DESCRIPTION

Demo board DC427 features the LTC1966 Precision Micro-power true RMS-to-DC converter. It incorporates a variety of passive components to support configurations for varied applications. Two optional post-filters are included to improve averaging ripple and step response performance, as illustrated in the Design Cookbook section of the LTC1966 Datasheet.

The new LTC1966 is a patent-pending $\Delta\Sigma$-based RMS to DC converter that is simpler, more accurate, more flexible, and lower power than conventional log-antilog RMS-to-DC converters. The LTC1966 accepts single-ended or differential inputs with rail-to-rail common-mode range. One standout feature of the LTC1966 is its superior linearity, which allows hassle-free system calibration at any input voltage.

QUICK START PROCEDURE

Table 1 shows the Jumper positions and their respective effects. Be sure that the jumpers are in the **bold** (default) positions. Refer to Figure 1 for the connection diagram and follow the procedure below:

1. Connect the power supplies as shown. The power labels of V_{SS} and V_{DD} directly correspond to pins 4 and 7 of the LTC1966, respectively, and combinations other than ±5V may be used, refer to the LTC1966 datasheet.
2. Apply an input signal to convert from RMS to DC to IN1. Any signal generator may be used; the LTC1966 works up to $1V_{PEAK}$ with V_{DD} = 5V.

   NOTE: There is a 50Ω termination to ground on DC427, remove if driving with an op-amp.
3. Observe the output with a DVM connected to terminals E4 and E7.

   NOTE: The LTC1966 output impedance is high, and a 10MΩ DVM input impedance will cause about –1% gain error.
4. To use the output filters, reposition JP3 and observe the output at terminal E1 or E8.

Table 1: DC427 Jumpers (default positions in bold)

JUMPER	SETTING	EFFECT
JP1	Top	LTC1966 shutdown
	Bottom	**LTC1966 always enabled**
	Removed	LTC1966 controlled by E2 input to DC427
JP2	Top	IN1 grounded
	Bottom	**IN1 active (J1 connected to pin 2)**
JP3	Top	LTC1966 connected to optional buffered post-filter
	Right	**LTC1966 connected to output terminal E4, no filter**
	Bottom	LTC1966 connected to optional DC-Accurate post-filter
JP4	Top	IN2 active (J2 connected to pin 3)
	Bottom	**IN2 grounded**
JP5	**Installed**	**OutRtn (pin 6) grounded**
	Removed	OutRtn floating; drive with voltage at terminal E7

