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19-5273; Rev 0; 7/10

MAX9934T Evaluation Kit

Evaluates: MAX9934

General Description

The MAX9934T evaluation kit (EV kit) demonstrates the MAX9934T low-voltage, precision, current-sense amplifier for power management in portable consumer electronics. The device's precision inputs and the EV kit's on-board, precision, low-value sense resistor allows the measurement of bidirectional (e.g., battery charge/discharge) currents up to 1A. Input common-mode range is -0.1V to +5.5V independent of supply. The device demonstrates a 25µA/mV fixed gain and the EV kit is configured for a 250V/V gain. The device's chip-select (CS) logic input allows users to multiplex several MAX9934T parts. The EV kit operates from a +2.5V to +3.6V, 100mA DC power supply.

The EV kit can also be used to evaluate the MAX9934F current-sense amplifier. See the *Evaluating the MAX9934F* section for more information.

Features

- **EV Kit Configured for Bidirectional Current Sensing Up to 1A**
- **EV Kit Configured for 250V/V Gain**
- **Chip-Select (CS) Logic Input**
- **-0.1V to +5.5V Input Common-Mode Range**
- **+2.5V to +3.6V DC Power-Supply Operation**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX9934TEVKIT+	EV Kit

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

Selector Guide

PART	GAIN	OUTPUT	LOGIC PIN
MAX9934T	25µA/mV	Current	Chip-select input
MAX9934F	5µA/mV	Current	Chip-select input

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	4.7µF ±10%, 16V X7R ceramic capacitor (0805) Murata GRM219R71C475K
C2, C4, C5	3	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C3	1	0.01µF ±10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71C103K
C6	0	Not installed, ceramic capacitor (0603)
GND	2	Black miniature PCB test points
GND, OUT_REF	2	Black multipurpose PCB test points
JU1, JU2, JU3	3	2-pin headers
OUT	1	Red multipurpose PCB test point

DESIGNATION	QTY	DESCRIPTION
R1	1	10mΩ ±0.1%, ±15ppm/°C 4-terminal resistor (2512) Vishay Y14870R01000B9
R2	1	10kΩ ±0.1%, ±25ppm/°C resistor (0603) Panasonic ERA-3YEB103V
R3, R4	2	10kΩ ±5% resistors (0603)
RS+, RS-	2	White miniature PCB test points
U1	1	Current-sense amplifier (6 UCSP™) Maxim MAX9934TART+ (Top Mark: AAF)
U2	1	Current-sense amplifier (8 µMAX®) Maxim MAX9934TAUA+
—	3	Shunts (JU1, JU2, JU3)
—	1	PCB: MAX9934T EVALUATION KIT+

UCSP is a trademark and µMAX is a registered trademark of Maxim Integrated Products, Inc.

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Panasonic Corp.	800-344-2112	www.panasonic.com
Vishay	402-563-6866	www.vishay.com

Note: *Indicate that you are using the MAX9934_ when contacting these component suppliers.*

Quick Start

Required Equipment

- MAX9934T EV kit
- +2.5V to +3.6V, 100mA DC power supply for VCC
- +5.5V, 2A DC power supply
- 2A electronic load
- One digital voltmeter (DVM) with 10MΩ input impedance

Procedure

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

1) Verify that jumpers JU1, JU2, and JU3 shunts are in-stalled as follows:

   JU1: Installed (OUT_REF PCB pad connected to GND PCB pad)

   JU2: Not installed (U1 output enabled)

   JU3: Installed (U2 output disabled; high impedance)

2) Set the +2.5V to +3.6V, 100mA DC power-supply voltage to +3.3V and disable the output.

3) Set the +5.5V, 2A DC power-supply voltage to +5V, the current limit above 1A, and disable the output.

4) Set the electronic load to 1A and disable the output.

5) Connect the low-power DC power-supply positive terminal to the VCC PCB pad and the negative terminal to the nearby GND PCB pad.

6) Connect the 2A DC power-supply positive terminal to the I_RS+ PCB pad and the negative terminal to the GND PCB pad.

