MAX14917 Evaluation Kit

Evaluates: MAX14917

General Description

The MAX14917 evaluation kit (EV kit) provides a proven design to evaluate the MAX14917 octal high-side switch. The EV kit includes the MAX14917 evaluation board and a graphical user interface (GUI) that provides communication from a PC to the target device through a USB port and the USB2GPIO interface board. The USB2GPIO EV kit should be ordered separately.

The GUI is compatible with Windows 10 for exercising the features of the MAX14917 IC. The EV kit GUI allows individual control of eight high-side switches through the high-speed SPI interface and receives diagnostic information from the MAX14917 per channel overload diagnostics, communication errors, and thermal shutdown diagnostics.

The MAX14917 EV kit must be powered from an external +24V power supply and can consume more than 10A when fully loaded. The USB2GPIO interface board is powered from the USB port.

The MAX14917 EV kit board comes with a MAX14917AFM+ installed in a 48-pin, 6mm x 6mm FC2QFN package.

Features

- Robust Operation with Wide Range of Input Voltages and Load Conditions
- VDDOK Indication
- LED Indication of Channel Status and Fault Conditions
- Fast Inductive-Load Demagnetization
- SYNCH Input for Simultaneous Update of Switches
- Supports SPI and SYNCH Watchdogs
- Global FAULT and Communication Error Indication
- Wide Logic-Voltage Range
- Daisy-Chainable SPI Communication
- -40°C to +125°C Temperature Range
- Proven PCB Layout
- Fully Assembled and Tested
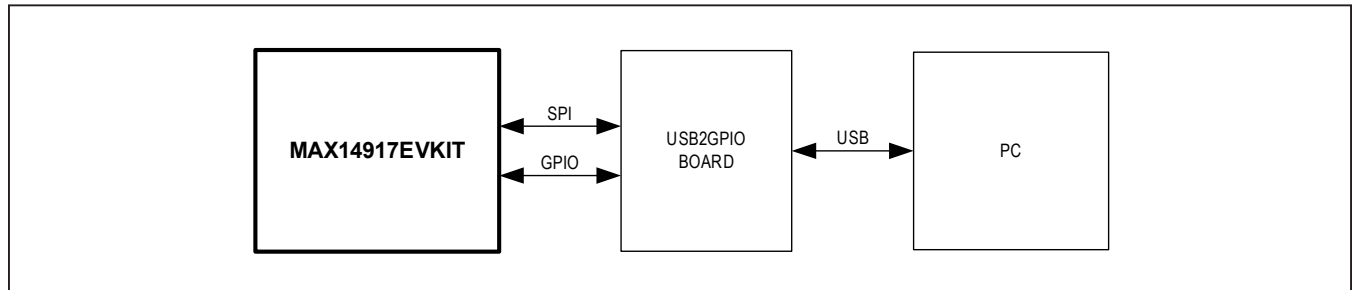- Windows* 10-Compatible Software

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

MAX14917 EV Kit Board
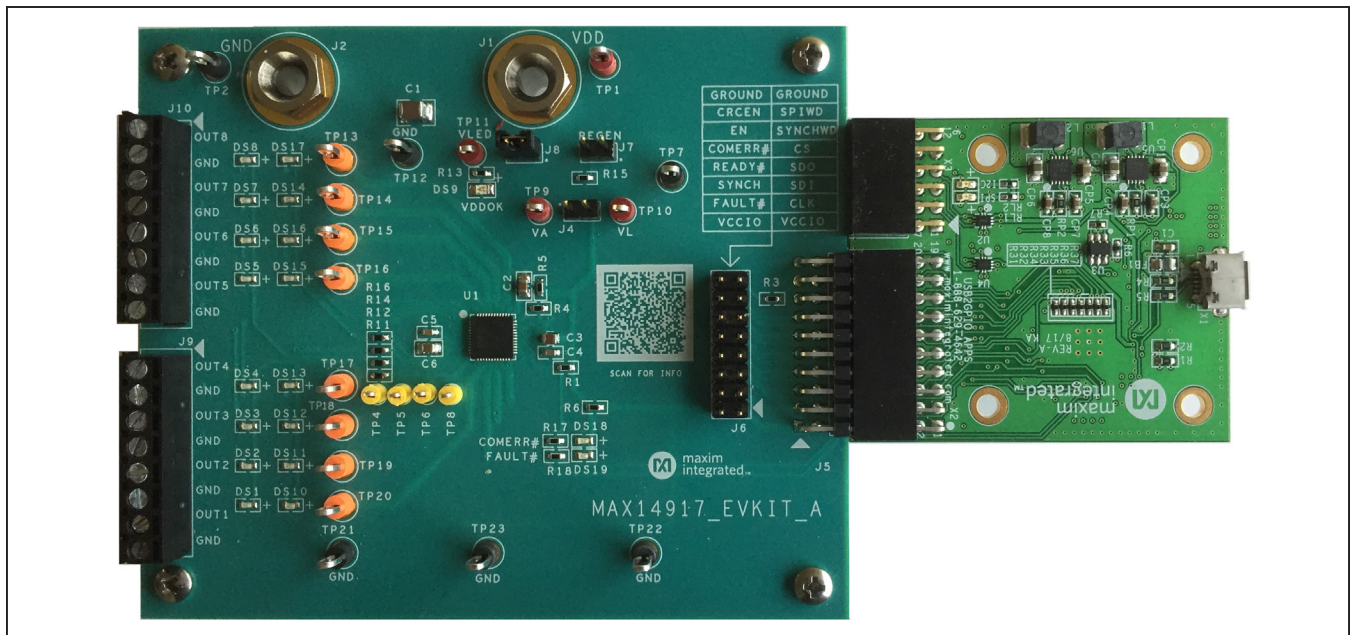
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System Block Diagram

