

## General Description

The MAX40007 evaluation kit (EV kit) is a fully assembled and tested circuit board that contains all the components necessary to evaluate the MAX40007 IC, offered in a space-saving 1.1mm x 0.76mm, 6-bump wafer-level package (WLP). The device is a rail-to-rail micropower op amp drawing only 700nA of supply current. The EV kit operates from a single 1.7V to 5.5V DC power supply.

## Features

- 1.7V to 5.5V Single-Supply Operation
- Comes in Unity-Gain Buffer Configuration
- Can Be Configured in Inverting, Non-Inverting, and Differential Amplifier Configurations
- Evaluates the Device in a 6-Bump WLP
- Proven PCB Layout
- Fully Assembled and Tested

## Quick Start

### Required Equipment

- MAX40007 EV kit
- 1.7V to 5.5V, 100mA DC power supply
- Voltmeter

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

## Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Caution: Do not turn on power supplies until all connections are completed and turn on VCC, VSS supplies before turning on power supplies on the input pins.**

- 1) Make sure J1 jumper is uninstalled and J2 jumper is in 2-3 position for single-supply operation. J2 should be in 1-2 position for split-supply operation.
- 2) **Single-supply operation:** Connect the positive terminal of the +5V supply to the VDD test point and the GND terminal of supply to the GND test point. Make sure J2 is in 2-3 position. The power supply should be off.
- 3) Connect the positive terminal of the precision voltage source to the IN+ test point.
- 4) Connect the DMM to monitor the voltage on the OUT test point.
- 5) Turn on the 5V power supply and apply 2.5V from the precision voltage source. Observe the output at the OUT test point on the DMM. OUT should read approximately 2.5V. Also, vary IN+ voltage between 0.05V to 3.9V to see if DMM on the OUT test point follows the IN+ voltage applied.
- 6) **Split-supply operation:** Connect the positive terminal of the +2.5V supply to the VDD test point and the GND terminal of the supply to the GND test point. Connect -2.5V supply to VSS test point. Make sure J2 is in 1-2 position for this test.
- 7) Connect the positive terminal of the precision voltage source to the IN+ test point.
- 8) Connect the DMM to monitor the voltage on the OUT test point.
- 9) Turn on the +2.5V and -2.5V power supply and apply 1V from the precision voltage source. Observe the output at the OUT test point on the DMM. OUT should read approximately 1V. Also, vary IN+ voltage between -2.45V to 1.4V to see if DMM on the OUT test point follows the applied IN+ voltage.

## Detailed Description of Hardware

The MAX40007 EV kit contains the MAX40007 IC, which is a rail-to-rail output micropower op amp with an ultra-low 700nA supply current designed in a 6-bump WLP. The EV kit operates from a single 1.7V to 5.5V DC power supply.

### Default Application Circuit

The EV kit comes preconfigured in a unity-gain buffer configuration.

### Op Amp Configurations

The EV kit provides flexibility to easily reconfigure the op amp into any of the three common circuit topologies: inverting amplifier, noninverting amplifier, differential amplifier. These configurations are described in the next few sections.

#### Noninverting Amplifier

To configure the device as a noninverting amplifier, replace R4 and R3 with suitable resistors. Install J1 to configure the op amp into noninverting mode. The output voltage ( $V_{OUT}$ ) for the noninverting configuration is given by the following equation:

$$V_{OUT} = \left(1 + \frac{R4}{R3}\right) (V_{IN+} + V_{OS})$$

where:

$V_{OS}$  = Input-referred offset voltage.

$V_{IN+}$  = Input voltage applied at the IN+ PCB pad.

