19-4489; Rev 0; 2/09

MAX14514 Evaluation Kit

Evaluates: MAX14514

General Description

The MAX14514 evaluation kit (EV kit) provides a proven design to evaluate the MAX14514 dual high-voltage EL lamp drivers. The EV kit also includes Windows® 2000/XP- and Windows Vista®-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX14514.

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Features

- **USB Powered**
- **Windows 2000/XP- and Windows Vista (32-Bit)-Compatible Software**
- **Lead(Pb)-Free and RoHS Compliant**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX14514EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
COM (x2), V1, V2	4	Wire assembly with micro alligator clip (steel, 5A) and vinyl insulator (black) Mueller BU34 Mueller BU36-0
C1	1	2200pF ±10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H222K
C2	1	1000pF ±10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H102K
C3	1	68pF ±5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H680J
C4, C7, C10, C11, C12	5	1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C105K
C5	1	3300pF ±20%, 250V X5R ceramic capacitor (0805) Murata GRM21AR72E332K
C6	1	10µF ±10%, 16V X7R ceramic capacitor (1206) Murata GRM31CR71C106K
C8, C9	2	18pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H180J
C13–C16	4	4.7µF ±10%, 10V X5R ceramic capacitors (0805) Murata GRM219R61A475K
C17–C25	9	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
D1	1	200V, 50ns fast-recovery diode (SOD 323)
D2	1	Green LED (0603)
EXT_VDD, VBATT	2	Multipurpose test points, red
FB1	1	120Ω at 100MHz, 200mA ferrite bead (0603) Murata BLM18RK121SN1
GND1, GND2	2	Multipurpose test points, black
J1	1	USB type-B right-angle receptacle
J2, J3	0	Not installed, dual-row (2 x 5) headers
JU1–JU7	7	3-pin headers
JU8	1	2-pin header
L1	1	220µH inductor (3.10mm x 3.10mm x 1mm) Cooper Bussmann SD3110-221-R
R1, R7	2	100kΩ ±5% resistors (0603)
R2, R3	2	33.2Ω ±1% resistors (0603)
R4	1	10kΩ ±5% resistor (0603)
R5	1	10.5kΩ ±1% resistor (0603)
R6	1	6.49kΩ ±1% resistor (0603)
R8	1	680Ω ±5% resistor (0603)
R9	1	1MΩ ±5% resistor (0603)
U1	1	High-voltage, dual-output EL driver (14 TDFN-EP*) Maxim MAX14514ETD+

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U2	1	USB peripheral controller (24 TQFN-EP*) Maxim MAX3420EETG+
U3	1	Microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+
U4	1	MAXII CPLD (100 TQFP) Altera EPM240T100C5N
U5	1	2.5V LDO regulator (5 SC70) Maxim MAX8511EXK25+
U6	1	200mA adjustable-output LDO regulator (6 SOT23) Maxim MAX8880EUT+

DESIGNATION	QTY	DESCRIPTION
VR1, VR2, VR3	3	2MΩ top-adjust, 12-turn trimmers (2mm)
Y1	1	12MHz crystal Hong Kong X'tals SSM1200000E18FAE
Y2	1	40MHz clock oscillator Hong Kong X'tals C437BM4000000AE00
—	8	Shunts
—	1	USB high-speed A-to-B cables, 6ft
—	1	PCB: MAX14514 Evaluation Kit+

**EP = Exposed pad.*

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Altera Corporation	408-544-7000	www.altera.com
Cooper Bussmann	916-941-1117	www.cooperet.com
Hong Kong X'tals Ltd.	852-35112388	www.hongkongcrystal.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com

Note: *Indicate that you are using the MAX14514 when contacting these component suppliers.*

MAX14514 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX14514.EXE	Application program
UNINST.INI	Uninstalls the EV kit software

Quick Start

Recommended Equipment

- MAX14514 EV kit (USB cable included)
- A user-supplied Windows 2000/XP- or Windows Vista-compatible PC with a spare USB port
- Up to two electroluminescent (EL) lamp elements

Note: In the following sections, software-related items are identified by bolding. Text in **bold** refers to items directly from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

Procedure

The MAX14514 EV kit is fully assembled and tested. Follow the steps below to verify board operation:

1) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 14514Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
2) Install the EV kit software on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied and icons are created in the Windows **Start | Programs** menu.
3) Verify that all jumpers (JU1–JU8) are in their default positions, as shown in Table 1.

