Evaluates: MAX22910

MAX22910 Evaluation Kit

General Description

The MAX22910 evaluation kit (EV kit) provides a proven design to evaluate the MAX22910, a 21mΩ single-channel high-side switch with advanced diagnostics for industrial applications. The EV kit is powered from an external power supply at V_{DD}, while the on-board LT3014 LDO generates a 3.3V for the logic input level of the MAX22910. The logic level can be set with an external power supply at V_L, alternatively. The EV kit is preinstalled with ADuM342E0, a four-channel digital isolator with default-low output. It provides digital isolation between the field and logic sides for logic control I/Os.

The MAX22910 EV kit comes with an output clamping diode installed to protect the device from negative kickback voltage during switching off the inductive loads. The EV kit is specified for EMC protection against surge and ESD transients, EFT, and RF conducted immunity.

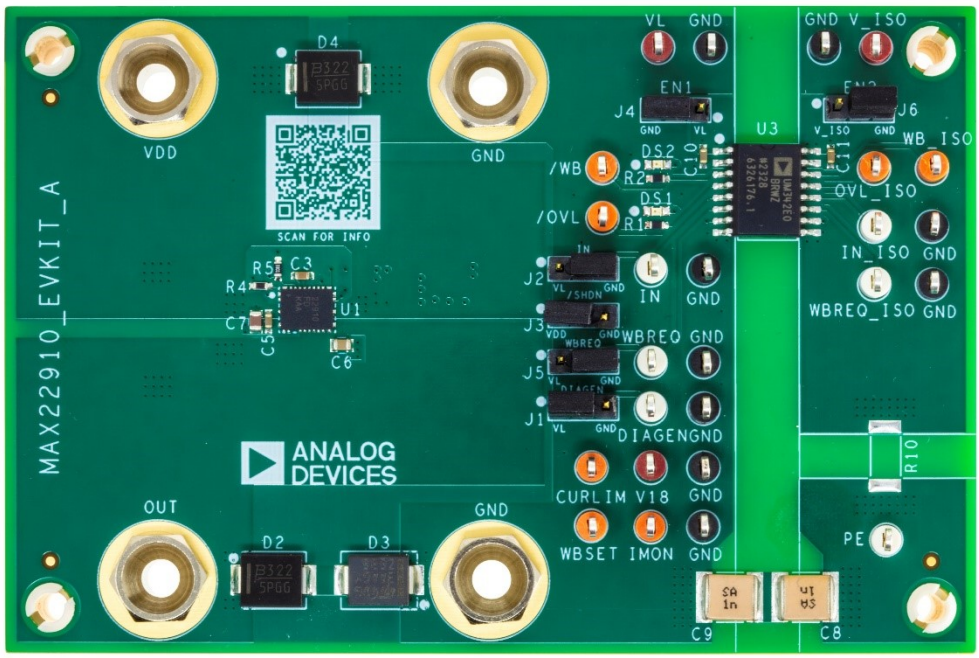
The MAX22910 EV kit comes with MAX22910AFZ+ installed in a compact 4.5mm x 5.75mm FC2QFN package. The EV kit is specified for operation with up to +60V supply voltage at V_{DD} and from -40°C to +125°C operating temperature range.

Features

- Robust Operation with Wide Range of Input Voltage up to +80V (max) and Load Current up to 9A (max)
- Safe Inductive Load Switching with Output Clamping
- Optional V_{DD}-reference Output Clamping Diode
- Wire-Break and Overload Fault LED Indications
- On-Board Isolation between Logic and Field Sides
- On-Board 3.3V LDO to Supply Logic Input
- ±2kV Surge Transients, ±8kV Contact, and ±15kV Airgap ESD Protection
- ±4kV EFT Burst and 10V_{RMS}, 10kHz to 80MHz RF Conducted Immunity
- -40°C to +125°C Operating Temperature Range
- Proven PCB Layout
- Fully Assembled and Tested

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

MAX22910 EV Kit Photo



319-101035; Rev 0; 11/23

Quick Start

Required Equipment

- MAX22910 EV kit
- +24V DC power supply
- Electronic load
- Optional +3.3V DC power supply
- Optional signal generator

Procedure

The MAX22910 EV kit is fully assembled and tested. Follow the steps below to verify the operation:

