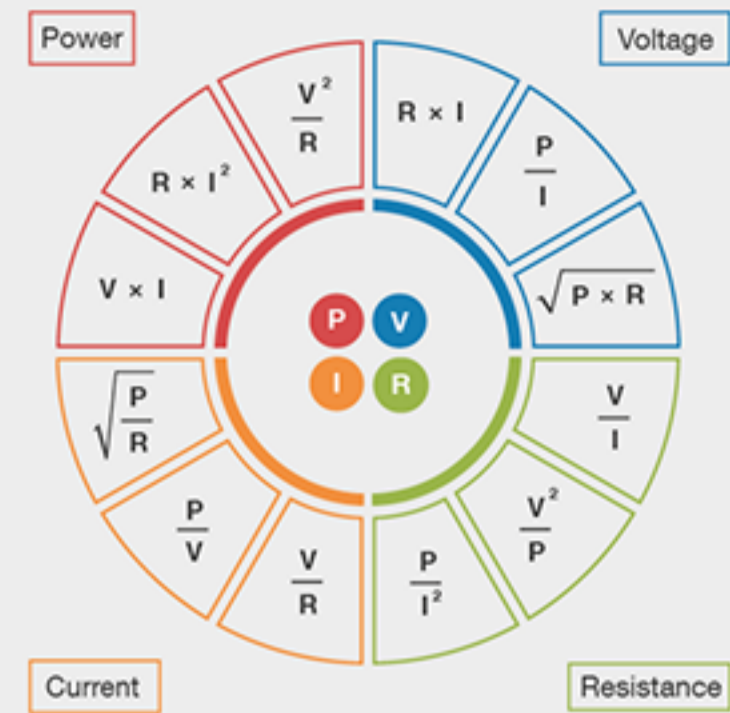


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ELECTRONICS CHEAT SHEET POSTER

Your quick reference companion in learning, referencing and debugging your electronics projects

Ohm's Law



American Wire Gauge

AWG No.	Diameter (in)	Diameter (mm)	CS Area (mm ²)	Resistance (Ω/km)	Actual Cross Sect. Size
4/0	.4600	11.68	107.2	.1608	0000
3/0	.4096	10.40	85.03	.2028	000
2/0	.3648	9.266	67.43	.2557	00
1/0	.3249	8.252	53.48	.3224	0
1	.2893	7.348	42.41	.4066	1
2	.2576	6.544	33.63	.5127	2
3	.2294	5.827	26.67	.6465	3
4	.2043	5.189	21.15	.8152	4
5	.1819	4.621	16.77	1.028	5
6	.1620	4.115	13.30	1.296	6
7	.1443	3.665	10.55	1.634	7
8	.1285	3.264	8.366	2.061	8
9	.1144	2.906	6.634	2.599	9
10	.1019	2.588	5.261	3.277	10
11	.0907	2.305	4.172	4.132	11
12	.0808	2.053	3.309	5.211	12
13	.0720	1.828	2.624	6.571	13
14	.0641	1.628	2.081	8.286	14
15	.0571	1.450	1.650	10.45	15
16	.0508	1.291	1.309	13.17	16
18	.0403	1.024	.8231	20.95	18
20	.0320	.8118	.5176	33.31	20
22	.0253	.6438	.3255	52.96	22
24	.0201	.5106	.2047	84.22	24
26	.0159	.4049	.1288	133.9	26
28	.0126	.3211	.08098	212.9	28
30	.0100	.2546	.05093	338.6	30
32	.00795	.2019	.03203	538.3	32
34	.00630	.1601	.02014	856.0	34
36	.00500	.1270	.01267	1361	36
38	.00397	.1007	.00797	2164	38
40	.00314	.0799	.00501	3441	40

Resistor Color Coding

4 Band
4 7 3 ±5%
= 47 × 10³
= 47 000 Ω
= 47 kΩ ± 5%

5 Band
4 7 0 0
= 470 × 10³
= 470 000 Ω
= 470 kΩ ± 5%

6 Band
4 7 0 0 20
= 470 kΩ ± 5%
Temp. Coeff. 50 ppm/K

Color	1st Band	2nd Band	3rd Band	Multiplier	Tolerance	Temp. Coeff. (ppm/K)
Black	0	0	0	x10 ⁰	±0%	250
Brown	1	1	1	x10 ¹	±1%	100
Red	2	2	2	x10 ²	±2%	50
Orange	3	3	3	x10 ³		15
Yellow	4	4	4	x10 ⁴		25
Green	5	5	5	x10 ⁵	±50%	20
Blue	6	6	6	x10 ⁶	±25%	10
Violet	7	7	7	x10 ⁷	±10%	5
Grey	8	8	8		±0.5%	1
White	9	9	9			
Gold				x10 ⁻¹	±5%	
Silver				x10 ⁻²	±10%	

Capacitor Coding

Common Capacitors

Ceramic
2D 103 J
Max. Voltage
Capacitance
Tolerance

Electrolytic
1uF 25V
Max. Voltage
Capacitance
Tolerance

103 = 10 × 10³ = 10 000 pF = 1 nF

Capacitance Conversion Table

Microfarads (uF)	Nanofarads (nF)	Picofarads (pF)
0.000001 uF	= 0.001 nF	= 1 pF
0.00001 uF	= 0.01 nF	= 10 pF
0.0001 uF	= 0.1 nF	= 100 pF
0.001 uF	= 1 nF	= 1 000 pF
0.01 uF	= 10 nF	= 10 000 pF
0.1 uF	= 100 nF	= 100 000 pF
1 uF	= 1 000 nF	= 1 000 000 pF

Max. Operating Voltage

1H	50 V	2E	250 V
2A	100 V	2G	400 V
2F	150 V	2J	630 V
2D	200 V		

Tolerance

B	±0.1 pF	H	±3%
C	±0.25 pF	J	±5%
D	±0.5 pF	K	±10%
F	±1%	M	±20%
G	±2%	Z	+80% -20%

Light Emitting Diode (LED)

Typical LED Characteristics

Color	Wavelength (nm)	Typical Forward Voltage (V) @ 20 mA
Red	630 - 660	1.8
Orange	605 - 620	2.0
Yellow	585 - 595	2.2
Green	550 - 570	3.5
Blue	430 - 505	3.6
White	450	4.0
Ultraviolet	850 - 940	1.2

Surface Mount Devices (SMDs)

