DS4404 Evaluation Kit

Evaluates: DS4402/DS4404

General Description

The DS4404 and DS4402 contain two or four I²C-programmable current DACs that are each capable of sinking and sourcing current.

The DS4404 evaluation kit (EV kit) provides the hardware and software graphical user interface (GUI) necessary to evaluate the DS4404 4-channel, 5-bit sink/source current DAC. The DS4402 has the same performance as the DS4404, except with only two channels. The DS4404 EV kit software is the same as the DS4424 EV kit software.

The EV kit includes a DS4404 installed, as well as two populated full-scale calibration resistors (R3 and R4) and two unpopulated resistors (R5 and R6). This allows the device to be evaluated without any board rework on two channels, but enables a custom-defined value to be populated on the two open channels. The EV kit also has the USB-to-I²C interface required to communicate to the device.

Features

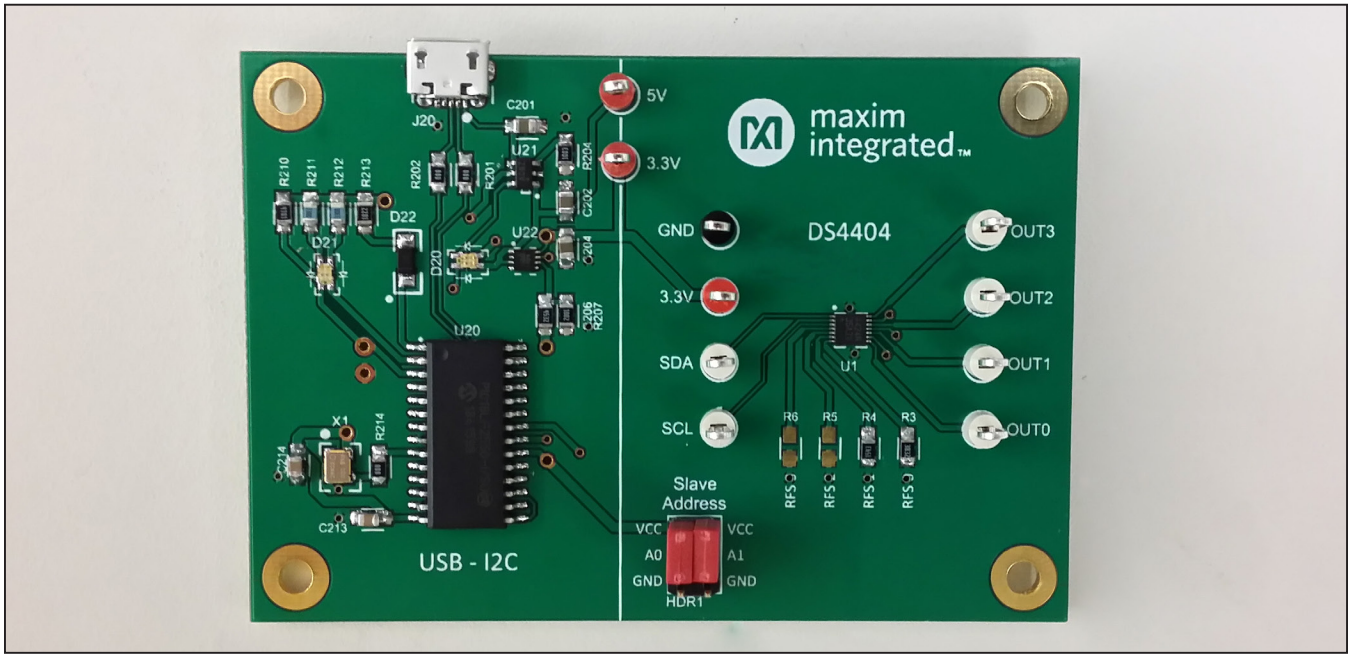
- Easy Evaluation of the DS4404
- EV Kit Hardware is USB Powered
- USB HID Interface
- Windows XP®- and Windows® 7-Compatible Software
- RoHS Compliant
- Proven PCB Layout
- Fully Assembled and Tested

EV Kit Contents

- Assembled Circuit Board Including DS4404

***Ordering Information* appears at end of data sheet.**

DS4404 EV Kit Photo



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DS4404 EV Kit Files

FILE	DESCRIPTION
DS4424EVKitSoftwareInstall.EXE	Application program

Note: *The .EXE file is downloaded as a .ZIP file.*

Quick Start

Required Equipment

- DS4404 EV kit hardware
- Windows XP or Windows 7 PC
- USB port
- Micro-USB cable

