DEM-ADS83xE

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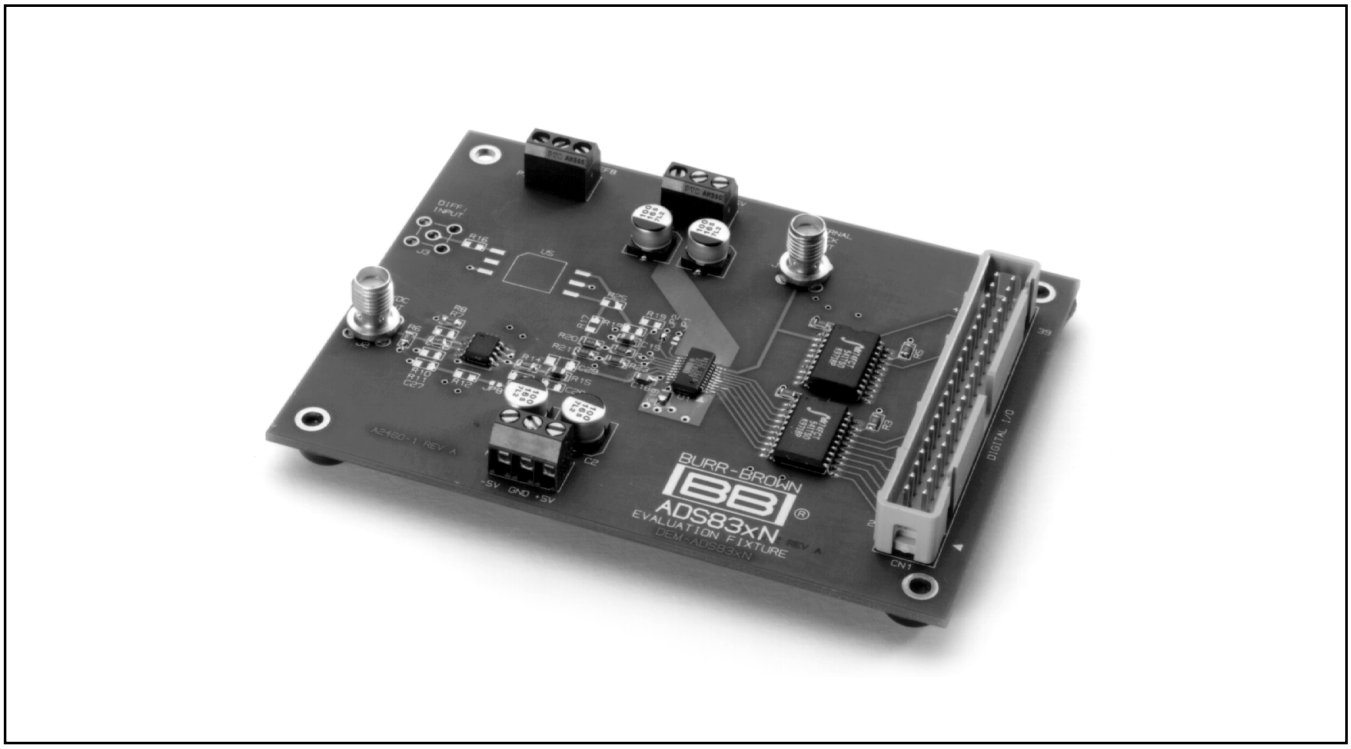

FEATURES

- **PROVIDES FAST AND EASY PERFORMANCE TESTING FOR ADS830/831**
- **AC- OR DC-COUPLED INPUTS**
- **SINGLE-ENDED OR DIFFERENTIAL INPUT CONFIGURATION**
- **EXTERNAL REFERENCE OPTION**

DESCRIPTION

The DEM-ADS83xE evaluation fixture is designed for ease of use when evaluating the 8-bit high speed Analog-to-Digital (A/D) converter ADS830 or ADS831. The ADS830 operates with a 60Msps maximum sampling rate while the ADS831 run up to 80Msps. Because of its flexible design, the user can evaluate the converter in many different configurations: either with DC-coupled or ac-coupled inputs, single-ended, or differential inputs. The data output of the ADS83x-E converter are decoupled from the connector by CMOS octal logic buffer.

