19-5744; Rev 0; 1/11

MAX16920B Evaluation Kit

Evaluates: MAX16920A/MAX16920B

General Description

The MAX16920B evaluation kit (EV kit) is an assembled and tested PCB used to evaluate the MAX16920B power-management IC for automotive radios, containing three step-down converters, one linear regulator (LDO), and an overvoltage-protection block.

The EV kit comes with a MAX16920BATJ/V+ installed, which is the 2.2MHz switching-frequency version. For the 400kHz switching-frequency version, contact the factory for free samples of the pin-compatible MAX16920AATJ/V+. Additional capacitors and inductors are provided in the EV kit for the MAX16920A.

Features

- **5.5V to 18V Input Range, Survives 45V Transients**
- **3.3V at 150mA Output (OUT1 from DC-DC1)**
- **5V at 600mA Output (OUT2 from DC-DC2)**
- **3.3V at 1.5A Output (OUT3 from DC-DC3)**
- **5V at 150mA Output (OUTA from LDOA)**
- **LED Power-Good Indicators for All Step-Down Converters and LDO**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

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

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C6	2	4.7µF ±10%, 6.3V X7R ceramic capacitors (0805) Murata GRM21BR70J475K
C2	1	0.47µF ±10%, 6.3V X7R ceramic capacitor (0603) Murata GRM188R70J474K
C3, C18	0	Not installed, ceramic capacitors (0603)
C4, C5, C17	3	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C7, C15, C16, C19	4	10µF ±20%, 50V X7R ceramic capacitors (2220) TDK C5750X7R1H106M
C8	1	22µF ±10%, 10V X7R ceramic capacitor (1206) Murata GRM31CR71A226K
C9, C13	2	47µF ±10%, 10V X7R ceramic capacitors (1210) Murata GRM32ER71A476K
C10	1	10µF ±10%, 10V X7R ceramic capacitor (1206) Murata GRM31CR71A106K
C11, C12, C20	0	Not installed, ceramic capacitors (1210)
C14	0	Not installed, aluminum electrolytic capacitor (8.00mm x 10.2mm)

DESIGNATION	QTY	DESCRIPTION
D1	1	3A, 50V Schottky diode (SMC) Diodes Inc. B350-13-F
D2, D3, D4	3	Green LEDs (0603)
D5	1	Red LED (0603)
D6	0	Not installed, diode (SMA)
JU1–JU6	6	3-pin headers
JU7–JU10	4	2-pin headers
L1	1	8.2µH, 790mA inductor (4mm x 4mm x 1.2mm) Panasonic ELLSFG8R2NA
L2	1	4.7µH, 1.16A inductor (5.0mm x 5.6mm x 1.2mm) TDK VLP5612T-4R7MR93
L3	1	2.2µH, 4.18A inductor (7.60mm x 7.60mm x 3.55mm) Cooper Bussmann DRA73-2R2-R
L4	1	10µH, 2.56A inductor (7.60mm x 7.60mm x 4.35mm) Cooper Bussmann DRA74-100-R
P1	1	50V, 5.3A p-channel MOSFET (D PAK) Vishay IRFR9010TRPbF
R1	1	100kΩ ±1% resistor (0603)
R2	1	19.1kΩ ±1% resistor (0603)
R3–R6	4	1kΩ ±5% resistors (0603)
R7, R8	2	10kΩ ±5% resistors (0603)
R9, R10	2	100kΩ ±5% resistors (0603)
R11–R16	0	Not installed, resistors (0603)
R17	1	0Ω ±5% resistor (0603)

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U1	1	Power-management IC (32 TQFN-EP) Maxim MAX16920BATJ/V+
—	10	Shunts
—	1	PCB: MAX16920B EVALUATION KIT+
ADDITIONAL COMPONENTS FOR MAX16920A EVALUATION		
—	3	22µF ±10%, 10V X7R ceramic capacitors (1206) Murata GRM31CR71A226K

DESIGNATION	QTY	DESCRIPTION
—	1	47µF ±10%, 10V X7R ceramic capacitor (1210) Murata GRM32ER71A476K
—	1	47µH, 1.14A inductor (7.60mm x 7.60mm x 4.35mm) Cooper Bussmann DRA74-470-R
—	1	22µH, 1.68A inductor (7.60mm x 7.60mm x 4.35mm) Cooper Bussmann DRA74-220-R
—	1	10µH, 2.56A inductor (7.60mm x 7.60mm x 4.35mm) Cooper Bussmann DRA74-100-R

