EVAL-AD5600PMDZ User Guide

UG-1584

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Evaluating the AD5600 High Temperature,16-Bit, Unbuffered Voltage Output DAC, SPI Interface

FEATURES

Full featured evaluation board for the AD5600
On-board references
Various link options
PC control in conjunction with the Analog Devices, Inc., SDP

EVALUATION KIT CONTENTS

EVAL-AD5600PMDZ
SDP-PMD-IB1Z

HARDWARE REQUIRED

EVAL-SDP-CB1Z (SDP-B) board, must be purchased separately

SOFTWARE REQUIRED

Analysis, control, evaluation (ACE) software, available for download from the EVAL-AD5600PMDZ product page

GENERAL DESCRIPTION

This user guide details the operation of the EVAL-AD5600PMDZ for the AD5600 voltage output, digital-to-analog converter (DAC).

The EVAL-AD5600PMDZ is designed to help users quickly prototype AD5600 circuits and reduce design time. The AD5600 operates from a single 2.7 V to 5.5 V supply. The EVAL-AD5600PMDZ also incorporates high temperature ADR225 voltage reference and AD8634 buffer.

The EVAL-AD5600PMDZ interfaces to the USB port of a PC via a system demonstration platform (SDP) board and the SDP-PMD-IB1Z board. The ACE software is available for download from the EVAL-AD5600PMDZ product page to use with the evaluation board to allow the user to program the AD5600. A peripheral module (PMOD) connection is also available to allow the connection of microcontrollers to the evaluation board without the SDP board. Note that when a microcontroller is used through the PMOD connection, the SDP board must be disconnected, and the user is unable to operate the ACE software.

The EVAL-AD5600PMDZ is compatible with any Analog Devices SDP board, which can be purchased separately. A typical connection between the EVAL-AD5600PMDZ, the EVAL-SDP-CB1Z board (SDP-B controller board), and the SDP-PMD-IB1Z is shown in Figure 1.

For full details, see the AD5600 data sheet, which must be used in conjunction with this user guide when using the EVAL-AD5600PMDZ.

EVAL-AD5600PMDZ CONNECTED TO THE SDP-B BOARD AND SDP-PMD-IB1Z BOARD

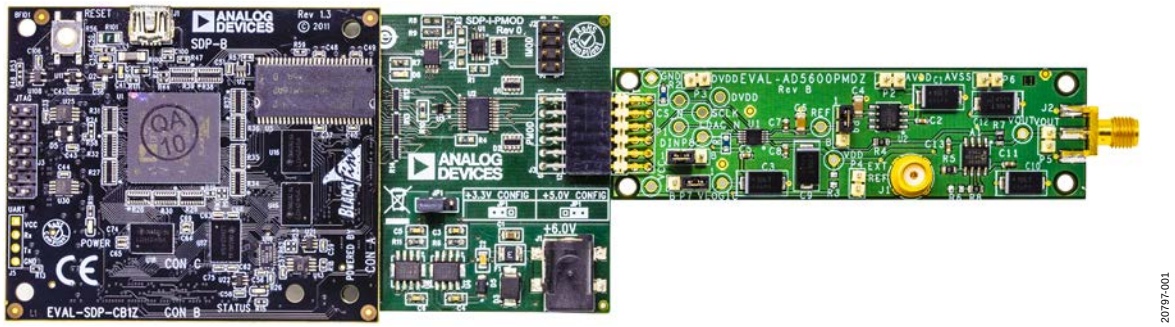

Figure 1.

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REVISION HISTORY

10/2019—Revision 0: Initial Version

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

INSTALLING THE SOFTWARE

The EVAL-AD5600PMDZ uses the ACE evaluation software, a desktop software application that allows the evaluation and control of multiple evaluation systems.

The ACE installer installs the necessary SDP drivers and the Microsoft® .NET Framework 4 by default. The ACE software is available for download from the EVAL-AD5600PMDZ product page, and must be installed before connecting the SDP board to the USB port of the PC to ensure that the SDP board is recognized when it connects to the PC. For full instructions on how to install and use this software, see the ACE software page on the Analog Devices website.

After the installation is finished, the EVAL-AD5600PMDZ icon appears when the ACE software is opened.

INITIAL SETUP

To set up the EVAL-AD5600PMDZ, take the following steps:

1. Connect the evaluation boards as shown in Figure 1, and then connect the USB cable between the SDP-B board and the PC.
2. Run the ACE application. The EVAL-AD5600PMDZ icon appear in the attached hardware pane of the **Start** tab.
3. Double click the board icon to open the board view shown in Figure 2.
4. Double click the **AD5600** icon in Figure 2 to access the chip block diagram. This view provides a basic representation of the functionality of the board. The main function blocks of the board are labeled in Figure 3.

