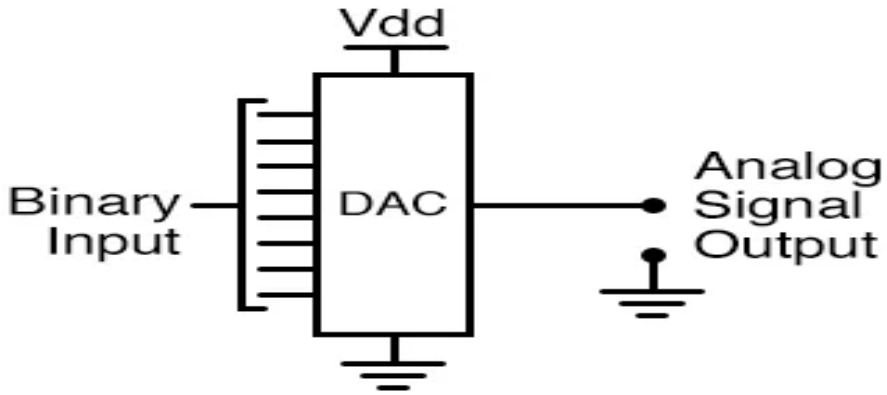
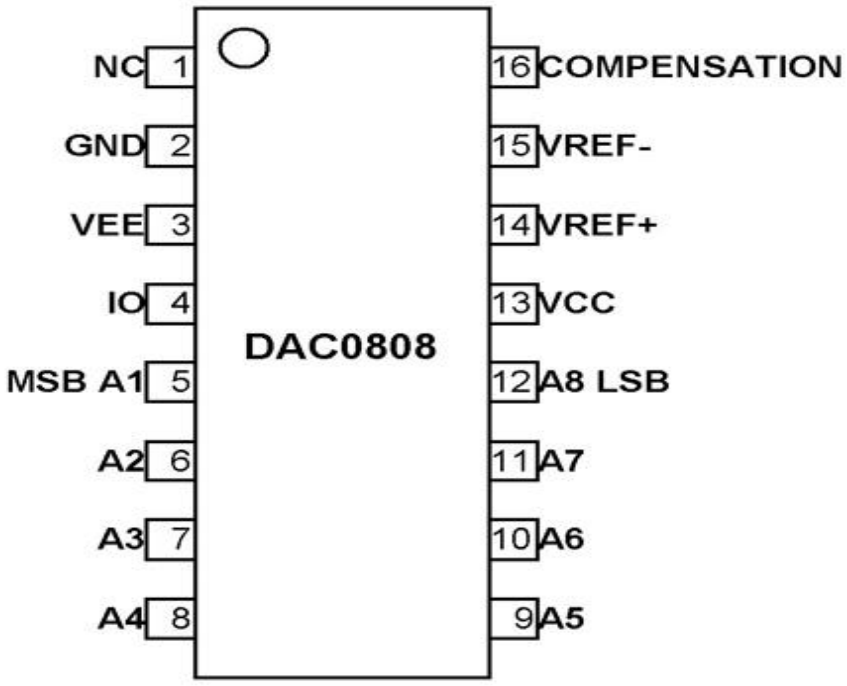
24EE404 -IOT SENSORS AND DEVICES

2.5.2 DAC

- A DAC, on the other hand, inputs a binary number and outputs an analog voltage or current signal. In block diagram form, it looks like this:



- DAC0808 is a D/A converter IC and is used for converting 8 bit digital data input to analog signal output.
- It is a monolithic IC featuring a full scale output current settling time of 150 ns while dissipating only 33 mW with ±5V supplies.
- The chip accuracy of conversion is good and power consumption is also low to make it popular.
- The power supply currents of the DAC0808 are independent of bit codes, and exhibits essentially constant device characteristics over the entire supply voltage range.



