19-3325; Rev 0; 7/04

MAX2745 Evaluation Kit

Evaluates: MAX2745

General Description

The MAX2745 evaluation kit (EV kit) simplifies evaluation of the MAX2745 global positioning system (GPS), radio frequency (RF), front-end IC. It enables testing of the device's RF performance and requires no additional support circuitry. The EV kit's signal inputs and outputs use SMA connectors to facilitate the connection of RF test equipment.

Features

- **Easy Evaluation of the MAX2745**
- **+2.4V to +3.6V Single-Supply Operation**
- **Jumpers for Digital Control and Shutdown**
- **All Critical Peripheral Components Included**

Component Suppliers

SUPPLIER	PHONE	FAX
Alpha	360-647-2360	360-671-4936
ATC	949-583-9119	949-583-9213
CoilCraft	847-639-6400	847-639-1469
Kayama	219-489-1533	219-489-2261
Murata	770-436-1300	770-436-3030

Note: *Indicate you are using the MAX2745 when contacting these manufacturers.*

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX2745EVKIT	-40°C to +85°C	48 TQFP-EP*

**EP = Exposed paddle.*

***These components are for internal test purposes.*

****These are the optional components. See the instructions on the schematic for more details.*

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3, C6, C7, C9–C15, C17, C22, C33, C53, C54, C109–C114	22	100nF ±10% (0402) capacitors Murata GRM155R61A104K
C2, C23, C32	3	100pF ±5% (0402) capacitors Murata GRM1555C1H101J
C4, C8	2	220pF ±10% (0402) capacitors Murata GRM155R71H221K
C5	1	1000pF ±10% (0402) capacitor Murata GRM155R71H102K
C16, C59, C60	3	1500pF ±10% (0402) capacitors Murata GRM155R71H152K
C18, C19	2	39pF ±5% (0402) capacitors Murata GRM1555C1H390J
C27–C30, C48–C51	0**	Open (0402) capacitors
C36, C43, C47, C52	4	22pF ±5% (0402) capacitors Murata GRM1555C1H220J
C66	1	12pF ±5% (0402) capacitor Murata GRM1555C1H120J
C80	0***	Open ±10% (0402) capacitor Murata
C81, C100	2	6800pF ±10% (0402) capacitors Murata GRM155R71E682K

DESIGNATION	QTY	DESCRIPTION
C98	1	1.0µF ±20% (0603) capacitor Taiyo Yuden JMK107BJ105MA-B
C101	1	10pF ±0.5pF (0402) capacitor Murata GRM1555C1H100B
C102	1	1pF ±0.1pF (0402) capacitor Murata GRM1555C1H1R0B
C105, C106	2	1.0µF ±10% (2012) capacitors AVX TAJR105K016
C107	1	10nF ±10% (0402) capacitor Murata GRM155R71C103K
F5	1	1.575GHz GPS RF saw filter Murata SAFSE1G57AB0T00R00
J5	1	Connector DSUB 25-R DB25 M PC board connector AMP 747238-4
J19–J22, J35–J38	0**	Open, SMA edge-mount connectors
J24, J26, J28, J33, J34	5	SMA edge-mount connectors Johnson 142-0701-801
JP1–JP12	12	Shunts Digi-Key S9000-ND
JP1–JP6, JP12	7	2-pin headers, 0.1in center Sullins PTC36SAAN
JP7–JP11	5	3-pin headers, 0.1in center Sullins PTC36SAAN

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
L58	1	8.2nH ±0.1nH (0402) inductor Murata LQP15MN8N2B02
L60	0***	Open ±0.1nH (0402) inductor Murata
R1	1	70kΩ ±1% (0402), 1/16W resistor
R5, R8	2	820Ω ±1% (0402), 1/16W resistors
R6, R18, R19, R20, R27, R69, R70, R77	8	0Ω ±1% (0402), 1/16W resistors
R9	1	100kΩ ±1% (0402), 1/16W resistor
R10–R13	4	200Ω ±1% (0402), 1/16W resistors
R14–R17	4	10kΩ ±1% (0402), 1/16W resistors
R22–R25	0**	Open, ±1%, 1/16W resistors
R59	0***	Open, ±1% (0402), 1/16W resistor
R62	1	22.1kΩ ±1% (0402), 1/16W resistor
R71	1	220Ω ±5% (0402), 1/10W resistor
R79–R86	8	30kΩ ±1% (0402), 1/16W resistors

