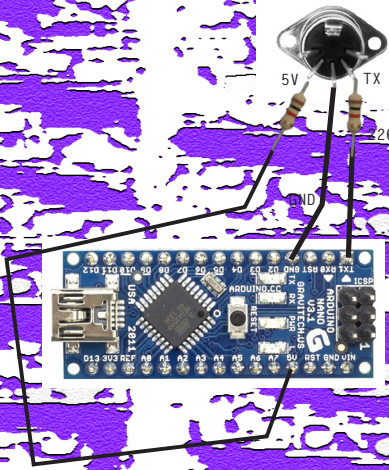
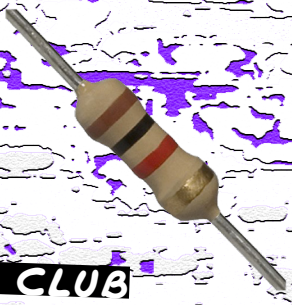
MIDI MADNESS

BUILD YOUR OWN MIDI CONTROLLER FROM SCRAPS!





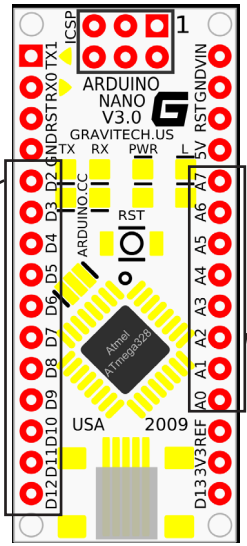
BY ACID SOLDER CLUB

MIDI MADNESS

LET'S BUILD OUR OWN MIDI CONTROLLER! FROM SCRAPS!