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Cooper Bussmann	916-941-1117	www.cooperet.com
Diodes Incorporated	805-446-4800	www.diodes.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Panasonic Corp.	800-344-2112	www.panasonic.com
TDK Corp.	847-803-6100	www.component.tdk.com
Vishay	402-563-6866	www.vishay.com

Note: *Indicate that you are using the MAX16920B when contacting these component suppliers.*

Quick Start

Required Equipment

- MAX16920B EV kit
- 12V, 2.5A DC power supply
- Four electronic loads (e.g., HP6060B)
- Four voltmeters

Procedure

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

1) Verify that all jumpers are in their default position, as shown in Table 1.
2) Adjust the power supply to 12V and connect to the VIN and PGND PCB pads on the EV kit.
3) Adjust the first load to 150mA and connect to the OUT1 and PGND1 PCB pads on the EV kit.
4) Connect the first voltmeter to the OUT1 and PGND1 PCB pads on the EV kit.
5) Adjust the second load to 600mA and connect to the OUT2 and PGND2 PCB pads on the EV kit.
6) Connect the second voltmeter to the OUT2 and PGND2 PCB pads on the EV kit.
7) Adjust the third load to 1.5A and connect to the OUT3 and PGND3 PCB pads on the EV kit.
8) Connect the third voltmeter to the OUT3 and PGND3 PCB pads on the EV kit.
9) Adjust the fourth load to 150mA and connect to the OUTA and GND PCB pads on the EV kit.
10) Connect the fourth voltmeter to the OUTA and GND PCB pads on the EV kit.
11) Connect the SYNC and GND PCB pads on the EV kit together.
12) Turn on the DC power supply.
13) Enable all loads.
14) Verify that the first voltmeter reads approximately 3.3V.
15) Verify that the second voltmeter reads approximately 5V.
16) Verify that the third voltmeter reads approximately 3.3V.
17) Verify that the fourth voltmeter reads approximately 5V.

Table 1. Jumper Descriptions (JU1–JU10)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	Enables the OUT2 output of the IC.
	2-3	Disables the OUT2 output of the IC.
JU2	1-2*	Enables the OUT3 output of the IC.
	2-3	Disables the OUT3 output of the IC.
JU3	1-2*	Enables the OUTA output of the IC.
	2-3	Disables the OUTA output of the IC.
JU4	1-2*	Connects the FB1 pin of the IC to ground, which sets the OUT1 voltage to 3.3V.
	2-3	Connects the FB1 pin of the IC to the voltage-divider of R11 and R12. Users must install appropriate feedback resistors to adjust the voltage between 1.22V and 5V.
JU5	1-2*	Connects the FB2 pin of the IC to ground, which sets the OUT2 voltage to 5V.
	2-3	Connects the FB2 pin of the IC to the voltage-divider of R13 and R16. Users must install appropriate feedback resistors to adjust the voltage between 1.22V and 5V.
JU6	1-2*	Connects the FB3 pin of the IC to ground, which sets the OUT3 voltage to 3.3V.
	2-3	Connects the FB3 pin of the IC to the voltage-divider of R14 and R15. Users must install appropriate feedback resistors to adjust the voltage between 1.22V and 8V.
JU7	1-2*	Uses LED D5 to indicate that the output of the converter (DC-DC2) is in the correct regulation range.
	Open	Disables LED D5. The PG2 signal can be monitored at the PG2 PCB pad on the EV kit.
JU8	1-2*	Uses LED D2 to indicate that the output of the converter (DC-DC3) is in the correct regulation range.
	Open	Disables LED D2. The PG3 signal can be monitored at the PG3 PCB pad on the EV kit.
JU9	1-2*	Uses LED D3 to indicate that the output of the LDO is in the correct regulation range.
	Open	Disables LED D3. The PGA signal can be monitored at the PGA PCB pad on the EV kit.
JU10	1-2*	Uses LED D4 to indicate that the output of the converter (DC-DC1) is in the correct regulation range.
	Open	Disables LED D4. The $\overline{\text{POR}}$ signal can be monitored at the PORB PCB pad on the EV kit.

**Default position.*

Detailed Description of Hardware

The MAX16920B EV kit is an assembled and tested PCB used to evaluate the MAX16920B power-management IC for automotive radios, containing three step-down converters, one linear regulator, and an overvoltage-protection block.

