SolariaPCB

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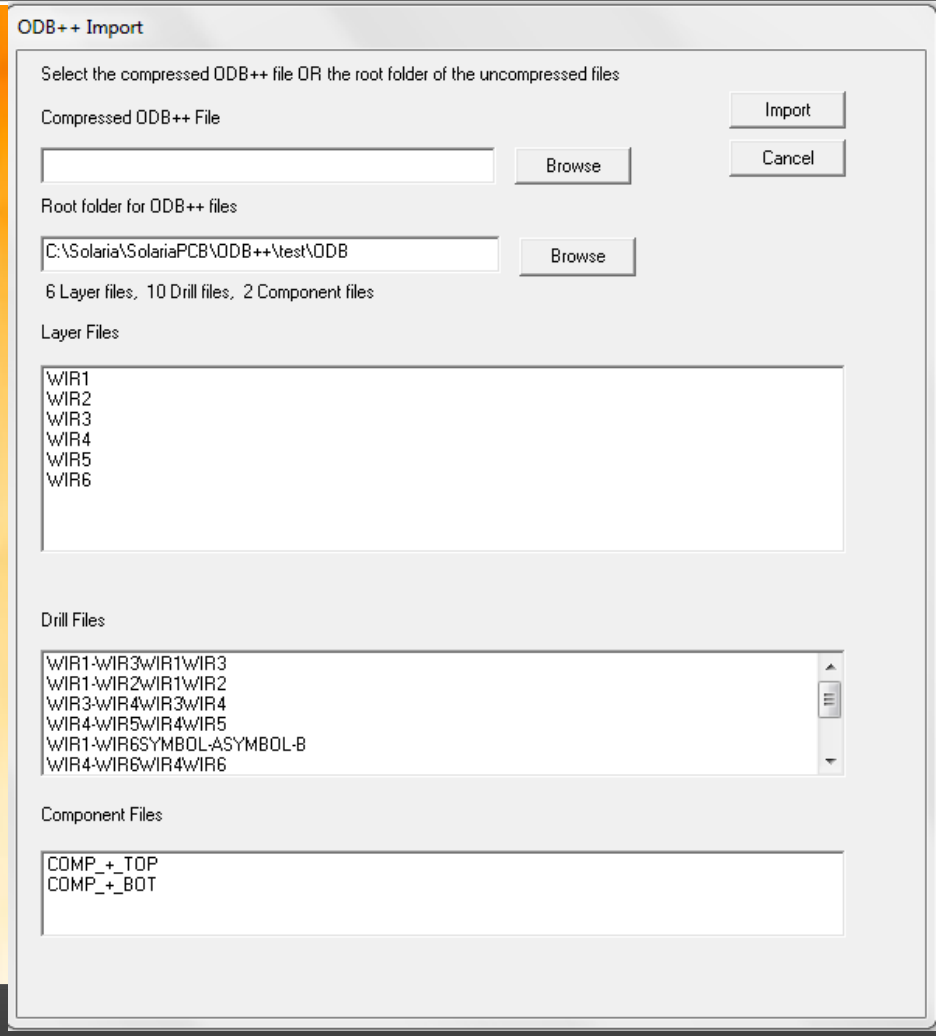
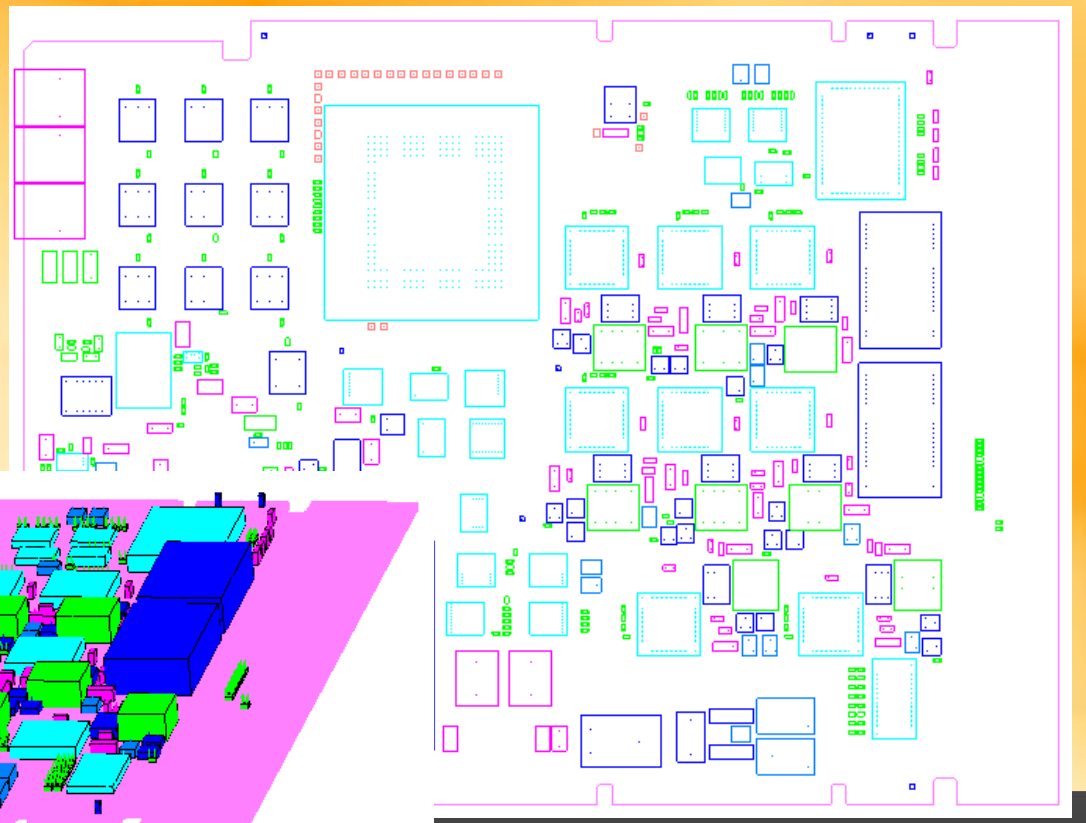
Importing ECAD Data

