19-5059; Rev 1; 4/10

MAX4951B Evaluation Kit

Evaluates: MAX4951BE

General Description

The MAX4951B evaluation kit (EV kit) provides a proven design to evaluate the MAX4951BE dual-channel redriver. The EV kit contains four sections: application circuit, characterization circuit, and two sets of calibration traces.

The application circuit is designed to demonstrate the MAX4951BE IC's use in redriving Serial-ATA (SATA) and external SATA (eSATA) signals and SATA cable-detection feature. 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 MAX4951BE (U1) device. All traces in the application circuit are 100Ω differential controlled-impedance traces.

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 power supply.

Features

- **Application Circuit with SATA Input/Output**
- **On-Board Standard 4-Pin Molex Connector**
- **Characterization Circuit with SMA Inputs/Outputs**
- **Calibration Traces (50Ω Load Trace and Through Trace)**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX4951BEVKIT+	EV Kit

+Denotes lead(Pb)-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
C28	1	4.7µF ±10%, 10V X7R ceramic capacitor (0805) Murata GRM21BR71A475K
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, JU8, JU9	0	Not installed, 3-pin headers
P1–P10	10	Edge-mount receptacle SMA connectors
R1	1	200Ω ±5% resistor (0603)
R2, R3	2	49.9Ω ±1% resistors (0603)
R4, R6	2	0Ω resistors (0603)
R5	0	Not installed, resistor (0603)
U1, U2	2	SATA/eSATA bidirectional redrivers (20 TQFN-EP*) Maxim MAX4951BECTP+
U3	1	3.3V regulator (6 SOT23) Maxim MAX6329TPUT-T+ (Top Mark: AAIP)
—	6	Shunts
—	1	PCB: MAX4951B EVALUATION KIT+

**EP = Exposed pad.*

MAX4951B Evaluation Kit

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 MAX4951BE when contacting these component suppliers.*

Quick Start (Application Circuit)

Recommended Equipment

- MAX4951B EV kit
- +5V power supply
- Two SATA cables
- SATA device (e.g., formatted hard drive)
- SATA host (e.g., PC)

Procedure

The MAX4951B EV kit is fully assembled and tested. Follow the steps below to verify board operation:

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

Table 1. Default Shunt Positions

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

Detailed Description of Hardware

The MAX4951B evaluation kit (EV kit) evaluates the MAX4951BE dual-channel redriver. The MAX4951BE is designed to redrive Serial-ATA (SATA) and external SATA (eSATA) signals. The EV kit is divided into four sections: application circuit, characterization circuit, and two sets of calibration traces.

The application circuit utilizes 100Ω differential controlled-impedance traces and provides two SATA connectors (J1, J2), allowing for evaluation of the MAX4951BE 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 MAX4951B 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 only the MAX4951BE device when evaluated in the characterization circuit.

The MAX4951BE has a cable-detect feature ($\overline{CAD}$) that reduces power consumption to < 1mA when a drive is not connected, and permits normal functionality, when a cable and drive are connected to J2.

Application Circuit (U1)

The application circuit provides the means for evaluating the MAX4951BE in a SATA application. This section of the EV kit provides two SATA connectors (J1, J2), one for connection to a SATA host (e.g., PC) and the other for connection to a SATA device (e.g., hard drive). If evaluating in an eSATA application, a certified SATA-to-eSATA user-supplied cable should be used.

Power Supply (VIN)

The MAX4951BE must be powered by +3.3V. There are two ways to get this voltage, through the on-board LDO (U3) or by connecting directly to a +3.3V power 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 the +3.3V supply or SATA power can be connected to the +3.3V pad (see Table 2).

Device Enable (JU1)

The MAX4951BE (U1) is enabled/disabled by configuring jumper JU1 (see Table 3). When disabled, the MAX4951BE buffers are powered down and the part is placed in a low-power mode. When enabled, and no SATA device is plugged in ($\overline{CAD}$ is unconnected), the device enters a low-power mode. Once a SATA device is plugged in ($\overline{CAD}$ grounded), the device goes into active mode.

Output Preemphasis (JU2, JU3)

The MAX4951BE host and device can be evaluated with or without preemphasis. Configure jumper JU2 to enable/disable the channel B output (BOUTP, BOUTM) preemphasis and jumper JU3 to enable/disable the channel A output (AOUTP, AOUTM) preemphasis (see Tables 4 and 5).