SMD Resistor Markings

3 Digit
473 = 47 × 10³ = 47 000 Ω = 47 kΩ

4 Digit
4702 = 470 × 10² Ω = 47 000 Ω = 47 kΩ

with Radix Point
4R7 = 4.7 Ω 0R47 = 0.47 Ω

SMD Capacitor Markings

Tantalum
473 = 47 × 10³ pF = 47 nF @ 16V

Electrolytic Capacitor
473 = 47 × 10³ pF = 47 nF @ 16V

Electrical Units

Basic Electrical Units

Quantity	Abbrev. / Unit	Quantity	Abbrev. / Unit
Capacitance	F Farad	Inductance	H Henry
Charge	C Coulomb	Magnetic Flux	Wb Weber
Current	A Ampere	Potential	V Volt
Energy	J Joule	Power	W Watt
Force	N Newton	Resistance	Ω Ohm
Frequency	Hz Hertz		

Metric Prefixes

Tera-	T	×10 ¹²	1 000 000 000 000
Giga-	G	×10 ⁹	1 000 000 000
Mega-	M	×10 ⁶	1 000 000
Kilo-	K	×10 ³	1 000
Hecto-	H	×10 ²	100
Deka-	Da	×10 ¹	10
(base)	-	×10 ⁰	1
Deci-	d	×10 ⁻¹	0.1
Centi-	c	×10 ⁻²	0.01
Milli-	m	×10 ⁻³	0.001
Micro-	μ	×10 ⁻⁶	0.000 000 1
Nano-	n	×10 ⁻⁹	0.000 000 000 1
Pico-	p	×10 ⁻¹²	0.000 000 000 000 1

Regulator

LM78XX Regulator

TO-220
Common Outputs
7805, 5V Regulator 7812, 12V Regulator
7905, -5V Regulator 7912, -12V Regulator

Basic Configuration

Op-Amp

741 Op-Amp (8 Pin DIP)

Offset Null 1, Inverting 2, Non-inverting 3, -Vcc 4, +Vcc 8 (NC), 7 +Vcc, 6 Output, 5 Offset Null

LM358 Dual Op-Amp (8 Pin DIP)

Output 1 1, Inverting 1 2, Non-inverting 1 3, -Vcc 4, +Vcc 8, 7 Output 2, 6 Non-inverting 2, 5 Inverting 2

555 IC

555 IC Pinout (8 Pin DIP)

Ground 1, Trigger 2, Output 1 3, Reset 4, +Vcc 8, 7 Discharge, 6 Threshold, 5 Control

Made possible by:



Other Stuff

Thanks to the Contributors

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References

Books: Engineer's Mini-Notebook by Forrest Mims III, Encyclopedia of Electric Components

Web Sources: dangerousprototypes.com, blog.ricardoturocabral.com, sizes.com, en.wikipedia.org, venkel.com

Compiled and Illustrated by: **Joseph Ricafort**

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Facebook: facebook.com/joricafort

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The Breadboard

Breadboard Anatomy and Parts

Connecting Wires, DIP Support, Terminal Strips, Power Rails

Horizontal holes in these rows are connected inside

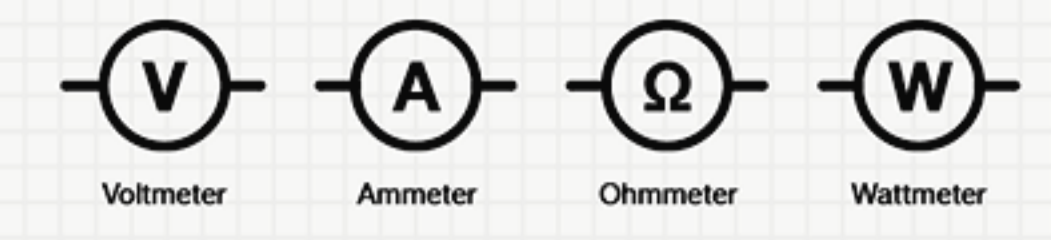
Vertical holes in these rows are connected inside

