

## General Description

The MAX38902 evaluation kit (EV kit) evaluates the MAX38902A/B/C/D IC family of low noise linear regulators. The MAX38902 EV kit features two independent circuits to evaluate two different IC packages of the MAX38902A/B/C/D family. Both circuits on the EV kit operate over an input range of 1.7V to 5.5V, and provide any output voltage range of 0.6V to 5.3V. The TDFN circuit evaluates the MAX38902A/B, while the wafer-level package (WLP) circuit evaluates the MAX38902C/D. Each circuit output on the EV kit delivers up to 500mA of current.

The EV kit comes with the MAX38902A-ATA+ and the MAX38902C-ANT+ installed.

## Features

- Two Independent Circuits on One Board
  - Evaluates the MAX38902A/B IC in an 8-pin (2mm x 2mm) TDFN
  - Evaluates the MAX38902C/D IC in a 6-ball (1.45mm x 0.86mm) WLP
- 1.7V to 5.5V Input Range
- 1.2V to 5.0V Jumper Configurable Output Voltage (MAX38902A, On Board)
- 0.6V to 5.3V Resistor Configurable Output Voltage (MAX38902B, with IC Replacement)
- 0.6V to 5.3V Resistor Configurable Output Voltage (MAX38902C, On Board)
- 1.2V to 5.0V Factory-Preset Output Voltage (MAX38902D, with IC Replacement)
- Up to 500mA Output Current
- Proven 2-Layer 1-oz Copper PCB Layout
- Demonstrates Compact Solution Size
- Fully Assembled and Tested

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

## MAX38902 EV Kit Files

| FILE                                    | DESCRIPTION               |
|-----------------------------------------|---------------------------|
| MAX38902 EV BOM                         | EV Kit Bill of Material   |
| MAX38902 EV PCB Layout                  | EV Kit Layout             |
| MAX38902 EV Schematic                   | EV Kit Schematic          |
| MAX38902 EV Minimal Component Schematic | Minimal Component Circuit |

## Quick Start

### Required Equipment

- MAX38902 EV kit
- 5.5V, 1A DC power supply
- Electronic load capable of 500mA
- Digital voltmeter (DVM)

### Procedure

#### Testing the (WLP) OUT1 Output Circuit

The EV kit is fully assembled and tested. Follow the steps below to verify board operation.

**Caution: Do not turn on power supply until all connections are completed.**

- 1) Verify that jumper JU1 is in its default position as shown in [Table 1](#).
- 2) Connect the 5.5V power supply between the IN1 and nearest GND1 terminal posts.
- 3) Connect the 500mA electronic load between the OUT1 and nearest GND1 terminal posts.
- 4) Connect the DVM between the OUT1 and nearest GND1 terminal posts.
- 5) Turn on the power supply.
- 6) Enable the electronic load.
- 7) Verify that the voltage at the OUT1 terminal post is approximately 3.3V.

## Procedure

### Testing the (TDFN) OUT Output Circuit

The EV kit is fully assembled and tested. Follow the steps below to verify board operation.

**Caution: Do not turn on power supply until all connections are completed.**

- 8) Verify that jumpers JU101, SELA and SELB are in their default positions, as shown in [Table 2](#) and [Table 3](#).
- 9) Connect the 5.5V power supply between the IN and nearest GND terminal posts.
- 10) Connect the 500mA electronic load between the OUT and nearest GND terminal posts.
- 11) Connect the DVM between the OUT and nearest GND terminal posts.
- 12) Turn on the power supply.
- 13) Enable the electronic load.
- 14) Verify that the voltage at the OUT terminal post is approximately 5V.

## Detailed Description of Hardware

The MAX38902 EV kit evaluates the MAX38902A/B/C/D IC family. The MAX38902A/B/C/D are low noise linear regulators that deliver 500mA of output current with only 12 $\mu$ V<sub>RMS</sub> of output noise from 10Hz to 100kHz. These regulators require only 100mV of input-to-output headroom at full load.