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	U1 powered by +3.3V from an external supply (remove the shunt from JU4 before applying power)

**Default position.*

Table 3. Jumper JU1 Function

SHUNT POSITION	EN PIN (U1)	DESCRIPTION
1-2*	Connected to +3.3V	MAX4951BE redriver enabled for normal operation
2-3	Connected to GND	MAX4951BE redriver disabled and device is in low-power mode

**Default position.*

Table 4. Jumper JU2 Function

SHUNT POSITION	PB PIN (U1)	DESCRIPTION
1-2	Connected to +3.3V	Channel B output preemphasis enabled
2-3*	Connected to GND	Channel B output preemphasis disabled
Not installed	Not connected	

**Default position.*

Table 5. Jumper JU3 Function

SHUNT POSITION	PA PIN (U1)	DESCRIPTION
1-2	Connected to +3.3V	Channel A output preemphasis enabled
2-3*	Connected to GND	Channel A output preemphasis disabled
Not installed	Not connected	

**Default position.*

MAX4951B Evaluation Kit

Characterization Circuit (U2)

The characterization circuit is provided as a separate test circuit for evaluation of the MAX4951BE 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.

Power 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 MAX4951BE (U2) is enabled/disabled by configuring jumper JU5 (see Table 6). When disabled, the MAX4951BE buffers are powered down and the part is placed in low-power mode.

Output Preemphasis (JU7)

The MAX4951BE's channel A can be evaluated with or without preemphasis. Configure jumper JU7 of the characterization circuit to enable/disable channel A output preemphasis (see Table 7).

Calibration Traces

The lower half of the MAX4951B 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 MAX4951BE (U2) of the characterization circuit. The first calibration trace includes a 50Ω load termination and the second calibration trace is a through trace.

Table 6. Jumper JU5 Function

SHUNT POSITION	EN PIN (U2)	DESCRIPTION
1-2*	Connected to +3.3V	MAX4951BE redriver enabled for normal operation
2-3	Connected to GND	MAX4951BE redriver disabled and device is in low-power standby mode

**Default position.*

Table 7. Jumper JU7 Function

SHUNT POSITION	PA PIN (U2)	DESCRIPTION
1-2	Connected to +3.3V	Channel A output preemphasis enabled
2-3*	Connected to GND	Channel A output preemphasis disabled
Not installed	Not connected	

