



MAX8643 Evaluation Kit

Evaluates: MAX8643

General Description

The MAX8643 evaluation kit (EV kit) is a fully assembled and tested PCB that demonstrates the capabilities of the MAX8643 integrated 3A step-down regulator. The EV kit generates a +1.8V output voltage at load currents up to 3A from a 2.35V to 3.6V input voltage range. The MAX8643 switches at 1MHz and up to 95% efficiency with the supplied components.

Component List

| DESIGNATION | QTY | DESCRIPTION |
|--------------|-----|---|
| C1, C2 | 2 | 22 μ F \pm 10%, 6.3V X5R ceramic capacitors (0805) TDK C2012X5R0J226K |
| C3, C9 | 2 | 0.1 μ F \pm 10%, 25V X7R ceramic capacitors (0603) TDK C1608X7R1E104K |
| C4, C6 | 2 | 0.01 μ F \pm 10%, 50V X7R ceramic capacitors (0603) TDK C1608X7R1H103K |
| C5 | 1 | 1 μ F \pm 10%, 16V X5R ceramic capacitor (0603) TDK C1608X5R1C105K |
| C7, C13, C14 | 0 | Not installed, ceramic capacitors (0603) |
| C8 | 1 | 0.022 μ F \pm 10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H223K |
| C10 | 1 | 560pF \pm 10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H561K |
| C11 | 1 | 1500pF \pm 10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H152K |
| C12 | 1 | 33pF \pm 5pF, 50V C0G ceramic capacitor (0603) TDK C1608C0G1H330CT |
| C15 | 1 | 1000pF \pm 10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H102K |

Component List continued on next page.

Features

- ◆ Internal 37m Ω On-Resistance MOSFETs
- ◆ 3A Output PWM Step-Down Regulator
- ◆ \pm 1% Output Accuracy over Load, Line, and Temperature
- ◆ Operates from 2.35V to 3.6V Input Supply
- ◆ Adjustable Output from 0.6V to (0.9 x V_{IN})
- ◆ 500kHz to 2MHz Adjustable Frequency
- ◆ Allows All-Ceramic Capacitor Design
- ◆ Programmable Soft-Start Time
- ◆ 24-Pin, 4mm x 4mm Thin QFN Package
- ◆ REFIN for DDR Termination and Tracking Applications
- ◆ Surface-Mount Components
- ◆ Assembled and Tested

Ordering Information

| PART | TEMP RANGE | IC PACKAGE |
|---------------|--------------|---------------------|
| MAX8643EVKIT+ | 0°C to +70°C | 24 TQFN (4mm x 4mm) |

+Denotes a lead-free and RoHS-compliant EV kit.

Quick Start

Recommended Equipment

- 2V to 4V at +3A variable DC power supply or battery
- Digital multimeter (DMM)
- Up to 3A load
- Ammeter (optional)

Procedure

The MAX8643 EV kit is fully assembled and tested. Follow the steps below to verify board operation.

- 1) Preset the DC power supply to 3.3V. Turn off the power supply. **Caution:** Do not turn on the power supply until all connections are made.
- 2) Remove the shunt from JU1.
- 3) Verify that no two pins are shunted together on jumper JU3.

MAX8643 Evaluation Kit

Component List (continued)

| DESIGNATION | QTY | DESCRIPTION |
|-------------|-----|---|
| JU1, JU2 | 2 | 2-pin headers |
| JU3, JU4 | 2 | 3-pin headers |
| L1 | 1 | 0.47 μ H, 7.6m Ω , 9.6A inductor (7.7mm x 7mm x 2mm) TOKO FDV0620-R47 |
| R1 | 1 | 10 Ω \pm 5%, resistor (0603) lead free |
| R2 | 1 | 10k Ω \pm 5% resistor (0603) lead free |
| R3 | 1 | 1k Ω \pm 5%, resistor (0603) lead free |
| R4 | 1 | 2.67k Ω \pm 1%, resistor (0603) lead free |
| R5 | 1 | 20k Ω \pm 5% resistor (0603) lead free |
| R6 | 1 | 158 Ω \pm 1% resistor (0603) lead free |
| R7 | 1 | 49.9k Ω \pm 1% resistor (0603) lead free |
| R8 | 0 | Not installed, resistor (0603). Must be 8.06k Ω \pm 1% resistor (0603) when populated for adjustable output voltage programming. |
| R9 | 0 | Not installed, resistor (0603) for adjustable output voltage programming |
| R10 | 1 | 2.2 Ω \pm 5% resistor (0603) lead free |
| U1 | 1 | MAX8643ETG+ (24-pin, 4mm x 4mm TQFN) |
| — | 5 | Shunts |
| — | 1 | MAX8643 EV kit PCB |

