Chapter 1 : Electronic Components IC,Capacitor,Resistors,Diodes,Transistors Supplies Manufacturers,Dat

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Simplifying assumptions[edit] For illustration this discussion assumes idealized diodes that conduct in the forward direction with no voltage drop and do not conduct in the reverse direction. Logic design assume two distinct levels of signals that are labeled 1 and 0. For positive logic the 1 represents the most positive level and 0 for the most negative level. In binary logic the exact magnitude of the signal voltage is not critical and it is only necessary that 1 and 0 states be represented by detectably different voltage levels. In these examples at least one input of every gate must be connected to a voltage level providing the defined logic 1 or logic 0 levels. If all the inputs are disconnected from any driving source the output signal is not confined to the correct voltage range. Diode logic gates[edit] In logic gates, logical functions are performed by parallel or series connected switches such as relay contacts or insulated gate FETs like CMOS controlled by logical inputs or parallel resistors or diodes which are passive components. Diode logic is implemented by diodes which exhibit low impedance when forward biased and a very high impedance when reverse biased. The diode symbol is an arrow showing the forward low impedance direction of current flow. All diodes have inputs on their anodes and their cathodes are connected together to drive the output. R is connected from the output to some negative voltage -6 volts to provide bias current for the diodes. If all inputs A and B and C are at 0 volts logic level 0 , current flowing through R will pull the output voltage down until the diodes clamp the output. Since these diodes are treated as ideal, the output is clamped to 0 volts, which is logic level 0. If any input switches to a positive voltage logic 1 , current flowing through the now forward-biased diode will pull the output voltage up, providing a positive voltage at the output, a logic 1. Any positive voltage will represent a logic 1 state; the summing of currents through multiple diodes does not change the logic level. The other diodes are reverse biased and conduct no current. Only if all inputs, A and B and C are 0 will the output be 0. This is the definition of a logic OR. The truth table on the right of the image shows the output for all combinations of inputs. This can be written as: R can return to any negative voltage. If R is connected to 0 volts it will have no drive current available to drive the next circuit; practical diodes need a bias current. In a practical circuit, all signal levels, the value of R and its return voltage are chosen by the circuit designer to meet the design requirements. The diodes are reversed so that the cathodes are connected to the inputs and the anodes are connected together to provide the output. If any input switches to 0 volts logical 0 level , current flowing through the diode will pull the output voltage down to 0 volts. The other diodes would be reverse biased and conduct no current. If input A or B or C is 0, the output will be 0. This is the definition of a logic AND. Similar to the diode OR, R can return to any voltage that is more positive than the logic level 1. If R is connected to a voltage equal to the 1 level it will have no drive current available to drive the next circuit. All signal levels, the value of R and its return voltage are options chosen by the circuit designer to meet the design requirements. Negative logic[edit] The assignment of 1 and 0 to the positive and negative signal levels respectively is an option of the logic designer using the AND or OR circuits. With this assignment it assumes that the logic is positive. It is just as likely that the assignment might be the reversed where 1 is the negative voltage and 0 is the positive voltage. This would be negative logic. Switching between positive and negative logic is commonly used to achieve a more efficient logic design. This relationship can easily be recognized by reading the above description of their operation. The logical function of any arrangement of diodes can only be established if the representation of logic states by voltage levels is known. The circuit designer must concern himself with real diodes. The articles p-n diode and a less detailed article p-n junction describe the physics of the PN diode. After all the discussion of electrons, holes, majority and minority carriers etc. The real PN diode actually has a voltage current characteristic similar to the curve on the right. A