

Evaluation Board for **AD5663R/AD5667R** 16-Bit Dual-Channel Voltage Output DACs

FEATURES

Full featured evaluation board for the **AD5663R** and **AD5667R**

Flexible configuration options

On-board references

PC control in conjunction with Analog Devices, Inc.

EVAL-SDP-CB1Z system demonstration platform (SDP)

PACKAGE CONTENTS

EVAL-AD5663R-SDZ/EVAL-AD5667R-SDZ evaluation board

GENERAL DESCRIPTION

This user guide details the operation of the evaluation board for the **AD5663R** and the **AD5667R**. These are 16-bit, dual-channel, voltage output digital-to-analog converters (DACs). The **AD5663R** uses a serial peripheral interface (SPI) for configuration and control, whereas the **AD5667R** uses an I²C interface.

The evaluation board is designed to allow straightforward customer evaluation of the device using the hardware and software provided. The evaluation board can also be used to quickly create a prototype with the **AD5663R/AD5667R**, reducing design time. The **AD5663R/AD5667R** operate from a single 2.7 V to 5.5 V supply.

Full data on the **AD5663R/AD5667R** can be found in the appropriate data sheets available from Analog Devices and should be consulted in conjunction with this user guide when using the evaluation board.

The evaluation board interfaces to the USB port of a PC via the SDP board.

This evaluation board requires the **EVAL-SDP-CB1Z** board (SDP-B controller board), which is available for order on the Analog Devices website at www.analog.com.

AD5663R/AD5667R EVALUATION BOARD

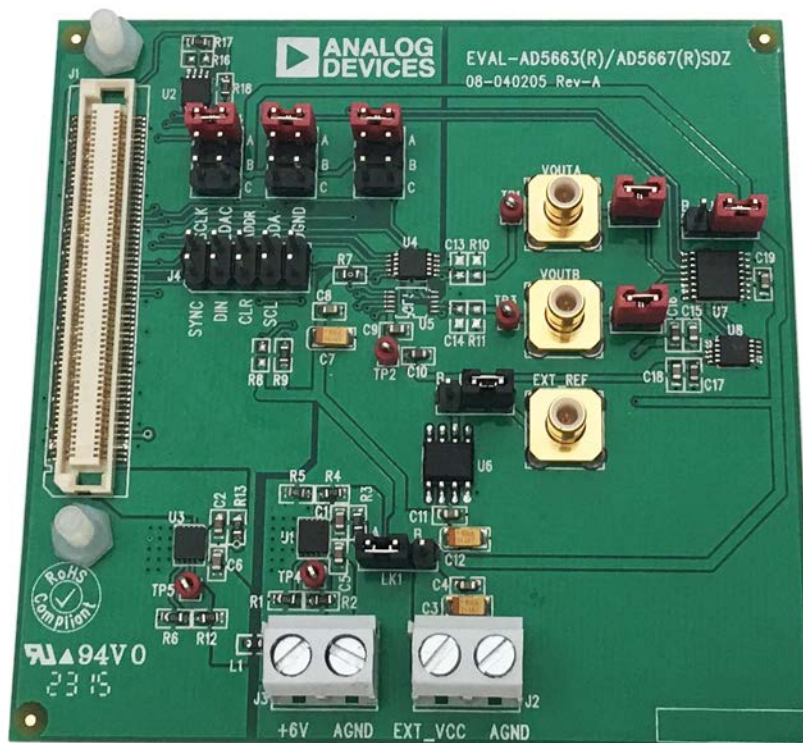


Figure 1. **AD5663R/AD5667R** Evaluation Board

TABLE OF CONTENTS

Features	1	Evaluation Board Software	4
Package Contents	1	Installing the Software	4
General Description	1	Initial Set Up	4
AD5663R/AD5667R Evaluation Board	1	AD5663R/AD5667R Block Diagram And Description	5
Revision History	2	Memory Map	6
Evaluation Board Hardware	3	Evaluation Board Schematics	7
Power Supplies	3	Ordering Information	9
Link Options	3	Bill of Materials	9

REVISION HISTORY

5/2016—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

POWER SUPPLIES

The [EVAL-AD5663R-SDZ](#) and [EVAL-AD5667R-SDZ](#) evaluation board can be powered by the J3 or J2 connector. Supply the J3 connector with 6 V to 20 V and is regulated by the [ADP7102](#) low noise, complimentary metal-oxide semiconductor (CMOS) low dropout regulator (LDO). Alternatively, the J2 connector can provide power to the board, bypassing the LDOs, and is intended for use with well regulated, bench supplies. All supplies are decoupled to ground with 10 μ F tantalum and 0.1 μ F ceramic capacitors.

