DOWNLOAD PDF ELECTRONICS DEVICES CIRCUITS

Chapter 1 : Electronic Circuits - Simple Circuits and Mini Projects

These devices are the main building blocks of electronic circuits. Electronics have various branches include, digital electronics, analog electronics, micro electronics, nanoelectronics, optoelectronics, integrated circuit and semiconductor device.

Embedded systems Electronic devices and components[edit] Electronics Technician performing a voltage check on a power circuit card in the air navigation equipment room aboard the aircraft carrier USS Abraham Lincoln CVN Electronic component An electronic component is any physical entity in an electronic system used to affect the electrons or their associated fields in a manner consistent with the intended function of the electronic system. Components are generally intended to be connected together, usually by being soldered to a printed circuit board PCB , to create an electronic circuit with a particular function for example an amplifier , radio receiver , or oscillator. Components may be packaged singly, or in more complex groups as integrated circuits. Some common electronic components are capacitors , inductors , resistors , diodes , transistors , etc. Components are often categorized as active e. History of electronic engineering and Timeline of electrical and electronic engineering Vacuum tubes Thermionic valves were among the earliest electronic components. They played a leading role in the field of microwave and high power transmission as well as television receivers until the middle of the s. Vacuum tubes are still used in some specialist applications such as high power RF amplifiers , cathode ray tubes , specialist audio equipment, guitar amplifiers and some microwave devices. In April , the IBM was the first IBM product to use transistor circuits without any vacuum tubes and is believed to be the first all-transistorized calculator to be manufactured for the commercial market. From that time on transistors were almost exclusively used for computer logic and peripherals. Types of circuits[edit] Circuits and components can be divided into two groups: A particular device may consist of circuitry that has one or the other or a mix of the two types. Analog electronics Hitachi J adjustable frequency drive chassis Most analog electronic appliances, such as radio receivers, are constructed from combinations of a few types of basic circuits. Analog circuits use a continuous range of voltage or current as opposed to discrete levels as in digital circuits. Analog circuits are sometimes called linear circuits although many non-linear effects are used in analog circuits such as mixers, modulators, etc. Good examples of analog circuits include vacuum tube and transistor amplifiers, operational amplifiers and oscillators. One rarely finds modern circuits that are entirely analog. These days analog circuitry may use digital or even microprocessor techniques to improve performance. This type of circuit is usually called "mixed signal" rather than analog or digital. Sometimes it may be difficult to differentiate between analog and digital circuits as they have elements of both linear and non-linear operation. An example is the comparator which takes in a continuous range of voltage but only outputs one of two levels as in a digital circuit. Similarly, an overdriven transistor amplifier can take on the characteristics of a controlled switch having essentially two levels of output. In fact, many digital circuits are actually implemented as variations of analog circuits similar to this exampleâ€”after all, all aspects of the real physical world are essentially analog, so digital effects are only realized by constraining analog behavior. Digital electronics Digital circuits are electric circuits based on a number of discrete voltage levels. Digital circuits are the most common physical representation of Boolean algebra , and are the basis of all digital computers. To most engineers, the terms "digital circuit", "digital system" and "logic" are interchangeable in the context of digital circuits. Most digital circuits use a binary system with two voltage levels labeled "0" and "1". Often logic "0" will be a lower voltage and referred to as "Low" while logic "1" is referred to as "High". However, some systems use the reverse definition "0" is "High" or are current based. Quite often the logic designer may reverse these definitions from one circuit to the next as he sees fit to facilitate his design. The definition of the levels as "0" or "1" is arbitrary. Ternary with three states logic has been studied, and some prototype computers made. Computers , electronic clocks , and programmable logic controllers used to control industrial processes are constructed of digital circuits. Digital signal processors are another example.

Chapter 2 : Electronic Devices and Circuit Theory | Semiconductor Diodes in Detail

Electronic devices and circuits surround our daily existence in an indispensable fashion. Thereby, the author S. Salivahanan, in this book have attempted to reveal the complexities of the world of electronics in an extremely simplified manner, using pedagogical features to illustrate and exemplify the concepts thoroughly.

