# MAX17515 Evaluation Kit

# Evaluates: MAX17515, 5A Integrated Power Module

## General Description

The MAX17515 evaluation kit (EV kit) is a fully assembled and tested PCB that demonstrates the typical 5A application circuit of the MAX17515. The MAX17515 is a fixed-frequency, integrated inductor, step-down power module for low-voltage, low-power applications.

The EV kit provides a 1.5V output voltage from a 2.4V to 5.5V input range and delivers up to 5A output current while achieving greater than 91.2% efficiency. The EV kit operates at 1MHz switching frequency and has superior line- and load-transient response. The EV kit also allows the evaluation of other adjustable output voltages from 0.75V to 3.6V by changing resistors R1 and R2.

***Ordering Information*** ***appears at end of data sheet.***

## Features

- High Integration Solution/Integrated Shielded Inductor
- 2.4V to 5.5V Input Range
- Configured for 1.5V Output Voltage
- Adjustable Output Voltage Range (0.75V to 3.6V)
- 5A Output Current
- 91.2% Efficiency ($V_{IN}$ = 3.3V, $V_{OUT}$ = 1.5V at 1.5A)
- 1MHz Switching Frequency
- Enable Input
- Power-Good Output Indicator (POK)
- Low-Profile Surface-Mount Components
- Proven PCB Layout
- Fully Assembled and Tested

## Component List

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| C1 | 1 | 33µF ±20%, 10V X5R electrolytic capacitors (B case)<br>Panasonic EEEFK1A330UR |
| C2 | 1 | 22µF ±20%, 10V X5R ceramic capacitors (1206)<br>TDK C3216X5R1A226M160AC |
| C3 | 1 | 220µF, 2.5V, 13mΩ ESR POS capacitor (B2 case)<br>Panasonic 2R5TPE220MFGB |
| C4 | 0 | Not installed, 1µF ±20%, 16V X7R ceramic capacitor (0603)<br>Murata GRM188R71C105K<br>TDK C1608X7R1C105K |

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| D1 | 1 | Green LED, clear (0805)<br>Lite-On LTST-C170GKT |
| JU1 | 1 | 2-pin headers |
| R1, R2 | 2 | 47.5kΩ ±1% resistor (0603) |
| R3 | 1 | 1kΩ ±5% resistor (0603) |
| U1 | 1 | 5A, 2.4V to 5.5V input, high-efficiency power module<br>Maxim MAX17515LI+ |
| — | 1 | Shunt |
| — | 1 | PCB: MAX17515 EVKIT |

## Component Suppliers

| SUPPLIER | PHONE | WEBSITE |
|---|---|---|
| Keystone Electronics Corp. | 800-221-5510 | www.keyelco.com |
| Lite-On, Inc. | 408-946-4873 | www.liteon.com |
| Murata Americas | 800-241-6574 | www.murataamericas.com |
| Panasonic Corp. | 800-344-2112 | www.panasonic.com |
| TDK Corp. | 847-803-6100 | www.component.tdk.com |

***Note:*** *Indicate that you are using the MAX17515 when contacting these component suppliers.*

*19-6705; Rev 1; 9/13*

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## Quick Start

### Recommended Equipment

- MAX17515 EV kit
- 2.4V to 5.5V DC power supply ($V_{IN}$)
- 5V DC power supply ($V_{CC}$)
- Dummy load capable of sinking 5A
- Digital multimeter (DMM)
- 100MHz dual-trace oscilloscope

### Procedure

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

1) Ensure that the circuit is connected correctly to the supplies and dummy load prior to applying any power.
2) Verify that a shunt is installed across jumper JU1.
3) Enable the power supply ($V_{IN}$ = 5V)
4) Observe the 1.5V output with the DMM and/or oscilloscope. Look at the EP2 switching node while varying the load current.

