General Description

The MAX34427 Shield evaluation kit (EV kit) is a fully assembled and tested PCB to evaluate the MAX34427, a SMBus two-channel, high dynamic range current, voltage, and power accumulator. The Shield operates from a single supply (either from USB or external power supply). This device is accessed through an I2C serial interface provided by a MAX32625PICO board connected to a PC by a USB port.

The MAX34427 Shield EV kit provides the hardware and software graphical user interface (GUI) necessary to evaluate the MAX34427. The kit includes an installed MAX34427. It connects to the PC through a MAX32625 PICO board and a micro-USB cable.

Features

- Easy Evaluation of the MAX34427
- +2.7V to +3.6V Single-Supply Operation
- Proven PCB Layout
- Fully Assembled and Tested
- USB-12C/SMBus™ Interface
- Windows® 7, 8, and 10 Compatible Software

EV Kit Contents

- Assembled circuit board, including the MAX34427
- Assembled MAX32625PICO I2C circuit board
- Micro-USB cable

MAX34427 EV Kit Files

FILE	DESCRIPTION
MAX34427EVKIT.exe	Installs EV kit files onto computer

Ordering Information appears at end of data sheet.

Quick Start

Required Equipment

- One high-current DC power supply capable of supplying +3V to +15V up to at least 3A
- One digital multimeter for measuring the voltage
- PC, laptop, or tablet with Microsoft Windows XP, Windows 7, 8, or 10 compatible software
- Micro-USB cable (included in the EV kit box)
- Variable power resistor for measuring the power
- MAX34427 EV kit

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.

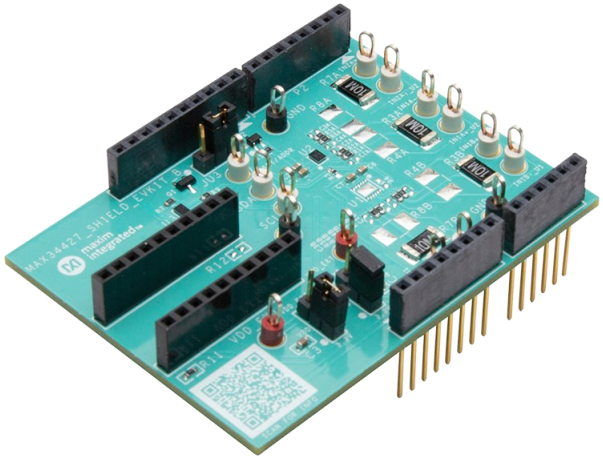
Procedure

The EV kit is fully assembled and tested. Follow these steps to verify board operation.

1. Place the MAX34427 EV kit on a nonconductive surface to ensure that nothing on the PCB gets shorted to the workspace.
2. Set the jumpers to their default positions as shown in *Table 1*.
3. Connect the MAX32625PICO I2C circuit board to the EV kit at its location (*Figure 1*).
4. Connect the micro-USB cable between the MAX32625PICO board and PC/laptop.
5. Visit *www.maximintegrated.com* to download the latest version of the MAX34427 Shield EV kit software, and run the control software.
6. Open the MAX34427 Shield EV kit software; this displays the MAX34427 Shield EV kit GUI.
7. When the GUI appears, the text at the bottom-right corner of the window should display **EV Kit Connected** and the text at the bottom-left corner of the window should display **Connected Mode**.
8. On the **Control/ Registers** page under **Sense Resistors,** ensure that the RSENSE (mΩ) shows 10.00.
9. With the output set to +3.8V and disabled, connect the positive terminal of the power supply to the $IN1A^{+}$_U2 test pin of the EV kit and connect the ground terminal to the GND header.

319-100926; Rev 0; 6/22

EV Kit Photo



10. Tune the variable Power Resistor to 38Ω and then connect it between the IN1A-_U2 test pin of the EV kit and GND connector of the EV kit.
11. Under **Read Options** on **Monitor/Graph** page of the GUI, set the **Polling Rate** to 2.5 seconds.
12. Turn on the power supply. Click **Auto Poll** and verify the voltage and average power.
13. Repeat steps 9 to 12 for IN2. Note: Both channels could be tested simultaneously by connecting two +3.8V DC supplies to the IN1A+_U2, IN2A+_U2 and connecting two power resistors to IN1A-_U2, IN2A-_U2. If using one DC power source for both channels, ensure that the DC power supply is capable of supplying the total current.
14. On the **Modes** window of the GUI, enable the **Slow Enable** slider for slow mode verification.
15. On the **Modes** window of the GUI, enable the **Park Enable** slider for park mode on either of the two channel's measurements.