Component Suppliers

| SUPPLIER | PHONE | WEBSITE |
|----------|--------------|-----------------------|
| TDK | 847-803-6100 | www.component.tdk.com |
| TOKO | 800-745-8656 | www.toko.com |
| Vishay | 402-563-6866 | www.vishay.com |

Note: Indicate that you are using the MAX8643 when contacting these component suppliers.

- 4) Verify that there is a shunt on pins 1-2 of jumper JU4.
- 5) Connect the positive lead of the power supply to the IN pad and connect the negative lead of the power supply to the GND pad on the EV kit.
- 6) Connect the positive lead of the DMM to the OUT pad and connect the negative lead of the DMM to the GND pad on the EV kit.
- 7) Turn on the power supply.
- 8) Verify that the voltage at OUT is 1.8V.
- 9) Connect the load between OUT and GND.
- 10) Verify that the voltage at OUT is 1.8V.

Detailed Description

Evaluating Other Output Voltages

The MAX8643 EV kit comes preset to a 1.8V output voltage. As shown in Table 1, the output voltage is pin-programmable by the logic states of CTL1 and CTL2, jumpers JU3 and JU4, respectively. CTL1 and CTL2 are three-level inputs: VDD, unconnected, and GND. The logic states of CTL1 and CTL2 should be programmed only before power-up. To avoid damage to the IC, CTL1 and CTL2 should not be changed once soft-start is complete. If the output voltage needs to be reprogrammed, cycle power or EN and reprogram during or before soft-start.

Table 1. CTL1 and CTL2 Output Voltage Selection

| CTL1/JU3 | CTL2/JU4 | V _{OUT} (V) |
|-------------|-------------|-------------------------|
| 2-3 | 2-3 | 0.6 or external divider |
| 1-2 | 1-2 | 0.7 |
| 2-3 | Unconnected | 0.8 |
| 2-3 | 1-2 | 1.0 |
| Unconnected | 2-3 | 1.2 |
| Unconnected | Unconnected | 1.5 |
| Unconnected | 1-2 | 1.8 |
| 1-2 | 2-3 | 2.0 |
| 1-2 | Unconnected | 2.5 |

When the output voltage of the MAX8643 is programmed to a preset voltage, R_i is internal to the IC and R₉ is not installed (Figure 1b).