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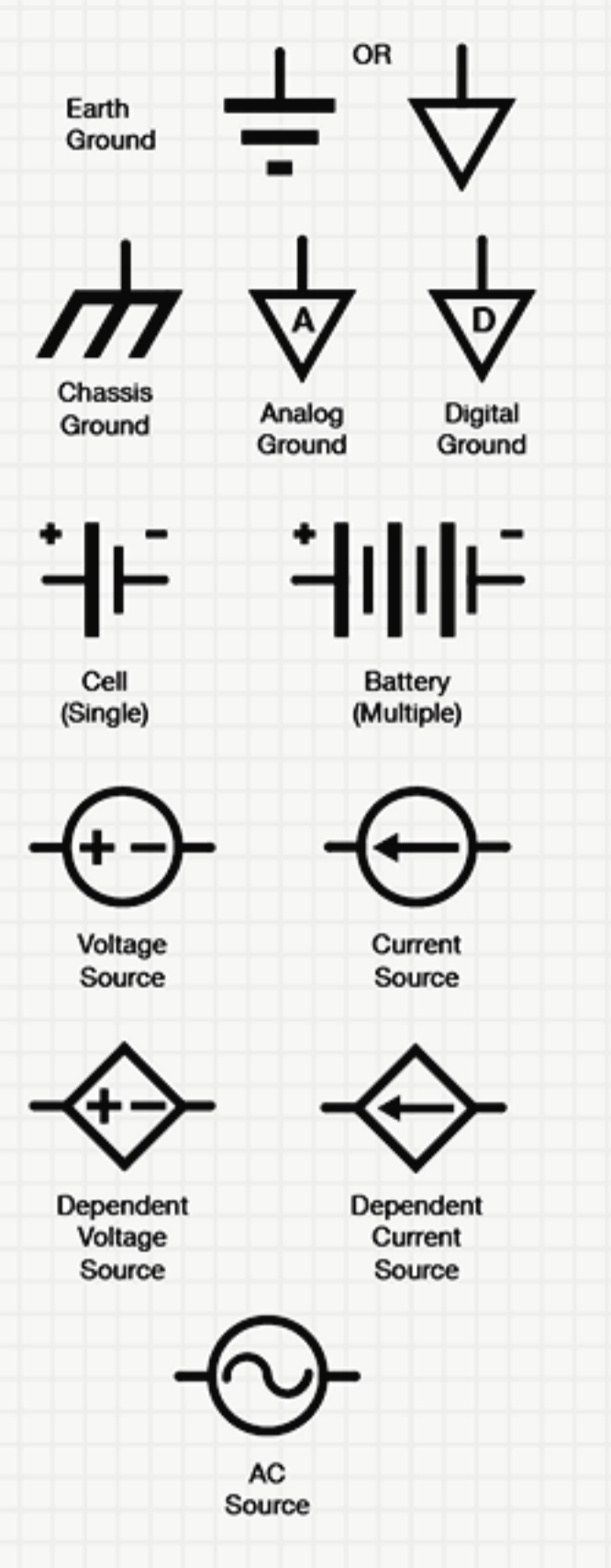
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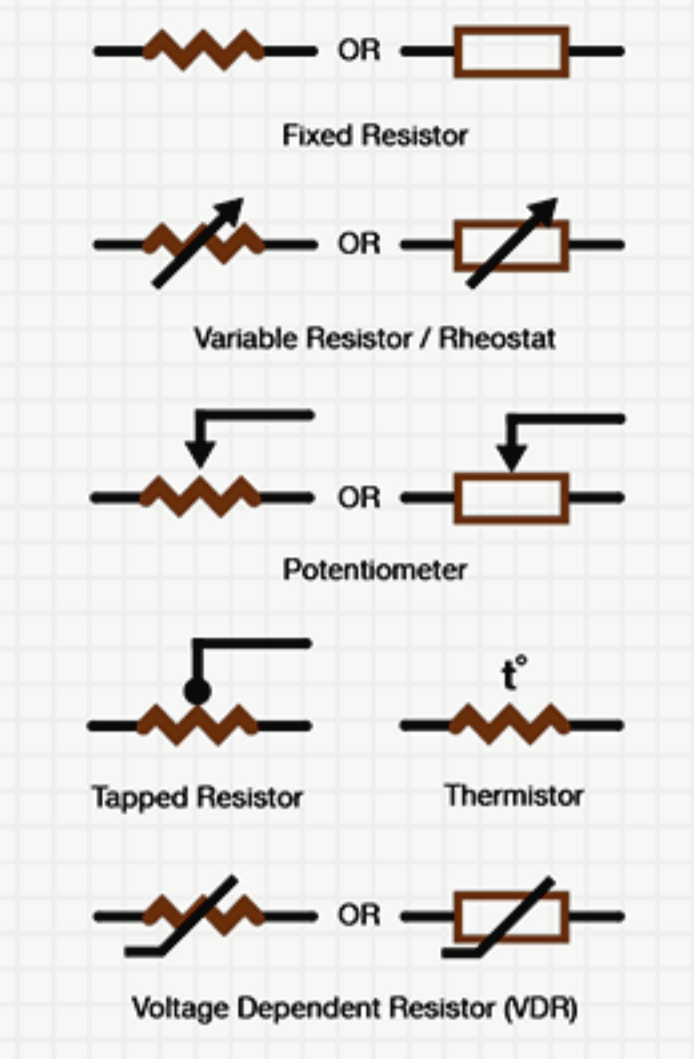
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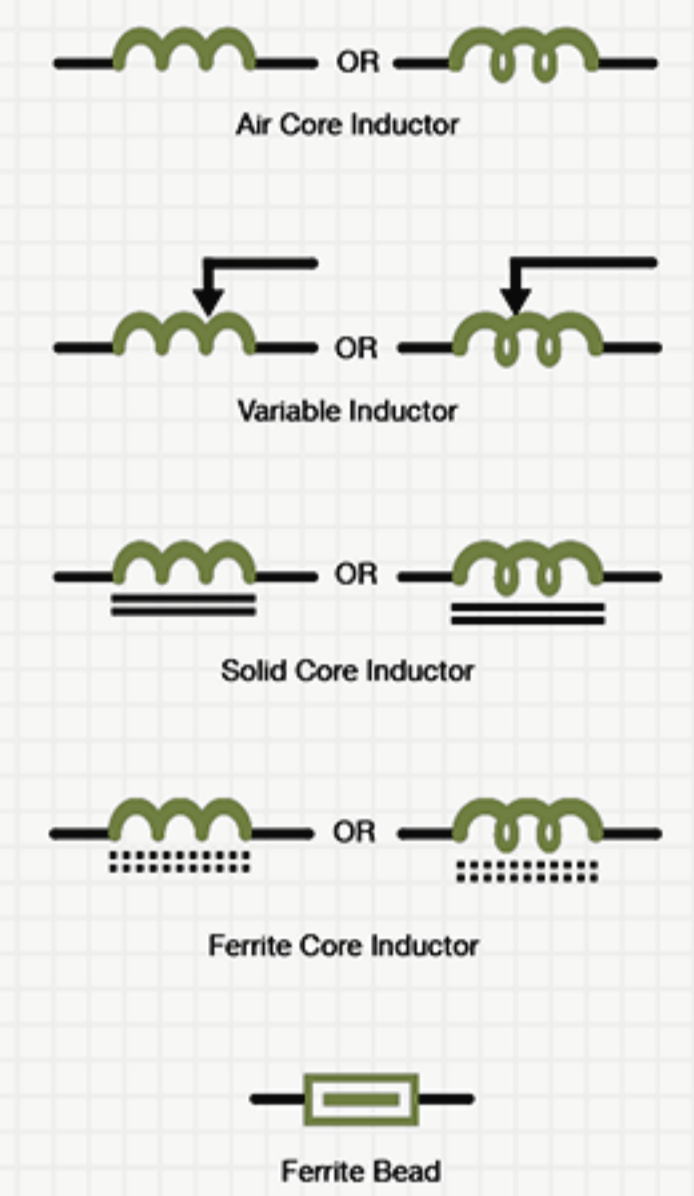
Sources / Ground



