

MAX8900A Evaluation Kit

Evaluates: MAX8900A/MAX8900B

General Description

The MAX8900A evaluation kit (EV kit) is a fully assembled and tested circuit for evaluating the MAX8900A switch-mode Li+/Li-Poly charger with $\pm 22V$ input rating and JEITA* battery temperature monitoring. The MAX8900A charges a 1-cell lithium-ion (Li+) or lithium-polymer (Li-Poly) battery. The MAX8900A delivers up to 1.2A of current to the battery from a 3.4V to 6.3V supply. External resistors and potentiometers adjust the fast-charge current and the prequalification and done current thresholds. A JEITA battery temperature monitor adjusts charge current and termination voltage.

The MAX8900A EV kit comes with the MAX8900A installed, but can also be used to evaluate the MAX8900B with IC replacement of U1. Request a free sample of the MAX8900B when you order the MAX8900A EV kit.

Ordering Information

| PART | TYPE |
|----------------|--------|
| MAX8900AEVKIT+ | EV KIT |

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

Features

- ◆ 3.25MHz Switching Li+/Li-Poly Battery Charger
- ◆ JEITA Battery Temperature Monitor Adjusts Charge Current and Termination Voltage
 - On-Board 3380K NTC Thermistor
 - On-Board Potentiometer Allows Easy Evaluation
- ◆ Battery Fast-Charge Current-Limit Adjustment Range of 50mA to 1200mA
 - Dynamic Charge Current Programming Using MOSFET and Resistor Array on the EV Kit
 - Potentiometer Adjustment Available
- ◆ Prequalification and Done Threshold Adjustment Range of 10mA to 200mA
 - Dynamic Charge Current Programming Using MOSFET and Resistor Array on the EV Kit
 - Potentiometer Adjustment Available
- ◆ Selectable Charge Source Connector
2.1mm Barrel or Micro-USB
- ◆ Three Status LED Indicators
- ◆ Fully Assembled and Tested

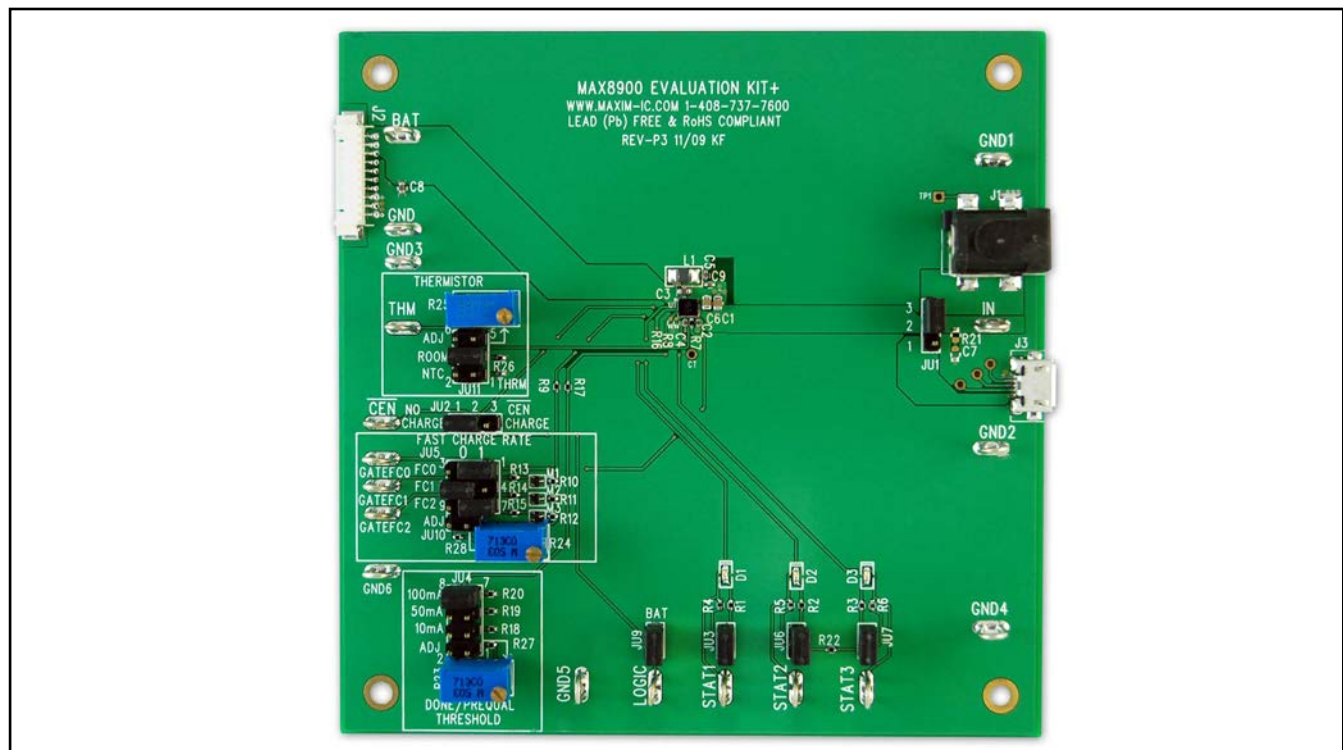


Figure 1. MAX8900 EV Kit Photo

*JEITA (Japan Electronics and Information Technology Industries Association) standard, "A Guide to the Safe Use of Secondary Lithium Ion Batteries in Notebook-type Personal Computers" April 20, 2007.

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at www.maximintegrated.com.

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Component List

| DESIGNATION | QTY | DESCRIPTION |
|--------------------------|-----|---|
| C1, C6 | 2 | 0.47 μ F \pm 20%, 25V X5R ceramic capacitors (0603) TDK C1608X5R1E474M |
| C2, C5 | 2 | 0.1 μ F \pm 20%, 10V X5R ceramic capacitors (0402) TDK C1005X5R1A104K |
| C3, C8 | 2 | 2.2 μ F \pm 20%, 6.3V X5R ceramic capacitors (0603) TDK C1608X5R0J225M |
| C4 | 1 | 0.47 μ F \pm 20%, 10V X5R ceramic capacitor (0402) TDK C1005X5R1A474M |
| C7 | 0 | Not installed, capacitor (0603) |
| C9 | 1 | 1 μ F \pm 20%, 6.3V X5R ceramic capacitor (0402) TDK C1005X5R0J105M |
| D1, D2, D3 | 3 | Green LEDs Avago Technologies HSMG-C190 |
| J1 | 1 | Male 2.1mm power connector CUI Inc. PJ-002A-SMT |
| J2 | 0 | Not installed, 1.25mm (0.049in) pitch header (surface-mount, right-angle, lead-free, 10 circuits) |
| J3 | 1 | Micro-USB connector Hirose Electric ZX62-AB-5PA |
| JU1, JU2 | 2 | 3-pin headers, 0.1in centers Sullins PEC36SAAN |
| JU3, JU6, JU7, JU9, JU10 | 5 | 2-pin headers, 0.1in centers Sullins PEC36SAAN |
| JU4 | 1 | 2 x 4-pin header, 0.1in centers Sullins PEC36SAAN |
| JU5 | 1 | 3 x 3-pin header, 0.1in centers Sullins PEC36SAAN |
| JU11 | 1 | 2 x 3-pin header, 0.1in centers Sullins PEC36SAAN |
| L1 | 1 | 1 μ H, 0.055 Ω , 1.6A chip inductor (2.5mm x 2mm x 0.9mm) Murata LQM2HPN1R0MGO |
| M1, M2, M3 | 3 | 20V, 238mA n-channel MOSFETs (SC-75) ON Semi NTA4001NT1G |

