

# MAX15108 Evaluation Kit

## Evaluates: MAX15108

### General Description

The MAX15108 evaluation kit (EV kit) provides a proven design to evaluate the MAX15108 high-efficiency, 8A, step-down regulator with integrated switches in a 20-bump wafer-level package (WLP). The EV kit is preset for 1.5V output at load currents up to 8A from a 2.7V to 5.5V input supply. The device features a 1MHz fixed switching frequency, which allows the EV kit to achieve an all-ceramic capacitor design and fast transient responses.

### Features

- ◆ Operates from a 2.7V to 5.5V Input Supply
- ◆ All-Ceramic Capacitor Design
- ◆ 1MHz Switching Frequency
- ◆ Output Voltage Range
  - 0.6V Up to  $0.94 \times V_{IN}$  (Forced PWM)
  - 0.6V Up to  $0.85 \times V_{IN}$  (Skip Mode)
- ◆ Enable Input/Power-Good Output
- ◆ Selectable Skip-Mode Functionality
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

[Ordering Information](#) appears at end of data sheet.

### Component List

| DESIGNATION    | QTY | DESCRIPTION   |
|----------------|-----|---|
| C1, C2, C19    | 3   | 10 $\mu$ F $\pm$ 10%, 6.3V X5R ceramic capacitors (0603)<br>Murata GRM188R60J106K<br>TDK C1608X5R0J106K |
| C3, C4, C21    | 0   | Not installed, ceramic capacitors (0603)  |
| C5, C7, C8, C9 | 4   | 47 $\mu$ F $\pm$ 20%, 6.3V X5R ceramic capacitors (1206)<br>Murata GRM31CR60J476M<br>TDK C3216X5R0J476M |
| C6             | 1   | 2200pF $\pm$ 10%, 50V X7R ceramic capacitor (0603)<br>Murata GRM188R71H222K<br>TDK C1608X7R1H222K       |
| C14            | 1   | 100pF $\pm$ 5%, 50V C0G ceramic capacitor (0603)<br>Murata GRM1885C1H101J<br>TDK C1608C0G1H101J         |
| C15            | 1   | 4700pF $\pm$ 10%, 50V X7R ceramic capacitor (0603)<br>Murata GRM188R71H472K<br>TDK C1608X7R1H472K       |

| DESIGNATION | QTY | DESCRIPTION   |
|-------------|-----|---|
| C16         | 1   | 0.033 $\mu$ F $\pm$ 10%, 16V X7R ceramic capacitor (0603)<br>Murata GRM188R71C333K<br>Taiyo Yuden EMK107BJ333KA |
| C20         | 1   | 1 $\mu$ F $\pm$ 10%, 6.3V X7R ceramic capacitor (0603)<br>Murata GRM188R70J105K                                 |
| C22         | 0   | Not installed, 220 $\mu$ F $\pm$ 20%, 10V aluminum electrolytic capacitor (6.3mm x 7.7mm)                       |
| C23         | 1   | 2.2 $\mu$ F $\pm$ 10%, 10V X7R ceramic capacitor (0603)<br>Murata GRM188R71A225K                                |
| JU1         | 1   | 2-pin header  |
| JU2         | 1   | 3-pin header  |
| L1          | 1   | 0.33 $\mu$ H, 18A inductor<br>Vishay IHL2525BD01R33M01  |
| R1          | 1   | 8.06k $\Omega$ $\pm$ 1% resistor (0603)   |
| R2          | 1   | 5.36k $\Omega$ $\pm$ 1% resistor (0603)   |
| R3          | 1   | 2.43k $\Omega$ $\pm$ 1% resistor (0603)   |