Table 1. Power Supply Connectors

Connector No.	Label	Voltage
J3, Pin 1	+6 V	Single 6 V power supply, used to generate the INT_VCC board supply
J3, Pin 2	AGND	Analog ground
J2, Pin 1	EXT_VCC	External V _{CC}
J2, Pin 2	AGND	Analog ground

Table 3. Link Functions

Link Number	Function
LK1	This link selects the positive voltage source (VCC) for the board. Position A selects the output from the LDO ADP7102 as the voltage source for the board (supplied by 6 V). Position B selects the external voltage as the voltage source for the board.
LK2	This link selects the LDAC pin voltage source. Position A selects the voltage source from the SDP general-purpose input/output (GPIO). Position B selects the voltage source (VCC). Position C selects AGND.
LK3	This link selects the CLR pin voltage source. Position A selects the voltage source from the SDP GPIO. Position B selects the voltage source (VCC). Position C selects AGND.
LK4	This link selects the ADDR pin voltage source, which sets the [A1:A0] I ² C address bits on the AD5667R . Position A selects the voltage source from the SDP GPIO. Address bits depend on state of GPIO. Position B selects the voltage source (VCC), giving address bits of 00. Position C selects AGND, giving address bits of 11. This jumper can also be no connection, giving address bits of 10.
LK5	This link selects the reference voltage source. Position A allows use of the internal reference, or can also be used to apply an external reference after the internal reference is disabled. Position B connects the evaluation board reference to the DAC. This position must only be used after the internal reference is disabled.
LK6	This link connects the ADG728 switch and the AD7992 analog-to-digital converter (ADC) to V _{OUTA} of the DAC. Inserted: connected. Removed: not connected.
LK7	This link connects the ADG728 switch and the AD7992 ADC to V _{OUTB} of the DAC. Inserted: connected. Removed: not connected.
LK8	This link selects the RESET pin voltage level. Position A selects the voltage source VCC. Position B selects AGND.

LINK OPTIONS

A number of link options are provided on the [EVAL-AD5663R-SDZ](#) and [EVAL-AD5667R-SDZ](#) board that must be set for the required operating conditions before using the board. Table 2 describes the positions of the links to control the evaluation board via the SDP board using a PC and external power supplies. The functions of these link options are described in detail in Table 3.

Table 2. Link Options for SDP Control (Default)

Link Number	Option
LK1	A
LK2	A
LK3	A
LK4	B
LK5	A
LK6	Inserted
LK7	Inserted
LK8	A

EVALUATION BOARD SOFTWARE

INSTALLING THE SOFTWARE

The [EVAL-AD5663R-SDZ](#) and [EVAL-AD5667R-SDZ](#) evaluation board uses the Analog Devices Analysis Control Evaluation (ACE) software. ACE is a desktop software application that allows the evaluation and control of multiple evaluation systems.

The ACE installer installs necessary SDP drivers and .NET Framework 4 by default. Install ACE 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. Follow this link to download the software, and access full instructions on how to install and use this software: <http://www.analog.com/ace>.

After the installation is finished, the [EVAL-AD5663R-SDZ](#) and [EVAL-AD5667R-SDZ](#) evaluation board plug-ins appear when you open ACE.

INITIAL SET UP

To set up the evaluation board, complete the following steps:

1. Connect the evaluation board to the SDP board and connect the SDP board to the computer via a USB cable.
2. Power the evaluation board as described in the Power Supplies section.
3. Run the ACE application. The [EVAL-AD5663R-SDZ/](#) [EVAL-AD5667R-SDZ](#) board plug-ins appear in the attached hardware section of the **Start** tab.
4. Double-click on the board plug-in to open the board view seen in Figure 2.
5. The chip block diagram can be accessed by double-clicking on the [AD5663R](#) or [AD5667R](#) chip. This view provides a basic representation of functionality of the board. The main functions are labeled in Figure 3.