| DESIGNATION | QTY | DESCRIPTION |
|---------------|-----|---|
| R1, R2, R3 | 3 | 422 Ω \pm 1% resistors (0402), lead-free |
| R4, R5, R6 | 3 | 560k Ω \pm 1% resistors (0402), lead-free |
| R7, R26 | 2 | 10k Ω \pm 1% resistors (0402), lead-free |
| R8, R16 | 0 | Not installed, resistors (0402) |
| R9, R17, R22 | 3 | 0 Ω \pm 1% resistors (0402), lead-free |
| R10, R18 | 2 | 35.7k Ω \pm 1% resistors (0402), lead-free |
| R11 | 1 | 9.09k Ω \pm 1% resistor (0402), lead-free |
| R12 | 1 | 4.75k Ω \pm 1% resistor (0402), lead-free |
| R13, R14, R15 | 3 | 100k Ω \pm 1% resistors (0402), lead-free |
| R19 | 1 | 7.68k Ω \pm 1% resistor (0402), lead-free |
| R20 | 1 | 3.83k Ω \pm 1% resistor (0402), lead-free |
| R21 | 0 | Not installed, resistor (0603) |
| R23, R24 | 2 | 50k Ω , 25-turn potentiometers Bourns 3296Y-1-503LF |
| R25 | 1 | 200k Ω , 25-turn potentiometer Bourns 3296Y-1-204LF |
| R27 | 1 | 1.21k Ω \pm 1% resistor (0402), lead-free |
| R28 | 1 | 2.26k Ω \pm 1% resistor (0402), lead-free |
| THRM | 1 | 10k Ω NTC thermistor (0402) Murata NCP15XH103F03 (β = 3380K) |
| U1 | 1 | High-frequency, switch-mode charger (30 WLP) Maxim MAX8900AEWV+ |
| — | 12 | Shunts (see Table 1 for jumper settings) |
| — | 1 | USB A-to-Micro-USB B, 2.0m cable Molex 68784-0003 Digi-Key WM17147-ND |
| — | 1 | Adjustment tool Bourns H-90 Digi-Key H90-ND |
| — | 1 | PCB: MAX8900A EVALUATION KIT+ |

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Component Suppliers

| SUPPLIER | WEBSITE |
|--------------------------------|----------------------------|
| Avago Technologies | www.avagotech.com |
| Bourns, Inc. | www.bourns.com |
| CUI Inc. | www.cui.com |
| Digi-Key Corp. | www.digikey.com |
| Hirose Electric Co., Ltd. | www.hirose.com |
| Murata Manufacturing Co., Ltd. | www.murata.com |
| ON Semiconductor | www.onsemi.com |
| Sullins Electronics Corp. | www.sullinselectronics.com |
| TDK Corp. | www.component.tdk.com |

Note: Indicate that you are using the MAX8900A when contacting these component suppliers.

Quick Start

Recommended Equipment

- Adjustable DC power supply capable of at least 1.2A at 6V
- Battery or simulated battery
 - 1-cell Li+ or Li-Poly battery (Figure 2A)
 - Simulated battery, preloaded power supply (Figure 2B)
- Digital multimeter (DMM)
- Two 3A ammeters

Procedure

The MAX8900A EV kit is fully assembled and tested. Follow the steps below to verify board operation. Use twisted wires of appropriate gauge (20AWG) that are as short as possible to connect the battery and power sources.

- 1) Ensure that the EV kit has the jumper settings as shown in Figure 3 and Table 1.
- 2) Preset the DC power supply to 5V. Turn off the power supply. Do not turn on the power supply until all connections are completed.

- 3) Connect the EV kit to the power supply, battery, or preloaded power supply and meters, as shown in Figure 3. Adjust the ammeters to their largest current range to minimize their series impedance. Do not allow the ammeters to operate in their “autorange” mode. If current readings are not desired, short across the ammeters.
- 4) Turn on the power supply.
- 5) If $3V \leq V_{BAT} \leq 4.1V$, then verify that the current from BAT into the battery is approximately 95mA. If V_{BAT} is not in this specified range, refer to Figure 6 in the MAX8900A/MAX8900B IC data sheet for more information.

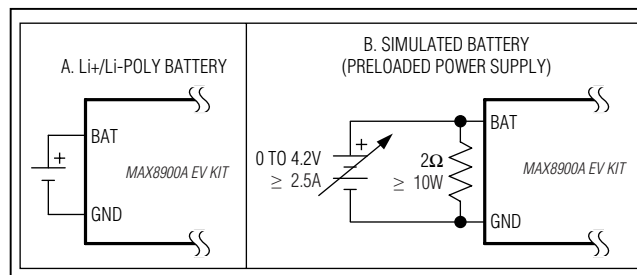


Figure 2. Battery Options for Evaluating the MAX8900A EV Kit

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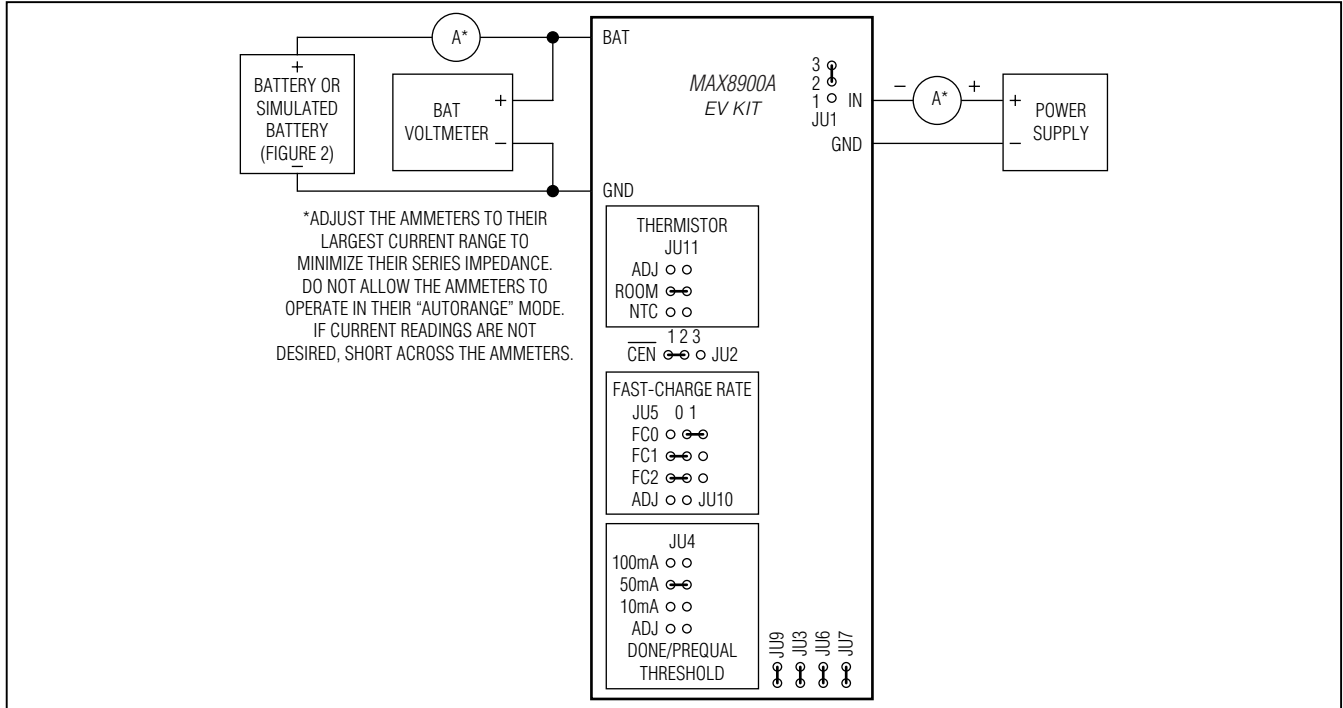


