19-4665; Rev 0; 5/09

MAX15040 Evaluation Kit

Evaluates: MAX15040

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	22µF ±20%, 6.3V X5R ceramic capacitors (0805) Murata GRM21BR60J226M
C3, C8	2	0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K
C4	1	1µF ±10%, 16V X5R ceramic capacitor (0603) TDK C1608X5R1C105K
C5	1	820pF ±10%, 16V ceramic capacitor (0603) AVX 0603YC821KAT2A
C6	1	33pF ±5%, 16V COG ceramic capacitor (0603) TDK C1608C0G1H330J
C7	1	0.033µF ±10%, 25V X7R ceramic capacitor (0603) TDK C1608X7R1E333K
C10	1	470pF ±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	0.47µH, 17.5A inductor (6.86mm x 6.47mm x 3.00mm) Vishay IHLP2525CZERR47M06
R1	1	10Ω ±5% resistor (0603)
R2	1	100kΩ ±1% resistor (0603)
R3	1	20kΩ ±5% resistor (0603)
R4	1	432Ω ±1% resistor (0603)
R5	1	8.06kΩ ±1% resistor (0603)
R6	1	4.02kΩ ±1% resistor (0603)
R7	1	4.99kΩ ±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+

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 t_{SS} 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 (V_{DD} - 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 V_{IN} 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:

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

where V_{FB} 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 V_{FB} 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).

Regulator Enable (EN)

To shut down the converter, install a shunt on jumper JU1. For normal operation, remove the shunt from JU1. See Table 1 to configure jumper JU1.

Table 1. Regulator Enable (EN) Jumper JU1 Description

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

**Default position.*

Power Good (PWRGD)

PWRGD is an open-drain output that goes high impedance when V_{FB} is above 92.5% x $V_{REFIN/SS}$ and $V_{REFIN/SS}$ is above 0.54V. PWRGD becomes low when V_{FB} 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.

