



# MAX9725E Evaluation Kit

**Evaluates: MAX9725A-MAX9725E**

## General Description

The MAX9725E evaluation kit (EV kit) is a fully assembled and tested printed-circuit board (PCB) that uses the MAX9725E IC to drive a stereo headphone in portable applications. The MAX9725E is a low-power stereo headphone amplifier with adjustable gain and DirectDrive™ outputs. Maxim's DirectDrive technology eliminates the need for bulky DC-blocking capacitors at the output of the amplifier.

The EV kit is configured for a -1.82V/V gain and is designed to operate from a 0.9V to 1.8V DC power supply. The EV kit is capable of delivering up to 20mW per channel into a 32Ω load and achieves 0.006% THD+N.

The MAX9725E EV kit can also be used to evaluate the MAX9725A, MAX9725B, MAX9725C, or MAX9725D fixed-gain amplifiers. Contact Maxim for free samples of the MAX9725A, MAX9725B, MAX9725C, or MAX9725D. See the *Part Selection Table* for IC ordering information. The MAX9725\_ IC temperature range is -40°C to +85°C.

## Part Selection Table

PART	GAIN
MAX9725AEBC+	-2
MAX9725BEBC+	-1.5
MAX9725CEBC+	-1
MAX9725DEBC+	-4
MAX9725EEBC+	Adjustable

DESIGNATION	QTY	DESCRIPTION
C1, C2, C3, C5, C6	5	1μF ±10%, 10V X5R ceramic capacitors (0603) Murata GRM188R61A105K
C4	1	4.7μF ±10%, 6.3V X5R ceramic capacitor (0603) Murata GRM188R60J475K
FB1, FB2, FB3	3	120Ω at 100MHz, 25mΩ DCR, 3A ferrite beads (0603) Murata BLM18SG121TN1
JU1	1	2-pin header
OUT	1	Stereo headphone jack (3.5mm)

## Features

- ◆ No DC-Blocking Output Capacitors Required
- ◆ 0.9V to 1.8V Operation
- ◆ Adjustable -1.82V/V Gain
- ◆ 20mW per Channel into a 32Ω Load
- ◆ Low 0.006% THD+N
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TYPE
MAX9725EEVKIT+	EV Kit

+Denotes lead-free and RoHS-compliant.

## Component List

DESIGNATION	QTY	DESCRIPTION
OUTL, OUTF, SGND	0	Not installed, test points
R1, R2, R5	3	10kΩ ±1% resistors (0603)
R3, R4	2	18.2kΩ ±1% resistors (0603)
U1	1	Fixed-gain, stereo headphone amplifier (12-bump UCSP™, 1.54mm x 2.02mm x 0.6mm) Maxim MAX9725EEBC+
—	1	Shunt (JU1)
—	1	PCB: MAX9725E Evaluation Kit+

## Component Supplier

SUPPLIER	PHONE	WEBSITE
Murata Mfg. Co., Ltd.	770-436-1300	www.murata.com

**Note:** Indicate that you are using the MAX9725E when contacting this component supplier.

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**For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at [www.maxim-ic.com](http://www.maxim-ic.com).**

# MAX9725E Evaluation Kit

## Quick Start

### Required Equipment

Before beginning, the following equipment is needed:

- 0.9V to 1.8V, 500mA power supply
- 32Ω stereo headphones with a 3.5mm plug
- Audio signal source (e.g., MP3 player, CD player, etc.)

### Procedure

The MAX9725E EV kit is fully assembled and tested. Follow the steps below to verify board operation.

**Caution: Do not turn on the power supply until all connections are completed.**

- 1) Verify that a shunt is not installed on jumper JU1 (IC disabled).
- 2) Set the power-supply output to 1.8V.
- 3) Disable the power-supply output.
- 4) Connect the power-supply ground to the PGND pad and the power-supply positive output to the VDD pad.
- 5) Verify that the audio source output is disabled.
- 6) Connect the audio source ground, left signal, and right signal to the SGND, VINL, and VINR pads, respectively.
- 7) Plug the headphone into the OUT headphone jack.
- 8) Enable the power-supply output.
- 9) Enable the audio source.
- 10) Install a shunt on jumper JU1 (IC enabled).
- 11) Verify that the headphones are playing the stereo audio source signal.

