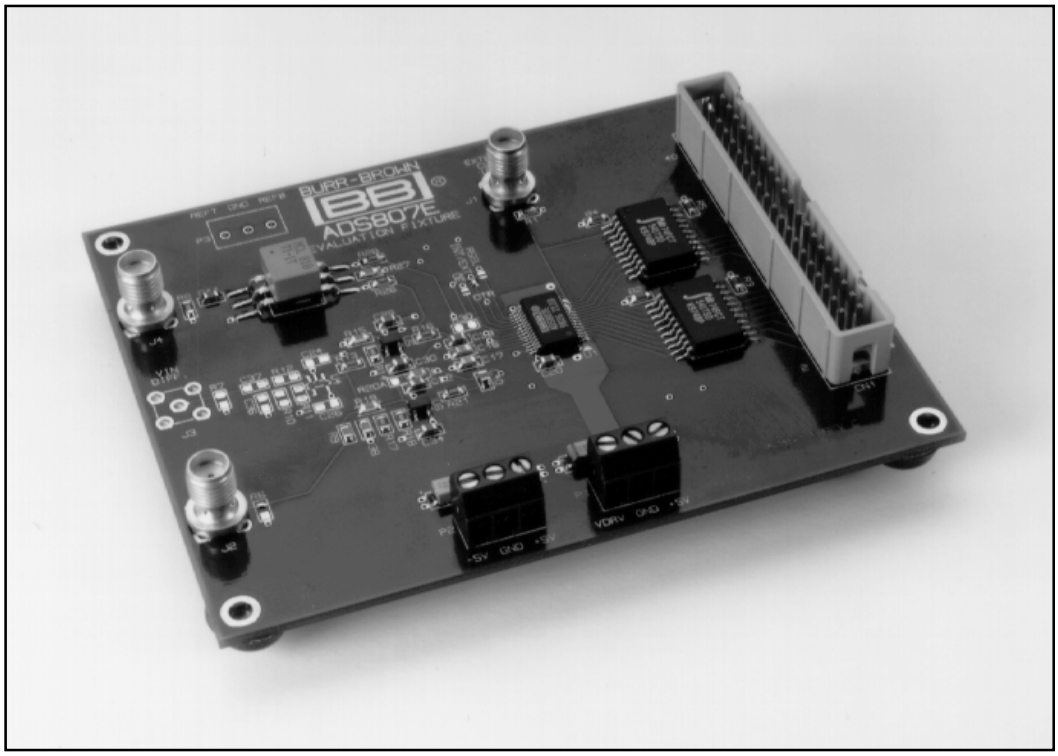
BURR-BROWN®

DEM-ADS807E

EVALUATION FIXTURE



FEATURES

- **PROVIDES FAST AND EASY PERFORMANCE TESTING FOR ADS807E**
- **SINGLE-ENDED OR DIFFERENTIAL INPUT CONFIGURATION**
- **ACTIVE OR PASSIVE FRONT ENDS**
- **EXTERNAL REFERENCE OPTION**

DESCRIPTION

The DEM-ADS807E evaluation fixture is designed for ease of use when evaluating the high speed analog-to-digital converter ADS807E. The ADS807E offers 12 bits of resolution with sampling rates of up to 53MHz. Because of its flexible design the user can evaluate the converter in many different configurations: either dc-coupled or ac-coupled input; or, single-ended or differential inputs. The data output of the ADS807E converter is decoupled from the connector by CMOS octal logic buffers.

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INITIAL CONFIGURATION

By using solder switches and resistor placements, DEM-ADS807E 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 following factory-set configuration:

- The signal input is the unbuffered input at SMA connector J2.
- Amplifiers U5 and U6 are performing a single-ended-to-differential conversion, using an inverting and a non-inverting gain stage.
- The signal is ac-coupled into the ADS807E by the coupling capacitors C_{39} and C_{40}.
- The converter is set to operate with the internal reference. Solder switch '$\overline{\text{INT}}$/EXT' is closed.
- The common-mode voltage required to bias the input of the ADS807E is derived from the internal top and bottom references by R_{22}, $R_{23,}$ and R_{24}, $R_{25,}$ and applied to each signal input, pin 24 and pin 25 (U1).