DESIGNATION	QTY	DESCRIPTION
S2, S3	2	DIP switches SW4 SMT CTS 204-12ST
TP1–TP5	5	Test points, PC mini, 0.040 red Digi-key 5000K-ND
U1	0***	Open TXCO, 16.367667MHz, SM Rakon
U3	1	MAX2745ECM IC, GPS RF, SM Maxim MAX2745ECM
U4	1	MAX8510EXK27 low-noise linear regulator Maxim MAX8510EXK27
U12	1	Hex buffer/driver with open drain Texas Instruments SN74LV07ADR
Y1	1	16.368327MHZ XTL Rakon IDD30UM-1SJ 16.367MHz/XZB548

***These components are for internal test purposes.*

****These are the optional components. See the instructions on the schematic for more details.*

Detailed Description

The MAX2745 EV kit simplifies evaluation of the MAX2745 GPS RF front-end IC. It enables testing of the device's RF performance and requires no additional support circuitry. The EV kit's signal inputs and outputs use SMA connectors to facilitate the connection of RF test equipment. In this section, detailed descriptions of the EV board as well as the control interface/software are given to facilitate better evaluation of the IC.

DC Power Supply

The MAX2745 EV kit requires three different power supplies:

- VINDC (JP3) is the main power supply for the MAX2745 IC and the external RF circuitry such as the TCXO. This VINDC supply powers the MAX8510 LDO, which produces 2.85V output with extremely low noise. If different supply voltages are desired to test the IC, bypass the LDO and directly power the board through JP2. See the *Jumper Description* section for more details.
- VDD18 (JP1) is the 1.6V to 2.3V supply voltage needed to test the voltage booster section. Do not use VDD18 for normal operation. See the *Jumper Description* section for more details.
- VDD5V (JP12) is the power supply for the I²C* control interface. It is not required if the control interface is not used.

I/O Ports

The MAX2745 EV kit has one RF input port, three IF output ports, one clock output port, and one PC control port.

- RF_IN (J24) is the GPS RF signal input port with SMA connector.
- VCMOUT_1P/VCMOUT_1N/DOUT are the IF output ports.
- CKOUT is the 16MHz/32MHz clock output port.
- J5 is the 25-pin PC parallel control port.

Digital Controls

There are two DIP switches (S2, S3) on the MAX2745 EV kit that provide eight digital controls. Refer to the MAX2745 data sheet for more details.

**Purchase of I²C components from Maxim Integrated Products, Inc., or one of its sublicensed Associate Companies, conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.*

Jumper Description

There are eight jumpers on the MAX2745 EV kit besides the power-supply jumpers.

1) JP9—SHDN. Connect pin 2 to pin 3 (GND) for normal operation.
2) JP7—TCXO power supply. By default the MAX2745 EV kit uses a 16MHz crystal, so leave this jumper open.
3) JP5—External LNA supply. Refer to the MAX2745 data sheet for more details.
4) JP6—Short this jumper when testing the voltage booster. When JP6 is shorted, JP2 MUST be open and 1.6V to 2.3V supply is expected at JP1 (VDD18).
5) JP10—Reserved. Pin 2 MUST be shorted to pin 1 (GND) for normal operation.
6) JP8—Voltage booster enable. Short pin 2 to pin 3 (VDD) to disable the voltage booster (normal operation).
7) JP11—SHDN of the MAX8510 LDO. Connect pin 2 to pin 1 (VDD) to enable the MAX8510 (normal operation).
8) JP2—Short this jumper to connect the MAX8510 LDO output to the power supply of the EV board. If a supply voltage other than 2.85V is desired, leave JP2 open and connect the new supply voltage to pin 1 of JP2. When the voltage booster is enabled, JP2 MUST be open and NO supply is allowed on either pin.

Control Software

The control software is needed to test the VSPORT of the MAX2745. It is mainly for internal test purposes and not required for normal operation. Refer to the MAX2745 data sheet for more details.

Quick Start

The MAX2745 EV kit is fully assembled and factory tested. Follow the instructions in the *Connections and Setup* section for proper device evaluation.

Test Equipment Required

This section lists the recommended test equipment to verify operation of the MAX2745. It is intended as a guide only, and some substitutions are possible.

