TEJ Electronics Quick Reference

Units, notation, GUESS, formulas, series circuits, and parallel circuits

Quantities, letters, and units

Quantity	Letter	Unit	Symbol	Meaning
Current	I	ampere	A	Rate of electric charge flow.
Voltage	V	volt	V	Electrical push between two points.
Resistance	R	ohm	Ω	Opposition to current.
Power	P	watt	W	Rate of energy transfer.
Energy	E	joule	J	Work supplied or used.
Charge	Q	coulomb	C	Amount of electric charge.
Time	t	second	s	Duration of an event.

Significant figures

Situation	Rule
Multiply or divide	Use the fewest significant figures.
Add or subtract	Use the fewest decimal places.
During the work	Keep the full calculator value.
Final answer	Round once. Include prefix and unit.
Engineering form	Use a power of ten in steps of three so a non-zero value is from 1 to less than 1000.

Common metric prefixes

Prefix	Symbol	Power	Example
giga	G	10^{9}	2.4 GHz
mega	M	10^{6}	3.3 MΩ
kilo	k	10^{3}	4.7 kΩ
none	none	10^{0}	12 V
milli	m	10^{-3}	47 mA
micro	μ	10^{-6}	220 μF
nano	n	10^{-9}	100 nF
pico	p	10^{-12}	22 pF

Engineering notation examples

Original	Engineering notation	Prefix form	Calculator entry
0.000 047 A	47×10^{-6} A	47 μA	`47 EXP -6`
4700 Ω	4.7×10^{3} Ω	4.7 kΩ	`4.7 EXP 3`
2 200 000 Hz	2.2×10^{6} Hz	2.2 MHz	`2.2 EXP 6`

Capital letters matter: M means mega, but m means milli. The calculator may display `E` instead of $\times 10^{n}$.

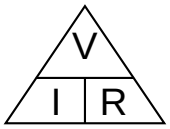
GUESS method

Letter	Step	What to write
G	Given	Known symbols, values, and units.
U	Unknown	What must be found and its unit.
E	Equation	General equation first, then rearrange it.
S	Substitute	Numbers and units in the rearranged equation.
S	Solve	Full value, rounded value, prefix, unit, and answer sentence.

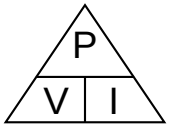
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Circuit Calculations

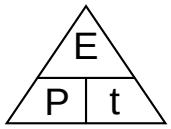
Choose the rule that matches the circuit and the known values



Ohm's law



Power



Energy

Ohm's law

Find	Formula	Unit
Voltage	$V = I \times R$	V
Current	$I = \frac{V}{R}$	A
Resistance	$R = \frac{V}{I}$	Ω

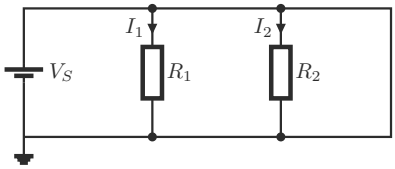
Power and energy

Question gives	Formula	Unit
V and I	$P = V \times I$	W
I and R	$P = I^2 \times R$	W
V and R	$P = \frac{V^2}{R}$	W
P and seconds	$E = P \times t$	J
P and hours	$E = P \times t$	Wh

Unit checks

$V/A = \Omega$, $V/\Omega = A$, $A \times \Omega = V$, and $V \times A = W$. Also, $1\ W = 1\ J/s$ and $1\ Wh = 3600\ J$.

Parallel circuits: more than one path

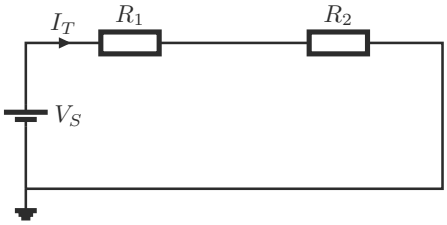


separate branches, same voltage across every branch

Quantity	General rule
Voltage	$V_T = V_1 = V_2 = \cdots$
Current	$I_T = I_1 + I_2 + \cdots$
Resistance	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$
Two resistors	$R_T = \frac{R_1 R_2}{R_1 + R_2}$
Power	$P_T = P_1 + P_2 + \cdots$

Check: $R_T <$ every branch resistance.

Series circuits: one path



one path, same current through every component

Quantity	General rule
Current	$I_T = I_1 = I_2 = \cdots$
Voltage	$V_T = V_1 + V_2 + \cdots$
Resistance	$R_T = R_1 + R_2 + \cdots$
Summation	$R_T = \sum_{i=1}^{n} R_i$
Power	$P_T = P_1 + P_2 + \cdots$

Check: the voltage drops add to the source voltage.

Standard 5% resistor values

E24 values in each decade: **10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91**. Multiply by a power of ten, for example 47 Ω, 470 Ω, 4.7 kΩ, or 47 kΩ.

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