



MAX8597 Evaluation Kit

General Description

The MAX8597 evaluation kit (EV kit) demonstrates the MAX8597/MAX8598/MAX8599 step-down DC-DC controller application circuits. The EV kit contains two circuits. The MAX8597 circuit demonstrates a voltage-controlled power supply used for DC fan control capable of up to 10A of current. This circuit accepts inputs from 10.8V to 13.2V and generates an output of 6V to 12V depending on the VADJ input. The MAX8598/MAX8599 circuit demonstrates a point-of-load power supply. The circuit accepts inputs from 10.8V to 13.2V and delivers 20A of current at a 1.2V output.

The MAX8597 circuit switches at 600kHz and has up to 97% efficiency with the supplied components. The MAX8598/MAX8599 circuit comes with the MAX8599 installed. It switches at 500kHz and has up to 87% efficiency with the supplied components. This circuit can be used to evaluate the MAX8598 with no external component changes. This EV kit comes fully assembled and tested.

Features

- ◆ Low Dropout with > 99.5% Duty Cycle
- ◆ Lossless High-Side Current Limit
- ◆ Dynamic Output Adjustment
- ◆ Output Short-Circuit Protection with Adjustable Hiccup Current Limit
- ◆ Prebias Soft-Start
- ◆ Adjustable Soft-Start
- ◆ Power-OK Output
- ◆ Small, Low-Profile Thin QFN Package
- ◆ Fully Assembled and Tested

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX8597EVKIT	0°C to +70°C	20 Thin QFN 4mm x 4mm (MAX8597) 16 Thin QFN 4mm x 4mm (MAX8599)

Note: To evaluate the MAX8598, request a free MAX8598ETE sample when ordering the MAX8597EVKIT.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C15, C18, C19, C24	0	Not installed, capacitors
C2, C3	2	10 μ F, 35V X5R ceramic capacitors (1210) Taiyo Yuden GDK325BJ106KN or equivalent
C4, C5	2	47 μ F \pm 20%, 25V X5S ceramic capacitors (1812) Taiyo Yuden TMK432C476MM or equivalent
C6, C33	2	4.7 μ F \pm 10%, 6.3V X5R ceramic capacitors (0805) Taiyo Yuden JMK212BJ475KG or equivalent
C7, C11, C34	3	0.01 μ F \pm 10%, 50V X7R ceramic capacitors (0603) TDK C1608X7R1H103K or equivalent

DESIGNATION	QTY	DESCRIPTION
C8	1	100pF \pm 5%, 50V C0G ceramic capacitor (0603) TDK C1608C0G1H101J or equivalent
C9	1	1500pF \pm 10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H152K or equivalent
C10	1	8.2pF \pm 0.5pF, 50V C0H ceramic capacitor (0603) Taiyo Yuden UMK107CH8R2DZ or equivalent
C12	1	1 μ F \pm 10%, 10V X5R ceramic capacitor (0603) Taiyo Yuden C1608X5R1A105K or equivalent
C13, C16, C23, C30	4	0.22 μ F \pm 10%, 10V X7R ceramic capacitors (0603) Taiyo Yuden LMK107 BJ224KA or equivalent

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Component List (continued)

DESIGNATION	QTY	DESCRIPTION
C14	1	1 μ F \pm 20%, 35V X7R ceramic capacitor (1206) Taiyo Yuden GMK316BJ105ML or equivalent
C17, C32	2	0.033 μ F \pm 10%, 16V X7R ceramic capacitors (0603) Taiyo Yuden EMK107BJ333KA or equivalent
C20, C21, C22	3	10 μ F, 16V X5R ceramic capacitors (1210) Taiyo Yuden EMK325BJ106MN or equivalent
C25, C26	2	470 μ F, 2V, 5m Ω polymer capacitors Panasonic EEFSE0D471R
C27	1	1800pF \pm 10%, 50V X7R ceramic capacitor (0603) Taiyo Yuden UMK107B182KZ or equivalent
C28	1	6800pF \pm 10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H682K or equivalent
C29	1	39pF \pm 5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H390J or equivalent
C31	1	1 μ F \pm 10%, 16V X7R ceramic capacitor (0805) Taiyo Yuden EMK212BJ105KG or equivalent
C35, C36	2	2200pF \pm 10%, 50V X7R ceramic capacitors (0603) Taiyo Yuden UMK107B222KZ or equivalent
D1, D3	2	30V, 100mA Schottky diodes (SOD-323) Central Semiconductor CMDSH-3
D2	0	Not installed

DESIGNATION	QTY	DESCRIPTION
JU1, JU2, JU3	3	3-pin headers
L1	1	1 μ H, 16A, 1.2m Ω inductor Sumida CEP125H-1R0
L2	1	0.7 μ H, 23A, 1.04m Ω inductor Panasonic ETQP2H0R7BFA
N1, N4	2	30V, 14A n-channel MOSFETs (SO-8) International Rectifier IRF7821 Vishay Si4390DY
N2, N3, N5	0	Not installed (SO-8)
N6	1	Hitachi HAT2168H
N7, N8	2	Hitachi HAT2165H
R1, R26	2	10 Ω \pm 5% resistors (0603)
R2	1	33.2k Ω \pm 1% resistor (0603)
R3	1	1.21k Ω \pm 1% resistor (0603)
R4, R5, R13, R16–R20, R30, R31, R35	0	Not installed
R6	1	5.11k Ω \pm 1% resistor (0603)
R7	1	93.1k Ω \pm 1% resistor (0603)
R8	1	6.04k Ω \pm 1% resistor (0603)
R9	1	24k Ω \pm 5% resistor (0603)
R10	1	24.9k Ω \pm 1% resistor (0603)
R11	1	32.4k Ω \pm 1% resistor (0603)
R12, R27	2	100k Ω \pm 5% resistors (0603)
R14, R15	2	48.7k Ω \pm 1% resistors (0603)
R21, R32	2	3 Ω \pm 5% resistors (0603)
R22, R37	2	1.2k Ω \pm 5% resistors (0603)
R23, R24	2	12.1k Ω \pm 1% resistors (0603)
R25	1	16k Ω \pm 5% resistor (0603)
R28	1	40.2k Ω \pm 1% resistor (0603)
R29	1	2.10k Ω \pm 1% resistor (0603)
R33	1	3 Ω \pm 5% resistor (1206)
R34	1	2 Ω \pm 5% resistor (1206)
U1	1	MAX8597ETP (20-pin Thin QFN)
U2	1	MAX8599ETE (16-pin Thin QFN)
—	3	Shunts
—	1	MAX8597 EV kit PC board

