

# MAX2769/MAX2769B/MAX2769C Evaluation Kit

# Evaluates: MAX2769/MAX2769B/ MAX2769C

## General Description

The MAX2769/MAX2769B/MAX2769C evaluation kit (EV kit) simplifies evaluation of the MAX2769/MAX2769B/MAX2769C universal GPS receiver. It enables testing of the device performance and requires no additional support circuitry. Standard 50Ω SMA connectors are included on the EV kit for the inputs and outputs to allow for quick and easy evaluation on the test bench. The evaluation kit is fully assembled and tested at the factory.

This document provides a component list, a list of equipment required to evaluate the device, a straightforward test procedure to verify functionality, a description of the EV kit circuit, the circuit schematic, and artwork for each layer of the printed circuit board (PCB).

## Component List

| DESIGNATION  | QTY | DESCRIPTION   |
|--|-----|---|
| C1–C4, C7, C16–C19, C21, C22, C23, C41–C45, C48, C49, C50, C53, C54, C55 | 23  | 0.1μF ±10% capacitors (0402)<br>Murata GRM155R61A104K     |
| C5, C8–C12, C14, C31, C40, C56, C67                                      | 11  | 100pF ±5% capacitors (0402)<br>Murata GRM1555C1H101J      |
| C6, C61, C62   | 3   | 10μF ±10% tantalum capacitors (B case)<br>AVX TAJB106K016 |
| C15, C25, C27, C29, C30, C57, C58, C65                                   | 8   | 0.01μF ±10% capacitors (0402)<br>Murata GRM155R71C103K    |
| C24  | 1   | 27pF ±5% capacitor (0402)<br>Murata GRM1555C1H270J        |
| C26, C36   | 2   | 6800pF ±10% capacitors (0402)<br>Murata GRM155R71H682K    |
| C28  | 1   | 470pF ±10% capacitor (0402)<br>Murata GRM155R71H471K      |
| C32–C35, C37, C38, C39, C58, C66, C68, C69                               | 0   | Not installed, capacitors                                 |
| C46, C47, C51, C52   | 4   | 10pF ±5% capacitors (0402)<br>Murata GRM1555C1H10R0J      |
| C59, C60, C63, C64, C70  | 5   | 1.0μF ±10% capacitors (0402)<br>Murata GRM155R60J105K     |

## Features

- Easy Evaluation of the MAX2769/MAX2769B/MAX2769C IC
- +2.7V to +3.3V Single-Supply Operation
- 50Ω SMA Connector on the RF Ports and for the Baseband Outputs
- All Critical Peripheral Components Included
- Parallel Port for 3-Wire Interfacing
- PC Control Software Available Upon Request

## Ordering Information

| PART           | TYPE   |
|----------------|--------|
| MAX2769EVKIT+  | EV Kit |
| MAX2769BEVKIT# | EV Kit |
| MAX2769CEVKIT# | EV Kit |

+Denotes lead-free and RoHS compliant.

#Denotes RoHS compliant.

| DESIGNATION  | QTY | DESCRIPTION  |
|--|-----|--|
| J1, J2, J3, J6, J7, J8, J10, J11, J12  | 9   | SMA end-launch jack receptacles, 0.062in<br>Johnson 142-0701-801 |
| J9   | 1   | 2 x 5 dual inline header, 100-mil center<br>Sullins PEC36DAAN    |
| JDR1   | 1   | DB25 right-angle male connector<br>AMP 5747238-4                 |
| L2, L3   | 0   | Not installed, inductors   |
| R1, R26–R29, R35–R43, R56  | 0   | Not installed, resistors   |
| R2, R10, R17, R21, R22, R23, R31–R34, R44–R55, R57, R59, R60, R66, R67, R68, R71 | 29  | 0Ω ±5% resistors (0402)  |
| R4, R24, R25   | 3   | 20kΩ ±5% resistors (0402)  |
| R5–R9, R30, R61–R65, R69, R70  | 13  | 10kΩ ±1% resistors (0402)  |
| R11, R14, R15  | 3   | 47.5Ω ±1% resistors (0402)                                       |
| R12, R13, R18, R19   | 4   | 75Ω ±1% resistors (0402)   |
| R16  | 1   | 22.1Ω ±1% resistor (0402)  |
| R20  | 1   | 100kΩ ±1% resistor (0402)  |
| T1, T2, T3   | 0   | Not installed  |
| TP1–TP5, TP10, TP11, TP15  | 8   | PC mini-red test points<br>Keystone 5000                         |

