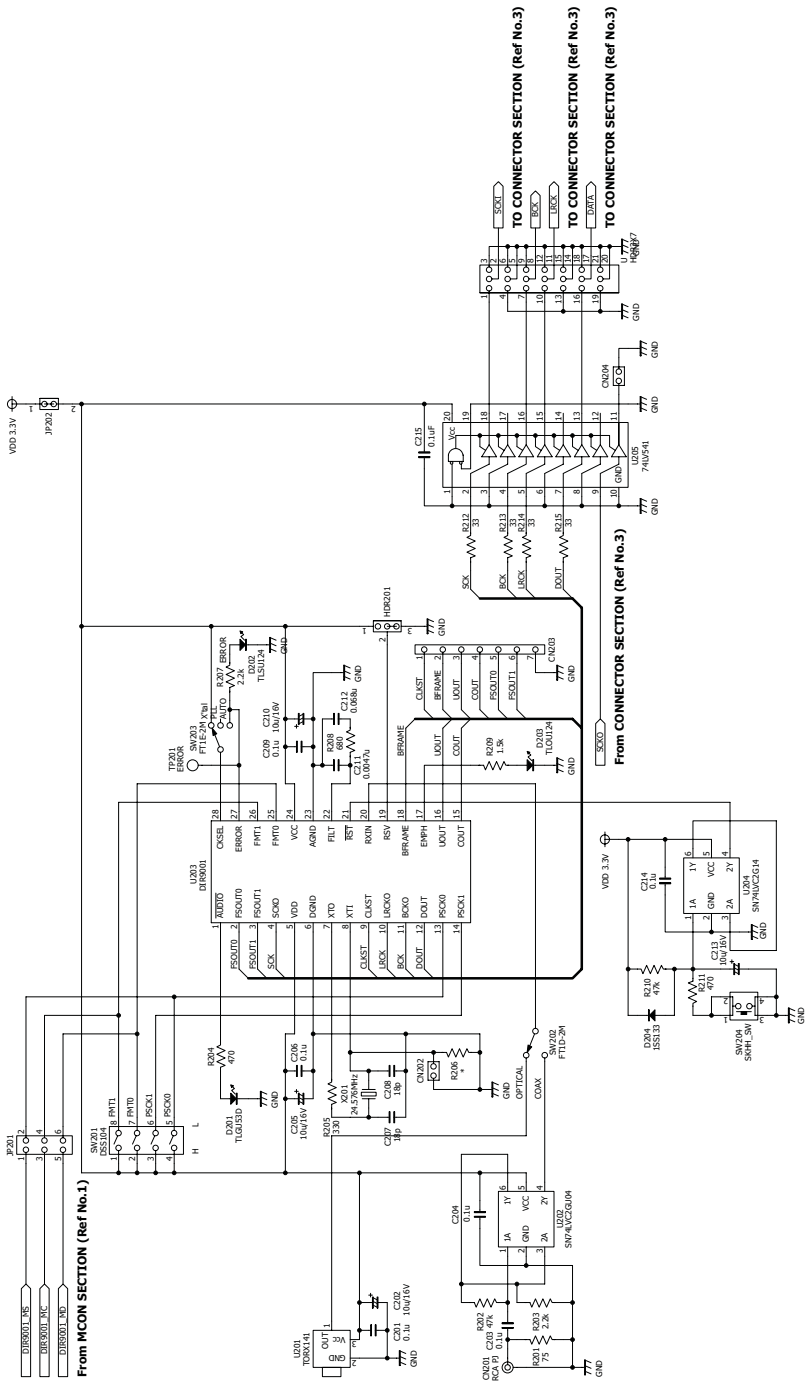

Figure 4-3. DIR Section

4.1.4 DEM-DAI/DAC_USB Interface to DUT Board

Figure 4-4 illustrates the interface to DUT board section.

