19-4430; Rev 0; 2/09

MAX3541/MAX3542 Evaluation Kits

Evaluate: MAX3541/MAX3542

General Description

The MAX3541/MAX3542 evaluation kits (EV kits) simplify the testing and evaluation of the MAX3541/MAX3542 PAL, DVB-T, and hybrid tuners. The evaluation kits are fully assembled and tested at the factory. Standard 50Ω SMA connectors are included on the EV kits for the inputs and outputs to allow quick-and-easy evaluation on the test bench.

This document provides a list of equipment required to evaluate the device, a straightforward test procedure to verify functionality, a description of the EV kit circuits, the circuit schematics, a components list of materials for the kits, and artwork for each layer of the PCBs.

Features

- **Easy Evaluation of the MAX3541/MAX3542**
- **50Ω SMA Connectors**
- **All Critical Peripheral Components Included**
- **Fully Assembled and Tested**
- **PC Control Software Available at www.maxim-ic.com**

Ordering Information

PART	TYPE
MAX3541EVKIT	EV Kit
MAX3542EVKIT	EV Kit

Component List

DESIGNATION	QTY	DESCRIPTION
+3_3V, IF_AGC, MUX, TP1	4	Red test points, PC mini red Keystone 5000
VCC2 (+5V)	0	Not installed, PC mini red test point
C1, C6, C37, C70, C71, C72, C73, C74	8	100pF ±5% ceramic capacitors (0603) Murata GRM1885C1H101J
C2, C4, C5, C52, C53, C54, C56, C59, C62, C63, C64, C66, C86	13	1000pF ±5% ceramic capacitors (0402) Murata GRM1555C1H102J
C3	1	0.033µF ±5% ceramic capacitor (0805) Murata GRM21A7U1H333J
C7	1	2.0pF ±0.1pF ceramic capacitor (0402) Murata GRM1555C1H2R0B
C8, C78, C87	3	1000pF ±10% ceramic capacitors (0603) Murata GRM188R71H102K
C9, C12	2	39pF ±5% ceramic capacitors (0603) Murata GRM1885C1H390J
C10, C30	2	0.1µF ±10% ceramic capacitors (0402) Murata GRM155R71C104K
C11	1	5.6pF ±0.25pF ceramic capacitor (0402) Murata GRM1555C1H5R6C
C13, C14	0	Not installed, ceramic capacitors
C17	1	22nF ±10% ceramic capacitor (0603) Murata GRM188R71H223K

DESIGNATION	QTY	DESCRIPTION
C18	1	4.7pF ±0.25pF ceramic capacitor (0402) Murata GRM1555C1H4R7C
C21, C25, C35	3	82pF ±5% ceramic capacitors (0603) Murata GRM1885C1H820J
C28	1	150pF ±5% ceramic capacitor (0603) Murata GRM1885C1H151
C29, C31	1	47pF ±5% ceramic capacitors (0603) Murata GRM1885C1H470J
C45	1	22pF ±5% ceramic capacitor (0402) Murata GRM1555C1H220J
C55	1	10µF ±10% ceramic capacitor (0805) Murata GRM21BR61A106K
C60, C61	2	100pF ±5% ceramic capacitors (0402) Murata GRM1555C1H101J
C65	1	0.47µF ±10% ceramic capacitor (0805) Murata GRM219R71C474K
C75, C77	2	0.1µF ±10% ceramic capacitors (0603) Murata GRM188R71C104K
C76	1	10µF ±10% tantalum capacitor (R case) AVX TAJR106K006
C82	1	820pF ±10% ceramic capacitor (0603) Murata GRM188R71H821K
C85	1	560pF ±10% ceramic capacitor (0402) Murata GRM155R71H561K
C96	1	8.2pF ±0.25pF ceramic capacitor (0603) Murata GRM1885C1H8R2C

