MAX34409 Evaluation Kit

Evaluates: MAX34409

General Description

The MAX34409 evaluation kit (EV kit) provides the hardware and software graphical user interface (GUI) necessary to evaluate the MAX34409 SMBus quad current monitor. The EV kit includes a MAX34409ETE+ installed, as well as a USB I2C dongle to communicate with a PC.

EV Kit Contents

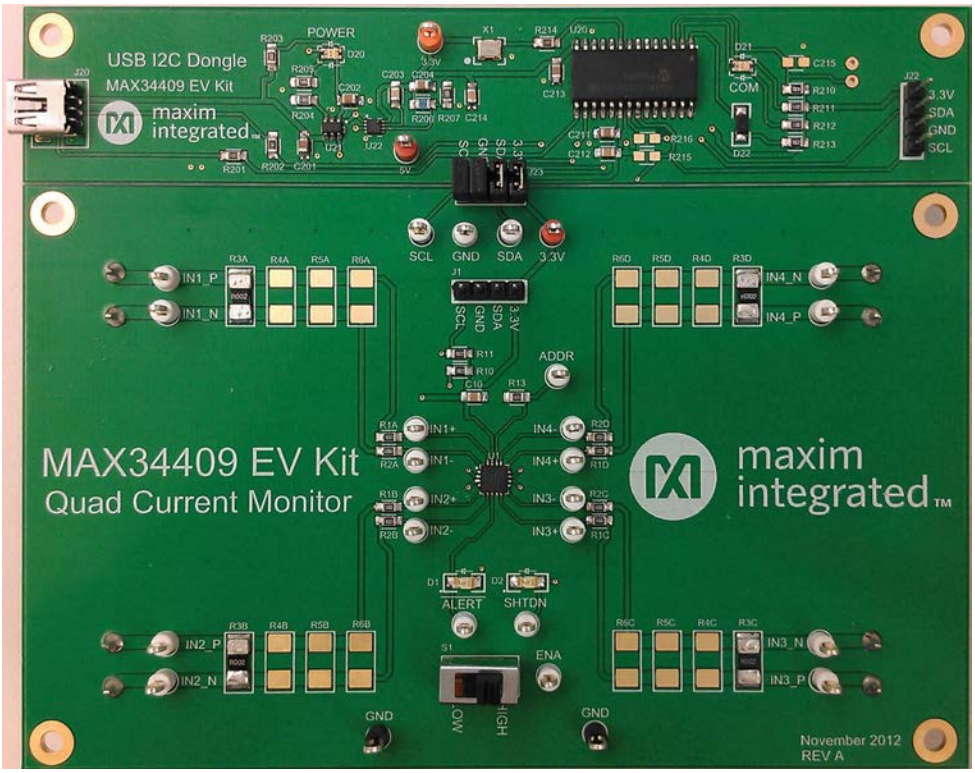
- Assembled circuit board including MAX34409ETE+
- Mini-USB cable

Features

- Easy Evaluation of the MAX34409
- USB HID interface
- Windows XP®- and Windows® 7-Compatible Software
- RoHS Compliant
- Proven PCB Layout
- Fully Assembled and Tested

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

EV Kit Photo



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Component List

DESIGNATION	QTY	DESCRIPTION
C1A–C1D, C2A–C2D, C211	9	1µF, X7R ceramic capacitors (0805)
C10, C11, C212	3	0.1µF, X7R ceramic capacitors (0805)
C201, C202, C204	3	10µF, X7R ceramic capacitors (0805)
C203, C214	2	0.01µF, X7R ceramic capacitors (0805)
C213	1	220nF, X7R ceramic capacitor (0805)
C215	0	Do not populate, ceramic capacitor (0805)
D1, D2	2	Red LEDs (1206)
D20, D21	2	Dual red/green LEDs
D22	1	Schottky diode Panasonic DB2W31900L
J1, J22	2	4-pin headers, 2.54mm pitch
J1A–J1D	4	2-position screw terminals, 6.35mm pitch Phoenix Contact 1714955
J20	1	Mini-USB 5-pin female header
J21	0	Do not populate, 2-pin header
J23	1	8-pin (2 x 4) header, 2.54mm pitch
R1A–R1D, R2A–R2D	8	100Ω ±1% resistors (0805)
R3–R3D	4	2mΩ ±1% resistors (2512)
R4A–R4D, R5A–R5D, R6A–R6D	0	Do not populate, resistors (2512)
R10, R11, R213	3	2.2kΩ ±1% resistors (0805)
R12, R15, R211, R212	4	330Ω ±1% resistors (0805)

