DEMO CIRCUIT 1398
QUICK START GUIDE
LTM9001 16-bit High Performance ADC Drivers

DESCRIPTION

Demonstration circuit 1398 is an evaluation board featuring Linear Technology Corporation’s LTM9001 16-bit Receiver Subsystem. DC1398 demonstrates good circuit layout techniques and recommended external circuitry for optimal system performance.

DC1398 comes with Linear Technology’s 16-bit LTM9001 amplifier/ADC subsystem installed. The board includes a wideband input transformer (for evaluation with a single-ended RF signal generator) and output CMOS buffers. DC1398 plugs into the DC890 Data Acquisition demo board and the output can be easily analyzed with Linear Technology’s PScope data processing software, which is available for no charge on our website at http://www.linear.com.

Design files for this circuit board are available. Call the LTC factory.

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QUICK START PROCEDURE

Validating the performance of the LTM9001 is simple with DC1398, and requires only an input source, a clock source, a computer, and a lab power supply. Refer to Figure 1 for proper board evaluation equipment setup and follow the procedure below:

1. Connect the power supply as shown in Figure 1. There are on-board low-noise voltage regulators that provide the three supply voltages for the LTM9001. The entire board and all components share a common ground. The power supply should still be a low-noise lab power supply capable of supplying at least 1 Amp.

2. Provide an encode clock to the ADC via SMA connector J3. Use a low-phase-noise clock source such as a filtered RF signal generator or a high-quality clock oscillator. Obtain DC1216 for a low-phase-noise ADC clock source that can plug directly into DC1398.

   **NOTE.** Similar to having a noisy input, a high-jitter (phase noise) encode clock will degrade the signal-to-noise ratio (SNR) of the system.

3. Apply an input signal to the board. DC1398 allows great flexibility in applying input signals (see the section on Applying Input Signals). For best results, use a low distortion, low noise signal generator with sufficient filtering to avoid degrading the performance of the amplifier and ADC.

4. Observe the ADC output with demo circuit DC890, a USB cable, a Windows computer, and Linear Technology’s PScope data processing software.

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### Table 1: DC1398 Connectors and Jumpers

<table>
<thead>
<tr>
<th>REFERENCE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1 (AIN-)</td>
<td>Differential Board Input. Normally not connected. See text for differential-input evalua-</td>
</tr>
</tbody>
</table>
ADDITIONAL INFORMATION

Although the DC1398 demo board is ready to use on delivery, it has additional flexibility built in for various types of input networks. Below is some information about configuring DC1398 to meet the specific needs of your evaluation.

APPLYING INPUT SIGNALS

The input network consists of various components designed to allow either single-ended or differential inputs, AC-coupled or DC-coupled. Table 2 shows some possible input configurations, and which components to install. LTM9001 is designed for excellent performance with both single-ended and differential input drive, with little difference in distortion performance. When using DC-coupled inputs, the inputs to DC1398 need to be level-shifted to within the input common-mode limits in the datasheet.

Table 2: DC1398 Input Configuration Guide

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>COMPONENTS NECESSARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Ended Input</td>
<td></td>
</tr>
<tr>
<td>AC-Coupled (Default Setup)</td>
<td>No change. Transformer T1 acts as a balun for differential drive.</td>
</tr>
<tr>
<td>Single-Ended Input</td>
<td></td>
</tr>
<tr>
<td>No Transformer</td>
<td>Remove T1, replace with 0Ω jumpers. May need to install impedance-matching resistor at R4 or R2/R6.</td>
</tr>
<tr>
<td>AC-Coupled</td>
<td></td>
</tr>
<tr>
<td>Single-Ended Input</td>
<td></td>
</tr>
<tr>
<td>No Transformer</td>
<td>Same as above. Change C1 and C8 to 0Ω jumpers. Inputs must be within the common-mode voltage limits of LTM9001.</td>
</tr>
<tr>
<td>DC-Coupled</td>
<td></td>
</tr>
<tr>
<td>Differential Inputs</td>
<td>Remove R7 and install R5. T1 and C1/C8 can be replaced with 0Ω for DC coupling.</td>
</tr>
</tbody>
</table>

NOTE. Even a high-quality signal synthesizer will still have noise and harmonics that should be attenuated with a low-pass or band-pass filter. For good-quality high order filters, see TTE, Lark Engineering, or equivalent.

RF Signal Generator (HP 8644B) or other low phase noise clock source (e.g. DC1216)

Power Supply (3.8V-6V @ 1.0A)

Figure 1. Proper Evaluation Equipment Setup
NOTE. When driving the ADC driver with a direct DC-coupled path, increased input bias currents may occur due to the amplifier's input impedance. See the LTM9001 datasheet for more details.

OTHER BOARD CIRCUITRY

Device U5 is an EEPROM device that is used by the PScope software to identify the board and apply the correct settings for the data collection.

USING PSCOPE SOFTWARE


The on-board EEPROM U5 should enable automatic board detection and auto-configuration of the software, but if the user wishes to change the settings, they can easily do so.

From the Configure menu in the toolbar, uncheck “Auto-detect Device”. The default settings for DC1398 are shown in Figure 2. The LTM9001 also has an output randomizer, which the user needs to select if it is enabled on the board. The software will automatically un-randomize the output by performing an exclusive-OR with each bit and the LSB.

![ADC Configuration](image)

Figure 2. Entering the correct device information for your ADC. Select the correct parameters for the DC1398. Under normal conditions, PSCOPE should automatically recognize the board and adjust the software settings accordingly.
Figure 3. Schematic