## Detailed Description of Hardware

The MAX9725E EV kit features the MAX9725E IC stereo headphone amplifier in a tiny (1.54mm x 2.02mm x 0.6mm) 12-bump UCSP package for portable applications. The MAX9725E IC features adjustable gain and low-power DirectDrive outputs. DirectDrive generates an internal negative supply (-VDD) from the positive supply (VDD), thus biasing the output signal at 0V DC. Zero-voltage biasing eliminates the need for bulky DC-blocking capacitors at the output of the amplifier. The MAX9725E operates from a 0.9V to 1.8V supply with a low quiescent current of 2.3mA.

The EV kit's gain for each channel is set to -1.82V/V. The left- and right-channel gain can be adjusted by modifying the ratio of the corresponding gain-setting resistors, R1–R4. R1 and R4 set the left-channel gain; R2 and R3 set the right-channel gain. The gain for

either channel can be adjusted to a minimum of 1-1V/V. The IC delivers up to 20mW per channel into a 32Ω load while achieving 0.006% THD+N.

Test points OUTL, OUTR, and SGND are provided to easily measure the output signals.

The MAX9725E EV kit can also evaluate the fixed-gain MAX9725A, MAX9725B, MAX9725C, or MAX9725D ICs. See the *Evaluating the MAX9725A–MAX9725D* section for more information.

### Shutdown ( $\overline{\text{SHDN}}$ )

Jumper JU1 controls the shutdown pin ( $\overline{\text{SHDN}}$ ) of the MAX9725E that enables and disables the MAX9725E IC. See Table 1 for jumper JU1 configurations.

**Table 1. Jumper JU1 Shutdown Selection**

SHUNT POSITION	$\overline{\text{SHDN}}$ PIN	MAX9725E FUNCTION
Installed	Connected to VDD	Enabled
Not installed	Connected to GND through R5	Disabled

### Gain Setting

The default gain-setting resistors (R1–R4) configure the gain for both left and right channels to -1.82V/V. The gain can be changed by replacing resistors R1–R4 with other surface-mount 0603 resistors. Resistors with a tolerance of 1% or better are recommended for optimum performance. Use Table 2 and the equations that follow to select new gain-setting resistors for the corresponding channel.

**Table 2. Component Function**

CHANNEL	RIN	RFB	CIN
Right	R2	R3	C6
Left	R1	R4	C5

$$RIN > \frac{1}{2\pi \times 20\text{Hz} \times CIN}$$

$$RFB \geq 10k\Omega$$

$$RIN = \frac{RFB}{-A}$$

where A is the desired gain. The gain for either channel can be adjusted to a minimum of 1-1V/V. Refer to the MAX9725 IC data sheet for more details.

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## Evaluating the MAX9725A-MAX9725D

The MAX9725E EV kit can also evaluate the fixed-gain MAX9725A, MAX9725B, MAX9725C, or MAX9725D ICs after performing the following:

- 1) Replace U1 with the alternate MAX9725 IC.
- 2) Replace resistors R1 and R2 with 0 $\Omega$  0603 surface-mount resistors.
- 3) Remove resistors R3 and R4.