1. Examine the EV kit and verify that all jumpers are in their default positions, as shown in *Table 1*.
2. Connect the +24V supply to the V_{DD} banana plug; connect the ground return to the GND banana plug.
3. Turn on the power supply.
4. Verify the voltage at the V_L test point is +3.3V and the voltage at the V18 test point (TP21) is +1.8V.
5. Move the shunt at J5 to the 1-2 position to turn on the wire-break detection. Verify the $\overline{WB}$ test point is GND and DS2, and the red LED is on due to wire broken.
6. Connect a load between the OUT banana plug and the GND banana plug. Verify the $\overline{WB}$ test point is +3.3V and DS2 is off due to the removal of wire broken.
7. Move the shunt at J5 to the 2-3 position. Move the shunt at J2 to the 1-2 position to turn on the switch.
8. Verify the OUT voltage is at +24V.
9. Verify the load current and that the IMON output voltage reflects the amount of output load current using the equation in the MAX22910 data sheet.

(Optional) Test the on-board digital isolator:

10. Connect the +3.3V DC power supply to V_ISO test point and turn on the power supply.
11. Move the shunts at J4 and J6 to the 1-2 position to enable the isolator outputs. Remove the shunts at J2 and J5.
12. Use IN_ISO (TP22) and WBREQ_ISO (TP23) to drive the MAX22910. Use /WB_ISO (TP24) and /OVL_ISO (TP25) to monitor the device diagnostics.

Table 1. MAX22910 EV Kit Shunt Positions

JUMPER	SHUNT CONNECTION	DESCRIPTION
J1	1-2*	Connect DIAGEN to V_L. Enable the $\overline{OVL}$, $\overline{WB}$, and IMON outputs.
	2-3	Connect DIAGEN to GND. Disable the $\overline{OVL}$, $\overline{WB}$, and IMON outputs and set to high-impedance.
J2	1-2	Connect IN to V_L. Turn on the switch output.
	2-3*	Connect IN to GND. Turn off the switch output.
J3	1-2*	Connect LDO $\overline{SHDN}$ to V_{DD}. Enable the 3.3V LDO output.
	2-3	Connect LDO $\overline{SHDN}$ to GND. Disable the 3.3V LDO output.
J4	1-2	Connect V_{E1} to V_{DD1}. Enable the isolator outputs on the V_{DD1} side.
	2-3*	Connect V_{E1} to GND. Disable the isolator outputs on the V_{DD1} side.
J5	1-2	Connect WBREQ to V_L. Enable the wire-break detection.
	2-3*	Connect WBREQ to GND. Disable the wire-break detection.
J6	1-2	Connect V_{E2} to V_{DD2}. Enable the isolator outputs on the V_{DD2} side.
	2-3*	Connect V_{E2} to GND. Disable the isolator outputs on the V_{DD2} side.

** Default Position*

Detailed Description of Hardware

The MAX22910 EV kit provides an easy-to-use solution for evaluating MAX22910, a 21mΩ single-channel high-side switch with advanced diagnostics for industrial applications. The EV kit is installed with an on-board LT3014 LDO to supply the logic levels and an ADuM342E0 isolator to enable users to evaluate MAX22910 with isolated inputs and outputs.

The MAX22910 EV kit is preinstalled with EMC-protection components and is specified for surge (level 3) and ESD (level 4) protection, EFT (level 4), and RF conducted (level 4) immunity. The EV kit also comes preinstalled with an output clamping diode to protect the MAX22910 against the negative kickback voltage during switching-off large inductive loads.

The MAX22910 EV kit is specified for operation with up to +60V voltage input at V_{DD} and from -40ºC to +125ºC operating temperature range.

Power Supply

The EV kit can be powered by an external DC power supply with up to 60V at V_{DD}. Connect the supply and ground return to the banana plugs on the board to support a large output current.

The TVS diode connected between V_{DD} and GND for EMC protection has a reverse standoff voltage of +58V. Remove the TVS diode to operate MAX22910 with a supply voltage higher than 60V. The MAX22910 EV kit is specified for operation with up to +80V (max) supply voltage at V_{DD} if OUT does not go below GND.