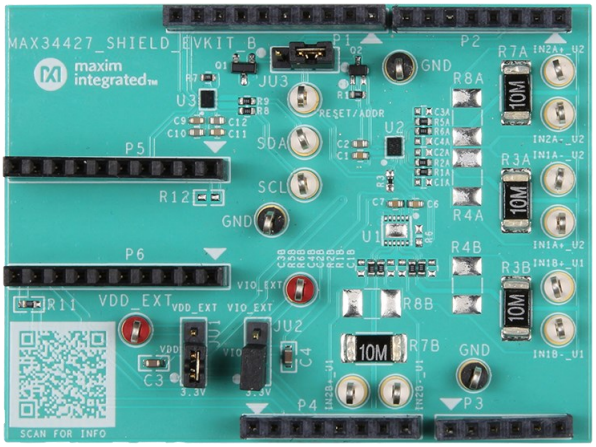


Figure 1. MAX34427Shield EV Kit Board Connections

Table 1. Jumper Connection Guide

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	System VDD is powered by a +3.3V supply from Arm® Mbed™ platform for Arduino®/PICO.
	2-3	System VDD is powered by VDD_EXT test pin using an external power supply.
JU2	1-2*	System VIO is powered by a +3.3V supply from Arm® Mbed™ platform for Arduino®/PICO.
	2-3	System VIO is powered by VIO_EXT test pin using an external power supply.
JU3	1-2	Connects RESET Pin to Arm® Mbed™ platform for Arduino®/PICO using level translator circuit to realize VIO voltage range from 1.6V to 3.6V.
	2-3*	Connects RESET Pin to Arm® Mbed™ platform for Arduino®/PICO without the level translator circuit at default VIO voltage of 3.3V.

**Default options*

Detailed Description

The MAX34427 automatically sequences through the channels to collect samples from the common-mode voltage and the current-sense amplifiers. The 16-bit current value and the 14-bit voltage value are then multiplied to create a 30-bit power/current value that is then written to the power accumulator. The MAX34427 contains a 56-bit power accumulator for each channel. This accumulator is updated 1024 times per second. When the host is ready to pull the latest accumulation data, it first sends the UPDATE command that causes the MAX34427 to load the latest accumulation data and accumulation count into the internal MAX34427 registers so the host can read them at any time. This type of operation allows the host to control the accumulation period. The only constraint is that the host should access the data before the accumulators can overflow. If the accumulators overflow, they do not roll over.

The MAX34427 contains a 14-bit ADC for voltage and a 13-bit ADC for current. During each sample time, a 14-bit voltage sample and a 16-bit current sample are resolved. To create a 16-bit current value from the 13-bit ADC, the device takes two current samples: one with the current sense amplifier in a high-gain mode and another with the amplifier in a low-gain mode. The high gain setting is eight times the low-gain setting. Based on the two current-sense ADC results, the device determines which result provides the best accuracy and fills the 16-bit current sample accordingly.

Detailed Description of Software

Software Startup

If the MAX34427 Shield EV kit is connected when the software is opened, the software first detects this hardware to communicate with the MAX34427 Shield EV kit. 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 Connected** at the bottom-right corner of the window and **Connected Mode** at the bottom-left of the window. If the EV kit is not connected on software startup, the GUI populates with default GUI configuration and displays **EV Kit not detected** at the bottom-right corner and **Demo Mode** at the bottom-left corner of the window. Once the EV kit is connected, the GUI searches for slave addresses.

Menu Items

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. The GUI detects the slave address and automatically checks the first slave address it finds; since the EV kit has only one device, user doesn't have to worry about the selection. The File menu is used to save measured data while Help menu can link users to *www.maximintegrated.com*.

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 (*Figure 1*) displays all the accumulator values. In the **Monitor** group box table, the Polled values are the Accumulator values read from PWR_ACC_1 and PWR_ACC_2 that are converted to amps using the **RSENSE** value in the **Sense Resistors** table on **Control/Registers** tab of the GUI (*Figure 2*). The **Instantaneous Voltage** and **Average Power** columns track the voltage and average power of the **Polled** value for each channel. The **Current** option can be selected from the **Mode** drop-down menu to see the **Average Current** column track the current of the **Polled** value for each channel. 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 with the **Polling Rate**.

The **Data Log Controls** group box contains the graph related controls. **Graph Points** displays the number of reads that have been tracked in the data log. To reset the **Poll Count**, click on the **Data Log Reset** button. The Data log reset button clears the graph log which includes the graph points recorded and the data logged for the graph thus far. The **Average Power/Voltage/Current** button selects the average power or voltage or current to be graphed.

