19-6238; Rev 0; 3/12

MAX17048X/MAX17049X Evaluation Kits (WLP)

Evaluate: MAX17048X/MAX17049X in a WLP

General Description

The MAX17048X/MAX17049X evaluation kits (EV kits) include the MAX17048X/MAX17049X EV kit and the Maxim DS91230+ command module. Windows XP®-, Windows Vista®-, and Windows 7-compatible software is also available for use with the evaluation kit and can be downloaded from **www.maxim-ic.com/evkitsoftware**.

The EV kits are fully assembled and tested surface-mount PCBs that evaluate the MAX17048X/MAX17049X host or battery-side fuel gauge for 1-cell/2-cell lithium-ion (Li+) batteries in handheld and portable equipment. The EV kits can be powered from a single battery (MAX17048X) and configured to evaluate a single lithium cell (MAX17048X) or from two lithium cells in series (MAX17049X).

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

Features

- **Battery Input Voltage Range**
  - **MAX17048X: +2.5V to +4.5V**
  - **MAX17049X: +2.5V to +12V**
- **Powered from a Single Battery (MAX17048X)**
- **Evaluates 1-Cell (MAX17048X) or 2-Cell (MAX17049X) Batteries**
- **Precision ±7.5mV Voltage Measurement per Cell**
- **Current Sense Not Required**
- **On-Board LDO for 2-Cell Evaluation (MAX17049X)**
- **Tiny 0.9mm x 1.7mm, 8-Bump Wafer-Level Package (WLP)**
- **Windows XP-, Windows Vista-, and Windows 7-Compatible Software**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C105K TDK C1608X7R1C105K
C3	1	0.1µF ±10%, 16V X7R ceramic capacitor (0402) Murata GRM155R71C104K TDK C1005X7R1C104K
C4	0	Not installed, ceramic capacitor (0603)
D1, D2, D3	3	5.6V zener diodes (SOD323) ON Semi MM3Z5V6ST1G
J1	1	RJ11 6-pos/6-pos, right-angle, through-hole jack
J2	1	6-pin straight-row header
JU1	1	3-pin header, 0.1in centers
JU2	1	2-pin header, 0.1in centers

DESIGNATION	QTY	DESCRIPTION
R1, R4, R5	3	150Ω ±5% resistor (0603)
R3	0	Not installed, resistor—short (PC trace) (0603)
R6	1	10kΩ ±5% resistor (0603)
R7	1	1MΩ ±5% resistor (0603)
U1	1	See the *EV Kit-Specific Component List*
U2	1	3.3V LDO (5 SOT23) Maxim MAX1726EUK33-T
—	1	DS91230 PicBrick board (USB to RJ11) Maxim DS91230+
—	1	RJ12 6-pos/6-pos reverse modular cord, 7ft
—	2	Shunts
	1	PCB: MAX17048X/MAX17049X EVALUATION KIT

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EV Kit-Specific Component List

PART	DESIGNATION	DESCRIPTION
MAX17048XEVKIT#	U1	Micropower 1-cell Li+ ModelGauge™ IC (8 WLP) Maxim MAX17048X+T10
MAX17049XEVKIT#		Micropower 2-cell Li+ ModelGauge IC (8 WLP) Maxim MAX17049X+T10

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
ON Semiconductor	602-244-6600	www.onsemi.com
TDK Corp.	847-803-6100	www.component.tdk.com

Note: *Indicate that you are using the MAX17048X/MAX17049X when contacting these component suppliers.*

MAX17048X EV Kit Files

FILE	DESCRIPTION
SETUP.EXE	Installs the EV kit files on your computer
MAX17048k.EXE	Application program
README.HTML	Help file

MAX17049X EV Kit Files

FILE	DESCRIPTION
SETUP.EXE	Installs the EV kit files on your computer
MAX17049k.EXE	Application program
README.HTML	Help file

Quick Start

Required Equipment

- MAX17048X or MAX17049X EV kit
- +2.5V to +4.5V DC power supply or 1-cell battery
- DS91230 PicBrick board
- RJ12 6-pos/6-pos reverse modular cord
- Windows XP, Windows Vista, or Windows 7 PC
- USB port

Procedure

The EV kits are fully assembled and tested. Follow the steps below to verify board operation. **Caution: Do not turn on the power supply until all connections are completed.**

1) Connect the DS91230 board to a spare USB port on the PC.
2) Connect the RJ12 cord between J2 on the DS91230 board and J1 on the MAX17048X/MAX17049X EV kit.
3) Verify that shunts are installed according to the defaults listed in Table 1.
4) Connect the positive terminal of the power supply or battery to the BAT+ PCB pad on the EV kit. Connect the negative terminal of the power supply to the BAT- PCB pad on the EV kit.