Logic Supply

An LT3014 LDO is installed on the EV kit to provide 3.3V logic input for MAX22910. Place a shunt at 1-2 position at J3 to enable the 3.3V LDO output.

Alternatively, a 1.6V to 5.5V logic level can be supplied at the V_L test point from an external DC supply. Place a shunt at 2-3 position at J3 to disable the LDO output and connect the external supply to V_L.

V18 is the internal LDO output at 1.8V (typ). It is used for internal biasing and cannot be used to supply external circuits.

Output Switch Control

Place a shunt at 1-2 position at J2 to close the switch. Place at 2-3 position to open the switch. Alternatively, use the IN test point (TP6) to control the switch. When doing so, remove the shunt at J2.

Diagnostic Enable

Place a shunt at 1-2 position at J1 to enable the diagnostic outputs at $\overline{OVL}$, $\overline{WB}$, and IMON. Place at 2-3 position to set them to high impedance.

Current Limit

The MAX22910 EV kit is preinstalled with a 3.3kΩ resistor at the CURLIM input, and the output current limit is set to 4.4A. During current limiting, the voltage at CURLIM is regulated at 0.7V (typ).

Wire-Break Detection

The MAX22910 EV kit is preinstalled with a 35.7kΩ resistor at the WBSET input, and the wire-break threshold is set to 5mA. Place a shunt at 1-2 position at J5 to enable wire-break detection. Place at 2-3 position to disable it. Alternatively, use the WBREQ test point (TP7) to drive pulses at the WBREQ input. When doing so, remove the shunt at J5.

Current Monitor

The MAX22910 EV kit is preinstalled with a 4.7kΩ resistor at IMON current output. Set DIAGEN high, and measure the IMON voltage at the IMON test point (TP4), and refer to the *IMON Current Monitor* section in the data sheet for calculating the load current.

Overload and Wire-Break Faults

When the MAX22910 is in a fault condition such as overtemperature or wire-break, the $\overline{OVL}$ or $\overline{WB}$ diagnostic output is pulled to GND if the DIAGEN is set high. There are two red LEDs on-board to indicate these fault conditions.

Digital Isolation

The MAX22910 EV kit comes with an ADuM342E0BRWZ digital isolator between field and logic sides, providing isolation for four digital logic I/Os:

- $\overline{OVL}$: the overload fault output;
- $\overline{WB}$: the wire-break fault output;
- IN: the switch control input;
- WBREQ: the wire-break request input.

The field-side (V_{E1}) of the isolator is powered by the same voltage powering the MAX22910 logic input. Use the on-board 3.3V LT3014 LDO output or connect an external supply at the V_L test point to power the field side. The logic-side (V_{E2}) of the isolator is supplied by the voltage at the V_ISO test point. Connect a voltage supply from 2.25V to 5.5V to power the logic side. Place the shunts at 1-2 position at J4 and J6 to enable the isolator outputs. When doing so, remove the shunts at J2 and J5 and use IN_ISO (TP22) and WBREQ_ISO (TP24) test points on the logic side to control the MAX22910.

Place the shunts at 2-3 position at J4 and J6 to disable the isolator output when it is not used.

The MAX22910 EV kit has a PE (Protective Earth) connection and two 1000pF Y-rated safety capacitors between the PE and the field-side GND.

Switching Inductive Loads

The MAX22910 EV kit is preinstalled with a GND-referenced TVS diode, SM15T22A, to clamp the negative kickback voltage during switching-off inductive loads. There is an available footprint between V_{DD} and GND for an SMD diode for optional V_{DD}-referenced clamping. Select a TVS diode that limits the (V_{DD} – OUT) voltage to less than +85V (max).

Refer to the *Inductive Load Switching* section in the data sheet for more information.

EMC Protection

The MAX22910 EV kit provides robust EMC transient protection against the following specifications:

- ±2kV, surge transients (IEC 61000-4-5) protection at V_{DD} and OUT.
- ±8kV, contact and ±15kV airgap ESD (IEC 61000-4-2) protection at V_{DD} and OUT.
- ±4kV, 5kHz and 100kHz EFT (IEC 61000-4-4) Immunity at $\overline{WB}$ and OUT.
- $10V_{RMS}$, 10kHz to 80MHz, Conducted RF (IEC 61000-4-6) Immunity at $\overline{WB}$ and OUT.

