



University of
Nottingham

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Printed Circuit Board Design Workshop

Introduction to PCB & Schematic Capture
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Department of Electrical and Electronic
Engineering

Printed Circuit Board

Invented since 20th century

Also called as *Printed Wiring Board* (PWB)

Function

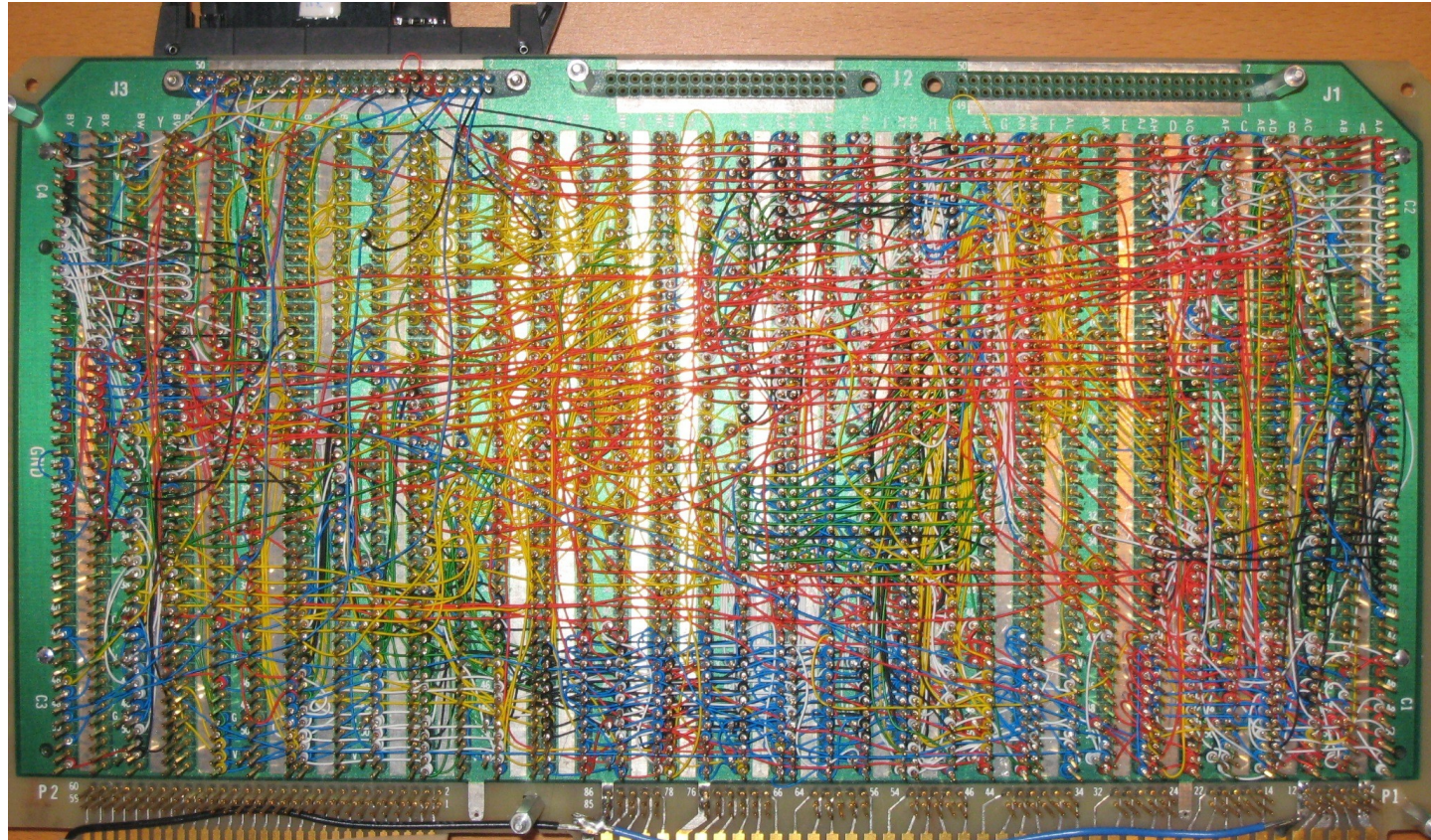
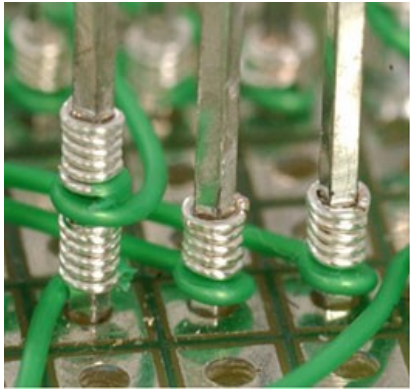
- Provide electrical connectivity
- Component population
- Act as heat sink
- Provide mechanical support





