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MAX2312/MAX2316 Evaluation Kits

Evaluate: MAX2312/MAX2316

General Description

The MAX2312/MAX2316 evaluation kits (EV kits) simplify testing of the MAX2312/MAX2316 IF receivers. These kits allow evaluation of the devices' variable-gain amplifier (VGA), I/Q demodulator, voltage-controlled oscillator (VCO), synthesizer, 3-wire programming interface, and power-management features. Figure 2 shows the MAX2312/MAX2316 EV kits schematic.

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). PC board pads (J12, J13, J14, J15) are available for installing low-inductance oscilloscope probe points, if desired.

Features

♦ **3-Wire Interface**

♦ **Differential Baseband Outputs**

♦ **+2.7V to +5.5V Single-Supply Operation**

♦ **SMA Connectors on All Signal Ports**

♦ **Low-Power Shutdown Mode**

♦ **PC Control Software (available at www.maxim-ic.com)**

Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
MAX2312EVKIT	-40°C to +85°C	28 QSOP
MAX2316EVKIT	-40°C to +85°C	28 QSOP

Note: *To evaluate the MAX2310 or MAX2314, order the MAX2310EVKIT or MAX2314 EV KIT, respectively.*

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C33, C34	3	47pF ±10%, 25V min ceramic capacitors (0402)
C2, C4, C8, C12, C23, C24, C25	7	330pF ±10%, 25V min ceramic capacitors (0402)
C3, C9, C10, C11, C13, C14, C16, C21, C22, C28, C35, C37, C38, C42	14	0.01µF ±10%, 25V min ceramic capacitors (0402)
C5	1	1.5pF ±0.1pF ceramic capacitor (0402) (MAX2312) or 5.0pF ±0.1pF ceramic capacitor (0402) (MAX2316)
C6, C7	2	12pF ±5%, 25V min ceramic capacitors (0402) (MAX2312) or 18pF ±5%, 25V min ceramic capacitors (0402) (MAX2316)
C15, C26, C32, C36, C39, C40	6	Open
C19, C20	2	8.0pF ±5%, 25V min ceramic capacitors (0402) (MAX2312) or 15pF ±5%, 25V min ceramic capacitor (0402) (MAX2316)
C27	1	10µF ±10%, 16V min tantalum capacitor AVX TAJC106K016
C29	1	0.033µF ±10%, 25V min ceramic capacitor (0402)

DESIGNATION	QTY	DESCRIPTION
C30	1	3300pF 10%, 25V min ceramic capacitor (0402)
R1, R11, R12, R31–R34	8	0Ω resistors (0402)
R2, R6, R8, R14, R16, R18, R35	6	100Ω ±5% resistors (0402)
R3, R10	2	68Ω ±5% resistors (0402)
R4, R5, R23	3	10kΩ ±5% resistors (0402)
R7	1	49.9Ω ±1% resistor (0402)
R9	1	680Ω ±5% resistor (0402)
R13, R24	2	10kΩ Bourns variable resistors Digi-Key 3296W-104-ND
R15, R17, R19, R20, R21, R25, R27–R30, R36	11	Open
R22	1	47kΩ ±5% resistor (0402)
T1	1	Balun transformer Toko 458DB-1011
L2	1	18nH ±5% inductor (MAX2312) Coilcraft 0805CS-180TJBC or 68nH ±5% inductor (MAX2316) Coilcraft 0805CS-680TJBC
L4	1	180nH ±10% inductor (MAX2312) Coilcraft 20805CS-181TKBC or 680nH ±10% inductor (MAX2316) Coilcraft 1008CS-681TKBC

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_____Component List (continued)

DESIGNATION	QTY	DESCRIPTION
L6	1	270nH inductor Coilcraft 0805CS-271 XKBC
J1–J5, J7, J8	7	SMA connectors (edge-mount) E.F. Johnson 142-0701-801
JU3, JU10, JU11	3	Shunts
J6	1	Open
Q1	1	Open
D1	1	Open
D4	1	Varactor diode Alpha SMV1255-003
U1	1	MAX2312EEI or MAX2316EEI
None	1	MAX2312/MAX2316 circuit board
None	1	MAX2310/MAX2312/MAX2314/ MAX2316 data sheet
None	1	20-pin ribbon cable
INTF2300 Board	1	3-wire programming and interface board

_____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
Digi-Key	218-681-6674	218-681-3380
Toko	708-297-0070	708-699-1194

_____Quick Start

The MAX2312/MAX2316 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 MAX2312/MAX2316 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 running the EV kits in CDMA mode.

