



# MAX1760 Evaluation Kit

**Evaluates: MAX1760**

## General Description

The MAX1760 evaluation kit (EV kit) is a fully assembled and tested surface-mount circuit board that contains a boost switching-regulator circuit. The EV kit provides a regulated +3.3V output at up to 800mA of current. The input voltage range is +0.7V to +5.5V. However, the output voltage rises above the regulation point for input voltages exceeding 3.3V. A 1- or 2-cell battery input can also be used to power the EV kit.

The MAX1760 features an internal n-channel MOSFET switch, a synchronous rectifier, and a pin-selectable forced-PWM mode. The MAX1760 EV kit demonstrates low quiescent current and power efficiency up to 96%, thus increasing battery life. Operation at 1MHz allows the use of tiny surface-mount components.

## Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	33 $\mu$ F, 16V, low-ESR electrolytic cap Sanyo 16TPC33M
C2	1	100 $\mu$ F, 6.3V, low-ESR electrolytic cap Sanyo 6TPC100M
C3	1	1 $\mu$ F $\pm$ 20%, 10V, X5R ceramic cap (0805) Taiyo Yuden LMK212BJ105MG
C4	1	0.68 $\mu$ F $\pm$ 10%, 10V, X5R ceramic cap (0805) Panasonic ECJ-2FB1A684K
C5	1	0.22 $\mu$ F $\pm$ 10%, 25V, X7R ceramic cap (1206) Taiyo Yuden TMK316BJ224KF
C6	0	Not installed, capacitor (0805)
D1	1	Not installed, Schottky diode Nihon EP10QY03
JU1, JU2	2	3-pin headers
L1	1	3.3 $\mu$ H, 1.4A inductor Coilcraft DO1606T-332
R3	1	4.7 $\Omega$ $\pm$ 5% resistor (0805)
R1, R2, R4, R5	0	Not installed, resistor (0805)
U1	1	Maxim MAX1760EUB (10-pin $\mu$ MAX)
—	2	Shunts (JU1, JU2)
—	1	MAX1760 PC board

## Features

- ◆ +0.7V to +5.5V Input Voltage
- ◆ +3.3V Output Voltage
- ◆ Internal Synchronous Rectifier Provides Up to 96% Efficiency
- ◆ Output Is Adjustable with External Resistors
- ◆ Up to 800mA Output
- ◆ On-Chip N-Channel Switch
- ◆ 1 $\mu$ A Shutdown Current
- ◆ 1MHz Switching Frequency
- ◆ Fixed-Frequency PWM Operation
- ◆ Surface-Mount Components
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX1760EVKIT	0°C to +70°C	10 $\mu$ MAX <sup>®</sup>

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## Component Suppliers

SUPPLIER	PHONE	WEBSITE
Coilcraft	847-639-6400	www.coilcraft.com
Nihon	81-33343-3411	www.niec.co.jp
Panasonic	714-373-7366	www.panasonic.com
Sanyo Electronic Device	619-661-6835	www.sanyodevice.com
Taiyo Yuden	800-348-2496	www.t-yuden.com

**Note:** Indicate that you are using the MAX1760 when contacting these component suppliers.

## Quick Start

The MAX1760 EV kit is fully assembled and tested. Follow these steps to verify board operation for a +3.3V output. **Do not turn on the power supply until all connections are completed:**

- 1) Connect a +1.1V to +3.2V DC power supply to the VIN pad. Connect the supply ground to the GND pad.
- 2) Connect a voltmeter to the VOUT pad.
- 3) Verify that jumper JU1 (ON) has a shunt across pins 2 and 3 and jumper JU2 (CLK/SEL) has a shunt across pins 1 and 2.
- 4) Turn on the power supply and verify that the main output is +3.3V.



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**Table 1. Jumper JU1 Functions**

SHUNT LOCATION	$\overline{\text{ON}}$ PIN	MAX1760 OUTPUT
1-2	Connected to VOUT	Shutdown mode, $V_{\text{OUT}} = V_{\text{IN}} - V_{\text{DIODE}}$
2-3	Connected to GND	MAX1760 enabled, $V_{\text{OUT}} = +3.3\text{V}$

## Detailed Description

The MAX1760 EV kit contains a boost switching-regulator circuit that provides a +3.3V output. The circuit requires a +0.7V to +3.2V input voltage to maintain regulation. The output supplies up to 800mA as configured.

