19-2581; Rev 0; 9/02

MAXIM

MAX2820/MAX2821 Evaluation Kits

Evaluate: MAX2820/MAX2821

General Description

The MAX2820/MAX2821 evaluation kits (EV kits) simplify testing of the MAX2820/MAX2821. The EV kits provide 50Ω SMA connectors for all RF and baseband inputs and outputs. Differential-to-single-ended and single-ended-to-differential line drivers are provided to convert the differential I/Q baseband inputs and outputs to single ended.

The EV kits simplify evaluation of the MAX2820/MAX2821s' receive and transmit performance in 802.11b applications operating in the 2.4GHz to 2.5GHz ISM band.

Features

- **On-Board Line Drivers and Voltage Reference**
- **50Ω SMA Connectors on All RF and Baseband Ports**
- **PC Control Software Available at www.maxim-ic.com**
- **SPI™/QSPI™/MICROWIRE™ Compatible**

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MICROWIRE is a trademark of National Semiconductor Corp.

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX2820EVKIT	-40°C to +85°C	48 QFN
MAX2821EVKIT	-40°C to +85°C	48 QFN

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3, C7, C10–C16, C20–C23, C25, C26, C28, C29, C33, C34, C35, C40, C50, C51	24	0.01µF ±10% ceramic capacitors (0402) Murata GRP155R71C103K
C2, C4, C5, C6, C8, C9, C17, C18, C19, C27, C36–C39, C41–C45	19	0.1µF ±10% capacitors (0402) Murata GRP155R61A104K
C24, C46, C47, C48	4	10µF ±10%, 16V tantalum capacitors, C case AVX TAJC106K016
C30	1	82pF ±5% capacitor (0402) Murata GRP1555C1H820J
C31	1	100pF ±5% capacitor (0402) Murata GRP1555C1H101J
C32	1	2000pF ±10% capacitor (0402) Murata GRP155R71H202K
C49	1	20pF ±5% capacitor (0402) Murata GRP1555C1H200J
C52	1	8200pF ±10% capacitor (0402) Murata GRP155R71E822K
C53, C54	2	10pF ±0.1pF capacitors (0402) Murata GRP1555C1H100B
C55, C56	2	Not installed
J1, J2, J5, J6, J13, J14, J17	7	SMA connectors, edge mount EFJohnson 142-0701-801 Digi-Key J502-ND
J3, J4, J7, J8, J11, J12, J15, J16	8	Not installed
J9, J10, J18–J22	7	Test points Digi-Key 5000K-ND
J23	1	DB25 male connector, right angle AMP AMP747238-4 Digi-Key A2098-ND
JP1–JP5, JP10, JP18–JP21	10	Not installed
L1	1	0Ω ±5% resistor (0402)
L2, L3	2	6.8nH ±5% inductors (0402) Murata LQG15HN6N8J02
L4	1	5.6nH ±0.3nH inductor (0402) Murata LQG15HN5N6S02
R1, R2	2	10kΩ ±10% variable resistors Trimmer— Bourne 3296W-103 Potentiometer—Digi-Key 3296W-103-ND
R3, R4, R35	3	100Ω ±1% resistors (0402)
R5, R7, R13, R17, R21, R22, R29, R31	8	75Ω ±1% resistors (0402)
R6, R10, R16, R18, R19, R24, R26, R32, R34, R41, R42, R48, R49	13	0Ω ±5% resistors (0402)
R8, R14, R23, R30	4	10kΩ ±1% resistors (0402)

