

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.

Contents

1	Description.....	2
2	Power Supply Requirements.....	2
3	Input Signals	2
4	VCA Control Voltage (V_{CNTL}).....	2
5	Output Configuration	2
6	Clamping Voltage.....	3
7	Switch Settings.....	3
8	Physical Description.....	3

List of Figures

1	Switch SW1 Settings	3
2	VCA2617EVM Schematic	4
3	VCA2617EVM PCB Top Layer (Top View)	5
4	VCA2617EVM PCB Power Layer (Top View)	6
5	VCA2617EVM PCB Ground Layer (Top View)	7
6	VCA2617EVM PCB Bottom Layer (Bottom View).....	8

List of Tables

1	Switch SW1 Summary	3
2	VCA2617EVM Parts List.....	9

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_{CLMPA} and V_{CLMPB} 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](#).)

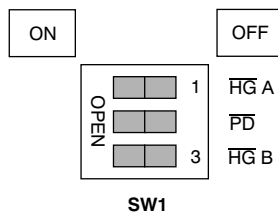


Figure 1. Switch SW1 Settings

Table 1. Switch SW1 Summary

	HG A / HG B	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

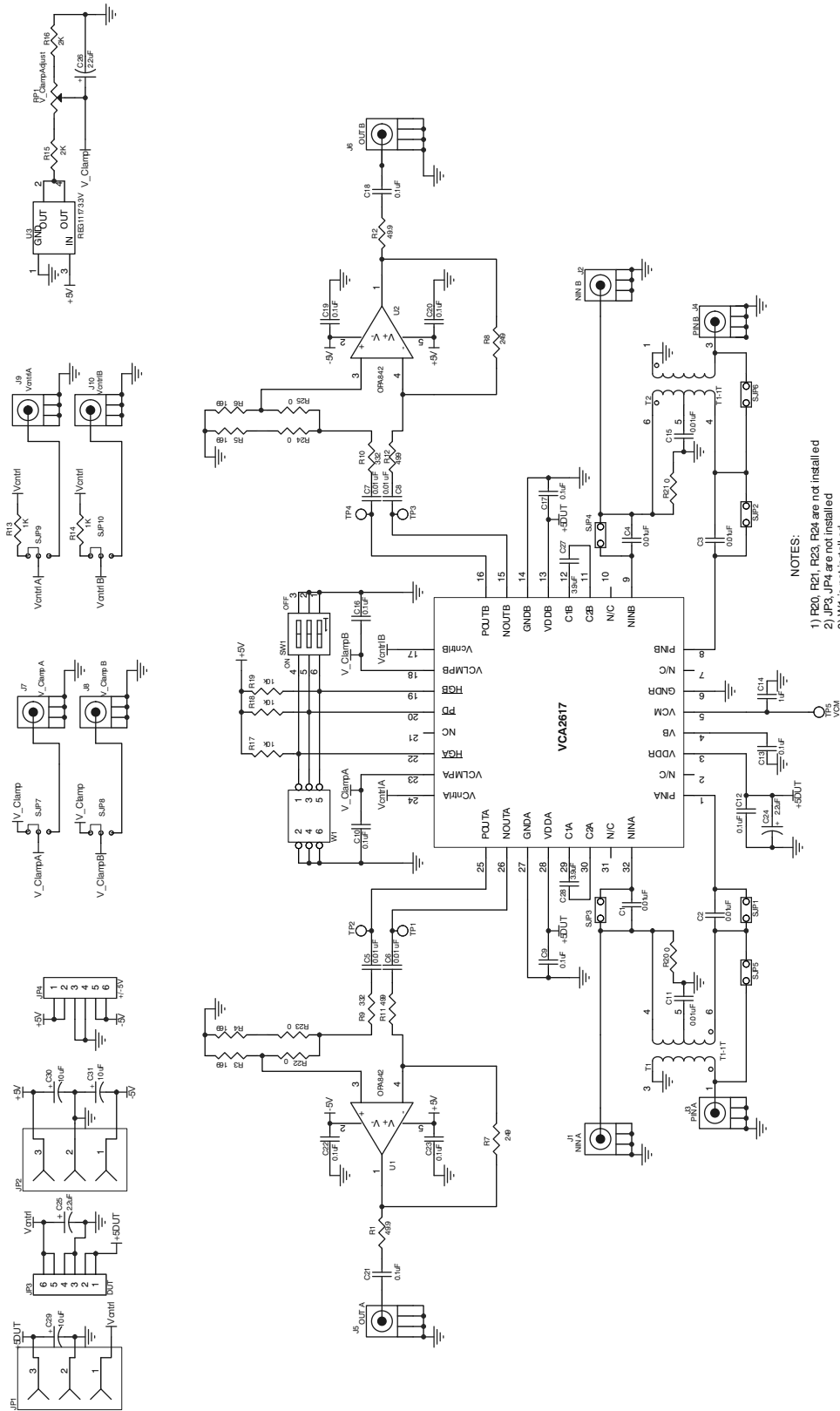
8 Physical Description

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.

Physical Description



- NOTES:
- 1) R20, R21, R23, R24 are not installed
 - 2) J13, J14 are not installed
 - 3) J17 is not installed
 - 4) J1, J2 are not installed
 - 5) Dotted lines denote default solder jumper for SJP7, SJP10