DC-DC1 Step-Down Converter

The output voltage of the DC-DC1 step-down converter is set to 3.3V and can be accessed from the OUT1 PCB pad on the EV kit. The output voltage can be adjusted from 1.22V to 5V by placing a shunt in the 2-3 position on jumper JU4 and selecting the appropriate resistor values for R11 and R12. A lit LED (D4) indicates that the output of DC-DC1 is in the correct regulation range.

DC-DC2 Step-Down Converter

The output voltage of the DC-DC2 step-down converter is set to 5V and can be accessed from the OUT2 PCB pad on the EV kit. The output voltage can be adjusted from 1.22V to 5V by placing a shunt in the 2-3 position on jumper JU5 and selecting the appropriate resistor values for R13 and R16. To enable DC-DC2, place a shunt in the 1-2 position on jumper JU1. To disable DC-DC2, place a shunt in the 2-3 position on JU1. A lit LED (D5) indicates that the output of DC-DC2 is in the correct regulation range.

DC-DC3 Step-Down Converter

The output voltage of the DC-DC3 step-down converter is set to 3.3V and can be accessed from the OUT3 PCB pad on the EV kit. The output voltage can be adjusted from 1.22V to 8V by placing a shunt in the 2-3 position on jumper JU6 and selecting the appropriate resistor values for R14 and R15. To enable DC-DC3, place a shunt in the 1-2 position on jumper JU2. To disable DC-DC3, place a shunt in the 2-3 position on JU2. A lit LED (D2) indicates that the output of DC-DC3 is in the correct regulation range.

LDOA

The output voltage on the linear regulator (LDOA) is set at 5V and can be accessed from the OUTA PCB pad on the EV kit. The output can be enabled or disabled by placing a shunt in the appropriate position on jumper JU3 (see Table 1). To enable LDOA, place a shunt in the 1-2 position on JU3. To disable LDOA, place a shunt in the 2-3 position on JU3. LED D3 indicates that the output of LDOA is in the correct regulation range.

SYNC

The IC provides a fixed 2.2MHz switching frequency when the SYNC PCB pad on the EV kit is connected to ground. For external synchronization, apply a clock signal between 1.8MHz to 2.4MHz at the SYNC PCB pad on the EV kit.

Voltage Output ($\overline{UVO}$)

$\overline{UVO}$ is an active-low voltage output to monitor the input voltage and is accessible through the UVOB PCB pad on the EV kit. The $\overline{UVO}$ signal is pulled low by the IC when the V_{IN} falls below 7V.

Overtemperature Output ($\overline{OT}$)

$\overline{OT}$ is an active-low overtemperature output and is accessible through the OTB PCB pad on the EV kit. The $\overline{OT}$ signal is pulled low by the IC and disables all converters except for DC-DC1 if the die temperature exceeds the thermal-shutdown temperature.

Evaluating the MAX16920A

Included with the EV kit are capacitors and inductors to evaluate the MAX16920A. Replace C10, C11, and C12 with the 22µF capacitors, C20 with the 47µF capacitor, L1 with the 47µH inductor, L2 with the 22µH inductor, and L3 with the 10µH inductor.