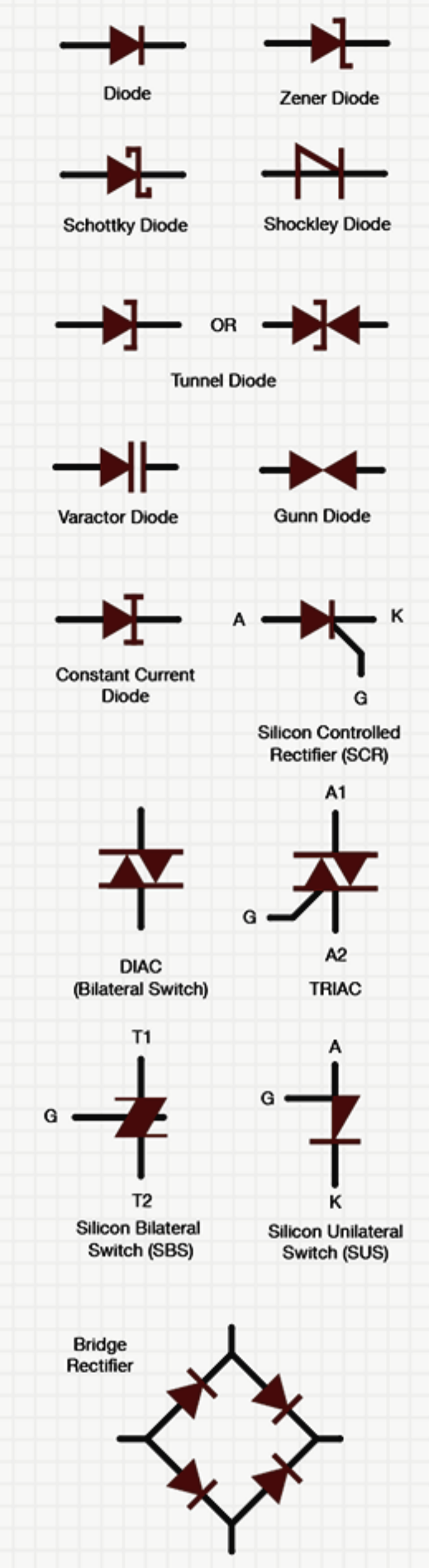
Resistors



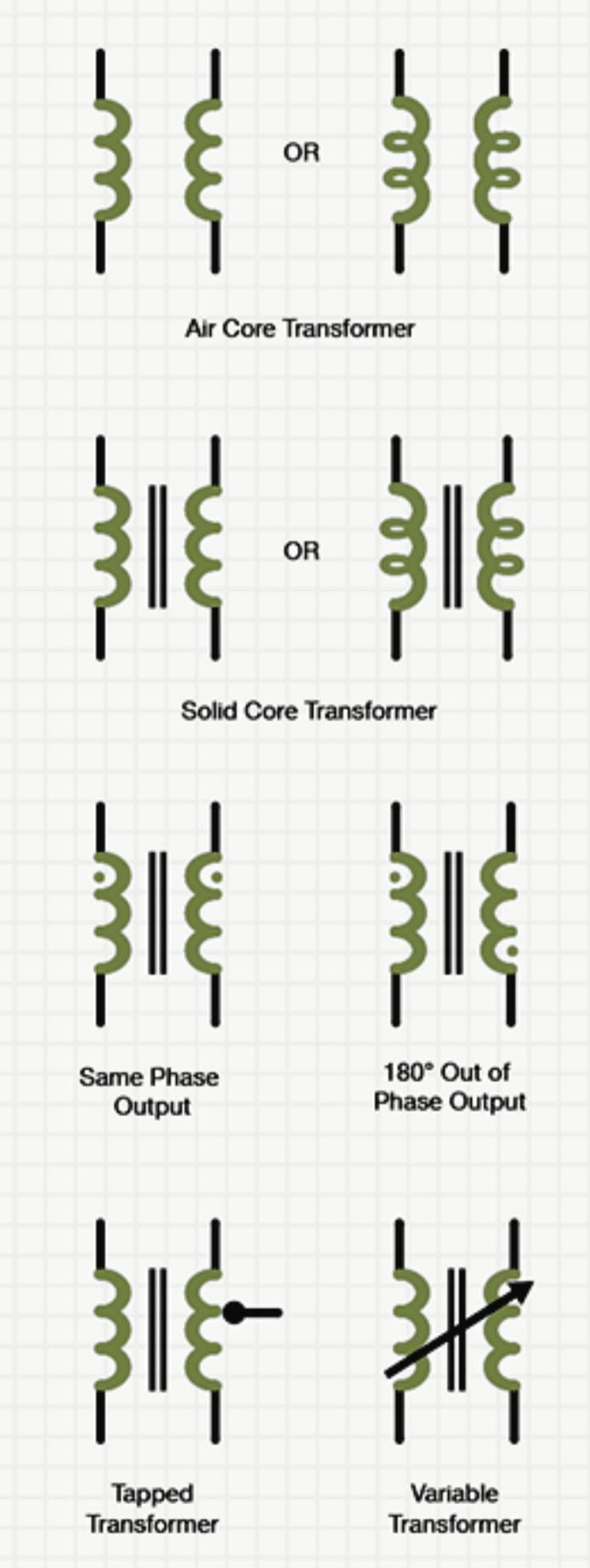
Inductors



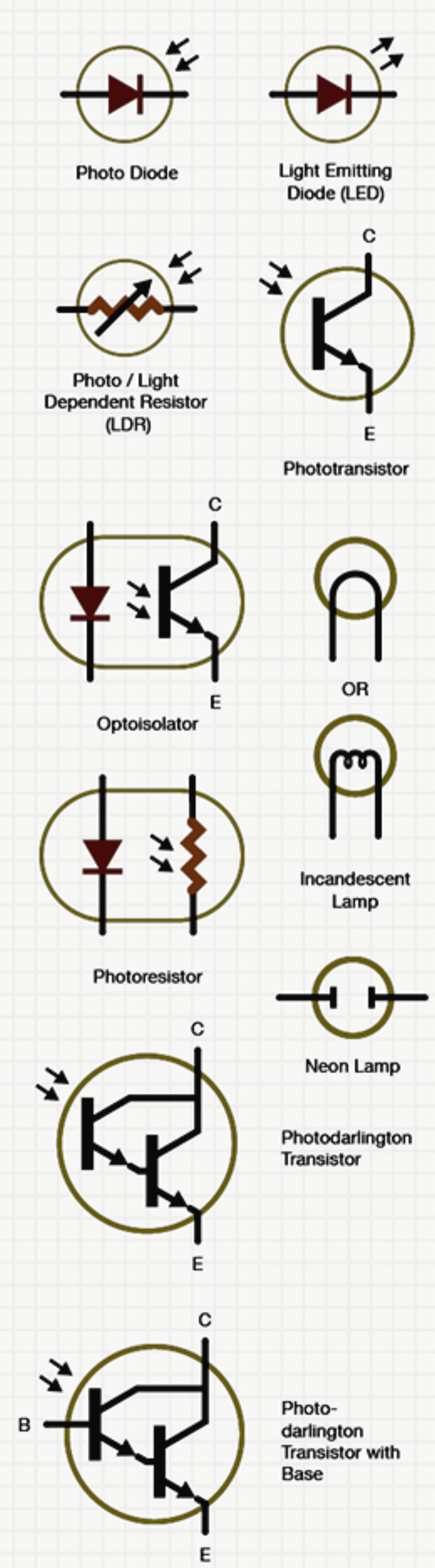
Diodes



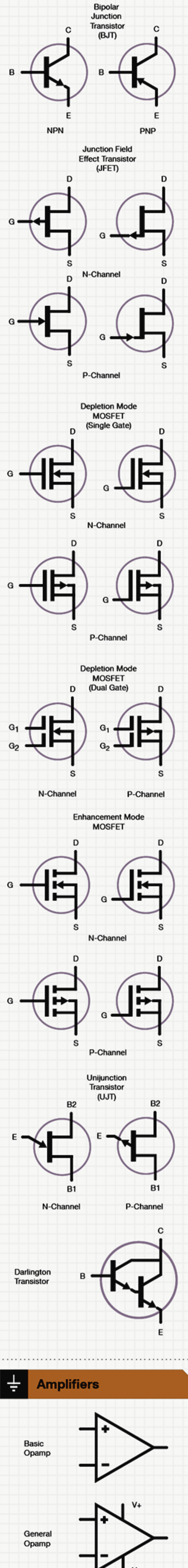
Transformers