BASIC MATERIALS

- ARDUINO NANO
- USB CABLE
- MIDI DIN PLUG 5 PINS
- 2X 220 OHM RESISTORS

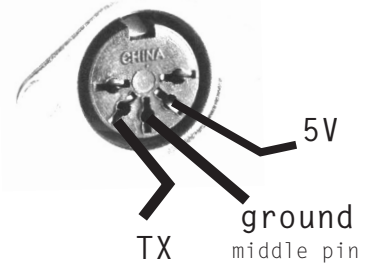


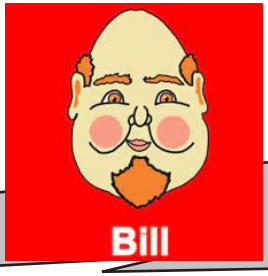
DIGITAL CONTROLLERS

BUTTONS
SWITCHES
DIGITAL SENSORS

ANALOG CONTROLLERS

POTENTIOMETERS
FADERS
JOYSTICK
MODWHEEL
ANALOG SENSORS



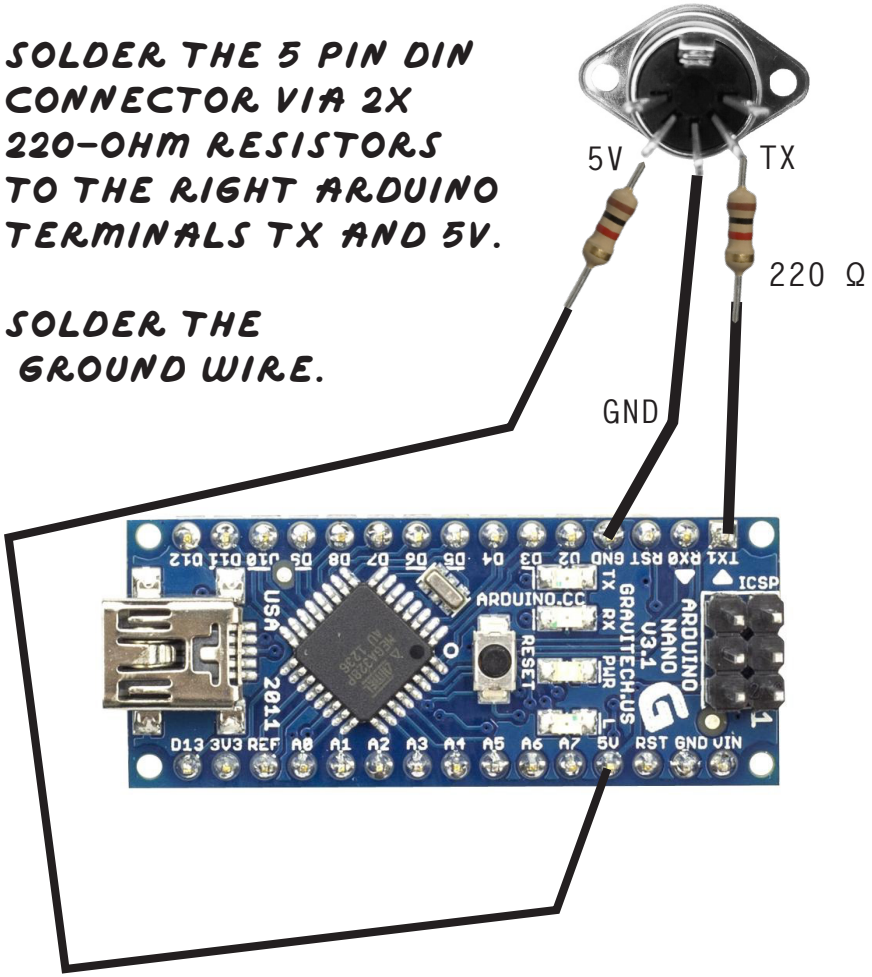


OF MATERIALS (BOM)

BASIC MIDI OUTPUT CIRCUIT

SOLDER THE 5 PIN DIN CONNECTOR VIA 2X 220-OHM RESISTORS TO THE RIGHT ARDUINO TERMINALS TX AND 5V.

SOLDER THE GROUND WIRE.

