19-2870; Rev 0; 04/03

MAX1544/MAX1545 Evaluation Kits

General Description

The MAX1544/MAX1545 evaluation kits (EV kits) demonstrate the high-power, dynamically adjustable multiphase notebook CPU application circuit. This DC-DC converter steps down high-voltage batteries and/or AC adapters, generating a precision, low-voltage CPU core VCC rail. The MAX1544 EV kit meets the mobile and desktop AMD Hammer CPU transient voltage specification. The MAX1545 EV kit meets the desktop and mobile Pentium 4 (P4) CPUs transient voltage specification. The MAX1544/MAX1545 kits consist of the MAX1544 or MAX1545 Dual-Phase Quick-PWM™ step-down controller, two MAX1980 slave controllers and the MAX6590 temperature sensor. The MAX1544/MAX1545 kits include active voltage positioning with adjustable gain and offset, reducing power dissipation and bulk output capacitance requirements. The kit features independent four-level logic inputs for setting the suspend voltage (S0/S1).

The MAX1980 provides additional gate drive circuitry, phase synchronization, current limit, and current balancing. Precision slew-rate control provides "just-in time" arrival at the new DAC setting, minimizing surge currents to and from the battery.

This fully assembled and tested circuit board provides a 5-bit digitally adjustable output voltage from a 7V to 24V battery input range. The EV kit operates at 300kHz switching frequency and has superior line- and load-transient response.

Features

- ♦ **Quad-Phase Quick-PWM™ EV Kit**
- ♦ **Mobile and Desktop P4 or AMD Hammer Compatible**
- ♦ **Active Voltage Positioning with Adjustable Gain, Offset and Remote Sensing**
- ♦ **High Speed, Accuracy and Efficiency**
- ♦ **Low Bulk Output Capacitor Count**
- ♦ **Multiphase Fast-Response Quick-PWM Architecture**
  - **MAX1544/MAX1545 Dual-Phase Controller**
  - **Two MAX1980 Slave Controllers**
- ♦ **7V to 24V Input Voltage Range**
- ♦ **5-Bit On-Board DAC**
  - **Mobile P4: 0.60V to 1.75V Output Range**
  - **Desktop P4: 1.10V to 1.85V Output Range**
  - **AMD Hammer: 0.675V to 1.55V Output Range**
- ♦ **68A Load-Current Capability (17A Each Phase)**
- ♦ **300kHz Switching Frequency**
- ♦ **MAX6509 Temperature Sensor**
- ♦ **40-Pin Thin QFN Package (MAX1544/MAX1545)**
- ♦ **20-Pin Thin QFN Package (MAX1980)**
- ♦ **Fully Assembled and Tested**

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX1544EVKIT **MAX1545**EVKIT	0°C to +70°C	40 QFN (MAX154_) 20 QFN (MAX1980)

Component List

DESIGNATION	QTY	DESCRIPTION
C1-C4, C7, C20, C25, C26, C33, C35, C62, C64	0	Not Installed (0603)
C5, C24, C36, C49	4	100pF 5% 50V C0G ceramic capacitor (0603) Murata GRM1885C1H101J
C6, C21, C23, C38, C39, C51, C60	7	0.22µF 16V X5R ceramic capacitor (0805) Taiyo Yuden EMK212BJ224KG
C8-C12, C31, C32, C47 or C8-C12, C31, C32, C47	8 or 8	330µF, 2.5V 9mΩ Low-ESR polymer capacitor (D case) Sanyo 2R5TPE330M9 330µF, 2V 7mΩ Low-ESR specialty polymer capacitor (D case) Panasonic EEFSD0D331XR
C13	0	Not installed (E case)
C14, C29, C58, C59	4	1000pF 10% 50V C0G ceramic capacitor (0603) Murata GRM188R71H102K

MAX1544/MAX1545 Evaluation Kits

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
C15, C22, C34, C45	4	4700pF 10% 50V X7R ceramic capacitor (0603) Murata GRM188R71H472K **(Not installed when using Si7442DP)**
C16	1	2.2µF 10V X5R ceramic capacitor (0612) TDK C1632X5R1A225KTB09N
C17, C18, C19, C41, C42, C43, C53, C54, C65	9	15µF 20% 25V X5R ceramic capacitor (1812) TDK C4532X5R1E156M
C27, C40, C52	3	1µF 20% 10V X5R ceramic capacitor (0805) Taiyo Yuden LMK212BJ105KG or TDK C2012X7R1C105MKT
C28	1	47pF 5% 50V C0G ceramic capacitor (0603) Murata GRM1885C1H470J
C30, C37, C50, C56, C63	5	470pF 10% 50V X7R ceramic capacitor (0603) Murata GRM188R71H471K
C44, C48, C55, C57	4	1µF 10% 25V X7R ceramic capacitor (0805) TDK C2012X7R1E105K
C61	1	0.1µF 10% 50V X7R ceramic capacitor (0805) Murata GRM21BR71H104K
C67, C69, C70, C83, C84, C85, C87, C97-C101	12	10µF 20% 6.3V X5R ceramic capacitor (0805) TDK C2012X5R0J106M or Taiyo Yuden AMK212BJ106MG
C71-C78, C80-C82, C88-C92	16	22µF 6.3V X5R ceramic capacitor (1206) TDK C3216X5R0J226MT
D1	1	100mA, 30V Dual Schottky Diode Central Semiconductor CMPSH-3A
D2, D3, D4, D12	4	5A Schottky Diode Central Semiconductor CMSH5-40
D5, D13	2	100mA, 30V Schottky Diode Central Semiconductor CMPSH-3
D6, D11	2	200mA Switching Diode Central Semiconductor CMPD2838
D7, D10	0	Not Installed 100mA, 30V Dual Schottky Diode Central Semiconductor CMPSH-3C
J2	1	4-pin header Molex 39-29-3046
JUA0-JUA5	6	2-pin header
JU1, JU3, JU4	3	4-pin header
JU13	0	2-pin header
JU2	1	3-pin header
L1-L4	4	0.6µH 26A 0.9mΩ Power Inductors Panasonic ETQP1H0R6BFA or Sumida CDEP134H-0R6
N1, N2, N5, N6, N7, N10, N15, N16 or N2, N7, N10, N16	8 or 4	N-channel MOSFET (SO-8) International Rectifier IRF7811W or Fairchild FDS6694 Vishay/Siliconix Si7886DP (Power PAK)
N3, N4, N8, N9, N11, N12, N13, N14	8	N-channel MOSFET (SO-8) International Rectifier IRF7822 or Fairchild FDS6688 or Vishay/Siliconix Si7442DP (Power PAK)
Q1, Q2	2	N-channel MOSFET Central Semiconductor 2N7002
R1, R8, R11, R14, R15, R17, R20, R37, R50, R52, R63, R64, R78, R98, R102	0	Not Installed, (short PC trace) (0603)
R2, R9, R39, R45	4	0.001Ω ±1% 1W resistor (2512) Panasonic ERJM1WTF1M0U
R3, R33-R35, R40, R44, R46, R48, R49, R107	10	100Ω ±5% resistor (0603)
R5, R6, R18, R24	4	1kΩ ±1% resistor (0603)
R7	1	60.4kΩ ±1% resistor (0603)
R10	1	100kΩ ±1% resistor (0603)
R12	1	20kΩ ±1% resistor (0603)
R16, R83, R84	3	10Ω ±5% resistor (0603)
R19, R21, R27, R30, R36, R51, R53, R61, R62, R65-R67, R74, R75, R81, R87, R92, R99-R101, R103-R106, R108, R109	0	Not Installed (0603)
R26, R28, R73, R76, R77, R79, R80	7	0Ω ±5% resistor (0603)
R29, R31	2	30.1kΩ ±1% resistor (0603)
R32, R42	2	150kΩ ±1% resistor (0603)
R41, R47	2	20Ω ±5% resistor (0603)
R43, R38	2	10kΩ ±5% resistor (0603)
R54-R59, R70, R95-R97, R110	11	100kΩ ±5% resistor (0603)
R60	1	11kΩ ±1% resistor (0603)
R82	1	1MΩ ±5% resistor (0603)
U2, U3	2	MAX1980ETP (20-TQFN)

MAX1544/MAX1545 Evaluation Kits

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U4	1	MAX6509HAUK-T (5-SOT23)
U5	0	MAX6509HAUK-T (5-SOT23)
None	10	Shunts
None	1	MAX1544/MAX1545 PC Board
None	1	MAX1544/MAX1545 EV kit data sheet
None	1	MAX1544/MAX1545 data sheet
None	1	MAX1980 data sheet
None	1	MAX6509 data sheet

MAX1544 EV Kit Additional Components

DESIGNATION	QTY	DESCRIPTION
R4, R23	2	2.61kΩ ±1% resistor (0603)
R22	1	24.9kΩ ±1% resistor (0603)
R25	1	100kΩ ±1% resistor (0603)
U1	1	MAX1544ETL (40-TQFN)
U8	1	Socket 754

