

## MAX22200 Evaluation Kit

Evaluates: MAX22200

### General Description

The MAX22200 evaluation kit provides a proven design to evaluate the MAX22200 solenoid driver. The MAX22200 integrated circuit (IC) is an eight half-bridge, serial-controlled solenoid driver with current regulation. The EV kit enables serial control of the MAX22200 and fault monitoring through an on-board USB to SPI interface via a MAX32625 microcontroller. It includes a graphical user interface (GUI) for exercising the features of the MAX22200 IC, making it a complete PC-based evaluation system.

### Benefits and Features

- Easy evaluation of the MAX22200
- Configurable for High-Side/Low-Side Solenoid Driver
- Configurable for Latched Valves or Brushed DC Motors
- Windows® XP, 7, 8, 10 Compatible Software
- Fully Assembled and Tested
- Proven PCB Layout

### MAX22200 EV Kit Files

FILE	DESCRIPTION
Setup MAX22200 Solenoid Driver EV Kit 1.1.2.0.exe	GUI Software

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

### Quick Start

#### Required Equipment

- MAX22200 EV kit
- USB Type A male to micro-USB Type B male cable
- +36V DC, 1.5A power supply

It is recommended that the user read the MAX22200 IC datasheet prior to using the EV kit and GUI.

#### Software Installation

- 1) Save the **Setup MAX22200 Solenoid Driver EV Kit 1.1.2.0.exe** file to your PC.
- 2) Click the **Run** button to begin the GUI installation.
- 3) Read the software license agreement and click the **I accept the agreement** button to continue.
- 4) Select the install directory and start menu folder name.
- 5) When installation is complete, click the **Finish** button to launch the MAX22200 EV kit GUI.

#### Verifying COM Port

When connecting the MAX22200 EV kit to a PC, a new COM port appears under the ports (COM and LPT) device tree in Windows Device Manager.

- 1) To verify the COM port, launch Windows Device Manager and expand the ports (COM and LPT) section.
- 2) Connect the MAX22200 EV kit board to the PC.
- 3) After device enumeration, a new USB serial device appears along with the COM port.

## Procedure

The EV kit is fully assembled and tested. The following instructions allow the user to begin evaluation of the MAX22200 IC using a load and the MAX22200 EV kit and GUI. Refer to the Application Diagram and Application Description in the MAX22200 IC data sheet for more information on output load topologies. Follow the steps below to verify board operation:

- 1) Verify that shunts are installed across pins 1–2, 3–4, 5–6, ... , 17–18 of header J11.
- 2) Connect the MAX22200 EV kit to the PC using the USB Type A to micro-USB Type B cable.
- 3) Verify the COM port.
- 4) Connect a +4V to +36V DC power supply to the VM test point J6 and GND test point J7.
- 5) Turn on the supply.
- 6) Launch the MAX22200 GUI.
- 7) From the drop-down menu , select the COM port of the MAX22200.
- 8) Click the **Connect** button.
- 9) In the Control Panel tab, click the **Enable** button.
- 10) Select the **Active** checkbox and click the **Write Status Register** button.
- 11) The Status Register can now be read. Click the **Read Status Register** button to check the status of a part.
- 12) Click the **Read Status Register** button again to clear any status faults.
- 13) The Fault Register can now be read. Click the **Read Fault Register** button to check for faults.
- 14) Click the **Read Fault Register** button again to clear any faults.
- 15) In the **Output Configuration** section, click the drop-down arrows to select the output configuration for channel pairs. Ensure that loads and output header shunts are installed according to the output configuration selection. For example, if parallel operation is selected for channel pair CH0 and CH1, install a shunt across pins 1-2 of header J12.
- 16) The TRIGA and TRIGB pins are brought up by the MCU in a logic high state. Click the **TRIGA** and **TRIGB** buttons to drive them low.
- 17) In the **Oscillator Frequency** section, select the oscillator frequency .
- 18) On the **Channel Configuration** tab, select the **Channels** checkboxes (CH0 to CH7) to be configured. Click **Select All** to configure all channels.
- 19) If half full scale is preferred, select the **HFS** checkbox.
- 20) To turn the output channels ON/OFF using the TRIGA and TRIGB inputs, select the **TRGnSPI** checkbox. Leave this box unchecked to use serial peripheral interface (SPI) writes from the GUI to turn the output channels ON/OFF.
- 21) Select the **VDRnCDR** checkbox to operate in VDR mode. Leave this box unchecked to operate in CDR mode.  
**Note:** CDR is supported in **low-side configuration** mode only.
- 22) Select the **HSnLS** checkbox if high-side drive operation is preferred. Leave this box unchecked for low-side drive operation.
- 23) If slower rise and fall edges are desired, click the **SRC** checkbox to enable Slew Rate Control. Rise and fall edges will be limited to 0.3uS in CDR and VDR modes for low side drive operation only.
- 24) To enable Open Load Detection, select the **OL\_EN** checkbox.
- 25) To enable HIT current check, select the **HHF\_EN** checkbox.
- 26) Click the **FREQ\_CFG** drop-down arrow to select the chopping frequency.
- 27) Adjust **Hold Current** based on VDR/CDR drive mode.

**NOTE:** For VDR HIT/Hold Currents, refer to tables 2 and 3 of the MAX22200 IC data sheet. For CDR HIT/HOLD Currents, refer to table 4.

- 28) Adjust **Hit Current** based on VDR or CDR drive mode.  
**NOTE:** For VDR HIT/Hold Currents, refer to tables 2 and 3 of the MAX22200 IC data sheet. For CDR HIT/HOLD Currents, refer to table 4.
- 29) Adjust **Hit Current Time**.  
**Note:** Refer to tables 1 and 5 in the MAX22200 IC datasheet.
- 30) Click the **Write Configuration Register** button when configuration is complete.
- 31) Repeat for other channels if programming individual channels.
- 32) To turn a channel ON in SPI mode, on the **Control Panel** tab, select the preferred channel checkbox and click the **Write On/Off Only** button. To turn a channel OFF, deselect the channel checkbox and click the **Write On/Off Only** button again.
- 33) To turn a channel ON in trigger mode, select the preferred channel checkbox. For channels 0, 2, 4, and 6, click the **TRIGA** button. For channels 1, 3, 5, and 7, click the **TRIGB** button. Click the corresponding **TRIGA** or **TRIGB** button again to turn the channels off.
- 34) Prior to disabling the part or deselecting an active checkbox, verify all channels are in the OFF state.

