EngineeringRise

LED, photodiode, solar cell and Zener diode

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Photon energy and wavelength	E = h c/lambda; lambda (nm) = 1240/E (eV) Valid when: photon energy; the 1240 shortcut needs lambda in nm, E in eV	J or eV (nm)
LED series resistor	R = (V_supply - V_LED)/I Valid when: LED forward biased with constant forward drop	ohm
Photodiode threshold	lambda_max = h c/E_g Valid when: photon energy at least equal to the band gap	m or nm
Photocurrent	I_photo proportional to intensity (fixed reverse bias) Valid when: reverse biased, photon energy above gap, negligible dark current	A
Solar cell power and efficiency	P = V I at working point; efficiency = P/(I_light x area) Valid when: solar cell at its working point, V and I from the operating point	W (percent)
Series current in regulator	I = (V_in - V_z)/R_s Valid when: Zener in breakdown, current through series resistor	A
Zener current	I_Z = I - V_z/R_L Valid when: Zener in breakdown with load across it	A
Zener power	P = V_z I_Z; I_Z(max) = P_max/V_z Valid when: Zener in breakdown at constant V_z	W
Bias modes	LED forward; photodiode reverse; solar cell none; Zener reverse breakdown	none

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/physics/electronic-devices/led-photodiode-solar-cell-and-zener-diode

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