

# MAXIM

## MAX9700B Evaluation Kit

### General Description

The MAX9700B evaluation kit (EV kit) is a fully assembled and tested circuit board that uses the MAX9700B 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 1.2W into an 8Ω 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 MAX9700B EV kit also evaluates the MAX9700A/MAX9700C/MAX9700D and the MAX9712.

### Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX9700BEVKIT	0°C to +70°C	10 TDFN-EP*

\*EP = Exposed paddle.

### Features

- ◆ Filterless Operation Passes FCC Radiated Emissions
- ◆ Evaluates the MAX9700A/B/C/D or MAX9712 (with IC Replacement)
- ◆ 2.5V to 5.5V Single-Supply Operation
- ◆ Up to 94% Efficiency
- ◆ Drives 1.2W into 8Ω 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
A1	0	Not installed, MAX9700BEUB (10-pin μMAX)
A2	0	Not installed, MAX9700BEBC-T (12-bump UCSP)
C1, C2	2	0.1μF ±10%, 25V X7R ceramic capacitors (0603) TDK C1608X7R1E104K
C3	1	10μF ±20%, 6.3V X5R ceramic capacitor (0805) TDK C2012X5R0J106M
C4	0	Not installed, capacitor (0805)
C5, C6	2	1μF ±10%, 10V X5R ceramic capacitors (0603) TDK C1608X5R1A105K
C7, C8, C9, C11–C14	0	Not installed, capacitors (0603)
C10	1	100pF ±5%, 50V C0G ceramic capacitor (0603) TDK C1608C0G1H101J

DESIGNATION	QTY	DESCRIPTION
JU1	1	3-pin header
JU2	1	5-pin header
JU3	1	2-pin header
L1, L2	0	Not installed, inductors recommended TOKO D53LC series
L3, L4, L5	3	Ferrite beads 100Ω at 100MHz, 50mΩ DCR, 3A (0603) TDK MPZ1608S101A
R1	1	49.9Ω ±1% resistor (0603)
R2, R3	0	Not installed, resistors (0603)
T1	0	Not installed, common-mode choke 50VDC, 1ADC 800Ω at 100MHz recommended TDK ACM4532-801-2P-X
U1	1	MAX9700BETB (10-pin TDFN, 3mm x 3mm x 0.8mm))
None	3	Shunts (JU1, JU2, JU3)
None	1	MAX9700B PC board

Evaluates: MAX9700A/B/C/D/MAX9712

# MAX9700B Evaluation Kit

## 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:** Please indicate that you are using the MAX9700B when contacting these component suppliers.

### Quick Start

The MAX9700B 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)
- 8Ω speaker

#### Procedures:

- 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 8Ω 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 MAX9700B EV kit features the MAX9700B 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 1.2W into an 8Ω speaker.

The EV kit provides three sets of differential outputs. The device outputs (OUT+/-) can be connected directly to a speaker load without any filtering. However, a filter can be added to ease evaluation. The filtered outputs (FOUTPUT+/-) require installation of filtering components L1, L2, C7, C8, C9, C13, C14, R2, and R3. When an LCR filter is required, remove C11, C12, and T1,

short T1-1 to T1-4, and short T1-2 to T1-3. See Table 1 for the suggested filtering component values for an 8Ω load and a 30kHz cutoff frequency.

**Table 1. Suggested Filtering Components for an 8Ω Load and 30kHz Cut-Off**

COMPONENT	VALUE
L1, L2	15μH
C7, C8	0.033μF
C9	0.15μF
C13, C14	0.068μF
R2, R3	22Ω

The MAX9700B is designed to pass FCC Class-B RF emissions without additional filtering when using 10cm of cable to connect the speaker. In applications where more margin and/or cable length are required, output capacitors C11, C12 and common-mode choke T1 can be added to reduce radiated emission. Connect the speaker to output +/- test points. Table 2 lists the cable length verses the required output components.

**Table 2. Cable Length vs. Suggested Output Components**

CABLE LENGTH X (CM)	OUTPUT CAPACITOR C11 AND C12	COMMON-MODE CHOKE T1	LCR FILTER L1, L2, C7, C8, C9, C13, C14, R2, R3
X < 10	—	—	—
10 < X < 15	Required (100pF)	—	—
15 < X < 30	Required (100pF)	Required	—
X > 30	—	—	Required*

\*When an LCR filter is required, remove C11, C12 and T1, short T1-1 to T1-4, short T1-2 to T1-3.