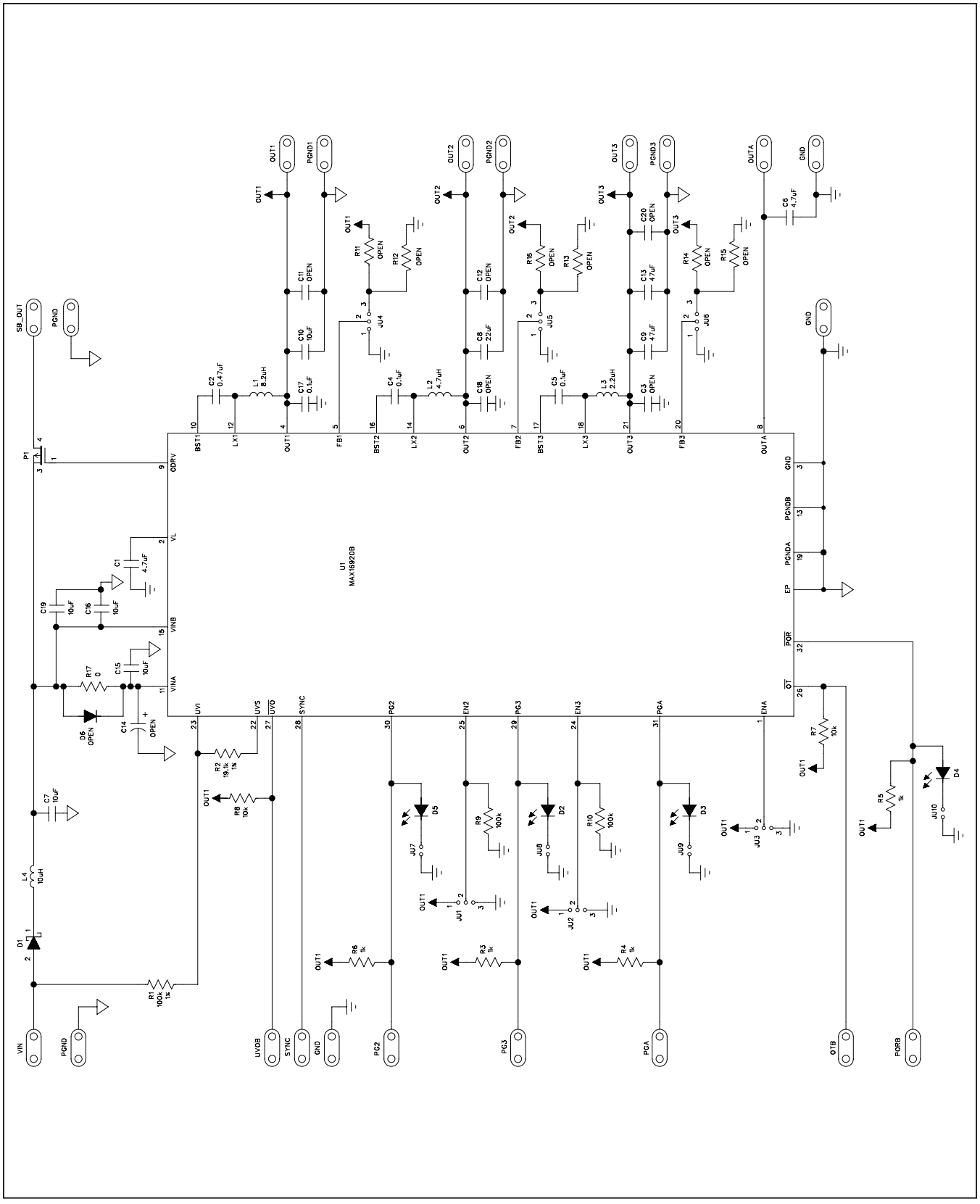

Figure 1. MAX16920B EV Kit Schematic

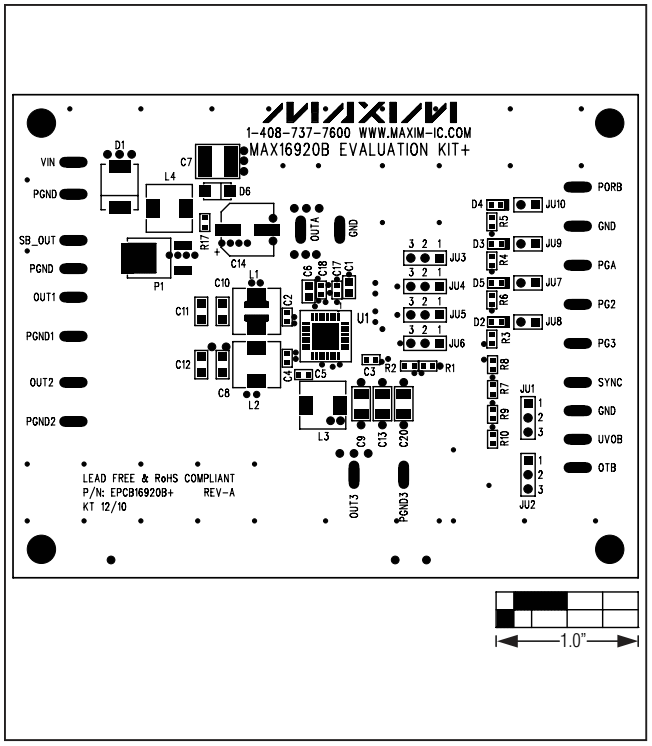

Figure 2. MAX16920B EV Kit Component Placement Guide—Component Side

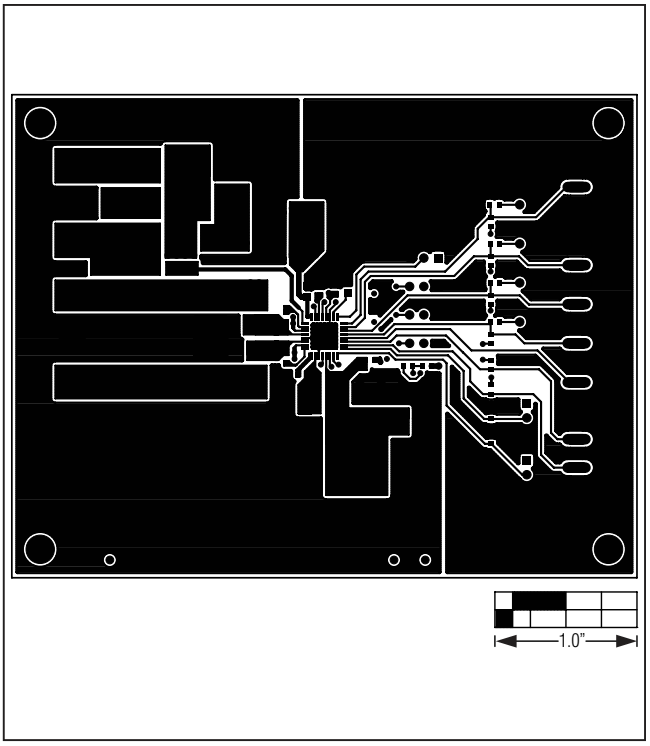

Figure 3. MAX16920B EV Kit PCB Layout—Component Side