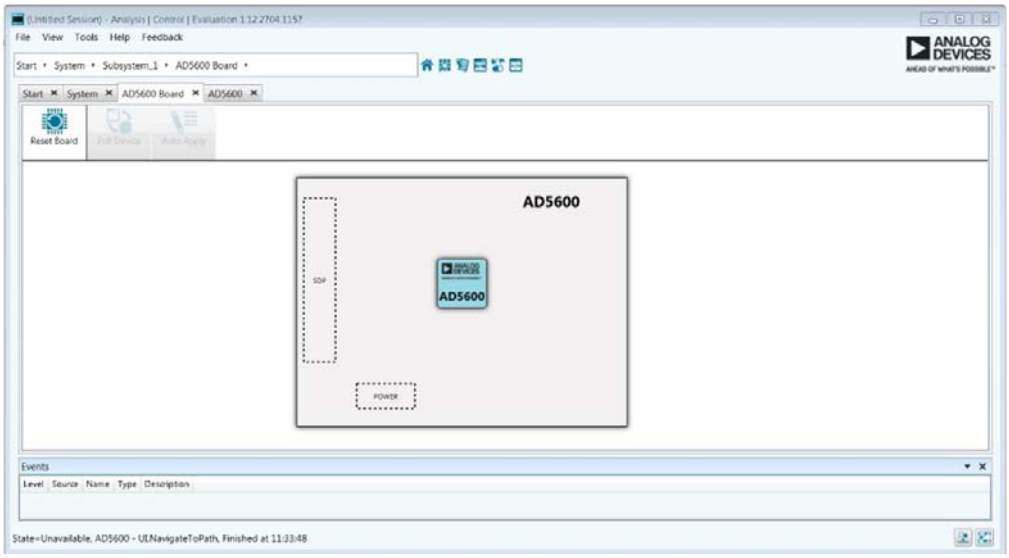

Figure 2. Board View of the EVAL-AD5600PMDZ

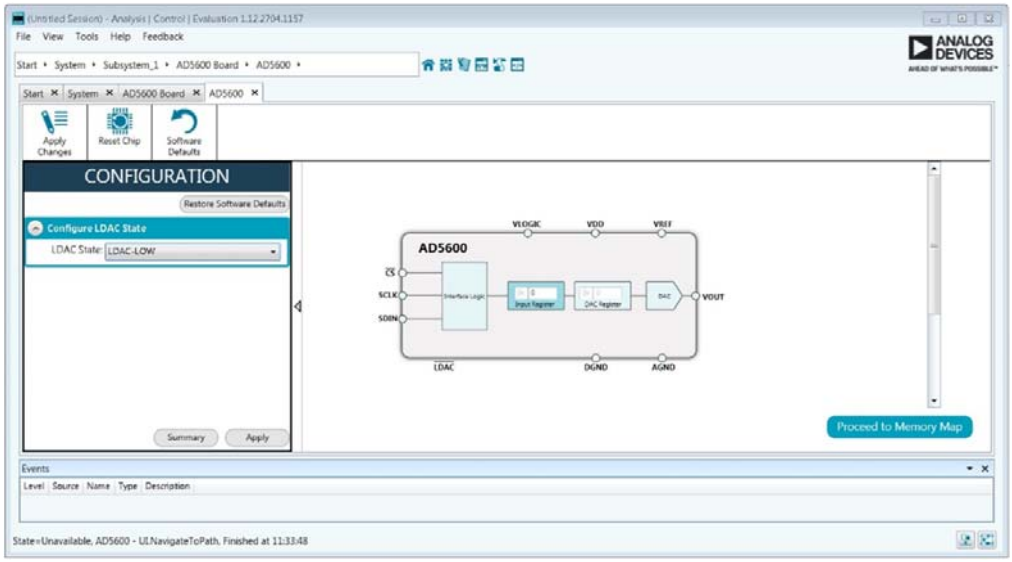

Figure 3. Chip Block Diagram of the AD5600

BLOCK DIAGRAM AND DESCRIPTION

The EVAL-AD5600PMDZ software is organized to appear similar to the functional block diagram shown in the AD5600 data sheet. Therefore, correlating the functions on the EVAL-AD5600PMDZ with the descriptions in the AD5600 data sheet is simplified.

