



# MAX15040 Evaluation Kit

## General Description

The MAX15040 evaluation kit (EV kit) provides a proven design to evaluate the MAX15040 high-efficiency, 4A, step-down regulator with integrated switches. The EV kit is preset for 1.8V output at load currents up to 4A from a 2.4V to 3.6V input supply. The MAX15040 features a 1MHz switching frequency, which allows the EV kit to achieve an all-ceramic capacitor design and fast-transient responses. The EV kit achieves up to 95% efficiency.

The MAX15040 EV kit PCB comes with a MAX15040EWE+ installed.

## Features

- ◆ Operates from 2.4V to 3.6V Input Supply
- ◆ All-Ceramic Capacitor Design
- ◆ 1MHz Switching Frequency
- ◆ Output-Voltage Range: 0.6V to (0.9 x  $V_{IN}$ )
- ◆ Lead(Pb)-Free and RoHS Compliant
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TYPE
MAX15040EVKIT+	EV Kit

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

## Component List

DESIGNATION	QTY	DESCRIPTION
C1	0	Not installed, ceramic capacitor (0805)
C2, C9	2	22 $\mu$ F $\pm$ 20%, 6.3V X5R ceramic capacitors (0805) Murata GRM21BR60J226M
C3, C8	2	0.1 $\mu$ F $\pm$ 10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K
C4	1	1 $\mu$ F $\pm$ 10%, 16V X5R ceramic capacitor (0603) TDK C1608X5R1C105K
C5	1	820pF $\pm$ 10%, 16V ceramic capacitor (0603) AVX 0603YC821KAT2A
C6	1	33pF $\pm$ 5%, 16V COG ceramic capacitor (0603) TDK C1608C0G1H330J
C7	1	0.033 $\mu$ F $\pm$ 10%, 25V X7R ceramic capacitor (0603) TDK C1608X7R1E333K
C10	1	470pF $\pm$ 10%, 50V, X7R ceramic capacitor (0603) Murata GRM188R71H471K

DESIGNATION	QTY	DESCRIPTION
C11	0	Not installed, ceramic capacitor (0805)
C12	0	Not installed, ceramic capacitor (0603)
JU1	1	2-pin header
L1	1	0.47 $\mu$ H, 17.5A inductor (6.86mm x 6.47mm x 3.00mm) Vishay IHLP2525CZERR47M06
R1	1	10 $\Omega$ $\pm$ 5% resistor (0603)
R2	1	100k $\Omega$ $\pm$ 1% resistor (0603)
R3	1	20k $\Omega$ $\pm$ 5% resistor (0603)
R4	1	432 $\Omega$ $\pm$ 1% resistor (0603)
R5	1	8.06k $\Omega$ $\pm$ 1% resistor (0603)
R6	1	4.02k $\Omega$ $\pm$ 1% resistor (0603)
R7	1	4.99k $\Omega$ $\pm$ 1% resistor (0603)
R8	0	Not installed, resistor (0603)
U1	1	Step-down regulator (16 WLP) Maxim MAX15040EWE+
—	1	Shunt
—	1	PCB: MAX15040 EVALUATION KIT+

Evaluates: MAX15040

# MAX15040 Evaluation Kit

## Component Suppliers

SUPPLIER	PHONE	WEBSITE
AVX Corporation	843-946-0238	www.avxcorp.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
TDK Corp.	847-803-6100	www.component.tdk.com
Vishay	402-563-6866	www.vishay.com

**Note:** Indicate that you are using the MAX15040 when contacting these component suppliers.

## Quick Start

### Recommended Equipment

- MAX15040 EV kit
- 3.3V/4A DC power supply
- One load capable of 4A
- One digital voltmeter

### Procedure

The MAX15040 EV kit is fully assembled and tested. Follow the steps below to verify the board operation.

**Caution:** Do not turn on power supply until all connections are completed.

- 1) Connect the positive terminal of the 3.3V supply to the VIN pad and the negative terminal to the nearest GND pad.
- 2) Connect the positive terminal of the 4A load to the VOUT pad and the negative terminal to the nearest GND pad.
- 3) Connect the digital voltmeter across the VOUT pad and the nearest GND pad.
- 4) Verify that a shunt is not installed on JU1.
- 5) Turn on the DC power supply.
- 6) Enable the load.
- 7) Verify that the voltmeter displays 1.8V.

