

MAX17597 Evaluation Kit

Evaluates: MAX17597 in a Step-Up (Boost) Configuration

General Description

The MAX17597 evaluation kit (EV kit) is a fully assembled and tested surface-mount circuit board to evaluate the MAX17597 peak-current-mode controller in a step-up (boost) configuration. The EV kit output is configured for 24V output voltage that can supply up to 1A of current. The input voltage range is from 8V to 14V.

High efficiency up to 95.6% is achieved using a boost converter operating at a switching frequency of 600kHz, providing an output power up to 24W.

Features

- 8V to 14V Input Range
- Output Voltage: 24V at 1A
- 600kHz Switching Frequency
- Efficiency Up to 95.6%
- Low-Cost Boost Converter Design
- Proven PCB Layout
- Fully Assembled and Tested

Ordering Information appears at end of data sheet.

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	22 μ F \pm 20%, 25V aluminum electrolytic capacitor (5.3mm x 5.3mm) Panasonic EEEFK1E220R
C2	1	1 μ F \pm 10%, 25V X7R ceramic capacitor (0603) Murata GRM188R71E105K
C3	1	0.047 μ F \pm 10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71C473KA01D
C4	1	2.2 μ F \pm 10%, 10V X7R ceramic capacitor (0603) Murata GRM188R71A225K
C5	1	0.033 μ F \pm 10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71H333KA61D
C6, C8	2	330pF \pm 10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H331K
C7	1	10 μ F \pm 10%, 25V X7R ceramic capacitor (1210) Murata GRM32DR71E106K
C9–C11	3	4.7 μ F \pm 10%, 50V X7R ceramic capacitors (1206) Murata GRM31CR71H475K
C13	0	Not installed, ceramic capacitor (1206)

DESIGNATION	QTY	DESCRIPTION
D1	1	40V, 4A Schottky diode (SMB) Vishay SSB44
L1	1	6.8 μ H, 3.8A inductor (12mm x 12mm) Coilcraft MSS1246-682ML
Q1	1	40V, 21A n-channel MOSFET (PowerPak, 8 SO) Vishay SiR836DP
R1	1	32.4k Ω \pm 1% resistor (0603)
R2, R6, R7	3	18k Ω \pm 0.1% resistors (0603)
R3	1	340k Ω \pm 1% resistor (0603)
R4	1	1.96k Ω \pm 1% resistor (0603)
R5	1	187k Ω \pm 1% resistor (0603)
R8	1	100 Ω \pm 0.1% resistor (0603)
R9, R12	2	0.13 Ω \pm 1%, 0.5W resistors (1206) Susumu RL1632R-R130-F
R10	1	16.5k Ω \pm 1% resistor (0603)
R11	0	Not installed, resistor (0603)
U1	1	Peak-current-mode boost controller (16 TQFN-EP*) Maxim MAX17597ATE+
—	1	PCB: MAX17597 EVALUATION KIT

*EP = Exposed pad.

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Coilcraft, Inc.	847-639-6400	www.coilcraft.com
Fairchild Semiconductor	888-522-5372	www.fairchildsemi.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Panasonic Corp	800-344-2112	www.panasonic.com
Susumu International USA	208-328-0307	www.susumu-usa.com
Vishay	402-563-6866	www.vishay.com

Note: Indicate that you are using the MAX17597ATE+ when contacting these component suppliers.

Quick Start

Required Equipment

- MAX17597 EV kit
- 8V to 14V, 3.5A DC power supply
- Voltmeter

VOUT Setup Procedure

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

- 1) Connect the positive lead of the DC voltmeter to the VOUT PCB pad.
- 2) Connect the negative lead of the DC voltmeter to the PGND PCB pad.
- 3) Set the DC power-supply output to 12V. Disable the power supply.
- 4) Connect the power-supply positive terminal to the VIN PCB pad.
- 5) Connect the power-supply negative terminal to the PCB PGND pad.
- 6) Enable the power supply.
- 7) Verify that VOUT is 24V throughout the input voltage range of 8V to 14V.