MAX1545 EV Kit Additional Components*

DESIGNATION	QTY	DESCRIPTION
R4, R23	2	3.01kΩ ±1% resistor (0603)
R22	1	182kΩ ±1% resistor (0603)
R25	1	20kΩ ±1% resistor (0603)
U1	1	MAX1545ETL (40-TQFN)
U8	1	None

**Contact Intel for the Mobile P4 specifications and contact Maxim for a reference schematic.*

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
Central Semiconductor	516-435-1110	516-435-1824	www.centralsemi.com
Fairchild Semiconductor	408-721-2181	408-721-1635	www.fairchildsemi.com
International Rectifier	310-322-3331	310-322-3332	www.irf.com
Panasonic	714-373-7939	714-373-7183	www.panasonic.com
Sumida	708-956-0666	708-956-0702	www.sumida.com
Taiyo Yuden	408-573-4150	408-573-4159	www.t-yuden.com
TDK	847-390-4373	847-390-4428	www.component.tdk.com
Vishay/Siliconix	203-268-6261	203-268-6296	www.vishay.com

Note: *Please indicate that you are using the MAX1544 and MAX1545 when contacting these component suppliers.*

Quick Start

Recommended Equipment

- 7V to 24V, >100W power supply, battery, or notebook AC adapter
- DC bias power supply, 5V at 1A
- One or more dummy loads capable of sinking 68A total
- Digital multimeter (DMM)
- 100MHz dual-trace oscilloscope

Procedure

1) Ensure that the circuit is connected correctly to the supplies and dummy load prior to applying any power.
2) Verify that the shunts are across JU1 pins 1 and 3 (S0) and JU3 pins 1 and 4 (S1), JU2 pins 1 and 2 ($\overline{\text{SHDN}}$) and JU4 pins 1 and 3 (TON). The DAC code settings (D4–D0) are set for 1.50V output through installed jumpers JUA3 and JUA1. A fixed +50mV offset fsets the final no load output voltage at 1.55V for the MAX1544 EV kit. A fixed -25mV offset sets the final no load output voltage at 1.45V for the MAX5145 EV kit.
3) Turn on the battery power before turning on the +5V bias power; otherwise, the output UVLO timer times out and the FAULT latch is set, disabling the regulator until +5V power is cycled or shutdown is toggled.
4) Observe the output voltage with the DMM and/or oscilloscope. Look at the LX switching nodes and MOSFET gate-drive signals while varying the load current.

Detailed Description

This 68A multiphase buck-regulator design is optimized for a 300kHz frequency and output voltage settings from 1.0V to 1.5V. At VOUT=1.5V and VIN=12V, the inductor ripple is approximately 30% (LIR=0.3). The MAX1544/MAX1545 controller shares the current between its two phases that operate 180° out-of-phase, supplying 17A per phase. Each MAX1980 slave is triggered by one side of the MAX1544/MAX1545 low-side gate driver, supplying another 17A per slave.

MAX1544/MAX1545 Evaluation Kits

Setting the Output Voltage

The MAX1544/MAX1545 has two unique internal VID input multiplexers that can select one of three different VID DAC code settings for different processor states. On startup, the controller selects the DAC code from the D0–D4 input decoder when SUS=GND. A second multiplexer selects the lower S0-S1 DAC code when SUS is high (SUS=3.3V or VCC), or the higher S0-S1 DAC code when SUS=REF. The output voltage can be digitally set by the D0-D4 pins (Table 1) or the S0-S1 pins (Table 2).

There are five different ways of setting the output voltage:

1) **Drive the external VID0–VID4 inputs (no jumpers installed):** The output voltage can be set by driving VID0–VID4 with open-drain drivers (pullup resistors are included on the board) or 3V/5V CMOS output logic levels (DPSLPVR = GND).
2) **Install jumpers JUA0–JUA4:** SUS=low. When JUA0–JUA4 are not installed, the MAX1544/MAX1545's D0–D4 inputs are at logic 1 (connected to VID_VCC). When JUA0–JUA4 are installed, D0–D4 inputs are at logic 0 (connected to GND). The output voltage can be changed during operation by installing and removing jumpers JUA0–JUA4. As shipped, the EV kit is configured with jumpers JUA0–JUA4 set for 1.50V output (Table 1). Refer to the MAX1544 and MAX1545 data sheets for more information.
3) **Drive DPSLPVR (suspend mode configuration):** As shipped, the EV kit is configured for operation in the suspend mode S0-S1 set for 1.000V output (Table 2).
4) **Drive $\overline{\text{DPSLP}}$:** $\overline{\text{DPSLP}}$ can be driven by an external driver to introduce offsets to the output voltage (Table 2).
5) **Drive header J1 for full system control:** VID0-VID4, $\overline{\text{DPSLP}}$, DPRSLPVR, VRON, and VROK are all available directly on header connections J1 (Figure 1c). Do not install jumper JU2 in this mode.

Table 1. MAX1544/MAX1545 Output Voltage Adjustment Settings (SUS=GND)

D4	D3	D2	D1	D0	MAX1544 VOUT (V)	MAX1545 CODE=VCC VOUT (V)	MAX1545 CODE=GND VOUT (V)
0	0	0	0	0	1.550	1.750	1.850
0	0	0	0	1	1.525	1.700	1.825
0	0	0	1	0	**1.500**	1.650	1.800
0	0	0	1	1	1.475	1.600	1.775
0	0	1	0	0	1.450	1.550	1.750
0	0	1	0	1	1.425	1.500	1.725
0	0	1	1	0	1.400	1.450	1.700
0	0	1	1	1	1.375	1.400	1.675
0	1	0	0	0	1.350	1.350	1.650
0	1	0	0	1	1.325	1.300	1.625
0	1	0	1	0	1.300	1.250	1.600
0	1	0	1	1	1.275	1.200	1.575
0	1	1	0	0	1.250	1.150	1.550
0	1	1	0	1	1.225	1.100	1.525
0	1	1	1	0	1.200	1.050	**1.500**
0	1	1	1	1	1.175	1.000	1.475

D4	D3	D2	D1	D0	MAX1544 VOUT (V)	MAX1545 CODE=VCC VOUT (V)	MAX1545 CODE=GND VOUT (V)
1	0	0	0	0	1.150	0.975	1.450
1	0	0	0	1	1.125	0.950	1.425
1	0	0	1	0	1.100	0.925	1.400
1	0	0	1	1	1.075	0.900	1.375
1	0	1	0	0	1.050	0.875	1.350
1	0	1	0	1	1.025	0.850	1.325
1	0	1	1	0	1.000	0.825	1.300
1	0	1	1	1	0.975	0.800	1.275
1	1	0	0	0	0.950	0.775	1.250
1	1	0	0	1	0.925	0.750	1.225
1	1	0	1	0	0.900	0.725	1.200
1	1	0	1	1	0.875	0.700	1.175
1	1	1	0	0	0.850	0.675	1.150
1	1	1	0	1	0.825	0.650	1.125
1	1	1	1	0	0.800	0.625	1.100
1	1	1	1	1	OFF	0.600	OFF

Table 2. MAX1544/MAX1545 Output Voltage Adjustment Settings (SUS=High or REF)

LOWER SUSPEND CODES				UPPER SUSPEND CODES			
SUS*	S1	S0	VOUT (V)	SUS*	S1	S0	VOUT (V)
High	GND	GND	0.675	REF	GND	GND	1.075
High	GND	REF	0.700	REF	GND	REF	1.100
High	GND	OPEN	0.725	REF	GND	OPEN	1.125
High	GND	VCC	0.750	REF	GND	VCC	1.150
High	REF	GND	0.775	REF	REF	GND	1.175
High	REF	REF	0.800	REF	REF	REF	1.200
High	REF	OPEN	0.825	REF	REF	OPEN	1.225
High	REF	VCC	0.850	REF	REF	VCC	1.250
High	OPEN	GND	0.875	REF	OPEN	GND	1.275
High	OPEN	REF	0.900	REF	OPEN	REF	1.300
High	OPEN	OPEN	0.925	REF	OPEN	OPEN	1.325
High	OPEN	VCC	0.950	REF	OPEN	VCC	1.350
High	VCC	GND	0.975	REF	VCC	GND	1.375
High	**VCC**	**REF**	**1.000**	REF	VCC	REF	1.400
High	VCC	OPEN	1.025	REF	VCC	OPEN	1.425
High	VCC	VCC	1.050	REF	VCC	VCC	1.450

