Evaluation Board for the Multichannel Ultra-Low Power 12-Bit ADC

FEATURES

- Full featured evaluation board for the AD7091R-2/ AD7091R-4/ AD7091R-8 family
- On-board power supplies
- Standalone capability
- System demonstration platform (SDP) compatible
  - (EVAL-SDP-CK1Z)
- PC software for control and data analysis (download from product page)

EVALUATION KIT CONTENTS

- EVAL-AD7091R-8ARDZ evaluation board

ADDITIONAL EQUIPMENT NEEDED

- EVAL-SDP-CK1Z (must be ordered separately and includes a USB cable)
- Signal source
- PC running Windows 10 with a USB 2.0 port

GENERAL DESCRIPTION

The EVAL-AD7091R-8ARDZ is a full featured evaluation board designed to allow easy evaluation of all of the features of the AD7091R-8 family of analog-to-digital converters (ADCs). The evaluation board can be controlled via the SDP board (EVAL-SDP-CK1Z), which allows the evaluation board to be controlled through the USB port of a PC using the evaluation board software available for download from the product page.

The EVAL-AD7091R-8ARDZ can be used as a reference for the performance of the AD7091R-2/AD7091R-4, AD7091R, and AD7091. These devices share the same ADC core but differ in the number of multiplexed channels. The entire AD7091 family shares the same ADC core, so to evaluate the AD7091R-2 enable two channels. For AD7091R-4, enable four channels. To evaluate the single channel AD7091R and AD7091, enable one channel only.

On-board components include: the AD8031 high speed precision rail-to-rail operational amplifier (op amp), the ADA4807-1 zero drift rail-to-rail dual op amp, the MAX17291 voltage boost converter with lowest quiescent current and highest efficiency across load currents , the ADP7118 high accuracy 200mA low dropout linear regulator, and the ADR3625, 2.5V precision micropower, low drop-out, low voltage reference.

EVALUATION BOARD PHOTOGRAPH

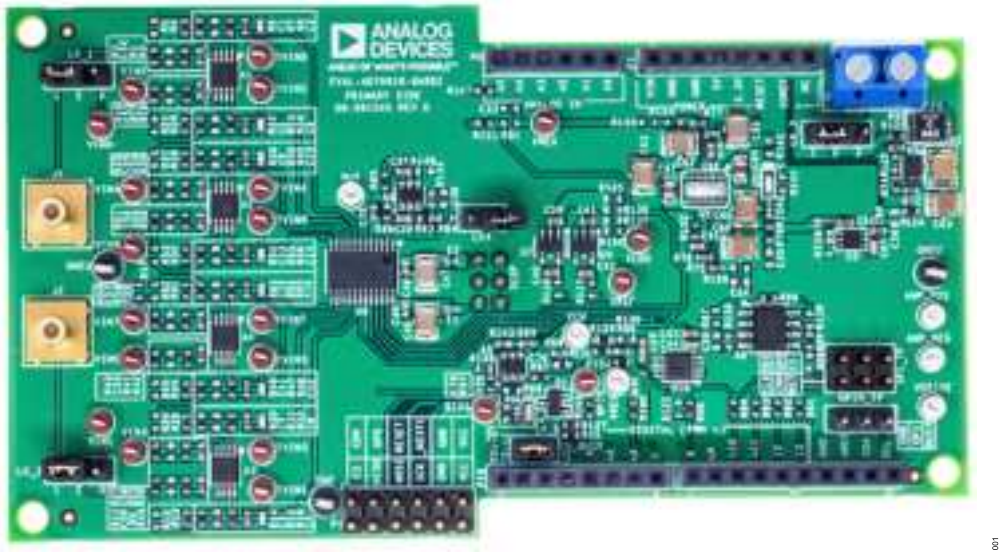


Figure 1. Evaluation Board Photograph

TABLE OF CONTENTS

REVISION HISTORY

5/2025—Revision 0: Initial Version

EVALUATION BOARD SOFTWARE

The Analog Devices, Inc., Analysis | Control | Evaluation (ACE) desktop software provides a plug and play evaluation experience, enabling users to get up and running quickly with the product evaluation board. ACE can configure the embedded software on supported controller boards and provides a fast and easy way to get set up, configure the board, and perform data capture, analysis, and/or waveform generation. The ACE software supports the EVAL-SDP-CK1Z controller board with the EVAL-AD7091R-8ARDZ.

For ACE installation and documentation instructions, see the ACE product page for additional information. Follow the instructions to install the necessary evaluation board plugin support.

If the computer ACE is installed on has internet access, find/install/update plugins directly from the ACE application.

For environments without internet access, download the plugins from the product page to a portable storage and install the plugins into the ACE software.

Note that the product-specific documentation for the evaluation software can be found within the ACE plugin.

