PV Cell Temperature from NOCT and Temperature-corrected Efficiency

Cell temperature of a PV module from ambient temperature, irradiance and NOCT, with an optional wind correction, and the module efficiency and output there.

Input parameters

Unit system: SI

Parameter	Value	Unit
Ambient temperature	42.000	°C
Irradiance on the module	1,000.0	W/m²
Nominal operating cell temperature (data sheet)	44.000	°C
Module efficiency at the operating point (first estimate)	20.000	%
Transmittance-absorptance (about 0.9)	90.000	%
Wind correction	Correct for wind speed	
Wind speed	4.0000	m/s
Module efficiency at 25 °C STC	21.000	%
Power temperature coefficient (per K, e.g. 0.0035)	0.003400	
Module area	2.0000	m²

Calculated results

Parameter	Value	Unit
Cell temperature	52.606	°C
Rise above ambient	10.606	K
Module efficiency at the cell temperature	19.029	%
Module output	380.58	W

Notes for this case

• NOCT is measured at 800 W/m², 20 °C ambient and 1 m/s wind with the module open-circuited. The efficiency term (1 − η/τα) is small; the linear temperature coefficient is the usual data-sheet model for crystalline silicon.

Formula and method

$$T_c - T_a = (T_{NOCT} - 20)\frac{G_T}{800}\left(1 - \frac{\eta_c}{\tau\alpha}\right) \quad \left[\times \frac{9.5}{5.7 + 3.8V}\right]$$

$$\eta = \eta_{ref}[1 - \beta_{ref}(T_c - 25)]$$

Variables

T_a	Ambient temperature	K
G_T	Irradiance on the module	W/m²
T_{NOCT}	Nominal operating cell temperature (data sheet)	K
η_c	Module efficiency at the operating point (first estimate)	-
$(\tau\alpha)$	Transmittance-absorptance (about 0.9)	-
wind	Wind correction	-
V	Wind speed	m/s
η_{ref}	Module efficiency at 25 °C STC	-

β_{ref}	Power temperature coefficient (per K, e.g. 0.0035)	-
A	Module area	m²
T_c	Cell temperature	K
$T_c - T_a$	Rise above ambient	K
η	Module efficiency at the cell temperature	-
P	Module output	W

Method and standards

NOCT energy balance scaling of module temperature.

Assumptions and limits

- Open-rack mounting; roof-integrated modules run hotter.

Report details

Report reference	FCC-WQDA-KBZW (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	PV Cell Temperature from NOCT and Temperature-corrected Efficiency
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/pv-cell-temperature-noct

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.