DAC290x-EVM

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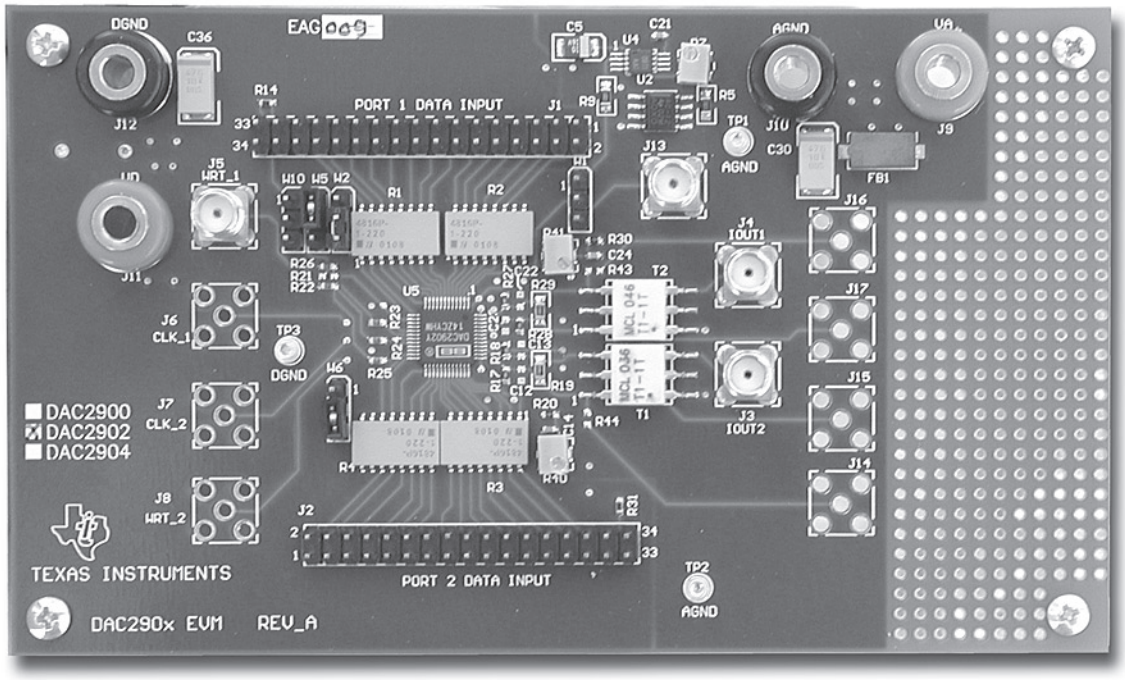

FEATURES

- POPULATED EVALUATION BOARD FOR THE DUAL, HIGH-SPEED DAC290x
- PROVIDES FAST AND EASY PERFORMANCE TESTING FOR THE DAC290x
- SINGLE-ENDED OR TRANSFORMER-COUPLED DIFFERENTIAL OUTPUTS
- SINGLE CLOCK INPUT CONFIGURATION
- ADJUSTABLE BIAS

DESCRIPTION

The DAC290x-EVM is designed for ease of use in evaluating the DAC290x dual, high-speed Digital-to-Analog Converter (DAC) family. This family consists of three 125MSPS DACs: the 10-bit DAC2900, the 12-bit DAC2902, and the 14-bit DAC2904. Due to its flexible design, the user can evaluate the converter with different clock configurations, independent bias control, internal or external reference source, and single- or dual-supply operation. The analog output of the DAC290x DACs can be configured to drive a 50Ω terminated cable using a single-ended, or 4:1 or 1:1 impedance ratio transformer.

INITIAL CONFIGURATION

By using jumpers and 0Ω resistors, the DAC290x-EVM can be set up in a variety of configurations to accommodate a specific mode of operation. Before starting evaluation, the user should decide on the configuration and make the appropriate connections or changes. The demonstration board comes with the following factory-set configuration:

- Single clock source driving CLK_1, WRT_1, CLK_2, and WRT_2 from WRT_1 input J5. W10, R21, R32-R37, and J6-J8 not installed.
- Transformer coupled outputs (1:1) using transformer T1 and T2. R43-R46, C12, C13, C22, and C23 not installed. Note that a dc-bias voltage is set at the center tap.
- The converter is set to operate with the internal reference. Jumper W1 is not installed.
- The full-scale output current of both DACs is set to 20mA through the FSA resistors R15 and R16 (2kΩ each). Jumper W2 is installed connecting pin 42 (GSET) to ground.
- The DAC290x output is enabled (power-down mode disabled). Jumper W6 is installed connecting pin 37 (PD) to ground.

