VCA2617EVM User's Guide

This document provides the information needed to set up and operate the VCA2617EVM evaluation module (EVM). For a more detailed description of the VCA2617, please refer to the product datasheet available from the Texas Instruments web site at http://www.ti.com. Throughout this document, the acronym *EVM* and the phrase *evaluation module* are synonymous with the VCA2617EVM. This user's guide includes setup and configuration instructions, information regarding operating procedures and input/output connections, an electrical schematic, printed circuit board (PCB) layout drawings, and a parts list for the EVM.

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1 Description

The VCA2617EVM is designed to provide ease of use in evaluating the performance of the VCA2617 variable gain amplifier. By using the 0Ω jumpers and DIP-switches, the VCA2617EVM can be configured to accommodate several different modes of operation. Before starting the evaluation, it is recommended to review the state of each of the switches to verify the desired configuration.

2 Power Supply Requirements

The VCA2617EVM requires a +5V DUT supply (at connector JP1) for the VCA2617, and separate ±5V supplies (at connector JP2) for the output amplifiers (U1 and U2). This configuration allows for the monitoring of supply currents to the VCA2617 independent of the rest of the evaluation board. If monitoring the supplies is not required, a single +5V supply can be substituted for the two separate +5V supplies. In this case, the –5V supply is still required. Please note that the pull-up resistors R17, R18 and R19 are connected to the +5V supply, which is required to operate the VCA2617.

2.1 Voltage Limits Warning

CAUTION

Exceeding the maximum input voltages can damage EVM components. Undervoltage conditions may cause improper operation of some or all of the EVM components.

3 Input Signals

The default configuration of the EVM is for the differential input configuration of the VCA2617. Here, a single-ended input signal may be applied to SMA connectors J3 (PIN_A) and J4 (PIN_B). The transformer will convert the signal into a differential signal and drive the VCA. Alternatively, each of the VCA2617 inputs can also be driven in single-ended configuration. To do so, use the appropriate solder switches (SJPn) for the desired configuration. Please note that the VCA2617 inputs are internally biased and therefore must be ac-coupled.

4 VCA Control Voltage (V_{CNTL})

While the VCA2617 allows controlling both channels independently, the default configuration of the EVM has both V_{CNTL} pins tied together. An external control voltage can be applied at connector JP1 (pin 1). In order to change to independent control, simply reconfigure the solder switches SJP9 and SJP10. Access to the V_{CNTL} pins is then provided through SMA connectors J9 and J10. This signal can be a dc voltage or a customer-specific waveform. The typical range for the control voltage, as specified in the VCA2617 datasheet, is from 0.2V to 2.3V.

5 Output Configuration

The differential outputs of the VCA2617 are fed into an amplifier stage set with a gain of 0.5V/V. Using the 0Ω jumpers, this stage can be configured in two different ways:

- as a single-ended inverter (R23, R24—closed, R22, R25—open), or
- as a difference amplifier (R22, R25—closed, R23, R24—open; this is the default configuration).

After the amplifier stage, the signal outputs are provided at SMA connectors J5 (OUT_A) and J6 (OUT_B).

The differential outputs of the VCA2617 can be terminated with 500Ω on each output, and the output signals can then be checked at test points TP1 and TP2 and test points TP3 and TP4, respectively.

6 Clamping Voltage

The VCA2617 allows for a user to limit the output voltage swing to a defined level. For this configuration, the desired clamping voltage level is applied to the $V_{CLMP}A$ and $V_{CLMP}B$ pins of the VCA2617. The EVM includes a 3.3V reference (U3) that supplies a stable voltage. Using potentiometer RP1, the clamping voltage can be adjusted to the desired value.

7 Switch Settings

Use switch SW1 to control the post-gain and power-down functions of the VCA2617. (See Figure 1 and Table 1.)