****Note:** Connect the 3-level SUS input to a 2.7V or greater supply (3.3V or V_{CC}) for an input logic level high.*

Table 3. MAX1544/MAX1545 Operating Mode Truth Table

$\overline{SHDN}$	SUS	$\overline{SKIP}$	OFS	OUTPUT VOLTAGE	OPERATING MODE
GND	x	x	x	GND	Low-Power Shutdown Mode. DL_ is forced high, DH_ is forced low, and the PWM controller is disabled. The supply current drops to 1µA (typ).
V_{CC}	GND	V_{CC}	GND or REF	D0-D4 (No offset)	Normal Operation. The no load output voltage is determined by the selected VID DAC code (D0-D4, Table 1).
V_{CC}	x	REF	GND or REF	D0-D4 (No offset)	Dual-Phase Pulse Skipping Operation. When $\overline{SKIP}$ is set to 2V, the MAX1544/MAX1545 immediately enters dual-phase pulse skipping operation allowing automatic PWM/PFM switchover under light loads. Both MAX1980 slaves are disabled. The VROK upper threshold is blanked.
V_{CC}	x	GND	GND or REF	D0-D4 (No offset)	Single-Phase Pulse Skipping Operation. When $\overline{SKIP}$ is pulled to GND, the MAX1544/MAX1545 immediately enters single-phase pulse skipping operation allowing automatic PWM/PFM switchover under light loads. Both MAX1980 slaves are disabled. The VROK upper threshold is blanked.
V_{CC}	GND	x	0 to 0.8V or 1.2V to 2.0V	D0-D4 (Plus offset)	Deep Sleep Mode. The no load output voltage is determined by the selected VID DAC code (D0-D4, Table 1) plus the offset voltage set by OFS.
V_{CC}	REF or High	x	x	SUS, S0-S1 (Offset disabled)	Suspend Mode. The no load output voltage is determined by the selected suspend code (SUS, S0-S1, Table 2), overriding all other active modes of operation.
V_{CC}	x	x	x	GND	Fault Mode. The fault latch has been set by either UVP, OVP (if enabled), or thermal shutdown. The controller will remain in FAULT mode until V_{CC} power is cycled or $\overline{SHDN}$ toggled.

MAX1544/MAX1545 Evaluation Kits

Reduced Power Dissipation Voltage Positioning

The MAX1544/MAX1545 EV kit uses voltage positioning to decrease the size of the output capacitor and to reduce power dissipation at heavy loads. Current-sense resistors (R2 and R9=1mΩ) are used to sense the inductor current and adjust the output voltage. The current-sense resistors dissipate some power but the net power savings are substantial. This EV kit further improves efficiency by using an internal op-amp gain stage to allow a reduction in the sense resistor value.

The MAX1544 op amp is configured for a gain of 2.5 (only 2 phases sensed) providing a -1.25mV/A voltage-positioning slope at the output when all four phases are active. The MAX1545 op amp is configured for a gain of 3 providing a slope of -1.5mV/A. Remote output and ground sensing eliminate any additional PC board voltage drops.

Dynamic Output Voltage Transition Experiment

Observe the output voltage transition between 1.00V and 1.50V by setting jumpers JUA0–JUA4 to 1.50V and toggling the SUS input between GND and VCC, respectively. This is the worst-case transition and should complete within 100µs.

This EV kit is set to transition the output voltage at 1-LSB per 2µs. The speed of the transition can be altered by changing resistor R7 (60.4kΩ).

During the voltage transition, watch the inductor current by looking across R2 and/or R9 with a differential scope probe or by inserting a current probe in series with the inductor. Observe the low, well-controlled inductor current that accompanies the voltage transition. The same slew rate and controlled inductor current are used during shutdown and startup, resulting in well-controlled currents into and out of the battery (input source).

There are two other methods to create an output voltage transition. Select D0–D4 (JUA0–JUA4). Then either manually change the JUA0–JUA4 jumpers to a new VID code setting (Table 1), or remove all jumpers and drive the VID0–VID4 PC board test points externally to the desired code settings.

Load-Transient Experiment

One interesting experiment is to subject the output to large, fast load transients and observe the output with an oscilloscope. This necessitates careful instrumentation of the output, using the supplied scope-probe jack. Accurate measurement of output ripple and load-transient response invariably requires that ground clip leads be completely avoided and that the probe must be removed to expose the GND shield, so the probe can be plugged directly into the jack. Otherwise, EMI and noise pickup corrupt the waveforms.

Most benchtop electronic loads intended for power supply testing lack the ability to subject the DC-DC converter to ultra-fast load transients. Emulating the supply current di/dt at the CPU VCORE pins requires at least 10A/µs load transients. One easy method for generating such an abusive load transient is to solder a power MOSFET directly across the scope-probe jack. Then drive its gate with a strong pulse generator at a low duty cycle (< 5%) to minimize heat stress in the MOSFET. Vary the high-level output voltage of the pulse generator to vary the load current.

To determine the load current, you might expect to insert a meter in the load path, but this method is prohibited here by the need for low resistance and inductance in the path of the dummy load MOSFET. There are two easy alternative methods of determining how much load current a particular pulse-generator amplitude is causing. The easiest method is to observe the currents through inductors L1 and L2 with a calibrated AC current probe, such as a Tektronix AM503, or by looking across R2 and R9 with a differential probe. In the buck topology, the load current is approximately equal to the average value of the inductor currents.

TON Settings

Jumper JU4 selects the MAX1544/MAX1545 switching frequency.

Note: Always set the MAX1980 slaves to the same switching frequency as the MAX1544/MAX1545.

Note: When changing the switching frequency, recalculate the inductor and output capacitor values using the equations in the MAX1544/MAX1545 and MAX1980 datasheets.

Table 4. Jumper JU4 Function (TON Setting)

SHUNT POSITION	TON PIN	MAX1544/MAX1545 SWITCHING FREQUENCY
1 and 2	Connected to GND	550kHz. Short R104 and R108 to set the MAX1980s to 550kHz.
1 and 3 (Default)	Connected to REF	300kHz.
1 and 4	Connected to V_{CC}	200kHz. Short R105 and R109 to set the MAX1980s to 200kHz.
Not installed	VR_ON driven by external signal	100kHz. Not supported by MAX1980. Disable MAX1980 when setting MAX1544/MAX1545 at 100kHz for highest suspend mode efficiency.

Table 5. PIN19 Function and Setting

PIN 19	MAX1544 (OVP PIN)	MAX1545 (CODE PIN)
High	Overvoltage Protection Enabled	Selects Mobile P4 VID code set
Low	Overvoltage Protection Disabled	Selects Desktop P4 VID code set

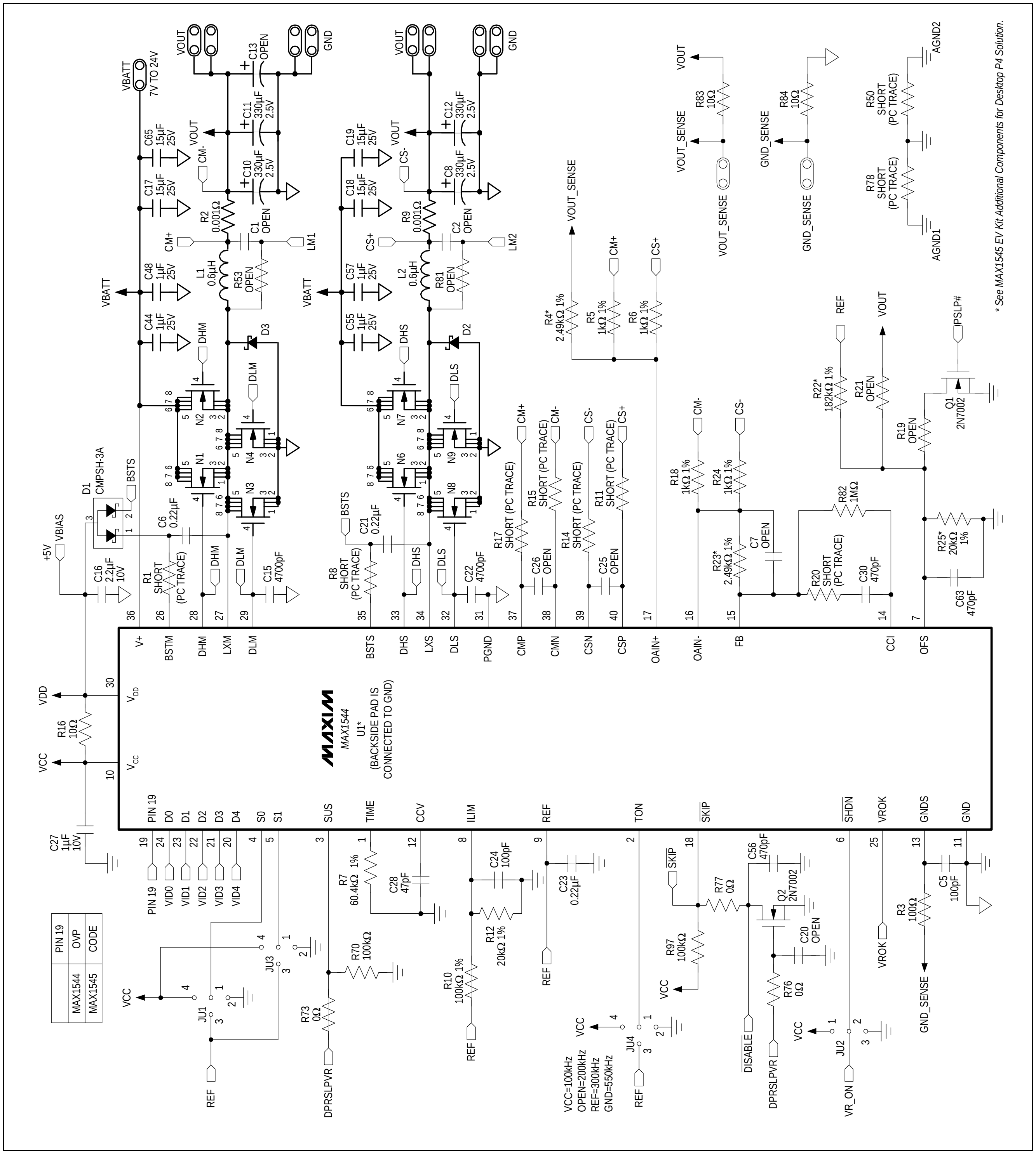

Figure 1a. MAX1544 EV Kit Schematic (Sheet 1 of 3)