The vacuum tube era Theoretical and experimental studies of electricity during the 18th and 19th centuries led to the development of the first electrical machines and the beginning of the widespread use of electricity. The history of electronics began to evolve separately from that of electricity late in the 19th century with the identification of the electron by the English physicist Sir Joseph John Thomson and the measurement of its electric charge by the American physicist Robert A. Edison had observed a bluish glow in some of his early lightbulbs under certain conditions and found that a current would flow from one electrode in the lamp to another if the second one anode were made positively charged with respect to the first cathode. Work by Thomson and his students and by the English engineer John Ambrose Fleming revealed that this so-called Edison effect was the result of the emission of electrons from the cathode, the hot filament in the lamp. The motion of the electrons to the anode, a metal plate, constituted an electric current that would not exist if the anode were negatively charged. This discovery provided impetus for the development of electron tubes, including an improved X-ray tube by the American engineer William D. The detection of a radio signal, which is a very high-frequency alternating current AC , requires that the signal be rectified; i. These devices were undependable, lacked sufficient sensitivity, and required constant adjustment of the whisker-to-crystal contact to produce the desired result. The fact that crystal rectifiers worked at all encouraged scientists to continue studying them and gradually to obtain the fundamental understanding of the electrical properties of semiconducting materials necessary to permit the invention of the transistor. In Lee De Forest , an American engineer, developed a type of vacuum tube that was capable of amplifying radio signals. De Forest added a grid of fine wire between the cathode and anode of the two-electrode thermionic valve constructed by Fleming. The new device, which De Forest dubbed the Audion patented in , was thus a three-electrode vacuum tube. In operation, the anode in such a vacuum tube is given a positive potential positively biased with respect to the cathode, while the grid is negatively biased. A large negative bias on the grid prevents any electrons emitted from the cathode from reaching the anode; however, because the grid is largely open space, a less negative bias permits some electrons to pass through it and reach the anode. Small variations in the grid potential can thus control large amounts of anode current. The vacuum tube permitted the development of radio broadcasting, long-distance telephony, television, and the first electronic digital computers. These early electronic computers were, in fact, the largest vacuum-tube systems ever built. The special requirements of the many different applications of vacuum tubes led to numerous improvements, enabling them to handle large amounts of power, operate at very high frequencies, have greater than average reliability, or be made very compact the size of a thimble. The cathode-ray tube , originally developed for displaying electrical waveforms on a screen for engineering measurements, evolved into the television picture tube. Such tubes operate by forming the electrons emitted from the cathode into a thin beam that impinges on a fluorescent screen at the end of the tube. The screen emits light that can be viewed from outside the tube. Deflecting the electron beam causes patterns of light to be produced on the screen, creating the desired optical images. Notwithstanding the remarkable success of solid-state devices in most electronic applications, there are certain specialized functions that only vacuum tubes can perform. These usually involve operation at extremes of power or frequency. Vacuum tubes are fragile and ultimately wear out in service. Failure occurs in normal usage either from the effects of repeated heating and cooling as equipment is switched on and off thermal fatigue , which ultimately causes a physical fracture in some part of the interior structure of the tube, or from degradation of the properties of the cathode by residual gases in the tube. These shortcomings motivated scientists at Bell Laboratories to seek an alternative to the vacuum tube and led to the development of the transistor. The semiconductor revolution Invention of the transistor The invention of the transistor in by John Bardeen , Walter H. Brattain , and William B. Shockley of the Bell research staff provided the first of a series of new devices with remarkable potential for expanding the utility of electronic equipment see photograph. Transistors, along with such subsequent developments as integrated circuits , are made of crystalline solid materials called semiconductors , which have electrical properties that can be varied over an extremely wide range by the addition of minuscule quantities of other elements. The availability of two kinds of charge carriers in semiconductors is a valuable property exploited in many electronic devices made of such materials. Early transistors were produced using germanium as the semiconductor material, because methods of purifying it to the required degree had been developed during and shortly after World War II. Because the electrical properties of semiconductors are extremely sensitive to the slightest trace of certain other elements, only about one part per billion of such elements can be tolerated in material to be used for making semiconductor devices. During the late s, research on the purification of silicon succeeded in producing material suitable for semiconductor devices, and new devices made of silicon were manufactured from about Silicon quickly became the preferred raw material, because it is much more abundant than germanium and thus less expensive. In addition, silicon retains its semiconducting properties at higher temperatures than does germanium. There was one other important property of silicon, not appreciated at the time but crucial to the development of low-cost transistors and integrated circuits: This film is utilized as a mask to permit the desired impurities that modify the electrical properties of silicon to be introduced into it during manufacture of semiconductor devices. The mask pattern, formed by a photolithographic process, permits the creation of tiny transistors and other electronic components in the silicon. Integrated circuits By vacuum tubes were rapidly being supplanted by transistors, because the latter had become less expensive, did not burn out in service, and were much smaller and more reliable. Computers employed hundreds of thousands of transistors each. This fact, together with the need for compact, lightweight electronic missile-guidance systems, led to the invention of the integrated circuit IC independently by Jack Kilby of Texas Instruments Incorporated in and by Jean Hoerni and Robert Noyce of Fairchild Semiconductor Corporation in Kilby is usually credited with having developed the concept of integrating device and circuit elements onto a single silicon