



# MAX9715 Evaluation Kit

**Evaluates: MAX9715**

## General Description

The MAX9715 evaluation kit (EV kit) is a fully assembled and tested PC board that uses the MAX9715 filterless Class D amplifier to drive a pair of stereo bridge-tied-load (BTL) speakers in portable audio applications. Designed to operate from a 5V DC power supply, the EV kit is capable of delivering 2.3W per channel at 1% THD+N into a pair of 4Ω speaker loads. Three different output configurations are available for ease of evaluation.

The MAX9715 EV kit accepts single-ended input signals, and provides fully differential outputs. The EV kit also provides an option to select between 9dB or 10.5dB gains.

## Component List

DESIGNATION	QTY	DESCRIPTION
C1, C4, C6	3	0.1μF ±10%, 25V X7R ceramic capacitors (0603) TDK C1608X7R1E104K
C2	1	1000pF ±10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H102K
C3, C8, C9	3	1μF ±10%, 10V X5R ceramic capacitors (0603) TDK C1608X5R1A105K
C5, C7	2	100μF ±20%, 6.3V X5R ceramic capacitors (1210) TDK C3225X5R0J107M
C10–C23	0	Not installed, capacitors (0603)
JU1, JU2	2	3-pin headers
L1, L2, L3	3	100Ω at 100MHz, 50mΩ DCR, 3A ferrite beads (0603) TDK MPZ1608S101A
L4, L5, L6, L7	0	Not installed, inductors Toko D53LC series recommended
R1–R4	0	Not installed, resistors (0603)
T1, T2	0	Not installed, common-mode chokes 50VDC, 1ADC, 800Ω at 100MHz TDK ACM4532-801-2P-X recommended
U1	1	MAX9715ETE (16-pin TQFN-EP 5mm x 5mm)
—	2	Shunts (see Tables 3 and 4)
—	1	MAX9715 EV kit PC board

## Features

- ◆ Filterless Operation
- ◆ Passes FCC Radiated Emissions Specifications (with Short Cable Lengths)
- ◆ 5V Single-Supply Operation
- ◆ Fully Differential Outputs
- ◆ Drives 2 x 2.3W into 4Ω Speakers at 1% THD+N
- ◆ Selectable Gain
- ◆ 0.1μA Shutdown Current
- ◆ Small 16-Pin TQFN Package
- ◆ Also Available in 16-Pin TSSOP
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX9715EVKIT	0°C to +70°C	16-TQFN-EP*

\*EP = Exposed paddle.

## Quick Start

The MAX9715 EV kit is fully assembled and tested. Follow the steps listed below to verify board operation. **Do not turn on the power supply until all connections are completed.**

### Recommended Equipment

- 5V, 3A power supply
- Audio source (i.e., CD player, cassette player)
- Two 4Ω speakers

### Procedure

- 1) Install a shunt across pins 1 and 2 of jumper JU1 (IC enabled).
- 2) Install a shunt across pins 1 and 2 of jumper JU2 (gain = 9dB).
- 3) Connect the first 4Ω speaker across the OUTL+ and OUTL- test points.
- 4) Connect the second 4Ω speaker across the OUTR+ and OUTR- test points.
- 5) Connect the positive terminal of the power supply to the VDD pad and the power-supply ground terminal to the GND pad.
- 6) Connect the positive terminal of the audio source to the IN\_L and IN\_R pads.
- 7) Connect the negative terminal of the audio source to the GND pad.
- 8) Turn on the power supply.
- 9) Turn on the audio source.

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## Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
TDK	847-803-6100	847-390-4405	www.component.tdk.com
Toko	847-297-0070	847-699-1194	www.tokoam.com

**Note:** Indicate that you are using the MAX9715 when contacting these component suppliers.

### Detailed Description

The MAX9715 EV kit features the MAX9715 filterless Class D amplifier IC, designed to drive a pair of stereo speakers in BTL configuration. The EV kit operates from a DC power supply that can provide 5V and 3A of current. The EV kit accepts single-ended audio inputs and provides fully differential outputs. The audio input sources are amplified to drive 2.3W per channel into a pair of 4Ω speakers.