more specific definition can be found in the Shockley diode equation. The designer of a reliable diode logic circuit is usually limited to what the diode specification provides which is often less than the equation suggests. Typically the specification will primarily provide a maximum forward voltage drop at one or more forward currents and a reverse leakage current. It will also provide a maximum reverse voltage limited by zener or avalanche breakdown. Typical worst case specifications are shown below for both germanium and silicon PN diodes. More realistically the germanium forward voltage might be 0. The silicon leakage current might be much lower, possibly 1 to nanoamps. PN diodes also have transient behaviors that might be of concern with the design. The capacitance of a PN diode between anode and cathode is inversely proportional to the reverse voltage, growing as it approaches zero volts and into forward bias. There is also a recovery concern where the current will not decrease immediately when it is switched from forward bias to reverse bias. In the case of the diode OR if two or more of the inputs are at the 1 level and one switches to 0 it will cause a glitch or increase in current in the diodes that remain at 1. This can cause a short term dip in the output voltage. In practice if the diode logic gate drives a transistor inverter, as it usually does, and the diode and transistor are of similar construction the transistor will have a similar base collector capacitance that is amplified by the transistor gain so that it will be too slow to pass the glitch. Only when the diode is of a much slower construction will it become any concern at all. In one unusual design small selenium diode discs were used with germanium transistors. The recovery time of the very slow selenium diodes caused a glitch on the inverter output. The image on the right shows two basic logic circuits packaged on cards. A single card would hold four two-way circuits or three three-way or one eight-way. All input and output signals were compatible. The circuits were capable of reliably switching pulses as narrow as one microsecond. Digital logic implemented by active elements is characterized by signal restoration. True and false or 1 and 0 are represented by two specific voltage levels. If the inputs to a digital logic gate is close to their respective levels, the output will be closer or exactly equal to its desired level. Active logic gates may be integrated in large numbers because each gate tends to remove noise at its input. Diode logic gates are implemented by passive elements; so, they have two restoration problems. The first restoration problem of diode logic is that there is a voltage drop VF about 0. This voltage is added to or subtracted from the input of every gate so that it accumulates when identical diode gates are cascaded. In an OR gate, VF decreases the high voltage level the logical 1 while in an AND gate, it increases the low voltage level the logical 0. The feasible number of logic stages thus depends on the difference between the high and low voltages. Another problem of diode logic is the internal resistance of the input voltage sources. Together with the gate resistor, it constitutes a voltage divider that worsens the voltage levels. In an OR gate, the source resistance decreases the high voltage level the logical 1 while in an AND gate, it increases the low voltage level the logical 0. The outputs of conventional ICs with complementary output drive stages are never directly connected together since they act as voltage sources. This wired logic connection can be a useful way of producing simple logic functions without using additional logic gates. Adding diode logic will degrade the signal level and result in poor noise rejection and possible failure. Tunnel diodes[edit] During the s the use of tunnel diodes in logic circuits was an active research topic. When compared to transistor logic gates of the time, the tunnel diode offered much higher speeds. Unlike other diode types, the tunnel diode offered the possibility of amplification of signals at each stage. The operating principles of a tunnel diode logic rely on biasing of the tunnel diode and supply of current from inputs over a threshold current, to switch the diode between two states. Consequently, tunnel diode logic circuits required a means to reset the diode after each logical operation. A simple tunnel diode gate offered little isolation between inputs and outputs and had low fan in and fan out. More complex gates, with additional tunnel diodes and bias power supplies, overcame some of these limitations.

