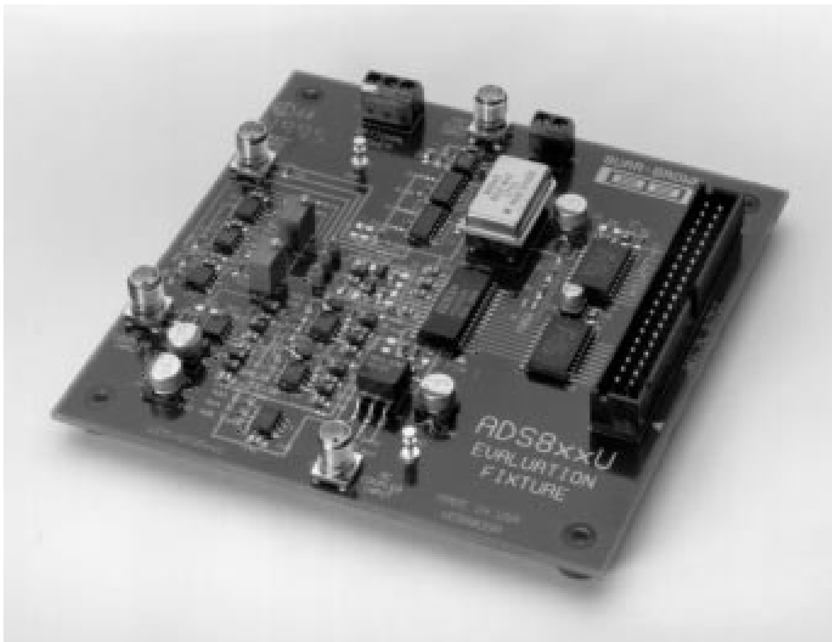
DEM-ADS8xxE
DEM-ADS8xxU

EVALUATION FIXTURE



FEATURES

- PROVIDES FAST AND EASY PERFORMANCE TESTING
- AC-COUPLED AND DC-COUPLED INPUTS
- ON-BOARD CLOCK
- EXTERNAL REFERENCES
- OPTIMIZED 4-LAYER PC BOARD LAYOUT

DESCRIPTION

The DEM-ADS8xxU/E evaluation fixtures are designed for ease of use when evaluating the high speed analog-to-digital converter of the ADS8xx family. A separate demonstration board is available for each of the five different converter products (see ordering information). However, all boards provide similar features that allow the user to evaluate all functions of the converter. For example, two options to apply the analog input signal are available, one DC-coupled and one AC-coupled path. The converter can be operated with one out of the three clock modes; on-board crystal clock, external clock, or external sine wave. Furthermore, a reference circuit is provided to evaluate the converter with reference voltages other than the internal voltage levels. The data outputs from the ADS8xx converter are decoupled from the connector via TTL-buffer.

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Internet: http://www.burr-brown.com/ • FAXLine: (800) 548-6133 (US/Canada Only) • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

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INITIAL CONFIGURATION AND QUICK START

The demo board DEM-ADS8xx comes in a default configuration that makes it easy for the user to start evaluation. The factory settings are as follows:

- The clock source is the on-board crystal with the appropriate divider ratio (÷2, ÷4, etc.) selected.
- The DC-coupled input is activated.
- The external reference is inactive; solder switches "REFT" and "REFB" are open.
- The output data format is straight offset binary with the solder switch "MSBI" open.
- The data output is enabled with the solder switch "OE\" open.
- The data read delay's set to one delay, solder switch "DLY1" closed.
- Note that the "PWRDWN" solder switch is without function and should stay open.

MODEL	CRYSTAL	ECLK	DIV 2	DIV4	DIV 8	B11	DLY 1
ADS800	80MHz	X	X			X	X
ADS801	50MHz	X	X			X	X
ADS802	80MHz	X			X	X	X
ADS820	80MHz	X		X			X
ADS821	80MHz	X	X				X

TABLE I. Factory configuration table of solder switches for the five different converter products.

Evaluation in this configuration requires a ±5V supply. The negative supply is necessary to power the op amp driving circuit, therefore, power connectors P1 and P2 must be connected appropriately to the supply unit. Re-configuring the demo board for AC-coupled input in combination with the crystal or external pulse clock, makes it possible to operate the demo board on a single +5V supply.

INPUTS

Transformer Coupled

The demo board provides one analog input at connector J4, which is labeled "AC Coupled Input." This input is terminated with 50Ω and ties to the RF-transformer T1. The model used is the T1-1T (by Mini-Circuits), a 1:1 ratio transformer with bandpass characteristic. The –3dB frequencies are at 50kHz and 200MHz for the lower and upper corners of the transformer. The –1dB insertion loss frequencies are listed with 0.2MHz and 80MHz, which might be used for choosing the input frequency without effecting the signal too much. If the AC-coupled input is used the two resistors, R40 and R41 (0Ω) have to be inserted to connect the transformer to the converter inputs. At the same time it is recommended that resistors R38 and R39 are taken out. The center tap of the secondary side of the transformer can be connected to the mid-reference of the ADS8xx by closing solder switch "CM". If necessary the center tap can also be driven by the buffer amplifier U10. To activate this buffer open solder switch CM and close the one labeled T1-CT. In addition, closing solder switch "X2" located at the primary side of the RF-transformer will short out half of the primary winding and change the turns ratio to 1:2. This function is not available with the transformer type used on the board.