The MAX9715 outputs (OUTL+/- and OUTFR+/-) can be connected directly to a pair of speaker loads without any filtering. Use the OUTL+/- and OUTFR+/- test points to connect the speakers directly to the MAX9715 outputs. This configuration is for a typical audio application.

The MAX9715 EV kit provides two sets of filtered outputs per channel. The EV kit features PC board pads for filters that can be added to ease evaluation and reduce EMI. Audio analyzers typically cannot accept pulse-width-modulated (PWM) signals at their inputs. The PWM output signal can be lowpass filtered by installing components: L4–L7, C14–C23, and R1–R4. The filtered outputs should then be monitored at the FOUTL+/- and FOUTR+/- pads. Connect the speakers to FOUTL+/- and FOUTR+/- when long cables are used. See Table 1 below for the suggested filtering component values to evaluate a 4Ω load with a 30kHz cutoff frequency.

**Table 1. Suggested Filtering Components for a 4Ω Load with a 30kHz Cutoff Frequency**

COMPONENT	VALUE
L4–L7	15μH
C14–C17	0.033μF
C18, C19	0.15μF
C20–C23	0.068μF
R1–R4	22Ω

The MAX9715 is designed to pass FCC Class B radiated emissions without additional filtering. In applications where medium length cables are required, or the circuit is near EMI-sensitive devices, output capacitors C10–C13, and common-mode chokes T1 and T2 can be added to reduce radiated emission. The EMI-filtered outputs should then be monitored at the TOUTL+/- and TOUTR+/- test points. Table 2 lists the recommended EMI filter components. Refer to the *Applications Information, Output Filter* section in the MAX9715 IC data sheet for additional information.

**Table 2. Recommended EMI Filter Components**

COMPONENT	VALUE
C10–C13	100pF
T1, T2	Common-Mode Chokes 50VDC, 1ADC, 800Ω at 100MHz TDK ACM4532-801-2P-X

### Jumper Selection Shutdown Mode (SHDN)

Jumper JU1 controls the shutdown pin (SHDN) of the MAX9715 IC. The shutdown pin can also be controlled by an external logic controller connected to the EV kit SHDN pad. Remove the shunt from jumper JU1 before connecting an external controller to the SHDN pad. See Table 3 for shunt positions.

### Gain Selection

Jumper JU2 provides an option to select the gain of the MAX9715 IC. The gain of the MAX9715 is selectable between 9dB and 10.5dB. See Table 4 for shunt positions.

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Table 3. JU1 Jumper Selection ( $\overline{\text{SHDN}}$ )

SHUNT POSITION	MAX9715 $\overline{\text{SHDN}}$ PIN CONNECTED TO	EV KIT FUNCTION
1-2 (default)	V <sub>DD</sub>	EV kit enabled
2-3	GND	Shutdown mode
None. <b>External logic controller connected to <math>\overline{\text{SHDN}}</math> pad</b>	External logic controller	$\overline{\text{SHDN}}$ driven by external logic controller. Shutdown is active low.

Table 4. JU2 Jumper Selection (GAIN)

SHUNT POSITION	MAX9715 GAIN PIN CONNECTED TO	GAIN (dB)
1-2	V <sub>DD</sub>	9
2-3 (default)	GND	10.5