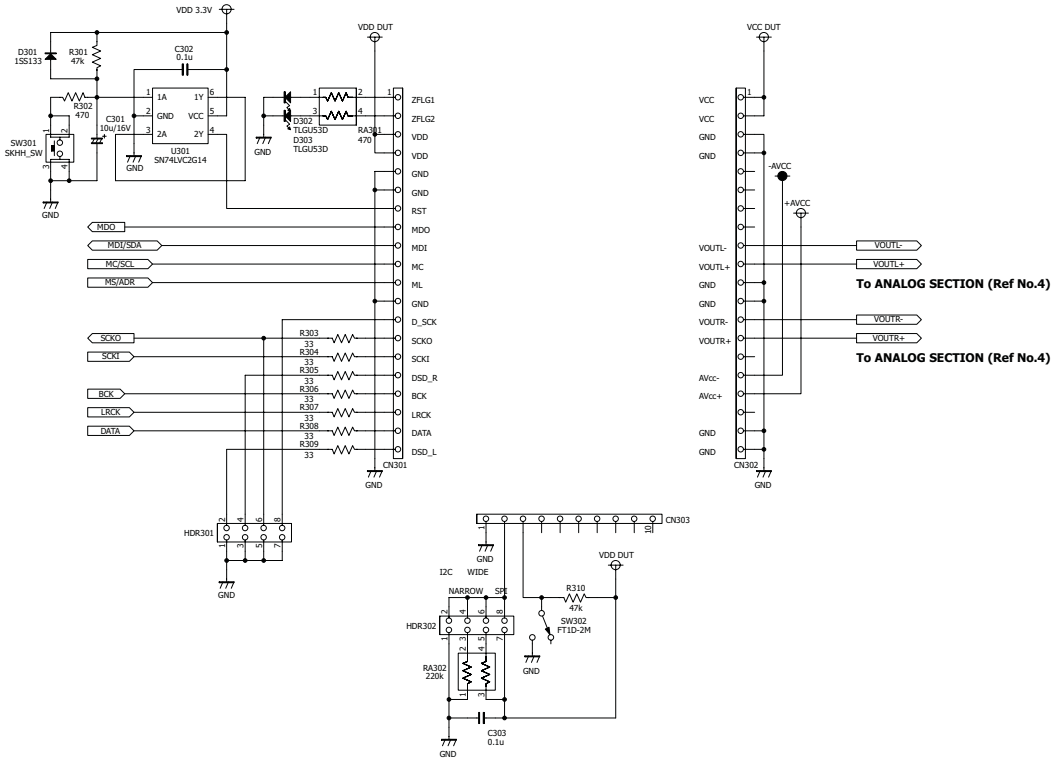

Figure 4-4. Interface to DUT Board Section

4.1.5 DEM-DAI/DAC_USB LPF and Buffer

The LPF and buffer section is shown in Figure 4-5.

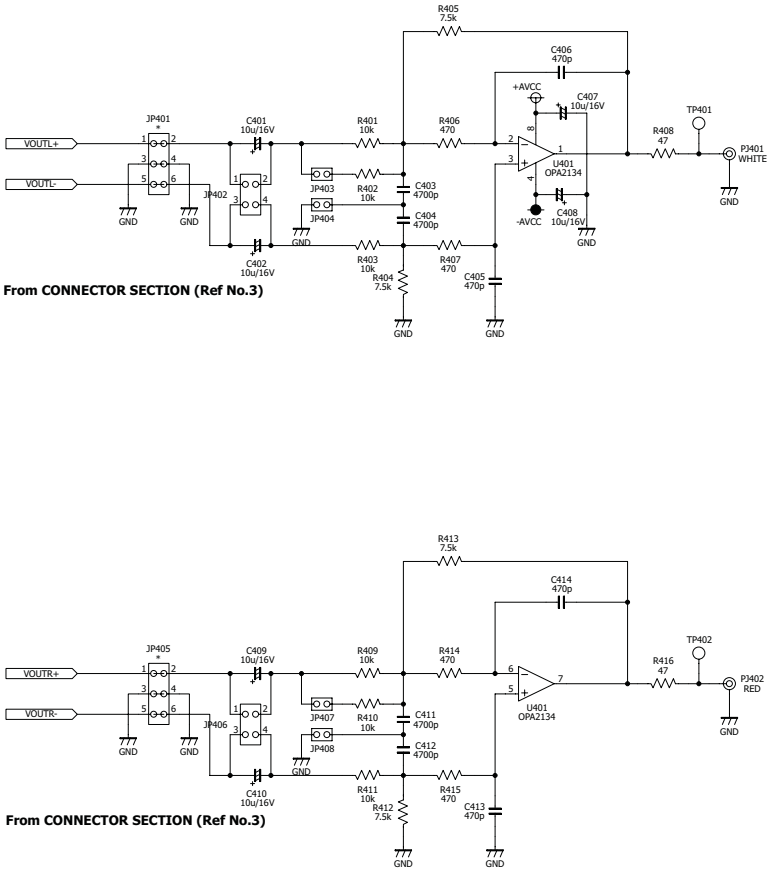

Figure 4-5. LPF and Buffer Sections

4.2 DEM-PCM1789 Schematic (DUT Daughtercard)

Figure 4-6 shows the DEM-PCM1789 schematic.