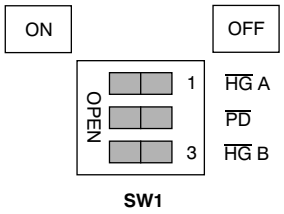

Figure 1. Switch SW1 Settings

Table 1. Switch SW1 Summary

	$\overline{HG}$ A / $\overline{HG}$ B	$\overline{PD}$
ON = H (5V)	Low-Gain Mode (–16dB to +32dB range)	Normal operation
OFF = L (0V)	High-Gain Mode (–10dB to +38dB range)	Power-down mode

8 Physical Description

This section describes the physical characteristics and PCB layout of the evaluation module, and lists the components used in the VCA2617EVM.

8.1 PCB Layout

The EVM is constructed on a four-layer, 4.5in x 3.5in PCB using FR-4 material. Figure 2 shows the schematic of the VCA2617EVM. Figure 3 through Figure 6 give a brief description of the individual layers.

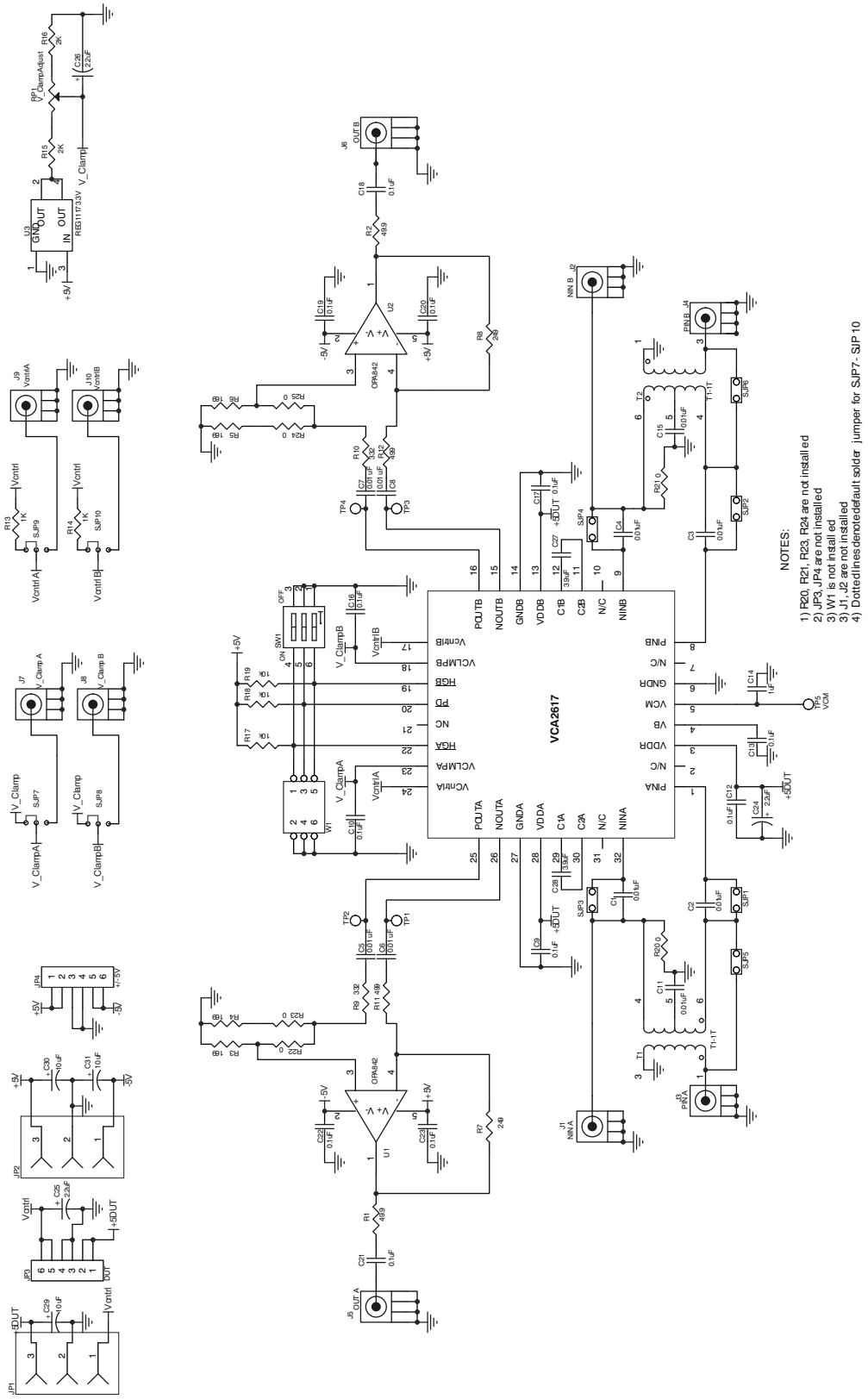

Figure 2. VCA2617EVM Schematic

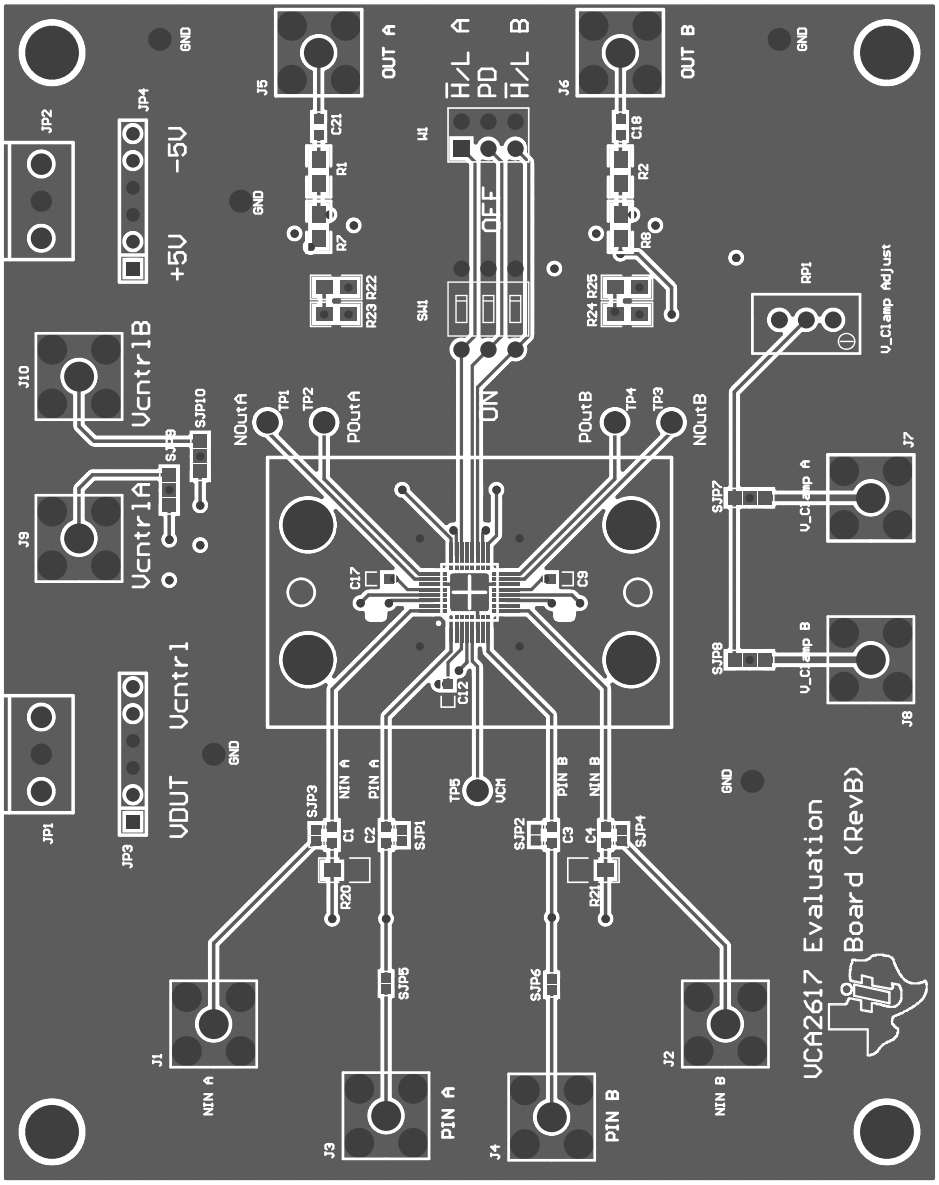

Figure 3. VCA2617EVM PCB Top Layer (Top View)