7) Connect the 2A electronic load positive terminal to the I_RS- PCB pad and the negative terminal to the GND PCB pad.

8) Set the DVM to measure voltage.

9) Connect the DVM positive terminal to the OUT PCB pad and the negative terminal to the OUT_REF PCB pad.

10) Enable the power supplies and the electronic load. Any power sequence can be used without damage to U1 or U2.

11) Verify that the DVM measures +2.5V.

Detailed Description of Hardware

The MAX9934T EV kit demonstrates the MAX9934T low-voltage, precision, current-sense amplifier in a tiny 1mm x 1.5mm, 3 x 2-bump UCSP package (U1) and an 8-pin µMAX package (U2). The EV kit can also be used to evaluate the MAX9934F current-sense amplifier. Contact the factory to obtain free samples. See the *Evaluating the MAX9934F* section for more information.

The device's precision inputs measure very small sense voltages up to ±10mV full scale. The EV kit features a precision, on-board, four-terminal surface-mount sense resistor, R1 (10mΩ ±0.1%, ±15ppm/°C). This enables measurement of bidirectional currents up to 1A connected across the EV kit's I_RS+ and I_RS- PCB pads. The input common-mode range is -0.1V to +5.5V independent of VCC. The EV kit operates from a +2.5V to +3.6V, 100mA DC power supply connected across the VCC and GND PCB pads.

The device's 25µA/mV fixed-gain output current creates an output voltage across the output-load resistor, R2 (10kΩ ±0.1%), achieving a 250V/V gain. R2 can be replaced with an appropriate surface-mount 0603 resistor to achieve different output gains. The EV kit's output voltage can be measured across the OUT and OUT_REF PCB pads. Connect a 1.65V reference voltage across the OUT_REF and GND PCB pads. The device's CS pin allows users to multiplex several MAX9934T parts.

Surface-mount 0603 capacitors C5 (installed) and C6 (not installed) provide optional input filters.

Chip Select (CS)

Jumpers JU2 and JU3 enable or disable the respective amplifier's output by controlling the device's CS pins on U1 and U2, respectively. An external controller can drive the U1 and U2 CS input pins using the EV kit's CS1(SIGN1) and CS2(SIGN2) PCB pads, respectively. The CS pins are compatible with +1.8V through +3.3V logic. Connect the external controller's logic ground return to a GND PCB pad and remove pullup resistors R3 and R4, if not needed. See Tables 1 and 2 for jumpers JU2 and JU3 configuration.

Table 1. U1 CS Pin Logic Input (JU2)

SHUNT POSITION	U1 CS PIN CONNECTION	EV KIT FUNCTION
Not installed	Pulled up to VCC through R3	U1 output enabled
Installed	GND	U1 output disabled (high impedance)

Evaluating the MAX9934F

To evaluate the MAX9934F, replace U1 (3 x 2-bump UCSP) or U2 (8-pin µMAX) with the appropriate version.

The device can be multiplexed with other MAX9934F parts. See the *Chip Select (CS)* section for additional information.

Output Measurements

The device provides a current output that can be measured across the OUT and OUT_REF PCB pads. Connect a 1.65V reference voltage across the OUT_REF and GND PCB pads.

Table 2. U2 CS Pin Logic Input (JU3)

SHUNT POSITION	U2 CS PIN CONNECTION	EV KIT FUNCTION
Not installed	Pulled up to VCC through R4	U2 output enabled
Installed	GND	U2 output disabled (high impedance)