MAX14917 EV Kit Files

FILE	DECRIPTION
MAX14915_6_7EVKITSetupV1.15.exe	Application Program (GUI)

Quick Start

Required Equipment

- MAX14917 EV kit
- USB2GPIO EV kit (must be ordered separately)
- +24V DC power supply
- PC with installed Windows 10 and a USB port
- USB-A to micro-USB cable (not included)

Procedure

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

Note: In the following section(s), software-related items are identified by bolding. Text in **bold** refers to items directly from the EV system software. Text in **bold and underline** refers to items from the Windows operating system.

1) Visit **https://www.maximintegrated.com/en/de-sign/tools/applications/evkit-software/index.mvp** to download the latest version of the EV kit software, MAX14915_6_7EVKITSetupV1.14.exe. Save the EV kit software to a temporary folder.

2) Install the EV kit software on your computer by running the MAX14915_6_7EVKITSetupV1.14.exe program inside the temporary folder. The program files are copied to your PC and icons are created in the Windows **Start | Programs** menu.

3) Verify that all jumpers are in their default positions (Table 1).

4) Power up the EV kit with +24V from an external power supply through J1 and J2 banana plugs.

5) Connect the EV kit to a USB port of a PC. A micro-USB cable is not included and should be obtained locally.

6) Start the EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software appears as shown in Figure 1. Verify that the lower-right status bar indicates the EV kit hardware is **Connected**.

    The GUI automatically detects EV kit is connected to the PC and enables serial communication. Any configuration change can be made at the Register Settings tab.

The following steps are used to verify functionality of the MAX14917:

7) Set all OUTPUT switches On by typing in 255 decimal number into SetOUT register 0x00. Note, the GUI accepts decimal, hex, or binary numbers, e.g., 255, 0xFF, or 0b11111111, respectively. The user can enable the **Auto Write** button to allow auto write of the changes instead of clicking **Write Modi-fied** or **Write Selected** buttons that allow individual commands to be sent to the MAX14917. When the data is sent out, the Status LEDs, DS1…DS8, light on indicating that all OUTPUTs are ON.
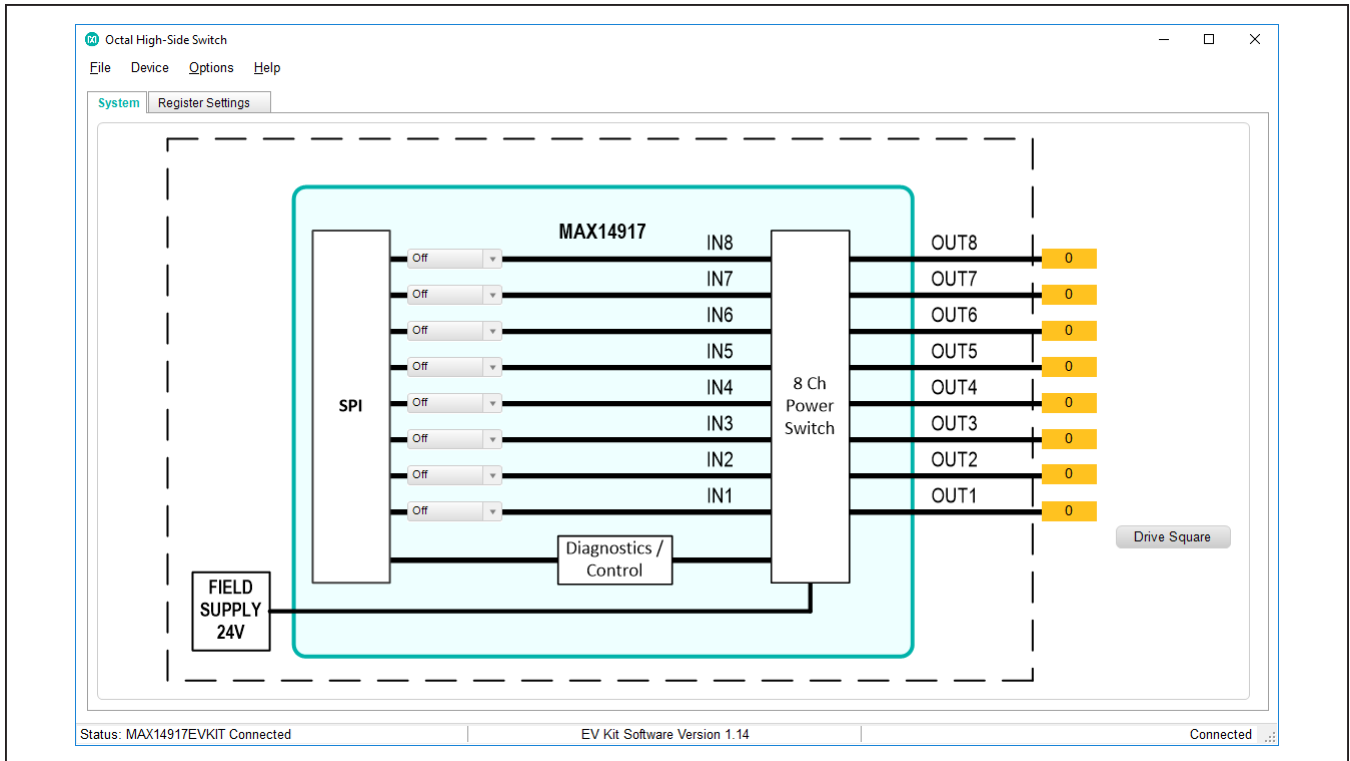
Figure 1. MAX14917 EV Kit GUI System Tab