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Quick Start

Recommended Equipment

- 15V at 10A DC variable power supply
- 5V at 100mA power supply
- Digital multimeter (DMM)
- 10A load
- 20A load
- Ammeter (optional)

Procedure

Follow these steps to verify board operation.

MAX8597

- 1) Preset the 10A power supply (PS1) to 12V. Preset the 100mA power supply (PS2) to 0V. Turn off the power supplies. **Do not turn on the power supplies until all connections are made.**
- 2) Verify that a shunt is installed between positions 2 and 3 of JU1. Verify that a shunt is installed between positions 1 and 2 of JU2.
- 3) Connect the positive lead of PS1 to the VIN1 pad on the EV kit and connect the negative lead of PS1 to the GND pad on the EV kit.
- 4) Connect the positive lead of PS2 to the VADJ pad on the EV kit and connect the negative lead of PS2 to the GND pad on the EV kit.
- 5) Connect the positive lead of the DMM to the VOUT1 pad on the EV kit and connect the negative lead of the DMM to the GND pad on the EV kit.
- 6) Turn on the power supplies.
- 7) Verify that the voltage at VOUT1 is approximately 6V.
- 8) Increase the voltage at PS1 up to 13.2V.
- 9) Increase the voltage at PS2 to 5V.
- 10) Verify that the voltage at VOUT1 is approximately 12V.
- 11) Connect a 10A load between VOUT1 and GND.
- 12) Verify that the voltage at VOUT1 is approximately 12V.

MAX8599

- 1) Preset the 10A power supply to 12V. Turn off the power supply. **Do not turn on the power supply until all connections are made.**
- 2) Verify that a shunt is installed between positions 1 and 2 of JU3.
- 3) Connect the positive lead of the power supply to the VIN2 pad on the EV kit and connect the negative lead of the power supply to the GND pad on the EV kit.

- 4) Connect the positive lead of the DMM to the VOUT2 pad on the EV kit and connect the negative lead of the DMM to the GND pad on the EV kit.
- 5) Turn on the power supply.
- 6) Verify that the voltage at VOUT2 is approximately 1.2V.
- 7) Connect a 20A load between VOUT2 and GND.
- 8) Verify that the voltage at VOUT2 is approximately 1.2V.

Detailed Description

Evaluating Additional Application Circuits (MAX8597)

The MAX8597 circuit can be used to evaluate three different application circuits. Figure 1 shows the DC fan-control application circuit that comes installed on the evaluation kit. The shunt on JU1 should remain between positions 2 and 3 for this application circuit. The output is programmed by the voltage at VADJ. A voltage of 0V on VADJ provides a 6V output. A voltage of 5V on VADJ provides a 12V output. The ratio of output to VVADJ can be changed. Refer to the MAX8597/MAX8598/MAX8599 data sheet for details.

Figure 3 shows the components to evaluate a fixed 1.2V output at 20A with remote output sensing. The shunt on JU1 should remain between positions 2 and 3 for this application circuit. This circuit can also be used with an external reference for tighter tolerance than the internal reference. To do this, connect the external reference to the REFIN pad and install the jumper between positions 1 and 2 of JU1. The output regulates to twice the voltage at REFIN. To evaluate other output voltages, refer to the MAX8597/MAX8598/MAX8599 data sheet for details on selecting external components.

Figure 4 shows the components to evaluate a tracking supply using the REFIN input that is clamped. Remove the shunt from JU1 and connect a supply to the REFIN pad on the EV kit. The output tracks VREFIN from 0 to 1.8V. The output is clamped to 1.8V, so increasing VREFIN past 1.8V does not produce any change in the output.

Evaluating Other Output Voltages (MAX8599)

The MAX8599 circuit comes preset to a 1.2V output voltage. The output of the MAX8599 is adjustable down to 0.6V. To adjust the output voltage, place a 1% resistor at R23 with a value corresponding to the equation:

$$R23 = 12.1 \times 10^3 \times ((V_{OUT} / 0.6) - 1)$$

Note that VOUT cannot exceed VIN and is limited by the maximum duty cycle of the MAX8599.

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Component Suppliers

SUPPLIER	COMPONENT	PHONE	WEBSITE
Central Semiconductor	Diodes	516-435-1110	www.centrasemi.com
Hitachi/ Renesas	MOSFETs	800-448-2244	www.renesas.com
International Rectifier	MOSFETs	310-252-7105	www.irf.com
Kemet	Capacitors	864-963-6300	www.kemet.com
Murata	Capacitors	770-436-1300	www.murata.com
Panasonic	Inductors/capacitors	714-373-7366	www.panasonic.com
Sumida	Inductors	81-03-3667-3381	www.sumida.com
Taiyo Yuden	Capacitors	408-573-4150	www.t-yuden.com
TDK	Capacitors	847-803-6100	www.component.tdk.com
Vishay	Resistors	402-563-6866	www.vishay.com

Note: Indicate that you are using the MAX8597/MAX8598/MAX8599 when ordering external components.

Refer to the MAX8597/MAX8598/MAX8599 data sheet for information on selecting output inductor, capacitors, and compensation components to optimize the circuit for different output voltages.

POK (MAX8599)

The MAX8599 contains an open-drain power-OK (POK) output that goes high impedance when the regulator output is greater than 88% of the regulation threshold. POK is low when the IC is disabled.