The MAX38902 EV kit features two independent circuits to evaluate two different IC packages of the MAX38902A/B/C/D family. Both circuits on the EV kit operate over an input range of 1.7V to 5.5V. The TDFN circuit evaluates the MAX38902A/B, while the WLP circuit evaluates the MAX38902C/D. Each circuit output on the EV kit delivers up to 500mA of current.

The MAX38902 (TDFN) circuit on the EV Kit comes with the MAX38902A-ATA+ installed and the output is jumper configurable between 1.2V and 5.0V ([Table 3](#)), and can deliver 500mA of current.

The MAX38902 (WLP) circuit on the EV kit comes with the MAX38902C-ANT+ installed and the output is resistor configured to 3.3V, and can deliver 500mA of current. The output voltage on the MAX38902C can be reconfigured to other voltages from 0.6V to 5.3V by replacing feedback resistors R1 and R2. Refer to the *MAX38902 IC data sheet* for feedback resistor calculation.

### EN for the MAX38902C/D (WLP) Circuit

The MAX38902C/D (WLP) circuit on the EV kit provide a jumper JU1 to enable or disable the MAX38902C (or the MAX38902D after IC replacement). Refer to [Table 1](#) for jumper setting of jumper JU1.

### EN for the MAX38902A/B (TDFN) Circuit

The MAX38902A/B (TDFN) circuit on the EV kit provide a jumper JU101 to enable or disable the MAX38902A (or the MAX38902B after IC replacement). Refer to [Table 2](#) for jumper setting of jumper JU101.

**Table 1. EN on MAX38902C/D (JU1)**

| JU1<br>SHUNT POSITION | DESCRIPTION         |
|-----------------------|---------------------|
| 1-2*                  | Enabled. EN = IN1   |
| 2-3                   | Disabled. EN = GND1 |

\*Default Position

**Table 2. EN on MAX38902A/B (JU101)**

| JU1<br>SHUNT POSITION | DESCRIPTION        |
|-----------------------|--------------------|
| 1-2*                  | Enabled. EN = IN   |
| 2-3                   | Disabled. EN = GND |

\*Default Position

### Output Selection (SELA and SELB) for the MAX38902A/B (TDFN) Circuit

The MAX38902A/B (TDFN) circuit on the EV kit provide a set of jumpers SELA and SELB to configure the output voltage of the MAX38902A. Refer to [Table 3](#) for jumper setting of jumpers SELA and SELB.

### Evaluating the MAX38902B

The MAX38902A/B (TDFN) circuit can evaluate the MAX38902B after IC (U101) replacement. When evaluating the MAX38902B, modify the EV Kit with the steps listed below:

- 1) Replace U101 with the MAX38902B-ATA+.
- 2) Install feedback resistors R101 and R102 to obtain the desired output voltage between 0.6V and 5.3V (Refer to the MAX38902 IC data for feedback resistor calculations).

- 3) Install a shunt on jumper SELA pins 2 and 3 (GS = GND).
- 4) Remove shunt from jumper SELB.  $\overline{POK}$  is accessible on the  $\overline{POK}$  test point.
- 5) Install a 100k $\Omega$  resistor on R103.  $\overline{POK}$  open-drain is pulled up via resistor R103 (When the regulator output reaches its regulation,  $\overline{POK}$  goes low).

### Evaluating the MAX38902D

The MAX38902C/D (WLP) circuit can evaluate the MAX38902D after IC (U1) replacement. The MAX38902D can be factory trimmed to any voltage between 0.7V and 5.3V in 50mV steps. Contact the factory to order the MAX38902D with the desired factory-preset output voltages.