MAX3541/MAX3542 Evaluation Kits

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
D1	1	DA221 dual switching diode ROHM DA221TL
FL2	1	X6966 bandpass filter EPCOS B39361X6966N201
GND1, GND4	2	Black test points, PC mini black Keystone 5001
GND2	0	Not installed, PC mini black test point
J3, J19	2	Connector SMA end-launch jack receptacles, 0.062in Johnson 142-0701-801
J13	1	DB25 right-angle female connector AMP 5745783-4
JP1, JP2, JP6	3	1 x 2-pin in-line headers, 100 mil centers Sullins PEC36SAAN
JP11, JP12	2	1 x 3-pin in-line header, 100 mil centers Sullins PEC36SAAN
L1	1	18nH ±5% inductor (0603) Murata LQG18HN18NJ00
L2, L15	2	270nH ±5% inductors (0603) TOKO LL1608-FSLR27J
L3	1	200nH ±5% inductor (0603) Murata LQW18ANR20J00
L5	1	15nH ±3% inductor (0402) Murata LQW15AN15NH00
L9	1	120nH ±5% inductor (0603) Murata LQW18ANR12J0
L10	1	220nH ±5% inductor (0603) Murata LQW18ANR22J00
L11	1	56pF ±5% ceramic capacitor (0603) Murata GRM1885C1H560J
L14	1	56nH ±5% inductor (0603) TOKO LL1608-FSL56NJ

DESIGNATION	QTY	DESCRIPTION
R1	1	2kΩ ±5% resistor* (0603)
R3, R8, R48	3	100Ω ±5% resistors* (0402)
R4, R55	2	0Ω ±0% resistors—short* (0603)
R5	1	75Ω ±5% resistor* (0402)
R6, R13, R40, R41, R42	5	100Ω ±5% resistors* (0603)
R7, R9	2	10kΩ ±5% resistors* (0402)
R10	1	86.6Ω ±1% resistor* (0603)
R11	1	43.2Ω ±1% resistor* (0603)
R12, R28, R49	3	1kΩ ±5% resistors* (0603)
R14	1	300Ω ±5% resistor* (0603)
R15, R16	2	36Ω ±5% resistors* (0603)
R38	1	2.2kΩ ±5% resistor* (0402)
R39	1	4.3kΩ ±5% resistor* (0402)
R43, R44, R58	3	5.1kΩ ±5% resistors* (0603)
R45, R46, R47	3	2.7kΩ ±5% resistors* (0603)
R56, R59, R60	3	Not installed, resistors
R61, R62	2	39Ω ±5% resistors (0603)
T8	1	4:1 transformer TOKO 617PT-1664
U3	1	SN74LV07ADR ±0% hex buffer/driver Texas Instruments SN74LV07ADR
U4	1	See the *EV Kit-Specific Component List*
Y2	1	8MHz crystal Citizen America HCM49-8.000MABJ-UT
—	3	Shunts, shorting jumper (JP2, JP11, JP12) Sullins SSC02SYAN
—	1	PCB: MAX3541/42 Evaluation Kit

**Use lead-free parts only.*
***EP = Exposed pad.*

EV Kit-Specific Component List

EV KIT PART NUMBER	DESIGNATION	DESCRIPTION
MAX3541EVKIT	U4	Complete single-conversion television tuner (48 fcLGA-EP) Maxim MAX3541ELM+
MAX3542EVKIT		Complete single-conversion television tuner (48 fcLGA-EP) Maxim MAX3542ULM+

Component Suppliers

SUPPLIER	PHONE	WEBSITE
AVX Corporation	843-946-0238	www.avxcorp.com
Citizen America Corp.	310-781-1460	www.citizencrystal.com
EPCOS AG	732-906-4300	www.epcos.com
Johnson Components	507-833-8822	www.johnsoncomponents.com
Keystone Electronics Corp.	209-796-2032	www.keyelco.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerican.com
ROHM Co., Ltd.	858-625-3630	www.rohm.com
Sullins Electronics Corp.	760-744-0125	www.sullinselectronics.com
Texas Instruments Inc.	972-644-5580	www.ti.com
TOKO America, Inc.	847-297-0070	www.tokoam.com

Note: *Indicate that you are using the MAX3541/MAX3542 when contacting these component suppliers.*

Quick Start

Required Equipment

- One power supply capable of supplying at least 500mA at +3.3V
- One dual-output power supply capable of supplying up to 3V at least 5mA (to apply gain control voltages)
- One RF signal generator capable of delivering at least 0dBm of output power at frequency. (HP 8482A or equivalent)
- One RF spectrum analyzer capable of covering the operating frequency range of the device.
- A PC (486DX33 or better) with Windows® 95/98, 2000, NT 4.0, XP or later operating system, 64MB of memory, and an available parallel port
- One 25-pin parallel cable
- 50Ω SMA cables
- (Optional) One multichannel digital oscilloscope
- (Optional) A network analyzer to measure return loss
- (Optional) An ammeter to measure supply current