Jumper Settings

Jumper JU1 Function (REFIN Control)

To use an external reference for the MAX8597 circuit, install a shunt between positions 1 and 2 of JU1. Install

the shunt between positions 2 and 3 of JU1 to use the internal 0.6V reference.

Jumper JU2/JU3 Function (Enable Control)

The MAX8597/MAX8598/MAX8599 feature a disable mode to minimize the quiescent current. To disable the MAX8597, place a shunt between pins 2 and 3 on JU2. To disable the MAX8599, place a shunt between pins 2 and 3 on JU3. For normal operation, install the shunts between positions 1 and 2 of JU2 or JU3.

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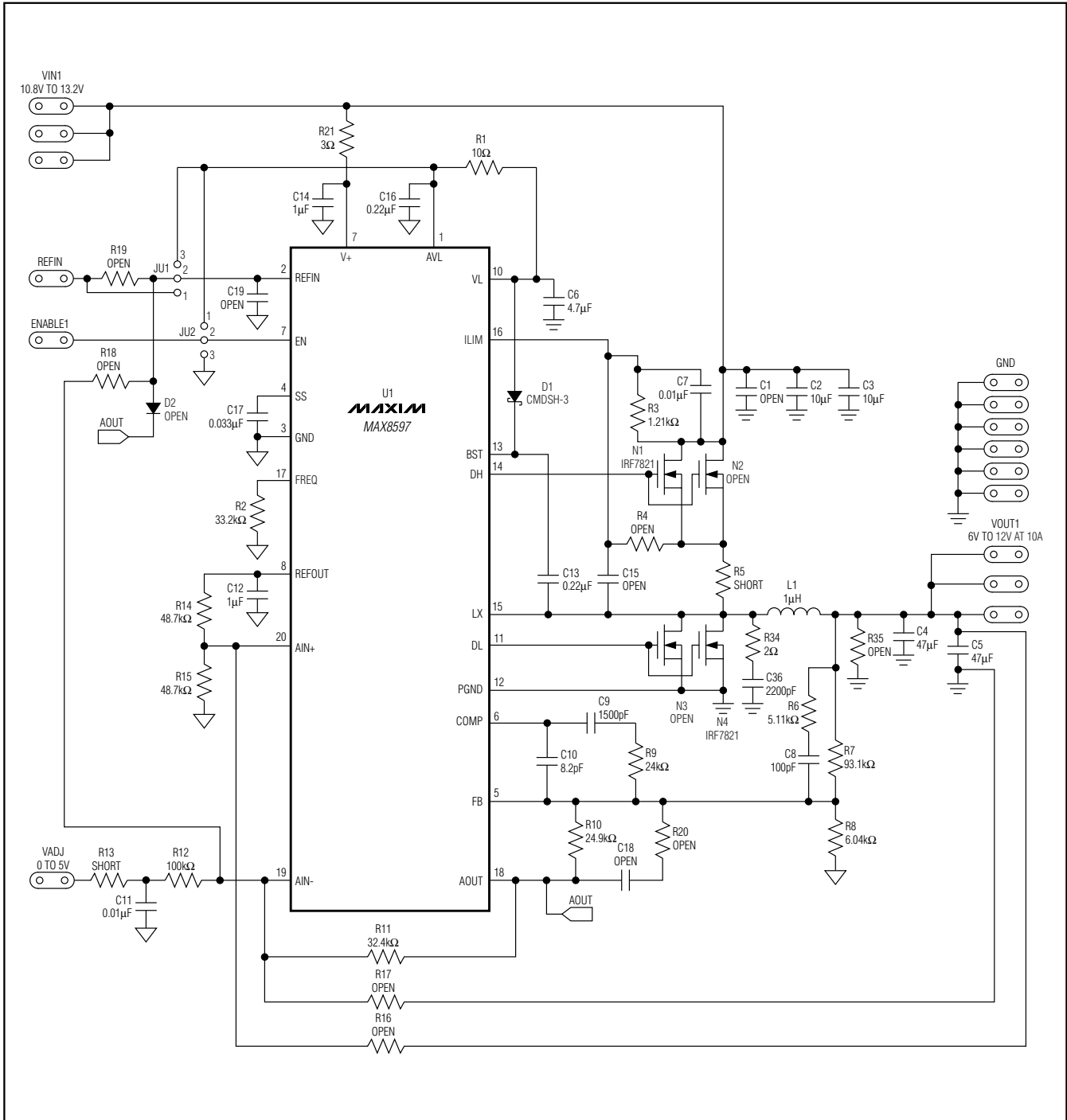