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INITIAL CONFIGURATION

By using solder switches and resistor placements, the demonstration board, DEM-ADS83xE, 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 evaluation board comes with the following factory-set configuration:

- The OPA681 is set for a noninverting configuration with a gain of +2V/V ($R_8 = R_9 = 402\Omega$). R_7, R_{11}, R_{12}, R_{13}, and C_{27} are not assembled.
- With capacitor C_{29}, the output of the driver op amp OPA681 is ac-coupled to the converter input.
- The converter is set to operate with the internal reference—solder switch JP2 is closed.
- The full-scale input range is set to 2Vp-p. The solder switch JP1 is open.
- The required common-mode voltage to bias the input of the ADS83xE is derived from the internal top and bottom references by R_{20} and R_{21} and applied to the signal input of the ADS83xE, pin 17 (U1).
- The bias for the complementary input ($\overline{IN}$) of the ADS83xE is developed similarly with R_{22} and R_{23}.

POWER SUPPLY

The evaluation board typically operates with a ±5V power supply. This ±5V supply, applied at connector P1, is the supply for the analog front end and is separated from the converter supply. The ADS83xE is powered with a +5V supply through connector P2. By using the negative supply for the driving op amp, the applied input signal can be a ground referenced signal with a bipolar swing and does not need to be level shifted. However, the input driver, OPA681, can be set to operate with a single +5V supply as well.

SIGNAL INPUT

DC-Coupled

The standard configuration of the evaluation board uses the high-speed op amp OPA681, a current-feedback type op amp that features low distortion. In order to implement level shifting for the dc-coupled circuit configuration op amp, U4 needs to be re-configured for inverting mode. For this, remove R_8 and install R_7. The level shifting voltage is derived from the +5V supply and applied to the noninverting input. To generate the correct DC-voltage, calculate appropriate values for resistors R_{11} and R_{12} and close solder switch JP8. Note that in this configuration the input impedance to the board is also determined by the input resistor, R_7, and an appropriate termination resistor (R_6) value should be selected. Connect terminal 3 of connector P1 to terminal 2 (GND).

To change the input full-scale range from 2Vp-p to 1Vp-p close solder switch JP1.

Transformer Coupled

The evaluation board provides the option to evaluate the A/D converter with differential signal inputs. Here, a RF-transformer is used to convert the single-ended input signal applied to SMA connector J3 into a differential signal. The following steps have to be done to reconfigure the board:

- Remove resistors R_{20}, R_{21}, and R_{22}, R_{23}.
- Remove C_{15} and replace with a 47pF capacitor.
- Remove R_{15}, C_{28} (C_{29}).
- Install R_{17} and R_{18}, typically 22Ω.
- Install RF-transformer (U5). The model TT1-6, for example, is a 1:1 wideband RF-transformer manufactured by “Mini-Circuits”. The layout is prepared for the “KK81” case style (surface mount). Note to add a proper termination resistor (R25) depending on the selected transformer model.
- Install R_{16}. Consider to use a 0.1µF capacitor to block the DC path in the case the input signal carries a DC voltage.

This differential input configuration can be operated with external references as well.

CLOCK

The DEM-ADS83xE evaluation board requires an external clock applied at SMA connector J1. This input represents a 50Ω input to the source. In order to preserve the specified performance of the ADS83x-E converter the clock source should feature a very low jitter. This is particularly important if the converter is to be evaluated at its maximum sampling rate or for undersampling condition.

EXTERNAL REFERENCE

The ADS830E and ADS831E converter can be operated with an external reference. For this solder switch JP2 must be opened, disabling the internal references. Close solder switches JP3 and JP4 and apply the external reference voltage at connector P3.

