POWER

Battery information

Diagram:

Type	Format	Voltage	Capacity mAh
Zinc Carbon	AAA	1.5V	600
	AA	1.5V	1000
	C	1.5V	2800
	PP3	9.0V	380
Alkaline	AAA	1.5V	1200
	AA	1.5V	2700
	C	1.5V	8000
Lithium	AA	1.5V	2500
	PP3	9.0V	1200
	CR2025	3.0V	160
	CR2032	3.0V	210

Function:

The most common power supply for electronic circuits, key considerations are; size, capacity and cost.

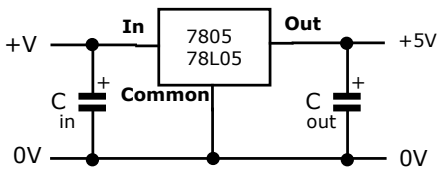
Capacity is how much current can be used before a battery is discharged.

For example a 500mAh cell can supply 500mA for 1 hour before it is discharged, or 50mA for 10 hours.

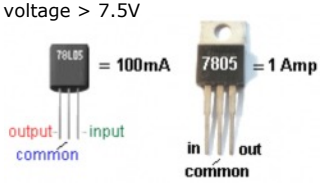
POWER

+5V Voltage Regulator

Diagram:



Input voltage > 7.5V



Function:

The standard circuit for all low voltage power supplies.

Cin optional or use 1uf capacitor

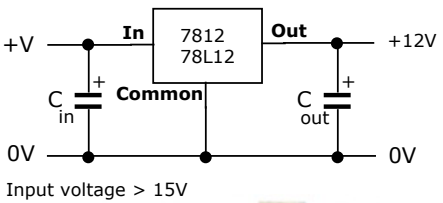
Cout optional or 0.1uF if powering logic circuits

The 7805 provides 1A and the 78L05 provides 100mA of current

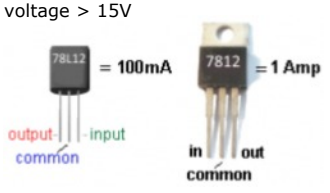
POWER

+12V Voltage Regulator

Diagram:



Input voltage > 15V



Function:

The standard circuit for all low voltage power supplies.

Cin optional or use 1uf capacitor

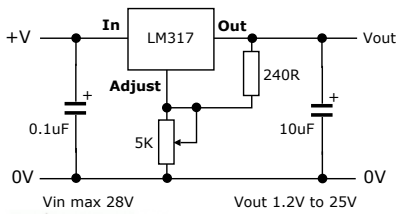
Cout optional or 0.1uF if powering logic circuits

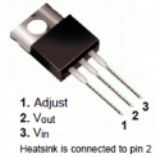
The 7812 provides 1A and the 78L12 provides 100mA of current

POWER

Variable Voltage Regulator

Diagram:





If you require more than 1.5A, use the LM350T which is a 3A version same pinout

Function:

The LM317 can be adjusted to provide any voltage, with a max current of 1.5A. The input voltage must be at least 2V greater than the output voltage.

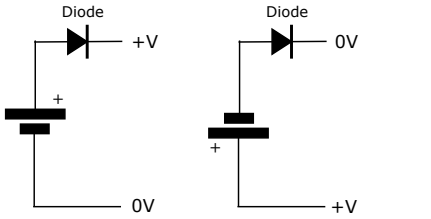
Vout can be calculated using:

Vout = 1.25V x (1+(R2/R1)) + (Iadj x R2)

POWER

Reverse voltage protection

Diagram:



In this arrangement the battery will power the circuit and the output voltage will the battery voltage - 0.5V

In this arrangement the battery will **NOT** power the circuit and **NO** current will flow due to the action of the diode

Typical diodes: 1N4148 < 250mA, 1N4001 > 250mA

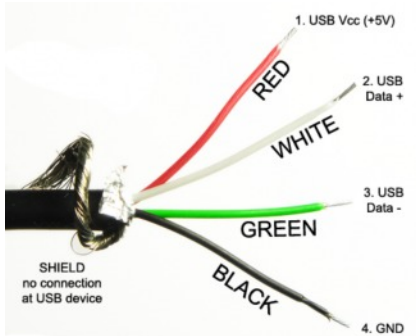
Function:

A common problem with power supplies and in particular with batteries, is that they can be connected the wrong way around. The circuit shown provides a solution to this problem by using a **diode**, which only allows current to flow one way, there will be a 0.5V drop as a result.

POWER

USB power connections

Diagram:



The white & green leads should be cut off

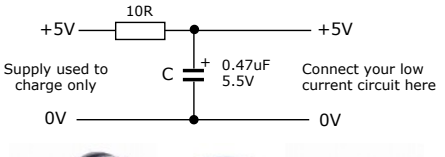
Function:

USB ports on PC's, Laptop's, phone chargers and wall chargers are a very good and easy way to power electronic circuits. It **MUST** be remembered to check the amount of current your circuit needs, PC's/Laptop's can **ONLY supply 500mA max**, if you need more than that you **MUST** use a wall charger.

