MAX17501H Evaluation Kit

Evaluate: MAX17501H in TDFN Package

General Description

The MAX17501H EV kit provides a proven design to evaluate the MAX17501H high-efficiency, high-voltage, synchronous step-down DC-DC converter in a TDFN package. The EV kit uses the MAX17501H device to generate 2.5V at load currents up to 500mA from a 4.5V to 60V input supply. The MAX17501H features a forced-PWM control scheme that provides constant switching-frequency operation at all load and line conditions.

Features

- **Operates from a 4.5V to 60V Input Supply**
- **2.5V Output Voltage**
- **500mA Output Current**
- **300kHz Switching Frequency**
- **Enable/UVLO Input**
- **Resistor-Programmable UVLO Threshold**
- **Open-Drain $\overline{\text{RESET}}$ Output**
- **Overcurrent and Overtemperature Protection**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information appears at end of data sheet.

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	2.2µF ±10%, 100V X7R ceramic capacitor (1210) Murata GRM32ER72A225K
C2	1	1µF ±10%, 6.3V X7R ceramic capacitor (0603) Murata GRM188R70J105K
C3	1	6800pF ±10%, 25V X7R ceramic capacitor (0402) Murata GRM155R71E682K
C4	1	22µF ±10%, 10V X7R ceramic capacitor (1210) Murata GRM32ER71A226K
C5	1	2200pF ±10%, 50V X7R ceramic capacitor (0402) Murata GRM155R71H222K
C7	1	33µF 80V aluminum electrolytic (D = 8mm) Panasonic EEEFK1K330P
C9	1	47pF ±10%, 50V C0G ceramic capacitor (0402) Murata GRM1555C1H470J
JU1	1	3-pin header
L1	1	47µH, 1.2A inductor (6mm x 6mm x 3.5mm) Coilcraft LPS6235-473ML
R1	1	3.32MΩ ±1% resistor (0402)
R2	1	1MΩ ±1% resistor (0402)
R3	1	20kΩ ±1% resistor (0402)
R4	1	69.8kΩ ±1% resistor (0402)
R5	1	39.2kΩ ±1% resistor (0402)
R6	1	10kΩ ±1% resistor (0402)
TP1, TP2	0	Not installed, test points
U1	1	Buck converter (10 TDFN-EP*) Maxim MAX17501HATB+
—	1	Shunt
—	1	PCB: MAX17501HT EVALUATION KIT

**EP = Exposed pad.*

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.

19-6424; Rev 0; 10/12

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Component Suppliers

SUPPLIER	PHONE	WEBSITE
Coilcraft, Inc.	847-639-6400	www.coilcraft.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Panasonic Corp.	800-344-2112	www.panasonic.com

Note: *Indicate that you are using the MAX17501 when contacting these component suppliers.*

Quick Start

Recommended Equipment

- MAX17501H EV kit
- 4.5V to 60V, 1A DC input power supply
- Load capable of sinking 500mA
- Digital voltmeter (DVM)
- Function generator

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) Set the power supply at a voltage between 4.5V and 60V. Disable the power supply.
2) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the nearest PGND PCB pad. Connect the positive terminal of the 500mA load to the VOUT PCB pad and the negative terminal to the nearest PGND PCB pad.
3) Connect the DVM across the VOUT PCB pad and the nearest PGND PCB pad.
4) Verify that a shunt is installed across pins 1-2 on jumper JU1.
5) Turn on the DC power supply.
6) Enable the load.
7) Verify that the DVM displays the expected voltage.

To turn-on/turn-off the part from EN/UVLO, follow the steps below:

1) Remove resistors R1 and R2 and the jumper connected across pins 1-2 on jumper JU1.
2) Connect the power supply to the EV kit and turn on the power supply. Set the power supply at a voltage between 4.5V and 60V.
3) Connect the function generator output to the EN/UVLO test loop.
4) EN/UVLO rising threshold is 1.24V and falling threshold is 1.11V. Make sure that the voltage-high and voltage-low levels of the function generator output are greater than 1.24V and less than 1.11V, respectively.
5) While powering down the EV kits, first disconnect the function generator output from the EN/UVLO test loop and then turn off the DC power supply.