POWER SUPPLY

The demonstration board requires ±5V power supply voltages. Two separate power connectors are on the board. Connector P2, labeled with –5V, GND, and +5V, is the supply connection for the analog front end (U4, U5, U6). Connector P1, labeled with VDRV, GND, and +5V, is the supply connector for the converter (U1). The VDRV connector is tied to pin 28 of the ADS807E. Varying the voltage on this pin will vary the data output voltage levels accordingly. Setting VDRV to +3V typically provides the best performance results.

SIGNAL INPUT

Unbuffered Input

The factory-set configuration of the demonstration board uses the high-speed op amp OPA642N; a voltage feedback op amp that features low distortion. Configured in an inverting and non-inverting configuration, two OPA642Ns convert the single-ended signal applied to SMA connector J2 into a differential signal to drive the differential input of the ADS807E. The signal is ac-coupled to the ADS807 and the required level shifting is done with resistors R_{22} through R_{25} at the inputs of the ADS807E. The op amp drivers are set for a gain of 2.

Buffered Input

The demonstration board offers the option for a second buffered input. If this configuration is desired, several components have to be added to the board (e.g., a buffer amplifier such as the OPA642 and its surrounding components). Resistor R_9 (0Ω) has to be removed when wiring this circuit configuration. The buffered input configuration has the benefit of providing a near ideal source impedance to the driver amplifiers, especially important for the inverting gain stage.

Transformer Coupled

The demonstration board provides the option to evaluate the A/D converter with either an amplifier-based differential interface, or with a RF transformer. The RF transformer is used to convert the single-ended input signal applied to SMA connector J4 into a differential signal. The following steps have to be carried out to set up the board for the transformer coupling:

- Remove R_{22}, $R_{23,}$ R_{24}, and R_{25}.
- Remove C_{39} and C_{40} to disconnect the op amp outputs from the converter inputs.
- Install R_{27} (0Ω) to connect the common-mode voltage available on the CM pin to the secondary side of the transformer.
- Install R_{26} and R_{28}, typically 24.9Ω.
- Add an appropriate termination resistor (R_{29}), depending on the selected transformer model. The installed model has a 1:1 turns ratio.

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

Single-Ended Operation

The flexible design of the interface circuit configuration allows the user to operate the ADS807E with a single-ended input signal. The following component changes must be made:

- Disconnect the output of amplifier U5 by removing C_{39}.
- Remove R_{22} and R_{23}.
- Install R_{30} (0Ω).

Amplifier U6 is now ac-coupled to the IN input of the ADS807E and is driving it single-ended. This requires the signal swing to be twice as high as in the differential mode, now 2Vp-p instead of 1Vp-p.

Input Full-Scale Range Select

The ADS807E provides an option for the user to select between a 2Vp-p and a 3Vp-p full-scale input range. This function is controlled by the logic level applied to pin 15 (RSEL) of the ADS807E. Internally, the RSEL pin has a pulldown resistor, setting the converter up for the 2Vp-p range. Tying the RSEL pin to a logic HIGH potential (+5V) will switch the converter into the 3Vp-p range operation. This can be easily accomplished on the demostration board by closing the RSEL solder switch.

CLOCK

The DEM-ADS807E requires an external TTL clock applied at SMA connector J1. This input represents a 50Ω load to the source. In order to preserve the specified performance of the ADS807E converter, the clock source should feature a very low jitter. This is particularly important if the converter is to be evaluated in an undersampling condition. The ADS807E can accept logic HIGH levels as low as +2.7V. For best performance results, a +3V logic HIGH voltage with rise and fall times of 1µs should be used.

EXTERNAL REFERENCE

The ADS807E can be operated with an external reference. For this, solder switch '$\overline{\text{INT}}$/EXT' 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 converter. However, the specified range for external reference voltages should be observed (see the ADS807 data sheet for details).

DATA OUTPUT

The data output is provided at CMOS logic levels. The ADS807E uses Straight Offset Binary coding. The data output pins of the converter are buffered from the I/O connector, CN1, by two CMOS octal buffer (FCT541).

PC BOARD LAYOUT

The DEM-ADS807E demonstration 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 demonstration board has one consistent ground plane. Keep in mind that this approach may not necessarily yield optimum performance results when designing the ADS807E 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.