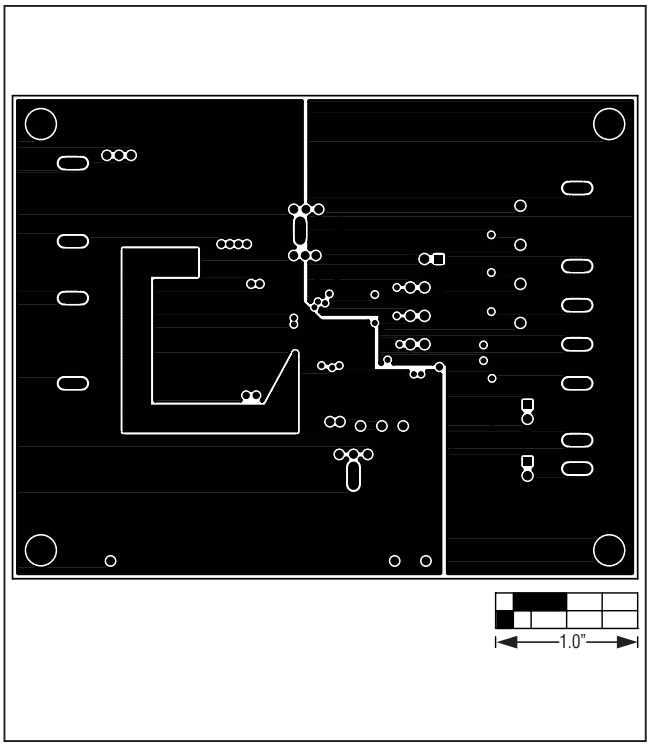

Figure 4. MAX16920B EV Kit PCB Layout—Inner Layer 2

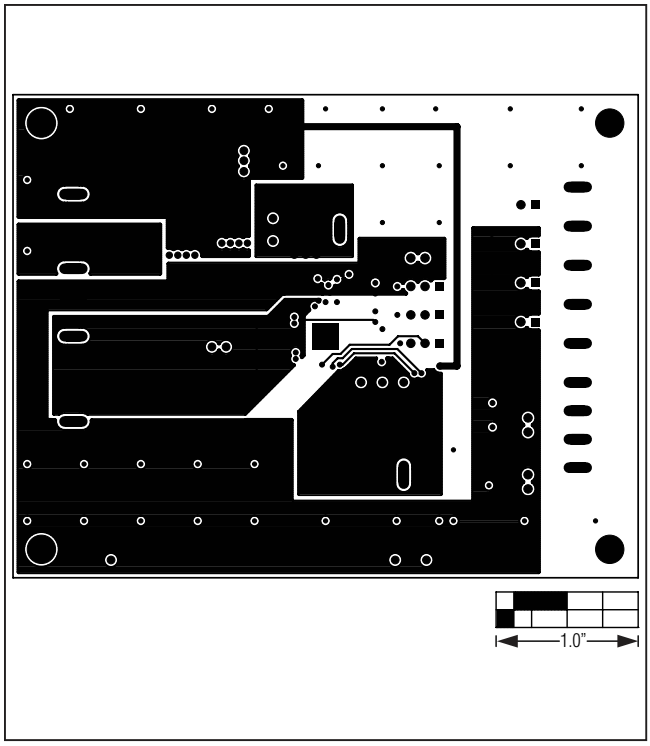

Figure 5. MAX16920B EV Kit PCB Layout—Inner Layer 3

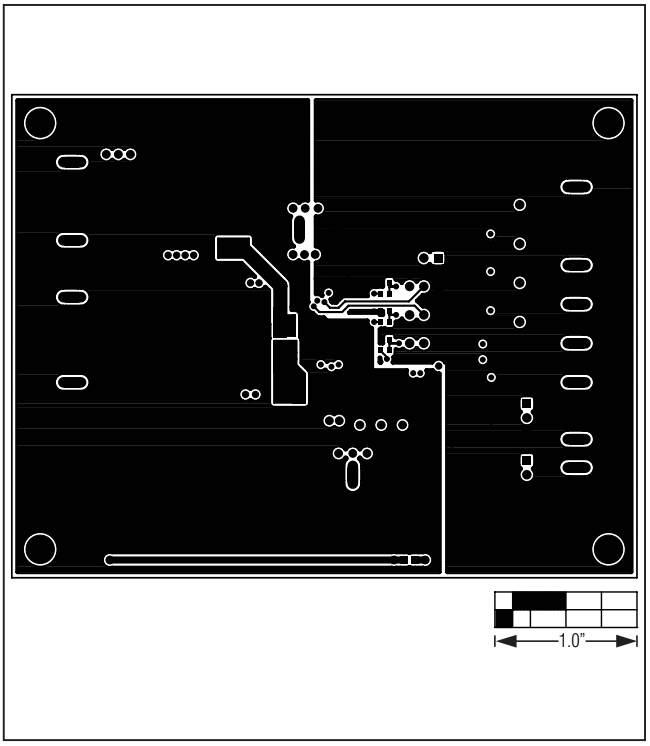