Ordering Information

PART	TYPE
MAX22910EVKIT#	EV kit

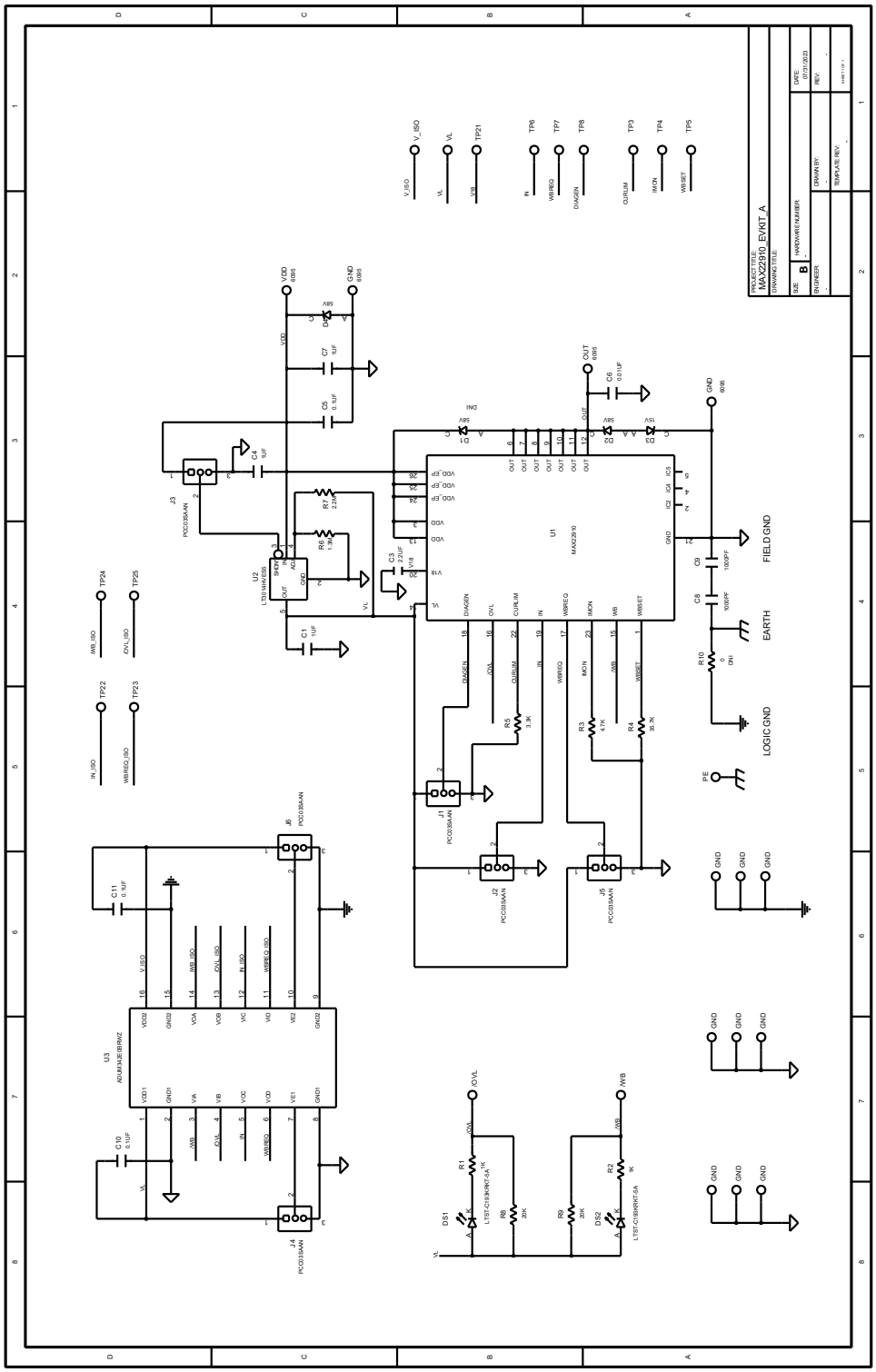
#Denotes RoHS Compliance.

