VCA261xEVM

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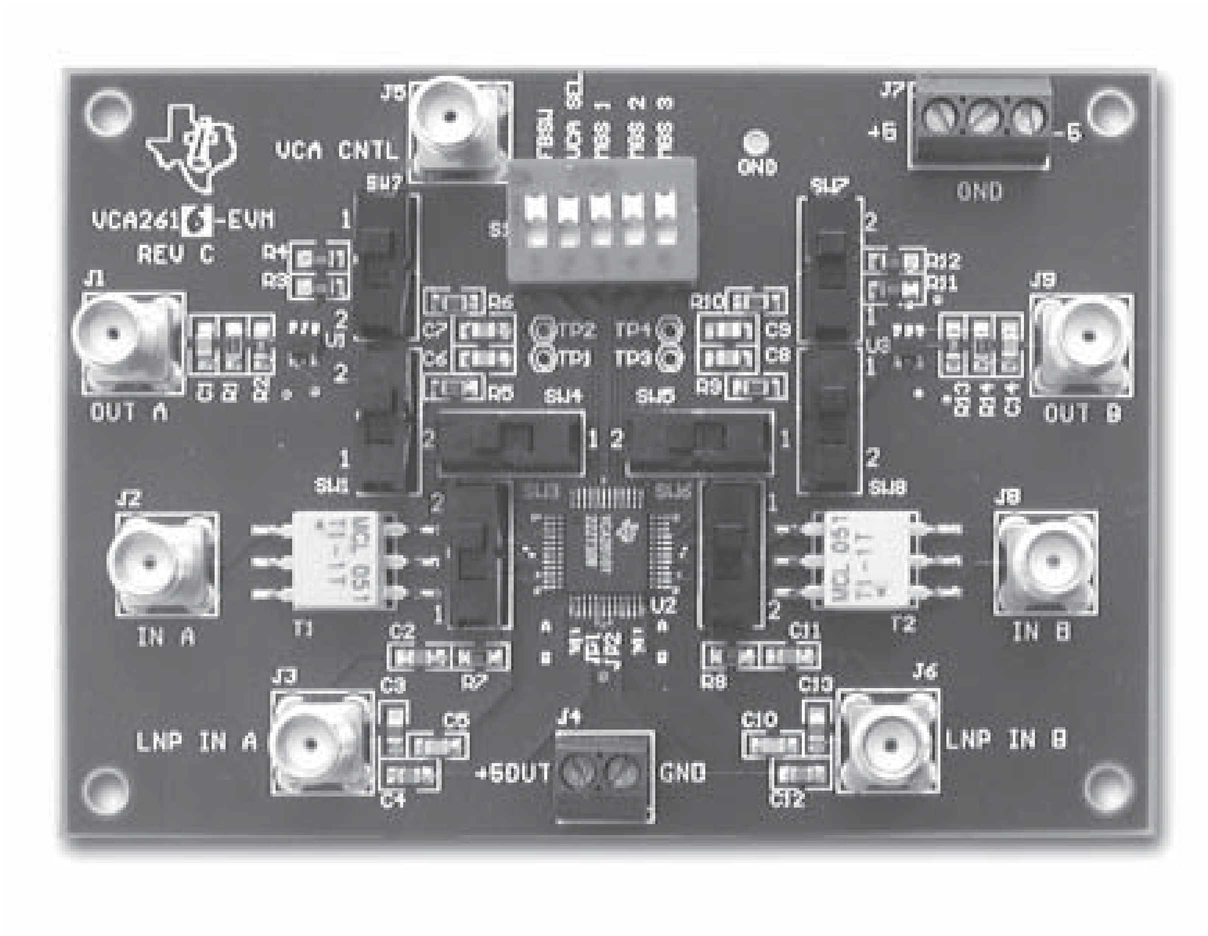

Actual Board Dimensions: 8.9cm x 6.2cm

FEATURES

- EASY TESTING OF VCA2611, VCA2612, VCA2613, VCA2616
- SINGLE-ENDED INPUT INTO LNA
- SINGLE-ENDED TO DIFFERENTIAL INPUT VIA TRANSFORMERS FOR VCA
- ADJUSTABLE GAIN RANGES

DESCRIPTION

The VCA261xEVM is designed to provide ease of use in evaluating the performance of the VCA2611, VCA2612, VCA2613 and VCA2616 variable gain amplifier family.

