



# MAX8664 Evaluation Kit

## General Description

The MAX8664 evaluation kit (EV kit) is a fully assembled and tested circuit for evaluating the MAX8664A/MAX8664B dual-output step-down controllers. The MAX8664 EV kit operates with a 600kHz switching frequency and is optimized for operation from a 10.8V to 13.2V supply. The EV kit can operate down to 4.5V with minor changes. The two step-down outputs provide up to 8A each at 2.5V for OUT1 and 1.8V for OUT2. Options are provided for sequencing or tracking of OUT2. The MAX8664A (independent fault action) comes installed in the EV kit and it can be replaced with the MAX8664B (joint fault action) with no other required component changes.

## Features

- ◆  $\pm 0.8\%$  Output Accuracy Over Load and Line
- ◆ Operates from a Single 10.8V to 13.2V Supply
- ◆ OUT1 Provides 2.5V at Up to 8A
- ◆ OUT2 Provides 1.8V at Up to 8A
- ◆ Digital Soft-Start Reduces Inrush Current
- ◆ 180° Out-Of-Phase Operation Reduces Input Ripple Current
- ◆ Overcurrent and Overvoltage Protection
- ◆ External Reference Input for Second Controller
- ◆ Prebiased Startup Operation
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TYPE
MAX8664EVKIT+	EV Kit

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

## Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3, C20, C21	4	10 $\mu$ F $\pm 20\%$ , 16V X5R ceramic capacitors (1206) TDK C3216X5R1C106M Murata GRM31CR61C106KA88L
C2, C29–C36	0	Not installed, electrolytic capacitors (8mm diameter)
C4	1	1000 $\mu$ F $\pm 20\%$ , 16V electrolytic capacitor (8mm diameter, 20mm height) SANYO 16ME1000WG
C5	1	390pF $\pm 5\%$ , 50V C0G ceramic capacitor (0603) TDK C1608C0G1H391J Murata GRM1885C1H391JA01B
C6, C7, C8	3	22 $\mu$ F $\pm 20\%$ , 6.3V X5R ceramic capacitors (1206) TDK C3216X5R0J226M Murata GRM31CR60J226KE19
C9, C10	2	47 $\mu$ F $\pm 20\%$ , 6.3V X5R ceramic capacitors (1206) TDK C3216X5R0J476M Murata GRM31CR60J476ME19
C11	0	Not installed, capacitor (1206)

DESIGNATION	QTY	DESCRIPTION
C12	1	470pF $\pm 5\%$ , 50V C0G ceramic capacitor (0603) TDK C1608C0G1H471J Murata GRM1885C1H471JA01B
C13, C15	2	0.22 $\mu$ F $\pm 10\%$ , 25V X7R ceramic capacitors (0603) TDK C1608X7R1E224K Murata GRM188R71E224K
C14	1	4.7 $\mu$ F $\pm 10\%$ , 6.3V X5R ceramic capacitor (0805) TDK C2012X5R0J475K Murata GRM21BR60J475KA37L
C16, C19	2	0.01 $\mu$ F $\pm 10\%$ , 50V X7R ceramic capacitors (0603) TDK C1608X7R1H103K Murata GRM188R71H103KA01
C17	1	1 $\mu$ F $\pm 20\%$ , 16V X5R ceramic capacitor (0603) TDK C1608X5R1C105M Murata GRM188R71C105KA12
C18	1	1 $\mu$ F $\pm 20\%$ , 6.3V X5R ceramic capacitor (0603) TDK C1608X5R0J105M Murata GRM185R60J105KE21

Evaluates: MAX8664A/MAX8664B



For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at [www.maxim-ic.com](http://www.maxim-ic.com).

# MAX8664 Evaluation Kit

## Component List (continued)

DESIGNATION	QTY	DESCRIPTION
C22, C23	2	0.1 $\mu$ F $\pm$ 20%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1E104M
C24, C27, C28	0	Not installed, capacitors (0603)
C25, C26	2	680pF $\pm$ 5%, 50V COG ceramic capacitors (0603) TDK C1608C0G1H681J Murata GRM1885C1H681JA01B
C37, C38	0	Not installed, capacitors (0805)
JU1, JU2	2	3-pin headers
JU3	1	2-pin header
L1, L2	2	1 $\mu$ H inductors TOKO FDV0630-1R0M
N1, N3	2	n-channel MOSFETs (8 SO) Fairchild Semiconductor FDS6690A Vishay Si4894BDY International Rectifier IRF7807ZPBF International Rectifier IRF7821PBF
N2, N4	2	n-channel MOSFETs (8 SO) Fairchild Semiconductor FDS8880 Vishay Si4386DY International Rectifier IRF7821PBF
N9	1	n-channel MOSFET (SOT23) Central Semi 2N7002, lead-free