MAX22910 EV Kit Bill of Materials

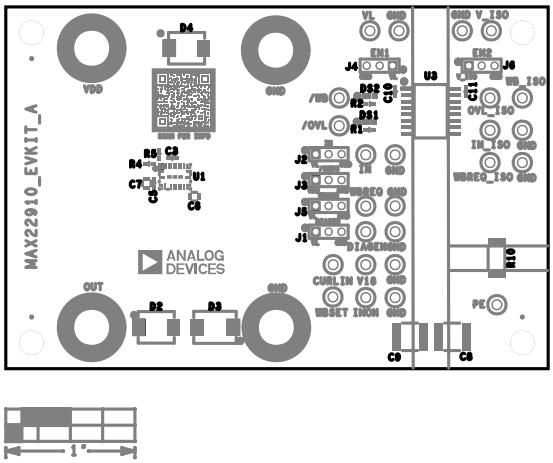
ITEM	REF_DES	DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C4, C7	-	3	C2012X7S2A105K125AB;GRJ21BC72A105KE11;GRM21BC72A105KE01	TDK;MURATA;MURATA	1µF	CAP; SMT (0805); 1µF; 10%; 100V; X7S; CERAMIC
2	C3	-	1	GRM188R71A225KE15;CL10B225KP8NNN;C1608X7R1A225K080AC;C0603C225K8RAC	MURATA;SAMSUNG;TDK;KEMET	2.2µF	CAP; SMT (0603); 2.2µF; 10%; 10V; X7R; CERAMIC
3	C5, C10, C11	-	3	CC0603KRX7R0BB104;GRM188R72A104KA35;HMK107B7104KA;06031C104KAT2A;GRM188R72A104K	YAGEO;MURATA;TAIYO YUDEN;AVX;MURATA	0.1µF	CAP; SMT (0603); 0.1µF; 10%; 100V; X7R; CERAMIC
4	C6	-	1	C0805C103K1RAC;GRM21BR72A103KA01;08055C103KAT2A	KEMET;MURATA;AVX	0.01µF	CAP; SMT (0805); 0.01µF; 10%; 100V; X7R; CERAMIC
5	C8, C9	-	2	VJ2220A102KXUSTX1	VISHAY VITRAMON	1000PF	CAP; SMT (2220); 1000PF; 10%; 250V; C0G; CERAMIC
6	D2, D4	-	2	5.0SMDJ58A	BOURNS	58V	DIODE; TVS; SMC (DO-214AB); VRM = 58V; IPP = 53.5A
7	D3	-	1	SM30T15AY	ST MICROELECTRONICS	15V	DIODE; TVS; SMC (DO-214AB); VRM = 15V; IPP = 140A
8	DS1, DS2	-	2	LTST-C193KRKT-5A	LITE-ON ELECTRONICS INC	LTST-C193KRKT-5A	DIODE; LED; WATER CLEAR; RED; SMT; VF = 2V; IF = 0.005A
9	J1-J6	-	6	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65°C TO +125°C
10	R1, R2	-	2	ERJ-3GEYJ102	PANASONIC	1K	RES; SMT (0603); 1K; 5%; ±200PPM/°C; 0.1000W
11	R3	-	1	CPF-A-0603B4K7E	TE CONNECTIVITY	4.7K	RES; SMT (0603); 4.7K; 0.10%; ±25PPM/°C; 0.0630W
12	R4	-	1	ERJ-3EKF3572	PANASONIC	35.7K	RES; SMT (0603); 35.7K; 1%; ±100PPM/°C; 0.1000W
13	R5	-	1	RCW06033K30FK;RC0603FR-073K3L;RK73H1J3301F	VISHAY;YAGEO;VISHAY	3.3K	RES; SMT (0603); 3.3K; 1%; ±100PPM/°C; 0.1000W
14	R6	-	1	ERJ-3EKF1304	PANASONIC	1.3M	RES; SMT (0603); 1.3M; 1%; ±100PPM/°C; 0.1000W
15	R7	-	1	CRCW06032M20FK	VISHAY DALE	2.2M	RES; SMT (0603); 2.2M; 1%; ±100PPM/°C; 0.1000W
16	R8, R9	-	2	CRCW060320K0JN	VISHAY DALE	20K	RES; SMT (0603); 20K; 5%; ±200PPM/°K; 0.1000W