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

Procedure

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

1) Place the EV kit hardware on a nonconductive surface to ensure that nothing on the PCB gets shorted together.
2) Prior to starting the GUI, connect the EV kit hardware to a PC using the mini-USB cable, or equivalent. The power LED (D20) should be green and the com LED (D21) should be red and slowly flash orange.
3) Windows should automatically begin installing the necessary device driver. The USB interface of the EV kit hardware is configured as an HID device and therefore does not require a unique/custom device driver. Once the driver installation is complete, a Windows message appears near the **System Icon** menu, indicating that the hardware is ready to use. Do not attempt to run the GUI prior to this message. If you do, then you must close the application and restart it once the driver installation is complete. On some versions of Windows, administrator privileges may be required to install the USB device.
4) Once the device driver installation is complete, visit www.maximintegrated.com/evkitsoftware to download the latest version of the EV kit software, DS4424EVKitSoftwareInstall.ZIP. Save the EV kit software to a temporary folder.
5) Open the .ZIP file and double-click the .EXE file to run the installer. A message box stating **The publisher could not be verified. Are you sure you want to run this software?** may appear. If so, click **Yes**.
6) The installer GUI appears. Click **Next** and then **Install**. Once complete, click **Close**.
7) Go to **Start | All Programs**. Look for the **DS4424EVKitSoftware** folder and click on the DS4424EVKitSoftware.EXE inside the folder.
8) When the GUI appears, the text in the bottom right-hand corner should display **EV Kit Hardware Connected**. The com LED (D21) on the EV kit board should turn green.