DESIGNATION	QTY	DESCRIPTION
Q1	0	Not installed, npn transistor (SOT23)
Q2	0	Not installed, n-channel MOSFET (SOT23)
R1	1	2.74k $\Omega$ $\pm$ 1% resistor (0603)
R2	1	3.01k $\Omega$ $\pm$ 1% resistor (0603)
R3, R6	2	51.1k $\Omega$ $\pm$ 1% resistors (0603)
R4, R7	2	3.92k $\Omega$ $\pm$ 1% resistors (0603)
R5	1	1.15k $\Omega$ $\pm$ 1% resistor (0603)
R8	1	1.82k $\Omega$ $\pm$ 1% resistor (0603)
R9	1	10k $\Omega$ $\pm$ 5% resistor (0603)
R10	1	40.2k $\Omega$ $\pm$ 1% resistor (0603)
R11, R13, R14, R15, R35	0	Not installed, resistors (0603)
R12	1	0 $\Omega$ resistor (0603)
R16, R41, R42, R45, R46	0	Not installed, resistors (0603) PCB short
R17, R18	2	10 $\Omega$ $\pm$ 1% resistors (0603)
R19, R33	2	10k $\Omega$ $\pm$ 1% resistors (0603)
R37, R38	2	3 $\Omega$ $\pm$ 5% resistors (0805)
TP1, TP2	2	Test points
U1	1	Dual-output step-down controller (20 QSOP) Maxim MAX8664AEEP+
—	3	Shunts, 2-position
—	1	PCB: MAX8664 EVALUATION KIT+

## Component Suppliers

SUPPLIER	PHONE	WEBSITE
Central Semiconductor Corp.	631-435-1110	www.centralsemi.com
Fairchild Semiconductor	888-522-5372	www.fairchildsemi.com
International Rectifier	310-322-3331	www.irf.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
SANYO Electric Co., Ltd.	619-661-6835	www.sanyodevice.com
TDK Corp.	847-803-6100	www.component.tdk.com
TOKO America, Inc.	847-297-0070	www.tokoam.com
Vishay	402-563-6866	www.vishay.com

**Note:** Indicate that you are using the MAX8664 when contacting these component suppliers.

# MAX8664 Evaluation Kit

Evaluates: MAX8664A/MAX8664B

## Quick Start

### Recommended Equipment

- Power supply capable of delivering at least 12V at 4A
- Voltmeter
- Two loads

### Procedure

- 1) Preset the power supply to 12V and turn the power supply off. **Do not turn the power supply on until all connections are completed.**
- 2) Connect the positive power-supply terminal to one of the EV kit pads labeled IN.
- 3) Connect the power-supply ground to one of the EV kit pads labeled PGND.
- 4) Connect the first load from the EV kit pads labeled OUT1 to PGND1.
- 5) Connect the second load from the EV kit pads labeled OUT2 to PGND2.
- 6) Verify that the jumpers are in their default positions (JU1 open, JU2 pins 2-3, and JU3 pins 1-2).
- 7) Turn on the power supply.
- 8) With the voltmeter, verify OUT1 is 2.5V and OUT2 is 1.8V.

## Detailed Description of Hardware

### Power-Good Output

Power good (PWRGD) is an open-drain output of the MAX8664A that pulls low when OUT1 is in regulation. The EV kit includes a 10kΩ pullup resistor from PWRGD to VCC. Refer to the MAX8664 IC data sheet for more information on the power-good output.

### OUT2 Internal Reference

In the default configuration, OUT2 is fixed to 1.8V, using the internal reference. To use the internal reference, place a shunt across the pins of JU3, and remove the shunt from JU1.

### OUT2 External Reference

To use an external reference to set the OUT2 regulation voltage, remove the shunt from JU3 and place a shunt across pins 1-2 of JU1. Connect the external 0 to 1.3V reference to the REFIN2 pad on the EV kit. Connect the reference ground to the GND pad.

