



MAX9705B Evaluation Kit

General Description

The MAX9705B evaluation kit (EV kit) is a fully assembled and tested circuit board that uses the MAX9705B filterless Class D amplifier to drive a mono bridge-tied-load (BTL) speaker in portable audio applications. Designed to operate from a 2.5V to 5.5V DC power supply, the EV kit is capable of delivering 2.3W into a 4Ω load.

The EV kit accepts differential or single-ended input signals. The EV kit provides an option to select between different switching frequency modes of operation. The MAX9705B EV kit also evaluates the MAX9705A/MAX9705C/MAX9705D.

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX9705BEVKIT	0°C to +70°C	10 TDFN-EP*

*EP = Exposed paddle.

Features

- ◆ Filterless Operation Passes FCC Radiated Emissions
- ◆ Evaluates the MAX9705A/B/C/D (with IC Replacement)
- ◆ 2.5V to 5.5V Single-Supply Operation
- ◆ 86% Efficiency
- ◆ Drives 2.3W into 4Ω Speaker at 1% THD+N
- ◆ Differential or Single-Ended Inputs
- ◆ Selectable Switching Frequency
- ◆ 0.1μA Shutdown Current
- ◆ Small 10-Pin TDFN Package
- ◆ Also Available in 10-Pin μMAX® and 12-Bump UCSP™ Packages
- ◆ Fully Assembled and Tested

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Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	0.1μF ±10%, 25V X7R ceramic capacitors (0603) TDK C1608X7R1E104K
C5, C6	2	1μF ±10%, 6.3V X5R ceramic capacitors (0603) TDK C1608X5R0J105K
U1	1	MAX9705BETB (10-pin TDFN)
OPTIONAL COMPONENTS FOR CUSTOMER EVALUATION		
A1	0	Not installed, MAX9705BEUB (10-pin μMAX)
A2	0	Not installed, MAX9705BEBC (12-bump UCSP)
C3*	1	10μF ±20%, 6.3V X5R ceramic capacitor (0603) TDK C1608X5R0J106M
C4	1	100pF ±5%, 50V C0G ceramic capacitor (0603) TDK C1608C0G1H101J

DESIGNATION	QTY	DESCRIPTION
OPTIONAL COMPONENTS FOR CUSTOMER EVALUATION (continued)		
C7–C11	0	Not installed, capacitors (0603)
JU1	1	3-pin header
JU2	1	5-pin header
JU3	1	2-pin header
L1, L2	0	Not installed, inductors (TOKO D53LC Series)
OUT-, OUT+, FOUT-, FOUT+	0	Not installed, test points
R1	1	49.9Ω ±1% resistor (0603)
R2, R3	0	Not installed, resistors (0603)
—	3	Shunts
—	1	MAX9705B EV kit board

*System-level requirement.

Component Suppliers

SUPPLIER	PHONE	WEBSITE
TDK	847-803-6100	www.component.tdk.com
TOKO	847-297-0070	www.tokoam.com

Note: Indicate that you are using the MAX9705B when contacting these component suppliers.

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Quick Start

The MAX9705B 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

- 2.5V to 5.5V, 1A power supply
- Audio source (i.e., CD player, cassette player)
- 8 Ω speaker

Procedure

- 1) Install a shunt across pins 1 and 2 of jumper JU1 (EV kit ON).
- 2) Install a shunt across pins 1 and 2 of jumper JU2 (internal oscillator set to spread-spectrum mode).
- 3) Verify that no shunt is across jumper JU3 (differential input mode).
- 4) Connect the 8 Ω speaker across the OUT+ and OUT- 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 audio source across the INPUT+ and INPUT- pads.
- 7) Turn on the power supply.
- 8) Turn on the audio source.

Detailed Description

The MAX9705B EV kit features the MAX9705B filterless Class D amplifier IC, designed to drive a BTL mono speaker in portable audio applications. The EV kit operates from a DC power supply that can provide 2.5V to 5.5V and 1A of current. The EV kit accepts a differential or single-ended audio input. The audio input source is amplified to drive 2.3W into a 4 Ω speaker.

The EV kit provides two sets of differential outputs. The device outputs (OUT+/-) can be connected directly to a speaker load, without any filtering, with up to 30cm of cable. However, a filter can be added to ease evaluation.

Output Filtering

The output (OUT+/-) can be connected directly to a speaker load without any filtering. Use the OUT+/- test points to connect the speakers directly to the EV kit outputs. This configuration is for a typical audio application.

