Adjustable Linear Regulator (LM317 Type): Resistors and Dissipation

Programming resistor for a 1.25 V adjustable linear regulator such as the LM317, with the adjust-pin error, minimum input voltage and regulator dissipation.

Method: Adjustable three-terminal regulator relations

Input parameters

Unit system: SI

Parameter	Value	Unit
Required output voltage	5.0000	V
Resistor from output to adjust (typically 240 Ω)	240.00	Ω
Reference voltage	1.2500	V
Adjust-pin current	0.050000	mA
Input voltage	12.000	V
Load current	0.50000	A
Dropout voltage	2.5000	V

Calculated results

Parameter	Value	Unit
Resistor from adjust to ground	713.15	Ω
R_2 ignoring the adjust current	720.00	Ω
Minimum input voltage V_out + V_do	7.5000	V
Regulator dissipation (V_in − V_out) I_out	3.5000	W
Efficiency V_out/V_in	41.667	%

Notes for this case

• V_out = V_ref(1 + R_2/R_1) + I_adj R_2. Keep the current through R_1 above the regulator's minimum load (about 3.5–10 mA) and choose the nearest standard R_2.

Formula and method

$$V_{out} = V_{ref}\left(1+\frac{R_2}{R_1}\right) + I_{adj}R_2 \;\Rightarrow\; R_2 = \frac{V_{out}-V_{ref}}{V_{ref}/R_1 + I_{adj}}, \quad P_D = (V_{in}-V_{out})I_{out}$$

Variables

V_{out}	Required output voltage	V
R_1	Resistor from output to adjust (typically 240 Ω)	Ω
V_{ref}	Reference voltage	V
I_{adj}	Adjust-pin current	A
V_{in}	Input voltage	V
I_{out}	Load current	A
V_{do}	Dropout voltage	V
R_2	Resistor from adjust to ground	Ω
$R_{2,ideal}$	R_2 ignoring the adjust current	Ω
$V_{in,min}$	Minimum input voltage V_out + V_do	V

P_D	Regulator dissipation (V_in − V_out) I_out	W
η	Efficiency V_out/V_in	-

Method and standards

Adjustable linear regulator design.

Assumptions and limits

- Typical datasheet values for V_ref, I_adj and dropout.

References

Adjustable three-terminal regulator relations

Report details

Report reference	FCC-4NAD-673R (the same inputs always give the same reference)
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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/electronics/lm317-regulator-resistors

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.