POWER SUPPLY

The DAC290x converter requires two power supplies—an analog and a digital supply. Each of the supplies may be set independently between +3.0V and +5.0V. The analog supply, +VA, must be connected at banana jack J9 with the return going to banana jack J10. The digital supply, +VD, connects at banana jack J11 with the return connected to J12.

When operating the DAC290x with a +3.0V digital supply, care must be taken that the amplitude of the digital data inputs has a corresponding logic level. The logic high level must not exceed the power supply by more than 0.3V. Refer to the product data sheets (DAC2900—SBAS166; DAC2902—SBAS167; DAC2904—SBAS198) for further details.

All analog and digital power, and grounds are distributed by the use of power planes.

INPUT CLOCK

The DAC290x-EVM default configuration requires only one clock input. The clock should be applied via SMA connector WRT_1 (J5), which provides a 50Ω terminated input. It is recommended to use a square wave clock with an amplitude of ≥ 3.0Vp-p. In order to preserve the specified performance of the DAC290x converter, the clock source should feature very low jitter.

MULTIPLE INPUT CLOCKS

The DAC290x-EVM evaluation board can be configured for multiple input clocks, each driving a CLK or WRT input pin. This mode would require the user to install J6, J7, J8, R32 thru R37, and removal of R22 thru R25.

INTERNAL REFERENCE OPERATION

The full-scale output current is set by applying an external resistor (R15 and R16) between the FAS1 and FAS2 pins of the DAC290x and ground. The full-scale output current can be adjusted from 20mA down to 2mA by varying R15 and R16 or changing the externally applied reference voltage. The full-scale output current, $IOUT_{FS}$, is defined as follows:

$$IOUT_{FS} = 32 \bullet (V_{REF\_IN}/R_{BIAS})$$

where V_{REF_IN} is the voltage at pin REF_IN and R_{BIAS} is the resistance of R15 (for DAC1) or R16 (for DAC2). This voltage is typically +1.25V when using the internally provided reference voltage source. Two potentiometers (R40 and R41) are provided to allow the user to adjust the center voltage of the DAC outputs across transformers T1 and T2. The EVM initial setup is for full-scale output current operation, with the potentiometers adjusted to provide 0.5V at the center tap of the transformers.

EXTERNAL REFERENCE OPERATION

The internal reference can be disabled and overridden by an external reference. Two methods of external reference are provided by the EVM. The user can provide an external reference by connecting a voltage source to SMA connector J13 with Jumper W1 installed between pins 2 and 3. In addition, a reference circuit has been included on the EVM to provide a second external reference source. This source is available by placing Jumper W1 between pins 1 and 2 and adjusting potentiometer R7 to the desired voltage. The range of this circuit is from 0V to 1.25V. The specified range for external reference voltages should never exceed the limits as specified per the data sheet.

POWER-DOWN MODE

The DAC290x-EVM provides a means of placing the DAC290x converter into a power-down mode. This mode is activated by re-configuring Jumper W6 so that it connects the PD-pin (pin37) to +VD.

INPUT DATA

The DAC290x-EVM allows the user to input I and Q digital data to the DAC using J1 and J2. The board provides series dampening 22Ω resistors and buffering to minimize digital ringing and switching noise. The connectors also provide a path for an input clock. With the EVM set up in the single clock source mode, the user can provide a clock through J1 or J2 by installing jumper W10 and resistor R21. The 14-bit input data buses are brought in through two 34 pin headers as shown in Tables I and II.

J1 PIN #	DESCRIPTION	J1 PIN #	DESCRIPTION
1	Data Bit 13 (MSB)	18	GND
2	GND	19	Data Bit
3	Data Bit 12	20	GND
4	GND	21	Data Bit 3
5	Data Bit 11	22	GND
6	GND	23	Data Bit 2
7	Data Bit 10	24	GND
8	GND	25	Data Bit 1
9	Data Bit 9	26	GND
10	GND	27	Data Bit 0
11	Data Bit 8	28	GND
12	GND	29	Open
13	Data Bit 7	30	GND
14	GND	31	Open
15	Data Bit 6	32	GND
16	GND	33	CLK1
17	Data Bit 5	34	GND

TABLE I. Input Connector J1—Data Port 1.