Connections and Setup

This section provides a step-by-step guide to testing the basic functionality of the EV kits in UHF mode. **Caution: Do not turn on DC power or RF signal generators until all connections are completed.**

1) Verify that the JP1 and JP6 shunts are removed, the JP2 shunt is installed, and JP11 and JP12 have shunts across pins 1-2.
2) With its output disabled, set the DC power supply to +3.3V. Connect the power supply to the V_{CC} (through an ammeter if desired) and GND terminals on the EV kits. If available, set the current limit to 500mA.
3) With its output disabled, set both outputs of the dual-output DC power-supply voltages to +3V. Connect one of the outputs to the TP1 connector and the other output to the IF_AGC connector.
4) With its output disabled, set the RF signal generator to a 50.5MHz frequency and a -80dBm power level. Connect the output of the RF signal generator to the SMA connector labeled RFIN on the evaluation board.
5) Connect a 25-pin parallel cable between the PC's parallel port and the MAX3541/MAX3542 evaluation board.
6) Turn on the +3.3V V_{CC} power supply, followed by the +3V dual-output gain-control power supply. The supply current from the +3.3V V_{CC} supply should read approximately 230mA. Be sure to adjust the power supply to account for any voltage drop across the ammeter.

Windows is a registered trademark of Microsoft Corp.

7) Install and run the MAX3541/MAX3542 control software. Software is available for download at www.maxim-ic.com/evkitssoftware.
8) Load the default register settings from the control software by clicking Edit: Load Defaults.
9) Connect the SMA connector labeled IF_OUT on the evaluation board to a spectrum analyzer or to an oscilloscope.
10) Enable the RF signal generator's output.
11) Set the center frequency to the IF frequency set on the control software. Check the output.

Gain Adjustment Calculations

Add an additional 6dB to the voltage gain to account for the 2:1 transformer on the output. Add another 3.96dB to the voltage gain to account for the minimum loss pad (R10 and R11) on the input. When measuring noise figure, account for 5.7dB power loss of the minimum loss pad.

A 36MHz IF anti-aliasing filter is provided on the EV kits (C9, C12, C21, C25, C28, C29, C31, C35, L3, L9, L10, and L11). Anti-aliasing filter requirements vary depending on applications; users should consult their demodulator vendors for more specific information.

Layout Considerations

The MAX3541/MAX3542 EV kits serve as a guide for PCB layout. Keep RF signal lines as short as possible to minimize losses and radiation. Use controlled impedance on all high-frequency traces. The exposed pad must be soldered evenly to the board's ground plane for proper operation. Use abundant vias beneath the exposed pad for maximum heat dissipation. Use abundant ground vias between RF traces to minimize undesired coupling.

To minimize coupling between different sections of the IC, the ideal power-supply layout is a star configuration, which has a large decoupling capacitor at the central V_{CC} node. The V_{CC} traces branch out from this node, with each trace going to separate V_{CC} pins of the MAX3541/MAX3542. Each V_{CC} pin must have a bypass capacitor with low impedance to ground at the frequency of interest. Do not share ground vias among multiple connections to the PCB ground plane.