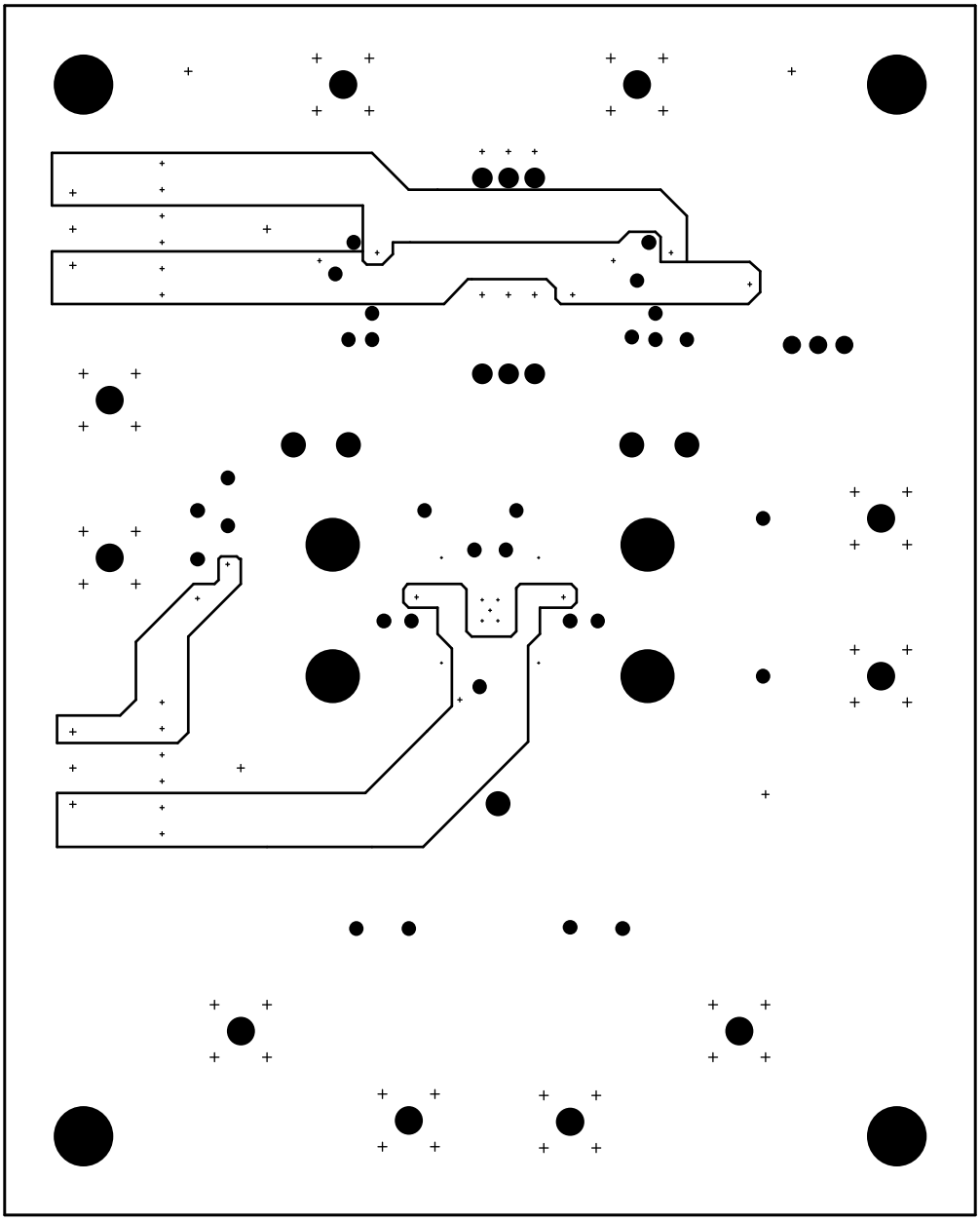

Figure 4. VCA2617EVM PCB Power Layer (Top View)