The selected reference voltage determines the full-scale input signal range of the converter.

DIGITAL OUTPUT DRIVER SUPPLY, V_{DRV}

The ADS83xE converter features a dedicated supply pin for the output logic drivers, V_{DRV}, which is not internally connected to the other supply pins. This allows the ADS83xE to be interfaced to either +3V or +5V logic. On the evaluation board the V_{DRV} supply available at connector P2 is shorted to the analog +5V supply with the 0Ω resistor, R_{25}.

DATA OUTPUT

The data output is provided at CMOS logic levels. The ADS83xE converter uses straight offset binary coding. The data output pins of the converter are buffered from the I/O connector, CN1, by two CMOS octal buffers (FCT541).

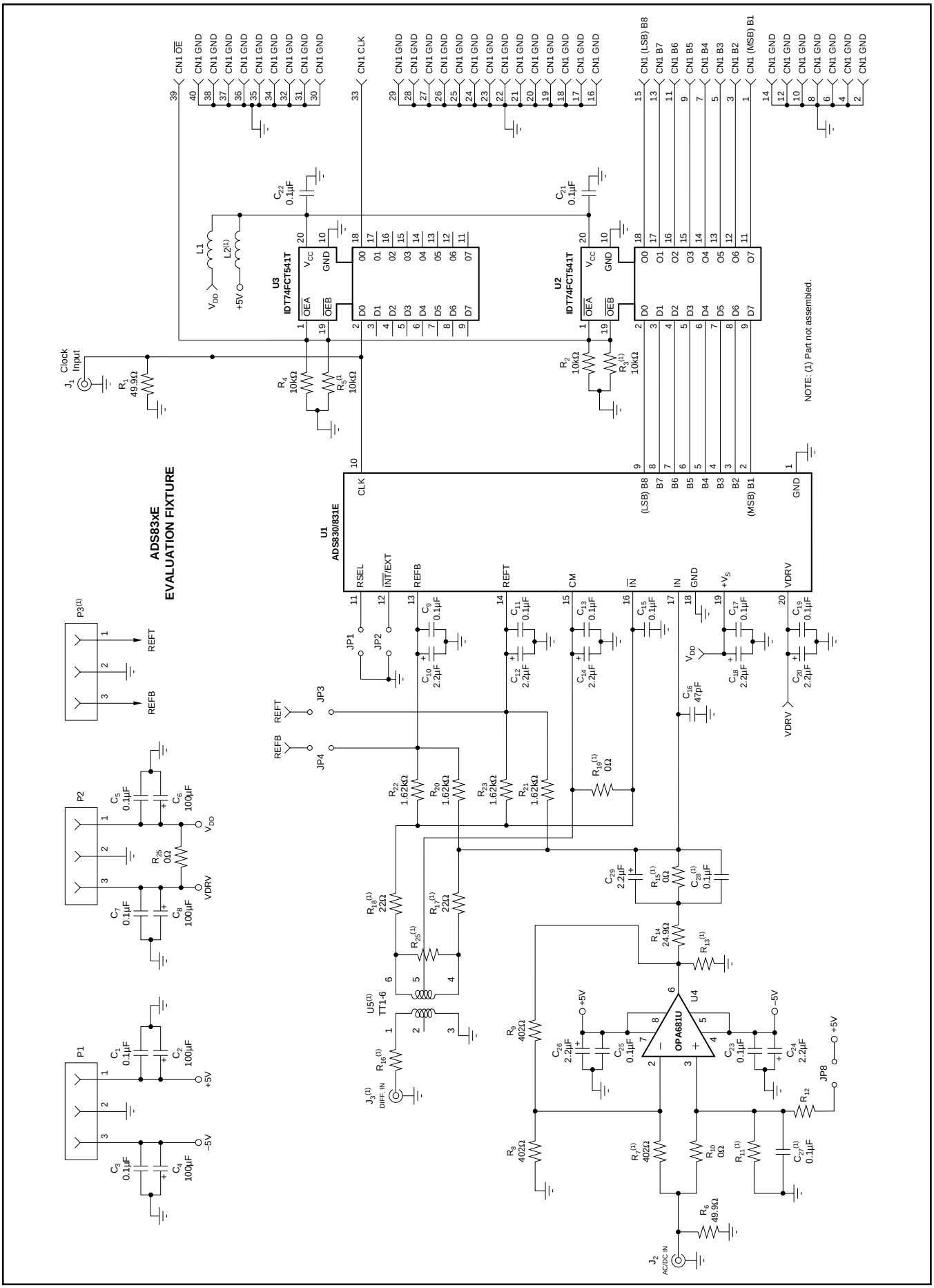

FIGURE 1. Circuit Schematic DEM-ADS83xE.

PC-BOARD LAYOUT

The DEM-ADS83xE evaluation demo board consists of a four-layer PC board. To achieve the highest level of performance, surface-mount components are used wherever possible. This reduces the trace length and minimizes the effects of parasitic capacitance and inductance. The A/D converter is treated like an analog component. Therefore, the evaluation board has one consistent ground plane. Keep in mind that this approach may not necessarily yield optimum performance results when designing the ADS83xE into different individual applications. In any case, thoroughly bypassing the power supply and reference pins of the converter, as demonstrated on the evaluation board, is strongly recommended.