### Tracking

To use OUT1 as the reference for tracking applications, remove the shunt from JU3 and connect pins 2-3 of JU1. In this configuration, R33 and R11 form a voltage-divider from OUT1 to REFIN2. The ratio of these resistors determines the  $V_{OUT2}/V_{OUT1}$  ratio. Ensure that the voltage at REFIN2 does not exceed 1.3V when OUT1 is in regulation. Refer to the MAX8664 IC data sheet for changes to the feedback network. Typically, R8 is not installed so that  $V_{OUT2} = V_{FB2}$ . Figure 3 in the MAX8664 IC data sheet shows an example tracking circuit.

**Table 1. Jumper Functions**

JUMPER	1-2	2-3	OPEN
JU1	Connect an external reference to REFIN2 to set the feedback regulation voltage for OUT2. Leave JU3 open.	REFIN2 is connected to OUT1 so the OUT2 voltage tracks OUT1. Leave JU3 open.	<b>Leave JU1 open when using the internal reference (jumper on JU3 pins 1-2)</b>
JU2	Shut down both regulators	<b>Enable both regulators</b>	Connect an external enable control signal to the EN pad
JU3	<b>Use the internal reference for regulator 2 for fixed output voltage operation. Leave JU1 open.</b>	—	Leave JU3 open when using an external reference (jumper on JU1 pins 1-2) or OUT1 tracking (jumper on JU1 pins 2-3)

*Bold indicates the default jumper positions.*

# MAX8664 Evaluation Kit

**Table 2. Recommended Components for Sequenced Outputs**

DESIGNATION	QTY	DESCRIPTION
C24	1	0.01 $\mu$ F $\pm$ 10% X7R ceramic capacitor (0603)
Q1	1	npn transistor (SOT23) Central Semiconductor CMPT3904
Q2	1	n-channel MOSFET (SOT23) Central Semiconductor 2N7002
R12, R15	2	10k $\Omega$ $\pm$ 1% resistors (0603)
R33	1	0 $\Omega$ resistor (0603)
R35	1	47k $\Omega$ $\pm$ 1% resistor (0603)

### Sequencing with an External Reference

The MAX8664 EV kit provides an option for sequencing the outputs when using an external reference. In this configuration, OUT1 starts first, then when OUT1 reaches regulation, PWRGD asserts logic-high allowing OUT2 to start. To configure the EV kit for sequencing, install an npn transistor in Q1, n-channel MOSFET Q2, capacitor C24, and resistors R12, R15, R33, and R35. The time constant  $R12 \times C24$  determines the startup time for OUT2. See Table 2 for recommended component values. Use the jumper settings for external reference operation (remove the shunt from JU3 and place a shunt across pins 1-2 of JU1).

### Input Supply Range

Although the MAX8664A/MAX8664B IC run from a 7.2V to 28V or 4.5V to 5.5V supply, the MAX8664 EV kit is optimized for operation from a 10.8V to 13.2V input supply. Note that the EV kit uses 16V-rated input capacitors. To evaluate circuits with a higher input, replace these capacitors with appropriately sized capacitors.

Options are provided on the EV kit that allow it to operate from a 4.5V to 5.5V power supply. For optimal performance, external components on the EV kit should be changed. Refer to the MAX8664 IC data sheet for the design procedure and an example circuit that uses a 5V input. To configure the EV kit for 4.5V to 5.5V input operation, install a 0 $\Omega$  resistor in R14 and a 10 $\Omega$  resistor in R13. Do not allow the input voltage to exceed 5.5V in this configuration.

