Electronic Components Cheat Sheet

A quick reference guide to common electronic components, their symbols, functions, and basic parameters. This cheat sheet provides a concise overview for electronics enthusiasts, students, and professionals.

Basic Passive Components

Resistors

Symbol:	[Image of Resistor Symbol]
Function:	Limits current flow; provides a voltage drop.
Units:	Ohms (Ω)
Types:	Fixed, Variable (Potentiometer, Trimmer), Thermistor, Photoresistor.
Color Code:	Bands indicate resistance value and tolerance.
Power Rating:	Specifies the maximum power the resistor can dissipate without damage (e.g., 1/4W, 1/2W, 1W).

Capacitors

Symbol:	[Image of Capacitor Symbol]
Function:	Stores electrical energy in an electric field; blocks DC, passes AC.
Units:	Farads (F)
Types:	Ceramic, Electrolytic, Tantalum, Film, Variable.
Voltage Rating:	Maximum voltage that can be applied without damage.
Tolerance:	Indicates the acceptable variation from the stated capacitance value.

Inductors

Symbol:	[Image of Inductor Symbol]
Function:	Stores energy in a magnetic field; blocks AC, passes DC.
Units:	Henries (H)
Types:	Air-core, Iron-core, Ferrite-core, Variable.
Current Rating:	Maximum current that can be passed without saturation or damage.
Self-Resonance Frequency (SRF):	The frequency at which the inductor behaves as a resonant circuit.

Diodes and Transistors

Diodes

Symbol:	[Image of Diode Symbol]
Function:	Allows current flow in one direction only.
Types:	Rectifier, Zener, LED, Schottky, Signal.
Forward Voltage (Vf):	Voltage drop across the diode when conducting.
Reverse Breakdown Voltage (Vr):	Maximum reverse voltage the diode can withstand.
Maximum Forward Current (If):	Maximum current that can flow through the diode in the forward direction.

Bipolar Junction Transistors (BJTs)

Symbol:	[Image of NPN and PNP BJT Symbols]
Function:	Current-controlled current source; used for amplification and switching.
Types:	NPN, PNP.
Current Gain (hFE or β):	Amplification factor (collector current / base current).
Collector-Emitter Voltage (VCE):	Voltage between collector and emitter terminals.
Base-Emitter Voltage (VBE):	Voltage between base and emitter terminals.

Field-Effect Transistors (FETs)

Symbol:	[Image of JFET and MOSFET Symbols]
Function:	Voltage-controlled current source; used for amplification and switching.
Types:	JFET (N-channel, P-channel), MOSFET (N-channel, P-channel, Enhancement, Depletion).
Gate-Source Voltage (VGS):	Voltage between gate and source terminals.
Drain-Source Voltage (VDS):	Voltage between drain and source terminals.
Drain Current (ID):	Current flowing through the drain terminal.

Integrated Circuits (ICs)

Operational Amplifiers (Op-Amps)

Symbol:	[Image of Op-Amp Symbol]
Function:	Amplifies the difference between two input voltages.
Key Parameters:	Open-loop gain, bandwidth, slew rate, input bias current, input offset voltage.
Common Configurations:	Inverting amplifier, non-inverting amplifier, voltage follower, summing amplifier, difference amplifier.
Supply Voltage:	Voltage range within which the op-amp operates correctly.
Common Mode Rejection Ratio (CMRR):	Measure of the op-amp's ability to reject common-mode signals.

Logic Gates

Types:	AND, OR, NOT, NAND, NOR, XOR, XNOR.
Function:	Performs Boolean logic operations.
Truth Table:	Defines the output for all possible input combinations.
Voltage Levels:	High (1) and Low (0) voltage levels representing logical states.
Fan-out:	Number of similar gates that the output of a gate can drive.
Propagation Delay:	Time delay between the change of input and the corresponding change in output.

Microcontrollers

Function:	Small computer on a single IC, used to control electronic devices.
Key Components:	CPU, memory (RAM, ROM, Flash), I/O ports, timers, ADC, DAC, communication interfaces (UART, SPI, I2C).
Programming Languages:	C, C++, Assembly, MicroPython.
Clock Speed:	Frequency at which the microcontroller operates (MHz).
Memory Size:	Amount of RAM and Flash memory available.
Operating Voltage:	Voltage required for the microcontroller to function properly.

Other Essential Components

Crystals and Oscillators

Function:	Provides a stable clock signal for timing circuits.
Types:	Crystal oscillators, ceramic resonators, RC oscillators.
Frequency:	Operating frequency of the oscillator (MHz, kHz).
Stability:	Measure of how constant the frequency remains over time and temperature.
Load Capacitance:	Capacitance required for the crystal to oscillate at its specified frequency.
Tolerance:	Acceptable variation from the stated frequency.

Switches

Function:	Controls the flow of current in a circuit by opening or closing a connection.
Types:	SPST, SPDT, DPST, DPDT, Pushbutton, Toggle, DIP.
Contact Rating:	Maximum voltage and current the switch contacts can handle.
Actuation Force:	Force required to operate the switch.
Contact Resistance:	Resistance across the switch contacts when closed.
Lifespan:	Number of switching cycles the switch can perform before failure.

Connectors

Function:	Provides a detachable connection between two electronic circuits or devices.
Types:	Headers, Terminals, USB, HDMI, Ethernet, Audio Jacks, Power Connectors.
Pin Count:	Number of individual connections the connector provides.
Current Rating:	Maximum current that can flow through each pin.
Voltage Rating:	Maximum voltage that can be applied between pins.
Mounting Style:	Through-hole, Surface Mount (SMT), Panel Mount.