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, 3-wire serial interface, and other functions
Power Supply	Capable of providing at least 100mA at +2.7V to +5.5V
Additional Voltage Source for External Control of VGA Functions	Optional
Personal Computer	486DX33 or better, with Windows95® or Windows98® operating system and a functional parallel port

Windows95 and Windows98 are registered trademarks of Microsoft Corp.

CDMA Mode

Perform the following steps to evaluate the MAX2312/MAX2316 in CDMA mode:

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

2) Connect the INTF2300 interface cable as shown in Figure 1. (Pin 1 of the interface cable corresponds to the red wire; pin 1 is designated in silk screen on each of the PC boards.)

3) Connect a +2.75V power supply to the V_{CC} and GND terminals.

4) Install and run Maxim's CDMA control software (available at www.maxim-ic.com). Click on the CDMA control software on the windows task bar. On the IC selection form, click on the MAX2312/MAX2316 control button.

5) With the MAX2312/MAX2316 control screen active, bring the DIVSEL pin high by clicking on the "H" control button located near the middle of the screen if testing a MAX2312. If testing a MAX2316, click on "L."

6) With the MAX2312/MAX2316 control screen active, bring the $\overline{SHDN}$ pin high by clicking on the "H" control button located near the middle of the screen.

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7) For the MAX2312 only, in the control register, change the VCOSEL bit to "1" and press "Send Data." For the MAX2316, in the control register, set the VCOSEL bit to "0" and press "Send Data."

8) Connect a function generator to the REF port configured for a sine wave with a 19.68MHz frequency and a -10dBm amplitude. (The REF port is 50Ω terminated.)

9) Connect a signal generator with 210.48MHz (MAX2312) or 85.48MHz (MAX2316) at -66dBm, and apply to the CDMA DIFF port.

10) Set the VGC control to 2.5VDC by rotating potentiometer R13.

11) Configure an oscilloscope to measure a high-impedance, 1Vp-p, 100kHz differential waveform. Connect it to the I or Q output.

Voltage gain can be calculated by:

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

$$V_{IN}(RMS) = \sqrt{1/2 \cdot 10^{\left(\frac{PIN(dBm)}{10}\right)}}$$

Gain = approximately 60dB

Note: The balun loss is not taken into account. This loss is typically 0.5dB.

_____ Adjustments and Control

VGC Adjust

The MAX2312/MAX2316 EV kits are configured with a 10kΩ trim pot for setting and adjusting the VGC gain. An external supply can be used by removing the 2-pin shunt JU3 and by directly connecting the supply to JU2. The VGC voltage must be clean to minimize undesired amplitude modulation.

VCO Adjust

The MAX2312/MAX2316 EV kits are configured with a 10kΩ trim pot for setting and adjusting the VCO voltage. Apply a 2-pin shunt to the VCO potentiometer and external VCO header (JU1). Place a 0Ω resistor in R25 and remove R1 to break the loop and remove the charge-pump output. The VCO voltage must be clean to minimize undesired frequency modulation.

Interface Control

The interface port is designed to use a 20-pin ribbon cable (Figure 1). Ten pins are signal lines, and the other 10 pins are digital grounds. Pin 1 of the interface cable is red. Pin 1 is also designated in silk screen on each of the PC boards.

_____ Detailed Description

The following sections cover the EV kits' circuit blocks in detail. (Refer to the MAX2310/MAX2312/MAX2314/MAX2316 data sheet for additional information.)

