



# MAX9820 Evaluation Kit

**Evaluates: MAX9820**

## General Description

The MAX9820 evaluation kit (EV kit) demonstrates the MAX9820 stereo headphone amplifier with external gain and DirectDrive® outputs for portable applications. Maxim's DirectDrive technology eliminates the need for bulky DC-blocking capacitors at the output of the amplifier.

The MAX9820 EV kit is configured for a -1V/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 95mW into a 32Ω load and achieves 0.005% THD+N.

*DirectDrive is a registered trademark of Maxim Integrated Products, Inc.*

## Features

- ◆ No DC-Blocking Output Capacitors Required
- ◆ 2.7V to 5.5V Operation
- ◆ Adjustable -1V/V Gain
- ◆ 95mW Into a 32Ω Load
- ◆ 0.005% THD+N
- ◆ Lead(Pb)-Free and RoHS Compliant
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TYPE
MAX9820EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

## Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	1μF ±10%, 50V X7R ceramic capacitors (0805) Murata GRM21BR71H105K
C3	1	10μF ±10%, 10V X5R ceramic capacitor (0805) Murata GRM21BR61A106K
C4	1	0.1μF ±10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71C104K
C5, C6	2	1μF ±10%, 10V X5R ceramic capacitors (0603) Murata GRM188R61A105K
C1P, VSS	0	Not installed, miniature PCB test points
HPOUT	1	Stereo headphone jack (3.5mm)

DESIGNATION	QTY	DESCRIPTION
JU1	1	2-pin header
OUTL	1	White miniature PCB test point
OUTR	1	Red miniature PCB test point
PGND	1	Black miniature PCB test point
R1-R4	4	40.2kΩ ±1% resistors (0603)
R5	1	10kΩ ±5% resistor (0603)
U1	1	External gain headphone amplifier (10 TDFN-EP*) Maxim MAX9820ETB+ (Top Mark: AAU)
—	1	Shunt (JU1)
—	1	PCB: MAX9820 EVALUATION KIT+

\*EP = Exposed pad.

## Component Supplier

SUPPLIER	PHONE	WEBSITE
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com

**Note:** Indicate that you are using the MAX9820 when contacting this component supplier.



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## Quick Start

### Required Equipment

- 2.7V to 5.5V, 500mA power supply
- One set of stereo headphones
- Audio signal source

### Procedure

The MAX9820 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 (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 PCB pad and the power-supply positive output to the VDD PCB pad.
- 5) Verify that the audio source output is disabled.
- 6) Connect the audio source ground, left signal, and right signal to the GND, VINL, and VINR PCB pads, respectively.
- 7) Plug the headphone into the HPOUT headphone jack.
- 8) Enable the power-supply output.
- 9) Enable the audio source.
- 10) Remove the shunt from jumper JU1 (IC enabled).
- 11) Verify that the headphones are playing the audio source signal.

## Detailed Description of Hardware

The MAX9820 EV kit features the MAX9820 stereo headphone amplifier, in a 10-pin TDFN package with an exposed pad, for portable applications. The MAX9820 IC features adjustable gain and DirectDrive outputs. DirectDrive generates an internal negative supply (-VDD) from the external 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 MAX9820 operates from a 2.7V to 5.5V, 500mA power supply.

The EV kit's gain for each channel is set to -1V/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, while R2 and R3 set the right-channel gain. The gain for either channel can be adjusted to a minimum of -1V/V. The IC delivers up to 95mW into a 32Ω load, while achieving 0.005% THD+N.

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

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

Jumper JU1 controls the shutdown pin ( $\overline{\text{SHDN}}$ ) of the MAX9820, which enables and disables the MAX9820 IC. See Table 1 for jumper JU1 configuration.

### Gain Setting

The default gain-setting resistors (R1–R4) configure the gain for both the left and right channels to -1V/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 equations to select new gain-setting resistors for the corresponding channel.

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

$$RFB \geq 10\text{k}\Omega$$

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

where RIN is the respective input resistance, CIN is the respective input capacitance, RFB is the respective feedback resistance, A is the desired gain, and -3dB frequency is set at 20Hz. The gain for either channel can be adjusted to a minimum of -1V/V. Refer to the MAX9820 IC data sheet for more details.