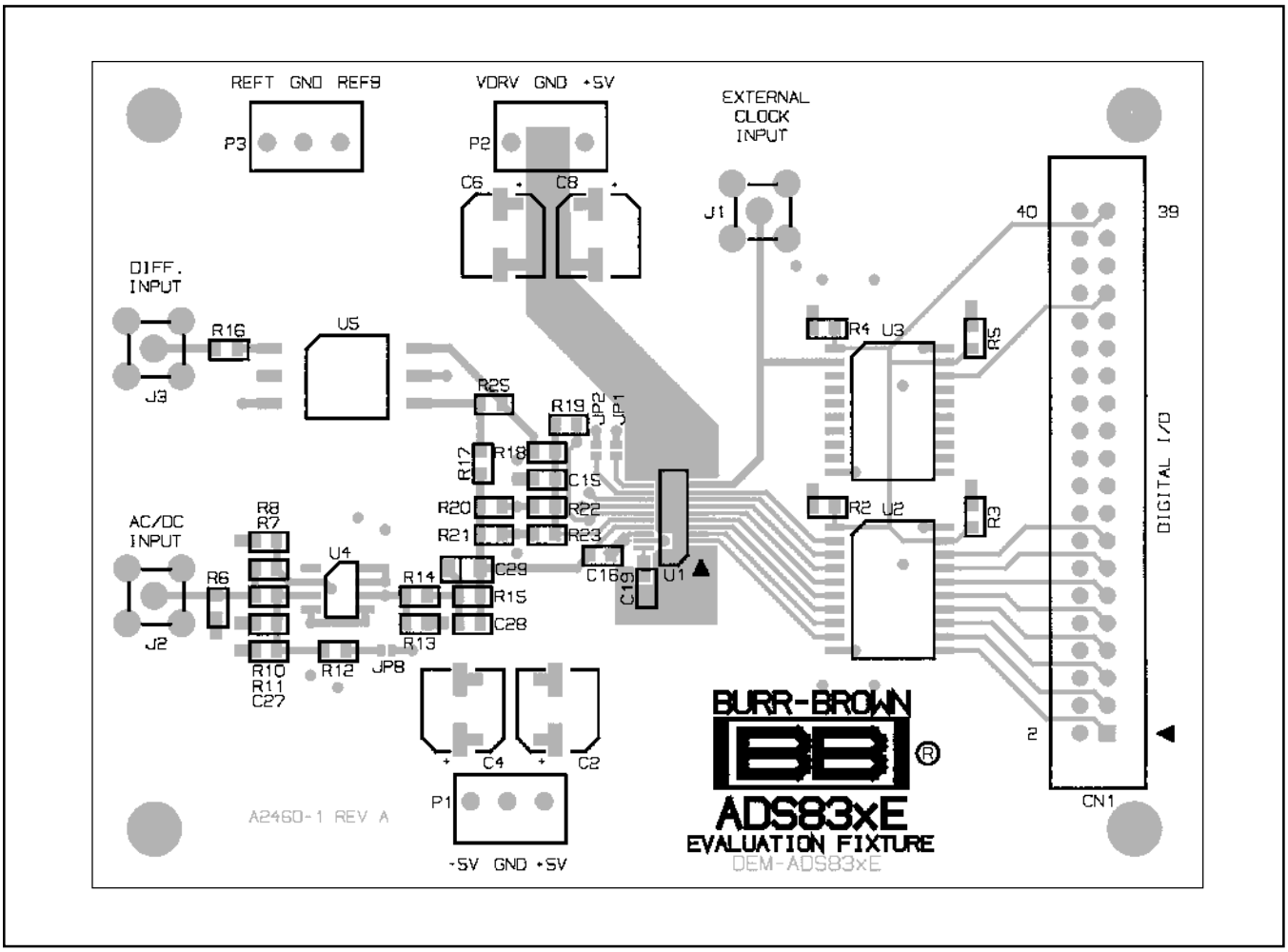

FIGURE 2. Top Layer with Silk-Screen.