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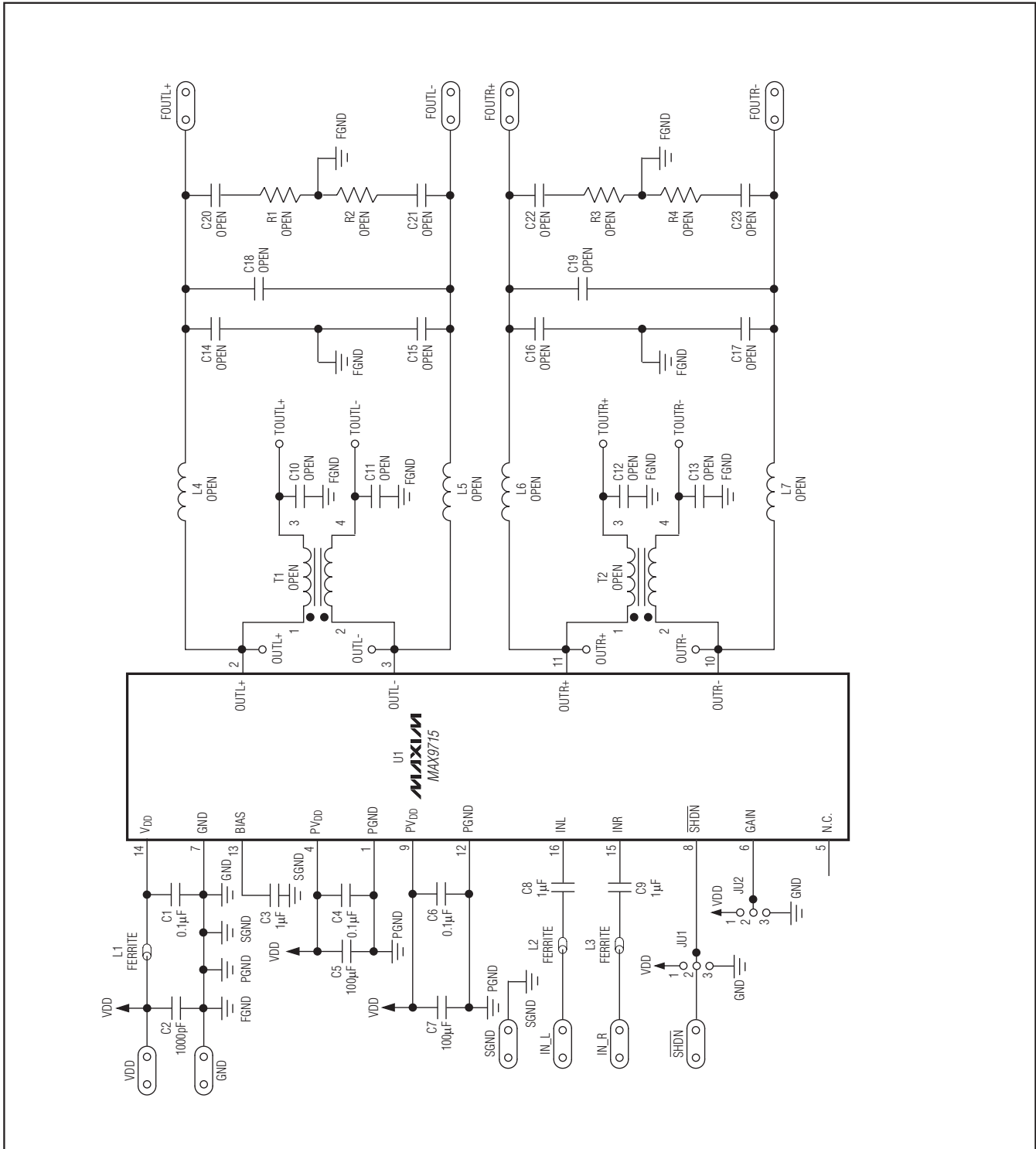


Figure 1. MAX9715 EV Kit Schematic

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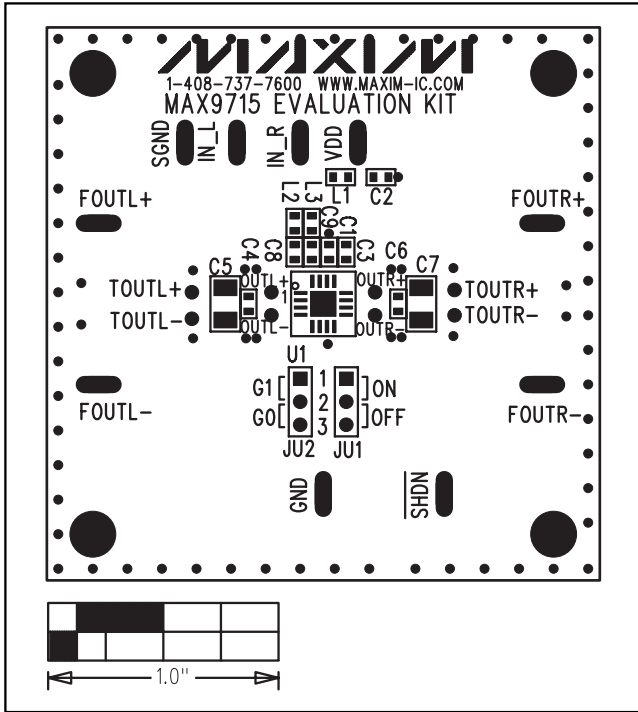