Figure 2. MAX14917 EV Kit GUI Register Settings Tab

Detailed Description of Hardware

The MAX14917 EV kit in conjunction with the USB2GPIO# adapter board provides an easy-to-use and flexible solution for evaluating the MAX14917 octal high-side switch for industrial applications. It allows SPI communication between the Windows-compatible GUI installed on a PC and the MAX14917. The USB2GPIO# adapter board is a plug-and-play device that is powered from the USB port and does not require any additional configuration. Refer to the USB2GPIO data sheet **https://datasheets. maximintegrated.com/en/ds/USB2GPIO.pdf** for mor information. A USB driver for the USB2GPIO# board is installed automatically with the MAX14917 GUI.

The MAX14917EVKIT# can be used as a standalone board connected to the SPI bus using J5 and/or J6 head-ers. Refer to the *MAX14917 EV Kit Schematic*. For full configuration options refer to Table 1.

Load for each channel should be connected to the J9 and J10 terminal block. Each channel (switch) can provide about 1A of current (typ) and can handle either resistive or inductive load.

On board diagnostics provide V_{DD} status through VDDOK LED (DS9), communication error through COMERR# LED (DS18) and a global fault condition through FAULT# LED (DS19). Per channel output state and per channel fault conditions are visible through the LED matrix, DS1 through DS8, and DS10 through DS17, respectively. Other diagnostics are provided through SDO data of SPI interface, refer to the *MAX14917 datasheet* for details.

Table 1. MAX14917 Board Shunt Positions and Settings

HEADER	SHUNT POSITION	DESCRIPTION
J8	1-2*	V_{LED} supplied from V_{DD}.
	Open	Use an external V_{LED} source. Apply V_{LED} power between V_{LED} (TP11) test point and GND (TP12).
J4	1-2	Select 3.3V logic level (V_L = V_A). USB2GPIO board should be replaced by user host controller.
	Open*	Logic voltage (V_L) supplied from USB2GPIO board (3.3V). Use an external source between V_L and GND (TP12) if another host controller is used.
J7	Open*	Internal 3.3V V_A regulator enabled.
	1-2	Internal V_A regulator disabled (REGEN = GND). Use an external V_A source between V_A test point and GND (TP7).

Default configuration

Detailed Description of Software

The MAX14917 GUI provides access to all registers and allows full configuration and control of the MAX14917. There are two tabs available to control the EV kit. The **System** tab provides system-level control of the selected output pins, including static and dynamic control. The **Register Settings** tab control of special features, such as Cycle Redundancy Check (CRC) and enabling SYNCH and/or SPI watchdogs, as well as SDO Diagnostic result.

System Tab

The **System** tab allows driving the output pins by configuring each output either On, Off, or driving square-wave frequency from the pull-down menu as shown in Figure 3.

Click the **Drive Pins** button on the right side of the GUI to drive the outputs. The indicators connected to the OUT_ pins show the state of each output.