ORDERING INFORMATION

PRODUCT	ANALOG-TO-DIGITAL CONVERTER
DEM-ADS830E	ADS830E, 8-Bit 60Msps
DEM-ADS831E	ADS831E, 8-Bit 80Msps

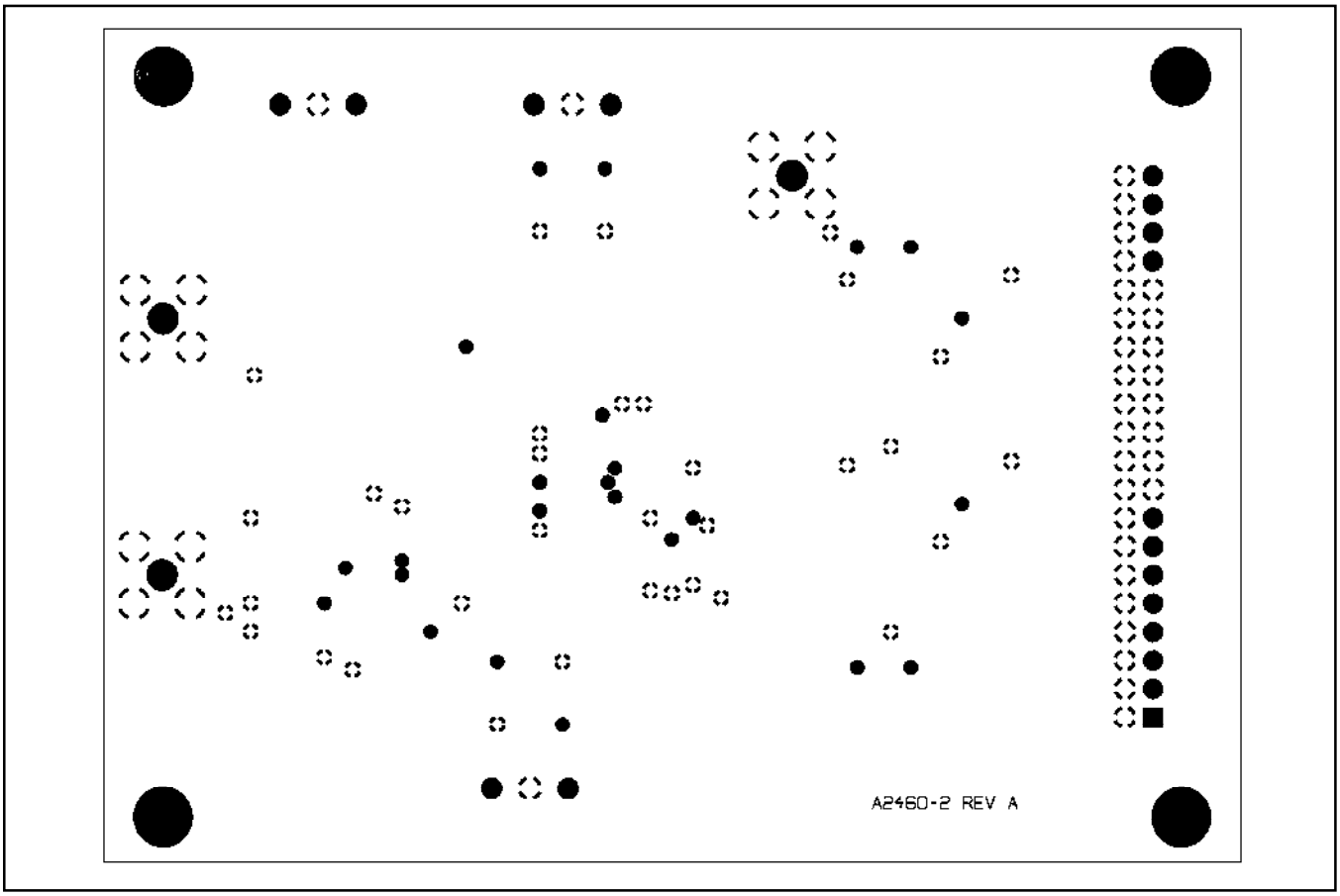

FIGURE 3. Ground Plane.