Introduction

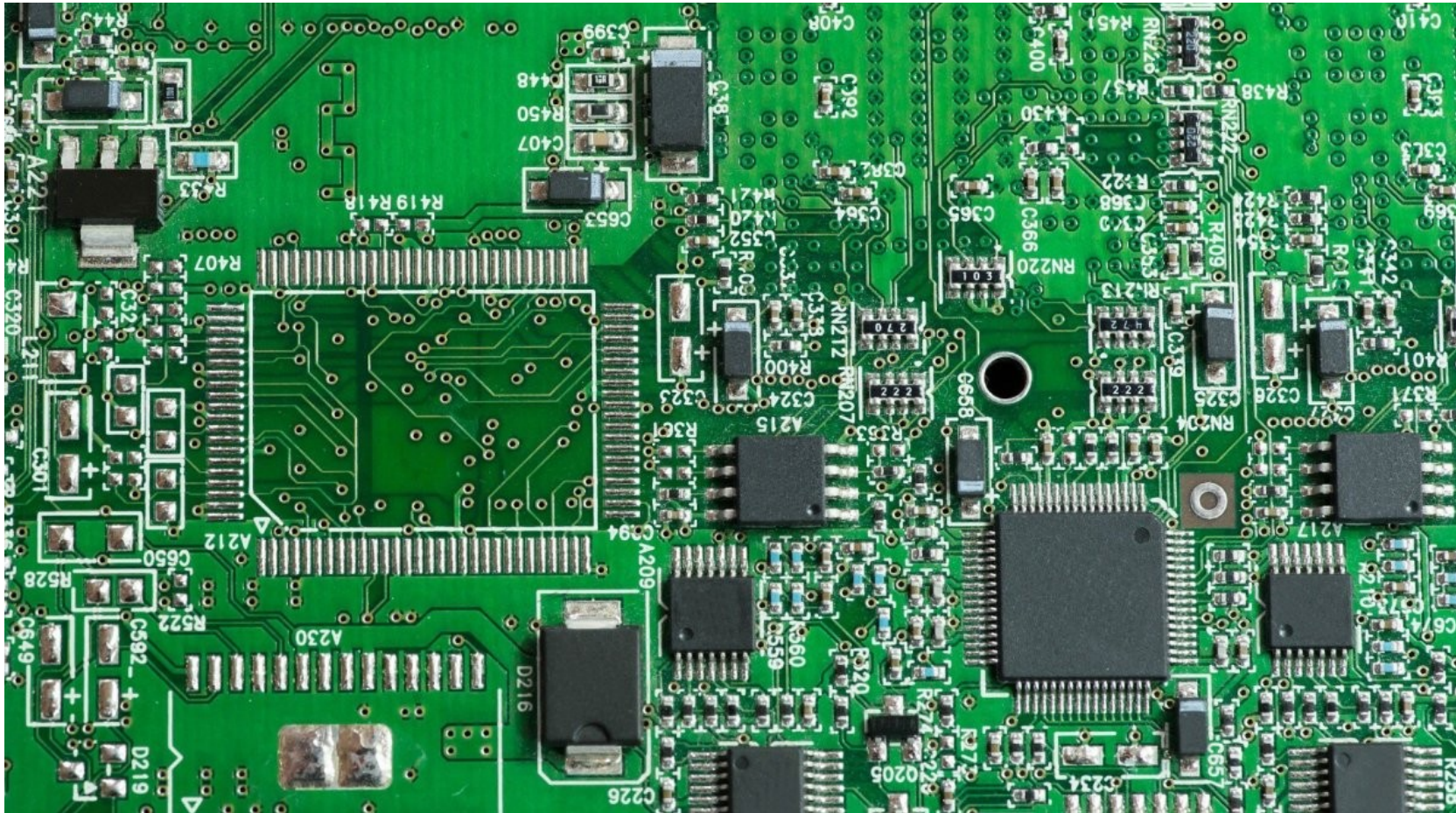
History - Wire Wrap



Wire wrap sockets are expensive.
Not suitable for discrete components.
Large, bulky and heavy.
Relatively fragile

Schematic Editing

History - Modern PCB



A printed circuit board can have multiple copper layers.

A two-layer board has copper on both sides; multi layer boards sandwich additional copper layers between layers of insulating material.

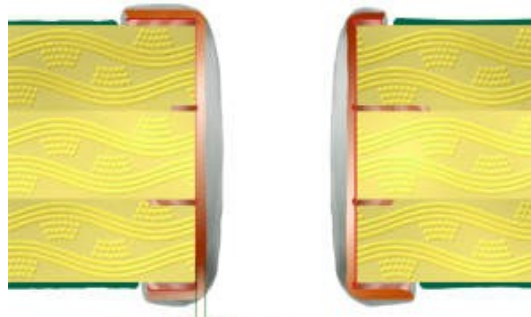
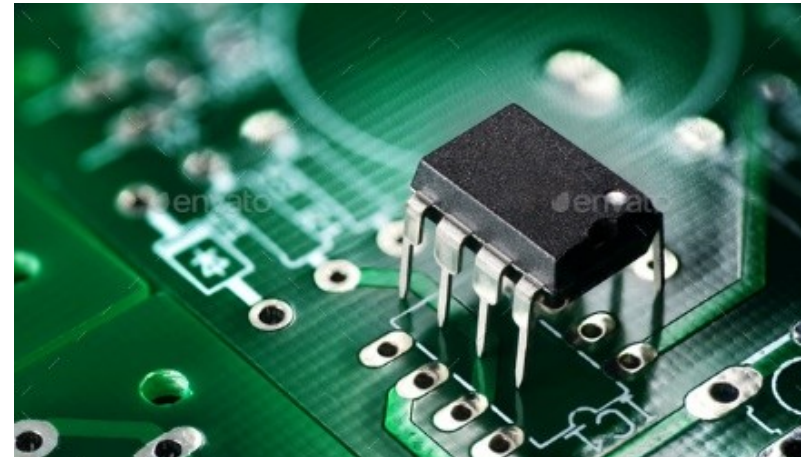
Conductors on different layers are connected with vias