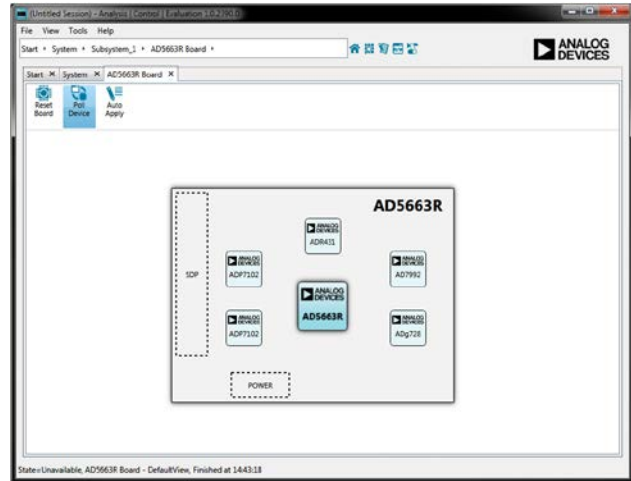


Figure 2. Board View of the [EVAL-AD5663R-SDZ](#)

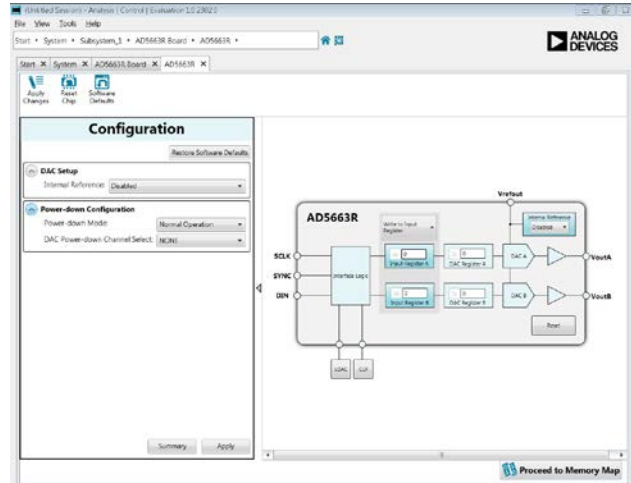


Figure 3. Chip Block Diagram view for the [AD5663R](#)

BLOCK DIAGRAM AND DESCRIPTION

The EVAL-AD5663R-SDZ/EVAL-AD5667R-SDZ software is organized so that it appears similar to the functional block diagram shown in the data sheets. In this way, it is easy to correlate the functions on the board with the description in the data sheets. A full description of each block, register, and its settings is given in the AD5663R/AD5667R data sheets.