CDMA Inputs

The CDMA+ and CDMA- pins are differential inputs to the MAX2312/MAX2316's VGA. The EV kit is configured for single-ended (50Ω) operation at the CDMA DIFF input connector. (The on-board balun converts this input to a differential signal for the MAX2312/MAX2316.) The impedance is set by the combination of L4, R9, C19, C20, and the 4:1 impedance ratio of the input balun.

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.

____ PC Board Layout/Construction

The MAX2312/MAX2316 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 via connection to the ground plane.

The MAX2312/MAX2316 EV kits' PC boards use 14mil-wide traces for 50Ω traces. The PC board has an 8mil-layer profile on FR4, with a 4.5 dielectric and 75mil trace-to-ground-plane spacing.

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_____Interface Board 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 V_{CC} 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 MAX2312/MAX2316 above +3.6V, jumper JU1 may be removed and an external supply voltage of +3.6V may be applied between V_{CC} (pin 2) and GND (pin 1) (Figure 1).
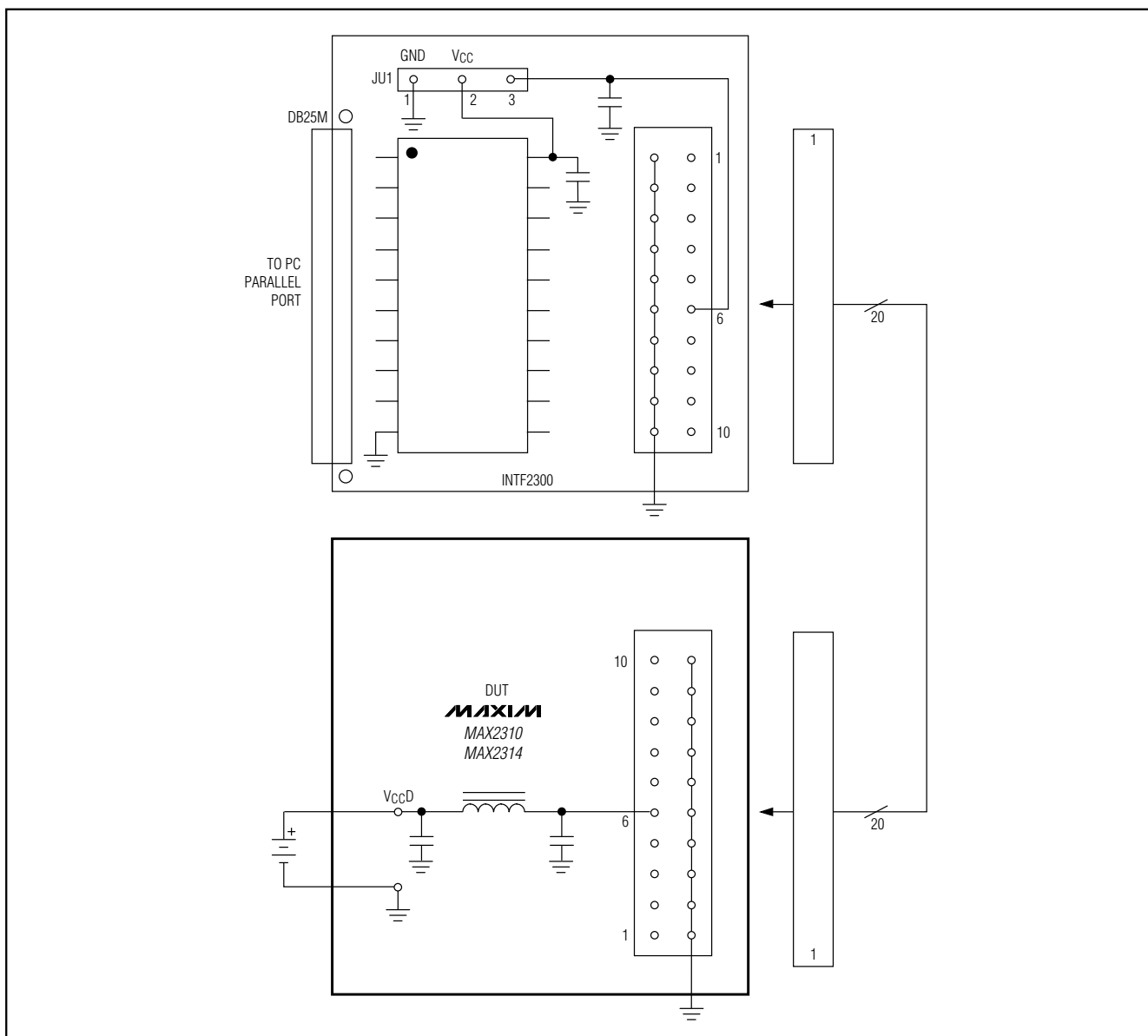
Figure 1. INTF2300 Interface Board