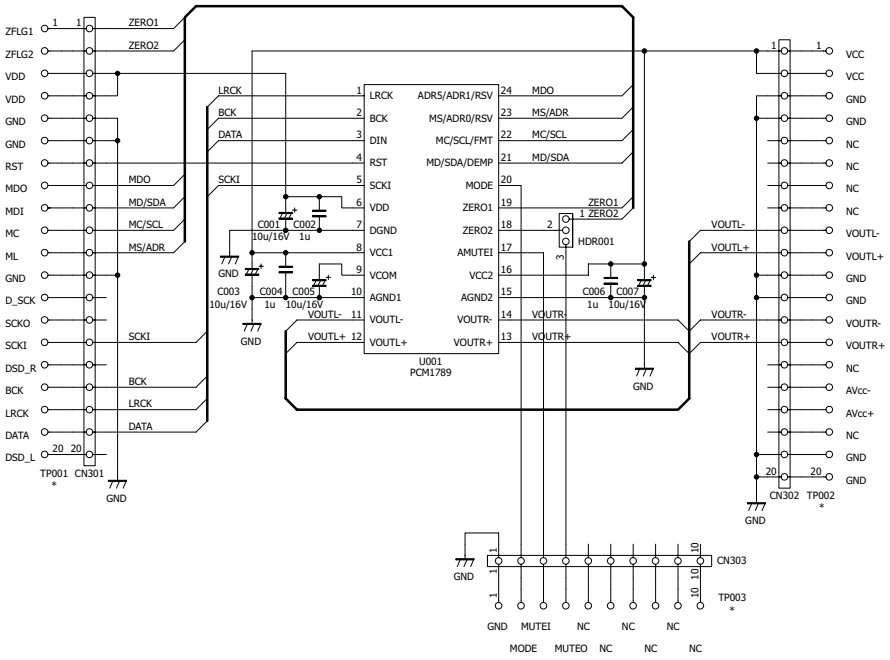

Figure 4-6. DEM-PCM1789

4.3 Printed Circuit Board Layouts

Note: Board layouts are not to scale. These figures are intended to show how the board is laid out; they are not intended to be used for manufacturing DEM-DAI1789 PCBs.

4.3.1 DEM-DAI/DAC_USB Silkscreen (Top)

Figure 4-7 shows the silkscreen plane, top layer image.