Figure 2. VCA2617EVM Schematic

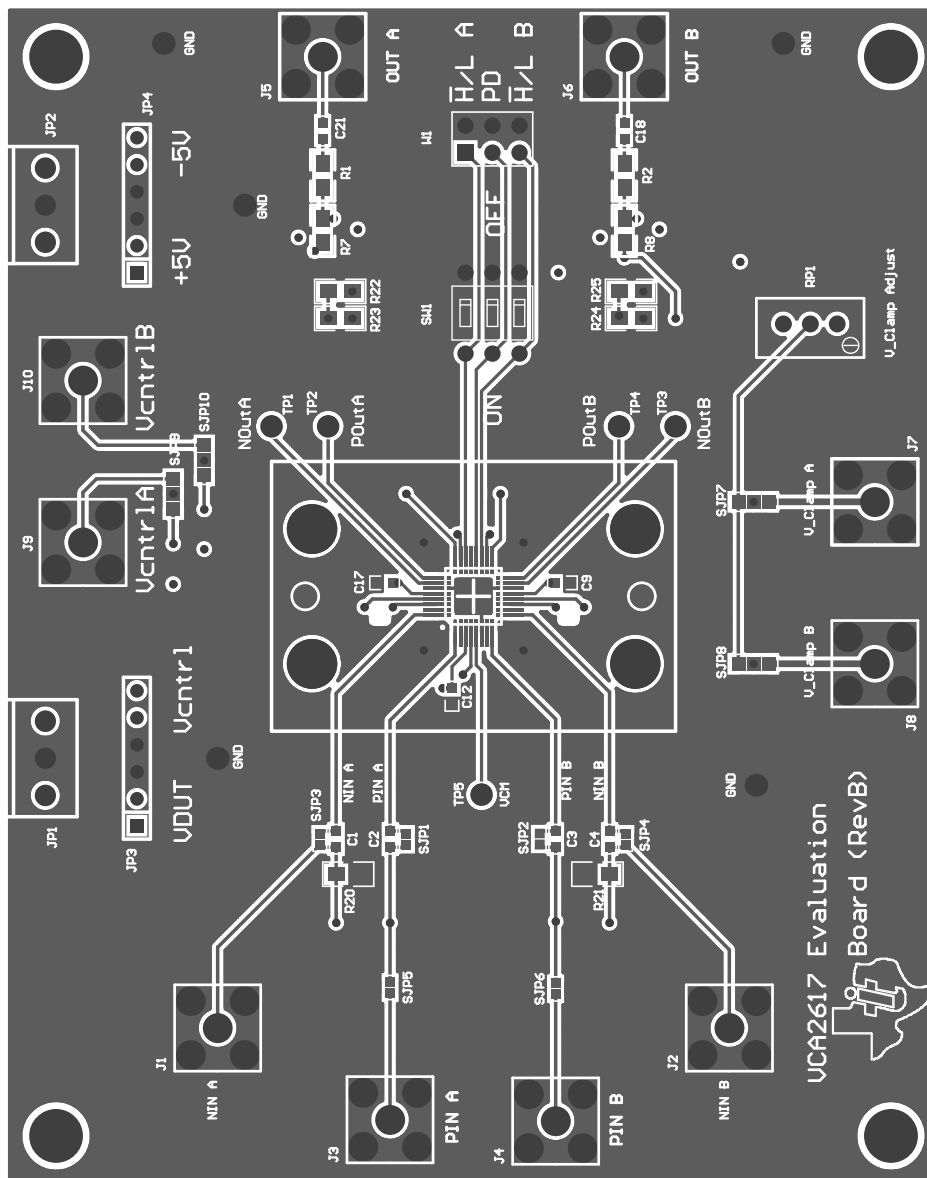


Figure 3. VCA2617EVM PCB Top Layer (Top View)