Evaluate: MAX2312/MAX2316
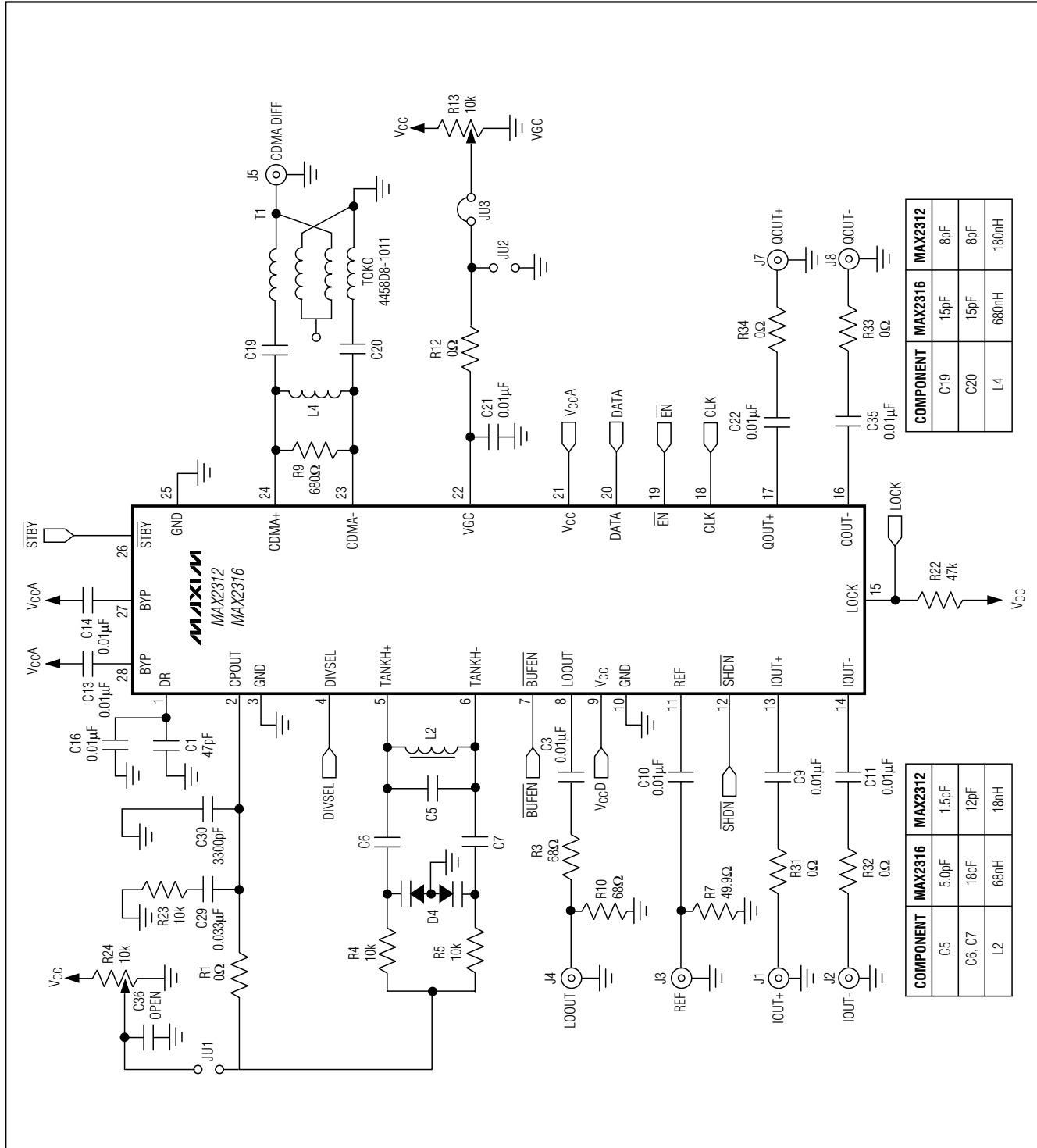
Figure 2. MAX3212/MAX3216 EV Kits Schematic