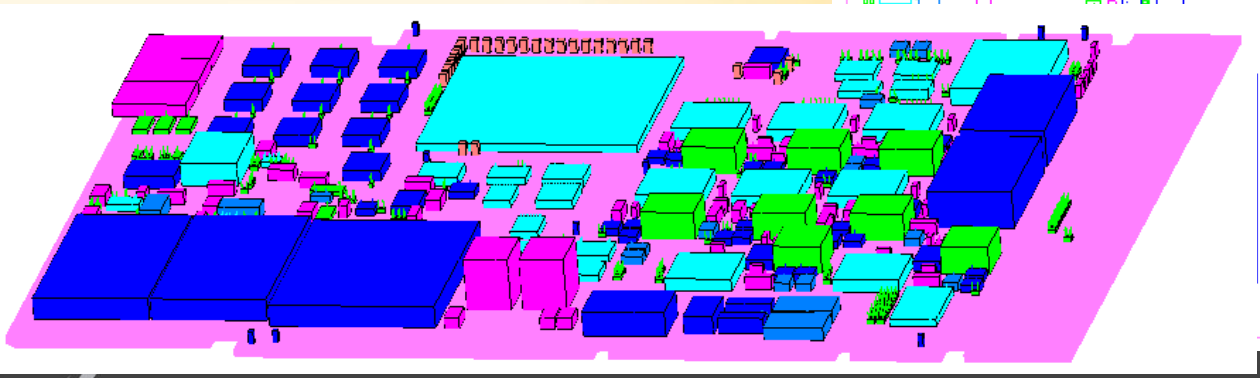
- SolariaPCB imports Electrical CAD data through ODB++ files.
- One compressed file is read and automatically expanded into the folder structure.
- Folders with Layers, Drills (defining vias) and components are identified.