J2 PIN #	DESCRIPTION	J2 PIN #	DESCRIPTION
1	Data Bit 13 (MSB)	18	GND
2	GND	19	Data Bit 4
3	Data Bit 12	20	GND
4	GND	21	Data Bit 3
5	Data Bit 11	22	GND
6	GND	23	Data Bit 2
7	Data Bit 10	24	GND
8	GND	25	Data Bit 1
9	Data Bit 9	26	GND
10	GND	27	Data Bit 0
11	Data Bit 8	28	GND
12	GND	29	Open
13	Data Bit 7	30	GND
14	GND	31	Open
15	Data Bit 6	32	GND
16	GND	33	CLK2
17	Data Bit 5	34	GND

TABLE II. Input Connector J2—Data Port 2.

VALUE	FOOTPRINT	QTY	PART NUMBER	VENDOR	REF DESIGNATOR	NOT INSTALLED
“47µF, Tantalum, 10%, 10V“	7343	2	10TPA47M	SANYO	C30 C36	
“0.1µF, 100V, 10% Capacitor”	805	3	08055C104JAT2A	AVX	C6 C28 C34	
“0.1µF,16V, 10% Capacitor”	603	7	ECJ-1VB1C104K	Panasonic	C7 C11 C14 C19 C20 C21 C24	
“10µF, 10V, 10% Capacitor”	3528	3	GRM42X5R106K10	Murata	C5 C26 C32	
“.01µF, 100V, 5% Capacitor”	805	2	12065C103KAT2A	AVX	C29 C35	
“1.0µF, 16V, 10% Capacitor”	1206	2	1206ZC105KAT2A	AVX	C27 C33	
“22pF, 50V, 5%, Capacitor”	603	0	06035A220JAT2A	AVX		C12 C13 C22 C23
Ferrite Bead	27—037447	2	#27-037447	FairRite	FB1 FB2	
“24.9Ω Resistor, 1/16W, 1%”	603	2	ERJ-3EKF24R9V	Panasonic	R20 R30	
“22.1Ω Resistor, 1/16W, 1%”	603	2	ERJ-3EKF22R1V	Panasonic	R14 R31	
“49.9Ω Resistor, 1/16W, 1%”	603	5	ERJ-3EKF49R9V	Panasonic	R17 R18 R27 R28 R38	“R32, R34, R36”
“2.0KΩ Resistor, 1/8W, 1%“	805	2	CRCW08052001F	Dale	R15 R16	
“1.0KΩ Resistor, 1/8W, 1%“	805	2	CRCW08051001F	Dale	R5 R9	
“100Ω Resistor, 1/4W, 1%”	805	2	CRCW08051000F	Dale	R19 R29	
“0Ω Resistor, 1/16W, 1%”	603	5	ERJ-3EKF0R00V	Panasonic	R22 R23 R24 R25 R26	R21 R33 R35 R37 R43 R44 R45 R46
“0Ω Resistor, 1/10W, 1%”	1206	4	ERJ-6ENF0R00V	Panasonic	R10 R11 R12 R13	
1K Pot	BOURNS_32X4W	1	TCO3X-2-102E	Bourns	R7	
500Ω Pot	BOURNS_32X4W	2	TC03X-2-501E	Bourns	R40 R41	
Transformer	MC_KK81	2	T1-1T-KK8	Mini-Circuits	T1 T2	
SMA Connectors	SMA_Jack	4	713-4339 (901-144-8RFX)	ALLIED	J3 J4 J5 J13	J14 J15 J16 J17 J6 J7 J8
Black Test Point	Test_Point	3	5001K	Keystone	TP1 TP2 TP3	
3-Pos_Header	3-Pos_Jumper	5	TSW-150-07-L-S	Samtec	W1 W2 W5 W6 W10	
2 Circuit Jumpers	NA	0	863-3285	Allied(molex)		
34-Pin Header	34-Pin Header	2	TSW-117-07-L-D	Samtec	J1 J2	
Red Banana Jacks	BANANA_JACK	2	ST-351A	ALLIED	J9 J11	
Black Banana Jacks	BANANA_JACK	2	ST351B	ALLIED	J10 J12	
DAC29XX	48-TQFP(PFB)	1	DAC2900/02/04Y	TI	U5	
LT1004D-1.2	8-SOP(D)	1	LT1004ID-1-2	TI	U2	
22Ω R-Pack	2NBS16	4	4816P-001-220	Bourns	R1 R2 R3 R4	
TLV2462	8-MSOP(DGK)	1	TLV2462CDGK	TI	U4	
“Stand Off Hex (1/4 x 1””)”	4-40 Screw	4	219-2063	Allied		