The output voltage can also be adjusted from +2.5V to +5.5V with external resistors. The MAX1760 EV kit permits jumper-selectable operational modes: normal mode, forced PWM mode, and forced PWM mode with the internal oscillator synchronized to an external clock.

### Jumper Selection

Two PC board jumpers provide the user with various operating configurations. Shutdown mode and CLK/SEL mode are configurable through jumpers.

### Shutdown Mode

The MAX1760 EV kit features a shutdown mode that reduces the IC's quiescent current to 1 $\mu\text{A}$  (typ), preserving battery life. The 3-pin jumper, JU1, selects the shutdown mode for the circuit. Table 1 lists the selectable jumper options.

### CLK/SEL Operating Mode

Jumper JU2 controls the CLK/SEL pin operating mode. Options include low-noise, forced-PWM mode, normal mode, and an external clock source to drive the CLK/SEL pin. The external clock source must operate in the 500kHz to 1200kHz range. Table 2 lists the CLK/SEL jumper options.

### Evaluating Lower Startup Input Voltages

The MAX1760 EV kit can operate from DC supply voltages down to +0.7V. Install Schottky diode, D1, to ensure startup when  $V_{\text{IN}}$  is below +1.1V. Refer to the *Output Diode* section in the MAX1760 data sheet for instructions on selecting D1. D1 is not needed for input voltages above +1.1V.

**Table 2. Jumper JU2 Functions**

SHUNT LOCATION	CLK/SEL PIN	OPERATING MODE
1-2	Connected to VOUT	Forced PWM mode: PWM operation at all loads
2-3	Connected to GND	Normal mode: PFM at light load and PWM at medium to heavy load
None	Clock connected to CLK/SEL pad	PWM mode synchronized to external 500kHz to 1200kHz range clock

### Evaluating Other Output Voltages

The output is set to +3.3V by grounding the feedback pin (FB). To generate output voltages other than +3.3V (+2.5V to +5.5V), cut open the PC board trace shorting R2, and select the external voltage-divider resistors (R1, R2). Refer to the *Setting the Output Voltage* section in the MAX1760 data sheet for instructions on selecting R1 and R2. To maintain a regulated output, the input voltage range is +0.7V to  $V_{\text{OUT}}$  to maintain a regulated output.

### Evaluating Other Current Limits

The EV kit inductor current limit can be set from 625mA to 1250mA. The EV kit is factory configured for 1250mA. To set the current limit to 625mA, cut open the PC board trace shorting R4, and insert 1M $\Omega$  resistors for R4 and R5. Refer to the *Setting the Switch Current and Soft-Start* section of the MAX1760 data sheet to select other R4 and R5 values.

### Enabling Soft-Start

The MAX1760 soft-start feature limits inrush current during startup. Installing capacitor C6 activates this feature. Refer to the *Setting the Switch Current and Soft-Start* section in the MAX1760 data sheet for instructions on selecting C6 values.

