19-4291; Rev 0; 10/08

MAX4951 Evaluation Kit

Evaluates: MAX4951

General Description

The MAX4951 evaluation kit (EV kit) provides a proven design to evaluate the MAX4951 dual-channel buffer. The EV kit contains four sections: an application circuit, a characterization circuit, and two calibration traces.

The application circuit is designed to demonstrate the use of the MAX4951 in redriving serial-ATA (SATA) and eSATA Gen I and Gen II signals. This section of the EV kit operates from an external +5V supply that is regulated by an on-board LDO to +3.3V, which powers the MAX4951 (U1) device. All traces in the application circuit are 100Ω differential controlled impedance.

The characterization circuit is provided for eye diagram evaluation using SMA connectors and 50Ω controlled impedance traces. This section is powered by an external +3.3V supply.

Features

- **Application Circuit with SATA Input/Output**
- **Eye Diagram Test Circuit with SMA Inputs/Outputs**
- **Calibration Traces (50Ω Load Trace and Through Trace)**
- **Lead-Free and RoHS Compliant**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX4951EVKIT+	EV Kit

+Denotes lead-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
C1–C8, C14–C17, C22–C25	16	0.01µF ±10%, 25V X7R ceramic capacitors (0402) Murata GRM155R71E103KA TDK C1005X7R1E103K
C9, C18, C26, C27	4	1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C105K TDK C1608X7R1C105K
C10–C13, C19, C20, C21	7	0.1µF ±10%, 16V X7R ceramic capacitors (0402) Murata GRM155R71C104K TDK C1005X7R1C104K
D1	1	Green LED (0603)
H1	1	Disk drive power connector
J1, J2	2	7-position SATA vertical connectors
JU1, JU2, JU3, JU5, JU7	5	3-pin headers, 0.1in centers
JU4	1	2-pin header, 0.1in centers
JU6	0	Not installed, 3-pin header
P1–P10	10	Edge-mount receptacle SMA connectors Johnson 142-0701-851
R1	1	200Ω ±5% resistor (0603)
R2, R3	2	49.9Ω ±1% resistors (0603)
U1, U2	2	SATA I/II bidirectional redrivers (20 TQFN-EP*) MAX4951CTP+
U3	1	+3.3V regulator (6 SOT23) MAX6329TPUT-T+ (Top Mark: AAIP)
—	6	Shunts
—	1	PCB: MAX4951 Evaluation Kit+

**EP = Exposed pad.*

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
TDK Corp.	847-803-6100	www.component.tdk.com

Note: *Indicate that you are using the MAX4951 when contacting these component suppliers.*

___Quick Start (Application Circuit)

Recommended Equipment

Before beginning, the following equipment is needed:

- MAX4951 EV kit
- +5V power supply
- Two SATA-to-SATA or eSATA-to-SATA cables
- SATA device (e.g., a hard drive)
- SATA host (e.g., a PC)

Procedure

The MAX4951 EV kit is fully assembled and tested. Follow the steps below to verify board operation:

1) Verify that all jumpers are in their default position, as shown in Table 1.
2) Connect the first SATA-to-SATA/eSATA-to-SATA cable from the PC to the host (J1) connector on the EV kit.
3) Connect the second SATA-to-SATA/eSATA-to-SATA cable from the device (J2) connector to the SATA device.
4) Verify communication between the host PC and SATA device.

Table 1. Default Shunt Positions

JUMPER	SHUNT POSITION
JU1, JU4, JU5	1-2
JU2, JU3, JU7	2-3

_Detailed Description of Hardware

The MAX4951 evaluation kit (EV kit) evaluates the MAX4951 dual-channel buffer. The MAX4951 is designed to redrive serial-ATA (SATA) and eSATA Gen I and Gen II signals. The EV kit is divided into four sections: application circuit, characterization circuit, and two calibration traces.

The application circuit utilizes 100Ω differential controlled impedance traces and provides two SATA connectors (J1 and J2), allowing for evaluation of the MAX4951 in a SATA environment. The characterization circuit utilizes 50Ω controlled impedance traces and SMA input/output connectors, allowing for eye diagrams and input/output return loss measurements.

The lower half of the EV kit provides two sets of calibration traces, all of which are matched to the trace lengths in the characterization circuit. These traces provide a reference for determining the performance of the MAX4951 device only, when evaluated in the characterization circuit.

Application Circuit (U1)

The application circuit (U1) provides the means for evaluating the MAX4951 in a SATA application. This section of the EV kit provides two SATA connectors (J1 and J2), one for connection to a SATA host (e.g., PC) and the other for connection to a SATA device (e.g., hard drive).