MAX8643 Evaluation Kit

Evaluates: MAX8643

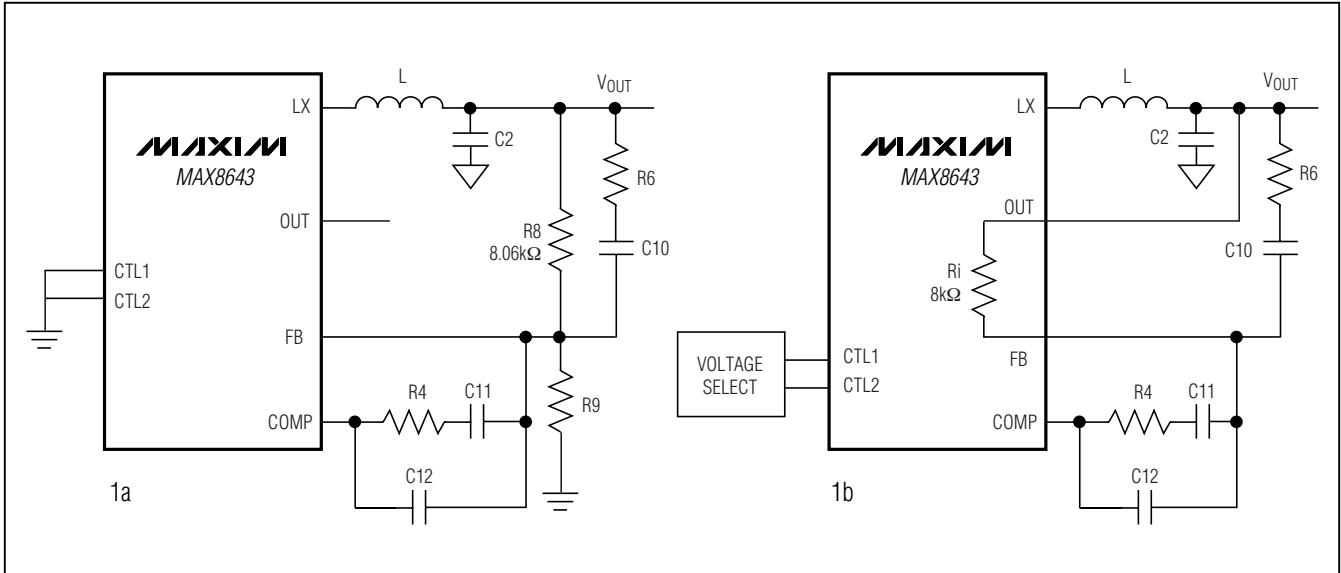


Figure 1. Preset and Adjustable Output Configuration

When externally programming the MAX8643 (Figure 1a), install an 8.06kΩ resistor at R8. The output voltage is then determined by:

$$R9 = \frac{4836}{V_{OUT} - 0.6}$$

For an output voltage of 0.6V, install an 8.06kΩ resistor at R8 and do not install R9. Refer to the MAX8643 data sheet for information on selecting output inductor, capacitor, and compensation components to optimize the circuit for different output voltages.

Evaluating Other Switching Frequencies (FREQ)

The MAX8643 EV kit comes preset with a 1MHz switching frequency. Replace R7 to change the switching frequency. R7 is calculated as:

$$R7 = 52.63 \times \left(\frac{1}{f_s} - 0.05 \right) \text{ k}\Omega$$

where the switching frequency is in megahertz and must be between 500kHz and 2MHz. Refer to the MAX8643 data sheet for information on selecting output inductor, capacitor, and compensation components to optimize the circuit for different switching frequencies.

Using the REFIN Input

The MAX8643 features an external reference input (REFIN). The IC regulates FB to the voltage applied to REFIN. The internal soft-start is not available when using an external reference. A method of soft-start when using an external reference is shown by the use of R3 and C7 in Figure 2. To use the REFIN input of the EV kit, remove the shunt on jumper JU2. Connect an external reference to the REFIN pad on the EV kit. If the external reference produces step-voltage changes, install C7. Refer to the MAX8643 data sheet for more details.

Power Good (PWRGD)

PWRGD is an open-drain output that goes high impedance when V_{FB} is above 0.54V. PWRGD pulls low when V_{FB} is below 0.54V for at least 48 clock cycles. PWRGD is low during shutdown. PWRGD is pulled up to V_{DD} through R5.

Jumper JU1 Function (Shutdown Mode)

The MAX8643 features a shutdown mode to minimize the IC quiescent current. To shut down the IC, place a shunt between pins 1-2 of JU1. For normal operation, remove the shunt from JU1.

