General Description

The MAX44211 evaluation kit (EV kit) provides a proven design to evaluate the MAX44211 high-current differential line driver for powerline communications (PLC). The line driver is an efficient low-distortion power amplifier that provides high current to the low-impedance loads.

The MAX44211 EV kit printed circuit board (PCB) comes with a MAX44211ETP+ in a 20-pin TQFN package.

Refer to the ZENOPLCEVK1# for a complete microcontroller and line driver evaluation platform.

Benefits and Features

- On-Board Single to Differential Amplifier (MAX9626) for Single-Ended Signal Sources to Match with MAX44211 Differential Inputs
- Connector with Accessible Signals and Supplies for Host Processor
- Proven PCB Layout
- Fully Assembled and Tested

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

Quick Start

Required Equipment

Before beginning, the following equipment is needed:

- MAX44211 EV kit
- +8V to +20V, 3A DC power supply
- +2.7V to +5.5V, 100mA DC power supply
- +3.3V, 100mA DC power supply
- Function generator (Agilent 33220A)
- Artificial mains network (line impedance stabilization network) or a 50Ω load across OUT- and OUT-

Procedure

The MAX44211 EV kit is fully assembled and tested. Follow the steps below to verify the board operation. **Caution: Do not turn on power supply until all connections are made.**

1) Connect the positive terminal of the +8V to +20V supply to the AVDD test point and the negative terminal of the supply to the nearest AGND test point.
2) Connect the positive terminal of the +2.7V to +5.5V supply to the DVDD test point and the negative terminal of the supply to the nearest DGND test point.
3) Connect the positive terminal of the +3.3V supply to the VCC_U2 test point and the negative terminal of the supply to the VEE_U2 test point.
4) Connect the artificial mains network to the OUT connector.
5) Connect the signal from the function generator to the SD_IN BNC.
6) Set the signal generator for 100mV$_{P-P}$, 0V offset, and 100kHz sine wave.
7) Enable all supplies.
8) Enable function generator.
9) Observe the output signal from the artificial mains network.

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Table 1. Jumper Description

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	Installed*	Connects the G1 pin of the MAX44211 to DVDD for appropriate gain selection. See Table 2.
	Not installed	Disconnects the G1 pin of the MAX44211 from DVDD for appropriate gain selection. See Table 2.
JU2	Installed*	Connects the G0 pin of the MAX44211 to DVDD for appropriate gain selection. See Table 2.
	Not installed	Disconnects the G1 pin of the MAX44211 from DVDD for appropriate gain selection. See Table 2.
JU3	Installed*	Enables TXEN.
	Not installed	Disables TXEN.
JU4	Installed	ARIB mode.
	Not installed*	Standard mode.
JU5	1-2*	Sets the output current limit to 2A.
	2-3	Do not connect.
	Not installed	Sets the output current limit as defined by a user-supplied resistor connected between the ILSET pin and GND.
JU6	Installed*	Connects the OUT- output of the MAX9626 to the input of the MAX44211.
	Not installed	Disconnects the OUT- output of the MAX9626 to the input of the MAX44211.
JU7	Installed*	Connects the OUT+ output of the MAX9626 to the input of the MAX44211.
	Not installed	Disconnects the OUT+ output of the MAX9626 to the input of the MAX44211.

**Default configuration*

Detailed Description of Hardware

The MAX44211 EV kit provides a proven design to evaluate the MAX44211 high-current line driver for power-line communications. The EV kit includes a MAX9626 amplifier used to generate the differential signal required by the MAX44211 from a single-ended input. The jumpers are used for gain and current limit settings, transmit enabling (TXEN), setting modes (MODE), and removing the single to differential input feature. A 12-pin connector is available to connect to a host processor. Also included are LEDs to indicate the status of the MAX44211.

Analog Inputs

Differential analog inputs can be applied to the IN+ and IN- BNC on the MAX44211 EV kit.