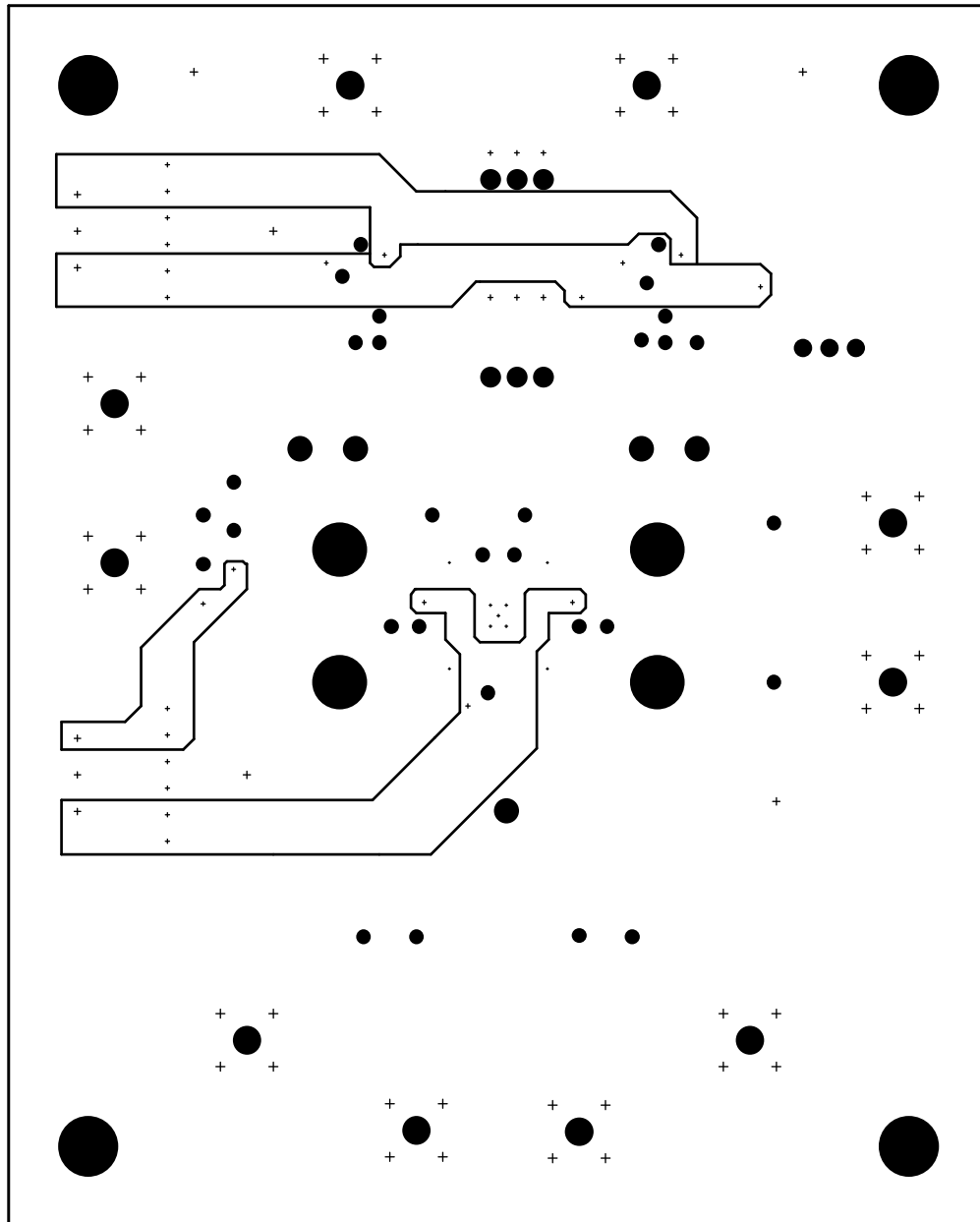


Figure 4. VCA2617EVM PCB Power Layer (Top View)