TABLE III. DAC290x-EVM Parts List.

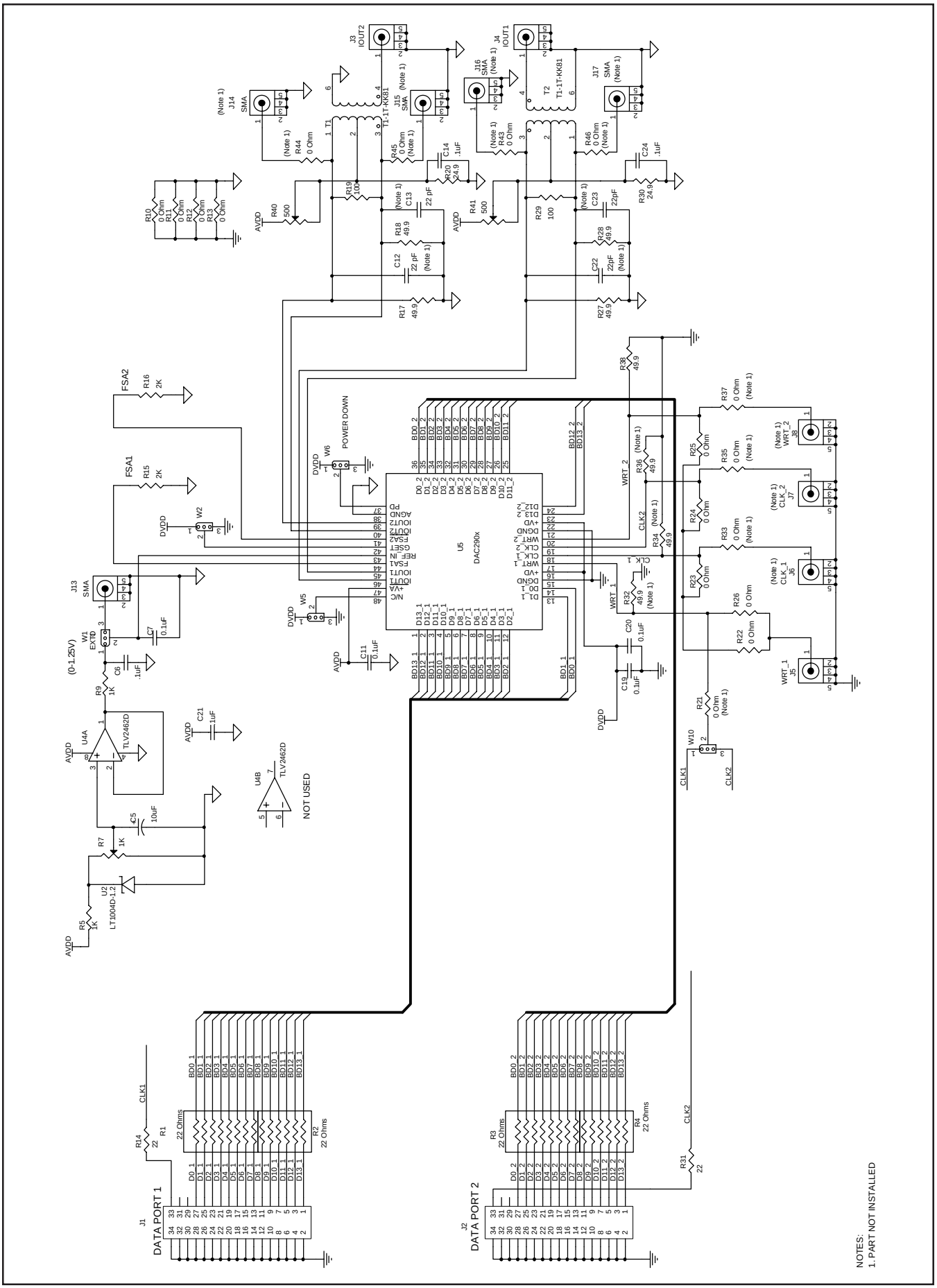

FIGURE 1. DAC290x-EVM Circuit Schematic #1.