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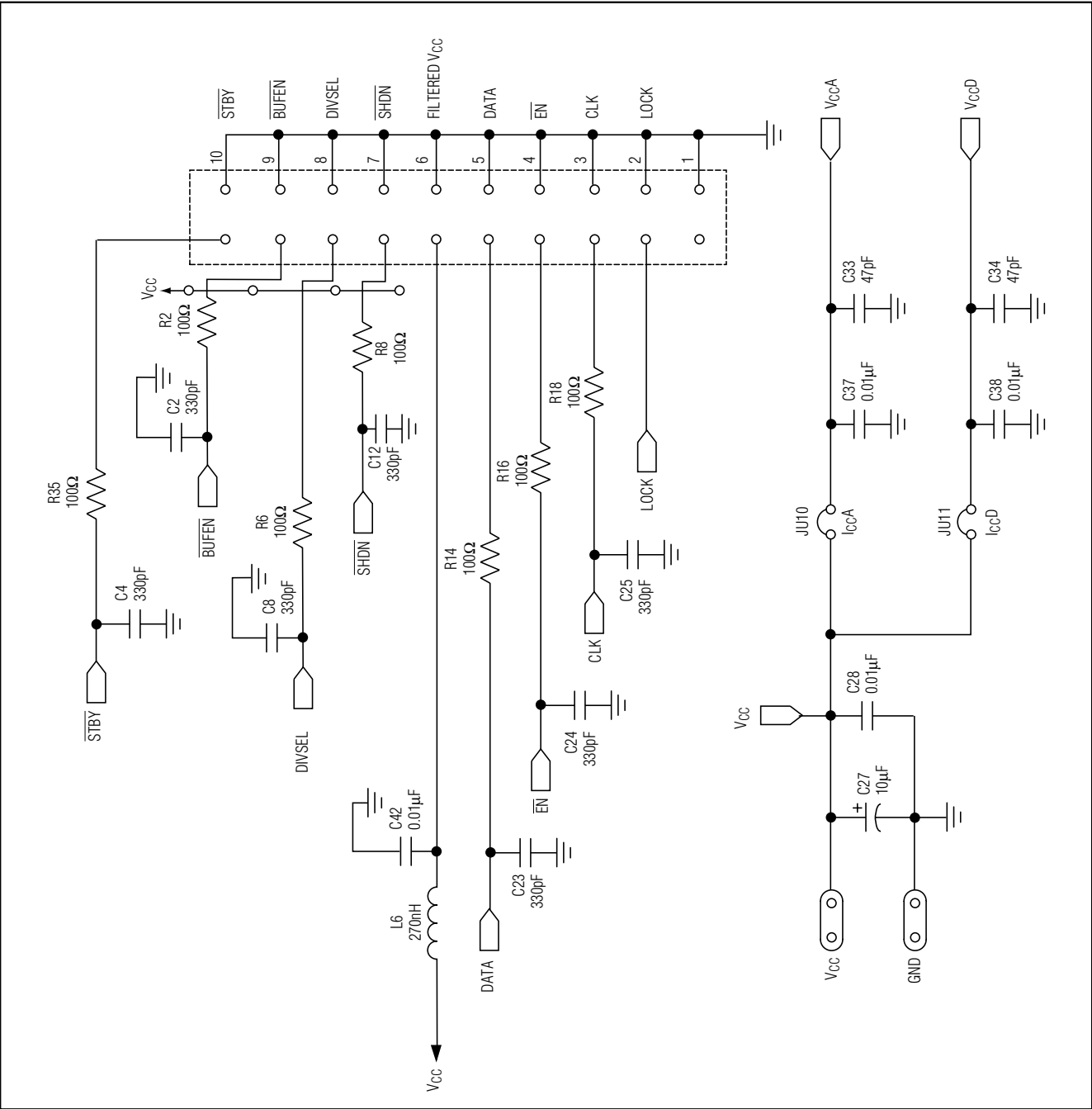
Figure 2. MAX3212/MAX3216 EV Kits Schematic (continued)