## Detailed Description of Hardware

### Input Supply Voltage

The MAX17515 EV kit can operate from a minimum 4.5V single DC power supply at VIN PCB pad with a shunt installed across JU1. The EV kit is also configured to power a lower input voltage at VIN PCB pad, which requires an additional 5V power supply at VCC PCB pad, a capacitor, C4, to be installed, and a connecting trace between $V_{IN}$ and $V_{CC}$ (next to R3's footprint) to be cut. Table 1 lists all operating configurations of the EV kit at different input voltage sources.

### Enable Input

The EV kit features a 2-pin jumper (JU1) that selects the enable/disable control input. The shunt is installed across JU1 to enable the device and vice versa.

### Switching Frequency (FREQ)

The EV kit features a PWM-mode switching frequency. The switching frequency is fixed at 1MHz.

### Programming the Output Voltage

The EV kit includes a default output programmed at 1.5V and also produces an adjustable 0.75V to 3.6V output voltage by connecting FB to a resistive divider. To obtain an output voltage other than the default programmed output, simply modify the R1 and R2 resistors with values according to the following equation:

$$V_{OUT} = V_{FB}\left(1+\frac{R1}{R2}\right)$$

where $V_{FB}$ = 0.75V. Output capacitance value changes are required for an output voltage greater than 2V. Refer to the MAX17515 data sheet for output capacitance selection.

## Table 1. Jumper JU1 Functions

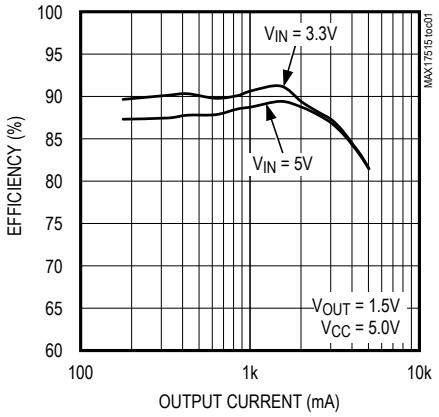
| SHUNT (JU1) POSITION | $V_{IN}/V_{CC}$ RANGE | REGULATOR OUTPUT |
|---|---|---|
| Installed | $V_{IN}$ = 4.5V to 5.5V<br>$V_{CC}$ = $V_{IN}$ | Enabled |
| Installed | $V_{IN}$ = 2.4V to 5.5V<br>Require an additional<br>$V_{CC}$ = 4.5V to 5.5V | Enabled |
| Not installed* | $V_{IN}$ = 2.4V to 5.5V<br>$V_{CC}$ = $V_{IN}$ | Disabled |

**The thin trace connecting $V_{IN}$ and $V_{CC}$ (next to R3's footprint) must be cut before applying the additional power supply to the VCC PCB pad.*

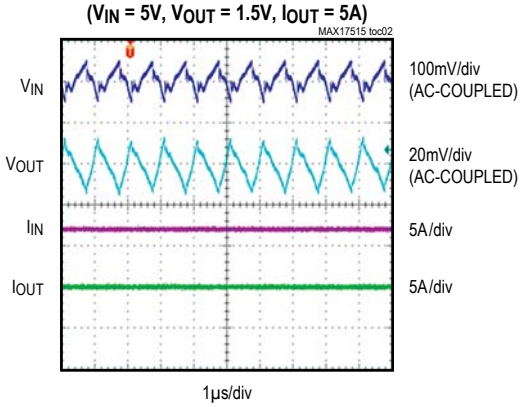
## Typical Operating Characteristics

($V_{CC}$ = 5V, $V_{IN}$ = 3.3V to 5V, $V_{OUT}$ = 0.9V to 3.3V, $I_{OUT}$ = 0–5A, $T_A$ = +25°C, unless otherwise noted.)