Control/Registers Tab

The Control/Registers tab (*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–R4X) between IN_P and IN_N signals. The **Max Current (A)** column displays the maximum current threshold converted to amps using the **RSENSE** value.

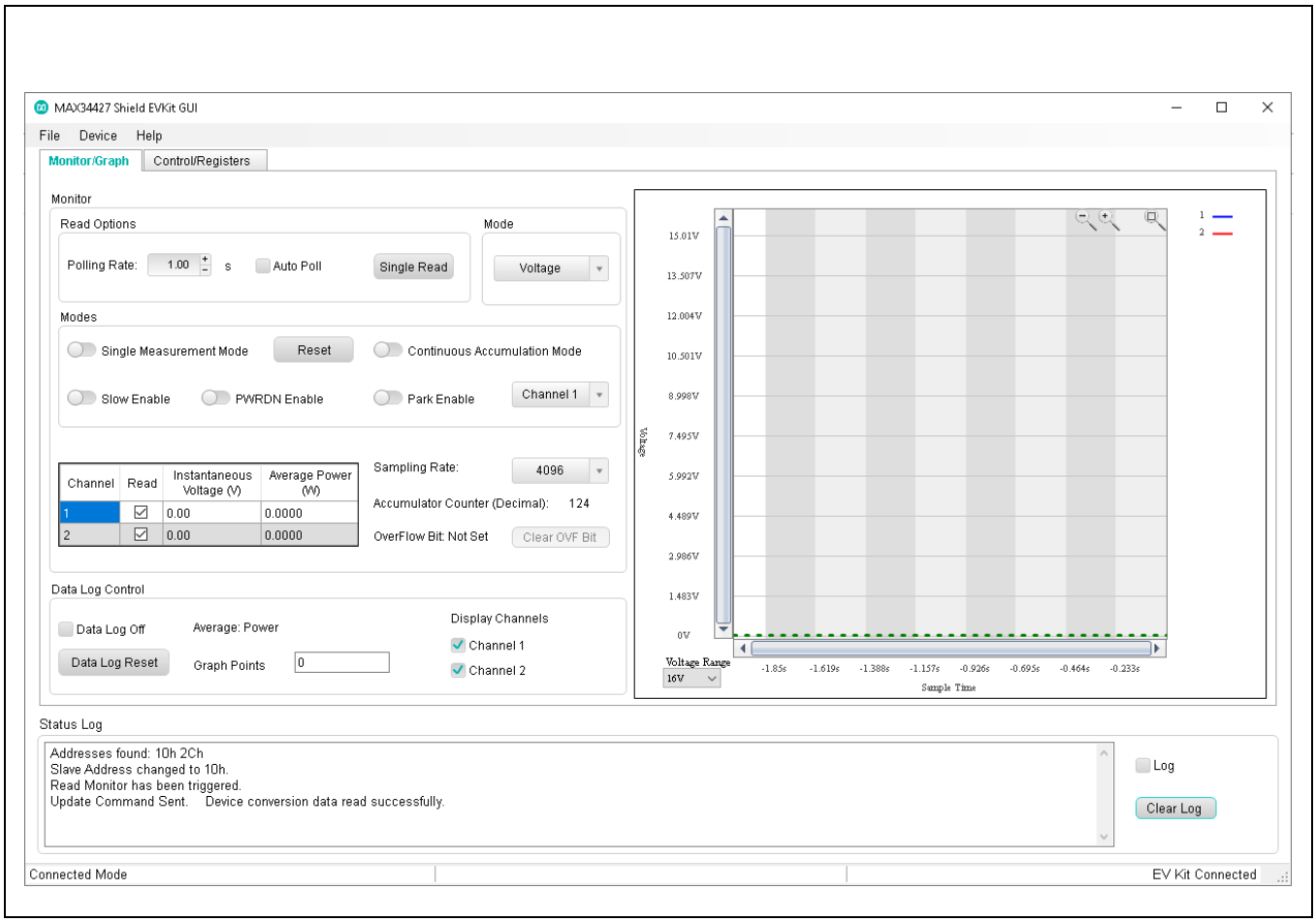


Figure 2. MAX34427 Shield EV Kit GUI—Monitor Graph Tab

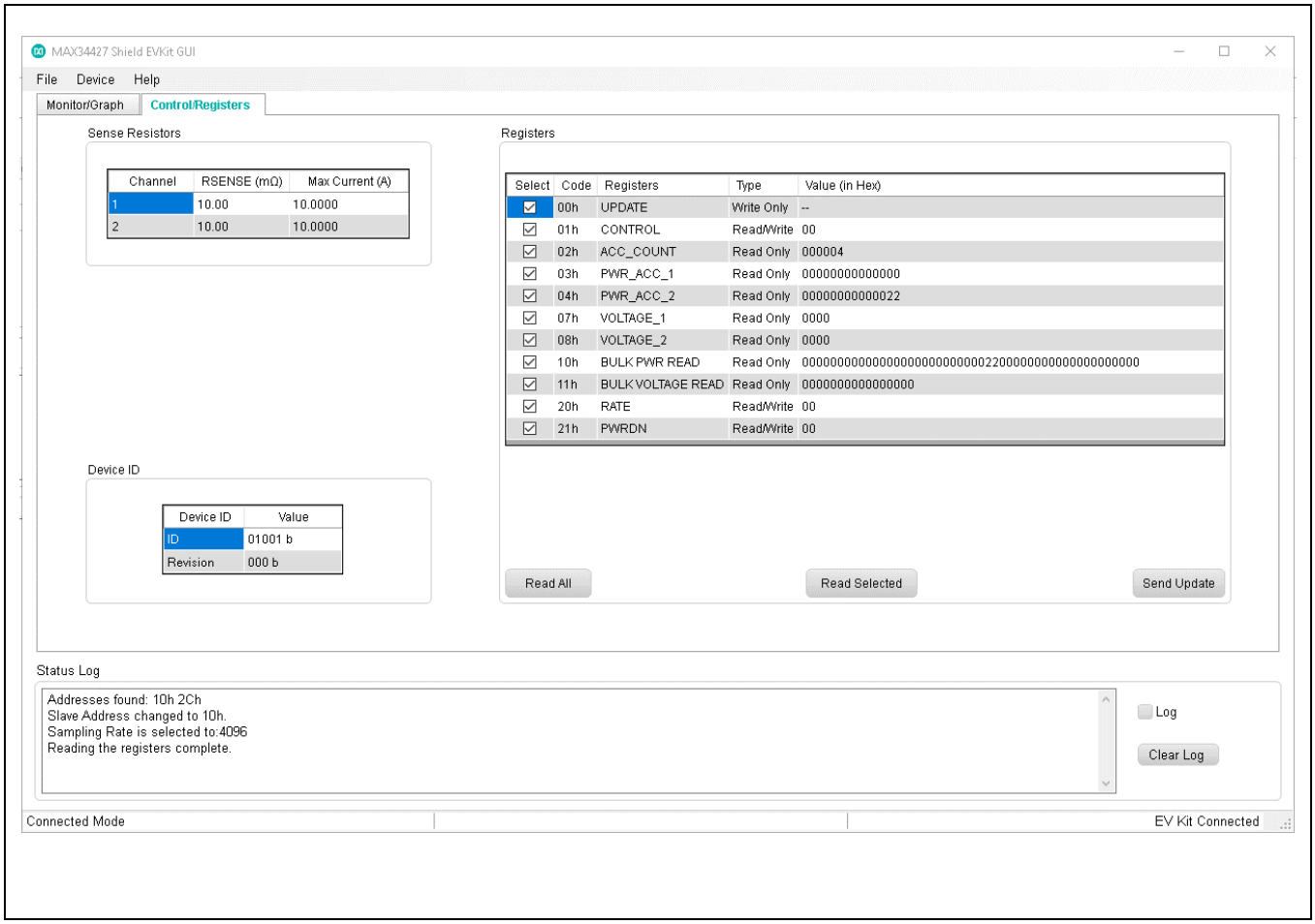


Figure 3. MAX34427 Shield EV Kit GUI—Control/Registers Tab

Ordering Information

PART	TYPE
MAX34427SHLD#	EV Kit

#Denotes RoHS-compliant.