**Table 1. Shutdown Selection (JU1)**

SHUNT POSITION	$\overline{\text{SHDN}}$ PIN	MAX9820 FUNCTION
Installed	Connected to PGND	Disabled
Not installed	Connected to VDD through resistor R5	Enabled

**Table 2. Component Function**

CHANNEL	RIN	RFB	CIN
Right	R2	R3	C2
Left	R1	R4	C1

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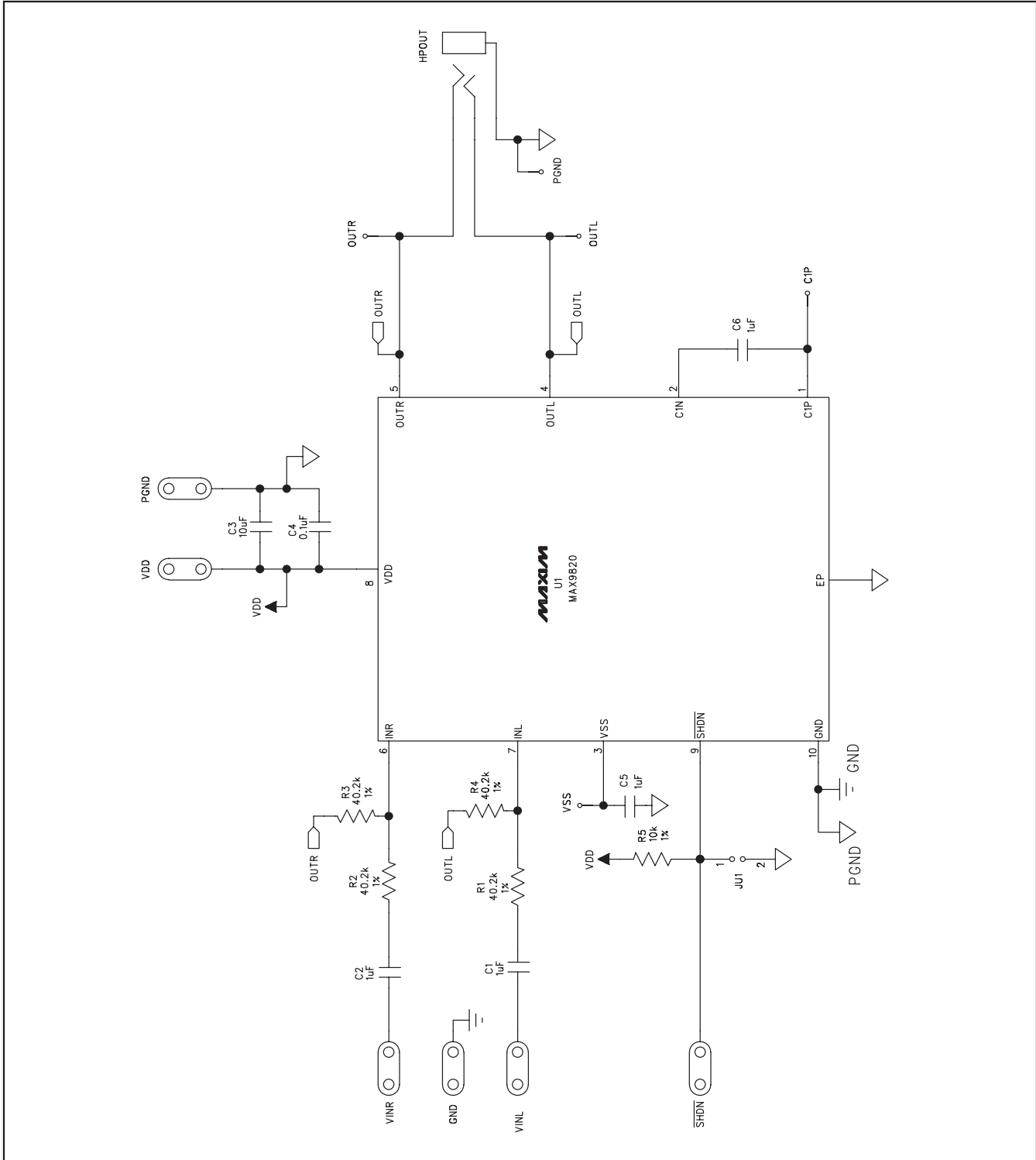


