19-2876; Rev 0; 5/03

MAXIM

MAX1955 Evaluation Kit

Evaluates: MAX1955/MAX1956

General Description

The MAX1955 evaluation kit (EV kit) is a fully assembled and tested circuit board for evaluating the MAX1955 dual-PWM step-down controller. The board comes with the MAX1955 installed, but can also be used to evaluate the MAX1956.

The EV kit is configured to operate from a 2.25V to 5.5V input supply range and provides 1.8V and 1.5V outputs capable of delivering 25A each. By changing appropriate external components, the output voltage can be set from 0.8V to 0.9 x V_{IN}. By using the MAX1956, the input supply range can be extended from 1.6V to 5.5V.

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX1955EVKIT	0°C to +70°C	28 Thin QFN 5mm x 5mm

Features

- **Configured for 1.8V and 1.5V Outputs**
- **MAX1955: 2.25V to 5.5V Input Supply Range**
- **MAX1956: 1.6V to 5.5V Input Supply Range**
- **Up to 25A Current for Each Output**
- **±4% Voltage Margining**
- **Foldback Current Limit**
- **Selectable Voltage Sequencing**
- **Independent ON/OFF Control**
- **Synchronizable to an External Clock**
- **Fully Assembled and Tested**

Component List

DESIGNATION	QTY	DESCRIPTION
C1–C7	7	10µF ±20%, 6.3V X5R ceramic capacitors (0805) Panasonic ECJ2FB0J106M or Taiyo Yuden JMK212BJ106MG
C8, C9, C29	3	0.47µF ±20%, 10V X5R ceramic capacitors (0603) Taiyo Yuden LMK107BJ474MA
C10, C17	0	Not installed, POSCAPs
C11, C12, C13, C18	4	680µF, 2.5V, 8mΩ POSCAPs Sanyo 2R5TPD680M8
C14, C16	0	Not installed (0603)
C15, C33	2	470µF, 6.3V POSCAPs Sanyo 6TPB470M
C19, C20	2	0.015µF ±10%, 25V X7R ceramic capacitors (0603) Taiyo Yuden TMK107B153KZ
C21, C22, C23, C30	4	4700pF ±10% X7R ceramic capacitors (0603) Murata GRM188R71H472K
C24, C27	2	6800pF ±10% X7R ceramic capacitors (0603) Murata GRM188R71H682K
C25, C26	2	33pF ±0.1pF, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H330J

DESIGNATION	QTY	DESCRIPTION
C28	1	0.22µF ±10%, 10V X7R ceramic capacitor (0603) Taiyo Yuden LMK107BJ224KA
C31, C32	2	82pF ±5%, 50V C0G ceramic capacitors (0402) Murata GRP1555C1H820J
C34	1	4.7µF ±10%, 6.3V X5R ceramic capacitor (0603) Panasonic ECJ1VB0J475K or equivalent
D1–D4	4	Schottky diodes (SOT323) Central Semiconductor CMSSH-3
D5, D6	0	Not installed (SMC) Central Semiconductor CMSH5-20
J1–J4	0	Not installed, scope probe connectors
JU1, JU2, JU3	3	3-pin headers
JU4, JU5	2	2-pin headers
L1, L2	2	0.3µH, 35A, 1.5mΩ inductors Sumida CDEP125(U)-0R3
L3	1	4.7µH inductor TDK LDR655312T-4R7W
N1, N2, N8, N9	4	N-channel MOSFETs (8-pin SO PowerPak) Vishay Si7892DP

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
N3, N4, N7, N10	0	Not installed (8-pin SO)
N5, N6, N11, N12	4	N-channel MOSFETs (8-pin SO) Vishay Si4842DY
Q1, Q2	2	NPN transistors (SOT23) ON Semiconductor MMBT3904LT1
R1, R23	0	Not installed (0603)
R2	1	7.15kΩ ±0.1% resistor (0603)
R3, R6	2	8.06kΩ ±0.1% resistors (0603)
R4	1	10kΩ ±0.1% resistor (0603)
R5, R20, R21, R22, R25–R28	8	1Ω ±5% resistors (0603)
R7	1	15kΩ ±5% resistor (0603)
R8	1	18kΩ ±5% resistor (0603)

