19-2109; Rev 0; 7/01

MAXIM

MAX2306/MAX2308/MAX2309 Evaluation Kits

Evaluate: MAX2306/MAX2308/MAX2309

General Description

The MAX2306/MAX2308/MAX2309 evaluation kits (EV kits) simplify testing of the MAX2306/MAX2308/MAX2309 IF receivers. These kits allow evaluation of the devices' variable-gain amplifier (VGA), I/Q demodulator, dual-band voltage-controlled oscillators (VCOs), synthesizer, 3-wire programming interface, and power-management features.

The EV kits provide 50Ω SMA connectors for all signal inputs and outputs. A varactor-based tank circuit is provided for the on-chip VCO and can be tuned by a potentiometer or an external voltage or phase-locked with the on-chip phase-locked loop (PLL).

Features

- ♦ **Dual Oscillators (MAX2306)**
- ♦ **On-Board PLL Synthesizer**
- ♦ **3-Wire Interface**
- ♦ **Single-Ended or Differential Baseband Outputs**
- ♦ **+2.7V to +5.5V Single-Supply Operation**
- ♦ **SMA Connectors on All Signal Ports**
- ♦ **PC Control Software (available at www.maxim-ic.com)**

Ordering Information

PART	TEMP. RANGE	IC PACKAGE
MAX2306EVKIT	-40°C to +85°C	28 QSOP-EP*
MAX2308EVKIT	-40°C to +85°C	28 QSOP-EP*
MAX2309EVKIT	-40°C to +85°C	28 QSOP-EP*

**Exposed pad*

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C33, C34	3	47pF ±10%, 25V min ceramic capacitors (0402)
C2	1	2pF ±0.1pF, 25V min ceramic capacitor (0402) (MAX2306)
C3	1	33pF ±10%, 25V min ceramic capacitor (0402) (MAX2306)
C4	1	33pF ±10%, 25V min ceramic capacitor (0402) (MAX2306/MAX2309)
C5	1	2pF ±0.1pF, 25V min ceramic capacitor (0402) (MAX2306/MAX2308)
C6	1	33pF ±10%, 25V min ceramic capacitor (0402)
C7	1	33pF ±10%, 25V min ceramic capacitor (0402) (MAX2306/MAX2308)
C8, C12, C23, C24, C25, C31	6	330pF ±10%, 25V min ceramic capacitors (0402)
C9, C10, C11, C13, C14, C15, C21, C22, C28, C30, C35, C37, C38, C42, C46, C57, C59	15	0.01µF ±10%, 25V min ceramic capacitors (0402)
C16	1	3.0pF ±0.1pF, 25V min ceramic capacitor (0402) (MAX2306/MAX2308)
C18	1	0.01µF ±1%, 25V min ceramic capacitor (0402) (MAX2306/MAX2308)
C19, C20	2	10pF ±10%, 25V min ceramic capacitors (0402)
C27, C56, C58	3	10µF ±10%, 16V min tantalum capacitors AVX TAJC106K016
C29	1	0.068µF ±10%, 25V min ceramic capacitor (0402)
C36	0	Open
C43	1	1000pF ±10% capacitor (0402) (MAX2309)

For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
C44, C47–C53	8	0.1µF ±10%, 25V min ceramic capacitors (0402)
C54, C55	2	0.1µF ±10%, 25V min ceramic capacitors (0805)
C60	1	0Ω resistor (0402) (MAX2309)
C61	1	2pF ±0.1pF, 25V min ceramic capacitor (0402) (MAX2309)
D2	1	Varactor diode (MAX2306) Alpha SMV1763-079
D3	1	Varactor diode Alpha SMV1763-079
D4	1	Varactor diode (MAX2306/MAX2308) Alpha SMV1763-079
D5	1	Varactor diode (MAX2306/MAX2309) Alpha SMV1763-079
L1	1	33nH inductor (MAX2306) Coilcraft 0603CS-33NXGBC
L2	1	33nH inductor (MAX2306/MAX2308) Coilcraft 0603CS-33NXGBC
L3	1	120nH inductor (MAX2306/MAX2308) Coilcraft 0603CS-33NXGBC
L4	1	220nH inductor Coilcraft 0603CS-R22TKBC
L5	1	33nH inductor (MAX2309) Coilcraft 0603CS-33NXGBC
L6	1	270nH inductor Toko LL1608-PSR275
Q1	1	Open
R1, R38, R39	3	0Ω resistors (0402)
R2	1	10kΩ ±5% resistor (0402) (MAX2306)
R3	1	10kΩ ±5% resistor (0402) (MAX2306/MAX2309)
R4	1	10kΩ ±5% resistor (0402)
R5		10kΩ ±5% resistor (0402) (MAX2306/MAX2308)
R6	1	100Ω ±5% resistor (0402) (MAX2306/MAX2309)
R8, R14, R16, R18	4	100Ω ±5% resistors (0402)
R7	1	49.9Ω ±1% resistor (0402)
R9	1	681Ω ±1% resistor (0402)
R10	1	4.7kΩ ±5% resistor (0402)
R11, R19, R31, R32, R33, R34, R40, R81	8	5kΩ ±5% resistors (0402)
R12, R22	2	47kΩ ±5% resistors (0402)
R13, R24	2	10kΩ Bourns variable resistors, Digi-Key 3296W-104-ND
R15, R17	2	100Ω ±5% resistors (0402) (MAX2309)
R20, R21, R25, R35	0	Open
R23	1	2.4kΩ ±5% resistor (0402)
R26	1	47kΩ ±5% resistor (0402)
R41	1	0Ω resistor (0402) (MAX2306)
R44	1	0Ω resistor (0402) (MAX2309)
J18	1	20-pin header
JU3, JU9, JU10, JU11	4	Two-pin headers
T1	1	Balun transformer, Toko DB458-1011
U1	1	MAX2306EGI, MAX2308EGI, or MAX2309EGI IC
U2, U3	2	MAX4108ESA
None	1	MAX2306/MAX2308/MAX2309 circuit board
None	1	MAX2306/MAX2308/MAX2309 data sheet
INTF2300 Interface Board	1	3-wire programming and interface board
None	1	20-pin ribbon cable

