



DEM-DAI1780/1781/1782EVM

Contents

1	Description.....	2
2	Schematic and Printed-Circuit Board	5
3	Demonstration Software.....	14

List of Figures

1	DEM-DAI1780/1781/1782 Block Diagram.....	2
2	DEM-DAI/DAC Daughtercard Sockets.....	5
3	DEM-DAI/DAC Connector and Regulator	5
4	DEM-DAI/DAC Digital Audio Interface	6
5	DEM-PCM1780/1781/1782.....	7
6	DEM-DAI/DAC Silkscreen	9
7	DEM-DAI/DAC Top View.....	10
8	DEM-DAI/DAC Bottom View.....	11
9	DEM-PCM1780/1781/1782 Silkscreen	12
10	DEM-PCM1780/1781/1782 Top View	12
11	DEM-PCM1780/1781/1782 Bottom View	13

List of Tables

1	Digital Audio Receiver Configuration.....	3
2	JP001 Jumper Configuration.....	3
3	Digital Audio Source Selection.....	3

1 Description

The DEM-DAI1780/1781/1782 is a complete evaluation platform for the PCM1780/1781/1782 24-bit, 192-kHz stereo audio digital-to-analog converter (DAC). All necessary connectors and circuitry are provided for interfacing to audio test systems and commercial audio equipment.

1.1 Block Diagram

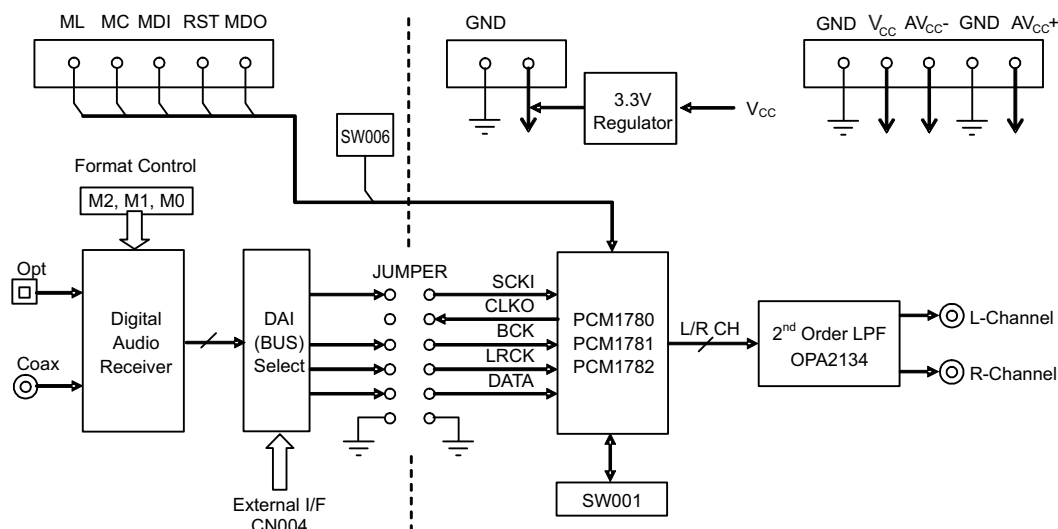


Figure 1. DEM-DAI1780/1781/1782 Block Diagram

1.2 Features

- Complete evaluation platform for the PCM1780/1781/1782 stereo audio DAC.
- Onboard low-pass filters for the left and right channels.
- Easy configuration using onboard switches and jumpers.
- 96-kHz digital audio receiver accepts S/PDIF inputs.
- Centronics connector for interfacing to a PC parallel port (required for the demonstration software)
- Demonstration software for programming the PCM1780/1781/1782's internal registers (requires a PC running Microsoft Windows™ 3.1, 95, 98, 2000, XP)
- Power-supply requirements: +5 V, +15 V, and –15 V

1.3 Hardware Description

1.3.1 Power Supplies

The DEM-DAI1780/1781/1782 evaluation fixture requires three power supplies for operating the PCM1780/1781/1782, the digital support circuitry, and the low-pass filter operational amplifier. Standard banana jacks are provided for all power-supply connections.

Connector CN054 provides the +5-V supply required for VCC. It is used to power the PCM1780/1781/1782, as well as the digital audio receiver (U002) and associated logic (U003 and U004).

Connectors CN051 (AVCC+) and CN (AVCC-) are used to power the OPA2134 dual operational amplifier (U101) that performs the DAC output low-pass filter function. AVCC+ can be set from +5 V to +18 V while AVCC- can be set from –5 V to –18 V.