Importing ECAD Data

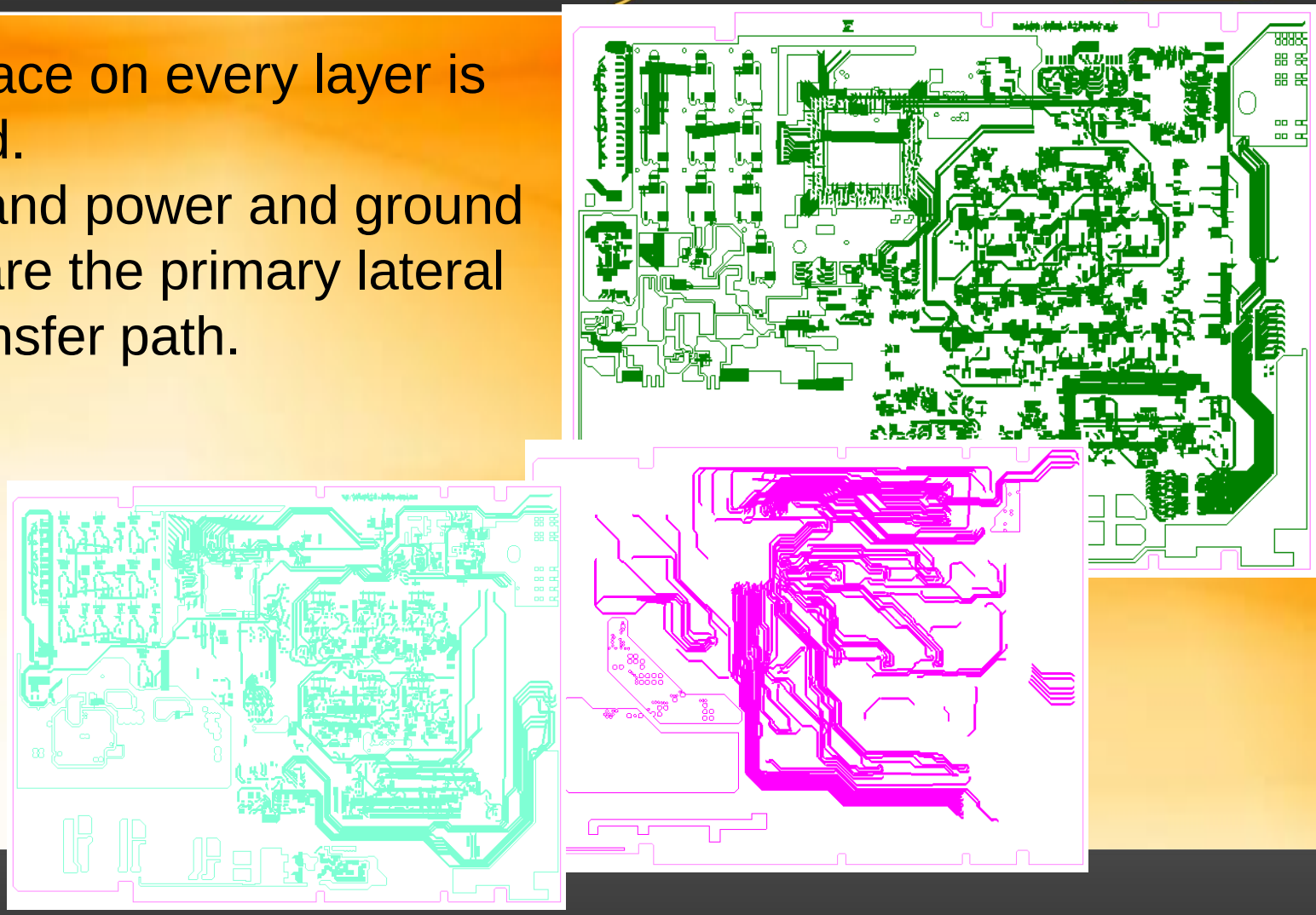
- All components on both sides of the board are imported.





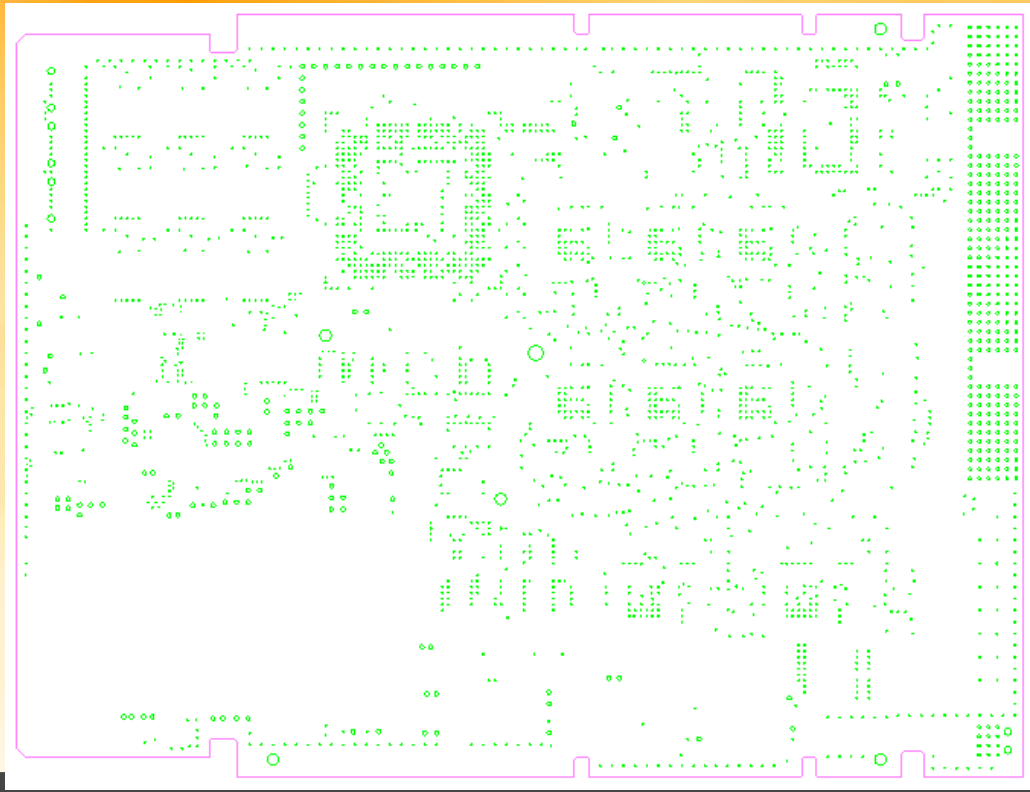
Importing ECAD Data

- Every trace on every layer is imported.
- Traces and power and ground planes are the primary lateral heat transfer path.