DESIGNATION	QTY	DESCRIPTION
R13, R14, R201, R202, R214	5	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)
R210	1	4.7kΩ ±1% resistor (0805)
R215, R216	0	Do not populate, resistors (0805)
S1	1	SPDT slide switch
TP1A–TP1D, TP2A–TP2D, TP3A–TP3D, TP4A–TP4D, TP10–TP15	22	White test points
TP7, TP8, TP16	3	Red test points
TP17–TP19	3	Black test points
U1	1	SMBus quad current monitor (16 TQFN-EP*) Maxim MAX34409ETE+
U20	1	Microcontroller (28 SO) Microchip PIC18LF2550-I/SO
U21	1	50mA to 600mA current-limit switch (6 SOT23) Maxim MAX4995AAUT+
U22	1	500mA LDO regulator (8 TDFN-EP*) Maxim MAX8902BATA+
X1	1	48MHz, 3.3V oscillator (SMD) AVX KC3225A48.0000C30E00
—	4	Jumpers/shunts
—	1	Mini-USB cable
—	1	PCB: MAX34409 EV Kit

**EP = Exposed pad.*

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MAX34409 EV Kit Files

FILE	DESCRIPTION
MAX34409EVKSoftwareInstall.EXE	Application program

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

Quick Start

Required Equipment

- MAX34409 EV kit
- Windows XP or Windows 7 PC
- USB port
- Mini-USB cable (included)
- EV kit hardware (included)
- Screw driver
- Load (to measure current)

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) Ensure that all four jumpers on J23 are populated
2) Place the EV kit hardware on a nonconductive surface to ensure that nothing on the PCB gets shorted to the workspace.
3) Prior to starting the GUI, connect the EV kit hardware to a PC using the supplied mini-USB cable, or equivalent. The POWER LED (D20) should be green and the COM LED (D21) should be red and slowly flash orange.
4) 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 driver.
5) Once the device driver installation is complete, visit **www.maximintegrated.com/evkitsoftware** to download the latest version of the EV kit software, MAX34409EVKitSoftwareInstall.ZIP. Save the EV kit software to a temporary folder.
6) Open the .ZIP file and double-click on 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**.
7) The installer GUI appears. Click **Next** and then **Install**. Once complete click **Close**.
8) Go to **Start | All Programs**. Look for the **MAX34409EVKitSoftware** folder and click on **MAX34409EVKitSoftware.EXE** inside the folder.
9) When the GUI appears, the text below the Maxim logo should display **EV Kit Hardware Connected**. The COM LED (D21) changes to green.
10) Connect a load to at least one of the current monitors (IN1–IN4) and then click **Read**. See the *Monitor Current of Load* section for details.

Detailed Description of Software

Software Startup

If the MAX34409 EV kit is connected when the software is opened, the software first initializes the hardware to communicate. Next, the software searches for all slave addresses on the I²C bus and connects to the first slave address that is valid. Then, the GUI displays **EV Kit Hardware Connected** at the bottom-right corner of the window under the Maxim logo. If the EV kit is not connected on software startup, the GUI populates with default EV kit values and displays **EV Kit not detected!** Once the EV kit is connected, the GUI searches for slave addresses.

Menu Items

The **File** menu item contains save, load, and exit options. To save the settings in the **Control** group box on the **Control/Registers** tab (Figure 2), click **Save Project As** or **Save Project**. This saves the settings to an XML file. **Load Project** updates the GUI with the XML file and writes the values to the device.

The **Connection** 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. Slave address 18h is not selectable to prevent communicating with the alert response address.

Status Log

The status log below the tabs displays all the actions the GUI performs. Whenever a SMBus command is read or written, the action is confirmed by the log. The log can be cleared by clicking on the **Clear Log** button.

Monitor/Graph Tab

The **Monitor/Graph** tab sheet (Figure 1) displays all the ADC values and overcurrent status for each channel. In the **Monitor** group box table, the **Polled** values are the ADC values read from ADC1–ADC4 (04h to 07h) that are converted to amps using the **RSENSE** value in the **Control** table shown in Figure 2. The **OC** column displays the overcurrent status bit in STATUS (00h). The **Peak** and **Average** columns track the maximum and average of the **Polled** value for each channel. These values can be reset by clicking on the **Reset Peak and Average** button. The **ENA Pin** and **SHTDN Pin** state are read from STATUS (00h). All values on the tab are read when the tab is selected or when the **Read** button is clicked. The **OC** status bits are cleared after every read. Check the **Auto Poll** checkbox to continuously read every 30ms.

