PROJECT REPORT

WINTER TRAINING

POWER SUPPLY

Author:
AmishSingh[22/EC/14]
Amit[23/EC/14]
Amitesh.K.Singh[24/EC/14]

Supervisor:
Dr.D.V Gadre

RESISTORS

The principal job of a resistor within an electrical or electronic circuit is to resist (hence the name Resistor), regulate or to set the flow of electrons (current) through them by using the type of conductive material from which they are composed. Resistors can also be connected together in various series and parallel combinations to form resistor networks which can act as voltage droppers, voltage dividers or current limiters within a circuit.

There are many different types of resistor available for the electronics constructor to choose from, from very small surface mount chip resistors up to large wire wound power resistors.
The symbol used in schematic for a Resistor can either be a **zig-zag** type line or a rectangular box.

All modern fixed value resistors can be classified into four broad groups:-

1. Carbon Composition Resistor Made of carbon dust or graphite paste, low wattage values

2. Film or Cermet Resistor Made from conductive metal oxide paste, very low wattage values.

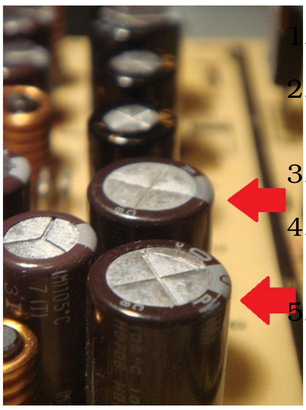
3. Wire-wound Resistor Metallic bodies for heatsink mounting, very high wattage ratings.

4. Semiconductor Resistor High frequency/precision surface mount thin film technology. *For colour code .See Appendix.*

CAPACITORS

In a way, a capacitor is a little like a battery. Although they work in completely different ways, capacitors and batteries both store electrical energy.
Inside the capacitor, the terminals connect to two metal plates separated by a non-conducting substance, or dielectric.

In theory, the dielectric can be any non-conductive substance. However, for practical applications, specific materials are used that best suit the capacitor's function. Mica, ceramic, cellulose, porcelain, Mylar, Teflon and even air are some of the non-conductive materials used. The dielectric dictates what kind of capacitor it is and for what it is best suited. Depending on the size and type of dielectric, some capacitors are better for high frequency uses, while some are better for high voltage applications. Capacitors can be manufactured to serve any purpose, from the smallest plastic capacitor in your calculator, to an ultra capacitor that can power a commuter bus. NASA uses glass capacitors to help wake up the space shuttle's circuitry and help deploy space probes.
Here are some of the various types of capacitors and how they are used.

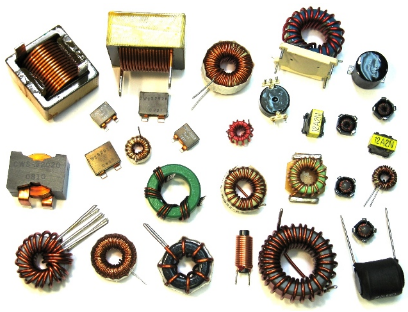


1. Air - Often used in radio tuning circuits
2. Mylar - Most commonly used for timer circuits like clocks, alarms and counters
3. Glass - Good for high voltage applications
4. Ceramic - Used for high frequency purposes like antennas, X-ray and MRI machines
5. Super capacitor - Powers electric and hybrid cars.

INDUCTORS

An inductor is a passive electronic component that stores energy in the form of a magnetic field. In its simplest form, an inductor consists-of a wire loop or coil. The inductance is directly proportional to the number of turns in the coil. Inductance also depends on the radius of the coil and on the type of material around which the coil is wound.

It is difficult to fabricate inductors onto integrated-circuit (IC) chips. Fortunately, resistors can be substituted for inductors in most micro-circuit applications. In some cases, inductance can be simulated by simple electronic circuits using transistors, resistors, and capacitors fabricated onto ICchips.



Inductors are used with capacitors in various wireless communications applications. An inductor connected in series or parallel with a capacitor can provide discrimination against unwanted signals. Large inductors are used in the power supplies of electronic equipment of all types, including computers and their peripherals. In these systems, the inductors help to smooth out the rectified utility AC, providing pure, battery-like DC.

OP-AMPS

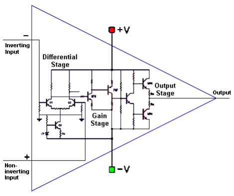
The term operational amplifier or ”op-amp” refers to a class of high-gain DC coupled amplifiers with two inputs and a single output. The modern integrated circuit version is typified by the famous 741 op-amp. Some of the general characteristics of the IC version are:

a) High gain, on the order of a million.