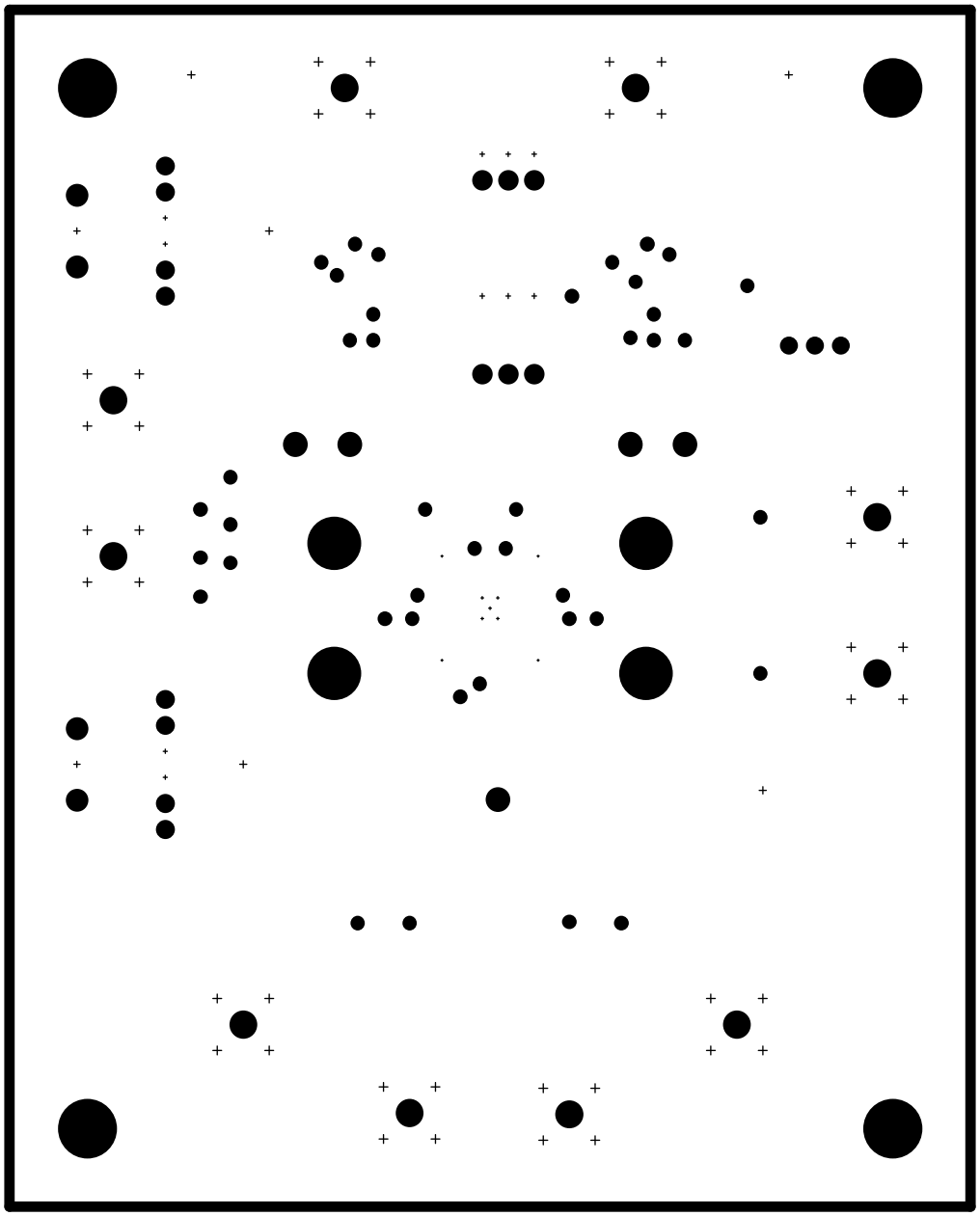

Figure 5. VCA2617EVM PCB Ground Layer (Top View)

