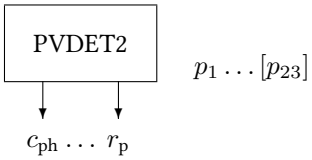
Block PVDET2

The PVDET2 block determines the two-diode-model parameters for c-Si modules from data sheet values and writes a .bp file.





Name	PVDET2
Function	se0025
Inputs	0
Outputs	6
Parameters	18 . . . [23]
Strings	6
Group	C

Inputs

None

Outputs

1 Coefficient of short-circuit current density c_{ph} / V^{-1}
2 Temperature coefficient of short-circuit current c_{t} / $\mathrm{V}^{-1}\,\mathrm{K}^{-1}$
3 Coefficient of saturation current density (Shockley diode) c_{s} / $\mathrm{A\,m}^{-2}\,\mathrm{K}^{-3}$
4 Coefficient of recombination current density (Recombination diode) c_{r} / $\mathrm{A\,m}^{-2}\,\mathrm{K}^{-5/2}$
5 Series resistance parameter r_{s} / $\Omega\,\mathrm{m}^2$
6 Parallel resistance parameter r_{p} / $\Omega\,\mathrm{m}^2$

Parameters

1 Cells in series per module
2 Cells in parallel per module
3 Single cell area / m^2
4 Module area / m^2
5 Maximum power point voltage at STC V_{m} / V
6 Maximum power point current at STC I_{m} / A

7 Open-circuit voltage at STC V_{oc} / V
8 Temperature coefficient of open circuit voltage α_v / $V K^{-1}$
9 Short-circuit current at STC I_{sc} / A
10 Temperature coefficient of short circuit current α_i / $A K^{-1}$
11 Module tolerance plus / %
12 Module tolerance minus / % (≤ 0)
13 Characteristic module length / m
14 Module mass / kg
15 Absorption coefficient
16 Emission coefficient
17 Specific module heat capacity / $J kg^{-1} K^{-1}$
18 NOCT temperature / °C
19 Overwrite mode
    0 Generate error (default)
    1 Overwrite
20..23 Ignored. They were used for the custom module info file, which isn't supported anymore.

Strings

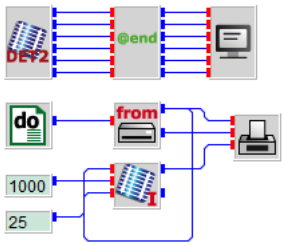
1 INSEL module ID (pv000000 defaults to the smallest free number ≥ 900000 in folder SP(2).)
2 Path to .bp file
3 Module name
4 Manufacturer
5 Cell type (e. g., cristalline)
6 Ignored, see BP(20..23)

Description

The parameters of the one- or two-diode model can be calculated uniquely from the data usually provided on the data sheets of PV module manufacturers by a rather simple set of equations. The PVDET2 block uses these equations to determine the two-diode model parameters.

pvdet2.vseit

A measured I-V curve of a typical crystalline solar cell is used to demonstrate the performance of the PVDET1 block. For the technical details please refer to the description of block PVDET1.



An ATEND block is used to ensure that the SCREEN block shows the resulting values of the six block parameters only once.

```
0.27302E+00 0.22463E-03 0.44022E+04 0.93590E+00 0.97861E-04 0.70507E-01
```

pvdet2.bp

```
              % Filename       pvdet2.bp
              % Module         pvdet2
              % Manufacturer   Manufacturer
              % Cell type      crystalline

              % Mode must be set externally
1             % Number of cells in series N_s per module
1             % Number of cells in parallel N_p per module
1             % Number of modules in series M_s
1             % Number of modules in parallel M_p
0.0156        % Cell area A_c (m^2)
0.016         % Module area A_m (m^2)

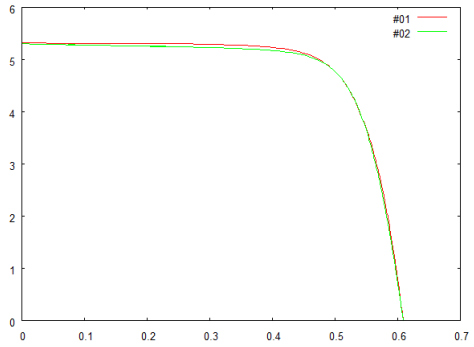
              % Electrical parameters
1.12          % Band gap (eV)
0.273023E+00 % Short-circuit current parameter C_0 (V^-1)
0.224639E-03 % Isc temperature coefficient  C_1 (V^-1 K-^1)
0.440225E+04 % Shockley saturation parameter C_01 (A m-2 K^-3)
0.935907E+00 % Recombination saturation parameter C_02 (A m-2 K^-5/2)
0.978612E-04 % Series resistance r_s (Ohm m^2)
0.705070E-01 % Parallel resistance r_p (Ohm m^2)
0.100000E+01 % Shockley diode ideality factor alpha
    2.000000 % Recombination diode quality beta
0.000000E+00 % Bishop parameter-1
0.000000E+00 % Bishop parameter-2
0.000000E+00 % Bishop parameter-3
0.0           % Module tolerance plus
0.0           % Module tolerance minus

              % Thermal parameters
1.000         % Characteristic module length l_m (m)
1.000         % Module mass m_m (kg)
```

```
  0.70          % Default absorption coefficient a
  0.85          % Default emission factor epsilon
900.0           % Default specific heat of a module C_mod (J kg^-1 K^-1)
 47.0           % Nominal operating cell temperature NOCT (degrees C)
 25.0           % Intial value of cell temperature (degrees C)

                % Numerical parameters (optional)
  1E-5          % Error tolerance of voltage of single cell (V)
100             % Maximal number of iterations to solve I/V-equation
```

The `.bp` file can directly be used in a `.insel` model. The following graph shows a comparison between the measured curve and the curve based on the obtained parameter set.



Since the open-circuit voltage, short-circuit current and maximum power point data are part of the analytical determination of the two-diode-model parameters, these points are met exactly by the method.

See also Blocks PVI, PVV, PVDET1.