chip, while Noyce is given credit for having conceived the method for integrating the separate elements. Early ICs contained about 10 individual components on a silicon chip 3 mm 0. By the number was up to 1, on a chip of the same size at no increase in cost. Late in the following year the first microprocessor was introduced. This type of large-scale IC was developed by a team at Intel Corporation , the same company that also introduced the memory IC in The stage was now set for the computerization of small electronic equipment. Until the microprocessor appeared on the scene, computers were essentially discrete pieces of equipment used primarily for data processing and scientific calculations. They ranged in size from minicomputers , comparable in dimensions to a small filing cabinet, to mainframe systems that could fill a large room. The microprocessor enabled computer engineers to develop microcomputers â€”systems about the size of a lunch box or smaller but with enough computing power to perform many kinds of business, industrial, and scientific tasks. Such systems made it possible to control a host of small instruments or devices e. The very existence of computer hardware inside such devices is not apparent to the user. The large demand for microprocessors generated by these initial applications led to high-volume production and a dramatic reduction in cost. This in turn promoted the use of the devices in many other applicationsâ€”for example, in household appliances and automobiles, for which electronic controls had previously been too expensive to consider. Continued advances in IC technology gave rise to very large-scale integration VLSI , which substantially increased the circuit density of microprocessors. These technological advances, coupled with further cost reductions stemming from improved manufacturing methods, made feasible the mass production of personal computers for use in offices, schools, and homes. By the mids inexpensive microprocessors had stimulated computerization of an enormous variety of consumer products. Common examples included programmable microwave ovens and thermostats, clothes washers and dryers, self-tuning television sets and self-focusing cameras, videocassette recorders and video games, telephones and answering machines, musical instruments, watches, and security systems. Microelectronics also came to the fore in business, industry , government, and other sectors. Microprocessor-based equipment proliferated, ranging from automatic teller machines ATMs and point-of-sale terminals in retail stores to automated factory assembly systems and office workstations. By mid memory ICs with a capacity of , bits binary digits were available. In fact, Gordon E. Moore , one of the founders of Intel, observed as early as that the complexity of ICs was approximately doubling every 18â€"24 months, which was still the case in Moore observed that the number of transistors on a computer chip was doubling about every 18â€"24 months. Compound semiconductor materials Many semiconductor materials other than silicon and germanium exist, and they have different useful properties. Silicon carbide is a compound semiconductor, the only one composed of two elements from column IV of the periodic table. It is particularly suited for making devices for specialized high-temperature applications. Other compounds formed by combining elements from column III of the periodic tableâ€"such as aluminum, gallium, and indiumâ€"with elements from column Vâ€"such as phosphorus, arsenic, and antimonyâ€"are of particular interest. These so-called III-V compounds are used to make semiconductor devices that emit light efficiently or that operate at exceptionally high frequencies. A remarkable characteristic of these compounds is that they can, in effect, be mixed together. One can produce gallium arsenide or substitute aluminum for some of the gallium or also substitute phosphorus for some of the arsenic. When this is done, the electrical and optical properties of the material are subtly changed in a continuous fashion in proportion to the amount of aluminum or phosphorus used. Except for silicon carbide , these compounds have the same crystal structure. This makes possible the gradation of composition , and thus the properties, of the semiconductor material within one continuous crystalline body. Modern material-processing techniques allow these compositional changes to be controlled accurately on an atomic scale. These characteristics are exploited in making semiconductor lasers that produce light of any given wavelength within a considerable range. Such lasers are used, for example, in compact disc players and as light sources for optical fibre communication. Digital electronics Computers understand only two numbers, 0 and 1, and do all their arithmetic operations in this binary mode. Many electrical and electronic devices have two states: A light switch is a familiar example, as are vacuum tubes and transistors. Because computers have been a major application for integrated circuits from their beginning, digital integrated circuits have become commonplace. It has thus become easy to design electronic systems that use digital language to control their functions and to communicate with other systems. A major advantage in using digital methods is that the accuracy of a stream of digital signals can be verified, and, if necessary, errors can be corrected. An example is the sound from a phonograph record , which always contains some extraneous sound from the surface of the recording groove even when the record is new. The noise becomes more pronounced with wear. Contrast this with the sound from a digital compact disc recording. No sound is heard that was not present in the recording studio. The disc and the player contain error-correcting features that remove any incorrect pulses perhaps arising from dust on the disc from the information as it is read from the disc. As electronic systems become more complex, it is essential that errors produced by noise be removed; otherwise, the systems may malfunction. Many electronic systems are required to operate in electrically noisy environments , such as in an automobile. The only practical way to assure immunity from noise is to make such a system operate digitally. In principle it is possible to correct for any arbitrary number of errors, but in practice this may not be possible. The amount of extra information that must be handled to correct for large rates of error reduces the capacity of the system to handle the desired information, and so trade-offs are necessary. A consequence of the veritable explosion in the number and kinds of electronic systems has been a sharp growth in the electrical noise level of the environment. Any electrical system generates some noise, and all electronic systems are to some degree susceptible to disturbance from noise. The noise may be conducted along wires connected to the system, or it may be radiated through the air. Care is necessary in the design of systems to limit the amount of noise that is generated and to shield the system properly to protect it from external noise sources.