QUICK START GUIDE

Follow these steps to quickly evaluate the AD7091R-2/AD7091R-4/AD7091R-8 ADCs:

1. Install the evaluation software from the AD7091R-2/AD7091R-4/AD7091R-8 product page. Ensure that the EVAL-SDP-CK1Z board is disconnected from the USB port of the PC while installing the software. The PC may need to be restarted after the installation.
2. Ensure that the various link options are configured as outlined in Link Configuration Options section.
3. Connect the EVAL-SDP-CK1Z board to the EVAL-AD7091R-8ARDZ board as shown in Figure 2.
4. Connect the EVAL-SDP-CK1Z board to the PC via the USB cable. For Windows® XP, you may need to search for the EVAL-SDP-CK1Z drivers. Choose to automatically search for the drivers for the EVAL-SDP-CK1Z board if prompted by the operating system.
5. Launch the ACE evaluation software.
6. For a unipolar signal, input signals are via J1 and J2 or from VIN0 to VIN 6.
7. A bipolar signal must use the bias circuit, BPIN. Input a bipolar signal to BPIN, which will go through VIN7 of the ADC. To test the other inputs, you can connect the BIAS test point to TVIN0 to TVIN6.

Figure 2. EVAL-AD7091R-8ARDZ (Left) Connected to the EVAL-SDP-CK1Z Board (Right)

EVALUATION BOARD HARDWARE

HARDWARE DESCRIPTION

This user guide describes the evaluation board for the AD7091R-2/AD7091R-4/AD7091R-8 family of ADCs. The EVAL-AD7091R-8ARDZ can be used as a reference to evaluate AD7091R-2/-4, AD7091R, and AD7091. The entire AD7091 family shares the same ADC core, so to evaluate the AD7091R-2, enable two channels. For the AD7091R-4, enable four channels.. And to evaluate the single channel AD7091R and AD7091, enable one channel only. For more information, open the AD7091R-8 plugin from ACE, click **Proceed to Documentation** and then click **Analysis View**.

All models in this family are 12-bit, ultra-low power, successive approximation ADCs. These devices operate from a single 2.7V to 5.25V power supply and can achieve a throughput rate of 1MSPS. These ADCs also feature an on chip conversion clock, an accurate reference, and a high-speed serial interface.

The conversion process and data acquisition are controlled using a $\overline{\text{CONVST}}$ signal and an internal oscillator. The AD7091R-2/AD7091R-4/AD7091R-8 devices have a serial interface allowing data to be read after the conversion while achieving a 1MSPS throughput rate. This family of devices uses advanced design and process techniques to achieve ultra-low power dissipation at high throughput rates. An on chip, accurate 2.5V reference is available.

Complete specifications for the AD7091R-2/AD7091R-4/AD7091R-8 devices are provided in the device data sheet, available from Analog Devices, Inc., which should be consulted in conjunction with this user guide when using the evaluation board.

Full details on the EVAL-SDP-CK1Z are available on the product page.

EVAL-AD7091R-8ARDZ, EVAL-SDP-CK1Z, AND HOST PC HARDWARE CONNECTIONS

Before powering up the EVAL-SDP-CK1Z board, mount the EVAL-AD7091R-8ARDZ onto the EVAL-SDP-CK1Z board. Ensure that the link options are in the default positions as outlined in Table 3. Also, before connecting the EVAL-SDP-CK1Z board to your PC, ensure that the evaluation software has been installed. The full software installation procedure is detailed in the Evaluation Board Software section.

Finally, mount the EVAL-AD7091R-8ARDZ to the EVAL-SDP-CK1Z as shown in Figure 2 which shows the connections between the EVAL-AD7091R-8ARDZ daughter board and the EVAL-SDP-CK1Z board.

POWER SUPPLIES

Care should be taken before applying power and signals to the evaluation board. To ensure that all link positions are set according to the required operating mode, see the

Table 1 shows the default power supplies available in the EVAL-AD7091R-8ARDZ.

Table 1. Default Power Supplies

Power Supply	Function	Component
5V	VDD (AMP_POS)	ADP7118
3.3V	VDRIVE	EVAL-SDP-CK1Z
2.5V	VREF	ADR3625
1.25V	VCM	ADR3625

STANDALONE MODE

The EVAL-AD7091R-8ARDZ evaluation board is powered by a 5V supply through the EVAL-SDP-CK1Z. If the evaluation board is used without the EVAL-SDP-CK1Z, it will go into standalone mode. For the complete list of link options for an external power supply, see Table 2.

For its power source, ensure that LK_3 is connected to Position B (Pin 2 and Pin 3) so that an external power supply of 5V can be connected to P-24.

VDRIVE requires an external supply of 5V that must be connected to XLDO during standalone mode to be able to use the LDO regulators, 1.8V or 3.3V.