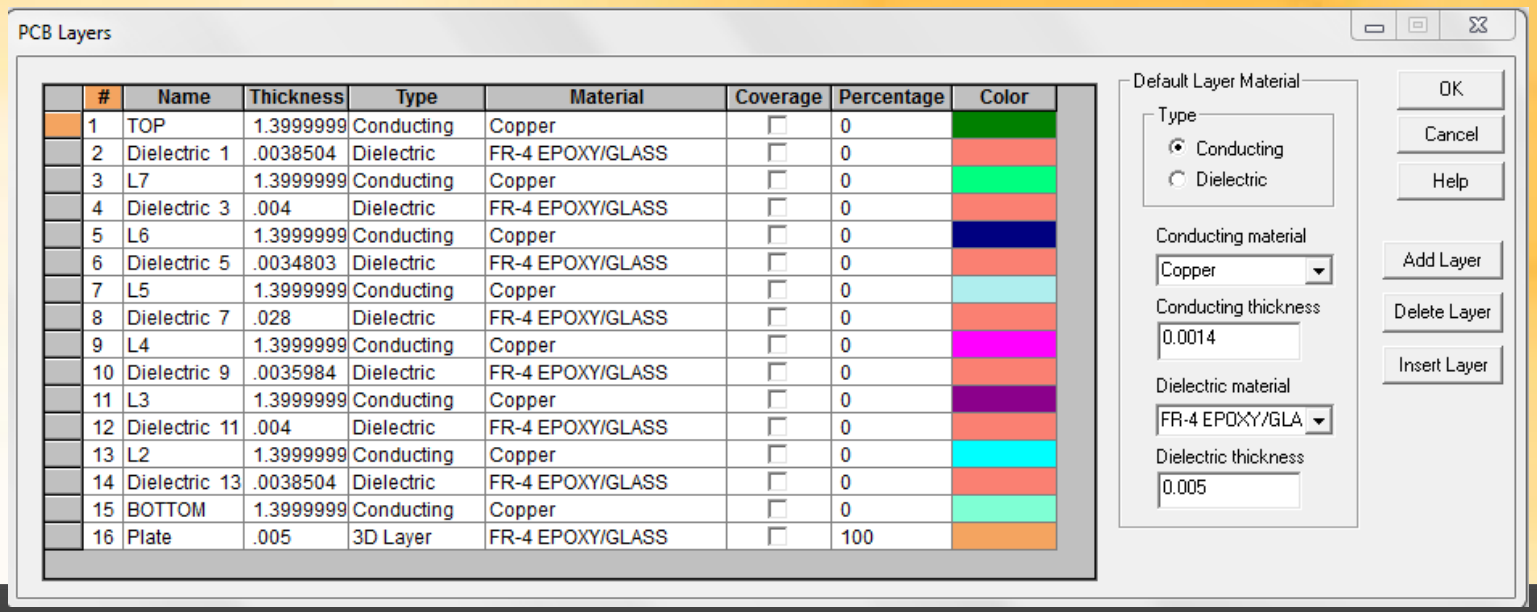
Importing ECAD Data

- Every via between every layer is imported.
- The diameter of each via is imported.
- Vias provide the major heat transfer path through the board thickness.