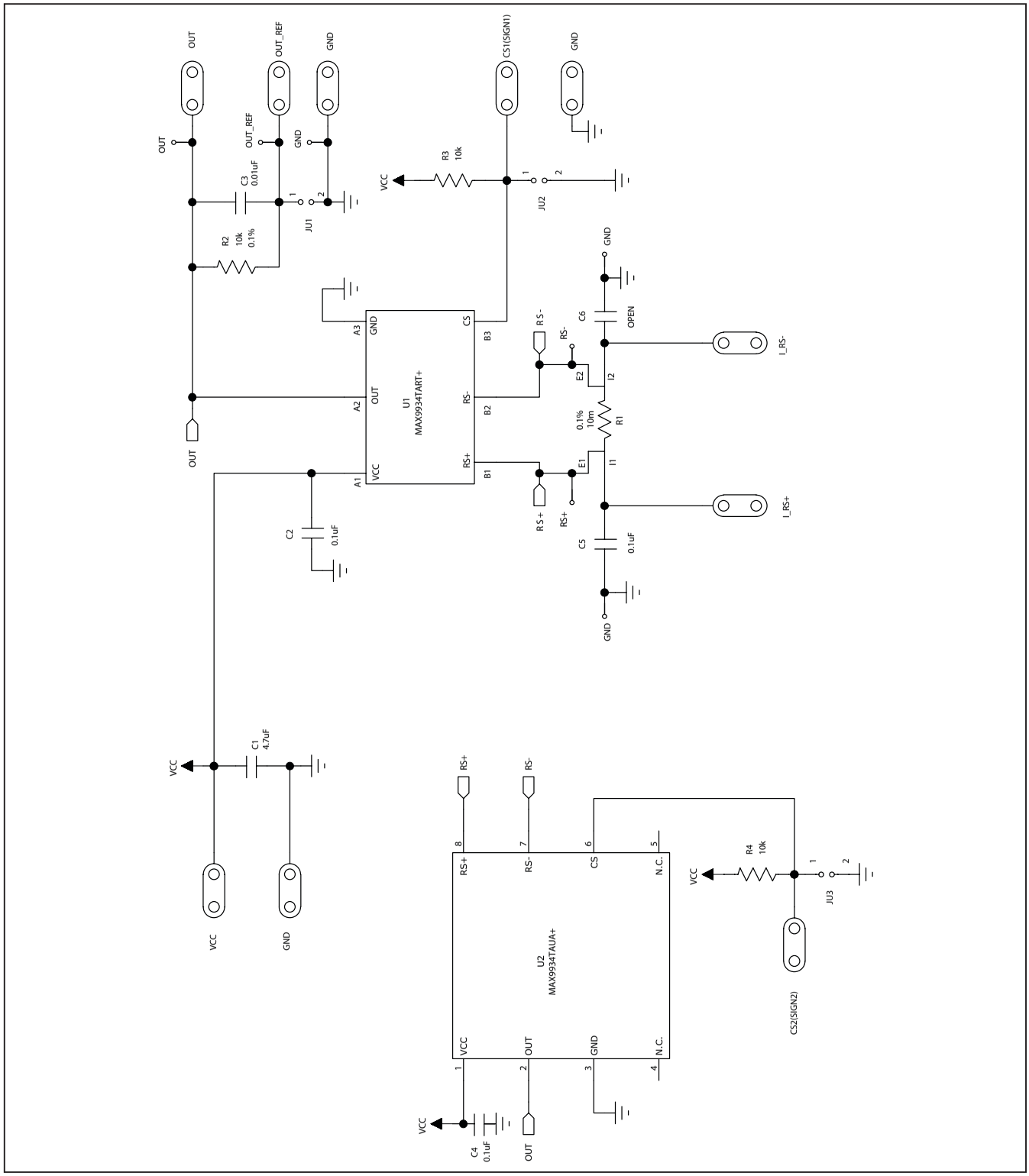

Figure 1. MAX9934T EV Kit Schematic

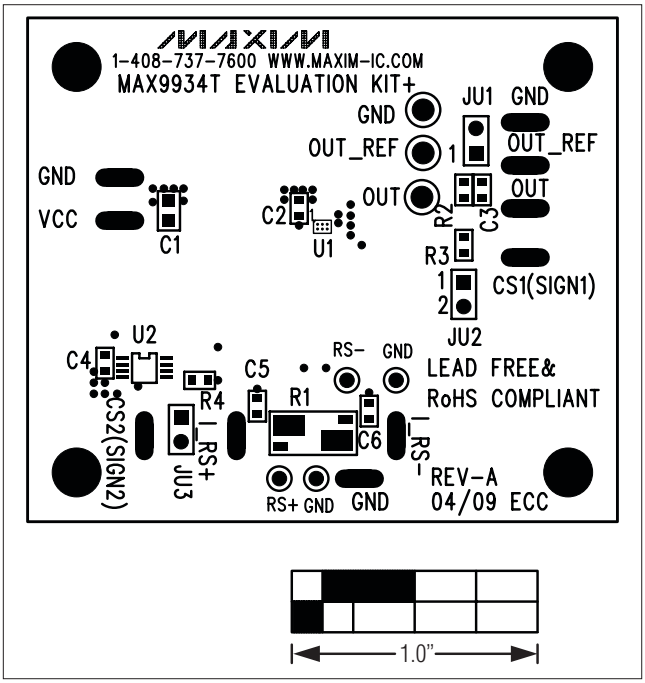

Figure 2. MAX9934T EV Kit Component Placement Guide—Component Side

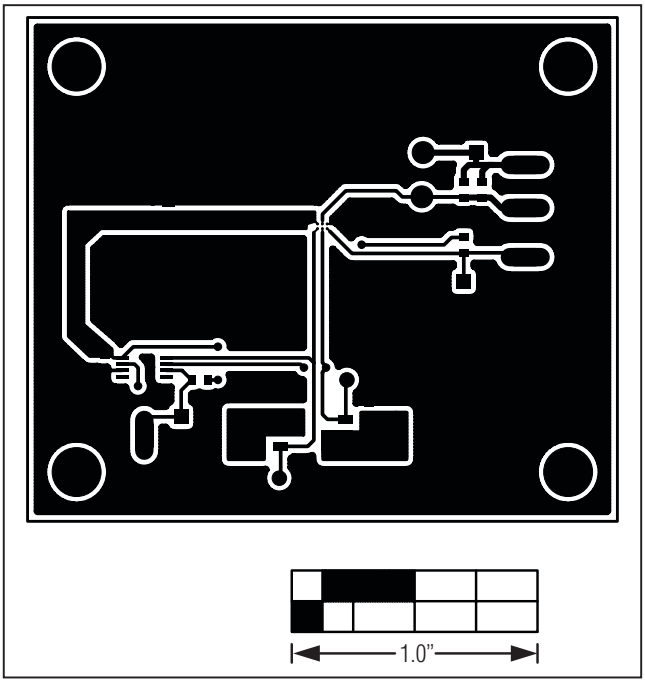