**Default position.*

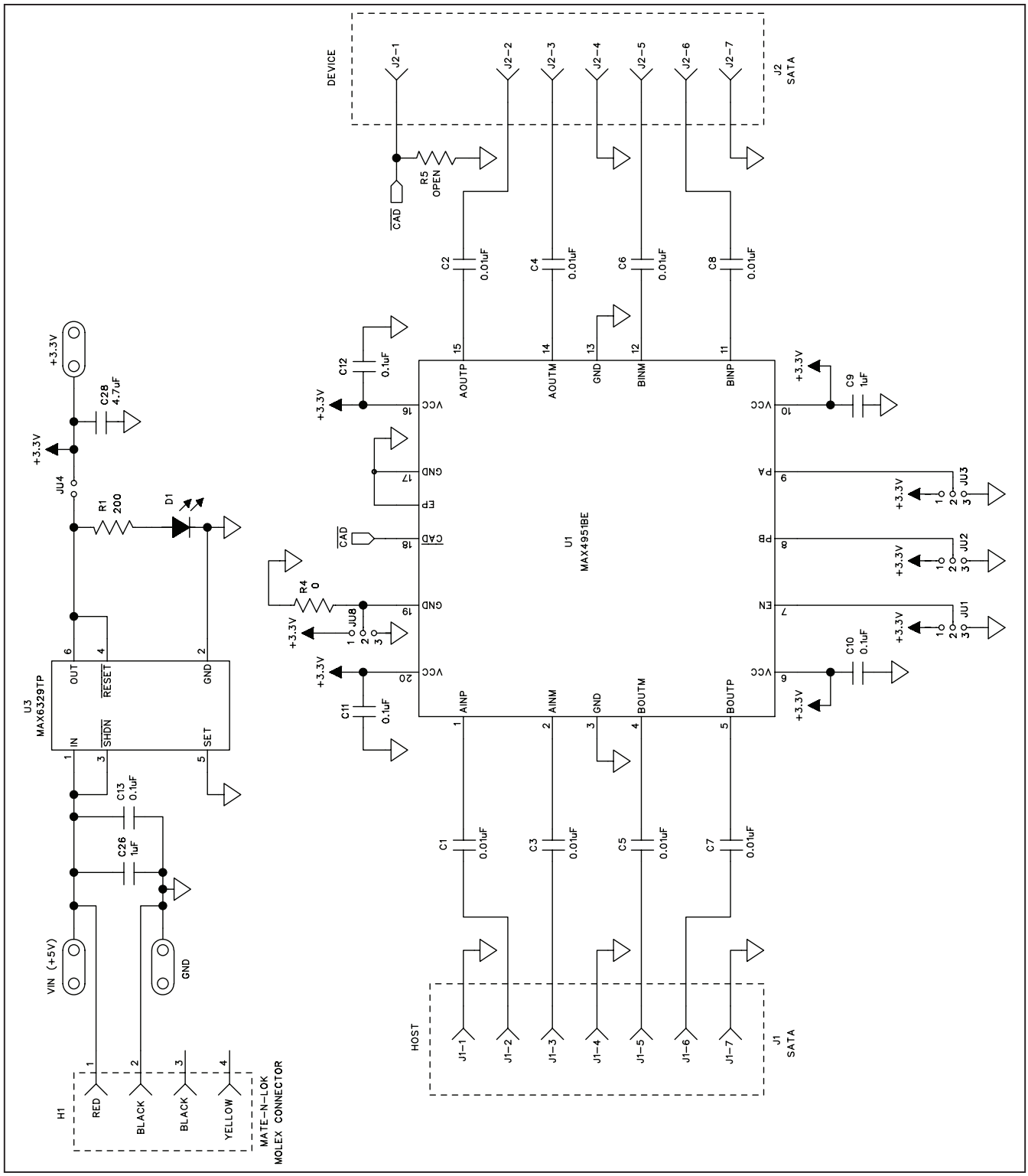

Figure 1a. MAX4951B EV Kit Schematic—Application Circuit (Sheet 1 of 3)