**Table 3. SELA and SELB on MAX38902A (SELA, SELB)**

| SELA           |                 | SELB           |                 | OUTPUT VOLTAGE |
|----------------|-----------------|----------------|-----------------|----------------|
| SHUNT POSITION | SELA CONNECTION | SHUNT POSITION | SELB CONNECTION |                |
| Not Installed  | Hi-Z            | 1-2            | IN              | 1.2            |
| 1-2            | IN              | Not Installed  | Hi-Z            | 1.5            |
| Not Installed  | Hi-Z            | 2-3            | GND             | 1.8            |
| Not Installed  | Hi-Z            | Not Installed  | Hi-Z            | 2.5            |
| 2-3            | GND             | 2-3            | GND             | 3.0            |
| 2-3            | GND             | 1-2            | IN              | 3.1            |
| 2-3            | GND             | Not Installed  | Hi-Z            | 3.3            |
| 1-2            | IN              | 2-3            | GND             | 4.0            |
| 1-2*           | IN              | 1-2*           | IN              | 5.0            |

\*Default Position

### Ordering Information

| PART           | TYPE   |
|----------------|--------|
| MAX38902EVKIT# | EV Kit |

#Denotes RoHS compliant.

### Component Suppliers

| SUPPLIER                                | WEBSITE                                                    |
|-----------------------------------------|------------------------------------------------------------|
| Murata/TOKO                             | <a href="http://www.murata.com">www.murata.com</a>         |
| TDK                                     | <a href="http://www.tdk.com">www.tdk.com</a>               |
| Samsung Electro-Mechanics America, Inc. | <a href="http://www.samsungsem.com">www.samsungsem.com</a> |