Figure 2. MAX9715 EV Kit Component Placement Guide—Component Side

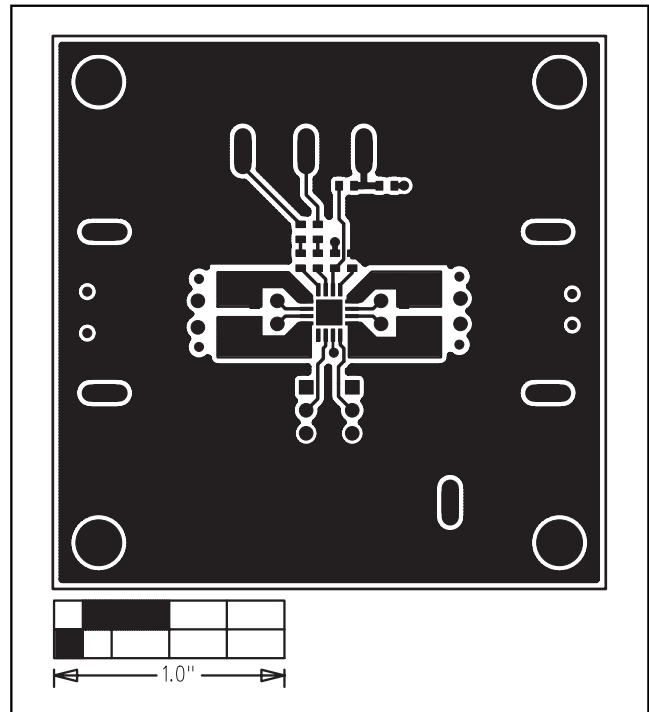


Figure 3. MAX9715 EV Kit PC Board Layout—Component Side

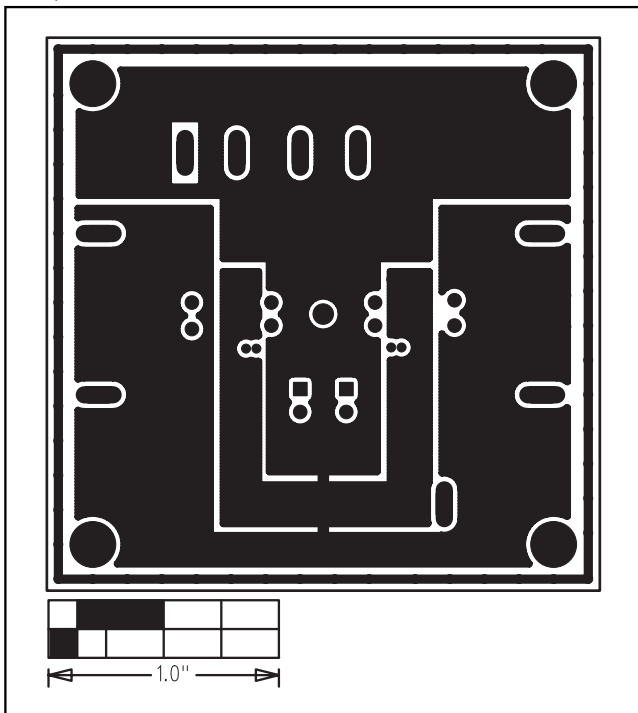


Figure 4. MAX9715 EV Kit PC Board Layout—GND Layer 2

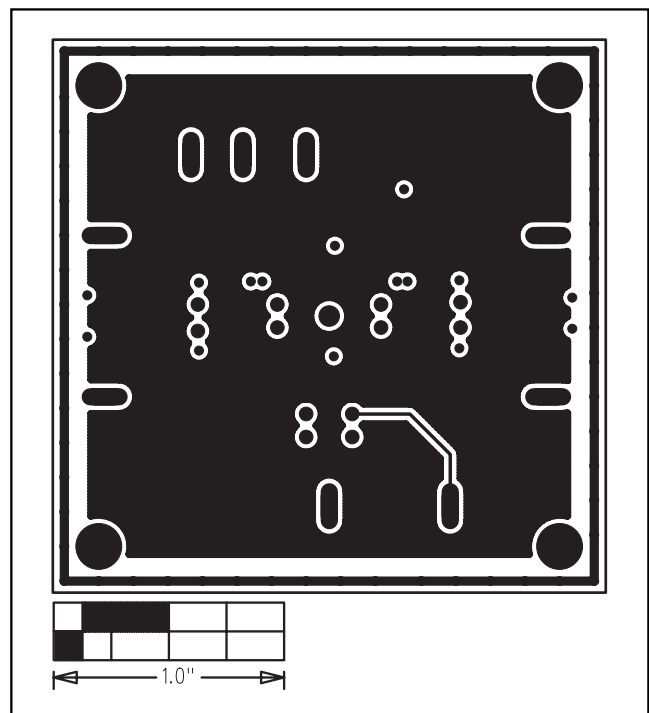


Figure 5. MAX9715 EV Kit PC Board Layout—VDD Layer 3