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

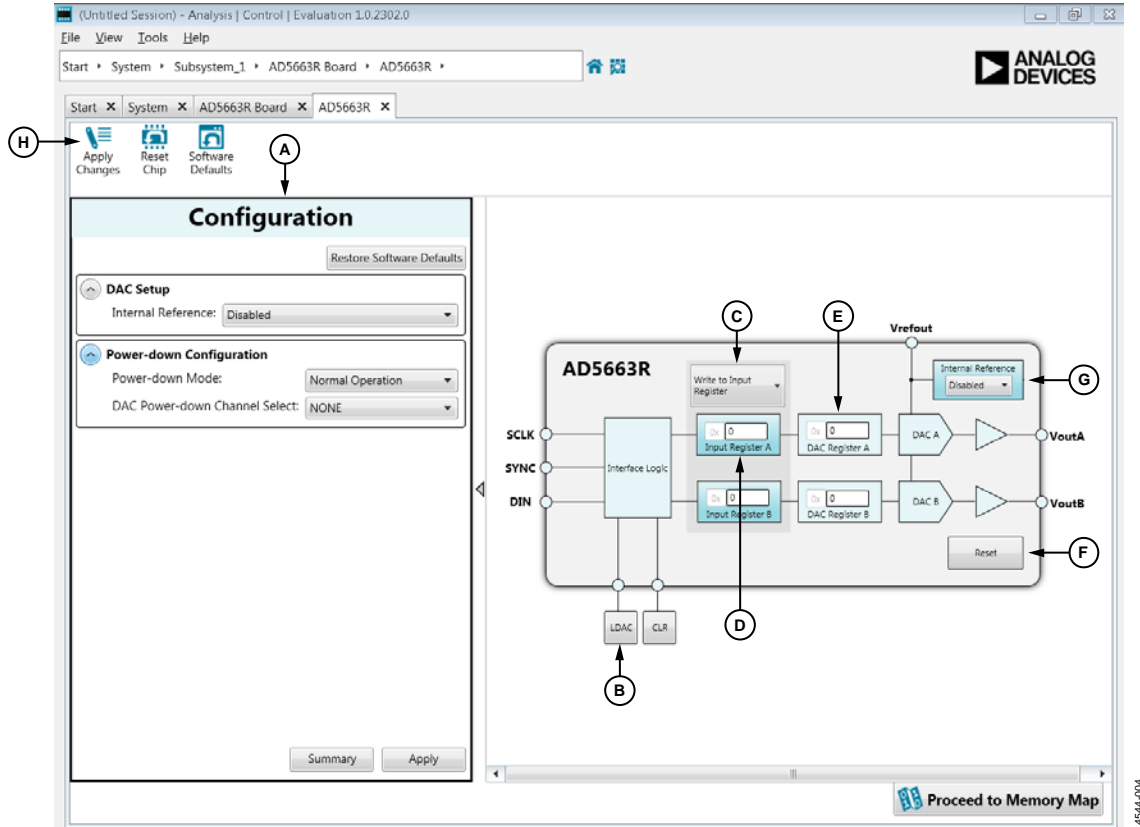


Figure 4. Block Diagram with Labels

Table 4. Block Diagram Functions

Label	Function
A	Configuration wizard: used to set the initial configuration for the board. From the DAC Setup drop-down menu, the internal reference can be enabled or disabled. The reference is disabled as default. From the Power-Down Mode drop-down menu, either channel can be configured as normal operation, powered down, or in a high impedance state. After setting up the initial configuration, click Apply and the values are applied. These settings can be modified at any stage while testing.
B	GPIO buttons: act as external GPIO pulses to the $\overline{\text{LDAC}}$ and $\overline{\text{CLR}}$ pins. The LDAC button pushes data from both input registers (D) to the DAC registers (E). The CLR button clears all data from input registers and DAC registers. These buttons are live, so there is no need to click Apply Changes (H).
C	Command Option drop-down menu: selects how the data being transferred to the device affects the input and DAC registers. After a data value is entered in either input register (see D), this menu determine if the data is transferred to the input register only, to the channel input register and channel DAC register (E), or to the channel input register and updates both DAC registers (E).
D	Input registers: 16-bit data word to be transferred to the device. Upon clicking the Apply Changes (H), this 16-bit data word is transferred to the device.
E	DAC registers: inaccessible registers, displays the value that is currently present in the DAC register on the device. The DAC registers can be updated by selecting the appropriate command option or by toggling LDAC (B).
F	Software reset: soft reset returns the board and software to default values. This button is live, so there is no need to click Apply Changes .
G	Internal reference: selecting enabled from this setting enables the on-chip reference for the board, if disabled is selected, an external reference must be applied.
H	Apply Changes : apply all modified values to the device.

MEMORY MAP

All registers are fully accessible from the memory map tab; this allows registers to be edited at a bit level. The bits shaded in dark gray are read only bits and cannot be accessed from ACE; all other bits are toggled. **Apply Changes** is used to transfer data to the device. All changes here correspond to the block diagram;

for example, if the internal register bit is enabled, it shows as enabled on the block diagram. Any bits or registers that are in bold are modified values that have not been transferred to the board. After **Apply Changes** is clicked, the data is transferred to the board.