Figure 1. MAX8597 EV Kit Schematic

MAX8597 Evaluation Kit

Evaluates: MAX8597/MAX8598/MAX8599

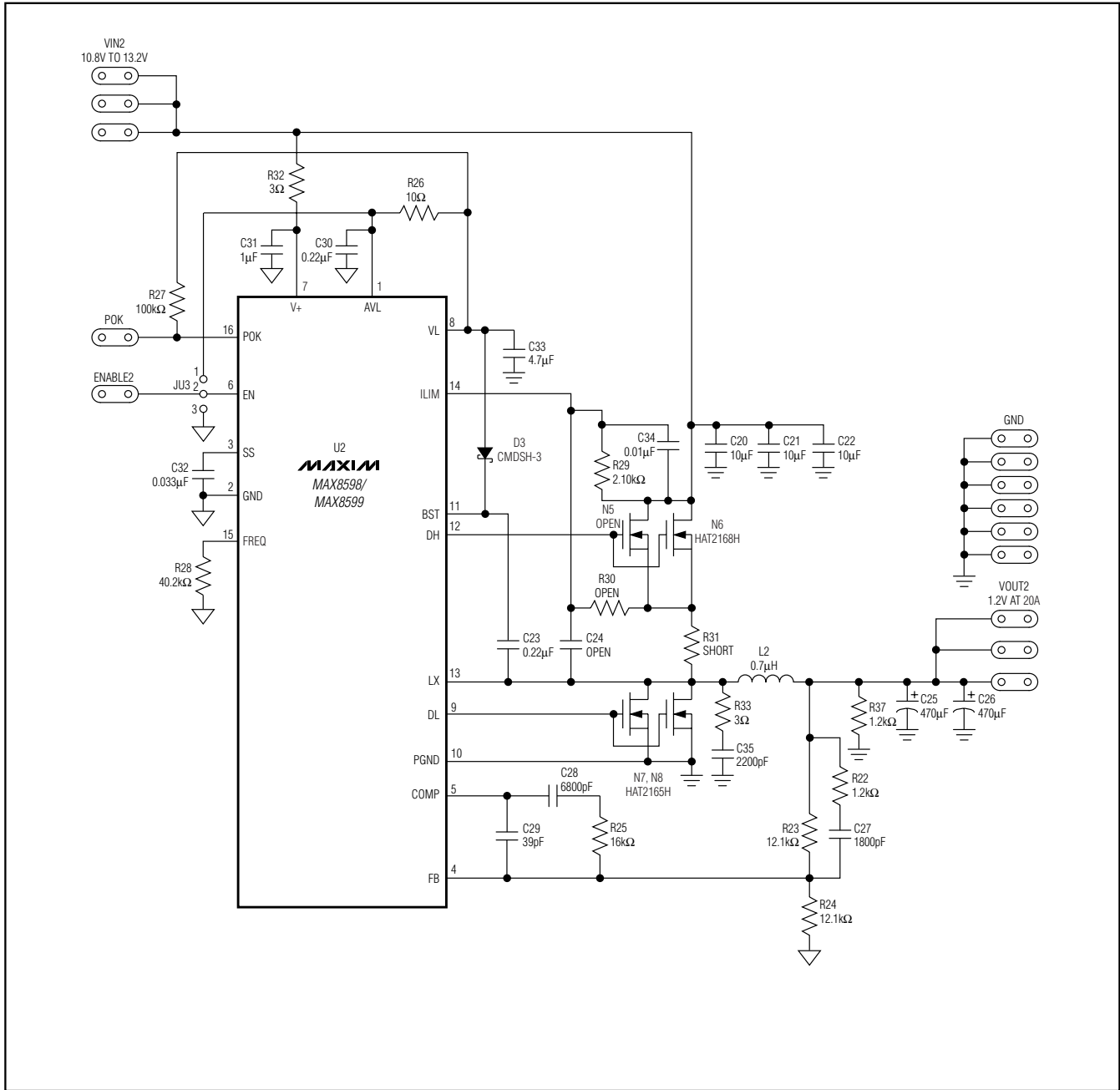


Figure 2. MAX8597 EV Kit Schematic Using the MAX8598/MAX8599

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Evaluates: MAX8597/MAX8598/MAX8599