Detailed Description of Software

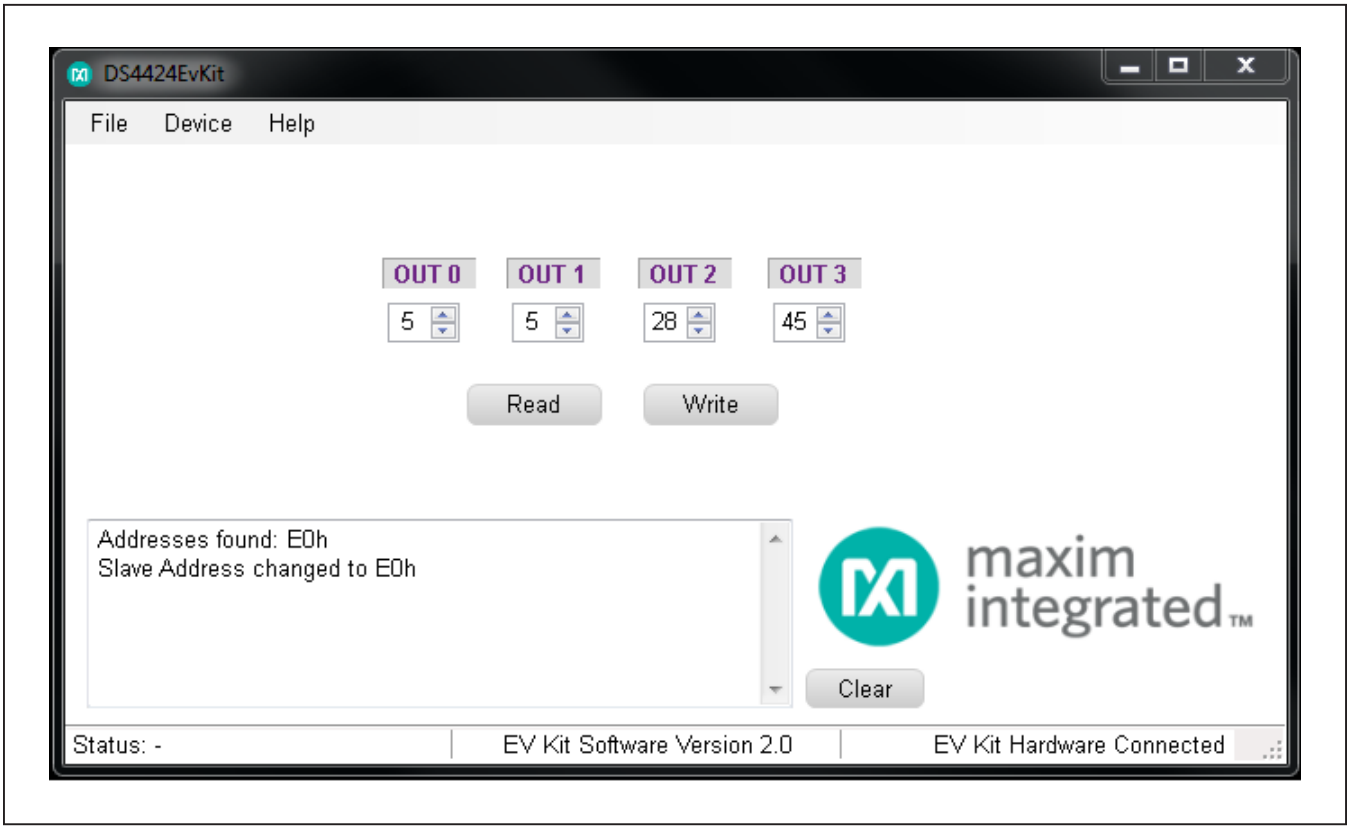

Figure 1. DS4404 EV Kit GUI

Software Startup

If the DS4404 EV kit is connected when the software is opened, the software first initializes the hardware to communicate. The software then searches for all slave addresses on the I²C bus and connects to the first valid slave address. The GUI displays **EV Kit Hardware Connected** in the bottom right-hand corner. If the EV kit is not connected on software startup, then the GUI populates with default EV kit values. Once the EV kit is connected, the GUI executes the sequence above.

Menu and Status Bar

The **File** menu item contains an exit option. To exit, select **Exit**. The **Device** menu item allows the user to connect to a desired device. **Find Slave Addresses** searches for all slave addresses connected to the I²C bus. To select a device, click **Select Slave Address** and all the slave addresses found are shown and are selectable.

Status Log

The status log located at the bottom left-hand side of the GUI displays all the actions the GUI performs. Whenever an I²C command is read or written, the action is confirmed by the log. The log can be cleared by clicking on the **Clear** button.

Status Tab

The **Status** tab, located on the bottom of the GUI, displays the current status, EV kit software version, and whether or not the hardware is connected.

Communicating with the Device

To read and write from the selected slave address, there are two buttons labeled **Read** and **Write**. Clicking the **Read** button updates the four register values displayed on the GUI. All values are represented in a hexadecimal format. To send data, type or use the up/down arrows to adjust the registers to the appropriate values. Then click the **Write** button.

Detailed Description of Hardware

Changing the Slave Address

The slave address for the DS4404 can be changed by changing the configuration of the jumpers on HDR1. Use two jumpers to connect the A0 and A1 nodes to either V_{CC}, N.C., or GND. The resulting address is shown in Table 1.

Troubleshooting

All efforts have been made to ensure that each kit works on the first try, right out of the box. In the rare occasion that a problem is suspected, see Table 3 to help troubleshoot the issue.

Table 1. Slave Addresses

A1	A0	SLAVE ADDRESS (HEXADECIMAL)
GND	GND	90h
GND	V_{CC}	92h
V_{CC}	GND	94h
V_{CC}	V_{CC}	96h
N.C.	GND	98h
N.C.	V_{CC}	9Ah
GND	N.C.	9Ch
V_{CC}	N.C.	9Eh
N.C.	N.C.	A0h

Table 2. Description of LEDs

LED	COLOR	DESCRIPTION
D20 (Power)	Red	USB Power Fault: A fault occurred due to overvoltage limit, current limit, or thermal limit.
	Green	USB Power: USB power supply is on.
D21 (Com)	Red	Communication: After the software has initialized the hardware, the LED flashes red when an I^2C command is received.
	Green	Initialized: Hardware has been initialized by software.