DC-Coupled

For evaluating input frequencies down to DC, the second analog input should be used. It is available through connector J3, labeled "DC Coupled Input". This input is also terminated for a 50Ω system. The first stage consists of amplifier U11, which is configured as a buffer amplifier. Using appropriate values for R21 and R22 the amplifier can be set for gain. The ADS8xx requires a differential input signal with a common-mode voltage of +2.25V. This is accomplished by amplifiers U8, U9, and U10 (refer to Figure 1). The amplifier U8 is configured in a non-inverting mode with a DC gain of +3V/V. The voltage divider formed by R27 and R28 gives an overall gain of +2V/V. The complementary input amplifier U9 is set for an inverting gain of +2V/V. The common-mode voltage of +2.25V is buffered from the ADS8xx by amplifier U10 and applied to each of the driving amplifiers. The OPA642 was selected to provide a low noise and low distortion front-end. To avoid any additional distortion due to the required output swing of +3.25V a level shifting stage was added. It consists of a silicon diode in series with the output of each driving amplifier and a resistor to the supply for biasing. Regardless of the configuration of the driving amplifiers, a series resistor (R38, R39) in combination with a small capacitor to ground at the inputs of the ADS8xx can improve the AC-performance. The capacitors (C34 and C35) will help to reduce the current transients that are generated by the ADS8xx during sampling. Note that when using the DC-coupled input resistors R40 and R41 should be removed to avoid unnecessary loading of the driving op amps.

CLOCK

On-Board Clock

The ADS8xx demo board is equipped with a crystal oscillator and D-Type Flip-Flops (U6 and U7), which allow different discrete divider ratios for the clock. The selection of the divider ratio can be done using the solder switches labeled DIV2, DIV4, DIV8, and DIV16. For this mode of operation make sure that solder switch "ECLK" is closed and "CCLK" is open.

External Clock

In addition to the on-board clock the demo board allows for two other clock configurations using external clock sources. The first alternative requires an external pulse generator, preferably with fast rise and fall times (≤ 2ns) and low jitter. This source can be directly connected to the board using the SMA connector J2. The input is terminated for 50Ω systems. Operation in this mode requires to close solder switch "CCLK" and open "ECLK."

If a low jitter sine wave generator is the only signal source available the second external clock input might be used. The ECL to TTL translator IC (U5) will transform the sine wave input into a logic signal with 50% duty cycle. Different divider ratios can be selected. The solder switch "XCLK" and "ECLK" should be closed in this mode and solder switch "CCLK" should be open.

EXTERNAL REFERENCE

Each of the converter inputs operates with a 2Vp-p input signal swing set between +1.25V and +3.25V. The input structure of the ADS8xx is differential making the complementary input of the ADS8xx 180° out of phase. This allows for an effective full scale input range of 4Vp-p. The +1.25V and the +3.25V are set by the internal reference voltages of the converter. These reference voltages may be adjusted with external references in order to reduce the full scale range. The demo board provides a circuit for this mainly consisting of the reference IC U13 and the op amps U12 and U14. To activate this circuit the solder switches labeled "REFT" and "REFB" should be closed. The top reference voltage can be adjusted with potentiometer RV1 between +3.25V and +2.25V. Potentiometer RV2 adjusts the bottom reference between +1.25V and +2.25V. Note that those reference voltages can vary slightly. Also, reducing the references too much will degrade the signal-to-noise ratio.

DATA OUTPUT

The output data is provided at CMOS logic levels. The standard output coding is straight offset binary where the full scale input signal corresponds to all "1" for the data output. This is with solder switch "MSBI" open. Closing this solder switch will invert the MSB (see the individual data sheet for details). To account for different data read timing up to four propagation delay cycles can be selected using the solder switches DLY1 through DLY4. The minimum propagation delay for the used buffer is 1.5ns with a maximum of 8ns.

PC-BOARD LAYOUT

The ADS8xx demo board is 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 analog-to-digital converter is treated like a pure analog component. Therefore the demo board has only one consistent ground plane. This approach may or may not yield optimum performance results when designing the ADS8xx into different individual applications. In any case, thoroughly bypassing the supply pins of the converter, like demonstrated on the demo board, is strongly recommended.

ORDERING INFORMATION

A/D	RESOLUTION	f_{CONV}	ORDER NUMBER
ADS800	12-Bit	40MHz	DEM-ADS800U
ADS801	12-Bit	25MHz	DEM-ADS801U
ADS802	12-Bit	10MHz	DEM-ADS802U
ADS820	10-Bit	20MHz	DEM-ADS820U
ADS821	10-Bit	40MHz	DEM-ADS821U
ADS8xx	10/12-Bit	—	DEM-ADS8xxE

Note: The demo board DEM-ADS8xxE is designed to fit the ADS8xx line of converters in the 28-pin SSOP package. The board is offered as fully populated except for the individual A/D converter (U1), which can be obtained through a sample request.