## Detailed Description of Hardware

The MAX15040 EV kit provides a proven design to evaluate the MAX15040 high-efficiency, 4A, step-down regulator with integrated switches. The applications include server, point-of-load, ASIC/CPU/DSP, DDR, base-station, telecom and networking, and RAID control power supplies. The EV kit is preset for 1.8V output at load currents up to 4A from a 2.4V to 3.6V input supply. The MAX15040 features a 1MHz fixed switching frequency, which allows the EV kit to achieve an all-ceramic capacitor design and fast-transient responses.

## Soft-Start and Reference Input (REFIN/SS)

The MAX15040 utilizes an adjustable soft-start function to limit inrush current during startup. The soft-start time is adjusted by the value of C7, the external capacitor from REFIN/SS to GND. By default, C7 is currently 0.033μF, which gives a soft-start time of approximately 2.5ms. To adjust the soft-start time, determine the C7 using the following formula:

$$C7 = (8\mu A \times t_{SS}) / 0.6V$$

where tSS is the required soft-start time in seconds and C7 is in farads. C7 should be a minimum of 1nF capacitor between REFIN/SS and GND.

When no external reference is applied at the REFIN/SS, the device uses the internal 0.6V reference. If a different reference voltage is needed, connect a reference up to (VDD - 1.85V) across the PCB pads of REFIN/SS and the nearest GND pad.

When an external reference is applied to REFIN/SS, soft-start must be provided externally and the external reference source must be able to sink 8μA soft-start current.

## Setting Output Voltage

The MAX15040 EV kit can be adjusted from 0.6V to 90% of VIN by changing the values of R5 and R6. To determine the value of the resistor-divider, first select R5 between 2kΩ to 10kΩ. Then use the following equation to calculate R6:

$$R6 = (V_{FB} \times R5) / (V_{OUT} - V_{FB})$$

where VFB is equal to the reference voltage at REFIN/SS and VOUT is the output. If no external reference is applied at REFIN/SS, the internal reference is automatically selected and VFB becomes 0.6V. In this case, R6 is not needed for VOUT = 0.6V.

When R5 is changed, compensation components R4, C10, R7, C5, and C6 must be recalculated to ensure loop stability (refer to the *Compensation Design* section in the MAX15040 IC data sheet).

**Evaluates: MAX15040**

### **Power Good (PWRGD)**

PWRGD is an open-drain output that goes high impedance when VFB is above  $92.5\% \times V_{REFIN}/SS$  and  $V_{REFIN}/SS$  is above 0.54V. PWRGD becomes low when VFB is below 90% of  $V_{REFIN}/SS$  for at least 48 clock cycles or  $V_{REFIN}/SS$  is below 0.54V. PWRGD also becomes low during shutdown. On the EV kit, the PWRGD PCB pad is pulled up to VDD through resistor R3. Use the GND PCB pad as a ground reference for this signal.

SHUNT POSITION	DESCRIPTION
1-2	Disables the MAX15040
Open*	Normal operation

\*Default position.