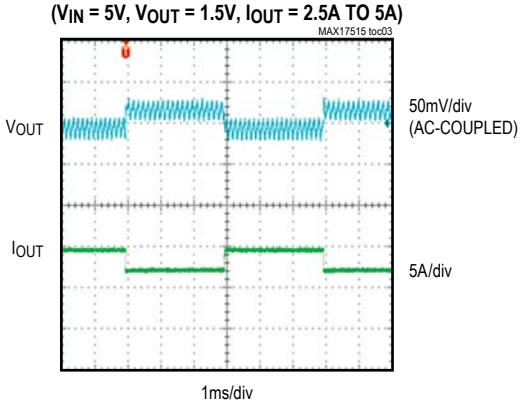
**EFFICIENCY vs. OUTPUT CURRENT**



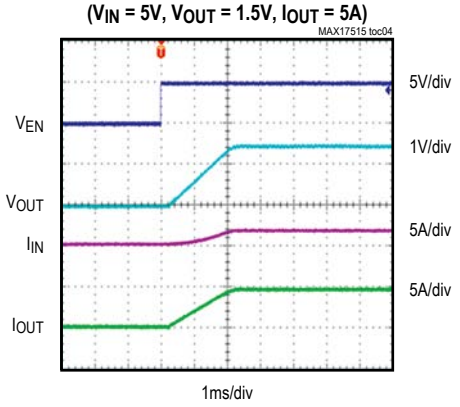

**VOLTAGE RIPPLE ($V_{IN}$ = 5V, $V_{OUT}$ = 1.5V, $I_{OUT}$ = 5A)**



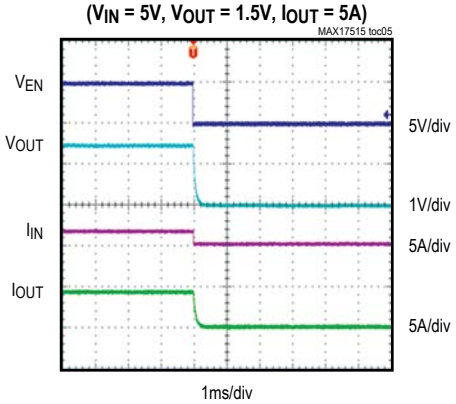

**LOAD CURRENT TRANSIENT RESPONSE ($V_{IN}$ = 5V, $V_{OUT}$ = 1.5V, $I_{OUT}$ = 2.5A TO 5A)**




**STARTUP WAVEFORM ($V_{IN}$ = 5V, $V_{OUT}$ = 1.5V, $I_{OUT}$ = 5A)**