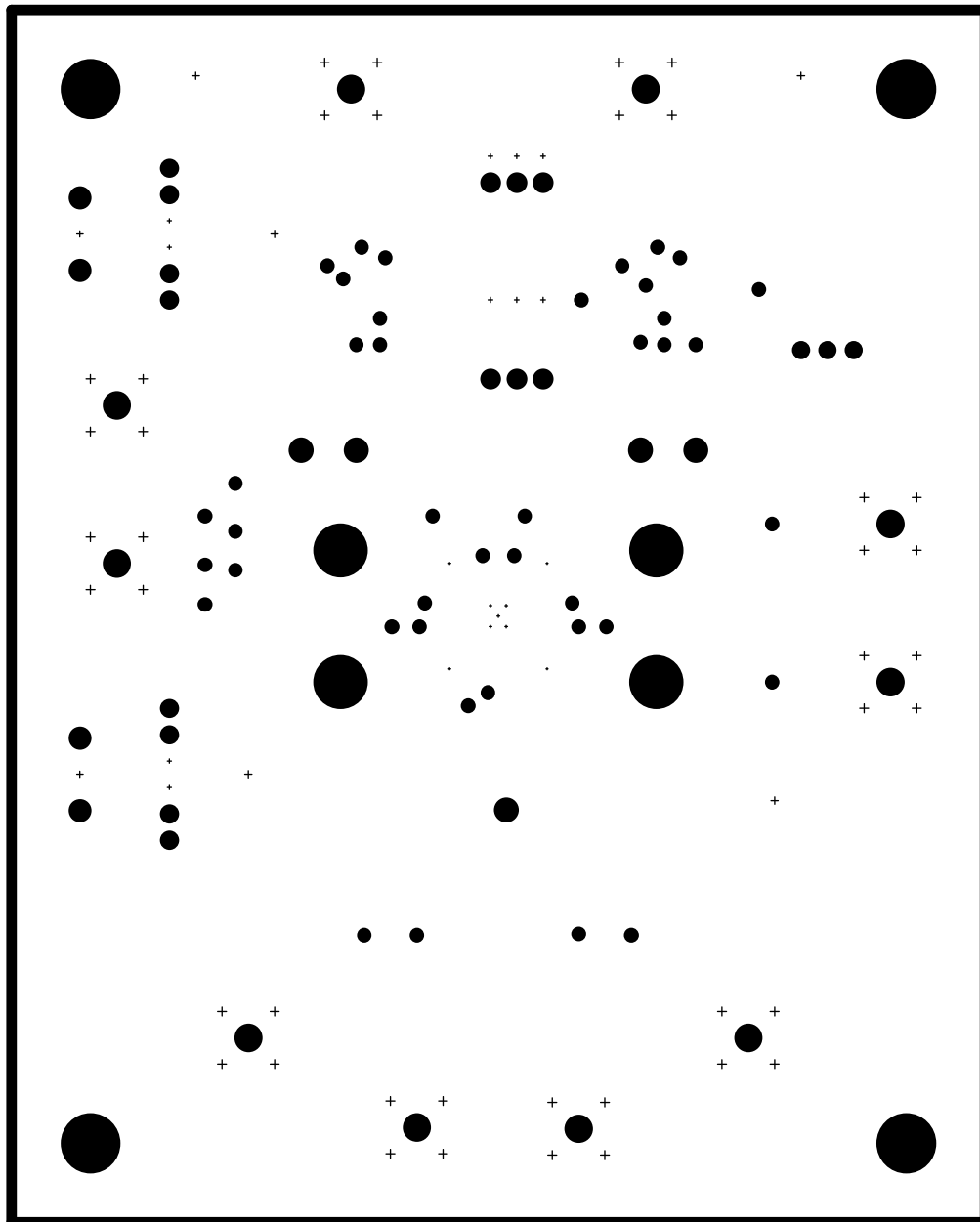


Figure 5. VCA2617EVM PCB Ground Layer (Top View)