# MAX8664 Evaluation Kit

Evaluates: MAX8664A/MAX8664B

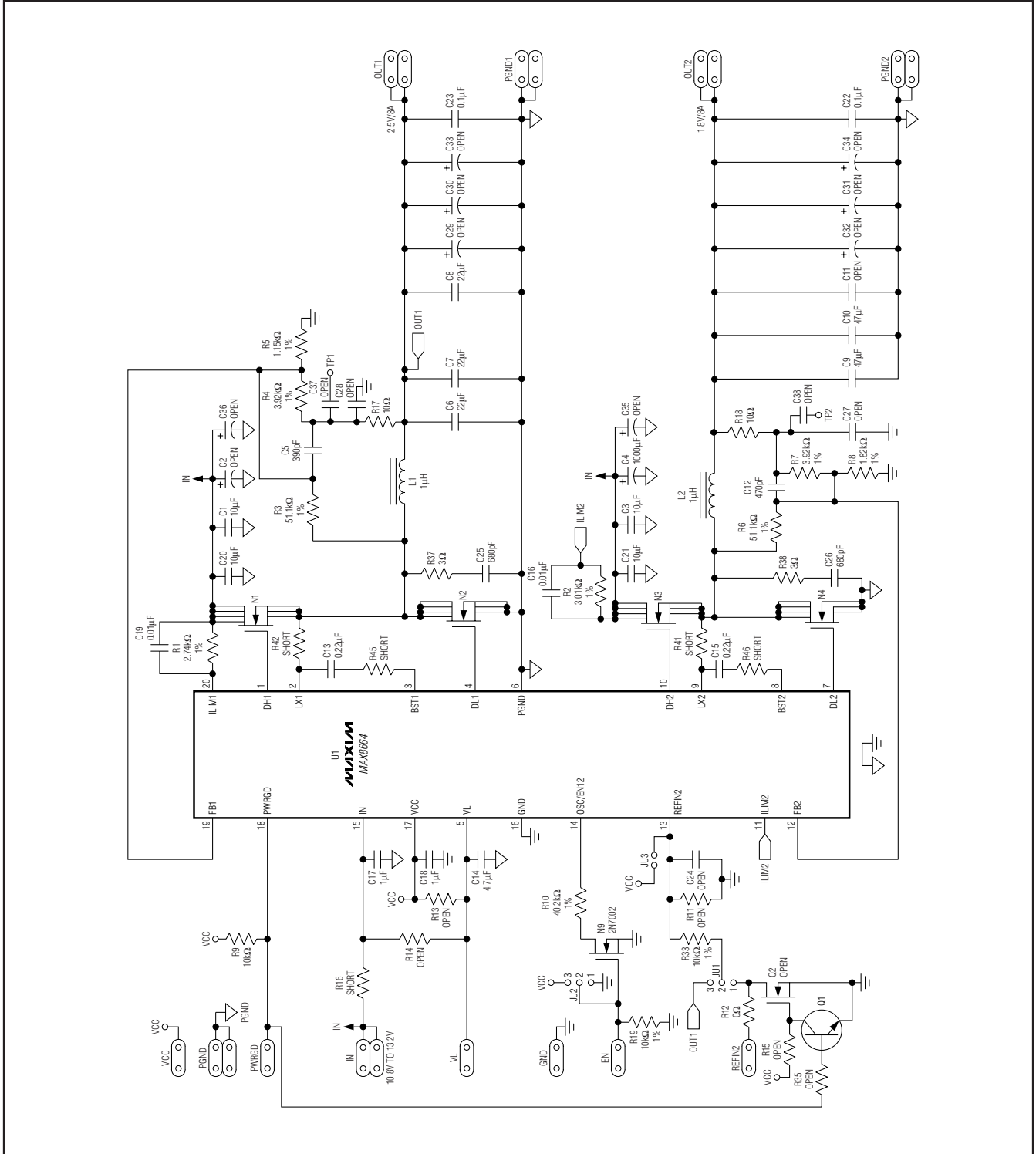


Figure 1. MAX8664 EV Kit Schematic

# MAX8664 Evaluation Kit

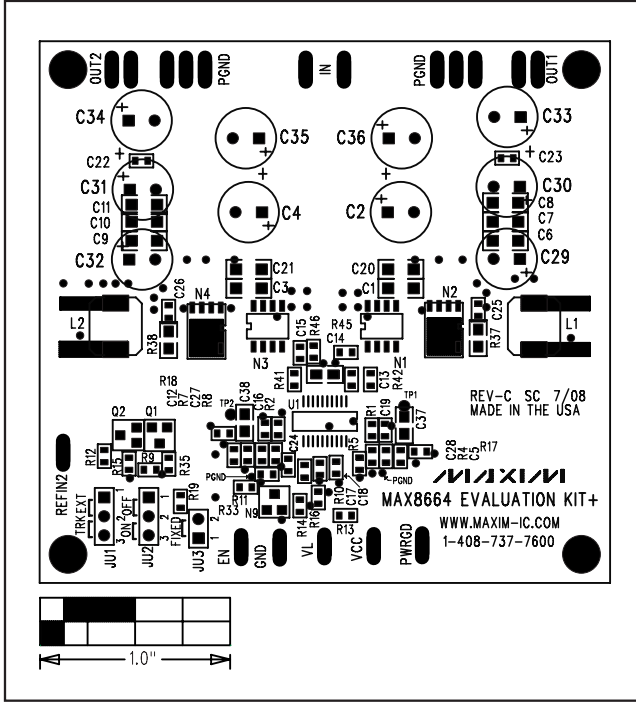


Figure 2. MAX8664 EV Kit Component Placement Guide—Component Side

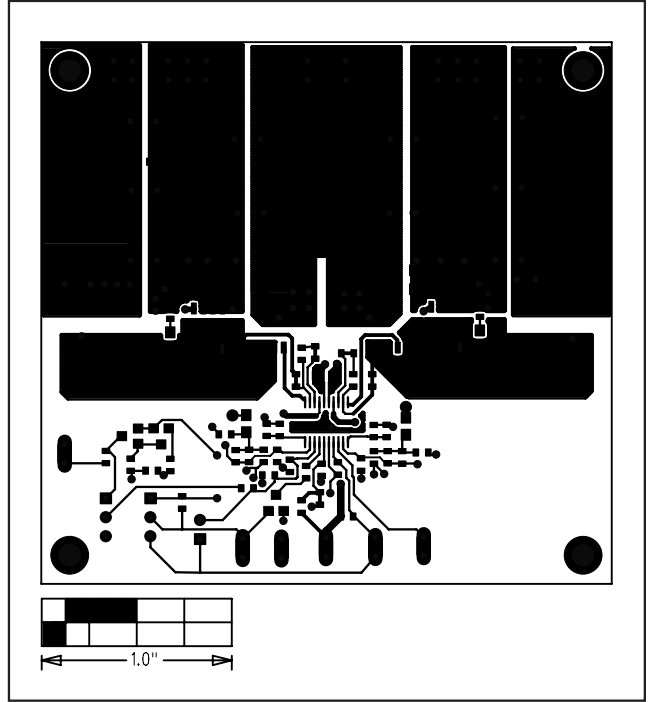