17	SPACER1-SPACER4	-	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
18	SU1-SU6	-	6	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
19	TP1-TP5, TP24, TP25	-	7	5008	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.35IN; BOARD HOLE = 0.063IN; ORANGE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
20	TP6-TP8, TP22, TP23, TP29	-	6	5007	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.35IN; BOARD HOLE = 0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
21	TP9-TP14, TP26-TP28	-	9	5006	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.35IN; BOARD HOLE = 0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
22	TP15, TP16, TP21	-	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;
23	TP17-TP20	-	4	6095	KEYSTONE	6095	CONNECTOR; FEMALE; PANELMOUNT; NON-INSULATED RECESSED HEAD BANANA JACK; STRAIGHT THROUGH; 1PIN
24	U1	-	1	MAX22910	ANALOG DEVICES	MAX22910	EVKIT PART - IC; 20 MILLI-OHM HIGH-SIDE SWITCH FOR APPLICATIONS UP TO 80V; PACKAGE OUTLINE DRAWING NUMBER: 21-100606; LAND PATTERN NUMBER: 90-100213
25	U2	-	1	LT3014HVES5	LINEAR TECHNOLOGY	LT3014HVES5	IC, LINEAR REGULATOR, 20mA OUTPUT CURRENT, 1.22V TO 60V ADJUSTABLE OUTPUT, OPERATES FROM 3V TO 80V INPUT VOLTAGE RANGE, VIN(MAX) = ±80V, SOT-23, -40°C TO +125°C
26	U3	-	1	ADUM342E0BRWZ	ANALOG DEVICES	ADUM342E0BRWZ	IC; ISO; 5.7 KV RMS QUAD DIGITAL ISOLATORS; WSOIC16
27	PCB	-	1	MAX22910	MAXIM	PCB	PCB:MAX22910
28	D1	DNP	0	5.0SMDJ58A	BOURNS	58V	DIODE; TVS; SMC (DO-214AB); VRM = 58V; IPP = 53.5A
29	R10	DNP	0	CRCW25120000Z0EGHP	VISHAY DRALORIC	0	RES; SMT (2512); 0; JUMPER; JUMPER; 1.5000W