Ground connections are made at connectors CN052 and CN055. Both are connected to the ground plane of the DEMDAI1780/1781/1782 board.

1.3.2 Analog Output

The left and right audio outputs are available at RCA jacks CN104 and CN105, respectively. The outputs are taken from the low-pass filter, which has a gain of 2. The low-pass filter can be configured for one of two cutoff frequencies: 54 kHz or 108 kHz. Typically, the 54-kHz cutoff frequency is used for all measurements.

For f-3dB = 54 kHz, jumpers JP101 through JP106 must all be installed.

For f-3dB = 108 kHz, jumpers JP101 through JP106 must all be removed.

1.3.3 Digital Audio Interface

A digital audio receiver (U002) is provided for easy connection to S/PDIF and optical signal sources, including audio test systems (Audio Precision, Rhode & Schwarz) and commercial audio equipment (CD and DVD players). The receiver can operate at rates up to a 96kHz with 24-bit audio data.

Switches SW001 through SW003 are used to set the receiver output data format, as shown in [Table 1](#). [Table 2](#) shows the jumper configuration for JP001 for normal operation.

Table 1. Digital Audio Receiver Configuration

SW001	SW002	SW003	Receiver Output Data Format
L	L	L	16- to 24-bit left-justified
L	H	L	16- to 24-bit I ² S
H	L	H	16-bit right-justified (or standard)
L	H	H	18-bit right-justified (or standard)

Table 2. JP001 Jumper Configuration⁽¹⁾

JP001 Jumper	16-Bit Right-Justified Format	16-Bit Right-Justified Format	16- to 24-Bit I ² S Format	16- to 24-Bit Left-Justified Format
CLKO	X	X	X	X
SCLK	O	O	O	O
GND	O	O	O	O
BCK	O	O	O	NC
BCK (L Just)	NC	NC	NC	NC
LRCK	O	O	O	O
DATA	O	O	O	O

⁽¹⁾ O = Install Jumper, NC = Remove Jumper, X = Don't Care

Switch SW004 is a normally open, momentary-contact pushbutton switch used to reset the digital audio receiver when necessary.

The demonstration board also supports direct interfacing to audio decoders and signal processors via connector CN004 (unpopulated). SCLK, BCK, LRCK, and DATA are available and buffered by U005. In addition, +5 V (VCC) and Ground are available at CN004. Switch SW005 is used to select between the digital audio receiver and connector CN004 as the source of the audio interface. [Table 3](#) shows the available switch settings.

Table 3. Digital Audio Source Selection

SW005 Setting	Source Selection
INT	Digital audio receiver (U002)
EXT	Connector CN004 via buffer U005

1.3.4 DIP-Switch Configuration

Switch SW006 is not used for the PCM1780/1781/1782. It is included for future products that can be compatible with this demonstration board. All switch elements must be set to the OFF position for the PCM1780/ 1781/ 1782.

1.3.5 Connector to PC Parallel Port / Host

The evaluation fixture includes a Centronics connector, CN003, that is used to connect to a PC parallel port or an alternative host controller. This connector is used to access the serial control port of the PCM1780/1781/1782. The serial control port is used to program the PCM1780/1781/1782's internal registers. A standard printer cable is used to connect CN003 of the evaluation fixture to a PC parallel port. The port signals are buffered using U006.

1.3.6 Operation Controls for PCM1781

SW001 on the daughtercard are operating controls for the PCM1781.

SW001: Data format select
 R/J-16 = 16-bit right-justified format
 I²S = 16- to 24-bit, I²S format

SW006 on the DAI/DAC motherboard is used as operating control for the PCM1781.

ML, MC/SW006		
MC	ML	De-emphasis
LOW	LOW	OFF
LOW	HIGH	ON fs = 48 kHz
HIGH	LOW	ON fs = 44.1 kHz
HIGH	HIGH	ON fs = 32 kHz

MD/SW006 MUTE CONTROL
 LOWMUTE OFF
 HIGHMUTE ON

2 Schematic and Printed-Circuit Board

This section presents the DEM-DAI/DAC and the DEM-PCM1780/1781/1782 printed-circuit boards and schematics.