#### Inverting Amplifier

To configure the device as an inverting amplifier, replace R4 and R3 with suitable gain resistors. An appropriate DC voltage ( $V_{DC}$ ) should be applied to the IN+ test point to level-shift the output voltage of the op amp if the applied input voltage ( $V_{IN-}$ ) at the IN- test point pad is positive:

$$V_{OUT} = -\frac{R4}{R3} (V_{IN-}) + \left(1 + \frac{R4}{R3}\right) (V_{OS}) + (V_{DC})$$

#### Differential Amplifier

To configure the device as a differential amplifier, replace R2,  $R_{CI}$ , R3, and R4 with appropriate resistors. When  $R_{CI} = R4$  and  $R2 = R3$ , the CMRR of the differential amplifier is determined by the matching of ratios  $R3/R4$  and  $R2/R_{CI}$ :

$$V_{OUT} = GAIN (V_{IN+} - V_{IN-}) + \left(1 + \frac{R4}{R3}\right) V_{OS}$$

where:

$$GAIN = \frac{R_{CI}}{R2} = \frac{R4}{R3}$$

**\*Note:**  $R_{CI}$  means resistor on CI Pad.

#### Buffer Amplifier

By default, the EV kit is configured as a standard unity-gain buffer.

$$V_{OUT} = V_{IN+} + V_{OS}$$

**Table 1. Default Jumper Settings**

| JUMPER | SHUNT POSITION | DESCRIPTION                             |
|--------|----------------|-----------------------------------------|
| JU1    | Not installed  | IN- to GND                              |
| JU2    | 2-3            | $V_{SS} = GND$                          |
|        | 1-2            | User-defined $V_{SS}$ on VSS test point |

## Component Suppliers

| SUPPLIER                               | WEBSITE        |
|----------------------------------------|----------------|
| Murata Electronics North America, Inc. | www.murata.com |

