

General Description

The MAX34417 evaluation kit (EV kit) provides the hardware and software graphical user interface (GUI) necessary to evaluate the MAX34417 SMBus Four-Channel, High Dynamic Range Power Accumulator. The EV Kit includes a MAX34417ENE+ installed EV board, as well as a micro-USB cable to communicate with a PC.

Ordering Information appears at end of data sheet.

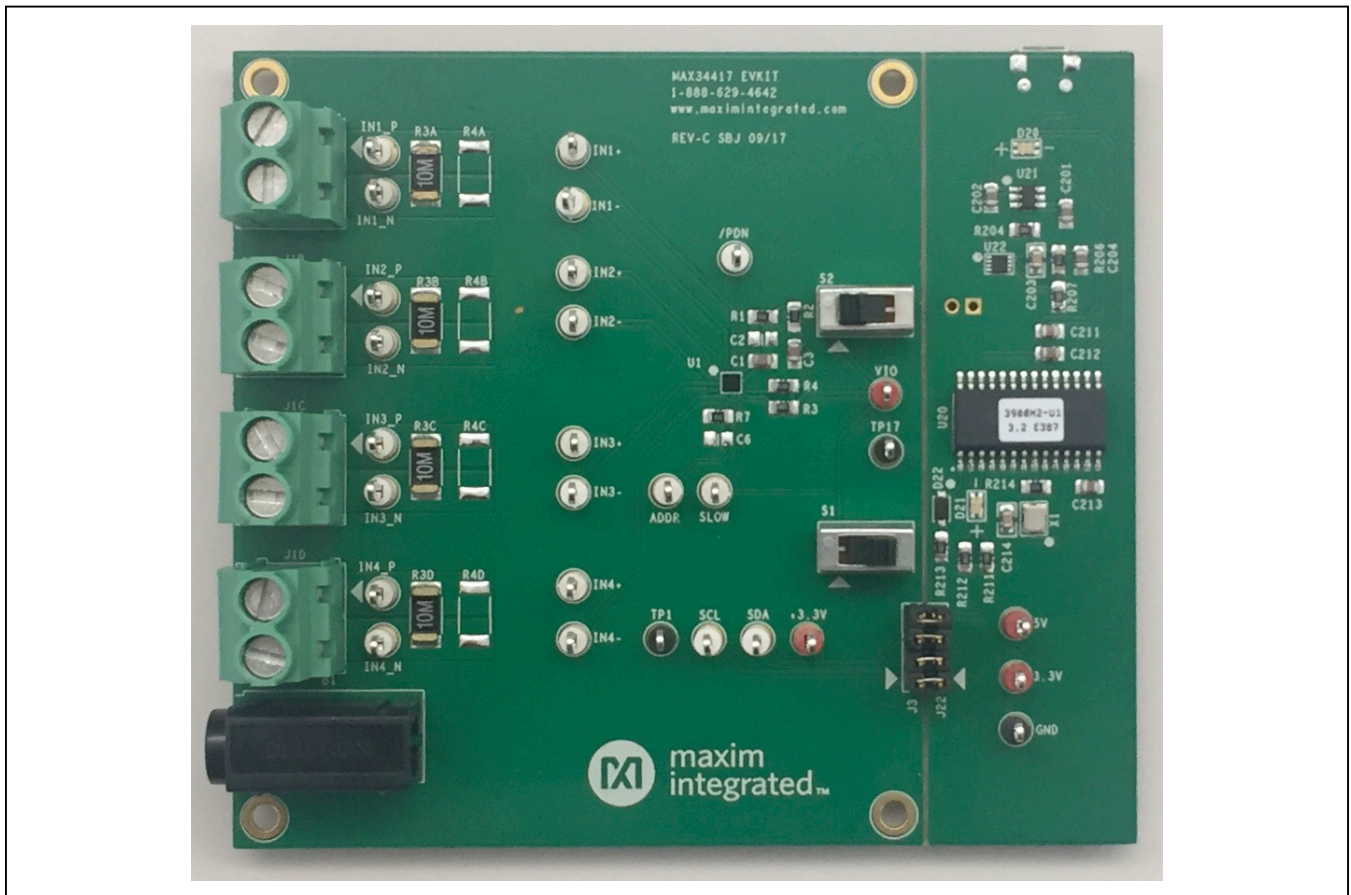
Features

- Easy Evaluation of the MAX34417
- USB-12C/SMBus Interface
- PC, Laptop, or Tablet with Windows XP®, Windows® 7, 8, and 10 Compatible Software
- Proven PCB Layout
- Fully Assembled and Tested

EV Kit Contents

- Assembled circuit board including MAX34417ENE+
- Micro-USB cable

MAX34417 EV Kit Photo



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Windows is a registered trademark and registered service mark of Microsoft Corporation.