The **Data Log Controls** group box contains the graph-related controls. **Poll Count** displays the number of reads that have been tracked in the data log. When the polled count reaches 100,000, the graph deletes the oldest polled value and adds a new polled value. The **Peak** and **Average** values are still based on all the poll count values, but the graph only displays the latest 100,000 polled values. To reset the **Poll Count**, **Peak**, and **Average** values, click on the **Data Log Reset** button. To turn off data logging during polling, check the **Data Log Off** checkbox. To save all the data graphed to a CSV file, click on the **Save Data Log** button.

Control/Registers Tab

The **Control/Registers** tab sheet (Figure 2) displays all the SMBus commands and their current values. In the **Control** group box table, the **RSENSE (mΩ)** column is the value of the resistor (R3X–R6X) between IN+ and IN- signals. The **Over-Current (A)** column displays the overcurrent threshold (08h to 0Bh) converted to amps using the **RSENSE** value. The **ALERT Signal Enabled** checkbox and the **ADC Averaging** drop-down list read/write to bits in Control (01h). The **Over-Current Delay** and **Shutdown Delay** edit boxes set the delays stored in registers 02h and 03h, respectively. The **Reset** checkboxes set the reset bit in the Overcurrent Delay (02h) or Shutdown Delay (03h) register.



Figure 1. MAX34409 EV Kit GUI (Monitor/Graph Tab)

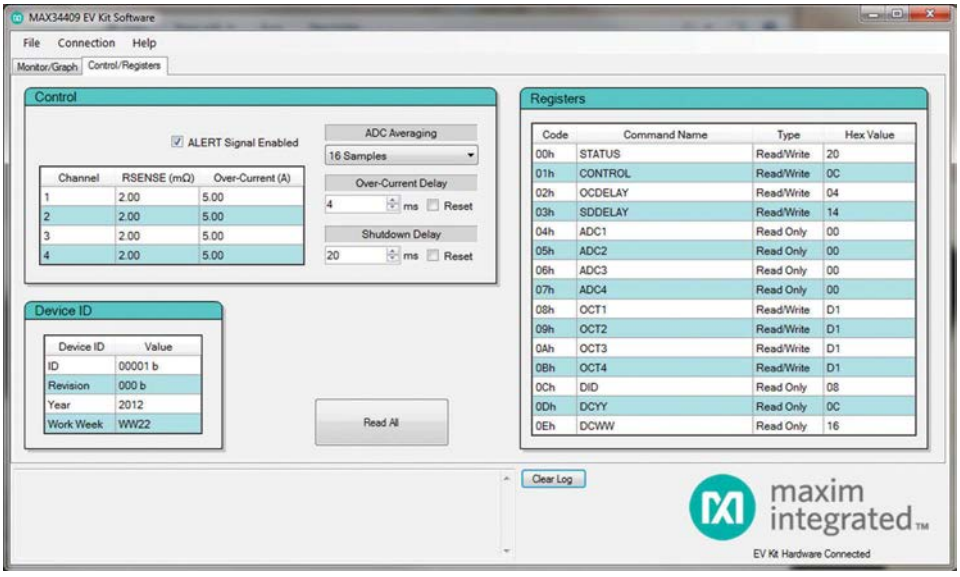


Figure 2. MAX34409 Control/Registers Tab

Detailed Description of Hardware

Monitor Current of Load

To monitor the current of a load, connect one of the screw terminal current-monitoring inputs (IN1–IN4) in series with the load, such that the current flows from the positive terminal to the negative terminal (Figure 3). The maximum voltage drop from INX+ to INX- should not exceed 12.25mV. The sense resistor (R3X–R6X) may need to be adjusted depending on the current being monitored.

User-Supplied I²C interface

To communicate with the device using a user-supplied I²C interface, first remove all the J23 jumpers to disconnect the USB I²C dongle. If the dongle is no longer desired, it can be separated from the EV kit by snapping the PCB at the scored line. Connect J1 signals SDA and SCL to the off-board I²C interface and connect power to the 3.3V and GND signals.

Troubleshooting

All efforts were made to ensure that each EV 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.

