

PCM Generation and Demodulation using CODEC Chip

AIM OF THE EXPERIMENT: PCM Modulation and Demodulation

Equipments Required:

1. Sciencetech 2123 PCM Generation & Demodulation using CODEC Chip
2. 2 mm Patch chords
3. Oscilloscope Sciencetech 801 or equivalent with connecting cable

Introduction

Sciencetech 2123 PCM Generation & Demodulation using CODEC Chip is a stereo codec based PCM Generator and Demodulator training system. The system has onboard selectable clock source and analog signal source. The analog signal source generates sinusoidal signal. Various test points and connection sockets are provided for easy understanding of an audio CODEC. It also shows the effect of various sampling rates on coding of speech signal. Coding seeks to minimize the number of bits in the digital representation of a signal without an objectionable loss of signal quality in the process. High quality is attained at low bit rates by exploiting signal redundancy as well as the knowledge that certain types of coding distortion are imperceptible because they are masked by the signal. Our models of signal redundancy and distortion masking are leading to continue improvements in the quality of low bit rate signals.

Technical Specifications

Audio codec : Stereo

Inputs : Single ended

Number of bits per channel : 16

: 16 bits for left channel and 16 bits for right channel

Sampling Rate : 48, 24, 12 and 6 KHz

System clock : 256 * Sampling clock

Clock Source : On-board

Analog Signal Source : Sinusoidal

Frequency : 2KHz (approximately)

Amplitude : 0 to 5 V (peak to peak)

Power Supply : 3.3V, +12V

Mains Supply : 230V \pm 10%, 50Hz

Dimensions (mm) : W 326 \times D 252 \times H 52

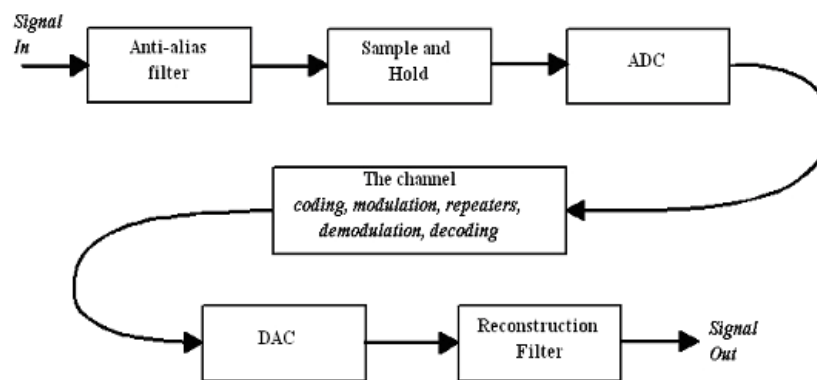
Weight : 1 Kg (approximately)

THEORY:

PCM signal. In PCM, modulation process is executed in three steps:

1. Sampling
2. Quantizing
3. Coding

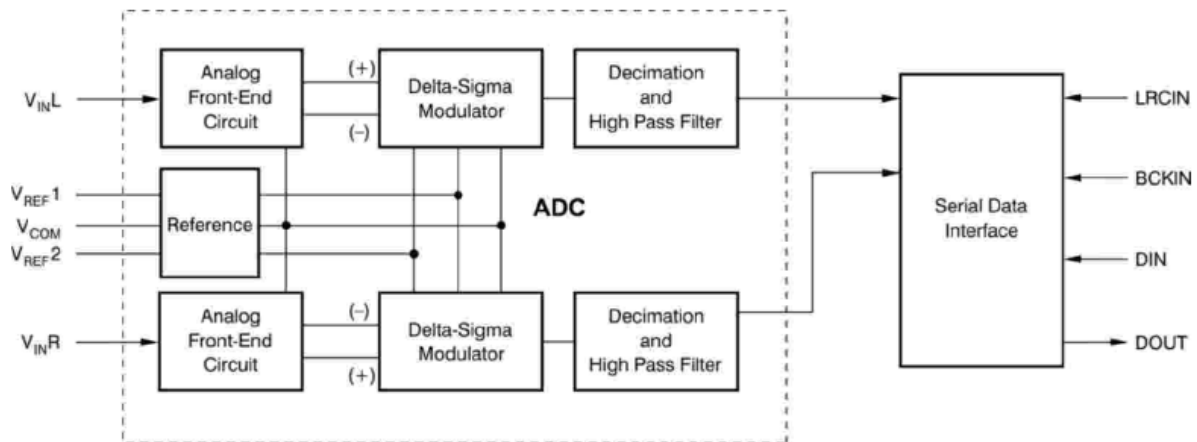
These steps are shown in Figure 1 with a block diagram:



ADC OF Stereo CODEC:

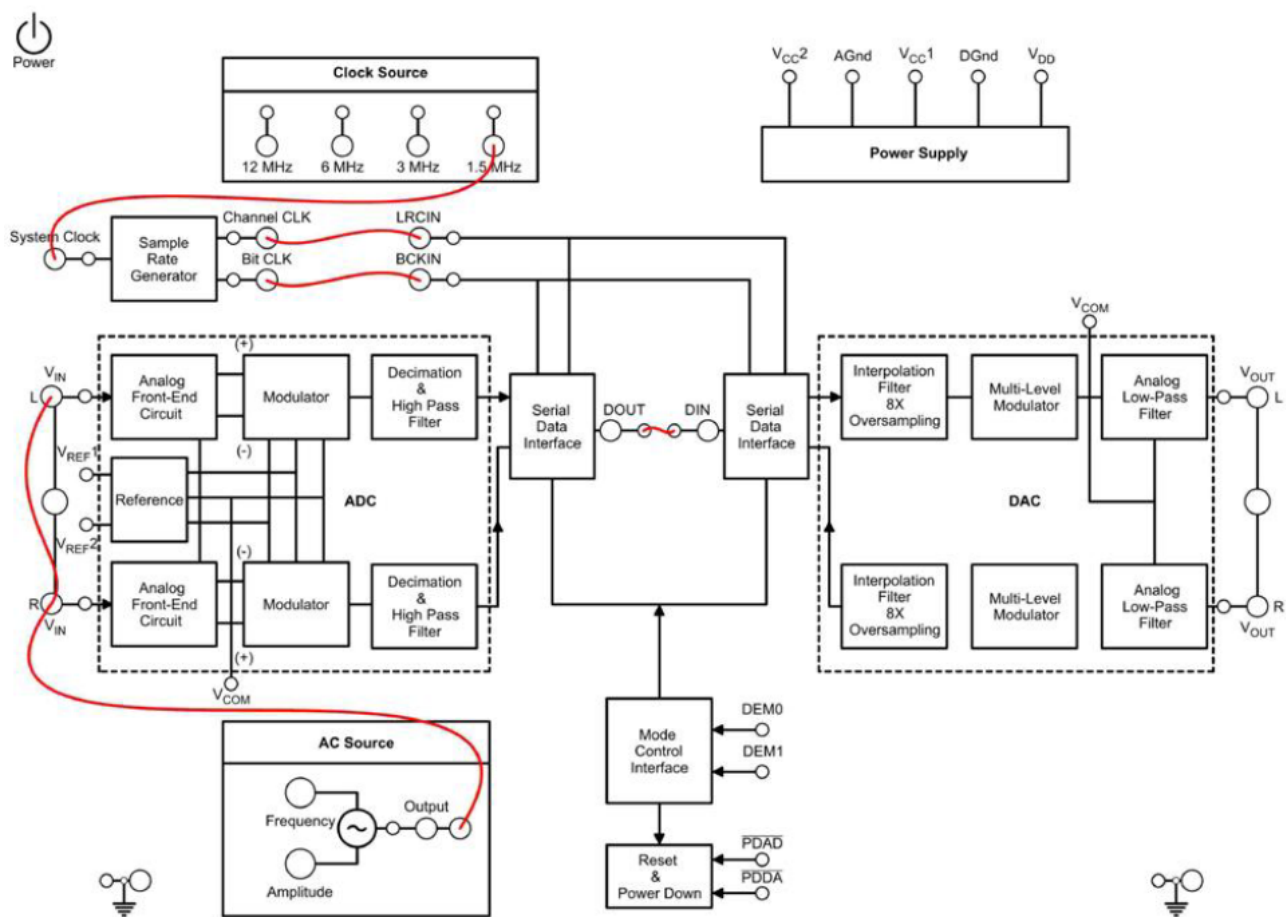
The ADC consists of two reference circuits, a stereo single-to-differential converter, a fully differential modulator, a decimation filter (including digital high pass), and a serial interface circuit.

An ADC is the initial stage required for digital representation of any kind of analog signal whether it will be voice or any other electrical signal of analog nature. The Block Diagram illustrates the architecture of the ADC section.



ADC OF Stereo CODEC

BLOCK DIAGRAM



Procedure:

1. Connect the power supply mains cord to the Scientech 2123 but do not turn ON the power supply until connections are made for this experiment.
2. Make the following connections as shown in figure 1.1.
3. From Clock Source, connect 1.5MHz Clock output to System Clock of Sample Rate Generator.
4. Switch 'On' the power supply of techbook and oscilloscope.
5. Connect Channel CLK to LRCIN and Bit CLK to BCKIN
6. Observe the signal available on Channel CLK and Bit CLK on oscilloscope with respect to ground terminal provided on board.
7. Connect the Output of AC Source to VIN of Scientech 2123 as shown in connection diagram in order to provide analog signal for modulation.
8. Observe the signal of DOUT on oscilloscope with respect to ground, which shows the modulated signal.
9. Connect the signal DOUT of ADC to DIN of DAC for demodulation of signal presented at input terminal
10. Observe the demodulated signal waveform at oscilloscope by connecting VOUT terminal of DAC to oscilloscope with respect to ground of board.
11. Change the System Clock of Sample Rate Generator to 3MHz, 6MHz and 12MHz; observe the effect of respective changes on PCM coding decoding.

Observations:

- Signals available on output (Vout), after PCM coding followed by decoding is same as analog signal given at input of codec.
- PCM Coding is method of converting analog signal to digital signal that's why the output of ADC Dout in this codec is digital levels showing the instantaneous changes of analog signal.

Conclusion:

1. The PCM codec is an analog-digital interface for voice band signals designed with a combination of coders and decoders (codecs) and filters.
2. It is a low-power device with companding options, and it meets the requirements for communication systems, including the cellular phone. The device operates in either the 15-bit linear or 8-bit companded.