Pin details:

Pin Number	Pin Name	Description
1	NC	No connection
2	GND	Ground Pin
3	VEE	Negative (-ve) power supply
4	IO	Input/Output signal pin
5	MSB A1	MSB (Digital i/p bit-1)
6	A2	Digital i/p bit-2
7	A3	Digital i/p bit-3
8	A4	Digital i/p bit-4
9	A5	Digital i/p bit-5
10	A6	Digital i/p bit-6
11	A7	Digital i/p bit-7
12	A8	Digital i/p bit-8 (Least Significant Bit)
13	VCC	Positive (+ve) power supply
14	VREF+	Positive (+ve) reference voltage
15	VREF-	Negative (-ve) reference voltage
16	Compensation	(Compensation)-Compensation capacitor pin

Features of IC DAC0808

The features of IC DAC0808 include the following.

- Relative exactness at ±0.19% highest error
- The range of voltage power supply will be ±4.5V to ±18VN.
- Noninverting digital i/ps are compatible with CMOS & TTL.
- The settling time is very fast 150 ns.
- Highest power dissipation will be 1000 mW.

Features of IC DAC0808

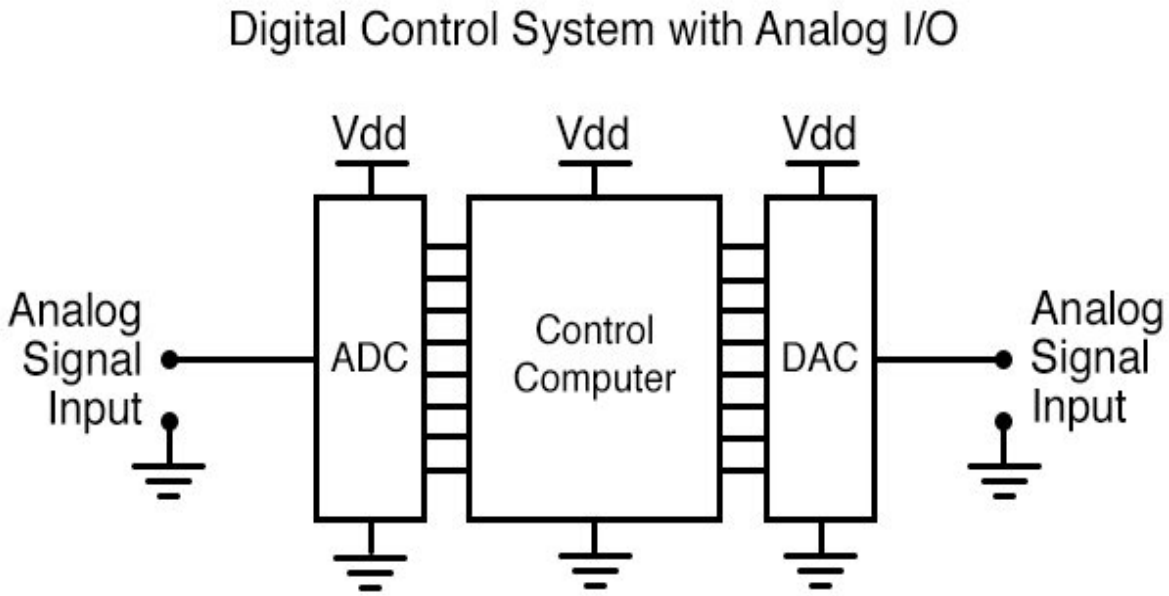
- The digital data input is 8-bit parallel.
- Input slew rate is high speed 8 mA/μs

- The match of Full-scale current is ±1 LSB.
- Low power utilization is 3 mW at ±5V.
- The range of operating temperature will be 0ºC-to- +75ºC.