Detailed Description of Hardware

The MMAX17501H EV kit provides a proven design to evaluate the MAX17501H high-efficiency, high-voltage, synchronous step-down DC-DC converter in a TDFN package. The EV kit generates 2.5V at load currents up to 500mA from a 4.5V to 60V input supply. The EV kit features a 300kHz fixed switching frequency for optimum efficiency and component size. The EV kit features a forced-PWM control scheme that provides constant switching frequency operation at all load and line conditions.

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The EV kit includes an EN/UVLO PCB pad and jumper JU1 to enable control of the converter output. An additional $\overline{RESET}$ PCB pad is available for monitoring the converter output. The VCC PCB pad helps measure the internal LDO voltage.

Soft-Start Input (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 C3, the external capacitor from SS to GND. To adjust the soft-start time, determine C3 using the following formula:

$$C3 = 5.55 \times t_{SS}$$

where t_{SS} is the required soft-start time in milliseconds and C3 is in nanofarads.

Regulator Enable/Undervoltage-Lockout Level (EN/UVLO)

The device features an EN/UVLO input. For normal operation, a shunt should be installed across pins 1-2 on jumper JU1. To disable the output, install a shunt across pins 2-3 on JU1 and the EN/UVLO pin is pulled to GND. See Table 1 for JU1 settings.

Setting the Undervoltage-Lockout Level

The device offers an adjustable input undervoltage-lockout level. Set the voltage at which the device turns on, with a resistive voltage-divider connected from VIN to GND (see Figure 1). Connect the center node of the divider to EN/UVLO.

Choose R1 to be 3.3MΩ and then calculate R2 as follows:

$$R2 = \frac{R1 \times 1.218}{(V_{INU} - 1.218)}$$

where V_{INU} is the voltage at which the IC is required to turn on. Ensure that V_{INU} is higher than 0.8 x V_{OUT}.

Adjusting the Output Voltage

The device offers an adjustable output voltage. Set the output voltage with a resistive voltage-divider connected from the positive terminal of the output capacitor (V_{OUT}) to GND (see Figure 1). Connect the center node of the divider to FB/VO.

Select the parallel combination of R4 and R5, R_P to be less than 30kΩ. Once R_P is selected, calculate R4 as follows:

$$R4 = \frac{R_P \times V_{OUT}}{0.9}$$

Calculate R5 as follows:

$$R5 = \frac{R4 \times 0.9}{(V_{OUT} - 0.9)}$$

Table 1. Regulator Enable (EN/UVLO) Jumper JU1 Description

SHUNT POSITION	EN/UVLO PIN	MAX17501_ OUTPUT
1-2*	Connected to IN	Enabled
Not installed	Connected to the center node of resistor-divider R1 and R2	Enabled, UVLO level set through the R1 and R2 resistor-divider
2-3	Connected to GND	Disabled