**SHUTDOWN WAVEFORM ($V_{IN}$ = 5V, $V_{OUT}$ = 1.5V, $I_{OUT}$ = 5A)**



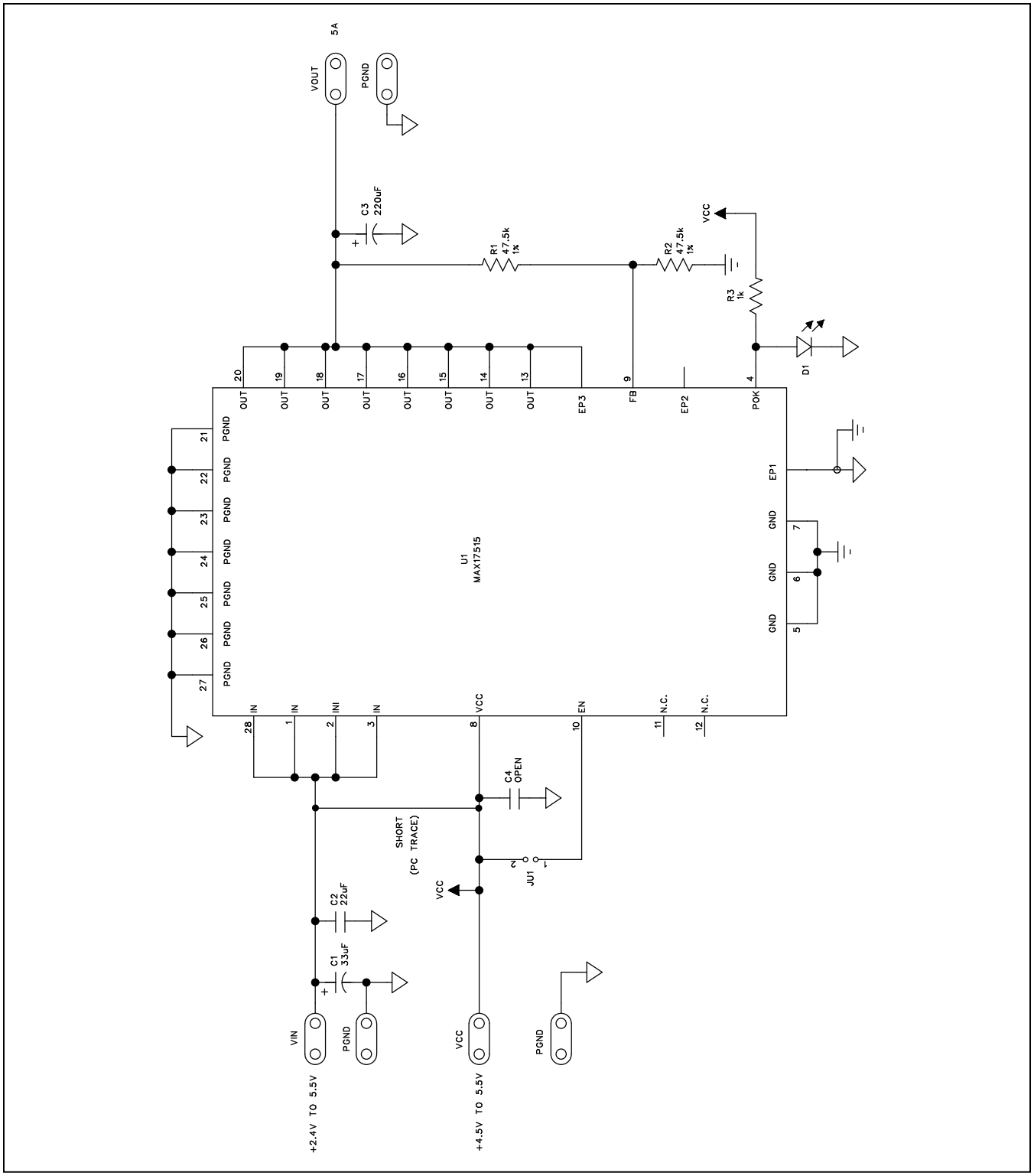



*Figure 1. MAX17515 EV Kit Schematic*

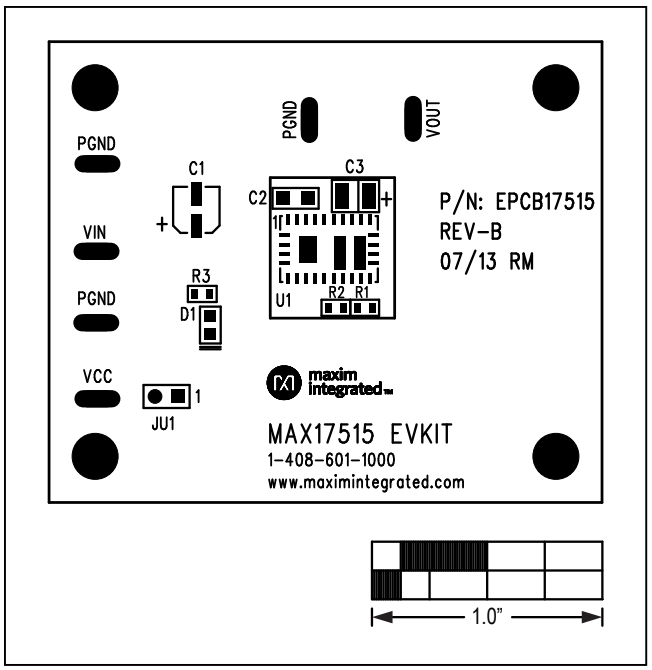



*Figure 2. MAX17515 EV Kit Component Placement Guide—Component Side*

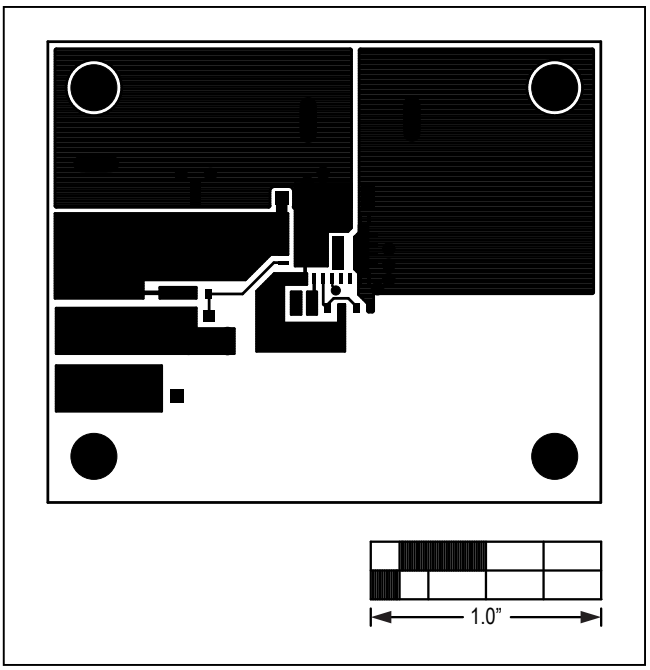



*Figure 3. MAX17515 EV Kit PCB Layout—Component Side*

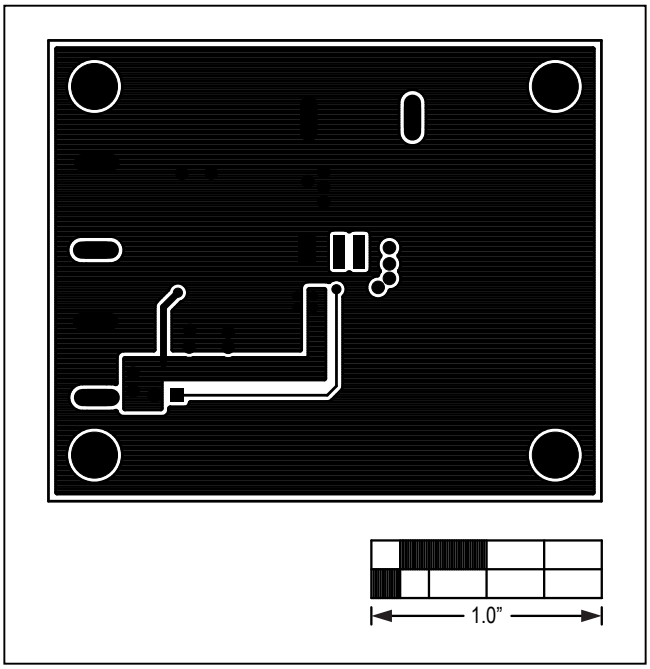



