Journal of Advances in Science and Technology

Vol. IV, No. VIII, February-2013, ISSN 2230-9659

STUDY ON USE OF DIODES AS DEMODULATORS AND POWER CONVERSION

www.ignited.in

Journal of Advances in Science and Technology
Vol. IV, No. VIII, February-2013, ISSN 2230-9659

Study on Use of Diodes as Demodulators and Power Conversion

Remya Balakrishnan[1] Dr. Radhey Shyam Jha[2]

[1]Research Scholar, Monad University, Hapur, Ghaziabad (U.P.)

[2]Principal, BMCTM, Farukhnagar (HR)

Abstract – An AM signal consists of alternating positive and negative peaks of a radio carrier wave, whose amplitude or envelope is proportional to the original audio signal. The diode (originally a crystal diode) rectifies the AM radio frequency signal, leaving only the positive peaks of the carrier wave. The audio is then extracted from the rectified carrier wave using a simple filter and fed into an audio amplifier or transducer, which generates sound waves. Rectifiers are constructed from diodes, where they are used to convert alternating current (AC) electricity into direct current (DC). Automotive alternators are a common example, where the diode, which rectifies the AC into DC, provides better performance than the commutator or earlier, dynamo. Similarly, diodes are also used in Cockcroft–Walton voltage multipliers to convert AC into higher DC voltages.

Key words: alternating, proportional, frequency signal, amplifier, commutator.

---------------------------♦-----------------------------

INTRODUCTION

Electricity is energy that can be transported. An electric circuit consists of an energy source, such as a battery or power supply, and interconnected electrical components implementing a useful function. The connections are formed by wires, also known as conductors, which are made of materials such as copper or some other metal that can conduct electricity. Electrical charge transported across a conductor is called electric current. Charge is carried by electrons, which are negatively charged, or by positively charged ions in the conductor. Current is the intensity of the flow of charge. Between two points in a circuit, electrons flow from the more negatively charged point toward the one that is more positively charged. Positive charges, sometimes called holes, move in the opposite direction. By convention, current flows in the direction of holes, which is opposite to the direction of electron flow.

REVIEW OF LITERATURE:

Following the end of forward conduction in a p–n type diode, a reverse current flows for a short time. The device does not attain its blocking capability until the mobile charge in the junction is depleted.

The effect can be significant when switching large currents very quickly. A certain amount of "reverse recovery time" t_r (on the order of tens of nanoseconds to a few microseconds) may be required to remove the reverse recovery charge Q_r from the diode. During this recovery time, the diode can actually conduct in the reverse direction. In certain real-world cases it can be important to consider the losses incurred by this non-ideal diode effect. However, when the slew rate of the current is not so severe (e.g. Line frequency) the effect can be safely ignored. For most applications, the effect is also negligible for Schottky diodes.

The reverse current ceases abruptly when the stored charge is depleted; this abrupt stop is exploited in step recovery diodes for generation of extremely short pulses.

There are several types of p–n junction diodes, which emphasize either a different physical aspect of a diode often by geometric scaling, doping level, choosing the right electrodes, are just an application of a diode in a special circuit, or are really different devices like the Gunn and laser diode and the MOSFET:

Normal (p–n) diodes, which operate as described above, are usually made of doped silicon or, more rarely, germanium. Before the development of silicon power rectifier diodes, cuprous oxide and later selenium was used; its low efficiency gave it a much higher forward voltage drop (typically 1.4 to 1.7 V per "cell", with multiple cells stacked to increase the peak inverse voltage rating in high voltage rectifiers), and required a large heat sink (often an extension of the diode's metal substrate), much larger than a silicon diode of the same current ratings would require. The vast majority of all diodes are the p–n diodes found in CMOS integrated circuits, which include two diodes per pin and many other internal diodes.

MATERIAL AND METHOD:

Radio demodulation

The first use for the diode was the demodulation of amplitude modulated (AM) radio broadcasts. The history of this discovery is treated in depth in the radio article. In summary, an AM signal consists of alternating positive and negative peaks of a radio carrier wave, whose amplitude or envelope is proportional to the original audio signal. The diode (originally a crystal diode) rectifies the AM radio frequency signal, leaving only the positive peaks of the carrier wave. The audio is then extracted from the rectified carrier wave using a simple filter and fed into an audio amplifier or transducer, which generates sound waves.