Figure 3. Connection Diagram and Default Jumper Connections

Table 1. Jumper Functions

| JUMPER | NODE OR FUNCTION | POSITION | FUNCTION |
|--------|-----------------------------------|----------|---|
| JU1 | IN input selector | Open | Only the "IN" pad is connected to the MAX8900A's power input (IN). |
| | | 1-2 | Both the "IN" pad and J3 are connected to IN. |
| | | 2-3* | Both the "IN" pad and J1 are connected to IN. |
| JU2 | $\overline{\text{CEN}}$ | 1-2 | Charger is disabled (logic-high). |
| | | 2-3* | Charger is enabled (logic-low). |
| JU3 | STAT1 output | 1-2* | D1 LED indicator is connected to STAT1. |
| | | Open | D1 LED indicator is not connected to STAT1. |
| JU4 | DONE/PREQUAL THRESHOLD adjustment | 1-2 | Adjustable setting. R23 (50k Ω potentiometer) and R27 are connected to DNI. |
| | | 3-4 | 10mA setting. R18 (35.7k Ω) is connected to DNI. |
| | | 5-6* | 50mA setting. R19 (7.68k Ω) is connected to DNI. |
| | | 7-8 | 100mA setting. R20 (3.83k Ω) is connected to DNI. |
| JU5 | FAST-CHARGE RATE adjustment | 1-2* | Gate of M1 driven high. R10 (35.7k Ω) is connected to SET1, which increases the fast-charge current setting by 95mA. |
| | | 2-3 | Gate of M1 driven low. R10 is disconnected from SET1. |
| | | 4-5 | Gate of M2 driven high. R11 (9.09k Ω) is connected to SET1, which increases the fast-charge current setting by 375mA. |
| | | 5-6* | Gate of M2 driven low. R11 is disconnected from SET1. |
| | | 7-8 | Gate of M3 driven high. R12 (4.75k Ω) is connected to SET1, which increases the fast-charge current setting by 717mA. |
| | | 8-9* | Gate of M3 driven low. R12 is disconnected from SET1. |

*Default position.

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Table 1. Jumper Functions (continued)

| JUMPER | NODE OR FUNCTION | POSITION | FUNCTION |
|--------|---|----------|--|
| JU6 | STAT2 output | 1-2* | D2 LED indicator is connected to STAT2. |
| | | Open | D2 LED indicator is not connected to STAT2. |
| JU7 | STAT3 output | 1-2* | D3 LED indicator is connected to STAT3. |
| | | Open | D3 LED indicator is not connected to STAT3. |
| JU9 | LOGIC | 1-2* | Connects VBAT to LOGIC. LOGIC serves as the pullup node for the STAT_ indicator LED. Pin 1 of JU2 connects to LOGIC. |
| | | Open | LOGIC must be supplied by an independent power supply that is less than 5V. |
| JU10 | FAST-CHARGE RATE R24 (potentiometer) connection | 1-2 | Adjustable setting R24 (50kΩ potentiometer) and R28 are connected to SET1. |
| | | Open* | R24 and R28 are not connected to SET1. |
| JU11 | Thermistor adjustment | 1-2 | NTC is connected to THM. |
| | | 3-4* | R26 is connected to THM. |
| | | 5-6 | R25 (200kΩ potentiometer) is connected to THM. |

*Default position.

Detailed Hardware Description

Input Power Connection

Two input power connectors are provided on the EV kit. J1 is a 2.1mm power connector and J3 is a Micro-USB connector. Shunting pins 1-2 of jumper JU1 connects J1 to IN on the MAX8900A. Shunting pins 2-3 of JU1 connects J3 to IN on the MAX8900A. The IN pad next to JU1 is always connected and can be used to measure the voltage on JU1 or JU3, or used as an input only.

Charger Input Enable (\overline{CEN})

\overline{CEN} is a digital input. Driving \overline{CEN} (JU2) high (pins 1-2) disables the battery charger. Driving \overline{CEN} (JU2) low (pins 2-3) enables the MAX8900A. Leaving \overline{CEN} (JU2) unconnected (pins open) also enables the charger.

Setting the Fast-Charge Current Limit (SET1)

As shown in Figure 3, MOSFET and resistor combinations adjust the total resistance from SET1 to ground. The MAX8900_ supports values of fast-charge current (IFC) from 50mA to 1200mA. Table 2 shows the IFC values that are easily obtainable by adjusting jumpers JU5 and JU10. The relationship between RSET1 and IFC is as follows:

$$IFC = 3405V/RSET1$$

Setting the Prequalification Current and Done Threshold (DNI)

As shown in Figure 3, several different resistor values can be connected from DNI to ground by using jumper JU4. The resistance from DNI to ground sets the prequalification current (IPQ) and done current (IDN). The MAX8900A supports IDN and IPQ currents from 10mA to 200mA. Table 3 shows the IDN and IPQ values that are easily attained with the EV kit. The relationship between RDNI, IDN, and IPQ is as follows:

$$IDN = 384V/RDNI$$

$$IPQ = 415V/RDNI$$

Thermistor (THM)

The MAX8900A adjusts the charge current and termination voltage, as described in the JEITA specification for safe use of secondary lithium-ion batteries (*A Guide to the Safe Use of Secondary Lithium Ion Batteries in Notebook-type Personal Computers*, April 20, 2007). The temperature thresholds are explained in detail in the MAX8900A/MAX8900B IC data sheet.

The EV kit includes four options for thermistor evaluation:

- 1) Disable thermistor (JU11 = Pins 3-4): Biases THM at AVL/2, which the MAX8900A interprets as the battery temperature at +25°C.