Figure 4. MAX8664 EV Kit PCB Layout—Component Side

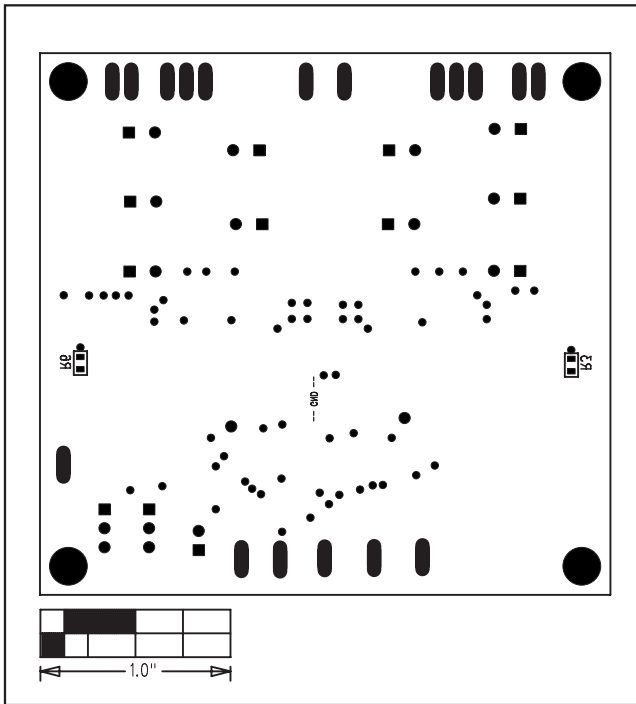


Figure 3. MAX8664 EV Kit Component Placement Guide—Bottom Silkscreen

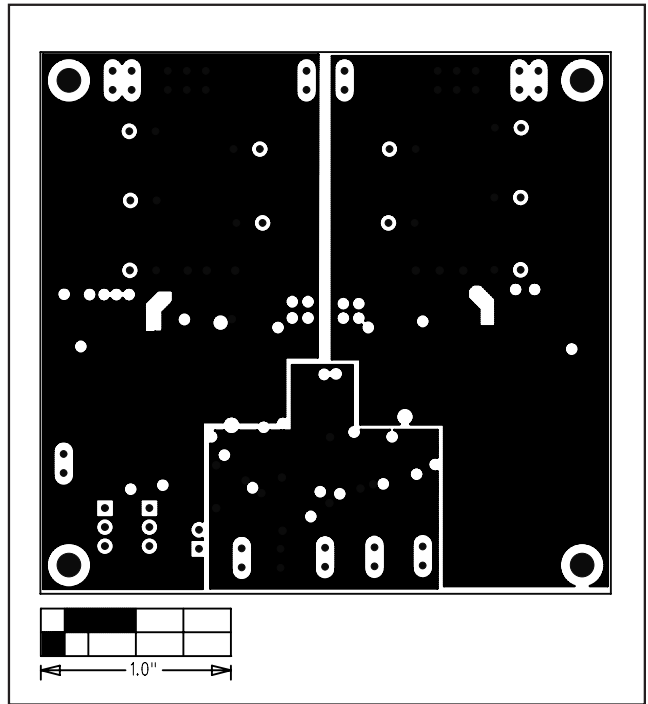


Figure 5. MAX8664 EV Kit PCB Layout—Inner Layer 2

# MAX8664 Evaluation Kit

Evaluates: MAX8664A/MAX8664B

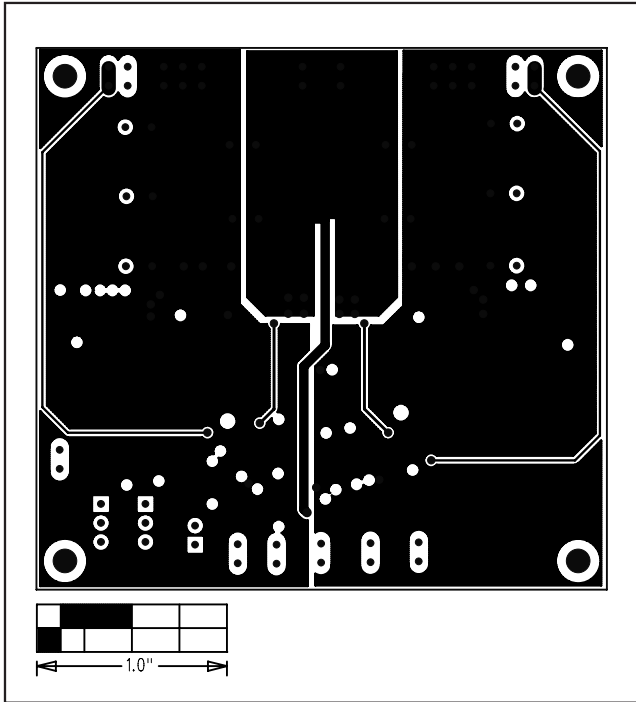