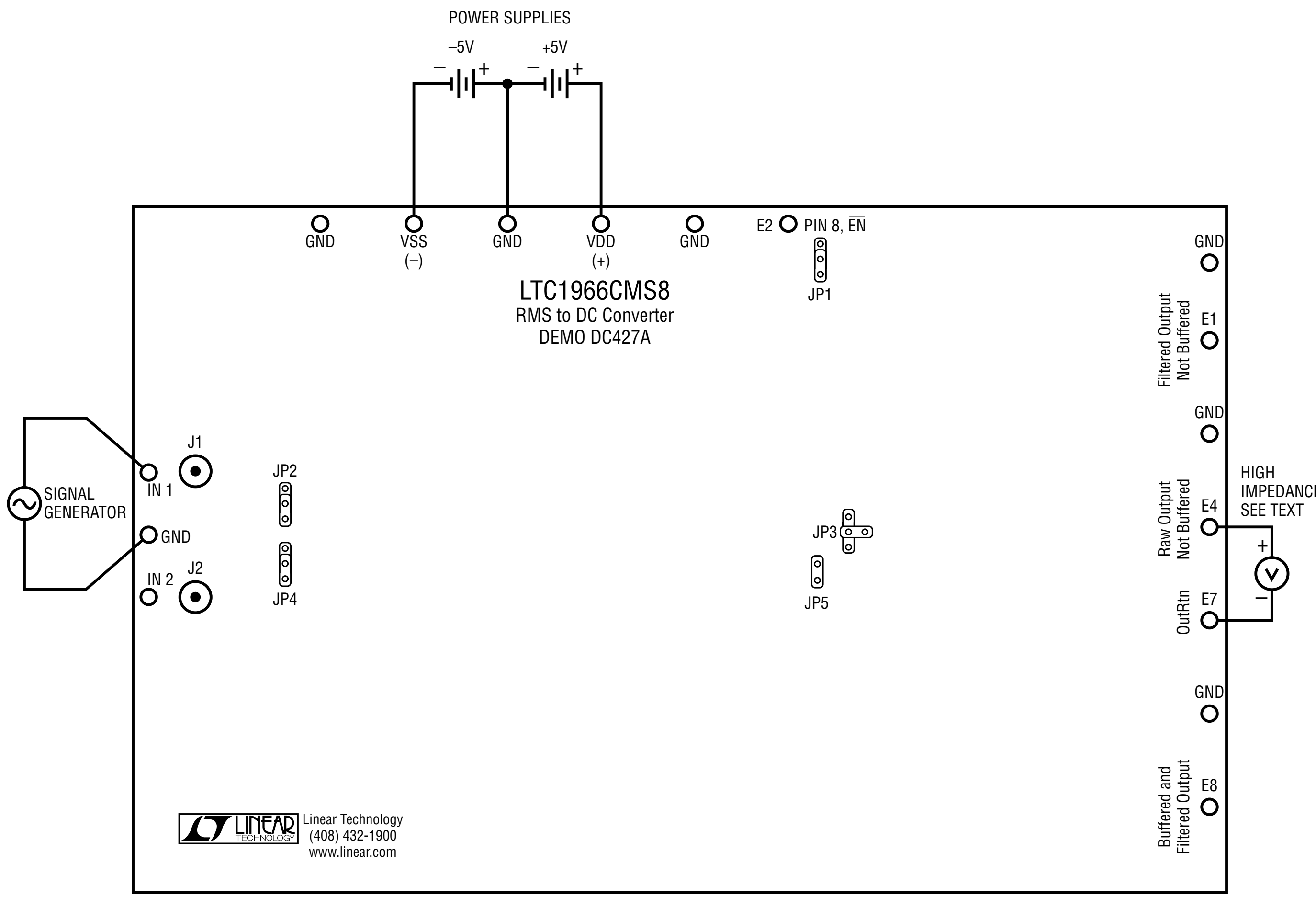

Figure 1. Proper Measurement Equipment Setup

ADDITIONAL FEATURES

Although the DC427 demo board is ready to use out of the box (See "Quick Start Procedure" above), it has features that you can access by adding, removing or changing components on the board. Here are some ways that you can change the configuration to take advantage of these features.

DIFFERENTIAL INPUTS

To drive the input differentially, move jumper JP4 from bottom to top. The LTC1966 will respond to the difference of the signals. If two different frequencies are used, the vector sum results.

AVERAGING CAPACITORS

The board provides space for trying out different averaging (and filtering) capacitors. The space at C7B parallels C7A (the included 1μF, 16V metal film capacitor). The space has a footprint that will accommodate 2.5mm, 5mm, 7.5mm, and 10mm spaced through-hole leaded components as well as a large solder mask-free area for use with a wide variety of surface mount case sizes. Try out the averaging capacitor you intend to use with the LTC1966 in DC427.

FILTER OP AMPS

Likewise, the layout of the U2/U3 Op Amps includes active locations for SOT-23, MS-8, SO-8 and DIP-8 single Op Amp packages. Try out the Op Amp you intend to use in such filters using DC427. Normally unused pins of the Op Amps (1, 5, and 8 in the 8-lead packages) are all tied in parallel, i.e. pin 8 of the DIP is tied to pin 8 of the SO and pin 8 of the MS. Pin 5 of the SOT-6 is tied to pin 5 of the other packages as well. If using any of these pins (for shutdown control, nulling, compensation, etc) the DIP-8 through-hole pins will likely be the easiest place to connect to them.

NOTE: The MS-8 and DIP-8 are located on the back (solder) side of the board. Using the back side for these parts is not advised for production.

AC COUPLING

Resistors R6 and R8 put 10kΩ between the LTC1966 and the signals driving DC427. With 50Ω signal generators, these are not needed, but they are helpful when driving DC427 with standard Op Amps whose output stages can get confused by the fast spikes of current drawn by the LTC1966's CMOS inputs (described in the LTC1966 datasheet). Another important reason for including R6/R8 is the ability to change one of them to a capacitor to provide AC coupling. Select a 1206 case size capacitor as described in the LTC1966 datasheet.

KELVIN-SENSE POINTS

The LTC1966 has a typical conversion gain accuracy of ±0.1%. Measuring this accuracy can be difficult. The primary challenge is getting a known good accurate input signal to the LTC1966 without corrupting it with parasitics. In a 50Ω environment, even 0.05Ω in series will result in a 0.1% attenuation of the signal. Of course many 50Ω terminators are ±1% tolerance, including R7 &R9 on DC427. To compensate for these effects, the signal at the LTC1966 inputs can be Kelvin-sensed. But parasitic capacitance can corrupt the LTC1966 sampling or the LTC1966 sampling can reduce the sensed signal level, depending on the exact impedance and parasitic levels. The preferred method is to sense at the outside of series feed resistors R6 and R8, at the dummy vias located above R6 and below R8. For a further discussion of the LTC1966 input sampling, refer to the “Input Impedance” information in the “Application Information” section of the LTC1966 datasheet.

JACKS AND TURRETS

Connectors J1 and J2 allow installation of a BNC jack, such as CONNEX type 112404.

The various holes around the periphery of the board allow the installation of turrets such as MILL-MAX type 2501-2. However, the size and placement of the holes allow clip lead connections without installing the turrets.

SHUTDOWN

Finally, by removing jumper JP1, the LTC1966 $\overline{\text{SHDN}}$ pin may be driven.

NOTE: The LT1494 Op-Amps and the R1/R3 divider network will continue to draw current even when the LTC1966 is disabled. To measure the near-zero current of the LTC1966, remove zero-Ω shunts R14 and R15. These can also be removed to power the optional filters with different supply voltages than the LTC1966.