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## Component List (continued)

| DESIGNATION   | QTY | DESCRIPTION  |
|---------------|-----|--|
| U1, U2        | 2   | MAX8510EXK29+ ultra-low-noise, high PSRR, low-dropout, 120mA linear regulators                     |
| U8            | 1   | 16.368MHz TCXO<br>Rakon IT3205BE   |
| U10, U11, U28 | 0   | Not installed  |
| U12, U18      | 2   | MAX4444ESE+ ultra-high-speed, low-distortion, differential-to-single-ended line receivers          |
| U14           | 1   | MAX4447ESE+ 6500V/ $\mu$ s wideband, high-output-current, single-ended-to-differential line driver |
| U21           | 1   | MAX2769ETI+ low-power, single-conversion, low-IF GPS receiver                                      |

| DESIGNATION                | QTY | DESCRIPTION   |
|----------------------------|-----|---|
| U23                        | 1   | SN74LV07ADR hex buffer/driver with open-drain output Texas Instruments SN74LV 07ADR   |
| W1–W12, W18, W19, W20, W28 | 16  | 1 x 2 inline headers, 100-mil center<br>Sullins PEC36SAAN                             |
| W13–W17, W23               | 6   | 1 x 3-inline headers, 100-mil center<br>Sullins PEC36SAAN                             |
| Y2                         | 0   | Not installed   |
| —                          | 17  | Shorting jumpers, gold finish contact (W1–W9, W13–W18, W23, W28)<br>Sullins SSC02SYAN |

## Component Suppliers

| SUPPLIER              | WEBSITE        |
|-----------------------|----------------|
| AVX Corp.             | www.avx.com    |
| Murata Mfg. Co., Ltd. | www.murata.com |
| Rakon Ltd.            | www.rakon.com  |
| Texas Instruments     | www.ti.com     |

**Note:** Indicate that you are using the MAX2769/MAX2769B/MAX2769C when contacting these component suppliers.

## Quick Start

The MAX2769/MAX2769B/MAX2769C EV kit includes two on-board MAX8510 linear regulators for powering up the MAX2769/MAX2769B/MAX2769C device to a regulated supply voltage of +2.85V. When using the linear regulators, connect pins 1-2 of jumpers W16 and W17. The MAX2769/MAX2769B/MAX2769C can also be powered directly through an external power supply through pin 2 of the jumpers (see [Figure 1](#) for details).

## Required Test Equipment

This section lists the recommended test equipment to verify operation of the MAX2769/MAX2769B/MAX2769C. It is intended as a guide only and some substitutions are possible.

- One RF signal generator capable of delivering at least +5dBm of output power at the operating frequency (e.g., HP E4433B or equivalent)

- An RF spectrum analyzer that covers the MAX2769/MAX2769B/MAX2769C operating frequency range (e.g., FSEB20, or equivalent)
- A power supply capable of up to 1A at +2.7V to +6V
- One ammeter for measuring the supply current (optional)
- 50 $\Omega$  SMA cables
- A network analyzer (e.g., HP 8753D or equivalent) to measure small-signal return loss (optional)
- A dual power supply capable of delivering up to 1A at  $\pm$ 5V
- A user-supplied IBM-compatible PC
- Oscilloscope or logic analyzer to measure digital outputs (optional)