Figure 6. MAX8664 EV Kit PCB Layout—Inner Layer 3

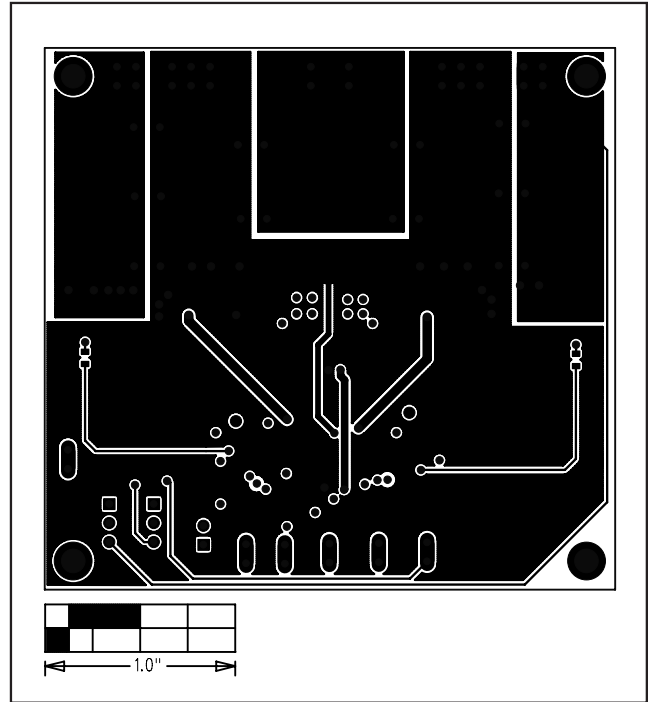


Figure 7. MAX8664 EV Kit PCB Layout—Solder Side

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 \_\_\_\_\_ 7

© 2009 Maxim Integrated Products

Maxim is a registered trademark of Maxim Integrated Products, Inc.