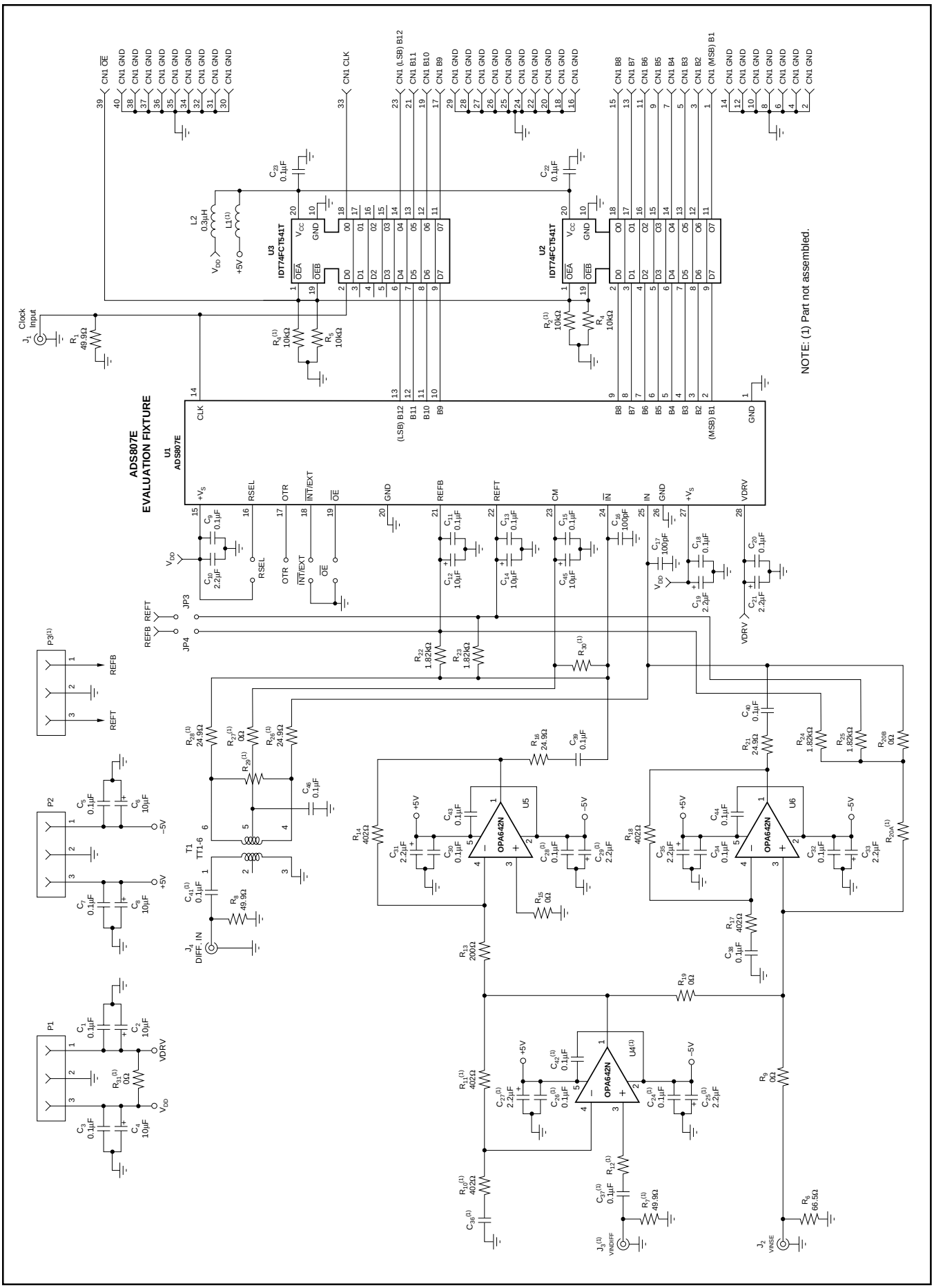

FIGURE 1. DEM-ADS807E Circuit Schematic.

