

ELECTRONICS- INTEGRATED CIRCUITS AND STANDARD COMPONENTS

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ELECTRONICS - INTEGRATED CIRCUITS AND STANDARD COMPONENTS

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1. INTEGRATED CIRCUITS (ICs)

2. STANDARD COMPONENTS

3. CLICK HERE FOR DETAILED EXERCISES AND INFORMATION

IMPORTANT

IT IS RECOMMENDED THAT YOU
DOWNLOAD THE FREE APPS ON
ELECTRONICS FROM THE MOBILE APP
SECTION OF
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INTEGRATED CIRCUITS

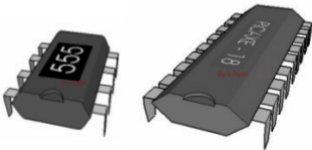
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Integrated circuits (ICs) are very important components found in many circuits. They are also called silicon chips or microchips. Basic

555 timer circuits ranging to complex PIC

Microcontroller circuits and computer processors (CPUs) are based on the use of integrated circuits. The ICs shown below are dual in line' (DIL), in that they have two rows of legs.

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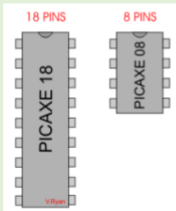
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INTEGRATED CIRCUITS

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The packages of popular integrated circuits are sometimes called a Dual In-Line Packages. They are also called either DIP packages or DIL packages and two examples are shown below. The PICAXE 18 is a DIL package with 18 pins and its smaller relation is the PICAXE 08 with 8 pins.



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TYPICAL SWITCHES

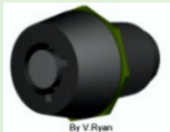
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KEY SWITCH

This switch is available in different forms. They provide limited security as a key is required to 'switch' them on and off.

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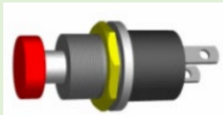


PUSH SWITCH

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These can be 'push to make' (push the switch to allow the circuit to work) or 'push to break' (push the switch to turn off the circuit).

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ROCKER SWITCH

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This switch is common on many electrical devices. For example they are found on computer units for turning them on and off.

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TOGGLE SWITCH

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These are available in miniature and standard sizes. The advantage of the toggle switch is that they can be extended and operated by a lever.

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SLIDE SWITCH

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A simple switch that slides to the on and off positions. Available in a range of sizes.

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REED / MAGNETIC SWITCH

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This is a thin glass tube that contains two thin strips of metal (the reeds). When a magnet is brought close to the glass tube, the reeds move together and make contact and the switch is turned on. The reeds open again when the magnet is removed.

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MICRO-SWITCH

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Micro-switches can be very small. Usually they include a small arm which when pressed clicks. They are very useful and can be found on many machines - used a safety switches. For example, if the 'lid' of a drilling machine is opened to change the pulley speeds, a micro-switch is released ensuring that all power is turned off.

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TILT SWITCH

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One of the most common types of tilt switch uses a 'blob' of mercury in a small tube. When the tube is tilted the mercury runs down and forms a bridge across the two contacts turning the switch on. This type of switch is used in warning systems that alert people to an excessive angle of tilt, e.g. for drivers of farm vehicles



By V.Ryan



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PRESSURE PAD

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This is a soft flexible switch available in many sizes. It consists of two flexible conductive foil sheets separated by a thin felt, paper or foam layer. If pressure is applied the conductive surfaces touch and the switch is 'on'

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Tap the image to download the exercise below.

COMPONENTS SHEET

For each of the components seen below. Add the sketch / symbol / name for each component to complete the sheet.