Table 1. MAX14514 EV Kit Jumper Descriptions (JU1–JU8)

JUMPER	SIGNAL	SHUNT POSITION	DESCRIPTION
JU1	DIM1	1-2	DIM1 connected to GND through VR1
		2-3*	DIM1 connected to the CPLD
JU2	DIM2	1-2	DIM2 connected to GND through VR2
		2-3*	DIM2 connected to the CPLD
JU3	CAP	1-2*	CAP connected to GND through C1 (2200pF)
		2-3	CAP connected to VDD
JU4	EL	1-2	EL connected to GND through C2 (1000pF)
		2-3*	EL connected to the CPLD
JU5	SW	1-2	SW connected to GND through C3 (68pF)
		2-3*	SW connected to the CPLD
JU6	Booster input	1-2	Booster input connected to external supply on VBATT
		2-3*	Booster input connected to the USB power bus (5V nominal)
JU7	VDD	1-2	VDD connected to external supply on EXT_VDD
		2-3*	VDD connected to the USB power bus (5V nominal)
JU8	EN	Open	EN pulled low by R9
		Closed*	EN controlled by the microcontroller (high by default)

**Default position.*

4) Connect an electroluminescent (EL) lamp between alligator clips V1 and COM.
5) Optionally, connect a second EL lamp between alligator clips V2 and COM.
6) Connect the USB cable from the PC to the EV kit board. The PC should recognize the EV kit as a human interface device. Verify that the D2 green LED is turned on.
7) Check that the EL lamp(s) is off.
8) Start the MAX14514 EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software main window appears, as shown in Figure 1.
9) Click on the **Enable** radio button in the **Device Enable** group box on the GUI to enable the MAX14514. Check that the EL lamp(s) is turned on.
10) In the software, moving the scrollbars of the **PWM Duty Cycle** will change the brightness of the EL lamp(s).

Detailed Description of Software

The main window of the evaluation software (Figure 1) lets a user set the EL voltage switching frequency, boost-converter switching frequency, and PWM signals on the DIM1 and DIM2 control pins. The user can also enable or disable the device by clicking on the **Enable** or **Disable** radio button.

The **Connect USB** button lets a user set up the communication between the software and the EV kit. The **Disconnect USB** button lets a user stop the communication between the software and the EV kit.

Detailed Description of Hardware

The MAX14514 utilizes an inductor-based boost converter to generate the high voltage necessary to drive EL lamps, and allows the use of a 220µH inductor to effectively drive total combined lamp sizes of up to 20nF.

For the inductors recommended in the MAX14514 IC data sheet, lowering the boost-converter frequency increases the chance of saturation, which may lead to the part's damage. A combined lamp over 20nF may overload the part and could lead to the part's damage. Refer to the MAX14514 IC data sheet for the selection of component values.

The MAX14514 EV kit provides two ways to evaluate the MAX14514, through a GUI-based approach or an analog trimmer-based approach. The default jumper settings are for the GUI-based approach.