Power conversion

Rectifiers are constructed from diodes, where they are used to convert alternating current (AC) electricity into direct current (DC). Automotive alternators are a common example, where the diode, which rectifies the AC into DC, provides better performance than the commutator or earlier, dynamo. Similarly, diodes are also used in *Cockcroft–Walton voltage multipliers* to convert AC into higher DC voltages.

Over-voltage protection

Diodes are frequently used to conduct damaging high voltages away from sensitive electronic devices. They are usually reverse-biased (non-conducting) under normal circumstances. When the voltage rises above the normal range, the diodes become forward-biased (conducting). For example, diodes are used in (stepper motor and H-bridge)motor controller and relay circuits to de-energize coils rapidly without the damaging voltage spikes that would otherwise occur. (Any diode used in such an application is called aflyback diode). Many integrated circuits also incorporate diodes on the connection pins to prevent external voltages from damaging their sensitive transistors. Specialized diodes are used to protect from over-voltages at higher power (see Diode types above).

Logic gates

Diodes can be combined with other components to construct AND and OR logic gates. This is referred to as diode logic.

CONCLUSION:

- Capacitance is the ability to store charge and is measured in units of farads (named for the great 19th-century British scientist Michael Faraday). A capacitor is a device with two parallel conducting plates separated by a nonconducting material. Placing negative charges on one plate will attract positive charges to the other plate. A capacitor uses current to charge the plates up slowly to a new voltage. Once charge is stored, the capacitor can also provide a "discharge" current to the rest of the circuit. Thus, capacitors are often used to smooth out variations in the current provided by the circuit's power supply. Continuing with our water analogy, a capacitor behaves much like a water holding tank. A hole at the bottom of the tank provides a steady "outflow" of current, even though the inflow may be sporadic. Charge, voltage, and capacitance are related by$Q = C \times V$

Charge is equal to capacitance times voltage. By placing a voltage *V* across a capacitor of *C* farads, we can store a charge of *Q* coulombs. RC **Delay** There is an interesting relationship between time, resistance, and capacitance. Consider how long it takes to charge up a discharged capacitor.

REFERENCES:

- A. Gacsadi and P. Szolgay, "Image Inpainting Methods by Using Cellular Neural Networks", Int'l Workshop on Cellular Neural Networks and Their Applications, 2005.

- B. Shi, T. Roska and L. Chua, "Estimating Optical Flow with Cellular Neural Networks," Int'l Journal of Circuit Theory and Applications, 26: 344-364, 1998.

- D. Vilarino and C. Rekeczky, "Implementation of a Pixel-Level Snake Algorithm on a ‚UM-Based Chip Set Architecture", IEEE Trans. On Circuits And Systems - I, 51(5): 885-891, 2004.

- G. Costantini, D. Casali, and R. Perfetti, "Detection of Moving Objects in a Binocular Video Sequence", Int'l Workshop on Cellular Neural Networks and Their Applications, 2006.

- G Costantini, D. Casafi., and R. Perfetti, "A New ‚-based Method for Detection of the Axis of Symmetry.", Int'l Workshop on Cellular Neural Networks and Their Applications, 2006.

- C. Amenta, P. Arena, S. Baglio, L. Fortuna, D. Richiura, M.Xibilia and L. Vu1, "SC-‚s for Sensors Data Fusion and Control in Space Distributed Structures", Int'l Workshop on Cellular Neural Networks and Their Applications, 2000.

- L. Bertucco, A. Fichaa, G. Nmari and A. Pagano, "A Cellular Neural Networks Approach to Flame Image Analysis for Combustion Monitoring", Int'l Workshop on Cellular Neural Networks and Their Applications, 2000.

- E. Lopez, M. Balsif, D. Vilarilio and D. Cabello, "Design and Training of Multilayer Discrete Time Cellular Neural Networks for Antipersonnel Mine Detection Using Genetic Algorithms", Int'l Workshop on Cellular Neural Networks and Their Applications, 2000.

- Zufa, C. Baldanza, F. Bisi, M. Bruschi, I. D'Antone, S. Meneghini, M. Riui, M. "A Cellular Neural Network For Peak Finding In High-Energy Physics", Int'l Workshop on Cellular Neural Networks and Their Applications, 2000.