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### Component List (continued)

| DESIGNATION | QTY | DESCRIPTION                             |
|-------------|-----|---|
| R4, R5      | 2   | 100k $\Omega$ $\pm$ 5% resistors (0603) |
| R6          | 1   | 10 $\Omega$ $\pm$ 5% resistor (0603)    |
| R8          | 1   | 1 $\Omega$ $\pm$ 1% resistor (0805)     |
| R9          | 1   | 1k $\Omega$ $\pm$ 5% resistor (0603)    |
| R10         | 1   | 10k $\Omega$ $\pm$ 5% resistor (0603)   |
| R11         | 0   | Not installed, resistor (0603)          |

| DESIGNATION | QTY | DESCRIPTION   |
|-------------|-----|---|
| U1          | 1   | 8A current-mode buck converter (20 WLP)<br>Maxim MAX15108EWP+ |
| —           | 2   | Shunts  |
| —           | 1   | PCB: MAX15108 EVALUATION KIT                                  |

### Component Suppliers

| SUPPLIER                               | PHONE        | WEBSITE                     |
|--|--------------|-----------------------------|
| Murata Electronics North America, Inc. | 770-436-1300 | www.murata-northamerica.com |
| Taiyo Yuden                            | 800-348-2496 | www.t-yuden.com             |
| TDK Corp.                              | 847-803-6100 | www.component.tdk.com       |
| Vishay                                 | 402-563-6866 | www.vishay.com              |

**Note:** Indicate that you are using the MAX15108 when contacting these component suppliers.

### Quick Start

#### Recommended Equipment

- MAX15108 EV kit
- 5V, 5A DC power supply
- Load capable of sinking 8A
- Digital voltmeter

#### Procedure

The 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 5V supply to the IN PCB pad and the negative terminal to the nearest PGND PCB pad.
- 2) Connect the positive terminal of the 8A load to the OUT PCB pad and the negative terminal to the nearest PGND PCB pad.
- 3) Connect the digital voltmeter across the OUT PCB pad and the nearest PGND PCB pad.
- 4) Verify that a shunt is installed on jumper JU1.
- 5) Verify that a shunt is installed on pins 2-3 on jumper JU2.
- 6) Turn on the DC power supply.
- 7) Enable the load.
- 8) Verify that the voltmeter displays 1.5V.

### Detailed Description of Hardware

The MAX15108 EV kit provides a proven design to evaluate the MAX15108 high-efficiency, 8A, step-down regulator with integrated switches. The applications include distributed power systems, portable devices, and preregulators. The EV kit is preset for 1.5V output at load currents up to 8A from a 2.7V to 5.5V input supply. The device features a 1MHz fixed switching frequency, which allows the EV kit to achieve an all-ceramic capacitor design and fast transient responses. A placeholder for an input aluminum electrolytic capacitor (C22) is provided to damp the input if long wires are used; they are not required in a tight system design.

#### Soft-Start (SS)

The device utilizes an adjustable soft-start function to limit inrush current during startup. The soft-start time is adjusted by the value of C16, the external capacitor from SS to GND. By default, C16 is currently 0.033 $\mu$ F, which gives a soft-start time of approximately 2ms. To adjust the soft-start time, determine C16 using the following formula:

$$C16 = (10\mu A \times t_{SS})/0.6V$$

where  $t_{SS}$  is the required soft-start time in seconds and C16 is in farads.

An external tracking reference with steady-state value between 0 and  $V_{IN} - 2V$  can be applied to SS. Refer to the *Programmable Soft-Start (SS)* section in the MAX15108 IC data sheet for a more detailed description.

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### Setting the Output Voltage

The EV kit can be adjusted from 0.6V up to  $0.94 \times V_{IN}$  (forced PWM) by changing the values of resistors R1 and R2. To determine the value of the resistor-divider, first select R2 between 1k $\Omega$  and 20k $\Omega$ . Then use the following equation to calculate R1:

$$R1 = R2 [(V_{OUT}/V_{FB}) - 1]$$

where  $V_{FB}$  is the feedback threshold voltage ( $V_{FB} = 0.6V$ ) and  $V_{OUT}$  is the desired output. When regulating for an output of 0.6V in skip mode, set R1 to 0 $\Omega$  and keep R2 connected from FB to ground.

When R1 is changed, compensation components C14, R3, and C15 must be changed to ensure loop stability. Refer to the *Compensation Design Guidelines* section in the MAX15108 IC data sheet.