Component Suppliers

SUPPLIER	PHONE	FAX
Alpha Industries	617-935-5150	617-933-2359
AVX	803-946-0690	803-626-3123
Coilcraft	847-639-6400	847-639-1469
Murata	770-436-1300	770-436-3030
Toko	708-297-0070	708-699-1194

Quick Start

The MAX2306/MAX2308/MAX2309 EV kits are fully assembled and factory tested. Follow the instructions in the *Connections and Setup* section.

Recommended Test Equipment

The test equipment recommended to verify MAX2306/MAX2308/MAX2309 operation is listed in Table 1. This list is intended as a guide only; substitutions may be possible.

Connections and Setup

The following sections provide instructions for getting the EV kit running in CDMA mode.

CDMA Mode

Perform the following steps to evaluate the MAX2306/MAX2308/MAX2309 in CDMA mode:

1) Verify that shunts JU3, JU10, and JU11 are in place.

Table 1. Recommended Equipment

EQUIPMENT	DESCRIPTION
RF Signal Generators (2)	HP 8648A or equivalent. Capable of delivering -70dBm to -10dBm of output power in the 10MHz to 500MHz frequency range. One generator is required to test the receive signal path and the other is for the reference frequency.
Oscilloscope	For viewing the demodulator outputs.
Power Supply (3)	Capable of providing at least 100mA at +2.7V to +5.5V.
Additional Voltage Source	For external control of VGA (optional).
Personal Computer	486DX33 or better, with Windows95® or later version of Windows® operating system and a parallel port.
INTF2300 Interface Board	Provided with EV kit.

Windows95 and Windows are registered trademarks of Microsoft Corp.

2) Connect the INTF2300 interface cable as shown in Figure 11. (Pin 1 of the interface cable corresponds to the red wire; pin 1 is designated in silkscreen on each of the PC boards.)
3) Connect a +2.75V power supply to the VCC and GND terminals. Set the other two supplies to +5V and -5V and then connect to the appropriate +5V, -5V, and GND terminals on the EV board.
4) Install and run Maxim's CDMA control software (available at www.maxim-ic.com). Under the Technical Support heading, click on SOFTWARE. Select the correct software to download and install.
5) With the MAX2306, MAX2308, or MAX2309 screen active, set the control pins. Set $\overline{SHDN}$ to "H". On the MAX2306, set the MODE to "H". On the MAX2309, set $\overline{STBY}$, $\overline{BUF_EN}$, and DIVSEL to "H". Turn on the power supplies. Under Preset Modes select CDMA mode. Under Program Dividers set M1 and M2 to 306. Set R1 and R2 to 16 and then click Send Data for M1, M2, R1, and R2. Under Control Register, click on Send Data.
6) Connect a signal generator to the REF port, configured for a sine wave with a 19.2MHz frequency and a -10dBm amplitude. (The REF port is 50Ω terminated.)
7) Connect a signal generator with 183.72MHz at -66dBm and apply it to the CDMA differential port.
8) Set VGC to 2.5VDC by rotating potentiometer R13. Optionally, an external VGC voltage may be used by removing jumper JU3 and applying a DC voltage to JU3 at the pin labeled VGC.
9) Configure an oscilloscope to measure a high-impedance, 1Vp-p, 100kHz waveform. Connect it to the I or Q output.

Voltage gain can be calculated by:

$$Gain = 20\log\left(\frac{V_{OUTp\text{-}p}}{2\sqrt{2}V_{IN}}\right)$$

$$V_{IN}(RMS) = \sqrt{500 \times 10\left(\frac{P_{IN}(dBm) - 30}{10}\right)}$$

Gain = approximately 60dB

Note: The balun loss is not taken into account. This loss is typically less than 0.5dB. There may also be some loss through the MAX4108 op amp.

Adjustments and Control

VGC Adjust

The MAX2306/MAX2308/MAX2309 EV kits are configured with a 10kΩ trim pot for setting and adjusting the VGA gain. An external supply can be used by removing the 2-pin shunt (JU3) and by directly connecting the supply to JU3 at pin labeled VGC. The VGC voltage must be clean to minimize undesired amplitude modulation.

Interface Control

The interface port is designed to use a 20-pin ribbon cable. Ten pins are signal lines, and the other ten pins are digital grounds. Pin 1 of the interface cable is red. Pin 1 is also designated in silkscreen on each of the PC boards.

Detailed Description

The following sections cover the EV kits' circuit blocks in detail. (Refer to the MAX2306/MAX2308/MAX2309 data sheet for additional information.)

CDMA Inputs

The on-board balun converts the CDMA DIFF input to a differential signal for the MAX2306/MAX2308/MAX2309. The 50Ω source impedance is transformed to 500Ω by the combination of L4, R9, C19, C20, and the 4:1 impedance ratio of the input balun.

FM Inputs

The EV kit is configured for single-ended (50Ω) operation at the FM connector. The matching network transforms 50Ω to 850Ω.

REF Inputs

The REF port is AC-coupled and terminated for use with a 50Ω signal source.