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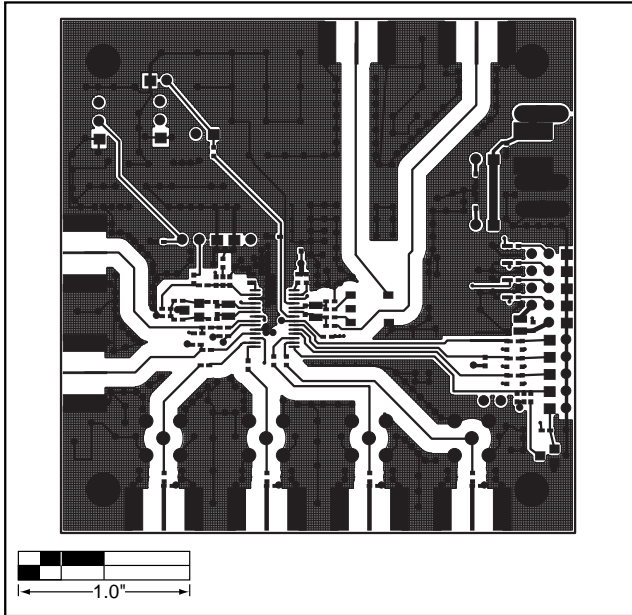
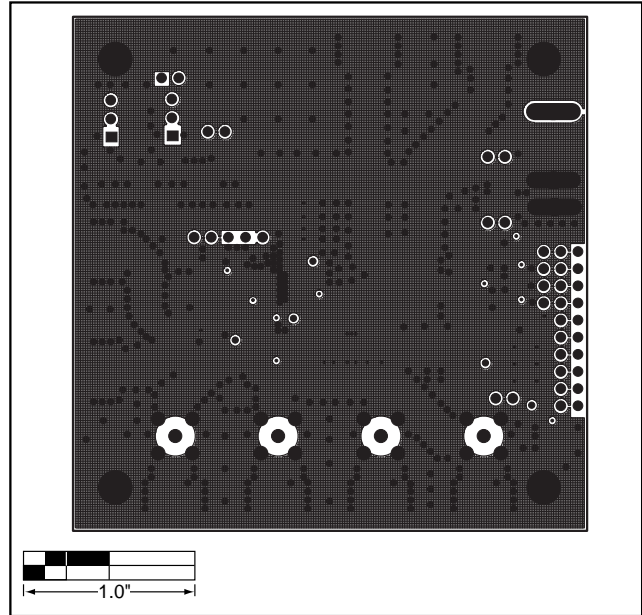Figure 3. MAX2312/MAX2316 EV Kits PC Board Layout Component Side—Layer 1

