



# MAX9724A Evaluation Kit

## General Description

The MAX9724A evaluation kit (EV kit) is a fully assembled and tested printed-circuit board (PCB) that uses the MAX9724A IC to drive a stereo headphone in portable applications. The MAX9724A is a 60mW 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 -1.5V/V gain and is designed to operate from a 2.7V to 5.5V DC power supply. The EV kit is capable of delivering up to 60mW per channel into a 32Ω load and achieving 0.02% THD+N.

The MAX9724A EV kit can also be used to evaluate the MAX9724B fixed-gain amplifier. Contact Maxim for a free sample of the MAX9724B IC.

## Features

- ◆ No DC-Blocking Output Capacitors Required
- ◆ 2.7V to 5.5V Operation
- ◆ Adjustable -1.5V/V Gain
- ◆ 60mW per Channel into a 32Ω Load
- ◆ 0.02% THD+N
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TYPE
MAX9724AEVKIT+	EV Kit

+ Denotes lead-free and RoHS-compliant.

## Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2, C4	3	1μF ±10%, 10V X5R ceramic capacitors (0603) Murata GRM188R61A105K
C3	1	0.1μF ±10%, 10V X5R ceramic capacitor (0402) Murata GRM155R61A104K
C5, C6	2	0.47μF ±10%, 10V X5R ceramic capacitors (0603) Murata GRM188R61A474K
JU1	1	3-pin header
OUT	1	Stereo headphone jack (3.5mm)

DESIGNATION	QTY	DESCRIPTION
OUTL, OUTR, SGND	0	Not installed, test points
R1, R3	2	10kΩ ±1% resistors (0603)
R2, R4	2	15kΩ ±1% resistors (0603)
U1	1	60mW, DirectDrive, stereo headphone amplifier (12-pin TQFN-EP*) Maxim MAX9724AETC+
—	1	Shunt (JU1)
—	1	PCB: MAX9724A Evaluation Kit+

\*EP = Exposed paddle.

## Component Supplier

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

**Note:** Indicate that you are using the MAX9724A when contacting this component supplier.

# MAX9724A Evaluation Kit

## Quick Start

### Required Equipment

Before beginning, the following equipment is needed:

- 2.7V to 5.5V, 500mA power supply
- 32Ω stereo headphones with a 3.5mm plug
- Audio signal source

### Procedure

The MAX9724A 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 installed on jumper JU1, pins 2-3 (IC disabled).
- 2) Set the power-supply output to 5V.
- 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, INL, and INR 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 across pins 1-2 (IC enabled).
- 11) Verify that the headphones are playing the audio source signal.

## Detailed Description

The MAX9724A EV kit features the MAX9724A IC stereo headphone amplifier. The MAX9724A features adjustable gain and 60mW DirectDrive outputs. DirectDrive generates an internal negative supply (-VDD) from the positive supply (VDD), thus biasing the amplifier output. Zero-voltage biasing eliminates the need for bulky DC-blocking capacitors at the amplifier output. The MAX9724A operates from a 2.7V to 5.5V supply with a low quiescent current of 3.5mA. The MAX9724A comes in a 12-pin thin QFN package suitable for portable applications.

The EV kit's gain for each channel is set to -1.5V/V. The left- and right-channel gain can be adjusted by modifying the ratio of the corresponding gain-setting resistors R1–R4. R1 and R2 set the right-channel gain and R3 and R4 set the left-channel gain. The IC delivers up to 60mW per channel into a 32Ω load while achieving 0.02% THD+N.

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

The MAX9724A EV kit can evaluate the fixed-gain MAX9724B IC, also in a 12-pin thin QFN package. The MAX9724B features a fixed gain of -1.5V/V. See the *Evaluating the MAX9724B* section for more information.

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

Jumper JU1 controls the shutdown pin ( $\overline{\text{SHDN}}$ ) of the MAX9724A that enables and disables the MAX9724A IC. See Table 1 for jumper JU1 configurations.

**Table 1. Jumper JU1 Shutdown Selection**

SHUNT POSITION	$\overline{\text{SHDN}}$ PIN	MAX9724A FUNCTION
1-2	Connected to VDD	Enabled
2-3	Connected to GND	Disabled

### Gain Setting

The default gain-setting resistors R1–R4 configure the gain for both the left and right channels to -1.5V/V. The gain can be changed by replacing these resistors with other surface-mount 0603 resistors. Resistors with a tolerance of 1% or better are recommended for optimum performance. Use Table 2 and the following equation to select new gain-setting resistors for the corresponding channel.