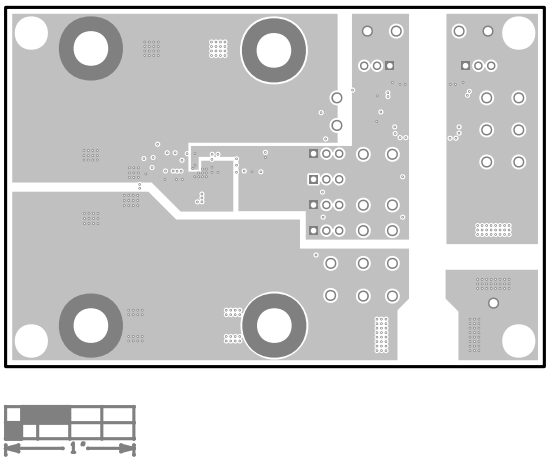
MAX22910 EV Kit Schematic



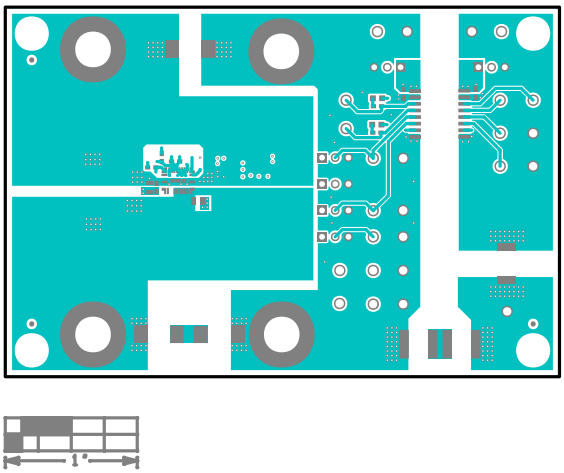
MAX22910 EV Kit PCB Layouts



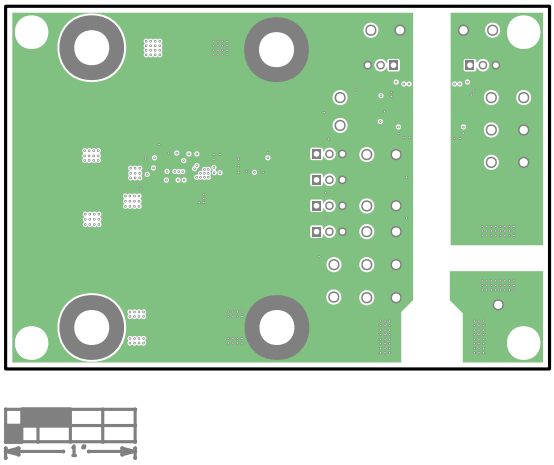
MAX22910 EV Kit PCB Layout—Top Silkscreen



MAX22910 EV Kit PCB Layout—Layer 2

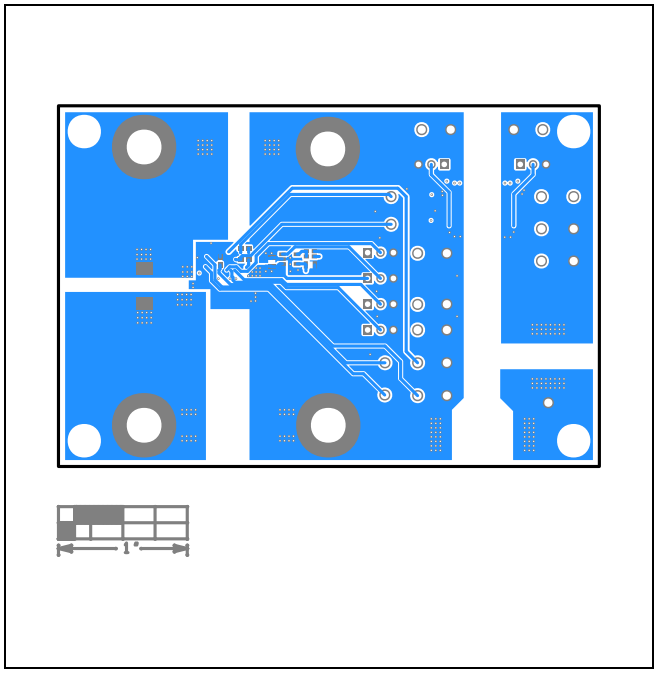


MAX22910 EV Kit PCB Layout—Top

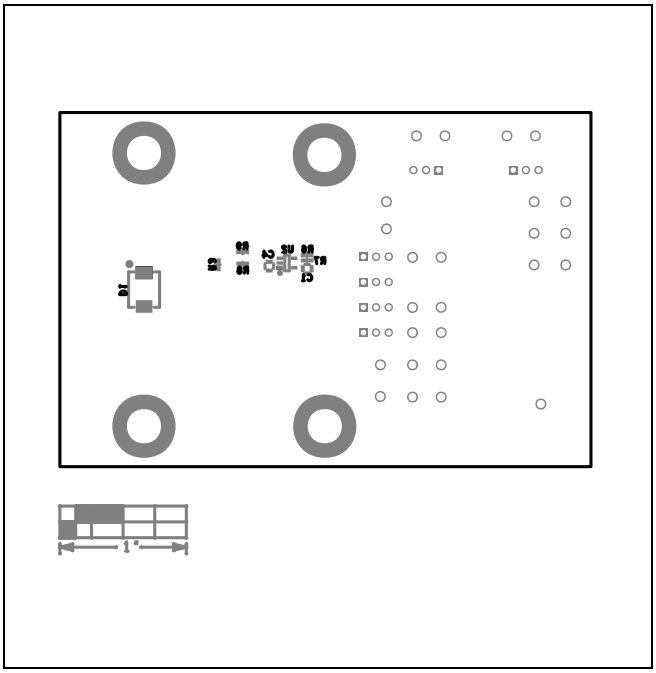


MAX22910 EV Kit PCB Layout—Layer 3

MAX22910 EV Kit PCB Layouts



MAX22910 EV Kit PCB Layout—Bottom



MAX22910 EV Kit PCB Layout—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/23	Initial release	—

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Analog Devices Inc.:

MAX22910EVKIT#