# MAX9700B Evaluation Kit

## Jumper Selection Shutdown Mode ( $\overline{\text{SHDN}}$ )

Jumper JU1 controls the shutdown pin ( $\overline{\text{SHDN}}$ ) of the MAX9700B IC. See Table 3 for shunt positions.

**Table 3. JU1 Jumper Selection**

SHUNT POSITION	EV KIT FUNCTION
1-2 ( $\overline{\text{SHDN}}$ = high)	EV kit enabled
2-3 ( $\overline{\text{SHDN}}$ = low)	Shutdown mode
None. External controller connected to $\overline{\text{SHDN}}$ pad (TTL).	$\overline{\text{SHDN}}$ driven by external controller. Shutdown is active low.

## Switching Frequency Mode (Sync)

Jumper JU2 provides an option to select the switching frequency of the MAX9700B IC. See Table 4 for the various shunt positions.

**Table 4. JU2 Jumper Selection**

SHUNT POSITION	MAX9700B 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 $f_{\text{NOM}} = 1.45\text{MHz}$
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 the nominal

## 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**

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

## Evaluating the MAX9700A/MAX9700C/MAX9700D and the MAX9712

The MAX9700B EV kit can evaluate the MAX9700A, MAX9700C, MAX9700D, and the MAX9712. To evaluate a different IC, replace U1 with the desired part. Refer to the MAX9700 or the MAX9712 data sheets for additional information.