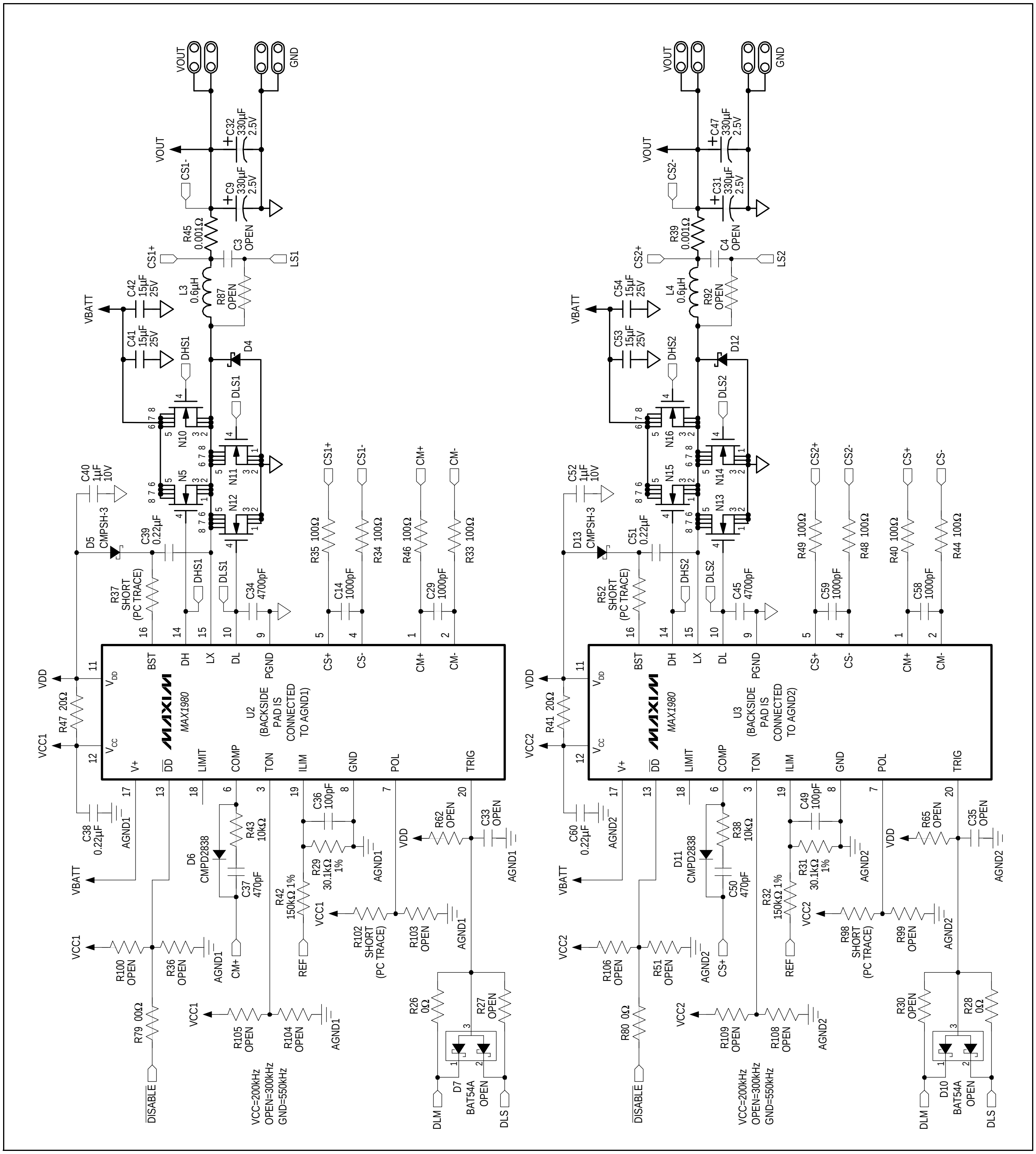

Figure 1b. MAX1544 EV Kit Schematic (Sheet 2 of 3)

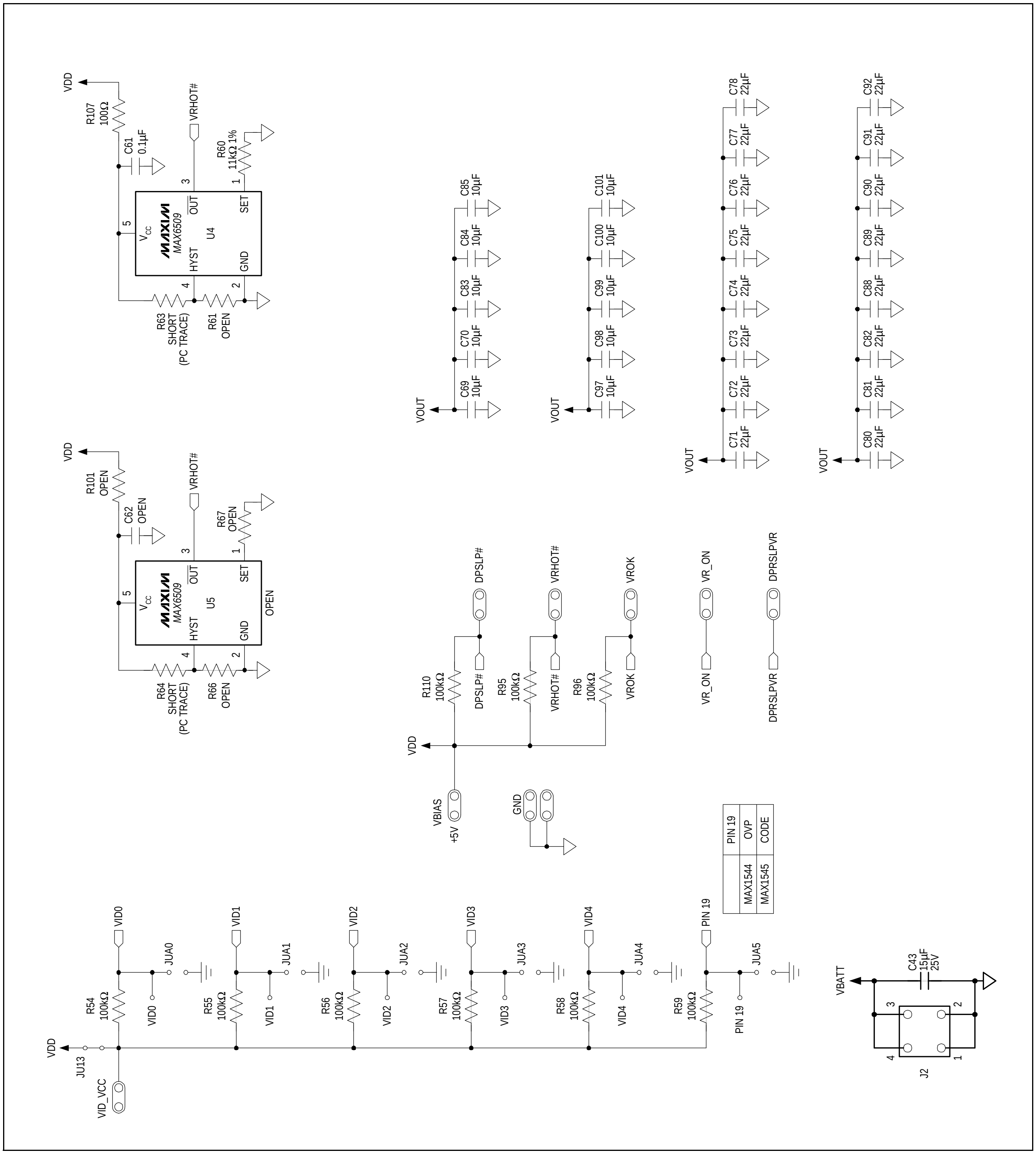

Figure 1c. MAX1544 EV Kit Schematic (Sheet 3 of 3)