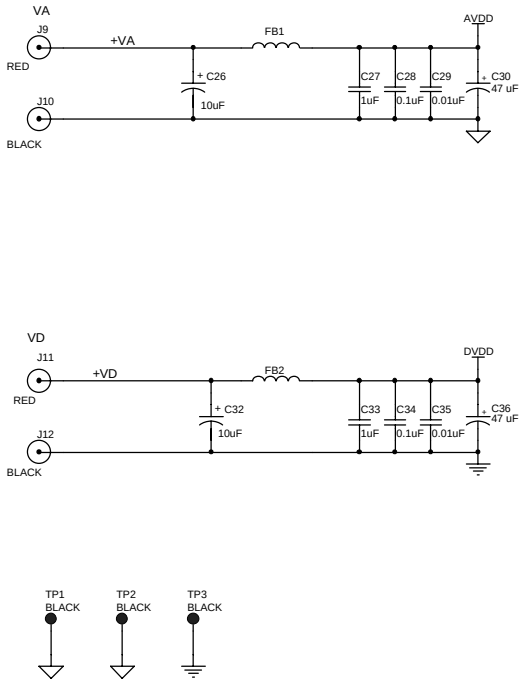

FIGURE 2. DAC290x-EVM Circuit Schematic #2.

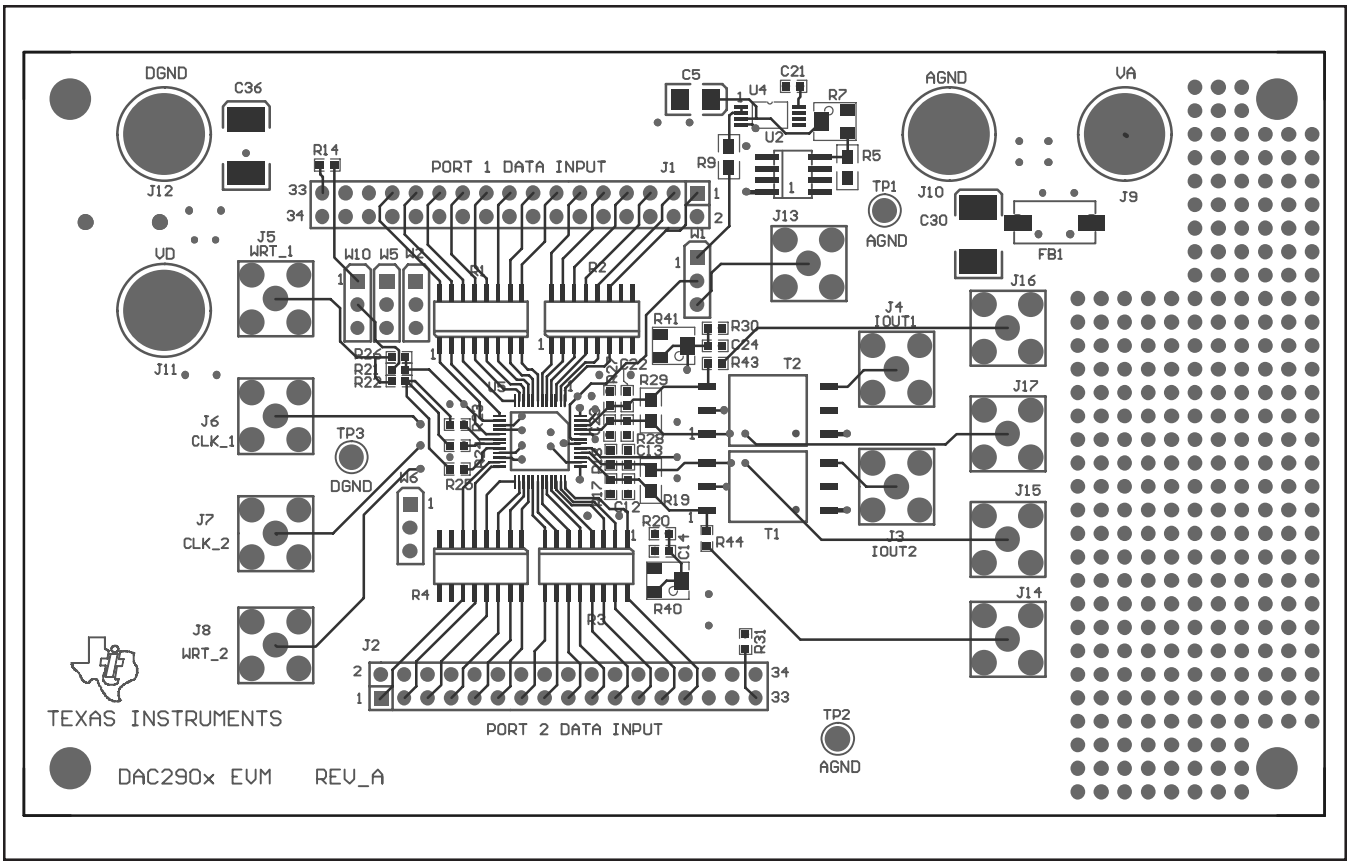

FIGURE 3. Top Layer with Silkscreen.