I/Q Outputs

The I/Q outputs are self-biased baseband outputs. The differential I/Q outputs are converted to single-ended outputs with MAX4108 op amps.

PC Board Layout/ Construction

The MAX2306/MAX2308/MAX2309 EV kits can serve as board layout guides. Keep PC board trace lengths as short as possible to minimize parasitics. Keep decoupling capacitors close to the device, with a low-inductance through connection to the ground plane.

INTF2300

Interface Board

The INTF2300 interface board is used to control the 3-wire interface of a device under test from the parallel port of a PC. This board level translates 5V logic from the PC to VCC of the device under test. The INTF2300 also provides buffering and EMI filtering. The recommended operating supply voltage range is +2.7V to +3.6V. For operation of the MAX2306/MAX2309 above +3.6V, jumper JU1 may be removed and an external supply voltage of +3.6V may be applied between VCC (pin 2) and GND (pin 1) (Figure 11).

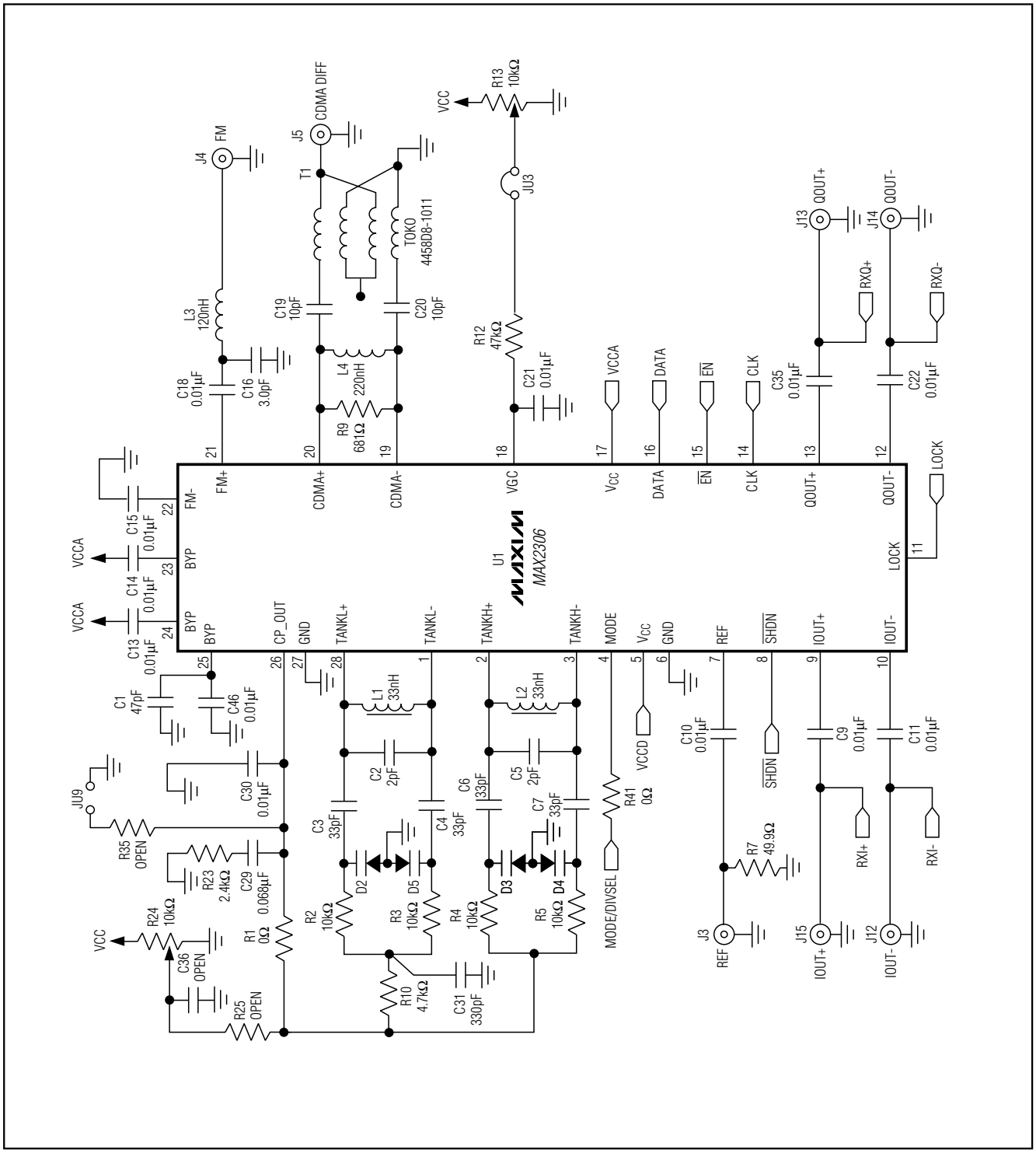

Figure 1. MAX2306EV Kit Schematic

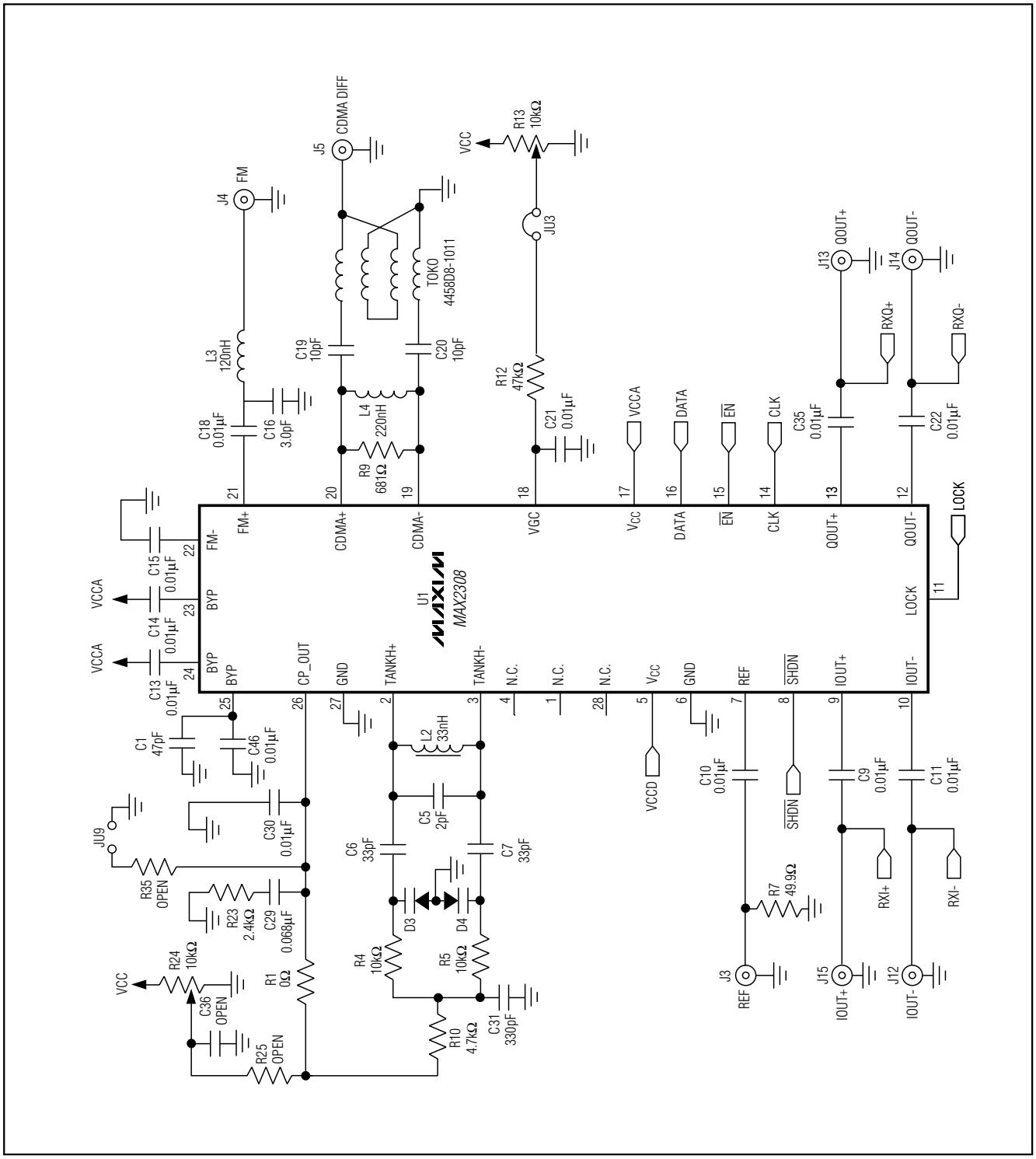

Figure 2. MAX2308EV Kit Schematic

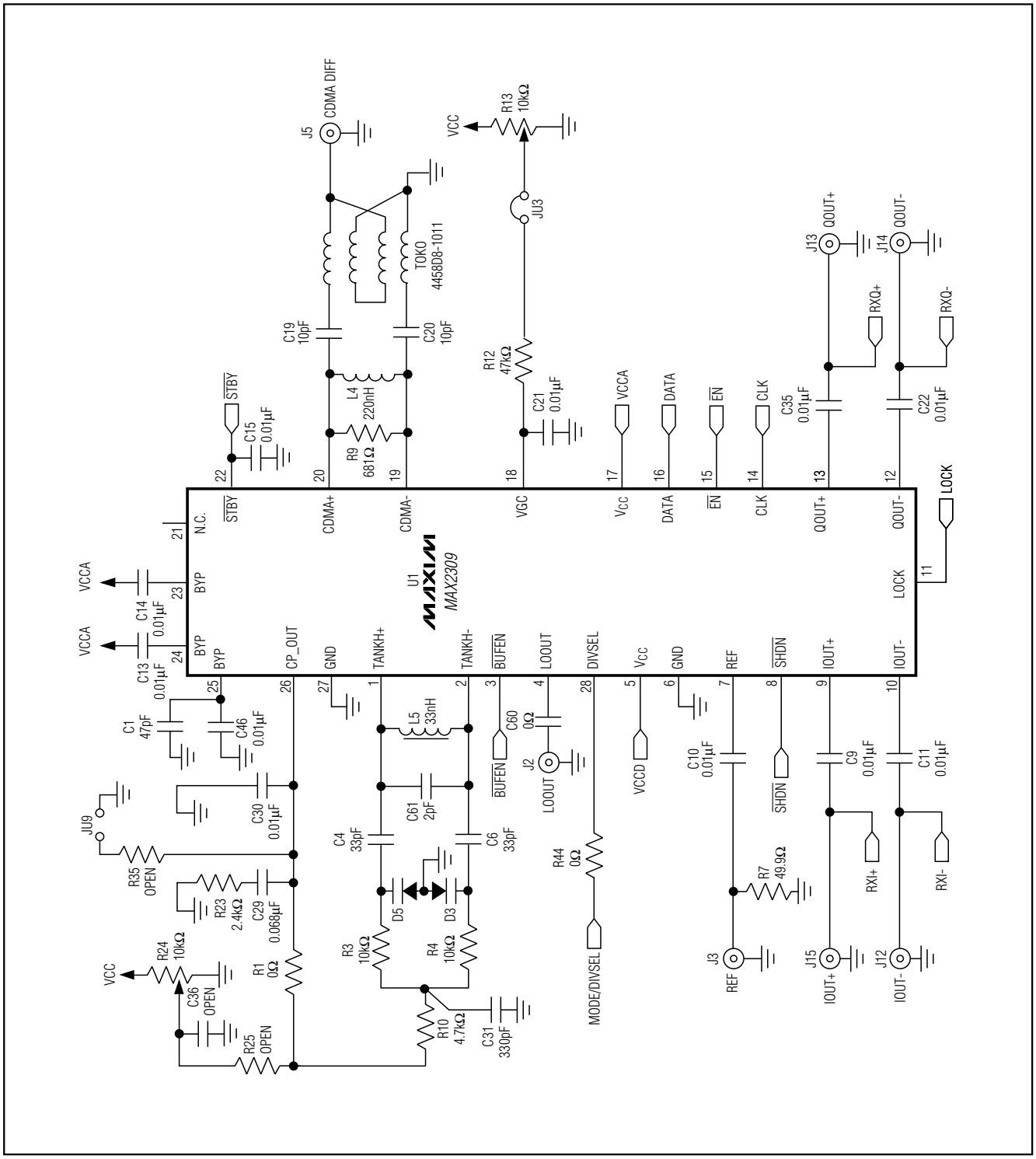

Figure 3. MAX2309EV Kit Schematic

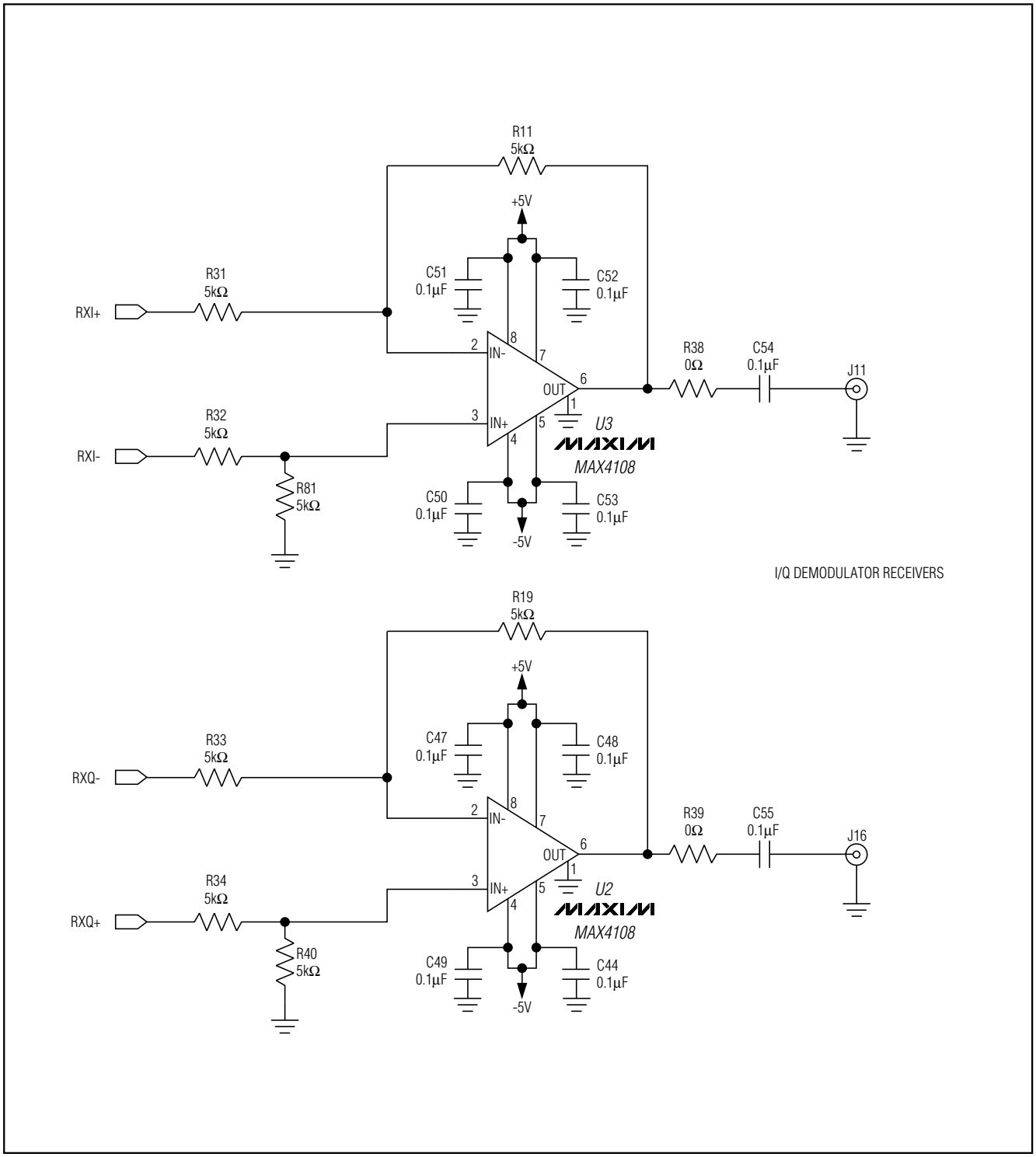

Figure 4. MAX2306/MAX2308/MAX2309 EV Kit Schematic (I/Q Section)