INITIAL CONFIGURATION

By using simple slide and DIP-switches, the VCA261xEVM can be configured to accommodate several different modes of operation. Before using the evaluation board, the user should determine the configuration and required settings needed for their specific evaluation. The demonstration board comes from the factory with the following preset configuration:

Slide Switches:

SW1, SW3, SW5, and SW7 are set to position 2.
SW2, SW4, SW6, and SW8 are set to position 1.

JP1 and JP2 have connections made at position B.

DIP-switch S1 has the following settings:

- MGS1 is set low
- MSG2 and MGS3 are set high
- VCAinSEL is set low
- FBSWcntl is set low

Components C20 and C29 are not populated.

POWER SUPPLY

The VCA261xEVM requires ±5V supplies (Connector J7) for the output amplifiers (U1 and U3) and a separate +5V supply (Connector J4) for the VCA261x. This configuration allows for the monitoring of supply currents to the VCA261x independently of the rest of the evaluation board. If monitoring of the supplies is not required, a single +5V supply can be substituted by connecting the two separate +5V supplies (J4 and J7) together. In this case the –5V supply is still required.

SIGNALS

INPUT SIGNALS

The input signals are applied to SMA connectors J3 and J6 for using the LNA and J2 and J8 for bypassing the LNA. The input signals should be provided from low impedance source. The inputs are ac-coupled into the LNA of the VCA261x through 0.01μF capacitors and through transformers into the VCA inputs.

OUTPUT SIGNALS

The outputs of the evaluation board are located at SMA connectors J1 and J9. When testing the EVM board, the outputs J1 and J9 should be terminated into 50Ω loads such as that of the inputs to a Spectrum Analyzer. This will result in a 6dB loss of the signal magnitude. This loss should be taken into account when taking all measurements.

OUTPUT CONFIGURATION

By utilizing the switches provided at the inputs to amplifiers U1 and U3, the outputs of the VCA261x can be monitored on SMA connectors J1 and J9. Amplifiers U1 and U3 are configured to have a gain of 1/2 in all modes except where the signals are terminated to ground through a 500Ω equivalent resistance. Table I shows the switch positions and the resulting output.

	SINGLE-ENDED NONINVERTING	SINGLE-ENDED INVERTING	DIFFERENCE[1]	NO OUTPUT AT J5 AND J6 (output at test points)
U1				
SW1	1	2	2	1
SW3	2	1	2	1
U3				
SW2	1	2	2	1
SW4	2	1	2	1
NOTE: (1) Denotes Factory Preset.				

TABLE I. Output Configuration.

The outputs of the VCA261x can be terminated through 500Ω on each output, and the output signals can then be observed at test points TP1 and TP2 and test points TP3 and TP4, respectively.

SWITCHES

The five dip-switches (S1) control the gain range bits (MGS1, MGS2, and MGS3) of the PGA, the input selection (VCA_{IN} SEL) to select between input into the LNA or into the VCA, and the feedback select switch to enable the switched-feedback configuration. Table II shows the MGS settings and the corresponding gain ranges.

MGS SETTING	ATTENUATOR GAIN VCA_{CNTL} = 0V to 3V	DIFFERENTIAL PGA GAIN	ATTENUATOR + DIFF. PGA GAIN
000	–24dB to 0dB	24dB	0dB to 24dB
001	–27dB to 0dB	27dB	0dB to 27dB
010	–30dB to 0dB	30dB	0dB to 30dB
011	–33dB to 0dB	33dB	0dB to 33dB
100	–36dB to 0dB	36dB	0dB to 36dB
101	–39dB to 0dB	39dB	0dB to 39dB
110	–42dB to 0dB	42dB	0dB to 42dB
111	–45dB to 0dB	45dB	0dB to 45dB

TABLE II. MGS Settings.

LNA

There are two sets of solder switches (JP1 and JP2) that enable setting the LNA gain. The following table outlines the gain settings for the LNA and the corresponding switch connections.