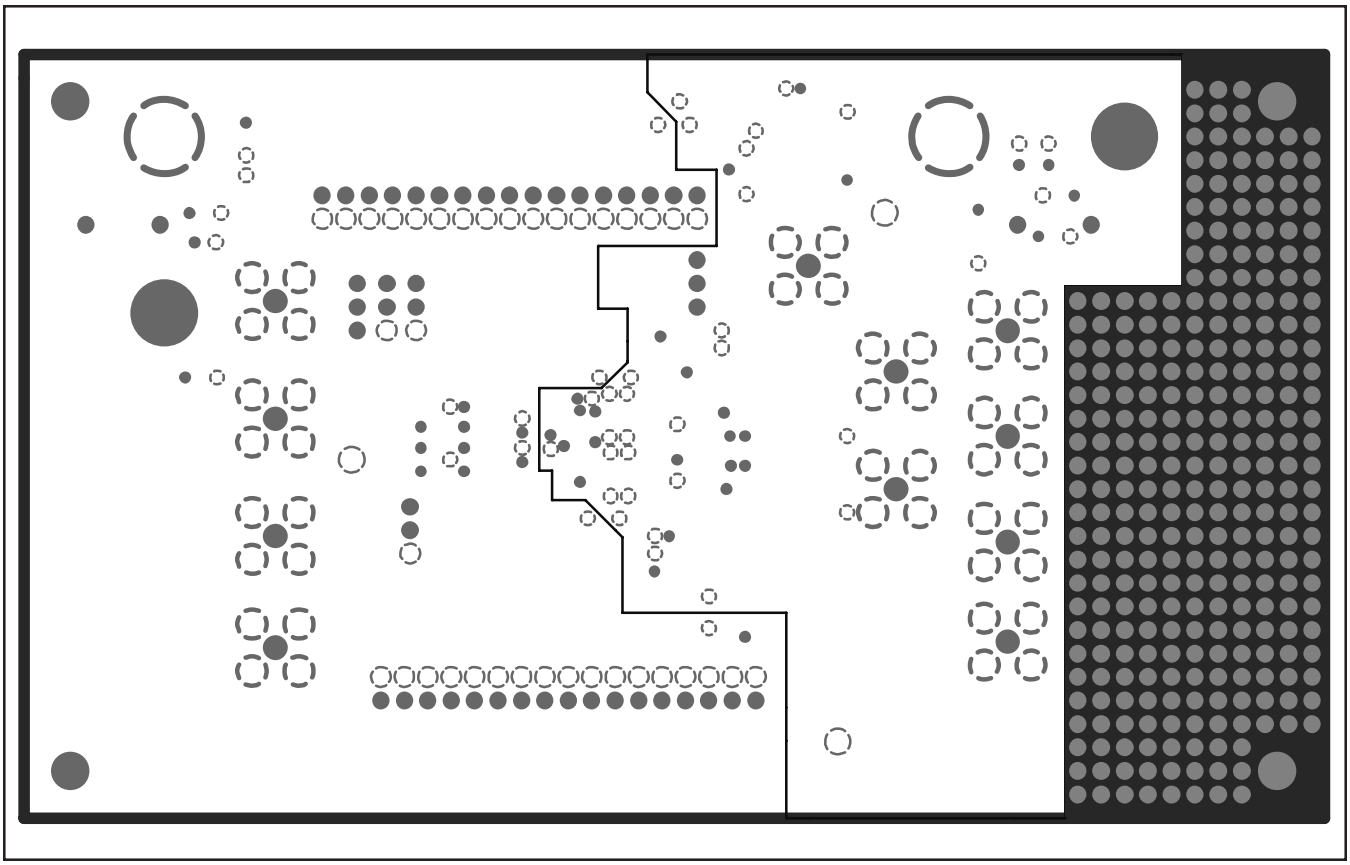

FIGURE 4. Ground Plane.