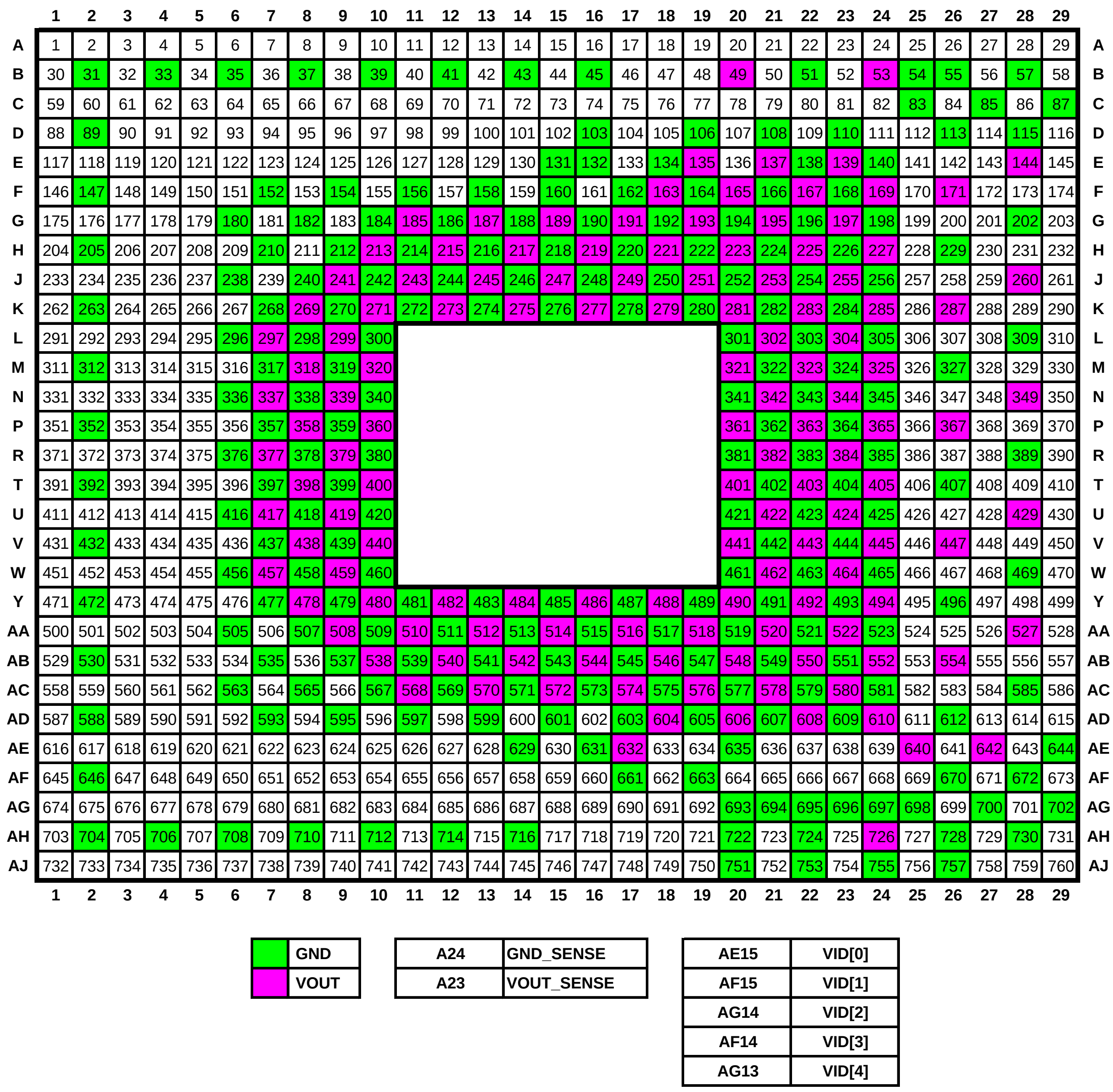

Figure 3. CPU Socket (U8) pinout

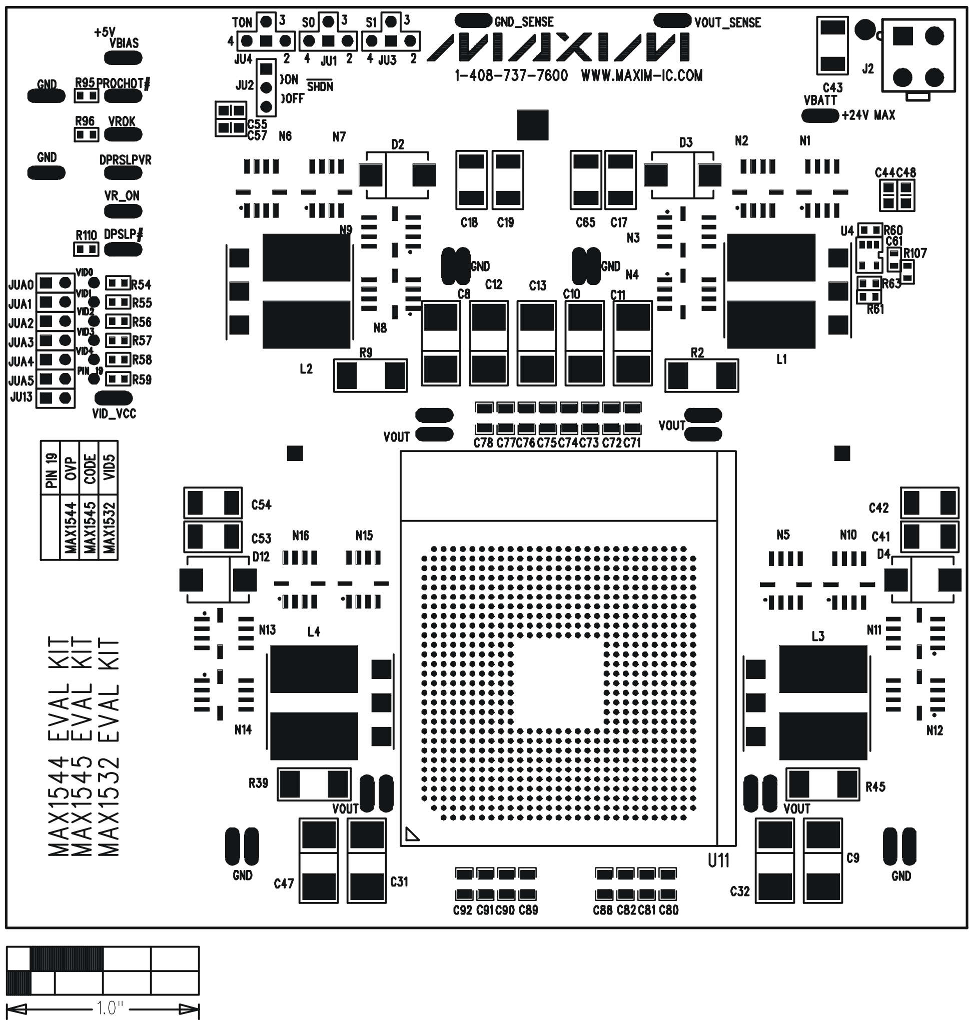

Figure 4. MAX1544/MAX1545 EV Component Placement Guide - Top Side

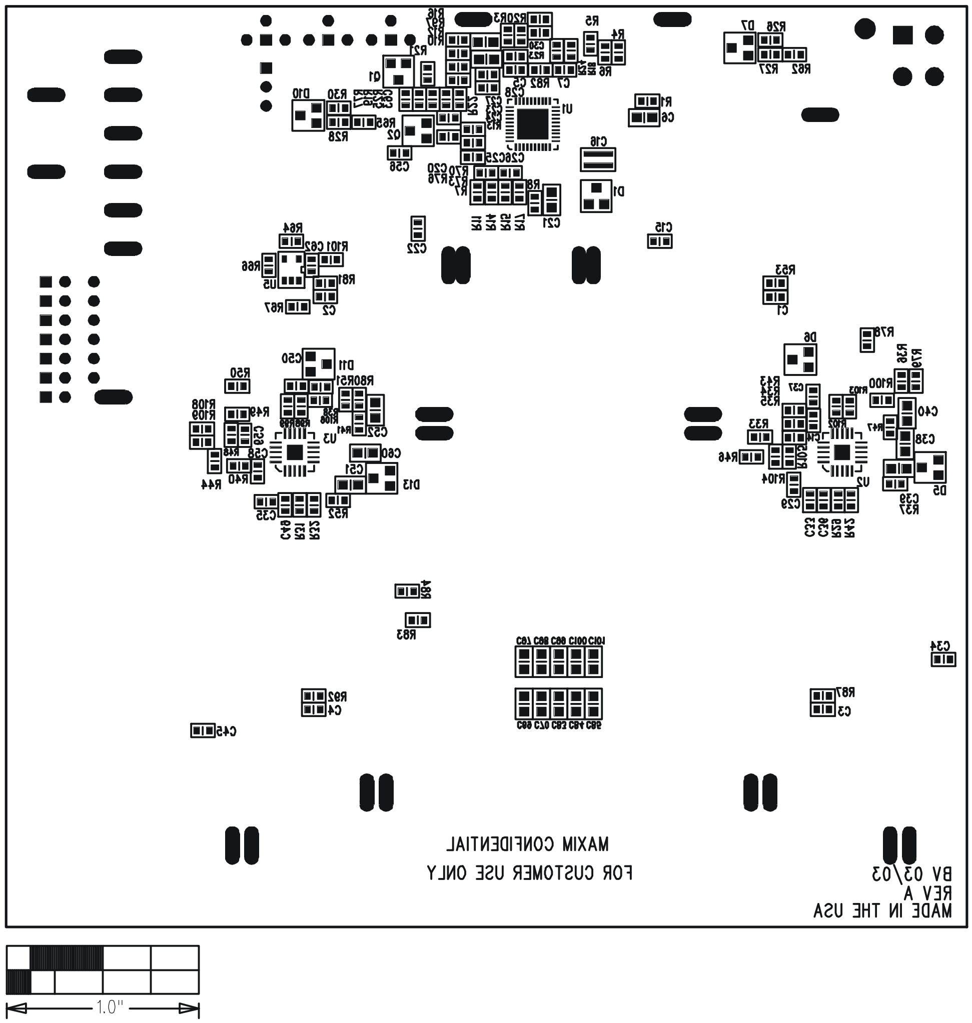

Figure 5. MAX1544/MAX1545 EV Kit Component Placement Guide - Bottom Side