Table 3. Troubleshooting

SYMPTOM	CHECK	SOLUTION
GUI says hardware not found	Is the LED labeled D20 red?	If yes, then the electronic fuse is in a fault state. Inspect for electrical shorts on the PCB and make sure that the PCB is not sitting on a conductive surface.
	Does the LED labeled D21 turn green when the GUI is running?	If not, then exit the GUI and try running it again. If D20 still does not turn green, then exit the GUI and try connecting the USB cable to a different USB port on the PC and wait for a Windows message that states the hardware is ready to use. Run the GUI again.
	Are any of the LEDs illuminated?	If not, then the PCB may not be getting power from the USB. Try a different USB cable or a different USB port.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C212	2	0.1µF ±10%, 100V ceramic capacitors (0805) TDK CGA4J2X7R2A104K
C201, C202, C204	3	10µF ±10%, 16V ceramic capacitors (0805) Taiyo Yuden EMK212ABJ106KD-T
C203, C214	2	0.01µF ±10%, 100V ceramic capacitors (0805) Murata GRM21BR72A103K
C211	1	1.0µF ±10%, 50V ceramic capacitor (0805) TDK C2012X7R1H105K/SOFT
C213	1	0.22µF ±10%, 50V ceramic capacitor (0805) TDK C2012X7R1H224K
C215	1	Do not populate, ceramic capacitor
D20, D21	2	Dual red/green LEDs (0805) Knightbright APHBM2012SURKCGKC
D22	1	30V, 3A Schottky diode (MINI2) Panasonic SSG DB2W31900L
HDR1	1	6-pin, dual-row header 3M 961206-6404-AR
J20	1	USB micro-B receptacle Molex 105017-0001
J21	1	2-pin, single-row header 3M 961102-6404-AR
R1, R2, R210	3	4.7kΩ ±1% resistors (0805)
R3	1	4.75kΩ ±1% resistor (0805)
R4	1	19.1kΩ ±1% resistor (0805)
R5, R6	0	Not populated, to allow user to select the full-scale calibration current for these outputs
R201, R202, R214	3	0Ω ±1% resistors (0805)
R203, R205	2	560Ω ±1% resistors (0805)
R204	1	100kΩ ±1% resistor (0805)
R206	1	45.3kΩ ±1% resistor (0805)
R207	1	10kΩ ± 1% resistor (0805)
R211, R212	2	330Ω ±1% resistors (0805)
R213	1	2.2kΩ ±1% resistor (0805)
Ref1	0	Do not populate
TP1, TP9, TP10	3	Red test points Keystone 5010
TP2	1	Black test point Keystone 5011
TP3–TP8	6	White test points Keystone 5012
U1	1	2-/4-channel, I2C, 5-bit sink/source current DAC (14 TDFN-EP*) Maxim DS4404N+
U20	1	Microcontroller (28 SO) Microchip PIC18LF2550-I/SO
U21	1	50mA to 600mA programmable current-limit switch (6 SOT23) Maxim MAX4995AAUT+
U22	1	500mA low-noise LDO regulator (8 TDFN-EP*) Maxim MAX8902BATA+
X1	1	48MHz, 3.3V oscillator, 3.2mm x 2.5mm SMD AVX KC3225A48.0000C30E00