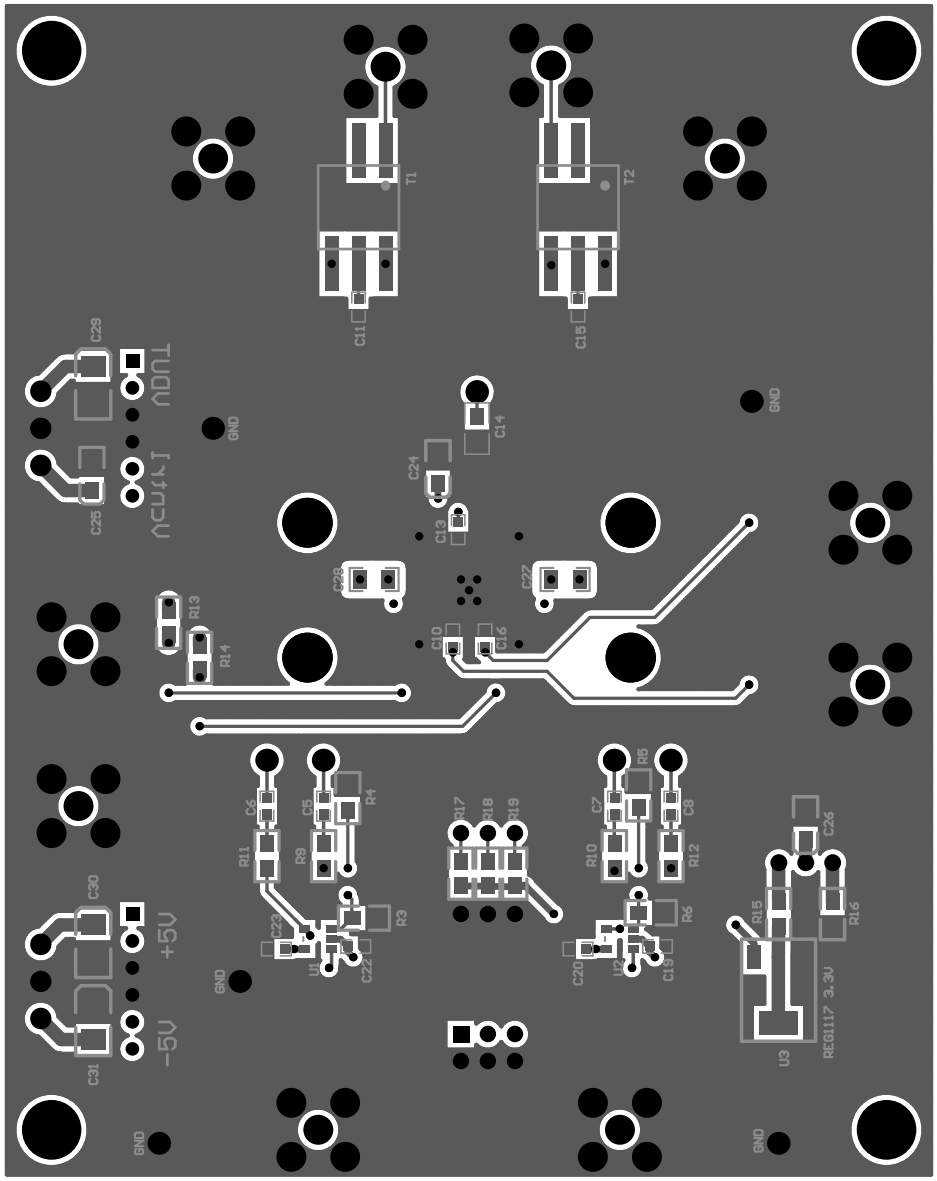

Figure 6. VCA2617EVM PCB Bottom Layer (Bottom View)