**Table 1. Regulator Enable (EN) Jumper JU1 Description**

| SHUNT POSITION | EN PIN                    | DEVICE OUTPUT |
|----------------|---------------------------|---------------|
| Installed*     | Connected to IN           | Enabled       |
| Not installed  | Pulled to PGND through R4 | Disabled      |

\*Default position.

### Regulator Enable (EN)

The device features a regulator enable input. For normal operation, a shunt should be installed on jumper JU1. To disable the output, remove the shunt on JU1 and the EN pin will be pulled to PGND through resistor R4. See Table 1 for JU1 settings.

### Skip-Mode Input (SKIP)

The device offers selectable skip-mode functionality to reduce current consumption and achieve a higher efficiency at light loads. To operate in skip mode, install a shunt on pins 1-2 on jumper JU2. See Table 2 for JU2 settings.

**Caution: Do not change the setting of the skip jumper while the device is operating.**

**Table 2. Skip-Mode Input (SKIP) Jumper JU2 Description**

| SHUNT POSITION | SKIP PIN          | MODE                 |
|----------------|-------------------|----------------------|
| 1-2            | Connected to EN   | Skip-mode operation  |
| 2-3*           | Connected to PGND | Forced-PWM operation |

\*Default position.

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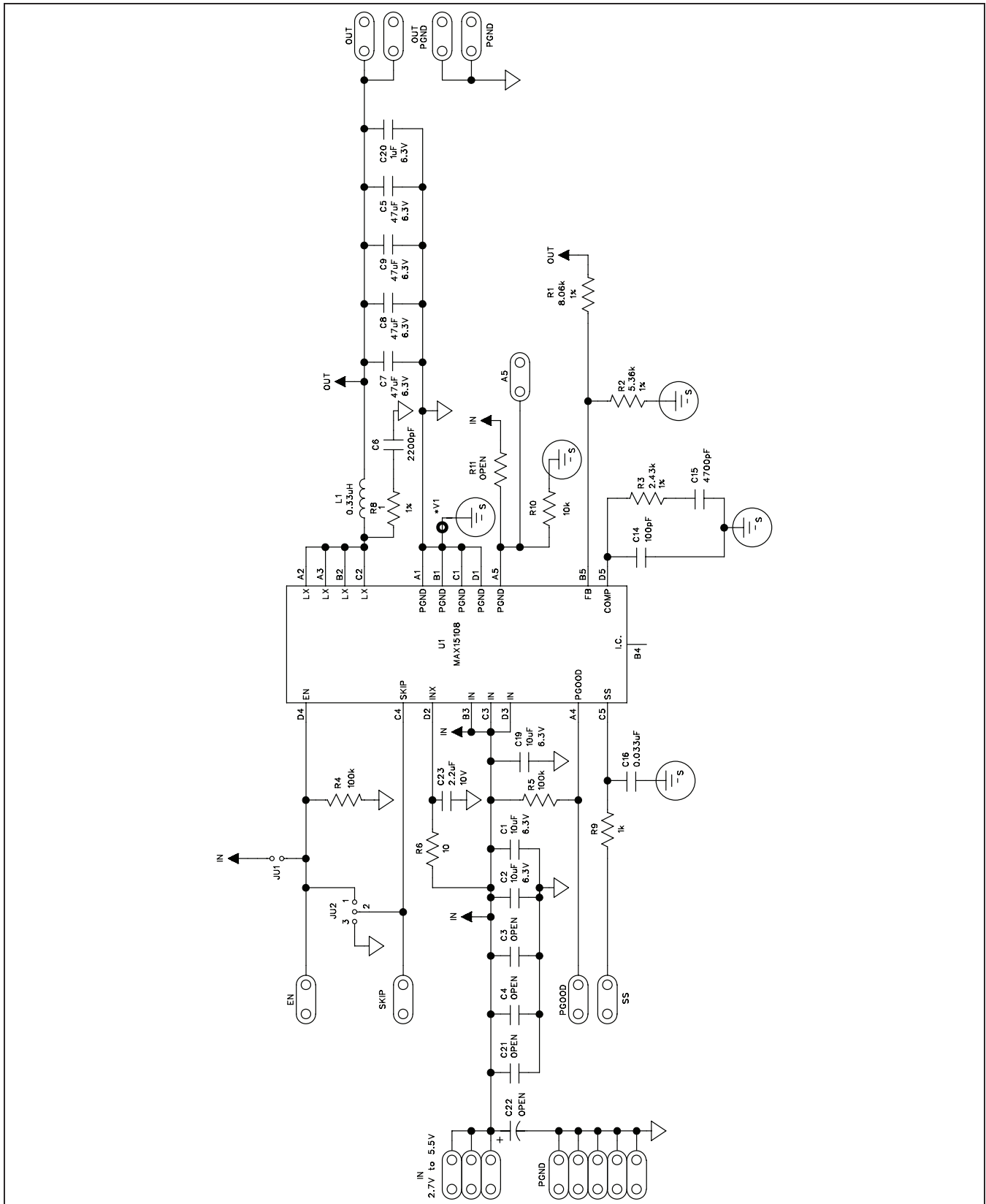