DESIGNATION	QTY	DESCRIPTION
R9, R14	2	100kΩ ±1% resistors (0603)
R10	1	200kΩ ±1% resistor (0603)
R11	1	60.4kΩ ±1% resistor (0603)
R12	1	56.2kΩ ±1% resistor (0603)
R13	1	10Ω ±5% resistor (0603)
R15, R16, R17	0	Not installed (0603), PC board shorts
R18	1	75kΩ ±1% resistor (0603)
R19	1	90.9kΩ ±1% resistor (0603)
R24	1	510Ω ±5% resistor (0603)
R29–R32	4	10kΩ ±5% resistors (0603)
U1	1	MAX1955ETI
—	5	Shunts, position 2
—	4	Rubber feet
—	1	MAX1955 EV kit PC board

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Central Semiconductor	631-435-1110	www.centralsemi.com
International Rectifier	310-322-3331	www.irf.com
Murata	814-237-1431	www.murata.com
Panasonic	714-373-7939	www.panasonic.com
Sanyo	619-661-6835	www.sanyo.com
Sumida	847-545-6700	www.sumida.com
Taiyo Yuden	408-573-4150	www.t-yuden.com
TDK	847-803-6100	www.component.tdk.com
Vishay	408-970-5715	www.vishay.com

Note: *Please indicate that you are using the MAX1955/MAX1956 when contacting these component suppliers.*

Quick Start

The MAX1955 EV kit is fully assembled and tested. Follow these steps to verify board operation. **Do not turn on the power supply until all connections are completed:**

1) Verify the shorts on JU2 and JU3 are across pins 2 and 3.
2) Verify the pins of JU4 and JU5 are not shorted.
3) Preset the input power supply to between 2.25V and 5.5V.
4) Turn the power supply off.
5) Connect the positive power-supply terminal to the EV kit pads labeled IN.
6) Connect the power-supply ground to the EV kit pads labeled PGND.
7) Connect a load and voltmeter from OUT1 to PGND and another load and voltmeter from OUT2 to PGND.
8) Turn on the input power supply and verify the voltage from OUT1 to PGND is 1.5V and the voltage from OUT2 to PGND is 1.8V.

Detailed Description

Evaluating the MAX1956

The MAX1955 EV kit comes with the MAX1955 installed, but can also be used to evaluate the MAX1956. To evaluate the MAX1956, carefully remove the MAX1955 from the PC board and replace it with the MAX1956. After installing the MAX1956, inspect all connections with an ohmmeter to verify there are no solder bridges or open connections before powering up the EV kit.

Setting the Output Voltages

The MAX1955 uses a pair of feedback resistors to set the output voltage for each output. In the MAX1955 EV kit, OUT1 is preset to 1.5V and OUT2 is preset to 1.8V. Each output can be set to any voltage from 0.8V to 0.9 x V_{IN}. Use the following procedure to change the output voltage:

1) Change the upper feedback resistors (R2 and R4) to set the output voltage. Use the following formulas to calculate the values of the resistors:

$$R2 = R3 \left(\frac{V_{OUT1}}{0.8} - 1 \right)$$

where R3 is 8.06kΩ and V_{OUT1} is the desired output voltage of OUT1, and:

$$R4 = R6 \left(\frac{V_{OUT2}}{0.8} - 1 \right)$$

where R6 is 8.06kΩ and V_{OUT2} is the desired output voltage of OUT2.

2) The output capacitors on the MAX1955 EV kit are rated for 2.5V. For higher output voltages, higher voltage-rated capacitors should be used.

3) Change the current-limit resistors (R11 and R18 for OUT1, R12 and R19 for OUT2). Refer to the MAX1955/MAX1956 data sheet for information on calculating values for these resistors.

4) Refer to the MAX1955/MAX1956 data sheet to select the optimum inductor, output capacitors, and compensation components.

Clock Synchronization Input (SYNC)

The MAX1955 EV kit can be synchronized to an external clock from 1080kHz to 1320kHz. Connect the clock signal to SYNC and connect the clock-signal ground to GND. Each of the step-down controllers switch at 1/2 the frequency applied to SYNC and are 180° out-of-phase with each other. To use the internal clock, leave SYNC unconnected, and each controller switches at 600kHz and is 180° out-of-phase with each other.