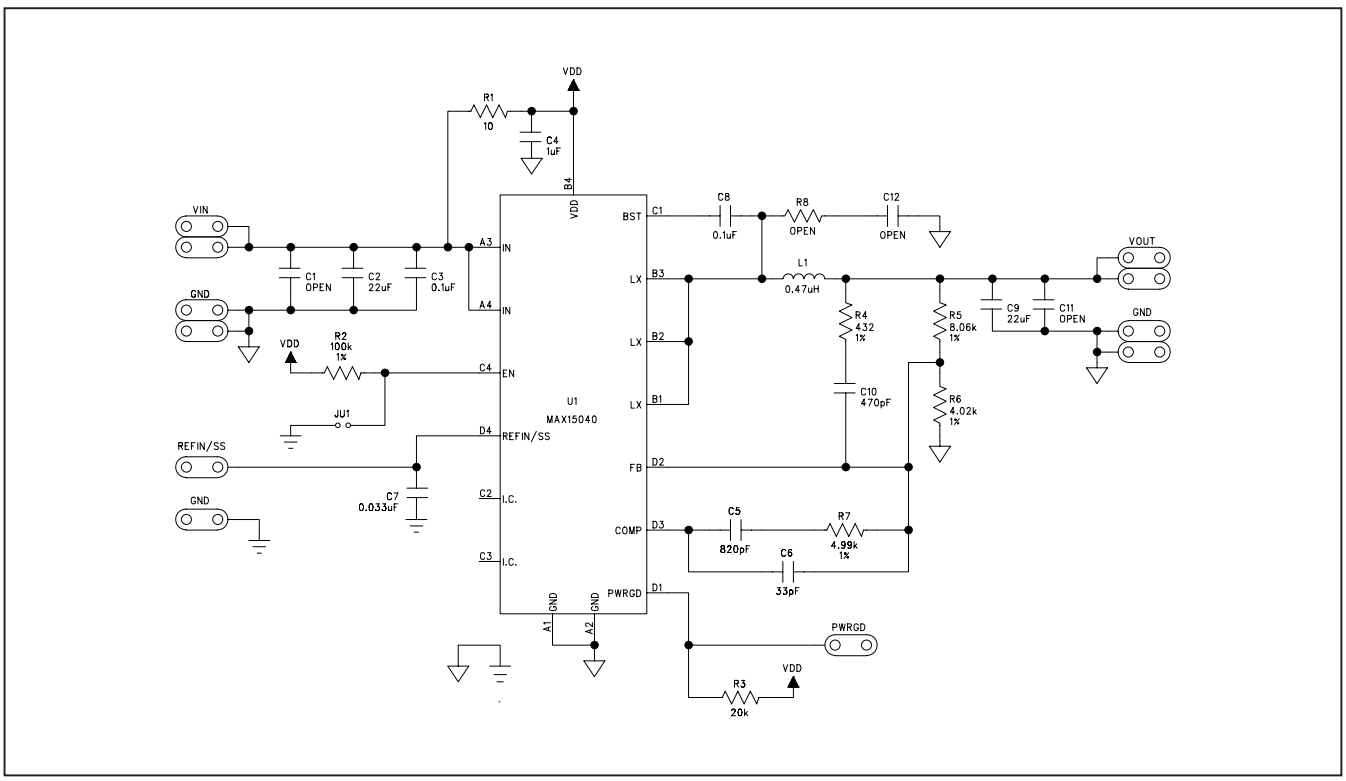

Figure 1. MAX15040 EV Kit Schematic

MAX15040 Evaluation Kit

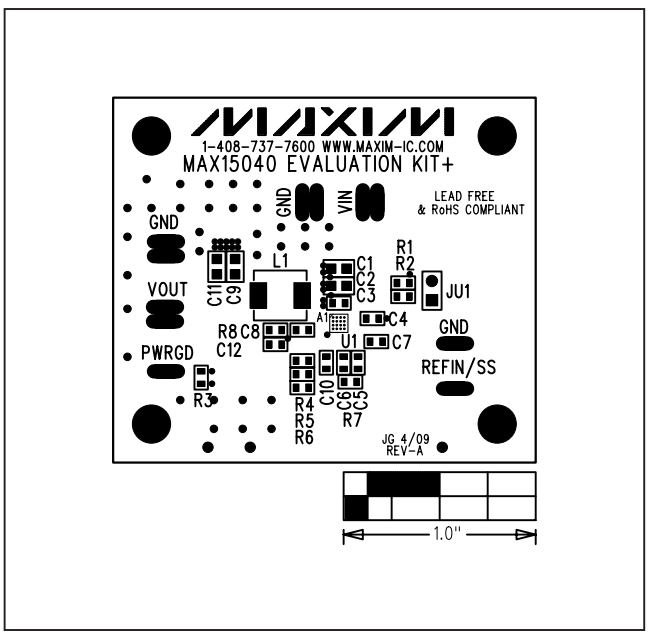

Figure 2. MAX15040 EV Kit Component Placement Guide—Component Side

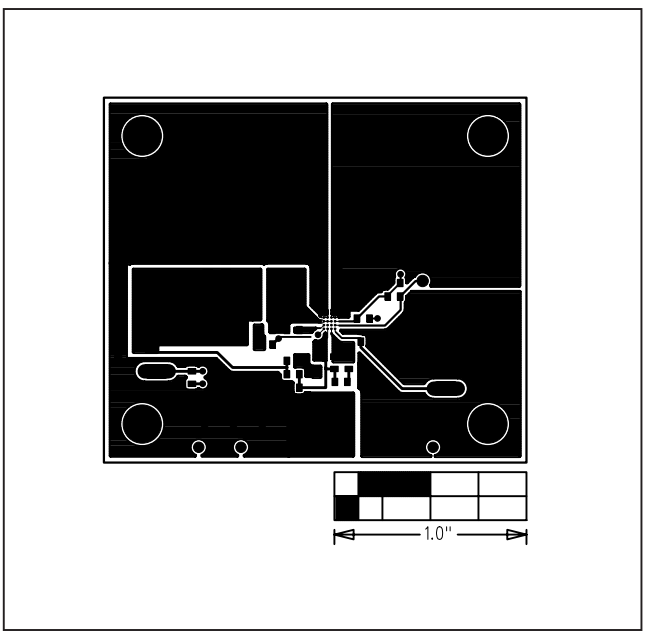

Figure 3. MAX15040 EV Kit Component PCB Layout—Component Side