Figure 1. MAX15108 EV Kit Schematic

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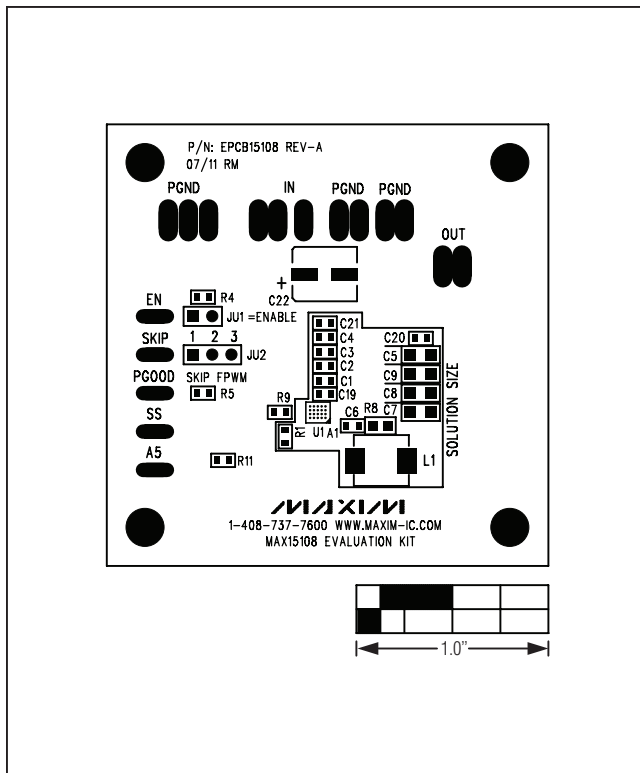