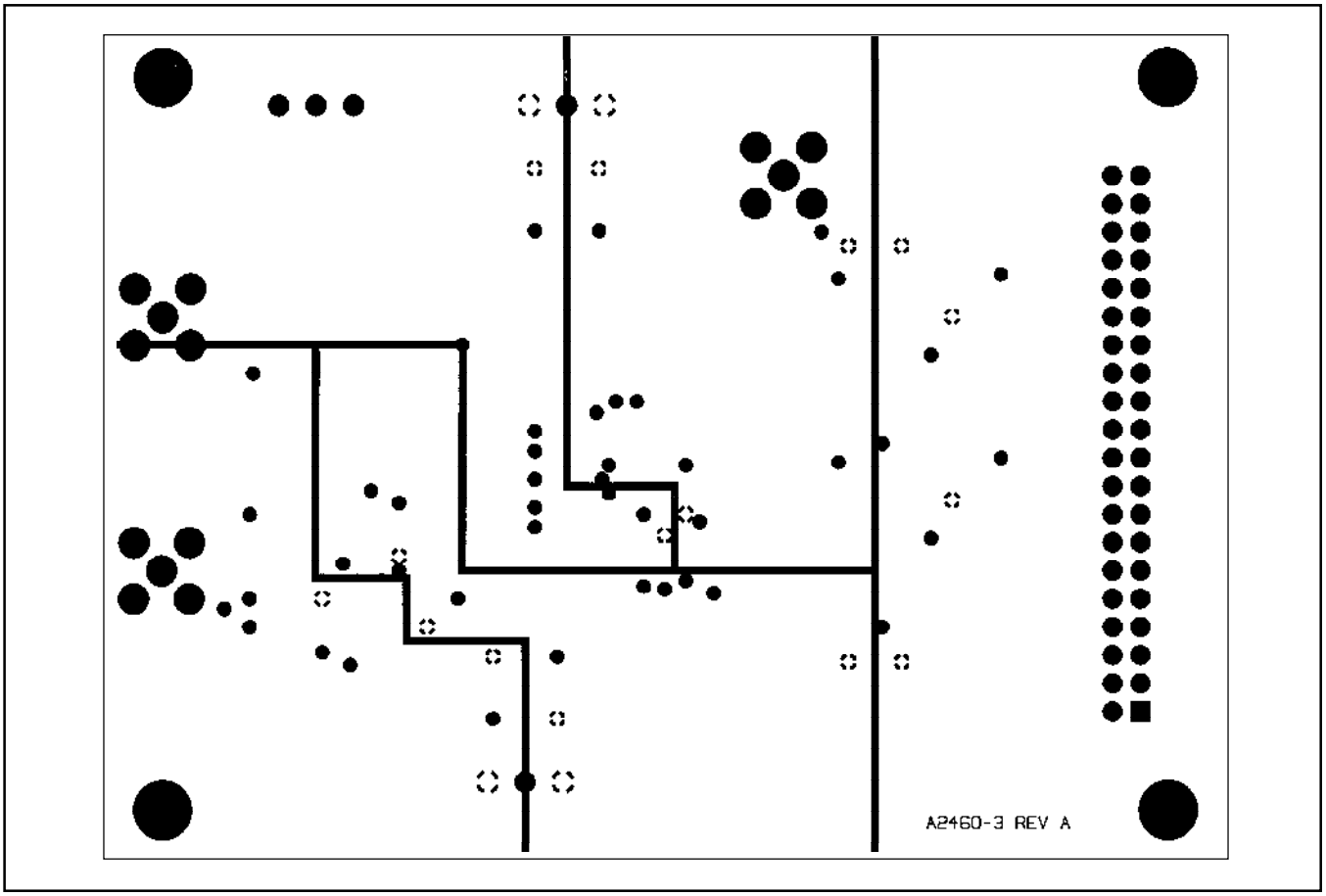

FIGURE 4. Power Plane.