- An RF signal generator capable of delivering RF power as low as -120dBm and as high as 0dBm at the 1575.42MHz operating frequency (HP E4433B, or equivalent)
- An RF spectrum analyzer that covers the MAX2745 operating frequency range, as well as a few harmonics (FSEB20, for example)
- Two power supplies capable of up to 1A at +1.6V to +6.0V
- One ammeter for measuring the supply current (optional)
- 50Ω SMA cables
- A network analyzer (HP 8753D, for example) to measure small-signal return loss and gain (optional)
- An oscilloscope to check the digital IF output

Connections and Setup

This section provides a step-by-step guide to operating the EV kit and testing the device's function. **Do not turn on the DC power or RF signal generators until all connections are made:**

1) Connect a DC supply set to +3.3V to the VDC and GND terminals on the EV kit. Do not turn on the supply.
2) Connect a DC supply set to +5.0V to the 5VDC on the EV kit. Do not turn on the supply.
3) Connect one RF signal generator to the RFIN SMA connector; do not turn on the generator's output. Set the output frequency to 1575.420000MHz. Set the power level to -120dBm.
4) Connect the ACOMOUT+/- output on the EV kit to a spectrum analyzer through an SMA cable.
5) Connect the EV kit to a PC through a parallel cable.
6) Run the control software on an IBM-compatible PC.
7) Set the digital controls to the appropriate states (refer to the MAX2745 data sheet for the digital control settings).
8) Turn on the DC supplies. The supply current should read approximately 20mA.
9) Activate the RF generator's output.
10) Check the IF outputs.
11) Check other features of the MAX2745, e.g., 16MHz clock output, voltage booster, temperature-sensor output, etc.

Layout Issues

A good PC board is an essential part of RF circuit design. The EV kit PC board can serve as a guide for laying out a board using the MAX2745. Keep traces carrying RF signals as short as possible to minimize radiation and insertion loss. Use impedance control on all RF signal traces. The VCC node on the PC board should have decoupling capacitors to the closest ground. Refer to the *Layout* section of the MAX2745 data sheet for more information.