Input Supply (VIN)

The application circuit must be powered by +3.3V. There are two ways to get this voltage, through the on-board LDO (U3) or connecting directly to a +3.3V supply. When using the on-board voltage regulator, the LDO can be powered by the 4-pin Molex connector (H1) or by a +5V external supply connected to the VIN and GND pads. When using the on-board LDO to supply power, there is a power LED (D1) to indicate the presence of +3.3V at VCC.

The user can also connect directly to a +3.3V supply, which is available on a SATA power connector. The shunt should be removed from jumper JU4 and a wire connected from the SATA power pin to pin 2 (rightmost pin) of jumper JU4 (see Table 2).

Table 2. Jumper JU4 Function

SHUNT POSITION	VCC PIN (U1)	DESCRIPTION
Installed*	Connected to on-board LDO output	U1 powered by LDO output, +3.3V
Not installed	Connected to external supply	Powered by +3.3V from an external supply or SATA power connector

**Default position.*

Device Enable (JU1)

The MAX4951 (U1) is enabled/disabled by configuring jumper JU1 (see Table 3). When disabled, the MAX4951 buffers are disabled and the part is placed in a low-power standby mode.

Table 3. Jumper JU1 Function

SHUNT POSITION	EN PIN (U1)	DESCRIPTION
1-2*	Connected to +3.3V	Buffers enabled for normal operation
2-3	Connected to GND	Buffers disabled and device is in low-power standby mode

**Default position.*

Output Boost Control (JU2, JU3)

The MAX4951 host and device can be evaluated with standard SATA output levels or with boosted output levels. Configure JU2 to enable/disable the host output boost and JU3 to enable/disable the device output boost (see Tables 4 and 5, respectively).

Table 4. Jumper JU2 Function

SHUNT POSITION	BB PIN (U1)	DESCRIPTION
1-2	Connected to +3.3V	Host output boost enabled
2-3*	Connected to GND	Host output boost disabled; standard SATA output levels
Not installed	Not connected	

**Default position.*

Table 5. Jumper JU3 Function

SHUNT POSITION	BA PIN (U1)	DESCRIPTION
1-2	Connected to +3.3V	Device output boost enabled
2-3*	Connected to GND	Device output boost disabled; standard SATA output levels
Not Installed	Not connected	

**Default position.*

Characterization Circuit (U2)

The characterization circuit (U2) is provided as a separate test circuit for eye diagram evaluation of the MAX4951 IC. This circuit provides differential SMA inputs and outputs with 50Ω controlled impedance traces. Channel B is not utilized in this section of the EV kit, but provides the same performance as channel A.

Input Supply (VCC)

The characterization circuit is powered by an external +3.3V power supply connected between the VCC and GND pads.

Device Enable (JU5)

The MAX4951 (U2) is enabled/disabled by configuring jumper JU5 (see Table 6). When disabled, the MAX4951 buffers are disabled and the part is placed in a low-power standby mode.

Table 6. Jumper JU5 Function

SHUNT POSITION	EN PIN (U2)	DESCRIPTION
1-2*	Connected to +3.3V	Buffers enabled for normal operation
2-3	Connected to GND	Buffers disabled and device is in low-power standby mode

**Default position.*

Output Boost Control (JU7)

The MAX4951 channel A can be evaluated with standard SATA output levels or with boosted output levels. Configure JU7 to enable/disable channel A's output boost (see Table 7).

Table 7. Jumper JU7 Function

SHUNT POSITION	BA PIN (U2)	DESCRIPTION
1-2	Connected to +3.3V	Channel A output boost enabled
2-3*	Connected to GND	Channel A output boost disabled; standard SATA output levels
Not installed	Not connected	

**Default position.*

Calibration Traces

The lower half of the EV kit provides two sets of calibration traces that can be used for further analysis. The lengths of the calibration traces are matched to the traces going from the SMA connector to MAX4951 (U2) of the characterization circuit. The first calibration trace includes a 50Ω load termination and the second calibration trace is a through trace.