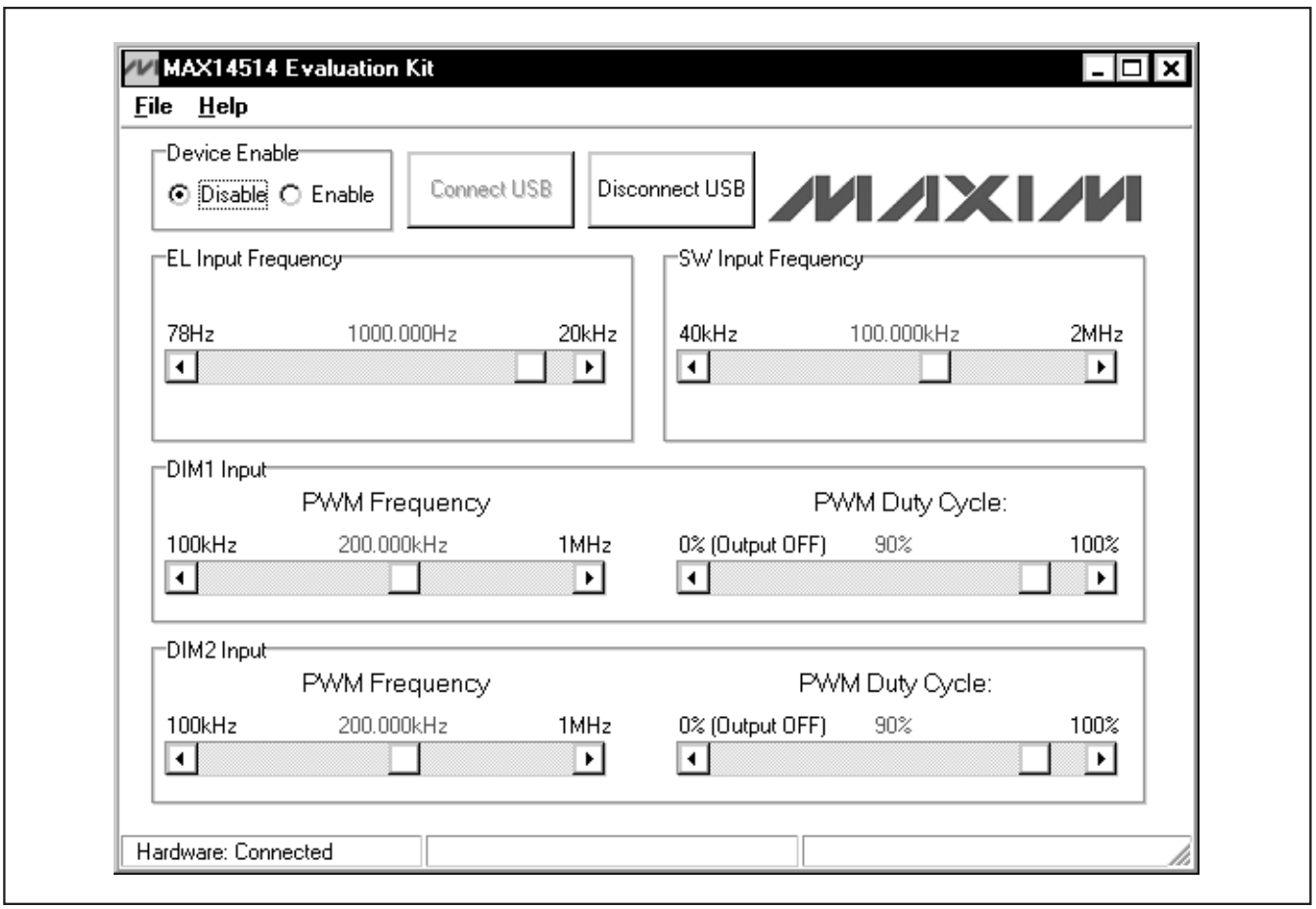

Figure 1. MAX14514 EV Kit Software Main Window

In the GUI-based approach, jumpers JU1, JU2, JU4, and JU5 are in the 2-3 position. The MAX14514 DIM1, DIM2, EL, SW, and EN pins are connected to the programmable logic device (CPLD) or the microcontroller, which generates programmable signals according to the settings on the software GUI.

In the analog trimmer-based approach, jumpers JU1, JU2, JU4, and JU5 are in the 1-2 position. The DIM1 pin is connected to ground through VR1, the DIM2 pin is connected to ground through VR2, the EL pin is connected to ground through C2 (1000pF), and the SW pin is connected to ground through C3 (68pF).

Power Supplies

By default, the MAX14514 EV kit is powered by USB. The MAX14514 VDD supply and the boost-converter supply input are connected to the USB power bus (5V nominal). They can be applied externally through test points VBATT and EXT_VDD on the EV kit, respectively. See Table 1 for details.