2.1 DEM-DAI/DAC Schematics

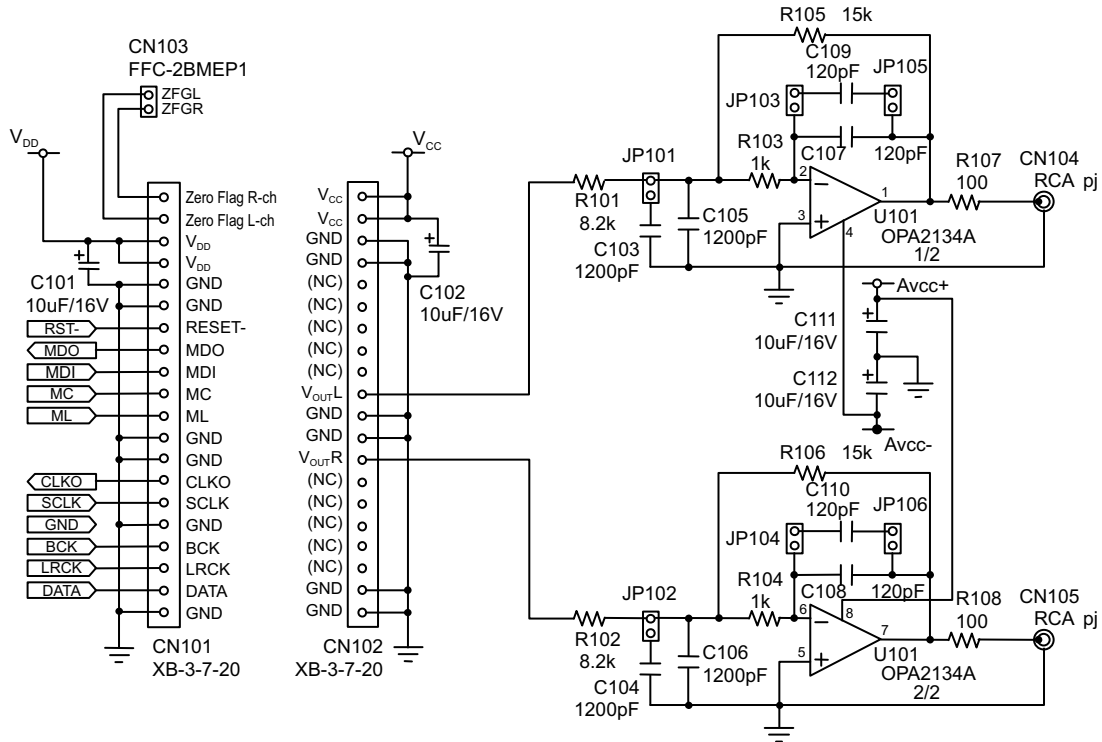


Figure 2. DEM-DAI/DAC Daughtercard Sockets

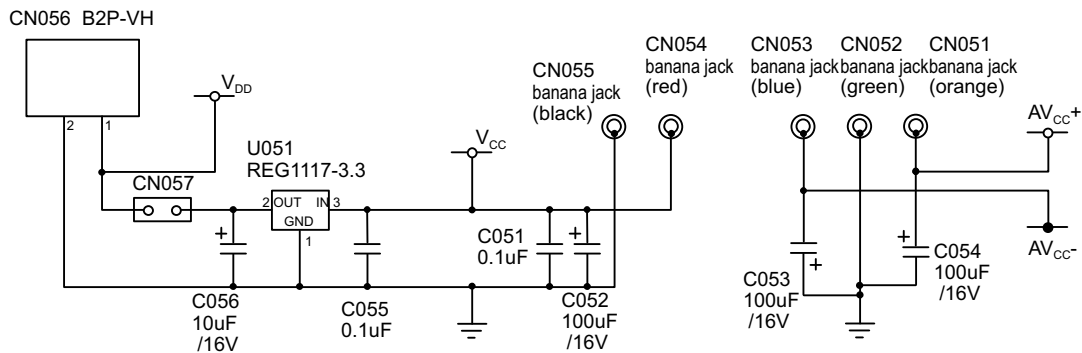


Figure 3. DEM-DAI/DAC Connector and Regulator

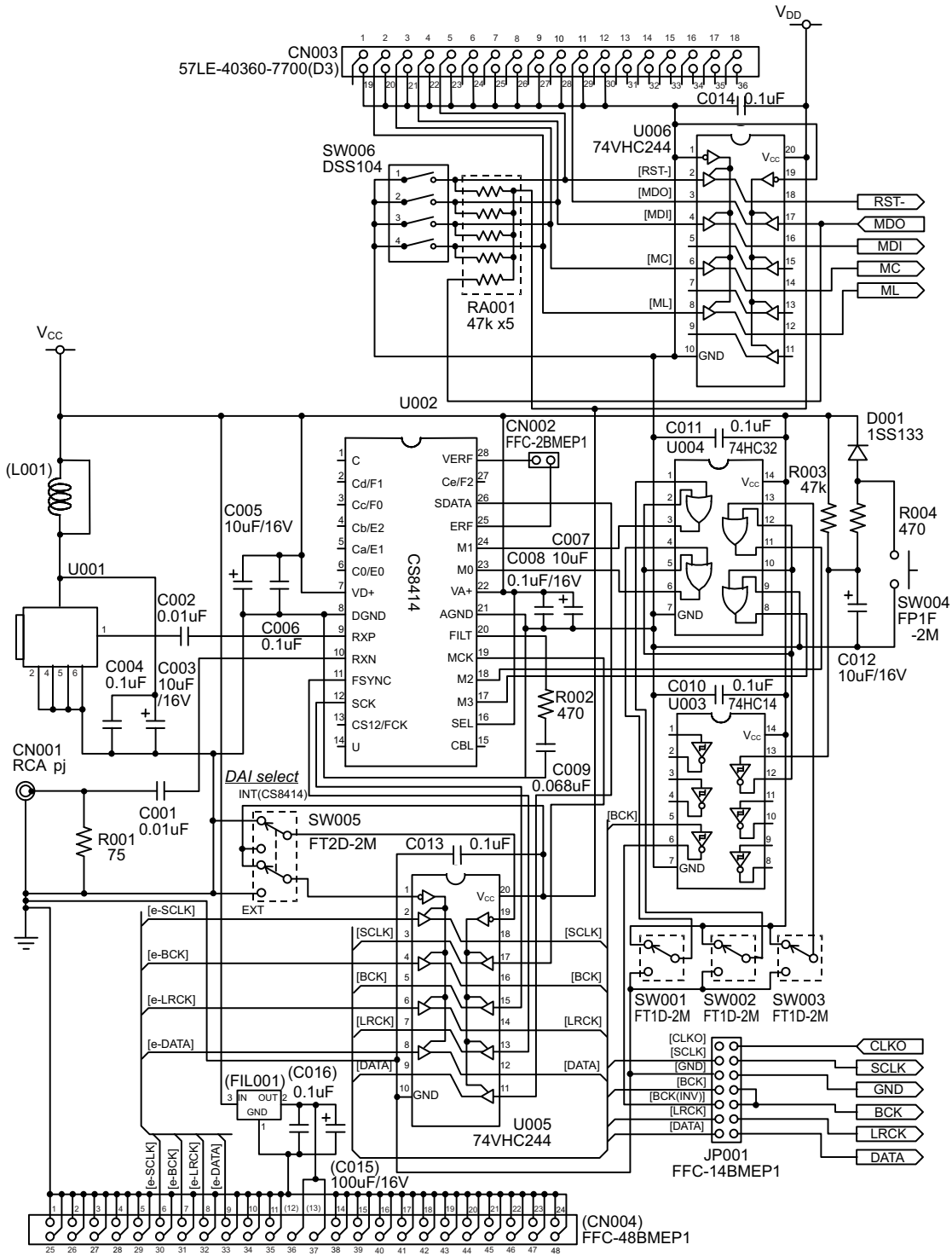


Figure 4. DEM-DAI/DAC Digital Audio Interface

2.2 DEM-PCM1780/1781/1782 Daughtercard Schematics

This daughtercard is a common board for both the PCM1680 (8ch DAC) and the PCM1780/1781/1782; both footprints are the same.

The schematics show an 8-channel version.