MAX4951 Evaluation Kit

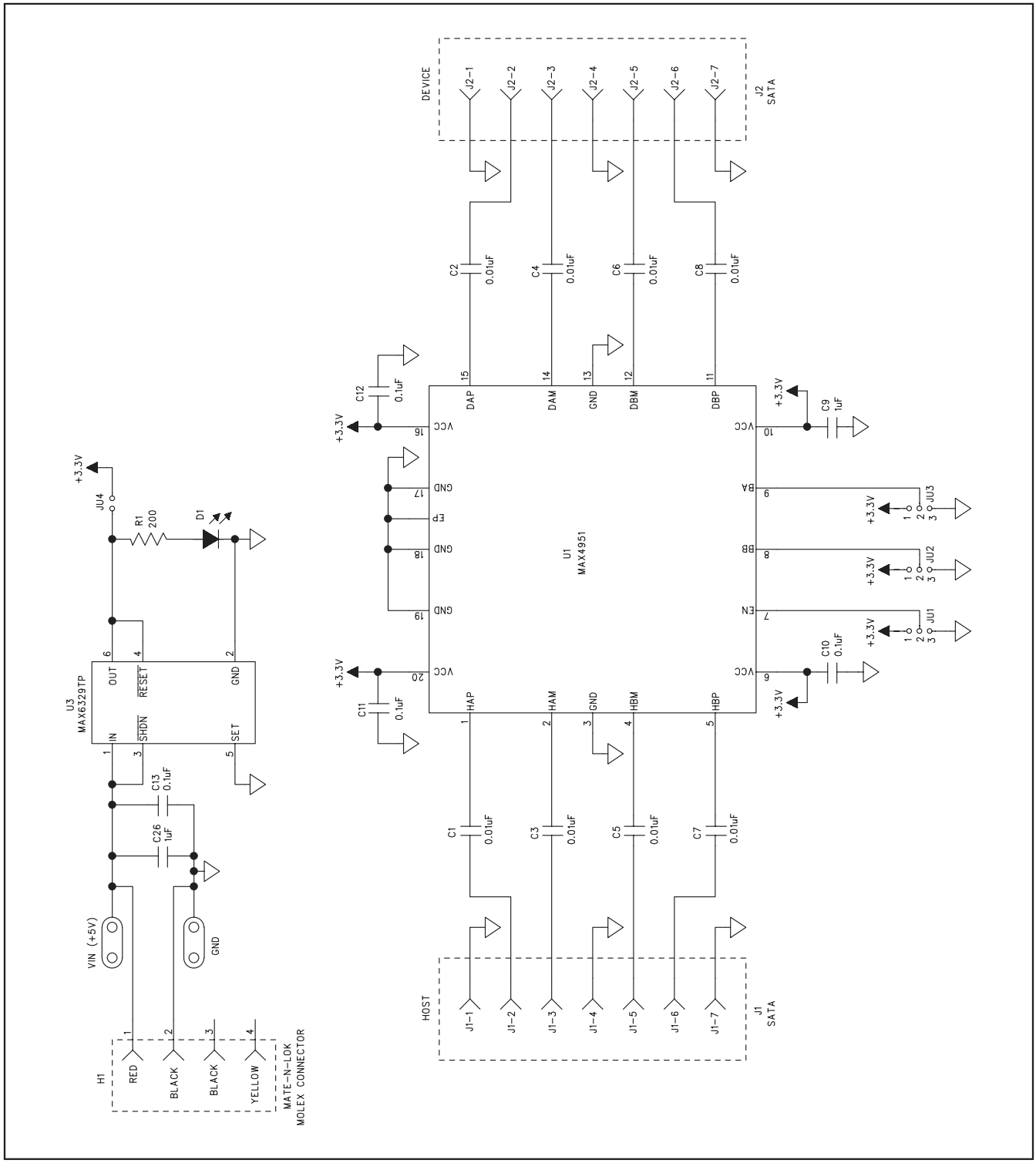

Figure 1a. MAX4951 EV Kit Schematic (Sheet 1 of 3)