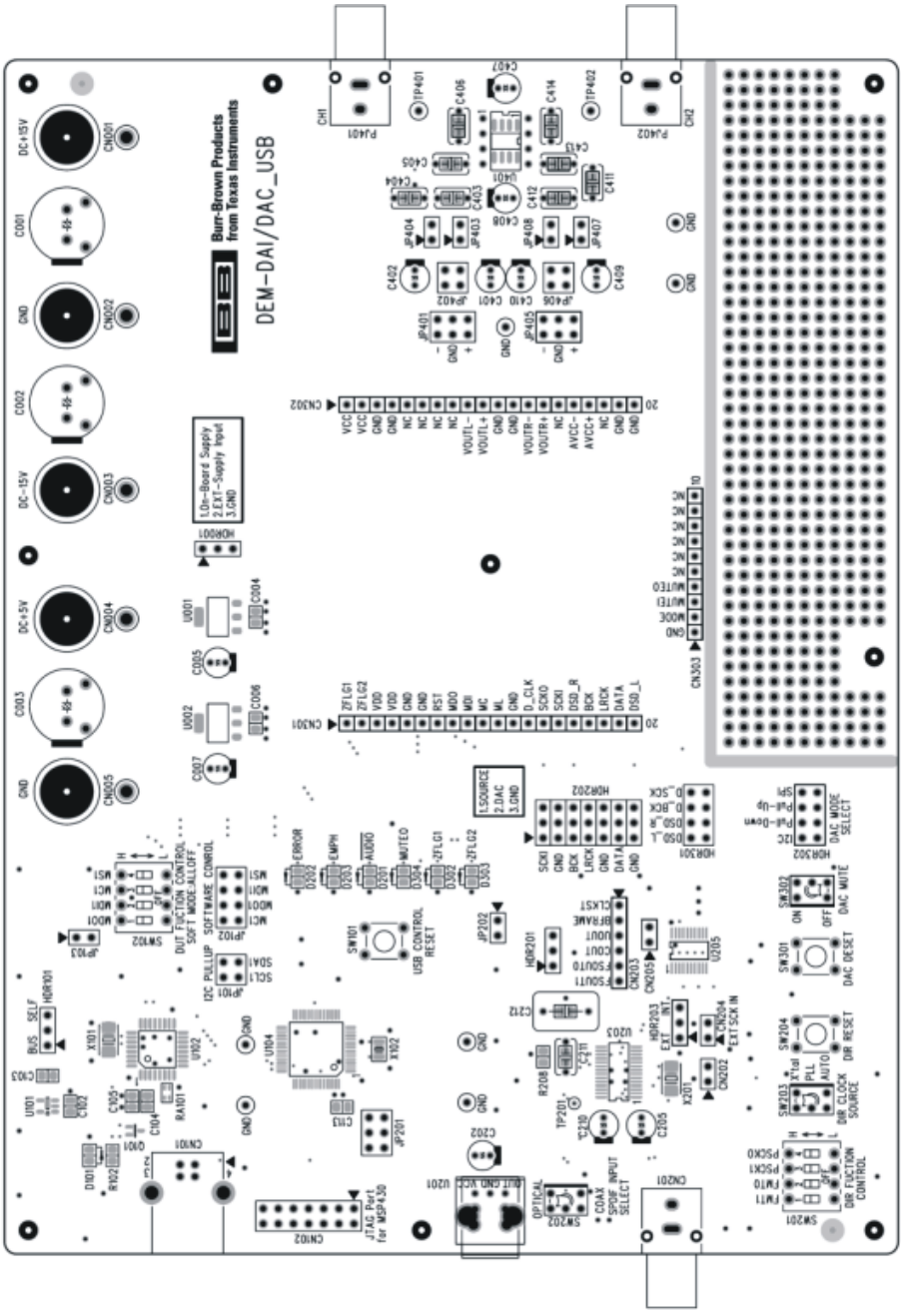

Figure 4-7. Silkscreen

4.3.2 DEM-DAI/DAC_USB Top Layer

Figure 4-8 shows the top layer image of the board.

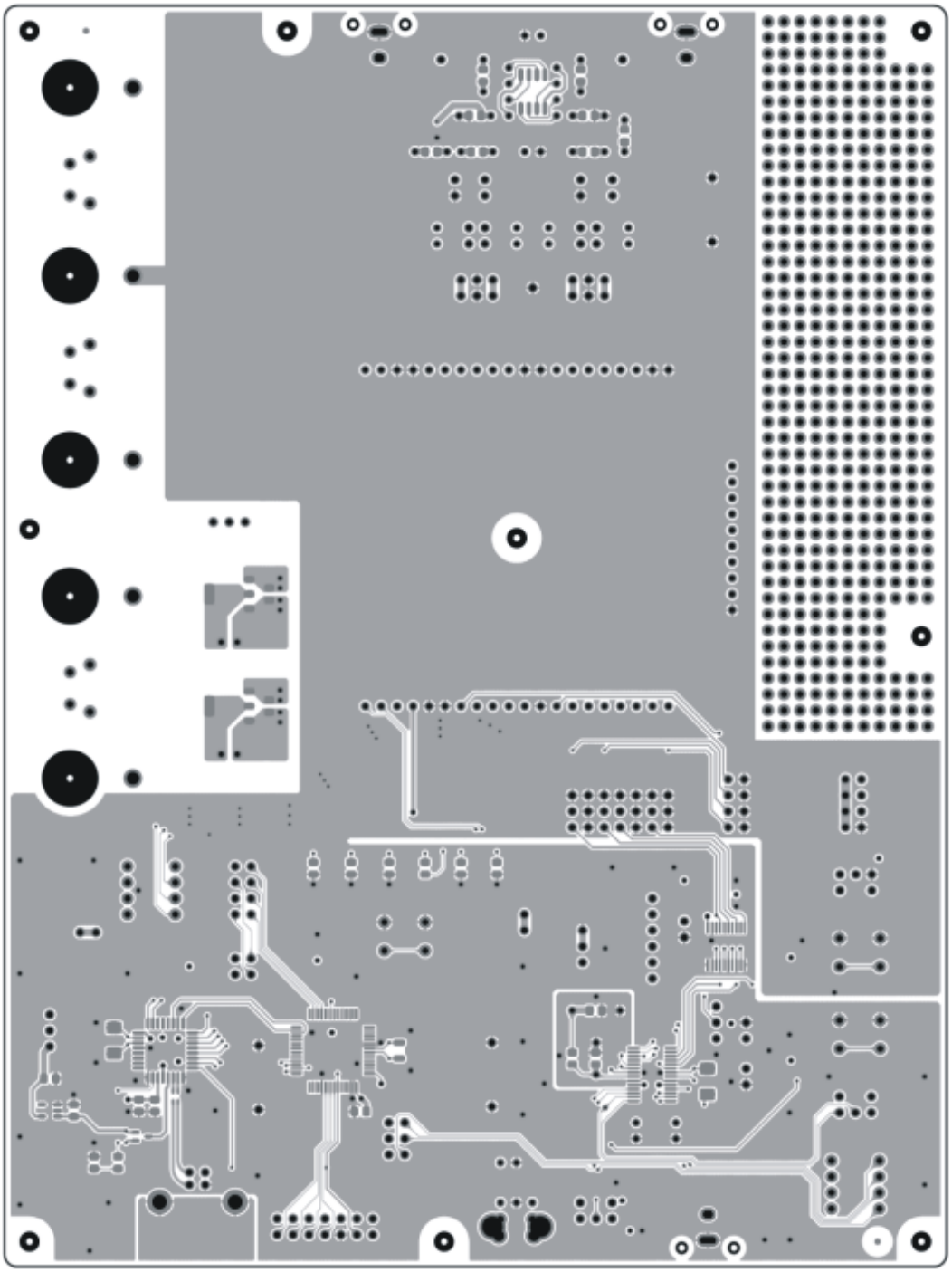

Figure 4-8. Top Layer

4.3.3 DEM-DAI/DAC_USB Bottom Layer

Figure 4-9 shows the bottom layer image of the board.

