Thévenin and Norton Equivalent from Open- and Short-Circuit Tests

Thévenin voltage and resistance and Norton current of a source from its open-circuit voltage and short-circuit current, with the load current and power.

Method: Thévenin and Norton theorems

Input parameters

Unit system: SI

Parameter	Value	Unit
Open-circuit voltage	12.000	V
Short-circuit current	3.0000	A
Load resistance	6.0000	Ω

Calculated results

Parameter	Value	Unit
Thévenin (and Norton) resistance	4.0000	Ω
Load current	1.2000	A
Load voltage	7.2000	V
Load power	8.6400	W
Maximum power (at R_L = R_th)	9.0000	W
Share of source power reaching the load	60.000	%

Notes for this case

• Any linear two-terminal network behaves as a voltage source V_th = V_oc in series with R_th, or a current source I_N = I_sc in parallel with the same resistance, R_th = V_oc/I_sc. The load then draws V_oc/(R_th + R_L). Maximum power reaches a load equal to R_th, but only at 50 % efficiency; power systems run at loads far above R_th for efficiency. Measure I_sc only where a short circuit is safe, or find R_th with the sources set to zero.

Formula and method

$$R_{th} = \frac{V_{oc}}{I_{sc}}, \quad I_L = \frac{V_{oc}}{R_{th} + R_L}, \quad P_{max} = \frac{V_{oc}^2}{4R_{th}}$$

Variables

V_{oc}	Open-circuit voltage	V
I_{sc}	Short-circuit current	A
R_L	Load resistance	Ω
R_{th}	Thévenin (and Norton) resistance	Ω
I_L	Load current	A
V_L	Load voltage	V
P_L	Load power	W
P_{max}	Maximum power (at R_L = R_th)	W
η	Share of source power reaching the load	-

Method and standards

Thévenin.

Assumptions and limits

- Linear network; DC or a single frequency.

References

Thévenin and Norton theorems

Report details

Report reference	FCC-ECSY-RZ8Z (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Thévenin and Norton Equivalent from Open- and Short-Circuit Tests
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/circuits/thevenin-norton-equivalent

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.