POWER

Rechargeable Supercapacitor

Diagram:



The **10R resistor** is to control the rate at which the Supercapacitor charges to protect USB ports in particular.

Function:

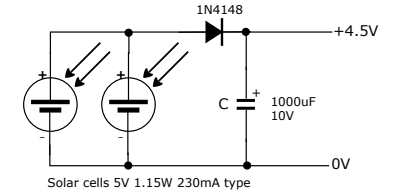
They can be charged up using a suitable battery or USB connection. Once charge they can provide either 2.7V or 5.5V depending upon the type used.

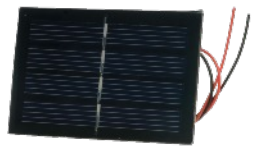
They can then be used to power a low current circuit for up to 15 mins. They make good power sources for portable lighting circuits.

POWER

Solar cell Power Supply

Diagram:





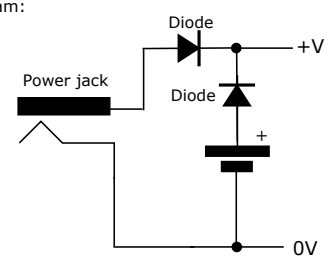
Function:

Solar cell modules make good power supply, each module will only produce a small current eg. 230mA, if more current is required you need to parallel 2 or more cells, 2 cells would give 2 x 230mA = 460mA. If you need a larger voltage connect them in series, eg. 2 x 5V = 10V @ 230mA.

POWER

Power supply switching

Diagram:



When the input voltage is greater than the battery voltage, power comes from the input. If the input is less than the battery or is not plugged in the battery supplies the power.

Typical diodes: 1N4148 < 250mA, 1N4001 > 250mA

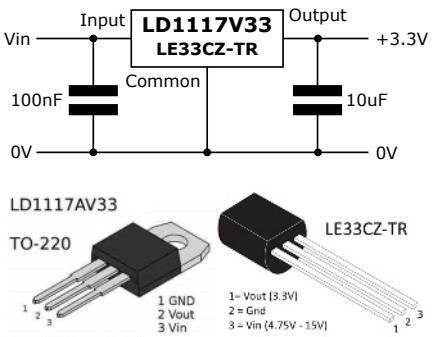
Function:

The use of the diodes in this circuit allow it to automatically switch between the power socket input and the internal battery supply. This system could also be used to switch between say solar cells and a battery for example.

POWER

+3.3V Voltage Regulator

Diagram:



Function:

The standard circuit for all low voltage power supplies.

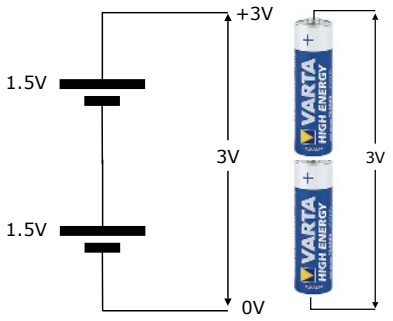
The value for **Vin** can be between 4.75V and 15V

The **LD1117V33** provides 0.8A and the **LE33CZ-TR** provides 100mA of current

POWER

Batteries in Series

Diagram:



Function:

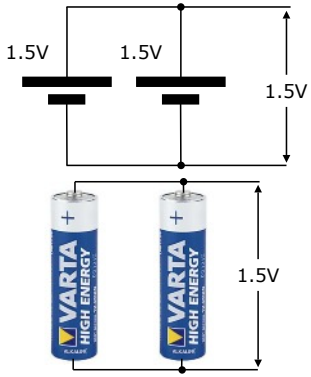
Placing batteries in **series** will give you more voltage, but the same current capacity.

To find the new voltage, add together the values from each of the batteries used.

POWER

Batteries in Parallel

Diagram:



Function:

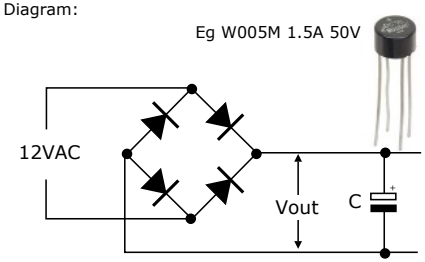
Placing batteries in **parallel** will give you the same voltage, but more current capacity.

To find the new current capacity, add together the current capacities of each battery, this is given in mAh.

POWER

AC to DC conversion

Diagram:



VAC x 1.414 to give peak-peak value = 16.97Vpp
Vout = 16.97Vpp - 1.4V = 15.75V
The 1.4V is the diode drop per cycle.

This process is known as **full wave rectification**, the smoothing capacitor needs to be 2200uF and rated at 25V.

Function:

Converting AC to DC you need to use a bridge rectifier, a specific arrange of diodes to force the current to flow only one way. The output will have a small ripple that needs to be removed to create true DC. This is done using a 'smoothing' capacitor, the output is then used as a DC supply or fed into a voltage regulator circuit.

POWER

Diagram:

Function:

POWER

Diagram:

Function:

POWER

Diagram:

Function: