Maximum Power Transfer Theorem Calculator

Power delivered to a load from a source of given voltage and internal resistance, the efficiency, and the maximum power when the load matches the source.

Method: Maximum power transfer theorem (Jacobi's law)

Input parameters

Unit system: SI

Parameter	Value	Unit
Source (Thévenin) voltage	12.000	V
Source (internal) resistance	4.0000	Ω
Load resistance	8.0000	Ω

Calculated results

Parameter	Value	Unit
Current	1.0000	A
Power in the load	8.0000	W
Efficiency R_L / (R_th + R_L)	66.667	%
Maximum power (at R_L = R_th)	9.0000	W
Share of the maximum delivered	88.889	%

Formula and method

$$P_L = \frac{V_{th}^2 R_L}{(R_{th} + R_L)^2}, \quad P_{max} = \frac{V_{th}^2}{4R_{th}}$$

Variables

V_{th}	Source (Thévenin) voltage	V
R_{th}	Source (internal) resistance	Ω
R_L	Load resistance	Ω
I	Current	A
P_L	Power in the load	W
η	Efficiency R_L / (R_th + R_L)	-
P_{max}	Maximum power (at R_L = R_th)	W
P_L/P_{max}	Share of the maximum delivered	-

Method and standards

Derivative of load power with respect to R_L is zero at R_L = R_th.

Assumptions and limits

- Resistive source and load.

References

- Maximum power transfer theorem (Jacobi's law)

Report details

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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/maximum-power-transfer

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Reopens the calculator with the inputs of this report.