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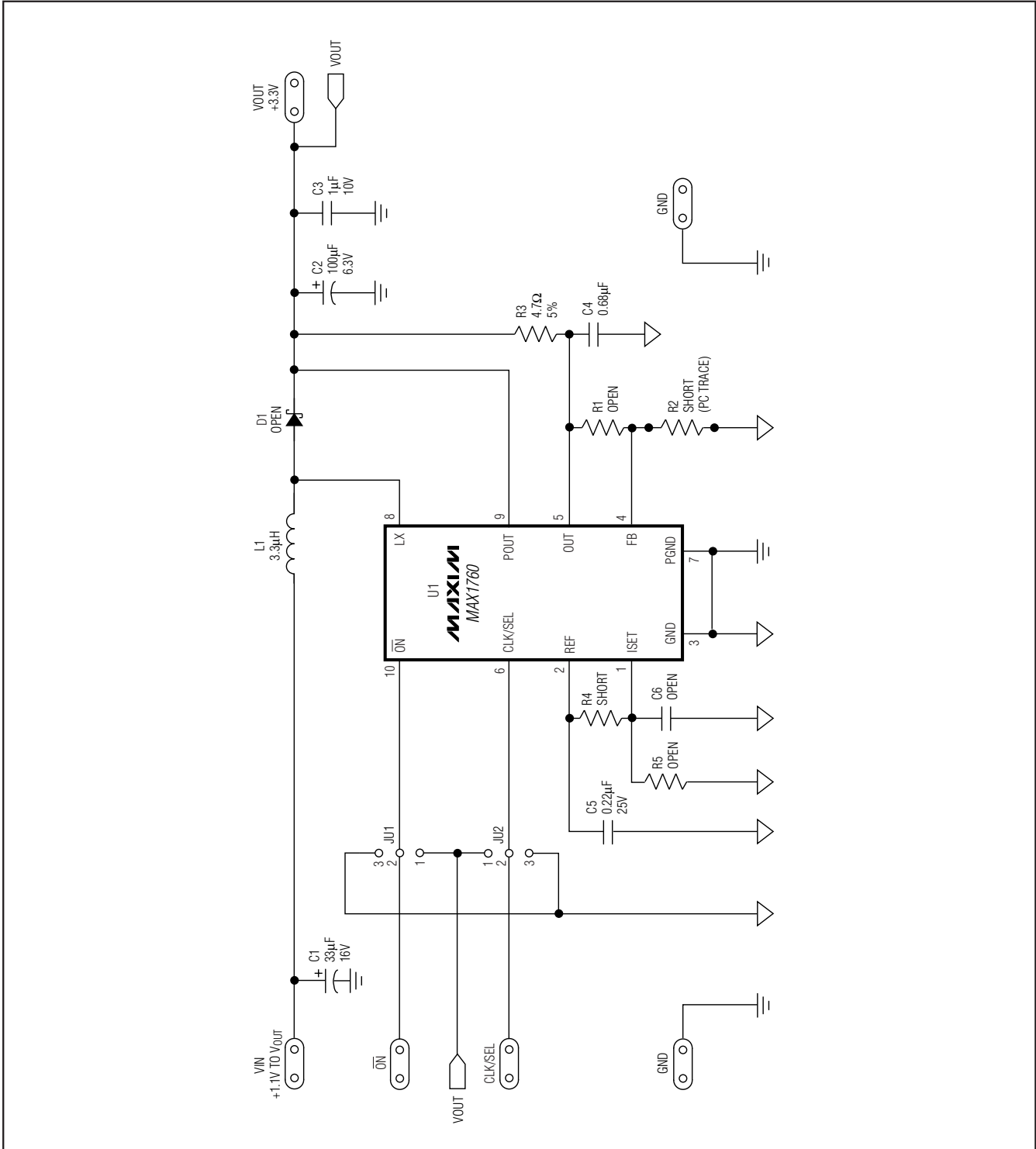


Figure 1. MAX1760 EV Kit Schematic

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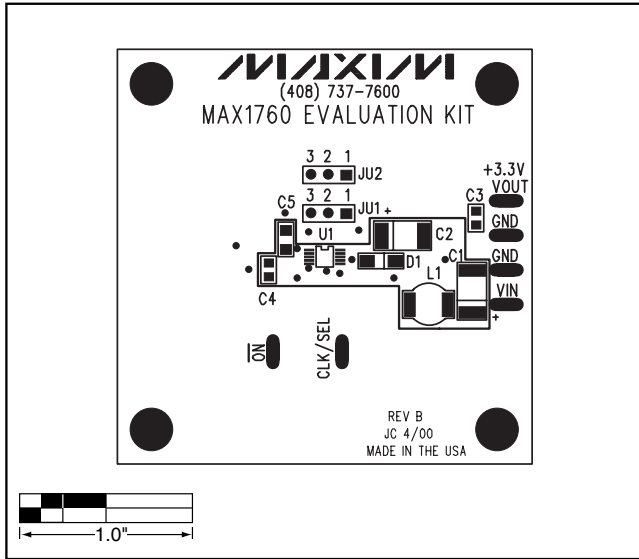