Note of the following:

- When using XLDO, only one VDRIVE source must be populated.
  - For 3.3V, populate R145.
  - For 1.8V, populate R150

Each supply is decoupled on this board using 10µF tantalum and 100nF multilayer ceramic capacitors.

Table 2. Standalone Power Supplies

Power Supply	Connector	Voltage Range	Description
VDD	P-24	5V	External 5V VDD source
VREF	XREF	1V to VDD	External Source for reference voltage
VDRIVE	XLDO	5V	External Source for VDRIVE LDOs (populate R145 for 3.3V or R150 for 1.8V)

OPTIONAL POWER SUPPLY—LINK CONFIGURATIONS

The board currently uses a single power supply for an analog front end (AFE) amplifiers (AD8629) and a bias-up circuit amplifier (ADA4807-1). For applications that support dual power supplies, you can follow either option to optimize performance.

Option 1

To easily evaluate a dual-supply option, the ADA4807 is capable of evaluating a dual-supply board design by completing the following steps:

1. Remove Resistors R149 and R151
2. Connect Resistor R81

EVALUATION BOARD HARDWARE

3. Connect a negative 5V supply at the XNEG test point

Option 2

Currently, the board uses the MAX17291 and ADP7118 for a single-supply option for the power tree. However, the board has a readily available footprint for LTC3265. This is to evaluate a dual-supply power tree. Thus, take the following steps:

1. Remove R144, R149, R79, and R151
2. Connect resistors R81, R142, R128, R154, and R155

LINK CONFIGURATION OPTIONS

Multiple link options must be set correctly to select the appropriate operating setup before using the EVAL-AD7091R-8ARDZ. The functions of these options are detailed in Table 3.

SETUP CONDITIONS

Ensure that all link positions are set as required by the selected operating mode before applying power and signals to the evaluation board. Table 3 shows the default positions of the links when the EVAL-AD7091R-8ARDZ is packaged.

Table 3. Setup Conditions

Category	Link No.	Default Position	Description
Analog Inputs			Selection of analog input pin
	LK_1	A	A: SMD[1]
	LK_2	A	B: Test point
VDD (AMP_POS)	LK_3	A (Pin 1 and Pin 2)	A: Arduino to MAX17291
			B: External source to MAX17291
Digital Line	LK_4	Inserted	Inserted: Tx – GP0 communication
VREF	LK_5		Inserted: source from ADR3625 VREF
		Not Inserted	Not Inserted: internal reference of AD7091
	R146	Connected	Inserted: source from ADR3625 VREF
			Not Inserted: internal reference of AD7091
VDRIVE	R118 (SMD Resistor)[2, 3]	Connected	Connected: VDRIVE 3.3V source from Arduino
			Disconnected: connect an external 5V supply to XLDO test point
3.3	R136, R116 (SMD Resistor)	Not connected	Connected: 5V Arduino to ADP150-3.3
			Not Connected: 3.3V of Arduino is being used
1.8	R137, R117	Not connected	Connected: 5V Arduino to ADP150-1.8
			Not Connected: 3.3V of Arduino is being used

[1] An SMD resistor is a surface-mount device resistor.

[2] For external supplies. Please refer to the Standalone Mode section.

[3] For the optional LDO regulators, remove R118 before connecting either R136 and R116 or R137 and R117.

EVALUATION BOARD HARDWARE

CONNECTORS AND SOCKETS

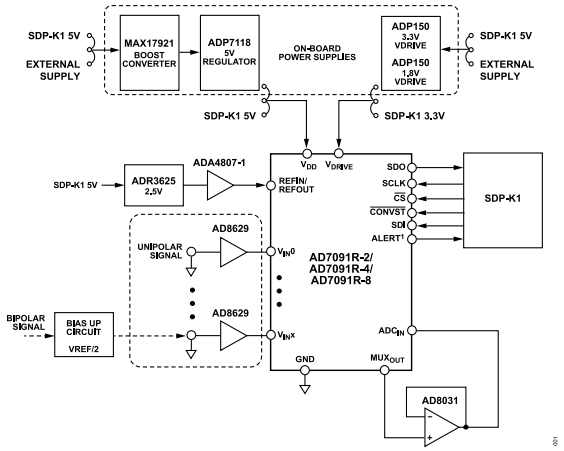
The connectors and sockets on the EVAL-AD7091R-8ARDZ are outlined in Table 4.

The default interface is via the Arduino headers that connect the EVAL-AD7091R-8ARDZ evaluation board.

Table 4. On Board Connections

Connector	Function
J1	VIN0 analog input signal
J2	VIN1 analog input signal
P24	External main supply
P6	Analog in from Arduino Uno Shield
P7	Power from Arduino Uno Shield
P9	Digital Section 1 from Arduino Uno Shield
P10	Digital Section 2 from Arduino Uno Shield

FUNCTIONAL BLOCK DIAGRAM



ORDERING INFORMATION

NOTES

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.