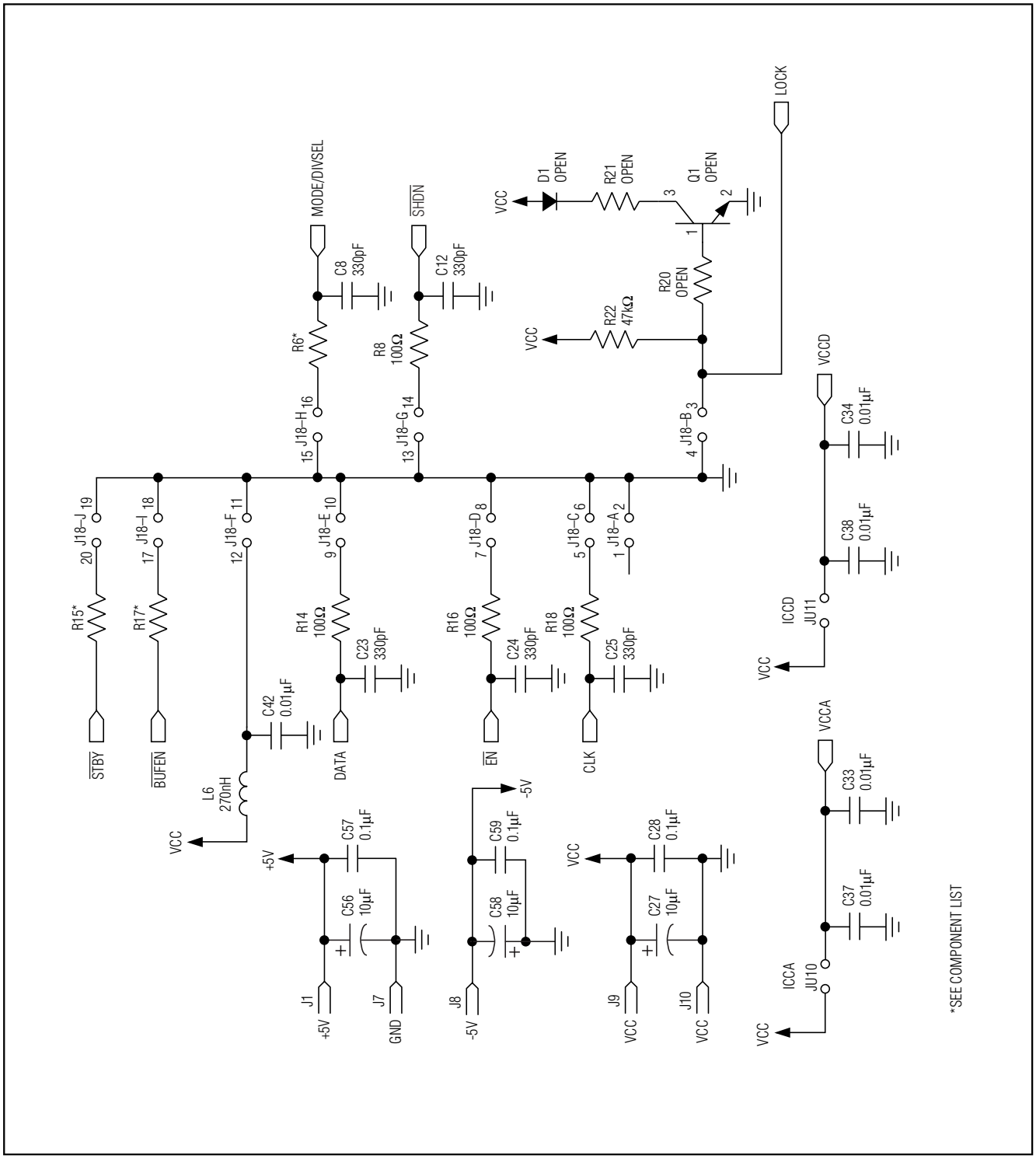

Figure 5. MAX2306/MAX2308/MAX2309 EV Kit Schematics (Supplies and Interface Sections) (continued)

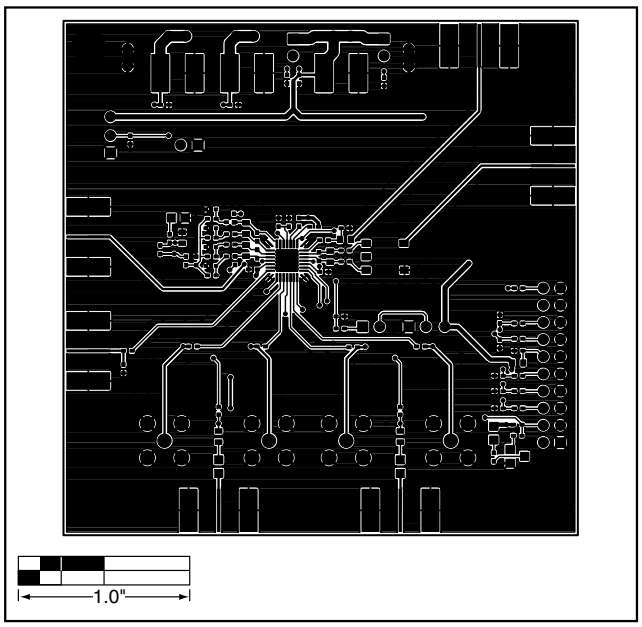

Figure 6. MAX2306/MAX2308/MAX2309 EV Kit PC Board Layout—Component Side (Layer 1)