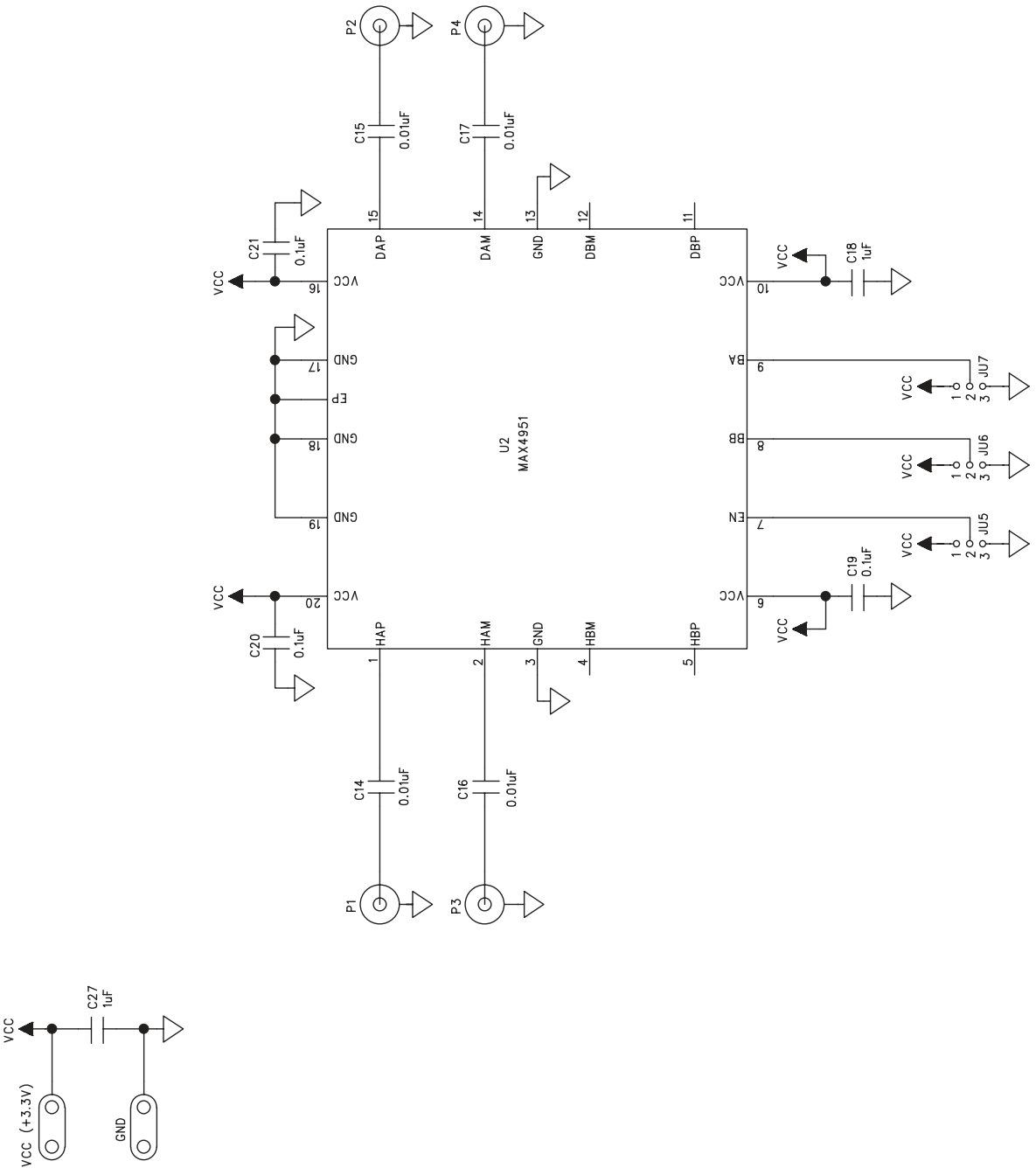

Figure 1b. MAX4951 EV Kit Schematic (Sheet 2 of 3)