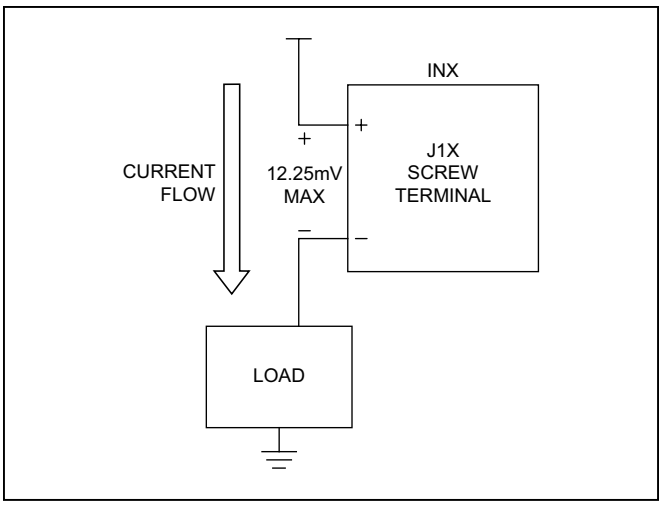


Figure 3. MAX34409 Monitor Load Current

Table 1. Description of Switches (S1)

SWITCH	POSITION	DESCRIPTION
S1	High	**ENA:** Enables shutdown.
	Low	**ENA:** Disables shutdown.

Table 2. Description of LEDs (D1, D2, D20, D21)

LED	COLOR	DESCRIPTION
D1	Red	**ALERT:** An overcurrent threshold was exceeded for longer than the overcurrent delay.
D2	Red	**SHTDN:** An overcurrent threshold was exceeded for longer than the shutdown delay.
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 a command from the PC is received.
	Green	**Initialized:** Hardware has been initialized by software.

Table 3. Troubleshooting

SYMPTOM	CHECK	SOLUTION
GUI indicates: **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 D21 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 indicating that 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.
GUI indicates **Read Failed! and all slave addresses are being found**	J23	Make sure all four jumpers on J23 are populated.