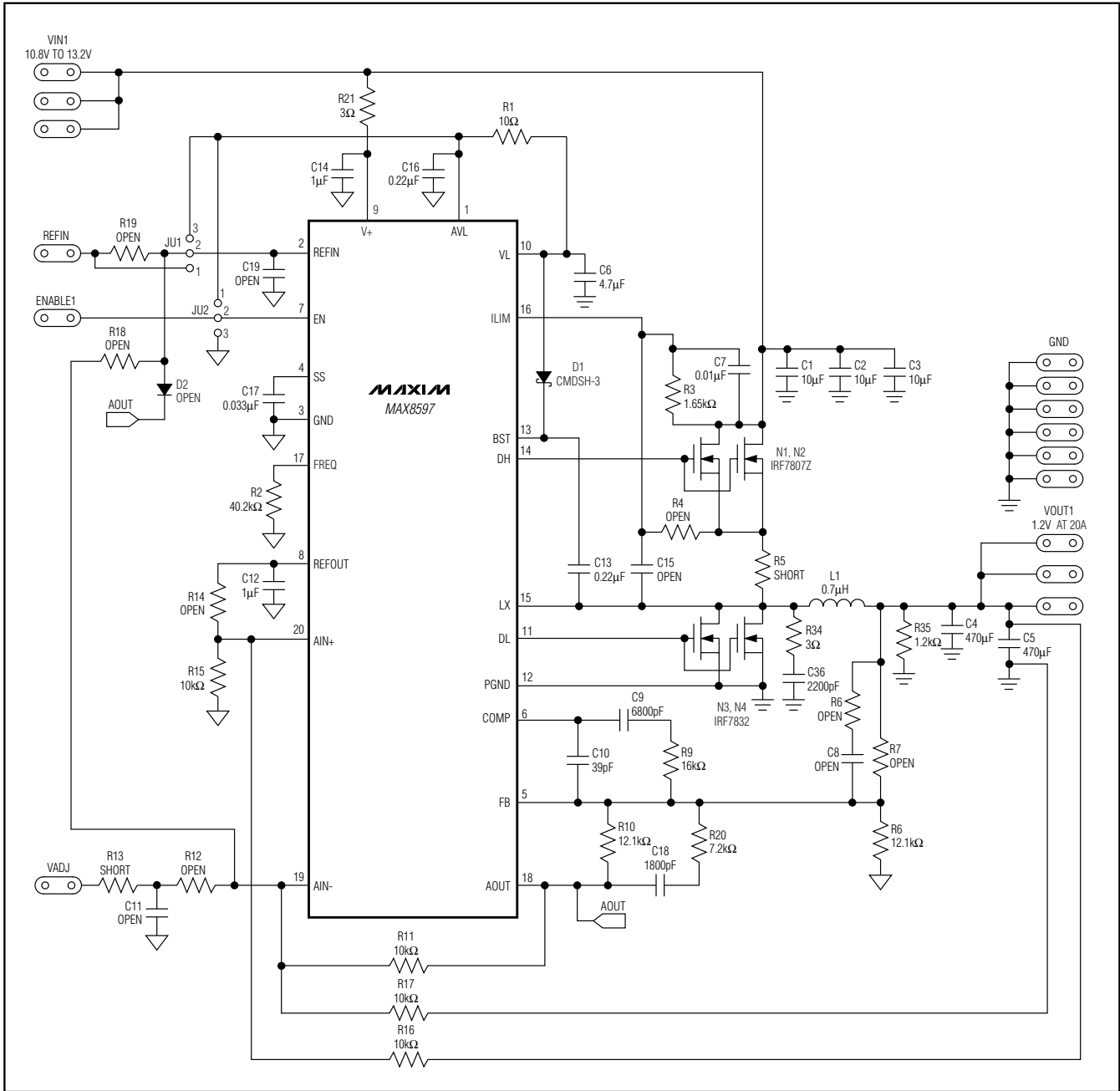


Figure 3. MAX8597 Remote-Sense Application Circuit Schematic

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Evaluates: MAX8597/MAX8598/MAX8599

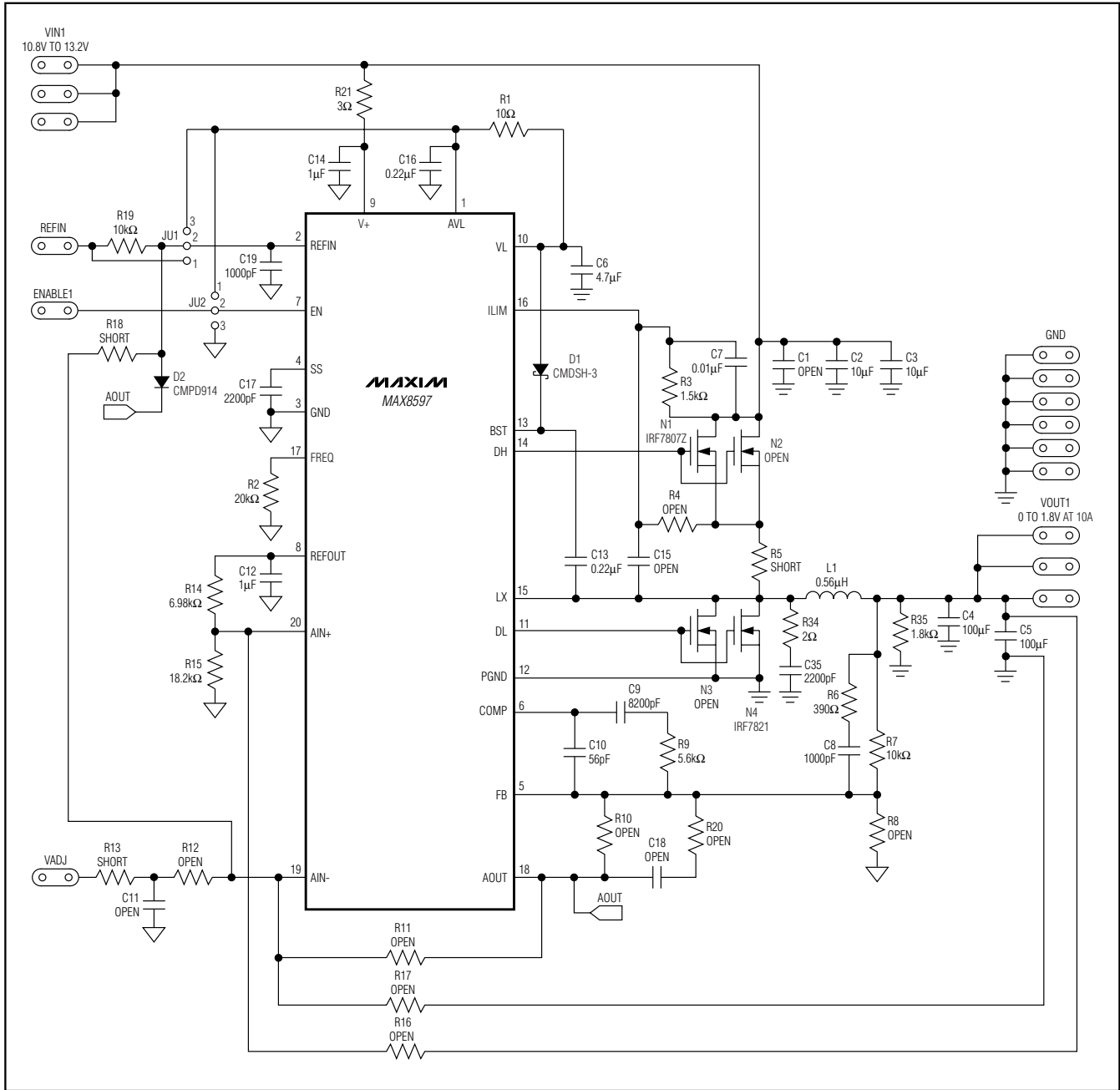


Figure 4. MAX8597 Output Tracking Using REFIN with a Clamp Application Circuit Schematic