MAX34417 EV Kit Files

FILE	DESCRIPTION
MAX34417 Power Accumulator EV Kit Software	Application program

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, and 10 compatible software
- Micro-USB cable (included in the EV kit box)
- Variable power resistor for measuring the power
- MAX34417 EV kit

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 to the workspace.
- 2) Ensure that all four jumpers on **J3/J22** are installed.
- 3) Prior to starting the GUI, connect the **J20** connector of the EV kit to a PC using the supplied micro-USB cable, the **POWER LED (D20)** should be green, and the **COM LED (D21)** should be red and slowly flash orange.
- 4) Visit www.maximintegrated.com/evkitsoftware to download the latest version of the MAX34417 power accumulator EV kit software. Save the EV kit software to a temporary folder.
- 5) Install and open the MAX34417 power accumulator EV kit Software.
- 6) 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**. The **COM LED (D21)** changes to green.
- 7) Measure the potential from **3.3V** and **+3.3V** test points to Ground and verify that it is within the range of 3.2V to 3.4V.
- 8) Measure the potential from **5V** test point to Ground and verify that it is within the range of 4.8V to 5.2V.
- 9) Set the **S1 switch** to right side (fast position) and **S2 switch** to left side (power-on position).
- 10) Make sure that the **RSENSE (mΩ)**, on **Control/Registers** page under **Sense Resistors**, shows 10.00.
- 11) With the output set to +3.8V and disabled, connect the positive terminal of the power supply to the **IN1_P** (SOURCE pin of the J1A) of the EV kit and connect the ground terminal to the **GND** header.
- 12) Tune variable **Power Resistor** to 38Ω and then connect it between the **IN1_N** (RETURN pin of the J1A) of the EV kit and **GND** connector of the EV kit.
- 13) On **Monitor/Graph** page of the GUI, under **Read Options**, set the **Polling Rate** to 2.5 seconds.
- 14) Turn on the power supply. Click **Auto Poll** and verify the voltage and average power.
- 15) Repeat steps 11 to 14 for IN2, IN3, and IN4.
Note: All 4 channels could be tested simultaneously by connecting four +3.8V DC supplies to the **IN1_P**, **IN2_P**, **IN3_P**, and **IN4_P**, and connecting four power resistors to **IN1_N**, **IN2_N**, **IN3_N**, and **IN4_N**. If using one DC power source for all 4 channels, make sure that the DC power supply is capable of supplying the total current.
- 16) Change the position of **S1 switch** to left side (slow position) or slide the **Slow Enable**, on the **Modes** window of the GUI, for Slow mode verification.
- 17) Slide **Park Enable**, on the **Modes** window of the GUI, for park on any of the four channels measurement.
- 18) Change the position of **S2 switch** to right side (power-off position) and verify that the **Auto Poll** stops polling.

Detailed Description

The MAX34417 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 value that is then written to the power accumulator. The MAX34417 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 MAX34417 to load the latest accumulation data and accumulation count into the internal MAX34417 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 MAX34417 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 8 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 MAX34417 EV kit is connected when the software is opened, the software first detects 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 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, and 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 the Maxim website.

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 to PWR_ACC_4 that are converted to amps using the **RSENSE** value in the **Sense Resistors** table on **Control/Registers** tab of the GUI (Figure 2). The **Sampled Voltage** and **Average Power** columns track the voltage and average power 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** button selects the average power or voltage to be graphed.

Control/RegistersTab

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.