The MAX9705B EV kit features PC board pads for filters that can be added to ease evaluation. Audio analyzers typically cannot accept pulse-width-modulated (PWM) signals at their inputs. The PWM output signal can be lowpass-filtered by installing components L1, L2, C7–C11, R2, and R3. The filtered outputs should then be monitored at the FOUT+/- test points. See Table 2 below for the suggested filtering components.

The MAX9705B is designed to pass FCC Class B RF emissions without additional filtering when using up to 30cm of cable to connect the speaker. Table 1 lists the cable length versus the required output components.

Table 1. Cable Length vs. Suggested Output Components

CABLE LENGTH X (cm)	LCR FILTER L1, L2, C7–C11, R2, R3
$X \leq 30$	—
$X > 30$	Required

Table 2. Suggested Filtering Components

COMPONENT	VALUE
C7, C8	0.033 μ F $\pm$ 10%, 25V X7R ceramic capacitors (0603) TDK C1608X7R1E333K
C9	0.15 μ F $\pm$ 10%, 25V X7R ceramic capacitor (0603) TDK C1608X7R1E154K
C10, C11	0.068 μ F $\pm$ 10%, 25V X7R ceramic capacitors (0603) TDK C1608X7R1E683K
L1, L2	15 μ H $\pm$ 20%, 1.4A inductors TOKO A915AY-150M
R2, R3	22 Ω $\pm$ 5% resistors (0603)

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Jumper Selection

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

Jumper JU1 controls the shutdown pin ($\overline{\text{SHDN}}$) of the MAX9705B IC. See Table 3 for shunt positions.

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

SHUNT POSITION	$\overline{\text{SHDN}}$ PIN	EV KIT FUNCTION
1-2 (default)	High	Enabled
2-3	Low	Disabled
None (external logic controller connected to $\overline{\text{SHDN}}$ pad)	Connected to external controller	$\overline{\text{SHDN}}$ driven by external logic controller. Shutdown is active low.

Switching Frequency Mode (SYNC)

Jumper JU2 provides an option to select the switching frequency of the MAX9705B IC. See Table 4 for the various shunt positions.

Table 4. JU2 Jumper Selection (SYNC)

SHUNT POSITION	SYNC PIN	INTERNAL OSCILLATOR FREQUENCY
1-2 (default)	SYNC pin = high	Spread-Spectrum Mode. Set at a switching frequency $f_{\text{SW}} = 1.22\text{MHz} \pm 120\text{kHz}$
1-3	SYNC pin = floating	Set at $f_{\text{SW}} = 1.45\text{MHz}$
1-4	SYNC pin = external TTL-compatible clock input. External clock input connected to SYNC (TTL).	Synchronized to the incoming TTL-compatible clock frequency
1-5	SYNC = low	Set at $f_{\text{SW}} = 1.1\text{MHz}$

Input Mode

Jumper JU3 provides an option to select between a differential or single-ended input mode for the EV kit. See Table 5 for shunt positions.

Table 5. JU3 Jumper Selection (Input Mode)

SHUNT POSITION	EV KIT INPUT MODE
None (default)	Differential Input Mode
Installed (INPUT- pad connected to GND)	Single-Ended Input Mode

Evaluating the MAX9705A/MAX9705C/MAX9705D

The MAX9705B EV kit can evaluate the MAX9705A, MAX9705C, and MAX9705D. To evaluate a different IC, replace U1 with the desired part. Refer to the MAX9705 IC data sheet for additional information.