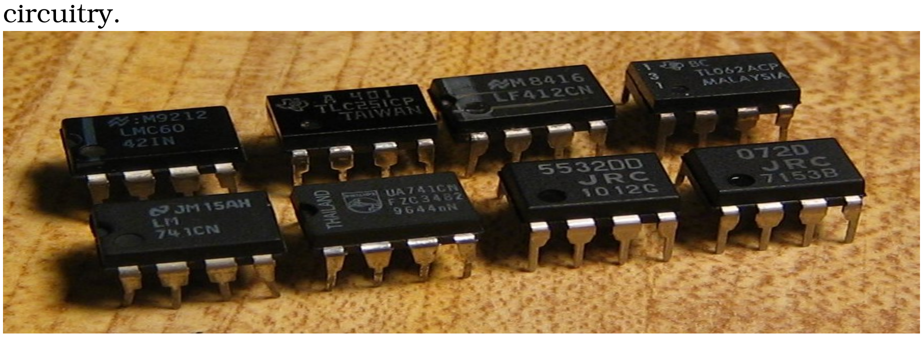
b) High input impedance, low output impedance.

c) Used with split supply, usually +/- 15V.

d) Used with feedback, with gain determined by the feedback network.

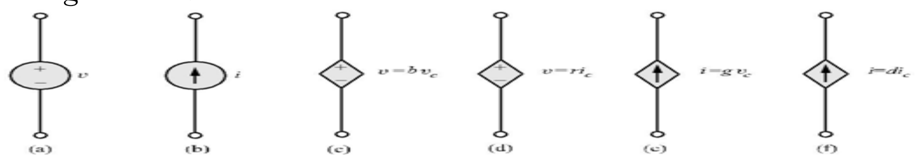


The standard 741 Op-amp circuit contains 20 transistors and 11 resistors. It starts with a differential input stage with a current mirror load. This is followed by an npn voltage amplification stage with an active output. A pnp emitter follower drives a push-pull emitter follower output stage. The output stage includes current limiting circuitry.



SOURCES

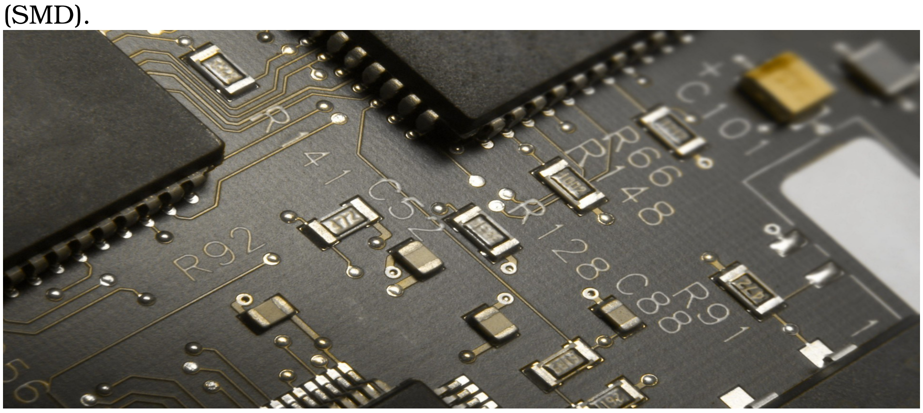
Independent current source or voltage source is that type of source which gives output without depending on any other parameter of the circuit to which the source is connected. The performance of the source does not depend upon any branch current and voltage of the circuit. Independent current or voltage source can either be constant current or constant voltage source or be time variant current or time variant voltage source.



A dependent current or voltage source is that type of source whose output is fully dependent on one of the voltage or current conditions of the circuit to which the source is connected. Bipolar junction transistor and MOSFET are two very commonly used dependent source.
Consider a voltage source which has open circuit voltage V s and internal resistance R in . If the source is short-circuited, it will give short-circuit current V s /R in = I SC . If internal resistance R in of voltage source is connected across an ideal current source of current I SC , then the arrangement will give current I SC to a short-circuited load. Open circuit voltage appears across the arrangement is I SC R in = V s . An equivalent current source of a voltage source, should give the same short-circuit current and same open circuit voltage as that of voltage source. As in our case, both the voltage source and current source give same short-circuit current I SC and open circuit voltage V s hence they are equivalent to each other. Therefore during conversation of voltage source to its equivalent current source, consider an ideal current source of current equals open circuit voltage divided by int. resistance of the voltage source and then the int. resistance of the voltage source should be connected in parallel with the ideal current source.