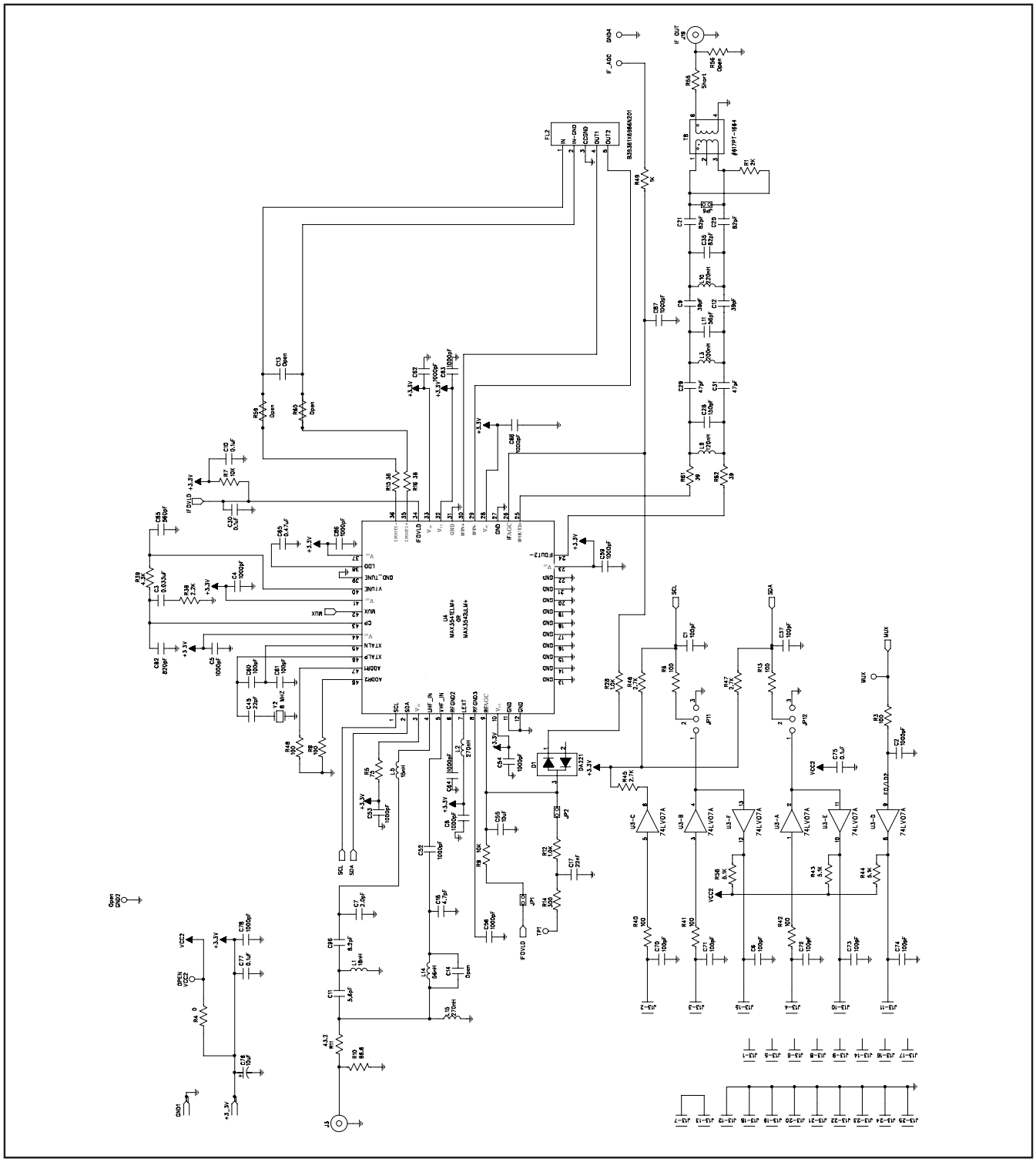

Figure 1. MAX3541/MAX3542 EV Kits Schematic

MAX3541/MAX3542 Evaluation Kits