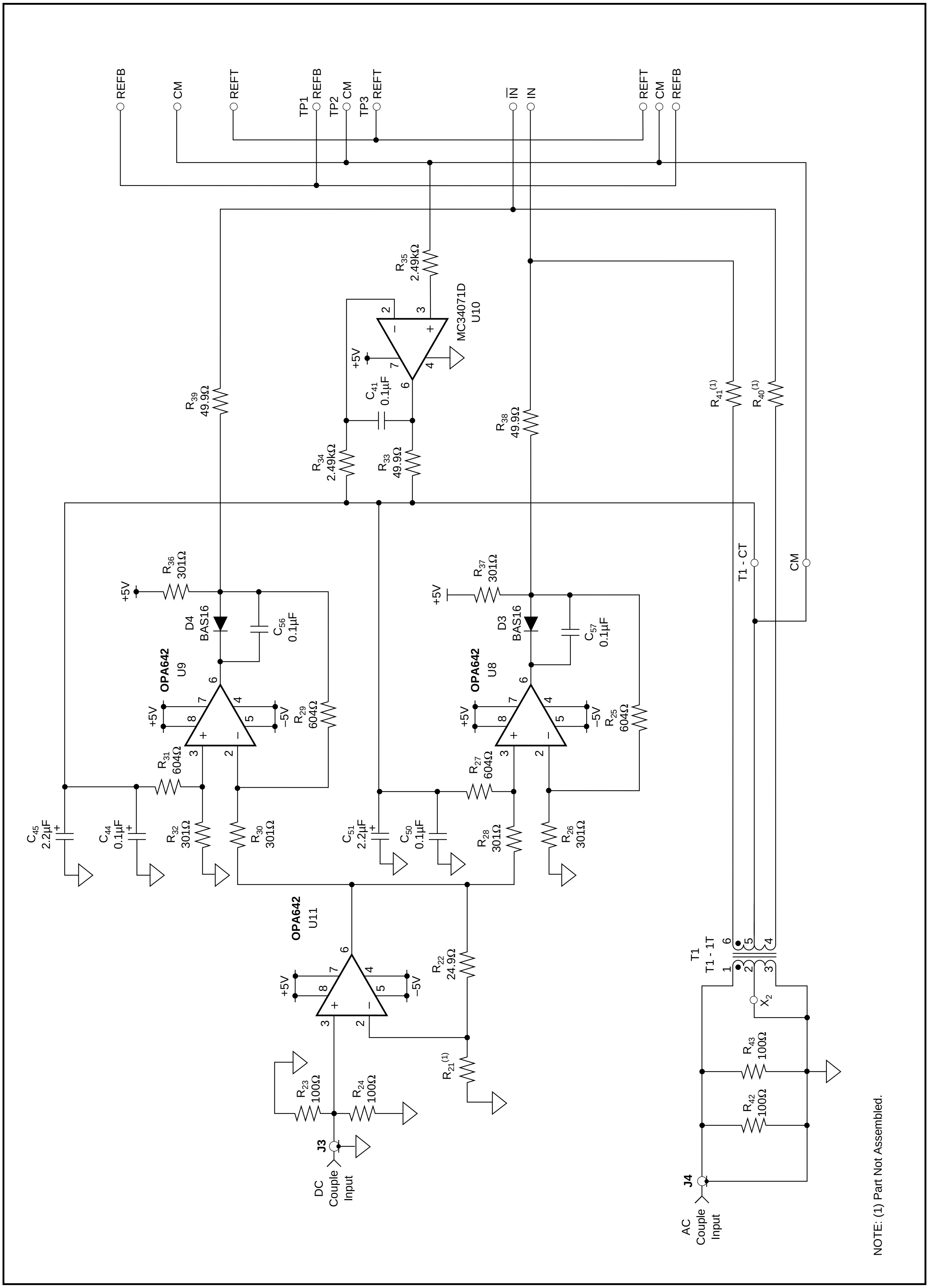

FIGURE 1a. DEM-ADS8xx Circuit Schematic.