**EP = Exposed pad.*

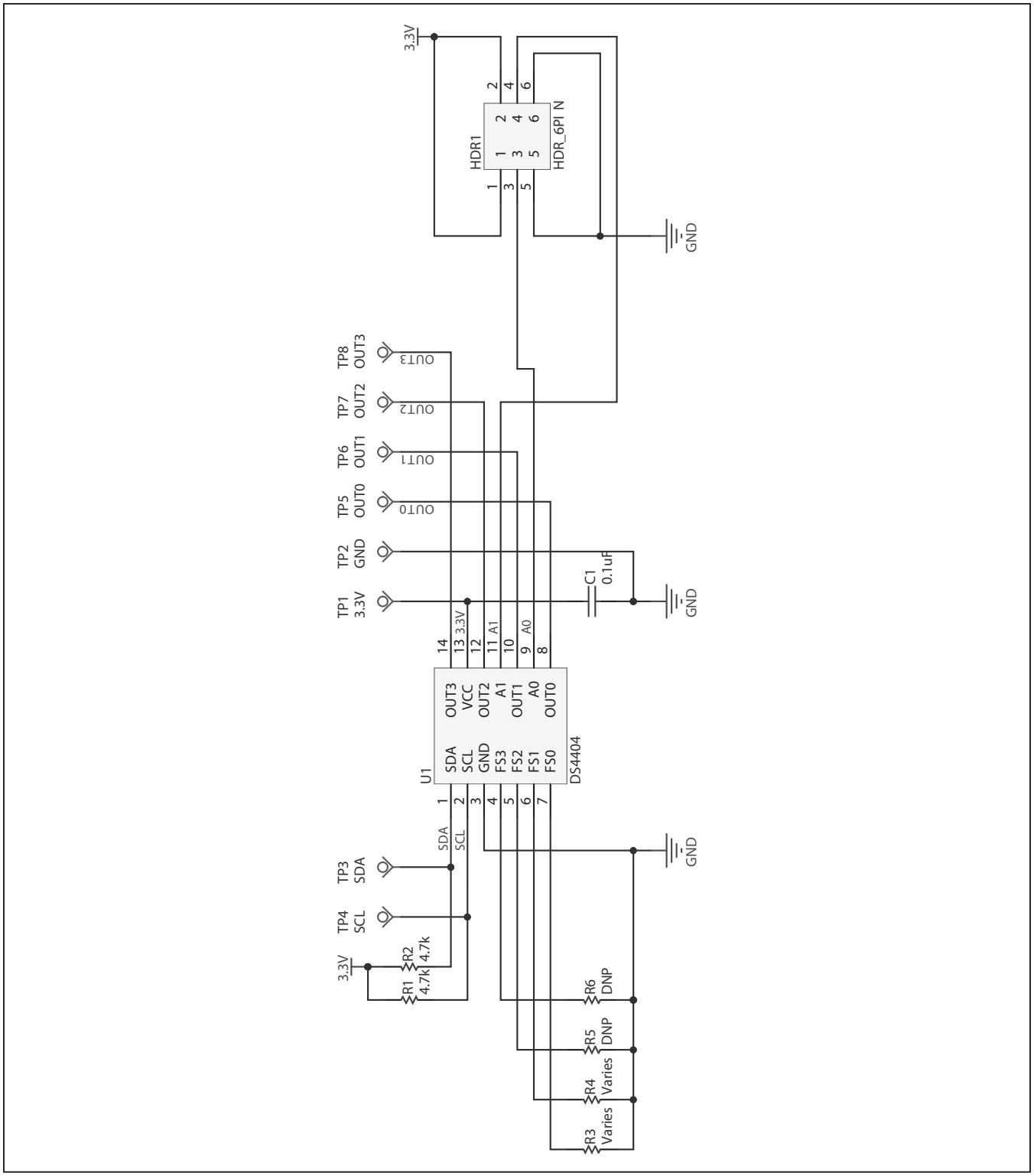

Figure 2a. DS4404 EV Kit Schematic (Sheet 1 of 2)