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
R9, R15, R25, R33, R36, R43, R44–R47, R50–R60	21	Not installed
R11, R12, R20, R27, R28	5	49.9Ω ±1% resistors (0402)
R37	1	12.1kΩ ±1% resistor (0402)
R38	1	2.43kΩ ±1% resistor (0402)
R39	1	1.82kΩ ±1% resistor (0402)
R40	1	27.4kΩ ±1% resistor (0402)
T1	1	Chip hybrid balun Murata LDB212G4020C-001
T2	1	Chip hybrid balun Murata LDB212G4005C-001
TP1–TP5, TP7–TP11	10	Test points Digi-Key 5000K-ND
TP6	1	Not installed
U1, U5	2	MAX4447ESE
U2, U6	2	MAX4444ESE
U3	1	MAX6061BEUR
U4	1	MAX2820EGM/MAX2821ETM
U7	1	Octal buffer/driver Texas Instruments SN74LVTH244ADBR Digi-Key 296-1269-1-ND
U8	1	Not installed

Quick Start

The MAX2820/MAX2821 EV kits are fully assembled and factory tested. Follow the instructions in the *Connections and Setup* section.

Test Equipment Required

This section lists the recommended test equipment to verify the operation of the MAX2820/MAX2821. It is intended as a guide only, and substitutions may be possible.

- DC supply capable of delivering +5.0V and 200mA of continuous current
- DC supply capable of delivering -5.0V and 200mA of continuous current
- DC supply capable of delivering +2.7V and 200mA of continuous current
- HP8663A or equivalent low-noise signal source capable of generating a 22MHz or 44MHz reference oscillator signal
- Two HP8648 or equivalent signal sources capable of generating 0dBm up to 3GHz
- 802.11b waveform generator
- HP8561E or equivalent RF spectrum analyzer with a minimum frequency range of 100kHz to 3GHz
- TDS3012 or equivalent oscilloscope with 200MHz bandwidth
- IBM PC or compatible with Windows 95/98®, Windows 2000®, Windows NT® 4.0, or later operating system and an available parallel port
- Male-to-male 25-pin parallel cable, straight through

Windows 95/98, Windows 2000, and Windows NT are registered trademarks of Microsoft, Inc.

Connections and Setup

This section provides step-by-step instructions for getting the EV kit up and running in all modes:

1) To control the MAX2820/MAX2821 through the 3-wire interface, connect the male-to-male 25-pin parallel cable between the PC and EV kit.
2) With the power supply turned off, connect a +2.7V power supply to the headers labeled VCC (J19) and VCCO (J10). Connect the power-supply ground to the header labeled GND (J18).
3) With the power supply turned off, connect a +5V power supply to the header labeled +5V (J22), and a -5V power supply to the header labeled -5V (J20). Connect the power-supply ground to the header labeled GND (J21).
4) Connect the low-noise signal source to ROSC (J17).
5) Install and run the MAX2820/MAX2821 control software.
6) With the MAX2820/MAX2821 control software active in the "Settings" screen, use Table 1 to set the operating mode to Shutdown.
7) Turn on the +5V and -5V power supplies, followed by the +2.7V power supply.
8) Set the low-noise signal source to 22MHz with an amplitude of -10dBm. Enable the signal source.

Receive Mode

To evaluate the MAX2820/MAX2821 in receive mode:

1) Connect an RF signal source to RX_RF (J2). Set the RF frequency to 2437.9MHz with an amplitude of -40dBm.
2) Connect RX_BBI (J5) to the spectrum analyzer. Set the spectrum analyzer to span from 100kHz to 5MHz.
3) Place the receive LNA in high-gain mode through the control software.

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
AVX	843-448-9411	843-448-1943	www.avx.com
Digi-Key	800-344-4539	218-681-3380	www.digikey.com
Murata	770-436-1300	770-436-3030	www.murata.com
Texas Instruments	—	—	www.ti.com

Table 1. MAX2820/MAX2821 Control Settings

CONTROL MODES		
Operating Mode	Shutdown	Device in shutdown mode
	Standby	Device in standby mode
	Transmit	Device in transmit mode
	Receive	Device in receive mode
LNA Gain	High gain	Receive LNA in high-gain mode
	Low gain	Receive LNA in low-gain mode
RX_1K	Enable	Sets receive highpass corner frequency to 1kHz
	Disable	Sets receive highpass corner frequency to 10kHz
PROGRAM MODES		
LO Frequency	Variable	Sets LO frequency from 2400MHz to 2499MHz
Ref Frequency	22MHz	Sets PLL to work with 22MHz crystal oscillator
	44MHz	Sets PLL to work with 44MHz crystal oscillator
CP Current	Variable	Sets charge-pump current between 1mA and 2mA
Power Amp Bias	Variable	Sets external power amplifier bias current
Receive LPF BW	Variable	Sets receive lowpass corner frequency from 6.0MHz to 8.5MHz

