ECE231: Electronics Cheatsheet

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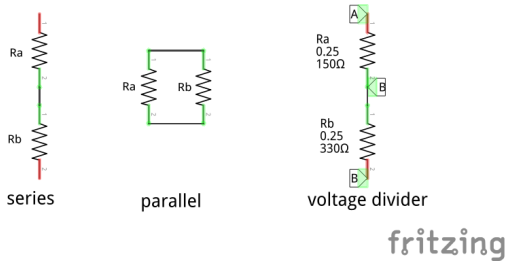
Basic Formulas

Ohm's Law:

$$V = IR$$

$$P = IV = I^2R = \frac{V^2}{R}$$



Series Resistance:

$$R_{eq} = R_1 + R_2 + R_3 + \dots$$

Parallel Resistance:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2} \text{ (for 2 resistors)}$$

Voltage Divider:

$$V_c = V_a \frac{R_a}{R_a + R_b} + V_b \frac{R_b}{R_a + R_b}$$

for $V_a = 0$, $V_c = V_b \frac{R_a}{R_a + R_b}$

Capacitor Energy:

$$E = \frac{1}{2} C V^2$$

Series Capacitance:

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$$

Parallel Capacitance:

$$C_{eq} = C_1 + C_2 + C_3 + \dots$$

RC Circuit Charging:

$$V_C(t) = V_S(1 - e^{-t/\tau})$$

$$I(t) = \frac{V_S}{R} e^{-t/\tau}$$

RC Circuit Discharging:

$$V_C(t) = V_0 e^{-t/\tau}$$

$$I(t) = -\frac{V_0}{R} e^{-t/\tau}$$

where $\tau = RC$ (time constant)

Passive Components

Resistor (US)		Resistor (IEC)	
Capacitor		Electrolytic Cap	
Battery		Voltage Source	
Earth Ground		Signal Ground	
LED		Diode	

Logic Gates

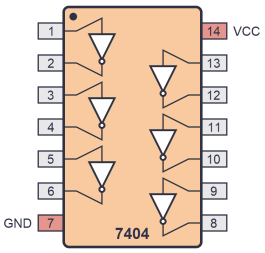
AND	
OR	
NOT	
NAND	
NOR	
XOR	

Transistors

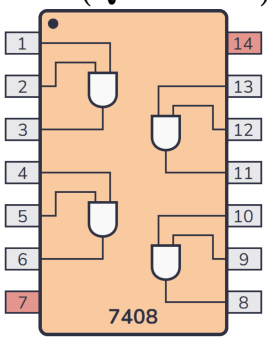
NPN BJT	
PNP BJT	
n-MOSFET	
p-MOSFET	
n-FET	
p-FET	

IC Pinouts

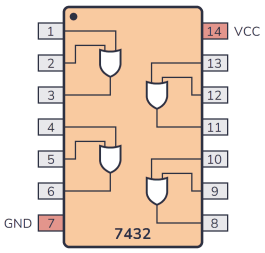
7404 (Hex Inverter)



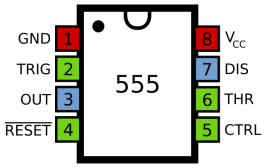
7408 (Quad AND)



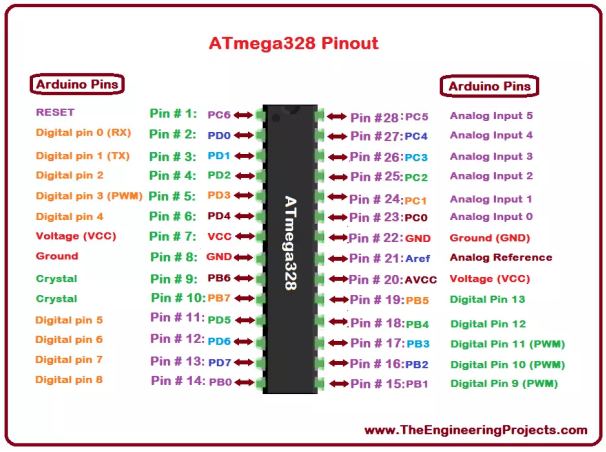
7432 (Quad OR)



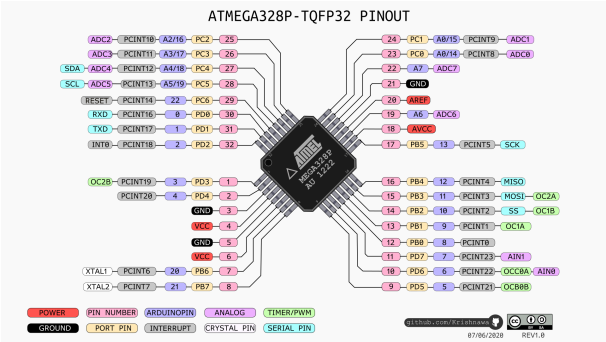
555 Timer



ATmega328 (DIP)



ATmega328 (Quad)



Common Values

- **Resistor Colors:** Black(0), Brown(1), Red(2), Orange(3), Yellow(4), Green(5), Blue(6), Violet(7), Gray(8), White(9)
- **Standard Resistors:** 1.0, 1.2, 1.5, 1.8, 2.2, 2.7, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2 ($\times 10^n$)

Power Supply

- **TTL Logic:** VCC = 5V, VSS = 0V
- **CMOS Logic:** VDD = 3.3V or 5V, VSS = 0V
- **Arduino:** 5V, 3.3V, GND