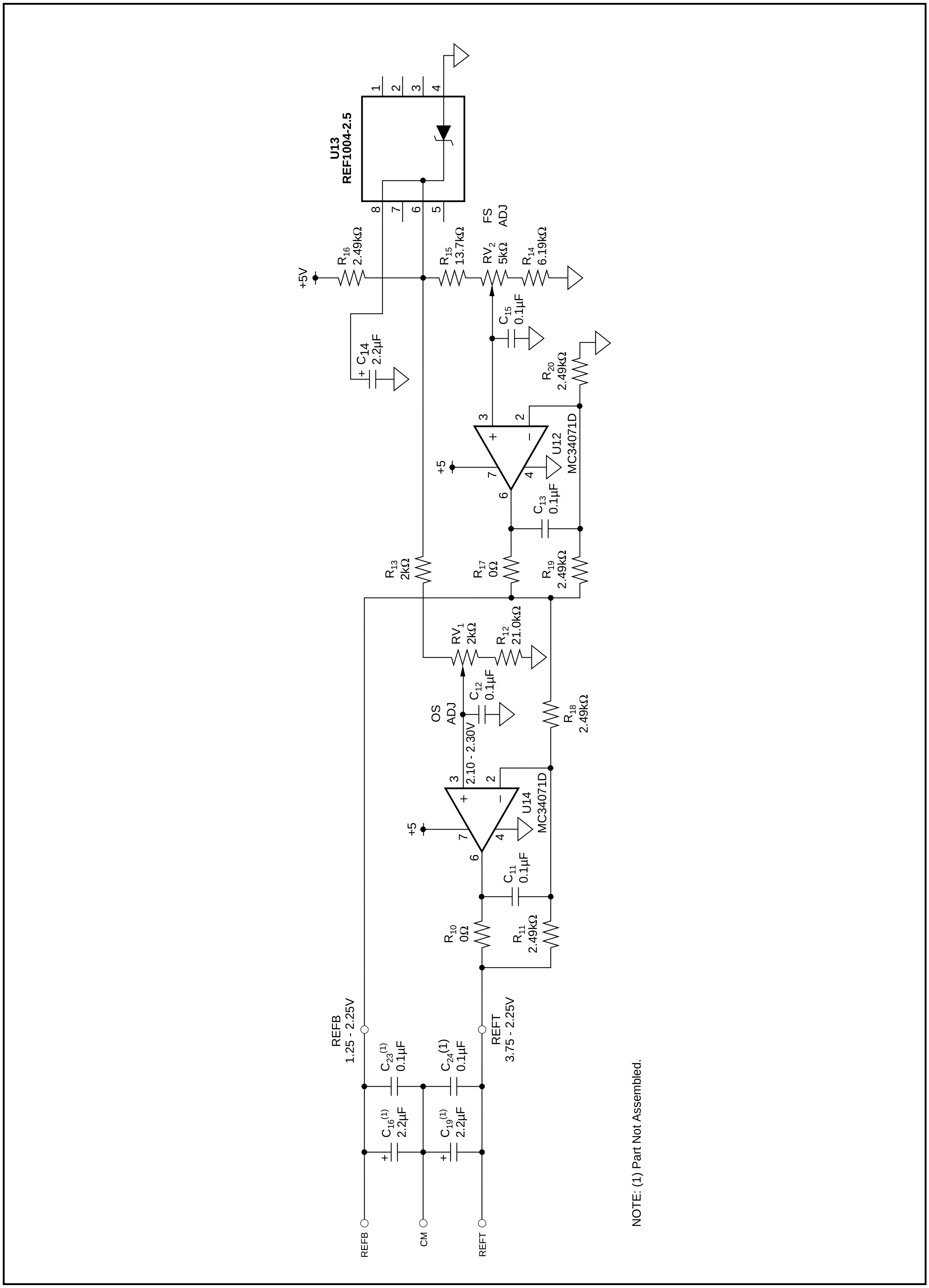

FIGURE 1b. DEM-ADS8xx Circuit Schematic.