Optional On-Board Single to Differential Amplifier

When a differential input source is not available, the user can use the on-board single-ended to differential amplifier (MAX9626). This option requires that a separate supply of +3.3V be applied between the VCC_U2 and VEE_U2 test points. The single-ended signal can be applied at the SD_IN BNC. Shunts must be installed at jumpers JU6 and JU7 to drive the MAX44211 analog inputs.

Table 2. Gain Settings (Jumpers JU1 and JU2)

Gain (V/V)	G1 (JU1)	G0 (JU0)
6	Not installed	Not installed
12	Not installed	Installed
15	Installed	Not installed
18	Installed*	Installed*

**Default configuration*

Gain Settings

The gain settings of the MAX44211 are summarized in Table 2.

Current Settings

Jumper JU5 controls the output current limit of the MAX44211. When the shunt is in the 1-2 position of jumper JU5, the current limit is set to 2A. Users can set their own current limit by removing the shunt on jumper JU5 and connecting their own resistor between the ILSET test point and GND. Use the equation below to set the desired current limit. ILIM is amps and R_{SET} is in kΩ.

$$I_{LIM} = \frac{60}{R_{SET} + 1}$$

$\overline{\text{Status}}$

The MAX44211 have two diagnostic status outputs: $\overline{\text{STATUS0}}$ AND $\overline{\text{STATUS1}}$. These are open-drain outputs that indicate the status of the device as shown in Table 3.

Connector

The connector (J1) is used to connect to a host processor. Signal and supply connections are listed in Table 4.

Component List

See the following links for component information:

- **MAX44211 EV BOM**

Table 3. $\overline{\text{Status}}$

$\overline{\text{STATUS1}}$	$\overline{\text{STATUS0}}$	DEVICE STATUS
0	0	*Overtemperature shut-down active*
0	1	*High temperature warning active*
1	0	Overcurrent active
1	1	Normal operation

Table 4. Connector Pin Assignment

J1	SIGNAL
1	G0
2	G1
3	$\overline{\text{STATUS0}}$
4	$\overline{\text{STATUS1}}$
5	DGND
6	DVDD
7	MODE
8	TXEN
9	INP
10	INN
11	AGND
12	AVDD