**Note:** Indicate that you are using the MAX40007 when contacting this component supplier.

## Ordering Information

| PART           | TYPE   |
|----------------|--------|
| MAX40007EVKIT# | EV Kit |

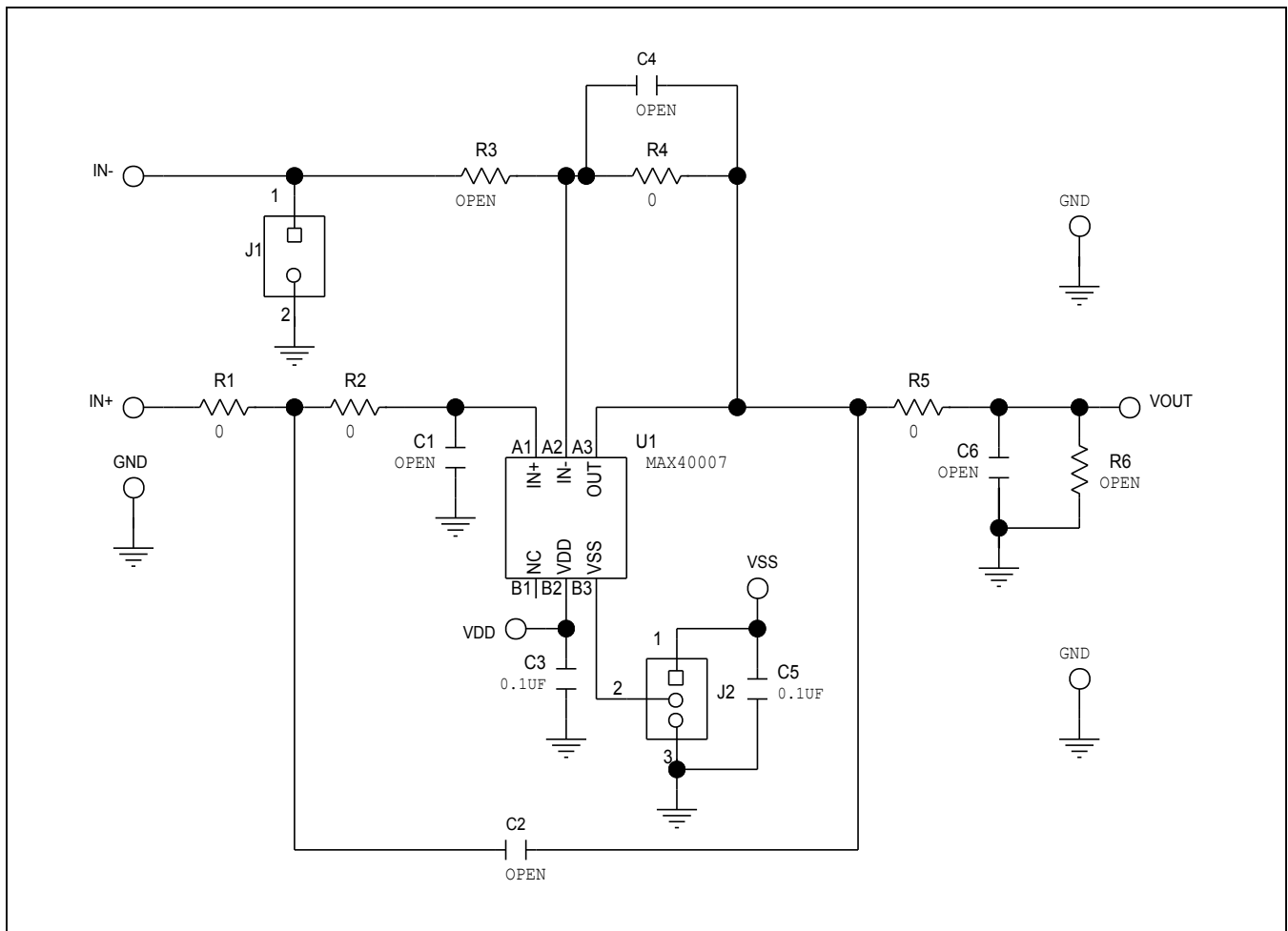
#RoHS-compliant

MAX40007 Evaluation Kit

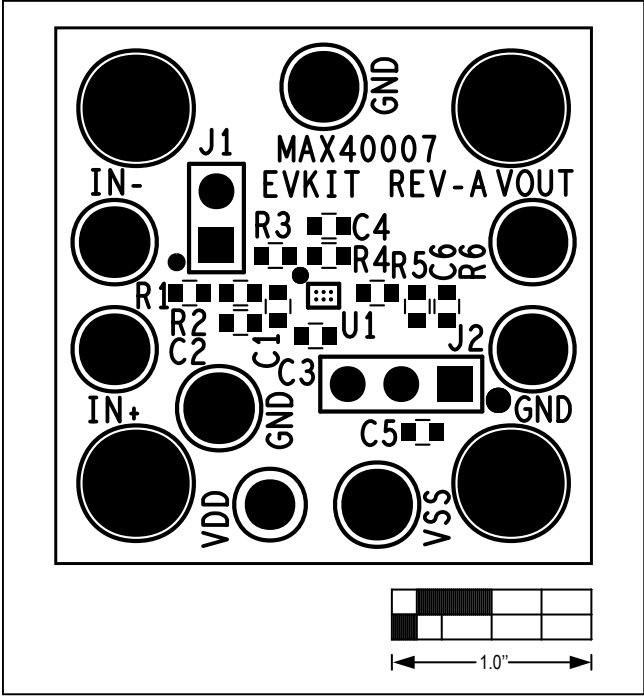
Evaluates: MAX40007

| ITEM                                                                                      | QTY | REF DES              | VAR STATUS    | MAXINV             | MFG PART #                                         | MANUFACTURER                     | VALUE                                                         | DESCRIPTION                                                                                                                                                                                    | COMMENTS |
|-------------------------------------------------------------------------------------------|-----|----------------------|---------------|--------------------|----------------------------------------------------|----------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1                                                                                         | 2   | C3, C5               | Pref          | 20-000U1-8403      | GCJ168R7H104K12;<br>GCJ32X2R7H104K08AE             | MURATA, TDK                      | 0.1UF                                                         | CAPACITOR, SMT (0603), CERAMIC, CHP, 0.1UF, 50V;<br>TOL = 10%; TG = -55C TO +125C; TC = X7R, AUTO                                                                                              |          |
| 2                                                                                         | 3   | GND, GND_1,<br>GND_2 | Pref          | 02-TPMIN6011-00    | 5011                                               | KEYSTONE                         | N/A                                                           | TEST POINT, PIN DIA = 0.15MM, TOTAL LENGTH = 0.4MM, BOARD HOLE = 0.063IN;<br>BLACK, PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;<br>RECOMMENDED FOR BOARD THICKNESS = 0.062IN; NOT FOR COLD TEST  |          |
| 3                                                                                         | 3   | IN+, IN-, VOUT       | Pref          | 02-TPMIN6012-00    | 5012                                               | KEYSTONE                         | N/A                                                           | TEST POINT, PIN DIA = 0.15MM, TOTAL LENGTH = 0.4MM, BOARD HOLE = 0.063IN;<br>WHITE, PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;<br>RECOMMENDED FOR BOARD THICKNESS = 0.062IN; NOT FOR COLD TEST  |          |
| 4                                                                                         | 1   | J1                   | Pref          | 01-PEC025AANP-21   | PEC025AAN                                          | SULLINS                          | PEC025AAN                                                     | CONNECTOR, MALE, THROUGH HOLE, BREAKAWAY, STRAIGHT, 2PINS                                                                                                                                      |          |
| 5                                                                                         | 1   | J2                   | Pref          | 01-PEC035AANP-21   | PEC035AAN                                          | SULLINS                          | PEC035AAN                                                     | CONNECTOR, MALE, THROUGH HOLE, BREAKAWAY, STRAIGHT, 3PINS                                                                                                                                      |          |
| 6                                                                                         | 4   | R1, R2, R4, R5       | Pref          | 86-0000R-27        | CRCW0603000002S;<br>MCR03EZP-0000;<br>EKJ-36E10K00 | VIKING CABLE CORP./<br>PANASONIC | 0                                                             | RESISTOR, 0603, 001, 0%, JUMPER, 0.10W, THICK FILM                                                                                                                                             |          |
| 7                                                                                         | 2   | SU1, SU2             | Pref          | 02-JMPFST025YAN-00 | ST025YAN                                           | SULLINS ELECTRONICS CORP.        | ST025YAN                                                      | TEST POINT, JUMPER, STR, TOTAL LENGTH = 0.25MM, BLACK;<br>INSULATION = PBT CONTACT = PHOSPHOR BRONZE, COPPER PLATED TIN OVERALL                                                                |          |