Detailed Description

The MAX17597 EV kit demonstrates the MAX17597 peak-current-mode boost controller device. The EV kit is configured for 24V output voltage that can supply up to 1A of current.

This EV kit uses the device, a 16-pin TQFN package with exposed pad, peak-current mode, and pulse-width modulating (PWM) controller. This PWM controller varies the duty cycle to compensate for the variation in input voltage and the output load to maintain a constant output voltage. The duty cycle determines the on/off duration of

the MOSFET (Q1). The duty cycle is controlled by the feedback loop consisting of voltage-divider resistors (R3, R2), internal error amplifier, compensation components (R4, C5, C6), and the PWM comparator inside the device.

The EV kit sets the minimum peak inductor current-limit threshold to 4.46A using resistors R9 and R12. The EV kit switching frequency is set to 600kHz using resistor R10. Capacitor C3 sets VOUT soft-start to 5.6ms.

Current Limit

Current-sense resistors R9 and R12 set the EV kit's minimum inductor peak current limit to 4.46A. The device turns off the Q1 MOSFET when the peak current reaches the current limit. To reconfigure the peak-current limit to a different value, use the following equation to choose a new current-sense resistor:

$$R9 \parallel R12 = \frac{290}{1.2 \times I_{PEAK}} \text{ m}\Omega$$

where I_{PEAK} is the peak inductor current in amps.

Undervoltage Lockout and Overvoltage Protection

The EV kit features a UVLO and OVI circuit that prevent operation below the programmed input-supply startup voltage and above the overvoltage threshold. Resistors R5–R7 set the undervoltage and overvoltage thresholds. The circuit undervoltage and overvoltage thresholds are set at 7.5V (typ) and 15V (typ), respectively. To reconfigure the UVLO and OVI voltages, refer to the *Startup Voltage and Input Overvoltage-Protection Setting (EN/UVLO, OVI)* section in the MAX17595/MAX17596/MAX17597 IC data sheet.

EN/UVLO and OVI PCB pads are available for monitoring the voltages present at the respective inputs.

Soft-Start

The EV kit provides an option to configure the circuit soft-start. Capacitor C3 configures the soft-start time (t_{SS}) to 5.6ms. To reconfigure the soft-start time to a different value, use the following equation to choose a new C3 value:

$$C3 = 8.2645 \times t_{SS} \text{ nF}$$

where t_{SS} is expressed in ms.

Slope Compensation

Slope compensation is necessary for stable operation of the device when operated at a duty cycle greater than 50%, in addition to the loop compensation required for small-signal stability. The EV kit operates at a maximum steady-state duty cycle of 68%. To reconfigure the slope compensation to a different value, use the following equation to choose a new R1 resistor value:

$$R1 = \left(\frac{S_E - 8}{1.55} \right) \text{ k}\Omega$$

where R1 is in $\text{k}\Omega$ and S_E is in $\text{mV}/\mu\text{s}$.

Switching Frequency

The EV kit switching frequency is set to 600kHz by resistor R10. To configure the device's switching frequency to a different value, between 100kHz and 1MHz, use the following equation to choose a new R10 resistor value:

$$R10 = \frac{10^{10}}{f_{SW}} \Omega$$

where f_{SW} is in Hz and R10 is in Ω .

Frequency Dithering

The EV kit switching frequency can be dithered in a range of $\pm 10\%$ to reduce EMI. There are two specifications for the frequency dithering, the frequency (how often) of dithering, and the amount (how much) of dithering. Capacitor C12 configures the dither frequency using the following equation:

$$C12 = \frac{50 \mu\text{A}}{3.2\text{V} \times f_{\text{DITHER}}} \text{ F}$$

where f_{DITHER} is in Hz and C12 is in farads, and the dither frequency f_{DITHER} is recommended to be set close to 1kHz.

Resistors R10 and R11 configure the amount of dithering in percentage (%) of the switching frequency using the following equation:

$$\% \text{DITHER} = \frac{R10}{R11}$$

The EV kit is shipped with the frequency dithering disabled, the DITHER/SYNC pin is shorted to SGND through the PCB trace. To set the desired frequency dither, cut the PCB trace to capacitor C12 and install resistor R11 with the appropriate values. The DITHER/SYNC PCB pad is available for monitoring the signal at the DITHER/SYNC pin.