For a full description of each block, register, and its settings, see the AD5600 data sheet.

Some of the blocks and their functions are described in this section as they pertain to the evaluation board. The block diagram is shown in Figure 4. Table 1 describes the functionality of each block.

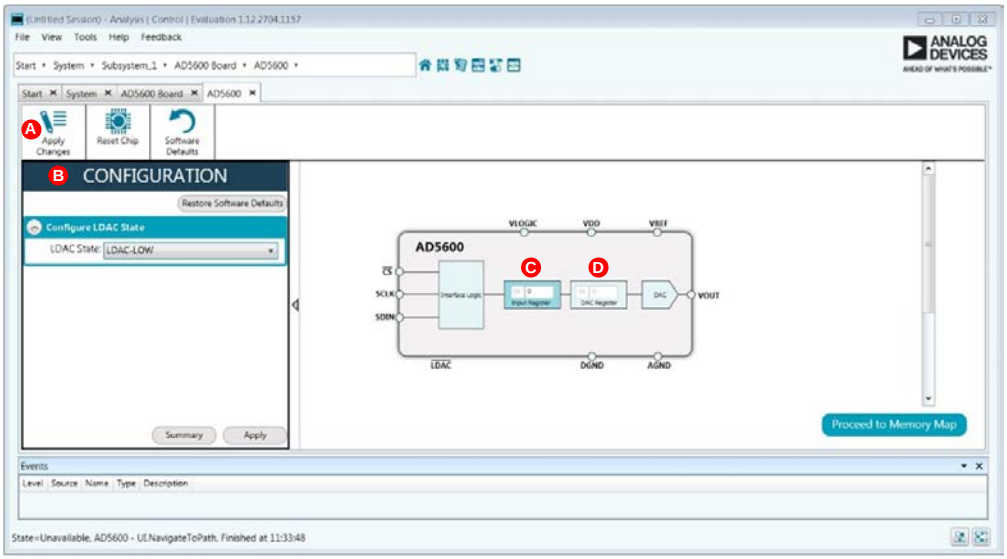

Figure 4. AD5600 Block Diagram with Labels

Table 1. Block Diagram Functions (See Figure 4 for Labels)

Label	Button/Function Name	Function
A	**Apply Changes**	Applies all modified values to the device. Note that if an evaluation board is not connected, values entered into the input registers are not transferred to the DAC registers.
B	**CONFIGURATION** Wizard	Used to set the initial configuration for the EVAL-AD5600PMDZ. Select the LDAC pin configuration from the **LDAC State** dropdown box. A gain of 1 is the default. After setting up the initial configuration, click **Apply** to apply the values. These settings can be modified at any stage while evaluating the EVAL-AD5600PMDZ.
C	**Input Register**	16-bit data word to be transferred to the device. Click **Apply Changes** (Label A) to transfer this 16-bit dataword to the device.
D	**DAC Register**	Displays the value that is currently present in the DAC register on the device. Update the DAC registers by selecting **LDAC-LOW** from the **LDAC State** dropdown box.

EVALUATION BOARD HARDWARE

POWER SUPPLIES

The EVAL-AD5600PMDZ requires an external source for the analog and digital supply. See Table 2 for more details.

Both AGND and DGND inputs are provided on the EVAL-AD5600PMDZ. The AGND and DGND planes are connected at one location close to the AD5600. To avoid ground loop problems, it is recommended that AGND and DGND not be connected elsewhere in the system.

All supplies are decoupled to ground with 10 µF tantalum and 0.1 µF ceramic capacitors.

TEST POINTS

The EVAL-AD5600PMDZ has various test points for debugging and monitoring purposes. These test points are described in Table 3.

VOLTAGE REFERENCES

The EVAL-AD5600PMDZ has an on-board voltage reference with a value of 2.5 V. Note that the ADR225 requires the use of an external supply through the AVDD connector (see Table 2).

LINK OPTIONS

A number of link options are incorporated on the EVAL-AD5600PMDZ and must be set for the required operating conditions before using the board. The functions of these link options are described in Table 4.

Table 2. Power Supply Connectors

Connector No.	Label	External Voltage Supplies Description
P2-1	AVDD	Positive analog supply. Connect 5.0 V to this terminal.
P6-1	AVSS	Negative analog supply. Connect −5.0 V to this terminal.
P2-2, P6-2	AGND	Analog ground.
P3-1	DVDD	Digital supply. Connect 5.0 V to this terminal.
P3-2	DGND	Digital ground.