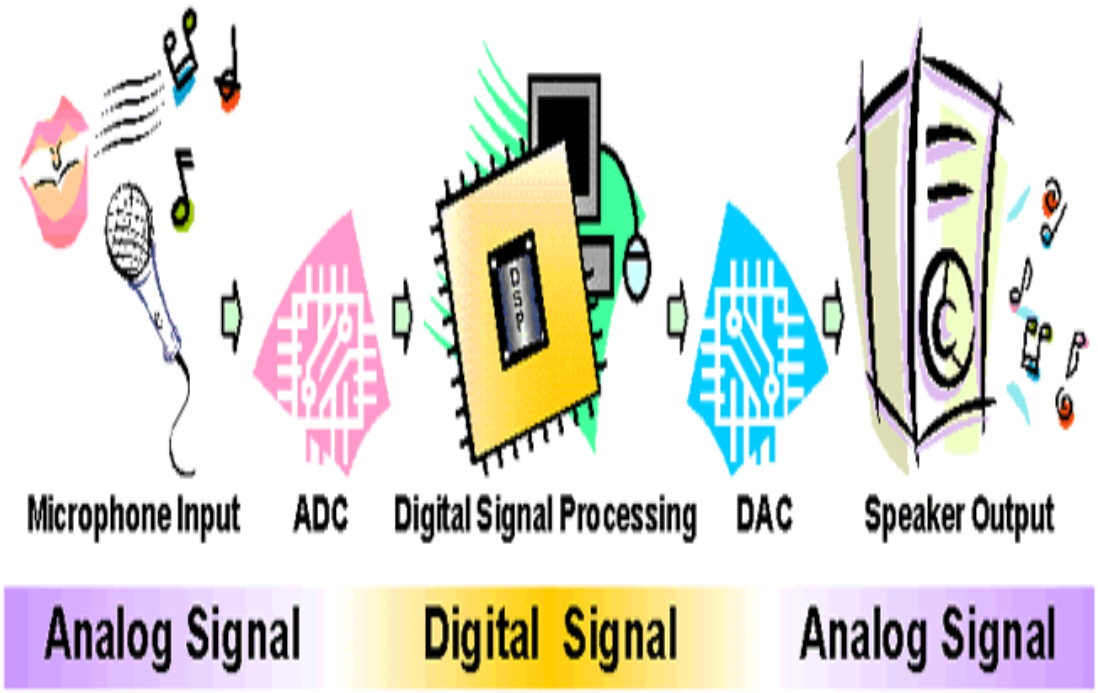
The applications of IC DAC0808 include the following.

- Conversion of Audio
- Electrical measurements
- Analog circuits as well as digital circuits
- And many more hobbyist applications

- Together, they are often used in digital systems to provide complete interface with analog sensors and output devices for control systems such as those used in automotive engine controls:



- In modern life, Analog to Digital Converter (ADC) and Digital to Analog Converter (DAC) are very important components in electronic equipment.
- Take the audio signal processing in Figure as an example, ADC converts the analog signal collected by audio input equipment, such as a microphone, into a digital signal that can be processed by computer. The computer may add sound effect such as echo and adjust the tempo and pitch of the music. DAC converts the processed digital signal back into the analog signal that is used by audio output equipment such as a speaker.



2.7 Data acquisition

Data acquisition refers to the process of collecting and measuring electrical signals from various sources and converting them into a form that can be analyzed and processed by a computer. This process is essential in fields such as engineering, environmental monitoring, and scientific research.

Components of Data Acquisition Systems

1. **Sensors and Transducers**: Devices that detect physical phenomena and convert them into electrical signals. Examples include temperature sensors, pressure sensors, and accelerometers.

2. **Signal Conditioning**: Involves amplifying, filtering, and converting signals from sensors into a format suitable for digitization. This step ensures that the signals are within the range and format that the data acquisition hardware can handle.

3. **Data Acquisition Hardware**: Includes analog-to-digital converters (ADCs) that digitize the conditioned signals for processing. It may also include multiplexers, which allow multiple signals to be processed by a single ADC.

4. **Computer and Software**: The digitized data is transferred to a computer for storage, analysis, and visualization. Software applications are used to control the data acquisition process, perform real-time analysis, and generate reports.

Data Acquisition Process

1. **Signal Detection**: Sensors detect changes in physical parameters and output an analog signal.
2. **Signal Conditioning**: The analog signal is conditioned through amplification and filtering to prepare it for conversion.

3. **Data Conversion**: The conditioned analog signal is converted into a digital signal by an ADC.
4. **Data Transmission**: The digital data is transmitted to a computer for processing.
5. **Data Analysis and Visualization**: The acquired data is analyzed and visualized using specialized software.

Applications of Data Acquisition

- **Industrial Automation**: Monitoring and controlling manufacturing processes.
- **Environmental Monitoring**: Collecting data on air and water quality.
- **Healthcare**: Measuring vital signs like heart rate and blood pressure.
- **Research and Development**: Conducting experiments and analyzing results in laboratories.