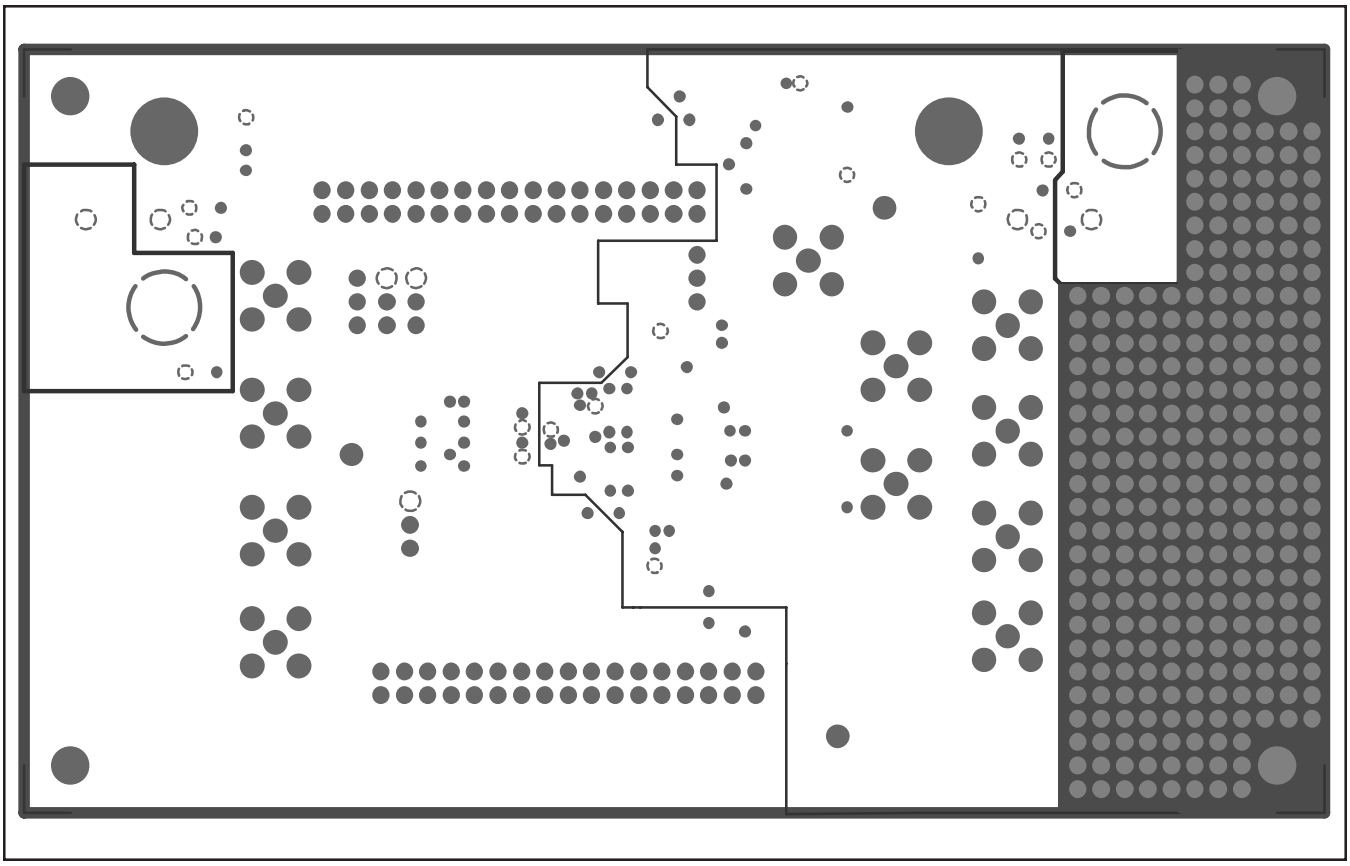

FIGURE 5. Power Plane.