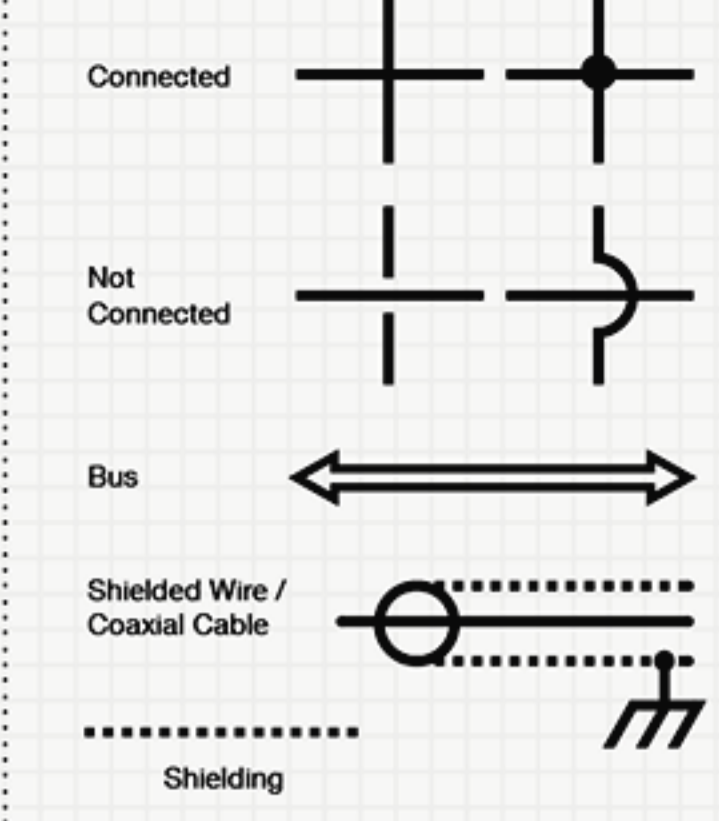
Optoelectronics



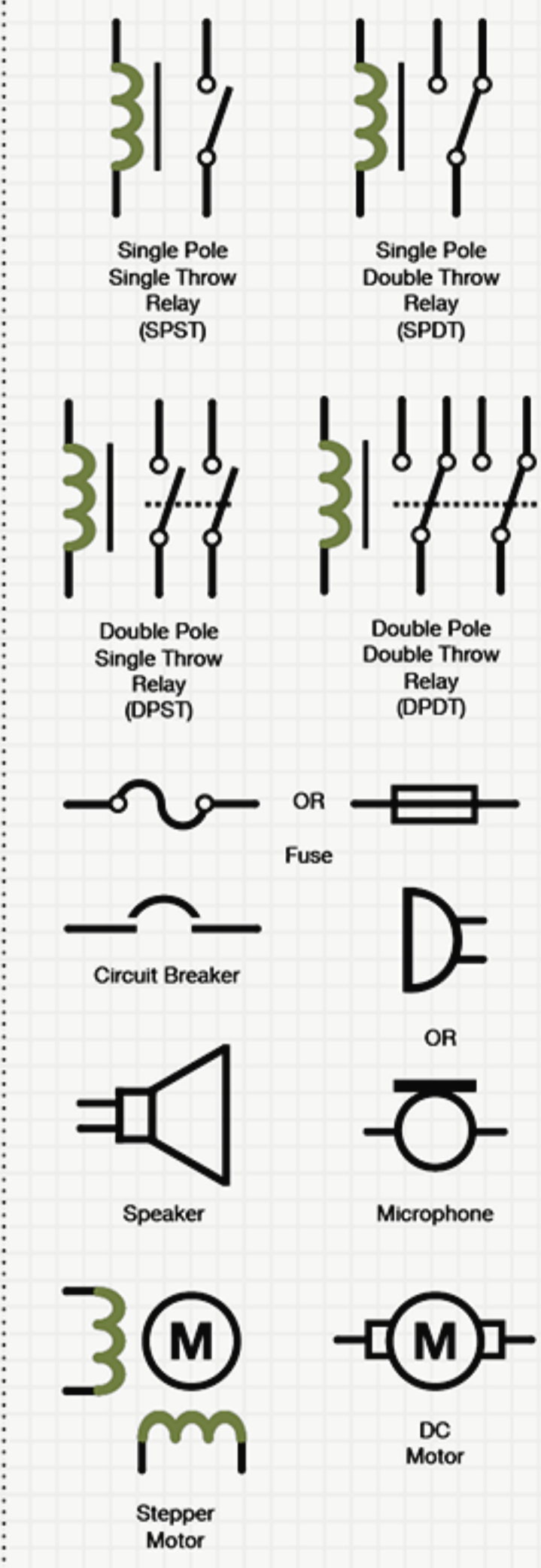
Transistors



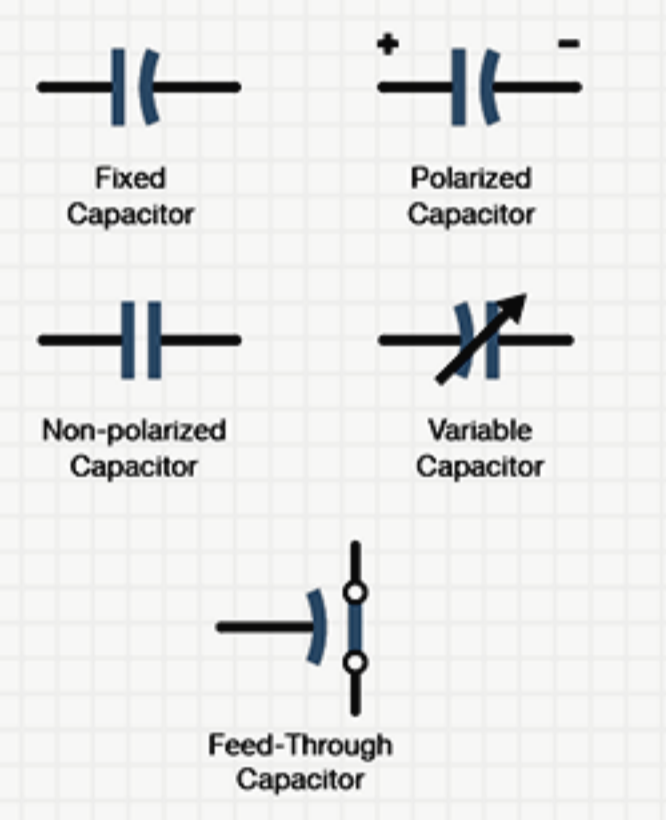
Wiring



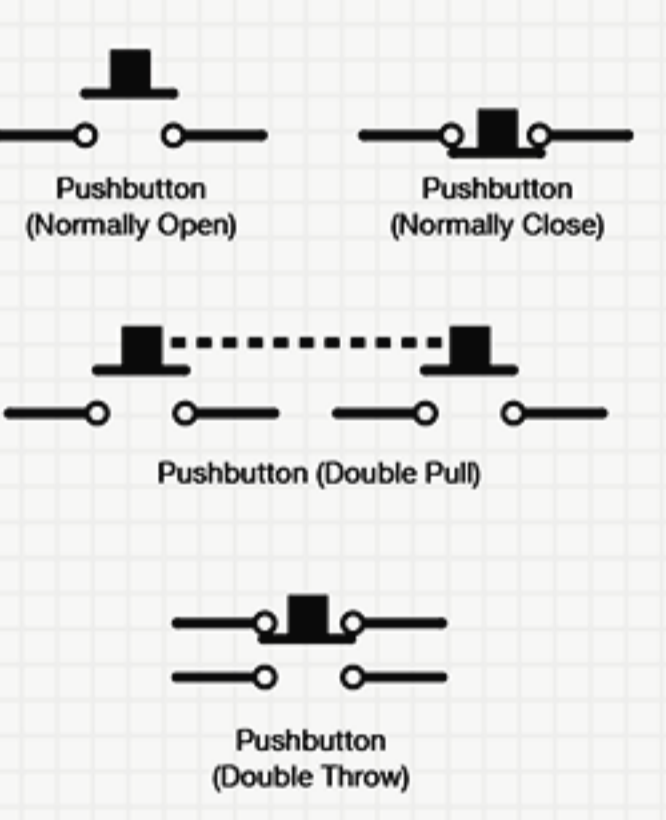
Electromechanical