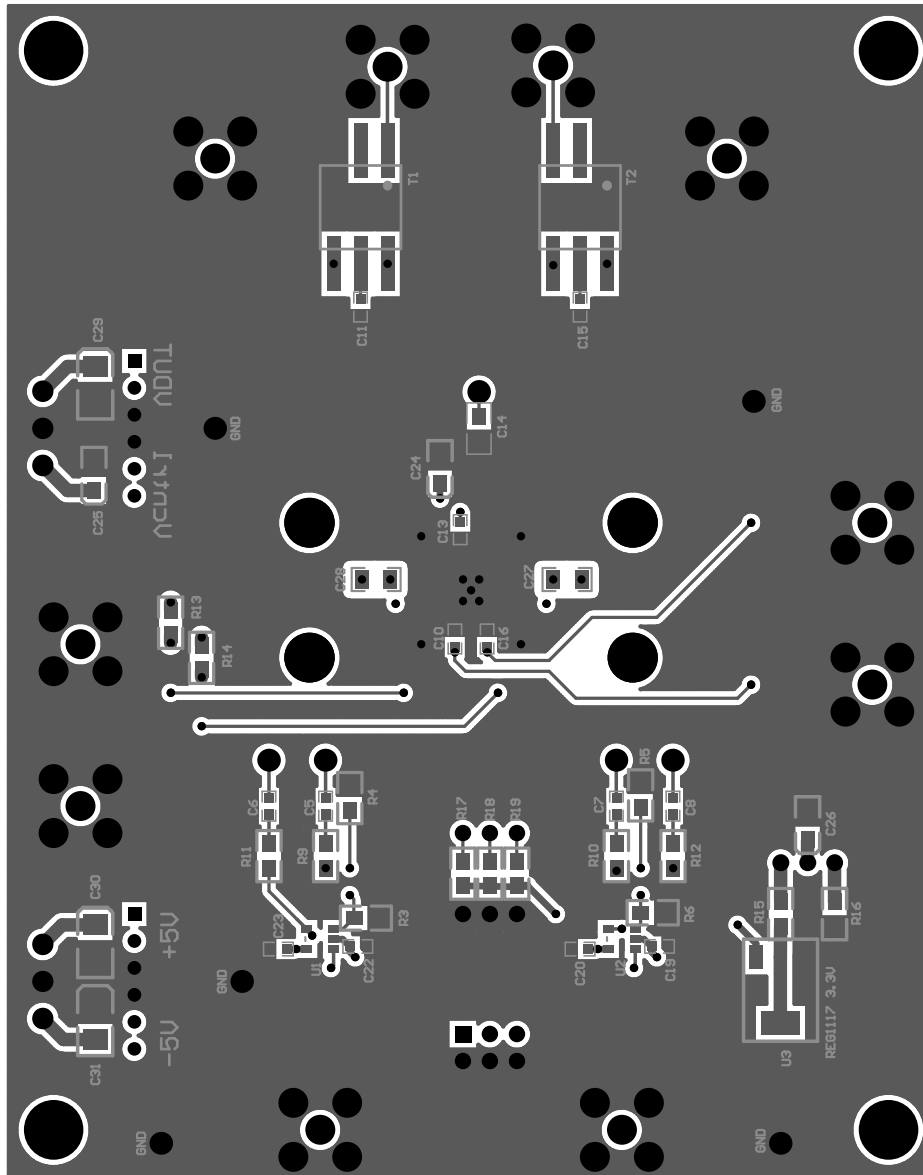


Figure 6. VCA2617EVM PCB Bottom Layer (Bottom View)