4) Verify that the LO frequency is set to 2437MHz through the control software.
5) Set the operating mode to “Receive” through the control software.
6) Measure the power of the 900kHz output tone on the spectrum analyzer display. Adjust RX_AGC (R2) between 0V and 2.0V to obtain a baseband output of -2dBm.

Transmit Mode

To evaluate the MAX2820/MAX2821 in transmit mode:

1) Connect a signal source to TX_BBI (J6). Set the signal source frequency to 900kHz with an amplitude of 400mV$_{P-P}$ (-4dBm).
2) Connect TX_RF (J1) to the spectrum analyzer. Set the spectrum analyzer to a center frequency of 2437MHz with a 20MHz span.
3) Verify that the LO frequency is set to 2437MHz through the control software.
4) Temporarily disable the baseband signal source output. Set the operating mode to “Transmit” through the control software. Enable the baseband signal source output.
5) Measure the amplitude of the upper sideband at 2437.9MHz using the spectrum analyzer. Adjust TX_GC (R1) to 0V to obtain the maximum RF output.
6) The observed output power should be roughly -5dBm due to driving only the I channel.

Layout Considerations

The MAX2820/MAX2821 EV kits can serve as guides for board layout. Keep PC board trace lengths as short as possible to minimize parasitic inductance. Also, keep decoupling capacitors as close to the IC as possible with a direct connection to the ground plane.