**Note:** Indicate that you are using the MAX38902A/B/C/D when contacting these component suppliers.

# MAX38902 Evaluation Kit

Evaluates: MAX38902A/B/C/D

## MAX38902 EV Kit Bill of Materials

| ITEM         | QTY       | REF DES                                                | VAR STATUS | MAXINV              | MFG PART #                                                    | MANUFACTURER                            | VALUE          | DESCRIPTION                                                                                                                                                                                 |
|--------------|-----------|--------------------------------------------------------|------------|---------------------|---------------------------------------------------------------|-----------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | 2         | C1, C101                                               | Pref       | 20-00U01-77         | C1608C0G1H103J;<br>CGA3E2C0G1H103J080AD;<br>GRM1885C1H103JA01 | TDK; MURATA                             | 0.01µF         | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.01µF;<br>50V; TOL = 5%; TG = -55°C to +125°C; TC = COG                                                                                               |
| 2            | 4         | C2, C3, C102, C103                                     | Pref       | 20-004U7-R1         | GMC10X7R475K6R3NT;<br>CL10B475KQ8NQC                          | CAL-CHIP ELECTRONIC INC./<br>SAMSUNG EL | 4.7µF          | CAPACITOR; SMT (0603); CERAMIC CHIP; 4.7µF; 6.3V;<br>TOL = 10%; MODEL = TG = -55°C TO +125°C; TC = X7R;<br>NOT RECOMMENDED FOR NEW DESIGN-USE 20-004U7-16                                   |
| 3            | 8         | IN, GND, IN1, OUT,<br>GND1, OUT1, GND_OUT,<br>GND1_OUT | Pref       | 02-15142-00         | 1514-2                                                        | KEYSTONE                                | 1514-2         | TERMINAL; TURRET; PIN DIA = 0.090IN; TOTAL LENGTH = 0.105IN;<br>BOARD HOLE = 0.098IN; BRASS; TIN PLATING;<br>RECOMMENDED FOR BOARD THICKNESS = 0.062IN                                      |
| 4            | 4         | JU1, JU101,<br>SELECTA, SELECTB                        | Pref       | 01-PEC03SAAN3P-21   | PEC03SAAN                                                     | SULLINS                                 | PEC03SAAN      | CONNECTOR; MALE; THROUGH HOLE;<br>BREAKAWAY; STRAIGHT; 3PINS                                                                                                                                |
| 5            | 1         | POK                                                    | Pref       | 02-TPMINI5002-00    | 5002                                                          | KEYSTONE                                | N/A            | TEST POINT; PIN DIA = 0.1IN; TOTAL LENGTH = 0.3IN;<br>BOARD HOLE = 0.04IN; WHITE; PHOSPHOR BRONZE WIRE SILVER;<br>NOT FOR COLD TEST                                                         |
| 6            | 1         | R1                                                     | Pref       | 80-0909K-AA4        | CRCW0603909KFK                                                | VISHAY DALE                             | 909K           | RESISTOR; 0603; 909KΩ; 1%; 100PPM; 0.1W; THICK FILM                                                                                                                                         |
| 7            | 1         | R2                                                     | Pref       | 80-0200K-24         | CRCW06032003FK                                                | VISHAY DALE                             | 200K           | RESISTOR; 0603; 200K; 1%; 100PPM; 0.1W; THICK FILM                                                                                                                                          |
| 8            | 1         | R101                                                   | Pref       | 80-0000R-AA6        | CRCW06030000Z0                                                | VISHAY DALE                             | 0              | RESISTOR; 0603; 0Ω; 0%; JUMPER; 0.1W; THICK FILM                                                                                                                                            |
| 9            | 4         | SU1-SU4                                                | Pref       | 02-JMPFSTC02SYAN-00 | STC02SYAN                                                     | SULLINS ELECTRONICS CORP.               | STC02SYAN      | TEST POINT; JUMPER; STR; TOTAL LENGTH = 0.256IN; BLACK;<br>INSULATION = PBT CONTACT = PHOSPHOR BRONZE;<br>COPPER PLATED TIN OVERALL                                                         |
| 10           | 4         | TP3, TP4, TP5, TP6                                     | Pref       | 01-131435300-10     | 131-4353-00                                                   | TEKTRONICS                              | 131-4353-00    | CONNECTOR; WIREMOUNT;<br>CIRCUIT BOARD TEST POINT MINIATURE PROBE; STRAIGHT; 4PINS                                                                                                          |
| 11           | 2         | TP_GND, TP_GND1                                        | Pref       | 02-TPMINI5001-00    | 5001                                                          | KEYSTONE                                | N/A            | TEST POINT; PIN DIA = 0.1IN; TOTAL LENGTH = 0.3IN; BOARD HOLE = 0.04IN;<br>BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;<br>RECOMMENDED FOR BOARD THICKNESS = 0.062IN; NOT FOR COLD TEST |
| 12           | 2         | TP_OUT, TP_OUT1                                        | Pref       | 02-TPMINI5000-00    | 5000                                                          | KEYSTONE                                | N/A            | TEST POINT; PIN DIA = 0.1IN; TOTAL LENGTH = 0.3IN;<br>BOARD HOLE = 0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;<br>RECOMMENDED FOR BOARD THICKNESS = 0.062IN; NOT FOR COLD TEST   |
| 13           | 1         | U1                                                     | Pref       | 00-SAMPLE-01        | MAX38902C-ANT+                                                | MAXIM                                   | MAX38902C-ANT+ | EVKIT PART - IC; MAX38902C-ANT+; WLP6;<br>PACKAGE OUTLINE DEVICE: 21-100055; PKG. CODE: N60C1+1                                                                                             |
| 14           | 1         | U101                                                   | Pref       | 00-SAMPLE-02        | MAX38902A-ATA+                                                | MAXIM                                   | MAX38902A-ATA+ | EVKIT PART - IC; MAX38902A-ATA+;<br>PACKAGE OUTLINE DEVICE: 21-0168; PACKAGE CODE XXXX                                                                                                      |
| 15           | 1         | PCB                                                    | -          | EPCB                | MAX                                                           | MAXIM                                   | PCB            | PCB:MAX                                                                                                                                                                                     |
| <b>TOTAL</b> | <b>37</b> |                                                        |            |                     |                                                               |                                         |                |                                                                                                                                                                                             |