Chapter 3 : Electronic Devices and Circuit Theory by Robert Boylestad

Electronics Devices And Circuits July 23, July 24, Purushottam Chilveri The course on Electronic Devices and Circuit is the base for all electronic circuits involving transistors.

Michal , 3 months ago 0 2 min read Electronic devices and circuits surround our daily existence in an indispensable fashion. Thereby, the author S. Salivahanan, in this book have attempted to reveal the complexities of the world of electronics in an extremely simplified manner, using pedagogical features to illustrate and exemplify the concepts thoroughly. Salivahanan provides a very cheap book for the concepts of electronic devices and circuits. He tried to provide examples of each topic from the real world. This is a complete set starting electronic engineer , which starts from an atom and proceed to the microprocessor. Review questions at the end of each chapter strengthen the concept. Provides good illustration for each topic. Physical properties of elements: Start with basic atomic structure and energy bands and expend the discussion to electron emission. Discusses the resistors, capacitor, and inductors. Introduce the charged particles, magnetic and electric field and their interaction. Start with an introduction to semiconductor and discusses the PN-Junction. Construction, characteristics, operation, and working of BJT as amplifier and switch. Construction, characteristics, operation, and working of FET as amplifier and switch. Mid-Band Analysis of the small signal amplifier: Two-port network and devices model with different amplifier configuration. Coupling schemes and concatenation of amplifiers. Discuss the frequency response of small single amplifiers and RF Amplifier. Discusses small signal and large signal amplifier Q-factor and stability. Basic concept of feedback and feedback topology. Barkhausen Criterion, Classification, and different oscillators. Wave Shaping and multi-vibrator circuit: Diode clipper, clamper, and comparators with multi-vibrator. Blocking oscillator and Time base generation: Time base circuits, pulse transformer and unijunction transistor UJT. Rectifier and Power Supply: Linear and switched mode power supply. Talks about different transducers. Discusses the optical components. Talks about measuring instrument like ammeter and voltmeter. Introduction to memories and basic computer microprocessor.