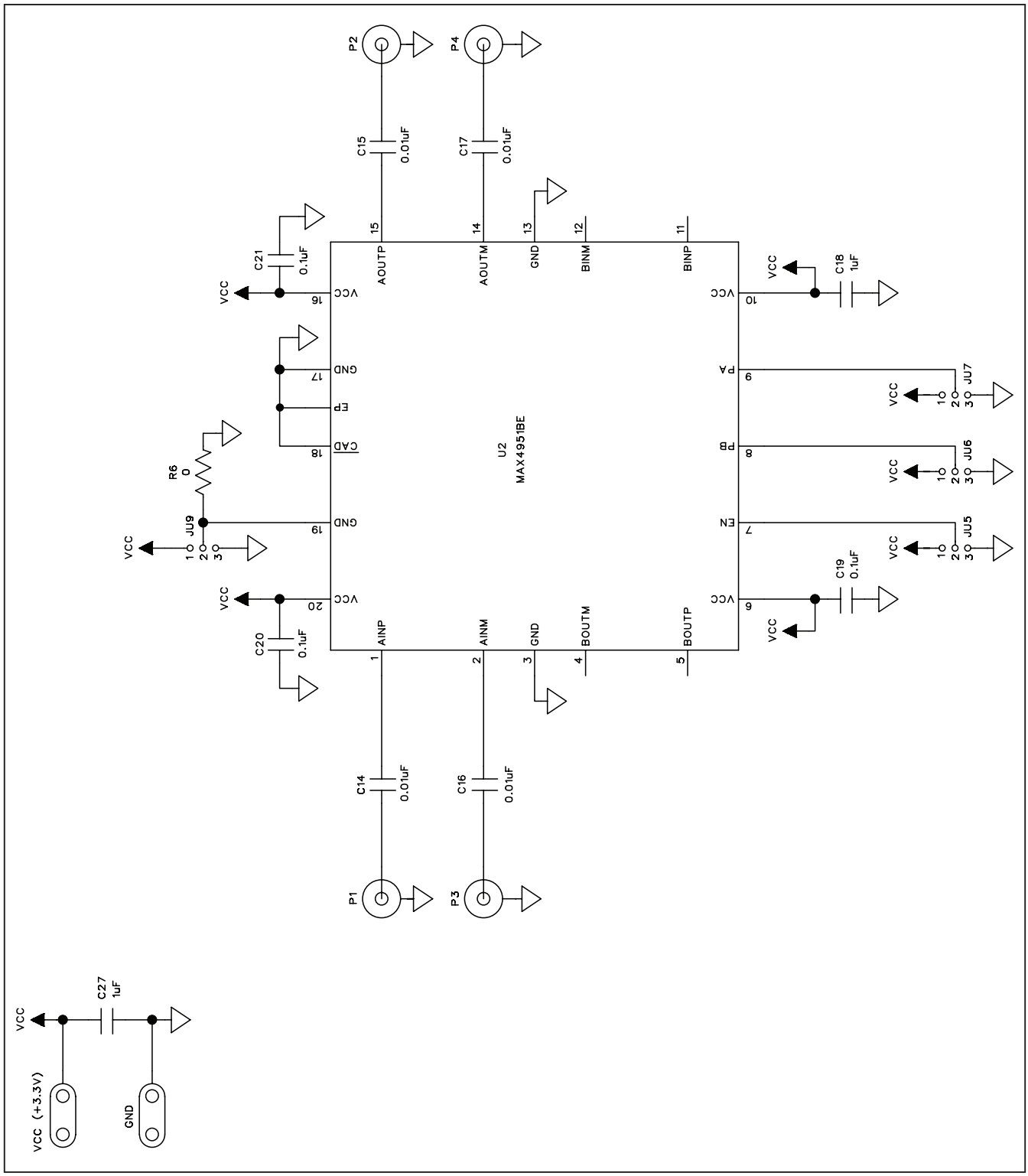

Figure 1b. MAX4951B EV Kit Schematic—Characterization Circuit (Sheet 2 of 3)