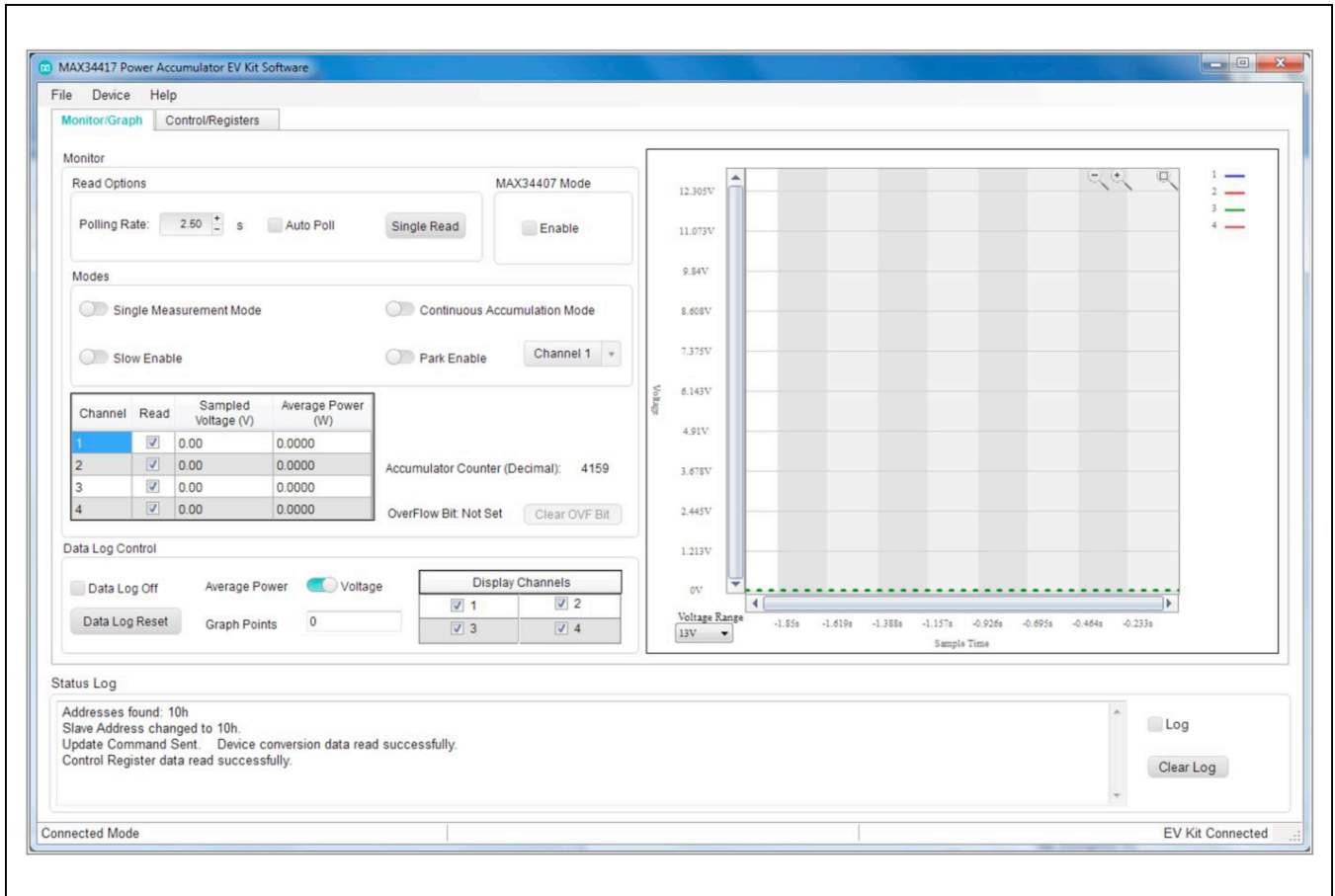


Figure 1. MAX34417EV Kit Software—Monitor/Graph Tab

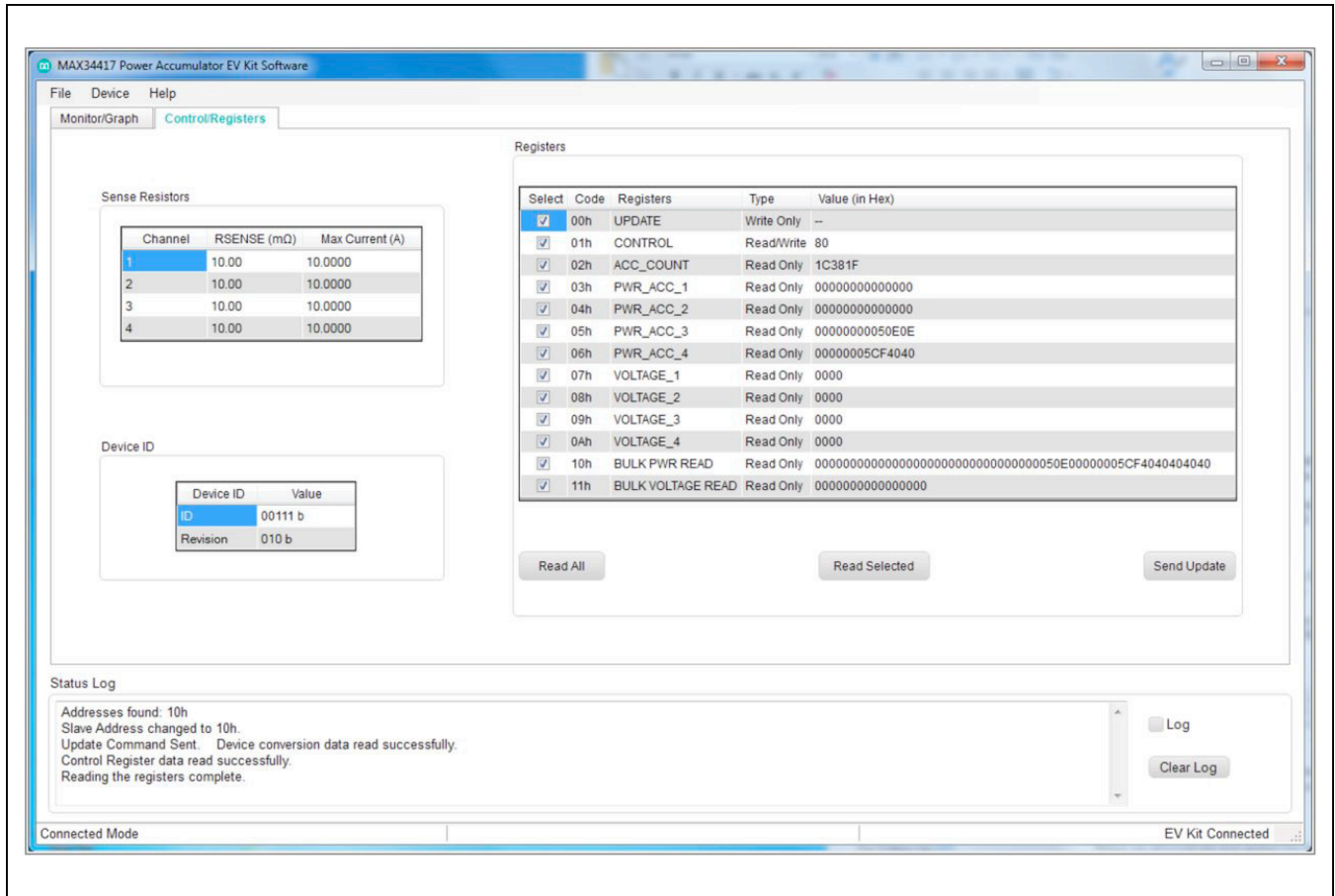


Figure 2. MAX34417EV Kit Software—Control/Registers Tab

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 2](#) to help troubleshoot the issue.

Table 1. Description of LEDs (D20, D21)

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 a command from the PC is received.
	Green	Initialized: Hardware has been initialized by software.

Table 2. Troubleshooting

SYMPTOM	CHECK	SOLUTION
GUI indicates: EV Kit Not Connected Device 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/J22	Make sure all four jumpers on J3/J22 are populated.

Component Suppliers

SUPPLIER	WEBSITE
TDK	http://www.tdk.com/
Taiyo Yuden	http://www.t-yuden.com/
Murata	http://www.murata.com/
Vishay Dale	http://www.vishay.com/
Koa Speer Electronics Inc.	http://www.koaspeer.com/
Keystone Electronics	http://www.keyelco.com/
Del-Tron	http://deltron.com/
King bright	http://www.kingbrightusa.com/
Panasonic	https://na.industrial.panasonic.com/
Phoenix Contact	http://www.phoenixcontact.com/
3M	http://www.3m.com/
Molex	http://www.molex.com/
TE Connectivity	http://www.te.com/usa-en/home.html
Microchip	http://www.microchip.com/
Kyocera	http://www.kyocera.com/