USED	PART TYPE	DESIGNATOR	FOOTPRINT	DESCRIPTION	PART NUMBER	MFG
6	0.01μF	C4, C12, C19 C22, C27, C32	805	Multilayer Ceramic—0805 Size	C0805C103J4RAC	Kemet
8	0.1μF	C1, C14, C16, C18, C21, C30, C33, C35	805	Multilayer Ceramic—0805 Size	C0805C104J4RAC	Kemet
5	1μF	C25, C26, C28 C23, C31	3216	Low Profile Tantalum Capacitor	T491A105M016AS	Kemet
4	2.2μF	C15, C17, C36, C37	3216	Low Profile Tantalum Capacitor	T491A225M016AS	Kemet
2	4.7pF	C5, C10	805	Multilayer Ceramic—0805 Size	C0805C479D3GAC	Kemet
5	10k	R15, R16, R17, R18, R19	805	1/10W 0805 Chip Resistor		
3	10μF	C24, C34, C38	3528	Low Profile Tantalum Capacitor	T491B106M016AS	Kemet
2	49.9	R1, R14	805	1/10W 0805 Chip Resistor	CRCW080549R9F	Dale
2	56pF	C3, C13	805	Multilayer Ceramic—0805 Size	C0805C560J3GAC	Kemet
4	169	R3, R4, R11, R12	805	1/10W 0805 Chip Resistor		Dale
2	250	R2, R13	805	1/10W 0805 Chip Resistor	CRCW08052500F	Dale
4	330pF	C6, C7, C8, C9	805	Multilayer Ceramic—0805 Size	C0805C331K3GAC	Kemet
2	332	R6, R10	805	1/10W 0805 Chip Resistor	CRCW08053320F	Dale
2	499	R5, R9	805	1/10W 0805 Chip Resistor	CRCW08054990F	Dale
2	549	R7, R8	805	1/10W 0805 Chip Resistor	CRCW08055490F	Dale
2	1nF	C2, C11	805	Multilayer Ceramic—0805 Size	C0805C102K3GAC	Kemet
1	CON_2TERM_SCREW	J4	2P-TERM	2 Terminal Screw Connector	ED-1514-ND	Digi-Key
1	CON_3TERM_SCREW	J7	3P-TERM	3 Terminal Screw Connector	ED-1515-ND	Digi-Key
2	Not Installed	C20, C29	805	Multilayer Ceramic—0805 Size		
2	OPA642N	U1, U3	SOT25	High-Speed, Low THD Op Amp	OPA642N	TI
7	SMA_PCB_MT_MOD	J1, J2, J3 J5, J6, J8, J9	SMA_JACK	SMA_JACK_STRAIGHT	142-0701-231	Johnson
8	SPDT_SLIDE	SW1-SW8	SPDT_SLIDE_500MIL	C&K/TS01-C-K-E	EG-1903-ND	Digi-Key
1	SW DIP-5	S1	5_SPST_DIP_SW	DIP Switch	CKN3004-ND	Digi-Key
2	T1-1T-KK81_XFMR	T1, T2	MC_KK81	RF Transformer MINI-Circuits T1-1T	T1-1T-KK81	MINI-Circuits
1	VCA261x	U2	48-TQFP(PFB)	Voltage Controlled Amplifier	VCA261x	TI

TABLE III. Schematic Parts List.