Evaluates: MAX9725A-MAX9725E

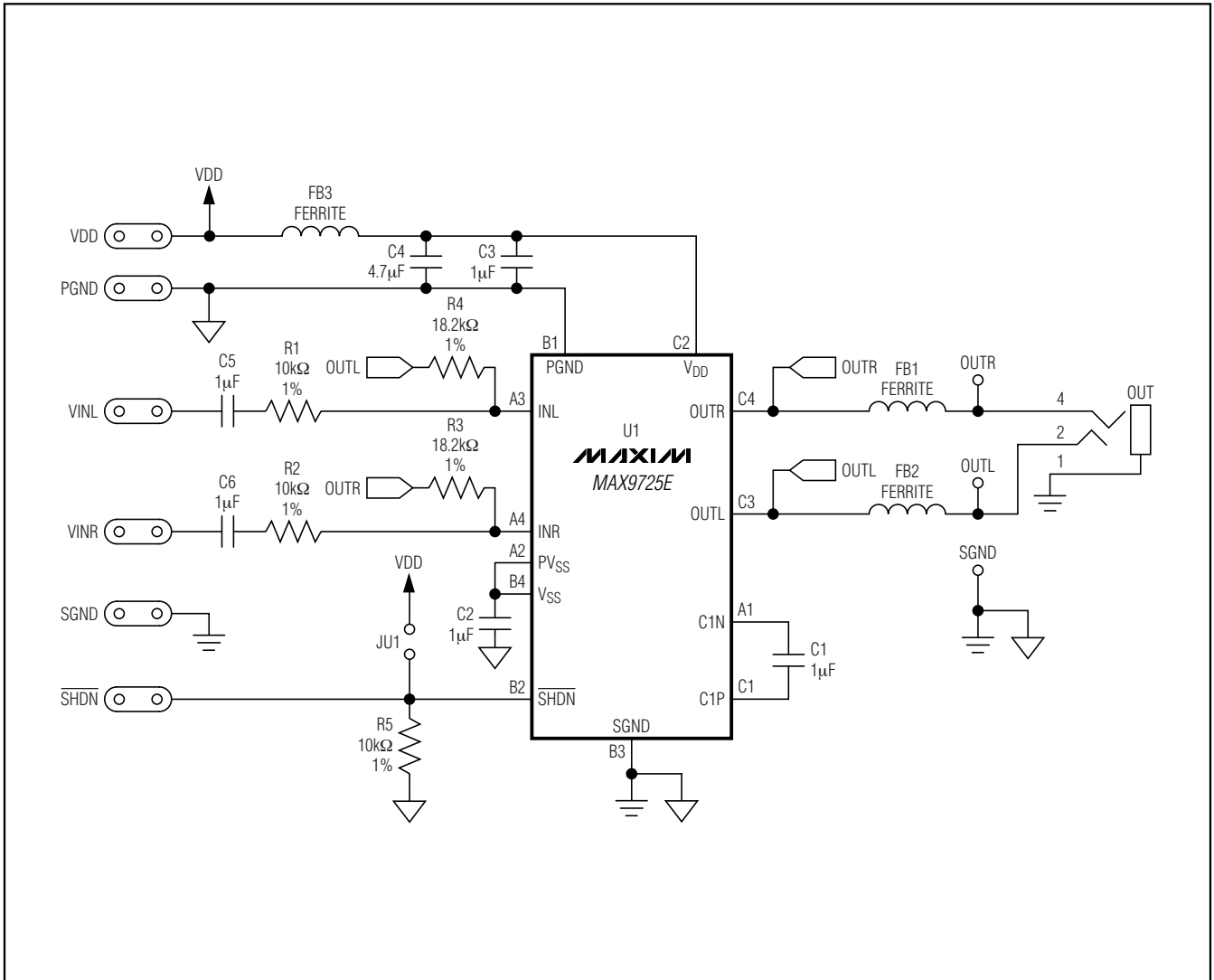


Figure 1. MAX9725E EV Kit Schematic

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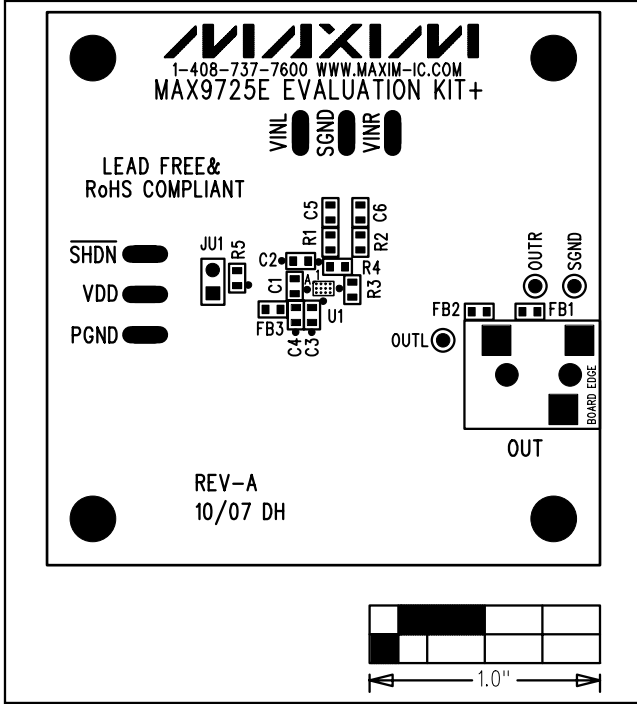