Connect the oscilloscope probe to OUT_ test points on the EV kit to see the output signal in real-time.
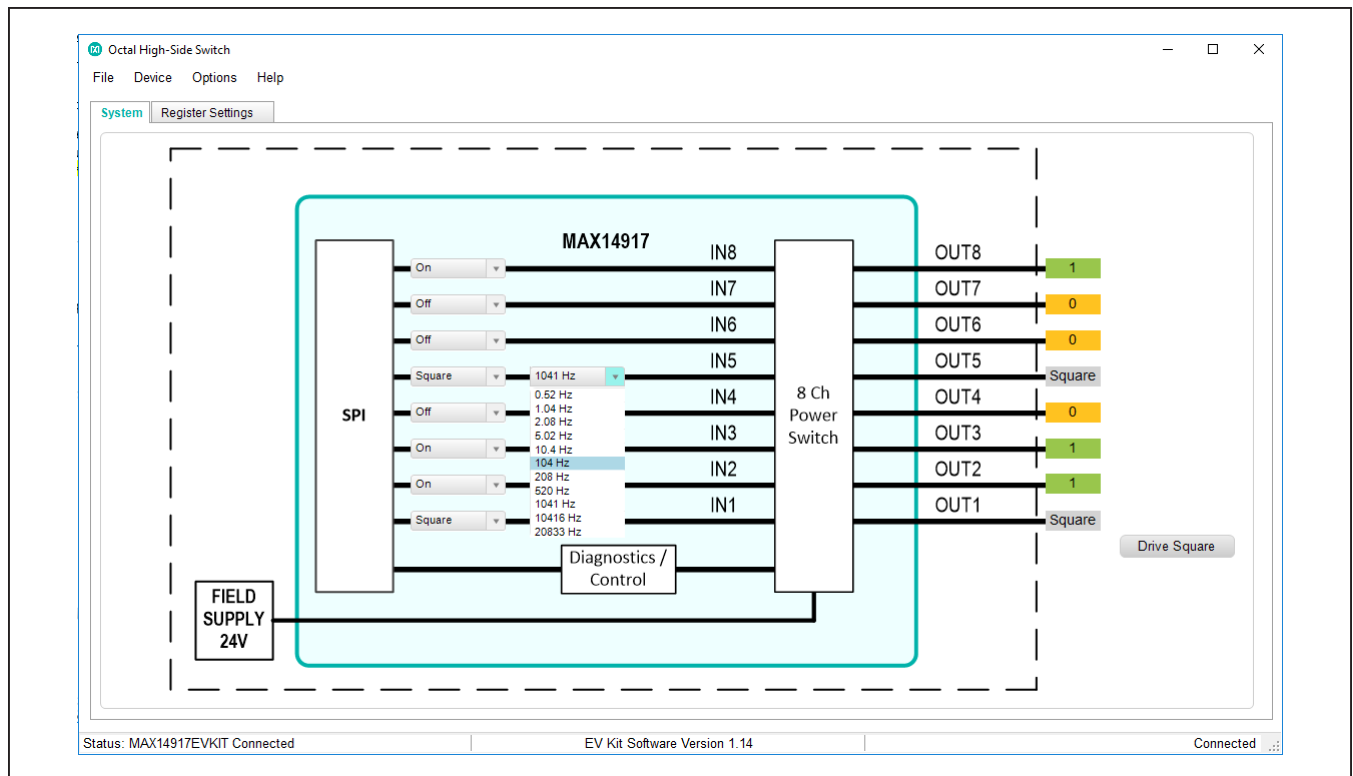

Figure 3. System Tab. Output Configuration

Register Settings Tab

The **Register Settings** tab allows detailed configuration of the device to explore all the available features (refer to Figure 4). The full register map table of the MAX14917 is located on the left side of the tab, and the bit-by-bit control and description table is located on the right side. When the register is selected in the register map table, the detailed description of each bit is shown on the right table. The register setting can be changed directly in the register map table by double clicking the Value cell. Each data entry should be followed by the "Enter/Return" button on the keyboard. The Value cell accepts binary (0b), decimal, or hex (0x) numbers. The modified register changes its color from black to red until the data is actually written to the register. The data in the right table can be changed using drop-down menus in the Setting cell for each bit individually. Both tables are synchronized so that changes made in one table appear in both tables. There are several write and read options available through the corresponding control buttons located below the register bit-by-bit description table.

- When the **Auto Write** button is selected, any data typed in, or selected through the **Setting** pulldown menu is automatically written into the corresponding writable register. The button renamed to **Stop Auto Write** and auto write function can be canceled by clicking on this button a second time.

The **Write Selected** button allows a write to the selected register only, while the **Write Modified** button performs write operations to all modified registers after each click.

The GUI provides I/O pin controls and status box of per-bit diagnostic results after each SPI write or read operation below the buttons. The EN slider allows enable or disable OUTs, CRCEN enables or disables error-detecting code to be added to each SPI transaction, and the SYNCH slider allows manual synchronization of multiple settings. The SYNCHWD and SPIWD sliders allow to enable respective watchdog timer.