ModelGauge is a trademark of Maxim Integrated Products, Inc.

Table 1. Default Jumper Settings

JUMPER	DEFAULT SHUNT POSITION	
	MAX17048X	MAX17049X
JU1	1-2	2-3
JU2	Open	Installed

5) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the MAX17048X or MAX17049X EV kit software, MAX17048Rxx.ZIP/MAX17049Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
6) Install the EV kit software on your computer by running the SETUP.EXE program inside the temporary folder. The program files are copied and icons are created in the Windows Start I Programs menu. The software requires the .NET Framework 4. If you are connected to the Internet, Windows automatically locates the correct files and walks you through the process. You can also download the **Microsoft .NET Framework 4 Client Profile (Standalone Installer)** and run that on your PC.
7) Start the MAX17048X/MAX17049X EV kit software by opening its icon in the **Start I Programs** menu.
8) Load the default or custom battery model.

Detailed Description of Hardware

The MAX17048X/MAX17049X EV kits are fully assembled and tested surface-mount PCBs that evaluate the MAX17048X/MAX17049X host or battery-side fuel gauge for 1-cell/2-cell Li+ batteries in handheld and portable equipment. The EV kits can be powered from a single supply or battery with an input range of +2.5V to +4.5V. The EV kits can be configured to evaluate a single lithium cell (MAX17048X) or two lithium cells in series (MAX17049X). Optional LDO U2 is provided to power VIN when using a higher voltage 2-cell Li+ battery to evaluate the MAX17049X.

Default Jumper Settings

The MAX17048X EV kit is set by default to evaluate 1-cell Li+ batteries while the MAX17049X EV kit is set by default to evaluate 2-cell Li+ batteries. LDO U2 is provided so that only a single supply is needed to power the EV kit in the case where a 2-cell battery is used.

When evaluating the MAX17048X, set jumper JU1 to pins 1-2 and remove any shunt installed on jumper JU2 to bypass the LDO. When evaluating the MAX17049X, set JU1 to pins 2-3 and install a shunt on JU2 to power VIN from the LDO. See Tables 2 and 3 for JU1 and JU2 settings. When using a separate supply for VIN or evaluating the MAX17048X, JU2 should be uninstalled to prevent additional current drawn from the battery.

Detailed Description of Software

Splash Screen

The splash screen (Figure 1) allows you to choose one of three distinct modes:

- Custom model with a physical MAX17048X/MAX17049X. Custom models for the MAX17040–MAX17044 can be used in this software provided you change the line Device = MAX1704x to Device = MAX17048.
- Default model with a physical MAX17048X. **Warning:** Using the default model normally results in poor fuel-gauge performance. For good fuel-gauge performance, it is recommended to always use a model that is matched to the battery according to battery characterization.
- Demo mode with a MAX17048X log file.
- The MAX17049X EV kit software is also available for download at **www.maxim-ic.com/evkitsoftware**.

Main Window

You can resize the left-right split in the window (Figure 2). Most major functionality is available from the menu, but some of these items should be observed early.

Currently Loaded Custom Battery Model

This group displays any custom model that has been loaded onto the part by the software. If the device resets, this model is automatically reloaded. If you are using the default model, nothing is displayed here. Any changes to the configuration file is not reloaded automatically.

Record Registers to Log File

This group displays the file path to which the software is recording the registers. If this box is blank, no file is being saved.

RCOMP Configuration

Enter a byte here and press the **Write** button to write it to the device. This is not the same as writing the value into the memory map because RCOMP is part of a larger 2-byte register.