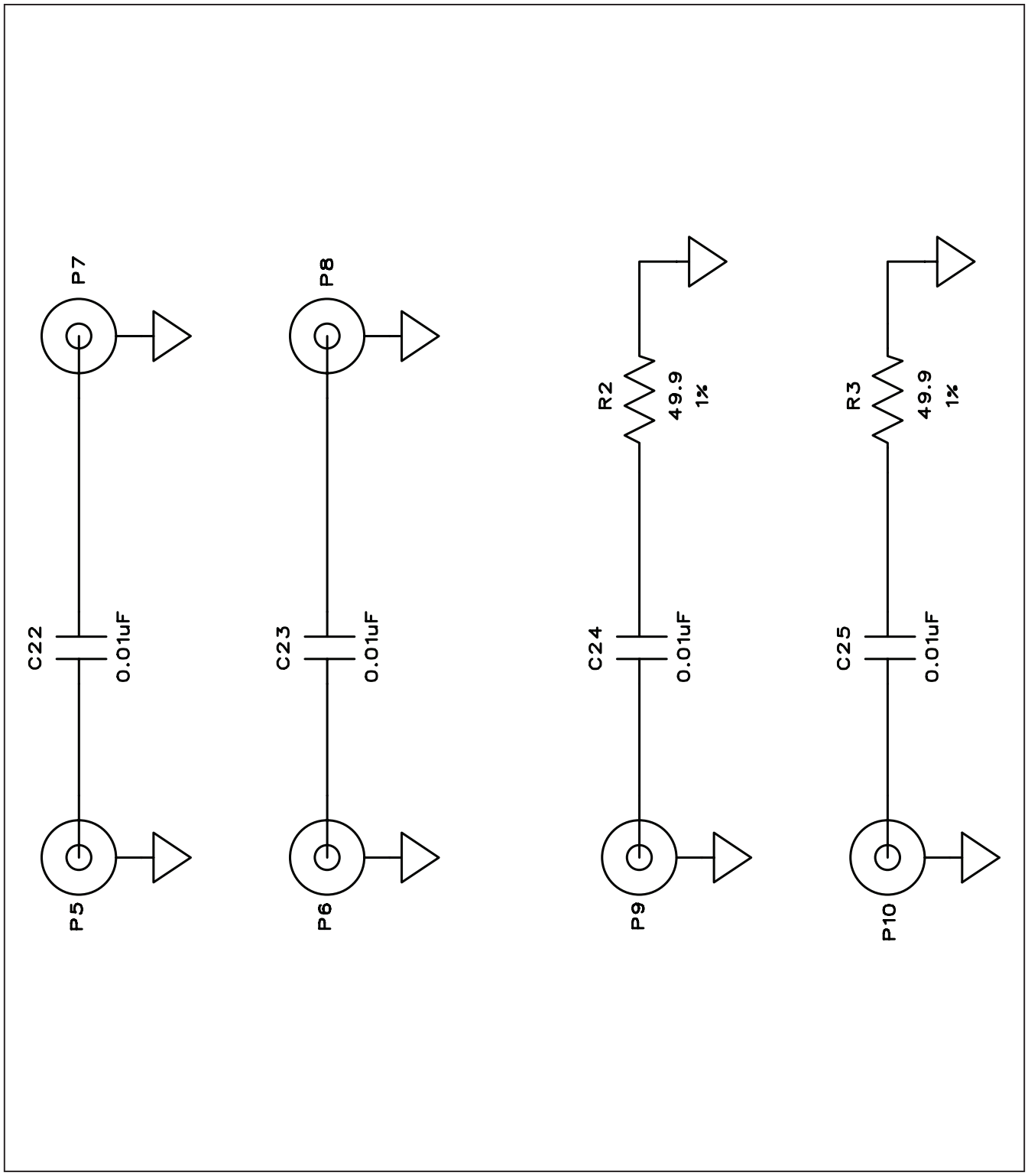

Figure 1c. MAX4951B EV Kit Schematic—Calibration Traces (Sheet 3 of 3)