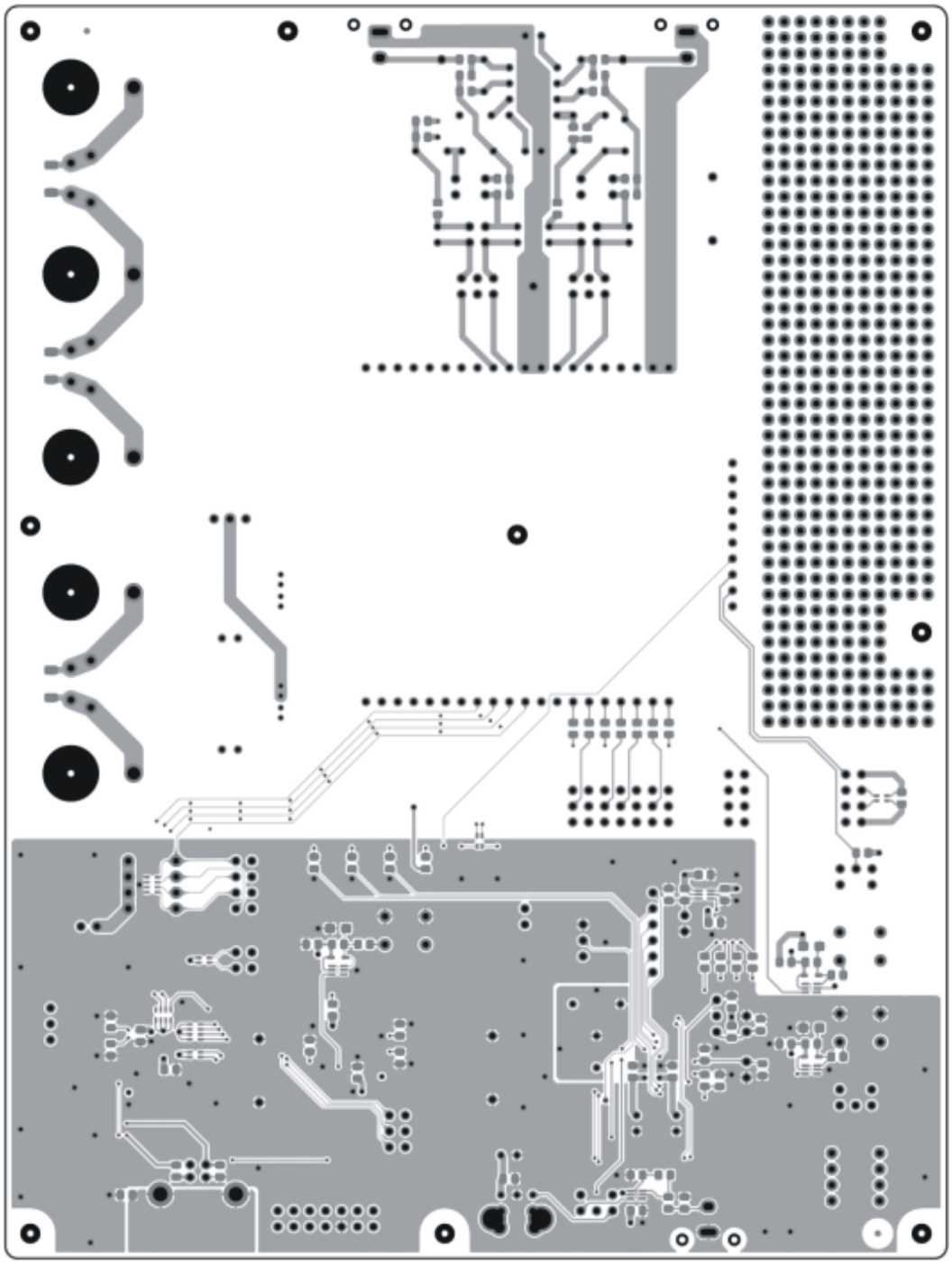

Figure 4-9. Bottom Layer

4.3.4 DEM-PCM1789 (DUT Daughterboard) Silkscreen

Figure 4-10 shows the silkscreen plane, top layer image for the DUT daughterboard.