Evaluate: MAX9705A/B/C/D

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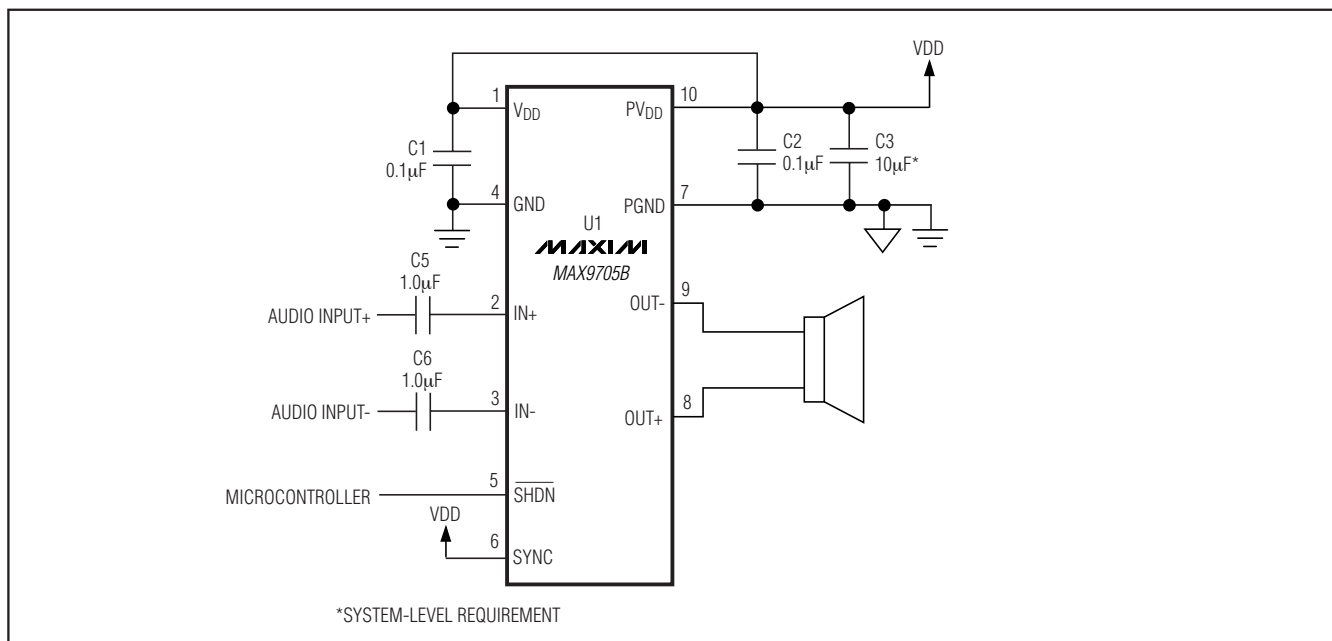