### Detailed Description of Hardware

The MAX22200 EV kit features an on-board MAX32625 microcontroller that provides USB to SPI interface. It also provides a general purpose input/output (GPIO) interface, allowing the user to configure and control the MAX22200 IC through a GUI. The on-board microcontroller also allows the user to monitor and display fault conditions and provides a GUI controlled trigger signal to manually control the MAX22200 outputs.

The MAX22200 EV kit has an on-board MAX14750 power management IC to provide the supplies needed for the

MAX32625 microcontroller from the +5V USB VBUS. The MAX22200 IC is powered externally from a +4V to +36V DC supply in order to provide the voltage and current to drive solenoids and motors.

The MAX22200 EV kit has perforations down the middle of the board to separate the microcontroller from the MAX22200 IC. Once separated, the user can depopulate the shunts on header J11 and use the even numbered pins to communicate to the MAX22200 IC with their own controller. The MAX22200 IC SPI pins and logic pins are labeled on the right side of header J11. For normal operation with the on-board MAX32625 microcontroller and the MAX22200 EV kit GUI, shunts must be installed across pins 1–2, 3–4, 5–6, ... , 17–18 of header J11.

### Detailed Description of Software

The MAX22200 EV kit GUI has a Control Panel tab to read and write to the Status Register and read to the Fault Register. It allows the user to enable the part, select a single or paired channel output configuration, select the oscillator frequency, and turn CH0–CH7 ON/OFF. Fault flag, as well as per channel faults, can be read from this tab. The outputs can be polled or turned ON/OFF without writing to the full 32-bit Status Register by using the **Read On/Off Only** or **Write On/Off Only** buttons. Similarly, if in Triggered control mode, the outputs can be turned ON/OFF using the **TRIGA** and **TRIGB** buttons.

The Channel Configuration tab is used to configure each channel's Configuration Register. To configure a channel, ensure that the channel is turned OFF and select the channel to be configured. The first byte of each channel can be configured when the channel is ON using the **Read HFS/HOLD Only** or **Write HFS/HOLD Only** buttons. Once configured, click the **Write Configuration Register** button to write to the configuration register for the selected channels. Verify the configuration for any channel by selecting that channel and clicking the **Read Configuration Register** button.