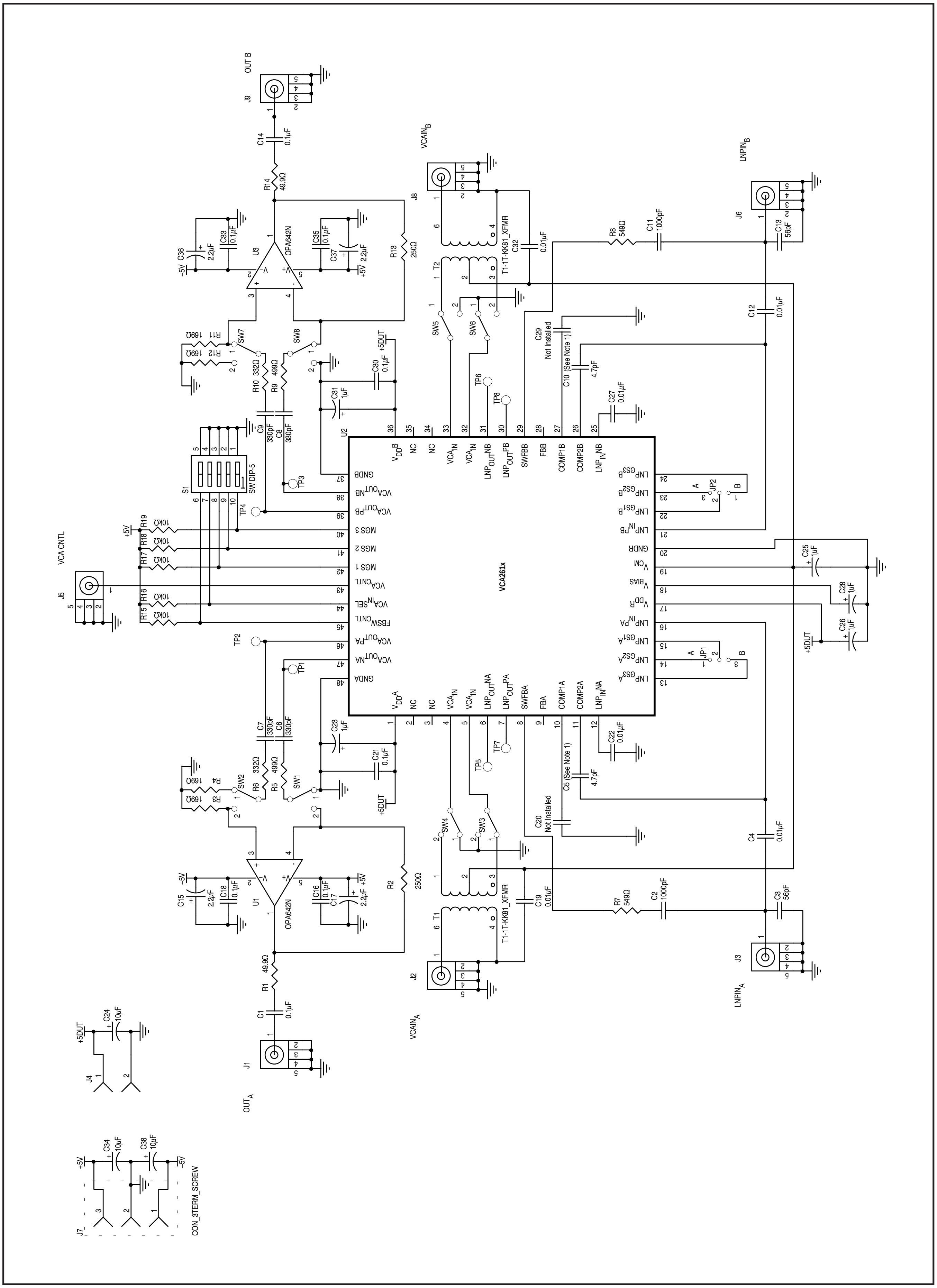

FIGURE 1. Schematic.