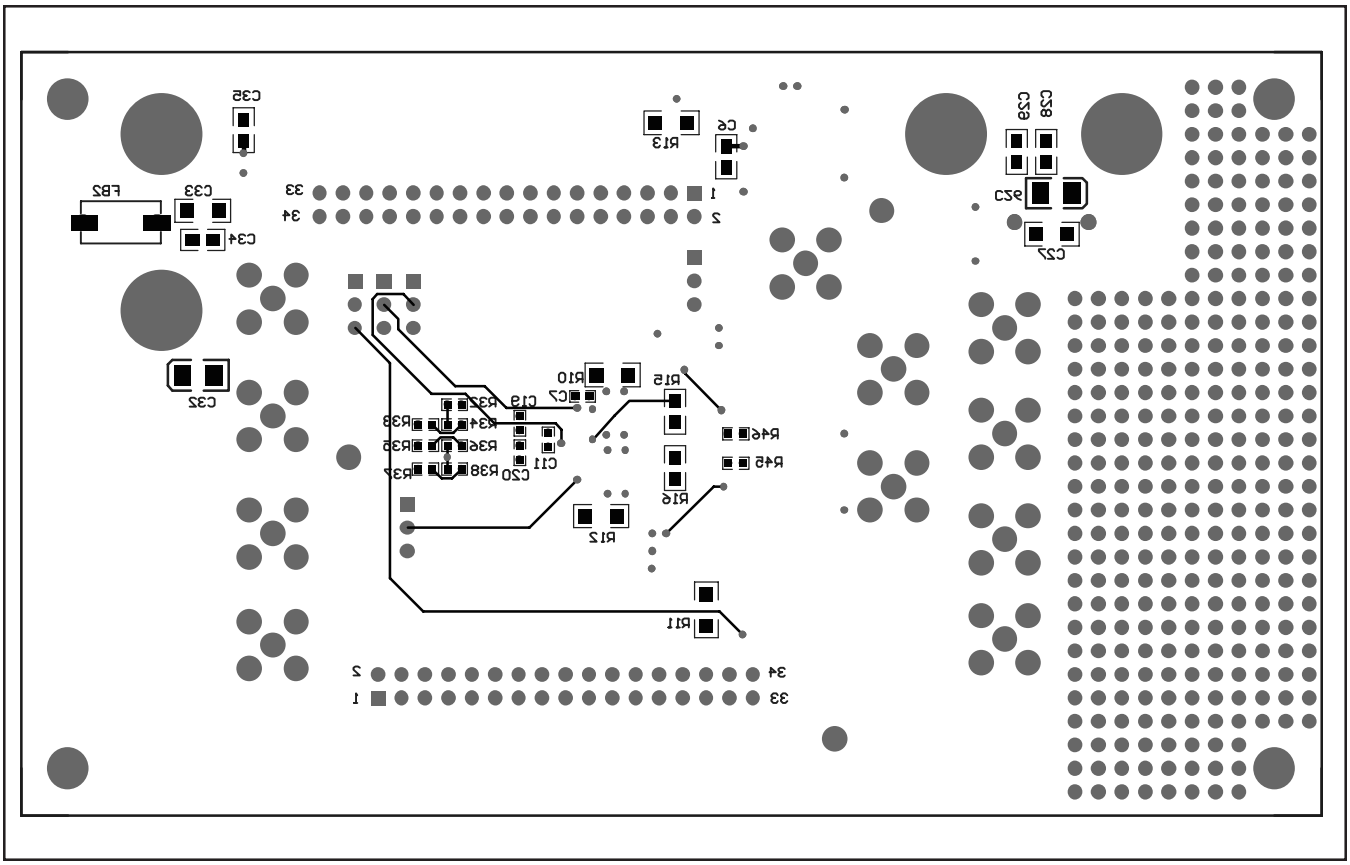

FIGURE 6. Bottom Layer with Silkscreen.

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