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## Connections and Setup

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

- 1) Connect the PC to the INTF3000 interface board using the USB cable. On the INTF3000, remove jumper JU1, and connect a DC supply set to +3V to the VPULL connector. Connect the 25-pin connector of the INTF3000 (J4) directly to the 25-pin connector of the EV kit (JDR1).
- 2) Connect a DC supply set to +3V (through an ammeter if desired) to jumpers W19 and W20 on the EV kit. Do not turn on the supply. When using the on-board linear regulators to power the MAX2769/MAX2769B/MAX2769C, connect pins 1-2 of jumpers W16 and W17.
- 3) Connect a DC supply set to +5V to jumper W12 on the EV kit. Connect a DC supply set to -5V to jumper W11 on the EV kit. Do not turn on the supply.
- 4) Make sure that jumpers W1–W9 and W18 are shorted for proper supply connection.
- 5) Leave jumpers W13, W14, W15, and W28 open and connect jumper W23 to ground (pins 1-2) if the MAX2769/MAX2769B/MAX2769C is evaluated using a 3-wire bus.
- 6) Set the signal generator to 1575.42MHz, -110dBm. Do not turn on the generator's output. Connect the RF signal generator to the LNA1 input.
- 7) Connect LNA\_OUT SMA connector (J8) to the MIX\_IN SMA connector (J12) on the EV kit.
- 8) Connect the output of the MAX4444 buffer (connector J3) on the EV kit to a spectrum analyzer.
- 9) Turn on the DC supply. The supply current should read approximately **20mA**.
- 10) Visit [HERE](#) to download the latest version of the EV kit software, *Max2769A\_Setup\_2-0-1.exe* (for MAX2769EVK), *Max2769B\_Setup\_2-0-1.exe* (for MAX2769BEVK), or *MAX2769C\_Setup\_1.0.0.exe* (for MAX2769CEVK). Run the installation file.
- 11) Run the control software on an IBM-compatible PC. Load the default state by clicking Settings, then

defaults, also set the  $\overline{\text{SHDN}}$  and  $\overline{\text{IDEL}}$  pins to 1, under “Entry” page, Hardware Control section. Upon device power-up, the default state should set the MAX2769 device in automatic-gain-control mode (AGCMODE = 00, PGAIEN = 1, and PGAQEN = 0). The default configuration will set the center frequency to 3.9MHz and a bandwidth of 2.5MHz. Using the control software, configure the following:

- a) In the “Entry” page of the graphical user interface (GUI), set the reference frequency to 16.368MHz.
  - b) Set the R divider to 16.
  - c) Enable the I and Q channels by setting the IQ enable = 1.
  - d) Set the “output level” to 1X = analog outputs through the “Entry” page or configuration register 2.
- 12) Activate the RF generator and observe the IF signal at 4.092MHz at an I\_OUT\_ANA SMA connector J3.
  - 13) Set the “output level” to 00 = CMOS logic through the “Entry” page and observe the ADC digital output at J9A–J9D header pins.

## Layout Issues

A good PCB is an essential part of an RF circuit design. The EV kit PCB can serve as a guide for laying out a board using the devices. Keep traces carrying RF signals as short as possible to minimize radiation and insertion loss. Use impedance control on all RF signal traces. The exposed paddle must be soldered evenly to the board's ground plane for proper operation. Use abundant throughputs beneath the exposed paddle and between RF traces to minimize undesired RF coupling.

To minimize coupling between different sections of the IC, each  $V_{CC}$  pin must have a bypass capacitor with low impedance to the closest ground at the frequency of interest. Do not share ground vias among multiple connections to the PCB ground plane. Refer to the *Layout Issues* section of the MAX2769/MAX2769B/MAX2769C IC data sheet for more information.