Ordering Information

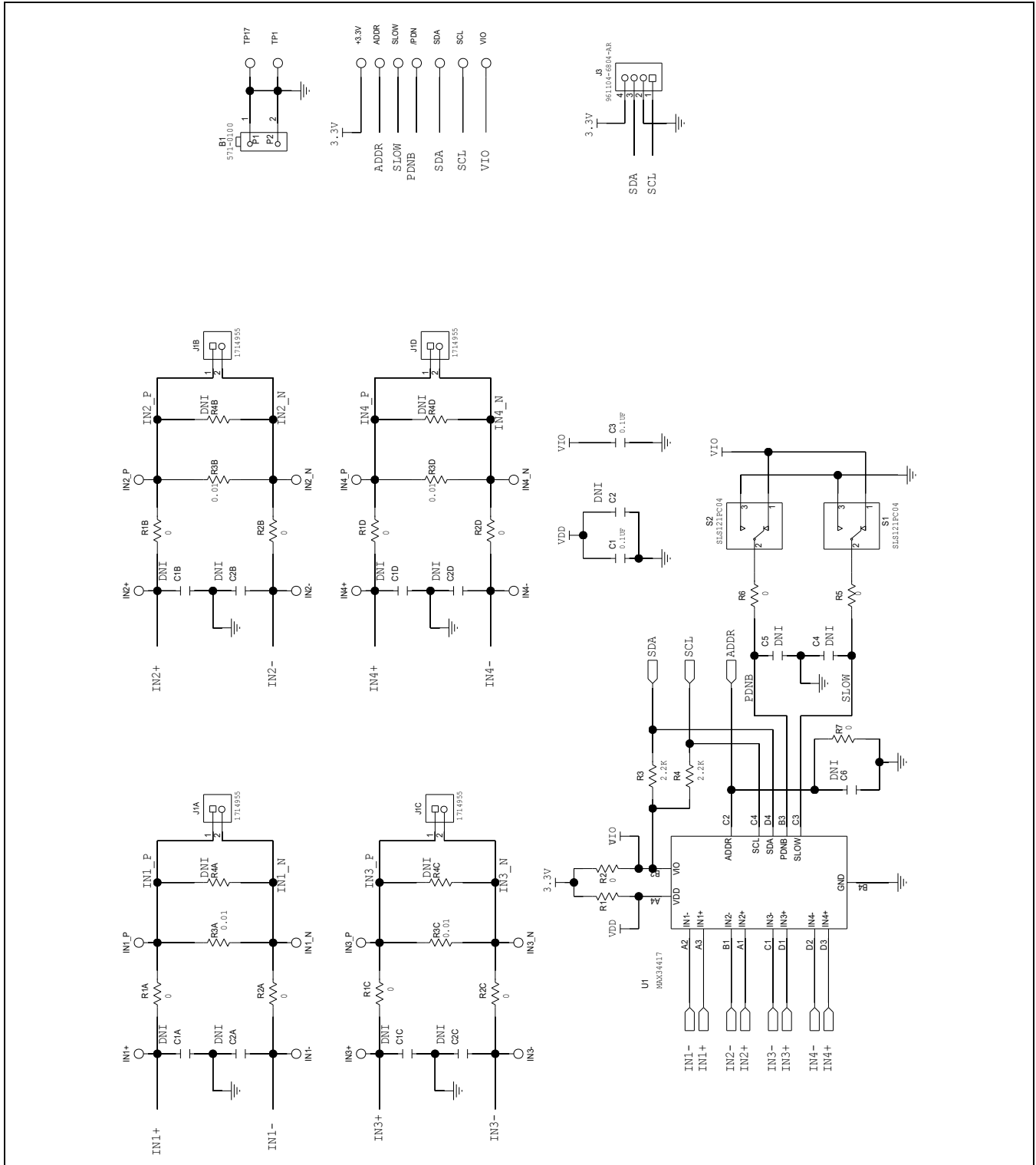
PART	TYPE
MAX34417EVKIT#	EV Kit

#Denotes RoHS compliant.

