Photon Energy, Band Gap Cutoff and Photon Flux

Photon energy at a wavelength, the cutoff wavelength of a semiconductor band gap, photons per watt and the share of a photon's energy a cell can use.

Method: Planck relation E = hc/λ

Input parameters

Unit system: SI

Parameter	Value	Unit
Wavelength	550.00	nm
Band gap	1.1200	eV

Calculated results

Parameter	Value	Unit
Photon energy	2.2543	eV
Cutoff wavelength of the band gap	1,107.0	nm
Photons per second per watt	2.7688e+18	
Share of photon energy usable (if E > E_g)	49.684	%
Absorbed (1) or not (0)	1.0000	

Notes for this case

• E = hc/λ (1,239.84 eV·nm/λ); photons with less energy than the band gap pass through, and the excess above E_g is lost as heat. Silicon (1.12 eV) cuts off near 1,107 nm.

Formula and method

$$E = \frac{hc}{\lambda}, \quad \lambda_c = \frac{hc}{E_g}$$

Variables

λ	Wavelength	m
E_g	Band gap	J
E	Photon energy	J
λ_c	Cutoff wavelength of the band gap	m
$\dot{N}/P$	Photons per second per watt	-
E_g/E	Share of photon energy usable (if E > E_g)	-
$E > E_g$	Absorbed (1) or not (0)	-

Method and standards

Photon energy.

Assumptions and limits

- Single photon energy; ideal absorption above the gap.

References

Planck relation E = hc/λ

Report details

Report reference	FCC-A2Z7-TJHR (the same inputs always give the same reference)
Generated	23 November 2026, 17:51 UTC
Calculator	Photon Energy, Band Gap Cutoff and Photon Flux
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/solar-pv/photon-energy-band-gap

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.