Figure 1. MAX9820 EV Kit Schematic

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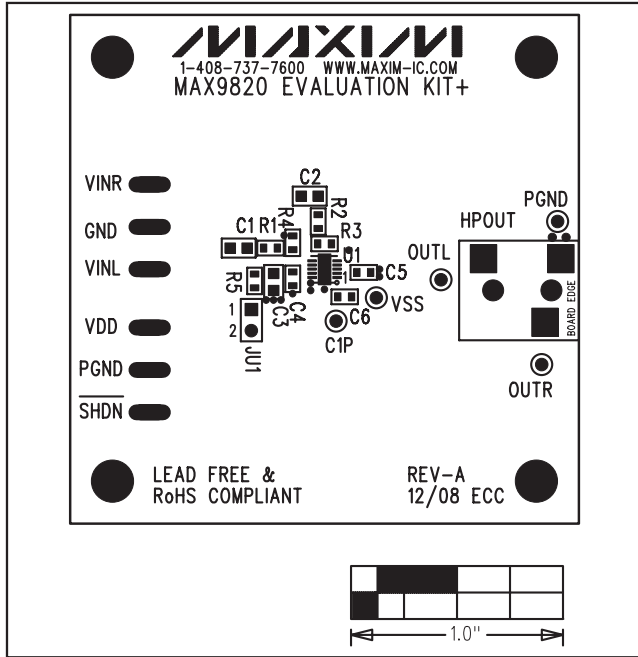


Figure 2. MAX9820 EV Kit Component Placement Guide—Component Side

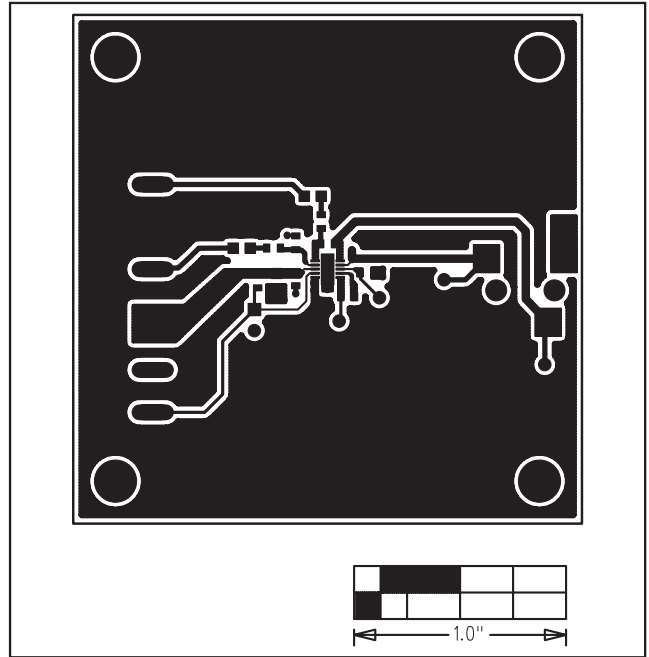


Figure 3. MAX9820 EV Kit PCB Layout—Component Side

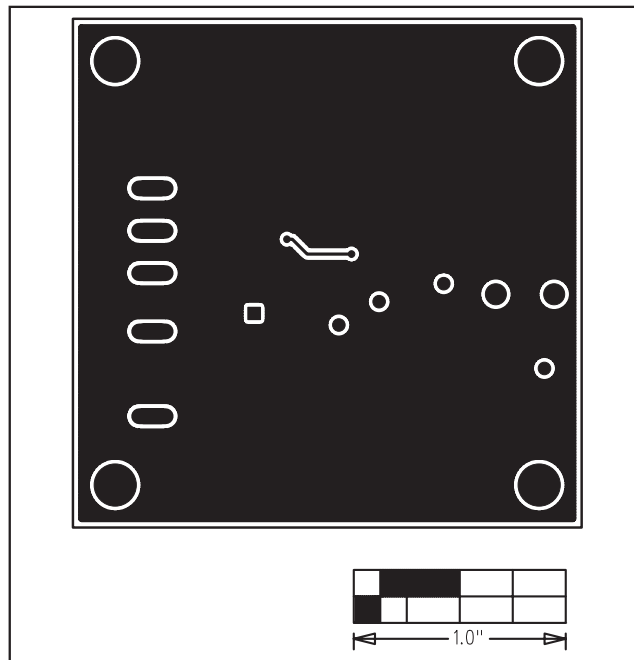


Figure 4. MAX9820 EV Kit PCB Layout—Solder Side

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