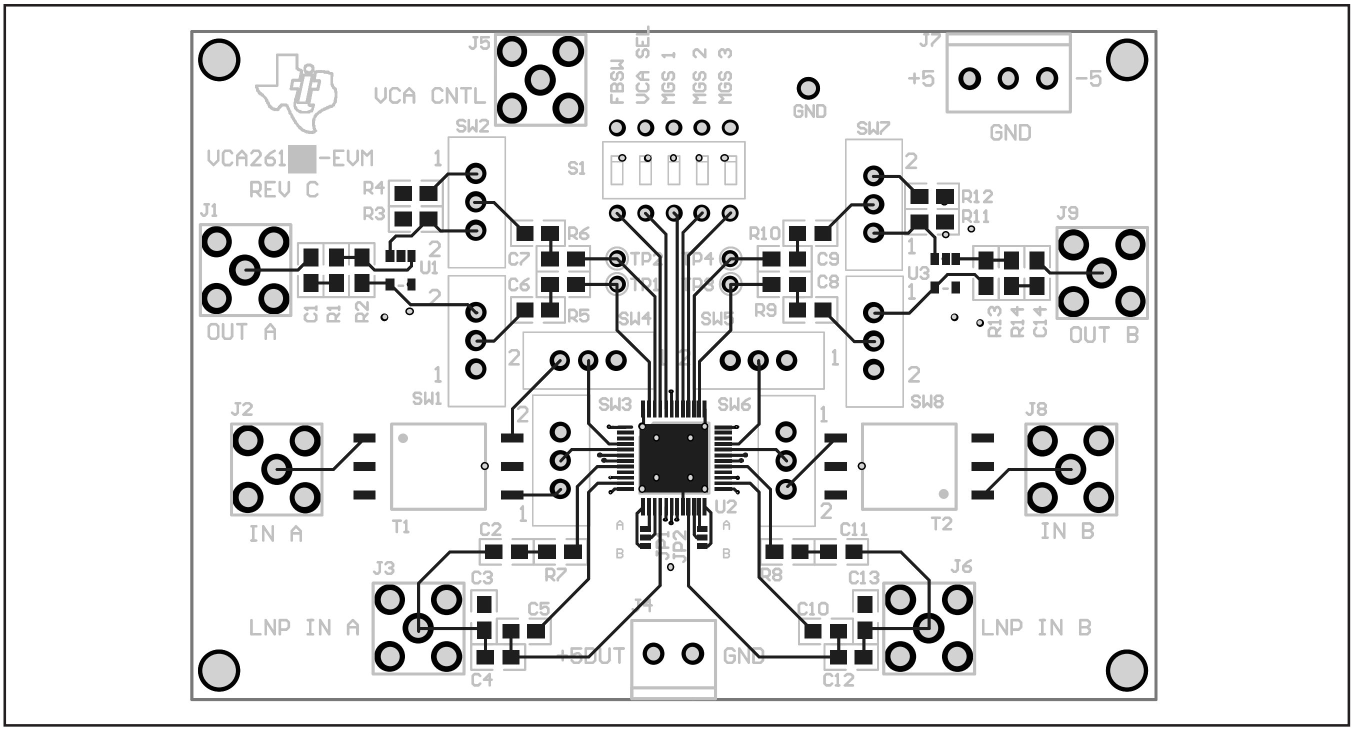

FIGURE 2. Top Layer and Silkscreen.