Figure 1. MAX9705B EV Kit Customer Design Schematic

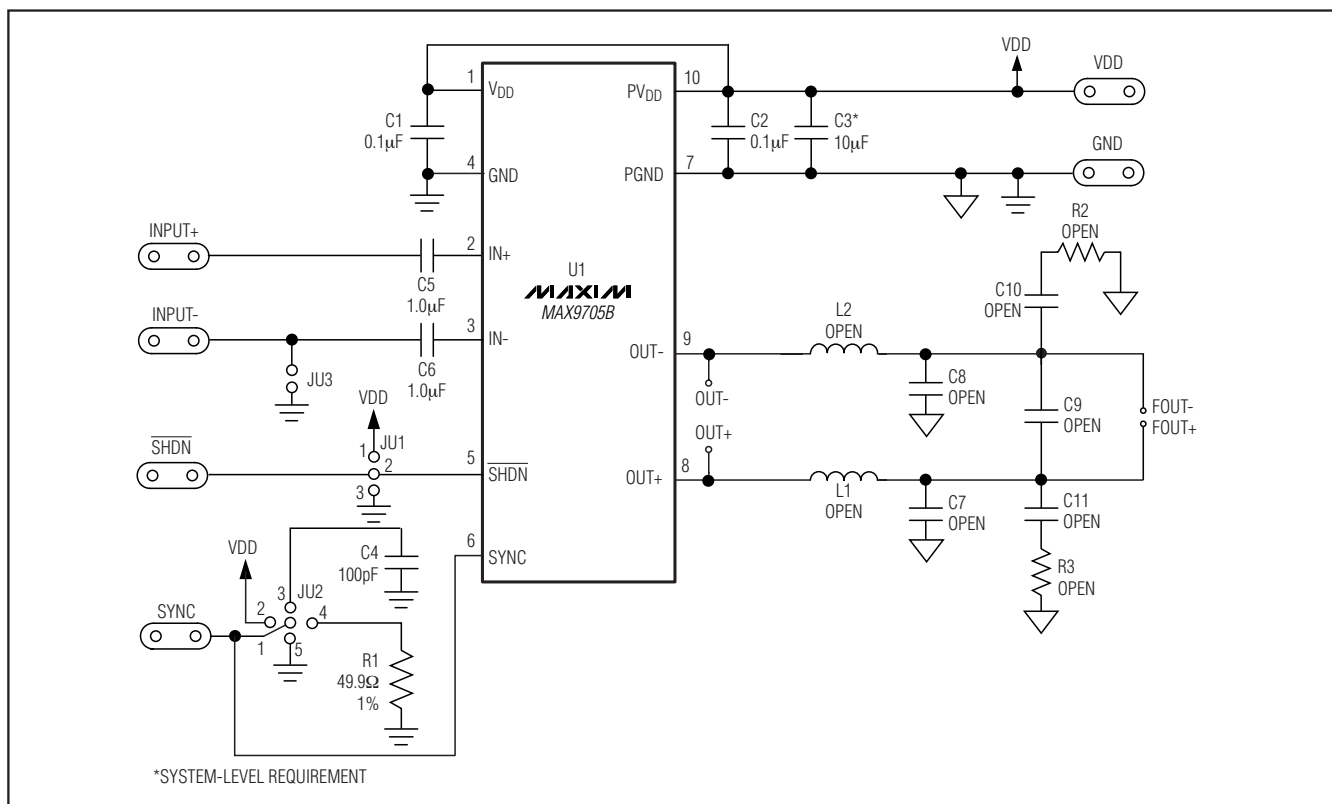


Figure 2. MAX9705B EV Kit Schematic

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Evaluates: MAX9705A/B/C/D

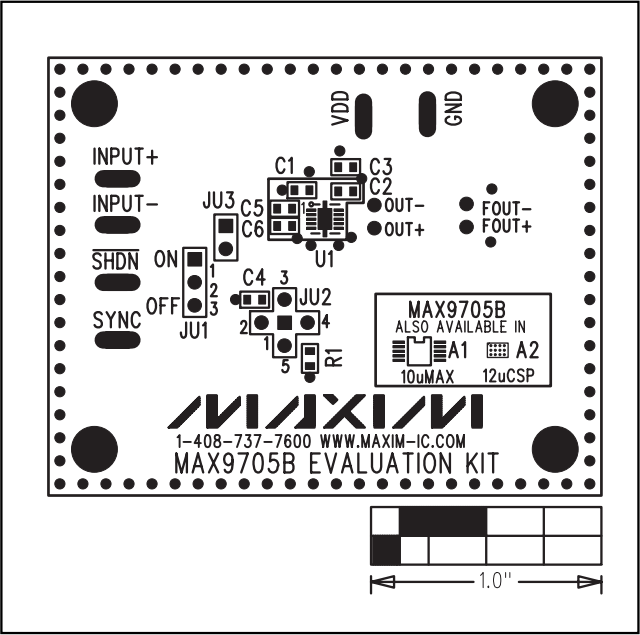


Figure 3. MAX9705B EV Kit Component Placement Guide—Component Side

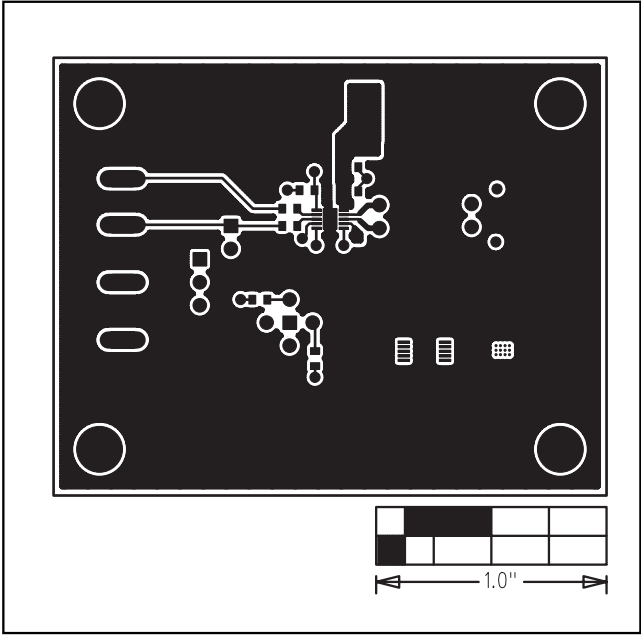


Figure 4. MAX9705B EV Kit PC Board Layout—Component Side

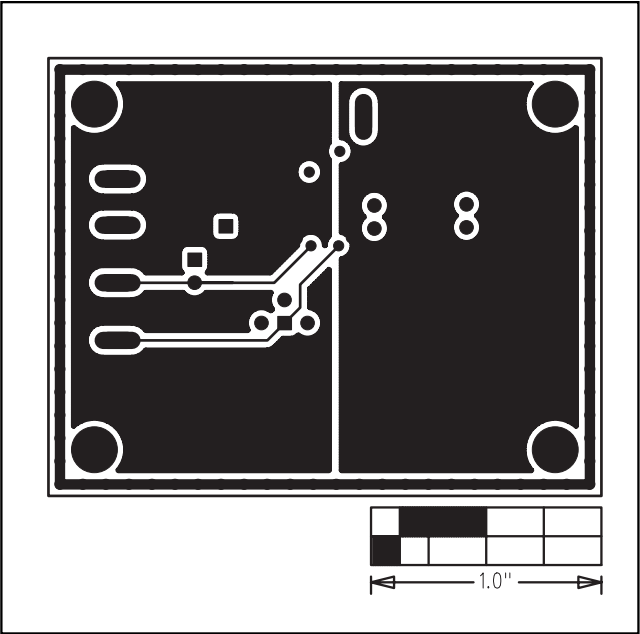