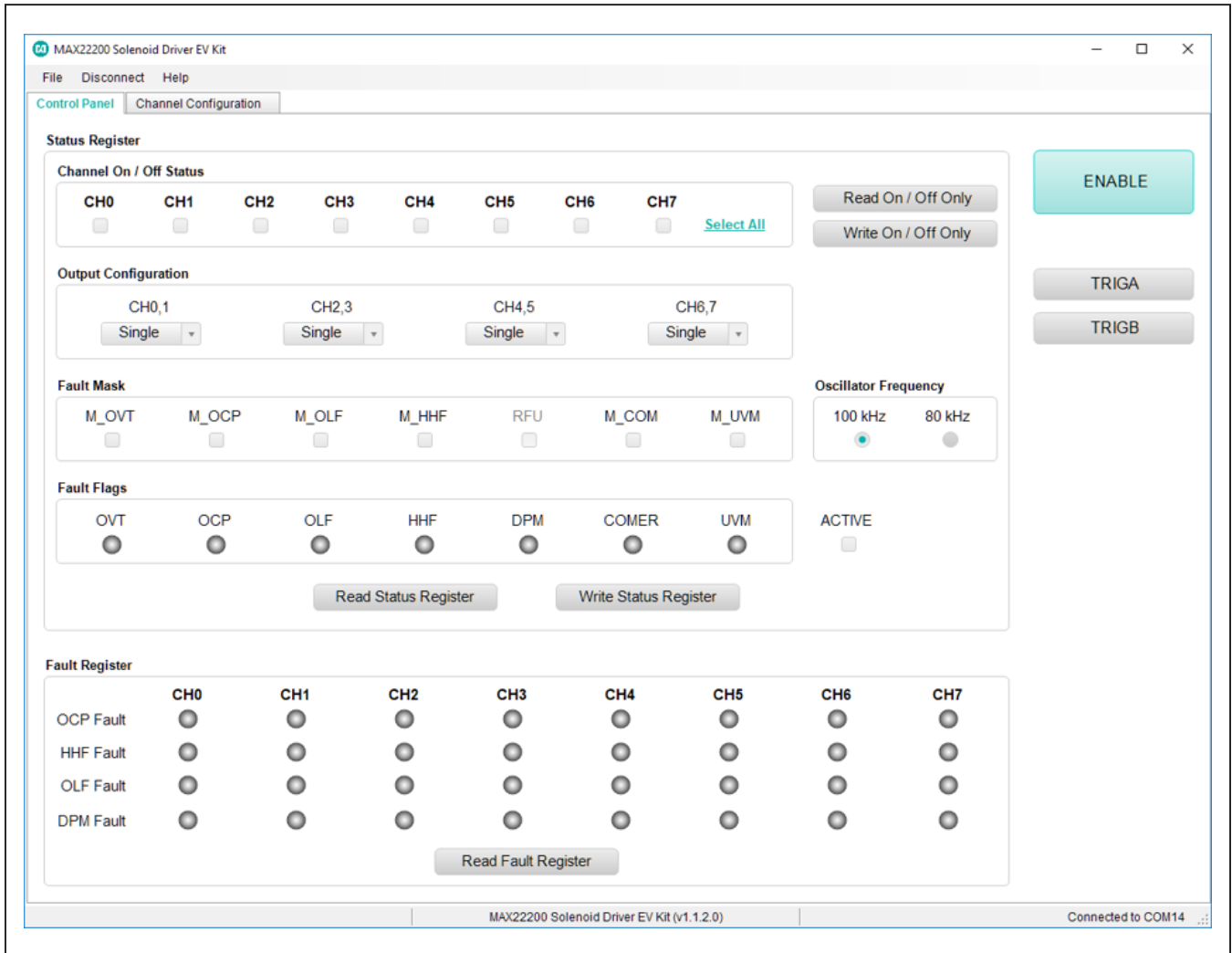


Figure 1. Control Panel tab

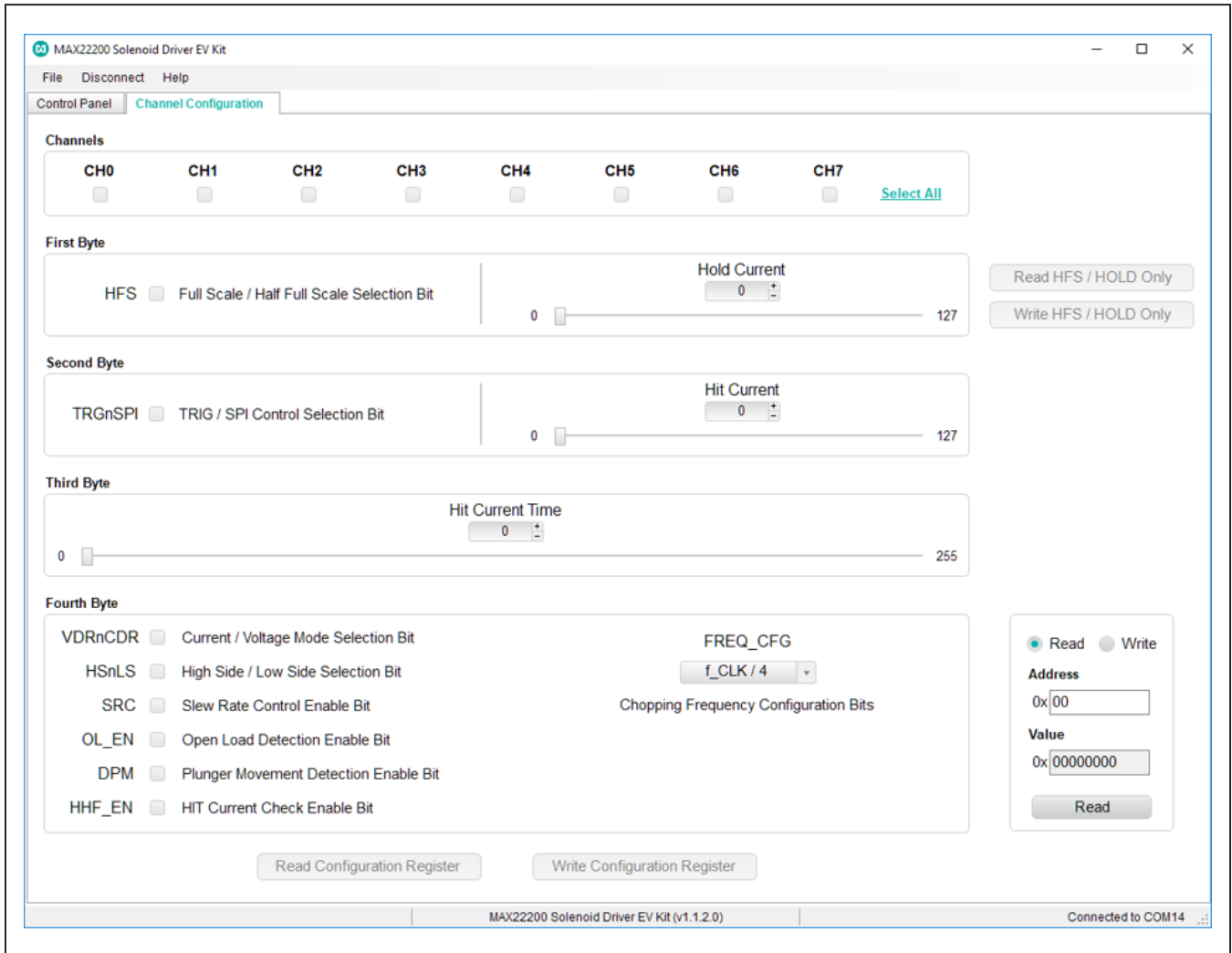


Figure 2. Channel Configuration tab

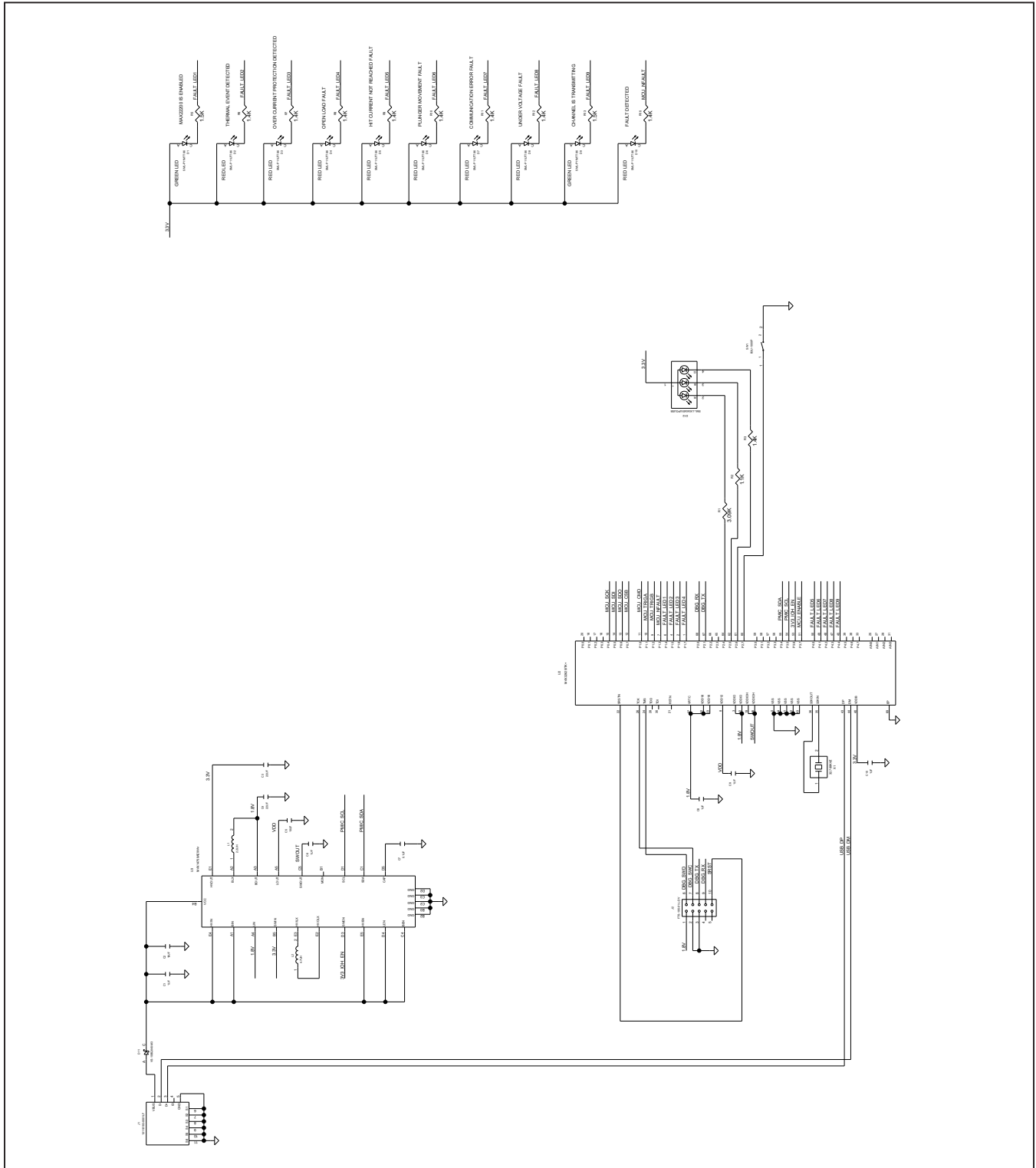
## Ordering Information

PART	TYPE
MAX22200EVKIT#	EV KIT

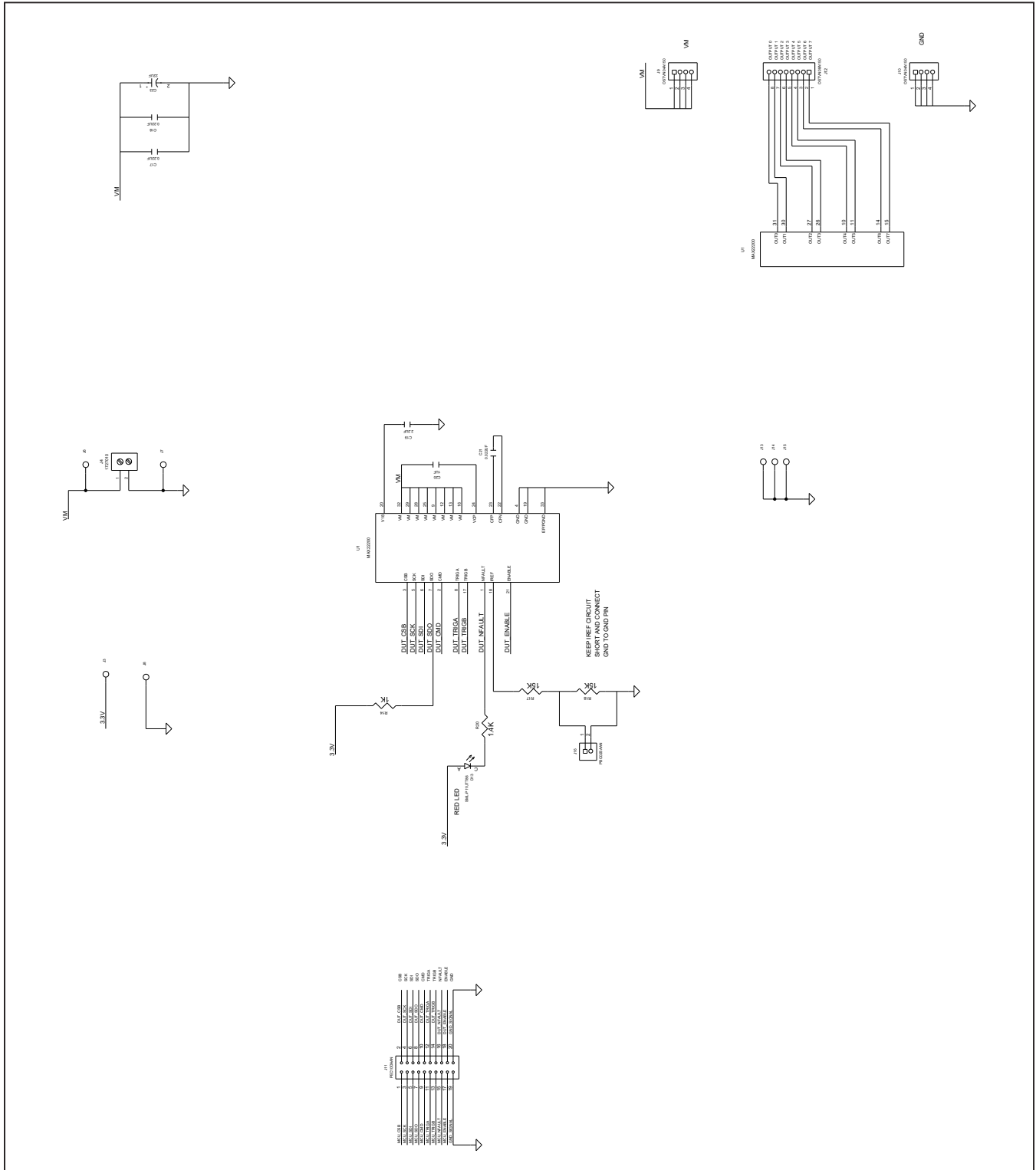
MAX22200 EV Kit Bill of Materials

ITEM	REF_DES	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	C1, C6, C8-C10	5	GRM188R71E105KA12; TMK107B7105KA; 06033C105KAT2A; C1608X7R1E105K080AE	MURATA;TAIYO YUDEN; AVX;TAIYO YUDEN	1UF	CAP; SMT (0603); 1UF; 10%; 25V; X7R; CERAMIC	
2	C2, C5	2	C1608X5R1A106K080AC	TDK	10UF	CAP; SMT (0603); 10UF; 10%; 10V; X5R; CERAMIC	
3	C3, C4	2	04026D226MAT2A; CL05A226MQ5QUNC	AVX;SAMSUNG	22UF	CAP; SMT (0402); 22UF; 20%; 6.3V; X5R; CERAMIC	
4	C7	1	C1005X5R1A104K050BA; LMK105BJ104KV	TDK;TAIYO YUDEN	0.1UF	CAP; SMT (0402); 0.1UF; 10%; 10V; X5R; CERAMIC	
5	C17, C18	2	UMK105BJ224KV	TAIYO YUDEN	0.22UF	CAP; SMT (0402); 0.22UF; 10%; 50V; X5R; CERAMIC	
6	C19	1	C1005X7S0J225K050BC; GRM155C70J225KE11	TDK;MURATA	2.2UF	CAP; SMT (0402); 2.2UF; 10%; 6.3V; X7S; CERAMIC	
7	C20	1	C0402C105K8PAC; CC0402KRX5R6BB105	KEMET;YAGEO	1UF	CAP; SMT (0402); 1UF; 10%; 10V; X5R; CERAMIC	
8	C21	1	GRM155R71H223KA12	MURATA	0.022UF	CAP; SMT (0402); 0.022UF; 10%; 50V; X7R; CERAMIC	
9	C23	1	EEE-1HA220WAP	PANASONIC	22UF	CAP; SMT (CASE_D); 22UF; 20%; 50V; ALUMINUM-ELECTROLYTIC	
10	D1, D9	2	SML-P11MTT86	ROHM	SML-P11MTT86	DIODE; LED; SMT; PIV=5V; IF=0.02A	GREEN LED