**Default position.*

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EV Kit Performance Report

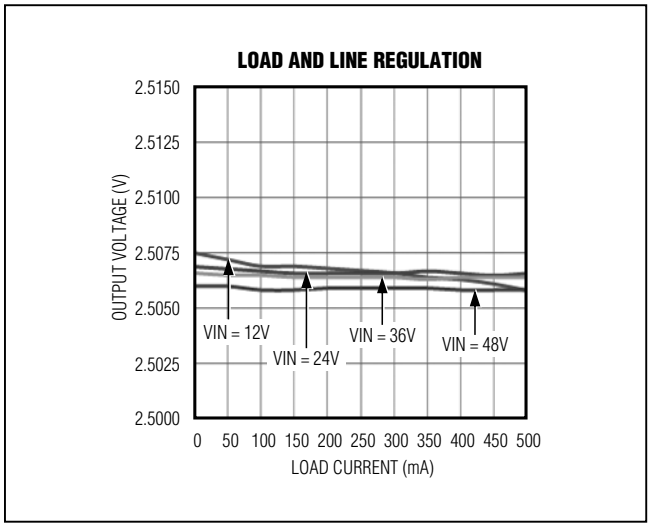


Figure 1. MAX17501H Load and Line Regulation

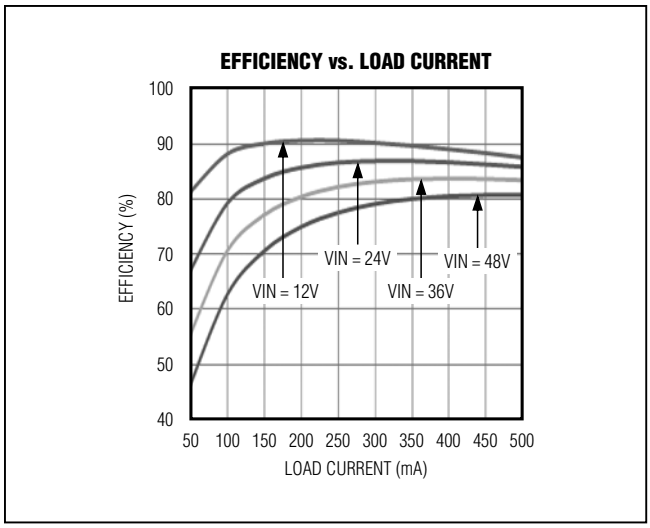


Figure 2. MAX17501H Efficiency

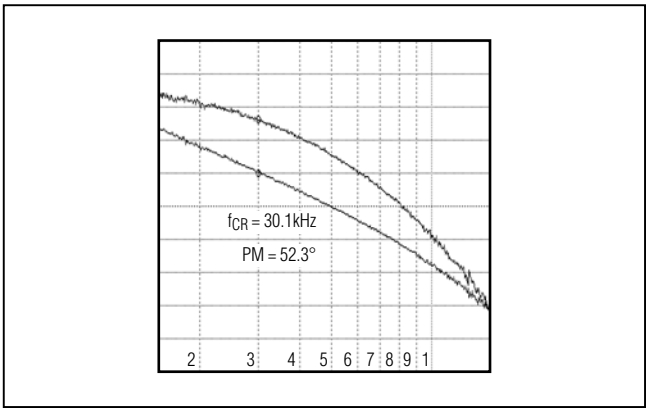


Figure 3. MAX17501H Full-Load Bode Plot (VIN = 24V)

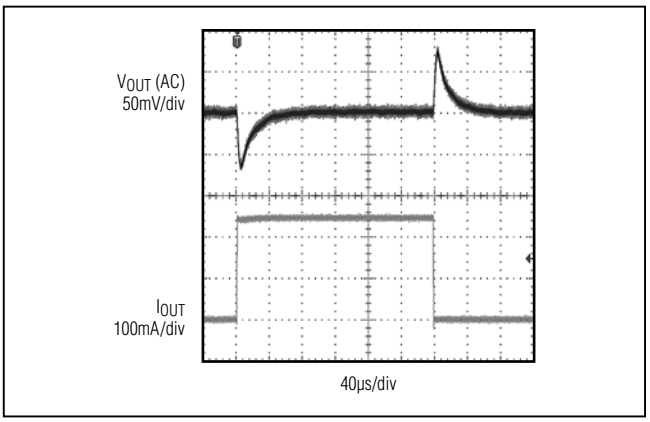


Figure 4. MAX17501H No Load to 250mA Load Transient (VIN = 24V)