If you have a custom model, you can also change the temperature, which adjusts the MAX17048X for proper temperature performance. Changing this value immediately calculates a new value of RCOMP and displays it in the box. This value is not written to the device until you press the **Write** button. A change to RCOMP is not reflected in the temperature.

Table 2. Power-Supply Input (JU1)

SHUNT POSITION	VDD PIN	EV KIT CONFIGURATION
1-2*	Powered from a battery applied between the BAT+ and BAT- PCB pads	MAX17048X
2-3	Powered from the +5V output of LDO U2	MAX17049X

**MAX17048X default position.*

Table 3. LDO U2 Input Settings (JU2)

SHUNT POSITION	U2 INPUT	U2 OUTPUT	EV KIT CONFIGURATION
Installed	Connected to the BAT+ PCB pad	Enabled	MAX17048X
Not installed*	Unconnected	Disabled	MAX17049X

**MAX17048X default position.*

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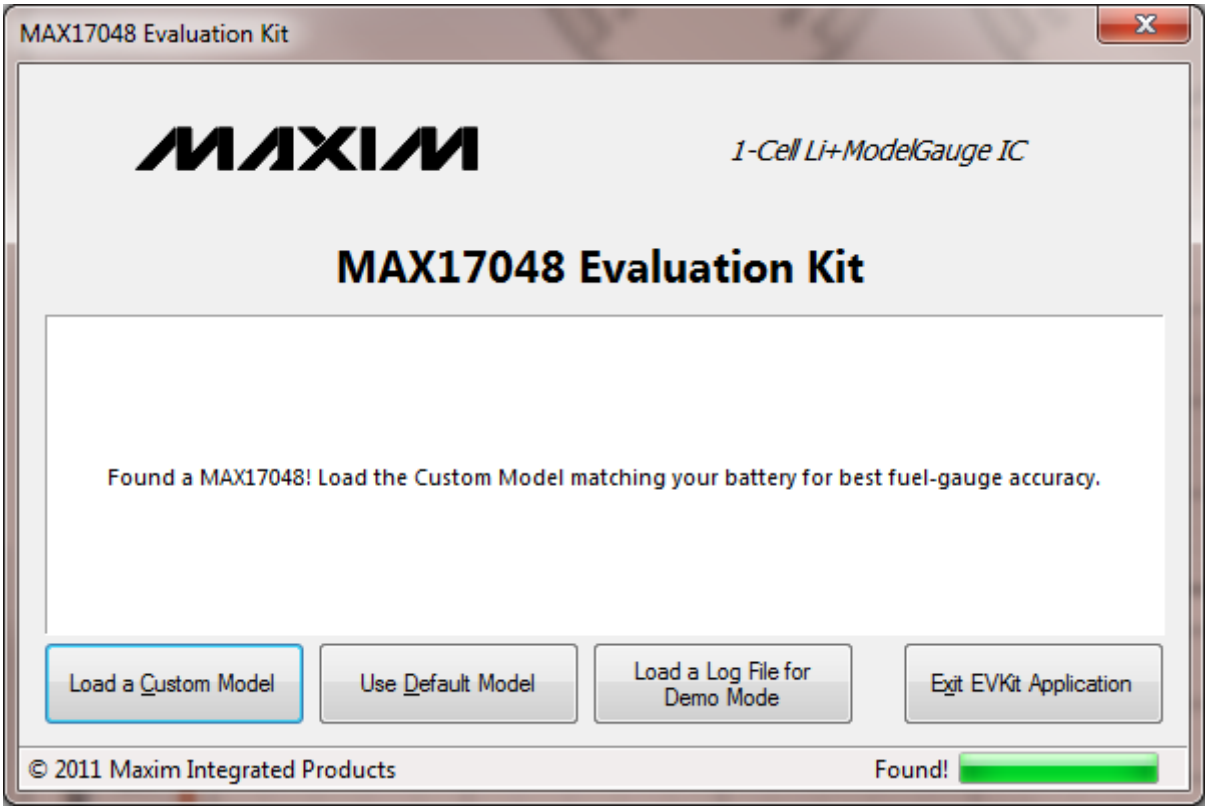

Figure 1. MAX17048X EV Kit Software (Splash Screen)

