

### FEATURES

- Accepts SOIC or PDIP packages
- Configurable for dual or single supplies
- Provision for optional circuitry:
  - Shield driver
  - Adjustable offset/reference

### GENERAL DESCRIPTION

The EVAL-AD623EB is a simple-to-use accessory for evaluating the AD623 instrumentation amplifier. In addition to the basic in-amp connection, circuit options enable the user to adjust the

offset voltage, apply an output reference, or provide shield drivers with user supplied components. The board is shipped with a surface mount package installed, and has an alternate footprint for a through-hole, 8-lead DIP.

### BASIC OPERATION

The AD623 converts a differential signal to single-ended with respect to a reference. User supplied power supplies are connected to the +V<sub>S</sub>, -V<sub>S</sub>, and GND pins, and the differential signal is applied to the +IN and -IN pins. The output is monitored at the OUT pin. Figure 2 shows the component layout and location of connections.

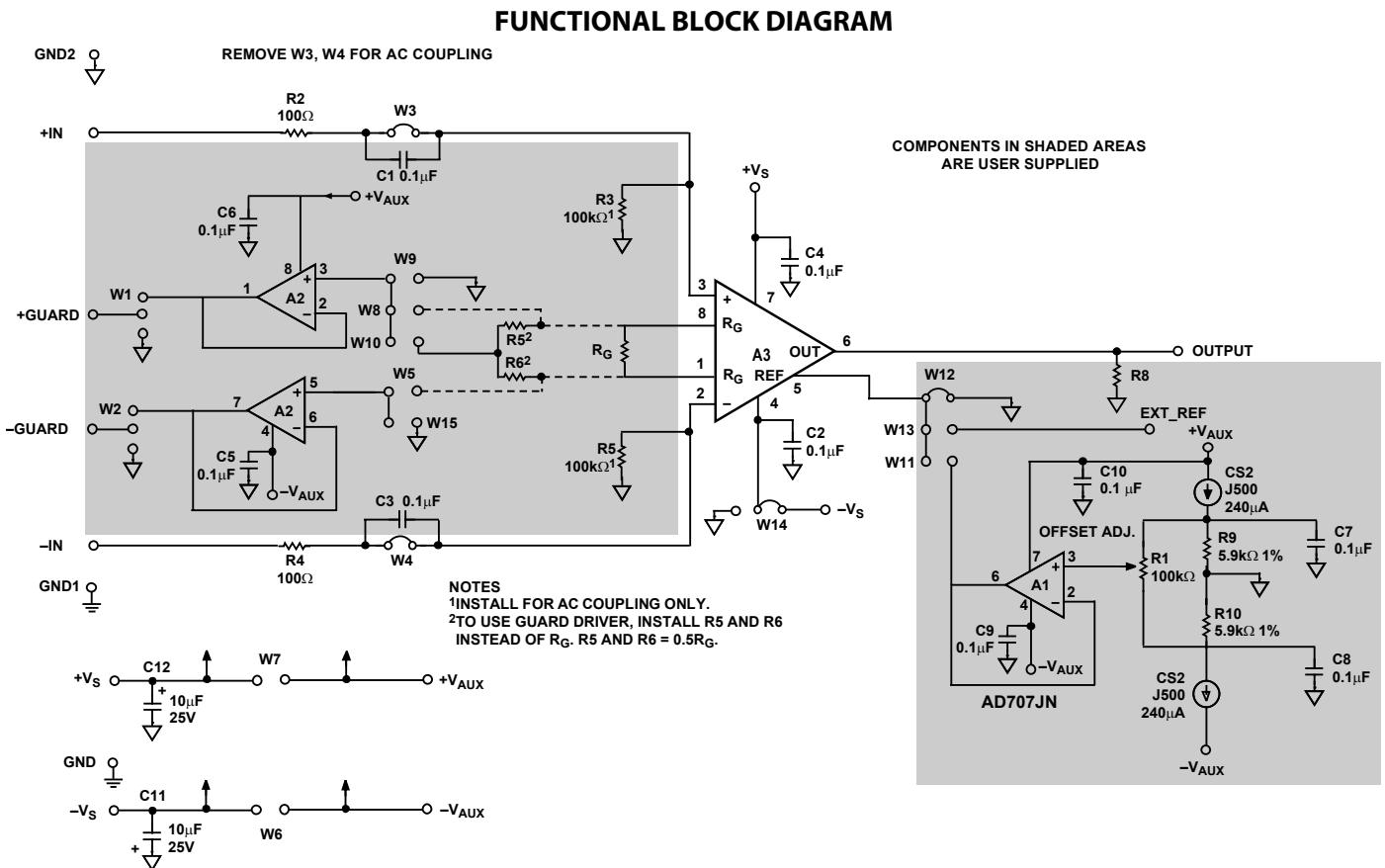


Figure 1. EVAL-AD623EB Functional Block Diagram

04223-0-001

### Rev. 0

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# EVAL-AD623EB

## CIRCUIT OPTIONS

### Single-Supply Operation

A jumper is provided to select between single or dual power supplies. The board is shipped with W14 in the dual-supply position. To convert to single supply, place W14 in the position marked with a ground symbol.

### Gain Adjustment

The default gain of the AD623 is unity; installing a resistor at  $R_G$  enables its adjustment.  $R_G$  may be calculated according to the following equation, or selected from Table 1:

$$R_G = 100 \text{ k}\Omega / (G - 1)$$

**Table 1. AD623 Standard Value Gain Resistors**

Desired Gain	1% Standard Value of $R_G$ ( $\Omega$ )	Calculated Gain Using Standard 1% Resistors
2	100 k	2
5	24.9 k	5.02
10	11 k	10.09
20	5.23 k	20.12
33	3.09 k	33.36
40	2.55 k	40.21
50	2.05 k	49.78
65	1.58 k	64.29
100	1.02 k	99.04
200	499	201.4
500	200	501
1000	100	1001

### External Reference or Offset Adjustment

When shipped, the reference of the EVAL-AD623EB is connected to ground. Certain single-supply applications (for example, an A/D converter connected to the AD623's output) require a symmetrical output voltage centered on a nonzero value. The reference may be equal to half the supply, or an application-specific voltage provided by an A/D converter. The user may install a jumper at W13 and connect an external reference to the EXT\_REF pin. To maintain proper operation of the in-amp, the reference should be provided by a voltage source.