MAX2820/MAX2821 Evaluation Kits

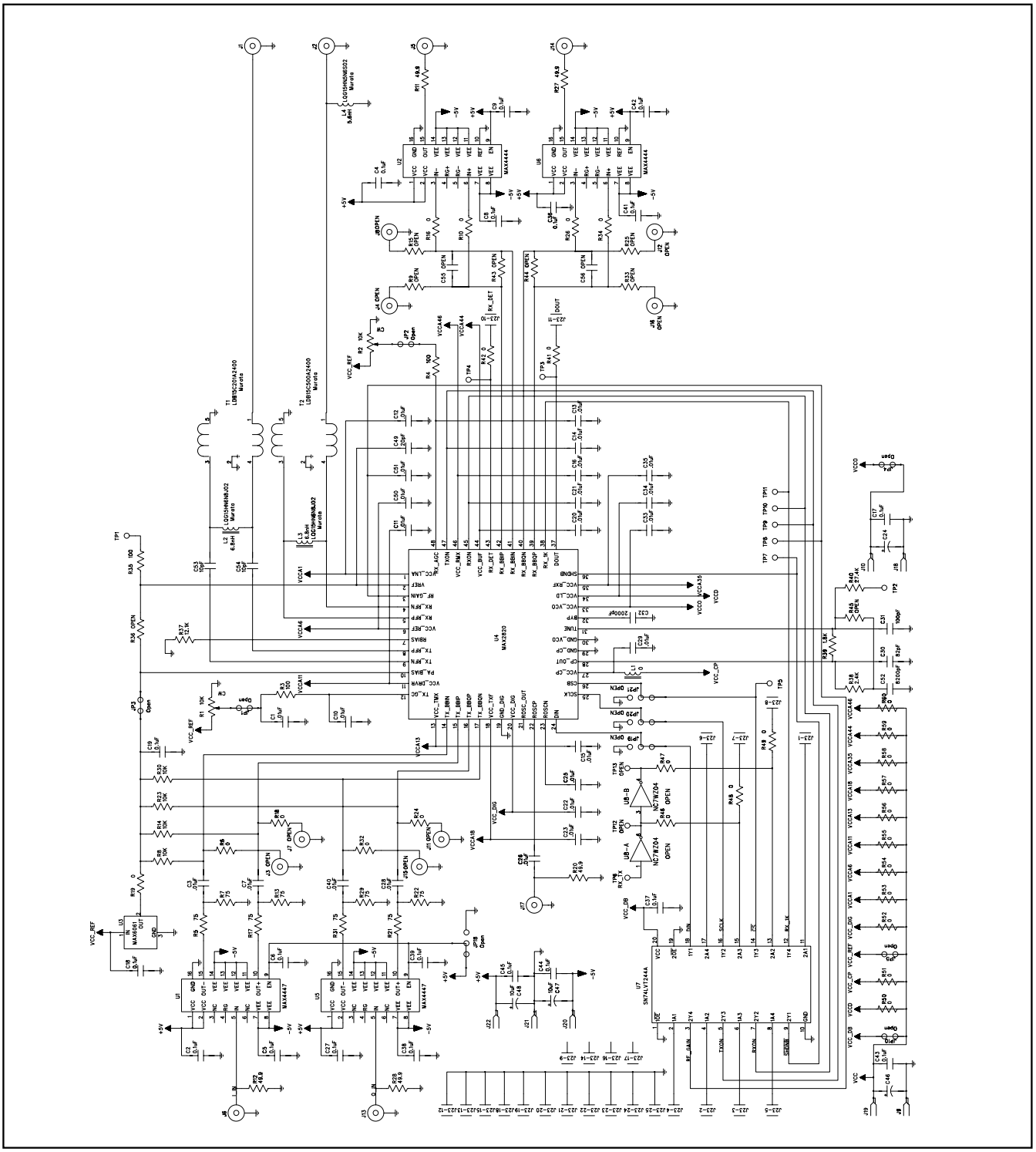

Figure 1. MAX2820/MAX2821 EV Kits Schematic

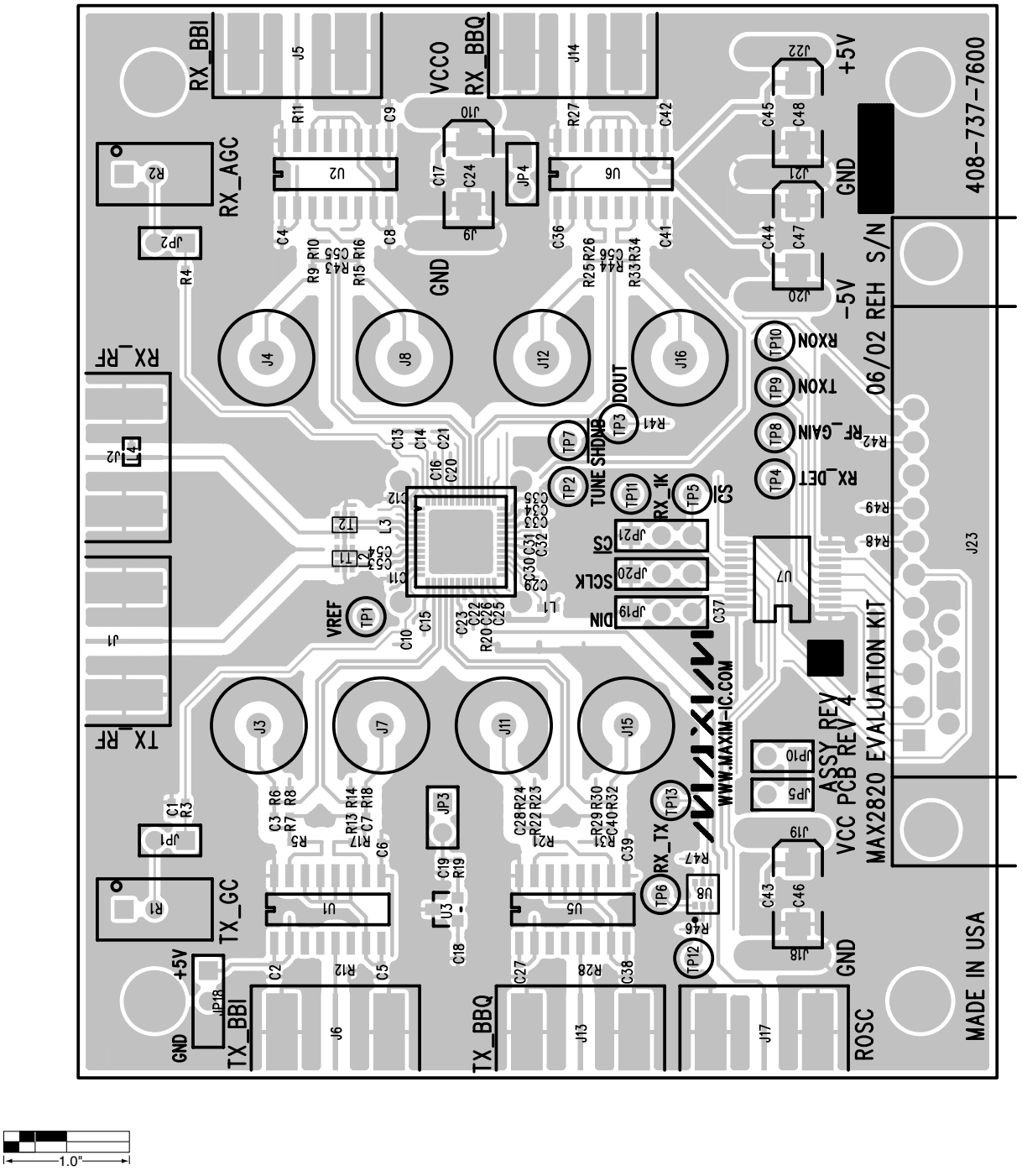

Figure 2. MAX2820/MAX2821 EV