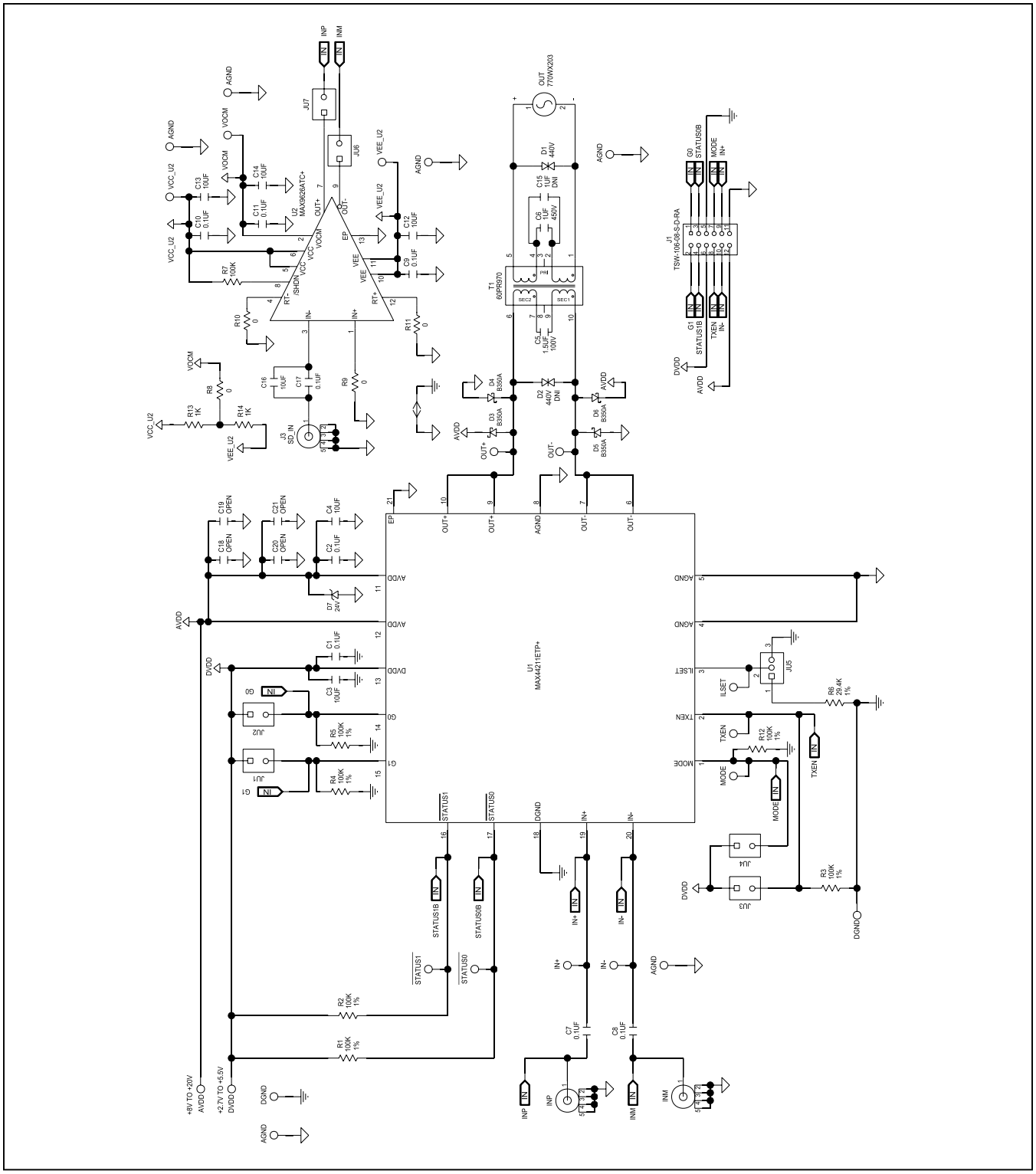


Figure 1. MAX44211 EV Kit Schematic

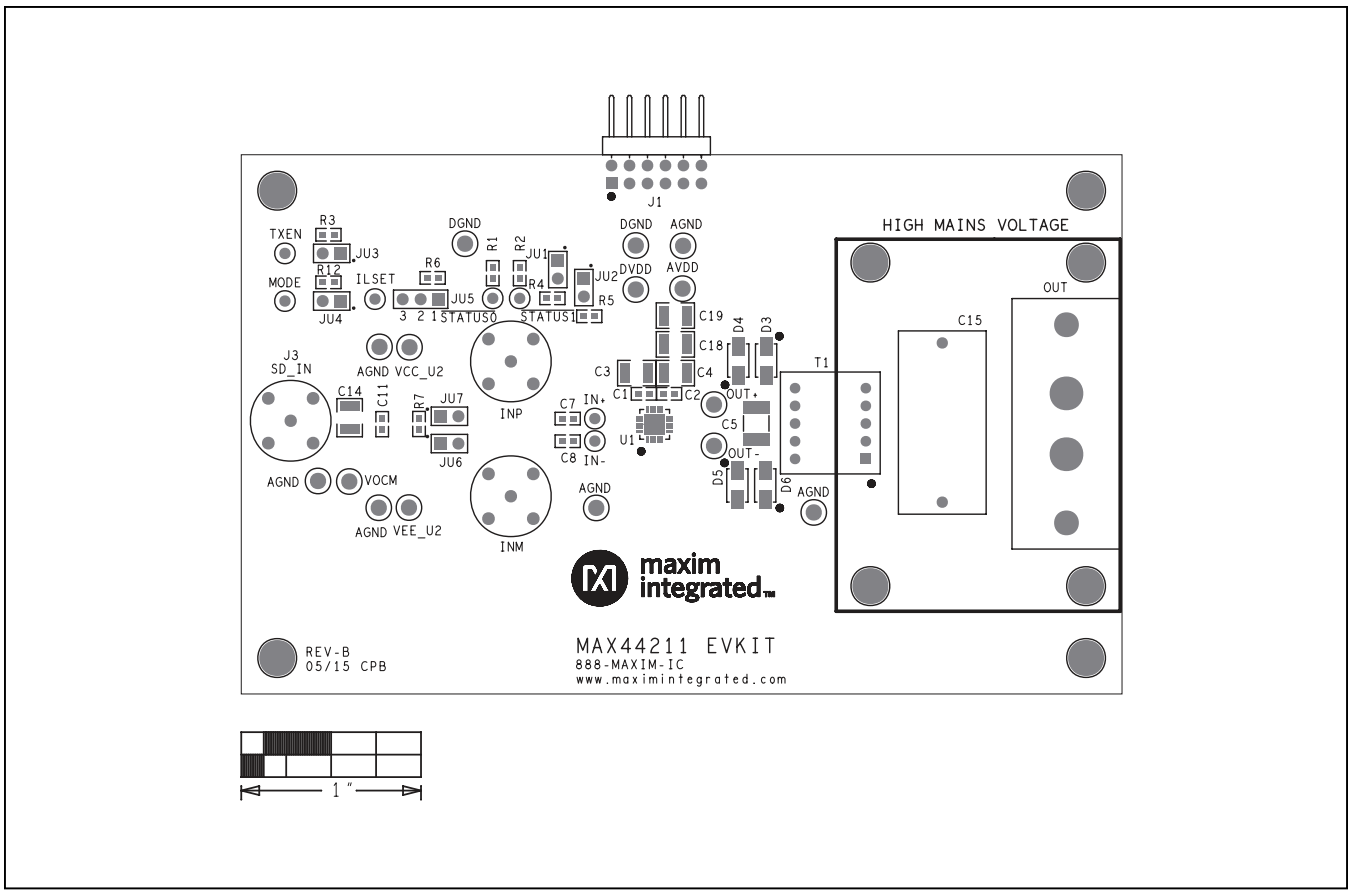


Figure 2. MAX44211 EV Kit Component Placement Guide—Component Side