DO NOT PURCHASE(DNP)

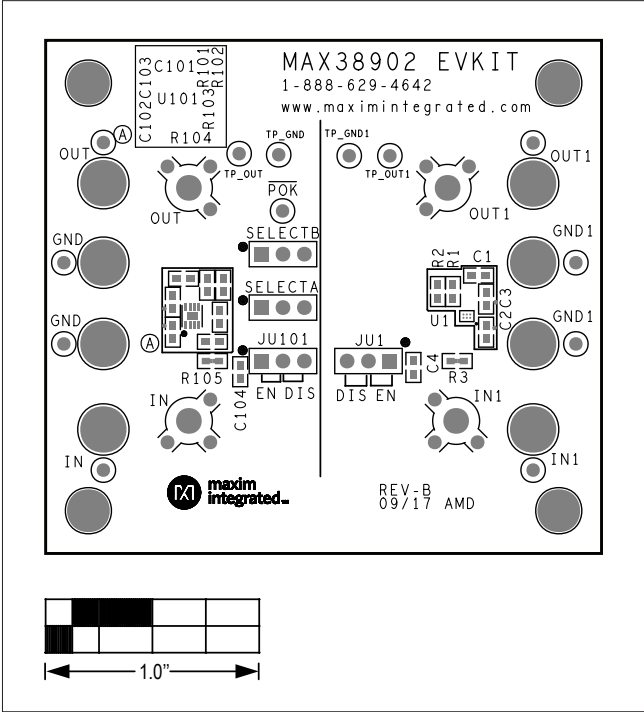
| ITEM         | QTY       | REF DES                                                                                        | VAR STATUS | MAXINV           | MFG PART #                                | MANUFACTURER    | VALUE  | DESCRIPTION                                                                                                                      |
|--------------|-----------|------------------------------------------------------------------------------------------------|------------|------------------|-------------------------------------------|-----------------|--------|----------------------------------------------------------------------------------------------------------------------------------|
| 1            | 8         | TP_IN, TP_IN1, TP1_OUT,<br>TP1_OUT1, TP_GND_IN,<br>TP_GND1_IN,<br>TP1_GND_OUT,<br>TP1_GND1_OUT | DNP        | 02-TPMINI5002-00 | 5002                                      | KEYSTONE        | N/A    | TEST POINT; PIN DIA = 0.1IN; TOTAL LENGTH = 0.3IN; BOARD HOLE = 0.04IN;<br>WHITE; PHOSPHOR BRONZE WIRE SILVER; NOT FOR COLD TEST |
| 2            | 0         | C1                                                                                             | DNP        | 20-00U01-R0      | C1608C0G1E103J                            | TDK             | 0.01UF | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.01µF; 25V; TOL = 5%;<br>MODEL=; TG = -55°C TO +125°C; TC = COG                            |
| 3            | 0         | C2                                                                                             | DNP        | 20-004U7-18      | C1608X5R1C475K080AC                       | TDK/TAIYO YUDEN | 4.7µF  | CAPACITOR; SMT (0603); CERAMIC CHIP; 4.7µF; 16V; TOL = 10%; MODEL=;<br>TG = -55°C TO +85°C; TC = X5R                             |
| 4            | 0         | C2                                                                                             | DNP        | 20-004U7-A66     | GRM188C71A475KE11;<br>C1608X7S1A475K080AC | MURATA; TDK     | 4.7µF  | CAPACITOR; SMT (0603); CERAMIC CHIP; 4.7µF; 10V; TOL = 10%;<br>TG = -55°C TO +125°C; TC = X7S                                    |
| 5            | 2         | C4, C104                                                                                       | DNP        | N/A              | N/A                                       | N/A             | OPEN   | PACKAGE OUTLINE 0603 NON-POLAR CAPACITOR - EVKIT                                                                                 |
| 6            | 2         | R3, R105                                                                                       | DNP        | N/A              | N/A                                       | N/A             | SHORT  | PACKAGE OUTLINE 0603 RESISTOR - EVKIT                                                                                            |
| 7            | 3         | R102-R104                                                                                      | DNP        | N/A              | N/A                                       | N/A             | OPEN   | PACKAGE OUTLINE 0603 RESISTOR - EVKIT                                                                                            |
| <b>TOTAL</b> | <b>15</b> |                                                                                                |            |                  |                                           |                 |        |                                                                                                                                  |