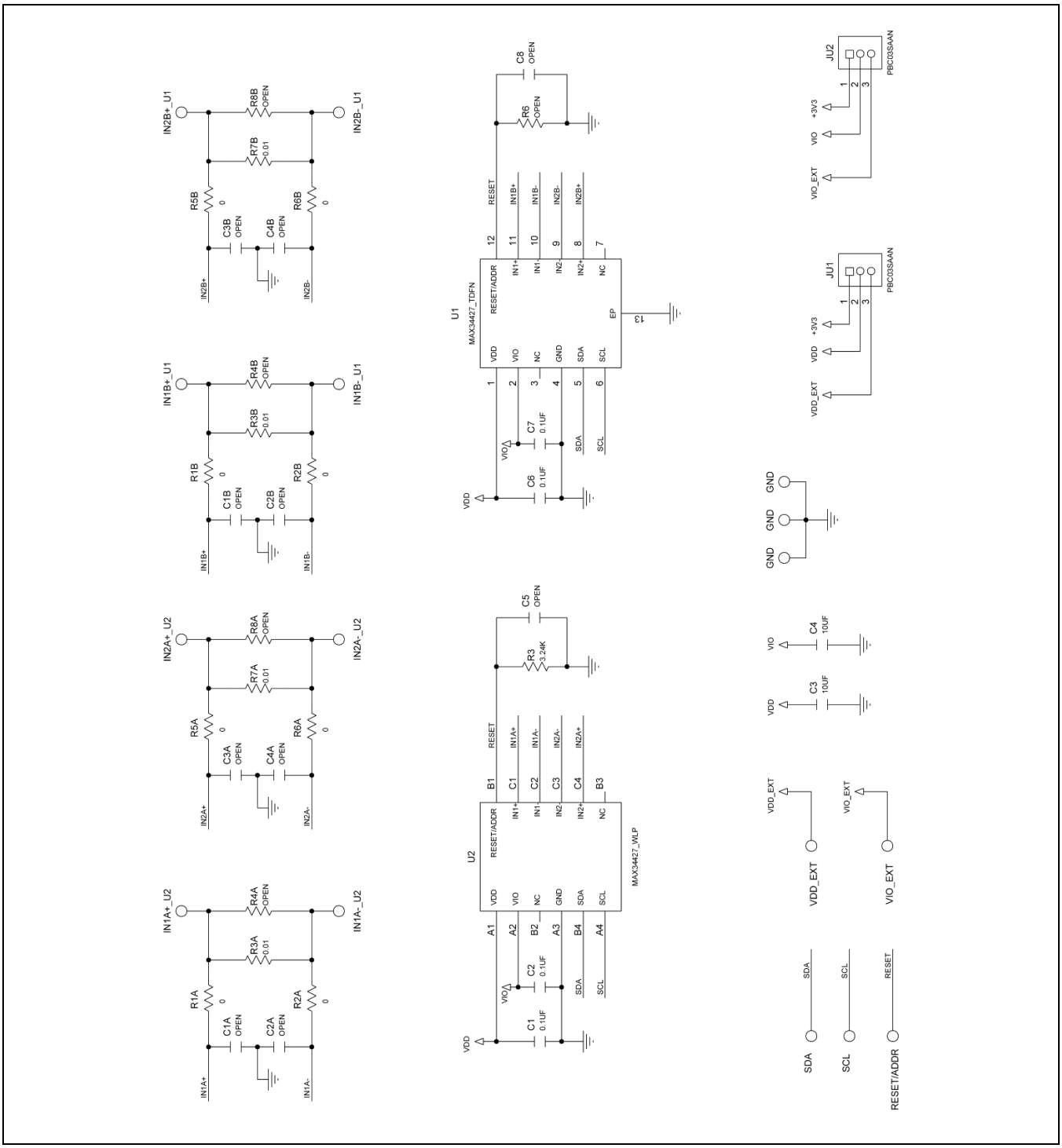
MAX34427 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C2, C6, C7, C10, C12	-	6	C0603C104K8RAC	KEMET	0.1UF	CAP; SMT (0603); 0.1UF; 10%; 10V; X7R; CERAMIC
2	C3, C4	-	2	GRM188Z71A106KA73	MURATA	10UF	CAP; SMT (0603); 10UF; 10%; 10V; X7R; CERAMIC ;
3	C9, C11	-	2	GRM188R71C103KA01; ECJ1VB1C10; CL10B103KO8NNN; GCJ188R71C103KA01	MURATA; PANASONIC; SAMSUNG; MURATA	0.01UF	CAP; SMT (0603); 0.01UF; 10%; 16V; X7R; CERAMIC
4	GND, GND1, GND2	-	3	5011	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
5	IN1A+_U2, IN1A-_U2, IN1B+_U1, IN1B-_U1, IN2A+_U2, IN2A-_U2, IN2B+_U1, IN2B-_U1, RESET/ADDR, SCL, SDA	-	11	5012	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
6	JU1-JU3	-	3	PBC03SAAN	SULLINS	PBC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC
7	P1	-	1	SSQ-110-04-G-S	SAMTEC	SSQ-110-04-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 10PINS ;
8	P2, P4	-	2	SSQ-108-04-G-S	SAMTEC	SSQ-108-04-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 8PINS ;