Through Hole Technology

Board are drilled, then plated

Provide connectivity between layers

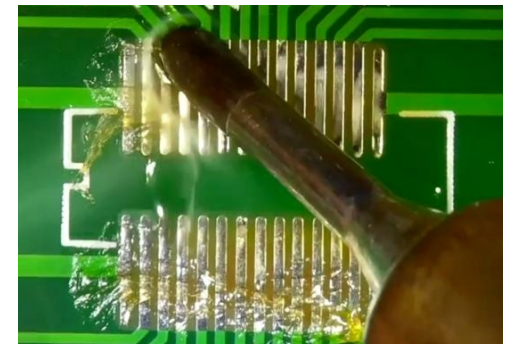
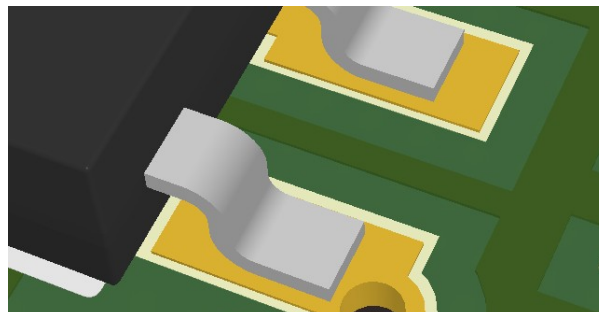
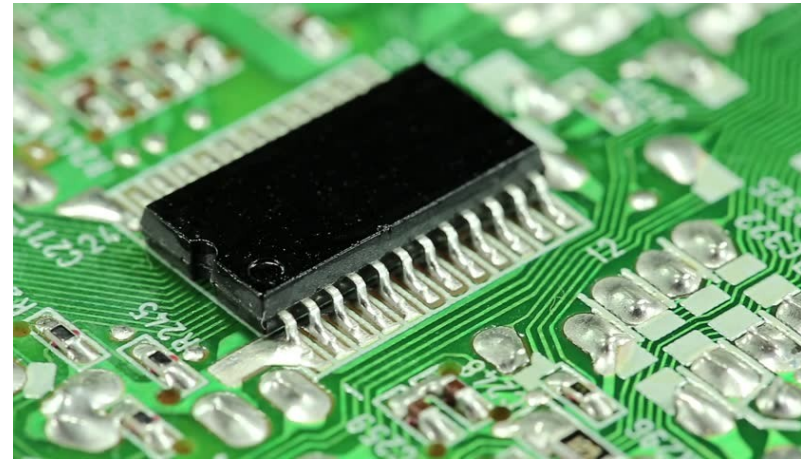