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Chapter 4 : Electronic Devices and Circuits - What is electronics - Electronics definition

The study of semiconductor devices and related technology is considered a branch of solid-state physics, whereas the design and construction of electronic circuits to solve practical problems come under electronics engineering.

The word electronics is derived from electron mechanics, which means to study the behavior of an electron under different conditions of applied electric field. Electronics definition The branch of engineering in which the flow and control of electrons in vacuum or semiconductor are studied is called electronics. Electronics can also be defined as the branch of engineering in which the electronic devices and their utilization are studied. The motion of electrons through a conductor gives us electric current. This electric current can be produced with the help of batteries and generators. The device which controls the flow of electrons is called electronic device. These devices are the main building blocks of electronic circuits. Electronics have various branches include, digital electronics, analog electronics, micro electronics, nanoelectronics, optoelectronics, integrated circuit and semiconductor device. History of electronics Diode vacuum tube was the first electronic component invented by J. Later, Lee De Forest developed the triode, a three element vacuum tube capable of voltage amplification. Vacuum tubes played a major role in the field of microwave and high power transmission as well as television receivers. In , Bell laboratories developed the first transistor based on the research of Shockley, Bardeen and Brattain. In , Jack Kilby of Texas Instruments developed the first integrated circuit. Integrated circuits contain large number of semiconductor devices such as diodes and transistors in very small area. Advantages of electronics Electronic devices are playing a major role in everyday life. The various electronic devices we use in everyday life include Computers Today, computers are using everywhere. At home, computers are used for playing games, watching movies, doing research, paying bills and reservation of tickets for railways and airlines. At school, students use computers to complete their assignments. Mobile phones Mobile phones are used for variety of purposes such as for sending text messages, making voice calls, surfing internet, playing games, and listening songs. ATM ATM is an electronic telecommunication device particularly used for withdrawing money at any time from anywhere. ATM stands for automated teller machine. The customer can withdraw money up to a certain limit during anytime of the day or night. Pen drive Pen drive is particularly used for storing large amount of data and also used for transferring data from one device to another. For example, the data stored in the computer can be transferred to the pen drive. The data stored in this pen drive can be retrieved at anytime. Television Television is an electronic device primarily used for entertainment and knowledge. Digital camera Digital camera is a camera used for taking pictures and videos. This images and videos are stored for later reproduction.

Chapter 5 : Electronic Devices and Circuits by S. Salivahanan

Our + Electronic Devices and Circuits questions and answers focuses on all areas of Electronic Devices and Circuits subject covering + topics in Electronic Devices and Circuits. These topics are chosen from a collection of most authoritative and best reference books on Electronic Devices and.

Chapter 6 : Electronic Devices and Circuits (PDF p) | Download book

Jacob Millman & Christos C. Halkias Electronic Devices & Circuits McGraw-Hill Acrobat 7 Pdf Mb. Scanned by artmisa using Canon.

Chapter 7 : Electronic Devices and Circuits: [With CDROM] by Theodore F. Bogart

This book is intended as a text for a first course in electronics for electrical engineering or physics students, has two primary objectives: to present a clear, consistent picture of the internal physical behavior of many electronic devices, and to teach the reader how to analyze and design electronic circuits using these devices.

Chapter 8 : Electronics Devices And Circuits - calendrierdelascience.com, calendrierdelascience.com - Go

is the header course for the department's "Devices, Circuits and Systems" concentration. The topics covered include: modeling of microelectronic devices, basic microelectronic circuit analysis and design, physical electronics of semiconductor junction and metal-on-silicon (MOS) devices, relation of electrical behavior to internal physical processes, development of circuit models, and.

Chapter 9 : Electronics - Wikipedia

Electronic devices and circuit theory: An overview A diode is the simplest semiconductor device with a very vital role in electronic systems, with characteristics matching a switch. It appears in a range of electronics applications and uses semiconductors.