Kits PC Board Layout—Top Silkscreen

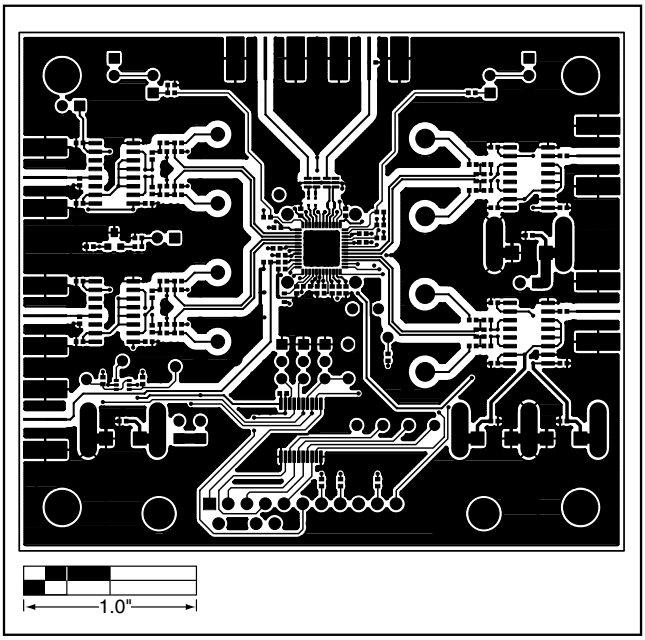

Figure 3. MAX2820/MAX2821 EV Kits PC Board Layout—Component Side

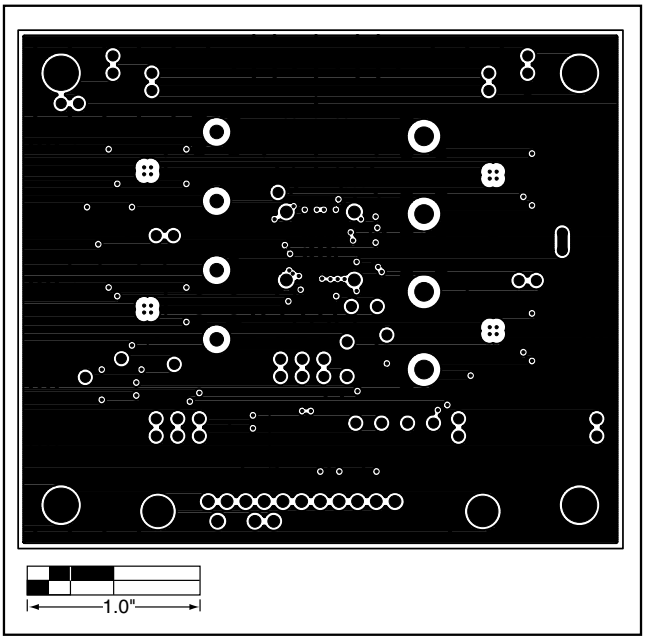