INPUTS			OUTPUTS		
	DRAWING	SYMBOL		DRAWING	SYMBOL
SLIDE SWITCH		<div style="border: 1px solid black; width: 50px; height: 50px;"></div>	BUZZER	<div style="border: 1px solid black; width: 50px; height: 50px;"></div>	
	<div style="border: 1px solid black; width: 50px; height: 50px;"></div>		LED		<div style="border: 1px solid black; width: 50px; height: 50px;"></div>
	<div style="border: 1px solid black; width: 50px; height: 50px;"></div>		BULB	<div style="border: 1px solid black; width: 50px; height: 50px;"></div>	
PUSH SWITCH	<div style="border: 1px solid black; width: 50px; height: 50px;"></div>				<div style="border: 1px solid black; width: 50px; height: 50px;"></div>
RELAY		<div style="border: 1px solid black; width: 50px; height: 50px;"></div>	SOLENOID		<div style="border: 1px solid black; width: 50px; height: 50px;"></div>
NAME:		INPUTS / OUTPUTS		DATE:	

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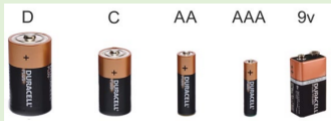


ALKALINE BATTERIES

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Batteries come in all shapes and sizes. They store electrical charge and as we all know, when they are put into an electronic device such as a portable radio, they provide the power. The usual battery sizes are seen below. They range from 1.5 volts to 9 volts.

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BUTTON BATTERIES / COIN CELLS

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A button cell is a very small battery, as found in most modern watches. This type of battery is also used in camcorders as backup batteries. They ensure that the date and time are held in memory even when the rechargeable batteries are removed. Button batteries are usually rated at 1.5 volts or 3 volts and consequently they are used in devices that need very little power.

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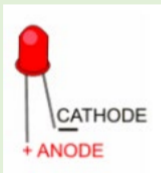


THE LED

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Light Emitting Diodes (LED) are very rugged, they last a very long time and they are an optical source. (A LIGHT SOURCE)
LEDs produce red, green, yellow, or orange light. They are used in a range of products.

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MORE ON LEDs

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LEDs are supplied in a range of shapes and forms. Some are design specifically to be soldered to PCBs

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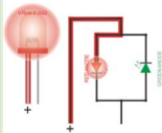
BICOLOUR LEDs

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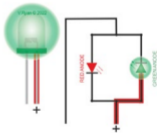
A typical bicolour LED will light up in one, of two colours, depending on the current direction. It is basically two LEDs in one. This type of LED has two terminals, with the LEDs connected side to side, anode to cathode. The terminal that is positive, has the LED that emits light.

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If a positive voltage is supplied to the red anode, the red LED emits light



If a positive voltage is supplied to the green anode, the green LED emits light



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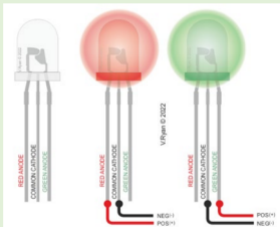


TRICOLOUR LEDs

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A typical tricolour LED has two anodes and a single cathode. The LED will either emit green or red light, depending on which anode is connected to positive / which one has current flowing through it.

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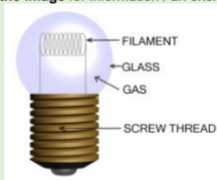


INCANDESCENT LAMPS (BULBS)

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Bulbs were once popular in electronics for a long time and they are used in a wide range of circuits. In more recent years bulbs have been replaced by LEDs as these are brighter, much more reliable, cheaper, energy efficient and have a much longer working life. They are also available in a range of colours.

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FIXED RESISTORS

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Resistors determine the flow of current in an electrical circuit. Where there is high resistance in a circuit the flow of current is small, where the resistance is low the flow of current is large. Resistance, voltage and current are connected in an electrical circuit by Ohm's Law.