11	D2-D8, D10, D13	9	SML-P11UTT86	ROHM	SML-P11UTT86	DIODE; LED; SMT; PIV=1.8V; IF=0.02A	RED LED
12	D11	1	VS-10BQ040-M3	VISHAY	VS-10BQ040-M3	DIODE; SCH; SMT (DO-214AA); HIGH PERFORMANCE SCHOTTKY RECTIFIER; PIV=40V; IF=1.0A	
13	D12	1	SML-LX0404SIUPGUSB	LUMEX OPTOCOMPONENTS INC	SML-LX0404SIUPGUSB	DIODE; LED; SML; FULL COLOR; WATER CLEAR LENS; RED-GREEN-BLUE; SMT; VF=2.95V; IF=0.1A	
14	J1	1	10118193-0001LF	FCI CONNECT	10118193-0001LF	CONNECTOR; FEMALE; SMT; MICRO USB B TYPE RECEPTACLE; RIGHT ANGLE; 5PINS	
15	J2	1	FTS-105-01-L-DV	SAMTEC	FTS-105-01-L-DV	CONNECTOR; MALE; SMT; MICRO LOW PROFILE TERMINAL STRIP; STRAIGHT; 10PINS;	
16	J3, J6	2	5010	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;	
17	J4	1	1727010	PHOENIX CONTACT	1727010	CONNECTOR; FEMALE; THROUGH HOLE; GREEN TERMINAL BLOCK; RIGHT ANGLE; 2PINS	
18	J7, J8, J13-J15	5	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;	
19	J9, J10	2	OSTVN04A150	ON-SHORE TECHNOLOGY INC	OSTVN04A150	CONNECTOR; TERMINAL BLOCK; FEMALE; THROUGH HOLE; STRAIGHT; 4PINS	
20	J11	1	PEC10DAAN	SULLINS ELECTRONICS CORP	PEC10DAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 20PINS	
21	J12	1	OSTVN08A150	ON-SHORE TECHNOLOGY INC.	OSTVN08A150	CONNECTOR; FEMALE; THROUGH HOLE; SCREW TYPE; GREEN TERMINAL BLOCK; RIGHT ANGLE; 8PINS	
22	J16	1	PBC02SAAN	SULLINS ELECTRONICS CORP.	PBC02SAAN	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS; - 65 DEGC TO +125 DEGC;	