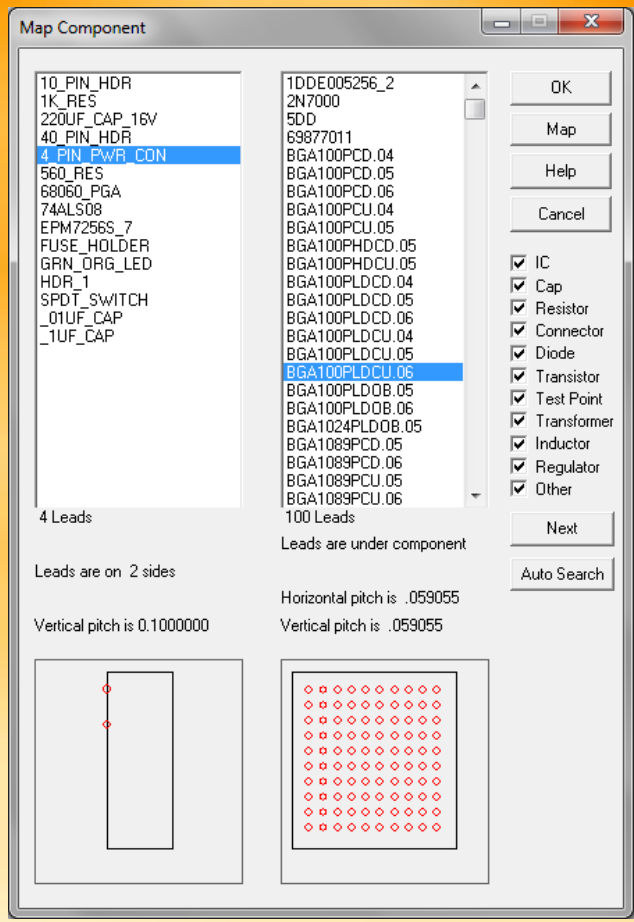
Board Layers

- Every layer and thickness is imported.
- If ECAD data was not imported, the Coverage checkbox can be checked and a Percentage of metal can be defined. A smearing method is then used to represent the metal for this layer.
- Layers can be manually added. This would be like a metal frame.



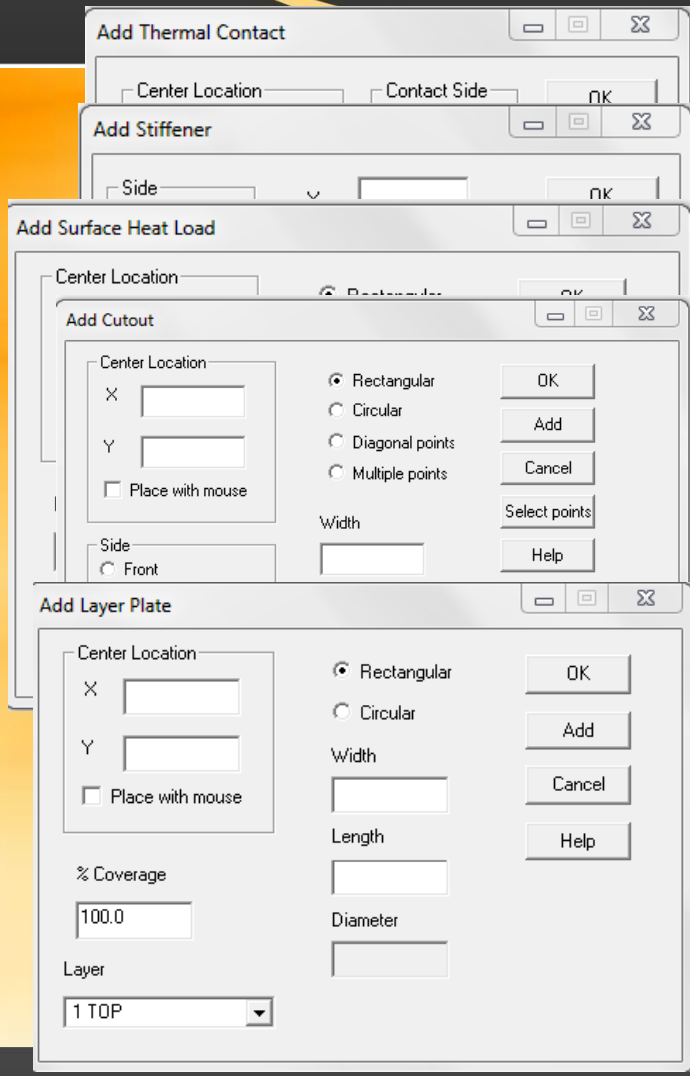
Mapping Components to the included library

- This is used to map imported components to those in the SolariaPCB library.