Figure 2. MAX9725E EV Kit Component Placement Guide—Component Side

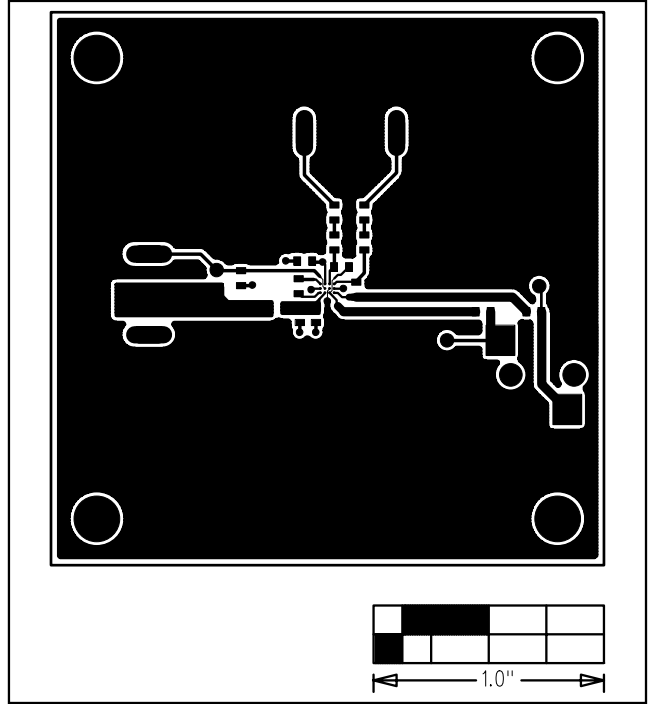


Figure 3. MAX9725E EV Kit PCB Layout—Component Side

# MAX9725E Evaluation Kit

Evaluates: MAX9725A-MAX9725E

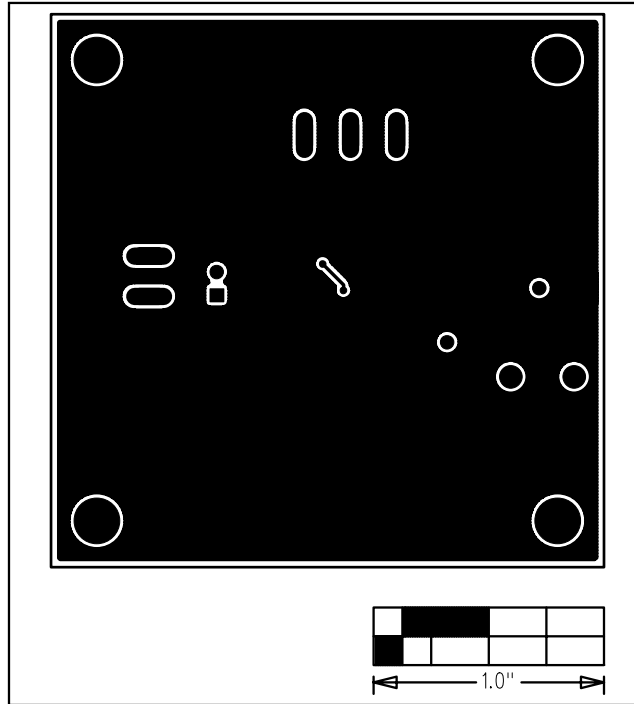


Figure 4. MAX9725E EV Kit PCB Layout—Solder Side

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