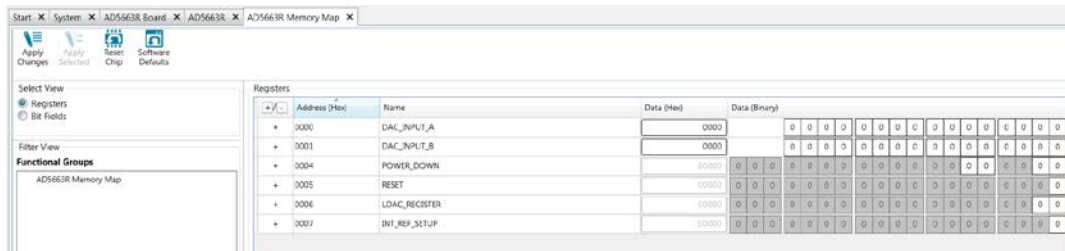


Figure 5. AD5663R Memory Map

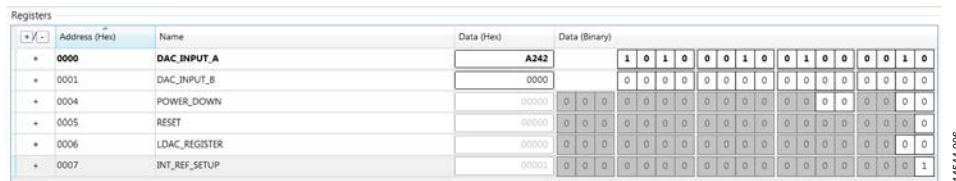
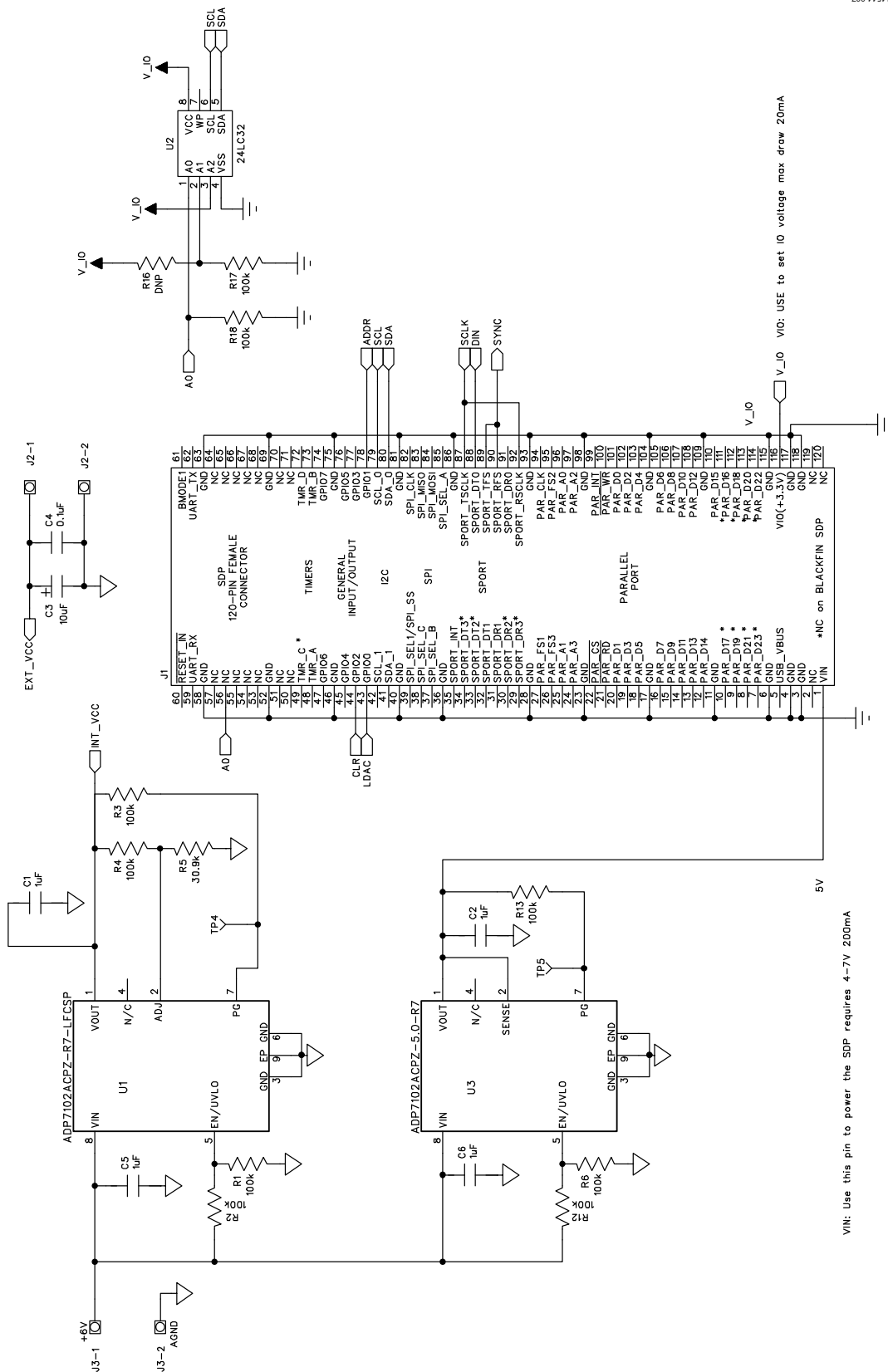