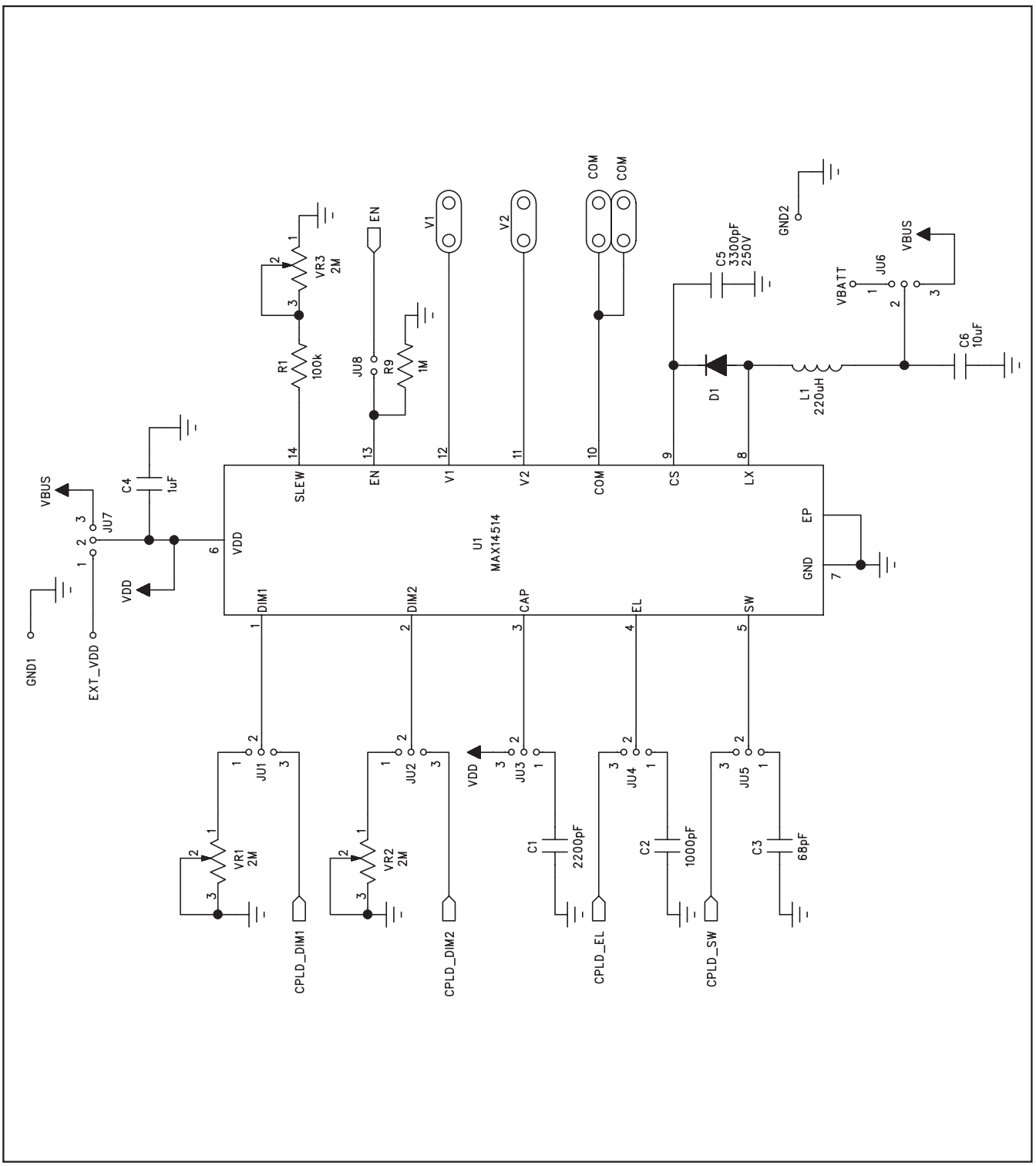

Figure 2a. MAX14514 EV Kit Schematic (Sheet 1 of 3)