Figure 4. MAX2312/MAX2316 EV Kits Ground Plane—Layer 2

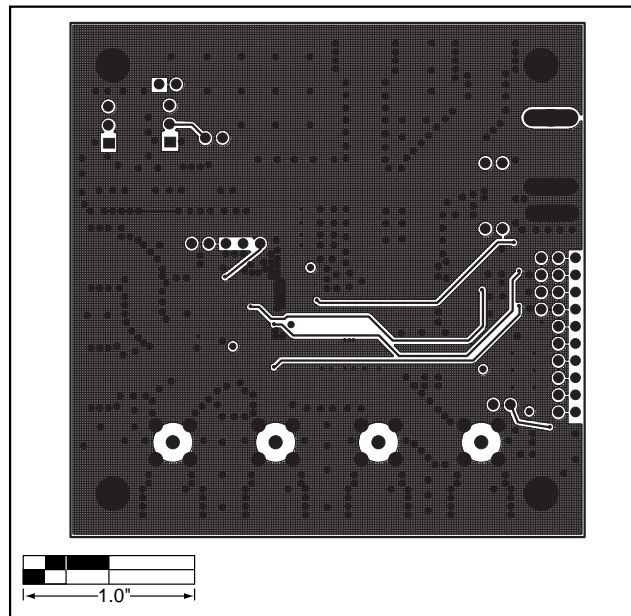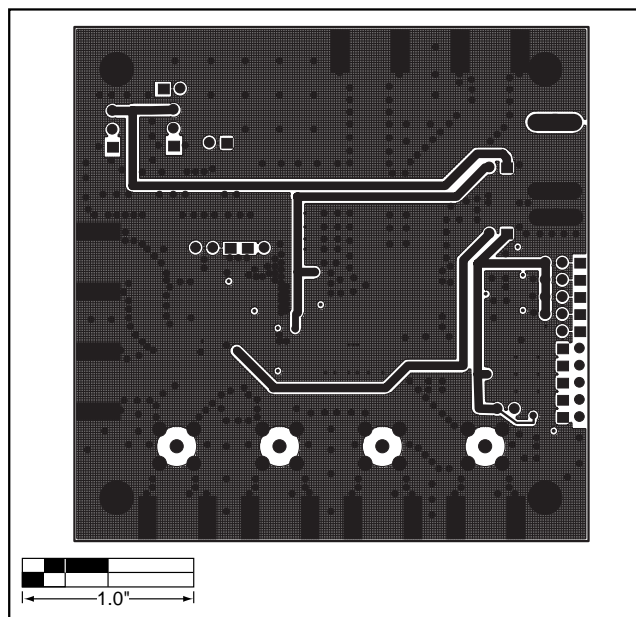Figure 5. MAX2312/MAX2316 EV Kits Inner Layer—Layer 3

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Figure 6. MAX2312/MAX2316 EV Kits PC Board Layout Solder Side—Layer 4
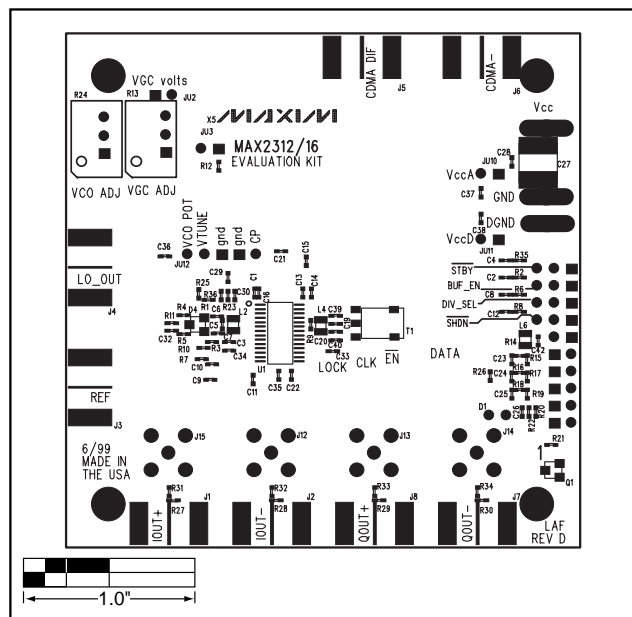

Figure 7. MAX2312/MAX2316 EV Kits Component Placement Guide—Component Side

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