Output Sequencing (SEQ)

The outputs can be set to power up at the same time, or OUT1 can be set to power up first and power down last. For simultaneous power-up/-down, short pins 1 and 2 of JU1 (Table 1). To make OUT1 power up first and power down last, short pins 2 and 3 of JU1.

Evaluating Voltage Margining

A voltage-margining feature is provided on the MAX1955 and MAX1956. This allows the output voltages to be shifted up or down by 4%. Voltage margining is controlled by JU2 and JU3 (Table 2). To ensure proper startup, verify that JU2 and JU3 are shorted between pins 2 and 3 (normal operation) when power is first applied to the EV kit.

Evaluating Shutdown

Shutdown mode turns off the IC and reduces the input current. JU2 and JU3 control the shutdown feature (Table 2). There are also individual shutdown inputs provided on the EV kit (EN1 and EN2). These inputs allow each output to be shut down individually, but do not completely power down the IC. For convenience, jumpers are provided to control the EN_ inputs. With no connection to the EN_ pads, short the pins of JU4 and JU5 to shut down OUT1 and OUT2, respectively. Remove the short to enable the outputs (Tables 3 and 4). To control individual shutdown with a logic source, remove the shorts from JU4 and JU5 and connect the logic source to the EN_ pad. Drive EN_ logic high for shutdown or logic low to enable the output. Refer to the MAX1955/MAX1956 data sheet for details.

Table 1. JU1 Functions

JU1 POSITION	SEQ CONNECTION	SEQUENCING
1 and 2	GND	OUT1 and OUT2 power up/down simultaneously
2 and 3	VDD	OUT1 powers up first and powers down last

Table 2. JU2 and JU3 Functions

JU2 POSITION	JU3 POSITION	FUNCTION
1 and 2	1 and 2	Shutdown
1 and 2	2 and 3	-4% margining
2 and 3	1 and 2	+4% margining
2 and 3	2 and 3	Enable (normal operation)

Table 3. JU4 Functions

JU4 POSITION	FUNCTION
OPEN	OUT1 enabled or controlled from $\overline{EN2}$ input
SHORT	OUT1 shutdown

Table 4. JU5 Functions

JU5 POSITION	FUNCTION
OPEN	OUT2 enabled or controlled from $\overline{EN2}$ input
SHORT	OUT2 shutdown