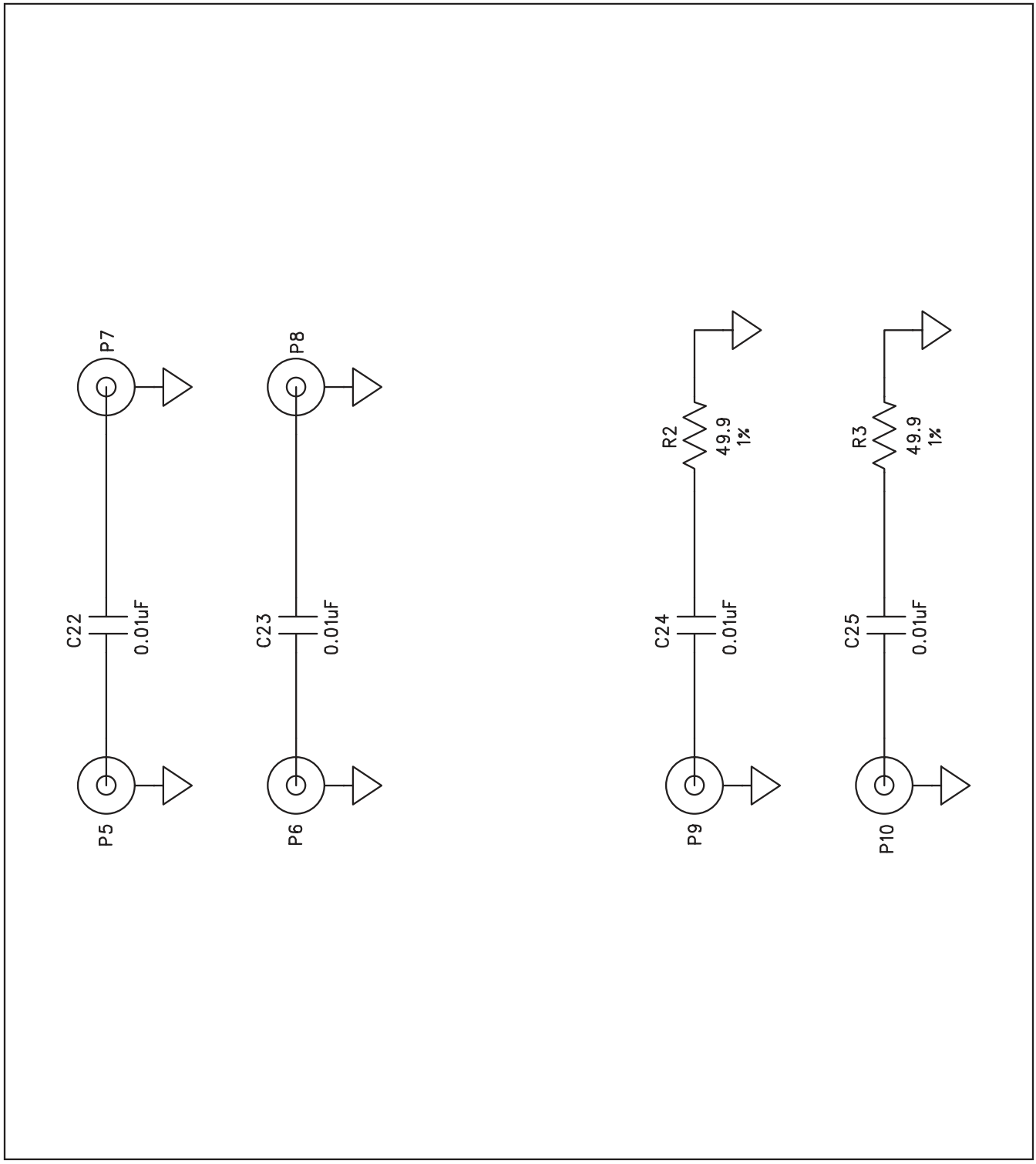

Figure 1c. MAX4951 EV Kit Schematic (Sheet 3 of 3)