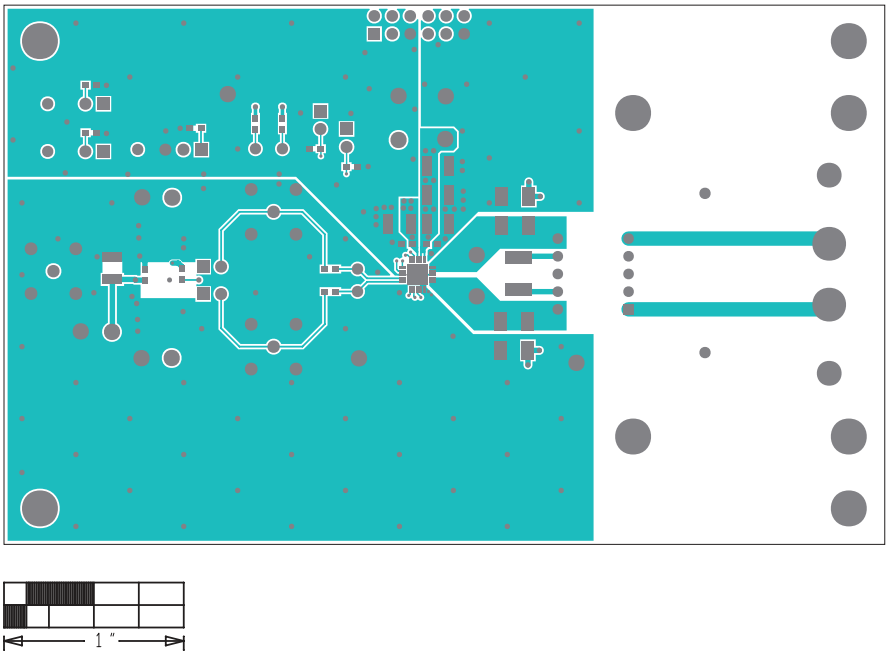


Figure 3. MAX44211 EV Kit PCB Layout—Component Side

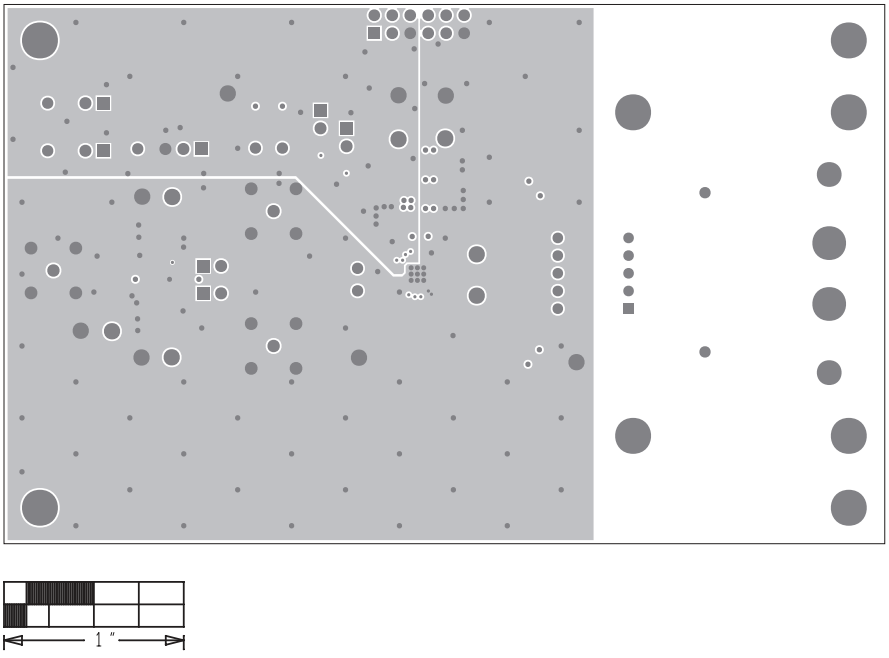


Figure 4. MAX44211 EV Kit PCB Layout—Inner Layer 2