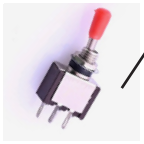


LEAVE ARDUINO UNPLUGGED FROM COMPUTER WHEN SOLDERING!

CIRCUIT CIRCUIT CIRCUIT

MIDIMADNESS

HARDWARE CONTROL DIGITAL

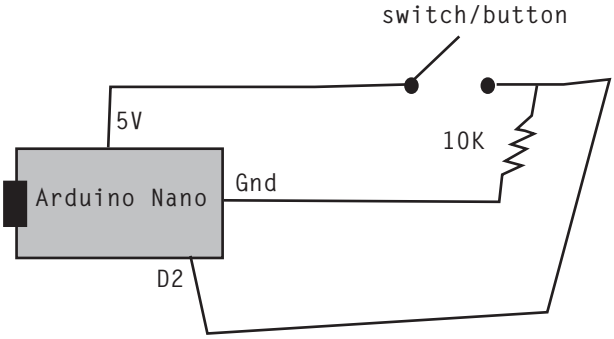


SWITCHES

MAKE ON - OFF CONNECTIONS BETWEEN POINTS. THAT GENERALLY 'STAYS' IN THAT STATE WHEN RELEASED.

BUTTON

MAKE ON-OFF CONNECTIONS BETWEEN POINTS. THAT GENERALLY ONLY IS IN THAT STATE AS LONG AS YOU PRESS IT.



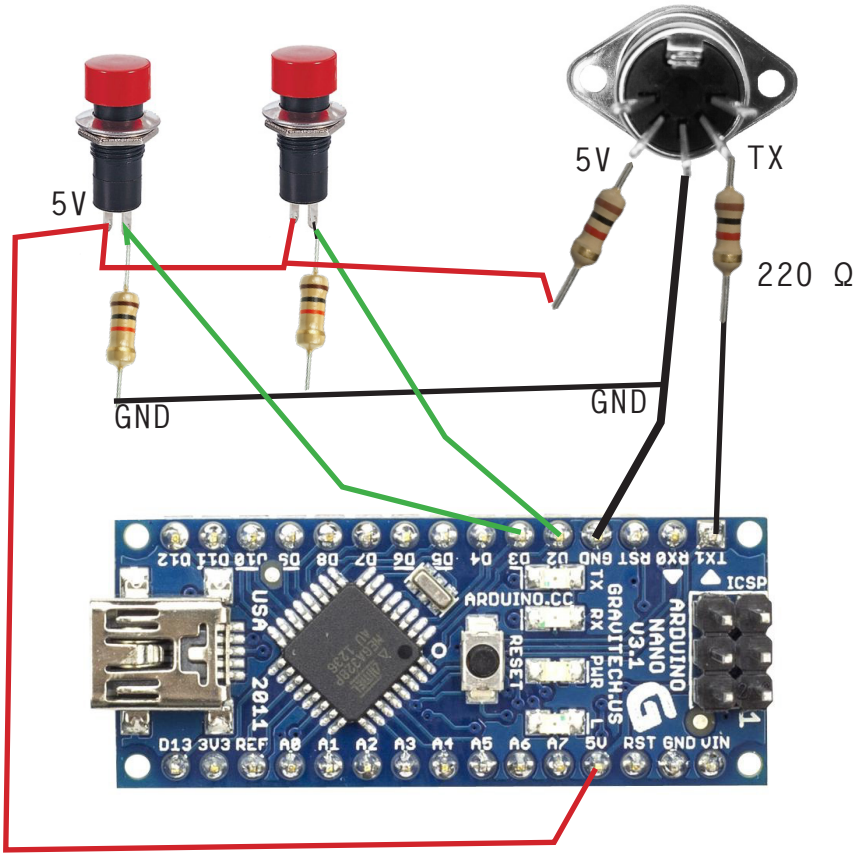
CONNECT YOUR SWITCH OR BUTTON BETWEEN 5V AND ONE OF THE DIGITAL PINS OF ARDUINO.

