# Most Important Symbols, Units, Constants, and Abbreviations

**Note:** Owing to historical reasons some symbols have multiple, context-dependent meaning.

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| $*$ | convolution integral (binary oper.); complex conjugate (superscript) |
| A | ampere, basic SI unit of el. current |
| $A$ | amplification; amplitude; area, [m$^2$] |
| $A_\mathrm{v}$ | voltage amplification |
| $A_\mathrm{c}$ | current amplification |
| $a$ | acceleration, [m/s$^2$] |
| AC | alternating current |
| C | unit of charge, coulomb, [C] = [As]; constant of integration |
| $C$ | capacitance [F, farad]; contour of integration |
| $C_\theta$ | thermal capacitance, [Ws/K] |
| c | light propagation velocity, 299 792 458 m/s |
| CD | critically damped system, all poles real and coincident |
| DC | direct current |
| $D$ | circle diameter |
| $d$ | distance, [m]; wire diameter, [m] |
| $E$ | electric field strength, [V/m] |
| $E_\mathrm{g}$ | energy gap, [eV] (in semiconductors) |
| e | Euler (natural) number, 2.718 281 828 459 045… |
| eV | electron Volt, unit of energy, 1 eV = $1.602 \times 10^{-19}$ VAs |
| F | farad, unit of capacitance, [F] = [As/V] |
| $F$ | force, [N, newton], [N] = [kg m/s$^2$] |
| $F(\omega)$ | rational function in frequency domain |
| $F(s)$ | rational function in complex freq. domain, $F(s) = P(s)/Q(s)$ |
| $f$ | frequency [Hz, hertz], [Hz] = [1/s] |
| $f_\mathrm{h}$ | upper half-power frequency of a non-peaking amplifier |
| $f_\mathrm{H}$ | upper half-power frequency of a peaking amplifier |
| $f(t)$ | function in time domain (usually impulse response) |
| $G$ | conductance, $G = 1/R$ |
| $G(s)$ | function in complex frequency domain, step resp., $G(s) = F(s)/s$ |
| $g_\mathrm{m}$ | mutual transconductance |
| $g(t)$ | function in time domain, usually step response, $g(t) = h(t)*f(t)$ |
| H | unit of inductance, [H, henry], [H] = [Vs/A] |
| $H(s)$ | Heaviside function in complex frequency domain, $H(s) = 1/s$ |
| $h(t)$ | Heaviside function, unit step |
| $I$ | current amplitude [A, ampere], (DC or a complex phasor) |
| i | index (subscript) |
| $i$ | instantaneous current [A, ampere] |
| $j$ | imaginary unit, $\sqrt{-1}$ |
| K | kelvin, absolute temperature, 0 K = −273.15 °C = −459.67 °F, $\Delta T$[1K] = [1°C] = [1.8 °F] |
| $k$ | magnetic field coupling factor of a coil; counting index |
| $k_\mathrm{B}$ | Boltzmann constant, $1.38 \times 10^{-23}$ VAs/K |
| kg | kilogram, basic SI unit of mass |
| $L$ | inductance, [H, henry], [H] = [Vs/A] |
| $\mathcal{L}\{\}$ | direct Laplace transform |
| $\mathcal{L}^{-1}\{\}$ | inverse Laplace transform |
| $l$ | length of coil winding, [m] |
| $M$ | mutual inductance [H, henry]; modulus (magnitude) |
| MFA | maximally flat amplitude |
| MFED | maximally flat envelope delay |
| $m$ | coil parameter |
| $m_\mathrm{e}$ | electron mass, $9.1095 \times 10^{-31}$ kg |
| m | meter, basic SI unit of length |
| $N$ | total number of turns of a coil |
| $n$ | system order number (n. of poles); specific number of turns (per unit length) of a coil; capacitance ratio |