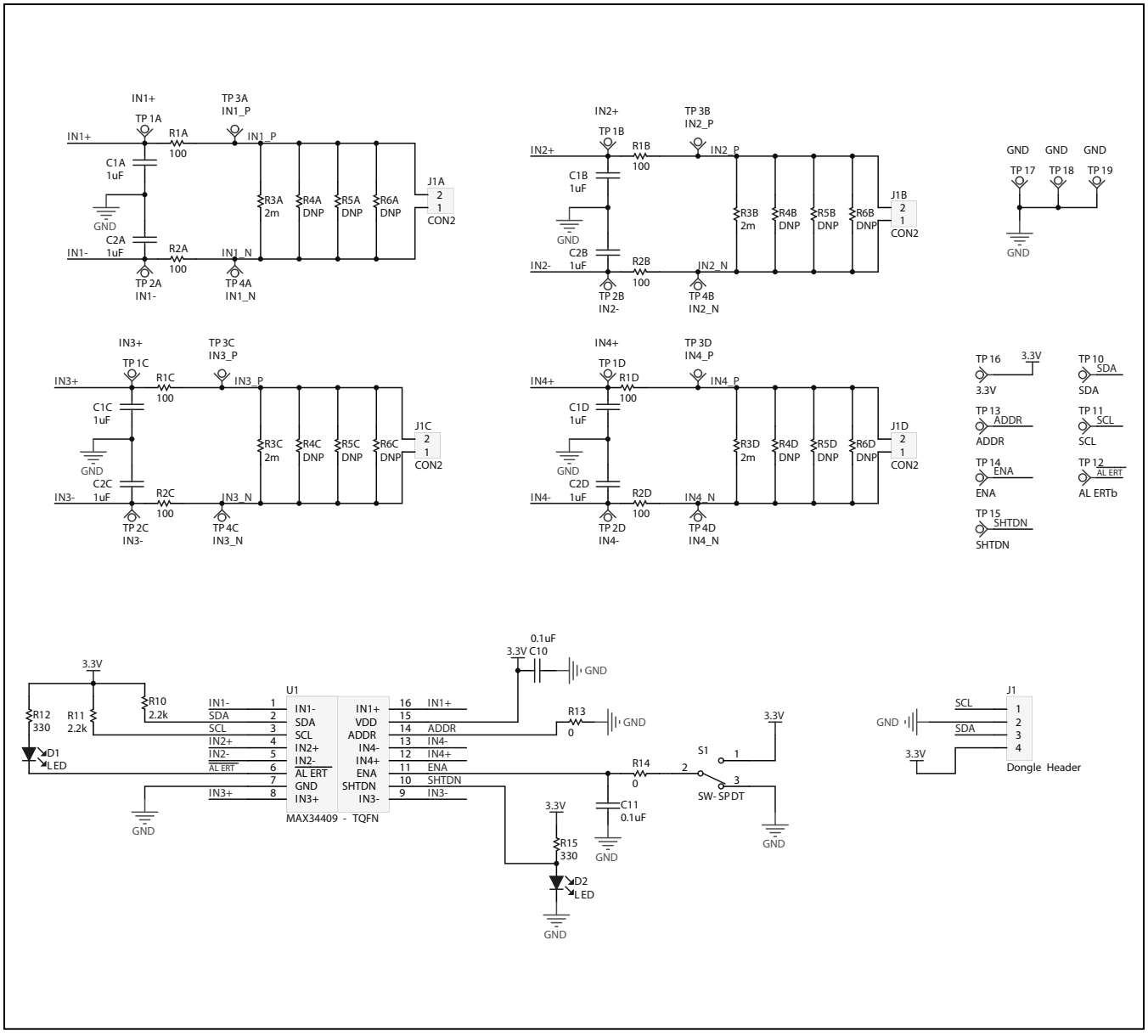
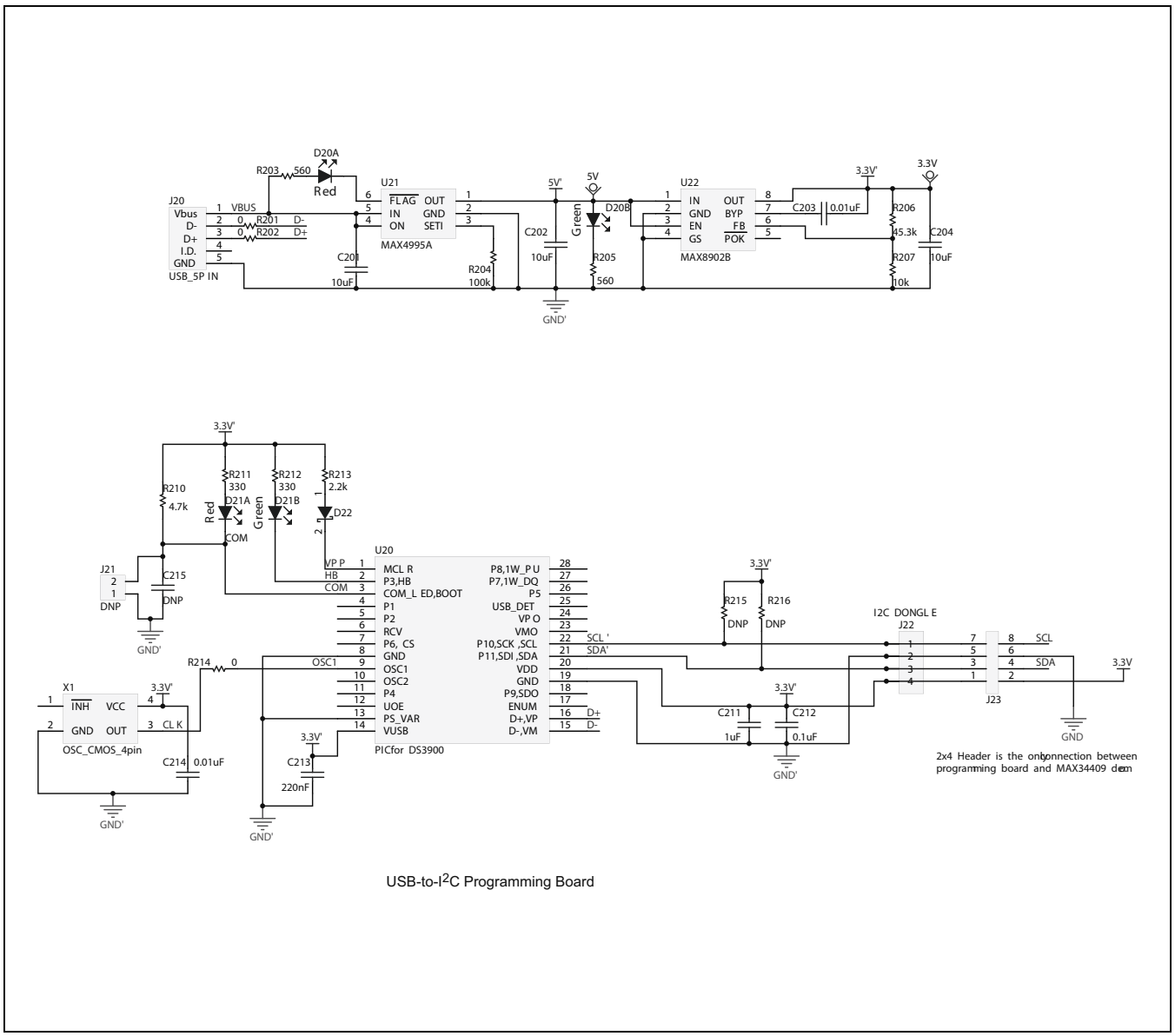