ADD A 10K 'PULLDOWN' RESISTOR FOR STABILITY

button code

BUTTON SWITCH MIDI

ADD BUTTONS TO THE CIRCUIT!



WE WILL PROGRAM THE BUTTON AS DIGITAL "INPUT" YOU CAN ADD AN LED AS DIGITAL OUTPUT LATER!

CONTROL CIRCUIT BUTTON

MIDIMADNESS

HARDWARE CONTROL ANALOG

POTENTIOMETERS

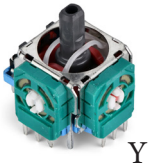
VARIABLE RESISTANCE. POTS ARE GOOD TO SALVAGE AND EASY TO RE-USE.

FADERS

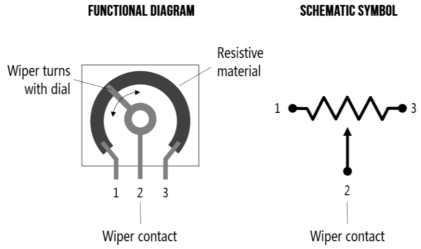
WORK SIMILAR TO POTS. FIND THE RIGHT TERMINALS TO CONNECT TO ARDUINO.

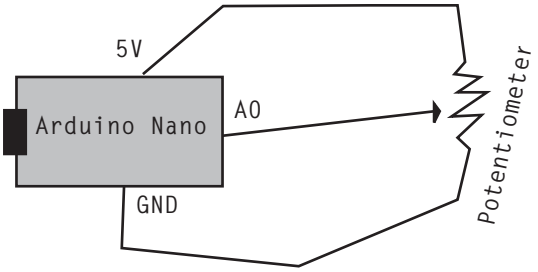
MODWHEEL AND JOYSTICK

1 OR 2 POTENTIOMETERS THAT REGISTER MOTION FROM FRONT-BACK OR MULTI-DIRECTIONS



X Y

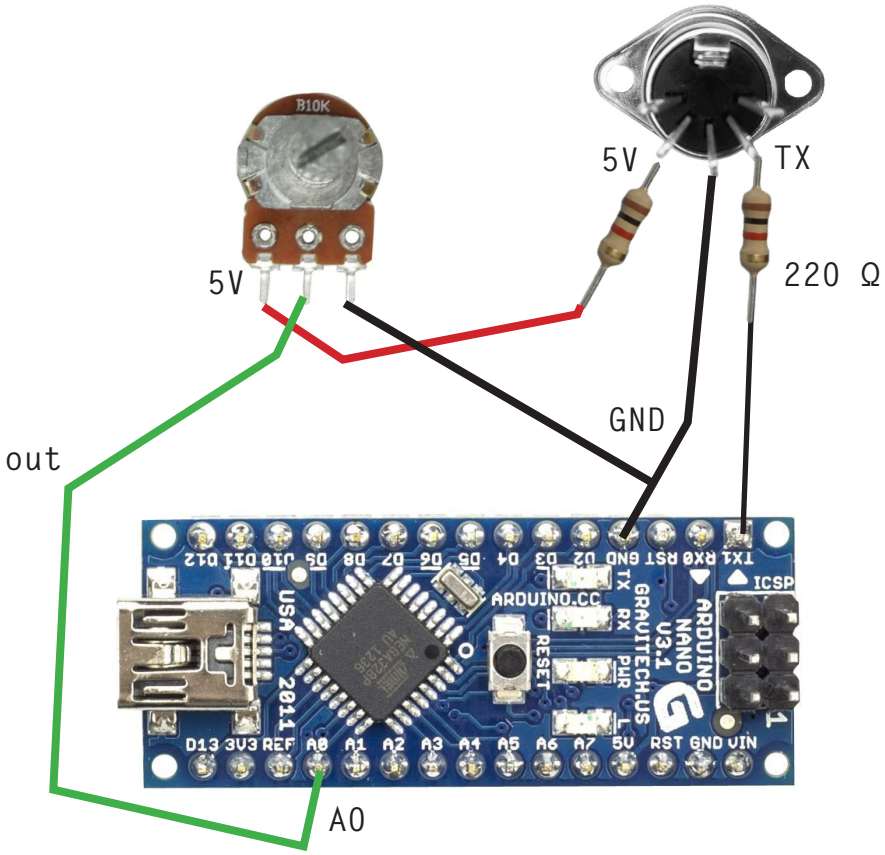




Analog read code

POT FADER MODWHEEL

ADD POTENTIOMETERS TO CIRCUIT



READ OUT THE VALUE OF THE POTEMETER USING 'ANALOGREAD' FUNCTION IN ARDUINO IDE

MIDI MADNESS

UNDERSTANDING THE MIDI CODE

PROGRAMMING TIME!

1. INSTALL THE ARDUINO IDE ONLINE VIA --- WWW.ARDUINO.CC ------

2. OPEN THE SOFTWARE. ARDUINO IDE WILL OPEN WITH A BLANK SKETCH.

3. GO TO THE 'LIBRAIRY' TAB ON THE LEFT OF THE IDE. SEARCH AND INSTALL THE MIDI LIBRARY BY FRANCOIS BEST

3. AFTER INSTALLING THE LIBRARY. YOU CAN ACCESS MIDI SKETCH FILES VIA FILE --- EXAMPLES ---MIDI

5. WE'RE GONNA START FROM SCRATCH WITH A BLANK SKETCH. ADD THE FOLLOWING

```
#include <MIDI.h>

MIDI_CREATE_DEFAULT_INSTANCE();


void setup()
{
MIDI.begin(MIDI_CHANNEL_OMNI);
}

void loop()
{

}
```

INCLUDE THE MIDI LIBRAIRY

A THING THAT NEEDS TO BE ADDED..

MIDI BEGIN ON CHANNEL OMNI. MEANING ALL CHANNELS.

OK LET'S DO SOME MIDI STUFF

5. NOW WE PROGRAM NOTES TO BE ON OR OFF.. BUT HOW?

```
MIDI.sendNoteOn(42, 127, 1);          //turns note on
```

MIDI NOTE?

MIDI CHANNEL

INTENSITY

```
or MIDI.sendNoteOff(42, 0, 1);
//turns the note off.
```

INTENSITY IS ZERO

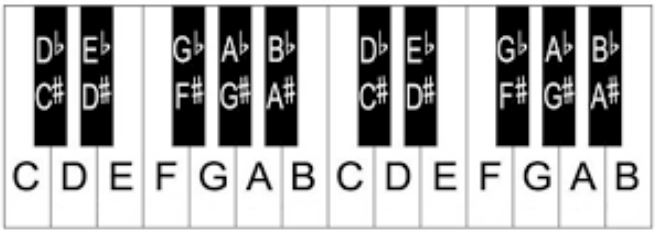
midi librairy

MIDI NOTE ON / OFF

MIDI MADNESS

WHAT NOTE TO PLAY?

Piano Keys and Notes



www.Piano-Keyboard-Guide.com

C-MAJOR SCALE IS ALL WHITE NOTES.