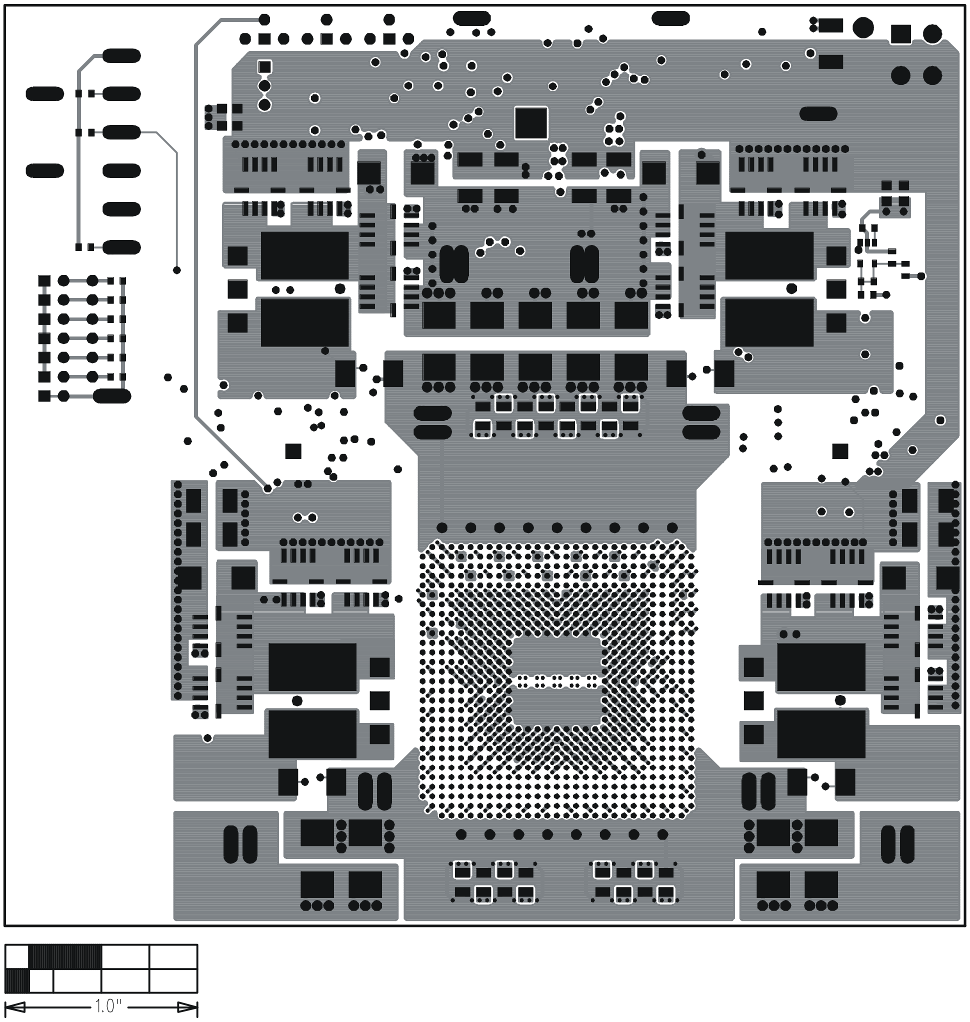

Figure 6. MAX1544/MAX1545 EV Kit PC Board Layout – Top Side

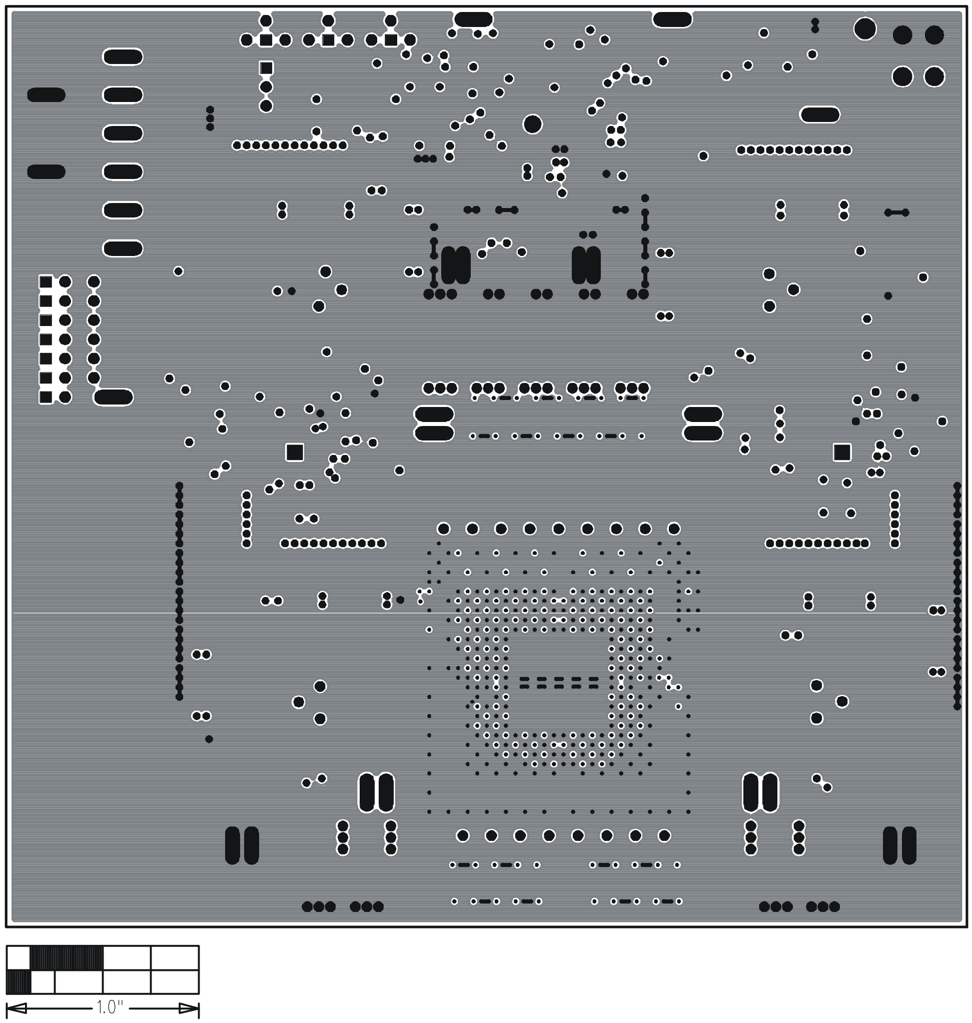

Figure 7. MAX1544/MAX1545 EV Kit PC Board Layout – GND Layer 2

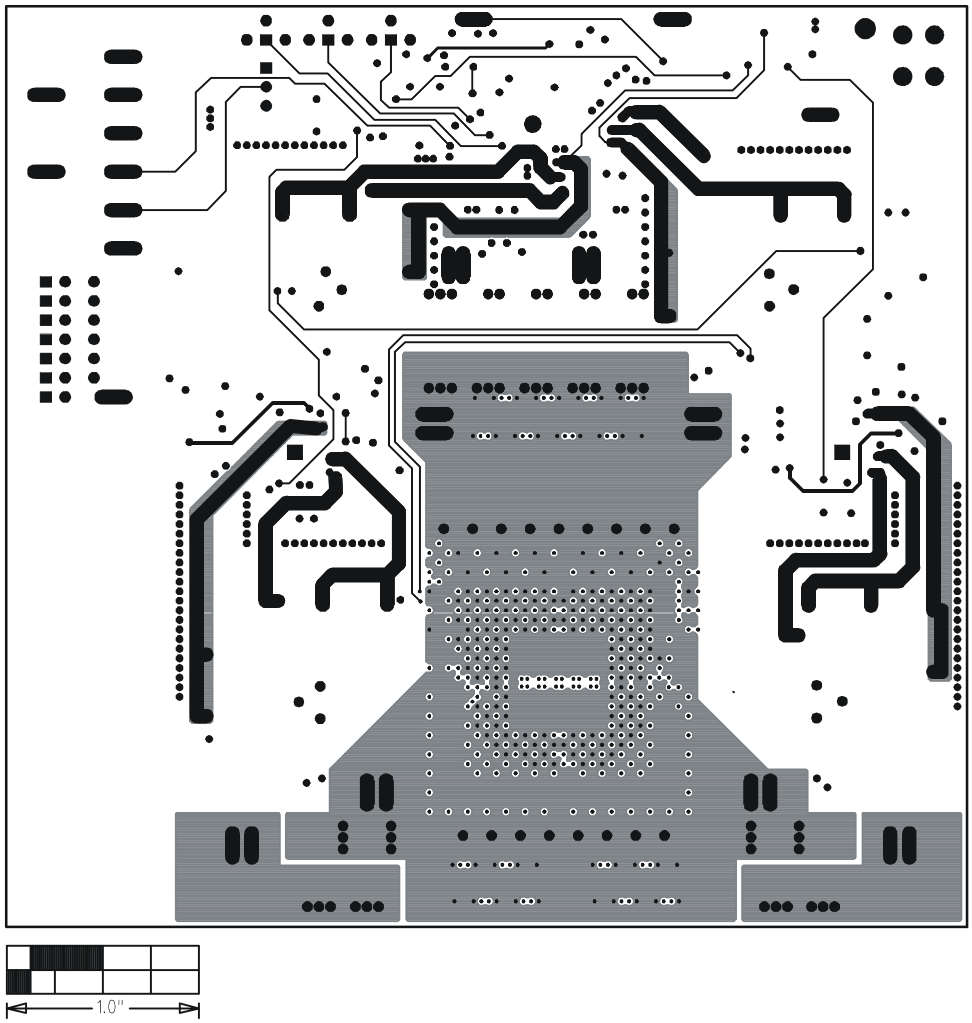