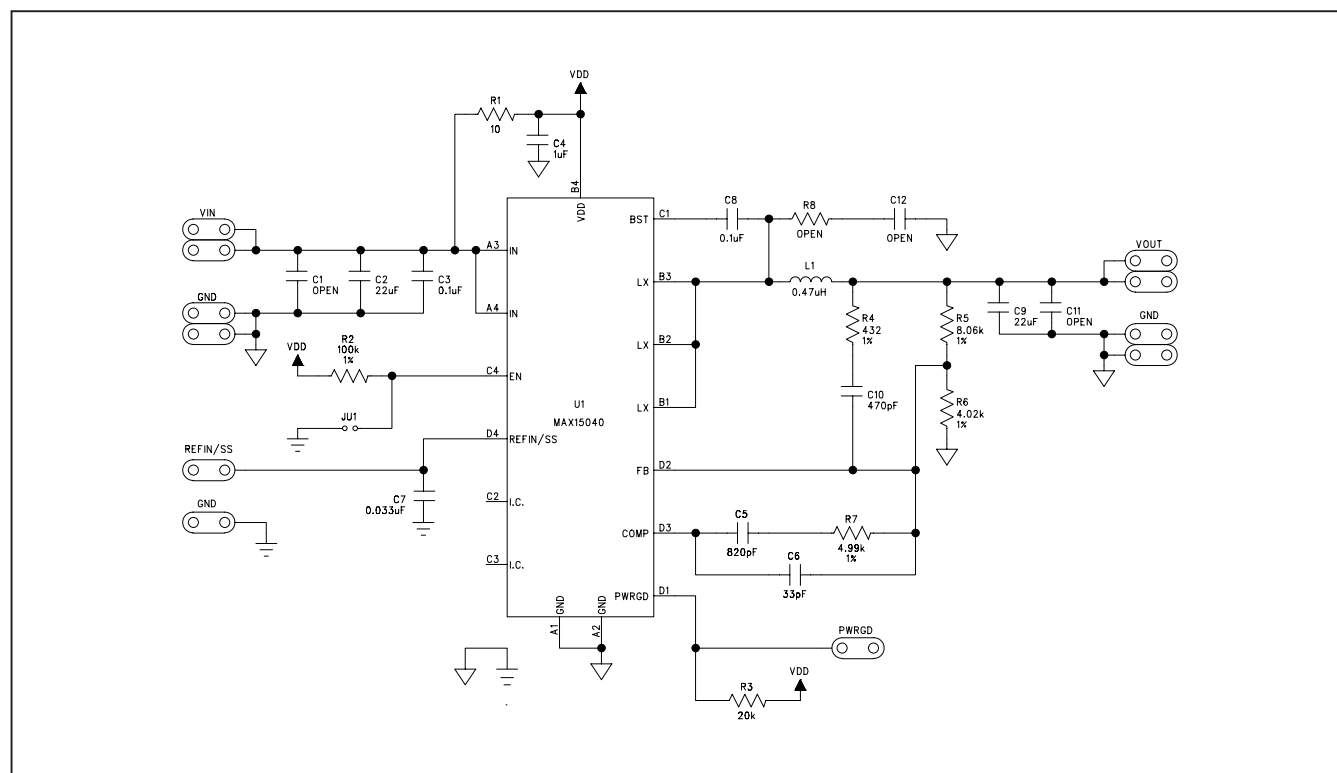


Figure 1. MAX15040 EV Kit Schematic

# MAX15040 Evaluation Kit

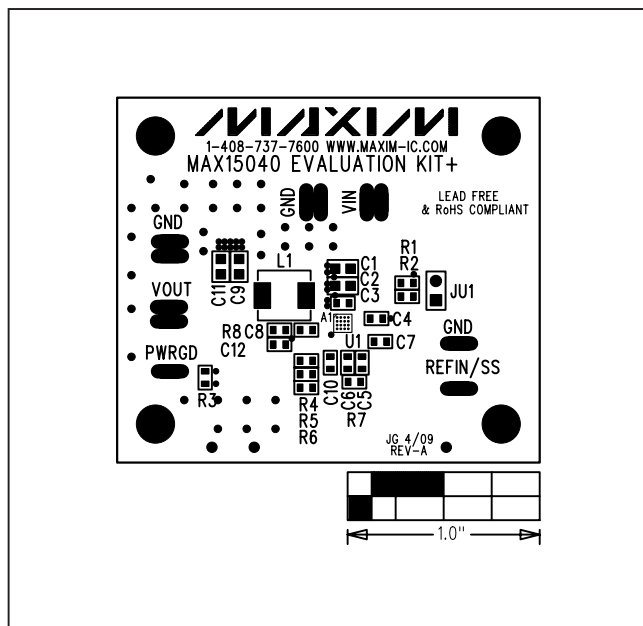


Figure 2. MAX15040 EV Kit Component Placement Guide—Component Side

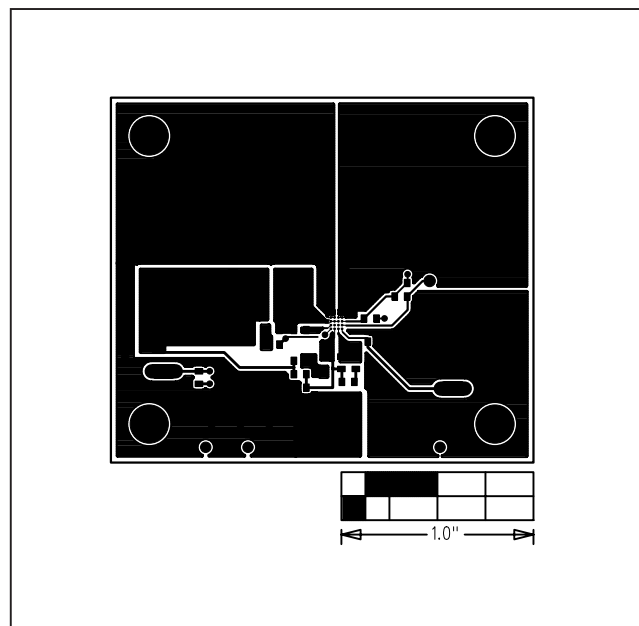


Figure 3. MAX15040 EV Kit Component PCB Layout—Component Side

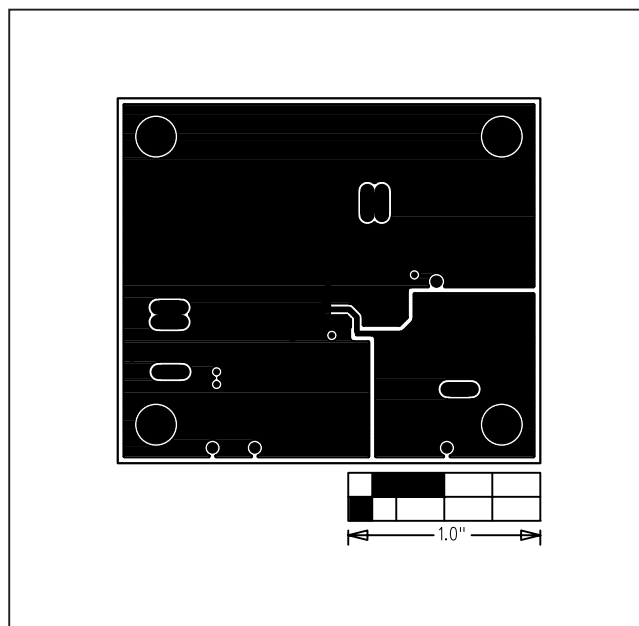


Figure 4. MAX15040 EV Kit PCB Layout—Inner Layer 2