Figure 4a. MAX34409 EV Kit Schematic (Sheet 1 of 2)



USB-to-I2C Programming Board

Figure 4b. MAX34409 EV Kit Schematic (Sheet 2 of 2)

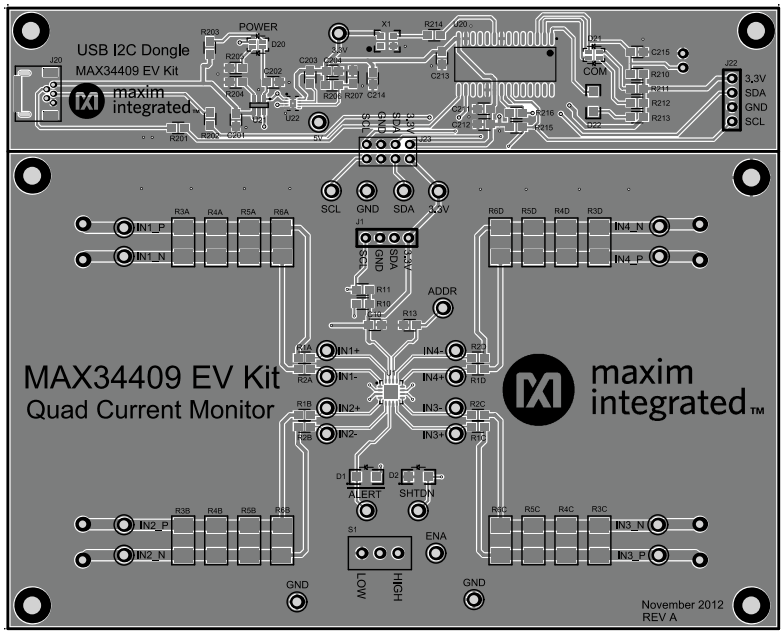


Figure 5. MAX34409 EV Kit PCB Layout—Top

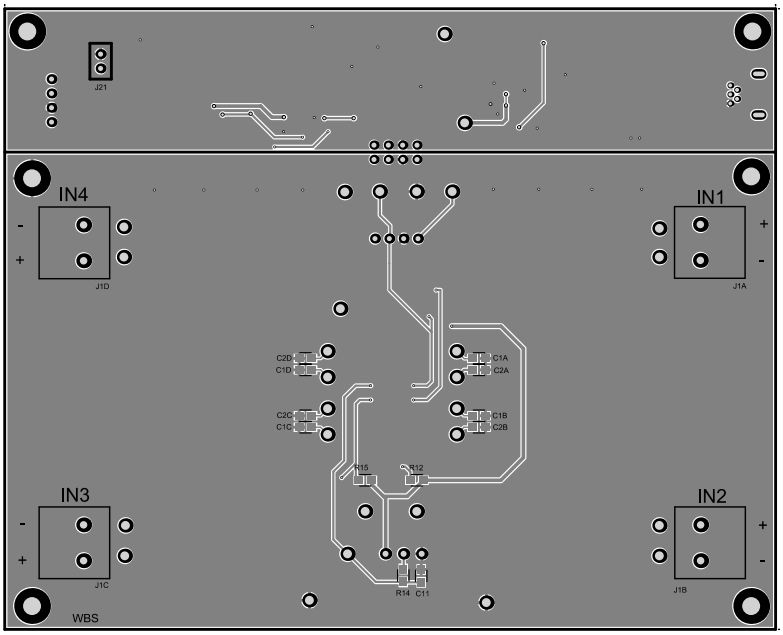


Figure 6. MAX34409 EV Kit PCB Layout—Bottom

Ordering Information

PART	TYPE
MAX34409EVKIT#	EV Kit

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

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/13	Initial release	—

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