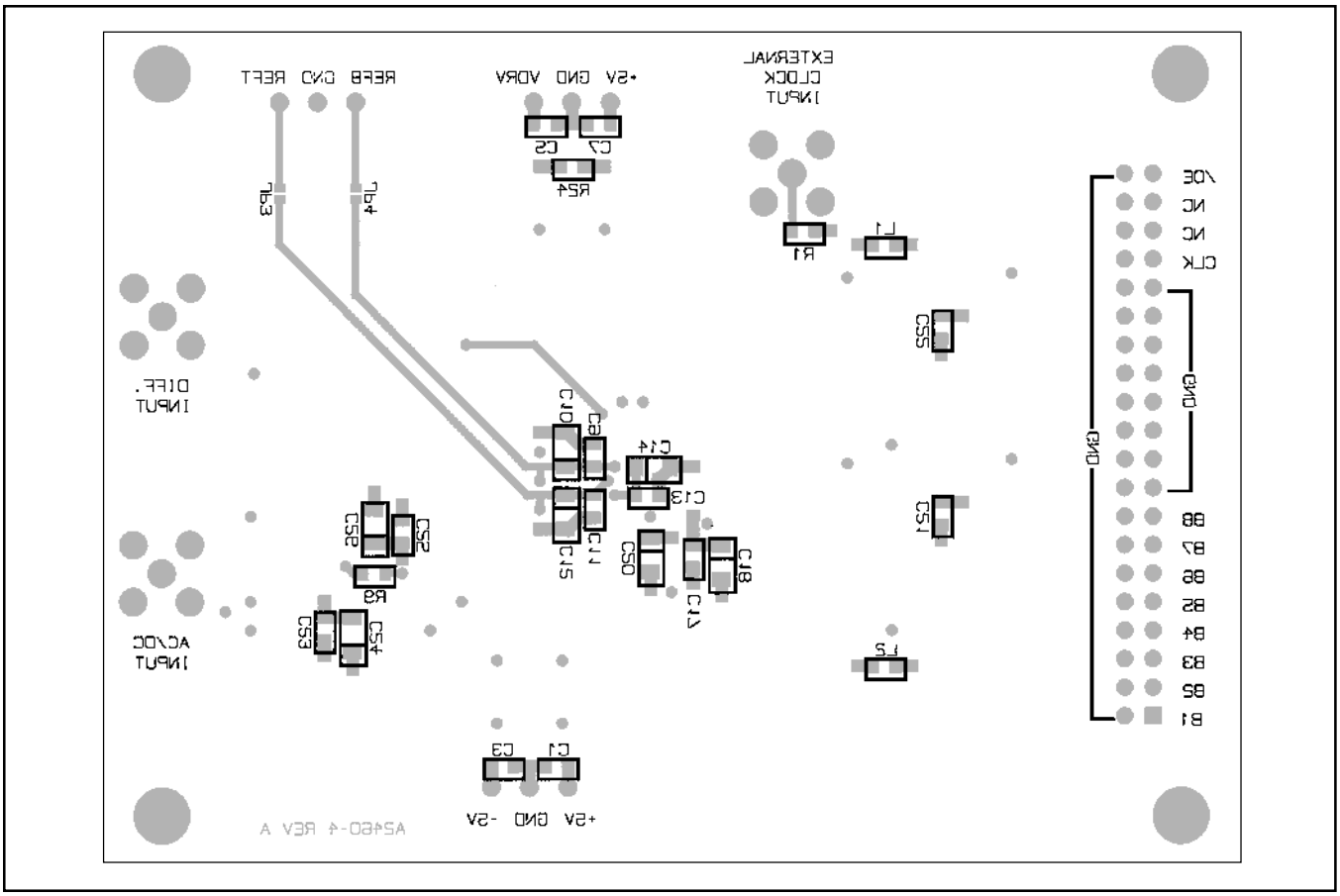

FIGURE 5. Bottom Layer with Silk-Screen.

COMPONENT LIST

REFERENCE	QTY	COMPONENT	DESCRIPTION	MANUFACTURER
U1	1	ADS830E or ADS831E	High-Speed ADC, 20-Pin SSOP	Texas Instruments
U2, U3	2	74FCT541	5V Octal Buffer, SO-20	IDT
U4	1	OPA681U	Wideband, Single Op Amp, SO-8	Texas Instruments
R10, 25, L1	3	CRCW0805ZEROF	0Ω, MF 0805 Chip Resistor, 1%	Dale
R14	1	CRCW080524R9F	24.9Ω, MF 0805 Chip Resistor, 1%	Dale
R1, 6	3	CRCW080549R9F	49.9Ω, MF 0805 Chip Resistor, 1%	Dale
R8, 9	2	CRCW08054020F	402Ω, MF 0805 Chip Resistor, 1%	Dale
R20, 21, 22, 23	4	CRCW08054751F	1.62kΩ, MF 0805 Chip Resistor, 1%	Dale
R2, 4	2	CRCW08051002F	10kΩ, MF 0805 Chip Resistor, 1%	Dale
R3, 5, 7, 11, 12, 13, 15, 16, 17, 18, 19, 25	12		Open, Use Depends on Configuration	
C2, 4, 6, 8	4	ECE-V1CA101P	100µF/16V, Surface Mount Polar. Alu Cap.	Panasonic (Digi-Key)
C10, 12, 14, 18, 20, 24, 26	7	TAJR225006	2.2µF/10V, 3216 Tantalum Capacitor	AVX
C1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 22, 23, 25, 28	15	08055C104KAT	0.1µF/50V X7R 0805 Ceramic Capacitor	AVX
C16	1	08055C470KAT	47pF/50V NP0 0805 Ceramic Capacitor	AVX
C27, 29	2		Open, Use Depends on Configuration	—
P1, P2	2	ED555/3DS	20 x 2 Dual-Row Shrouded Header	On-Shore Technology
CN1	1	IDH-40LP-S3-TG		Robinson-Nugent
J1, J2	2	142-0701-201	Straight SMA PCB Connector	EF Johnson
	4	1-SJ5003-0-N	Rubber Feet, Black, 0.44 x 0.2	Digi-Key
	1	PCB A2460	PC Board A2460, Rev. A	Texas Instruments

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