PACKOUT (These are purchased parts but not assembled on PCB and will be shipped with PCB)

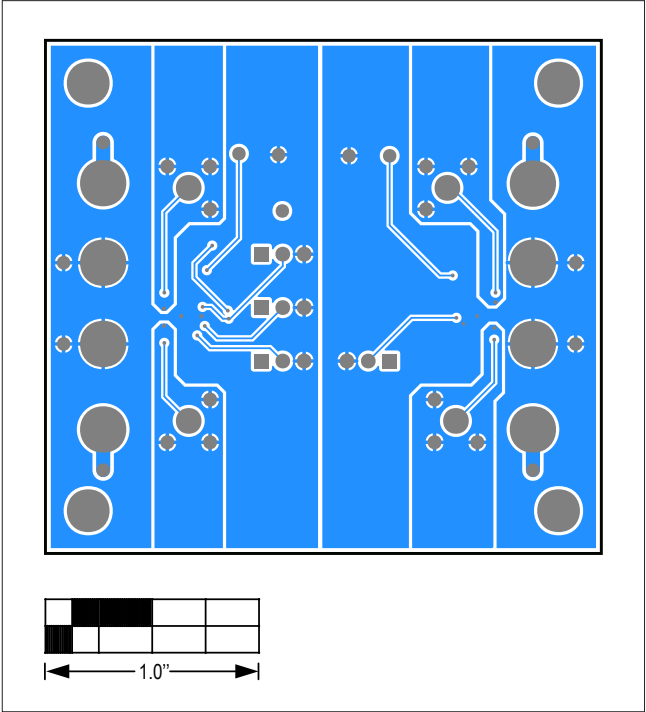
| ITEM         | QTY      | REF DES     | VAR STATUS | MAXINV        | MFG PART #     | MANUFACTURER                        | VALUE          | DESCRIPTION                                                                                         |
|--------------|----------|-------------|------------|---------------|----------------|-------------------------------------|----------------|-----------------------------------------------------------------------------------------------------|
| 1            | 1        | PACKOUT_BOX | Pref       | 88-00711-SML  | 88-00711-SML   | N/A                                 | ?              | BOX; SMALL BROWN 9 3/16X7X1 1/4 - PACKOUT                                                           |
| 2            | 1        | PACKOUT_BOX | Pref       | 87-02162-00   | 87-02162-00    | N/A                                 | ?              | ESD BAG; BAG; STATIC SHIELD ZIP 4inX6in; WESD LOGO - PACKOUT                                        |
| 3            | 1        | PACKOUT_BOX | Pref       | 85-MAXKIT-PNK | 85-MAXKIT-PNK  | N/A                                 | ?              | PINK FOAM; FOAM; ANTI-STATIC PE 12inX12inX5MM - PACKOUT                                             |
| 4            | 1        | PACKOUT_BOX | Pref       | EVINSERT      | EVINSERT       | N/A                                 | ?              | WEB INSTRUCTIONS FOR MAXIM DATA SHEET                                                               |
| 5            | 1        | PACKOUT_BOX | Pref       | 85-84003-006  | 85-84003-006   | N/A                                 | ?              | LABEL(EV KIT BOX) - PACKOUT                                                                         |
| 6            | 4        | BUMP1-BUMP4 | DNI        | 02-SJ5003-00  | SJ-5003(BLACK) | 3M ELECTRONIC<br>SOLUTIONS DIVISION | SJ-5003(BLACK) | BUMPER; BLACK; HEMISPHERICAL SHAPE EVKIT EH0231;<br>0.44ID; 0.28H; RESILIENT ELASTOMER POLYURETHANE |
| <b>TOTAL</b> | <b>9</b> |             |            |               |                |                                     |                |                                                                                                     |



