

Characteristics of a PV module

Manufacturer, model : **Trina Solar, TSM-410DE09**

Availability : Prod. Since 2021

Data source : UL 2021

STC power (manufacturer)	Pnom	410 Wp	Technology	Si-mono
Module size (W x L)	1.096 x 1.754	m ²	Rough module area	Amodule 1.92 m ²
Number of cells	2 x 60		Sensitive area (cells)	Acells 1.76 m ²
Specifications for the model (manufacturer or measurement data)				
Reference temperature	TRef	25 °C	Reference irradiance	GRef 1000 W/m ²
Open circuit voltage	Voc	41.6 V	Short-circuit current	Isc 12.40 A
Max. power point voltage	Vmpp	34.6 V	Max. power point current	Impp 11.85 A
=> maximum power	Pmpp	410.0 W	Isc temperature coefficient	mulsc 4.9 mA/°C

One-diode model parameters

Shunt resistance	Rshunt	180 ohm	Diode saturation current	IoRef 0.012 nA
Serie resistance	Rserie	0.14 ohm	Voc temp. coefficient	MuVoc -133 mV/°C
			Diode quality factor	Gamma 0.98
Specified Pmax temper. coeff.	muPMaxR	-0.38 %/°C	Diode factor temper. coeff.	muGamma -0.001 1/°C

Reverse Bias Parameters, for use in behaviour of PV arrays under partial shadings or mismatch

Reverse characteristics (dark)	BRev	3.20 mA/V ²	(quadratic factor (per cell))	
Number of by-pass diodes per module		3	Direct voltage of by-pass diodes	-0.7 V

Model results for standard conditions (STC: T=25° C, G=1000 W/m², AM=1.5)

Max. power point voltage	Vmpp	35.1 V	Max. power point current	Impp 11.72 A
Maximum power	Pmpp	411.1 Wc	Power temper. coefficient	muPmpp -0.37 %/°C
Efficiency(/ Module area)	Eff_mod	21.4 %	Fill factor	FF 0.797
Efficiency(/ Cells area)	Eff_cells	23.3 %		

