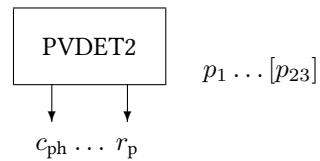


Block PVDET2

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 $c_t / V^{-1} K^{-1}$
- 3 Coefficient of saturation current density (Shockley diode) $c_s / A m^{-2} K^{-3}$
- 4 Coefficient of recombination current density (Recombination diode) $c_r / A m^{-2} K^{-5/2}$
- 5 Series resistance parameter $r_s / \Omega m^2$
- 6 Parallel resistance parameter $r_p / \Omega m^2$

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

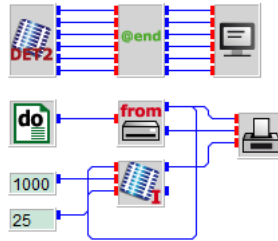
- 7 Open-circuit voltage at STC V_{oc} / V
- 8 Temperature coefficient of open circuit voltage α_v / $V K^{-1}$
- 9 Short-circuit current at STC I_{sc} / A
- 10 Temperature coefficient of short circuit current α_i / $A K^{-1}$
- 11 Module tolerance plus / %
- 12 Module tolerance minus / % (≤ 0)
- 13 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 / $^{\circ}C$
- 19 Overwrite mode
 - 0 Generate error (default)
 - 1 Overwrite
- 20 Generate custom module info file record
 - 0 No
 - 1 Yes (In this case it is expected that SP(1) has the form pv9xxxxxx)
- 21 Maximum module voltage / V
- 22 Module width / m
- 23 Module height / m

Strings

- 1 INSEL module ID (pv000000 defaults to the smallest free number ≥ 900000 in file SP(6).)
- 2 Path to .bp file
- 3 Module name
- 4 Manufacturer
- 5 Cell type (e. g., cristalline)
- 6 Name of custom module info file

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)
```

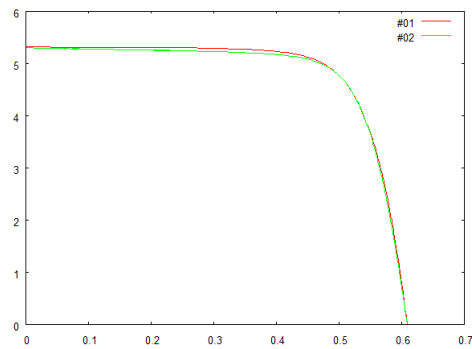
```

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](#).