Figure 2. MAX15108 EV Kit Component Placement Guide—Component Side

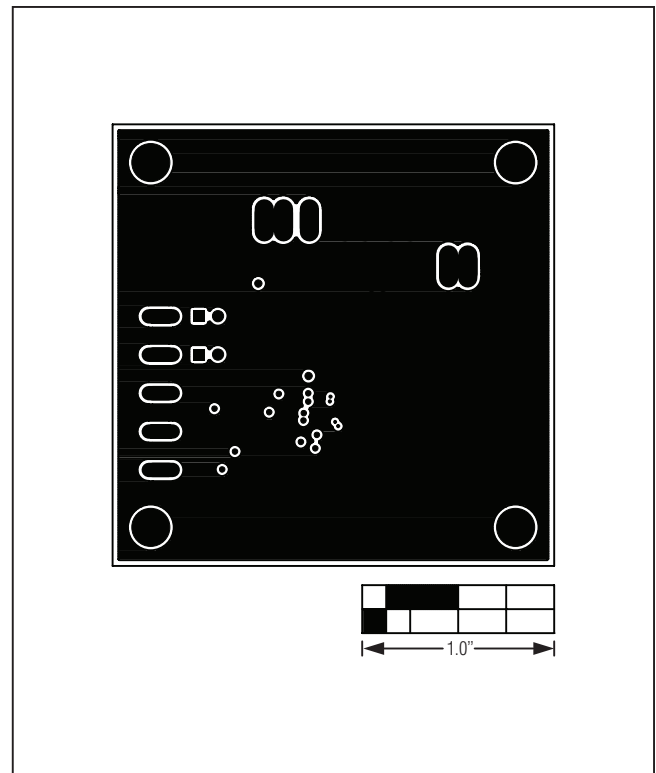


Figure 4. MAX15108 EV Kit PCB Layout—Inner Layer 2

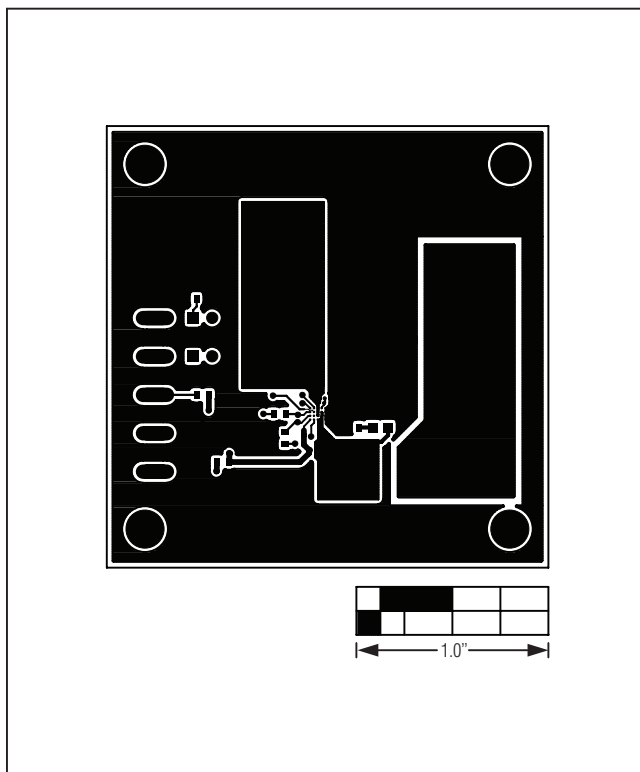


Figure 3. MAX15108 EV Kit PCB Layout—Component Side

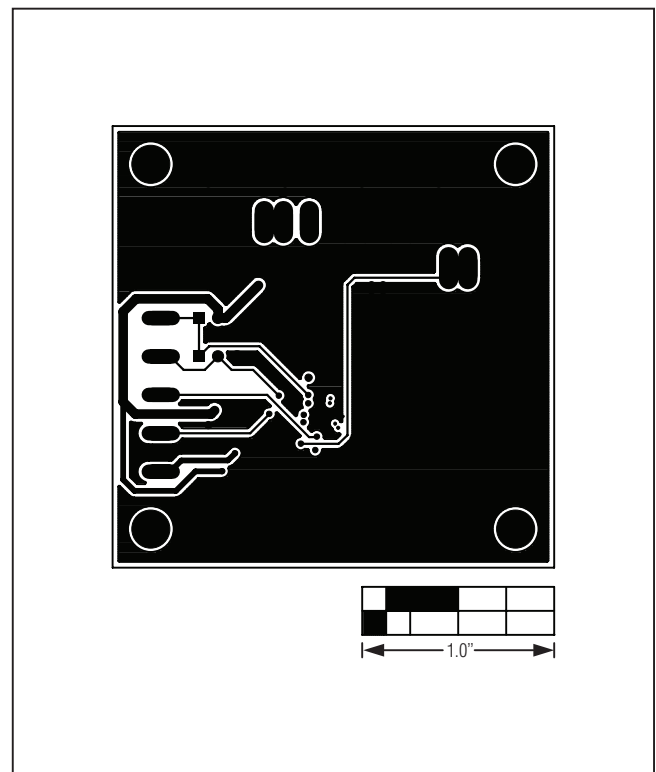


Figure 5. MAX15108 EV Kit PCB Layout—Inner Layer 3

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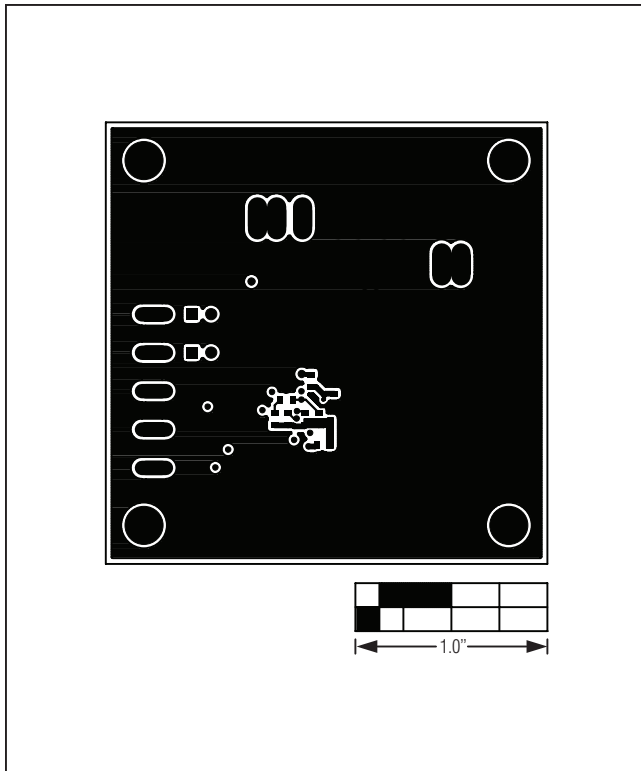


Figure 6. MAX15108 EV Kit PCB Layout—Solder Side

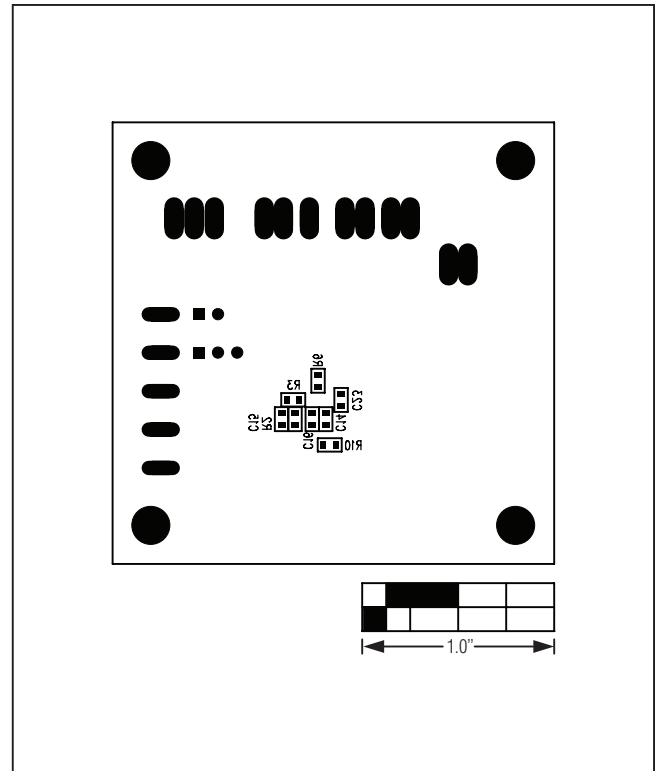


Figure 7. MAX15108 EV Kit Component Placement Guide—Solder Side

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### ***Ordering Information***

| PART           | TYPE   |
|----------------|--------|
| MAX15108EVKIT# | EV Kit |

#Denotes RoHS compliant.

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### ***Revision History***

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION     | PAGES<br>CHANGED |
|--------------------|------------------|-----------------|------------------|
| 0                  | 8/11             | Initial release | —                |

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