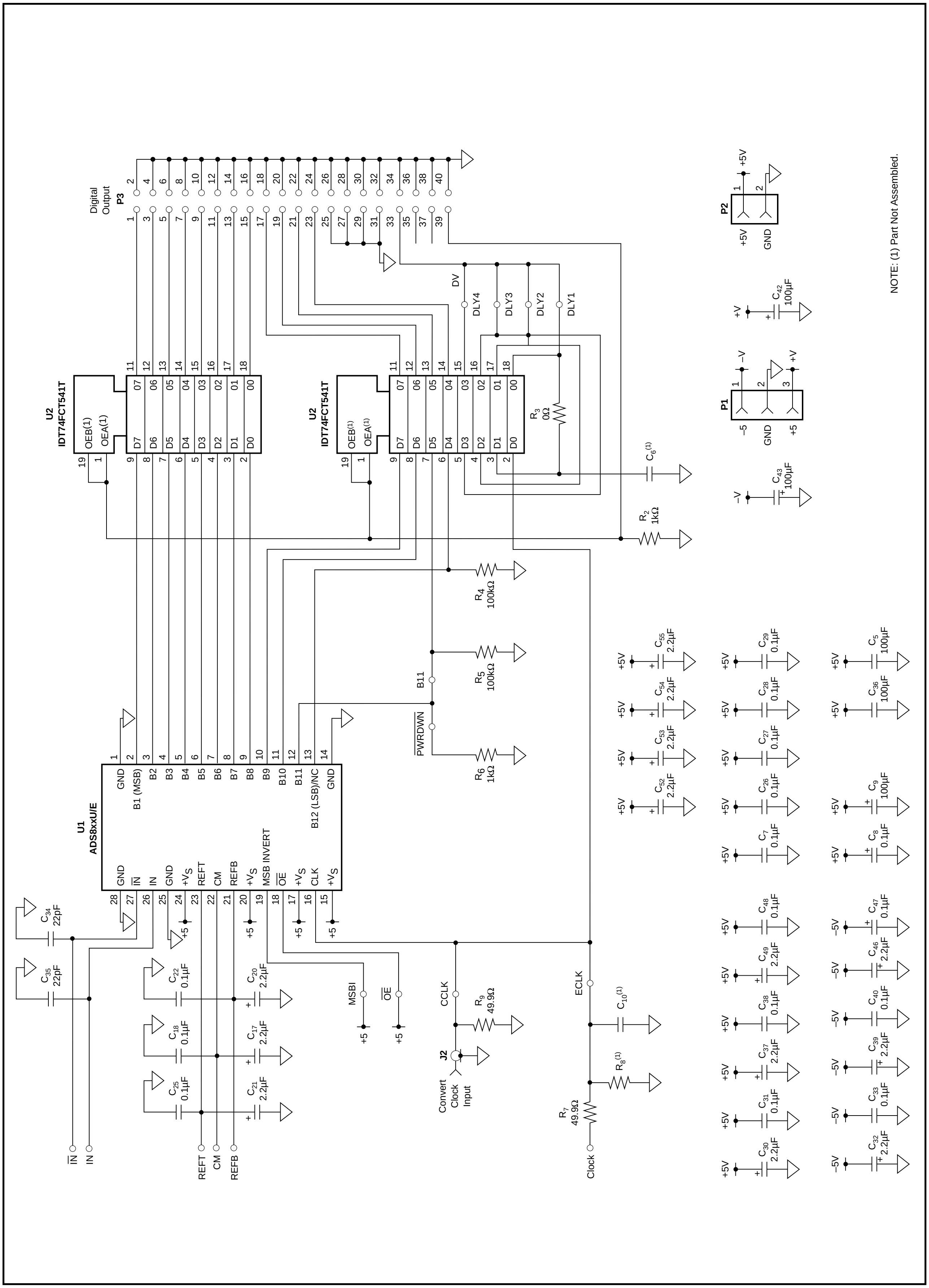

FIGURE 1c. DEM-ADS8xx Circuit Schematic.

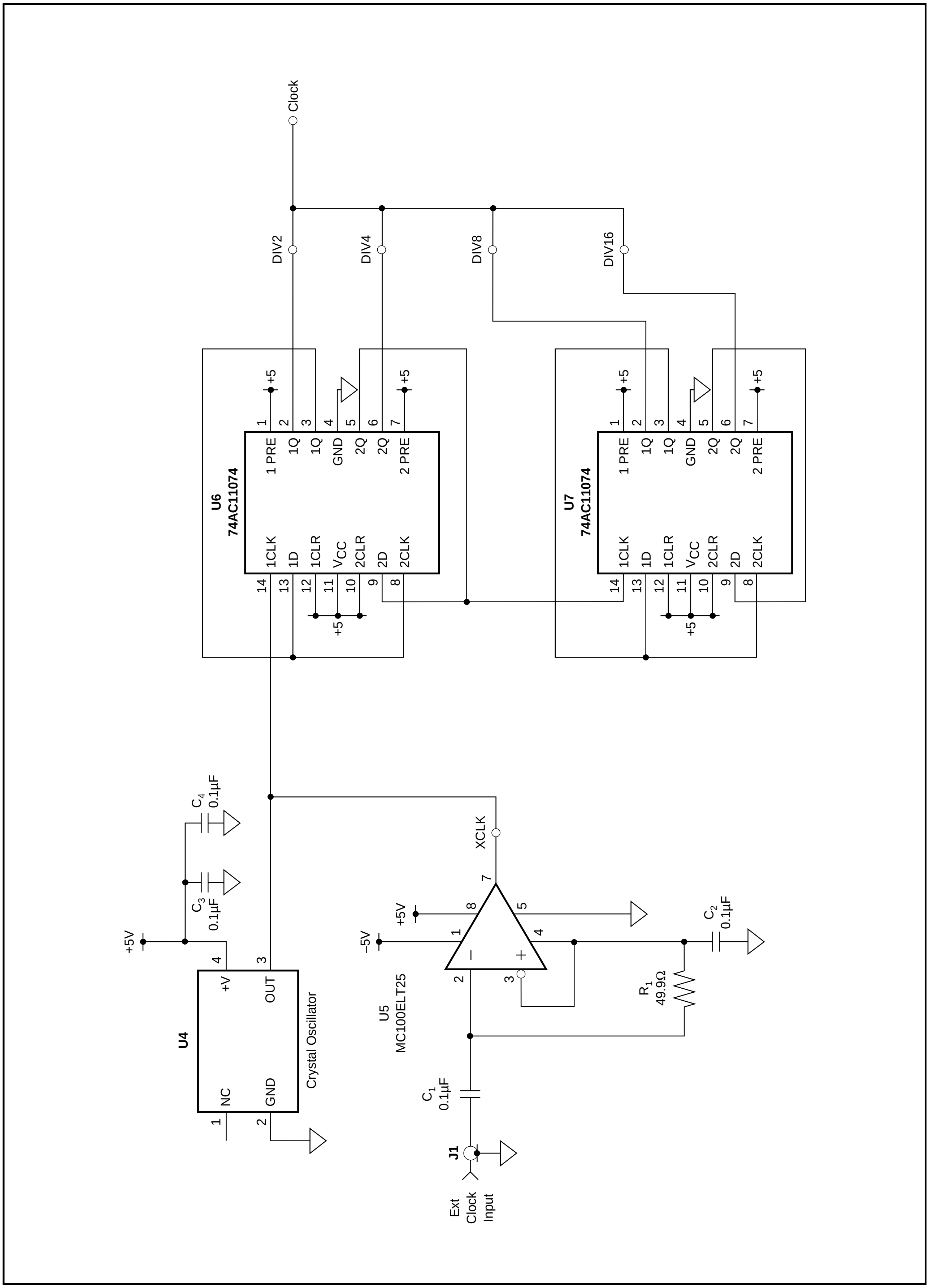

FIGURE 1d. DEM-ADS8xx Circuit Schematic.