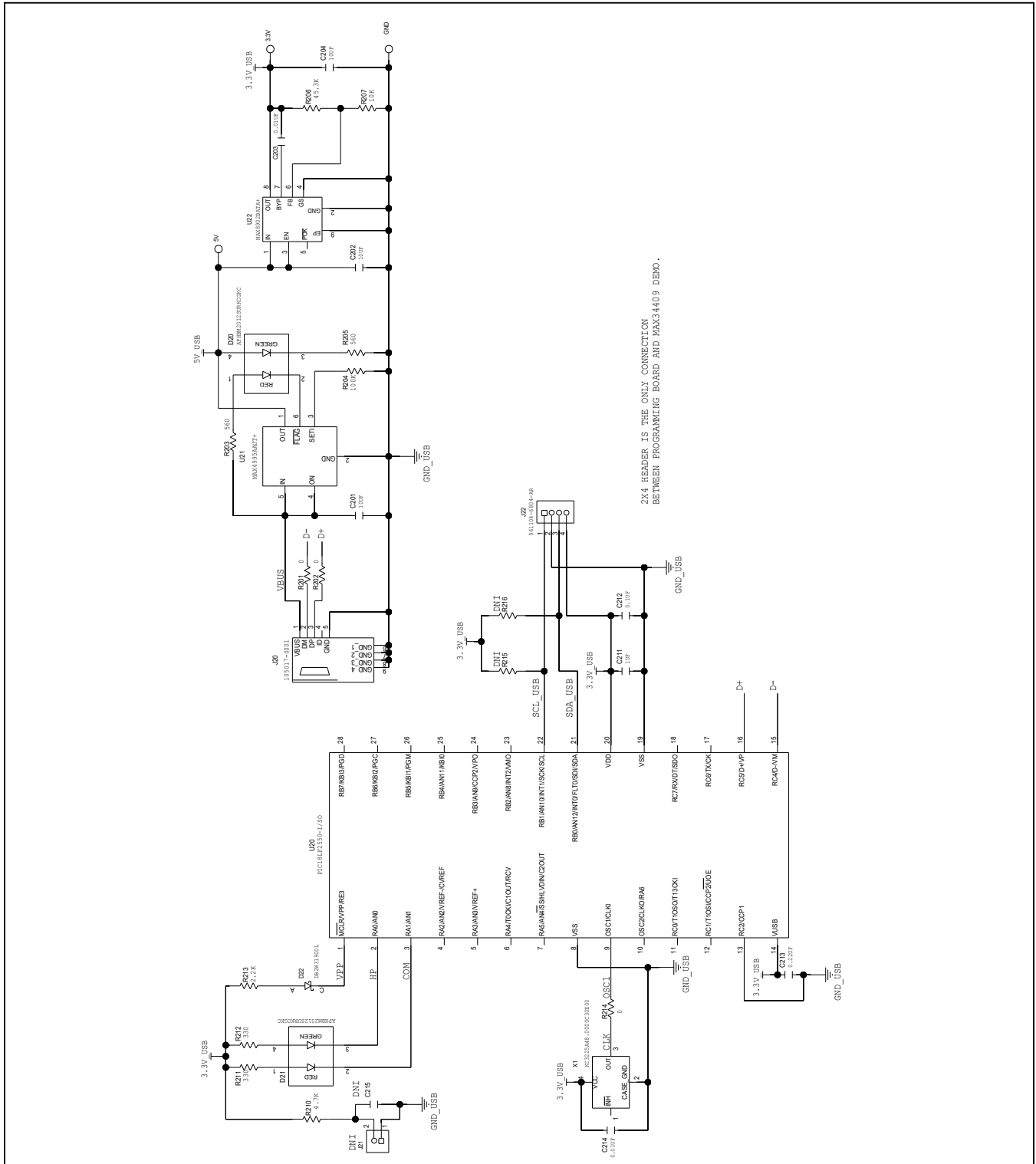
MAX34417 EV Kit Bill of Materials

Item	Reference	Quantity	Value	Description	MAXIMV	Manufacturer Part Number	Manufacturer	DiGi-Key Part Number	Comments
1	5V, VIO, 3.3V, +3.3V	4	N/A	TEST POINT WITH 1.80MM HOLE DIA. RED; MULTIPURPOSE; NOT FOR COLD TEST	02-TPMIN5010-00	5010	KEYSTONE	36-5010-ND	
2	SCL, SDA, /P0N, ADDR, IN1-IN4+, INT1-IN4-, SLOW, INT1-IN4-, IN1_P-, IN1_P	21	N/A	TEST POINT, PIN DIA=0.125IN, TOTAL LENGTH=0.44IN, BOARD THICKNESS=0.063IN; WHITE; RECOMMENDED FOR BOARD THICKNESS=0.062IN;	02-TPMIN5012-00	5012	KEYSTONE	36-5012-ND	
3	B1	1	N/A	CONNECTOR, FEMALE, THROUGH HOLE; SOCKET; 100% CERAMIC CHIP; 0.1UF;	01-57101002P-80	571-0100	DELTRON	445-5827-2-ND	
4	C1, C3, C212	3	0.1UF	100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=XTR; AUTO	20-0000U1-CAR2	CGA4L2X7R2A104K125AA	TDK		
5	C2, C4-C6, C7A, C7B, C7C, C7D, C2A, C2B, C2C, C2D, C2E	13	DNP	PACKAGE OUTLINE 0805 NON-POLAR CAPACITOR - EVKIT	N/A	N/A	N/A		
6	C201, C202, C204	3	10UF	CAPACITOR, SMT (0805); CERAMIC CHIP; 10UF; 16V; TOL=10%; TG=-55 DEGC TO +85 DEGC; TC=X5R	20-0010U-23A	EMK212AB108KD-T	TAYO YUDEN	587-2880-2-ND	
7	C203, C214	2	0.01UF	CAPACITOR, SMT (0805); CERAMIC CHIP; 0.01UF; 100V; TOL=10%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=XTR	20-0000U1-E9	GRM21BR72A103KA01	MURATA	490-1652-2-ND	
8	C211	1	1UF	CAPACITOR, SMT (0805); CERAMIC CHIP; 1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=XTR	20-0001U-04	C2012X7RH105K085AC	TDK	445-14539-2-ND	
9	C213	1	0.22UF	CAPACITOR, SMT (0805); CERAMIC CHIP; 0.22UF; 50V; TOL=10%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=XTR	20-00022-04	C2012X7RH224K125AA	TDK	445-1350-2-ND	
10	D20, D21	2	N/A	DIODE, LED, SMD CHIP, LED, LAMP; RED-GREEN; SMT; VF=2.5V; IF=0.02A	30-APHBM2012S1URKCGKC-00	APHBM2012S1URKCGKC	KINGBRIGHT	754-1095-2-ND	
11	D22	1	N/A	DIODE, SCH; SMT (MINI2-F5-B); PIV=30V; IF=3A	30-DB2W31900L-00	DB2W31900L	PANASONIC	DB2W31900LTR-ND	
12	GND, TP1, TP17	3	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.44IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE; WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN; NOT FOR COLD TEST	02-TPMIN5011-00	5011	KEYSTONE	36-5011-ND	
13	J1A, J1B, J1C, J1D	4	N/A	CONNECTOR, FEMALE, THROUGH HOLE; PCB TERMINAL; BLOCK; RIGHT ANGLE; 2PINS	01-17149552P-25	1714955	PHOENIX CONTACT	277-1269-ND	
14	J3, J22	2	N/A	CONNECTOR, MALE, THROUGH HOLE; 961 SPRING; 24 POS; STRAIGHT; 4PINS; 2.54 MM; SOLDER TAIL; STRAIGHT; 4PINS	01-9611046804AR4P-19	961104-6804-AR	3M	961104-6804-AR-ND	