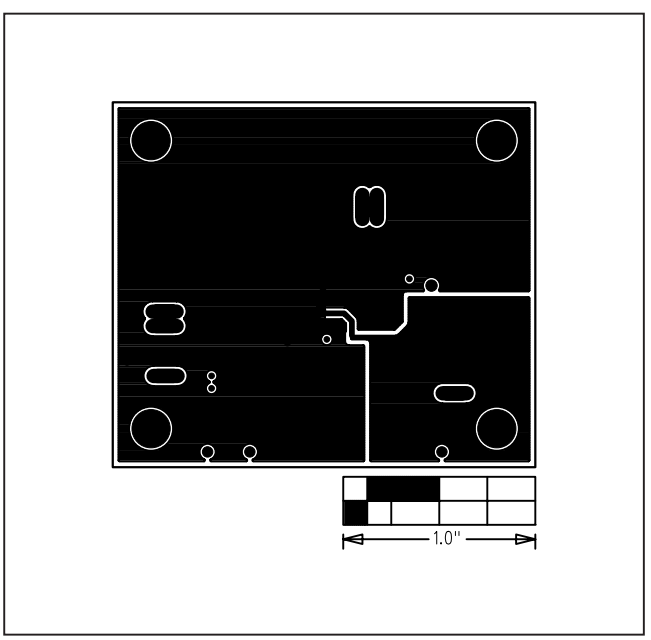

Figure 4. MAX15040 EV Kit PCB Layout—Inner Layer 2

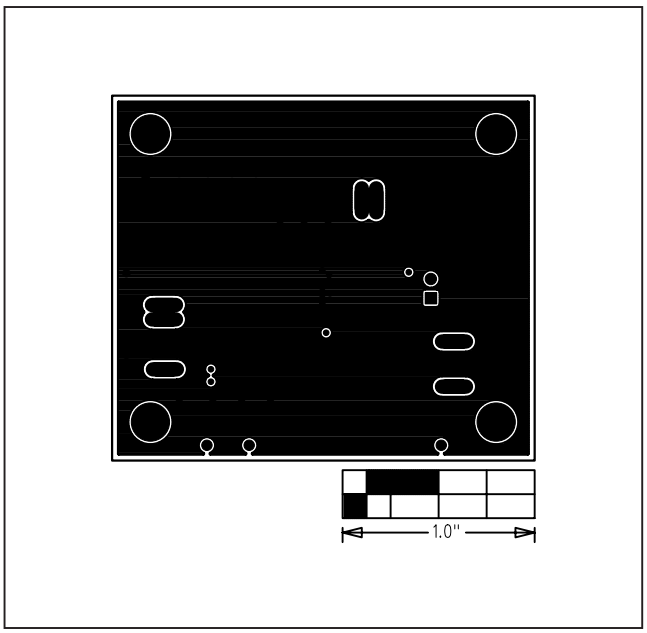

Figure 5. MAX15040 EV Kit PCB Layout—Inner Layer 3

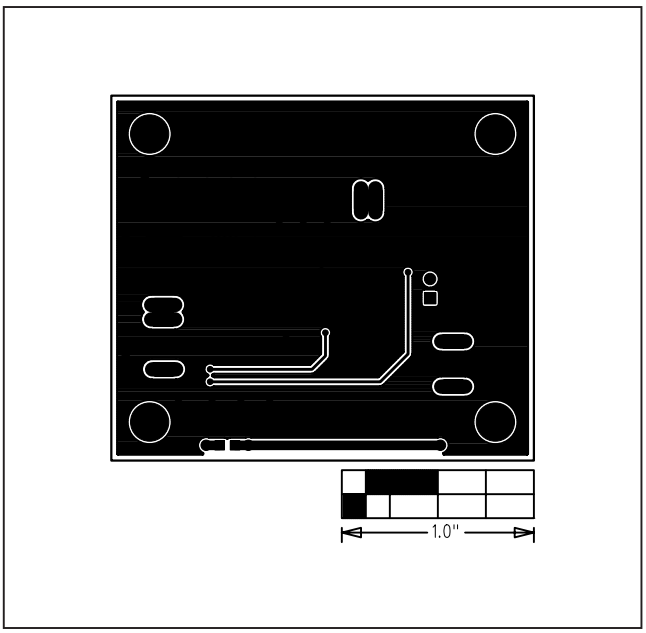

Figure 6. MAX15040 EV Kit PCB Layout—Solder Side