**Table 2. Gain-Setting Resistors**

CHANNEL	RIN	RF
Right	R1	R2
Left	R3	R4

$$\text{RF} = -A \cdot \text{RIN}$$

where  $\text{RIN} \geq 10\text{k}\Omega$  and A is the desired negative gain. Refer to the *Output Dynamic Range* and *Maximum Output Swing* sections in the MAX9724A/MAX9724B IC data sheet for limitations on setting the gain.

### Evaluating the MAX9724B

The MAX9724A EV kit can evaluate the fixed-gain MAX9724B IC after performing the following:

- 1) Replace U1 with the MAX9724B IC.
- 2) Remove resistors R2 and R4.
- 3) Replace resistors R1 and R3 with 0Ω 0603 surface-mount resistors.

The MAX9724B features a fixed-gain of -1.5V/V. Contact Maxim for a free sample of the MAX9724BETC+.

# MAX9724A Evaluation Kit

Evaluates: MAX9724A/MAX9724B

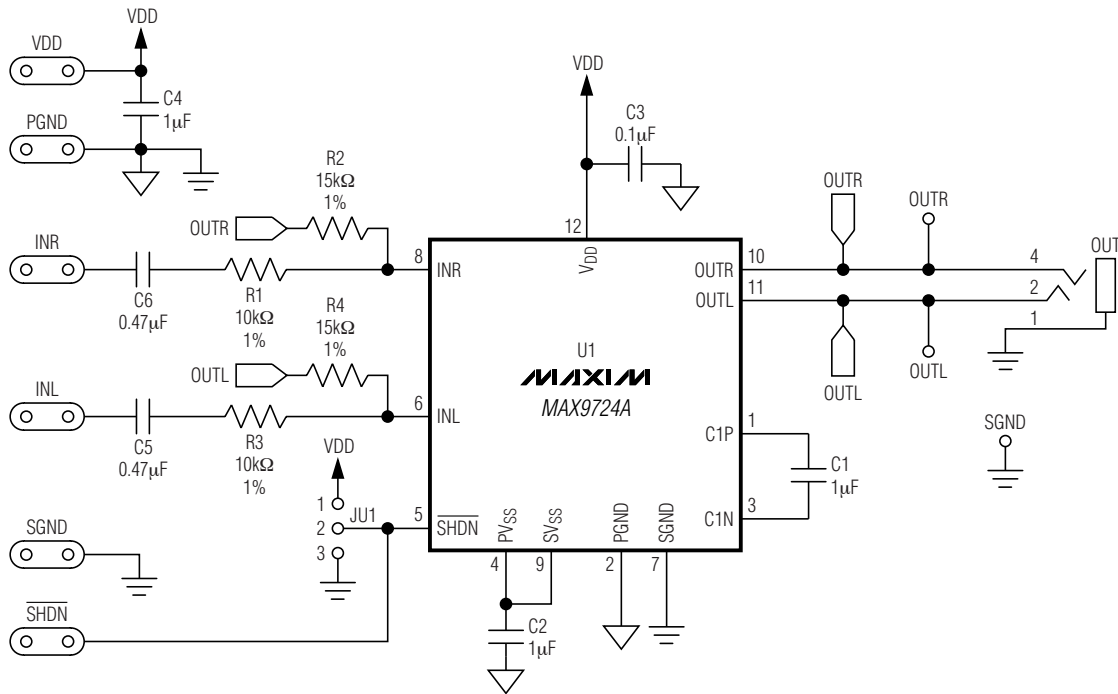


Figure 1. MAX9724A EV Kit Schematic

# MAX9724A Evaluation Kit

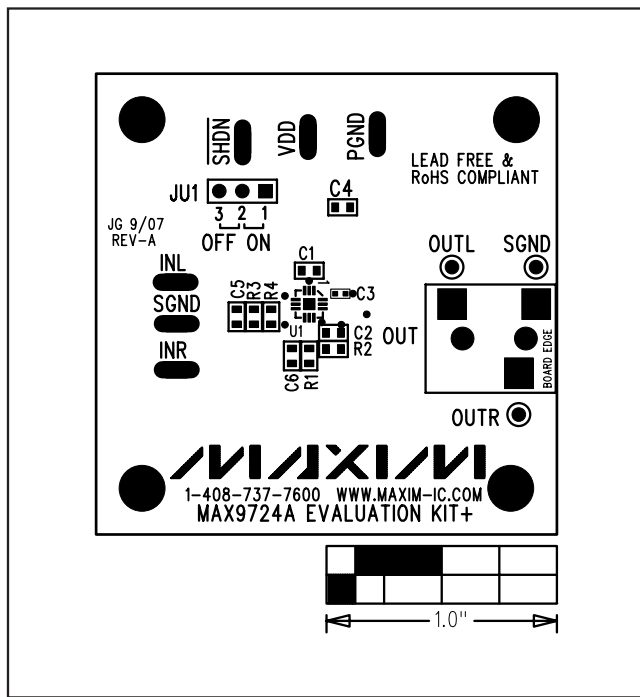


Figure 2. MAX9724A EV Kit Component Placement Guide—Component Side

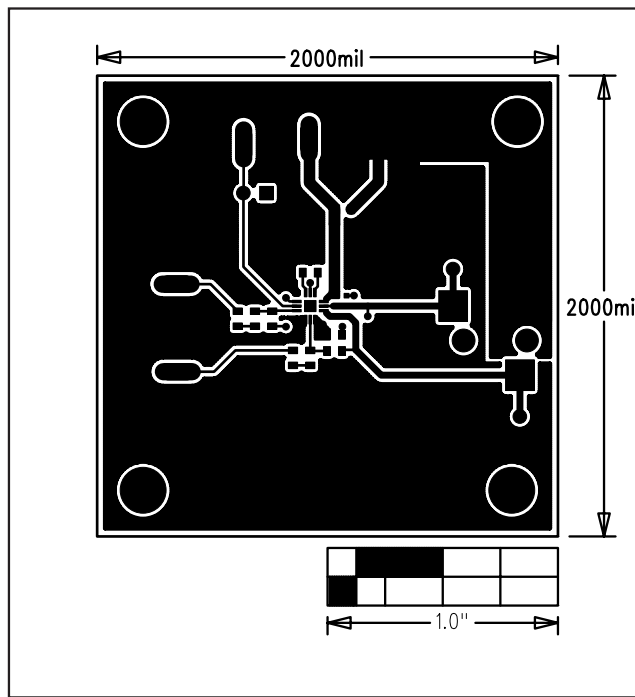


Figure 3. MAX9724A EV Kit PCB Layout—Component Side

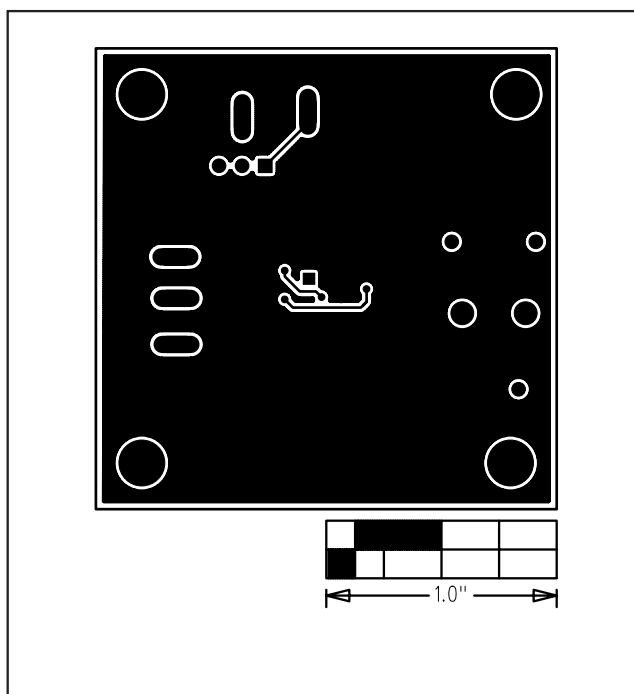


Figure 4. MAX9724A EV Kit PCB Layout—Solder Side

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