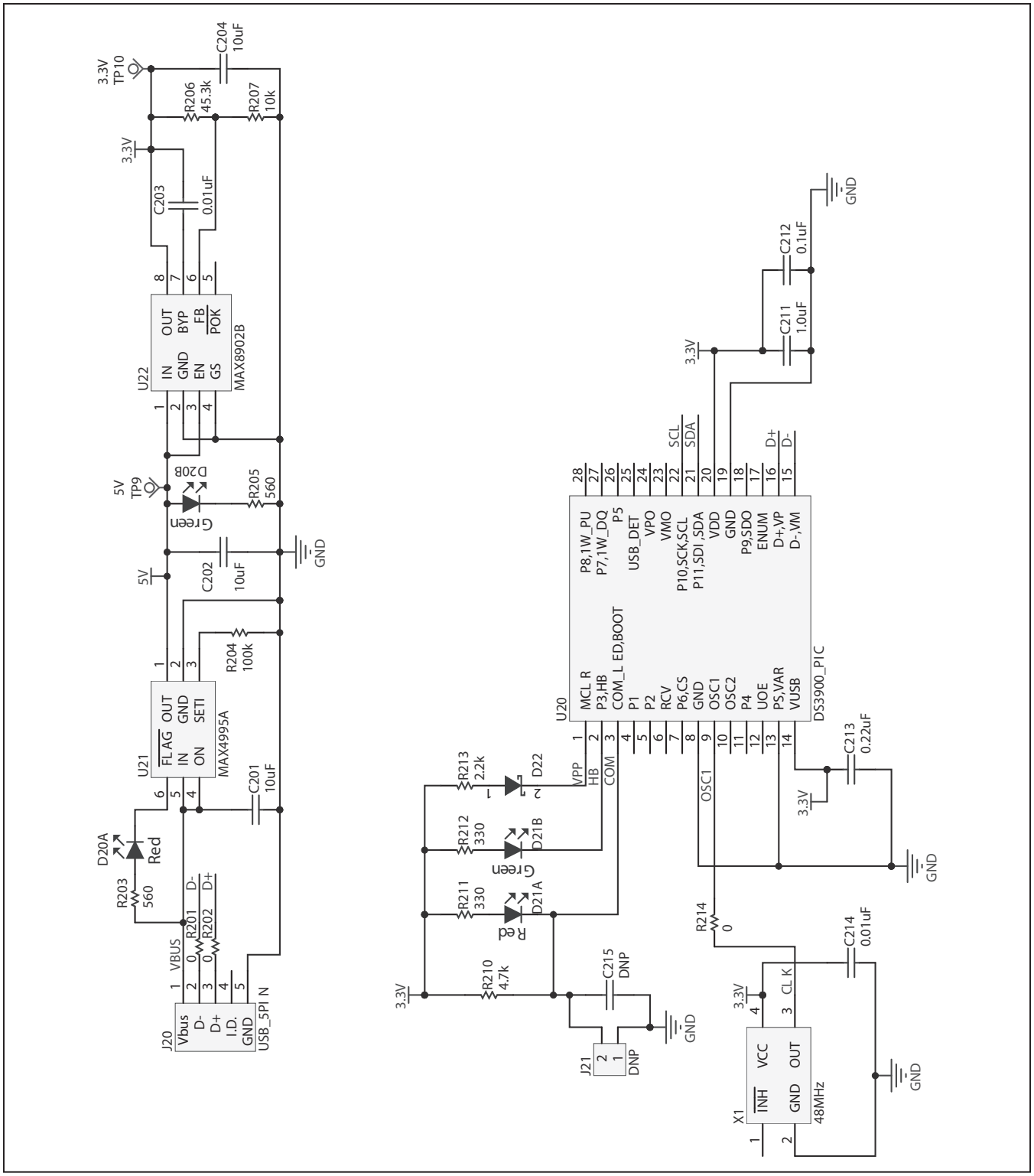

Figure 2b. DS4404 EV Kit Schematic (Sheet 2 of 2)