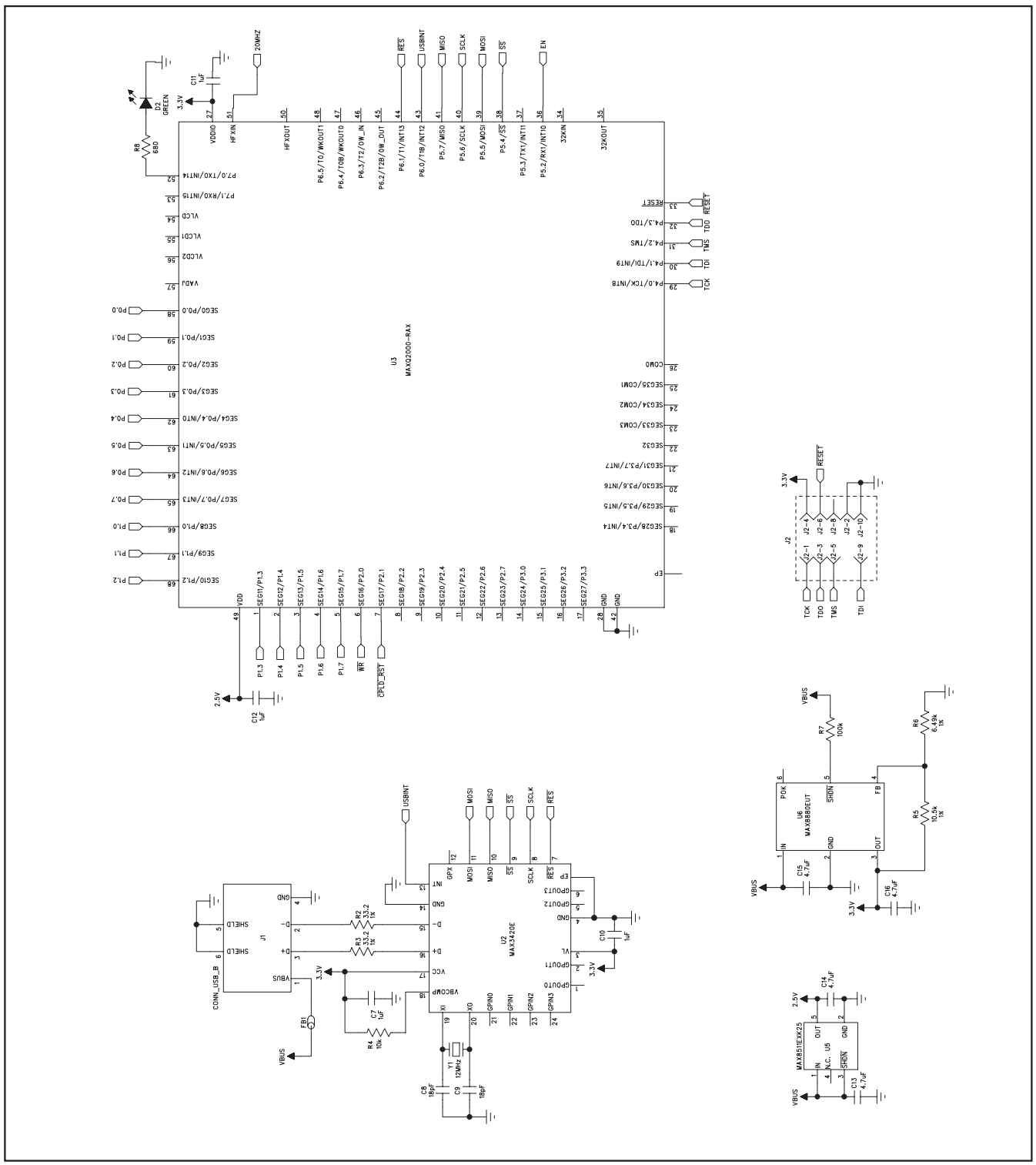

Figure 2b. MAX14514 EV Kit Schematic (Sheet 2 of 3)