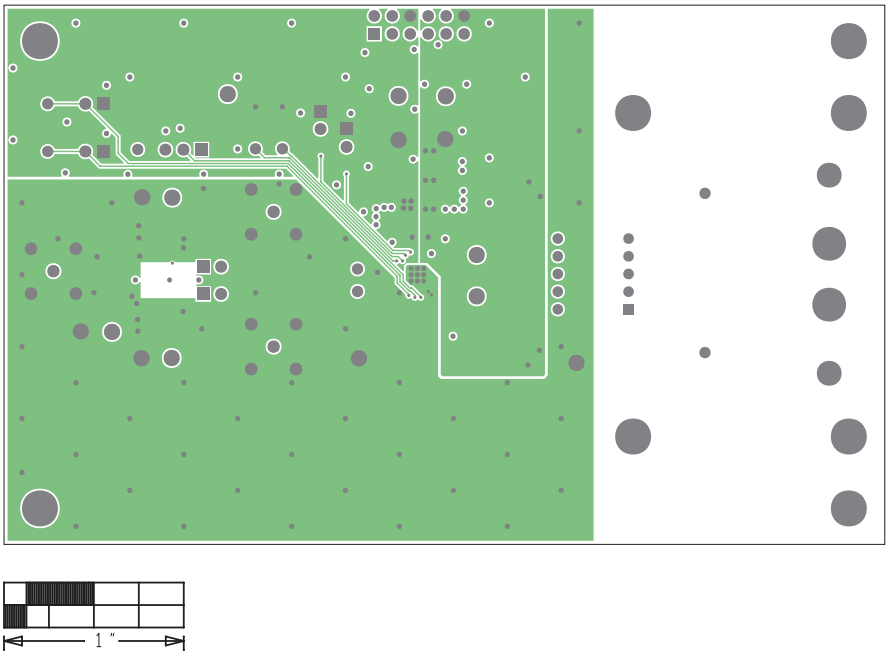


Figure 5. MAX44211 EV Kit PCB Layout—Inner Layer 3

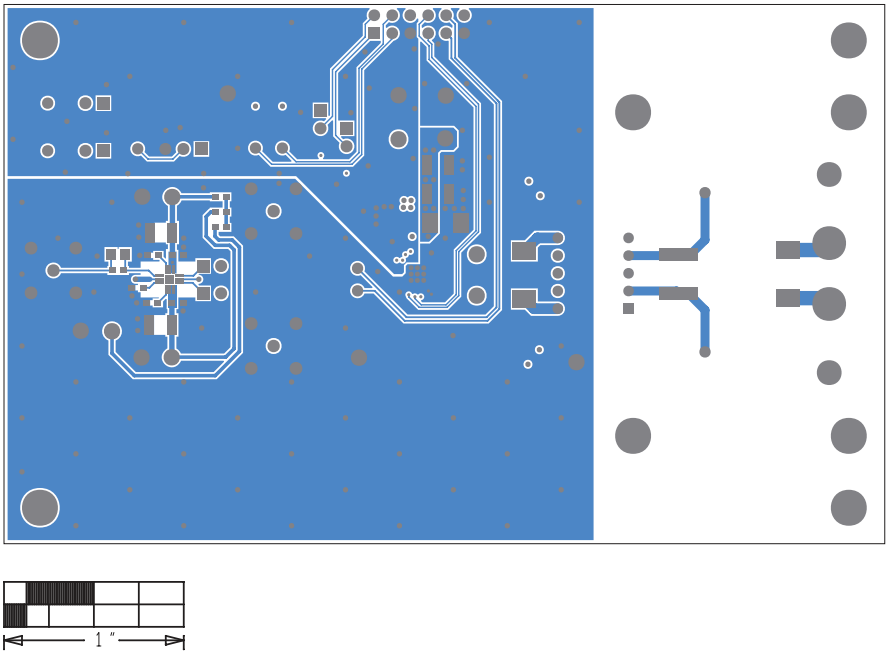


Figure 6. MAX44211 EV Kit PCB Layout—Solder Side