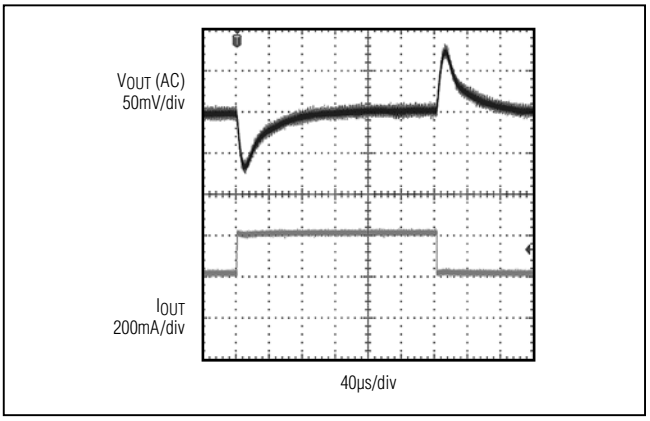


Figure 5. MAX17501H 250mA to 500mA Load Transient (VIN = 24V)

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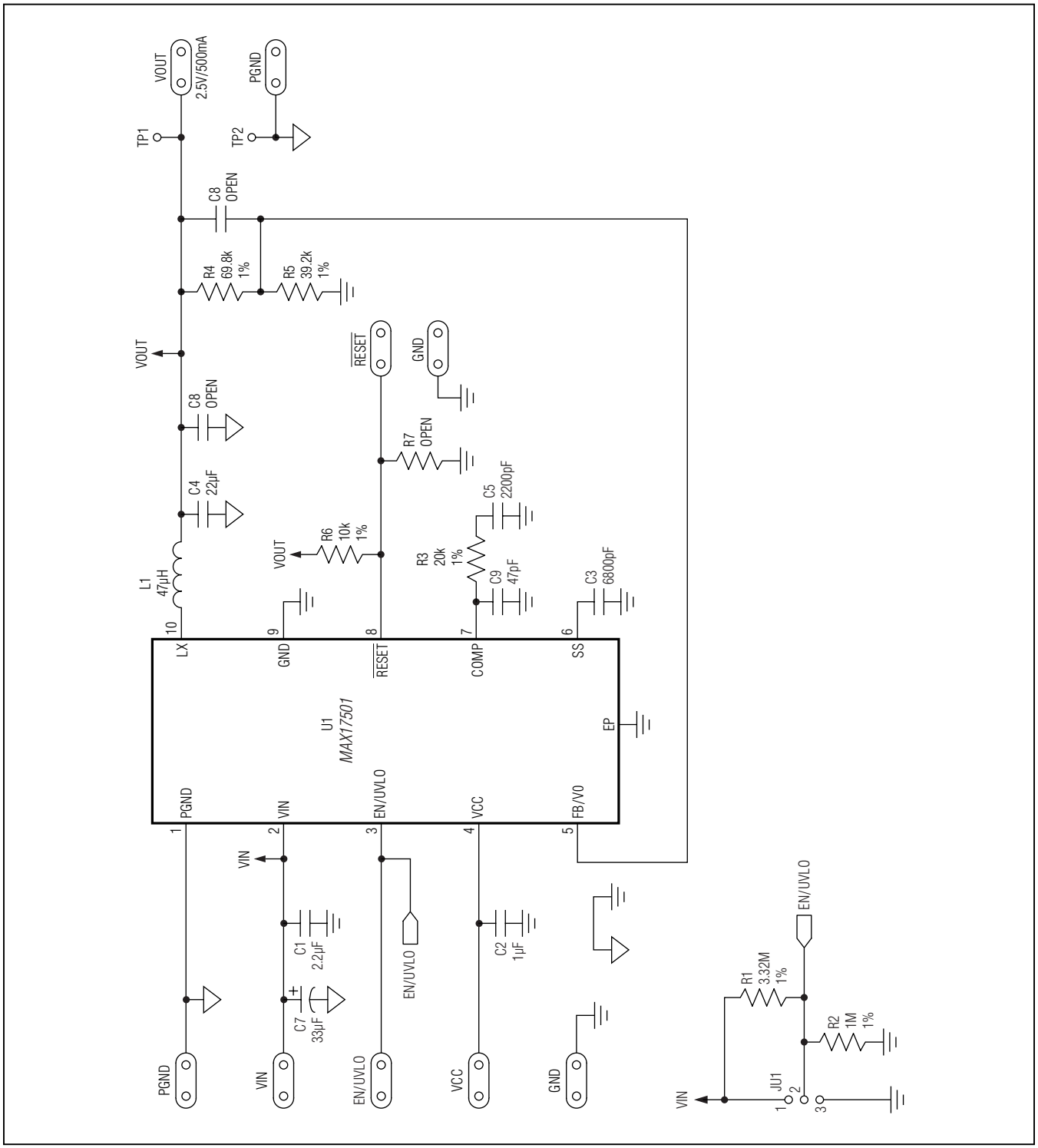