Figure 5. MAX9705B EV Kit PC Board Layout—GND Layer 2

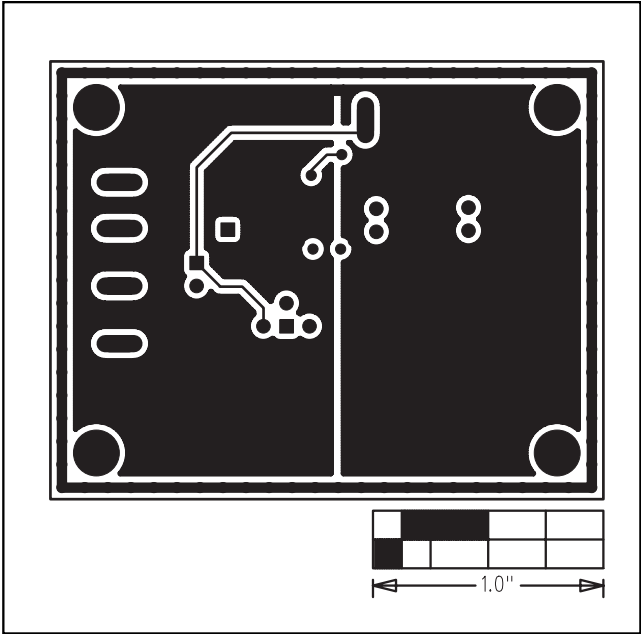


Figure 6. MAX9705B EV Kit PC Board Layout—GND Layer 3

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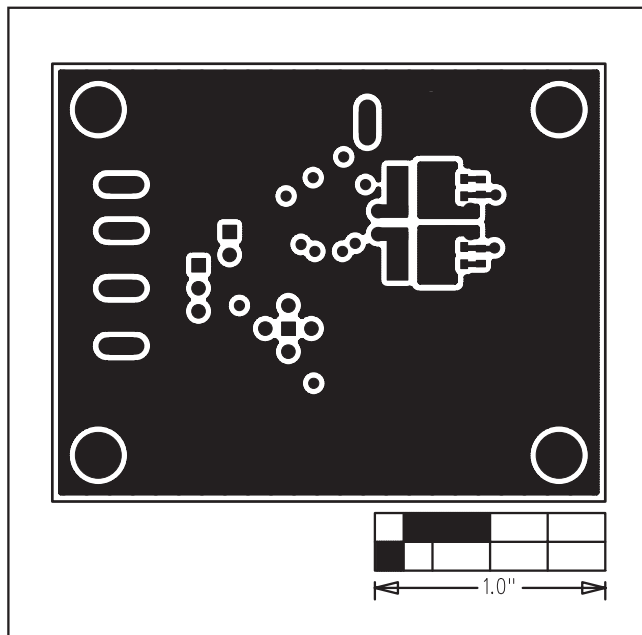


Figure 7. MAX9705B EV Kit PC Board Layout—Solder Side

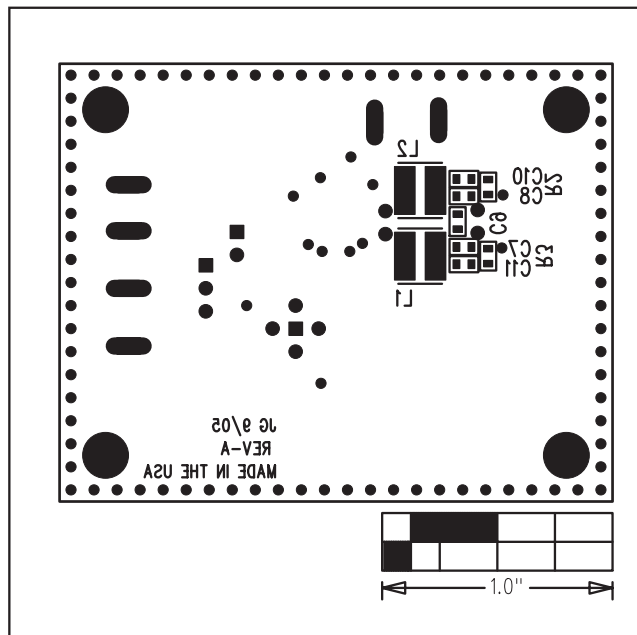


Figure 8. MAX9705B EV Kit Component Placement Guide—Solder Side

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