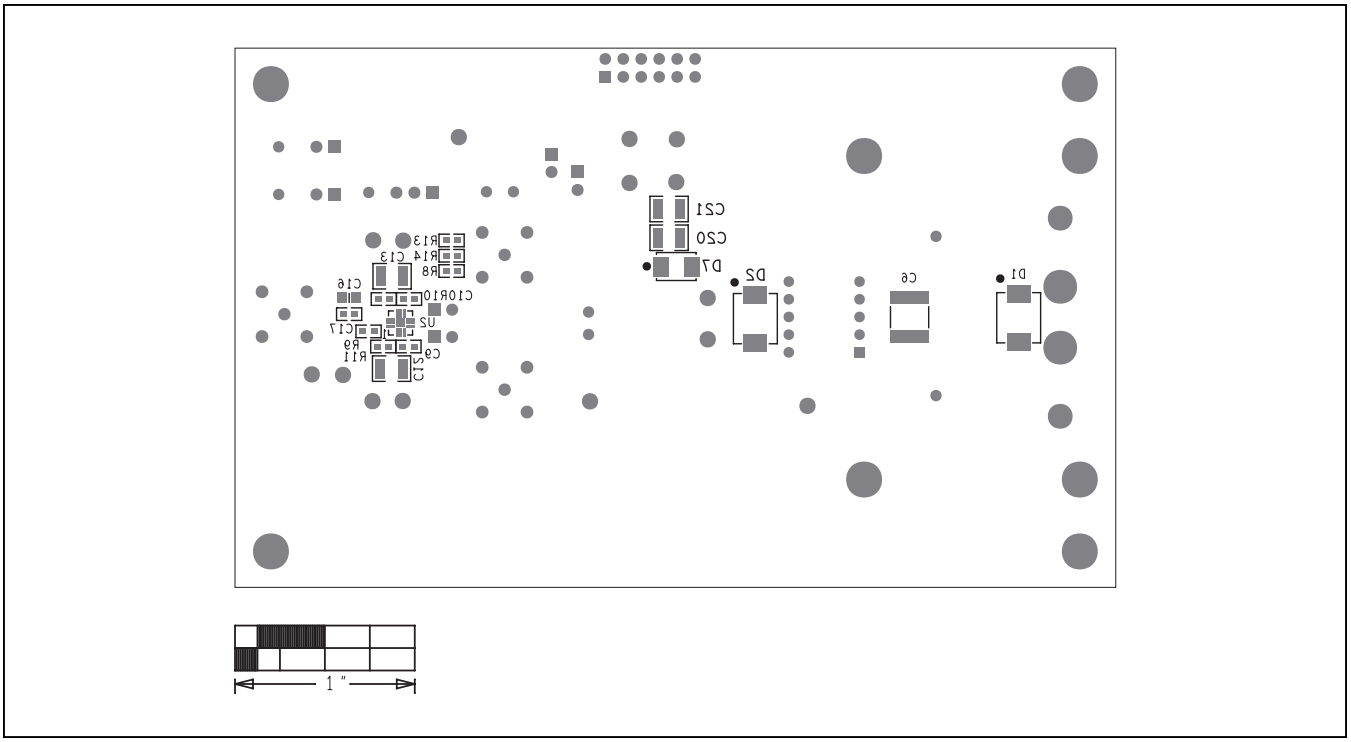


Figure 7. MAX44211 EV Kit Component Placement Guide—Solder Side

Ordering Information

PART	TYPE
MAX44211EVKIT#	EV Kit

#RoHS-compliant

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/15	Initial release	—

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MAX44211 EVKIT BOM 6/15
TITLE: Bill of Materials
DATE: 05/15/2015
DESIGN: max44211_evkit_b