Chapter 2 : Diode logic - Wikipedia

*Diodes, Transistors, and Integrated Circuits for Switching Systems. [Robert Lyon-Caen] on calendrierdelascience.com *FREE* shipping on qualifying offers.*

An antenna ground system, tank circuit, peak detector, and headphones are the the main components of a crystal radio. See Figure above a. The antenna absorbs transimtted radio signals b which flow to ground via the other components. The combination of C1 and L1 comprise a resonant circuit, refered to as a tank circuit. Its purpose is to select one out of many available radios signals. The variable capacitor C1 allows for tuning to the various signals. The diode passes the positive half cycles of the RF, removing the negative half cycles c. C2 is sized to filter the radio frequencies from the RF envelope c , passing audio frequencies d to the headset. Note that no power supply is required for a crystal radio. A germanium diode, which has a lower forward voltage drop provides greater sensitvity than a silicon diode. The ceramic earphone is desirable for all but the strongest radio signals The circuit in Figure below produces a stronger output than the crystal detector. Since the transistor is not biased in the linear region no base bias resistor , it only conducts for positive half cycles of RF input, detecting the audio modulation. An advantage of a transistor detector is amplification in addition to detection. Note the transistor is a germanuim PNP device. This is probably more sensitive, due to the lower 0. However, a silicon device should still work. Reverse battery polarity for NPN silicon devices. TR One, one transistor radio. No-bias-resistor causes operation as a detector. After Stoner, Figure 4. However, the low impedance earbuds commonly used with portable audio equipment may be substituted when paired with a suitable audio transformer. The circuit in Figure below adds an audio amplifier to the crystal detector for greater headphone volume. The original circuit used a germanium diode and transistor. A silicon transistor may be used if the base-bias resistor is changed according to the table. Crystal radio with one transistor audio amplifer, base-bias. First mass produced transistor radio, The circuit in Figure below is an integrated circuit AM radio containing all the active radio frequency circuitry within a single IC. All capacitors and inductors, along with a few resistors, are external to the IC. The Pf variable capacitor tunes the desired RF signal. The RF signal and local oscillator frequencies mix producing the sun and difference of the two at pin The external KHz ceramic filter between pins 15 and 12, selects the KHz difference frequency. Most of the amplification is in the intermediate frequency IF amplifier between pins 12 and 7. A diode at pin 7 recovers audio from the IF. The meshed plates of a dual variable capacitor make for a bulky component. It is ecconomic to replace it with varicap tuning diodes. Increasing the reverse bias Vtune decreases capacitance which increases frequency. Vtune could be produced by a potentiometer. IC radio comparison of a mechanical tuning to b electronic varicap diode tuning. Sony engineers have included the intermediate frequency IF bandpass filter within the 8-pin IC. This eliminates external IF transformers and an IF ceramic filter. L-C tuning components are still required for the radio frequency RF input and the local oscillator. Though, the variable capacitors could be replaced by varicap tuning diodes. Compact IC radio eliminates external IF filters. The bulky external IF filter transformers have been replaced by R-C filters. The resistors are integrated, the capacitors external. See Figure 5 or 8 of the datasheet for the omitted signal strength circuit. The simple tuning circuit is from the Figure 5 Test Circuit. Figure 8 has a more elaborate tuner. Datasheet Figure 8 shows a stereo FM radio with an audio amplifier for driving a speaker. For the 56nH inductor, wind 8 turns of 22 AWG bare wire or magnet wire on a 0. Remove the mandrel and strech to 0. The tuning capacitor may be a miniature trimmer capacitor. Figure below is an example of a common-base CB RF amplifier. It is a good illustration because it looks like a CB for lack of a bias network. Since there is no bias, this is a class C amplifier. The transistor conducts for less than o of the input signal because at least 0. The common-base configuration has higher power gain at high RF frequencies than common-emitter. Though, more sections would likely be required by modern radiated emissions standards. Class C common-base mW RF power amplifier. The common-base circuit can be pushed to a higher frequency than other configurations. This is a common base configuration because the transistor bases are grounded for AC by pF capacitors. They stablize the collector current. Class A common-base small-signal high gain amplifier. After Texas Instruments [TX2] A cascode amplifier has a wide bandwdth like a common-base amplifier and a moderately high input impedance like a common emitter arrangement. The biasing for this cascode amplifier Figure below is worked out in an example problem Ch 4. Class A cascode small-signal high gain amplifier. Use RF or microwave transistors for best high frequency response. PIN diode antenna switch for direction finder receiver. PIN diodes function as voltage variable resistors. The anti-series diodes cancel some harmonic distortion compared with a single series diode. The control voltage Vcontrol, increases current through the parallel diodes as it increases. This decreases the resistance and attenuation, passing more RF from input to output. However, the frequency response varies too much to use.

Chapter 3 : Radio Circuits | Practical Analog Semiconductor Circuits | Electronics Textbook

CISSOID is a Fabless Semiconductor company and leader in High Temperature Electronics. They develop and sell Integrated Circuits (IC) and discrete semiconductors designed for the highest reliability in the widest range of temperatures.