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- 2) Ambient temperature monitor (JU11 = Pins 1-2): Connects the on-board thermistor (THRM), which is a 10kΩ NTC thermistor ($\beta = 3380K$), allowing ambient temperature monitoring.
- 3) Potentiometer simulation (JU11 = pins 5-6): Connects a 200kΩ potentiometer (R25), allowing user adjustment of V_{THM} to quickly evaluate all thermistor operating regions.
- 4) Battery pack (JU11 = Open): Leaves JU11 open such that the EV kit user can wire the THM pad directly to the battery pack's internal thermistor for "true" battery temperature monitoring.

Charge Timers

A fault timer prevents the battery from charging indefinitely. The prequalification and fast-charge timers are controlled by the capacitance at C_{CT} : C4.

$$t_{PQ} = 30\text{min} \times \frac{C_{CT}}{0.1\mu\text{F}}$$

$$t_{FC} = 180\text{min} \times \frac{C_{CT}}{0.1\mu\text{F}}$$

The top-off time (t_{TO}) is fixed at 16s:

$$t_{TO} = 16\text{s}$$

Connect CT to GND to disable the prequalification and fast-charge timers. With the internal timers of the MAX8900A disabled, an external device such as a microprocessor (μP) can control the charge time through the \overline{CEN} input.

Status Outputs

STAT_ includes pullup resistors R4, R5, and R6, which allow voltage monitoring on the STAT_ pads near the edge of the PCB. Jumpers JU3, JU6, and JU7 allow the connection of indicator LEDs D1, D2, and D3. Table 1 describes the jumper connections. Tables 4 and 5 define the status output truth tables.

When evaluating the MAX8900A, STAT3 pulls low when the battery-temperature monitor detects that the battery temperature is greater than the T4 threshold; otherwise, STAT3 is high impedance. Some systems may want to reduce the battery loading when STAT3 pulls low to prevent the battery from getting excessively hot.

Table 2. Fast-Charge Current-Limit Settings

| JU5 (FC0) | | JU5 (FC1) | | JU5 (FC2) | | JU10 (ADJ) | RESISTORS CONNECTED IN PARALLEL FROM SET1 TO GROUND | TOTAL RESISTANCE (Ω) | I_{FC}^* (mA) |
|-----------|---------|-----------|---------|-----------|---------|------------|---|-------------------------------|------------------------------|
| 1-2 (1) | 2-3 (0) | 4-5 (1) | 5-6 (0) | 7-8 (1) | 8-9 (0) | 1-2 | | | |
| — | O | — | O | — | O | O | R10, R11, R12 | 2869 | 1187 |
| O | — | — | O | — | O | O | R11, R12 | 3120 | 1091 |
| — | O | O | — | — | O | O | R10, R12 | 4192 | 812 |
| O | — | O | — | — | O | O | R12 | 4750 | 717 |
| — | O | — | O | O | — | O | R10, R11 | 7245 | 470 |
| O | — | — | O | O | — | O | R11 | 9090 | 375 |
| — | O | O | — | O | — | O | R10 | 35700 | 95 |
| O | — | O | — | O | — | O | — | Open | 0 |
| O | — | O | — | O | — | — | R24 + R28 | Adjustable 52260 to 2260 | Adjustable 65.2 to 1507** |

Note: () = Parenthetic items reference the silkscreen.

— = Contact closed (i.e., shunt installed).

O = Contact open (i.e., shunt not installed).

*Current values shown assume $T_2 < T_{HM} < T_4$.

**Device rated up to 1200mA.

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Table 3. Prequalification and Done Current-Limit Settings

| JU4 | | | | RESISTANCE (kΩ) | IDN (mA) | IPQ (mA)* |
|-----|-----|-----|-----|------------------------------|----------------------------|----------------------------|
| 1-2 | 3-4 | 5-6 | 7-8 | | | |
| — | O | O | O | R27 + R23 (51.21 to 1.21) | Adjustable 8.1 to 343** | Adjustable 7.5 to 317** |
| O | — | O | O | R18 (35.7) | 10.76 | 11.63 |
| O | O | — | O | R19 (7.68) | 50.00 | 54.04 |
| O | O | O | — | R20 (3.83) | 100.26 | 108.36 |

Note: — = Contact closed (i.e., shunt installed).

O = Contact open (i.e., shunt not installed).

*Current values shown assume $T_2 < THM < T_4$.

**Device rated for 9.8mA to 200mA.

Table 4. MAX8900A 2-Pin Status Output Truth Table

| STAT1 | | STAT2 | | INDICATION |
|-------|-----|-------|-----|---|
| PAD | D1 | PAD | D2 | |
| 0 | On | 0 | On | Undefined |
| 0 | On | 1 | Off | Charging (dead-battery state or dead battery and prequalification state or prequalification state or fast-charge state) |
| 1 | Off | 0 | On | Timer fault or $V_{IN} > V_{OVLO}$ or battery cold ($THM < T_1$) or battery hot ($THM > T_4$) |
| 1 | Off | 1 | Off | Done state or $\overline{CEN} = 1$ or $V_{IN} < V_{UVLO}$ or $V_{IN} < (V_{BAT} + V_{IN2BAT})$ or thermal shutdown |

Note: STAT1 and STAT2 are open-drain outputs. 0 indicates that the output device is pulling low; 1 indicates that the output is high impedance.

Table 5. MAX8900B 3-Pin Status Output Truth Table

| STAT1 | | STAT2 | | STAT3 | | INDICATION |
|-------|-----|-------|-----|-------|-----|---|
| PAD | D1 | PAD | D2 | PAD | D3 | |
| 0 | On | 0 | On | 0 | On | Battery cold ($THM < T_1$) |
| 0 | On | 0 | On | 1 | Off | $V_{IN} > V_{OVLO}$ |
| 0 | On | 1 | Off | 0 | On | Charging (dead-battery state or dead battery and prequalification state or prequalification state or fast-charge state) |
| 0 | On | 1 | Off | 1 | Off | Battery hot ($THM > T_4$) |
| 1 | Off | 0 | On | 0 | On | Done state |
| 1 | Off | 0 | On | 1 | Off | Undefined |
| 1 | Off | 1 | Off | 0 | On | Timer fault |
| 1 | Off | 1 | Off | 1 | Off | $V_{IN} < V_{UVLO}$ or $\overline{CEN} = 1$ or $V_{IN} < (V_{BAT} + V_{IN2BAT})$ or thermal shutdown |

Note: STAT1, STAT2, and STAT3 are open-drain outputs. 0 indicates that the output device is pulling low; 1 indicates that the output is high impedance.

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PCB Layout Guidelines

The MAX8900_ wafer-level package (WLP) and bump configuration allows for a small-size, low-cost PCB design. Figure 4 shows that the 30 bumps on the MAX8900_ WLP are combined into 18 functional nodes. The bump configuration places all like nodes adjacent to each other to minimize the area required for routing. The bump configuration also allows for a layout that does not use any vias within the WLP bump matrix (i.e., no micro vias). To utilize this no-via layout, \overline{CEN} is left unconnected and the STAT3 pin is not used (2-pin status version). Note that although layouts without micro vias are possible, this EV kit uses filled micro vias that are on the WLP pads of the MAX8900A (A2, A5, A6, B2, C2, D2, and E6). These filled micro vias on pads were used to showcase the small solution size.