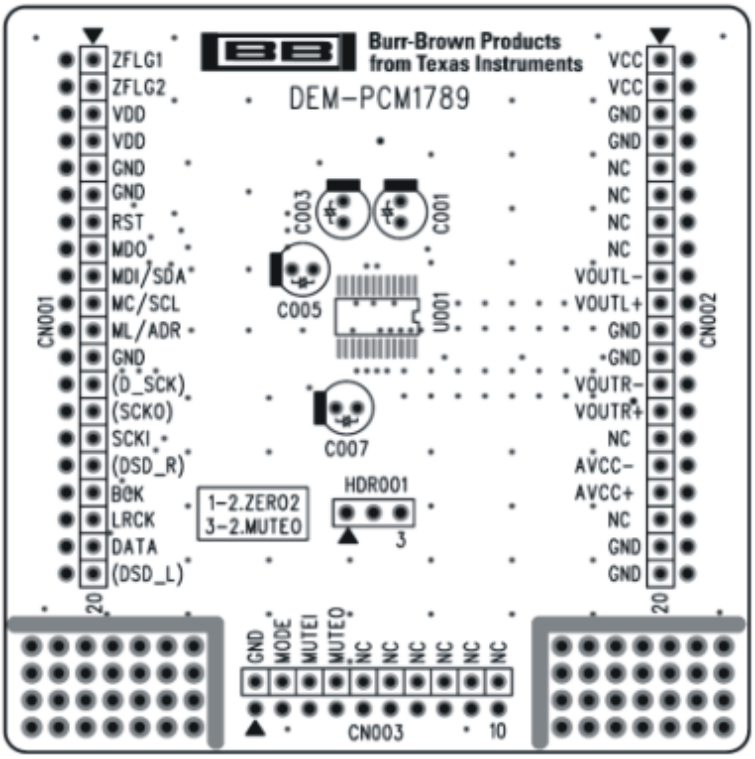

Figure 4-10. Silkscreen

4.3.5 DEM-PCM1789 (DUT Daughterboard) Top View

Figure 4-11 shows the top layer image for the DUT daughterboard.

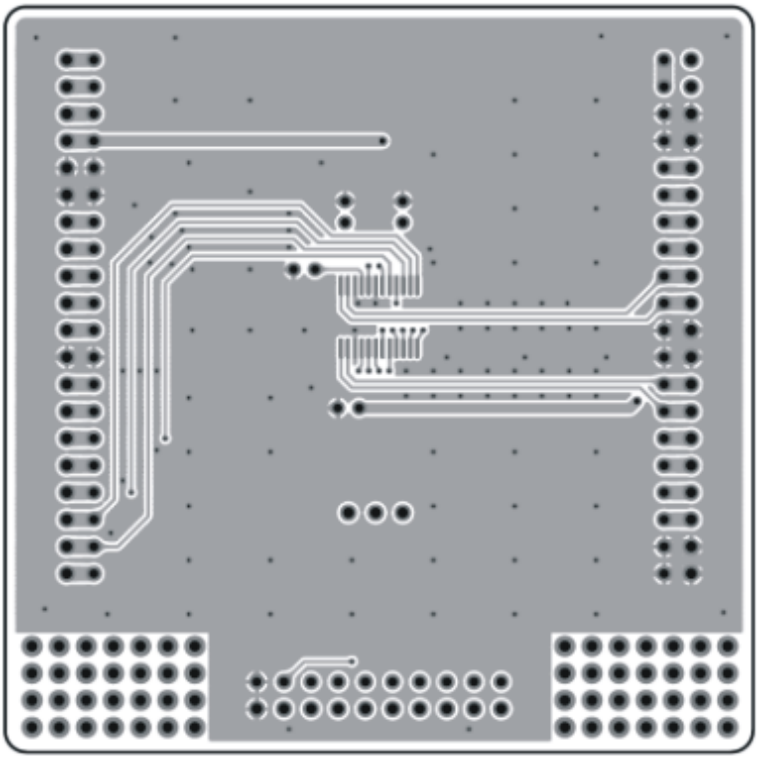

Figure 4-11. Top Layer

4.3.6 DEM-PCM1789 (DUT Daughterboard) Bottom View

Figure 4-12 shows the bottom layer image for the DUT daughterboard.