Figure 4. MAX2820/MAX2821 EV Kits PC Board Layout—Inner Layer 2

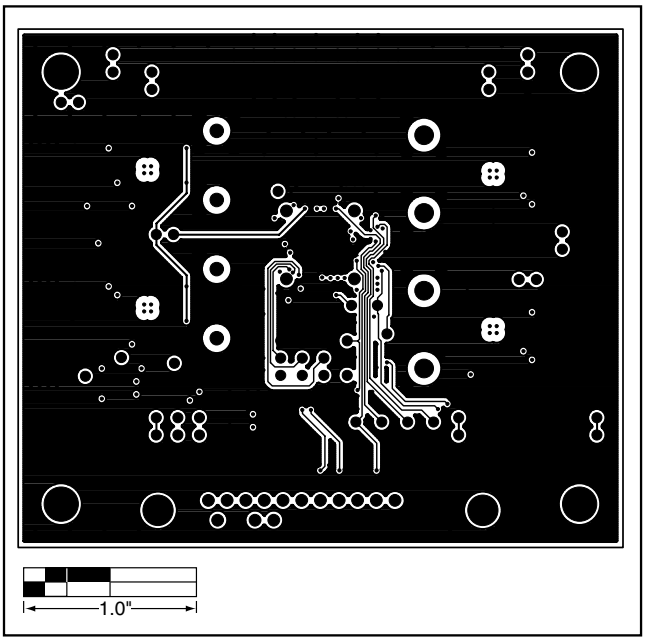

Figure 5. MAX2820/MAX2821 EV Kits PC Board Layout—Inner Layer 3

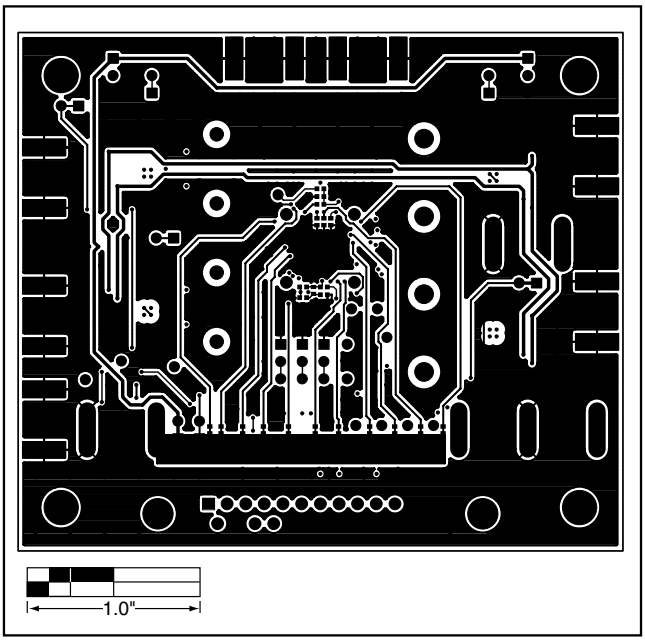