15	J20	1	N/A	CONNECTOR, FEMALE; SMT; MICROUSB B RECEPTACLE; RIGHT ANGLE; SPINS	01-10501700015P-26	105017-0001	MOLEX	WM1399TR-ND	
16	J21	1	DNP	CONNECTOR, MALE; THROUGH HOLE; PIN STRIP; HEADER; STRAIGHT; 2PINS	N/A	N/A	N/A		
17	R1, R2, R5-R7, R7A, R7B, R7C, R7D, R2A, R2B, R2C, R2D, R201, R202, R214	16	0	RESISTOR; 0805; 0 OHM; 0%; JUMPER; 0.5W; THICK FILM	80-0000R-BA47	CRCW08050000202EAHP	VISHAY DALE	541-0.0TBTTR-ND	
18	R3, R4, R213	3	2.2K	RESISTOR; 0805; 2.2K OHM; 1%; 100PPM; 0.125W; THICK FILM	80-002K2-AA28	CRCW08052K202FK	VISHAY DALE	541-2.20KCTR-ND	
19	R3A, R3B, R3C, R3D	4	0.01	RESISTOR; 2512; 0.01 OHM; 1%; 100PPM; 1W; METAL STRIP	80-00R01-BA88	ERJM1W5F10M	PANASONIC	P10MTR-ND	
20	R4A, R4B, R4C, R4D	4	DNP	PACKAGE OUTLINE 2512 RESISTOR - EVKIT	N/A	N/A	N/A		
21	R203, R205	2	560	RESISTOR; 0805; 560 OHM; 1%; 100PPM; 0.125W; THICK FILM	80-0560R-25	CRCW0805560R2FK	VISHAY DALE	541-560CTR-ND	
22	R204	1	100K	RESISTOR; 0805; 100K; 1%; 100PPM; 0.125W; THICK FILM	80-0100K-25	CRCW0805100K2FK	VISHAY DALE	541-100KCTR-ND	
23	R206	1	45.3K	RESISTOR; 0805; 45.3K OHM; 1%; 100PPM; 0.125W; THICK FILM	80-045K3-25	CRCW080545K3FK	VISHAY DALE	541-45.3KCTR-ND	
24	R207	1	10K	RESISTOR; 0805; 10K; 1%; 100PPM; 0.125W; THICK FILM	80-0010K-25	CRCW080510K02FK	VISHAY DALE	541-10.0KCTR-ND	
25	R210, R212	2	4.7K	RESISTOR; 0805; 4.7K OHM; 1%; 100PPM; 0.125W; THICK FILM	80-004K7-AA28	CRCW08054K70FK	VISHAY DALE	541-4.70KTTTR-ND	
26	R211, R216	2	330	RESISTOR; 0805; 330 OHM; 1%; 100PPM; 0.25W; THICK FILM	80-0330R-BA89	RK73H2ATD3300F	KOA SPEER ELECTRONICS INC		
27	R215, R218	2	DNP	PACKAGE OUTLINE 0805 RESISTOR - EVKIT	N/A	N/A	N/A		
28	S1, S2	2	N/A	SWITCH; SPDT; THROUGH HOLE; VERTICAL; 125V; 0.25A; SLIDE SWITCH; ROOIL=0.06 OHM; INSULATION=500M OHM	11-SLS121PC04-00	1825115-1	TE CONNECTIVITY	450-1598-ND	
29	U1	1	N/A	MAX34417FENE+	MAX34417	MAX34417FENE+	MAXIM		
30	U20 <i>Should be programmed</i>	1	N/A	SOIC127P1030X265-28N <i>IC+ PRGM. 89-3900HK02.U20</i>	89-3900HK02.U20	PIC16LF2560-ISO	Microchip	PIC16LF2560-ISO-ND	Blank Internal Part Number, EQ1270 Programmed Internal Part Number, EICF3900HU1
31	U21	1	N/A	IC; SWITCH; 50MA TO 600MA PROGRAMMABLE CURRENT-LIMIT SWITCH; SOT23-6	10-MAX4985AUAUT-J	MAX4985AUAUT+	MAXIM		
32	U22	1	N/A	IC; VREG; LOW-NOISE LDO REGULATOR; TDF48 2X2	10-MAX8902BATA-T	MAX8902BATA+	MAXIM		
33	X1	1	N/A	OSCILLATOR; SMT (3225) 3.2X2.5; 15PF; 48MHZ; +/-50PPM	60-0048M-0CH	KC3225A48.000C30E00	AVX CORP/KYOCERA CORP	478-4790-2-ND	
34	PCB	1	PCB	PCB:MAX34417	EPCB34417	MAX34417	MAXIM		