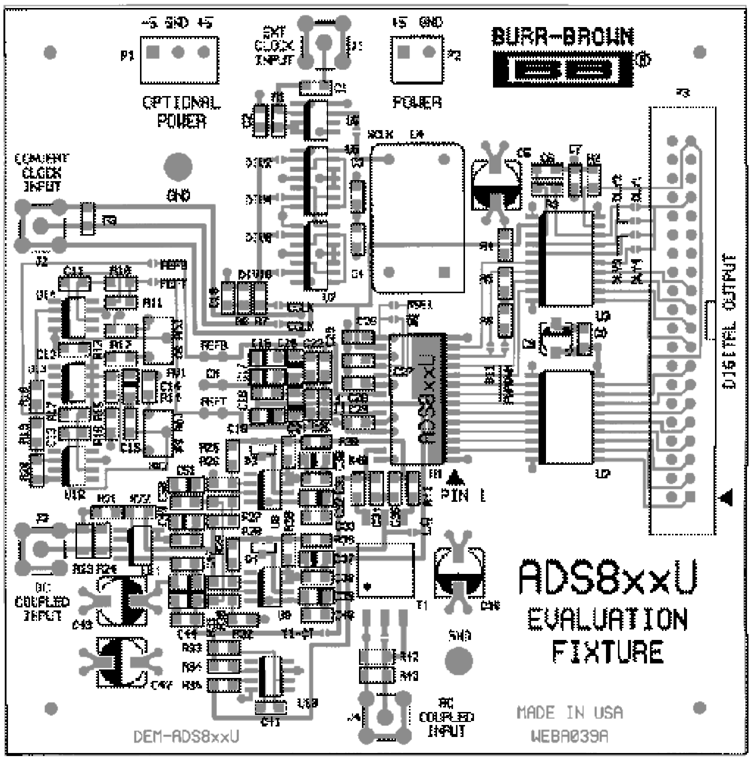

FIGURE 2. Top-Layer (component side) with Silk-Screen; DEM-ADS8xxU.

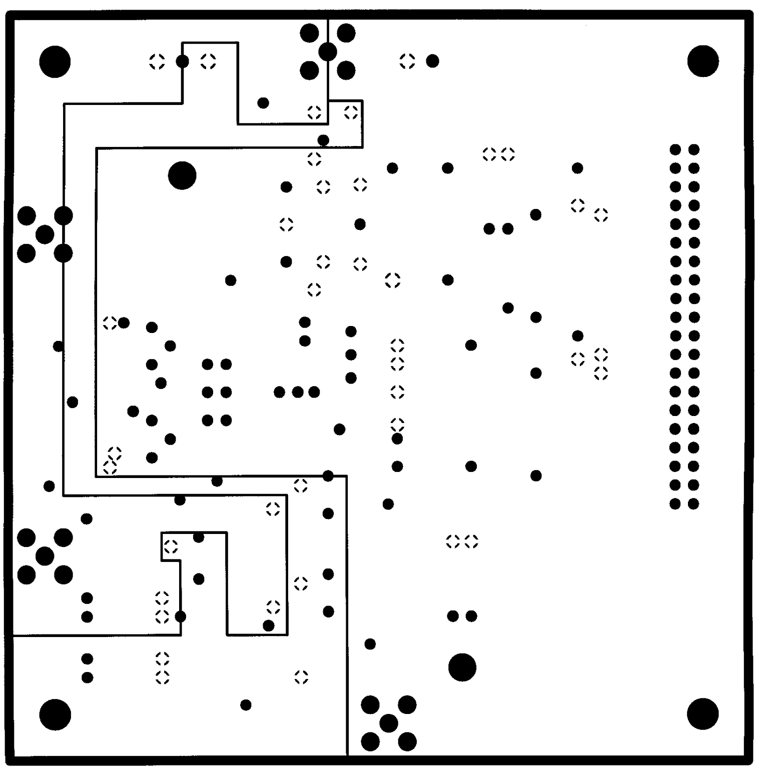

FIGURE 3. Power Plane; DEM-ADS8xxU.

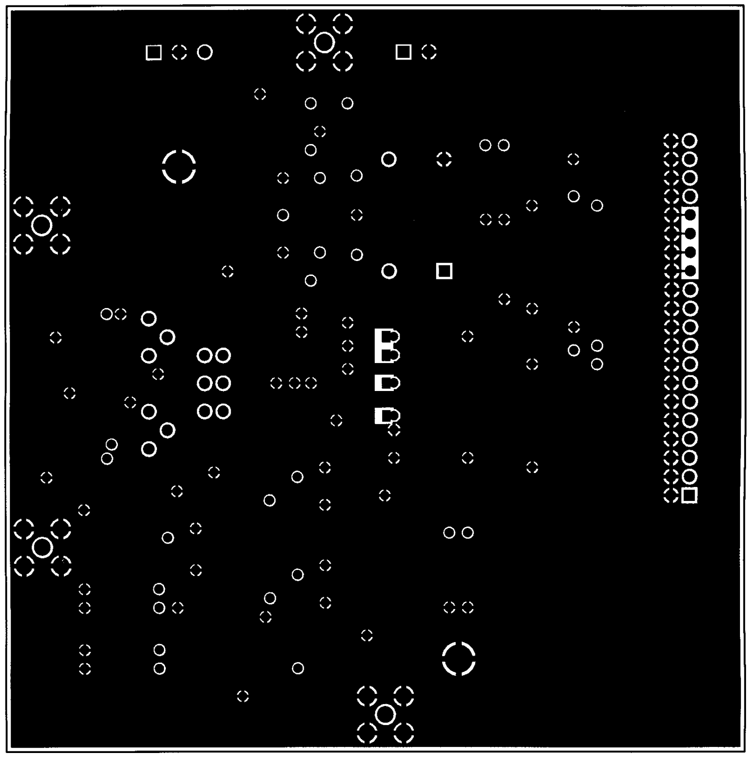

FIGURE 4. Ground Plane; DEM-ADS8xxU.