Figure 6. MAX16920B EV Kit PCB Layout—Solder Side

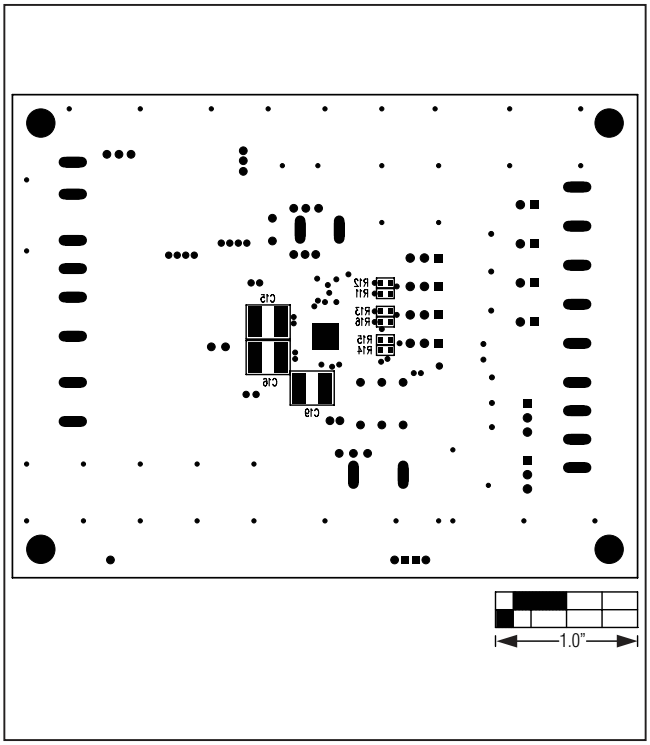

Figure 7. MAX16920B EV Kit Component Placement Guide—Solder Side

Ordering Information

PART	TYPE
MAX16920BEVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	1/11	Initial release	—