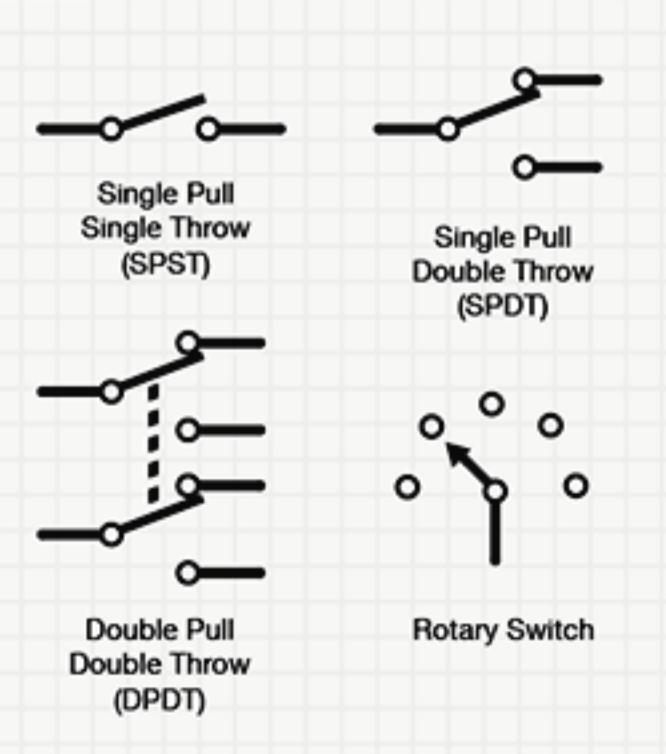
Capacitors



Push Buttons



Switches

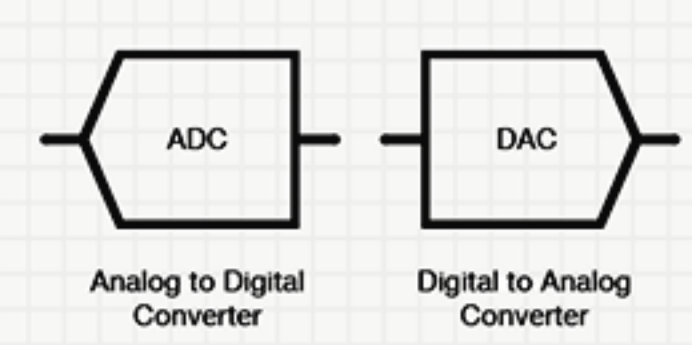


Other Stuff

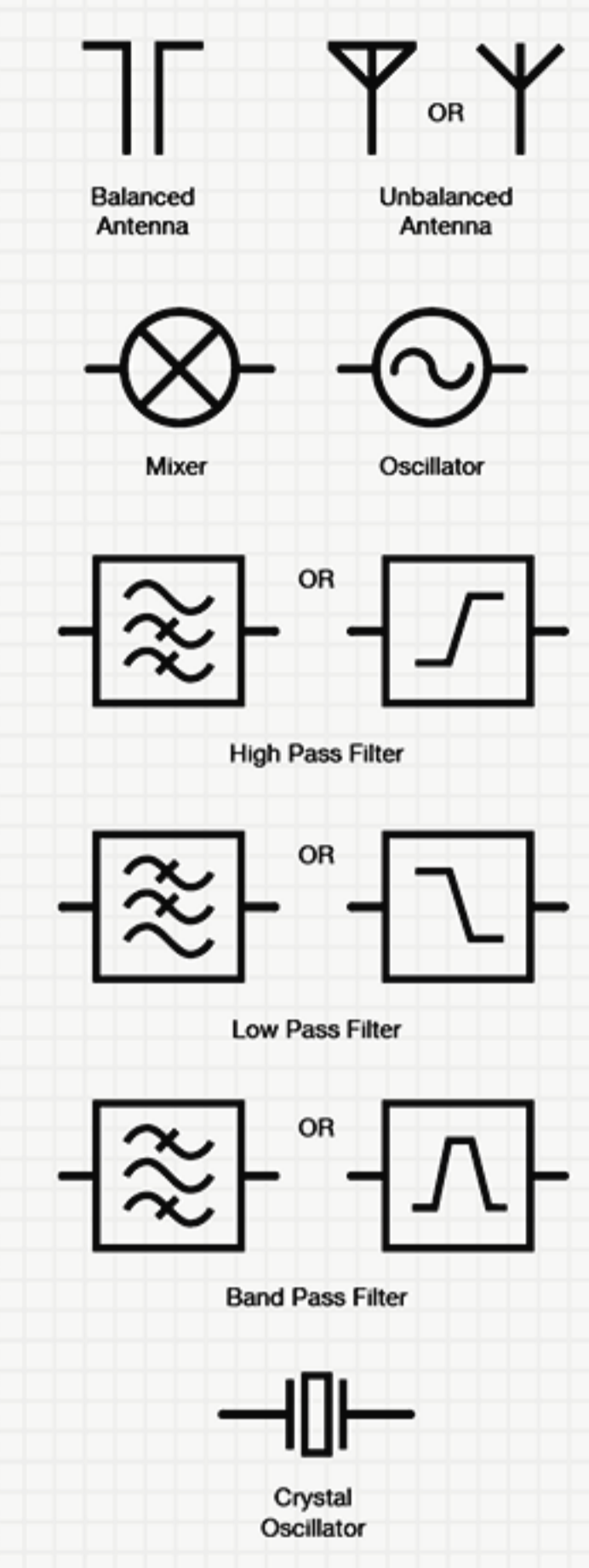
References
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 