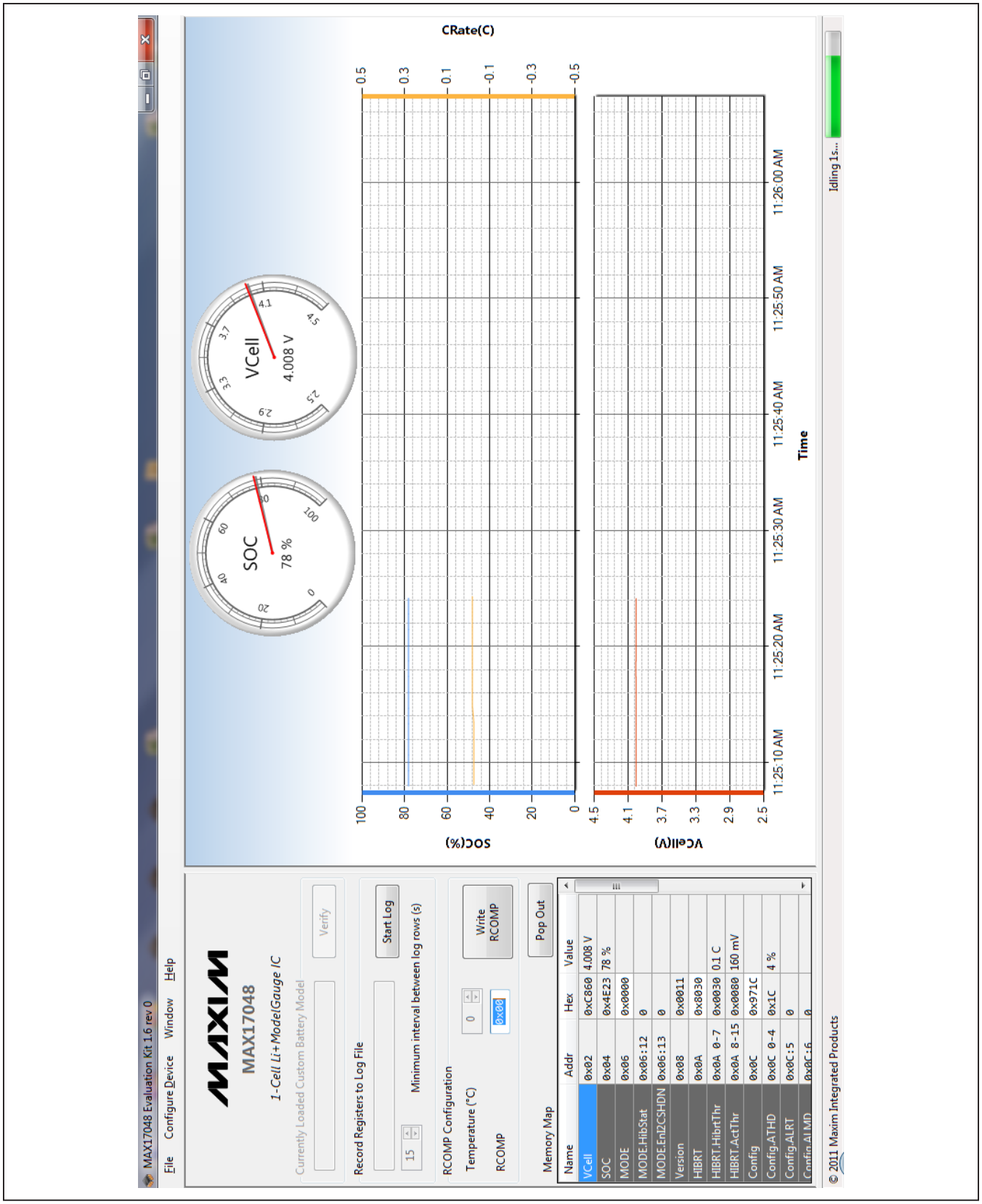

Figure 2. MAX17048X EV Kit Software (Main Window)

Memory Map

Notation used for name and address should be familiar to C programmers with one small change. The memory map lists:

- **Register Name:** A dot indicates that a single address has multiple meanings. This is similar to how the C firmware might access the bits.
- **Memory Address:** A colon indicates the 0-indexed location, not the size of the bit field. A dash indicates a range of values (e.g. 0x0C:0-4 is a 5-bit value, offset 0 bits at address 0x0C).
- **Hex:** The raw value as read directly from the device
- **Value:** A conversion of the raw hex value, usually with units. Alert bit flags are blank when inactive, or show text when they are alerting.
- **Description:** Reminders of the functionality. For full details, refer to the MAX17048/MAX17049 IC data sheet.