23	L1	1	VLS201612HBX-2R2M-1	TDK	2.2UH	INDUCTOR; SMT; WIREWOUND CHIP; 2.2UH; TOL=+/-20%; 1.97A	
24	L2	1	VLS201610CX-4R7M	TDK	4.7UH	INDUCTOR; SMT (2016); FERRITE CORE; 4.7UH; TOL=+/-20%; 0.92A	
25	R1	1	CR0402-16W-3091FT; ERJ-2RKF3091	VENKEL LTD.;PANASONIC	3.09K	RES; SMT (0402); 3.09K; 1%; +/-100PPM/DEGC; 0.0630W	
26	R2	1	CRCW04021K10FK	VISHAY DALE	1.1K	RES; SMT (0402); 1.1K; 1%; +/-100PPM/DEGC; 0.0630W	
27	R3, R6-R12, R15, R20	10	CRCW04021K40FK; RC0402FR-071K4L	VISHAY DALE;YAGEO PHICOMP	1.4K	RES; SMT (0402); 1.4K; 1%; +/-100PPM/DEGC; 0.0630W	
28	R5, R13	2	RC0402FR-071K5L	YAGEO PHYCOMP	1.5K	RES; SMT (0402); 1.5K; 1%; +/-100PPM/DEGC; 0.0630W	
29	R14	1	ERJ-3GEYJ102	PANASONIC	1K	RES; SMT (0603); 1K; 5%; +/-200PPM/DEGC; 0.1000W	
30	R17, R18	2	CRCW060315K0FK	VISHAY DALE	15K	RES; SMT (0603); 15K; 1%; +/-100PPM/DEGC; 0.1000W	
31	SW1	1	B3U-1000P	OMRON	B3U-1000P	SWITCH; SPST; SMT; STRAIGHT; 12V; 0.05A; ULTRA-SMALL TACTILE SWITCH	
32	U1	1	MAX22200	MAXIM	MAX22200	EVKIT PART - IC; MAX22200; TQFN32-EP; PACKAGE OUTLINE DRAWING: 21-0140; PACKAGE LAND PATTERN: 90-0013	
33	U2	1	MAX32625ITK+	MAXIM	MAX32625ITK+	IC; UCON; ULTRA-LOW POWER; HIGH-PERFORMANCE CORTEX-M4 MICROCONTROLLER FOR WEARABLES; FLASH=512KB; SRAM=160KB; TQFN68-EP	
34	U3	1	MAX14750BEWA+	MAXIM	MAX14750BEWA+	IC; PWRM; POWER-MANAGEMENT SOLUTION; WLP25	
35	X1	1	ECS-327-6-12-C	ECS INC	32.768KHZ	CRYSTAL; SMT 2.0 MM X 1.2 MM; 6PF; 32.768KHZ; +/-10PPM; -0.03PPM/DEGC2	
36	PCB	1	MAX22200	MAXIM	PCB	PCB:MAX22200	
TOTAL		69					