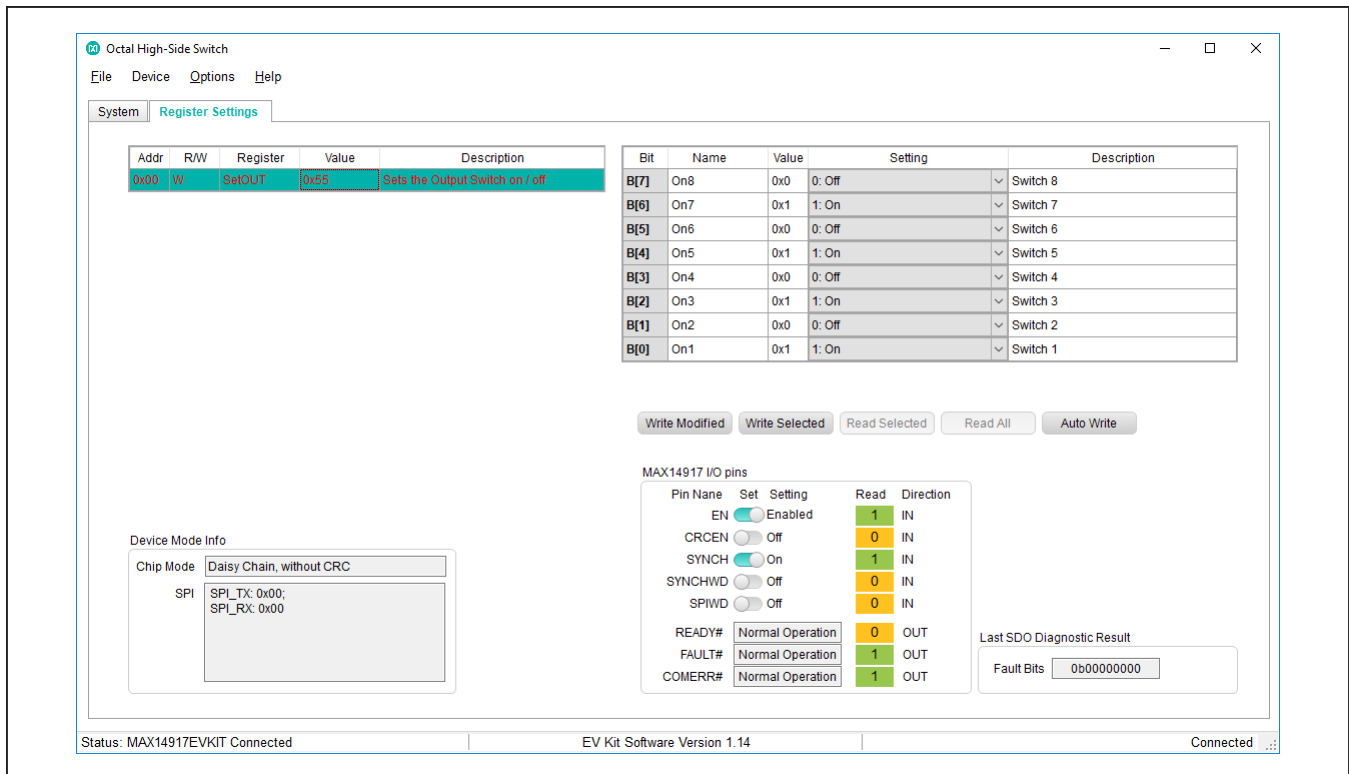Each SPI transaction is displayed in the **Device Mode Info** box for user convenience.


Figure 4. Register Settings Tab

Ordering Information

PART	TYPE
MAX14917EVKIT#	EV Kit

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

## MAX14917 EV Kit Bill of Materials

| ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	C1	-	1	C3225X7S1H106K250AB; CGA6P3X7S1H106K250AB; GCM32EC71H106K	TDK;TDK;MURATA	10UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 10UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S	
2	C2, C6	-	2	GMK212B7105KG; GRM219R7YA105KA12	TAIYO YUDEN;MURATA	1.0UF	CAPACITOR; SMT (0805); CERAMIC; 1UF; 35V; TOL=10%; MODEL=GMK SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R	
3	C3	-	1	CGA4J1X7S1C106K125; GCM21BC71C106KE35	TDK;MURATA	10UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 16V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S; AUTO	
4	C4, C5	-	2	CC0603KRX7R0BB104; GRM188R72A104KA35; GCJ188R72A104KA01;HMK107B7104KA; 06031C104KAT2A;GRM188R72A104K	YAGEO;MURATA;MURATA; TAIYO YUDEN;AVX;MURATA	0.1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
5	C7-C14	-	8	CGA3EANP02A103J080AC	TDK	0.01UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.01UF; 100V; TOL=5%; MODEL=MULTILAYER CERAMIC CHIP CAPACITOR; TC=NPO	
6	D1	-	1	SMBJ36A-E3	VISHAY GENERAL SEMICONDUCTOR	36V	DIODE; TVS; SMB (DO-214AA); VRM=36V; IPP=10.3A	
7	DS1-DS8	-	8	LGL29K-G2J1-24-Z	OSRAM	LGL29K-G2J1-24-Z	DIODE; LED; SMARTLED; GREEN; SMT; PIV=1.7V; IF=0.02A	
8	DS9	-	1	LTST-C171GKT	LITE-ON ELECTRONICS INC.	LTST-C171GKT	DIODE; LED; STANDARD; GREEN; SMT (0805); PIV=5.0V; IF=0.12A; -55 DEGC TO +85 DEGC	
9	DS10-DS19	-	10	LS L29K-G1J2-1-Z	OSRAM	LS L29K-G1J2-1-Z	DIODE; LED; SMART; RED; SMT (0603); PIV=1.8V; IF=0.02A; -40 DEGC TO +100 DEGC	
10	J1, J2	-	2	3267	POMONA ELECTRONICS	3267	CONNECTOR; MALE; PANELMOUNT; STANDARD UNINSULATED BANANA JACK; STRAIGHT; 1PIN	
11	J4, J7, J8	-	3	PCC02SAAN	SULLINS	PCC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC	
12	J5	-	1	68021-220HLF	AMPHENOL ICC	68021-220HLF	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; BERGSTIK II BREAKAWAY HEADER; RIGHT ANGLE; 20PINS;	
13	J6	-	1	PBC08DAAN	SULLINS ELECTRONICS CORP.	PBC08DAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 16PINS; -65 DEGC TO +125 DEGC	
14	J9, J10	-	2	OSTTE080104	ON-SHORE TECHNOLOGY INC.	OSTTE080104	CONNECTOR; MALE; THROUGH HOLE; TERMINAL BLOCKS-WIRE TO BOARD; STRAIGHT; 8PINS	
15	R1, R5	-	2	CRCW060310K0FK;ERJ-3EKF1002	VISHAY DALE;PANASONIC	10K	RESISTOR; 0603; 10K; 1%; 100PPM; 0.10W; THICK FILM	
16	R3, R4, R15, R17, R18	-	5	CRCW06031K00FK;ERJ-3EKF1001	VISHAY DALE;PANASONIC	1K	RESISTOR; 0603; 1K; 1%; 100PPM; 0.10W; THICK FILM	
17	R6	-	1	ERJ-3EKF28R0	PANASONIC	28	RESISTOR; 0603; 28 OHM; 1%; 100PPM; 0.10W; THICK FILM	
18	R11, R12, R14, R16	-	4	CRCW06035K60FK	VISHAY DALE	5.6K	RESISTOR, 0603, 5.6K OHM, 1%, 100PPM, 0.10W, THICK FILM	
19	R13	-	1	CRCW060324K9FK;ERJ-3EKF2492	VISHAY DALE;PANASONIC	24.9K	RESISTOR; 0603; 24.9K OHM; 1%; 100PPM; 0.10W; THICK FILM	
20	SPACER1-SPACER4	-	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON	
21	SU2	-	1	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	
22	TP1	-	1	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;	
23	TP2, TP7, TP12, TP21-TP23	-	6	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;	
24	TP4-TP6, TP8	-	4	5004	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
25	TP9-TP11	-	3	5005	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
26	TP13-TP20	-	8	5013	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; ORANGE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
27	U1	-	1	MAX14917AFM+	MAXIM	MAX14917AFM+	EVKIT PART - IC; SWTC; SPI CONTROLLED OCTAL HIGH-SIDE SWITCH;	
28	PCB	-	1	MAX14917	MAXIM	PCB	PCB:MAX14917	-
29	SU3, SU5	DNI	2	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	
30	R7-R10, R19-R22	DNP	0	CRCW0603499KFK;ERJ-3EKF4993	VISHAY DALE;PANASONIC	499K	RESISTOR; 0603; 499K OHM; 1%; 100PPM; 0.1W; THICK FILM	
TOTAL			87					