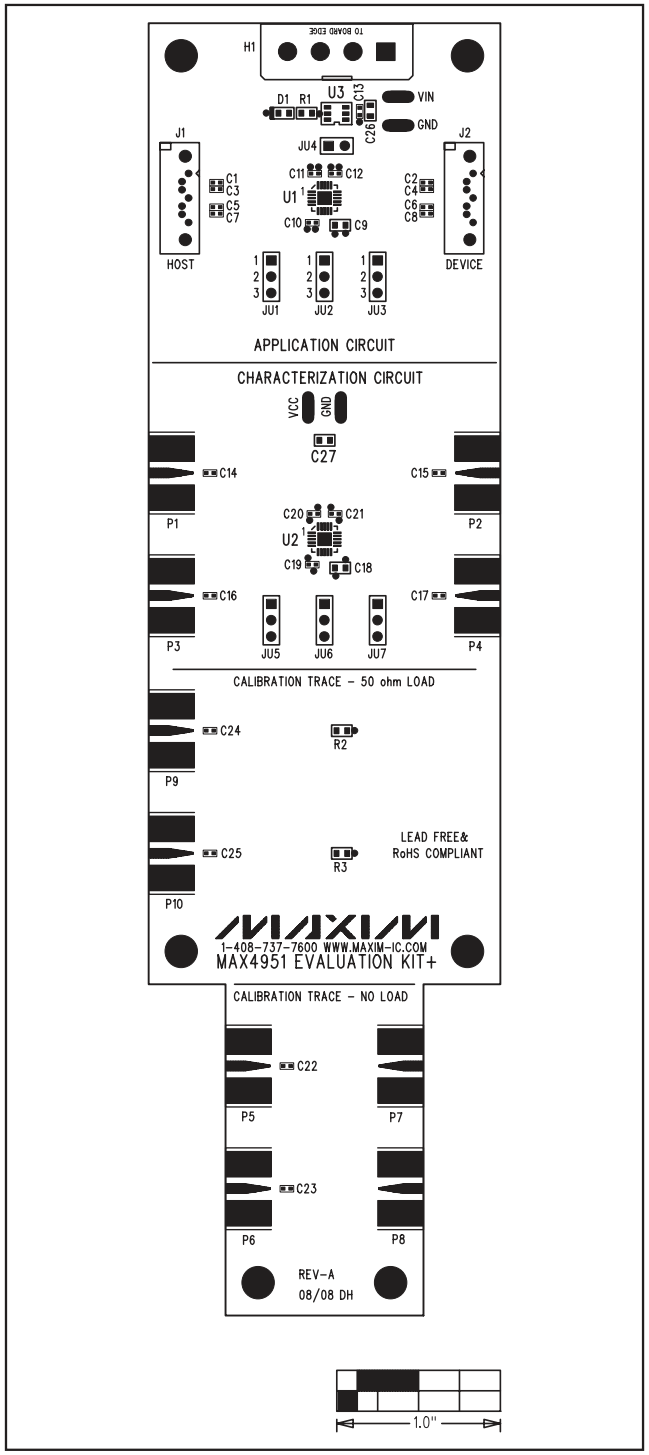

Figure 2. MAX4951 EV Kit Component Placement Guide—Component Side

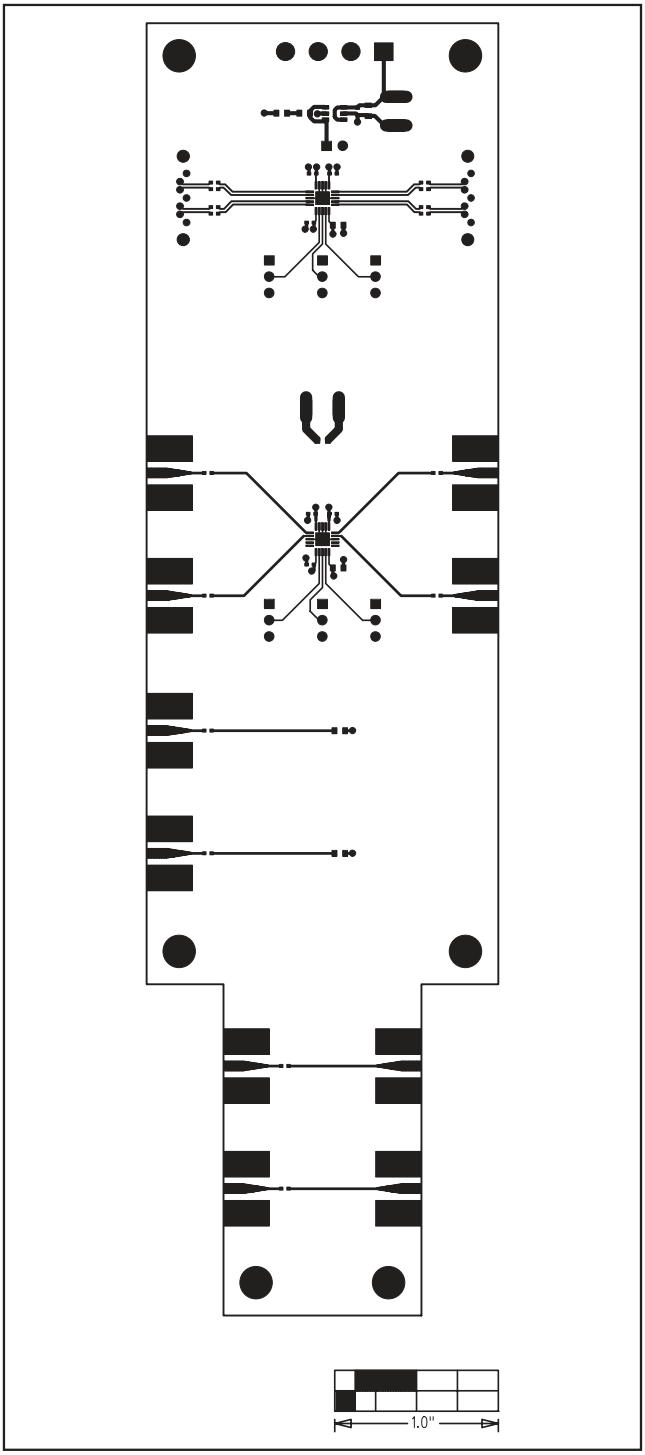