Figure 6. AD5663R Memory Map with Unapplied Changes in DAC_INPUT_A Register

EVALUATION BOARD SCHEMATICS



14544-007

Figure 7. Interface and Power Evaluation Board Schematics

8001145P1

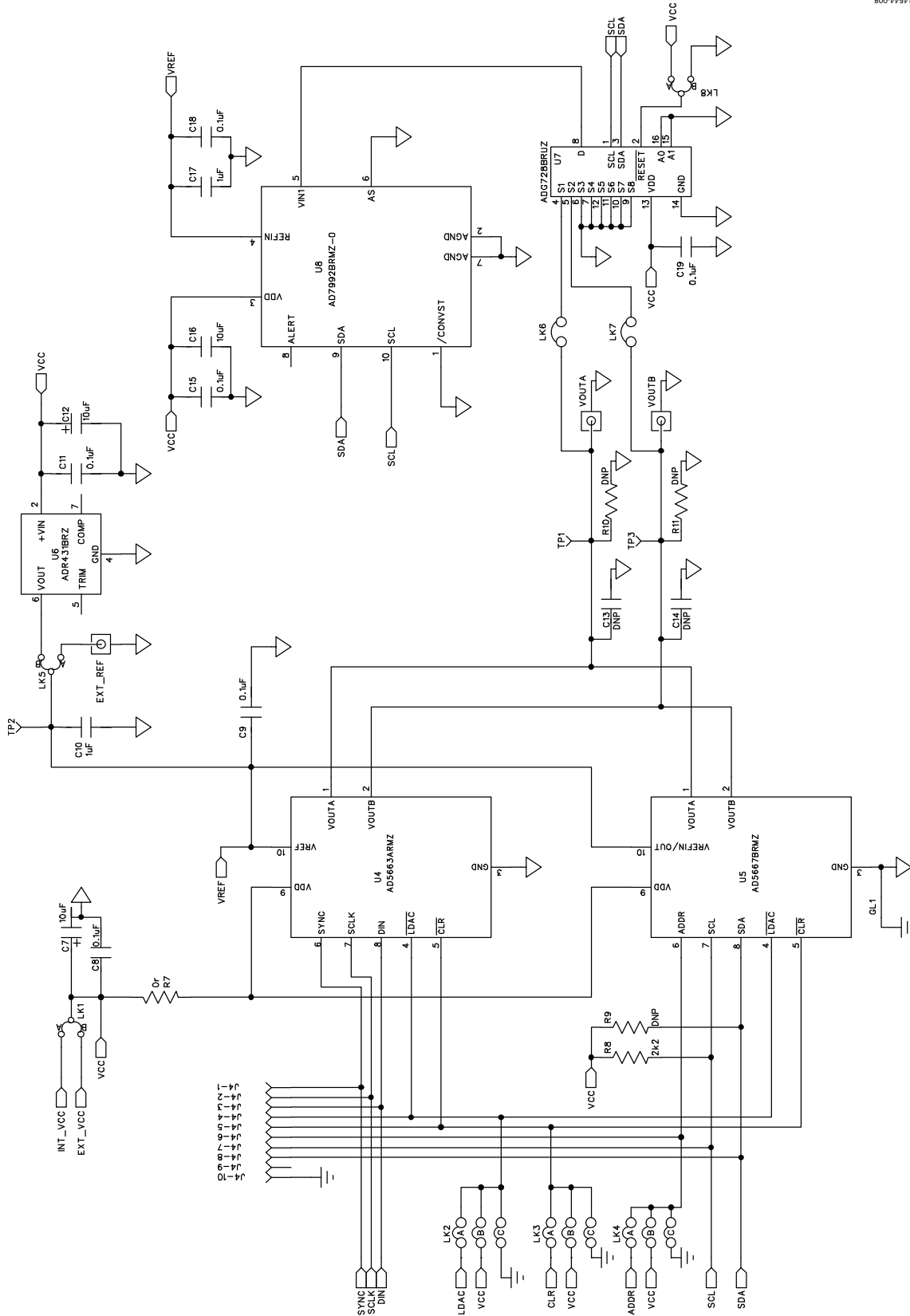


Figure 8. DAC Circuitry Evaluation Board Schematics

ORDERING INFORMATION

BILL OF MATERIALS

Table 5.