Write values to the device directly through the memory map. To write a raw hex value, select the cell in the hex column, overwrite the value, and press the Enter or Tab key. You are prompted to write to the device. Normal communication pauses and you see a corresponding blank spot in the graph.

For registers with a conversion factor (e.g. Hibernate Threshold or VAlertMax), you can also modify the **Value** column. The software converts the value back to the raw hex and prompts you to verify that you are writing what you expect.

Remember that not all registers are writable.

Plot

The plot can be configured using the **Preferences** window.

The plot is interactive. Zoom into the time axis by left-clicking and dragging anywhere in the plot area. While dragging, the region becomes highlighted as you drag. You can zoom out either by clicking the small button in the bottom left, or by right-clicking in the plot area.

Plotted information not in a log file cannot be recovered once the application closes.

The top and bottom plots are synchronized in time, so zooming one zooms the other. The y-axes are fixed scale and you cannot modify which registers are plotted, or where.

Standalone Windows

Preferences

Here you can see options for how frequently you wish to read the device and how to plot points. To observe transient events, increase the read speed, as well as how frequently the points are actually plotted.

The plots can use a lot of system memory if you read frequently for a long time, so be aware of these settings. After the maximum number of points is reached, points are trimmed from the beginning. The discarded points cannot be recovered on the plot.

I²C Traffic Log Window

Here you can see a log of traffic that you initiate, as well as any time the device is programmed. It describes each step in detail, including the particular values read or written. This can help remove uncertainty about how to communicate with the device. This log does not show the standard reading events.

Memory Map Pop-Up Window

This window displays the same information as the memory map on the main application, except that values in this map cannot be modified. This is the easiest place to read descriptions of registers.