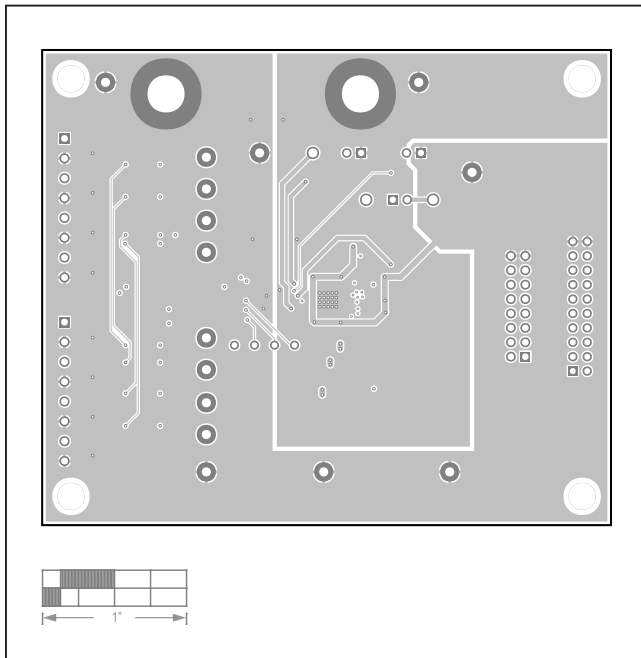## MAX14917 EV Kit Schematic
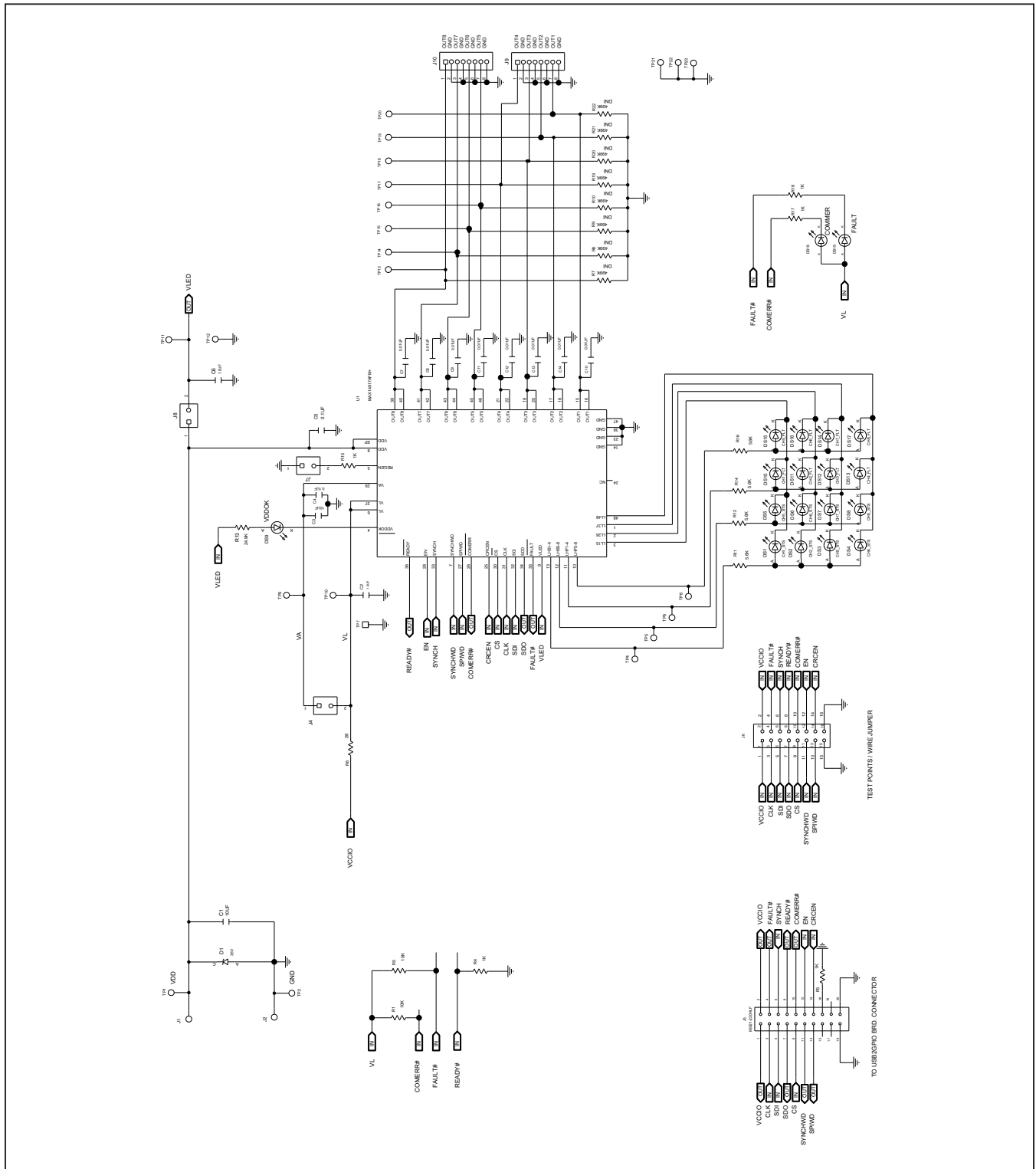
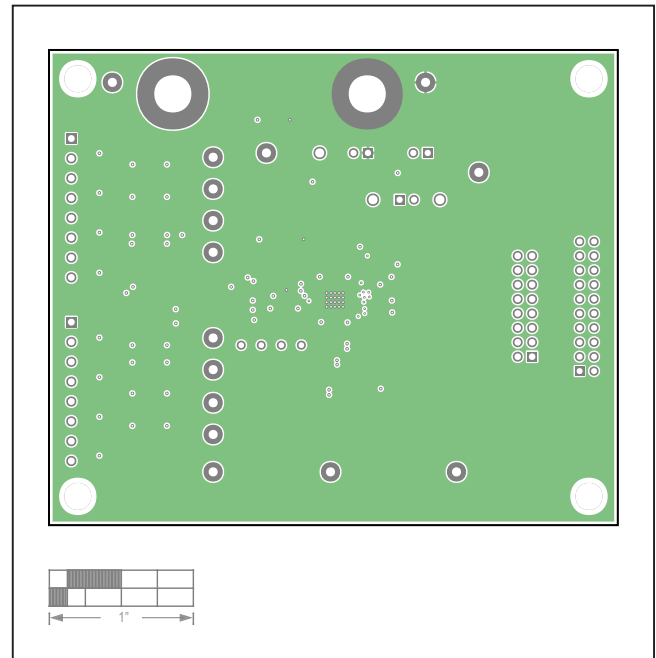## MAX14917 EV Kit PCB Layout Diagrams
