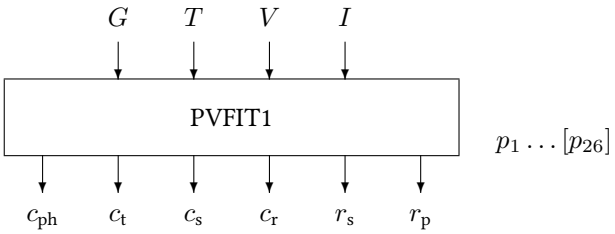
Block PVFIT1

The PVFIT1 block performs a one-diode-model fit on I-V curves of a PV module connected to the block's inputs.





Name	PVFIT1
Function	se0034
Inputs	4
Outputs	7
Parameters	25 . . . [26]
Strings	5
Group	I

Inputs

1 Global radiation / $\mathrm{W\,m^{-2}}$
2 Module temperature / °C
3 Module voltage / V
4 Module current / A

Outputs

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

Parameters

1 Fit procedure
  0 Nelder Mead downhill simplex method
  1 Marquard Levenberg algorithm (not yet implemented)

2 Number of cells in series
3 Number of cells in parallel
4 Area of a single cell / m^2
5 Module area / m^2
6 Minimum photocurrent parameter / V^{-1}
7 Maximum photocurrent parameter / V^{-1}
8 Minimum temperature coefficient / $\mathrm{V}^{-1}\,\mathrm{K}^{-1}$
9 Maximum temperature coefficient / $\mathrm{V}^{-1}\,\mathrm{K}^{-1}$
10 Minimum saturation-current parameter
11 Maximum saturation-current parameter
12 Minimum diode-quality parameter
13 Maximum diode-quality parameter
14 Minimum series resistance / $\Omega\,\mathrm{m}^2$
15 Maximum series resistance / $\Omega\,\mathrm{m}^2$
16 Minimum parallel resistance / $\Omega\,\mathrm{m}^2$
17 Maximum parallel resistance / $\Omega\,\mathrm{m}^2$
18 Module tolerance plus / $\% > 0$
19 Module tolerance minus / $\% < 0$
20 Characteristic module length / m
21 Module weight / kg
22 Absorption coefficient a
23 Emission coefficient ϵ
24 Specific module heat capacity / $\mathrm{J\,kg}^{-1}\,\mathrm{K}^{-1}$
25 NOCT temperature / °C
26 Overwrite mode
    0 Generate error (default)
    1 Overwrite

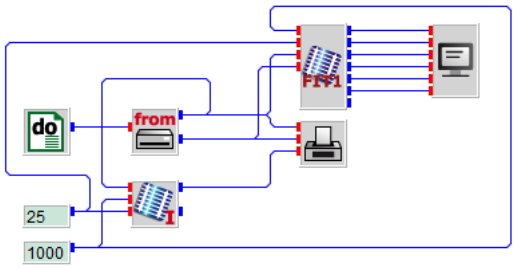
Strings

1 INSEL module ID (max. eight characters)
2 Path to .PARAMS file
3 Module name
4 Manufacturer
5 Cell type (e. g., monocrystalline)

Remarks

The PVFIT1 block performs a fit to given data points provided by the inputs. It is not possible to determine the Bishop parameters with the PVFIT1 block.

pvfit1.vseit



A file with measured I-V curve data named `pvcell.dat`, located in the `examples/data` directory for standard test conditions is read by a READ block driven by a DO block. For details of the technical data of the cell please refer to the description of block PFDET1. The radiation and module temperature are set by two CONST blocks to 1000 W/m^2 and 25 °C, respectively.

The tupels (G, T, V, I) are fed to the PVFIT1 block which performs the parameter fit. As a result a file named `pvfit1.bp` is generated and the results are displayed by a SCREEN block.

```
0.26730E+00 0.24355E-03 0.54241E+08 0.16316E+01 0.38628E-04 0.27776E+00
```

pvfit1.bp

```
                % Filename       pvfit1.bp
                % Module         pvfit1
                % 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)

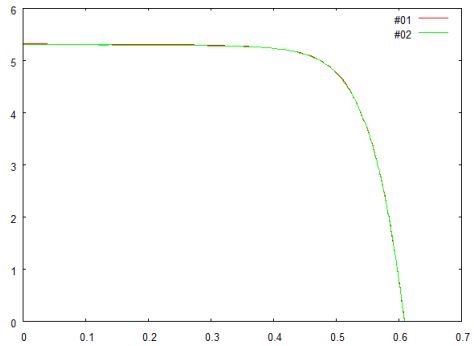
                % Electrical parameters
1.12            % Band gap (eV)
0.267307E+00 % Short-circuit current parameter C_0 (V^-1)
0.243551E-03 % Isc temperature coefficient  C_1 (V^-1 K-^1)
0.542419E+08 % Shockley saturation parameter C_01 (A m-2 K^-3)
0.000000E+00 % Recombination saturation parameter C_02 (A m-2 K^-5/2)
0.386289E-04 % Series resistance r_s (Ohm m^2)
0.277769E+00 % Parallel resistance r_p (Ohm m^2)
0.163165E+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
  5.0          % Module tolerance plus
 -5.0          % Module tolerance minus

               % Thermal parameters
  1.409        % Characteristic module length l_m (m)
 19.000        % 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)
  1.0          % 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 parameters have been incorporated into the `pvfit1.vseit` example using a PVI block in order to demonstrate the quality of the fit. The PLOT block then shows the measured data (red curve) and the simulated points (green curve).



Temperature dependency

Please note that there is no guarantee that the temperature dependency of the cell is modeled correctly if only one curve is provided to the fit procedure. The most critical parameters are c_{ph} and c_{t}. Their search intervals can be narrowed if the values are known from data sheet information, for instance.

See also

Blocks PVI, PVV, PVFIT2.