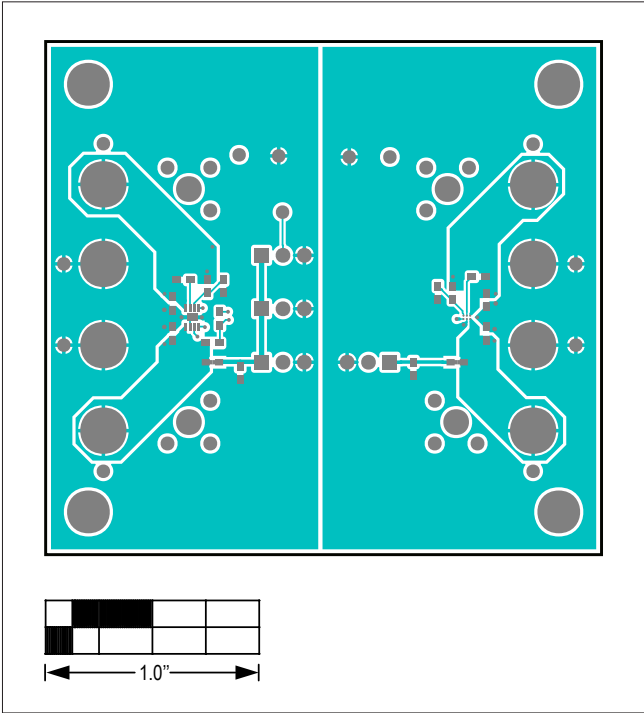
MAX38902 EV Kit PCB Layout Diagrams



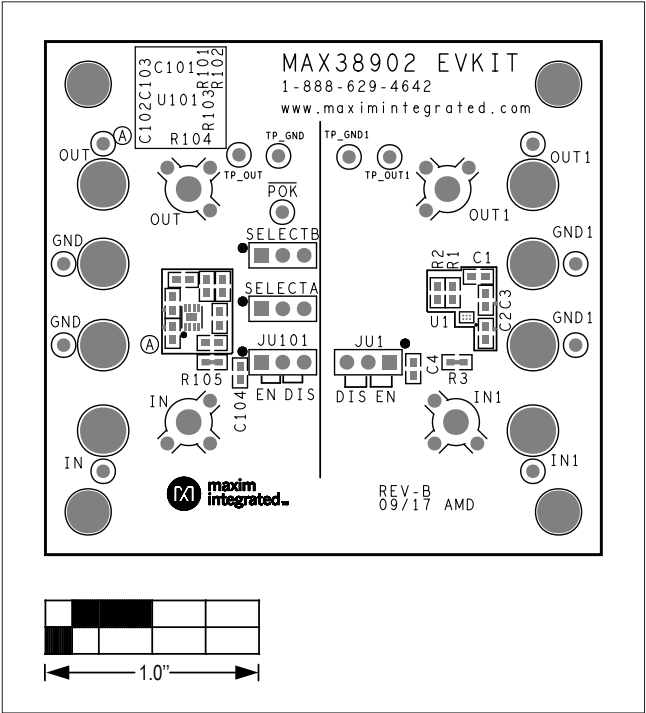
MAX38902 EV Kit—Top Silkscreen



MAX38902 EV Kit—Bottom View



MAX38902 EV Kit—Top View



MAX38902 EV Kit—Bottom Silkscreen

## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION     | PAGES<br>CHANGED |
|--------------------|------------------|-----------------|------------------|
| 0                  | 11/17            | 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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