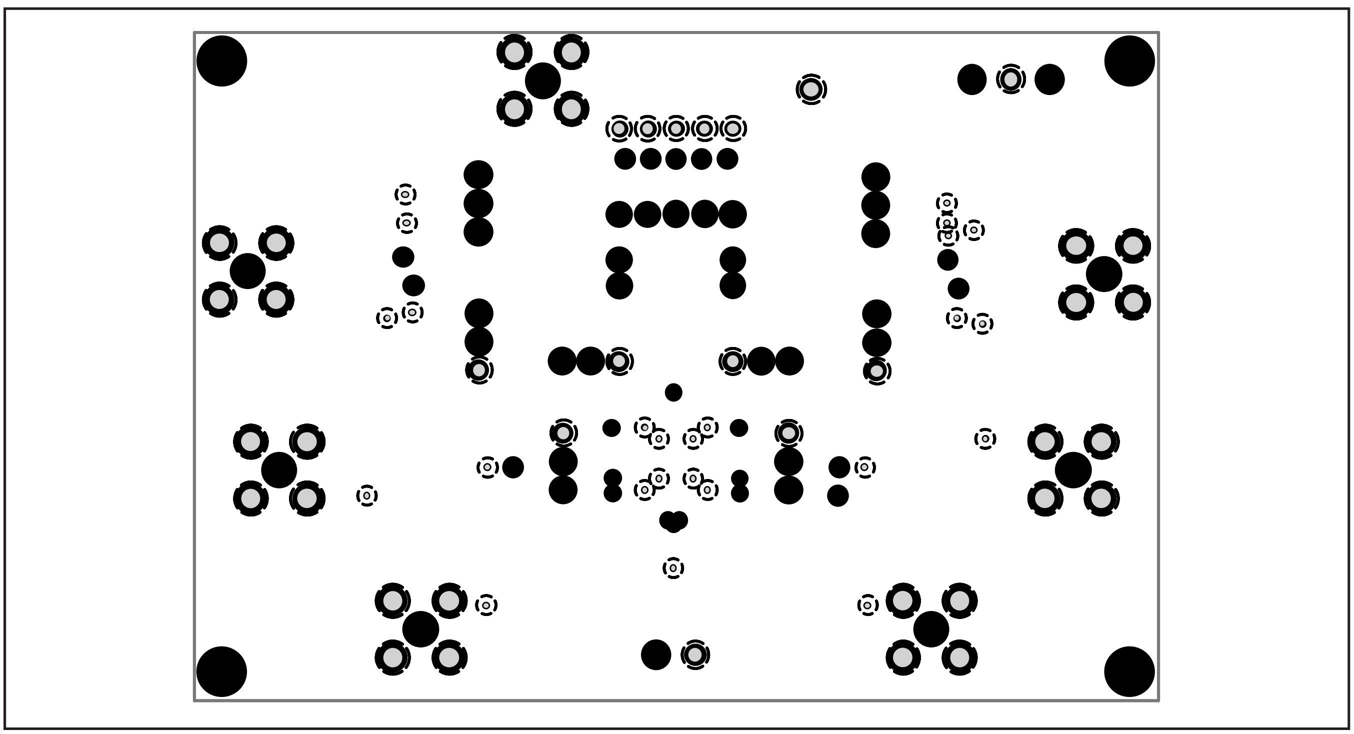

FIGURE 3. Ground Layer.