Figure 6. MAX17501H EV Kit Schematic

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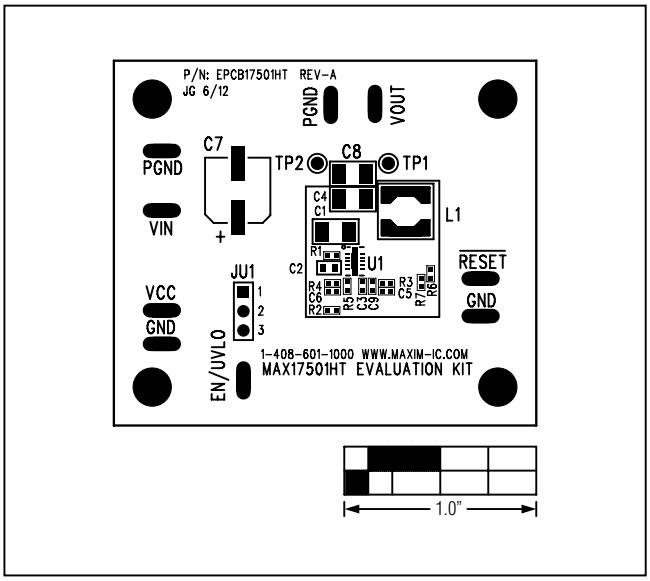