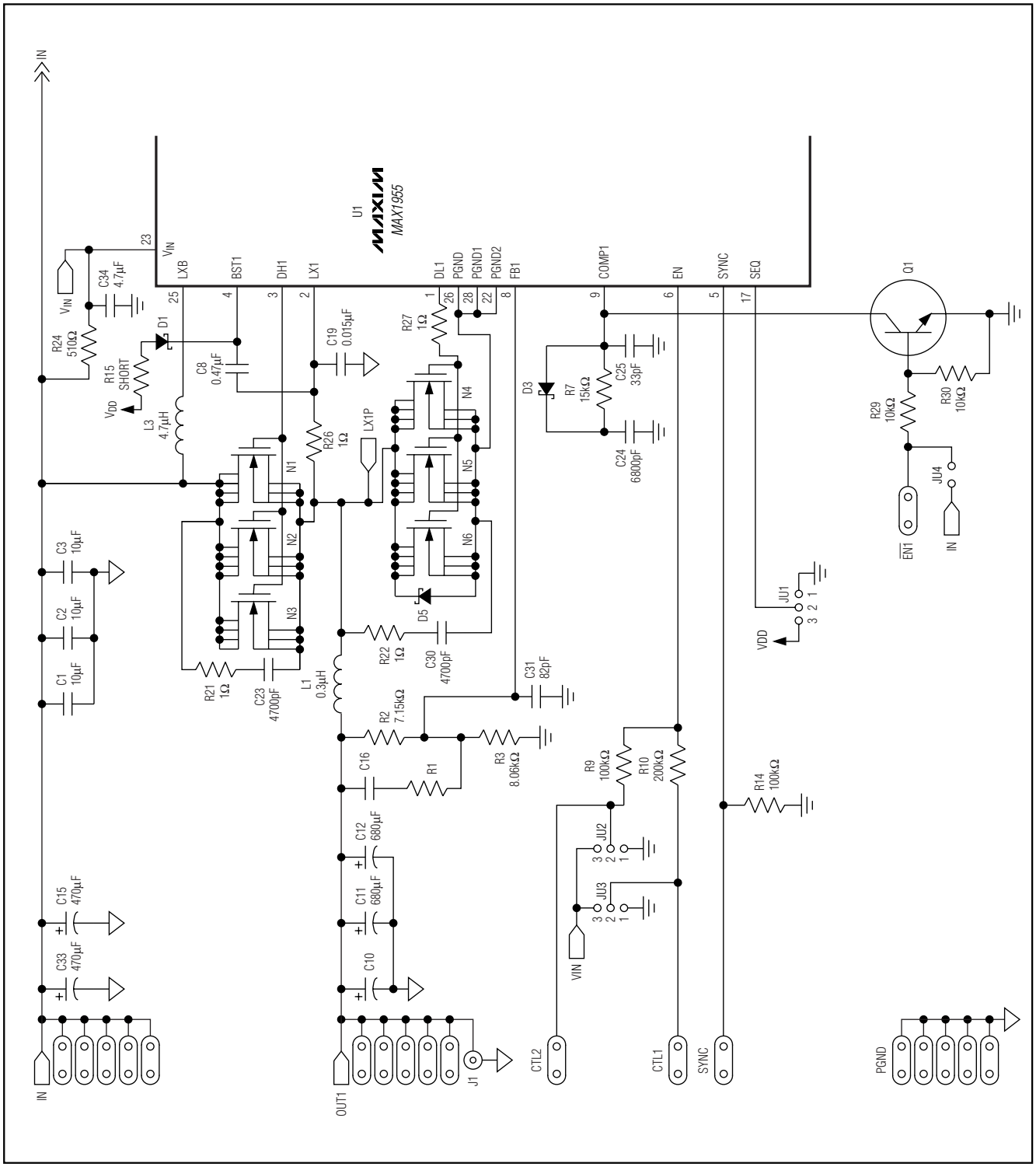

Figure 1. MAX1955 EV Kit Schematic (Sheet 1 of 2)