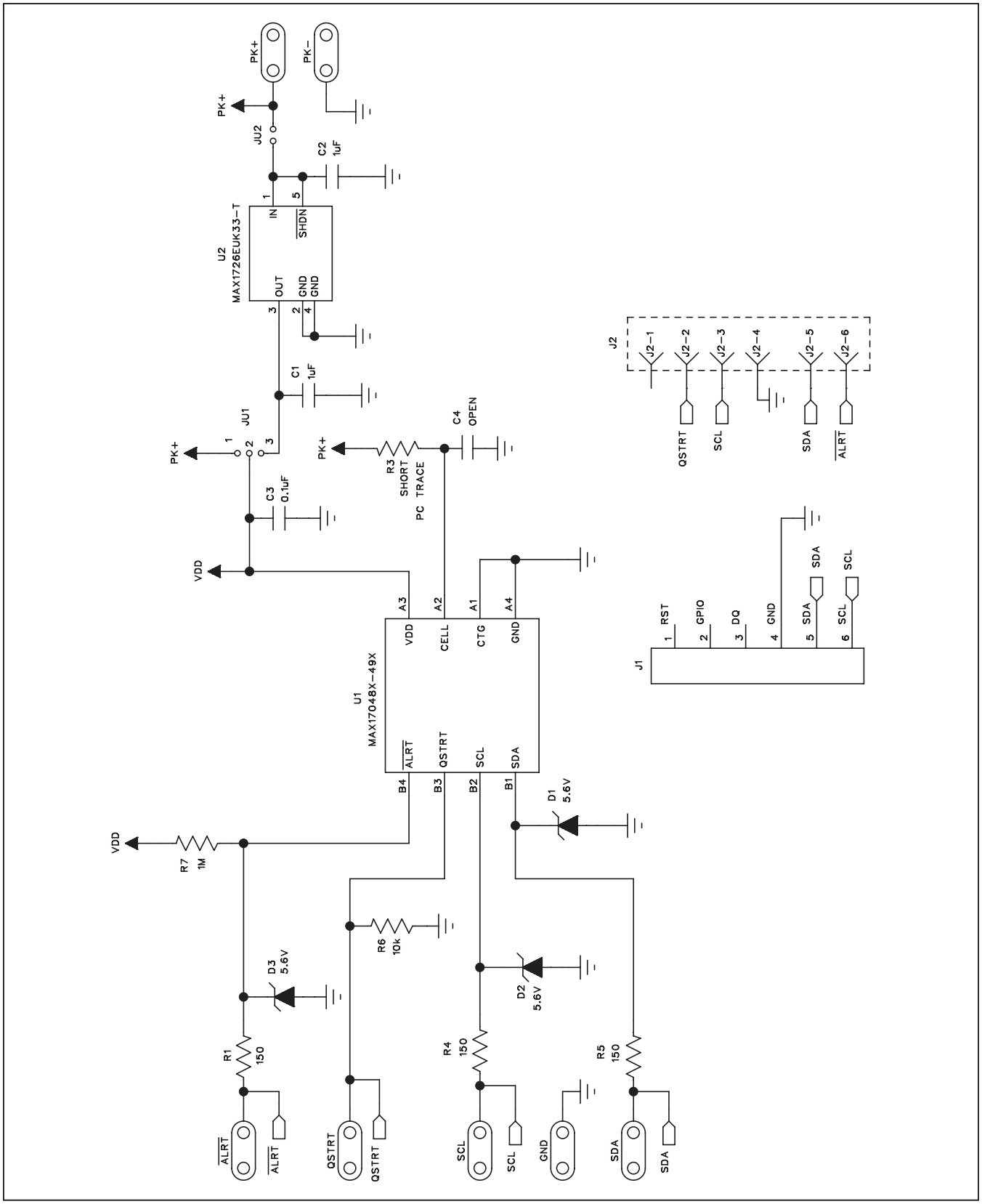

Figure 3. MAX17048X/MAX17049X EV Kits Schematic

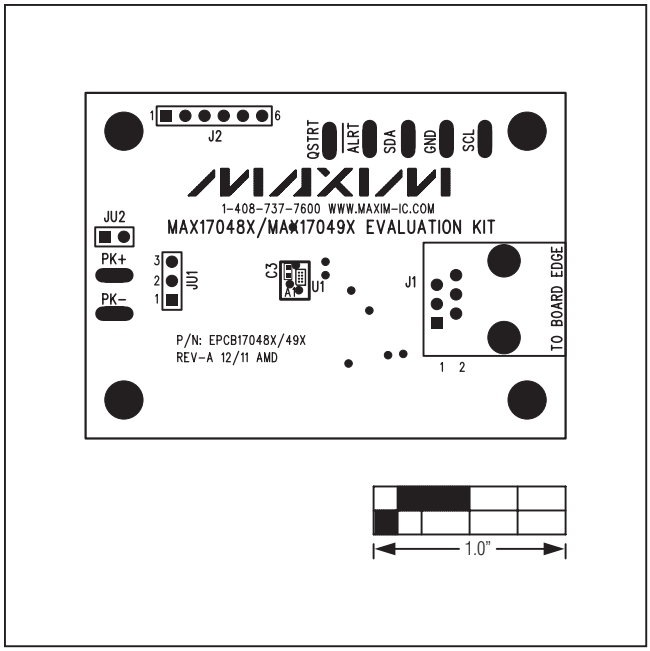

Figure 4. MAX17048X/MAX17049X EV Kits PCB Layout—Component Side

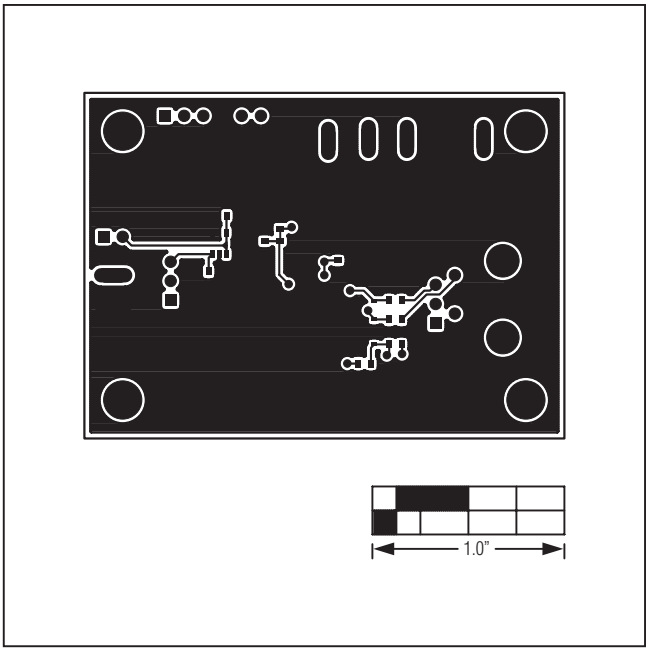

Figure 6. MAX17048X/MAX17049X EV Kits PCB Layout—Solder Side