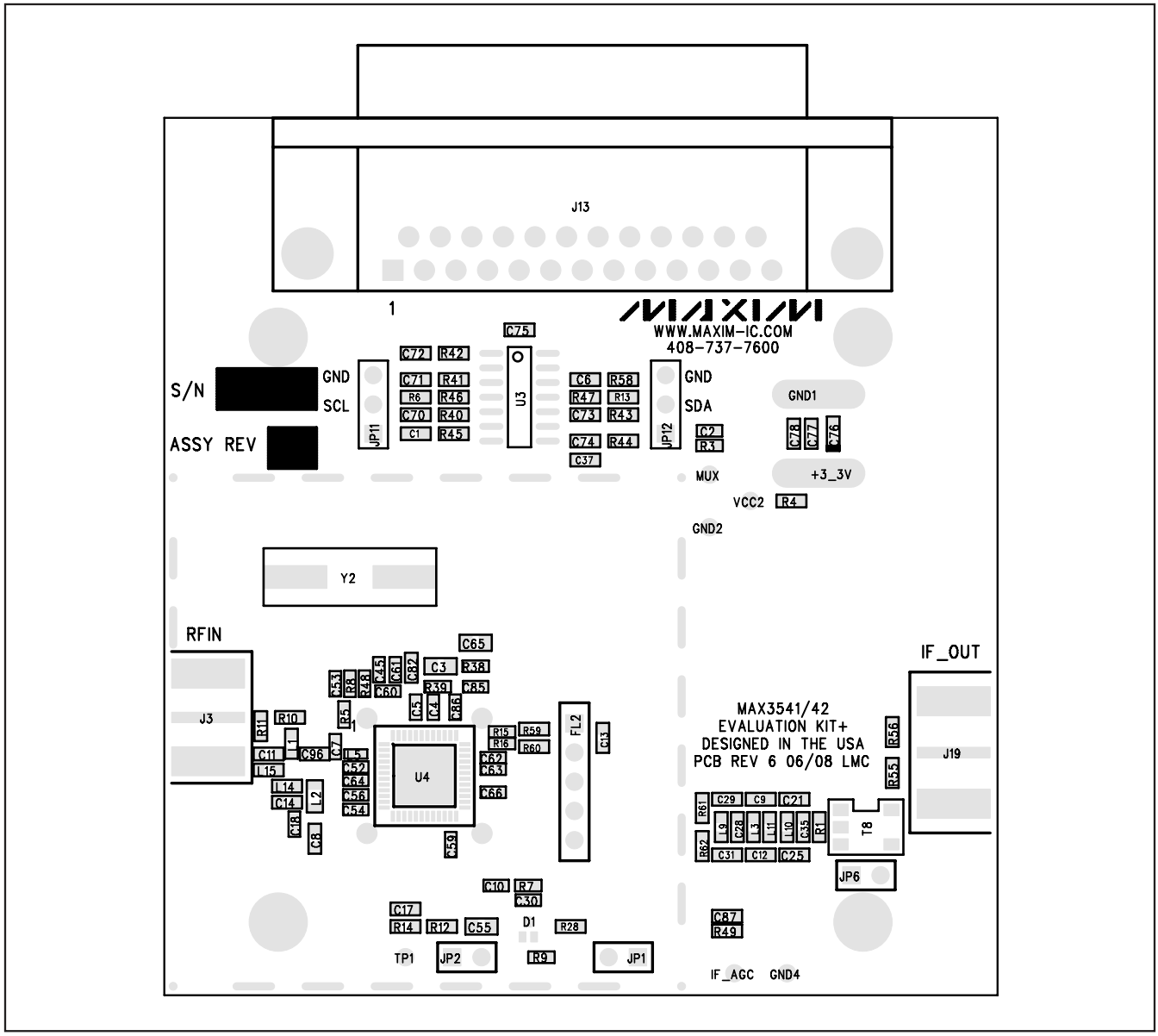

Figure 2. MAX3541/MAX3542 EV Kits PCB Layout—Component Placement Guide

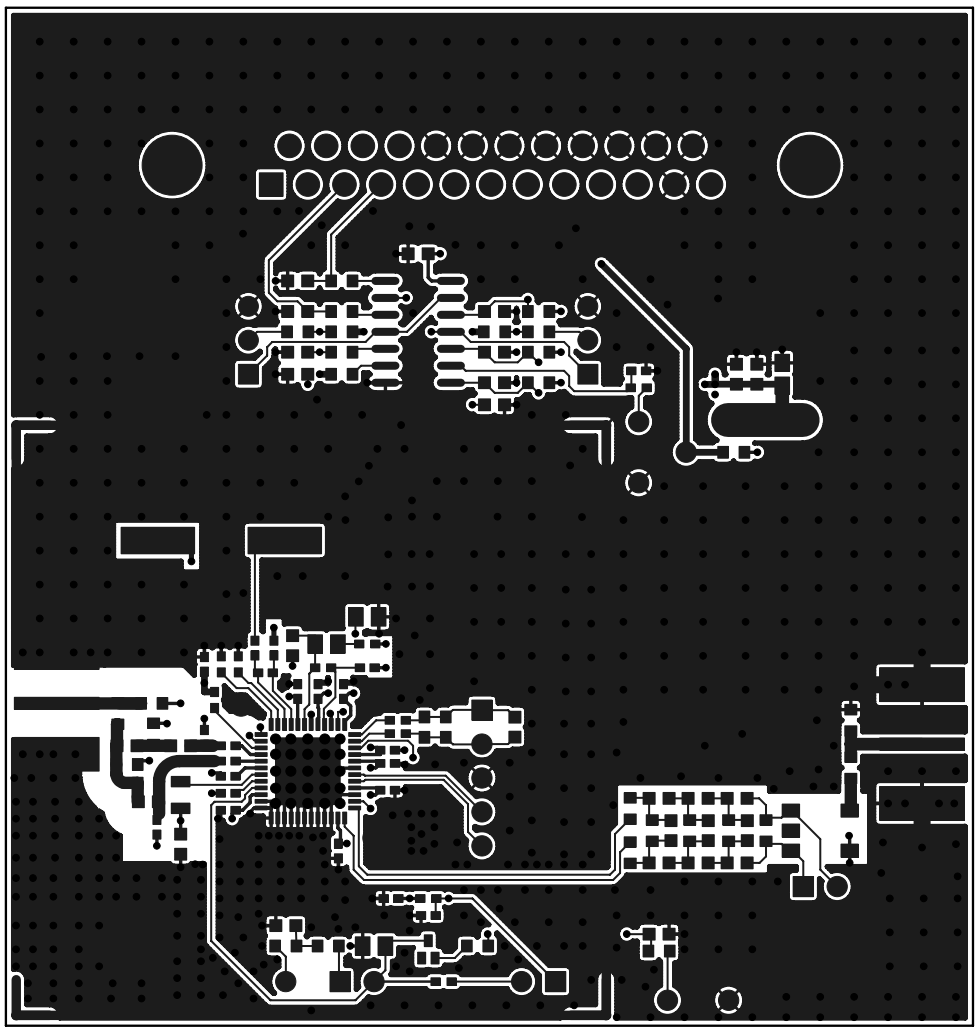