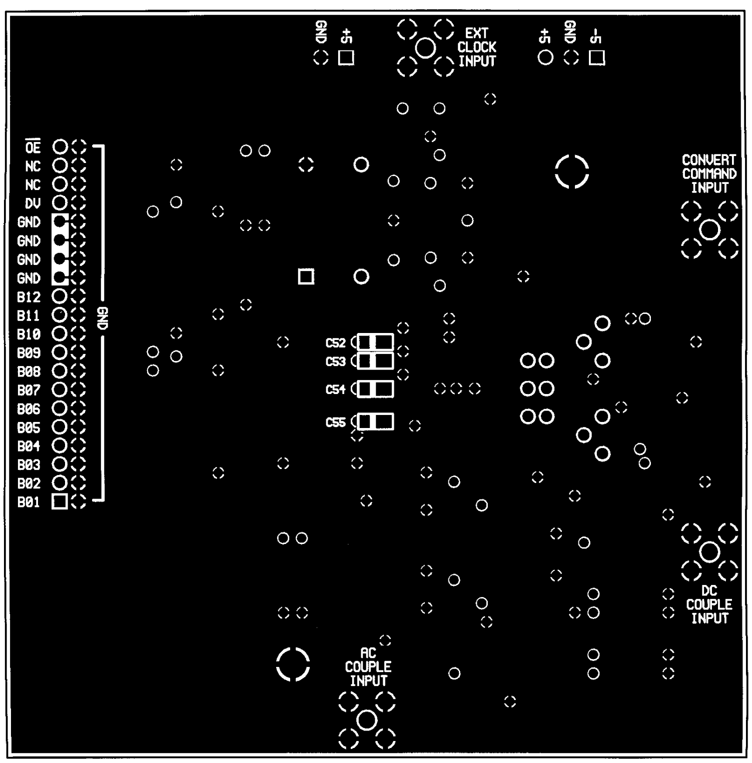

FIGURE 5. Bottom Layer with Silk-Screen; DEM-ADS8xxU.

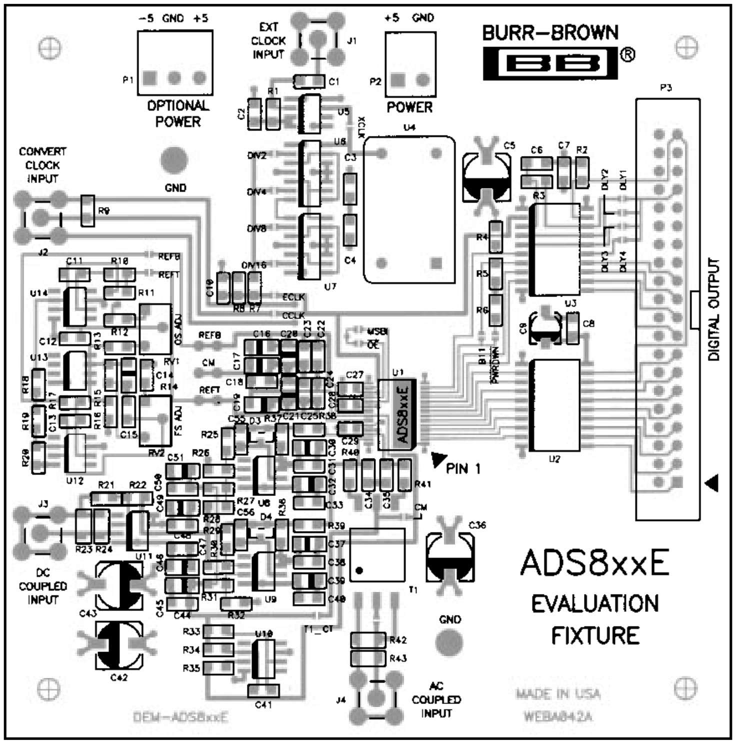

FIGURE 6. Top-Layer with Silk-Screen; DEM-ADS8xxE.

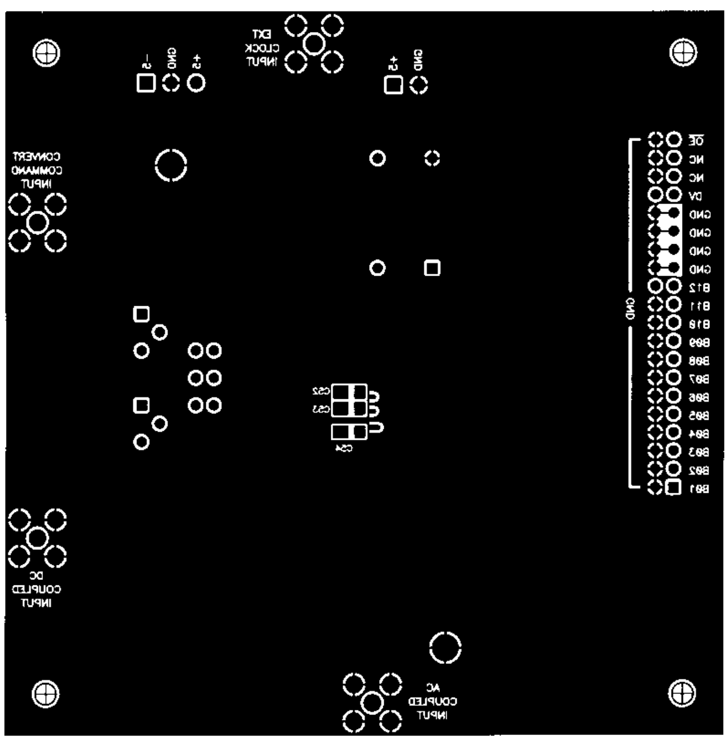

FIGURE 7. Bottom-Layer with Silk-Screen; DEM-ADS8xxE.