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NO RESISTOR - LARGE FLOW OF CURRENT



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FIXED RESISTORS CONTINUED

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Resistors are marked with a number of coloured bands. Each colour stands for a number. Three colour bands shows the resistors value in ohms and the fourth shows tolerance. The resistor on the left is 4700 ohms

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YELLOW 4	VIOLET 7	RED 00	RED +/- 2%	4K7 +/- 2%
GREEN 5	BLUE 6	BLACK NONE	GOLD +/- 5%	56R +/- 5%
BROWN 1	GREY 8	GREEN 00000	SILVER +/- 10%	1M8 +/- 10%
ORANGE 3	ORANGE 3	ORANGE 000	NONE +/- 20%	33K +/- 20%

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POTENTIOMETER/VARIABLE RESISTOR

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Potentiometers are used in circuits, when it is necessary to alter the resistance, allowing the circuit to be made more or less sensitive (they can be turned up or down - reducing or increasing resistance).

The range of resistance varies, for example:

0 to 100 ohms

0 to 1M ohms

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THE PRESET RESISTOR

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Preset resistors are used in circuits when it is necessary to alter the resistance. They can be regarded as a miniature version of the variable resistor.

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LIGHT DEPENDENT RESISTORS

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LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits.

Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.

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THE THERMISTOR

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Thermistors have a higher resistance at low temperatures, but when they are warmed up, their resistance decreases rapidly. Current can then flow through them. This makes them ideal as one of the components for a temperature sensor.

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TRANSISTORS

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Transistors can be regarded as a type of switch, as can many electronic components. They are used in a variety of circuits and you will find that it is rare that a circuit built in a school Technology Department does not contain at least one transistor. They are central to electronics and there are two main types; NPN and PNP. Most circuits tend to use NPN.

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THE DIODE

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A diode allows electricity to flow in one direction only and blocks the flow in the opposite direction. They may be regarded as one-way valves and they are used in various circuits, usually as a form of protection. There are different types of diode but their basic functions are the same.

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ZENER DIODES

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Zener diodes allow electricity to flow through them, in the same way as normal diodes. However, a Zener Diode is different, in that it will allow electricity to flow in the opposite direction (reverse), when the voltage exceeds its 'threshold' value. This is known as the 'breakdown voltage' OR 'zener voltage'. The zener diode can be used as a type of switch, within a circuit.

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SYMBOL



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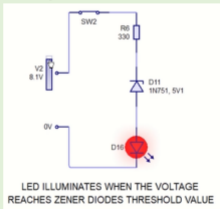


ZENER DIODES

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The circuit below, includes a zener diode. The diode is arranged to prevent the flow of electricity, until the voltage reaches the breakdown voltage / zener voltage of the diode. Then, it acts as a 'switch', allowing electricity to flow through it, illuminating the LED

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CAPACITORS

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Capacitors are components that are used to store an electrical charge and are used in timer circuits. A capacitor may be used with a resistor to produce a timer. Sometimes capacitors are used to smooth a current in a circuit as they can prevent false triggering of other components such as relays. When power is supplied to a circuit that includes a capacitor - the capacitor charges up. When power is turned off the capacitor discharges its electrical charge slowly.

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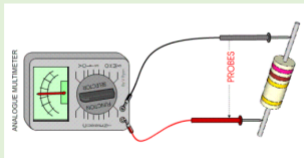


TEST INSTRUMENTS

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Voltage, current and resistance can easily be measured by using a 'multimeter'. An 'ammeter' measures current, a 'voltmeter' measures the potential difference (voltage) between two points, and an 'ohmmeter' measures resistance. However, a **multimeter** measures all these.

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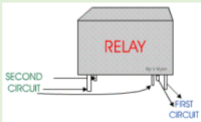


THE RELAY

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A relay is an electromagnetic switch. In other words it is activated when a current is applied to it. They are often used to join one circuit to another. The primary circuit activates the relay which then activates the secondary circuit.

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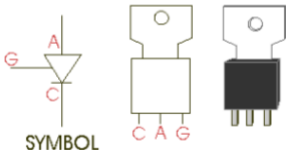


THE THYRISTOR

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A Thyristor (silicon controlled rectifier or SCR) - when a small current flows into the GATE (G), this allows a larger current to flow from the ANODE (A) to the CATHODE (C). Even when the current into the gate stops the thyristor continues to allow current to flow from anode to cathode. It 'latches' on. This component is used in steady hand games, alarm systems and many more.

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