Surface Mount Technology

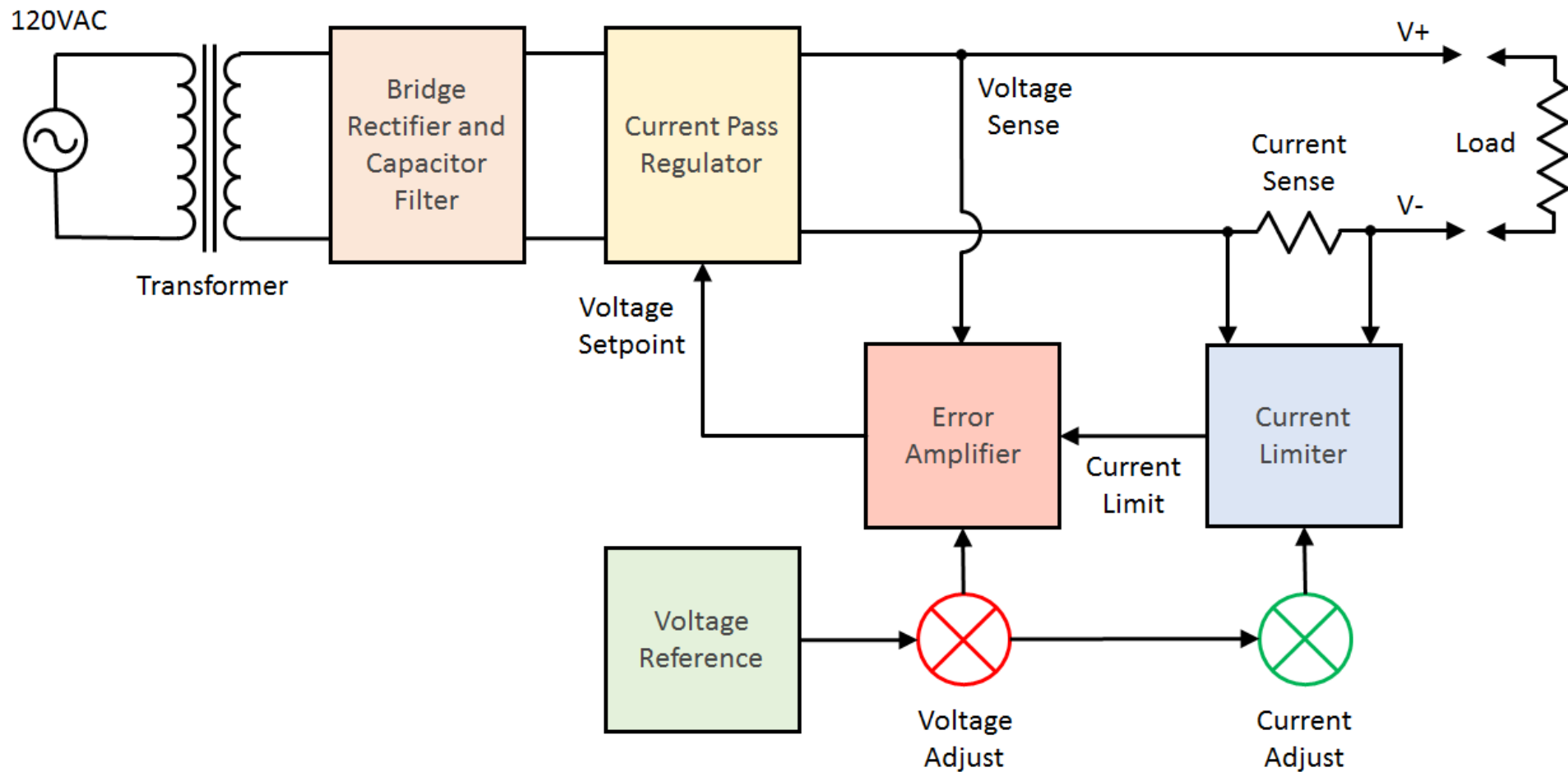
Land pattern are etched

Component may or may not have leads

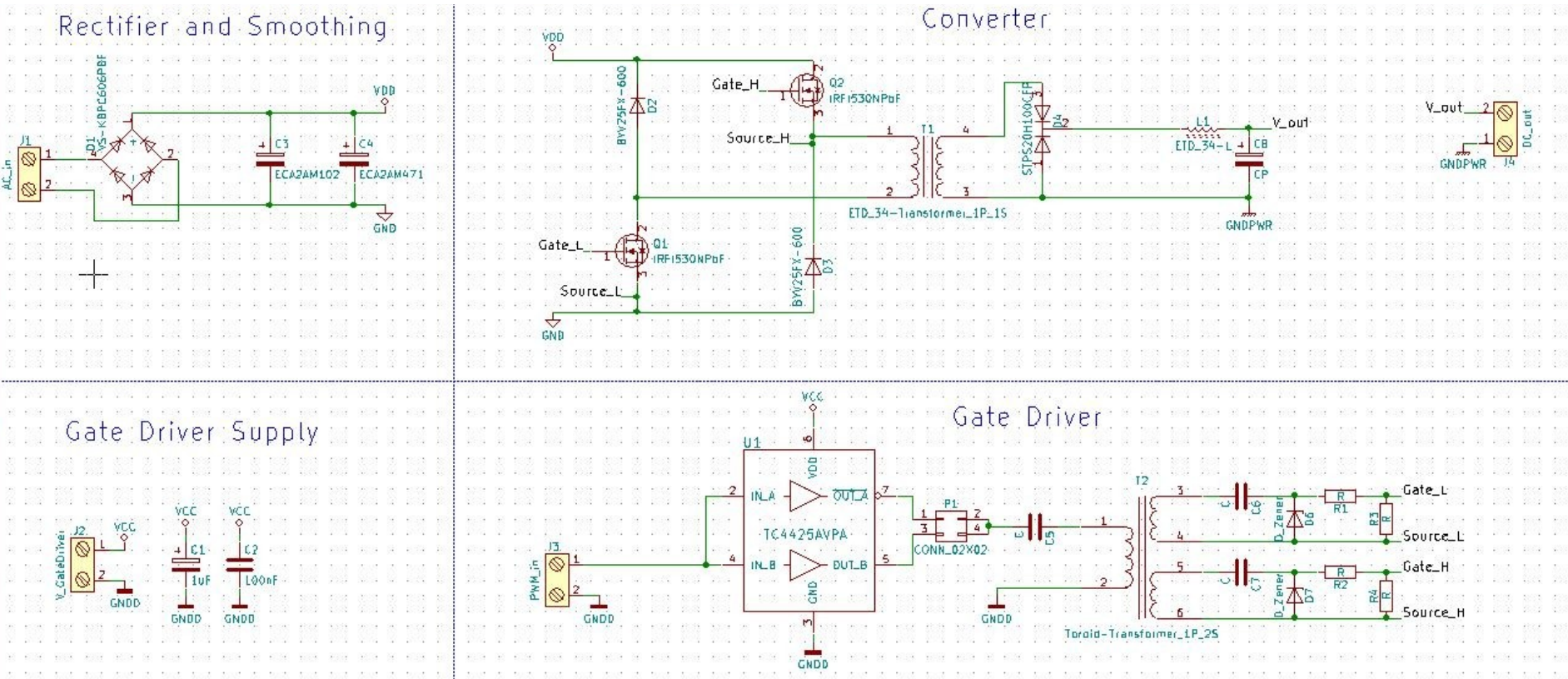




Block Diagram



Schematic Diagram





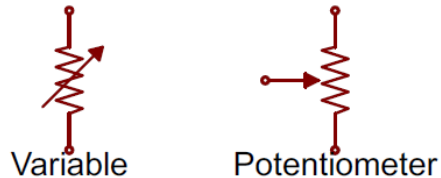
Schematic Editing

Schematic Symbols

Resistors



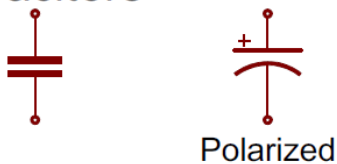
Variable Resistors



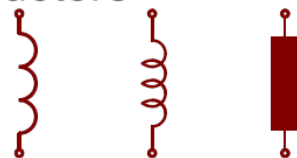
Switches



Capacitors



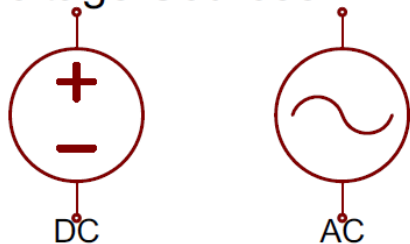
Inductors



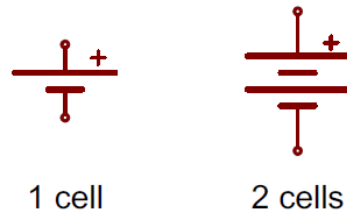
Diodes



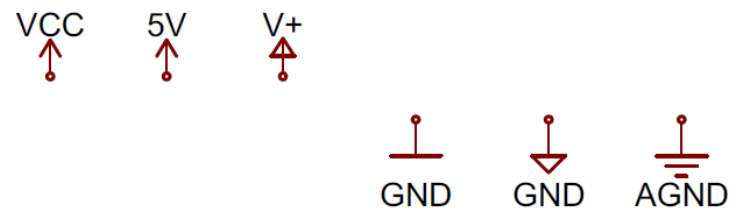
Voltage Sources



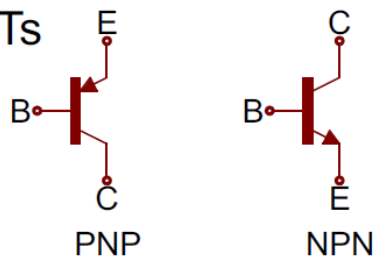
Batteries



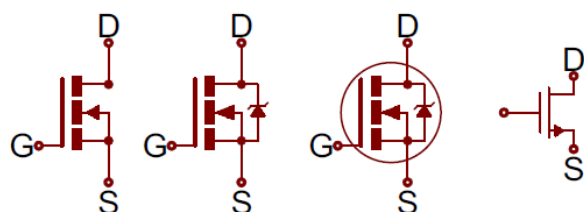
Voltage Nodes



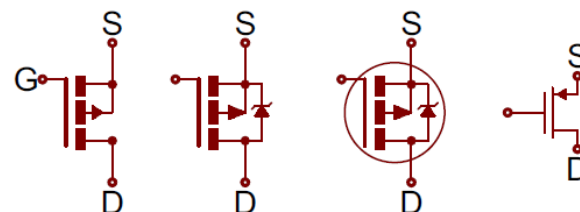
BJTs



n-Channel MOSFETs



p-Channel MOSFETs

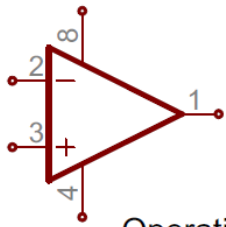




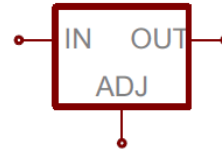
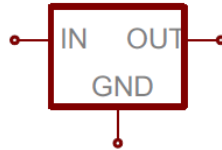
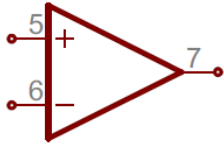
Schematic Editing

Schematic Symbols

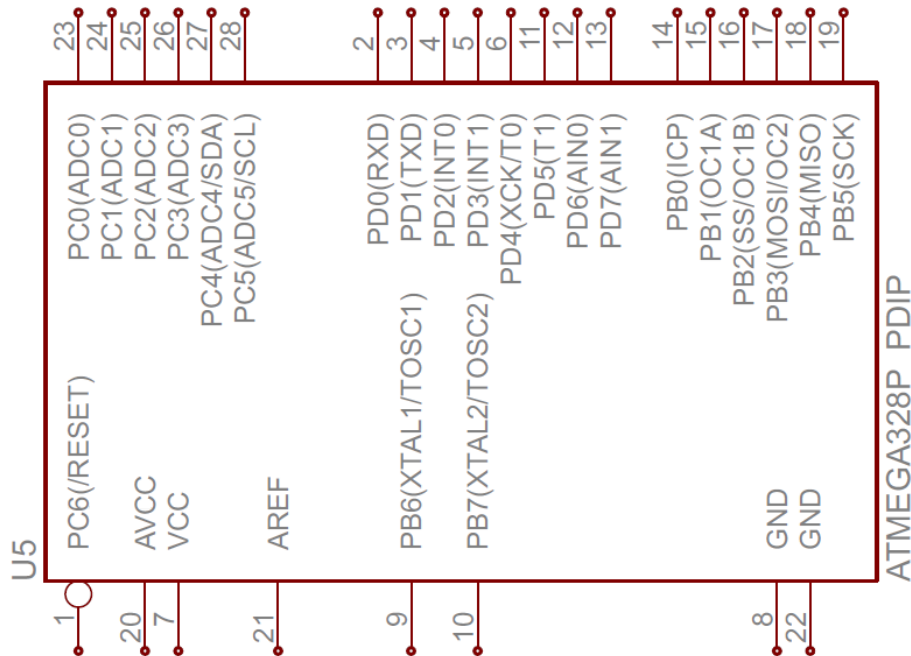
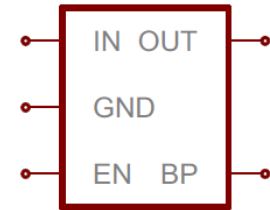
Integrated Circuits



Operational Amplifiers

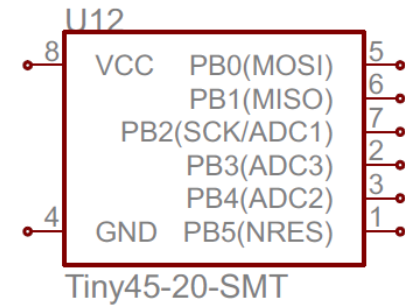


Voltage Regulators

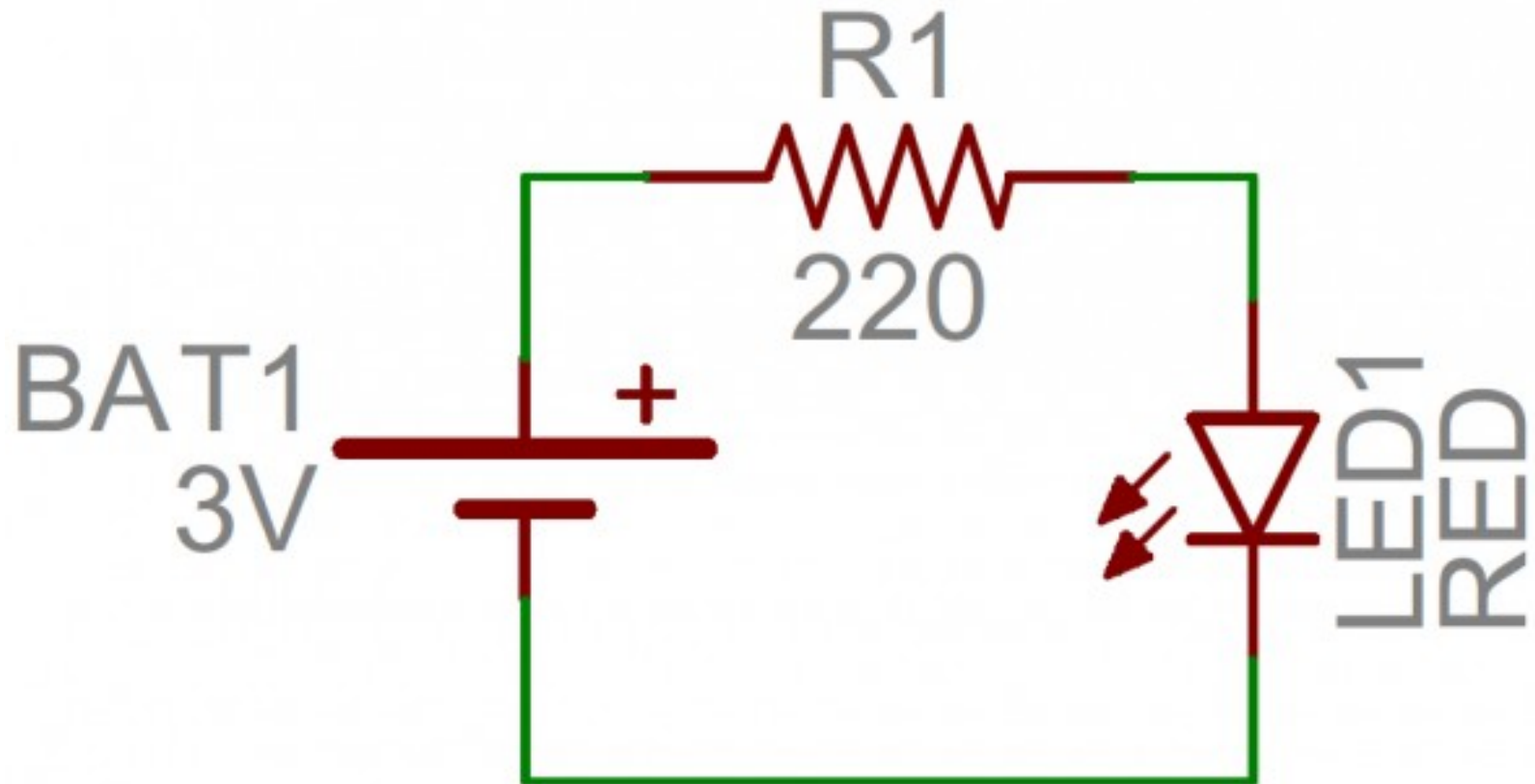


ATMEGA328P_PDIP

Microcontrollers

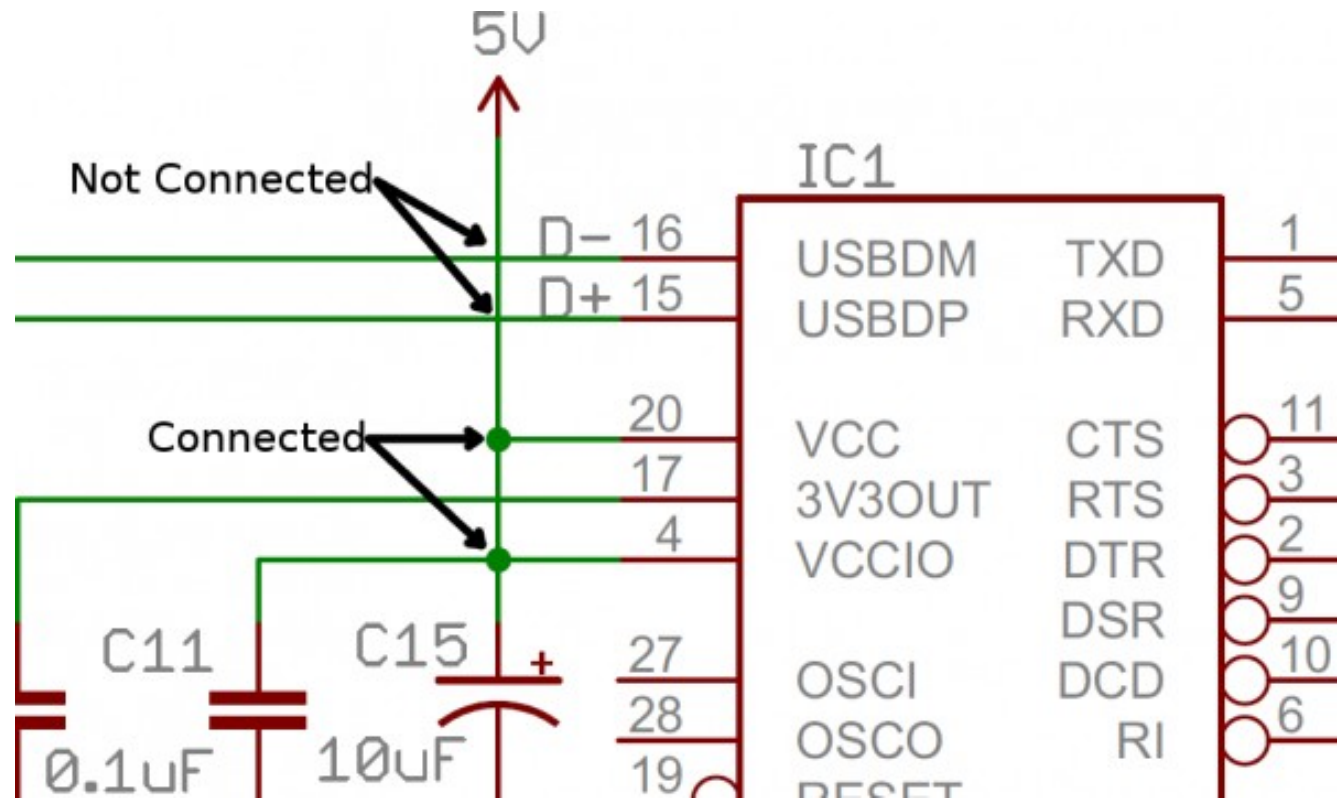
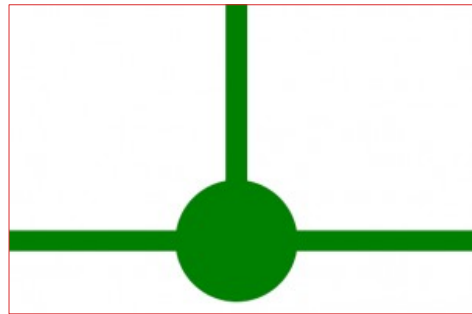


Tiny45-20-SMT





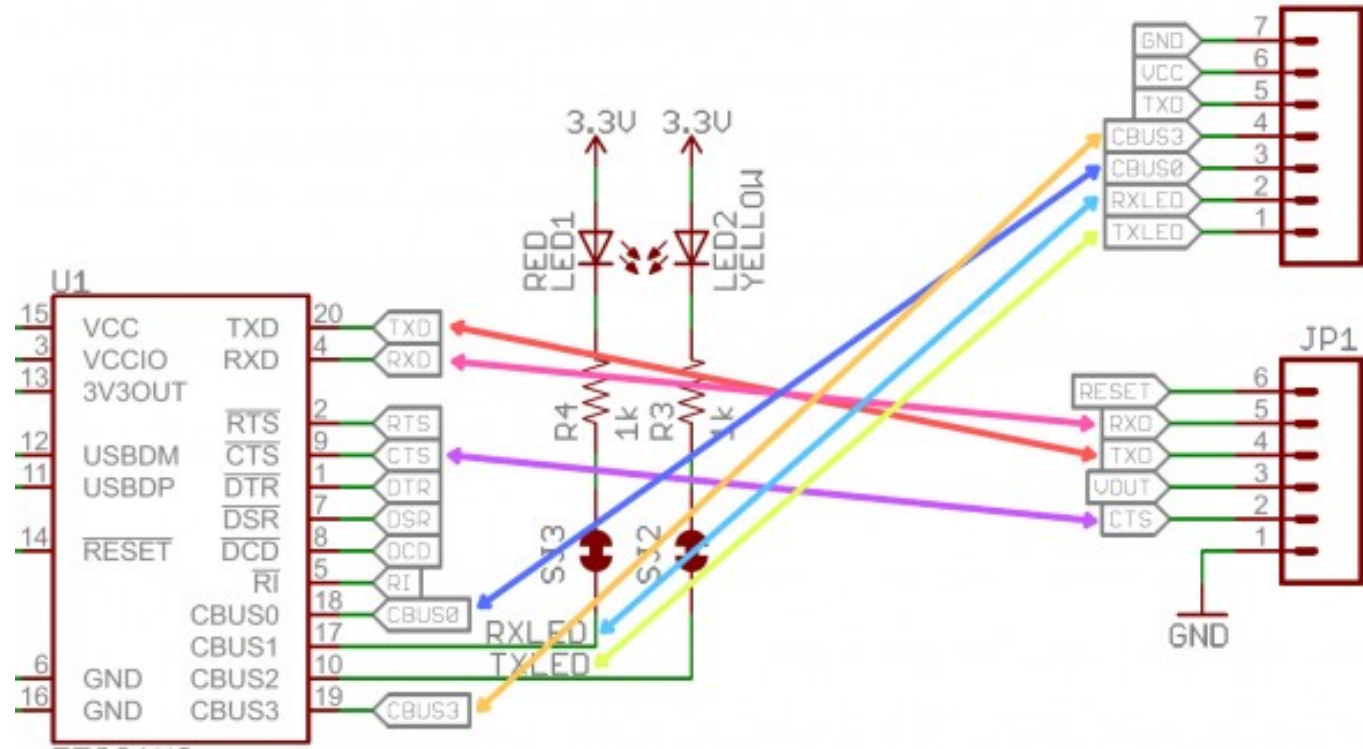
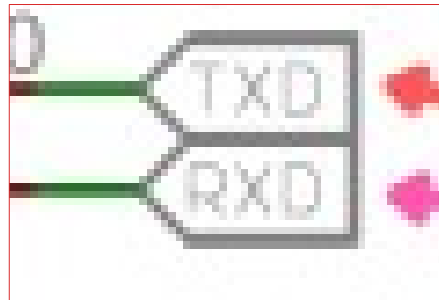
Schematic Editing Nodes