**Evaluates: MAX9700A/B/C/D/MAX9712**

# MAX9700B Evaluation Kit

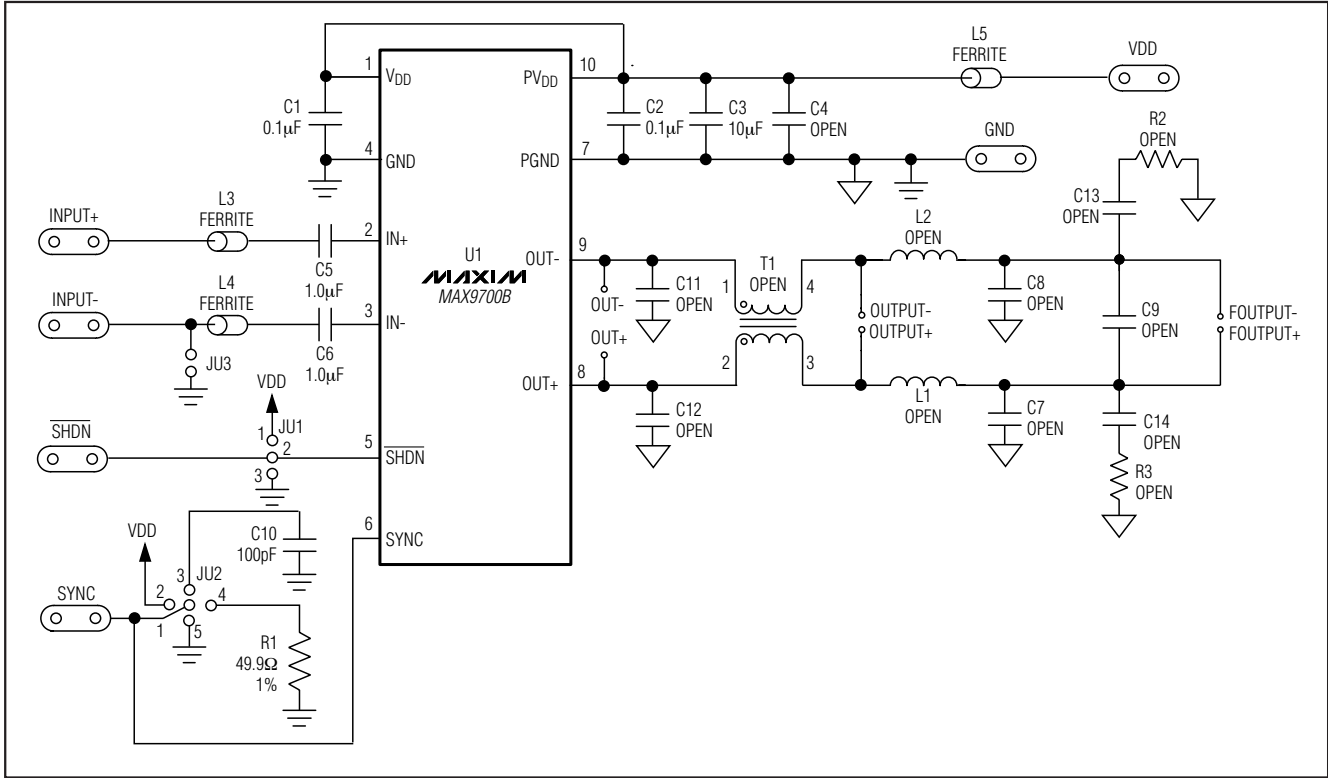


Figure 1. MAX9700B EV Kit Schematic

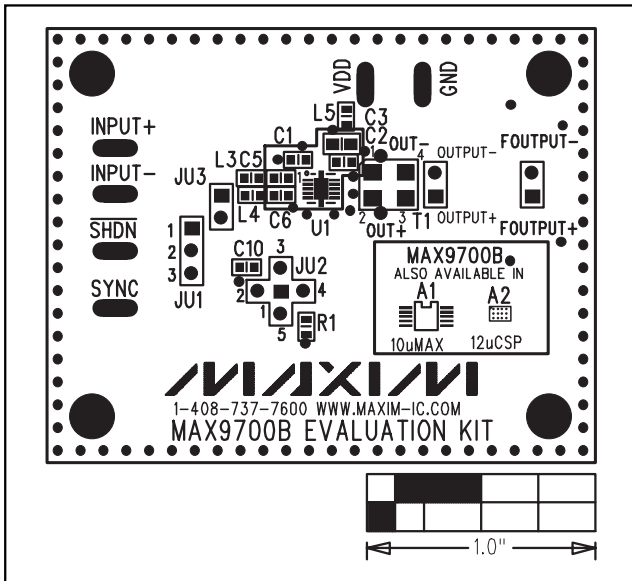


Figure 2. MAX9700B EV Kit Component Placement Guide—Component Side

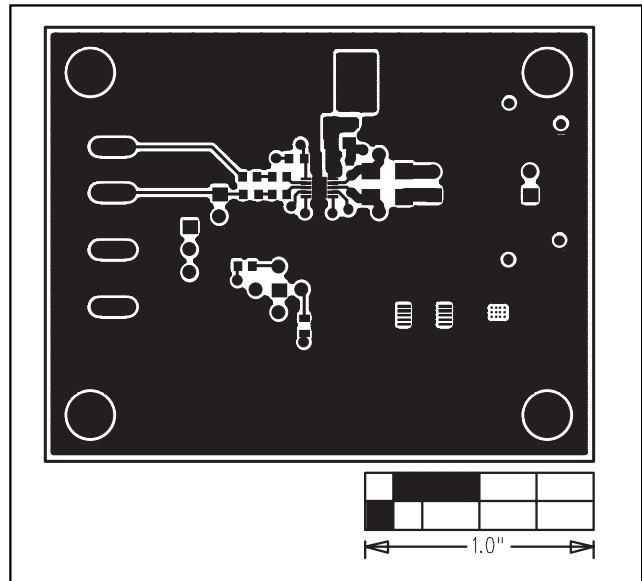


Figure 3. MAX9700B EV Kit PC Board Layout—Component Side

# MAX9700B Evaluation Kit

Evaluates: MAX9700A/B/C/D/MAX9712

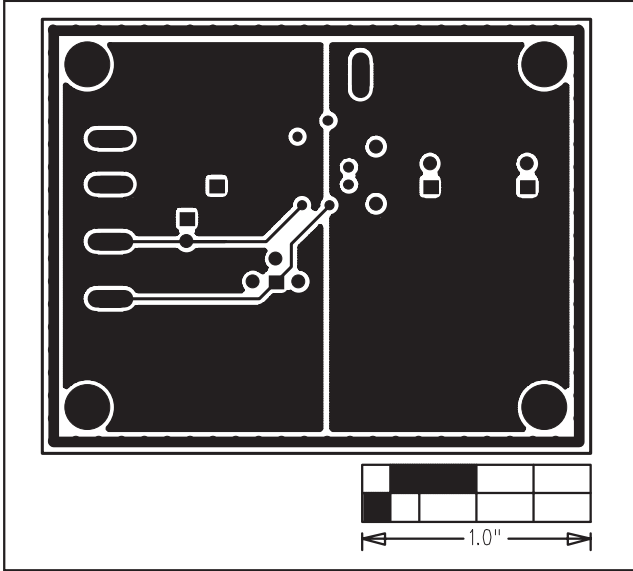


Figure 4. MAX9700B EV Kit PC Board Layout—GND Layer 2

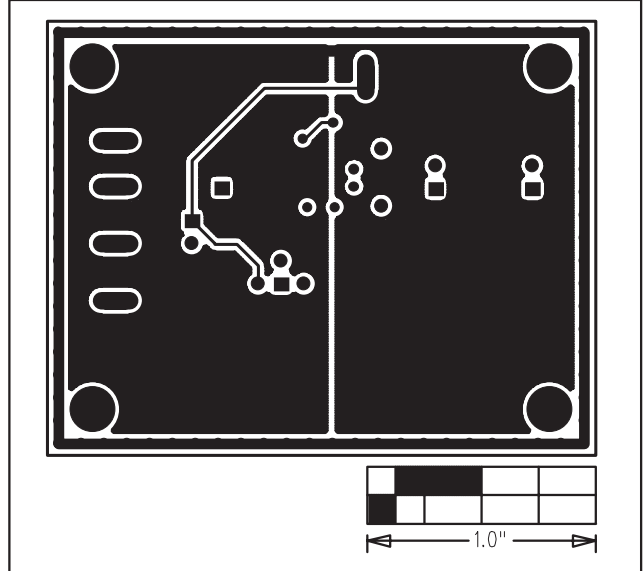


Figure 5. MAX9700B EV Kit PC Board Layout—GND Layer 3

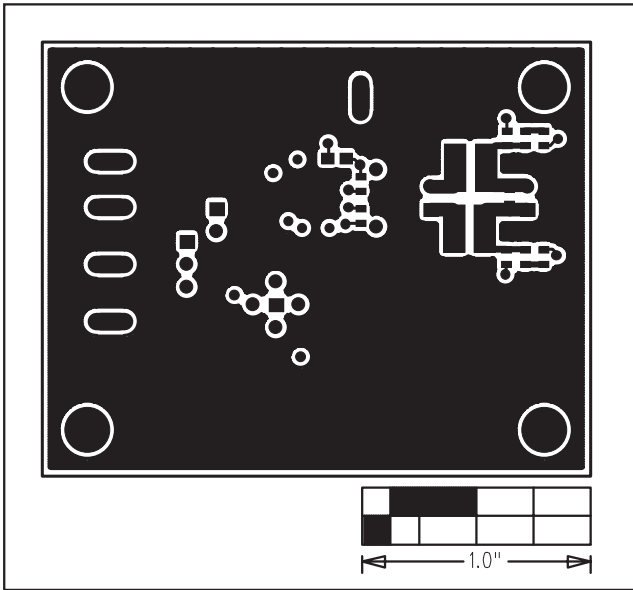


Figure 6. MAX9700B EV Kit PC Board Layout—Solder Side

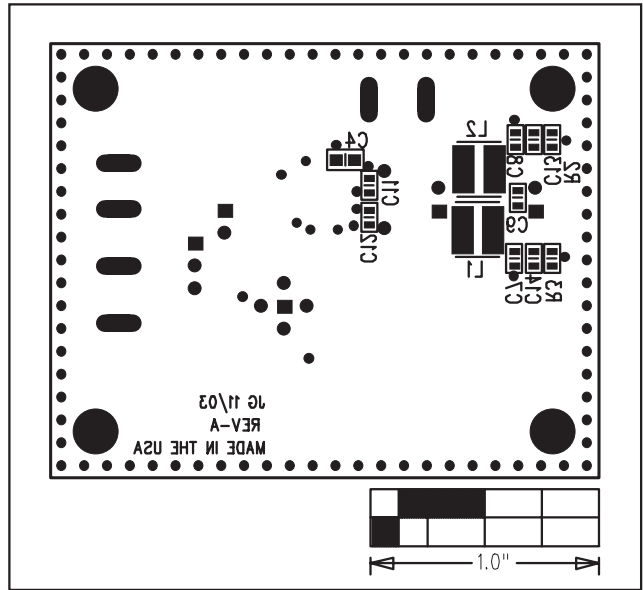


Figure 7. MAX9700B EV Kit Component Placement Guide—Solder Side

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