Figure 7. MAX17501H EV Kit Component Placement Guide—Component Side

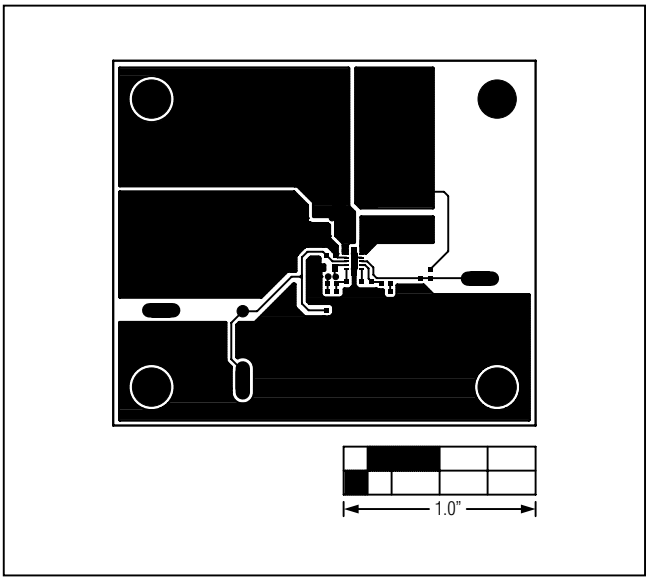


Figure 8. MAX17501H EV Kit PCB Layout—Component Side

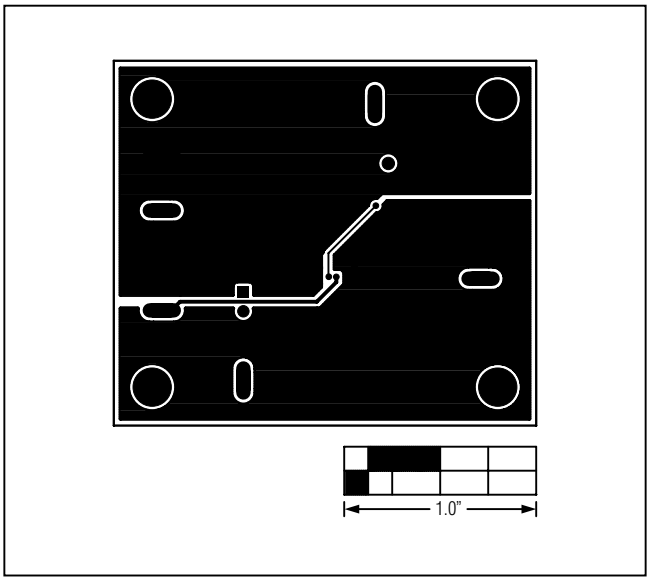


Figure 9. MAX17501H EV Kit PCB Layout—Solder Side

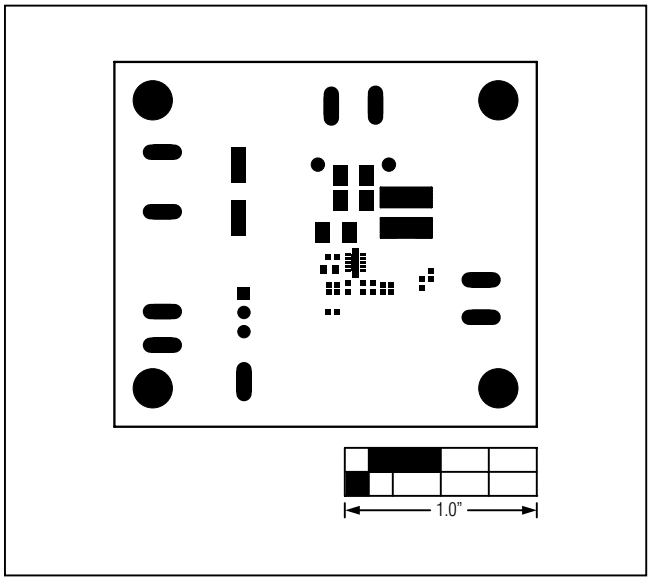


Figure 10. MAX17501H EV Kit PCB Layout—Top Solder Mask

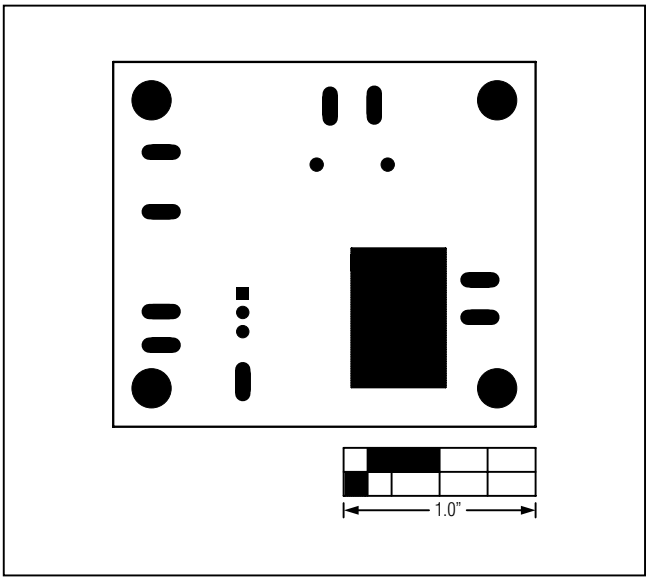


Figure 11. MAX17501H EV Kit PCB Layout—Bottom Solder Mask

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Ordering Information

PART	TYPE
MAX17501HTEVKIT#	EV Kit

#Denotes RoHS compliant.

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Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/12	Initial release	—

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