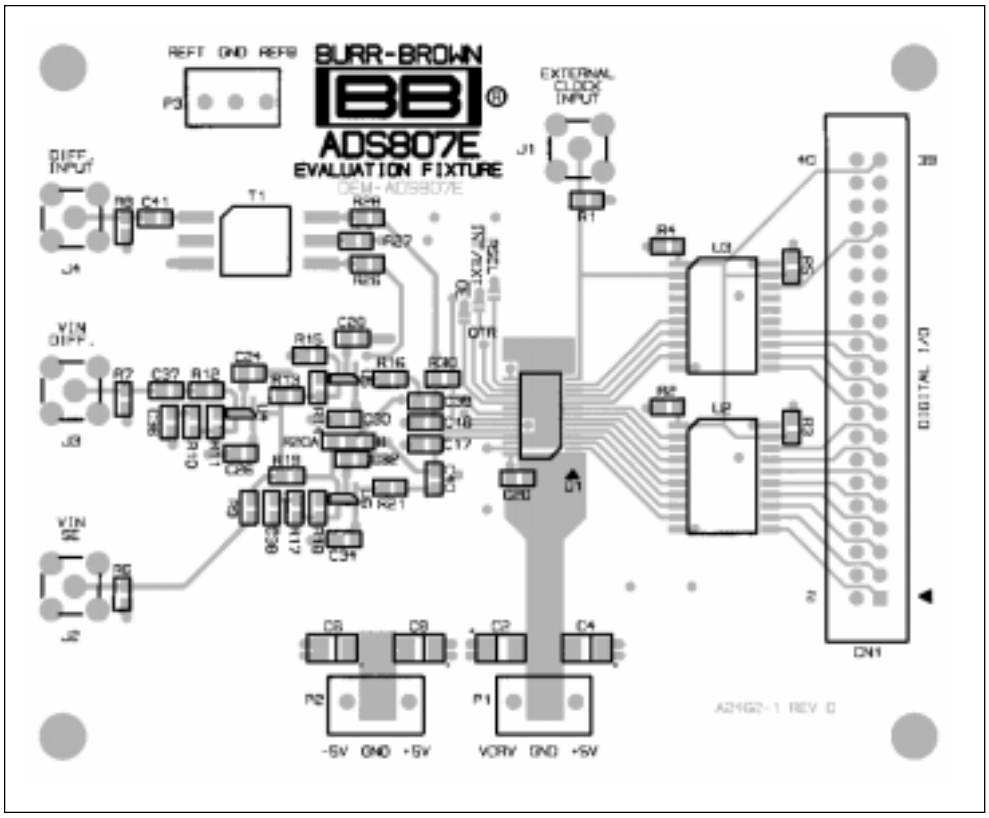

FIGURE 2. Top Layer with Silk Screen.

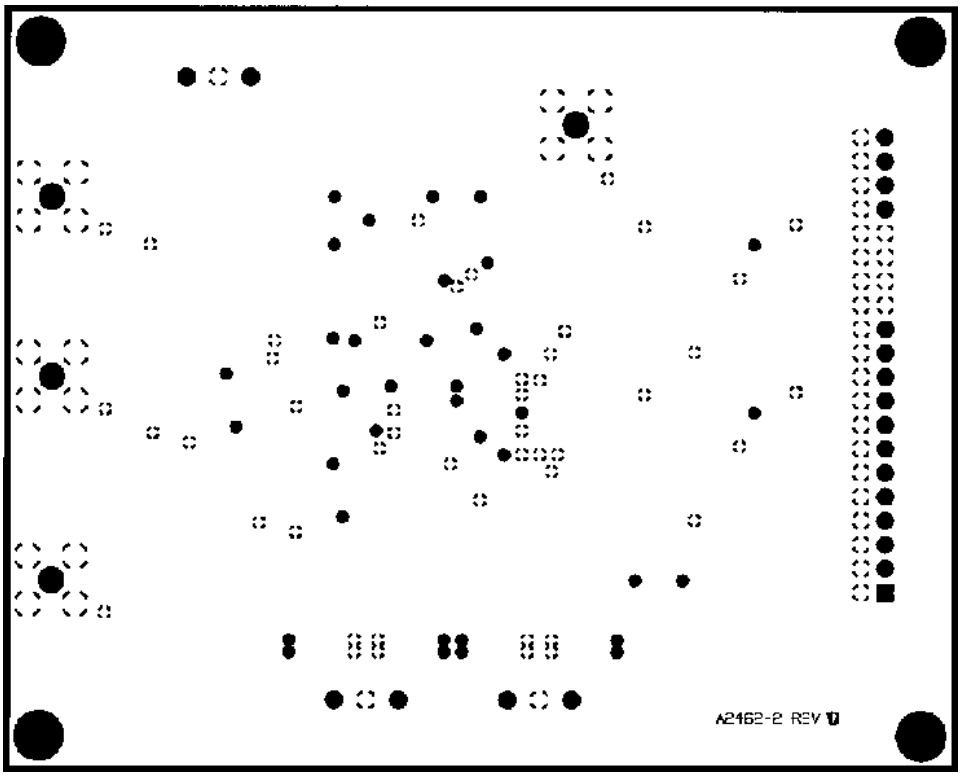

FIGURE 3. Power Plane.