# MAX2769/MAX2769B/MAX2769C Evaluation Kit

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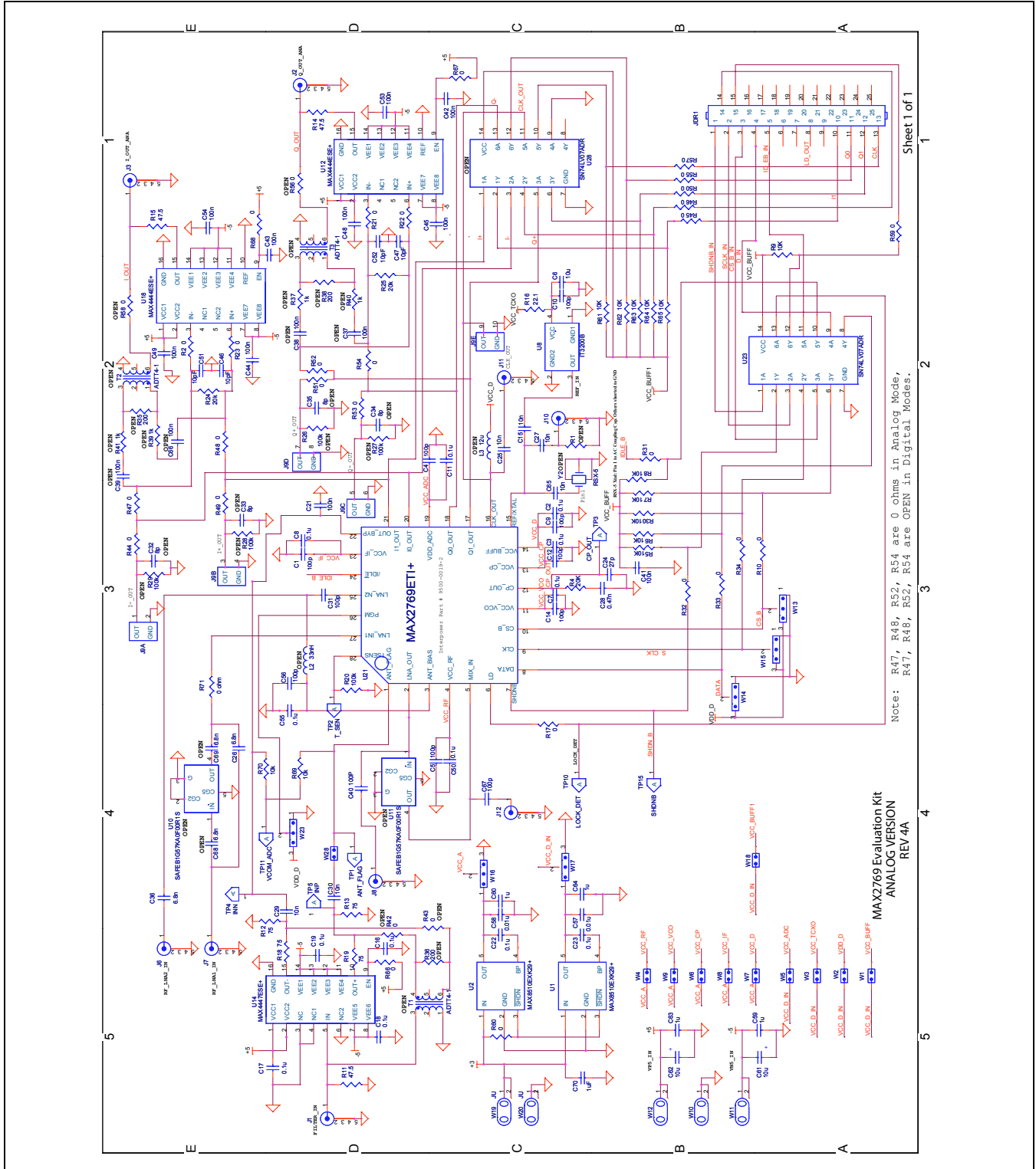