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| $P$ | electric power [W, watt]; |
| $P_n$ | polynomial of order $n$ |
| $p$ | pole (polynomial denominator's zero) |
| $Q_m$ | polynomial of order $m$ |
| $Q_1$ | transistor label |
| $q_\mathrm{e}$ | electron charge, $1.602 \times 10^{-19}$ As |
| $R$ | resistance [Ω, ohm] |
| $R_\theta$ | thermal resistance, [K/W] |
| $r$ | incremental resistance; radius of a circle |
| res | residue (*residuum* [lat.]) |
| rad | radian, unit of angle, [1 rad] $= \dfrac{360^\circ}{2\pi}$ |
| s | second, basic SI unit of time |
| S | unit of conductance, siemens, $[1/\Omega]$ |
| $s$ | complex frequency, $\sigma + j\omega$, |
| $s_\mathrm{i}$ | pole or zero of a transfer function |
| $T$ | time constant, $RC$ or $L/R$; temperature |
| $t$ | time [s, second] |
| $t_\mathrm{r}$ | rise time |
| $u$ | real part of a complex variable; part of a decomposed function |
| V | volt, unit of electric tension (voltage) |
| $V$ | voltage amplitude [V, volt], DC voltage or phasor |
| $v$ | instantaneous voltage [V, volt]; imaginary part of a complex variable; part of a decomposed function; velocity, [m/s] |
| W | watt, unit of power, [W] = [VA] |
| $X$ | reactance, the imaginary part of an impedance |
| $x$ | general variable |
| $Y$ | admittance (complex), $Y = 1/Z$ |
| $y$ | general function or operation result |
| $Z$ | impedance (complex), $R + jX$ |
| $z$ | complex variable; polynomial zero |

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| $\alpha$ | current ratio $i_\mathrm{c}/i_\mathrm{e} = \beta/(1+\beta)$ |
| $\beta$ | transistor current gain, $i_\mathrm{c}/i_\mathrm{b}$ |
| $\Delta$ | difference |
| $\delta$ | overshoot [%]; spacing between adjacent turns of a coil [m] |
| $\delta(t)$ | Dirac function, ideal impulse |
| $\varepsilon$ | electrical permittivity, dielectric constant |
| $\varepsilon_0$ | electrical permittivity of vacuum, $8.8542 \times 10^{-12}$ As/Vm |
| $\varepsilon_\mathrm{r}$ | relative electrical permittivity |
| $\eta_\mathrm{b}$ | bandwidth improvement factor (extension) |
| $\eta_\mathrm{r}$ | rise time improvement factor (decrease) |
| $\theta$ | pole angle, $\arctan(\sigma/\omega)$ |
| $\mu$ | magnetic permeability, $\mu = \mu_0\,\mu_\mathrm{r}$; mobility of charge carriers |
| $\mu_0$ | magnetic permeability of vacuum, $1/(4\pi \times 10^7)$ Vs/Am |
| $\mu_\mathrm{r}$ | relative magnetic permeability |
| $\prod$ | product |
| $\pi$ | Ludolph number, 3.141 592 653… |
| $\sum$ | sum |
| $\sigma$ | real part of a pole |
| $\tau$ | dummy time variable |
| $\tau_\mathrm{T}$ | transistor time constant, $1/\omega_\mathrm{T}$ |
| $\tau_\mathrm{r}$ | rise time |
| $\varphi$ | phase angle |
| $\chi$ | frequency ratio, $\omega/\omega_\mathrm{h}$ |
| $\Omega$ | unit of resistance, Ohm |
| $\omega$ | angular frequency, $2\pi f$; imaginary part of a pole |
| $\omega_\mathrm{h}$ | upper half-power angular frequency of a non-peaking amplifier |
| $\omega_\mathrm{H}$ | upper half-power angular frequency of a peaking amplifier |
| $\omega_\mathrm{T}$ | transistor transition frequency at which $\beta(\omega_\mathrm{T}) = 1$ |

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| $\Im\{\}$ | imaginary part of a complex quantity |
| $\Re\{\}$ | real part of a complex quantity |