Figure 5 shows the recommended land pattern for the MAX8900_. Figure 6 shows the bump cross section of the MAX8900_ under-bump metal (UBM). The diameter of each pad in the land pattern is close to the diameter of the UBM. This land pattern to UBM relationship is important to get proper reflow of each solder bump. Note that although layouts without micro vias are possible, this EV kit uses filled micro vias that are on the WLP pads of the MAX8900A (A2, A5, A6, B2, C2, D2, and E6). These filled micro vias on pads were used to showcase the small solution size.

Underfill is not necessary for the MAX8900_ WLP to pass the JESD22-B111 Board Level Drop Test Method for Handheld Electronic Products. JESD22-B111 covers end applications such as cell phones, PDAs, cameras, and other products that are more prone to being dropped during their lifetime due to their size and weight. Consider using underfill for applications that require higher reliability than what is covered in the JESD22-B111 standard.

Careful printed circuit layout is important for minimizing ground bounce and noise. Figure 4 is an example layout of the critical power components for the MAX8900_. The arrangement of the components that are not shown in Figure 4 is less critical. Figures 8–10 show the entire layout of the MAX8900A EV kit and Table 6 shows the EV kit construction attributes. To ensure a successful layout for the MAX8900A, use the following list of guidelines and refer to Application Note 1891: *Wafer-Level Packaging (WLP) and Its Applications*, which is available at www.maximintegrated.com.

The following guidelines are listed in order of importance, with the most important elements listed first:

- 1) When the step-down converter's high-side MOSFET turns on, C_{INBP} delivers a high di/dt current pulse to INBP. Because of this high di/dt current pulse, place C_{INBP} close to INBP to minimize the parasitic impedance in the PCB trace.
- 2) When the step-down converter is increasing the current in the inductor, the high-side MOSFET is on and current flows in the following path: from C_{INBP} into INBP → out of LX → through the inductor → into CS → out of BAT → through C_{BAT} and back to C_{INBP} through the ground plane. This current loop should be kept small and the electrical length from the positive terminal of C_{INBP} to INBP should be kept short to minimize parasitic impedance. The electrical length from the negative terminal of C_{BAT} to the negative terminal of C_{INBP} should be short to minimize parasitic impedance. Keep all sensitive signals such as feedback nodes or audio lines outside of this current loop with as much isolation as your design allows.
- 3) When the step-down converter is decreasing the inductor current, the low-side MOSFET is on and the current flows in the following path: out of LX → through the inductor → into CS → out of BAT → through C_{BAT} → into PGND → out of LX again. This current loop should be kept small and the electrical length from the negative terminal of C_{BAT} to PGND should be short to minimize parasitic impedance. Keep all sensitive signals such as feedback nodes or audio lines outside of this current loop with as much isolation as your design allows.
- 4) The LX node voltage switches between INBP and PGND during the operation of the step-down converter. Minimize the stray capacitance on the LX node to maintain good efficiency. Also, keep all sensitive signals such as feedback nodes or audio lines away from LX with as much isolation as your design allows.
- 5) In Figure 4, the CS node is connected to the second layer of metal with vias. Use low-impedance vias capable of handling 1.5A of current. Also, keep the routing inductor current path on layer 2 just underneath the inductor current path on layer 1 to minimize impedance.
- 6) Both C_{BST} and C_{PVL} deliver current pulses for the MAX8900_'s MOSFET drivers. These components should be placed as shown in Figure 4 to minimize parasitic impedance.

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- 7) Each of the MAX8900_ WLP bumps have approximately the same ability to remove heat from the die. Connect as much metal as possible to each bump to minimize the θ_{JA} associated with the MAX8900_. Refer to the *Thermal Management* section in the MAX8900A/MAX8900B IC data sheet for more information on θ_{JA} .

In Figure 4, many of the top-layer bump pads are connected together in top metal. When connecting bumps together with top-layer metal, the solder mask should define the pads from 180 μ m to 210 μ m, as shown in Figure 5. When using solder-mask defined pads, double-

check the solder-mask openings on the PCB Gerber files before ordering boards because some PCB layout tools have configuration boards that automatically oversize solder-mask openings. Also, give special instruction in your PCB construction attributes (Table 6) that the BGA solder mask under the MAX8900A should not be modified by the board manufacturer. Occasionally, optimization tools are used at the PCB fabrication house that modify solder masks. Layouts that do not use solder-mask defined pads are possible. When using these layouts, adhere to guidelines 1–7.