Figure 8. MAX1544/MAX1545 EV Kit PC Board Layout – Signal Layer 3

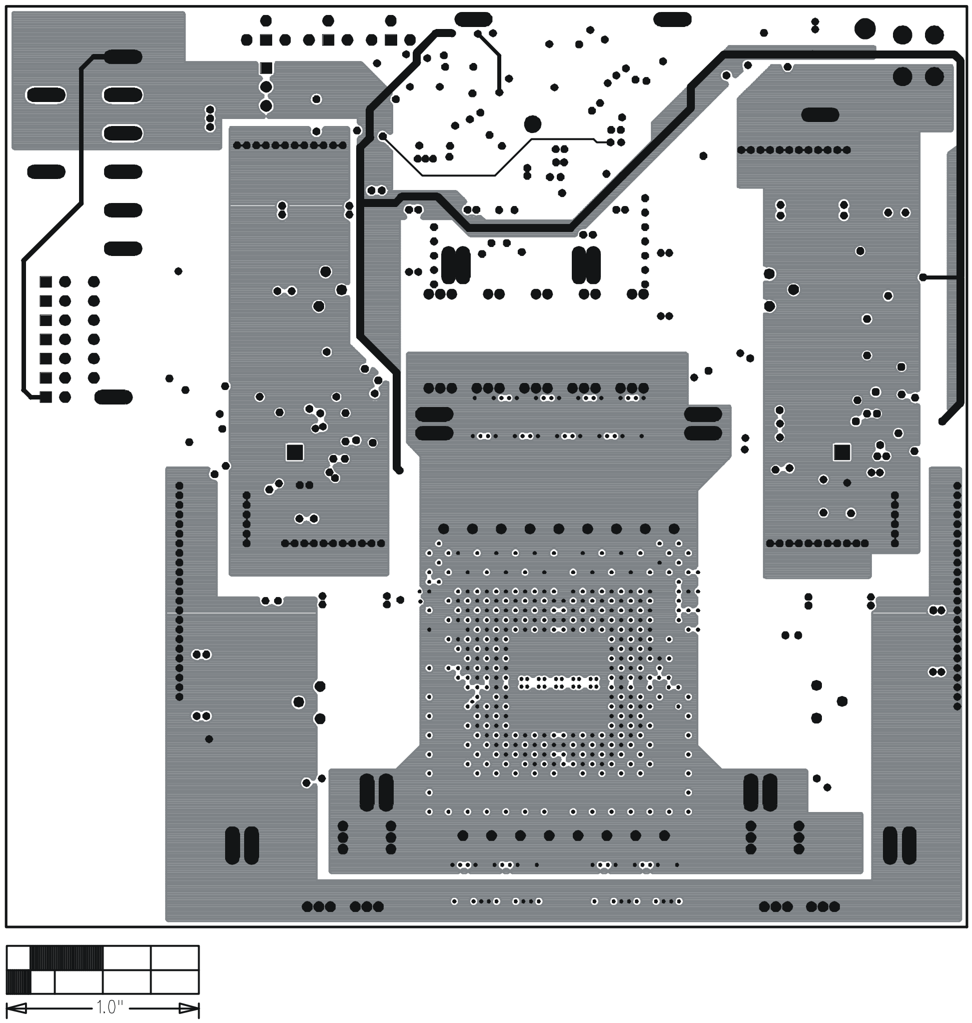

Figure 9. MAX1544/MAX1545 EV Kit PC Board Layout – Layer 4

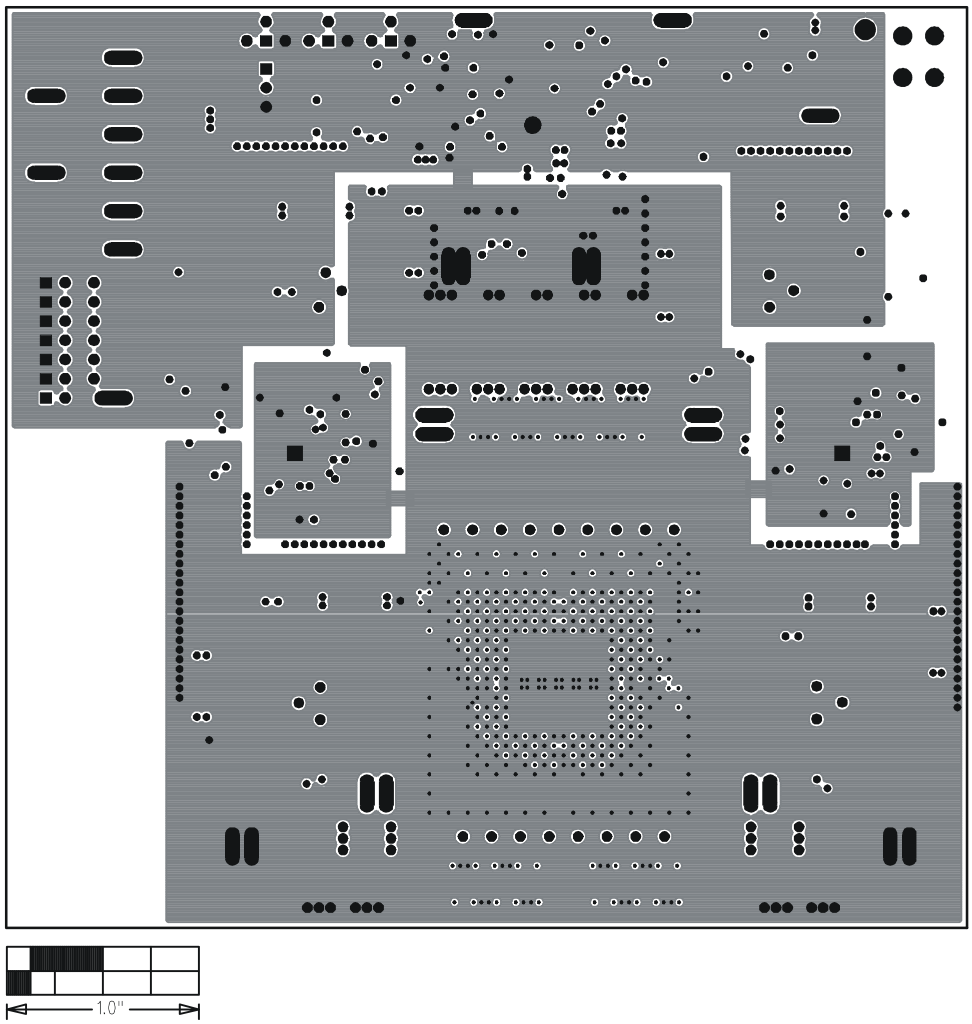

Figure 10. MAX1544/MAX1545 EV Kit PC Board Layout – Layer 5

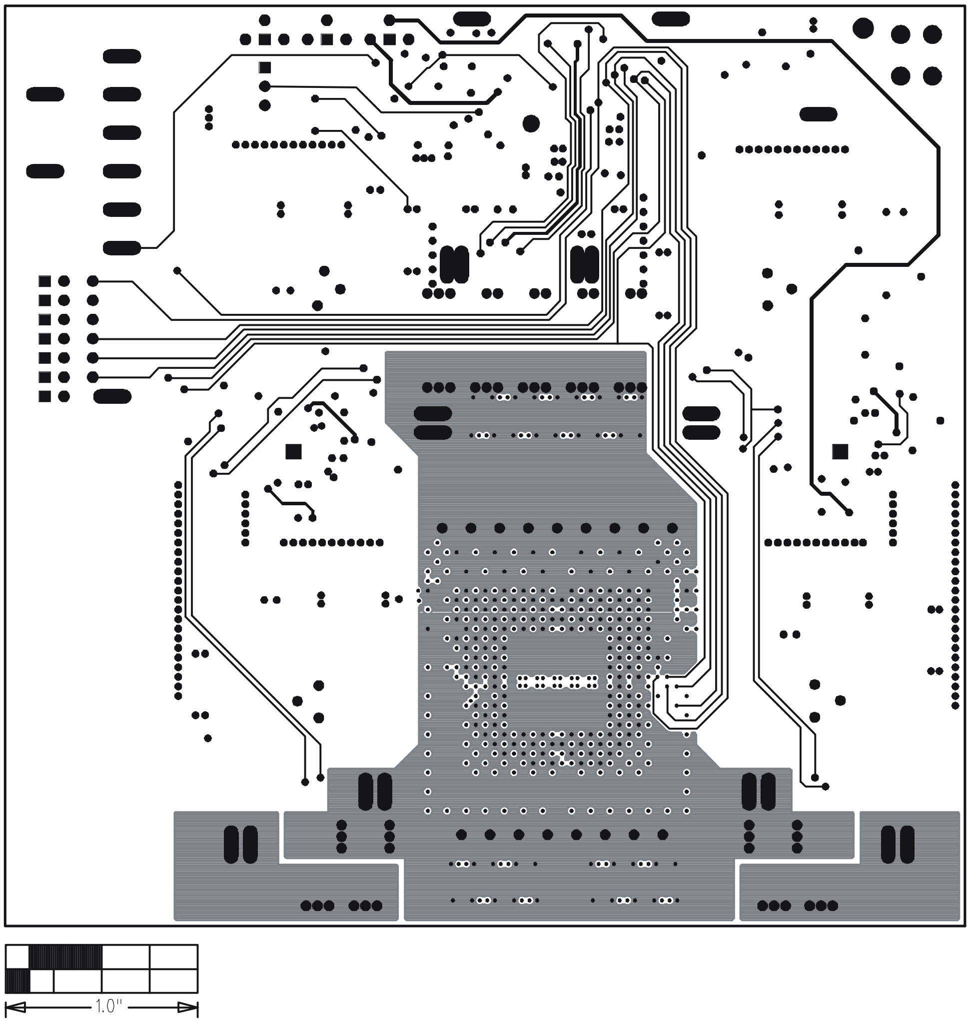