| 8                                                                                         | 1   | U1                   | Pref          | MAX40007           | MAX40007                                           | MAXIM                            | MAX40007                                                      | EVKIT PART IC: MAX40007S(X)T19, Q20R;<br>OPERATING TEMPERATURE RANGE: -40C TO +125C                                                                                                            |          |
| 9                                                                                         | 1   | VDD                  | Pref          | 02-TPMIN6010-00    | 5010                                               | KEYSTONE                         | N/A                                                           | TESTPOINT WITH 1.0MM HOLE DIA, RED, MULTIPROPOSE, NOT FOR COLD TEST                                                                                                                            |          |
| 10                                                                                        | 1   | VSS                  | Pref          | 02-TPMIN6013-00    | 5013                                               | KEYSTONE                         | N/A                                                           | TEST POINT, PIN DIA = 0.15MM, TOTAL LENGTH = 0.4MM, BOARD HOLE = 0.063IN;<br>ORANGE, PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;<br>RECOMMENDED FOR BOARD THICKNESS = 0.062IN; NOT FOR COLD TEST |          |
| 11                                                                                        | 1   |                      | Pref          | EPC840007          | MAX40007                                           | MAXIM                            | PCB                                                           | PCB: MAX40007                                                                                                                                                                                  |          |
| TOTAL                                                                                     |     | 20                   |               |                    |                                                    |                                  |                                                               |                                                                                                                                                                                                |          |
| DO NOT PURCHASE (DNP)                                                                     |     |                      |               |                    |                                                    |                                  |                                                               |                                                                                                                                                                                                |          |
| ITEM                                                                                      | QTY | REF DES              | VAR STATUS    | MAXINV             | MFG PART #                                         | MANUFACTURER                     | VALUE                                                         | DESCRIPTION                                                                                                                                                                                    | COMMENTS |
| 1                                                                                         | 4   | C1, C2, C4, C6       | DNP           | N/A                | N/A                                                | N/A                              |                                                               | PACKAGE OUTLINE 0603 NON-POLAR CAPACITOR - EVKIT                                                                                                                                               |          |
| 2                                                                                         | 2   | R3, R6               | DNP           | N/A                | N/A                                                | N/A                              | OPEN                                                          | PACKAGE OUTLINE 0603 RESISTOR - EVKIT                                                                                                                                                          |          |