Early digital circuits containing tens of transistors provided a few logic gates, and early linear ICs such as the Plessey SL or the Philips TAA had as few as two transistors. The number of transistors in an integrated circuit has increased dramatically since then. The early integrated circuits were SSI. SSI circuits were crucial to early aerospace projects, and aerospace projects helped inspire development of the technology. Both the Minuteman missile and Apollo program needed lightweight digital computers for their inertial guidance systems. Although the Apollo guidance computer led and motivated integrated-circuit technology, [55] it was the Minuteman missile that forced it into mass-production. The demand by the U. Government supported the nascent integrated circuit market until costs fell enough to allow IC firms to penetrate the industrial market and eventually the consumer market. A typical application was FM inter-carrier sound processing in television receivers. In , Frank Wanlass demonstrated a single-chip bit shift register he designed, with a then-incredible transistors on a single chip. Further development, driven by the same economic factors, led to "large-scale integration" LSI in the mids, with tens of thousands of transistors per chip. Integrated circuits such as 1K-bit RAMs, calculator chips, and the first microprocessors, that began to be manufactured in moderate quantities in the early s, had under 4, transistors. True LSI circuits, approaching 10, transistors, began to be produced around , for computer main memories and second-generation microprocessors. Some SSI and MSI chips, like discrete transistors , are still mass-produced, both to maintain old equipment and build new devices that require only a few gates. The series of TTL chips, for example, has become a de facto standard and remains in production. Very-large-scale integration Upper interconnect layers on an Intel DX2 microprocessor die The final step in the development process, starting in the s and continuing through the present, was "very-large-scale integration" VLSI. The development started with hundreds of thousands of transistors in the early s, As of [update] , transistor counts continue to grow beyond ten billion transistors per chip. Multiple developments were required to achieve this increased density. Manufacturers moved to smaller design rules and cleaner fabrication facilities so that they could make chips with more transistors and maintain adequate yield. Electronic design tools improved enough to make it practical to finish these designs in a reasonable time. Modern VLSI devices contain so many transistors, layers, interconnections, and other features that it is no longer feasible to check the masks or do the original design by hand. Instead, engineers use EDA tools to perform most functional verification work. Microprocessor chips passed the million-transistor mark in and the billion-transistor mark in Through a combination of large size and reduced packaging, WSI could lead to dramatically reduced costs for some systems, notably massively parallel supercomputers. The design of such a device can be complex and costly, and building disparate components on a single piece of silicon may compromise the efficiency of some elements. This has led to an exploration of so-called Network-on-Chip NoC devices, which apply system-on-chip design methodologies to digital communication networks as opposed to traditional bus architectures. A three-dimensional integrated circuit 3D-IC has two or more layers of active electronic components that are integrated both vertically and horizontally into a single circuit. Communication between layers uses on-die signaling, so power consumption is much lower than in equivalent separate circuits. Judicious use of short vertical wires can substantially reduce overall wire length for faster operation. Ever since ICs were created, some chip designers have used the silicon surface area for surreptitious, non-functional images or words. These are sometimes referred to as chip art , silicon art, silicon graffiti or silicon doodling. ICs and IC families[edit].

Chapter 4 : Remote Controller | Diodes Incorporated

An IC consists of interconnected transistors, capacitors, resistors, diodes etc. These components are interconnected with an external connecting terminals contained in a small package. Classification of ICs (Integrated Circuits).