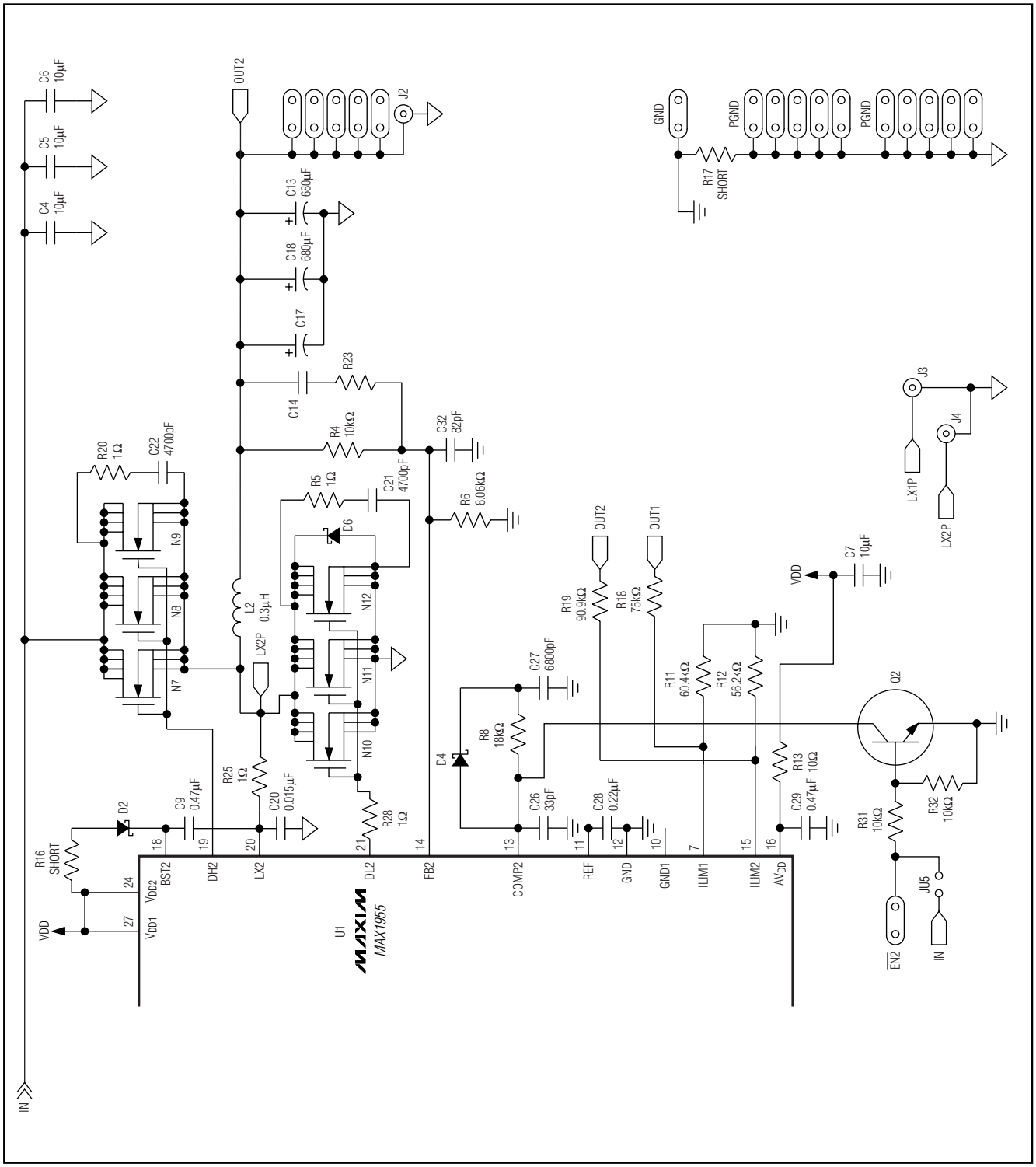

Figure 1. MAX1955 EV Kit Schematic (Sheet 2 of 2)