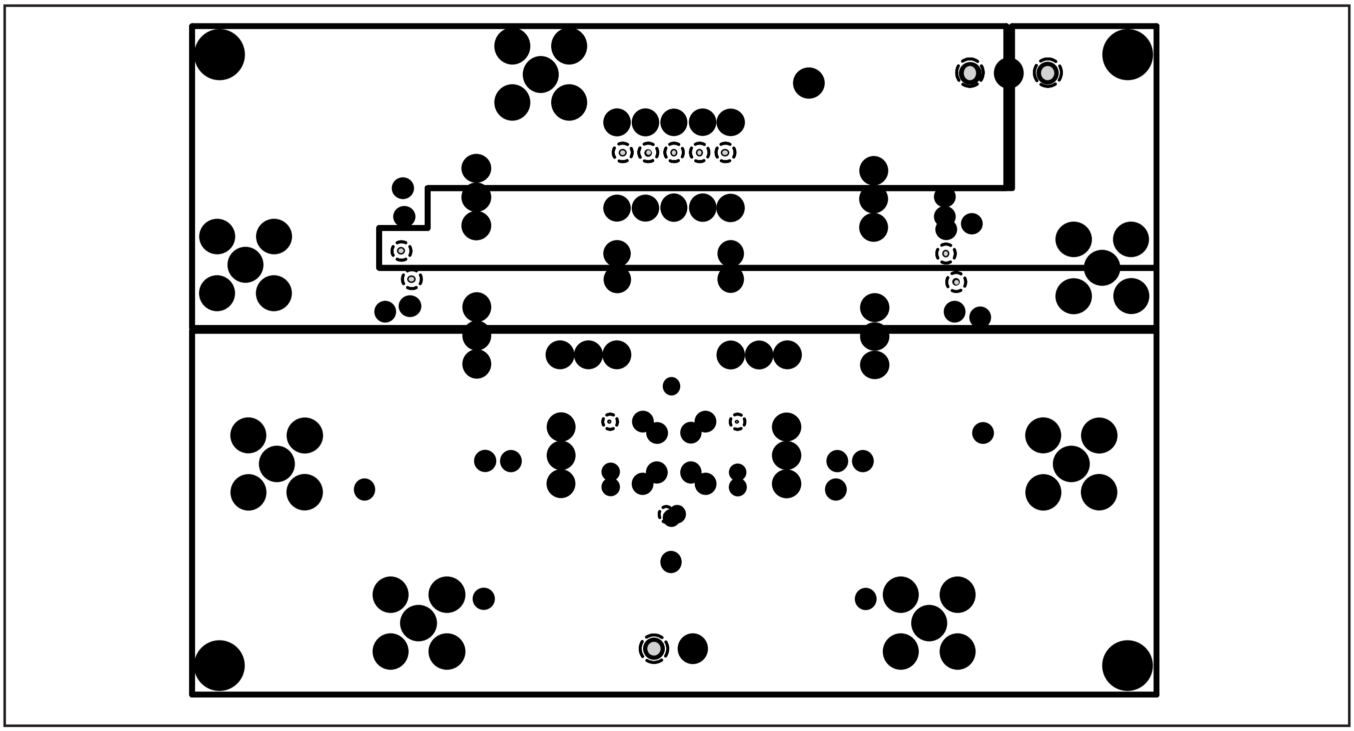

FIGURE 4. Power Layer.

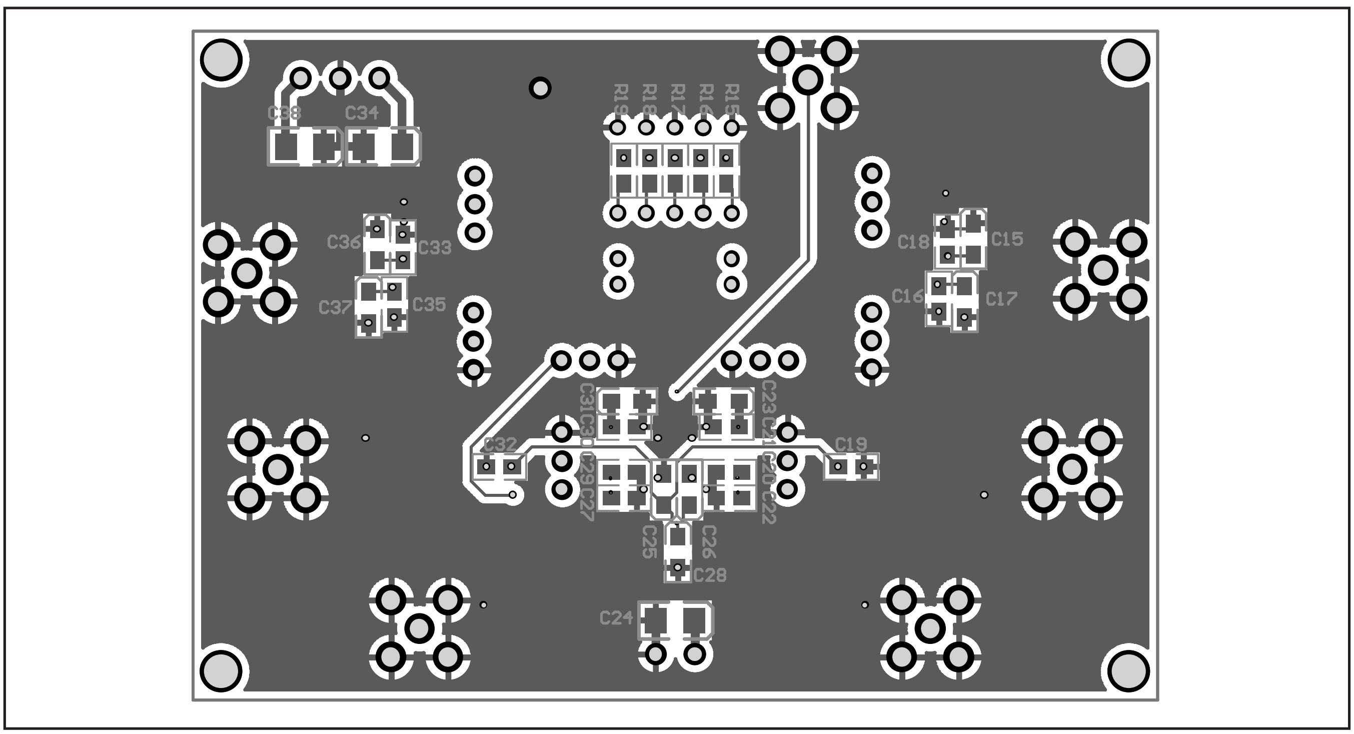

FIGURE 5. Bottom Layer and Silkscreen.

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It is important to operate this EVM within the specified input and output ranges described in the EVM User's Guide.

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 60°C. The EVM is designed to operate properly with certain components above 60°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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