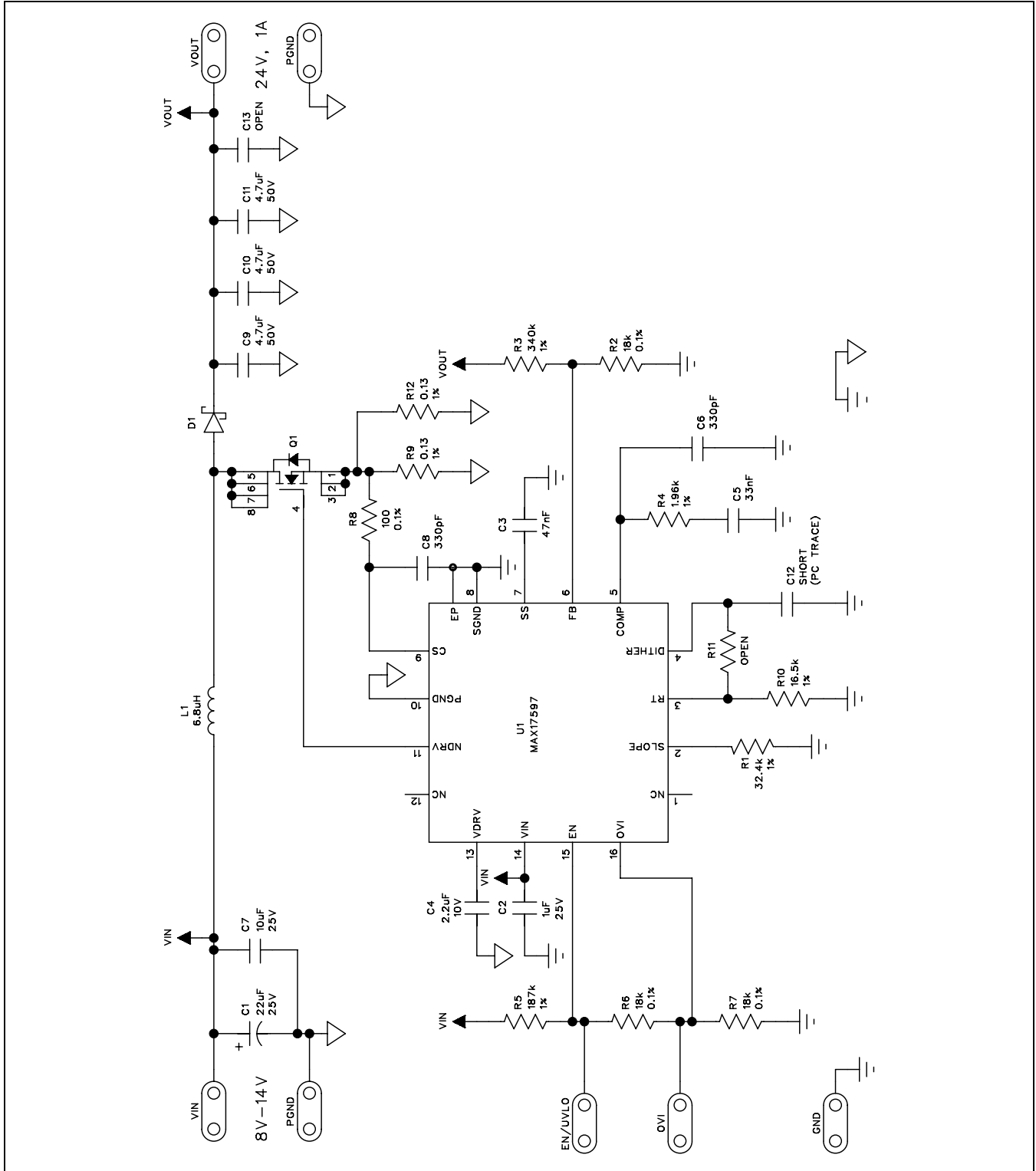


Figure 1. MAX17597 EV Kit Schematic

MAX17597 Evaluation Kit

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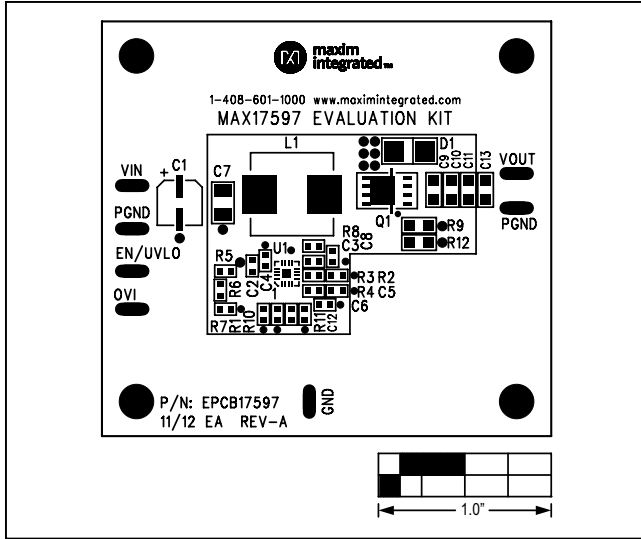


Figure 2. MAX17597 EV Kit Component Placement Guide—Component Side

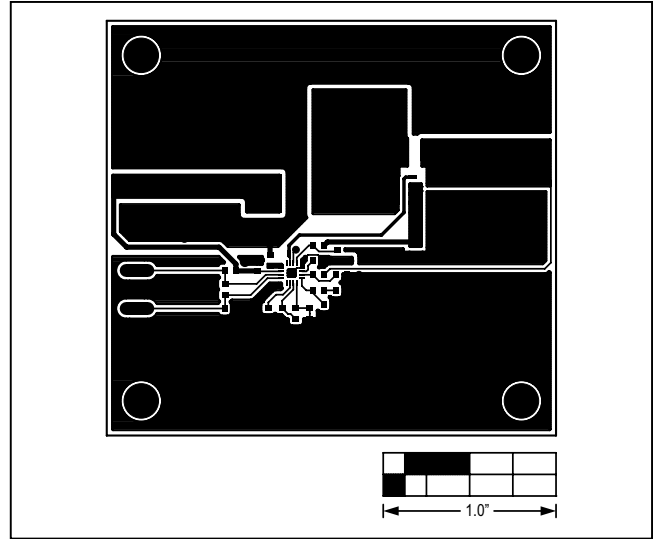


Figure 3. MAX17597 EV Kit PCB Layout—Component Side