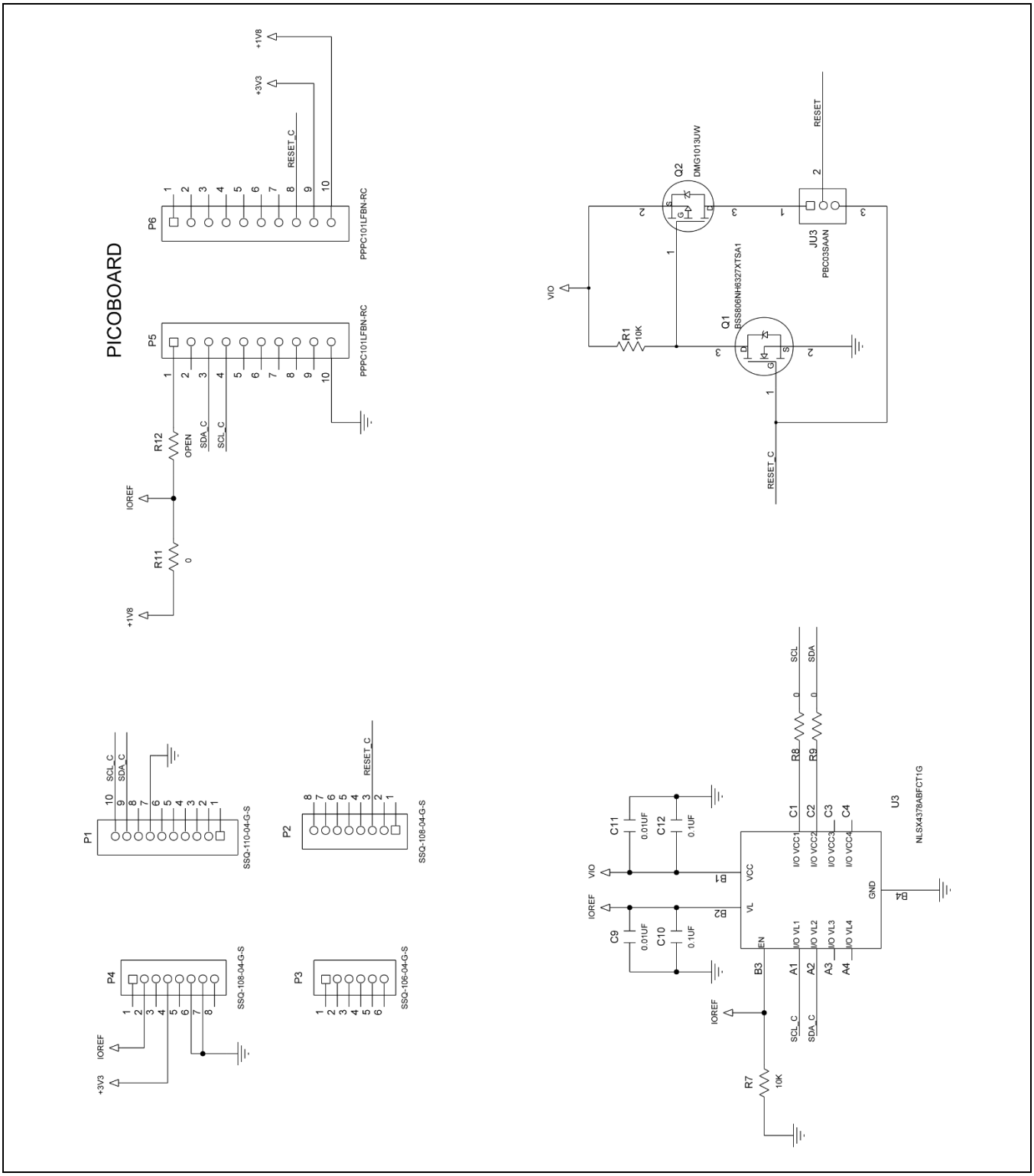
9	P3	-	1	SSQ-106-04-G-S	SAMTEC	SSQ-106-04-G-S	CONNECTOR; FEMALE; THROUGH HOLE; .025IN SQ POST SOCKET; STRAIGHT; 6PINS ;
10	P5, P6	-	2	PPPC101LFBN-RC	SULLINS ELECTRONICS CORP.	PPPC101LFBN-RC	CONNECTOR; FEMALE; THROUGH HOLE; HEADER CONNECTOR; STRAIGHT; 10PINS
11	Q1	-	1	BSS806NH6327XTSA1	INFINEON	BSS806NH6327XTSA1	TRAN; N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR; NCH; SOT-23; PD-(0.5W); I-(2.3A); V-(20V)
12	Q2	-	1	DMG1013UW	DIODES INCORPORATED	DMG1013UW	TRAN; P-CHANNEL ENHANCEMENT MODE MOSFET; PCH; SOT-323; PD-(0.31W); I-(-0.82A); V-(-20V)
13	R1, R7	-	2	CRCW060310K0FK; ERJ-3EKF1002;AC0603FR-0710KL;RMCF0603FT10K0	VISHAY DALE;PANASONIC; YAGEO	10K	RES; SMT (0603); 10K; 1%; +/-100PPM/DEGC; 0.1000W
14	R1A, R1B, R2A, R2B, R5A, R5B, R6A, R6B, R8, R9, R11	-	11	CRCW06030000Z0	VISHAY DALE	0	RES; SMT (0603); 0; JUMPER; JUMPER; 0.1000W
15	R3	-	1	RMCF0603FT3K24	STACKPOLE ELECTRONICS INC.	3.24K	RES; SMT (0603); 3.24K; 1%; +/-100PPM/DEGC; 0.1000W
16	R3A, R3B, R7A, R7B	-	4	ERJ-M1WSF10M	PANASONIC	0.01	RESISTOR; 2512; 0.01 OHM; 1%; 100PPM; 1W; METAL STRIP
17	SU1-SU3	-	3	S1100-B;SX1100-B;STC02SYAN	KYCON;KYCON;SULLINS ELECTRONICS CORP.	SX1100-B	TEST POINT; JUMPER; STR; TOTAL LENGTH=0.24IN; BLACK; INSULATION=PBT;PHOSPHOR BRONZE CONTACT=GOLD PLATED
18	U1	-	1	MAX34427_TDFN	MAXIM	MAX34427_TDFN	EVKIT PART - IC; MAX34427; TDFN12-