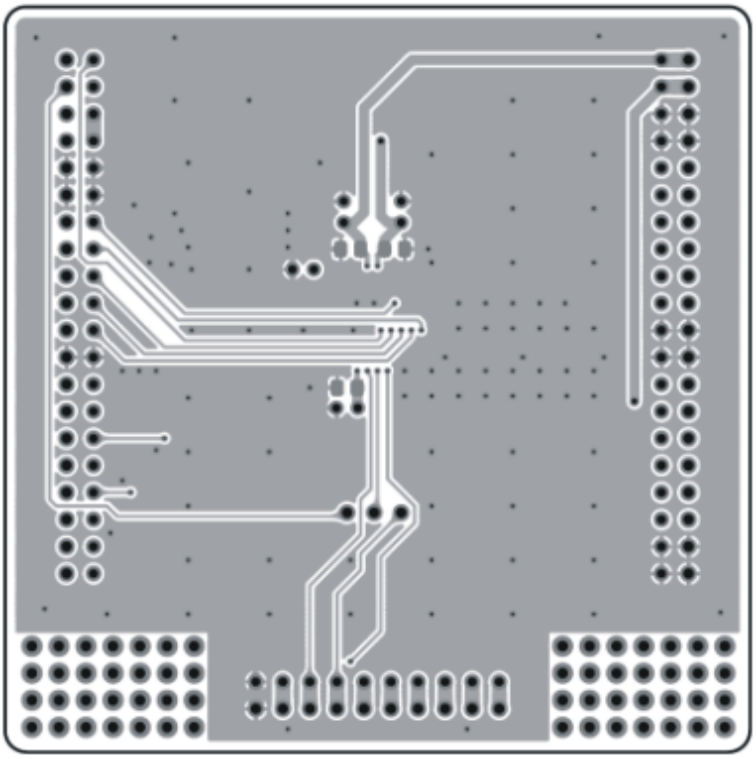

Figure 4-12. Bottom Layer

4.4 Bills of Material (BOMs)

Table 4-1 lists the BOM information for the DEM-DAI/DAC_USB board. Table 4-2 includes the BOM information for the DEM-PCM1789 board.

Table 4-1. Bill of Materials: DEM-DAI/DAC_USB

Qty	Reference Designators	Part Name, Type	Specification	Manufacturer Part No	Manufacturer
2	C207, C208	Chip Ceramic Capacitor	18 pF, J		Murata
4	C107, C108, C114, C115	Chip Ceramic Capacitor	22 pF, J		Murata
20	C004, C006, C101, C105, C106, C109, C111, C112, C201, C203, C204, C206, C209, C214-C218, C302, C303	Chip Ceramic Capacitor	0.1 µF	GRM188B11E104KA01	Murata
1	C103	Chip Ceramic Capacitor	1 µF	GRM188B11A105(K)	Murata
3	C102, C104, C113	Chip Ceramic Capacitor	10 µF	GRM21BB31A106KA	Murata
4	C405, C406, C413, C414	Polypropylene Capacitor	470 pF	APSF0100J471	NISSEI
5	C211, C403, C404, C411, C412	Polypropylene Capacitor	4700 pF	APSF0100J472	NISSEI
1	C212	Polypropylene Capacitor	0.068 µF	APSF0100J683	NISSEI
3	C110, C213, C301	Chip Tantalum Capacitor	10 µF/16 V	ESVA1C106M	NEC TOKIN
5	C005, C007, C202, C205, C210	OS Capacitor	10 µF/16 V	16SS10M	Sanyo
6	C401, C402, C407-C410	Electrolytic Capacitor	10 µF/16 V	R0A-16V100M	ELNA
3	C001-C003	Electrolytic Capacitor	220 µF/25 V	R0A-25V221M	ELNA
11	R212-R215, R303-R309	Chip Resistor	33 Ω, D	RR0816	Susumu
2	R408, R416	Chip Resistor	47 Ω, D	RP0816	Susumu
1	R201	Chip Resistor	75 Ω, D	RR0816	Susumu
1	R205	Chip Resistor	330 Ω, D	RR0816	Susumu
8	R104, R204, R211, R302, R406, R407, R414, R415	Chip Resistor	470 Ω, D	RP0816	Susumu
2	R208, R209	Chip Resistor	680 Ω, D	RR0816	Susumu
2	R101, R311	Chip Resistor	1.5 kΩ, D	RP0816	Susumu
3	R102, R203, R207	Chip Resistor	2.2 kΩ, D	RP0816	Susumu
4	R404, R405, R412, R413	Chip Resistor	7.5 kΩ, D	RP0816	Susumu
7	R105, R401-R403, R409-R411	Chip Resistor	10 kΩ, D	RP0816	Susumu
5	R103, R202, R210, R301, R310	Chip Resistor	47 kΩ, D	RP0816	Susumu
1	R106	Chip Resistor	100 kΩ, D	RP0816	Susumu
1	RA101	Resistor Networks	33 Ω (x2)	CN1J2	KOA
1	RA301	Resistor Networks	470 Ω (x2)	CN1J2	KOA
1	RA105	Resistor Networks	1 kΩ (x2)	CN1J2	KOA
1	RA102	Resistor Networks	10 kΩ (x2)	CN1J2	KOA
1	RA302	Resistor Networks	220 kΩ (x2)	CN1J2	KOA
2	RA103, RA104	Resistor Networks	10 kΩ (x4)	CN1J4	KOA
1	RA106	Resistor Networks	47 kΩ (x4)	CN1J4	KOA
1	L101	Chip Ferrite Bead		MPZ2012S331A	TDK
3	D102, D204, D301	Chip Diode		HSU119-E	Renesas
3	D001-D003	Diode		CMS05	Toshiba
3	D201, D302, D303	LED	Green	TLPGU1002A	Toshiba
1	D304	LED	Orange	TLOU1002A	Toshiba
2	D101, D202	LED	Red	TLSU1002A	Toshiba
1	D203	LED	Yellow	TLYU1002A	Toshiba
1	Q101	Digital Transistor		DTC143E	ROHM