MAX4951B Evaluation Kit

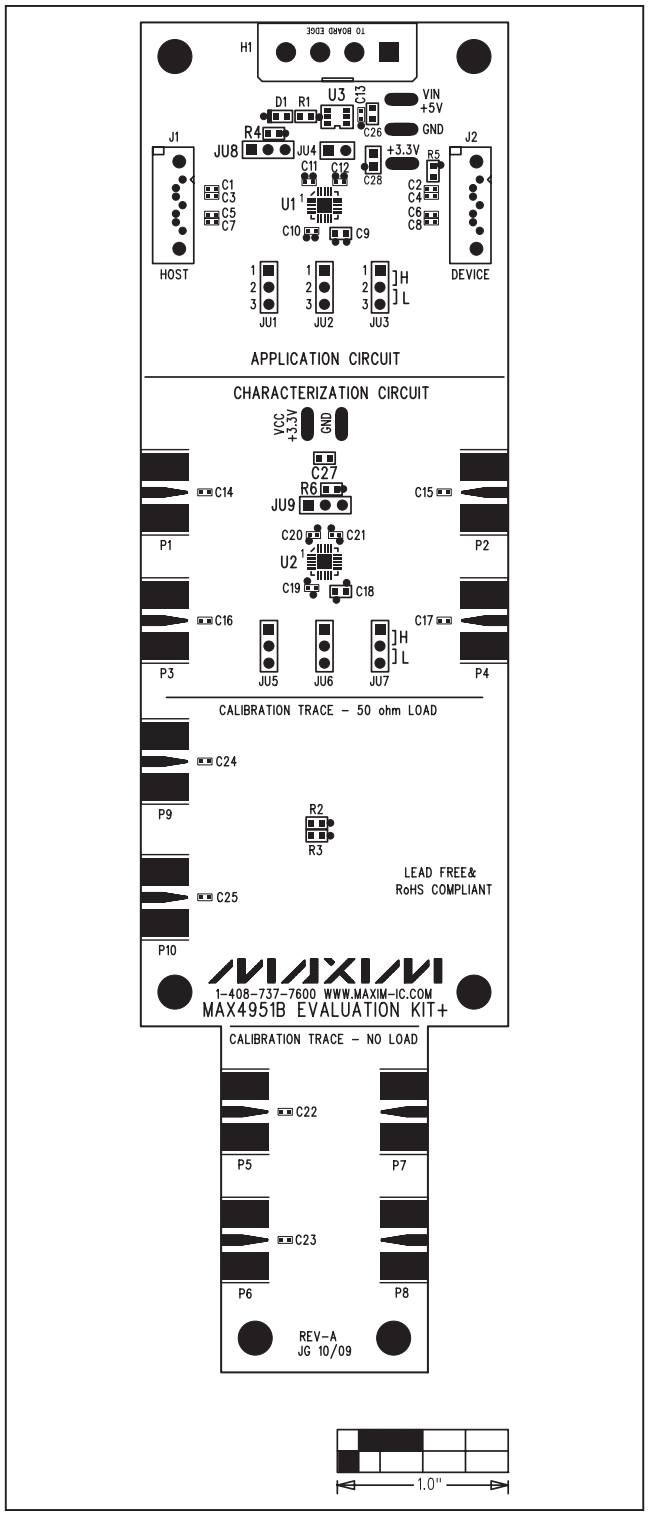

Figure 2. MAX4951B EV Kit Component Placement Guide—Component Side

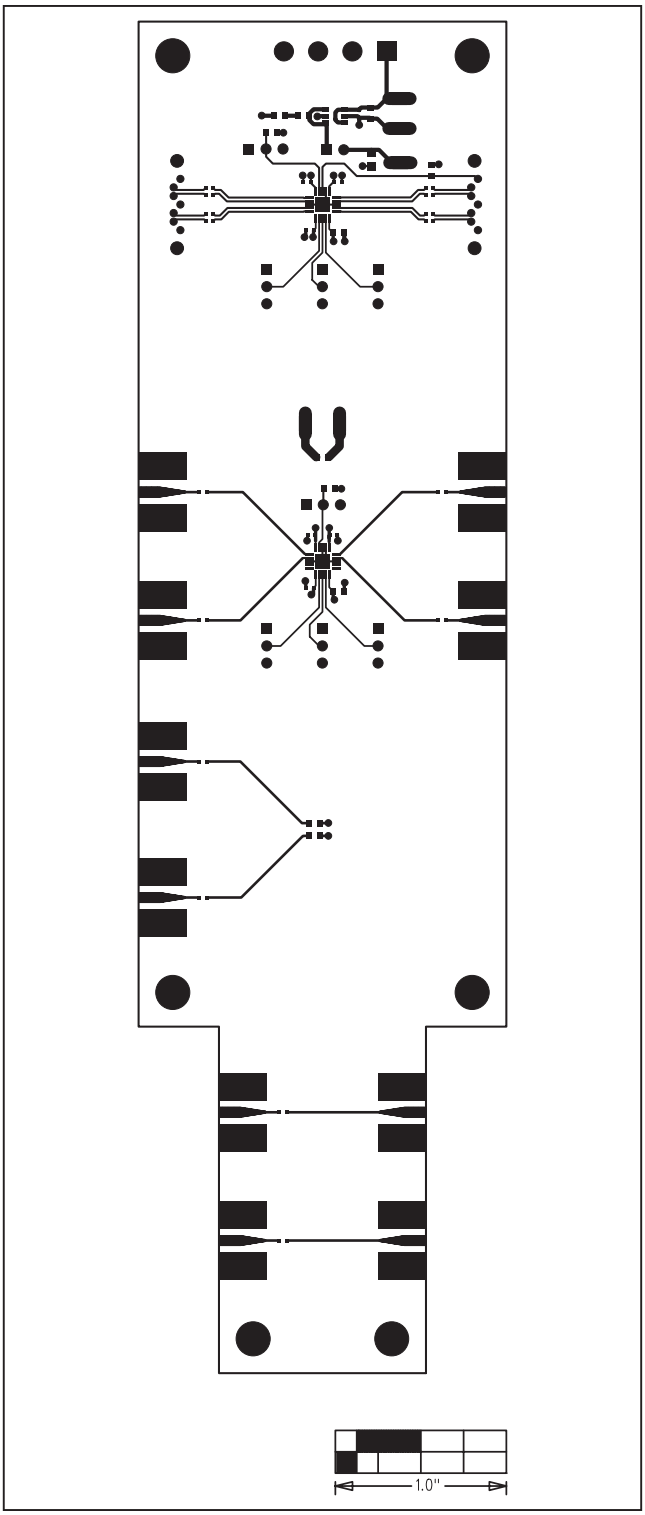

Figure 3. MAX4951B EV Kit PCB Layout—Component Side

