LED Series Resistor Calculator

Series resistor for one or more LEDs from the supply voltage, LED forward voltage and current, with the power in the resistor and the circuit efficiency.

Method: Ohm's law across the series resistor

Input parameters

Unit system: SI

Parameter	Value	Unit
Supply voltage	12.000	V
Forward voltage of one LED	2.0000	V
LED current	20.000	mA
LEDs in series	3.0000	

Calculated results

Parameter	Value	Unit
Series resistor	300.00	Ω
Power in the resistor	0.12000	W
Power in the LEDs	0.12000	W
Share of the power reaching the LEDs	50.000	%

Notes for this case

- Choose the next higher standard resistor and a power rating at least twice P_R.

Formula and method

$$R = \frac{V_s - nV_f}{I}, \quad P_R = (V_s - nV_f)\, I$$

Variables

V_s	Supply voltage	V
V_f	Forward voltage of one LED	V
I	LED current	A
n	LEDs in series	-
R	Series resistor	Ω
P_R	Power in the resistor	W
P_{LED}	Power in the LEDs	W
η	Share of the power reaching the LEDs	-

Method and standards

The resistor drops the voltage the LEDs do not.

Assumptions and limits

- Constant forward voltage.

References

- Ohm's law across the series resistor

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/led-series-resistor

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.