Figure 3. MAX9934T EV Kit PCB Layout—Component Side

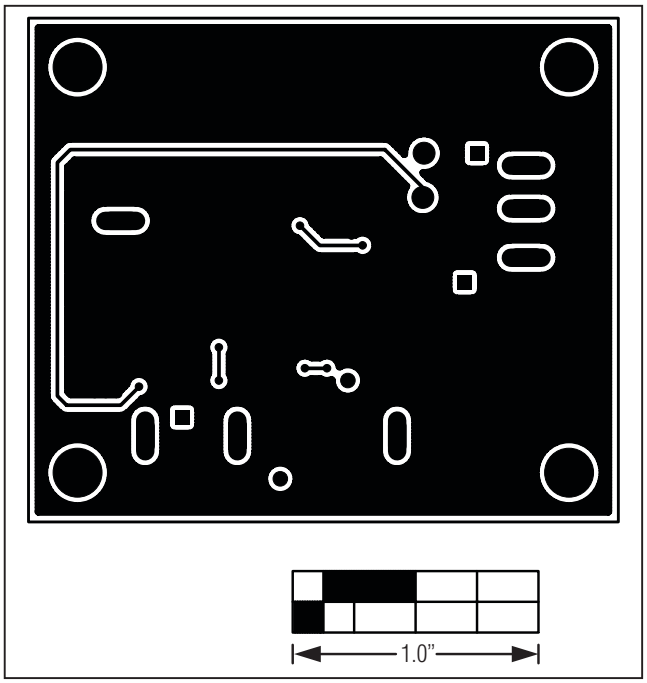

Figure 4. MAX9934T EV Kit PCB Layout—Solder Side

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/10	Initial release	—