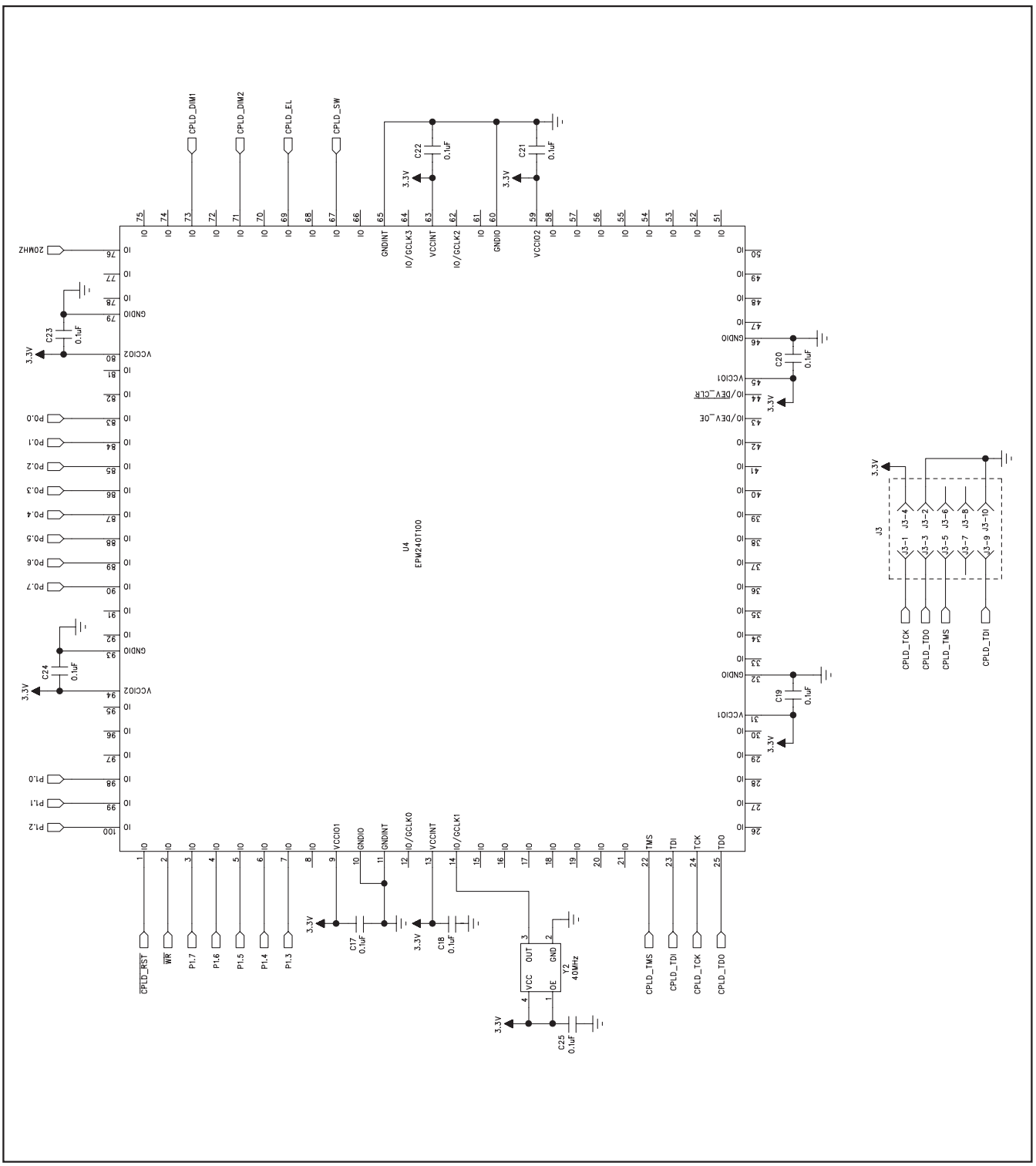

Figure 2c. MAX14514 EV Kit Schematic (Sheet 3 of 3)