Diode Uni-polar, uncontrolled, switching device used in applications such as rectification and circuit directional current control. Reverse voltage blocking device, commonly modeled as a switch in series with a voltage source, usually 0. The model can be enhanced to include a junction resistance, in order to accurately predict the diode voltage drop across the diode with respect to current flow. Up to amperes and volts in a single silicon device. High voltage requires multiple series silicon devices. Silicon-controlled rectifier SCR This semi-controlled device turns on when a gate pulse is present and the anode is positive compared to the cathode. When a gate pulse is present, the device operates like a standard diode. When the anode is negative compared to the cathode, the device turns off and blocks positive or negative voltages present. The gate voltage does not allow the device to turn off. For most of the devices, a gate pulse turns the device on. The device turns off when the anode voltage falls below a value relative to the cathode determined by the device characteristics. When off, it is considered a reverse voltage blocking device. One issue with the device is that turn off gate voltages are usually larger and require more current than turn on levels. A snubber circuit is required in order to provide a usable switching curve for this device. Without the snubber circuit, the GTO cannot be used for turning inductive loads off. These devices, because of developments in IGCT technology are not very popular in the power electronics realm. They are considered controlled, uni-polar and bi-polar voltage blocking. The main difference between an SCR and a Triac is that both the positive and negative cycle can be turned on independently of each other, using a positive or negative gate pulse. Similar to an SCR, once the device is turned on, the device cannot be turned off. This device is considered bi-polar and reverse voltage blocking. Generally, BJTs are not utilized in power electronics switching circuits because of the I2R losses associated with on resistance and base current requirements. Because of these multiple transistor configurations, switching times are in the hundreds of nanoseconds to microseconds. They can also be paralleled in order to increase power handling, but must be limited to around 5 devices for current sharing. At low frequencies this greatly reduces gate current because it is only required to charge gate capacitance during switching, though as frequencies increase this advantage is reduced. Most losses in MOSFETs are due to on-resistance, can increase as more current flows through the device and are also greater in devices that must provide a high blocking voltage. Switching times range from tens of nanoseconds to a few hundred microseconds. Like MOSFET devices, the insulated gate bipolar transistor has a high gate impedance, thus low gate current requirements. Like BJTs, this device has low on state voltage drop, thus low power loss across the switch in operating mode. The output BJTs are configured to allow for bidirectional control and low voltage reverse blocking. The IGCT can be used for quick switching with little gate current. ABB Group company has published data sheets for these devices and provided descriptions of the inner workings. The device consists of a gate, with an optically isolated input, low on resistance BJT output transistors which lead to a low voltage drop and low power loss across the device at fairly high switching voltage and current levels. An example of this new device from ABB shows how this device improves on GTO technology for switching high voltage and high current in power electronics applications. The power devices family, showing the principal power switches. A power device may be classified as one of the following main categories see figure 1: A two-terminal device e. A three-terminal device e. A four terminal device e. SCS is a type of thyristor having four layers and four terminals called anode, anode gate, cathode gate and cathode. A majority carrier device e. A minority carrier device e. A majority carrier device is faster, but the charge injection of minority carrier devices allows for better on-state performance. Diodes[edit] An ideal diode should have the following characteristics: When forward-biased, the voltage across the end terminals of the diode should be zero, no matter the current that flows through it on-state. When reverse-biased, the leakage current should be zero, no matter the voltage off-state. The transition or commutation between the on-state and the off-state should be instantaneous. In reality, the design of a diode is a trade-off between performance in on-state, off-state, and commutation. Indeed, the same area of the device must sustain the blocking voltage in the off-state and allow current flow in the on-state; as the requirements for the two states are completely opposite, a diode has to be either optimised for one of them, or time must be allowed to switch from one state to the other i. These trade-offs are the same for all power devices; for instance, a Schottky diode has excellent switching speed and on-state performance, but a high level of leakage current in the off-state. On the other hand, a PIN diode is commercially available in different commutation speeds what are called "fast" and "ultrafast" rectifiers , but any increase in speed is necessarily associated with a lower performance in the on-state. Switches[edit] Fig. The trade-offs between voltage, current, and frequency ratings also exist for a switch. In fact, any power semiconductor relies on a PIN diode structure in order to sustain voltage; this can be seen in figure 2. The power MOSFET has the advantages of a majority carrier device, so it can achieve a very high operating frequency, but it cannot be used with high voltages; as it is a physical limit, no improvement is expected in the design of a silicon MOSFET concerning its maximum voltage ratings. By placing several devices in parallel, it is possible to increase the