Web Sources: dangerousprototypes.com, blog.ricardorturocabral.com, sizes.com, en.wikipedia.org, venkel.com

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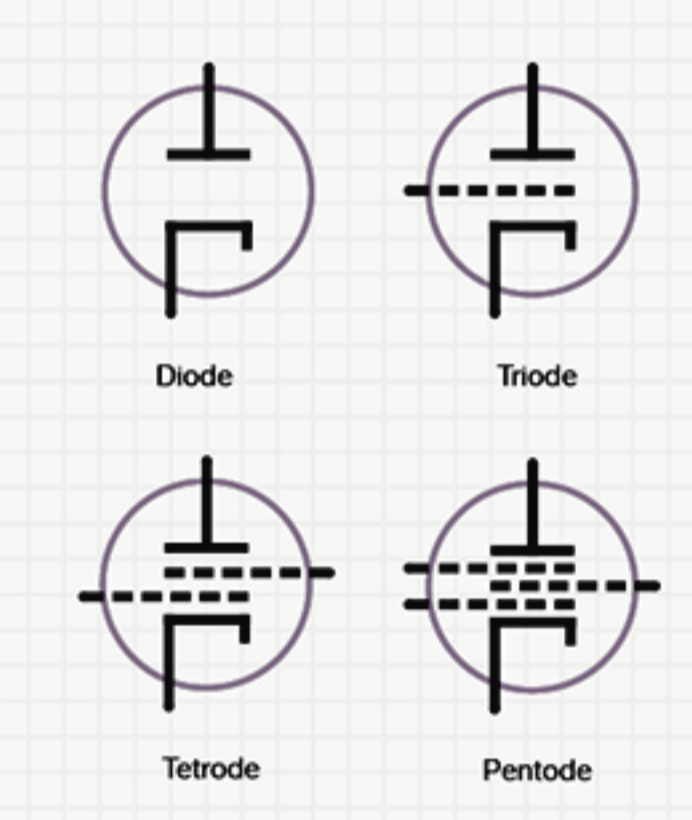
Converters