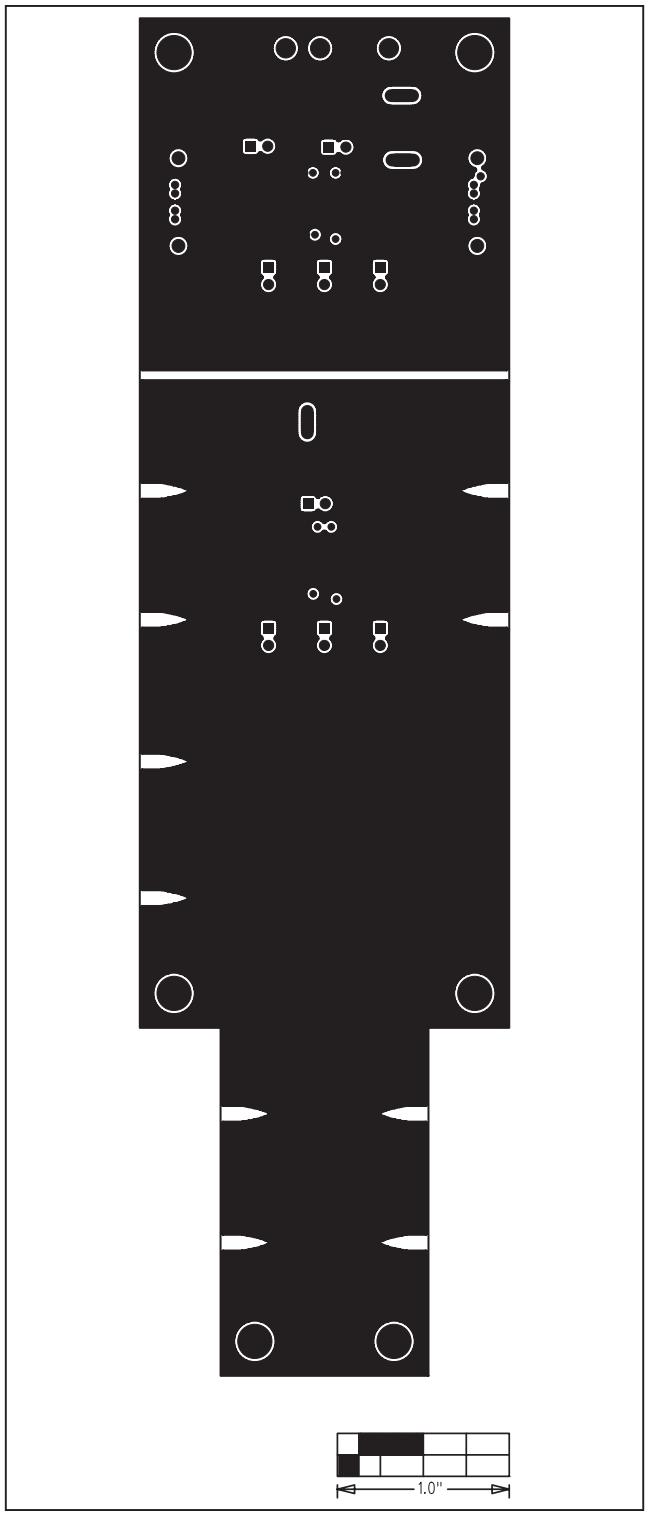

Figure 4. MAX4951B EV Kit PCB Layout—Inner Layer 2

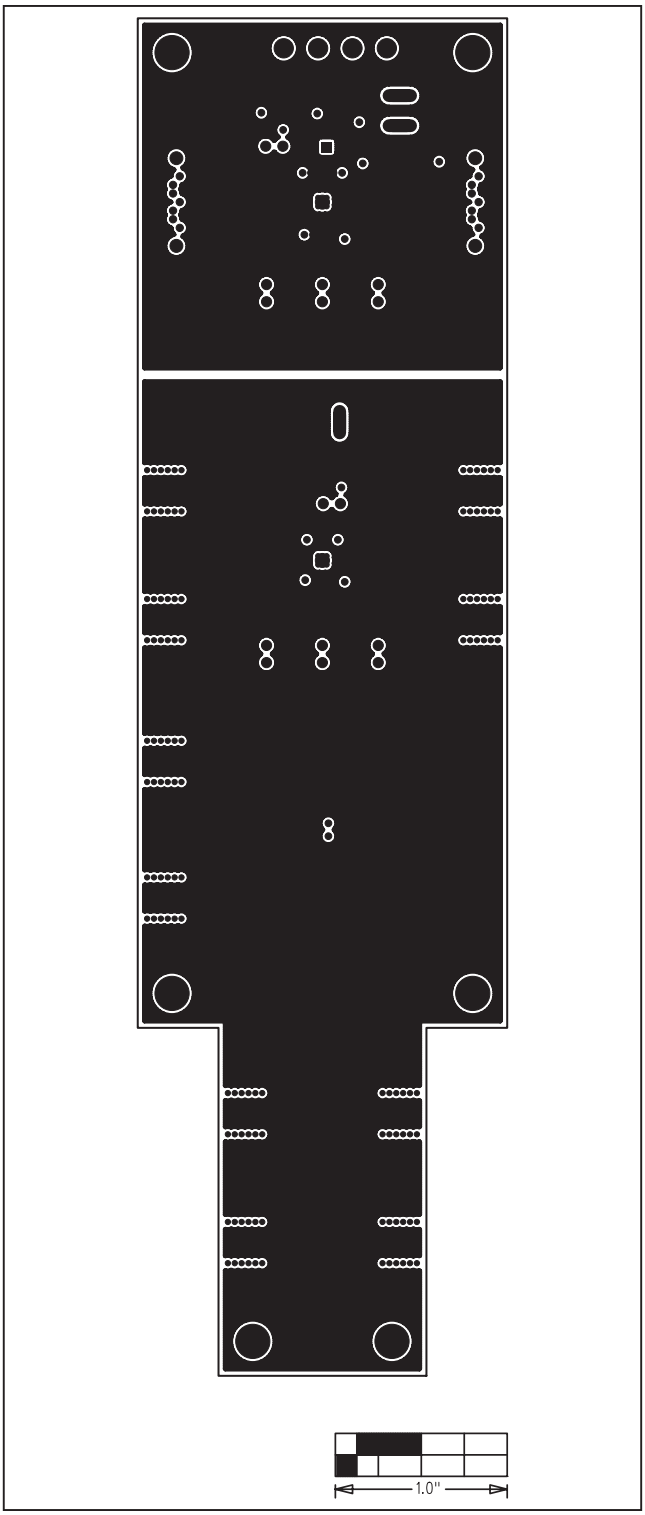

Figure 5. MAX4951B EV Kit PCB Layout—Inner Layer 3

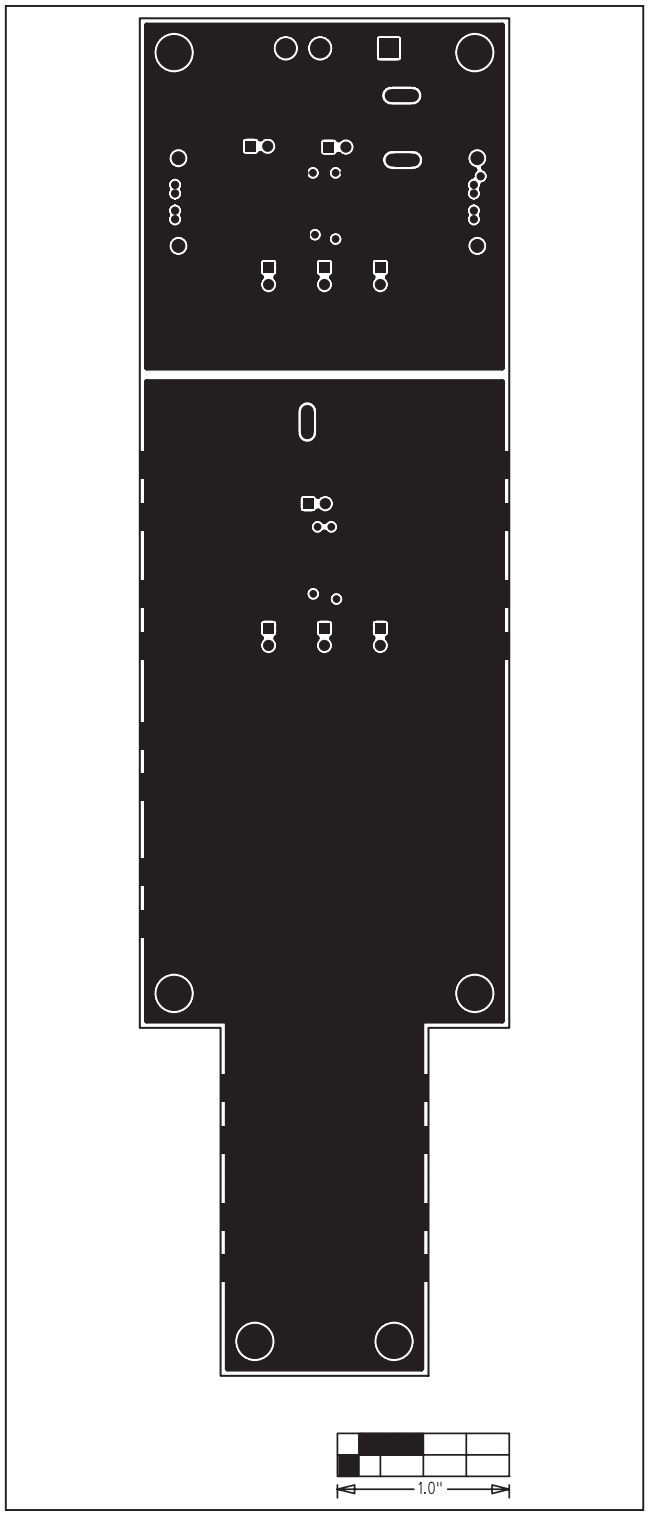

Figure 6. MAX4951B EV Kit PCB Layout—Solder Side

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/09	Initial release	—
1	4/10	Revised the *Output Preemphasis (JU2, JU3)* section (formerly named *Output Boost Control (JU2, JU3))* and Tables 3–6	3, 4