current rating of a switch. The MOSFET is particularly suited to this configuration, because its positive thermal coefficient of resistance tends to result in a balance of current between the individual devices. The IGBT is a recent component, so its performance improves regularly as technology evolves. It has already completely replaced the bipolar transistor in power applications; a power module is available in which several IGBT devices are connected in parallel, making it attractive for power levels up to several megawatts, which pushes further the limit at which thyristors and GTOs become the only option. Basically, an IGBT is a bipolar transistor driven by a power MOSFET; it has the advantages of being a minority carrier device good performance in the on-state, even for high voltage devices , with the high input impedance of a MOSFET it can be driven on or off with a very low amount of power. The net result is that the turn-off switching loss of an IGBT is considerably higher than its turn-on loss. Generally, in datasheets, turn-off energy is mentioned as a measured parameter; that number has to be multiplied with the switching frequency of the intended application in order to estimate the turn-off loss. At very high power levels, a thyristor -based device e. This device can be turned on by a pulse provided by a driving circuit, but cannot be turned off by removing the pulse. A thyristor turns off as soon as no more current flows through it; this happens automatically in an alternating current system on each cycle, or requires a circuit with the means to divert current around the device. Both MCTs and GTOs have been developed to overcome this limitation, and are widely used in power distribution applications. A few applications of power semiconductors in switch mode include lamp dimmers , switch mode power supplies , induction cookers , automotive ignition systems , and AC and DC electric motor drives of all sizes. Amplifiers[edit] Amplifiers operate in the active region, where both device current and voltage are non-zero. Consequently power is continually dissipated and its design is dominated by the need to remove excess heat from the semiconductor device. Power amplifier devices can often be recognized by the heat sink used to mount the devices. Multiple types of power semiconductor amplifier device exist, such as the bipolar junction transistor, the vertical MOS field effect transistor, and others. Power levels for individual amplifier devices range up to hundreds of watts, and frequency limits range up to the lower microwave bands. A complete audio power amplifier, with two channels and a power rating on the order of tens of watts, can be put into a small integrated circuit package, needing only a few external passive components to function. Another important application for active-mode amplifiers is in linear regulated power supplies, when an amplifier device is used as a voltage regulator to maintain load voltage at a desired setting. While such a power supply may be less energy efficient than a switched mode power supply , the simplicity of application makes them popular, especially in current ranges up to about one amp. Parameters[edit] A power device is usually attached to a heatsink to remove the heat caused by operation losses. Two contacts are on top of the die, the remaining one is on the back. Often, there is a trade-off between breakdown voltage rating and on-resistance, because increasing the breakdown voltage by incorporating a thicker and lower doped drift region leads to a higher on-resistance. A higher current rating lowers the on-resistance due to greater numbers of parallel cells. This increases overall capacitance and slows down the speed. Rise and fall times: The amount of time it takes to switch between the on-state and the off-state. This is a thermal dissipation and "latch-up" consideration. This is an often ignored but extremely important parameter from the point of view of practical design; a semiconductor does not perform well at elevated temperature, and yet due to large current conduction, a power semiconductor device invariably heats up. Therefore, such a devices needs to be cooled by removing that heat continuously; packaging and heatsink technology provide a means for removing heat from a semiconductor device by conducting it to the external environment. Generally, a large current device has a large die and packaging surface areas and lower thermal resistance. Research and development[edit] The role of packaging is to: Many of the reliability issues of a power device are either related to excessive temperature or fatigue due to thermal cycling. Research is currently carried out on the following topics: Resistance to thermal cycling by closely matching the Coefficient of thermal expansion of the packaging to that of the silicon. The maximum operating temperature of the packaging material. Research is also ongoing on electrical issues such as reducing the parasitic inductance of packaging; this inductance limits the operating frequency, because it generates losses during commutation. A low-voltage MOSFET is also limited by the parasitic resistance of its package, as its intrinsic on-state resistance is as low as one or two milliohms. Improvement of structures[edit] The IGBT design is still under development and can be expected to provide increases in operating voltages. At the high-power end of the range, the MOS-controlled thyristor is a promising device. Achieving a major improvement over the conventional MOSFET structure by employing the super junction charge-balance principle: On the other hand, during the on-state, the higher doping of the drift region allows for the easy flow of carriers, thereby reducing on-resistance. Wide band-gap semiconductors[edit] The major breakthrough in power semiconductor devices is expected from the replacement of silicon by a wide band-gap semiconductor. At the moment, silicon carbide SiC is considered to be the most promising. As both are majority carrier devices, they can operate at high speed.