SURFACE MOUNTED DEVICES

SMD - Surface Mount Device. Surface-mount technology (SMT) is a method for producing electronic circuits in which the components are mounted or placed directly onto the surface of printed circuit boards (PCBs). An electronic device so made is called a surface-mount device (SMD).

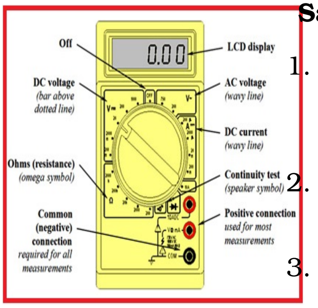


A Surface Mounted Technology (SMT) component is usually smaller than its through-hole counterpart because it has either smaller leads or no leads at all. It may have short pins or leads of various styles, flat contacts, and a matrix of solder balls (BGAs), or terminations on the body of the component.
The main advantages of SMT over the older through-hole technique are:

1. Smaller components. As of 2012 smallest was 0.4 0.2 mm (0.016 0.008 in: 01005). Expected to sample in 2013 are 0.25 0.125 mm (0.010 0.005 in, size not yet standardized)
2. Much higher component density (components per unit area) and many more connections per component.
3. Lower initial cost and time of setting up for production.
4. Fewer holes need to be drilled.

MEASURING DEVICES

A multimeter is used to make various electrical measurements, such as AC and DC voltage, AC and DC current, and resistance. It is called a multimeter because it combines the functions of a voltmeter, ammeter, and ohmmeter. Multimeters may also have other functions, such as diode and continuity tests.



Safety Info:

1. Be sure the test leads and rotary switch are in the correct position for the desired measurement.
2. Never use the meter if the meter or the test leads look damaged.
3. Never measure resistance in a circuit when power is applied.
4. Never touch the probes to a voltage source when a test lead is plugged into the 10 A or 300mAinput.
5. To avoid damage or injury, never use the meter on circuits that exceed 4800 watts.
6. Never apply more than the rated voltage between any input jack and earth ground .
7. Be careful when working with voltages above 60 V DC or 30 V AC rms. Such voltages pose a shock hazard.

DATASHEETS

A data sheet or spec sheet is a document that summarizes the performance and other technical characteristics of a product, machine, component (e.g., an electronic component), material, a subsystem (e.g., a power supply) or software in sufficient detail to be used by a design engineer to integrate the component into a system. Typically, a data sheet is created by the component/subsystem/software manufacturer and begins with an introductory page describing the rest of the document, followed by listings of specific characteristics, with further information on the connectivity of the devices.

The **basic parts** of a datasheet are:

1. Manufacturer's name, product number and name
2. Notable device properties
3. Short functional description
4. Pin connection diagram
5. Recommended operating conditions (as absolute minimum and maximum ratings)
6. DC specifications (various temperatures, supply voltages, input currents, etc.)
7. AC specifications (various temperatures, supply voltages, frequencies, etc.)
8. Physical details showing minimum/typical/maximum dimensions, contact locations and sizes
9. Ordering codes for differing packages and performance criteria
10. Application recommendations, such as required filter capacitors, circuit board layout, etc.

A sample LM723 datasheet is attached in the appendix

TEST PROBES

A test probe (test lead, test prod, or scope probe) is a physical device used to connect electronic test equipment to a device under test (DUT). They range from very simple, robust devices to complex probes that are sophisticated, expensive, and fragile.
Voltage Probe: Voltage probes are used to measure voltages present on the DUT. To achieve high accuracy, the test instrument and its probe must not significantly affect the voltage being measured. This is accomplished by ensuring that the combination of instrument and probe exhibit a sufficiently high impedance that will not load the DUT. For AC measurements, the reactive component of impedance may be more important than the resistive.

a) Simple Test Probes

b) Tweezer Probes

c) Pogo Pins

Oscilloscope Probes: Oscilloscopes display the instantaneous waveform of varying electrical quantities, unlike other instruments which give numerical values of relatively stable quantities.

Scope probes fall into two main categories: passive and active. Passive scope probes contain no active electronic parts, such as transistors, so they require no external power.
Because of the high frequencies often involved, oscilloscopes do not normally use simple wires ("flying leads") to connect to the DUT. Flying leads are likely to pick up interference, so they are not suitable for low-level signals. Furthermore, the inductance of flying leads make them unsuitable for high frequency signals. Instead, a specific scope probe is used, which uses a coaxial cable to transmit the signal from the tip of the probe to the oscilloscope. This cable has two main benefits: it protects the signal from external electromagnetic interference, improving accuracy for low-level signals; and it has a lower inductance than flying leads, making the probe more accurate for high-frequency signals.