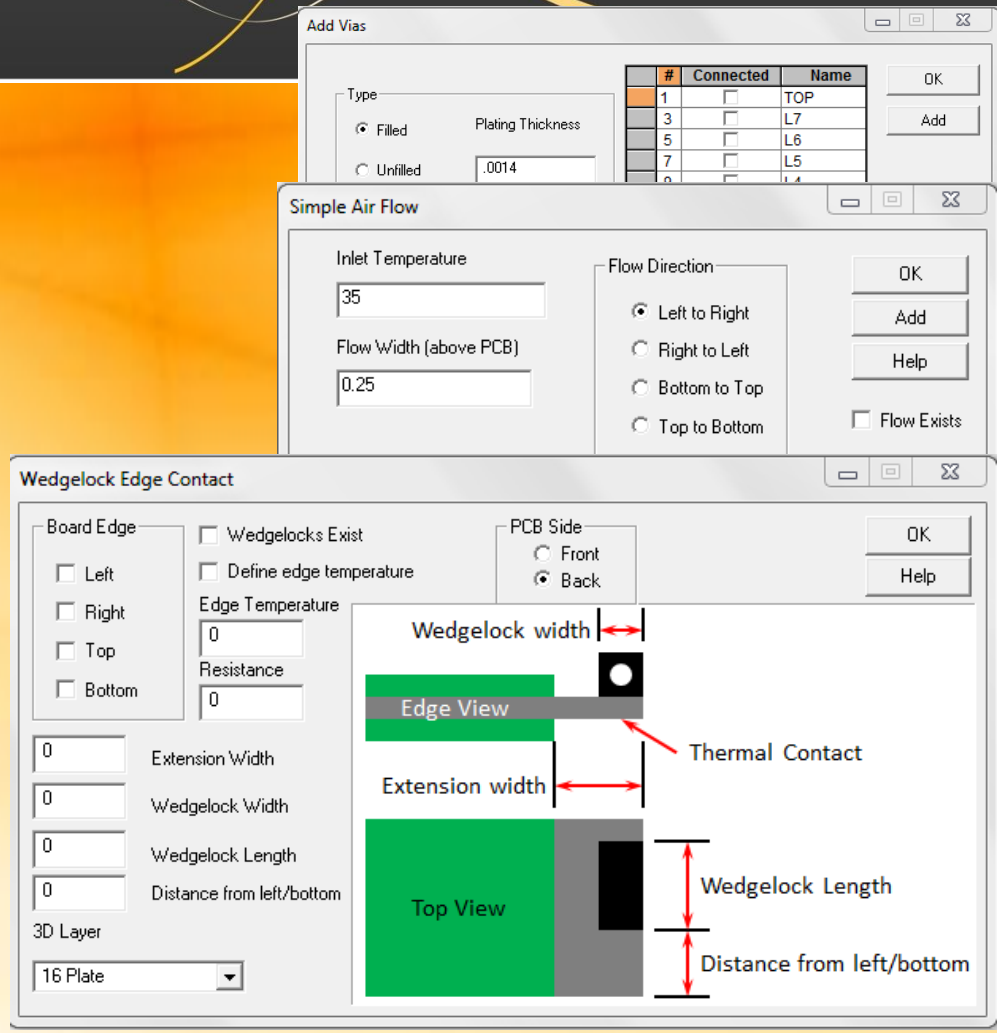
Other features that can be added

- Thermal Contact – Board attachment to chassis
- Stiffener – Add rigidity to the PCB as well as heat transfer
- Surface Heat – Spread heat over part of the board
- Cutout – Add a hole or a cutout to the board
- Layer Plate – Add metal to the surface or internal to the board to enhance heat transfer