8.2 Parts List

The Parts List, showing the components used in the assembly of the VCA2617EVM, is given in Table 2.

Table 2. VCA2617EVM Parts List

Designator	Value	Quantity	Description	Footprint	Part Number	Note
C1–C8, C11, C15	0.01µF	10	Ceramic	0603	399-1092-1-ND	
C9, C10, C12, C13, C16–C23	0.1µF	12	Ceramic	0603	399-1282-1-ND	
C14	1.0µF	1	Ceramic	0805	399-1284-1-ND	
C24–C26	2.2µF	3	Low Profile Tantalum Capacitor	3216/A	399-1257-1-ND	
C27, C28	3.9µF	2	Ceramic, X5R, Variable Footprint	0805/1206	C1206C395K3PACTU	
C29–C31	10µF	3	Low Profile Tantalum Capacitor	3528/B	TAJB106K016R	
R22, R25	0Ω	2	1/10W 0805 Chip Resistor	0805		
R20, R21, R23, R24	0Ω	4	1/10W 0805 Chip Resistor	0805		Not Installed
R1, R2	49.9Ω	2	1/10W 0805 Chip Resistor	0805		
R3–R6	169Ω	4	1/10W 0805 Chip Resistor	0805		
R7, R8	249Ω	2	1/10W 0805 Chip Resistor	0805		
R9, R10	332Ω	2	1/10W 0805 Chip Resistor	0805		
R11, R12	499Ω	2	1/10W 0805 Chip Resistor	0805		
R13, R14	1kΩ	2	1/10W 0805 Chip Resistor	0805		
R15, R16	2kΩ	2	1/10W 0805 Chip Resistor	0805		
R17–R19	10kΩ	3	1/10W 0805 Chip Resistor	0805		
RP1	10kΩ	1	Bourns 3296 Series Pot	0.4in (9.52mm) Square	Digi-Key # 3296Y-103-ND	
SW1		1	Switch, 3-Position, DIP EXT ROCK SEALED	3POS_SPST_DIP	Newark 55F5001	
T1, T2		2	RF Transformer MINI-Circuits T1-1T	TTWB	T1-1T-KK81	
TP1–TP4		4	Test Point - Single 0.025in Pin	test_point_85mil	Digi-Key # 5007K-ND	Not Installed
W1		1	Pin Strips Header 3x1			Not Installed
J3–J10		8	SMA	SMA_JACK	AMP 901-144-8RFX	or equivalent
J1, J2		2	SMA			Not Installed
JP1, JP2		2	Terminal Block, 3.5mm 3-Position PCB	3P-TERM	Digi-Key # ED1515-ND	
JP3, JP4		2	6-Pin Right Angle Connector	SIP6		Not Installed
Stand Offs		4	Spacer, Self-Retain #4 Screw 1/2in		Digi-Key # SRS4-8-01-ND	
DUT		1	VCA2617	32-pin QFN	TI, VCA2617RHB	
U1, U2		2	OPA842 or Equivalent	SOT23	TI, OPA842DBV	
U3		1	REG1117, 3.3V Voltage Regulator	SOT223	TI, REG1117-3.3	

FCC Warnings

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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By providing user with this EVM, product and services, TI is NOT granting user any license in any patent or other intellectual property right.

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of ±5V and the output voltage range of ±5V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than +50°C. The EVM is designed to operate properly with certain components above +50°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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