

# CHAPTER 16 OSCILLATORS

## 16-1 THE OSCILLATOR

- **Oscillators** are electronic circuits that generate an output signal without the necessity of an input signal.
- It produces a periodic waveform on its output **with only the DC supply voltage as an input**.
- The output voltage can be either sinusoidal or nonsinusoidal, depending on the type of oscillator.
- Different types of oscillators produce various types of outputs including sine waves, square waves, triangular waves, and sawtooth waves.
- A basic oscillator is shown in Figure 1.

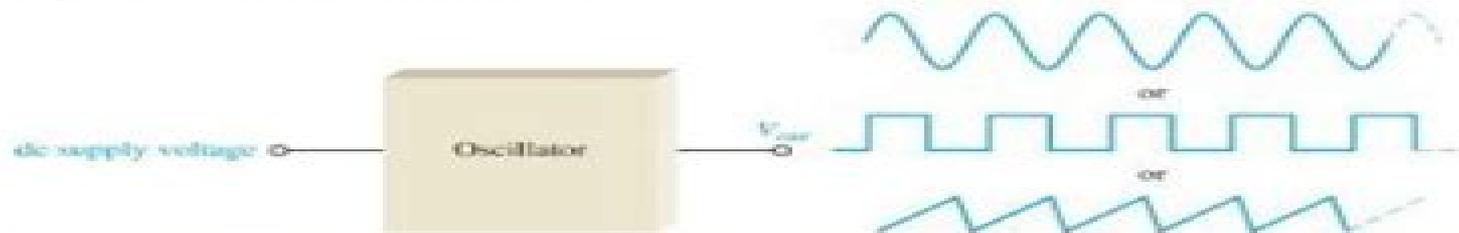


Figure 1 The basic oscillator concept showing three common types of output wave-forms: sine wave, square wave, and sawtooth.

- Oscillators can be of 2 types.

### Feedback Oscillators

- One type of oscillator is the **feedback oscillator**, which returns a fraction of the output signal to the input with no net phase shift, resulting in a reinforcement of the output signal.
- After oscillations are started, the **loop gain is maintained at 1.0 to maintain oscillations**.
- A feedback oscillator consists of an **amplifier for gain** (either a discrete transistor or an op-amp) and a **positive feedback circuit** that produces phase shift and provides attenuation, as shown in Figure 2.

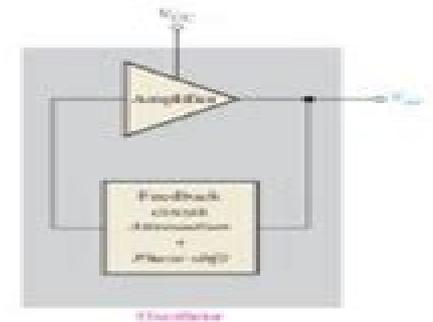


Figure 2 Basic elements of a feedback oscillator.

### Relaxation Oscillators

- A second type of oscillator is the **relaxation oscillator**.
- Instead of feedback, a relaxation oscillator uses an RC timing circuit to generate a waveform that is generally a square wave or other nonsinusoidal waveform.
- Typically, a relaxation oscillator uses a **Schmitt trigger** or other device that changes states to alternately charge and discharge a capacitor through a resistor.
- Relaxation oscillators are discussed in Section 16-5.

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