MAX22200 EV Kit Schematics

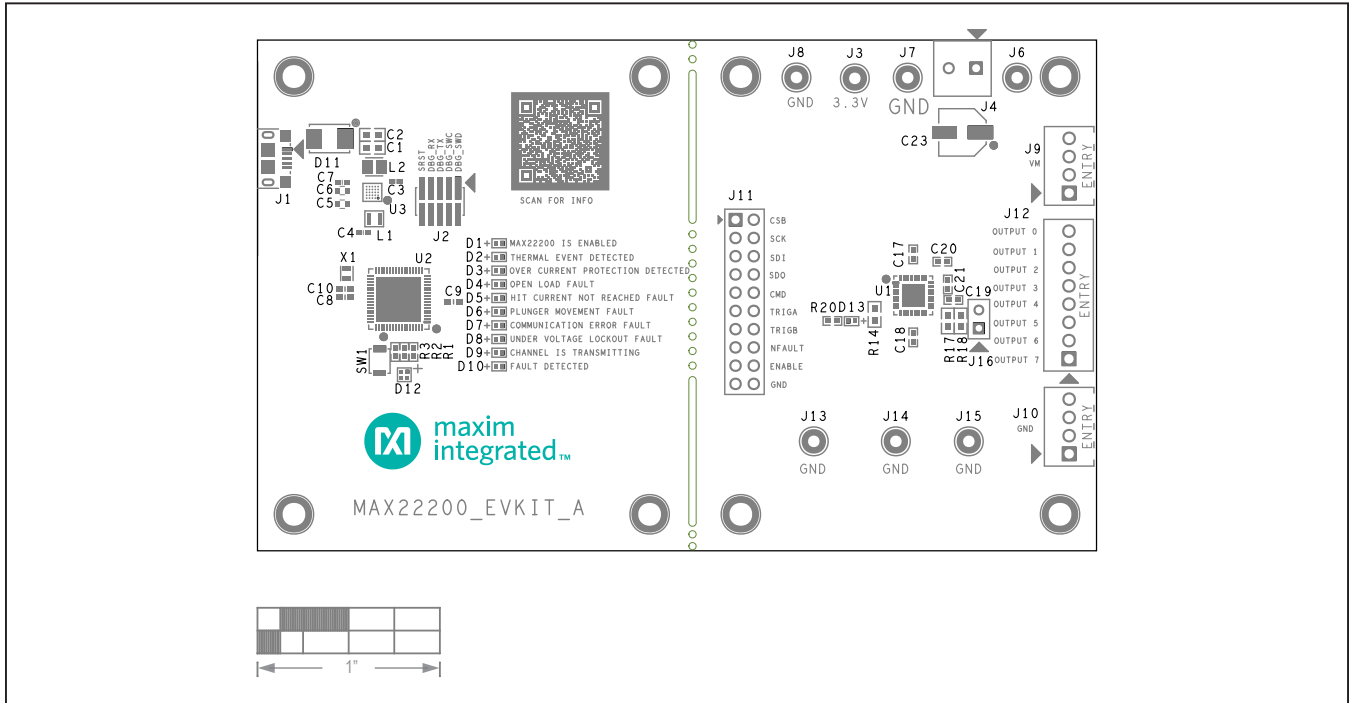


MAX22200 EV Kit Schematics (continued)