Figure 2. MAX1760 EV Kit Component Placement Guide—Top Silkscreen

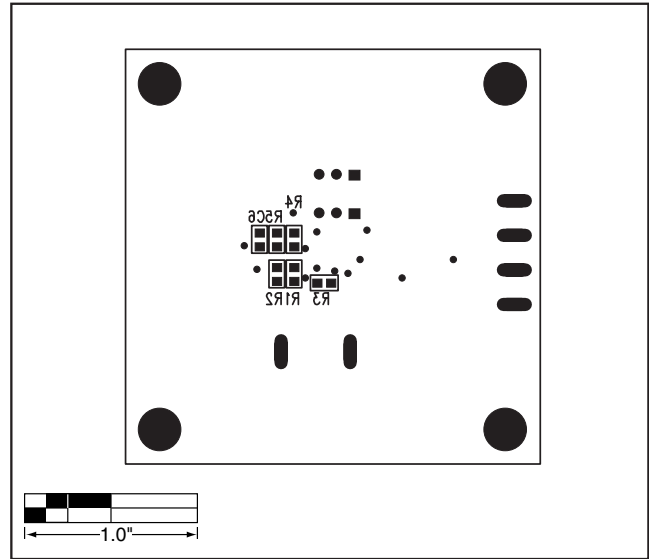


Figure 3. MAX1760 EV Kit Component Placement Guide—Bottom Silkscreen

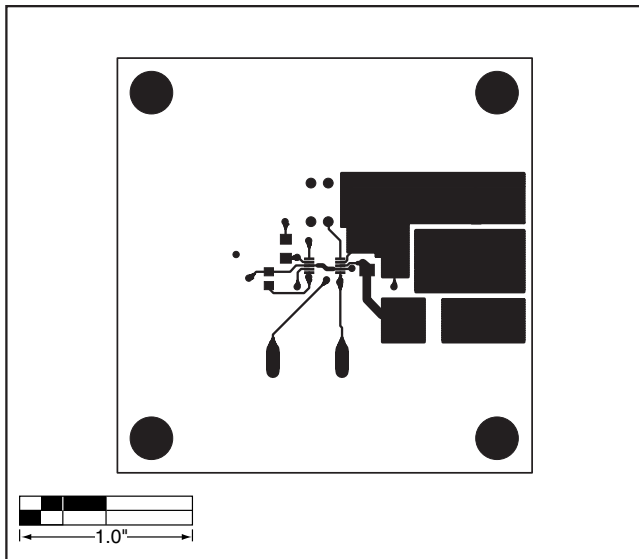


Figure 4. MAX1760 EV Kit PC Board Layout—Component Side

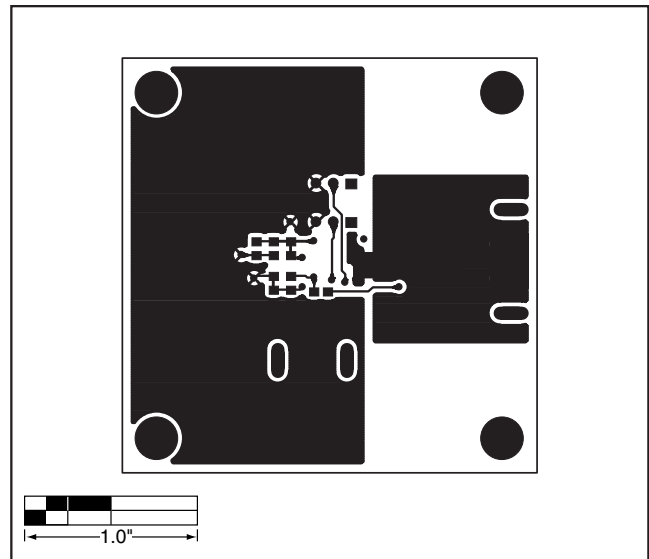


Figure 5. MAX1760 EV Kit PC Board Layout—Solder Side

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