Table 3. Test Point Descriptions[1]

Test Point	Description
GND	Board ground.
VCC	PMOD digital supply.
DVDD	External digital supply.
VLOGIC	IOVDD digital supply.
VDD	VDD analog supply.
CS_N	Chip select.
DIN	Serial data input signal.
SCLK	Serial clock input signal.
LDAC_N	$\overline{\text{LDAC}}$ input signal.
VOUT	Buffered DAC output voltage.

[1] These test points are not populated on the evaluation board, but the user can use the copper pads to solder the test points.

Table 4. Link Options Setup for SDP Control

Link	Position	Description
P7	A (default)	VLOGIC test point is connected to DVDD.
	B	VLOGIC test point is connected to the VCC test point on PMOD.
P8	A (default)	$\overline{\text{LDAC}}$ is connected to PMOD.
	B	$\overline{\text{LDAC}}$ is connected to ground.
P9	A (default)	VREF is connected to ADR225 output.
	B	VREF is connected to J1. Connect an external reference voltage to J1.

EVALUATION BOARD SCHEMATICS AND ARTWORK

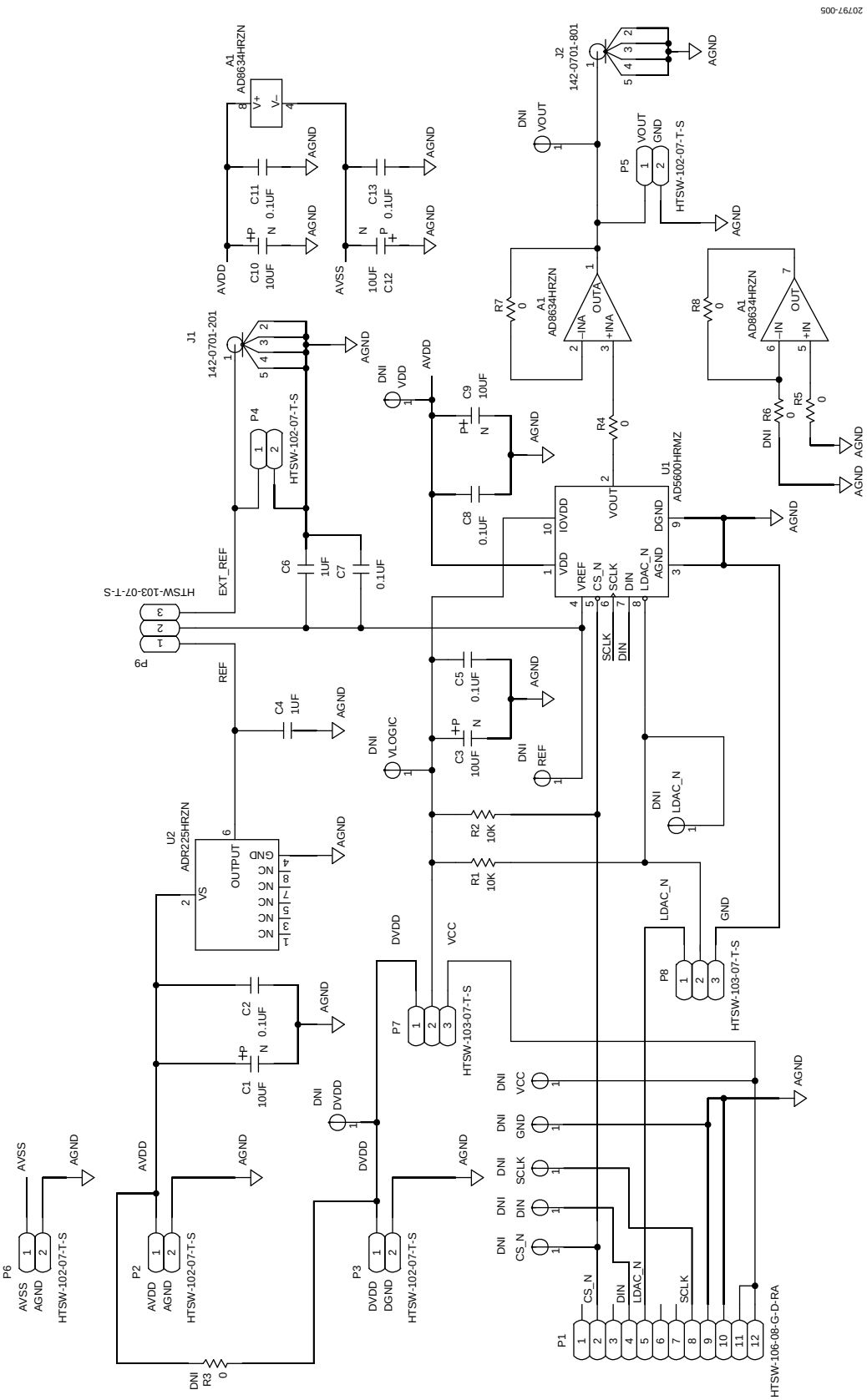

Figure 5. EVAL-AD5600PMDZ Schematic: Power Supply and Signal Routes

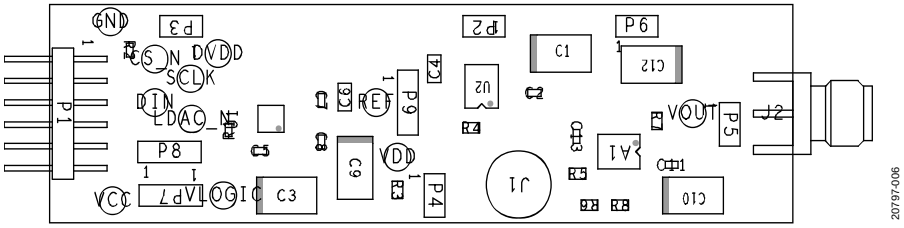

Figure 6. EVAL-AD5600PMDZ Component Placement

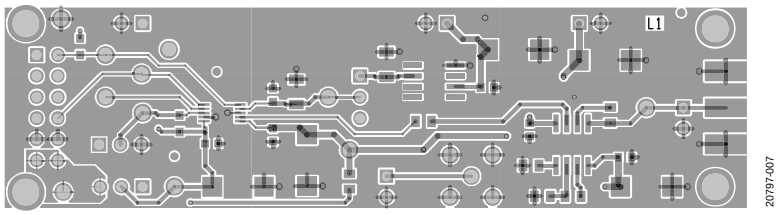

Figure 7. EVAL-AD5600PMDZ Top Side Routing