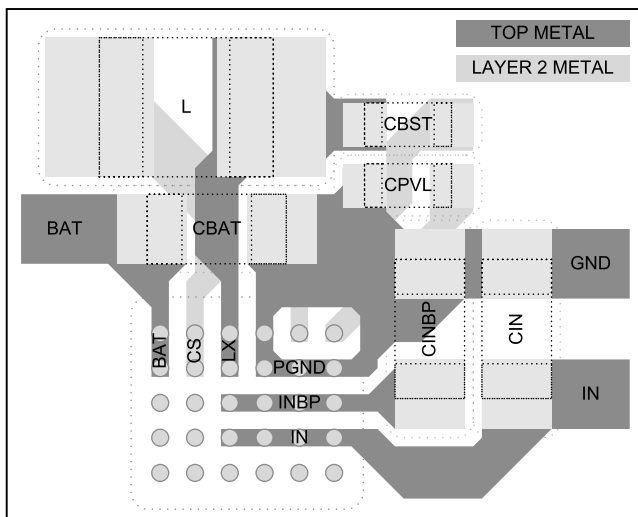


Figure 4. Power PCB Layout Example

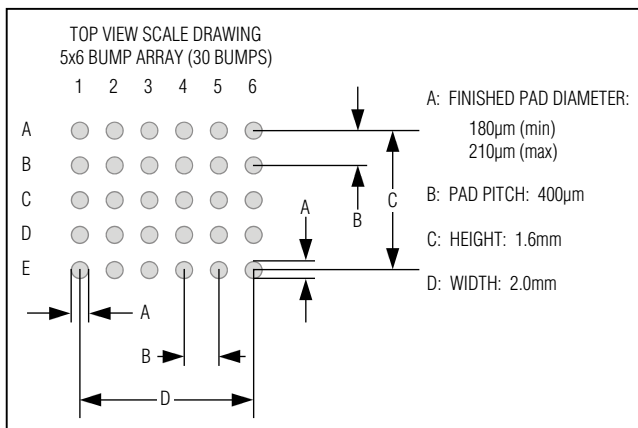


Figure 5. Recommended Land Pattern

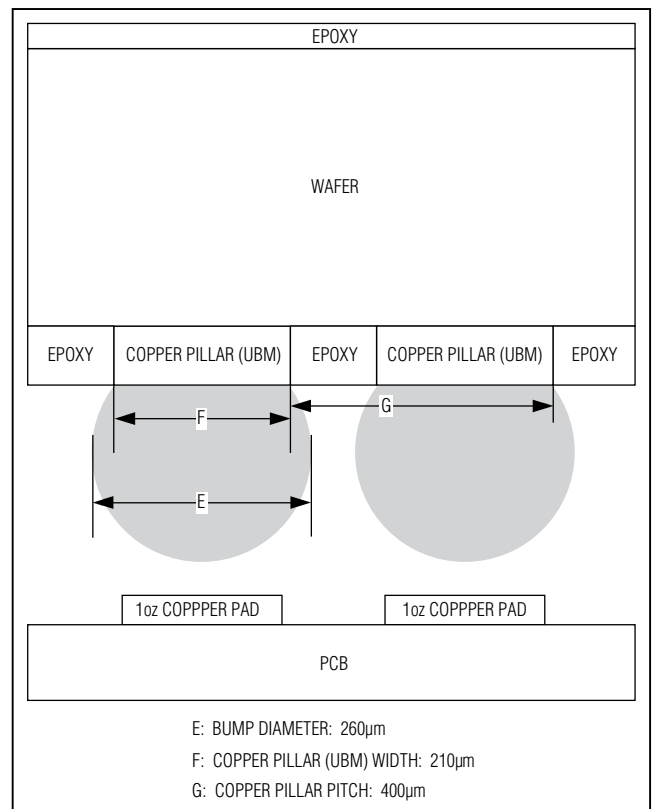


Figure 6. Bump Cross Section and Copper Pillar Detail

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Evaluating the MAX8900B

The EV kit comes with the MAX8900A installed, but can also be used to evaluate the MAX8900B. To evaluate the MAX8900B, carefully remove the MAX8900A (U1) from the EV kit and replace it with a MAX8900B; no other component changes are required. For guidelines on how to remove and replace the MAX8900_, refer to the Component Rework section in Application Note 3377: *Maxim Wafer-Level Package Assembly Guide*, which is available at www.maximintegrated.com.

Request a free sample of the MAX8900B when you order the MAX8900A EV kit.

EV Kit I/O Pads

The EV kit has I/O pads on several points of interest (see Figure 9: IN, BAT, GND, etc.). A 20AWG bare wire installed in the I/O pad provides a convenient means to attach scope probes or the clip leads of a power supply or DMM. Figure 7 shows a 20AWG bare wire loop installed in an I/O pad. Note that most production EV kits are shipped without wire installed in the I/O pads. EV kits that have been customized or have been used for additional testing within Maxim typically have wire installed in the I/O pads.

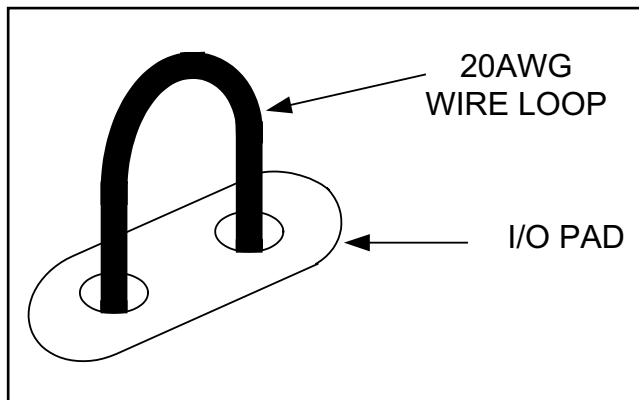


Figure 7. Wire Loop in I/O Pad Provides Convenient Attach Point

Table 6. PCB Construction Attributes

| | |
|---|---|
| MATERIAL: | RoHS-compliant FR-4 laminate material compatible with lead-free soldering processes |
| SIZE: | 4.000in x 4.000in |
| THICKNESS: | 0.064in |
| LAYERS: | Two |
| SOLDER MASK: | Green LPI SMOBC |
| LEGENDS: | White (clipped all legends from exposed metal) |
| COPPER CLAD FINISH: | 1oz top and 1oz bottom |
| VIA UNDER WLP: | 6 mil drill and 3 mil annular ring on top and bottom layers, filled via (Figure 8) |
| VIA ON REMAINING AREA OF PCB: | 10 mil drill and 5 mil annular ring on top and bottom layers (Figure 8) |
| SPECIAL INSTRUCTIONS (WLP SPECIFIC): | BGA is solder-mask defined (do not oversize during manufacturing) |
| SPECIAL INSTRUCTIONS (6 MIL VIAS): | Nonconductive epoxy on the 6 mil drill vias |