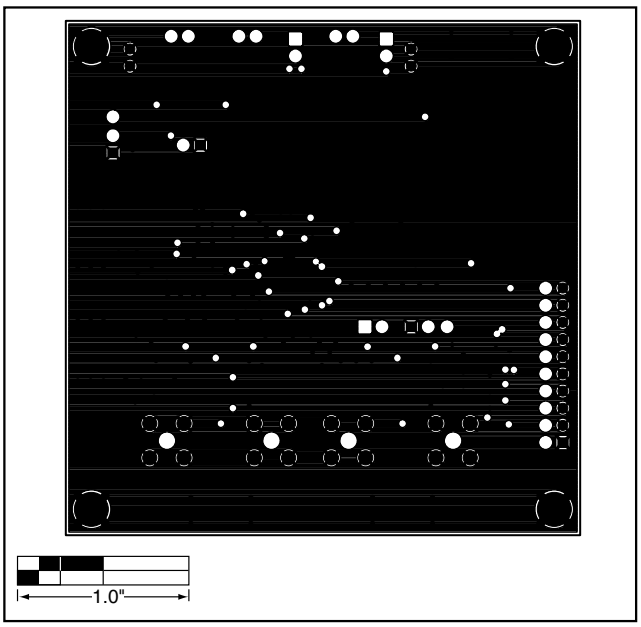

Figure 7. MAX2306/MAX2308/MAX2309 EV Kit PC Board Layout—Ground Plane (Layer 2)

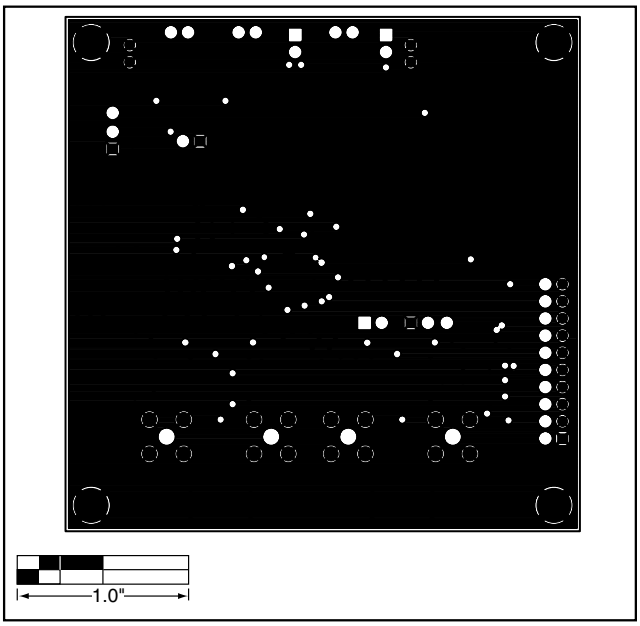

Figure 8. MAX2306/MAX2308/MAX2309 EV Kit PC Board Layout—Inner Layer (Layer 3)

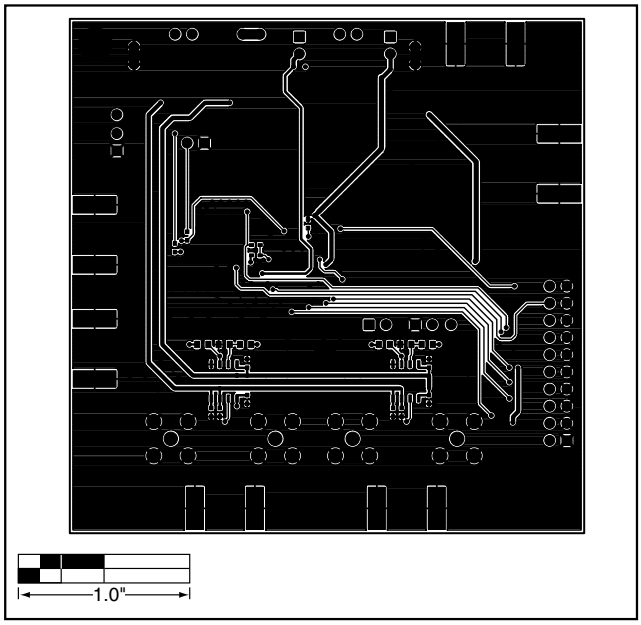

Figure 9. MAX2306/MAX2308/MAX2309 EV Kit PC Board Layout—Solder Side (Layer 4)

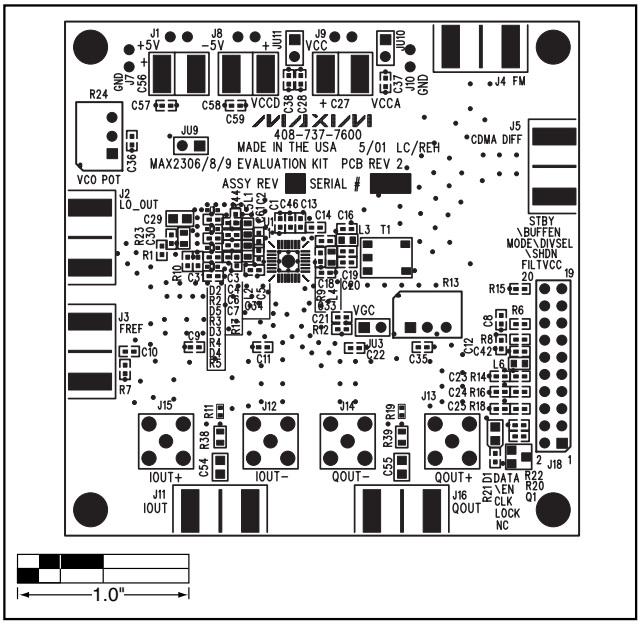

Figure 10. MAX2306/MAX2308/MAX2309 EV Kit Component Placement Guide—Component Side

