1. Introduction

SHARC EZ-KIT Lite is one of the best buys in development systems available today (only US$169). The ADSP-21061 processor used in the system has many features integrated onto a single chip, including 32-bit single precision (or 40-bit extended precision) IEEE floating-point and 32-bit fixed-point DSP core (40MIPS) and fast on-chip 1 Megabit internal SRAM, two simultaneous inputs and outputs through a AD1847 Codec. It is most suitable for prototyping new applications.

The board can run standalone or can be simply connected to the RS232 port of your PC. A monitor program running on the DSP in conjunction with a host program running on the PC lets users interactively download programs as well as interrogate the ADSP-21061. The board comes with a socketed EPROM so that users can run the monitor program and demonstration provided, or the users can plug in an EPROM containing their own code. It also comes with a C compiler, assembler, run-time libraries, linker and even an EPROM splitter utility.

However, it is always found that the output from the board (ADSP-2106x SHARC EZ-KIT Lite) has noise with an amplitude of about 100mVp-p. This report describes the measured noise data and discusses its effect on the use of the board for active control.

2. Measurements

During measurement, the input gain and output attenuation of the Codec is set as 0. The maximum output of the board for a sine wave with an amplitude of 32767 (full 16bit) is 2.0Vp-p. The full scale of the board input is 6.0Vp-p (Codec input is 2.8Vp-p, there is a pre-amp on the board before inputting to the Codec).

2.1 Spectrum of the noise with an output set to 0

The output of the signal generator (software) was set to 0, so that the noise of the board could be measured. It is found that the time domain amplitude of the noise is about 100mVp-p. Figure 1 shows the spectrum of the noise. It can be seen from Figure 1 that the noise is dominated by 48KHz and 96KHz components. For the 96KHz component, it is about –60dB, while for the 48KHz component, it is about –63.8dB, there is also a small peak at 50Hz, which is –90dB. For the full scale output of a sine wave, which has an amplitude of 32767 (16-bit), the signal output is 2.0Vp-p, about –2.8dB, for an amplitude of 1024, the output is –32.9dB, for an amplitude of 32, the signal output is –63.2dB. So the noise will not cause problem for active control because the noise level is more than 50dB lower then the normal output (for example, half of the full scale).
Figure 1 The spectrum of the noise at the output of the SHARC EZ-KIT Lite board (sample rate 48KHz, 0 output)

Figure 2 shows the noise spectrum when sample rate is 8KHz. The noise spectrum is similar as in figure 1, which is for 48KHz sampling rate. Therefore, the noise does not depend on the sample frequency.

Figure 2 The spectrum of the noise at the output of the SHARC EZ-KIT Lite board (sample rate 8KHz, 0 output)

2.2 Input signal measurements

Figures 3-6 show the data obtained after sampling four input sine waves with amplitudes of 6.0Vp-p, 0.6Vp-p, 30mVp-p, and 0Vp-p. 0 Vp-p input is obtained by switching off the signal generator. It can be seen from these figures that the Analog to Digital converter of the board actually has a resolution of about 13 bit (not 16bit) because of the noise of the board. It also has a DC offset of about –60 which is about 50dB lower than the full scale. All these agree well with the specification of Codec AD1847, which says that the device should have a dynamic range of more than 70dB and DC offset of 55LSB [1].

Figure 3 The data of A/D converter for 6.0Vp-p input of a sine wave
3. Conclusion

The noise at the output of the board mainly comes from the Codec, which has frequency components of 48KHz and 96KHz about 55dB lower than full scale. For ordinary active control, this will not cause a problem. This noise has little influence on the input of the Codec, where the Analog to digital converter has a resolution of at least 13bit.

Reference