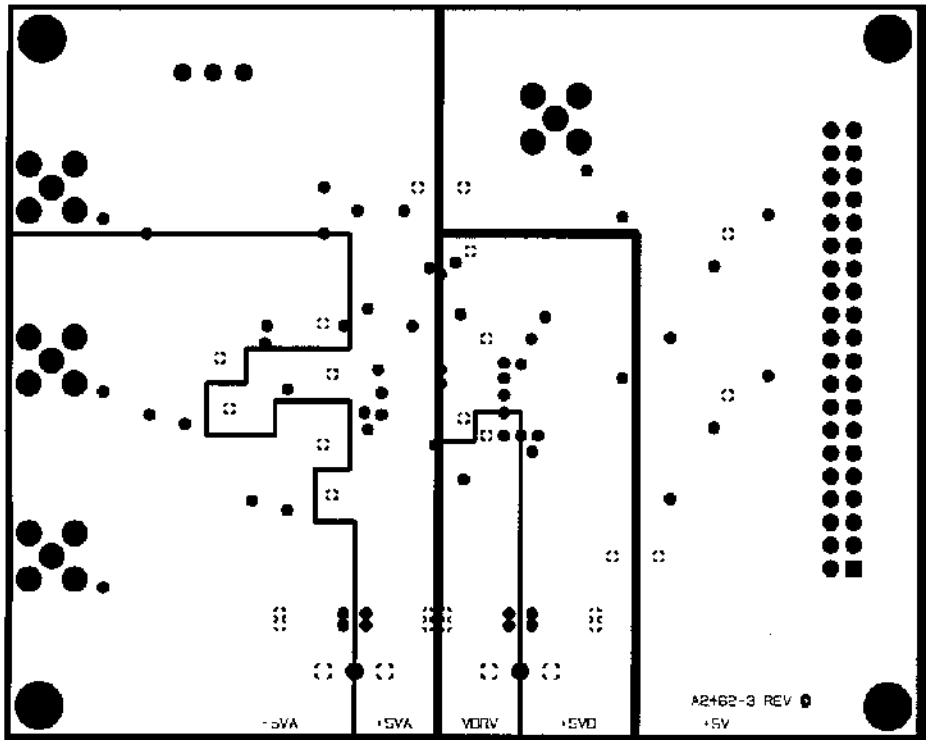

FIGURE 4. Ground Plane.