Figure 3. MAX4951 EV Kit Component PCB Layout—Component Side

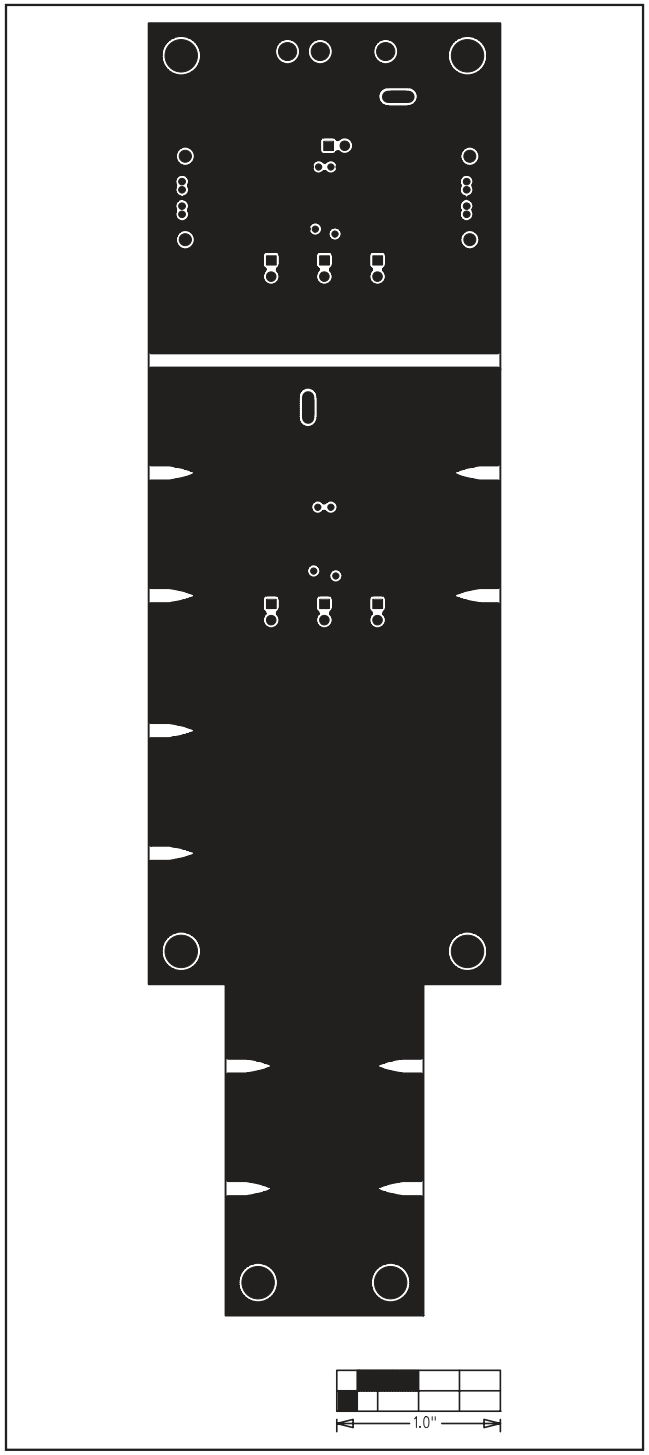

Figure 4. MAX4951 EV Kit PCB Layout—Inner Layer 2