Chapter 5 : Products - Integrated Circuits - Capacitors - Resistors - Transistors - Inductors - BYCHIPS

The most common use for diode logic is in diode-transistor logic (DTL) integrated circuits that, in addition to diodes, include inverter logic for power gain and signal restoration. While diode logic has the advantage of simplicity, the lack of an amplifying stage in each gate limits its application.

The DTL circuit shown in the picture consists of three stages: Resistors R1 and R3 will then supply enough current to turn on Q1 drive Q1 into saturation and also supply the current needed by R4. There will be a small positive voltage on the base of Q1 VBE, about 0. If either or both inputs are low, then at least one of the input diodes conducts and pulls the voltage at the anodes to a value less than about 2 volts. The used germanium transistors and diodes in its basic gates. Integrated[edit] In an integrated circuit version of the DTL gate, R3 is replaced by two level-shifting diodes connected in series. Also the bottom of R4 is connected to ground to provide bias current for the diodes and a discharge path for the transistor base. The resulting integrated circuit runs off a single power supply voltage. This clock uses switching diodes and transistors to divide 60 Hz power line frequency down to one pulse per second and provide a display of hours, minutes and seconds. The DTL propagation delay is relatively large. When the transistor goes into saturation from all inputs being high, charge is stored in the base region. When it comes out of saturation one input goes low this charge has to be removed and will dominate the propagation time. One way to speed up DTL is to add a small "speed-up" capacitor across R3. The capacitor helps to turn off the transistor by removing the stored base charge; the capacitor also helps to turn on the transistor by increasing the initial base drive. That can be done with a Baker clamp. The Baker clamp is named for Richard H. Baker, who described it in his technical report "Maximum Efficiency Switching Circuits. Biard filed a patent for the Schottky transistor. The diode could also be integrated on the same die, it had a compact layout, it had no minority carrier charge storage, and it was faster than a conventional junction diode. His patent also showed how the Schottky transistor could be used in DTL circuits and improve the switching speed of other saturated logic designs, such as Schottky-TTL, at a low cost. Interfacing considerations[edit] A major advantage over the earlier resistorâ€"transistor logic is increased fan-in. Additionally, to increase fan-out, an additional transistor and diode may be used.

Chapter 6 : Diodeâ€“transistor logic - Wikipedia

Diodes and Transistors CMOS integrated circuits, which include 2 diodes per pin and many other internal diodes. Switching diodes Switching diodes, sometimes also.

Chapter 7 : Power semiconductor device - Wikipedia

Thanks to this feature, transistors can be used alone to implement switches and amplifiers, while they are also the most essential component in modern electronic circuitry. They can be combined in many different ways to create many complex circuits.

Chapter 8 : Home Appliance | Diodes Incorporated

Several circuits have been suggested to successfully command transistors for operating in power electronic switching systems. Such circuits try to satisfy the following requirements: supply the right collector current, adapt the base current to the collector current, and extract a reverse current from base to speed up the device blocking.

Chapter 9 : CISSOID - High Temperature Integrated Circuits, Diodes, Transistors and FETS - GM SYSTEM

DOWNLOAD PDF DIODES, TRANSISTORS AND INTEGRATED CIRCUITS FOR SWITCHING SYSTEMS.

A digital clock made only with discrete transistors, diodes and resistors, no integrated circuits. This clock uses switching diodes and transistors to divide 60 Hz power line frequency down to one pulse per second and provide a display of hours, minutes and seconds.