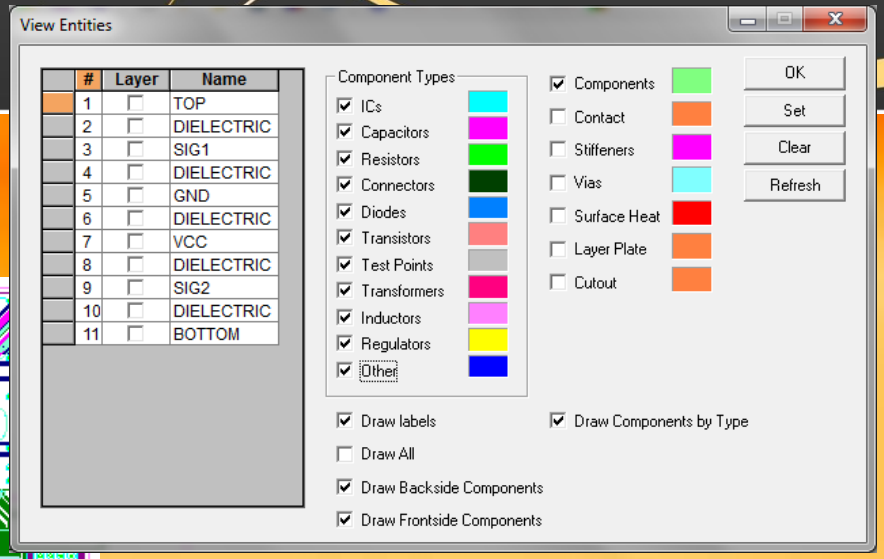


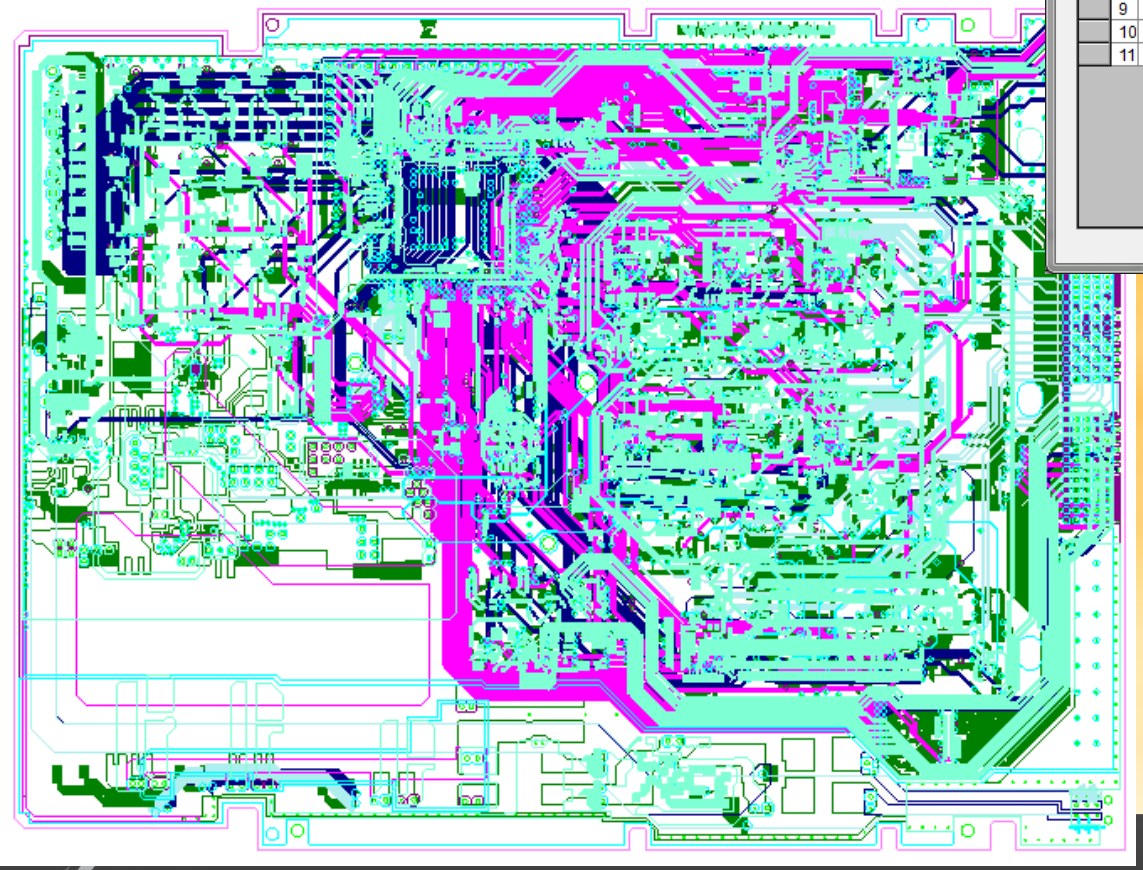
Other features that can be added

- Vias – In addition to those imported, thermal vias can be added to help heat transfer into the board.
- Air Flow – Cooling air flowing over the board can be simulated.
- Wedgelocks – Provide edge cooling.