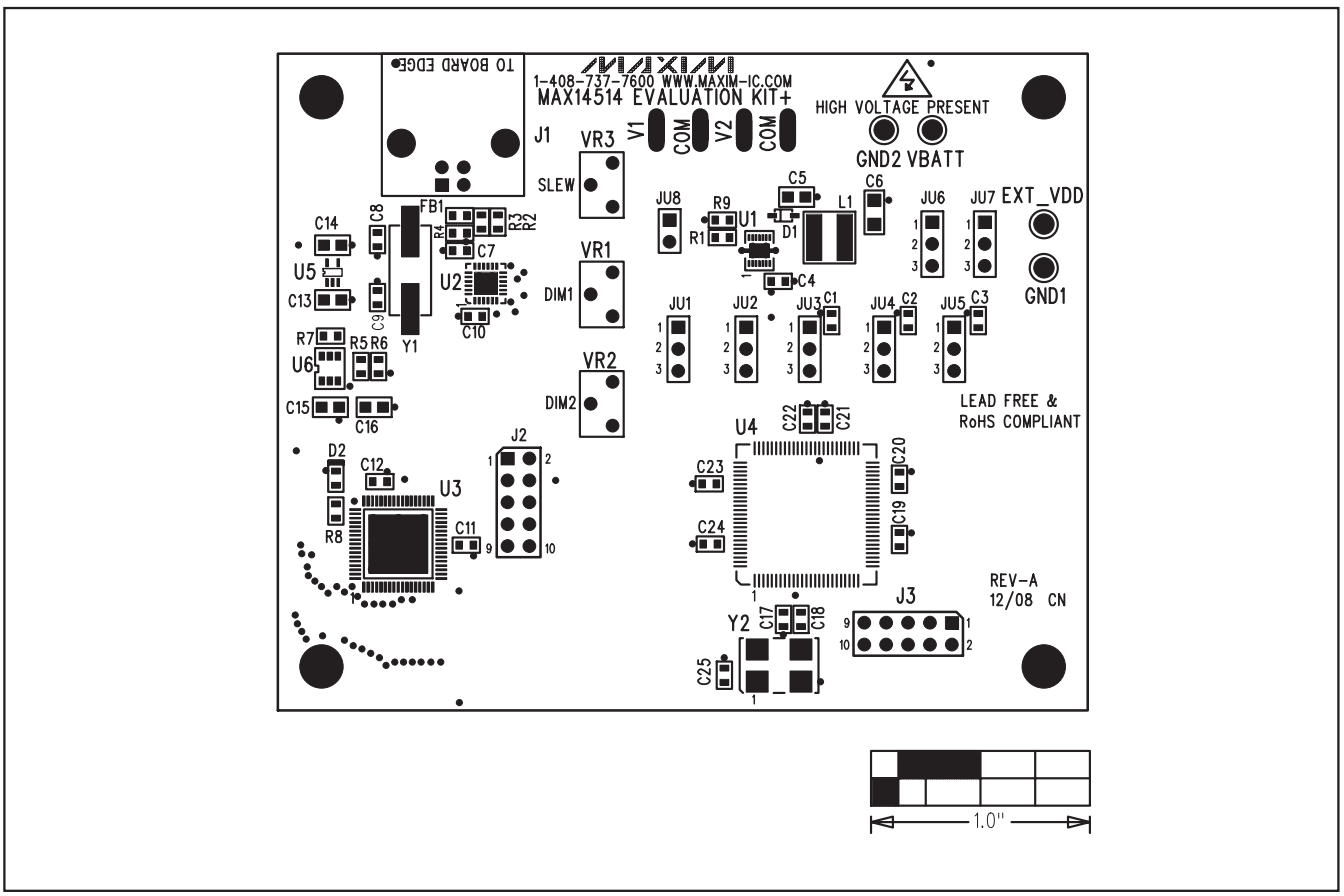

Figure 3. MAX14514 EV Kit Component Placement Guide—Component Side

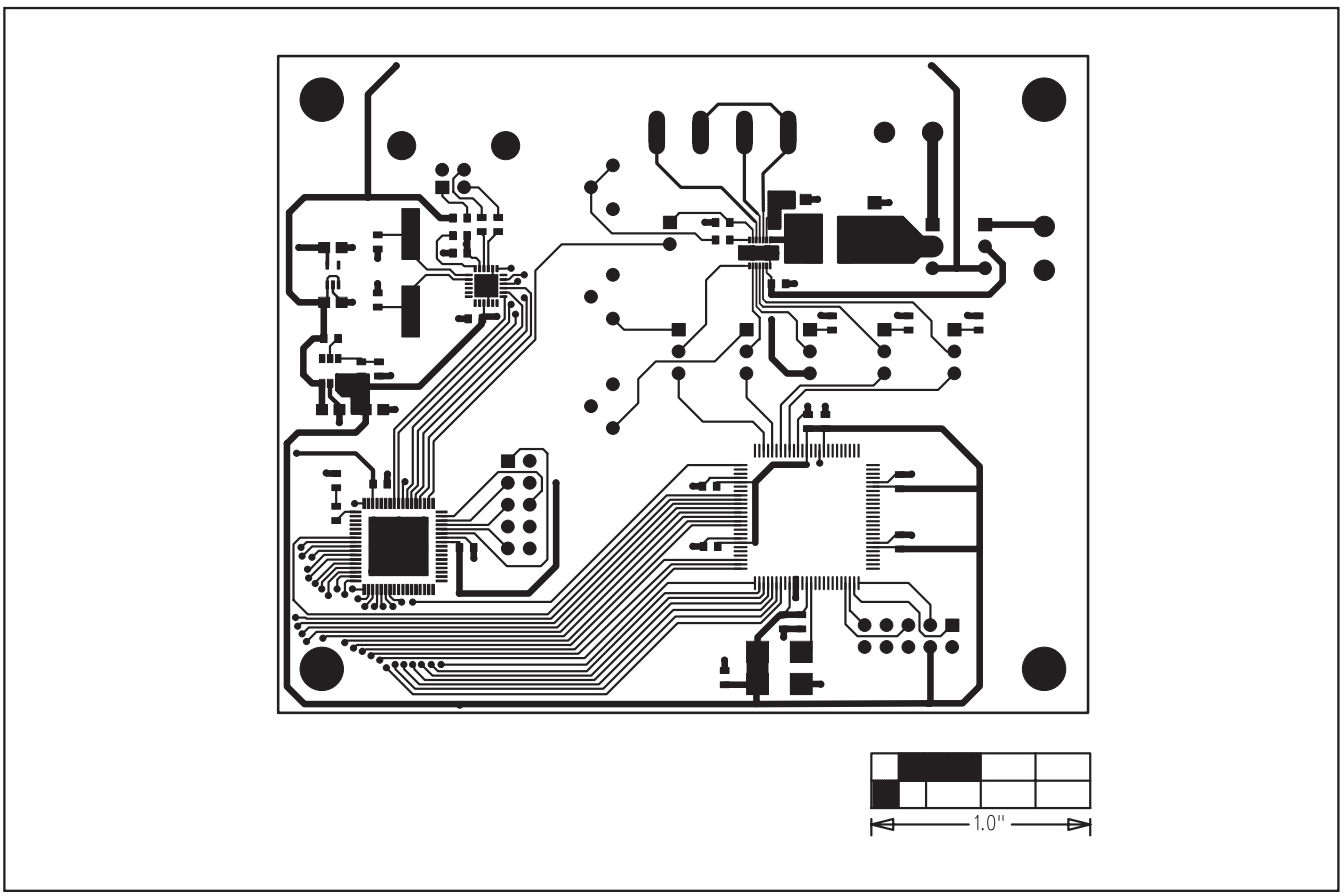

Figure 4. MAX14514 EV Kit PCB Layout—Component Side