| TOTAL                                                                                     |     | 6                    |               |                    |                                                    |                                  |                                                               |                                                                                                                                                                                                |          |
| PACKOUT (These are purchased parts but not assembled on PCB and will be shipped with PCB) |     |                      |               |                    |                                                    |                                  |                                                               |                                                                                                                                                                                                |          |
| ITEM                                                                                      | QTY | REF DES              | MAXINV        | MFG PART #         | MANUFACTURER                                       | VALUE                            | DESCRIPTION                                                   | COMMENTS                                                                                                                                                                                       |          |
| 1                                                                                         | 1   | PACKOUT              | 85-00711-SML  | 85-00711-SML       | N/A                                                | ?                                | BOX-SMALL BROWN<br>9.3'X0.7X1.1/4" - PACKOUT                  |                                                                                                                                                                                                |          |
| 2                                                                                         | 1   | PACKOUT              | 87-02162-00   | 87-02162-00        | N/A                                                | ?                                | ESD BAG-BAG-STATIC SHIELD ZIP-40x80in;<br>WESD LOGO - PACKOUT |                                                                                                                                                                                                |          |
| 3                                                                                         | 1   | PACKOUT              | 85-MAXKIT-PNK | 85-MAXKIT-PNK      | N/A                                                | ?                                | PINK FOAM (FOAM)<br>ANTI-STATIC FOAM 20x20x25x3MM - PACKOUT   |                                                                                                                                                                                                |          |
| 4                                                                                         | 1   | PACKOUT              | EVINSERT      | EVINSERT           | N/A                                                | ?                                | ESD-ANTI-STATIC BAG<br>FOR MAXIM DATA SHEET                   |                                                                                                                                                                                                |          |
| 5                                                                                         | 1   | PACKOUT              | 85-54002-506  | 85-54002-506       | N/A                                                | ?                                | LABEL/EVKIT BOX - PACKOUT                                     |                                                                                                                                                                                                |          |
| TOTAL                                                                                     |     | 5                    |               |                    |                                                    |                                  |                                                               |                                                                                                                                                                                                |          |