Table 4-1. Bill of Materials: DEM-DAI/DAC_USB (continued)

Qty	Reference Designators	Part Name, Type	Specification	Manufacturer Part No	Manufacturer
1	U401	Op Amp		OPA2134PA	TI
1	U206	Logic IC	Package: DCK	SN74LVC1T45	TI
3	U103, U204, U301	Logic IC	Package: DCK	SN74LVC2G14	TI
1	U202	Logic IC	Package: DCK	SN74LVC2GU04	TI
1	U205	Logic IC		SN74LV541	TI
1	U203	IC	DIR	DIR9001	TI
1	U104	IC	MCU	MSP430F169IPM	TI
1	U102	IC	USB	TUSB3410VF	TI
1	U101	IC	100 mA, 3.3 V	TPS76933	TI
2	U001, U002	Regulator IC	800 mA, 3.3 V	REG1117-3.3	TI
1	U201	TOSlink™	Receiver	TORX141	Toshiba
1	X101	Crystal Resonator	12.000 MHz	CX5032GB	KSS
1	X201	Crystal Resonator	24.576 MHz	CX5032GB	KSS
1	X102	Crystal Resonator	32.768 kHz	FC-135, 12.5pF	EPSON
3	HDR001, HDR101, HDR203	TH-type Male Connector	3-pin	FFC-3AMEP1	HTK
2	HDR301, HDR302	TH-type Male Connector	8-pin	FFC-8BMEP1	HTK
1	HDR202	TH-type Male Connector	21-pin	FFC-21NSM1	HTK
5	JP202, JP403, JP404, JP407, JP408	TH-type Male Connector	2-pin	FFC-2BMEP1	HTK
3	JP101, JP402, JP406	TH-type Male Connector	4-pin	FFC-4BMEP1	HTK
1	JP201	TH-type Male Connector	6-pin	FFC-6BMEP1	HTK
1	JP102	TH-type Male Connector	8-pin	FFC-8BMEP1	HTK
1	CN203	TH-type Male Connector	7-pin	FFC-7AMEP1	HTK
3	CN202, CN204, CN205	TH-type Male Connector	2-pin	FFC-2BMEP1	HTK
1	CN102	TH-type Male Connector	14-pin	FFC-14BMEP1	HTK
3	CN301-CN303	Connector	10-pin	XB-3-7-10P	Mac8
5	CN001-CN005	Banana Jack	Yellow, Green, Blue, Red, Black	T-45	Sato Parts
1	CN101	USB Connector type B	USB_TYPE-B	67068-8001	Molex
1	CN201	RCA Pin Jack	Yellow	LPR6520-0804	SMK
1	PJ402	RCA Pin Jack	Red	LPR6520-0802	SMK
1	PJ401	RCA Pin Jack	White	LPR6520-0803	SMK
2	SW102, SW201	DIP Switch		DSS104	Fujisoku
2	SW202, SW302	Toggle Switch		FT1D-2M	Fujisoku
1	SW203	Toggle Switch		FT1E-2M	Fujisoku
3	SW101, SW204, SW301	Tact Switch			Alps
2	TP401, TP402	Test Pin		LC-2-G	Mac8
1	TP201	Test Pin		LC-4-G	Mac8

Table 4-2. Bill of Materials: DEM-PCM1789

Qty	Reference Designators	Part Name, Type	Specification	Manufacturer Part No	Manufacturer
3	C002, C004, C006	Chip Ceramic Capacitor	1 μF	GRM188B11A105(K)	Murata
4	C001, C003, C005, C007	Electrolytic Capacitor	10 μ/16 V	R3A-16V100M	ELNA
1	U001	IC	DAC	PCM1789	TI
1	HDR001	TH-type Male Connector	3-pin	FFC-3AMEP1	HTK

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