Figure 3. MAX3541/MAX3542 EV Kits PCB Layout—Primary Component Side

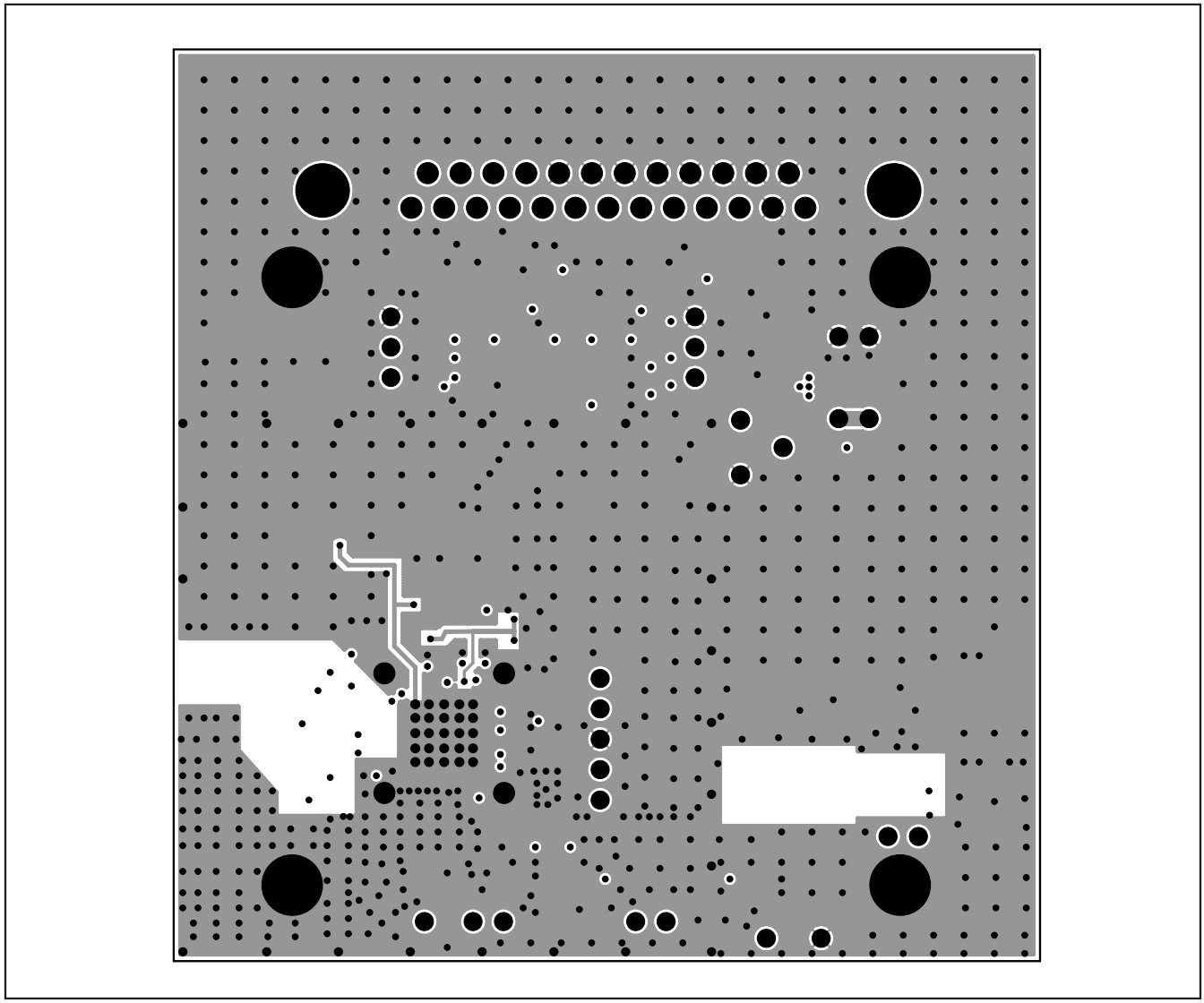