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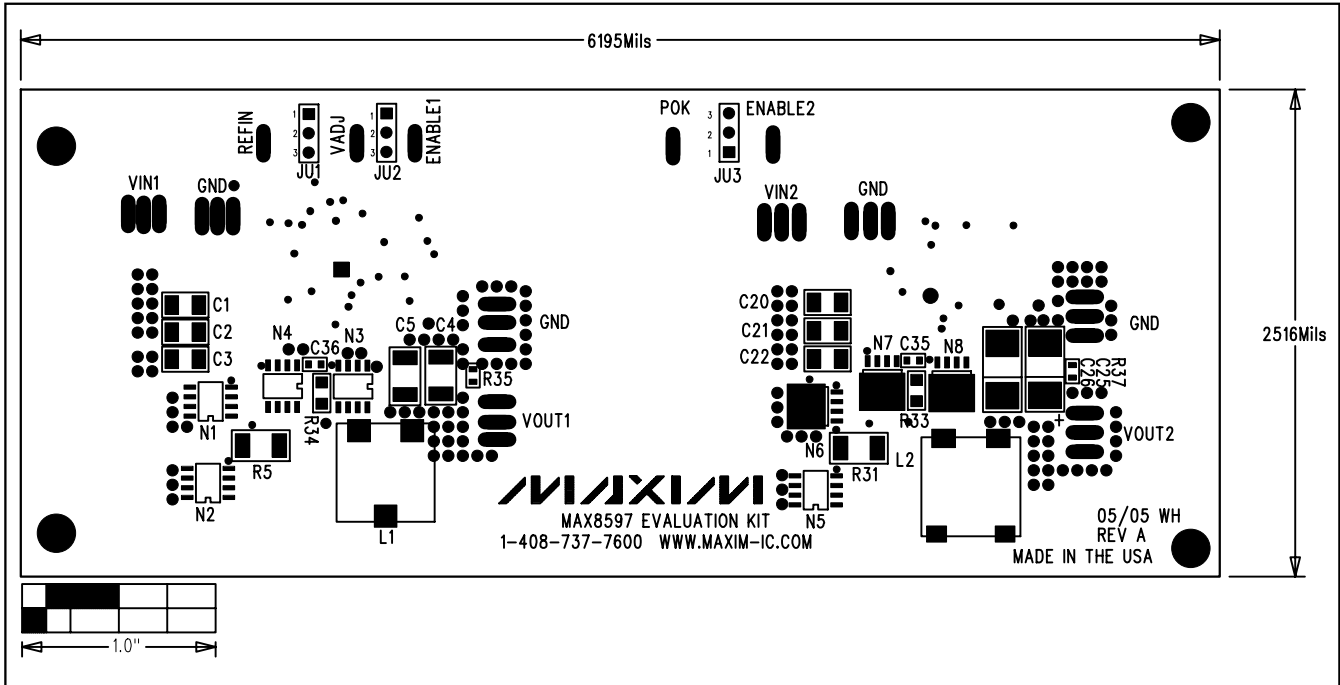