							EP; PACKAGE OUTLINE DRAWING: 21-0664; LAND PATTERN DRAWING: 90-0397; PACKAGE CODE: TD1233+1C
19	U2	-	1	MAX34427_WLP	MAXIM	MAX34427_WLP	EVKIT PART - IC; MAX34427; WLP; PACKAGE OUTLINE DRAWING: 21-0009; PACKAGE CODE: W121C2+1
20	U3	-	1	NLSX4378ABFCT1G	ON SEMICONDUCTOR	NLSX4378ABFCT1G	IC; TRANS; 4-BIT 24 MB/S DUAL-SUPPLY LEVEL TRANSLATOR; UBUMP12
21	VDD_EXT, VIO_EXT	-	2	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
22	PCB	-	1	MAX34427SHIELD	MAXIM	PCB	PCB:MAX34427SHIELD
23	R4A, R4B, R8A, R8B	DNP	0	ERJ-M1WSF10M	PANASONIC	0.01	RESISTOR; 2512; 0.01 OHM; 1%; 100PPM; 1W; METAL STRIP
24	R6	DNP	0	CRCW0603118KFK; ERJ-3EKF1183	VISHAY DALE;PANASONIC	118K	RES; SMT (0603); 118K; 1%; +/-100PPM/DEGC; 0.1000W
25	C1A-C4A, C1B-C4B, C5, C8	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0603 NON-POLAR CAPACITOR
26	R12	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0603 RESISTOR