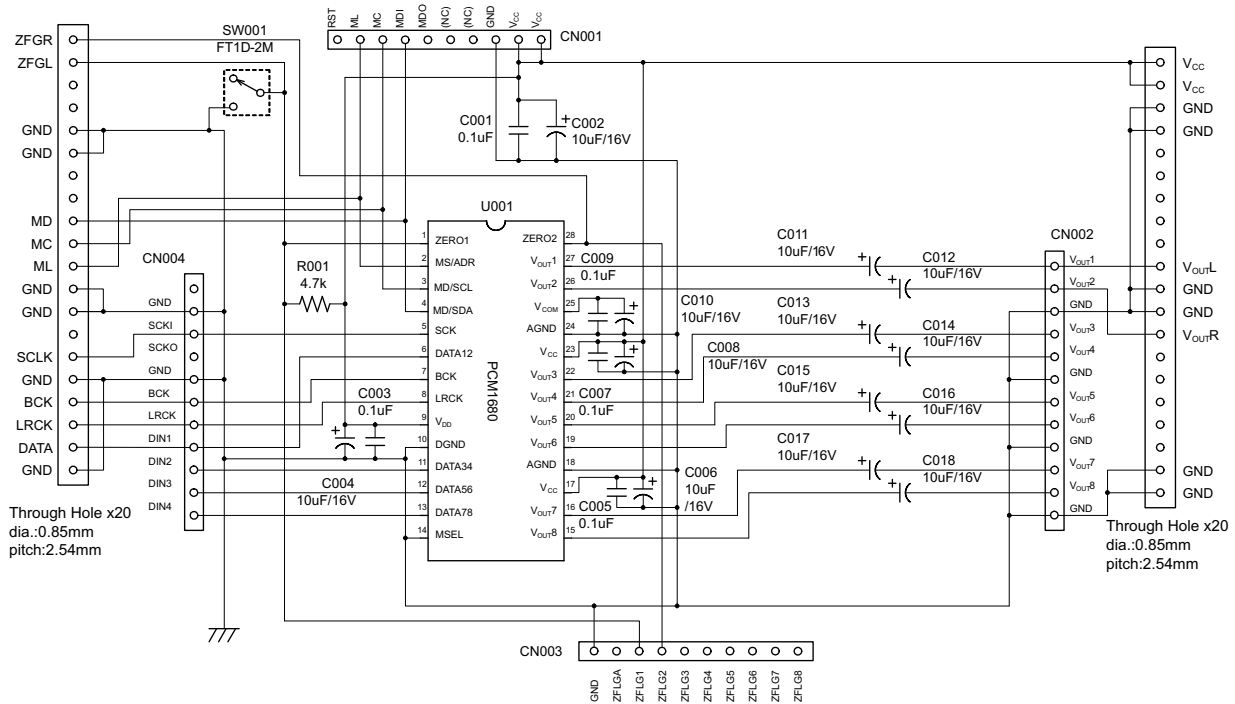


Figure 5. DEM-PCM1780/1781/1782

2.3 DEM-DAI/DAC Parts List

Qty	Ref. No.	Type	Model	Value	Manufacturer
2	C001,C002	Polyester Film Capacitor	AMFF0050J103	0.01 μ F, J	NISSEI
4	C004, C006, C008, C016,C051	Polyester Film Capacitor	AMFF0050J104	0.1 μ F, J	NISSEI
1	C009	Polyester Film Capacitor	AMFF0050J683	0.068 μ F, J	NISSEI
5	C010, C011, C013, C014,C055	Ceramic Capacitor	D55Y5V1H104Z51	0.1 μ F	NEC
5	C003,C005,C007,C111,C112	AL EL Capacitor	ROA-16V100M	10 μ F/16 V	ELNA
3	C015, C052–C054	AL EL Capacitor	ROA-16V101M	100 μ F/16 V	ELNA
2	C101, C102	AL EL Capacitor	R3A-16V100M	10 μ F/16 V	ELNA
4	C103–C106	Polypropylene Capacitor	APSF0100J122	1200pF	NISSEI
4	C107–C110	Polypropylene Capacitor	APSF0100J121	120pF	NISSEI
1	C012	AL EL Capacitor	SME16VB10M	10 μ F/16 V	Nippon Chemi Con
1	C056	Tantalum Capacitor	DN1C100M1S	10 μ F/16V	NEC
1	CN003	Centronics	57LE40360-7700(D3)		DAIICHI DENSHI
3	CN002, CN057, CN103	2 pin Connector	FFC-2BMEP1		HONDA TSUSHIN
1	CN105	RCA Connector (red)	LPR6520-0802		SMK
1	CN104	RCA Connector (white)	LPR6520-0803		SMK
1	CN001	RCA Connector (yellow)	LPR6520-0804		SMK
1	CN051	Banana Jack (orange)	T-45		SATO PARTS

