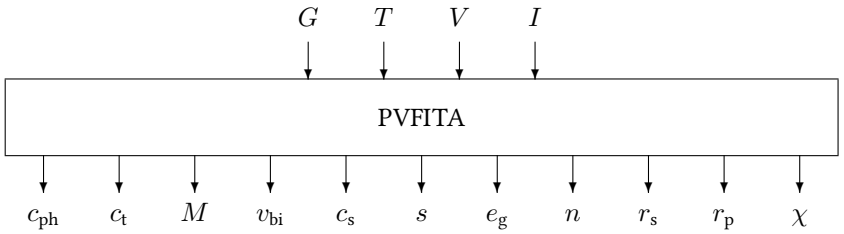
Block PVFITA

The PVFITA block performs a modified one-diode-model fit on I-V curves of a (micro-) amorphous PV module connected to the block's inputs.





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Function	se0005
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Group	I

Inputs

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

Outputs

1 Photocurrent parameter c_{ph} / $\mathrm{V^{-1}}$
2 Temperature coefficient c_t / $\mathrm{V^{-1}\,K^{-1}}$
3 Merten parameter M / $\mathrm{V^{-1}}$
4 Built-in voltage parameter v_{bi} / V
5 Saturation current parameter c_s / $\mathrm{A\,m^{-2}\,K^{-s}}$
6 Temperature exponent s
7 Bandgap parameter e_g / eV
8 Diode quality parameter n
9 Series resistance r_s / $\Omega\,\mathrm{m^2}$
10 Parallel resistance r_p / $\Omega\,\mathrm{m^2}$
11 Accuracy 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 Merten parameter / V^{-1}
11 Maximum Merten parameter / V^{-1}
12 Minimum built-in voltage / V
13 Maximum built-in voltage / V
14 Minimum saturation-current parameter $\mathrm{A\,m^{-2}\,K^{-}}s$
15 Maximum saturation-current parameter $\mathrm{A\,m^{-2}\,K^{-}}s$
16 Minimum temperature exponent
17 Maximum temperature exponent
18 Minimum bandgap parameter / eV
19 Maximum bandgap parameter / eV
20 Minimum diode-quality parameter
21 Maximum diode-quality parameter
22 Minimum series resistance / $\Omega\,\mathrm{m}^2$
23 Maximum series resistance / $\Omega\,\mathrm{m}^2$
24 Minimum parallel resistance / $\Omega\,\mathrm{m}^2$
25 Maximum parallel resistance / $\Omega\,\mathrm{m}^2$
26 Module tolerance plus / $\% > 0$
27 Module tolerance minus / $\% < 0$
28 Characteristic module length / m
29 Module weight / kg
30 Absorption coefficient a
31 Emission coefficient ϵ
32 Specific module heat capacity / $\mathrm{J\,kg^{-1}\,K^{-1}}$
33 NOCT temperature / °C
34 Overwrite mode
   - 0 Generate error (default)
   - 1 Overwrite

Strings

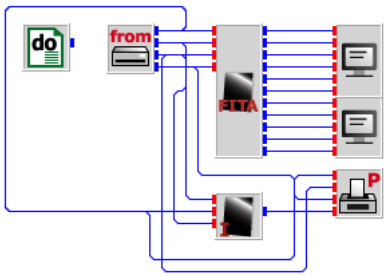
1 INSEL module ID (max. eight characters)
2 Path to .PARAMS file

3 Module name
4 Manufacturer
5 Cell type (e. g., micromorphous)

Description

The PVFITA block can be used to determine the parameters for block PVAI and PVAV, respectively.

pvfita.vseit



A file with measured I-V curve data named `pvfita.dat`, located in the `examples/data` directory for standard test conditions is read by a READ block driven by a DO block. 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 PVFITA block which performs the parameter fit.

Two SCREEN blocks are used to show the parameters.

```
0.10807E+00 0.65624E-04 0.58518E+01 0.18123E+01 0.99146E+01 0.23929E+01
0.68577E+00 0.34136E+01 0.65709E-03 0.13827E+02 0.79720E-02
```

As final result a file named `pvfita.bp` is generated.

pvfita.bp

```
                % Filename       pvfita.bp
                % Module         No name
                % Manufacturer   No name
                % Cell type      Mircroamorphous

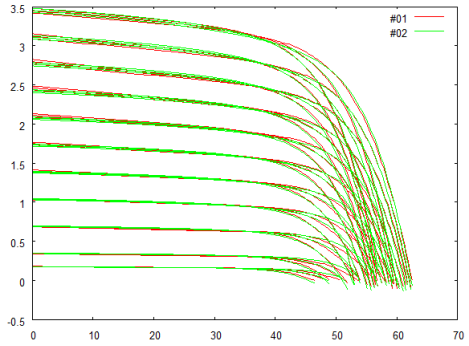
                % Mode must be set externally
 45             % Number of cells in series N_s per module
  4             % Number of cells in parallel N_p per module
  1             % Number of modules in series M_s
  1             % Number of modules in parallel M_p
  0.0075        % Cell area A_c (m^2)
  1.420         % Module area A_m (m^2)

                % Electrical parameters
  0.108074E+00 % Short-circuit current parameter c_ph (V^-1)
  0.656252E-04 % Isc temperature coefficient c_t (V^-1 K-^1)
  0.585197E+01 % Merten parameter M (V^-1)
  0.181235E+01 % Built-in voltage parameter v_bi (V)
  0.991458E+01 % Coeff. of sat. current density c_s (A m-2 K^-s)
  0.239290E+01 % Temperature exponent of sat. current density s
  0.685773E+00 % Band gap parameter (eV)
      3.413680 % Diode ideality factor
  0.657086E-03 % Series resistance r_s (Ohm m^2)
  0.138270E+02 % Parallel resistance r_p (Ohm m^2)
  5.0           % Module tolerance plus
 -5.0           % Module tolerance minus

                % Thermal parameters
  1.409         % Characteristic module length l_m (m)
 19.000         % Module weight 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
  0.100000E-02 % Error tolerance
100.0           % Maximum number of iterations
```

The parameters have been incorporated into the `pvfita.vseit` example using a PVAI block in order to demonstrate the quality of the fit. The PLOTP block then shows the measured data (red curves) and the simulated points (green curves).



Remark

In the current version 8.2 no mechanism is included to create a VSEit entity for a PVAI block with the fitted parameters. A workaround uses the following idea:

Open the generated `.bp` file with a text editor, add these line

```
s 1 pvai
p 1 0           % Mode
```

to the top of the file, save the file as `somename.ins` and use the File – Import function of VSEit. This will create the wanted PVAI block.

See also

Blocks PVAI and PVAV.