Figure 5. MAX8597 EV Kit Component Placement Guide—Top Silkscreen

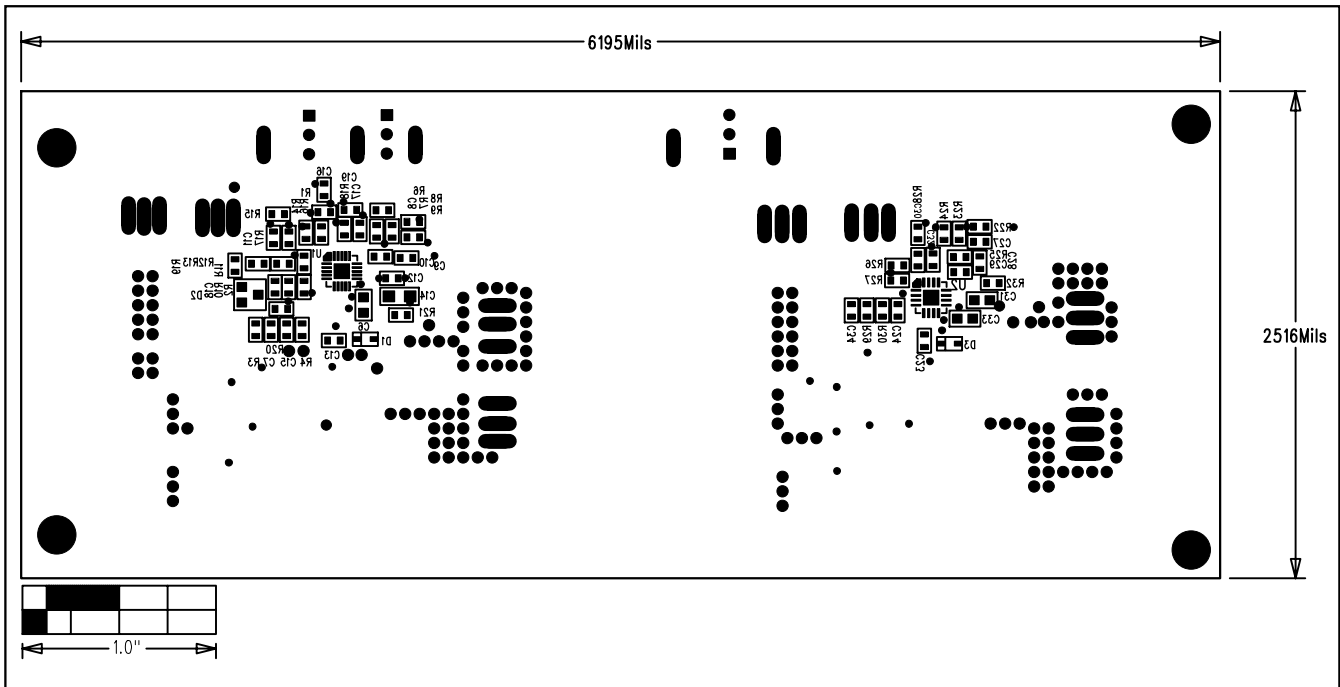


Figure 6. MAX8597 EV Kit Component Placement Guide—Bottom Silkscreen

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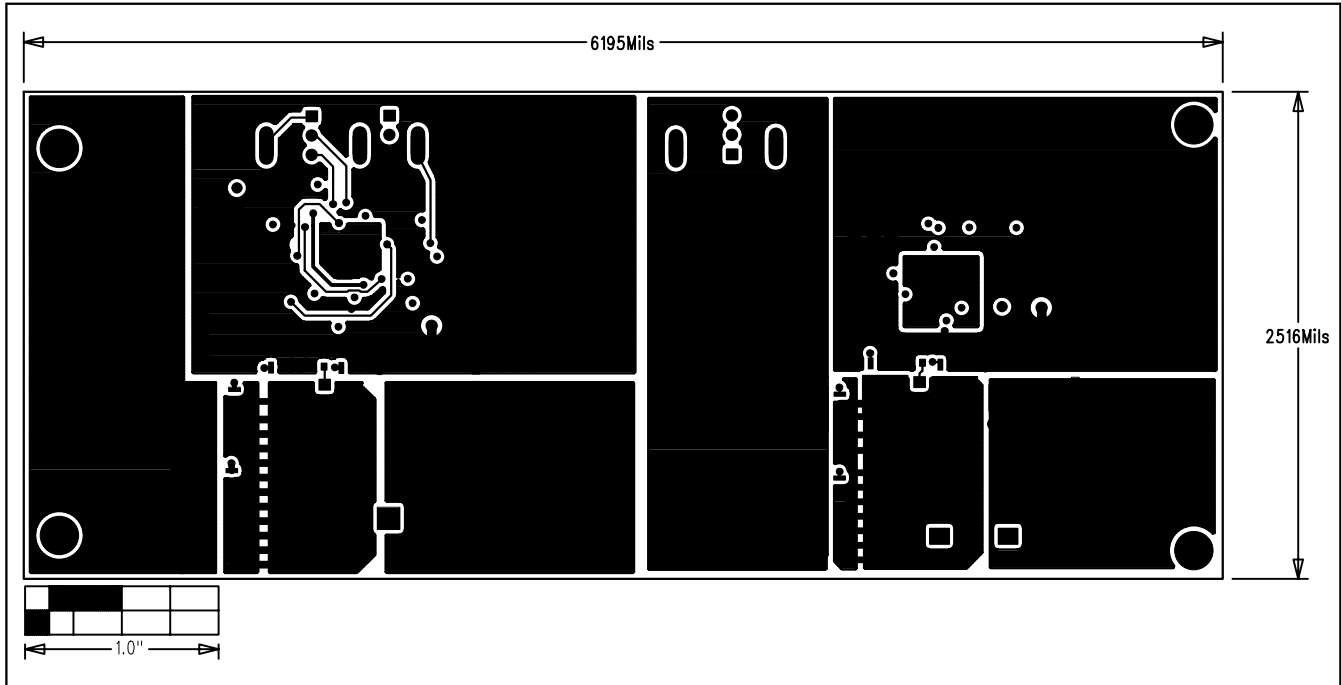