Figure 4. MAX3541/MAX3542 EV Kits PCB Layout—Inner Layer 2

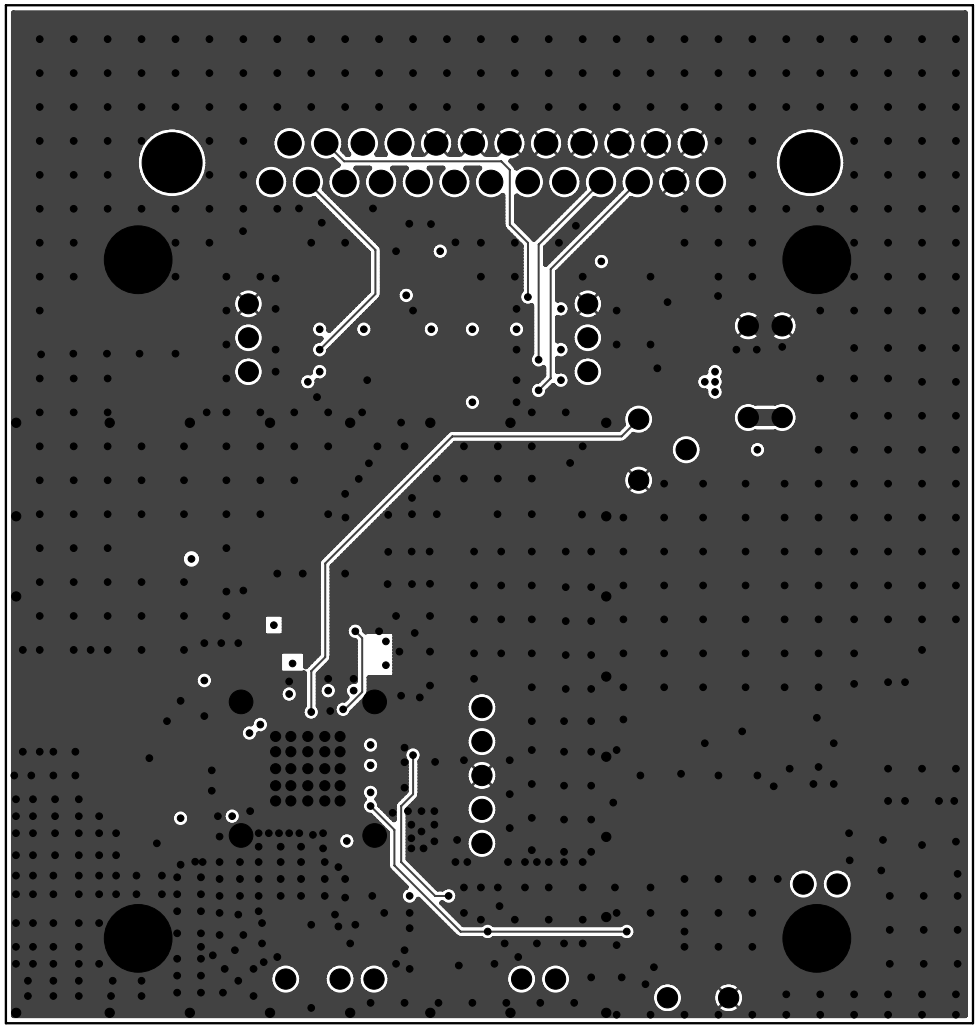

Figure 5. MAX3541/MAX3542 EV Kits PCB