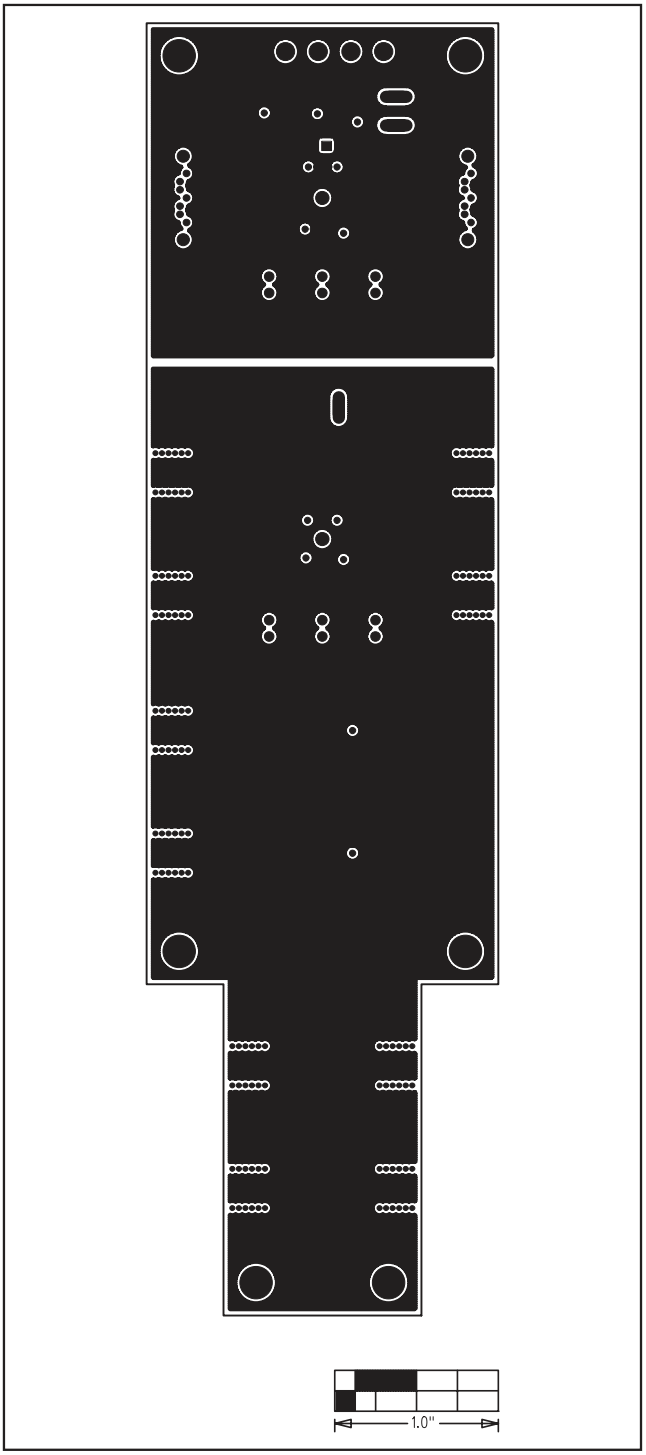

Figure 5. MAX4951 EV Kit PCB Layout—Inner Layer 3

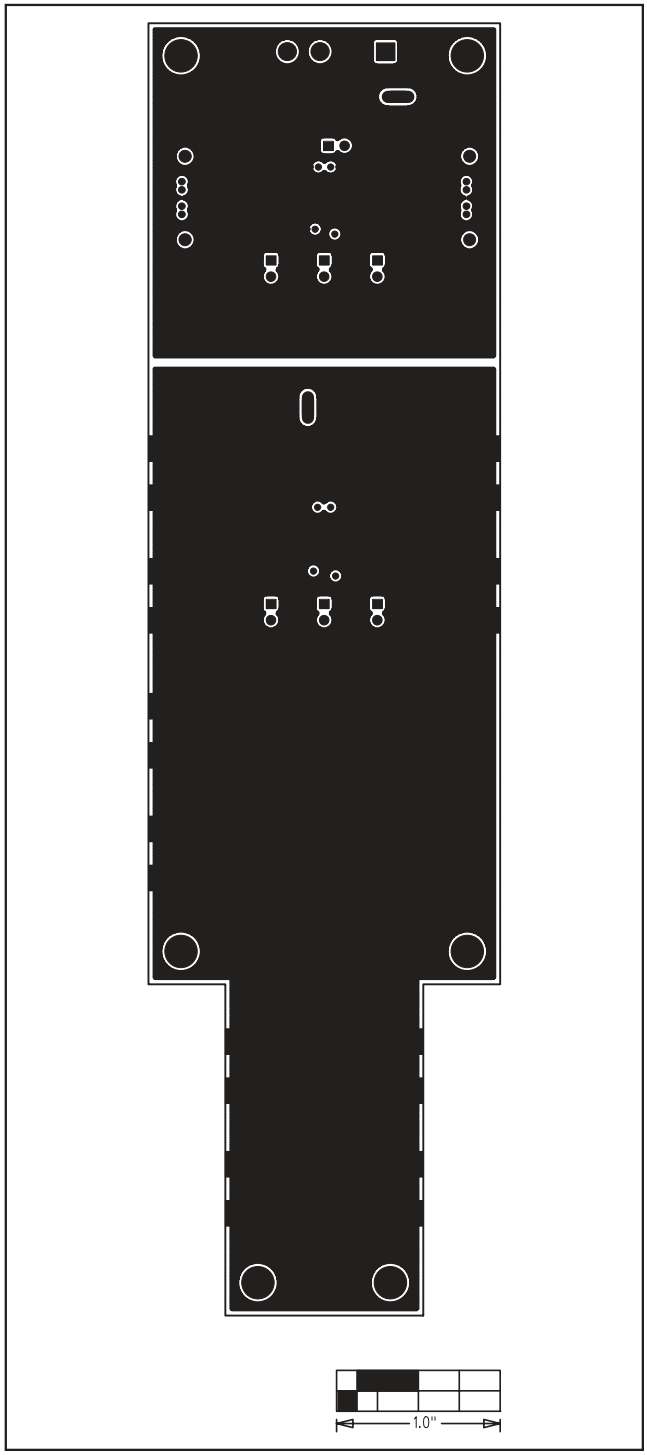

Figure 6. MAX4951 EV Kit PCB Layout—Solder Side