Figure 7. MAX8597 EV Kit PC Board Layout—Component Side

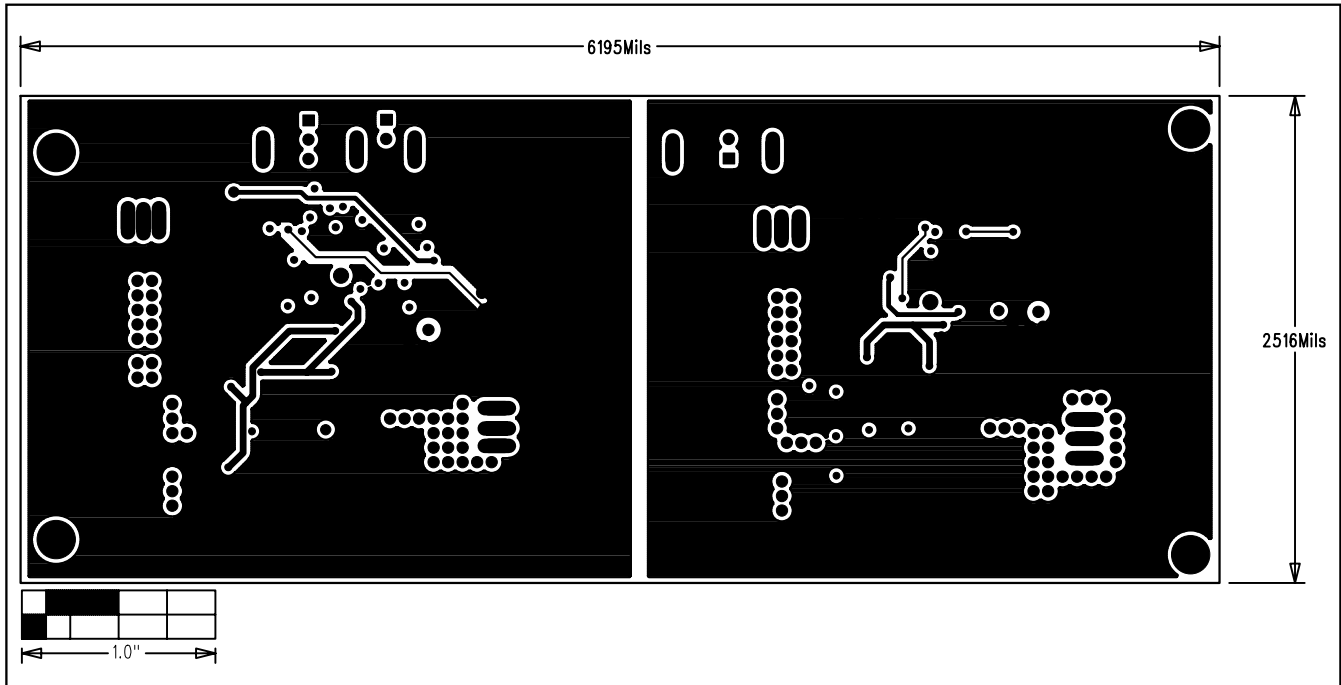


Figure 8. MAX8597 EV Kit PC Board Layout—Layer 2

MAX8597 Evaluation Kit

Evaluates: MAX8597/MAX8598/MAX8599

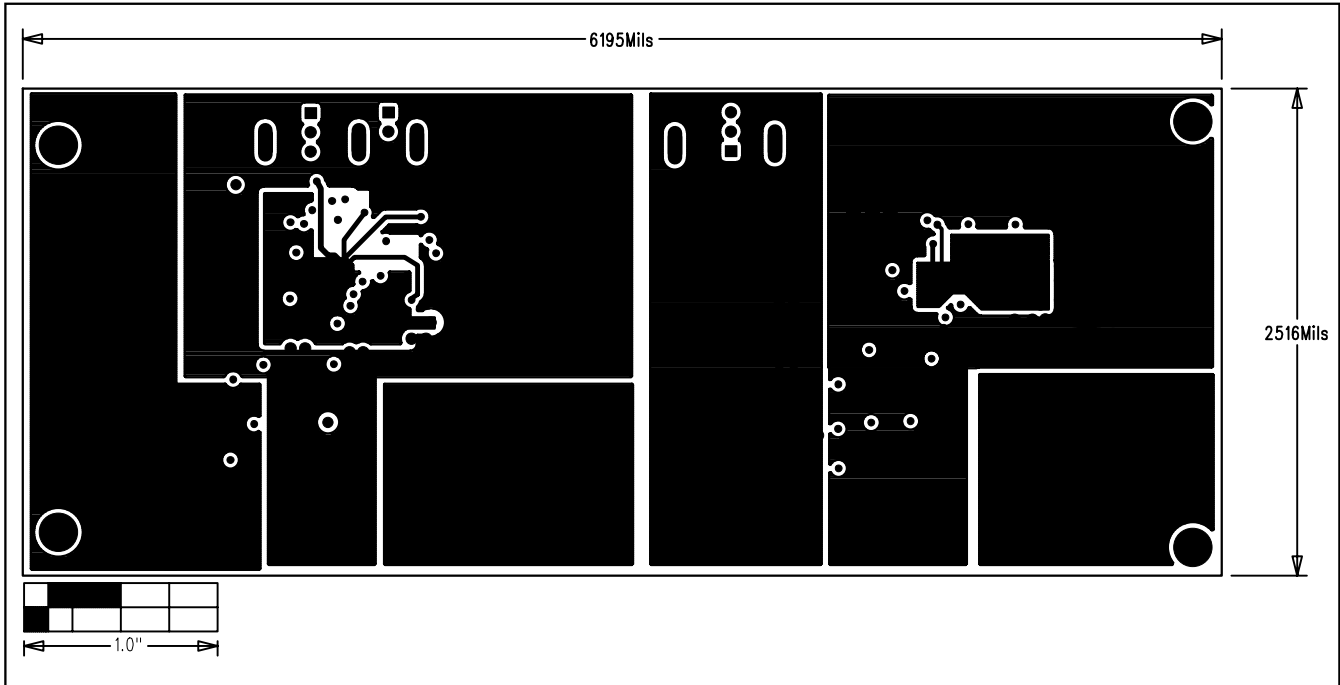


Figure 9. MAX8597 EV Kit PC Board Layout—Layer 3

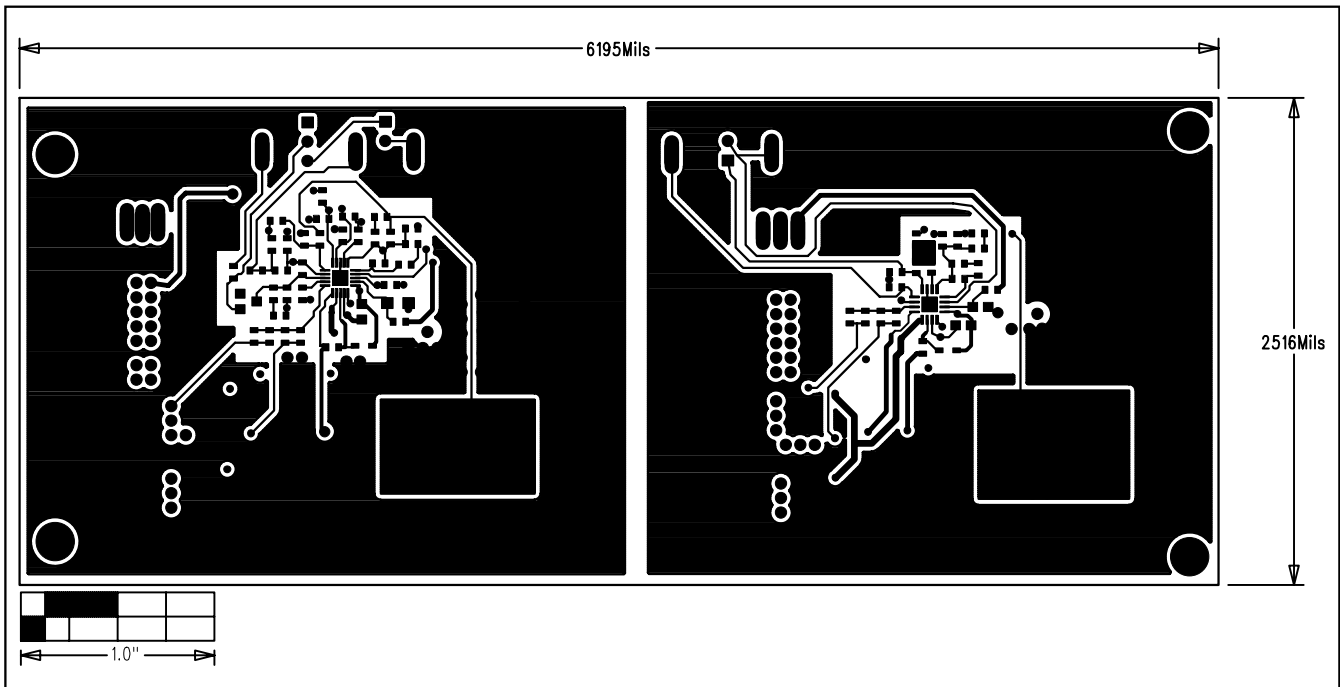


Figure 10. MAX8597 EV Kit PC Board Layout—Solder Side

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