Figure 11. MAX1544/MAX1545 EV Kit PC Board Layout – Layer 6

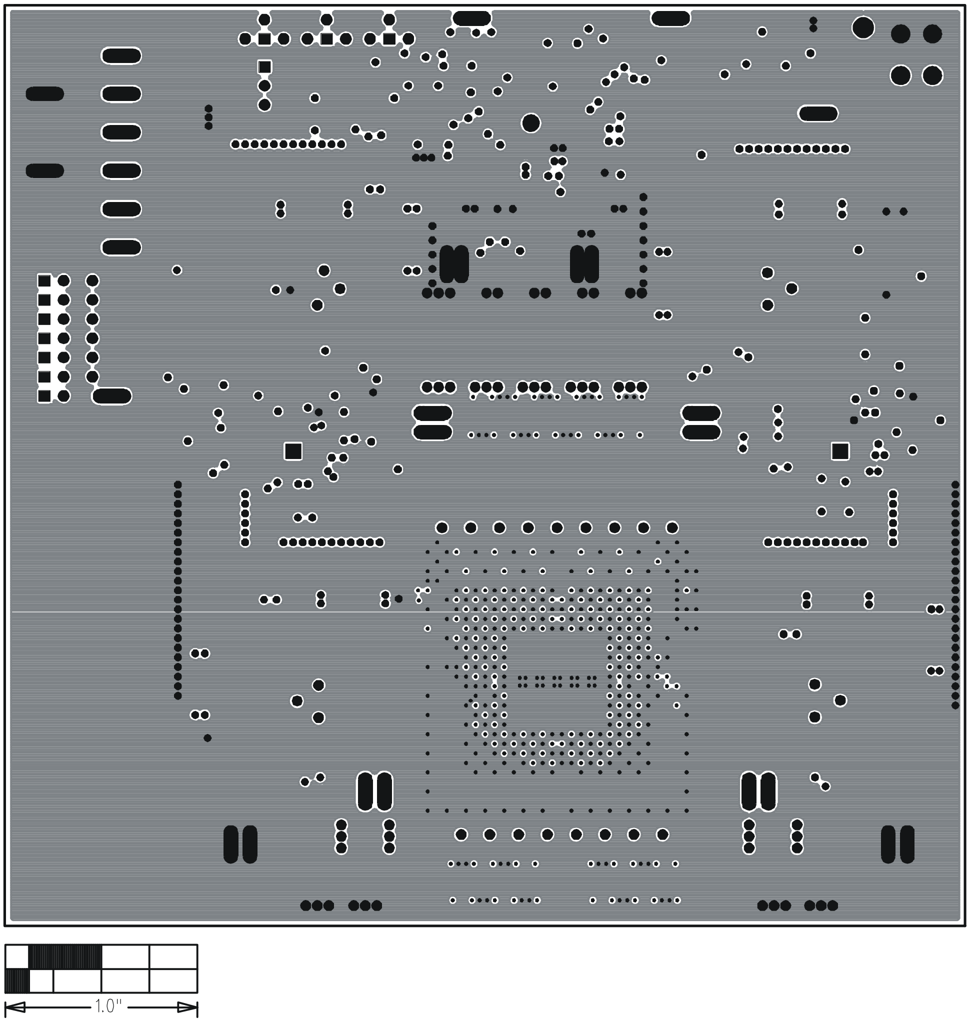

Figure 12. MAX1544/MAX1545 EV Kit PC Board Layout – Layer 7

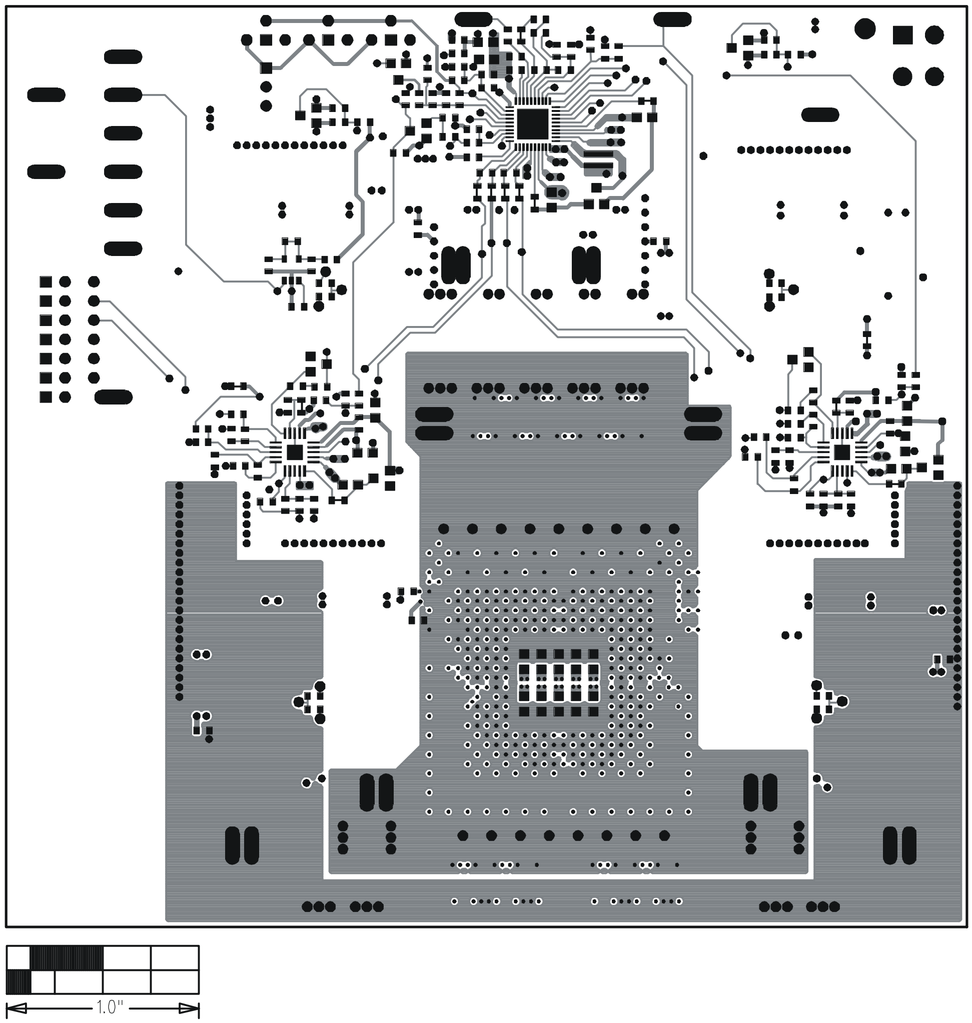

Figure 13. MAX1544/MAX1545 EV Kit PC Board Layout – Bottom Layer