

Units & Prefixes

Introduction

It is important to know the standard units used in electronics. In many cases quantities are very small or very large and prefixes or standard form are used to make the numbers more manageable. Using prefixes, and converting between prefixes and standard form, is a key skill when undertaking calculations for component values etc.

Units

The standard quantities and units used in electronics are, with their corresponding symbols:

Quantity (symbol)	Unit (symbol)
Current (I)	ampere (A)
Voltage (V)	volt (V)
Resistance (R)	ohms (Ω)
Energy (E)	joules (J)
Power (W)	watts (W)
Charge (Q)	coulomb (C)
Time (t)	seconds (s)
Frequency (f)	hertz (Hz)
Capacitance (C)	farads (F)

Prefixes & Standard Form

Quantities in electronics are quite often very large or very small. Writing out the quantity with lots of zeros is inconvenient and confusing, leading to mistakes. To represent large and small quantities prefixes are used to modify the unit or standard form is used in place of the extra zeros. It does not matter which system is adopted but it is often easier to talk about quantities using prefixes and to do calculations using standard form.

For example a current of 0.005 A is more conveniently talked about as 5 mA and more readily used in calculations as 5×10^{-3} A

Working with small numbers

Prefix name	Symbol	Prefix meaning	Standard Form
Milli	m	$\div 1000$	$\times 10^{-3}$
Micro	μ	$\div 1000,000$	$\times 10^{-6}$
Nano	n	$\div 1000,000,000$	$\times 10^{-9}$
Pico	p	$\div 1000,000,000,000$	$\times 10^{-12}$

For example, a voltage of 8 μ V in standard units is $8 \div 1000,000 = 0.000008$ V

For example, 0.0035 V can be more conveniently written as 3.5 mV because 1 mV = 0.001 V

Working with large numbers

Prefix name	Symbol	Prefix meaning	Standard Form
Kilo	k	$\times 1000$	$\times 10^3$
Mega	M	$\times 1000,000$	$\times 10^6$
Giga	G	$\times 1000,000,000$	$\times 10^9$
Tera	T	$\times 1000,000,000,000$	$\times 10^{12}$

For example, a resistance of 4.7 k Ω in standard units is $4.7 \times 1000 = 4700$ Ω

A voltage of 25,000 V is more conveniently written as 25 kV because 1 kV = 1000 V

Website

<http://www.pfnicholls.com/Electronics/units.html>

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