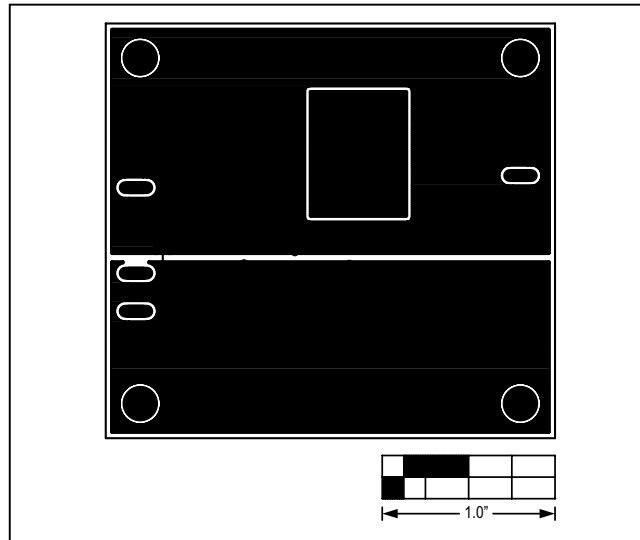


Figure 4. MAX17597 EV Kit PCB Layout—Solder Side

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Ordering Information

PART	TYPE
MAX17597EVKIT#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	1/13	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.

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