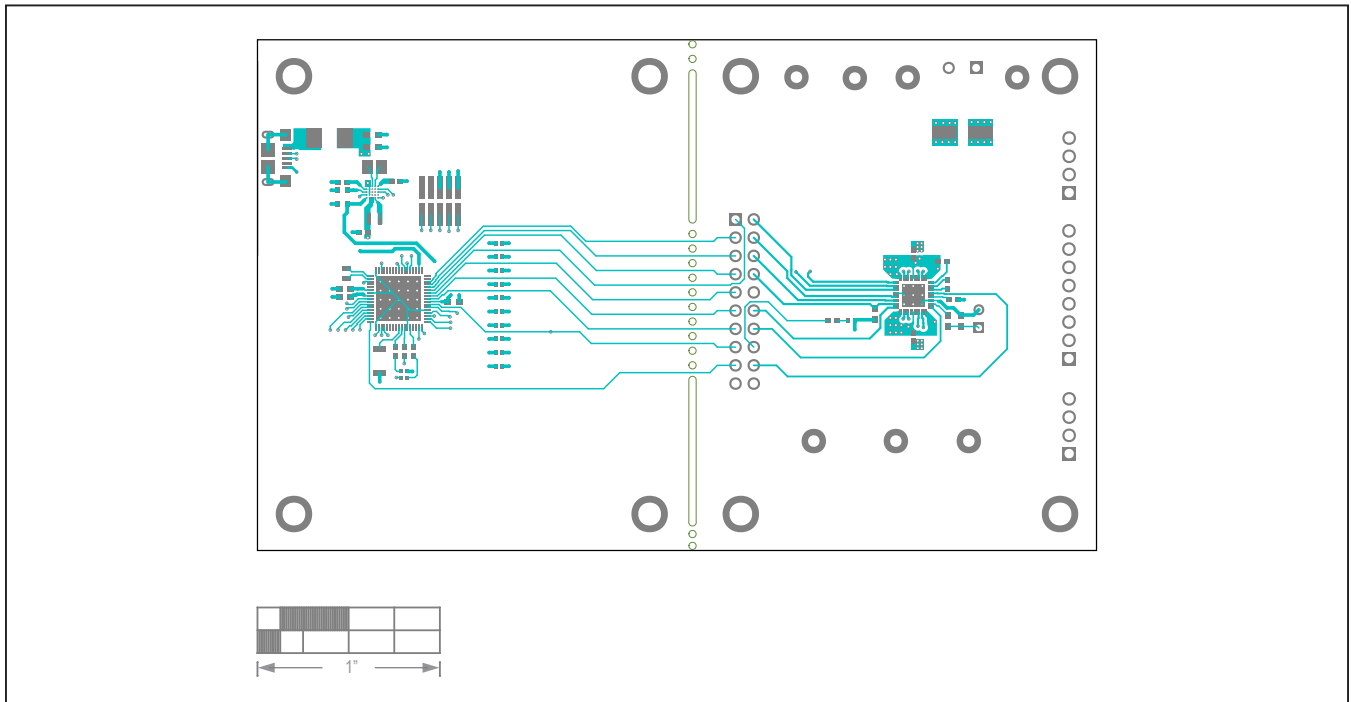




MAX22200 EV Kit PCB Layout

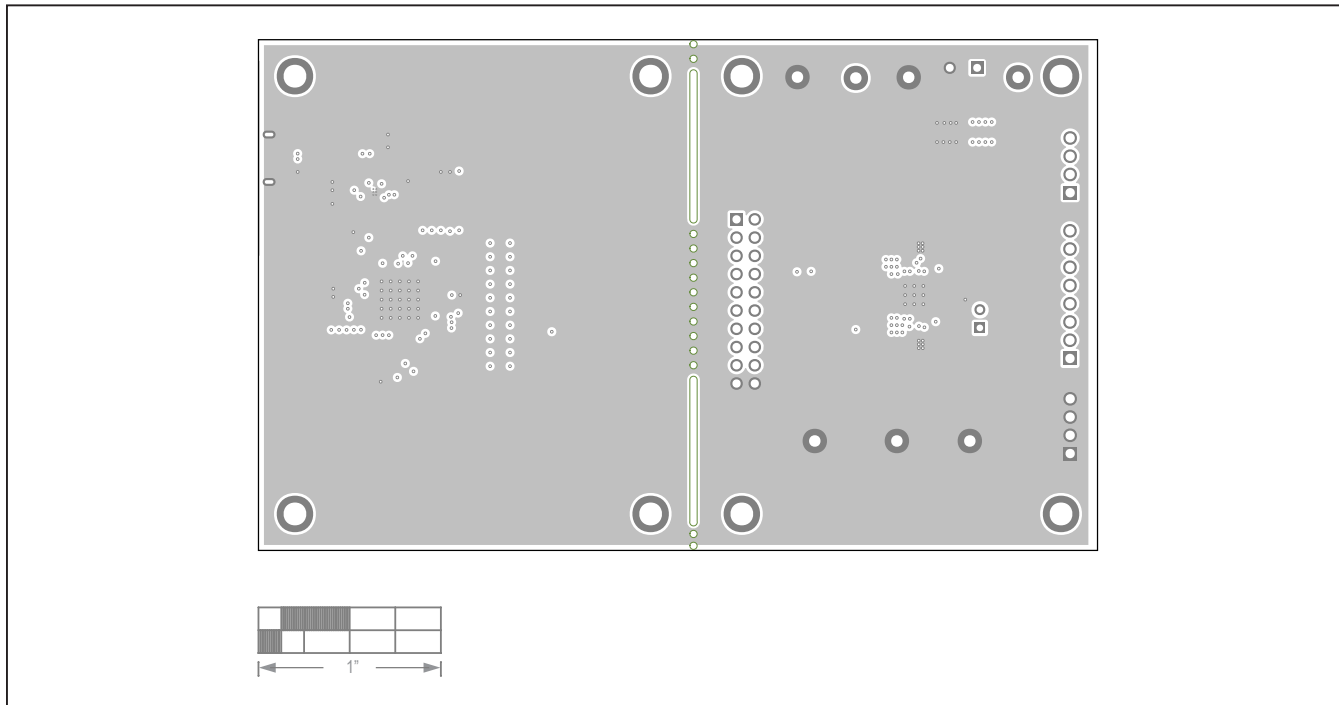


MAX22200 EV Kit PCB—Silk Top

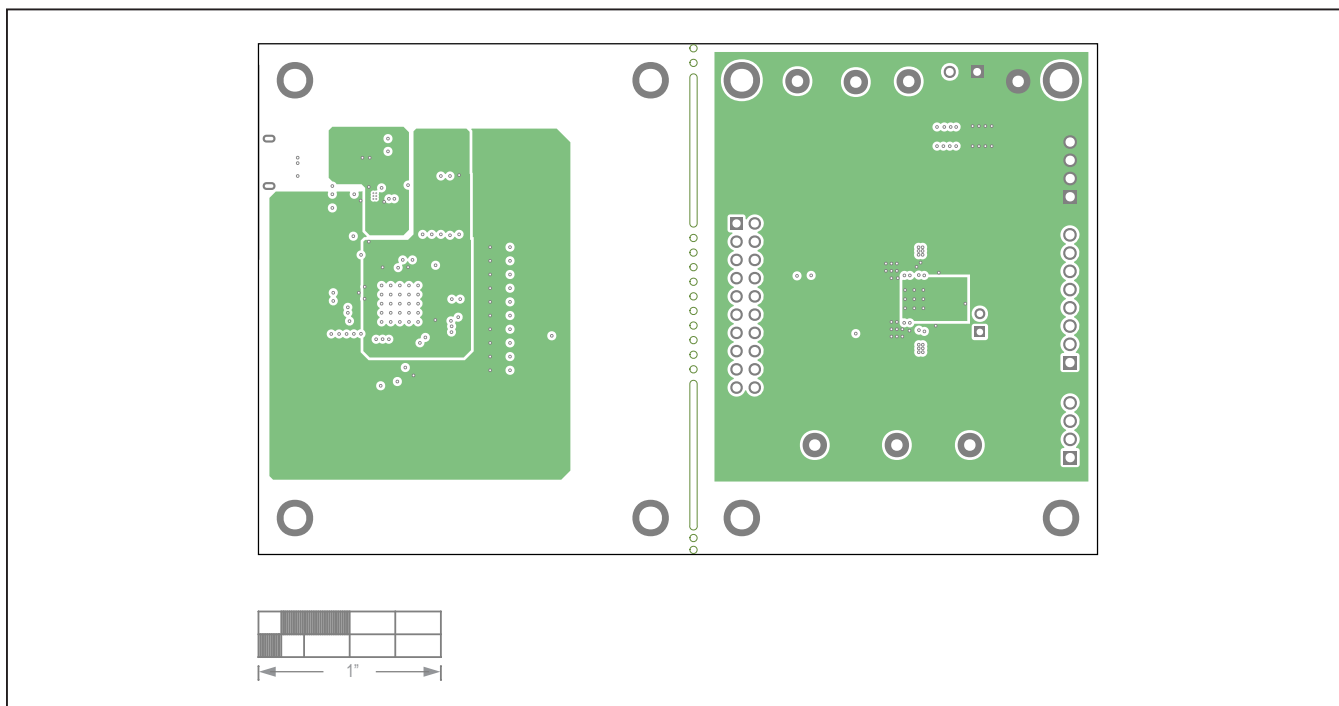


MAX22200 EV Kit PCB—Top

MAX22200 EV Kit PCB Layout (continued)