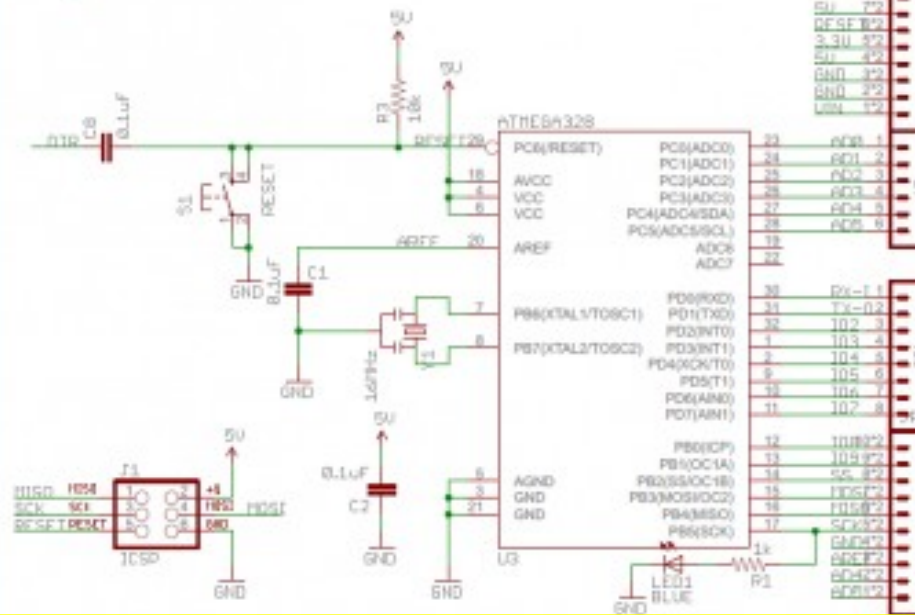
Schematic Editing

Net Label

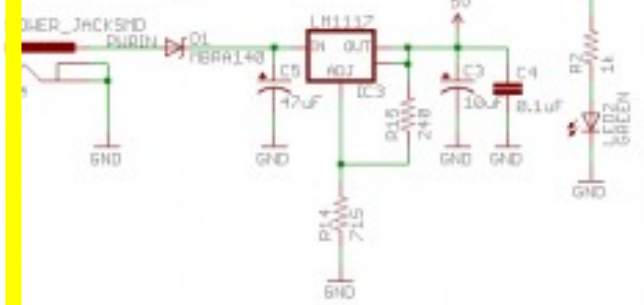


Schematic Editing Block

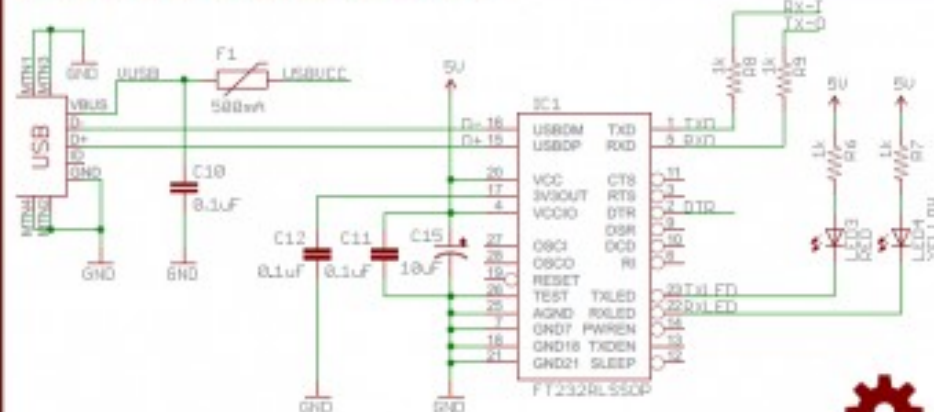
ATmega328



in / 5U Regulator

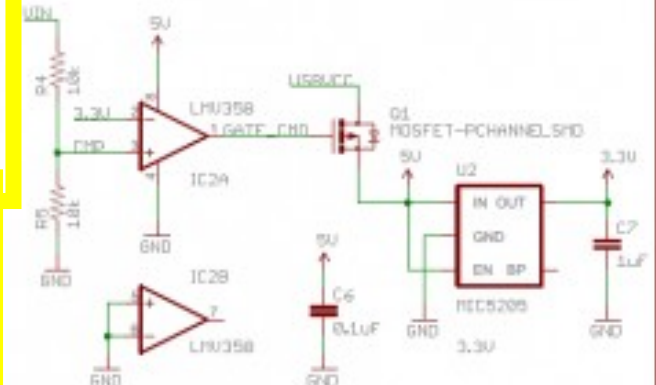


FT232RL (USB-to-Serial Converter)



open hardware

September 1, 2011, 12:34 PM



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UBanzi, D.Cuartelleles, T.Igoe, G.Martino, D.Mellis, J.Lindblom

TITLE: RedBoard-v06

Document Number:

Date: 11/14/2012 11:39:07 AM

Sheet: 1/1



Schematic Editing

Reference Designator

A	separable assembly	LS	loudspeaker, buzzer
AR	amplifier	M	meter
AT	attenuator; isolator	MG	motor-generator
B	blower, motor	MH*	mounting hole
BT	battery	MK	microphone
C	capacitor	MP	mechanical part
CB	circuit breaker	P	connector, plug, male
CP	connector adapter, coupling	PS	power supply
CN	capacitor network	Q	transistor
D or CR	diode	R	resistor
D or VR	breakdown diode	RN	resistor network
DC	directional coupler	RT	thermistor
DL	delay line	S	switch
DS	display, lamp	T	transformer
E	terminal	TB	terminal board, terminal strip
F	fuse	TC	thermocouple
FD*	fiducial	TP⁻⁻⁻	test point, In-circuit test points
FL	filter	TZ	transzorb
G	generator, oscillator	U	inseparable assembly, IC pkg
GN	general network	V	electron tube
H	hardware	VR	voltage regulator
HY	circulator, directional coupler	W	wire, cable, cable assembly
J	connector, jack, female	X	fuse holder, lamp holder, socket
K	contactor, relay	Y	crystal, magnetostriction oscillator
L	coil, inductor, bead, ferrite bead	Z	miscellaneous

Schematic Editing

Schematic Symbols