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:

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

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

Capacitor Energy:

$$E = \frac{1}{2}CV^2$$

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 

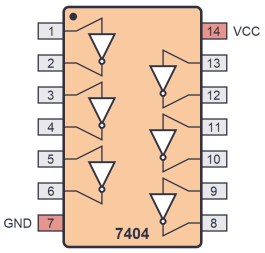
p-MOSFET 

n-FET 

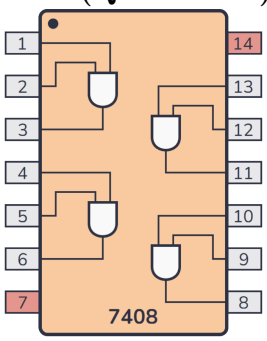
p-FET 

IC Pinouts

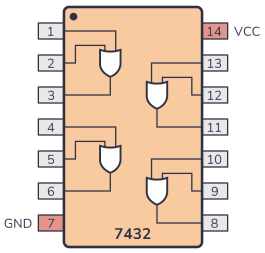
7404 (Hex Inverter)



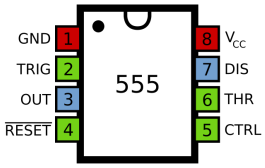
7408 (Quad AND)



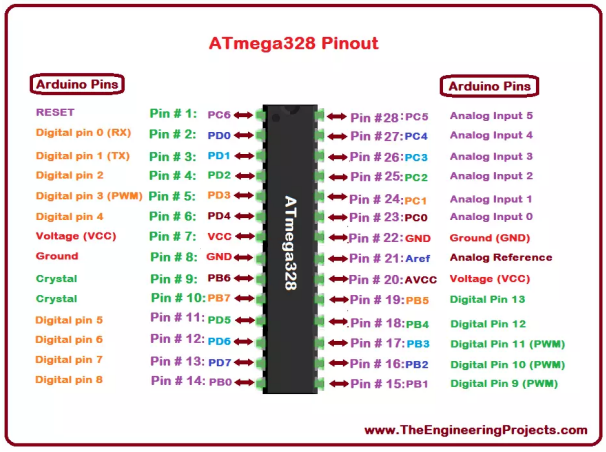
7432 (Quad OR)



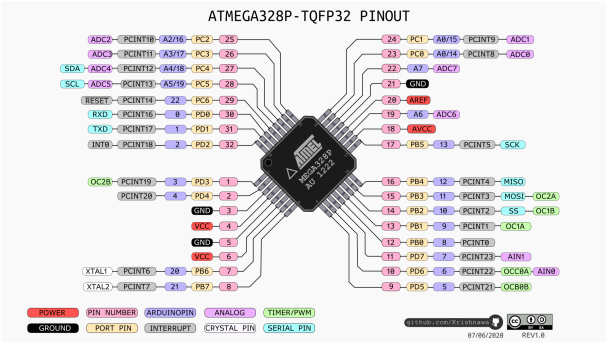
555 Timer



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