COMPONENT LIST

REFERENCE	QTY	PART NUMBER	DESCRIPTION	MANUFACTURER
C1, C2, C3, C4, C7, C8, C11-13, C15, C18, C22, C25-29, C31, C33, C38, C40, C41, C44, C47, C48, C50, C56, C57	28	08055C104KAT	0.1µF 50V X7R 0805 Ceramic Capacitor	AVX
C14, C16, C17, C19-C21, C30, C32, C37, C39, C45, C46, C49, C51	14	TAJR225006	2.2µF 10V 3216 Tantalum Capacitor	AVX
C34, C35	2	08055C220KAT	22pF 50V NPO 0805 Ceramic Capacitor	AVX
C6, C10	2	08055C100KAT	10pF 50V NPO 0805 Ceramic Capacitor	AVX
C5, C36, C42, C43	4	ECE-V1AA101P	100µF 16V Surface-Mount Aluminum Capacitor	Panasonic
C9	1	ECE-V1CV100SR	10µF 16V Surface-Mount Aluminum Capacitor	Panasonic
D1, D2	2	BAS16	Signal Diode SOT-23	Philips
J1-4	4	142-0701-201	Straight SMA PCB Connector	EF Johnson
P1	1	ED555/3DS	3-Pin Term Block	On-Shore Technology
P2	1	ED555/2DS	2-Pin Term Block	On-Shore Technology
P3	1	IDH-40LP-S3-TG	20 x 2 Dual-Row Shrouded Header	Robinson-Nugent
R1, R7, R9, R33, R38, R39	6	CRCW080549R9F	49.9Ω 1/10W 1% MF 0805 Chip Resistor	Dale
R26, R28, R30, R32, R36, R37	6	CRCW08053010F	301Ω 1/10W 1% MF 0805 Chip Resistor	Dale
R11, R16, R18-20, R34, R35	7	CRCW08052491F	2.49kΩ 1/10W 1% MF 0805 Chip Resistor	Dale
R12	1	CRCW08056040F	20kΩ 1/10W 5% MF 0805 Chip Resistor	Dale
R13	1	CRCW08052001F	2kΩ 1/10W 1% MF 0805 Chip Resistor	Dale
R14	1	CRCW08056191F	6.19kΩ 1/10W 1% MF 0805 Chip Resistor	Dale
R15	1	CRCW08051372F	13.7kΩ 1/10W 1% MF 0805 Chip Resistor	Dale
R2, R6	2	CRCW08051001F	1kΩ 1/10W 1% MF 0805 Chip Resistor	Dale
R22	1	CRCW080524R9F	24.9Ω 1/10W 1% MF 0805 Chip Resistor	Dale
R23, R24, R42, R43	4	CRCW12061000F	100Ω 1/10W 1% MF 1206 Chip Resistor	Dale
R25, R27, R29, R31	4	CRCW08056040F	604Ω 1/10W 1% MF 0805 Chip Resistor	Dale
R3, R10, R17	3	CRCW0805ZEROF	0Ω 1/10W 1% MF 0805 Chip Resistor	Dale
R4, R5	2	CRCW08051003F	100kΩ 1/10W 1% MF 0805 Chip Resistor	Dale
RV1	1	RJ26FW-202	2kΩ 1/4" 10-Turn Pot	Bourns
RV2	1	RJ26FW-502	5kΩ 1/4" 10-Turn Pot	Bourns
T1	1	T1-1T-KK81	RF Transformer	Mini-Circuits
REFB, REFT, CM	3	151-205	Test Point	Mouser
TP4, TP5	2	10-216-2-01	Turret Terminal, Brass, Silver Plated	Concord
U10, U12, U14	3	MC34071D	Single Op-Amp SO-8	Motorola
U13	1	REF1004C-2.5	2.5V Voltage Reference SO-8	Burr-Brown
U2, U3	2	IDT74FCT 541T	Octal Bi-directional Buffers SO-20	IDT
U3	1	ADS8xxU	Monolithic High-Speed ADC SO-28	Burr-Brown
U4A(1)	1	F3000 80.000MHz	80MHz DIP Crystal Oscillator	Fox
U4B(2)	1	F3000 50.000MHz	50MHz DIP Crystal Oscillator	Fox
U5	1	MC100ELT25	ECL to TTL Translator SO-8	Motorola
U6, U7	2	74AC11074	Dual D-Type Flip-Flop SO-14	T.I.
U8, U9, U11	3	OPA642U	Single High-Speed Op-Amp SO-8	Burr-Brown
	1	A039A	PCB	
	4	SJ5003-0-N	Rubber Feet, Black, 0.44 x 0.2	Digi-Key

NOTES: (1) Used on the DEM-ADS800U, DEM-ADS802U, DEM-ADS820U, and DEM-ADS821U. (2) Used on the DEM-ADS801U.