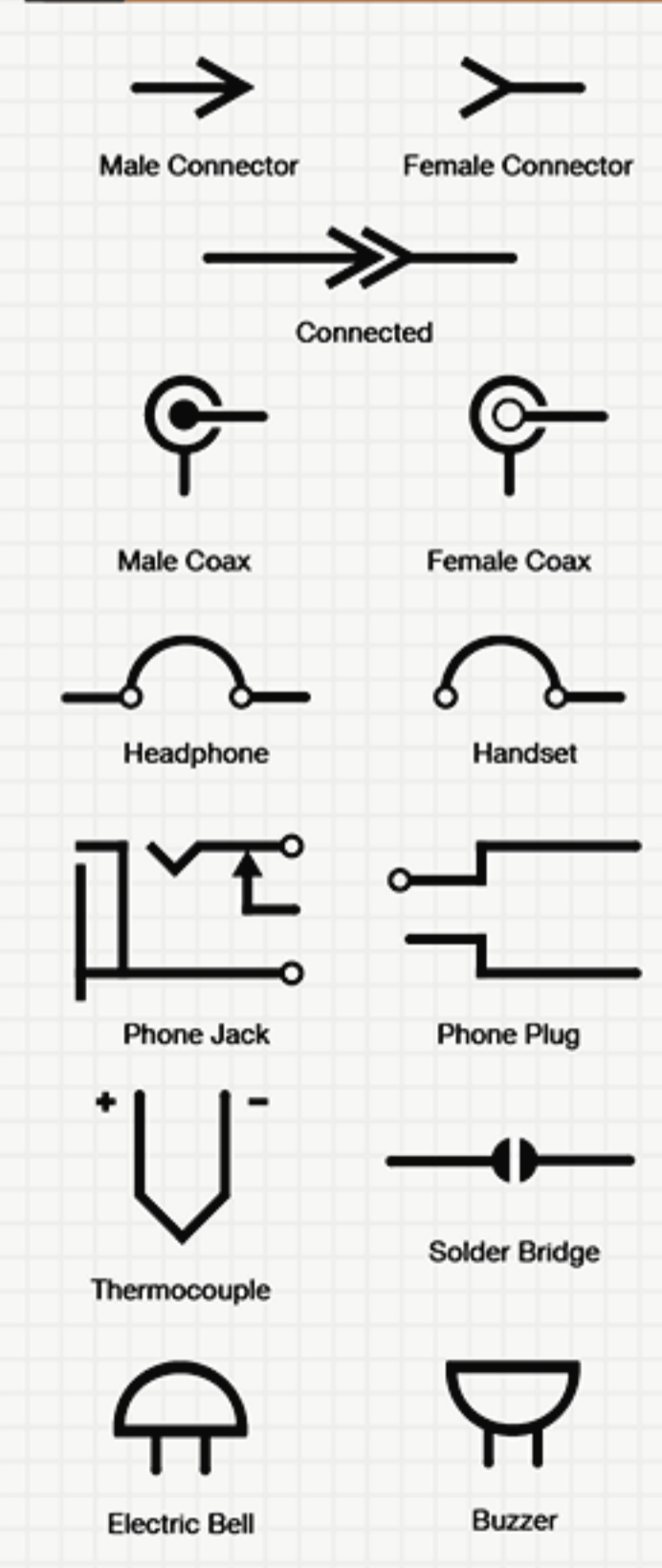
RF / Microwave



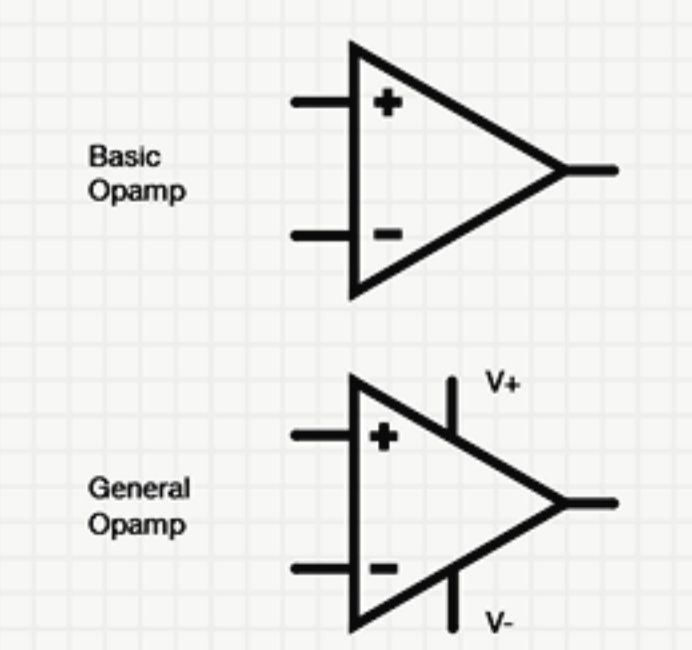
Vacuum Tubes



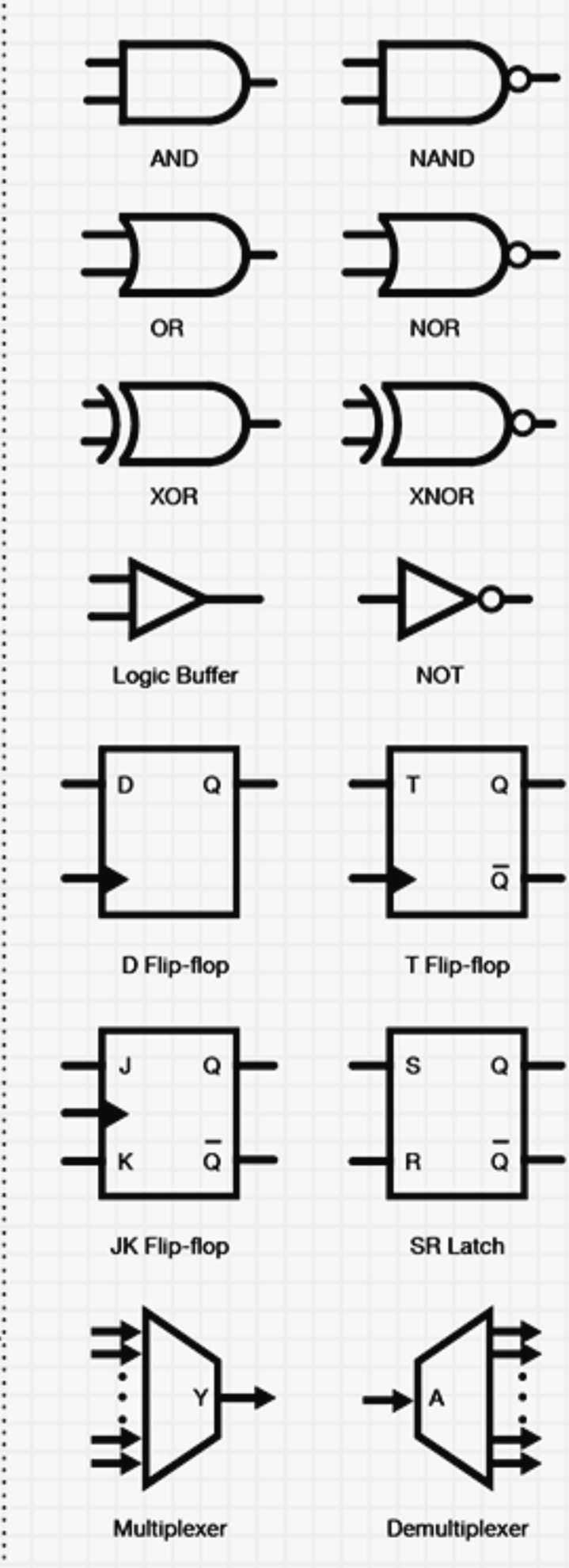
Others



Amplifiers



Logic



Compiled and Illustrated by:
Joseph Ricafort

Let's Keep in Touch!
 Let's keep in touch! Drop me a message if you have some:
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