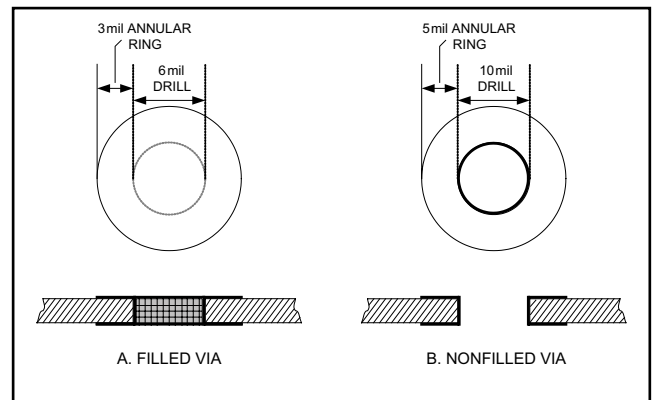


Figure 8. Via Details

MAX8900A Evaluation Kit

Evaluates: MAX8900A/MAX8900B

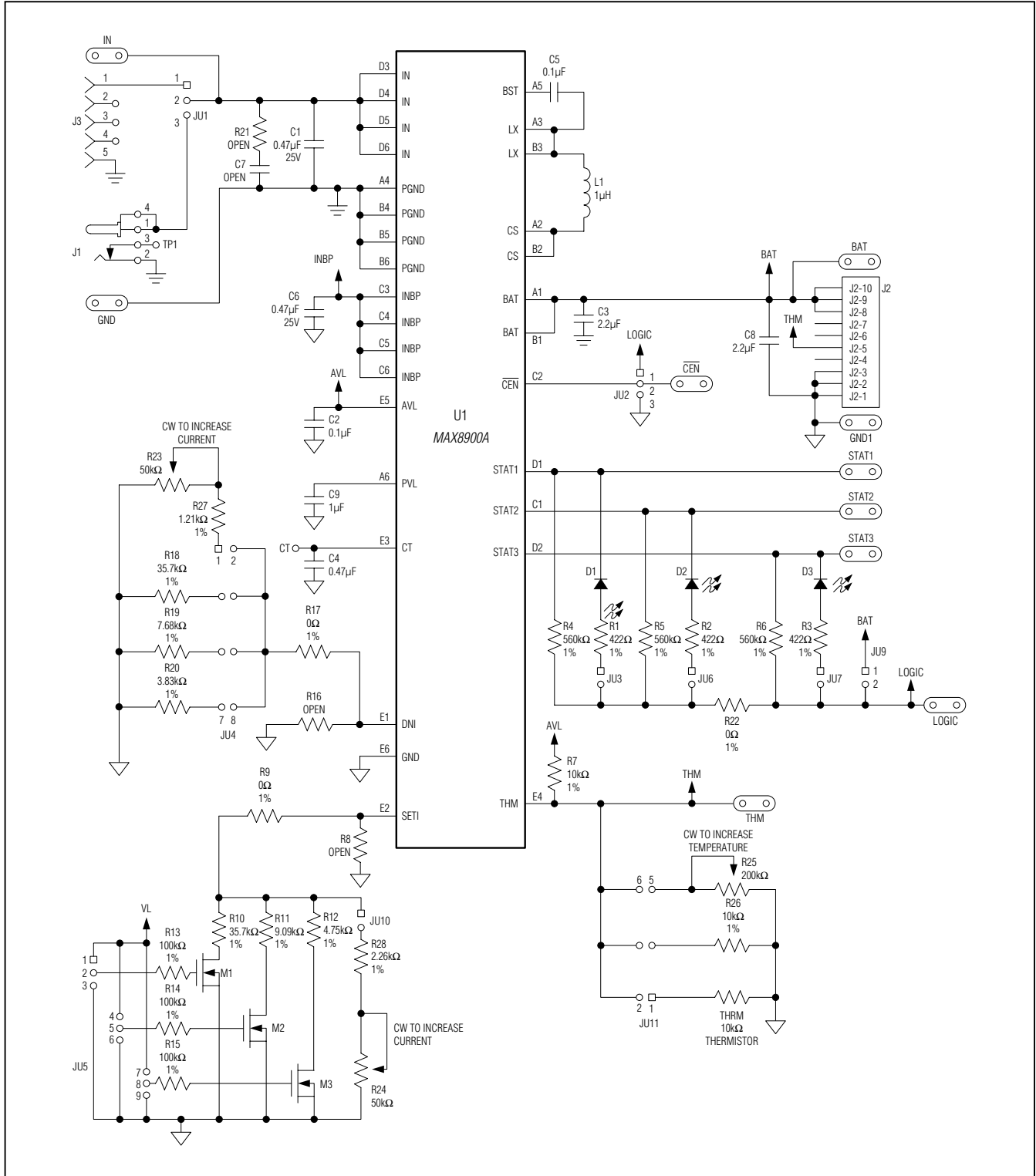


Figure 9. MAX8900A EV Kit Schematic

MAX8900A Evaluation Kit

Evaluates: MAX8900A/MAX8900B

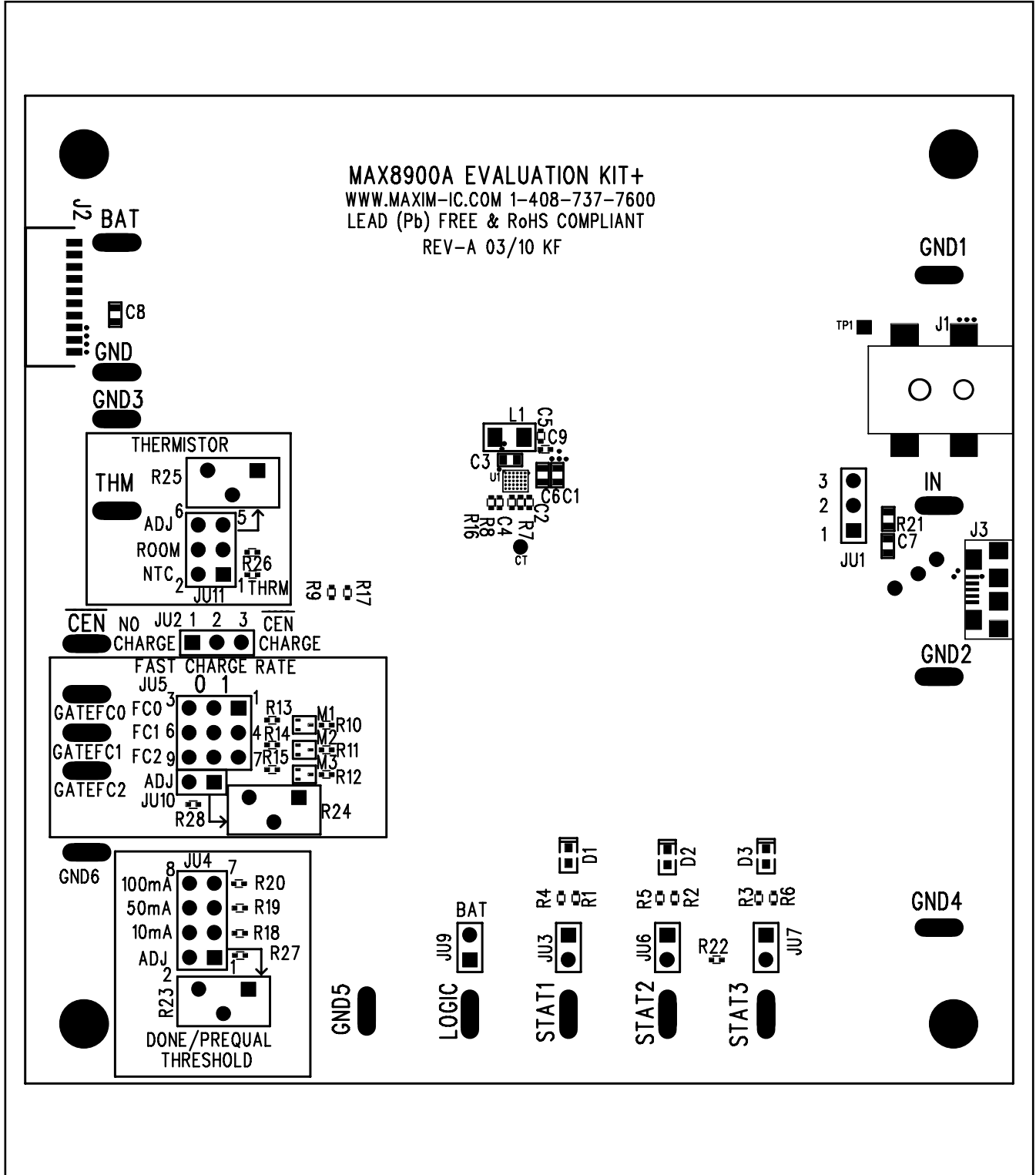


Figure 10. MAX8900A EV Kit Component Placement Guide—Top Layer

MAX8900A Evaluation Kit

Evaluates: MAX8900A/MAX8900B

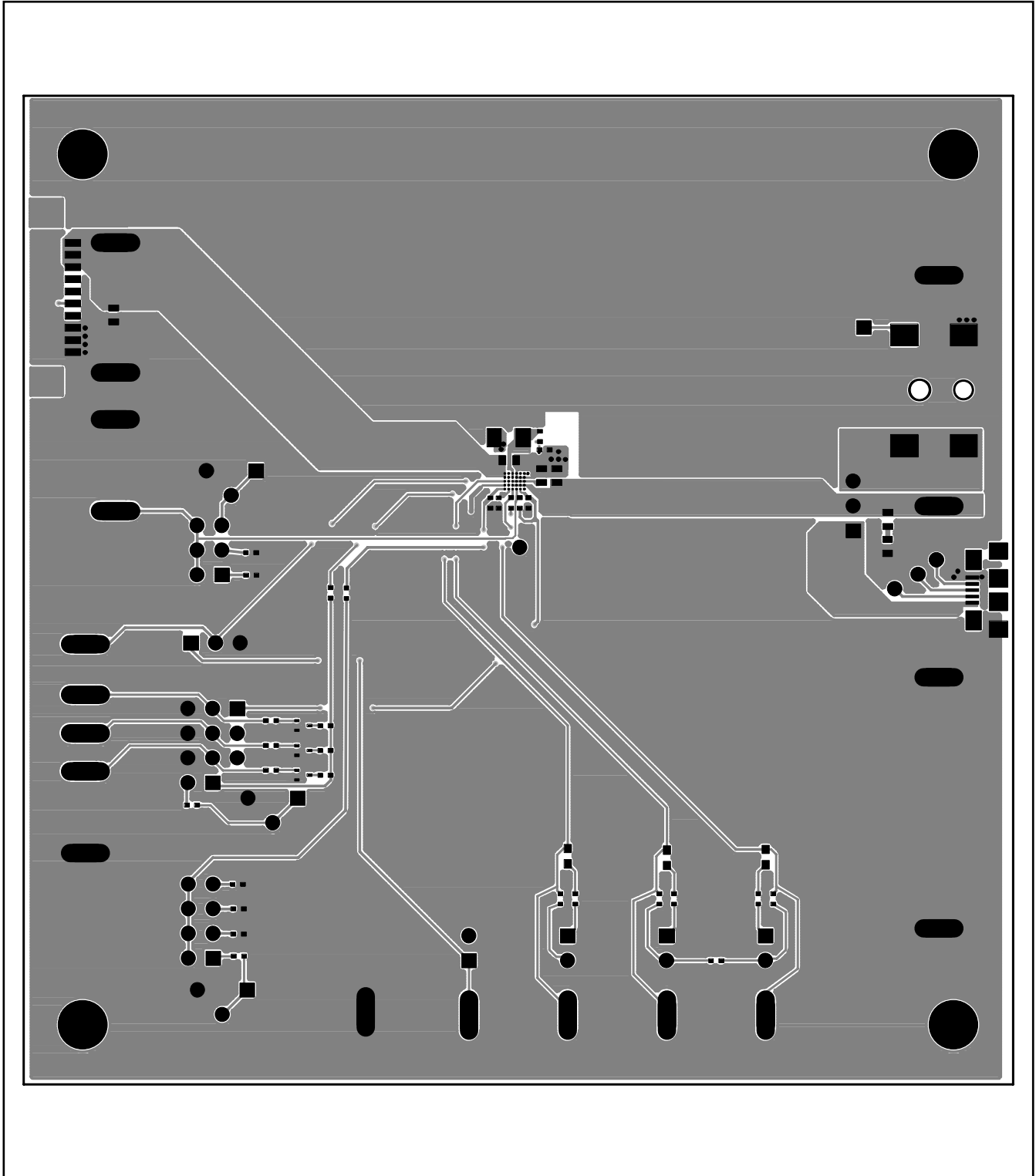


Figure 11. MAX8900A EV Kit PCB Layout—Top Layer