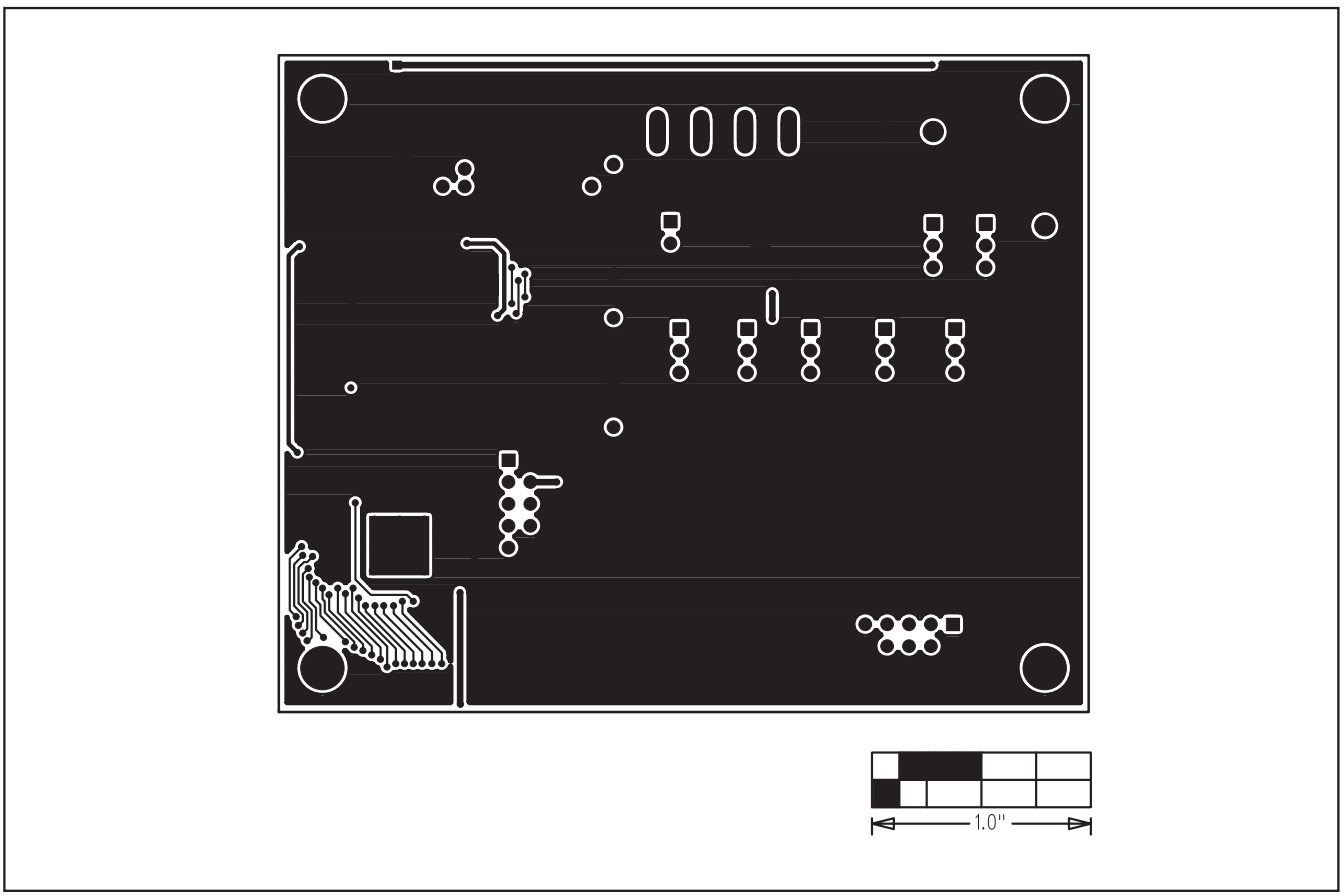

Figure 5. MAX14514 EV Kit PCB Layout—Solder Side

Mouser Electronics

Authorized Distributor

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Maxim Integrated:

MAX14514EVKIT+