*Figure 4. MAX17515 EV Kit PCB Layout—PGND Layer 2*

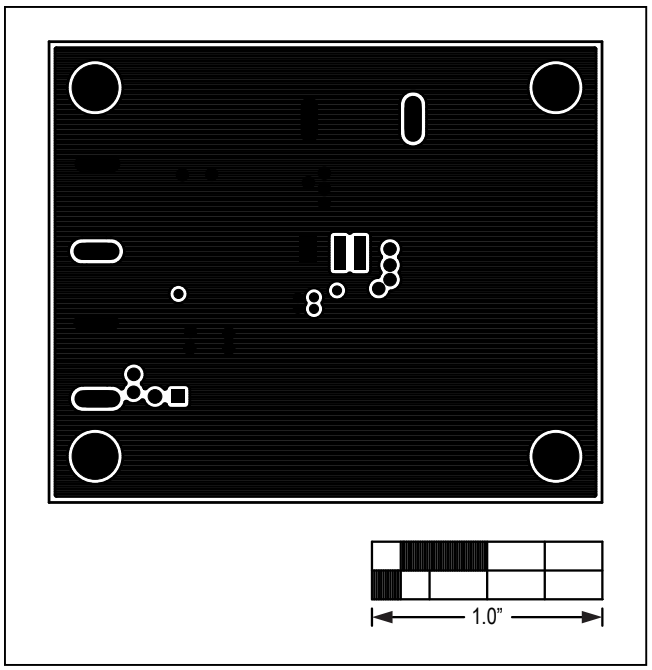



*Figure 5. MAX17515 EV Kit PCB Layout—PGND Layer 3*

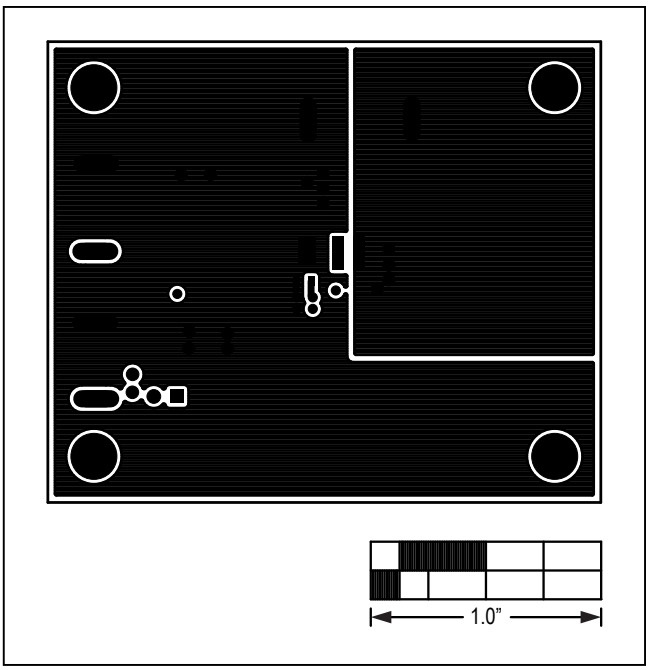



*Figure 6. MAX17515 EV Kit PCB Layout—Solder Side*

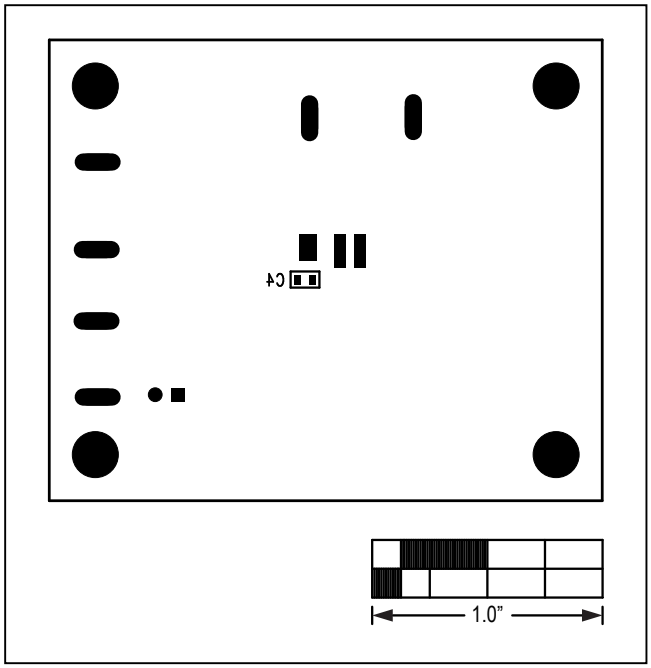



*Figure 7. MAX17515 EV Kit PCB Layout—Bottom Silk Screen*

## Ordering Information

| PART | TYPE |
|---|---|
| MAX17515EVKIT# | EV Kit |

*#Denotes RoHS compliant.*

## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|---|---|---|---|
| 0 | 5/13 | Initial release | — |
| 1 | 9/13 | Various changes including EV kit layout with multiple outputs to compact layout with a single output | 1–6 |

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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