Figure 1. MAX2769/MAX2769B/MAX2769C EV Kit Schematic

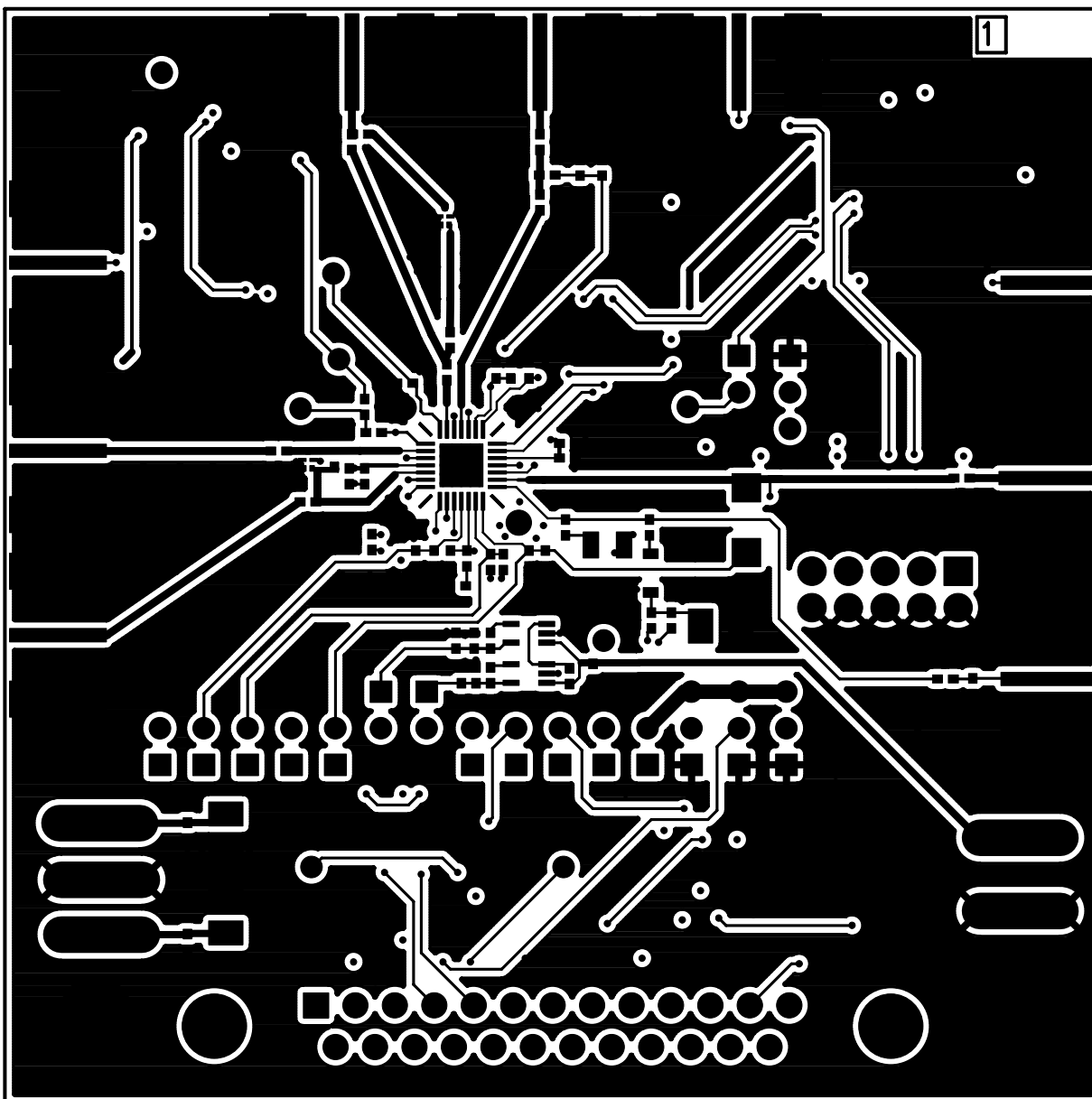


Figure 2. MAX2769/MAX2769B/MAX2769C EV Kit PCB Layout—Top Layer Metal

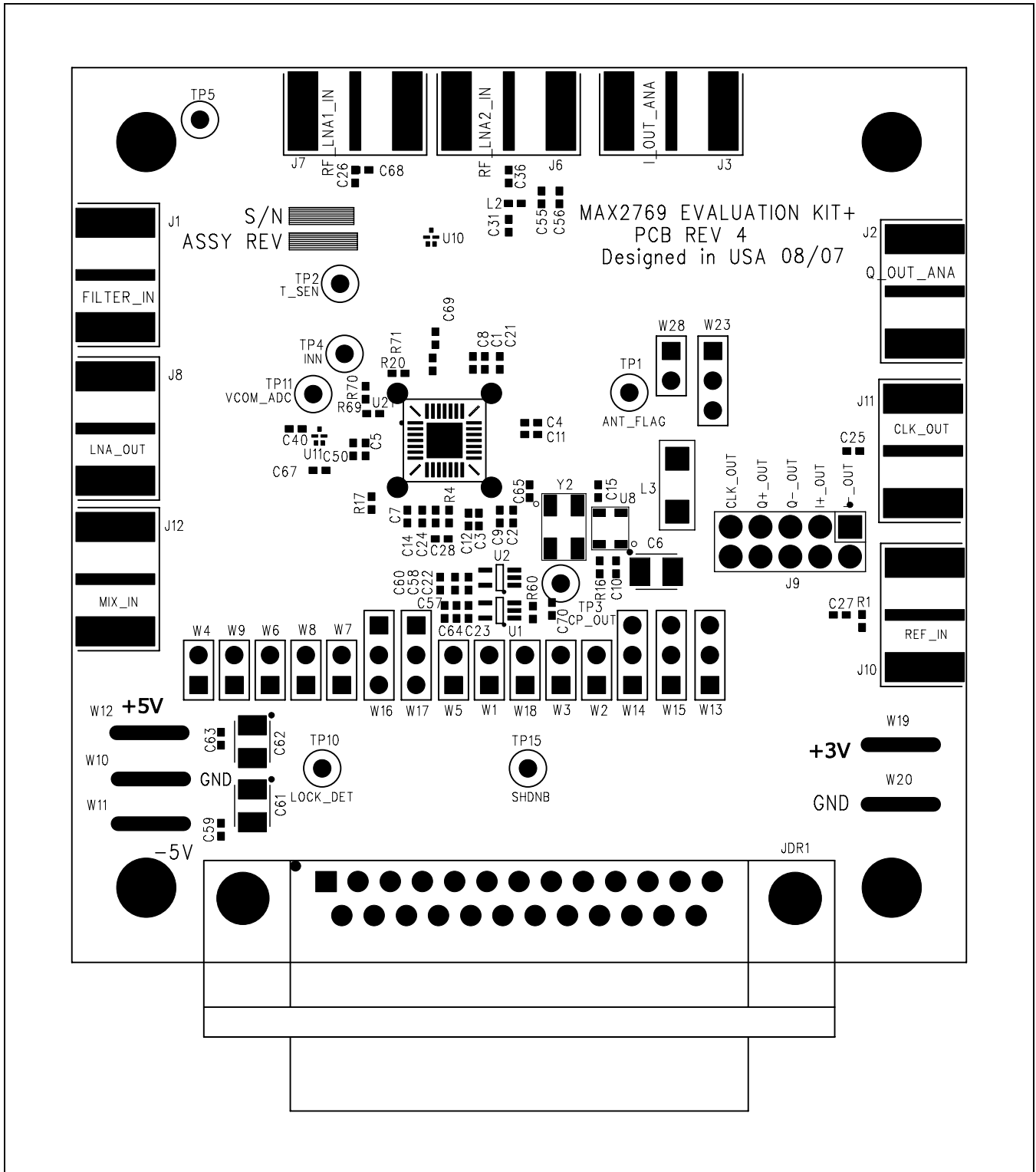


Figure 3. MAX2769/MAX2769B/MAX2769C EV Kit PCB Layout—Top Silkscreen