Schematic and Printed-Circuit Board

Qty	Ref. No.	Type	Model	Value	Manufacturer
1	CN052	Banana Jack (green)	T-45		SATO PARTS
1	CN053	Banana Jack (blue)	T-45		SATO PARTS
1	CN054	Banana Jack (red)	T-45		SATO PARTS
1	CN055	Banana Jack (black)	T-45		SATO PARTS
1	CN056	VH Connector 2 PIN	B2P-VH		J.S.T. Connector
2	CN101,CN102	Connector 20 PIN	XB-3-7-20		MAC8
1	D001	Diode	1SS133		ROHM
1	JP001	14 pin Connector	FFC-14BMEP1		HONDA TSUSHIN
6	JP101–JP106	2 pin Connector	FFC-2BMEP1		HONDA TSUSHIN
1	R001	1/4W Resistor	SN14C2C	75[Ω], F, 1/4W	KOA
2	R107, R108	1/4W Resistor	SN14C2C	100[Ω], F, 1/4W	KOA
2	R002, R004	1/4W Resistor	SN14C2C	470[Ω], F, 1/4W	KOA
2	R103, R104	1/4W Resistor	SN14C2C	1k[Ω], F, 1/4W	KOA
2	R101, R102	1/4W Resistor	SN14C2C	8.2k[Ω], F, 1/4W	KOA
2	R105, R106	1/4W Resistor	SN14C2C	15k[Ω], F, 1/4W	KOA
1	R003	1/4W Resistor	SN14C2C	47k[Ω], F, 1/4W	KOA
1	RA001	Resistor Array	M6-1-473J	47k[Ω] x5	BI
1	U001	TOSLINK Optical Connector	TORX179P		TOSHIBA
1	U002	Digital Audio I/F Receiver IC	CS8414-CS		CIRRUS
1	U003	Logic IC	TC74VHC14AF		TOSHIBA
1	U004	Logic IC	TC74HCT32AF		TOSHIBA
2	U005, U006	Logic IC	TC74VHC244F		TOSHIBA
1	U051	Regulator IC	REG1117-3.3		Burr-Brown
1	U101	IC Socket DIP 8 pin	100-008-000		3M
3	SW001, SW002, SW003	DIP Switch	FT1D-2M		FUJISOKU
1	SW004	Push Switch	FP1F-2M		FUJISOKU
1	SW005	DIP Switch	FT2D-2M		FUJISOKU
1	SW006	DIP Switch	DSS104		FUJISOKU
4		Spacer	AR-325B		HIROSUGI KEIKI

2.4 DEM-PCM1780/1781/1782 Parts List

Qty	Ref. No.	Type	Model	Value	Manufacture
3	C001, C007, C009	Chip Ceramic Capacitor(2125)	GRM40F104Z50PT	0.1 μF	MURATA
5	C002, C008, C010–C012	AL EL Capacitor	R3A-16V100M	10 μF/16V	ELNA
1	R001	1/4W Resistor	SN14C2C-4.7kΩF	4.7kΩ	KOA
1	SW001	DIP Switch	FT1D-2M		FUJISOKU
1	U001	Logic IC	PCM1780		TI