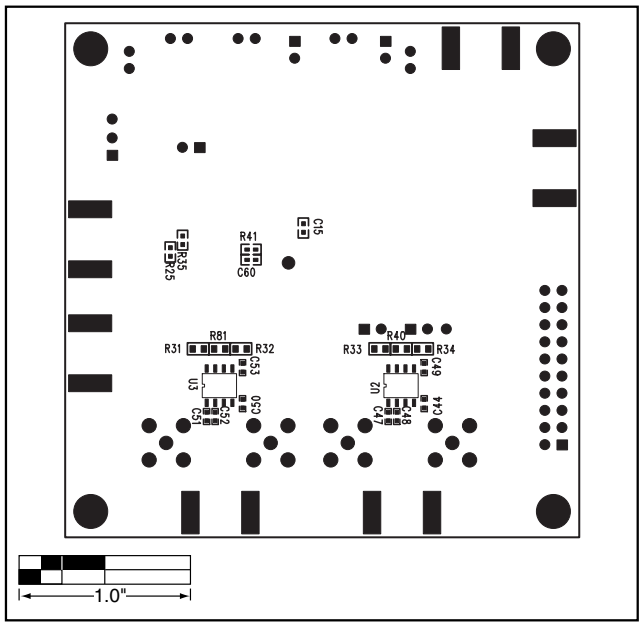

Figure 11. MAX2306/MAX2308/MAX2309 EV Kit Component Placement Guide—Solder Side

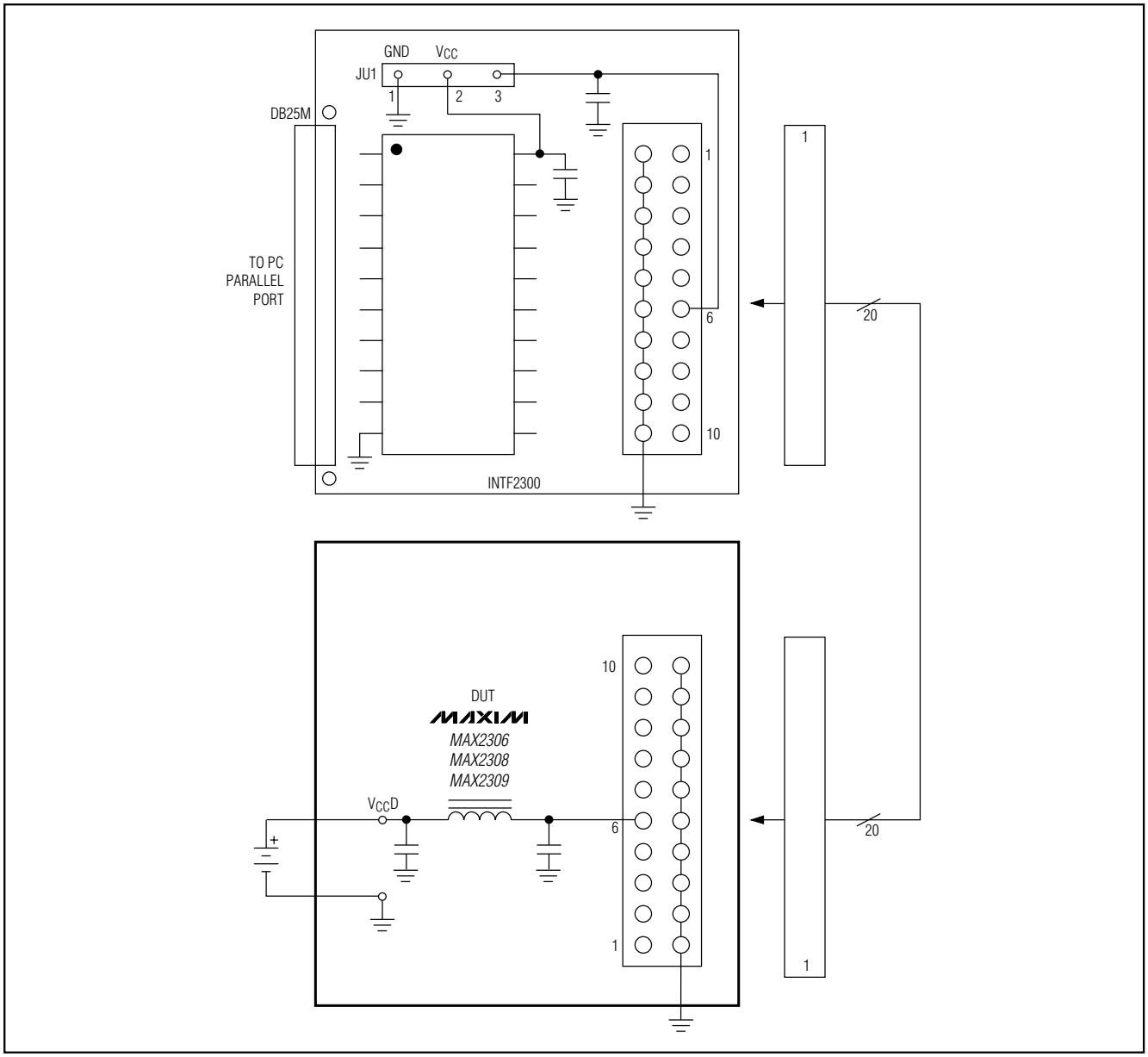

Figure 12. INTF2300 Interface Board

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