MIDI NOTE TABLE

Note	-1	0	1	2	3	4	5	6	7	8	9
C	0	12	24	36	48	60	72	84	96	108	120
C#	1	13	25	37	49	61	73	85	97	109	121
D	2	14	26	38	50	62	74	86	98	110	122
D#	3	15	27	39	51	63	75	87	99	111	123
E	4	16	28	40	52	64	76	88	100	112	124
F	5	17	29	41	53	65	77	89	101	113	125
F#	6	18	30	42	54	66	78	90	102	114	126
G	7	19	31	43	55	67	79	91	103	115	127
G#	8	20	32	44	56	68	80	92	104	116	
A	9	21	33	45	57	69	81	93	105	117	
A#	10	22	34	46	58	70	82	94	106	118	
B	11	23	35	47	59	71	83	95	107	119	

PICK YOUR NUMBERS!

HOW TO PUT A NOTE ON USING A BUTTON EXAMPLE

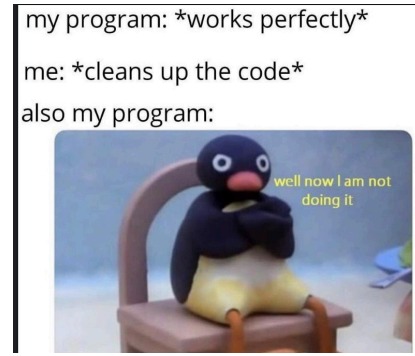
```
#include <MIDI.h>

MIDI_CREATE_DEFAULT_INSTANCE();

const int Button1 = 2;
int buttonState = 0;

void setup() {

  MIDI.begin(MIDI_CHANNEL_OMNI);
  pinMode(Button1, INPUT);

}

void loop() {

  buttonState2 = digitalRead(Button1);

  if (buttonState == HIGH) {
  MIDI.sendNoteOn(60,127,1);
  delay(50);

  } else {
  MIDI.sendNoteOff(60,0,1);
  delay(50);

   }
```

DECLARE BUTTON

OUR BUTTON IS AN INPUT

EVERY TIME BUTTON IS HIT SEND A NOTE

EVERY TIME BUTTON IS RELEASED NO NOTE



MIDI MADNESS

CONNECT TO YOUR SYNTHESEIZER OR COMPUTER VIA USB DONGLE

5 PIN DIN CABLE

MIDI CABLE

MIDI CONTROLLER OF DOOM!

CONNECT TO MIDI SYNTH

TO USB DONGLE

TO PC

UXG®

5 PIN DIN CABLE

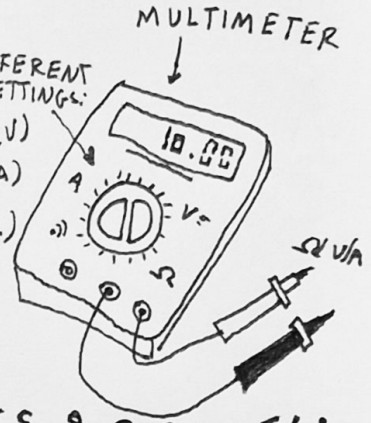
MIDI USB DONGLE

FOLLOWING PAGES ARE FROM

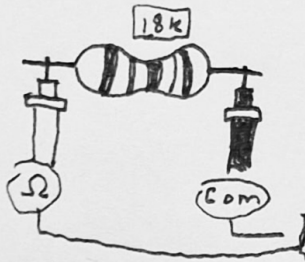
OHM'S LAW FOR DUMMIES:

OHM's Law is widely used in electronics/projects for electrical calculations. (ie. How much resistance is needed for a LED?)
Often you will use a MULTIMETER

MEASURING RESISTORS:



- Take out your Multimeter and turn it on
- Use the Ω OHM setting
- Choose the right ammount (200Ω, 2kΩ, 20k... etc)
- Place the Resistor between the two meters



17.5 k = ± 18 k

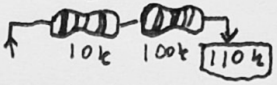
Value of the Resistor:

17.5 k
11.5 k

SERIES & PARALLEL:

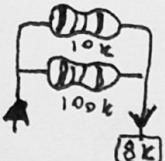
Important difference between components in a series & in a parallel.

SERIES



When resistors are in series the result value is the SUM of the value of each resistor.

PARALLEL



In parallel the result value is slightly less than the value of the SMALLEST resistor.

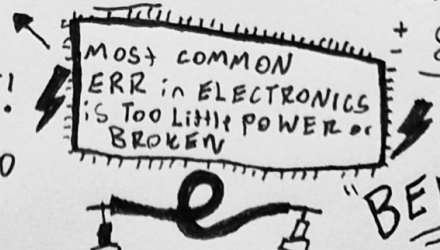
MEASURING VOLTAGE:

Example on a 9V Battery
(NEVER TEST WALL SOCKETS)

- Plug the black meter in the ⊖ and the red in the ⊕.
- Read the voltage with the (V⎓) volts option!