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	0.01 μ F	10	Ceramic	0603	399-1092-1-ND	
C9, C10, C12, C13, C16–C23	0.1 μ F	12	Ceramic	0603	399-1282-1-ND	
C14	1.0 μ F	1	Ceramic	0805	399-1284-1-ND	
C24–C26	2.2 μ F	3	Low Profile Tantalum Capacitor	3216/A	399-1257-1-ND	
C27, C28	3.9 μ F	2	Ceramic, X5R, Variable Footprint	0805/1206	C1206C395K3PACTU	
C29–C31	10 μ F	3	Low Profile Tantalum Capacitor	3528/B	TAJB106K016R	
R22, R25	0 Ω	2	1/10W 0805 Chip Resistor	0805		
R20, R21, R23, R24	0 Ω	4	1/10W 0805 Chip Resistor	0805		Not Installed
R1, R2	49.9 Ω	2	1/10W 0805 Chip Resistor	0805		
R3–R6	169 Ω	4	1/10W 0805 Chip Resistor	0805		
R7, R8	249 Ω	2	1/10W 0805 Chip Resistor	0805		
R9, R10	332 Ω	2	1/10W 0805 Chip Resistor	0805		
R11, R12	499 Ω	2	1/10W 0805 Chip Resistor	0805		
R13, R14	1k Ω	2	1/10W 0805 Chip Resistor	0805		
R15, R16	2k Ω	2	1/10W 0805 Chip Resistor	0805		
R17–R19	10k Ω	3	1/10W 0805 Chip Resistor	0805		
RP1	10k Ω	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.

EVM TERMS AND CONDITIONS

Texas Instruments (TI) provides the enclosed Evaluation Module and related material (EVM) to you, the user, (you or user) **SUBJECT TO** the terms and conditions set forth below. By accepting and using the EVM, you are indicating that you have read, understand and agree to be bound by these terms and conditions. **IF YOU DO NOT AGREE TO BE BOUND BY THESE TERMS AND CONDITIONS, YOU MUST RETURN THE EVM AND NOT USE IT.**

This EVM is provided to you by TI and is intended for your **INTERNAL ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY**. It is provided "AS IS" and "WITH ALL FAULTS." It is not considered by TI to be fit for commercial use. As such, the EVM may be incomplete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety measures typically found in the end product. As a prototype, the EVM does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may not meet the technical requirements of the directive.

Should this EVM not meet the specifications indicated in the EVM User's Guide, it may be returned within 30 days from the date of delivery for a full refund of any amount paid by user for the EVM, which user agrees shall be user's sole and exclusive remedy. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY TI TO USER, AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR NON-INFRINGEMENT.**

TI shall have no obligation to defend any claim arising from the EVM, including but not limited to claims that the EVM infringes third party intellectual property. Further, TI shall have no liability to user for any costs, losses or damages resulting from any such claims. User shall indemnify and hold TI harmless against any damages, liabilities or costs resulting from any claim, suit or proceeding arising from user's handling or use of the EVM, including but not limited to, (i) claims that the EVM infringes a third party's intellectual property, and (ii) claims arising from the user's use or handling of the EVM. TI shall have no responsibility to defend any such claim, suit or proceeding.

User assumes all responsibility and liability for proper and safe handling and use of the EVM and the evaluation of the EVM. TI shall have no liability for any costs, losses or damages resulting from the use or handling of the EVM. User acknowledges that the EVM may not be regulatory compliant or agency certified (FCC, UL, CE, etc.). Due to the open construction of the EVM it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE USER'S INDEMNITY OBLIGATIONS SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHETHER TI IS NOTIFIED OF THE POSSIBILITY OR NOT.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive**.

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.**

User agrees to read the EVM User's Guide and, specifically, the EVM warnings and Restrictions notice in the EVM User's Guide prior to handling the EVM and the product. This notice contains important safety information about temperatures and voltages.

It is user's responsibility to ensure that persons handling the EVM and the product have electronics training and observe good laboratory practice standards.

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 $\pm 5V$ and the output voltage range of $\pm 5V$.

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 $+50^{\circ}C$. The EVM is designed to operate properly with certain components above $+50^{\circ}C$ 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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2005, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265