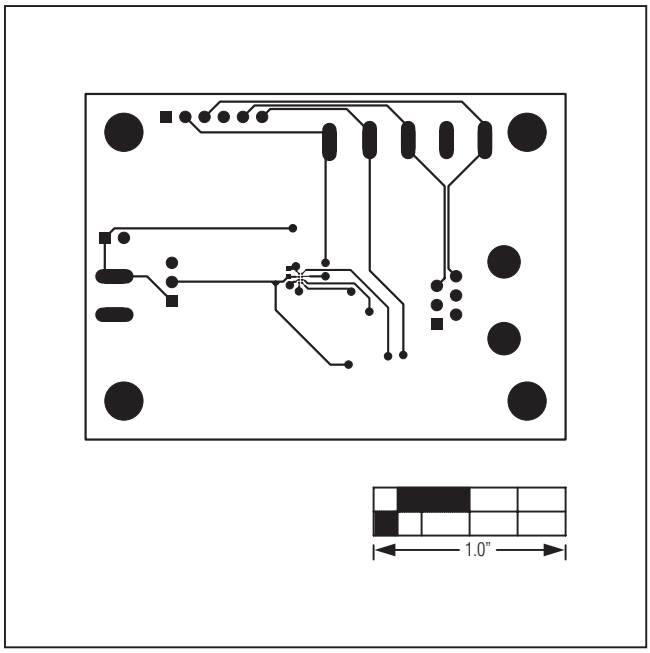

Figure 5. MAX17048X/MAX17049X EV Kits Component Placement Guide—Component Side

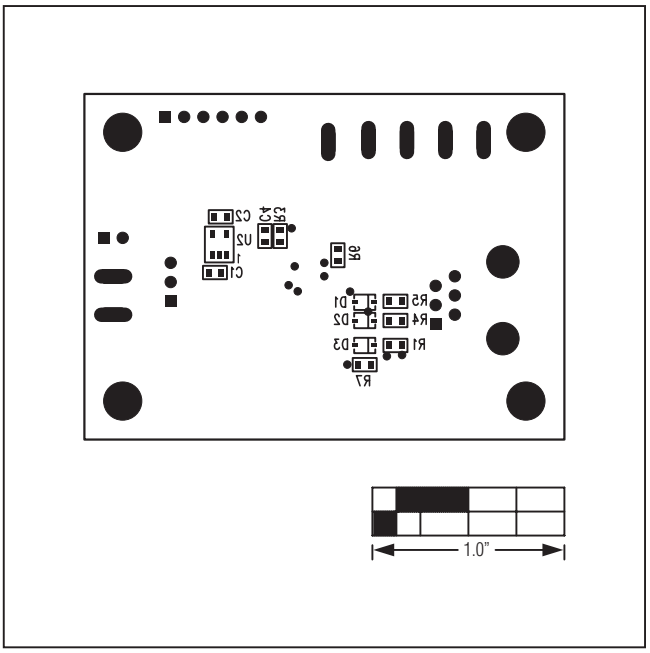

Figure 7. MAX17048X/MAX17049X EV Kits Component Placement Guide—Solder Side

Ordering Information

PART	TYPE
MAX17048XEVKIT#	EV Kit
MAX17049XEVKIT#	EV Kit

#Denotes RoHS compliant.