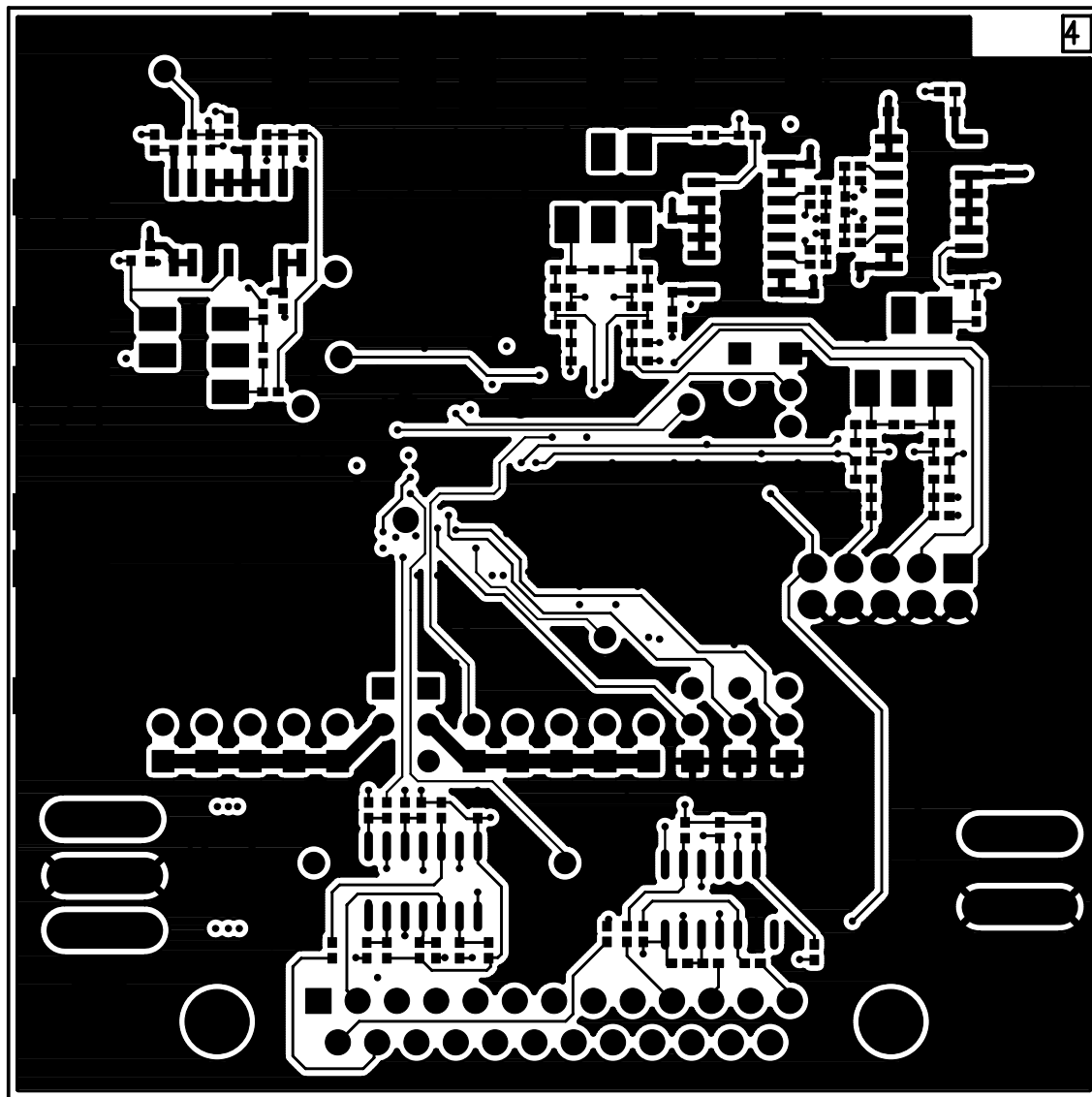


Figure 4. MAX2769/MAX2769B/MAX2769C EV Kit PCB Layout—Bottom Layer Metal

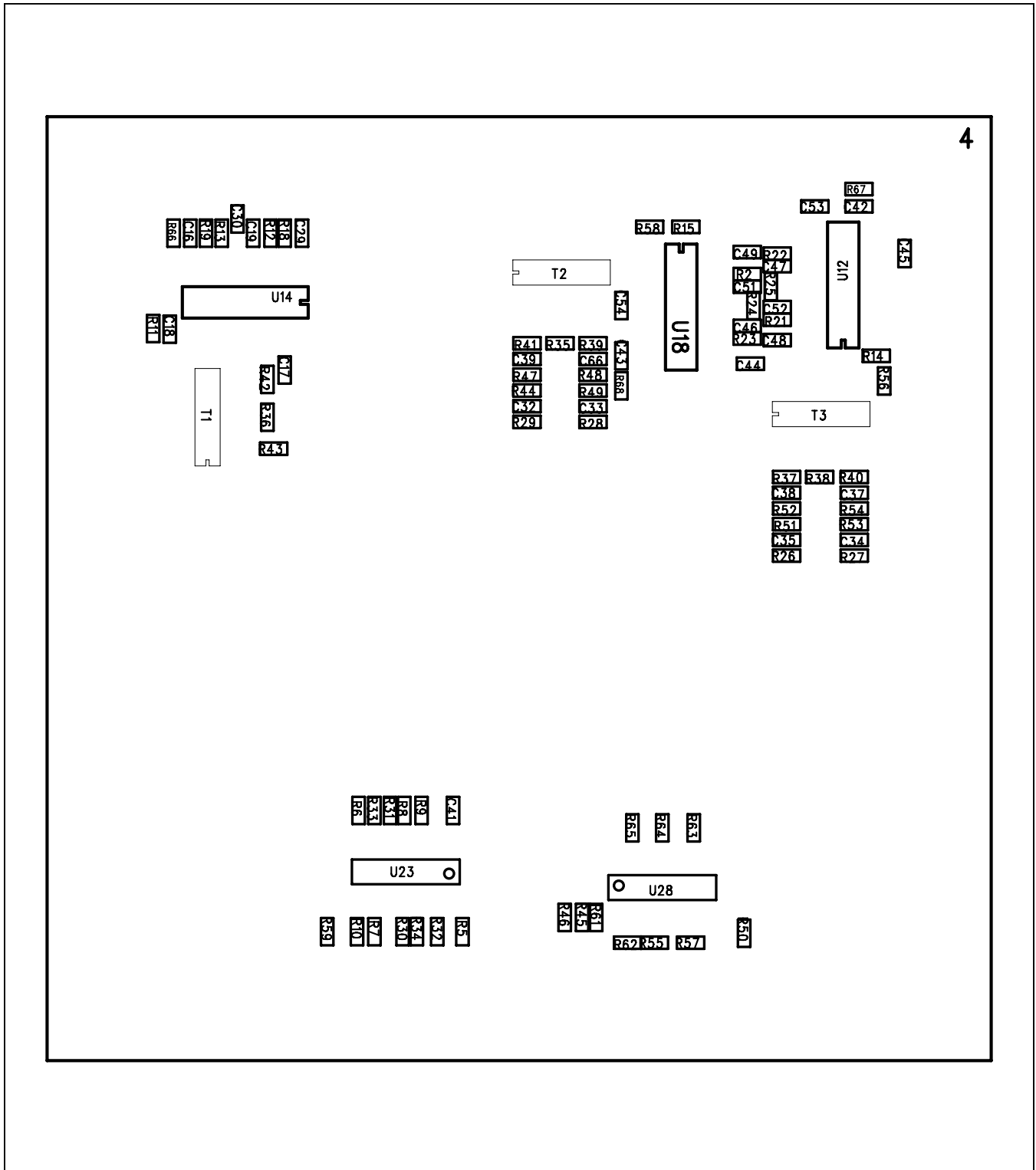


Figure 5. MAX2769/MAX2769B/MAX2769C EV Kit PCB Layout—Bottom Silkscreen



## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION   | PAGES CHANGED |
|-----------------|---------------|---|---------------|
| 0               | 9/07          | Initial release   | —             |
| 1               | 7/14          | Updated step 1 in the <i>Connections and Setup</i> section        | 2             |
| 2               | 3/16          | Added MAX2769B  | 1–9           |
| 3               | 8/16          | Added MAX2769C part number and updated Center Frequency to 3.9MHz | 1–9           |

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at [www.maximintegrated.com](http://www.maximintegrated.com).

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