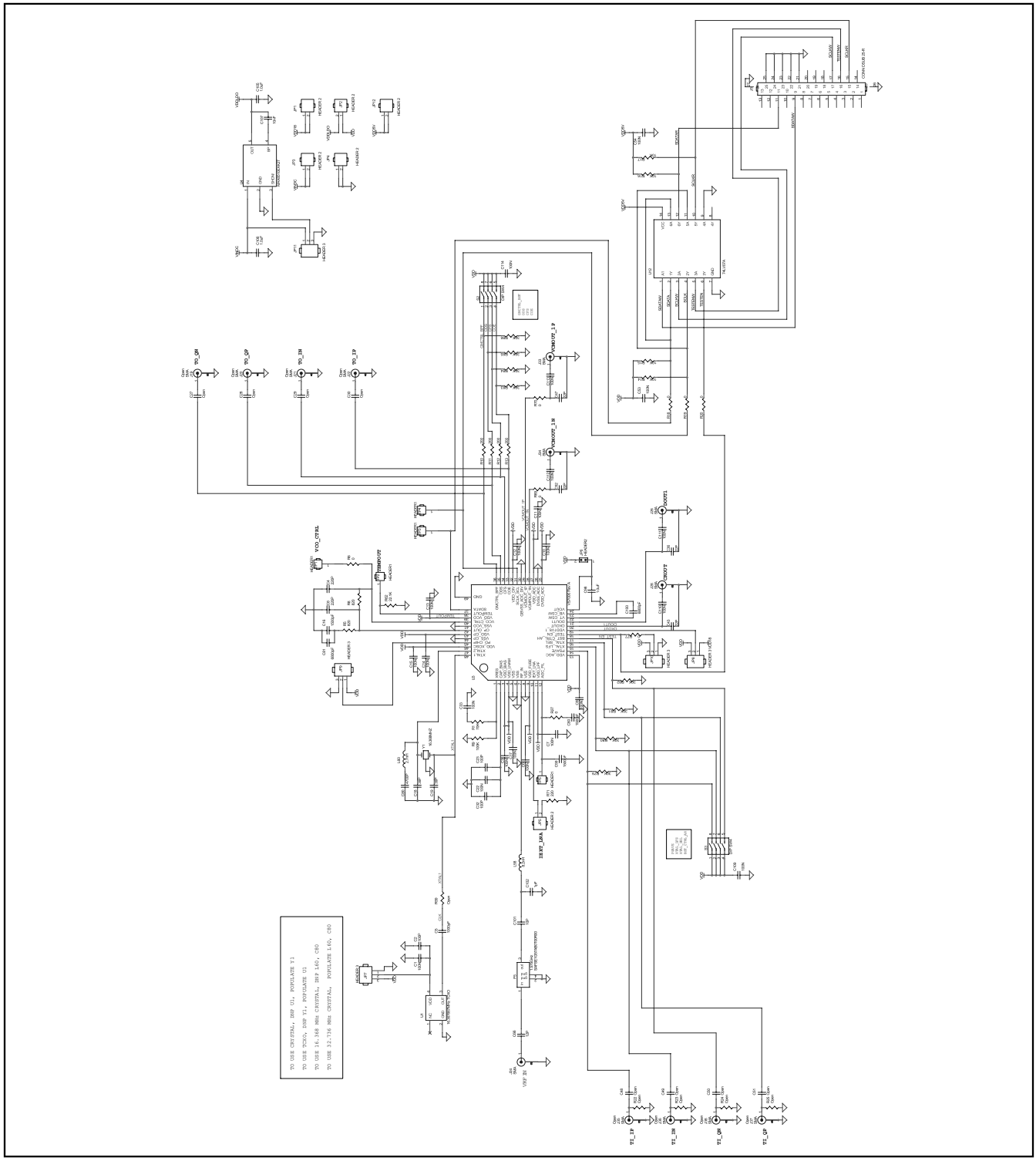

Figure 1. MAX2745 EV Kit Schematic

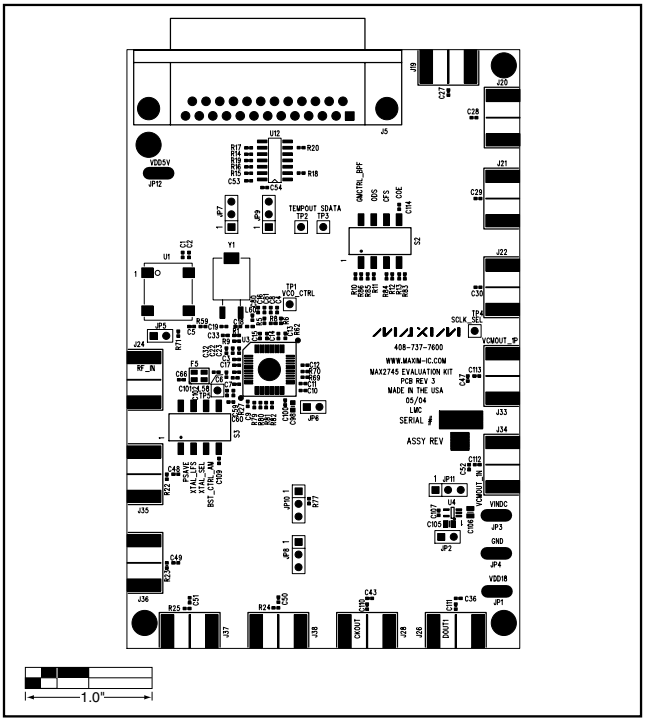

Figure 2. MAX2745 EV Kit Component Placement Guide—Component Side

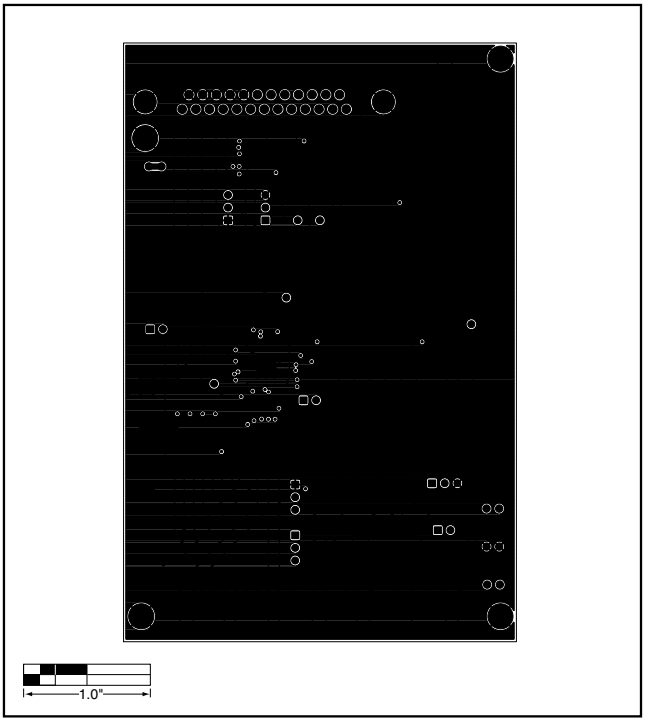

Figure 3. MAX2745 EV Kit PC Board Layout—Layer 2