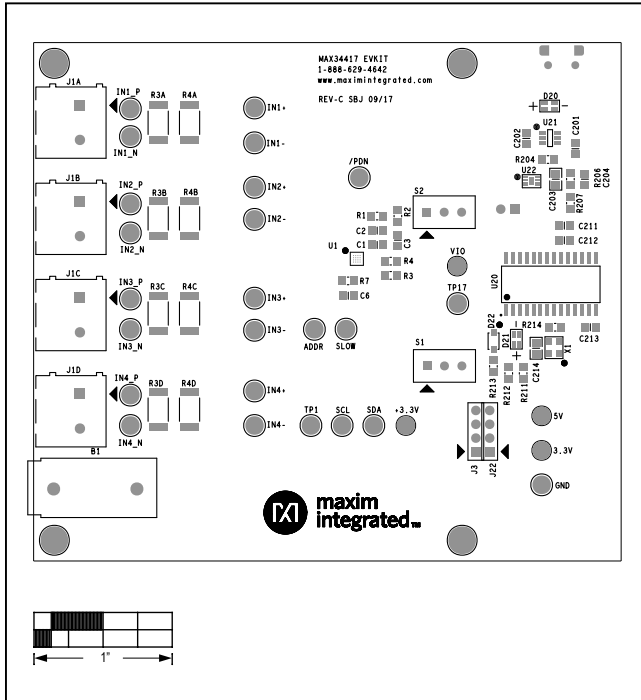
MAX34417 EV Kit Schematic



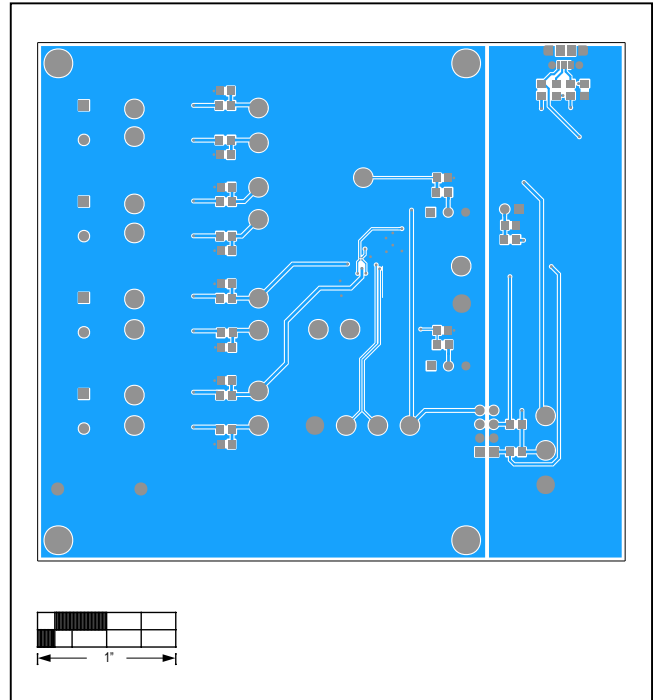
MAX34417 EV Kit Schematic (continued)



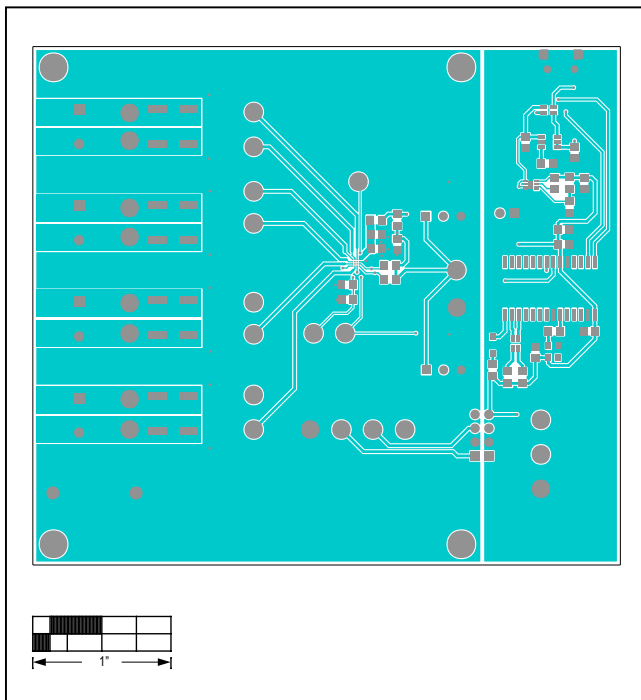
MAX34417 EV Kit PCB Layout Diagrams



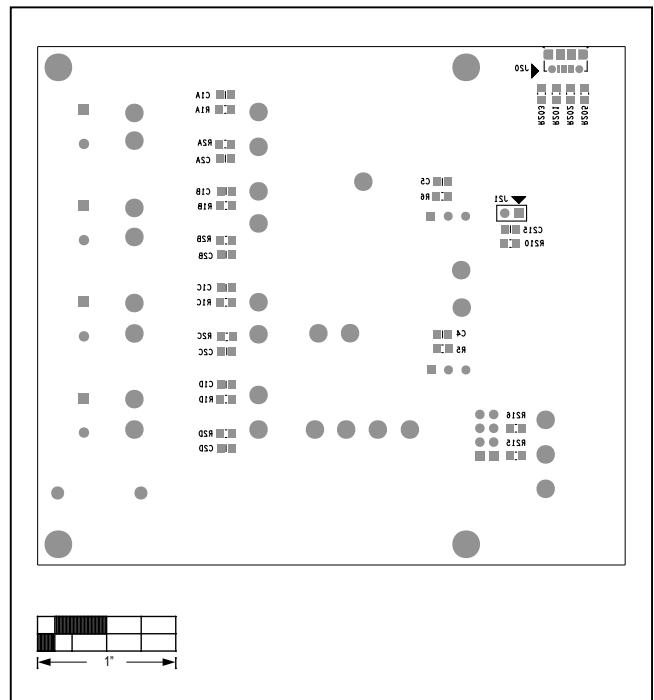
MAX34417 EV Kit—Top Silkscreen



MAX34417 EV Kit—Bottom



MAX34417 EV Kit—Top



MAX34417 EV Kit—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	2/18	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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