MAX8900A Evaluation Kit

Evaluates: MAX8900A/MAX8900B

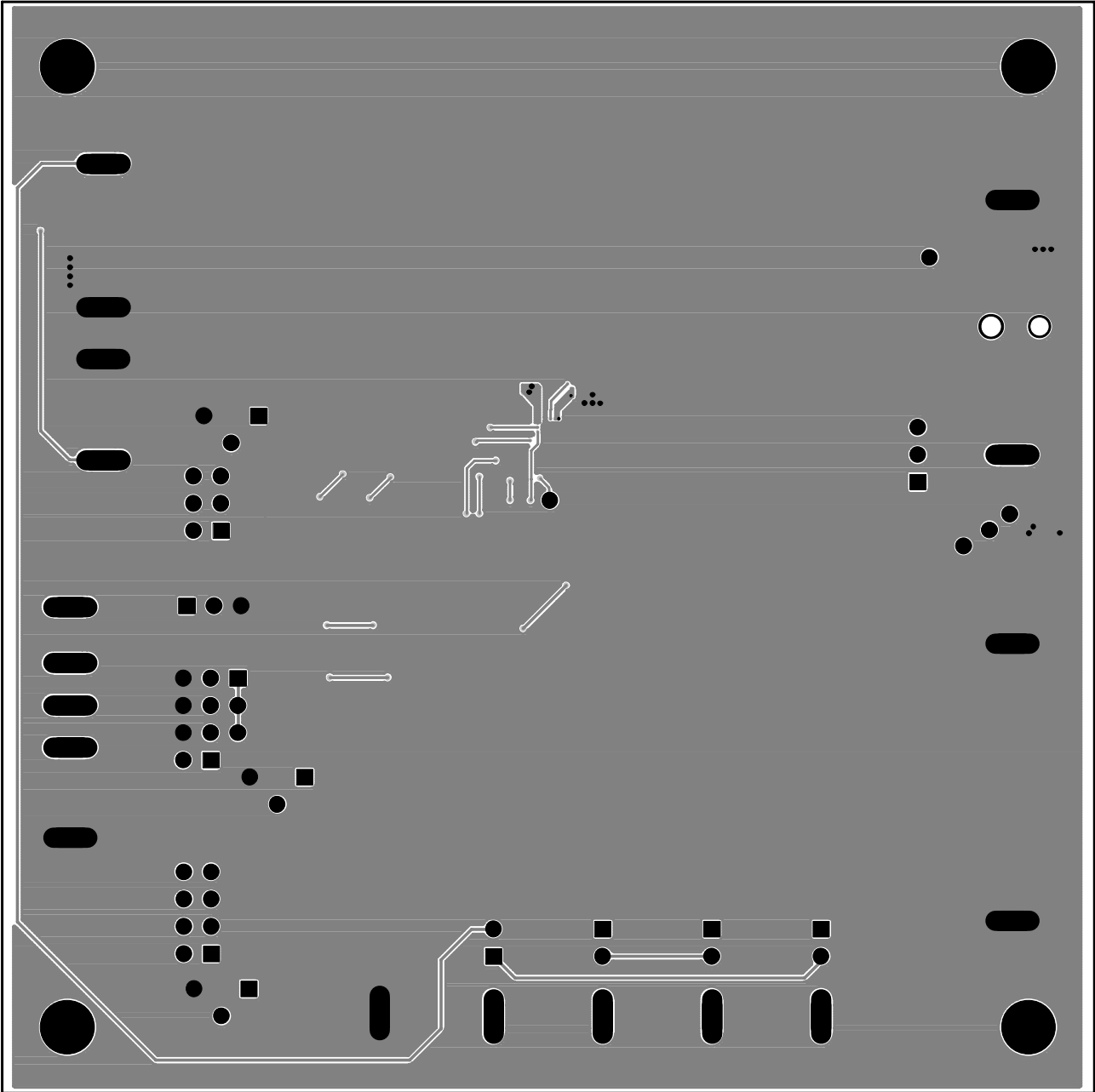


Figure 12. MAX8900A EV Kit PCB Layout—Bottom Layer

MAX8900A Evaluation Kit

Evaluates: MAX8900A/MAX8900B

Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|------------------------|----------------------|--------------------|----------------------|
| 0 | 4/10 | Initial release | — |



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Стандарт Электрон Связь

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