Similarly, provision is made for an offset adjustment of  $\pm 1.12 \text{ V}$  by installing the parts listed in Table 4. Although it may be used with single or dual power supply connection, A1 requires a dual supply. To enable the offset feature, install a shunt in position W11. To adjust the offset of the AD623, ground both inputs and measure the output voltage. Adjust potentiometer R1 for 0 V.

### LOAD RESISTOR

Though a load resistor is not required for normal operation, one may be inserted at position R8.

## GUARD DRIVERS

When interference from sources such as power lines must be reduced to levels below those provided by standard shielded cable, guard drivers can be effective. A guard equalizes the ac potential between the in-amp input and the cable shield of the line, effectively reducing the low frequency interference voltage.

A1 in Figure 2 is a dual op amp AD708H driving the shield(s) of the input cable(s) from the AD623's gain resistor pins. The voltages at these pins are equal to the input voltages plus 0.6 V (refer to Figure 40 in the AD623 data sheet.)

The EVAL-AD623EB provides single and differential guards. Differential guards drive the shields with essentially the same signals as the inputs, while the single guard may be used for dual conductor cables. In this mode, the +GUARD will drive the shield at  $\frac{1}{2}(V_{IN \text{ DIFF}}) + 0.6 \text{ V}$ .

To activate the guard drivers,  $+V_{AUX}$  and  $-V_{AUX}$  must be connected. For shielded cables at both inputs, install jumpers W1, W2, W8, and W5.

### Using a Single Guard

For gains greater than 1, resistors R6 and R11 (which are each half the calculated resistance of  $R_G$ ), and W1, W2, and W10 are installed. For a gain of 1, either position R6 or R11 may be shorted to enable the guard driver input. Connect the shield to the +GUARD. On the header pins that do not bear the ground symbol, insert a shunt across position W1.

The guard drivers may be assembled using the components listed in Table 4.