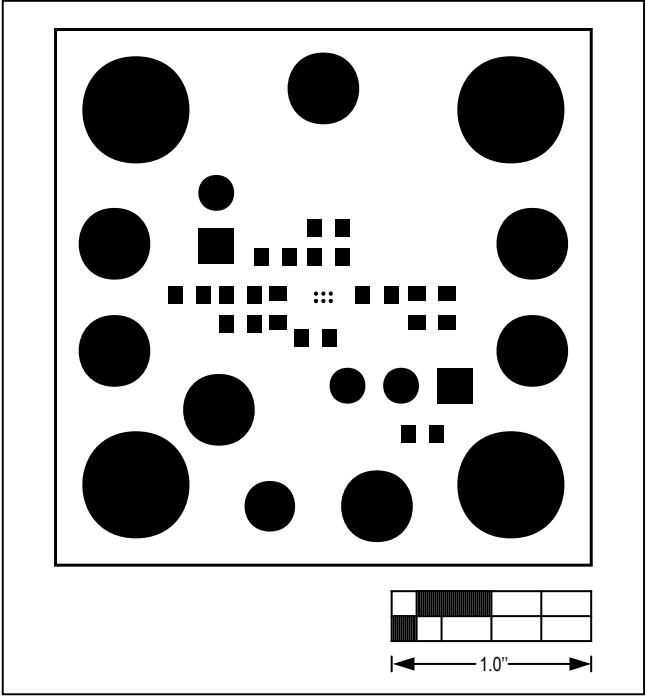
## MAX40007 EV Kit Schematic



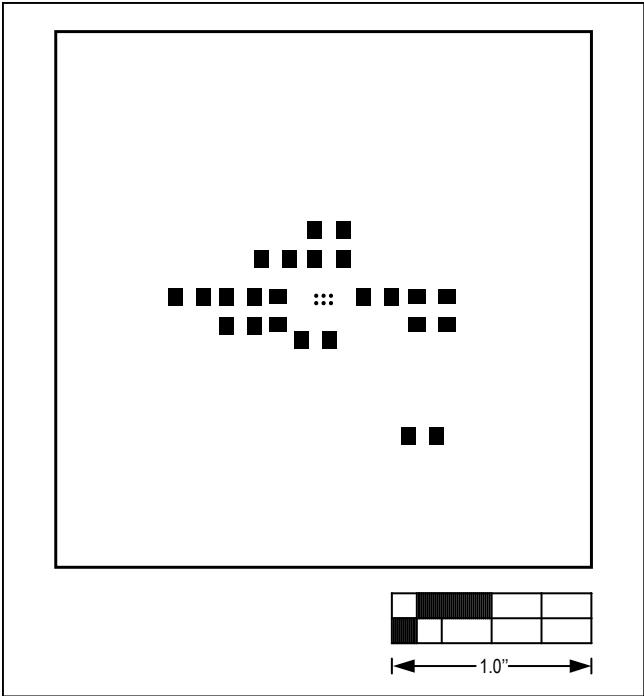
MAX40007 EV Kit PCB Layout Diagrams



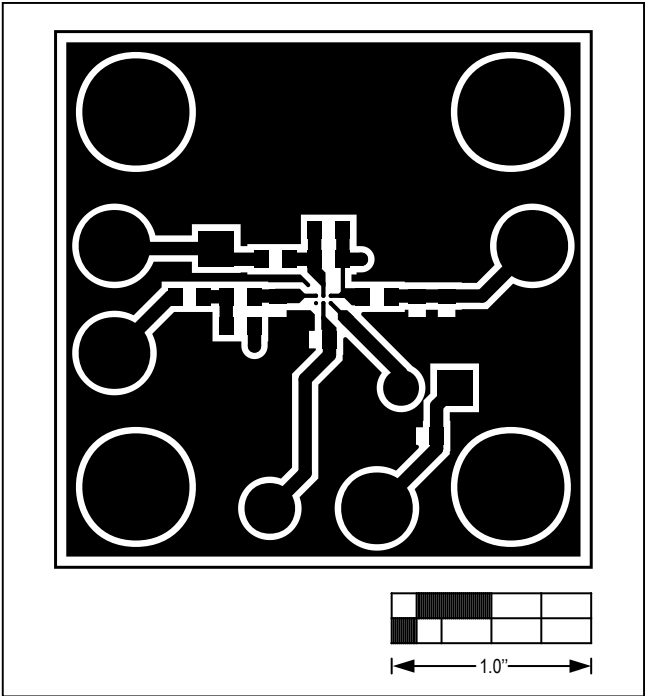
MAX40007 EV Kit—Top Silkscreen



MAX40007 EV Kit—Top Mask

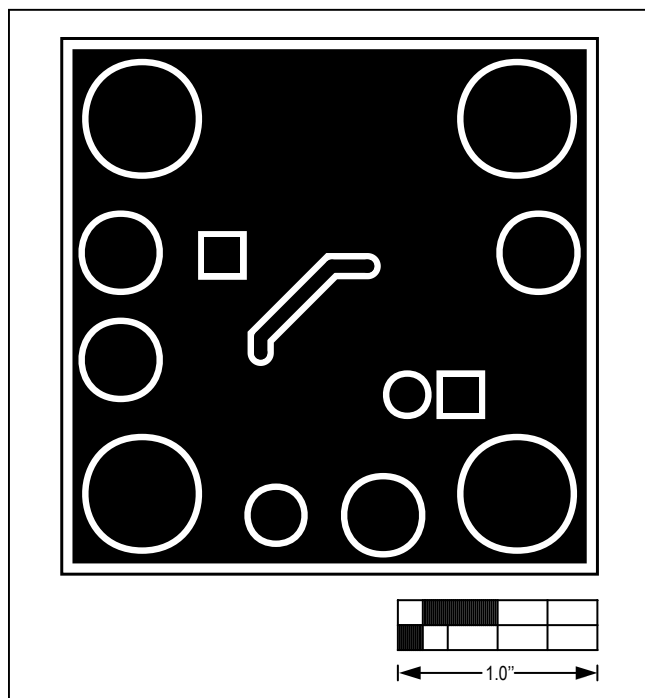


MAX40007 EV Kit—Top Paste

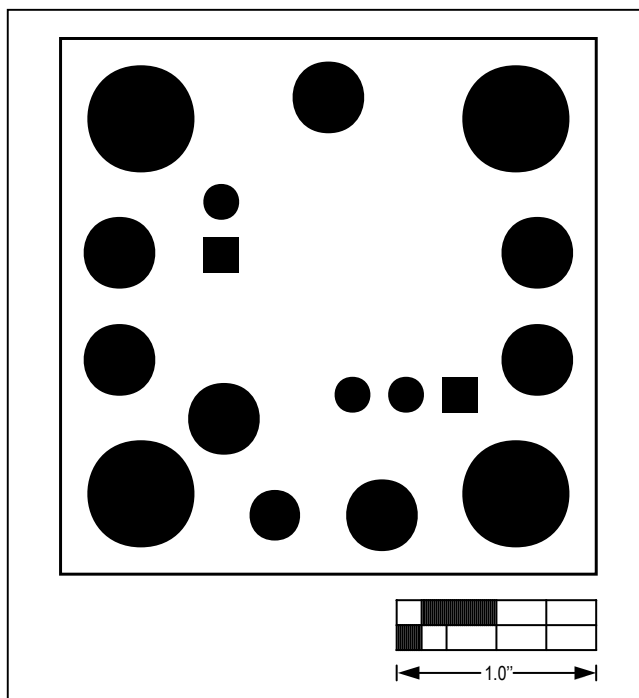


MAX40007 EV Kit—Top

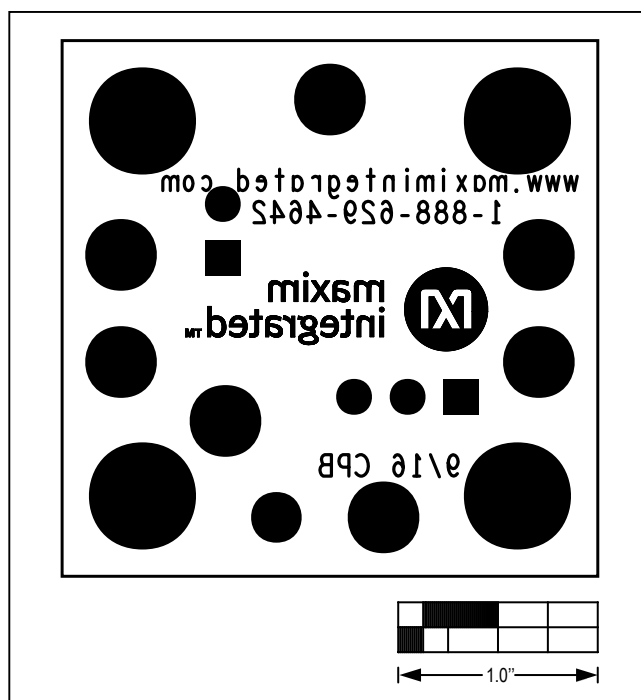
## MAX40007 EV Kit PCB Layout Diagrams (continued)



MAX40007 EV Kit—Bottom



MAX40007 EV Kit—Bottom Mask



MAX40007 EV Kit—Bottom Silkscreen

## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION     | PAGES<br>CHANGED |
|--------------------|------------------|-----------------|------------------|
| 0                  | 1/17             | Initial release | —                |

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](http://www.maximintegrated.com).

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