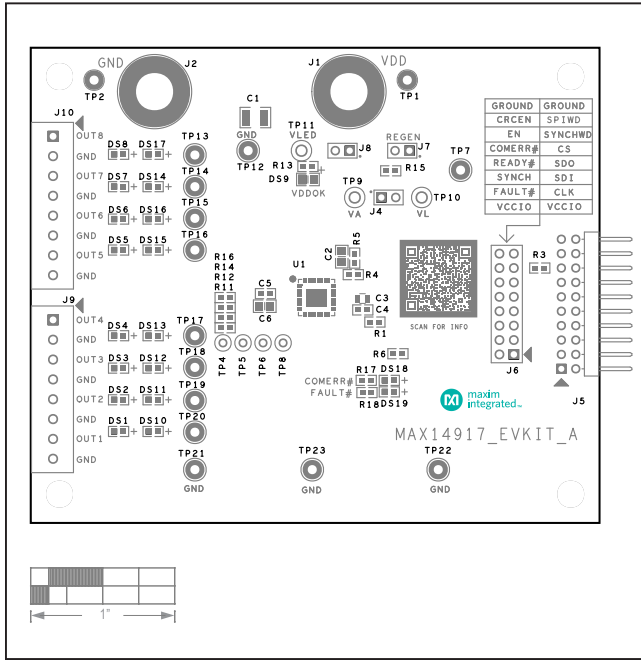
MAX14917 EV Kit—Top Silkscreen
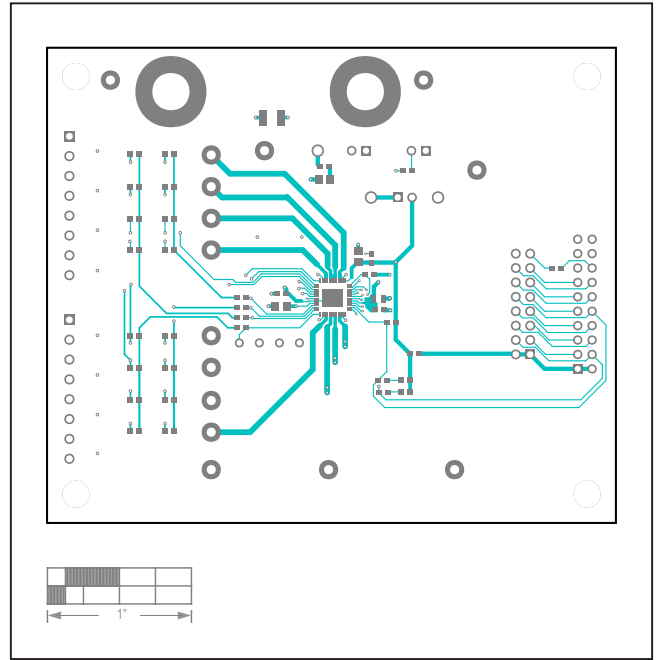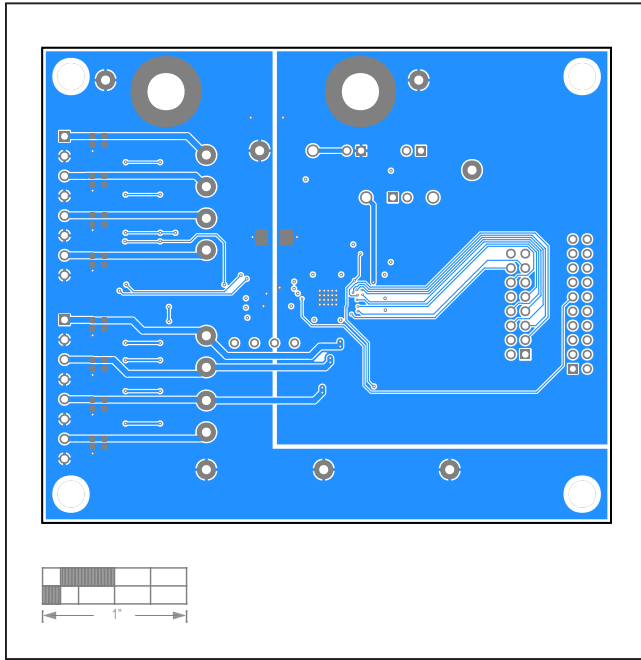