Reference Designator	Value	Part Description
C1	1 μ F	Capacitor, 1 μ F, 25 V, 0603
C2	1 μ F	Capacitor, 1 μ F, 25 V, 0603
C3	10 μ F	Capacitor, Case A, 10 μ F, 10 V
C4	0.1 μ F	50 V X7R multilayer ceramic capacitor
C5	1 μ F	Capacitor, 1 μ F, 25 V, 0603
C6	1 μ F	Capacitor, 1 μ F, 25 V, 0603
C7	10 μ F	Capacitor, Case A, 10 μ F, 10 V
C8	0.1 μ F	50 V X7R multilayer ceramic capacitor
C9	0.1 μ F	50 V X7R multilayer ceramic capacitor
C10	1 μ F	Capacitor, 0603, 1 μ F, Y5V, 10 V
C11	0.1 μ F	50 V X7R multilayer ceramic capacitor
C12	10 μ F	Capacitor, Case A, 10 μ F, 10 V
C13	Not placed	Not applicable
C14	Not placed	Not applicable
C15	0.1 μ F	50 V X7R multilayer ceramic capacitor
C16	1 μ F	Capacitor, 0603, 1 μ F, Y5V, 10 V
C17	1 μ F	Capacitor, 0603, 1 μ F, Y5V, 10 V
C18	0.1 μ F	50 V X7R multilayer ceramic capacitor
C19	0.1 μ F	50 V X7R multilayer ceramic capacitor
EXT_REF	Not applicable	Straight printed circuit board mount (PCB) SMB jack, 50 Ω
GL1	Not applicable	Solder short
J1	Not applicable	120-way female connector, 0.6 mm pitch
J2	Not applicable	2-pin terminal block (5 mm pitch).
J3	Not applicable	2-pin terminal block (5 mm pitch)
J4	Not applicable	10-pin (2 \times 5) 0.1" pitch SMT header
L1	600 Ω at 100 MHz	Ferrite bead
LK1	Not applicable	Jumper block using 3-Pin SIP header
LK2	Not applicable	6-pin (3 \times 2) 0.1" header and shorting block
LK3	Not applicable	6-pin (3 \times 2) 0.1" header and shorting block
LK4	Not applicable	6-pin (3 \times 2) 0.1" header and shorting block
LK5	Not applicable	Jumper block using 3-pin SIP header
LK6	Not applicable	2-pin (0.1" pitch) header and shorting shunt
LK7	Not applicable	2-pin (0.1" pitch) header and shorting shunt
LK8	Not applicable	3-pin (0.1" pitch) header and shorting shunt
R1	100 k Ω	SMD resistor
R2	100 k Ω	SMD resistor
R3	100 k Ω	SMD resistor
R4	100 k Ω	SMD resistor
R5	30.9 k Ω	SMD resistor
R6	100 k Ω	SMD resistor
R7	0 Ω	Resistor, 0603 1% 0R
R8	Not fitted	SMD resistor 0603
R9	2.2 k Ω	SMD resistor, 0.063 W, 1%, 0603
R10	Not placed	SMD resistor 0603
R11	Not placed	SMD resistor 0603
R12	100 k Ω	SMD resistor
R13	100 k Ω	SMD resistor
R16	Not placed	SMD resistor
R17	100 k Ω	SMD resistor

Reference Designator	Value	Part Description
R18	100 kΩ	SMD resistor
TP1	Not applicable	Red test point
TP2	Not applicable	Red test point
TP3	Not applicable	Red test point
TP4	Not applicable	Red test point
TP5	Not applicable	Red test point
U1	ADP7102ACPZ-R7	Linear regulator adjustable, 20 V, 300 mA, ultralow noise, CMOS
U2	24LC32	32 kB I ² C serial EEPROM
U3	ADP7102ACPZ-5.0-R7	LDO 5 V
U4	AD5663RBRMZ-5	Dual 16-bit <i>nanoDAC</i> ® with SPI interface; only placed on EVAL-AD5663R-SDZ
U5	AD5667RBRMZ-1	Dual 16-bit <i>nanoDAC</i> with I ² C interface; only placed on EVAL-AD5667R-SDZ
U6	ADR431BRZ	Ultralow noise XFET® voltage reference
U7	ADG728BRUZ	Serial controlled mux
U8	AD7992BRMZ-0	12-bit ADC
V _{OUTA}	Not applicable	Straight PCB mount SMB jack, 50 Ω
V _{OUTB}	Not applicable	Straight PCB mount SMB jack, 50 Ω

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).



ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А