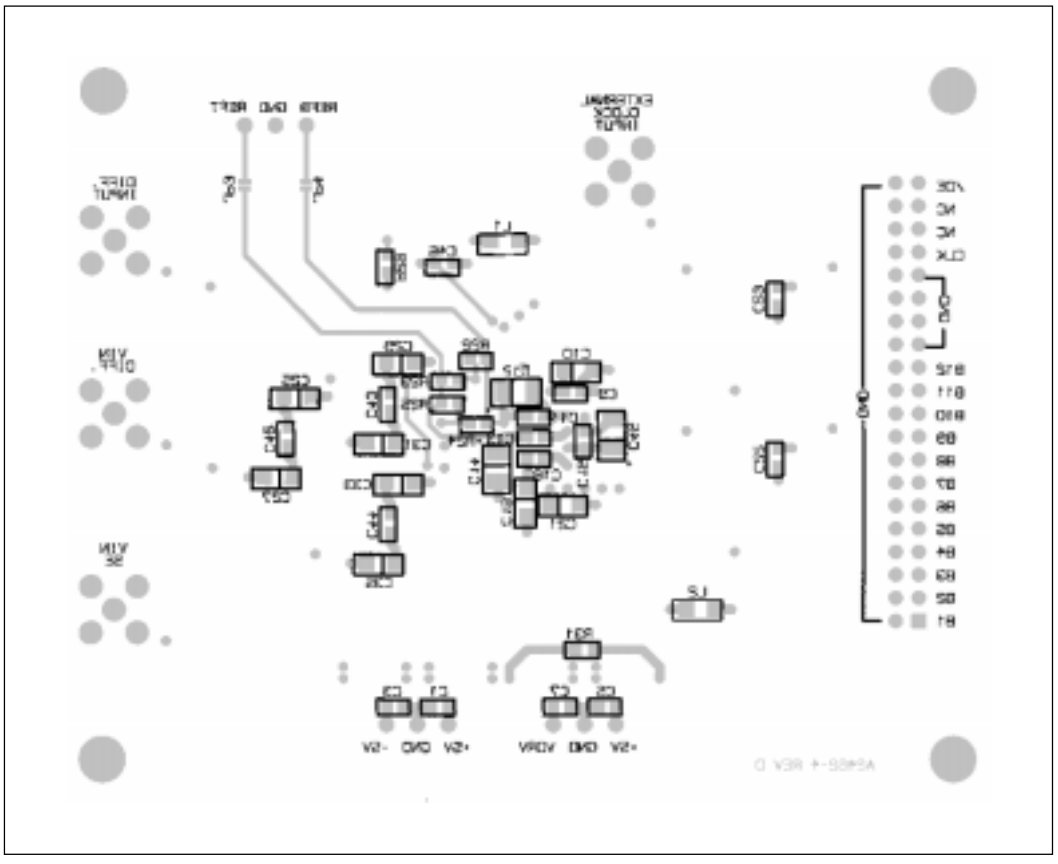

FIGURE 5. Bottom Layer with Silk Screen.

COMPONENT LIST

REFERENCE	QTY	COMPONENT	DESCRIPTION	MANUFACTURER
U1	1	ADS807E	High-Speed ADC, 28-Lead SSOP	Burr-Brown
U2, U3	2	74FCT541	5V Octal Buffer, 20-Lead SOIC	IDT
U5, U6	2	OPA642 NB	Wideband, Single Op Amp, SO-8	Burr-Brown
R_9, R_{19}, R_{15}, R_{20B}	4	CRCW0805ZEROF	0Ω, MF 0805 Chip Resistor, 1%	Dale
R_{16}, R_{21}	2	CRCW0805245R9F	24.9Ω, MF 0805 Chip Resistor, 1%	Dale
R_1, R_8	2	CRCW080549R9F	49.9Ω, MF 0805 Chip Resistor, 1%	Dale
R_6	1	CRCW080566R5F	66.5Ω, MF 0805 Chip Resistor, 1%	Dale
R_{13}	1	CRCW08052000F	200Ω, MF 0805 Chip Resistor, 1%	Dale
R_{14}, R_{17}, R_{18}	3	CRCW08054020F	402Ω, MF 0805 Chip Resistor, 1%	Dale
R_{22}, R_{23}, R_{24},R_{25}	4	CRCW08051821F	1.82kΩ, MF 0805 Chip Resistor, 1%	Dale
R_3, R_5	2	CRCW08051002F	10kΩ, MF 0805 Chip Resistor, 1%	Dale
R_2, R_4,R_7, R_{10}, R_{11}, R_{12}, R_{20A}, R_{26}, R_{27}, R_{28}, R_{29}, R_{30}, R_{31}	13		Not Assembled	
C_2, C_4, C_6, C_8, C_{12}, C_{14}, C_{45}	7	T491B106M006AS	10µF, 6V, Size 3528 Tantalum Capacitor	Kemet
C_{10}, C_{19}, C_{21}, C_{29}, C_{31}, C_{33}, C_{35}	7	T491A225M010AS	2.2µF, 10V, Size 3216 Tantalum Capacitor	Kemet
C_1, C_3, C_5, C_7, C_9, C_{11}, C_{13}, C_{15}, C_{18}, C_{20}, C_{22},C_{23}, C_{28}, C_{30}, C_{32}, C_{34}, C_{38}, C_{39}, C_{40}, C_{41}, C_{43}, C_{44}, C_{46}	23	08055C104KAT	0.1µF, 50V X7R 0805 Ceramic Capacitor	AVX
C_{16}, C_{17}	2	08055C101KAT	100pF, 50V NP0 0805 Ceramic Capacitor	AVX
C_{24}, C_{25}, C_{26}, C_{27}, C_{36}, C_{37}, C_{42}	7		Not Assembled	
L1	1	L1-1206B900R	Ferrite Chip, 900Ω at100MHz	Steward
T1	1	T1-1T-KK81	RF Transformer	Mini-Circuits
P1, P2	2	ED555/3DS	3-Pin Term Block	On-Shore Technology
CN1	1	IDH-40LP-S3-TG	20 x 2 Dual-Row Shrouded Header	Robinson-Nugent
J1, J2, J4	3	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 A2462	PC Board A2462, Rev. D	Burr-Brown

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