# MAX15040 Evaluation Kit

**Evaluates: MAX15040**

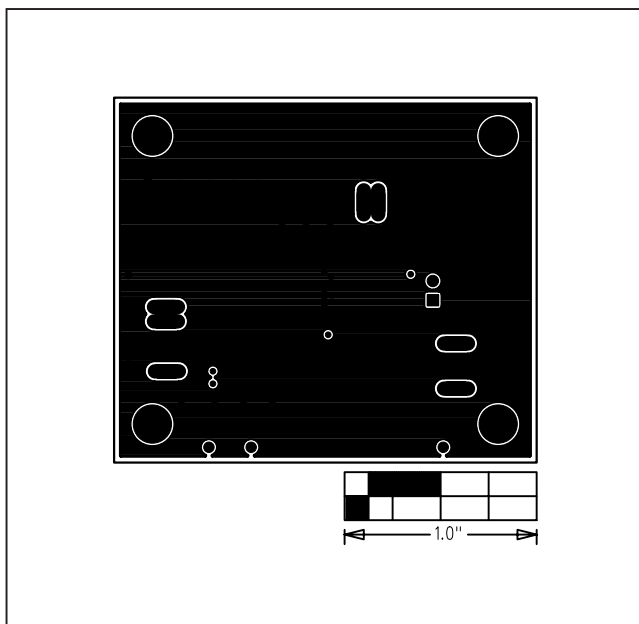


Figure 5. MAX15040 EV Kit PCB Layout—Inner Layer 3

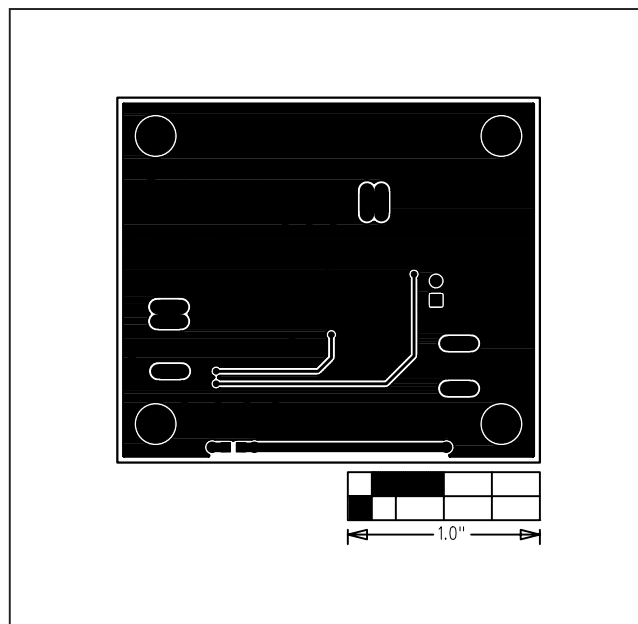


Figure 6. MAX15040 EV Kit PCB Layout—Solder Side

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

**Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 408-737-7600** \_\_\_\_\_ **5**