MAX14917 EV Kit—Top Layer
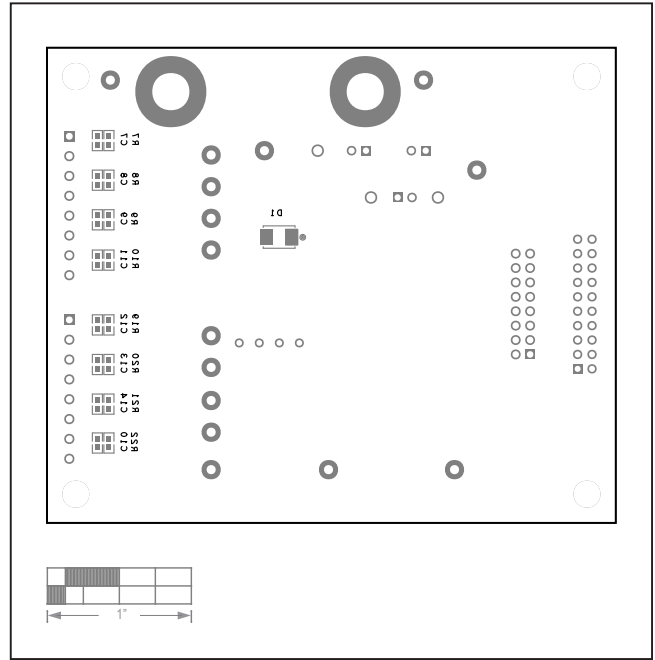

MAX14917 EV Kit—Layer 2

MAX14917 EV Kit—Layer 3

MAX14917 EV Kit PCB Layout Diagrams (continued)

MAX14917 EV Kit—Bottom Layer

MAX14917 EV Kit—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/20	Initial release	—

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