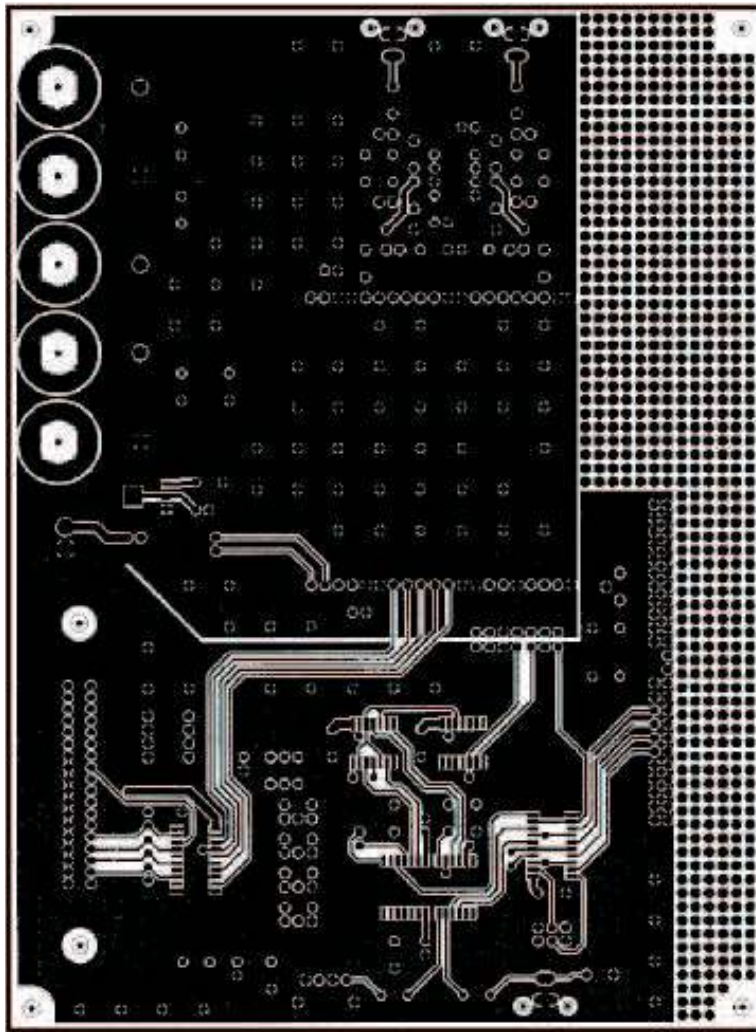


Figure 7. DEM-DAI/DAC Top View

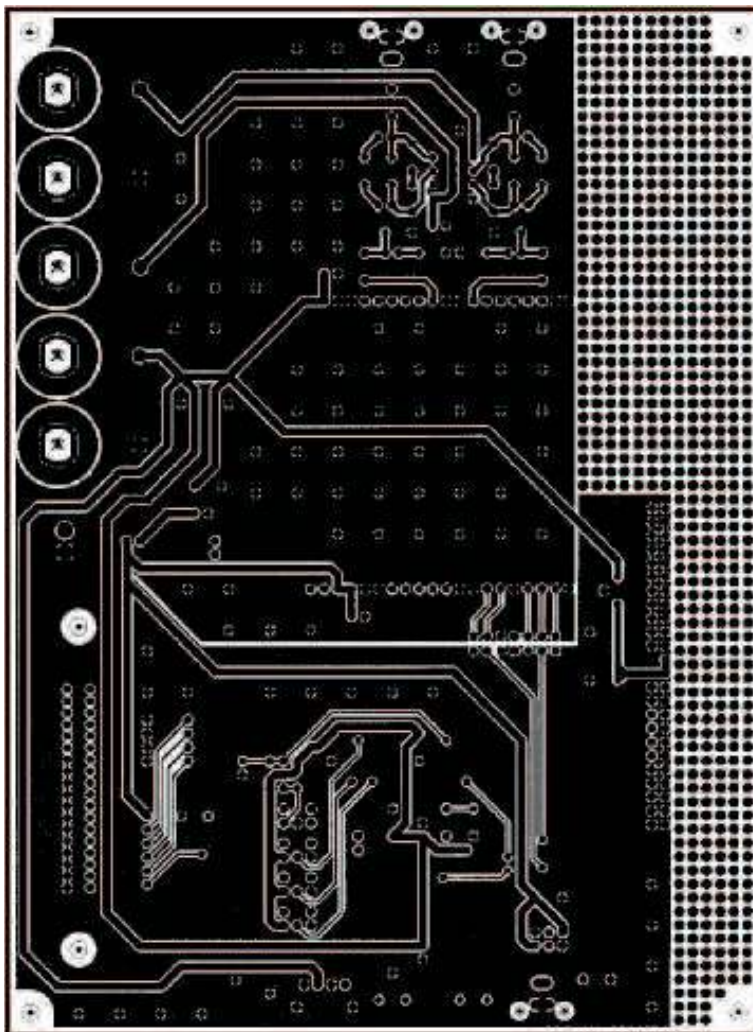


Figure 8. DEM-DAI/DAC Bottom View

2.6 DEM-PCM1780/1781/1782 Daughtercard Printed-Circuit Board

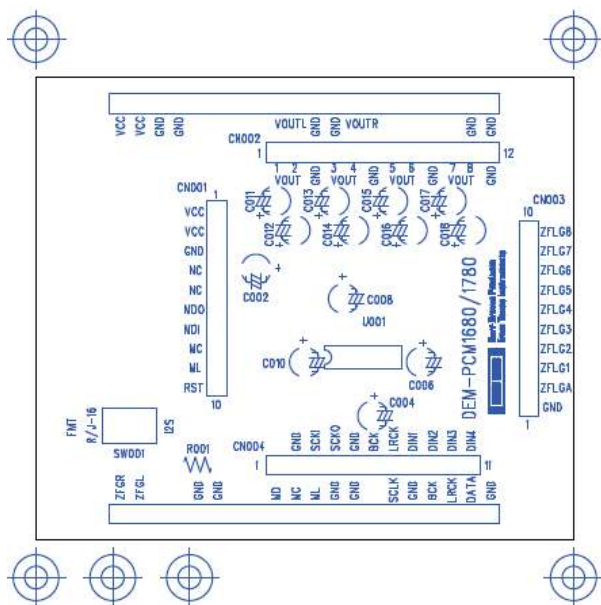


Figure 9. DEM-PCM1780/1781/1782 Silkscreen

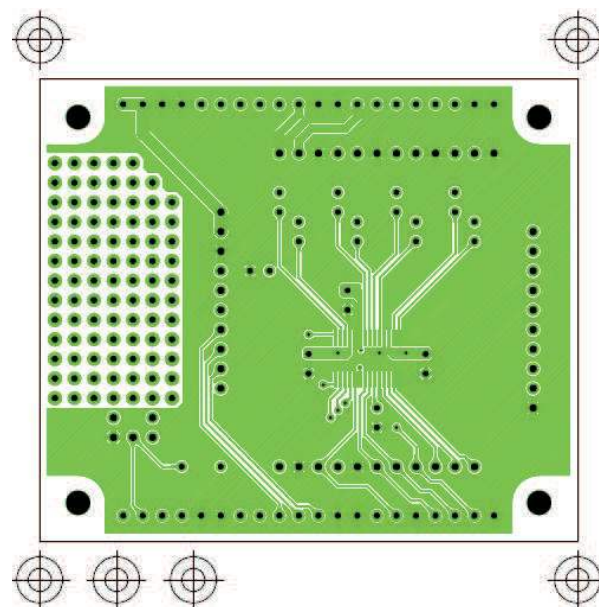


Figure 10. DEM-PCM1780/1781/1782 Top View

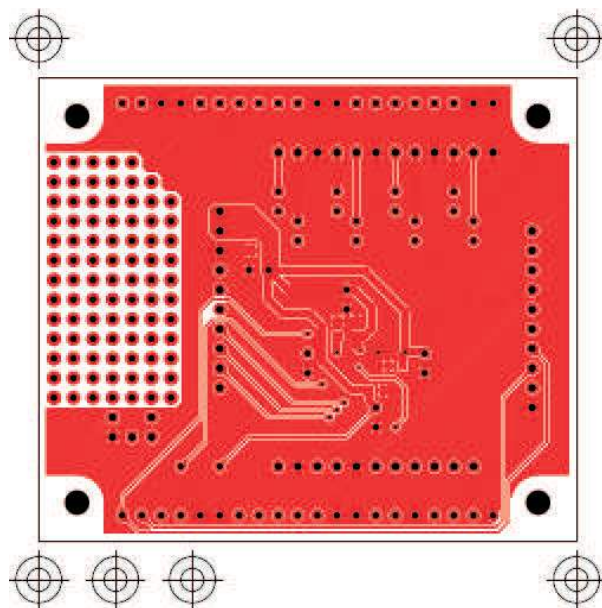


Figure 11. DEM-PCM1780/1781/1782 Bottom View

3 Demonstration Software

Software provided with the EVM board to allow programming of the PCM1608 internal registers. The software operates on computers running Microsoft Windows™ 3.1, 95, 98, 2000 or XP.

The demonstration software requires connection of the PC printer port to CN-2 of the EVM board using a standard printer cable.

3.1 Installation

The demonstration software is distributed on a CD-ROM.

To install the software on your PC computer, first create a new folder on your hard drive with an appropriate name (such as DEM1608). Then, open the DEMxxxx folder on the installation CD-ROM and copy all its files to your new folder.

Open the configuration setting file named # DEMxxxx using a text editor, such as Notepad. After the file opens, search for the following line:

```
PCMIFADR = &h378
```

The &h378 indicates the printer port address that the demonstration software uses to communicate with the EVM board.

This address must be set to %h378, &h278, or &h3BC. Most PCs use &h378 as the default printer port address. If your printer port is not located at &h378, edit the address to match your computer's port address.

3.2 Using the Demonstration Software

Double-click on the application file named DEMxxxx. A window appears on your screen with two menu selections (Execute and Window) near the top of the window.

The Execute menu includes three selections: Initialize, Reset, and Exit. Selecting Initialize instructs the program to write all of the PCMDAC internal registers with the default values.

Reset instructs the program to rewrite the PCMDAC internal registers with the data currently elected in the application windows. Exit closes the application.

3.3 HOLD and PASS

Each window has a button near the top which is labeled either HOLD or PASS. The current setting is toggled by clicking on this button. When set to HOLD, the settings in a window can be changed, but are not written to the register(s) until the OK button (which appears at the bottom of the window) is pressed.

When set to PASS, any setting changes made in a window are immediately written to the corresponding register(s).

EVALUATION BOARD/KIT IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive.**

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.**

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

FCC Warning

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to 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 will be required to take whatever measures may be required to correct this interference.

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of +5 V and the output voltage range of -15 V to +15 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 55°C. The EVM is designed to operate properly with certain components above 55°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2007, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Telephony	www.ti.com/telephony
Low Power Wireless	www.ti.com/lpw	Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2007, Texas Instruments Incorporated