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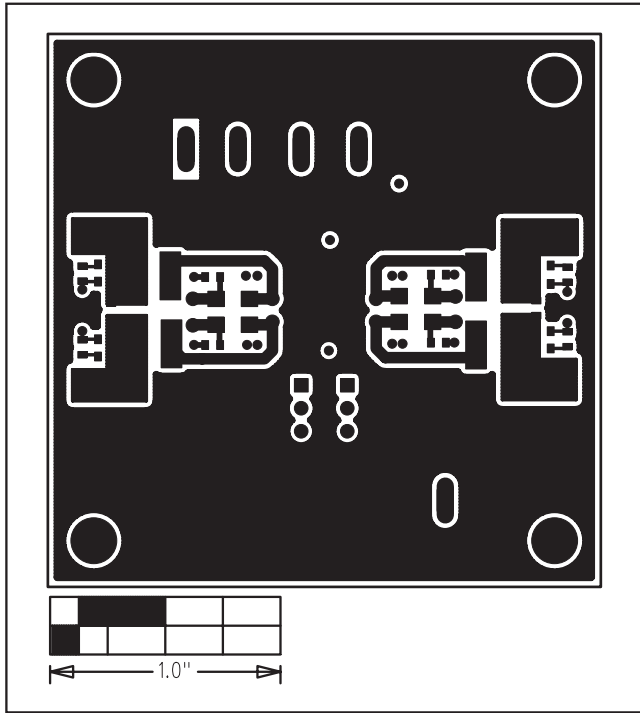


Figure 6. MAX9715 EV Kit PC Board Layout—Solder Side

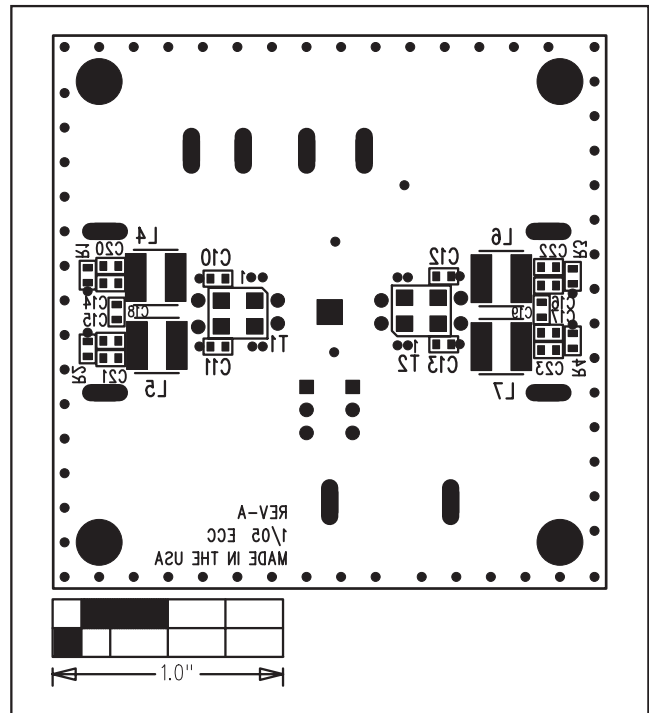


Figure 7. MAX9715 EV Kit Component Placement Guide—Solder Side

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