Layout—Inner Layer 3

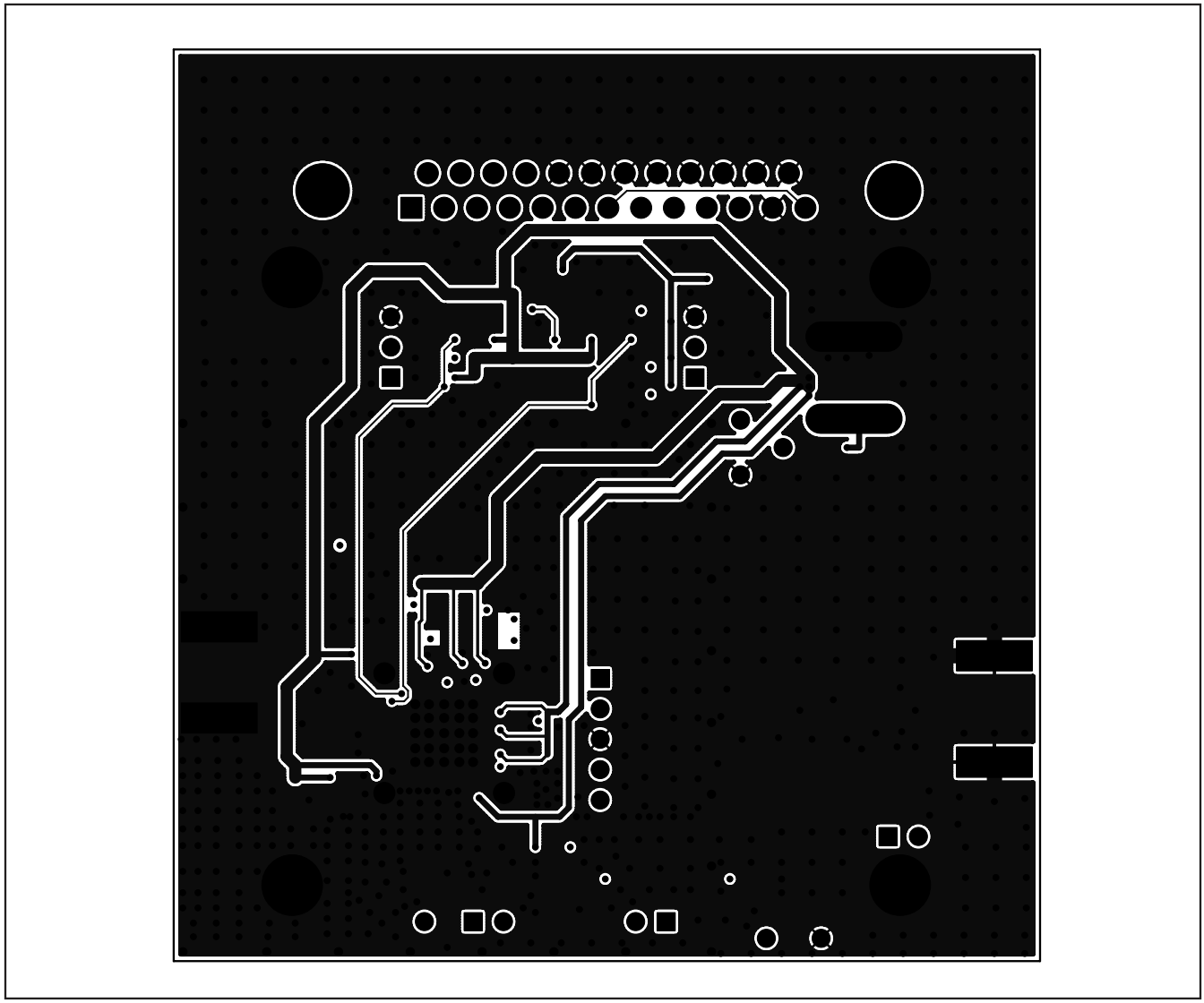

Figure 6. MAX3541/MAX3542 EV Kits PCB Layout—Secondary Component Side