Figure 6. MAX2820/MAX2821 EV Kits PC Board Layout—Solder Side

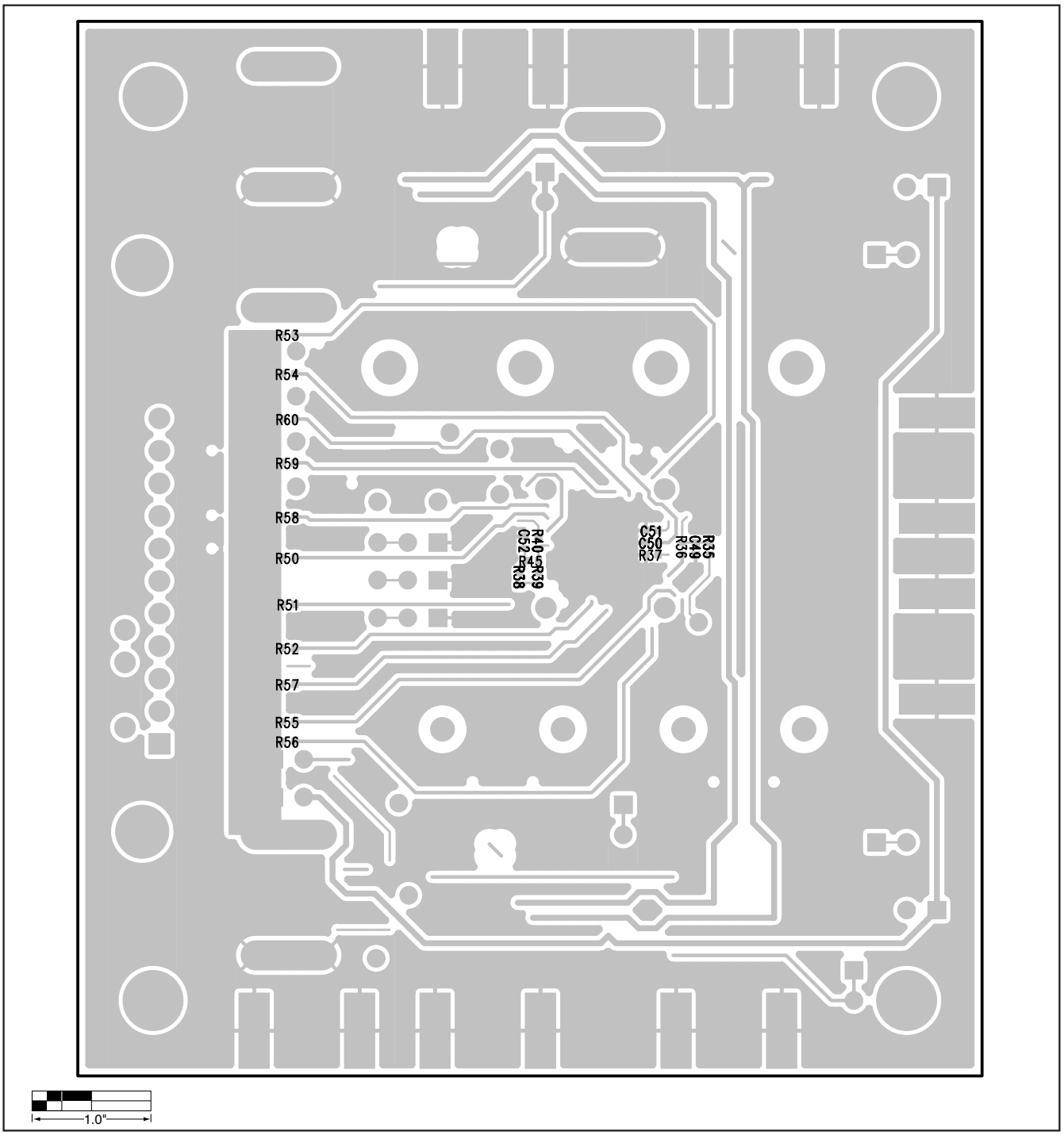

Figure 7. MAX2820/MAX2821 EV Kits PC Board Layout—Bottom Silkscreen