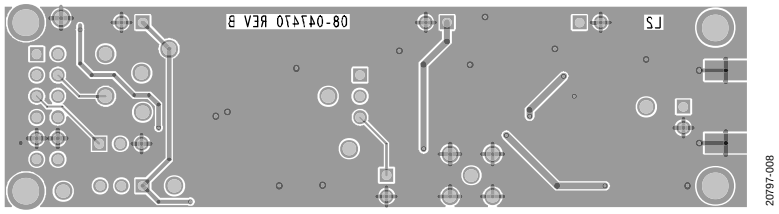

Figure 8. EVAL-AD5600PMDZ Bottom Side Routing

ORDERING INFORMATION

BILL OF MATERIALS

Table 5.

Qty	Reference Designator	Description	Supplier/Part Number	Manufacturing Part Number
5	C1, C3, C9, C10, C12	Capacitors, 10 µF, 50 V	AVX	THJD106K050RJN
6	C2, C5, C7, C8, C11, C13	Capacitors, 0.1 µF, 25 V, 0603	KEMET	C0603C104K3RACTU
2	C4, C6	Capacitors, 1 µF, 25 V, 1206	KEMET	C1206R105K3RAC7800
1	J1	Surface-mount type A (SMA) connector straight	CINCH Connectivity Solutions	142-0701-201
1	J2	SMA connector end launch	CINCH Connectivity Solutions	142-0701-801
1	P1	12-pin PMOD connector	SAMTEC	HTSW-106-08-G-D-RA
5	P2, P3, P4, P5, P6	2-pin header, 1 position link/jumper	SAMTEC Inc.	HTSW-102-07-T-S
3	P7, P8, P9	3-pin header, 2 position link/jumper	SAMTEC Inc.	HTSW-103-07-T-S
2	R1, R2	Resistors, 10 kΩ, 1%, 1/8W, 0603	Vishay	CHPHT0603K1002FGT
4	R4, R5, R7, R8	Resistors, 0 Ω, 1%, 1/8W, 0805	Panasonic	ERJ-6GEY0R00V
2	R3, R6	Resistors, 0 Ω, 1%, 1/8W, 0805	Panasonic	Not Inserted
1	U1	High temperature, 16-bit, unbuffered voltage output DAC	Analog Devices	AD5600HRMZ
1	U2	High temperature, low drift, micropower 2.5 V reference	Analog Devices	ADR225HRZN
1	A1	High temperature, low power op amp	Analog Devices	AD8634HRZN