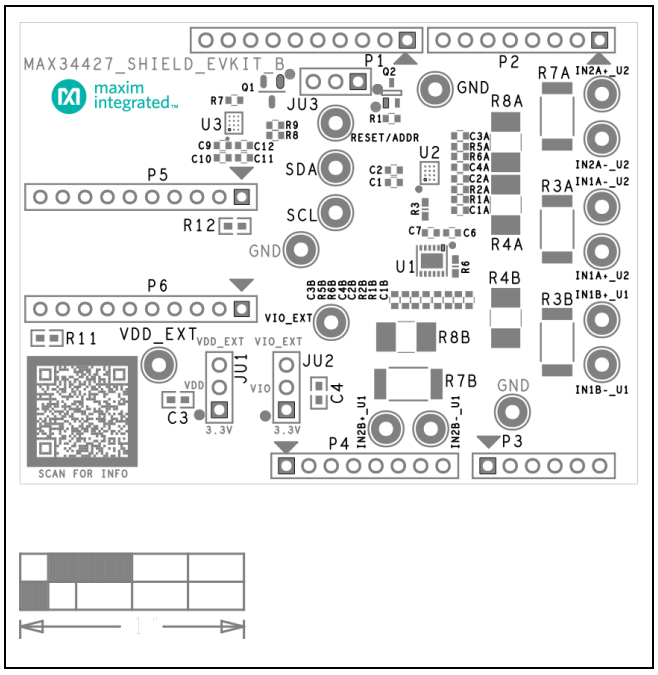
MAX34427 EV Kit Schematic



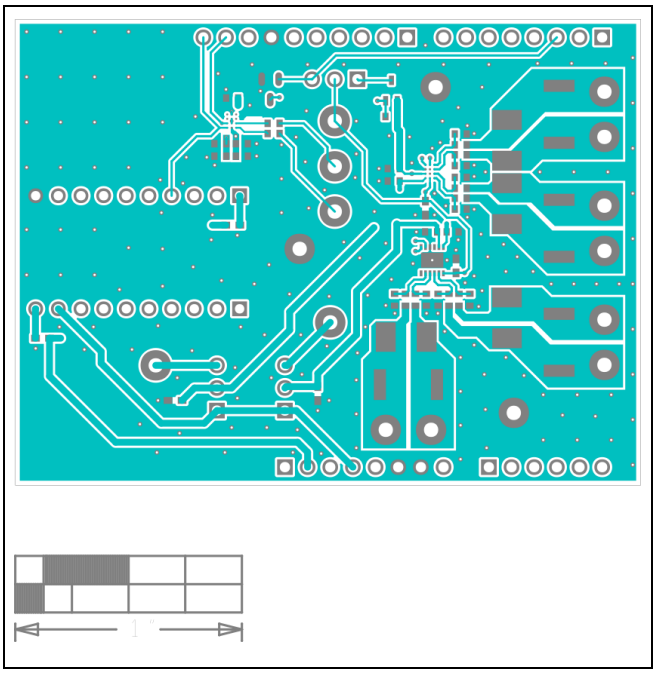
MAX34427 EV Kit Schematic (continued)



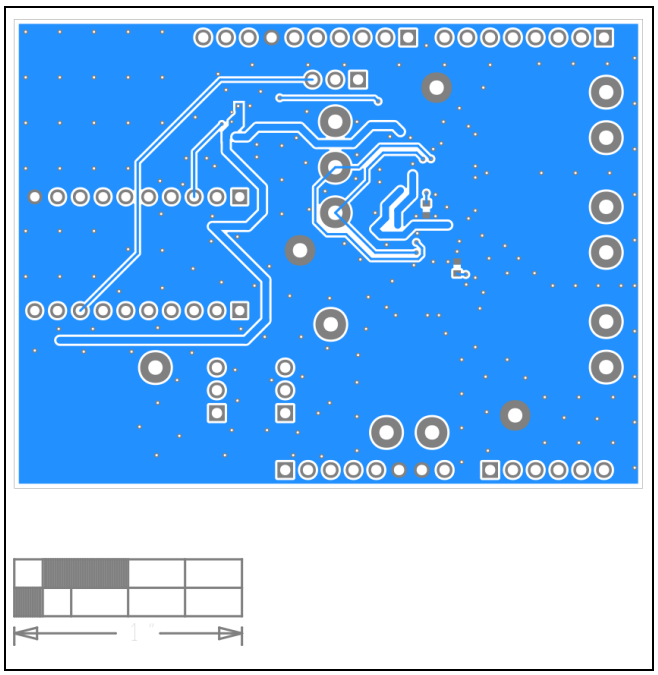
MAX34427 EV Kit PCB Layout



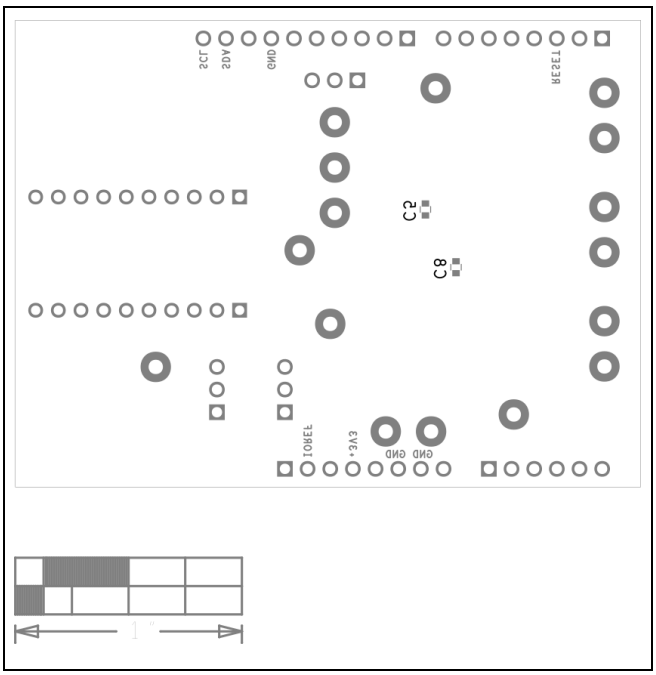
MAX34427 EV Kit PCB Layout—Top Silkscreen



MAX34427 EV Kit PCB Layout—Top Layer



MAX34427 EV Kit PCB Layout—Bottom Layer



MAX34427 EV Kit PCB Layout—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/22	Initial release	—