110 k
± 8 k

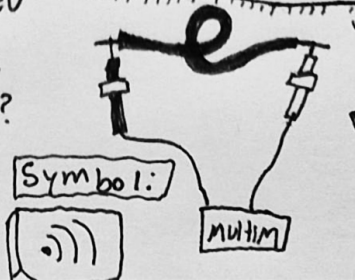
DR. BIBBER TEST!



How can I quickly know if a LED works? if the connection is properly soldered? Broken cabel?

Use the BEEEP! function on the MULTIMETER

Symbol:



if the connection works you will hear a beep!

TIPS FOR SKIP-PING ELECTRONICS!

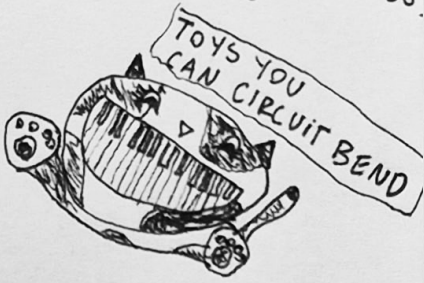
"SKIPPING" IS ANNOTHER WORD FOR DUMPSTER DIVING or GETTING MATERIALS FOR FREE, ANYTHING THAT HAS BEEN "SKIPPED" OVER.

- Often I find things just on the street, by trash cans, or the collective bins - especially moldors!

- ASK second Hand stores if they are throwing away any electronics, I got TONS of cables this way, also for "broken" parts they cant sell but YOU CAN USE :)

- Very sneakily reach in (or just look in) the electronic disposal bins. Mostly found by Stores like the GAMMA. This is very ground upon so be discreete BUT lots of good thiss.

- ASK friends / aquaintances if they have any broken or ~~extra~~ extra electronics they want to get ridof, often people do!



- Look in your networks / ASK local buisnesses look in trash cans or on construction sites :)

HAPPY SKIPPING!

COMPONENTS: A FEW IMPORTANT COMPONENTS YOU WILL CERTAINLY COME ACROSS

CAPACITORS

Symbols

NOT POLARIZED (often looks like this:)

POLARIZED (check if good with + or -)

CERAMIC OR PLASTIC

ELECTROLYTIC

RESISTORS

Resistors reduce the electrical current! Often used with LEDs often:

1 Ω till 10 Ω

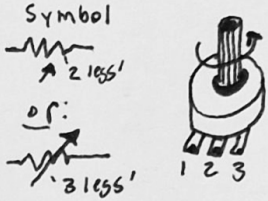
Symbol:

* the colors and rings tells us the value!

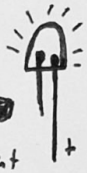
POTMETERS

Variable resistor where you can choose how much current flows by turning the nob!

Symbol

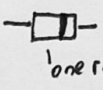


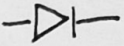
DIODES



Unidirectional regulator. The current can only leave from one side.

Symbol:



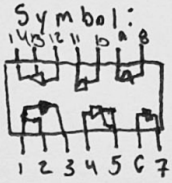


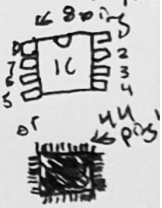
* the most known Diode is a LED (Light emitting Diode)

INTEGRATED CIRCUITS (IC):

IC's or "Chips" do all the thinking for electronics. They are the heart & Brain of the circuit. There are many different kinds/types

Symbol:

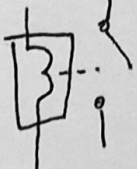




RELAYS

A controled or controllable switch or a large machin controlled by a small signal. A large coil controlled on/off

Symbol:

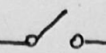


BUTTONS

ON/OFF regulators!

When pushed (or flipped) current flows or stops

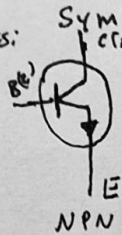
Symbol:



lots and LOTS of different types:

TRANSISTORS

Also found in IC's, transistors are used for many things but namely to amplify or switch electronic signals Sort of traffic controler!



BY ACID SOLDER CLUB