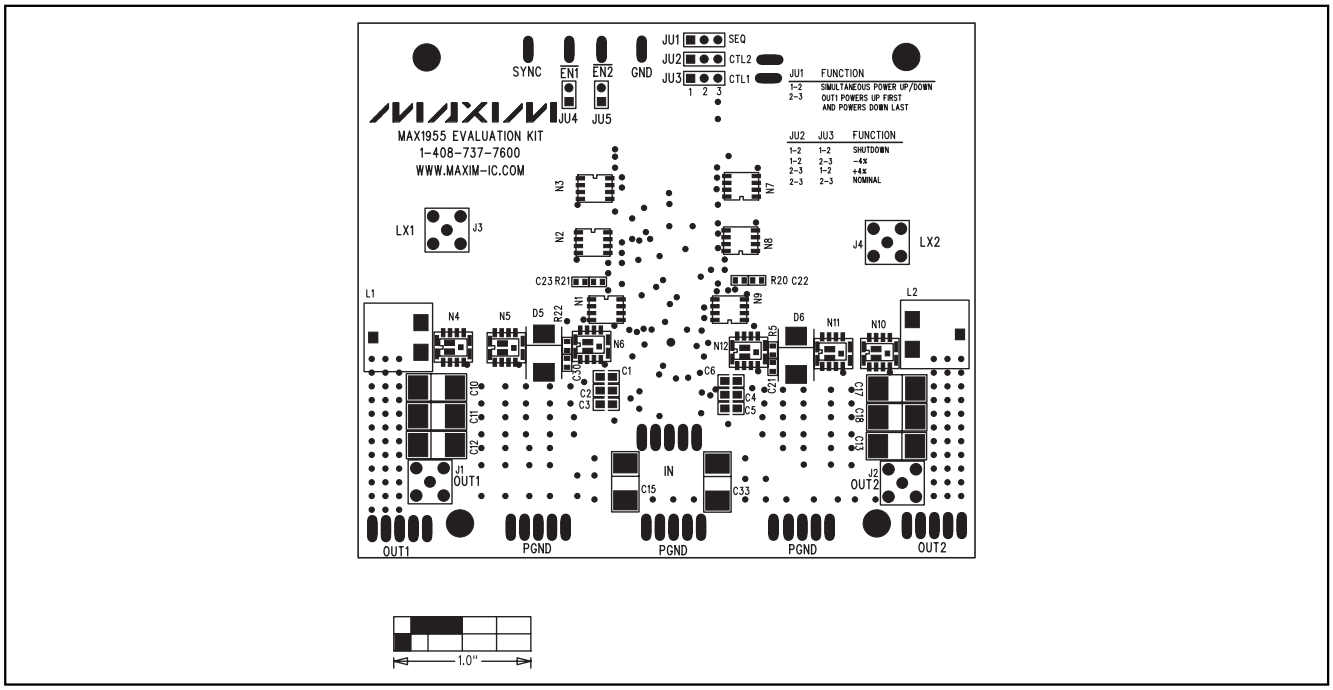

Figure 2. MAX1955 EV Kit Component Placement Guide—Component Side

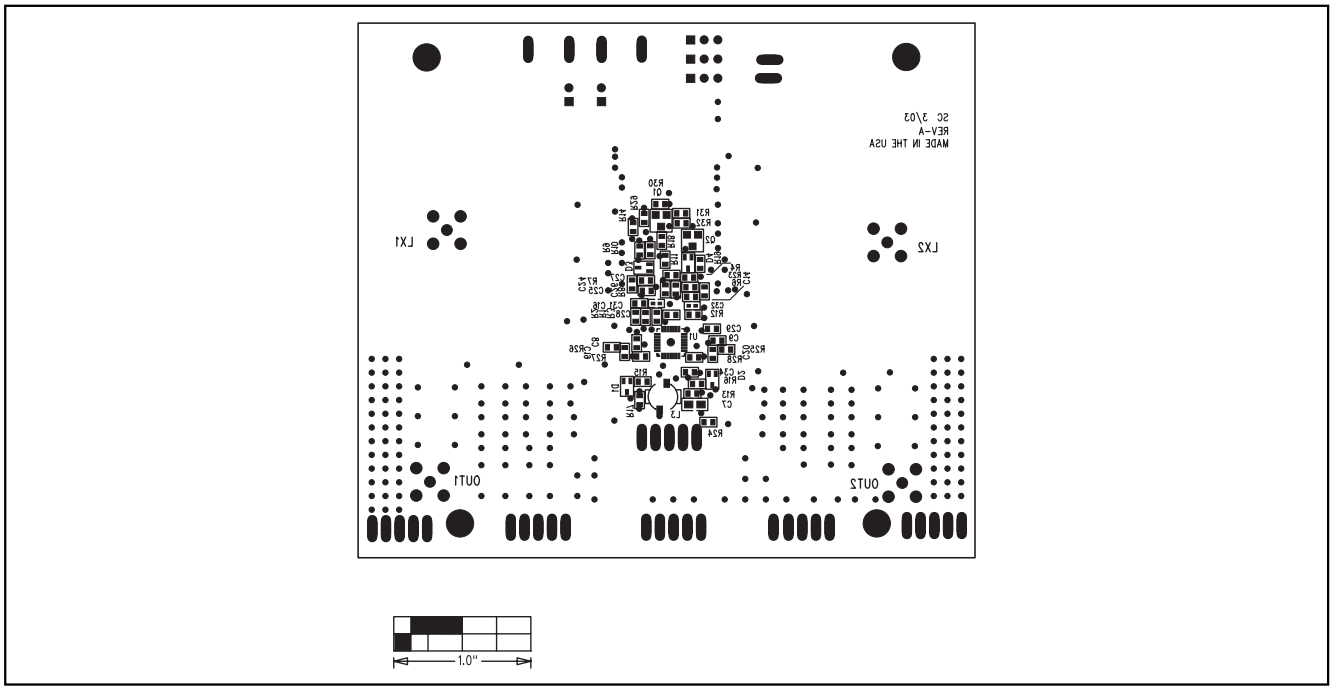

Figure 3. MAX1955 EV Kit Component Placement Guide—Solder Side

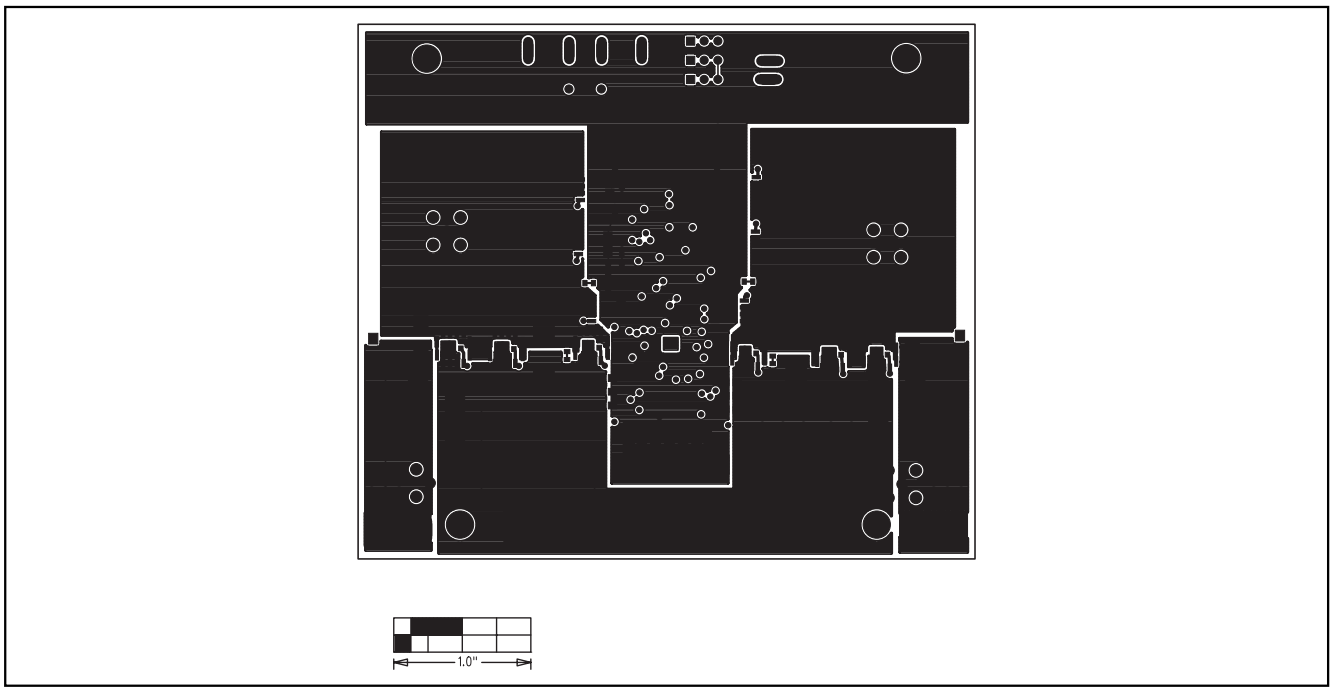

Figure 4. MAX1955 EV Kit PC Board Layout—Component Side

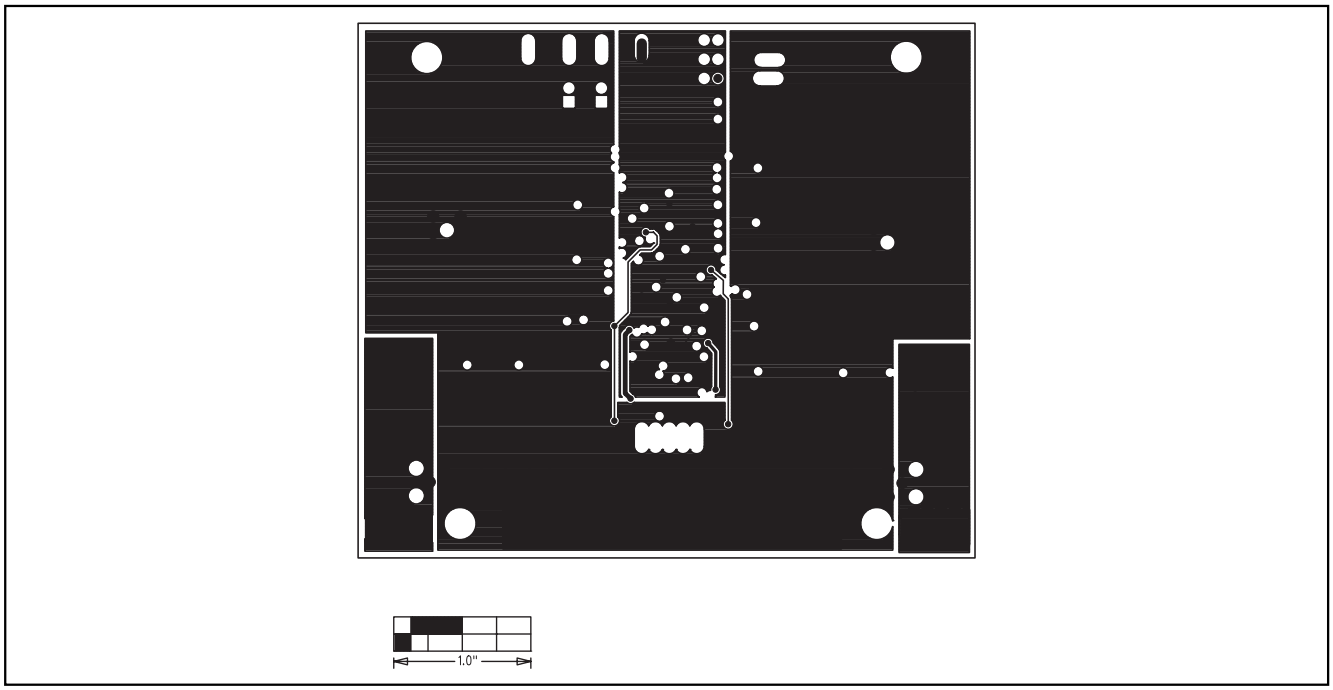

Figure 5. MAX1955 EV Kit PC Board Layout—Layer 2

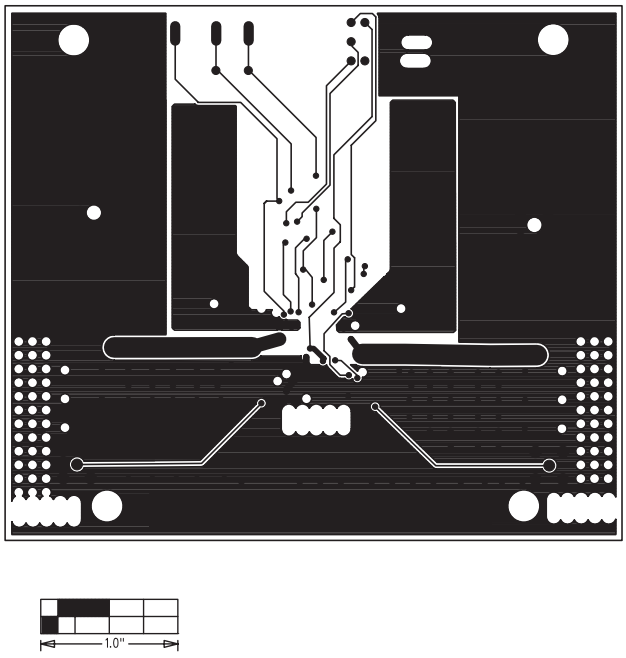

Figure 6. MAX1955 EV Kit PC Board Layout—Layer 3

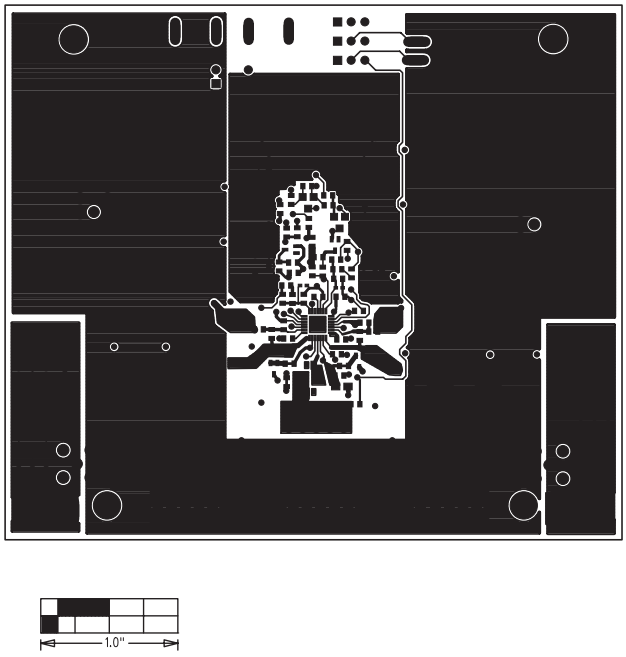

Figure 7. MAX1955 EV Kit PC Board Layout—Solder Side