MAX8643 Evaluation Kit

Evaluates: MAX8643

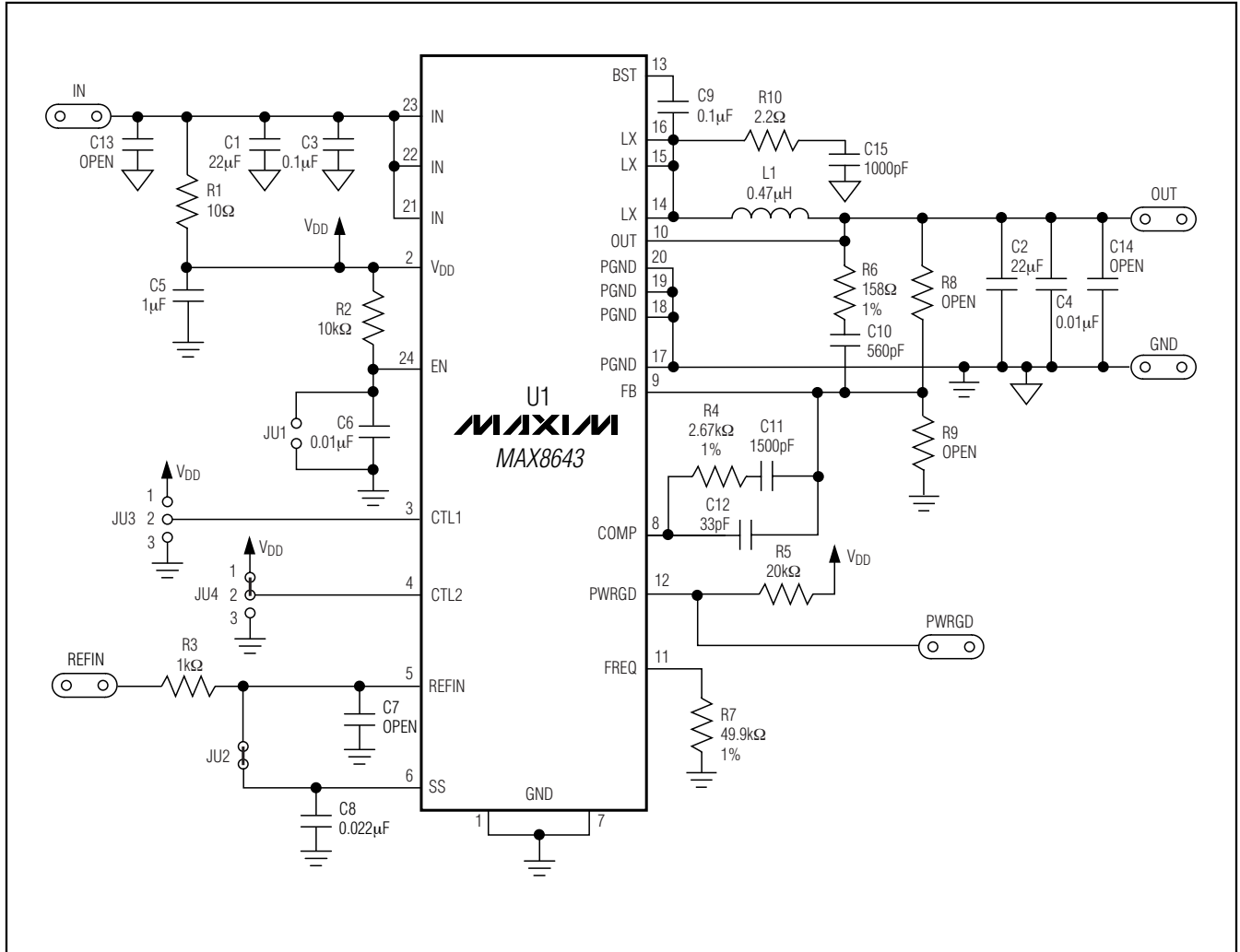


Figure 2. MAX8643 EV Kit Schematic

MAX8643 Evaluation Kit

Evaluates: MAX8643

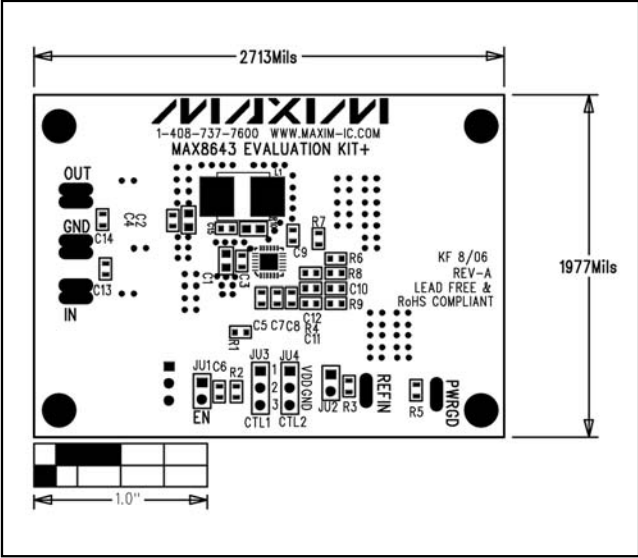


Figure 3. MAX8643 EV Kit Component Placement Guide—Top Silkscreen

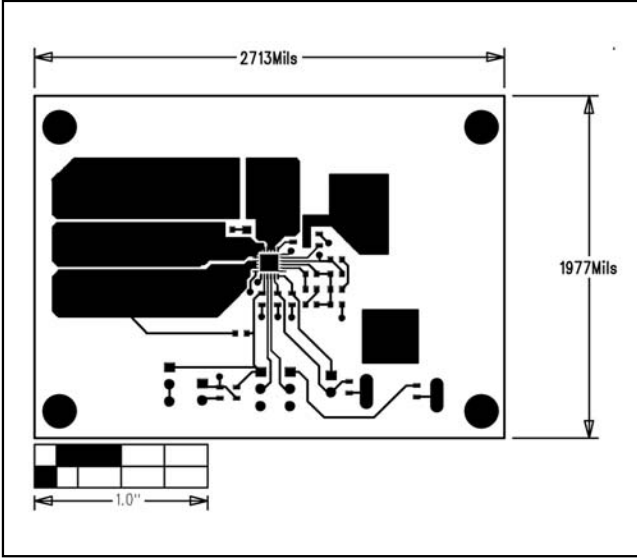


Figure 4. MAX8643 EV Kit PCB Layout—Component Side

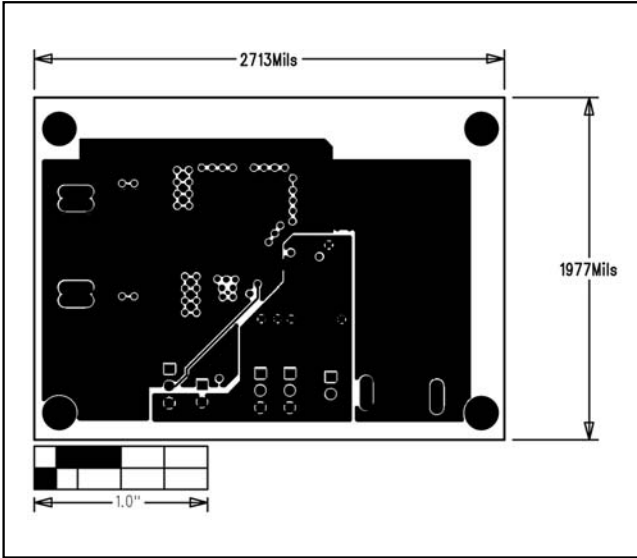