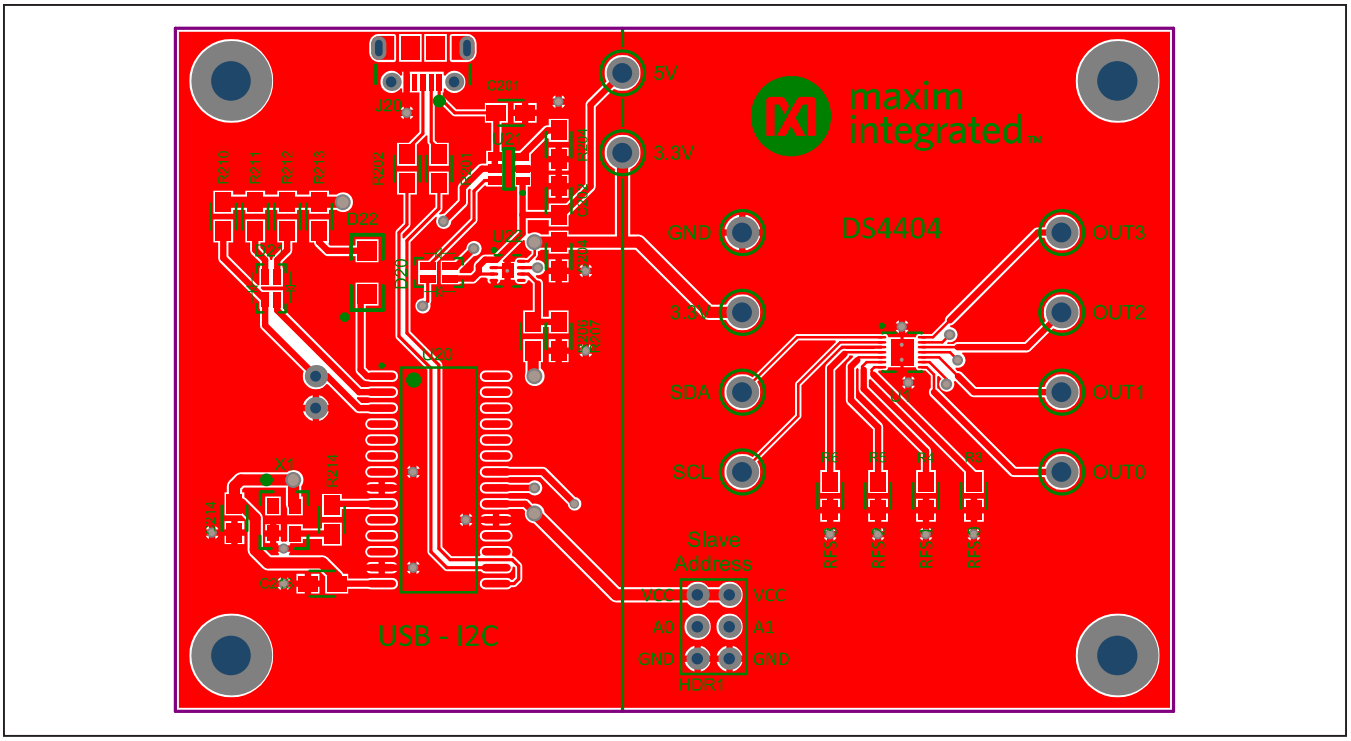

Figure 3. DS4404 EV Kit PCB Layout—Top

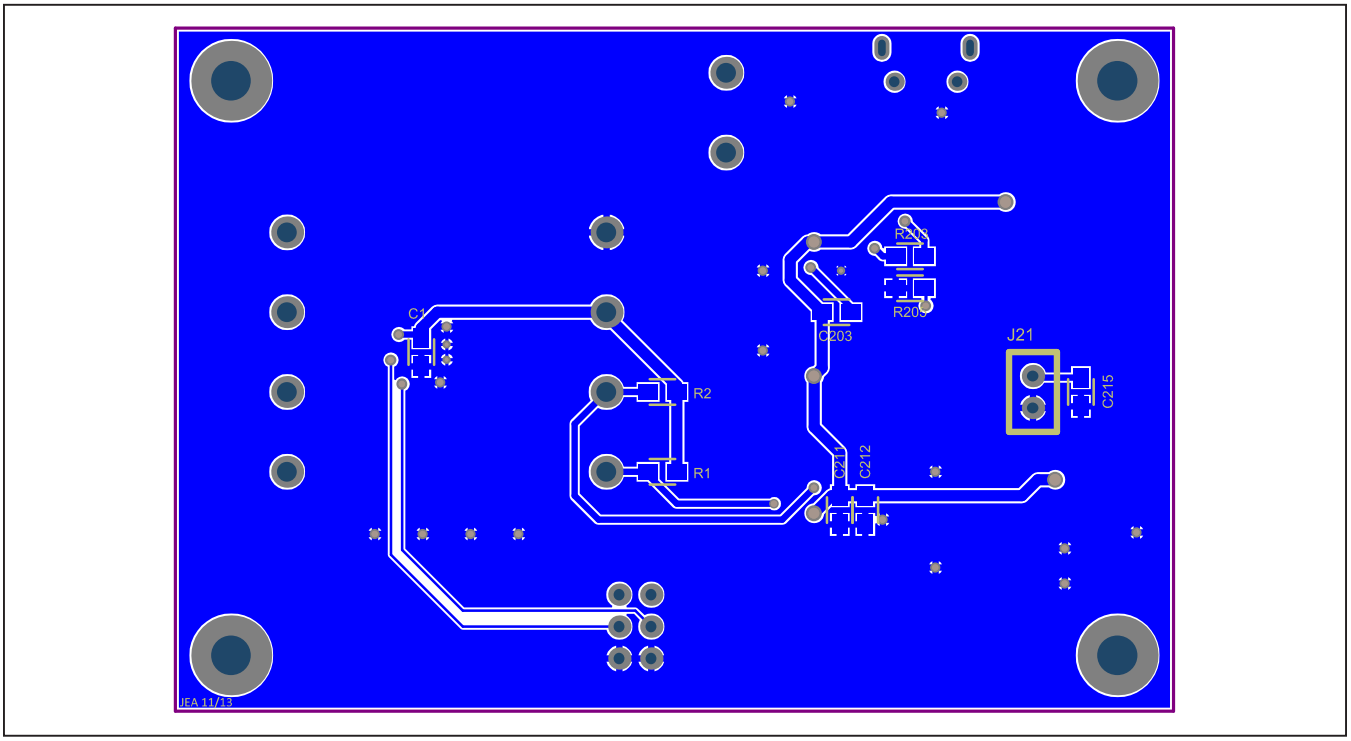

Figure 4. DS4404 EV Kit PCB Layout—Bottom

Ordering Information

PART	TYPE
DS4404EVKIT#	EV Kit

#Denotes an RoHS-compliant device that may include lead(Pb) that is exempt under the RoHS requirements.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/14	Initial release	—

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331