ITEM	REF_DES	DNI	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	X1, X2, X5, X21-X23, AGND, DGND	-	8	5011	?	5011	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
2	AVDD, DVDD, VOCM, VCC_U2, VEE_U2	-	5	5010	?	5010	TESTPOINT WITH 1.80MM HOLE DIA, RED, MULTIPURPOSE	
3	C1, C2, C7-C11, C17	-	8	C0603C104K5RAC; C1608X7R1H104K	KEMET; TDK	0.1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R;NOTE:	
4	C3, C4, C12-C14	-	5	GRM32ER71H106KA12L; CL32B106KBJNNN	MURATA; SAMSUNG ELECTRONICS	10UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 10UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
5	C5	-	1	C4532X7R2A155K230KA	TDK	1.5UF	CAPACITOR; SMT (1812); CERAMIC CHIP; 1.5UF; 100V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R	
6	C6	-	1	C5750X7T2W105K250KE	TDK	1UF	CAPACITOR; SMT (2220); CERAMIC CHIP; 1UF; 450V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7T	
7	C16	-	1	CL21B106KOQNNN	SAMSUNG ELECTRONICS	10UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 16V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
8	D1	-	1	SMCJ440CA	LITTLE FUSE	440V	DIODE; TVS; SMC; PIV=440V; IF=2.1A; -65 DEGC TO +150 DEGC	
9	D3-D6	-	4	B350A	DIODES INCORPORATED	B350A	DIODE; SCH; SMA (DO-214AC); PIV=50V; IF=3A	
10	D7	-	1	1SMB5934BT3G	ON SEMICONDUCTOR	24V	DIODE; ZNR; SMB (DO-214AA); VZ=24V; IZ=0.0156A	
11	MODE, TXEN, ILSET	-	3	5000	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
12	IN+, IN-, STATUS0, STATUS1	-	4	5002	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; WHITE; PHOSPHOR BRONZE WIRE SILVER;	
13	J3, INM, INP	-	3	CN-BNC-011PG	FIRST TECH ELECTRONICS, CO.	CN-BNC-011PG	CONNECTOR; FEMALE; THROUGH HOLE; BNC JACK; STRAIGHT; 5PINS	
14	J1	-	1	TSW-106-08-S-D-RA	SAMTEC	TSW-106-08-S-D-RA	CONNECTOR; THROUGH HOLE; DOUBLE ROW; RIGHT ANGLE; 12PINS	
15	JU1-JU4, JU6, JU7	-	6	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS	
16	JU5	-	1	PEC03SAAN	SULLINS	PEC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS	
17	OUT	-	1	770WX203	QUALTEK ELECTRONICS CORP.	770WX203	CONNECTOR; MALE; THROUGH HOLE; AC RECEPTACLE; STRAIGHT; 2PINS	
18	OUT+, OUT-	-	2	5012	?	5012	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
19	R1-R5, R7, R12	-	7	CRCW06031003FK; ERJ-3EKF1003	VISHAY DALE/PANASONIC	100K	RESISTOR; 0603; 100K; 1%; 100PPM; 0.10W; THICK FILM	
20	R6	-	1	RC0603FR-0729K4L	YAGEO PHYCOMP	29.4K	RESISTOR; 0603; 29.4K OHM; 1%; 100PPM; 0.10W; THICK FILM	
21	R8-R11	-	4	CR0603-16W-000T; CR0603-16W-000RJT	VENKEL LTD.	0	RESISTOR; 0603; 0 OHM; 5%; JUMPER; 0.063W; THICK FILM	
22	R13, R14	-	2	CRCW06031001FK; ERJ-3EKF1001V	VISHAY DALE; PANASONIC	1K	RESISTOR; 0603; 1K; 1%; 100PPM; 0.10W; THICK FILM	
23	T1	-	1	60PR970	VITEC	60PR970	TRANSFORMER; TH; 10; 1.333 : 1; VITEC	
24	U1	-	1	MAX44211ETP+	MAXIM	MAX44211ETP+	IC; DRV; HIGH-CURRENT DIFFERENTIAL LINE DRIVER FOR POWERLINE COMMUNICATION; TQFN20-EP 4X4	
25	U2	-	1	MAX9626ATC+	MAXIM	MAX9626ATC+	IC; AMP; LOW-NOISE, LOW-DISTORTION, 1.35GHZ FULLY DIFFERENTIAL AMPLIFIER; TQFN12-EP 3X3	
26	C15	DNP	1	ECQ-U2A105ML	PANASONIC	1UF	CAPACITOR; THROUGH HOLE-RADIAL LEAD; POLYESTER; 1UF; 275V; TOL=20%; MODEL=ECQ-UL SERIES; TG=-40 DEGC TO 1OO DEGC	
27	C18-C21	DNP	4	N/A	N/A	?	CAPACITOR; 1210 PACKAGE; GENERIC	OPEN
28	D2	DNP	1	SMCJ440CA	LITTLE FUSE	440V	DIODE; TVS; SMC; PIV=440V; IF=2.1A; -65 DEGC TO +150 DEGC	
TOTAL			79					