Figure 5. MAX8643 EV Kit PCB Layout—Layer 2

MAX8643 Evaluation Kit

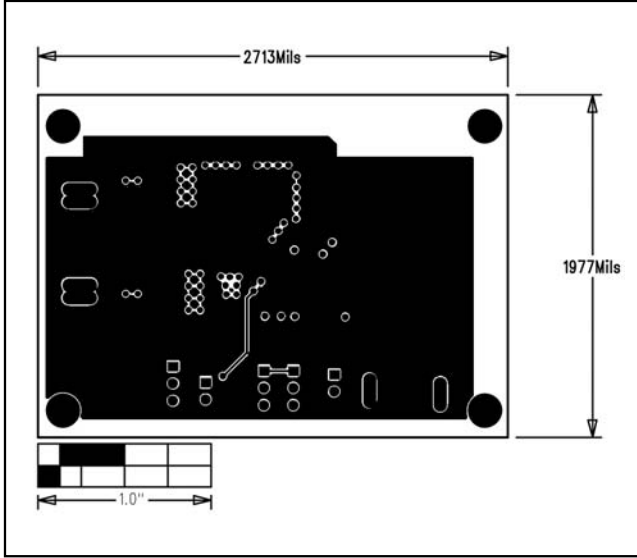


Figure 6. MAX8643 EV Kit PCB Layout—Layer 3

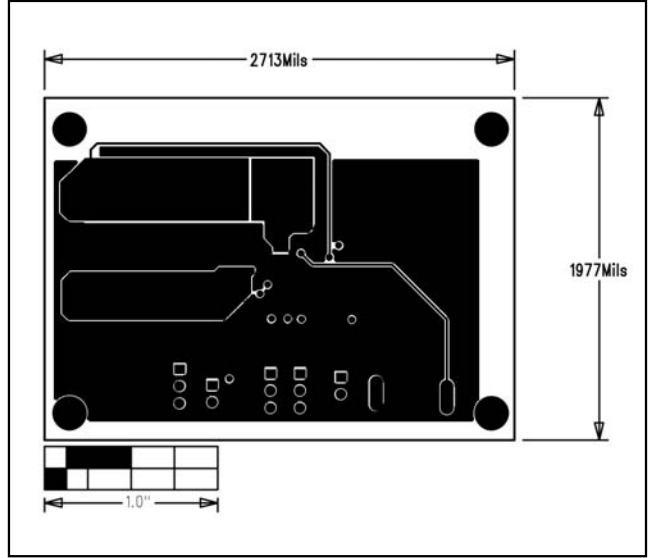


Figure 7. MAX8643 EV Kit PCB Layout—Solder Side

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.

6 _____ **Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 408-737-7600**