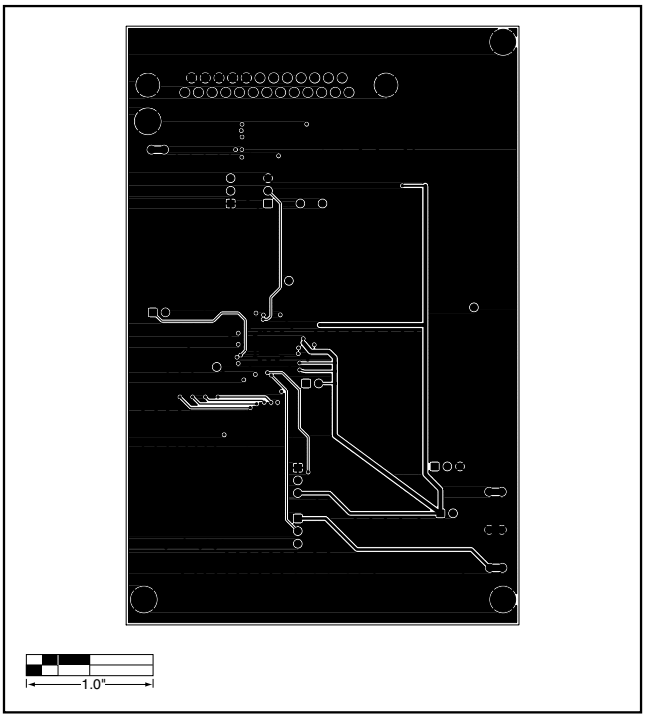

Figure 4. MAX2745 EV Kit PC Board Layout—Layer 3

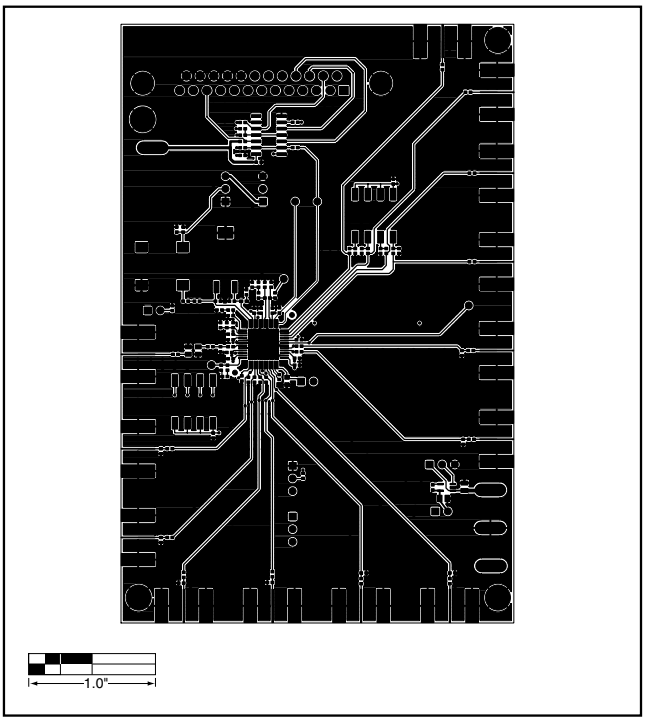

Figure 5. MAX2745 EV Kit PC Board Layout—Component Side

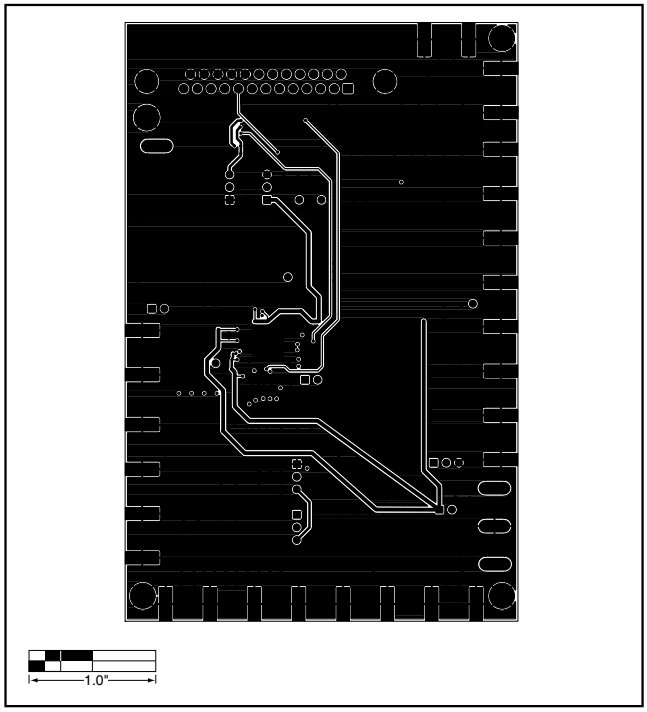

Figure 6. MAX2745 EV Kit PC Board Layout—Secondary Side