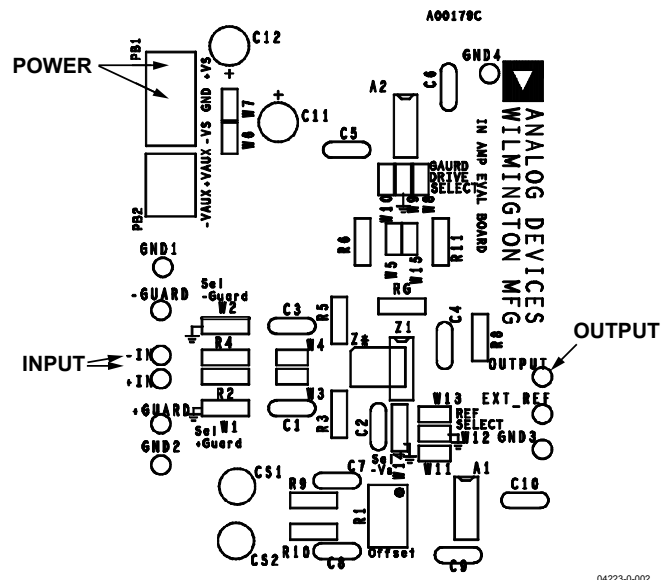


Figure 2. Component Location of In-Amp Evaluation Board

## APPENDIX

Table 2. Jumpers

Jumper	Function	Description	Status
W1	+Guard Select	Allows Shield of +Input Cable to be Connected to Guard Driver or Ground	Not Installed
W2	–Guard Select	Allows Shield of –Input Cable to be Connected to Guard Driver or Ground	Not Installed
W3	+Input Coupling	Installed, the +Input Is DC-Coupled	Installed
W4	–Input Coupling	Installed, the –Input Is DC-Coupled	Installed
W5	Guard Driver –IN	Connects –Shield Guard Driver to In-Amp Pin 1	Not Installed
W6	–V <sub>S</sub> to –V <sub>AUX</sub>	Connects –Supply Voltage to –Auxiliary Voltage if the Same Value	Not Installed
W7	+V <sub>S</sub> to +V <sub>AUX</sub>	Connects +Supply Voltage to +Auxiliary Voltage if the Same Value	Not Installed
W8	Guard Driver +IN	Connects +Shield Guard Driver to In-Amp Pin 8	Not Installed
W9	Guard Driver +IN	Connects +Shield Guard Driver to Ground	Not Installed
W10	Guard Driver +IN	Selects Single-Shield Guard Driver	Not Installed
W11	Reference Input	Connects the Reference of the In-Amp to the Offset Adjustable Voltage Reference	Not Installed
W12	Reference Input	Connects the Reference of the In-Amp to Ground	Installed
W13	Reference Input	Connects the Reference of the In-Amp to an External Reference Supply	Not Installed
W14	In-Amp –V <sub>S</sub> Source	Connects the In-Amp's –V <sub>S</sub> Pin to GND or to –V <sub>S</sub> of the Evaluation Board	Connected to –V <sub>S</sub>
W15	Guard Driver –IN	Connects –Shield Guard Driver to Ground	Not Installed

Table 3. Input/Output

I/O	Function
+V <sub>S</sub> /–V <sub>S</sub>	Positive and Negative Rails of the In-Amp
GND	Ground for the Board. GND1, 2, 3, and 4 designate pins.
+IN/–IN	Positive and Negative Input of the In-Amp
+Guard/–Guard	Positive and Negative Terminals for Use with Shielded Cable
EXT_REF	External Reference Input for the In-Amp
OUTPUT	Output of the In-Amp
+V <sub>AUX</sub> /–V <sub>AUX</sub>	Auxiliary Power Rails for Guard Drivers and Offset Reference Circuitry

Table 4. User Supplied Parts for Guard and Offset Circuits

Reference Designation	Part
<b>Guard Drivers</b>	
C5, C6	0.1 μF, 25 V Ceramic Capacitor
A2	AD708JN Dual Precision Op Amp
<b>Offset Regulators</b>	
C7–C10	0.1 μF, 25 V Ceramic Capacitor
A1	AD707JN Precision Op Amp
CS1, CS2	J500 240 μA Current Source
R9, 10	5.9 kΩ, 1% Metal Film Resistor

# EVAL-AD623EB

## ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the EVAL-AD623EB features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



## ORDERING GUIDE

Model	Package Description
AD623-EVAL	Evaluation Board