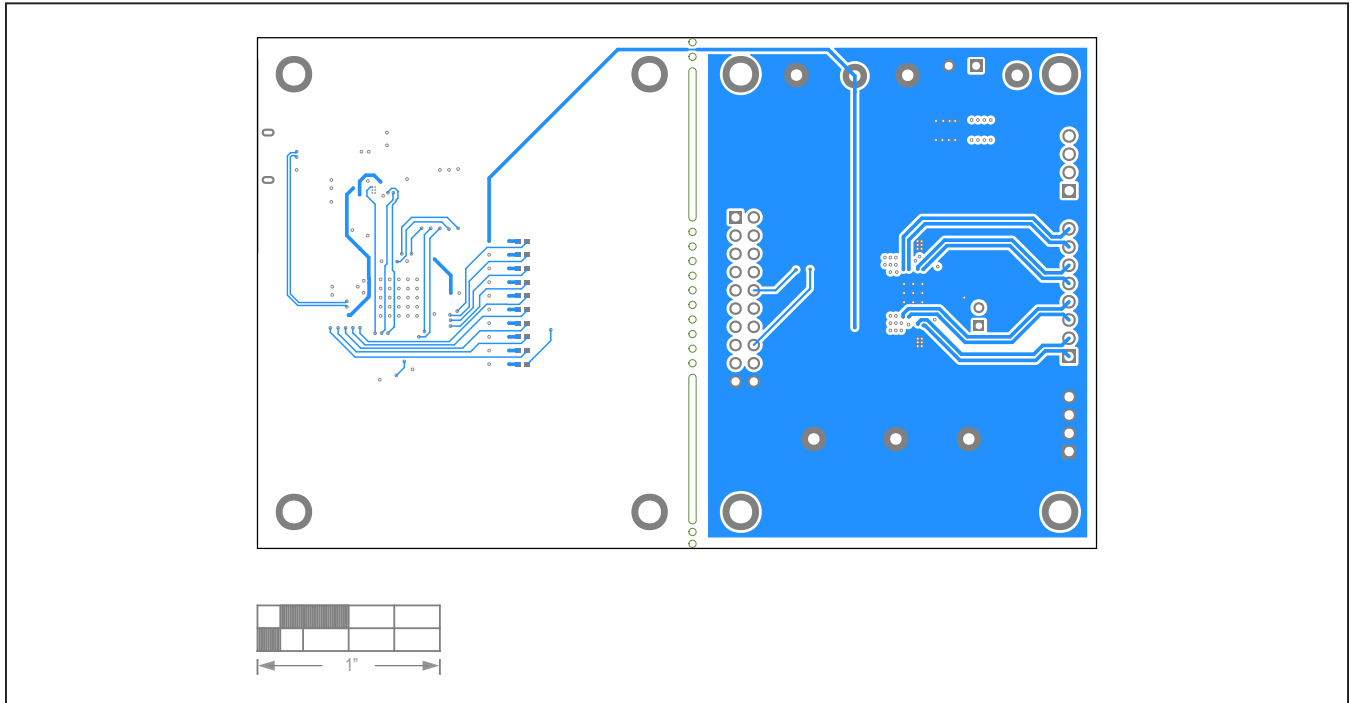


MAX22200 EV Kit PCB—GND2

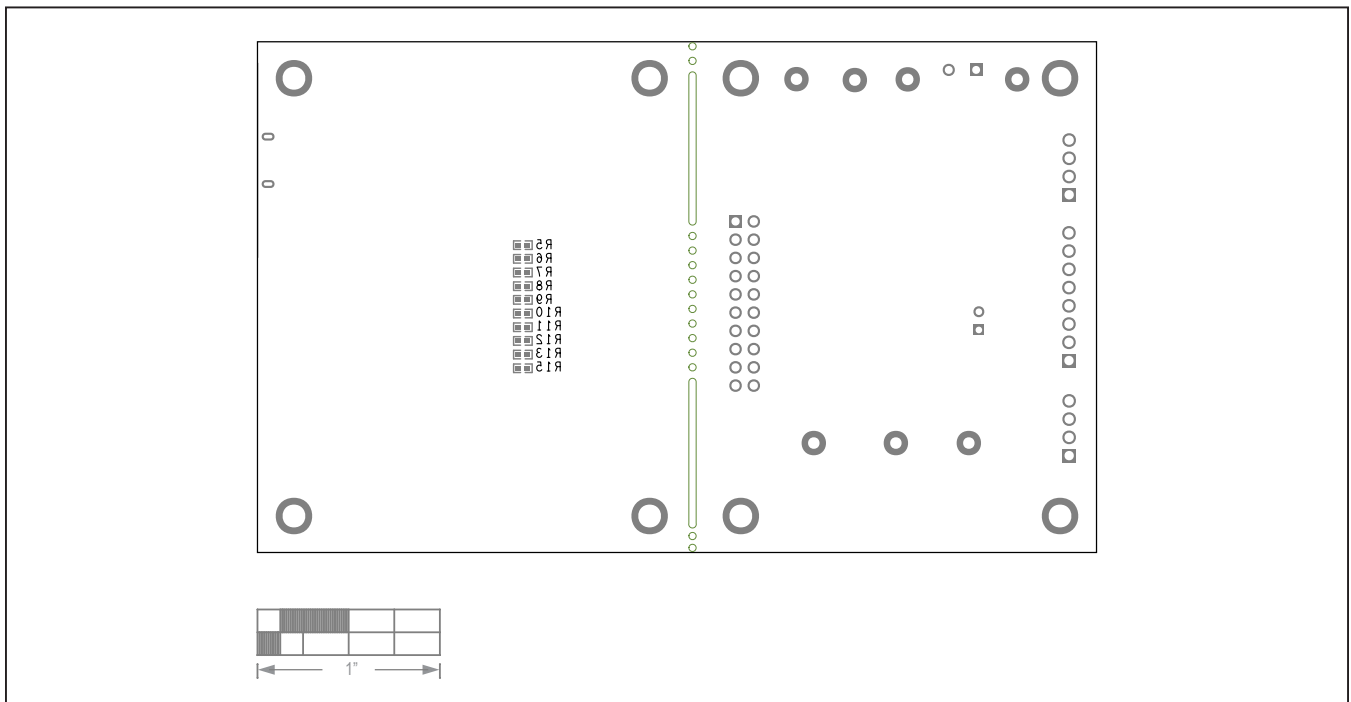


MAX22200 EV Kit PCB—PWR3

MAX22200 EV Kit PCB Layout (continued)



MAX22200 EV Kit PCB—Bottom



MAX22200 EV Kit PCB—Silk Bottom

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/21	Initial release	—

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