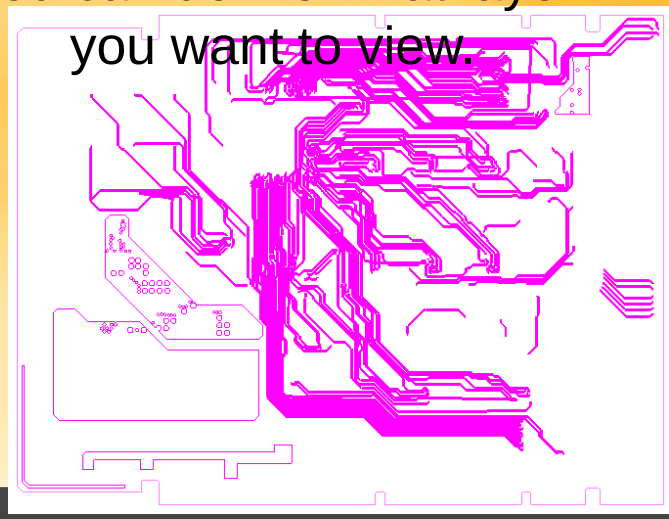


The user can define what they want to see



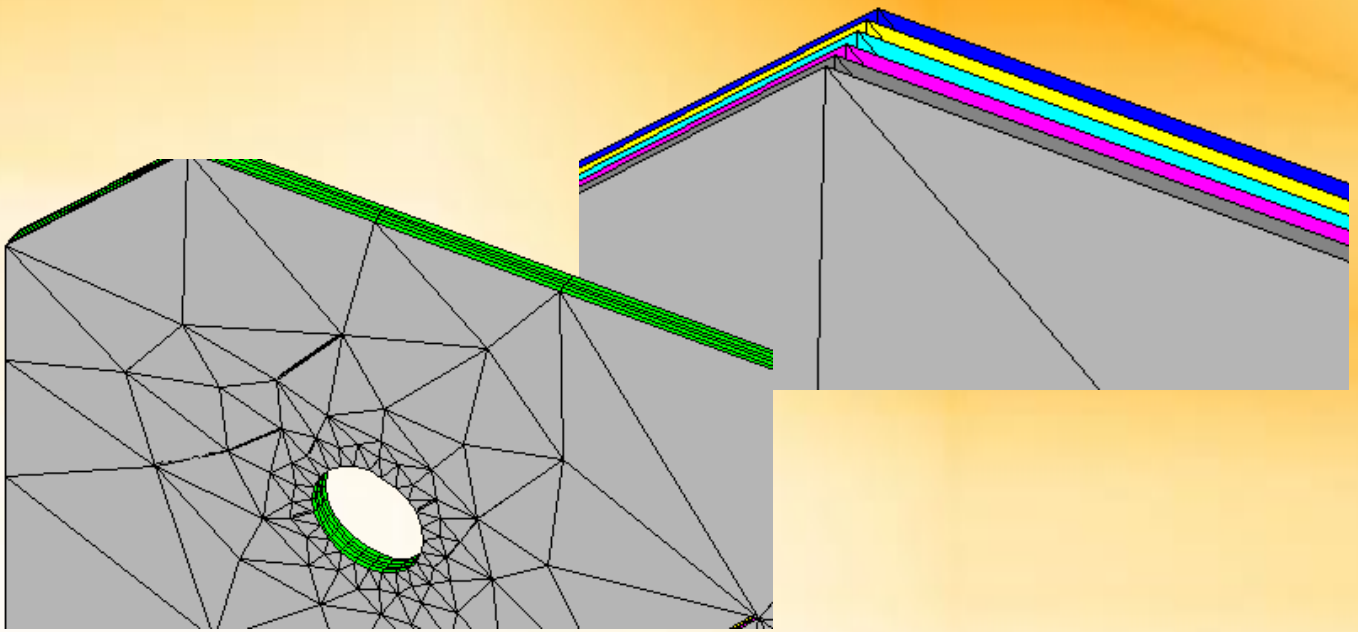


You can define what layer you want to view.



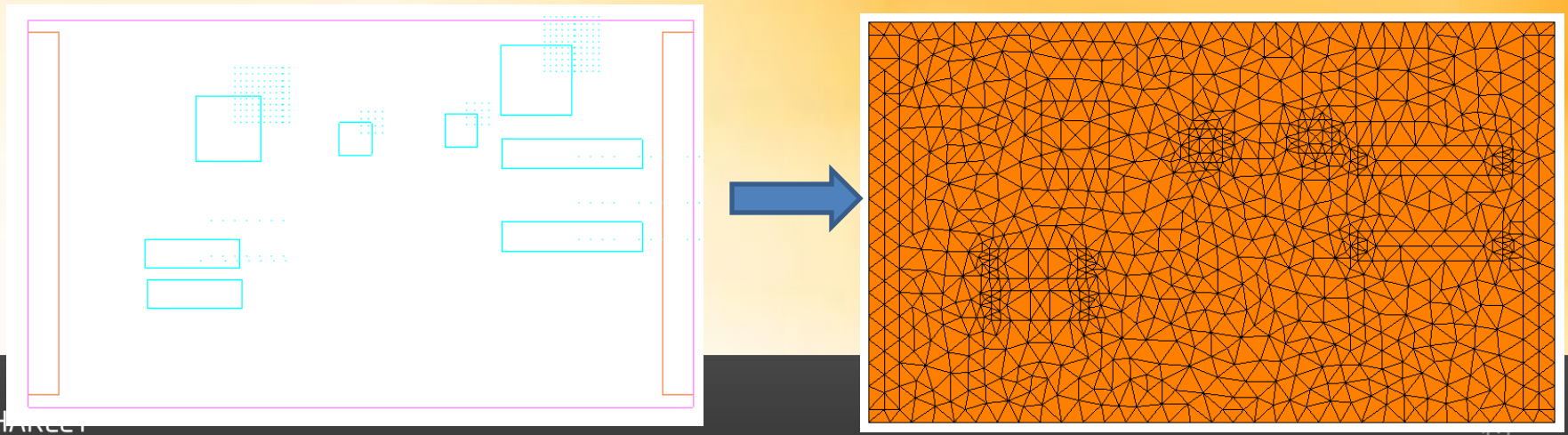
PCB Automatic Model Generation

- A full 3D model of the PCB is automatically generated.
- The dielectric layers are 3D solid elements
- 2D Plate elements represent metal layers IF ECAD data is NOT imported.



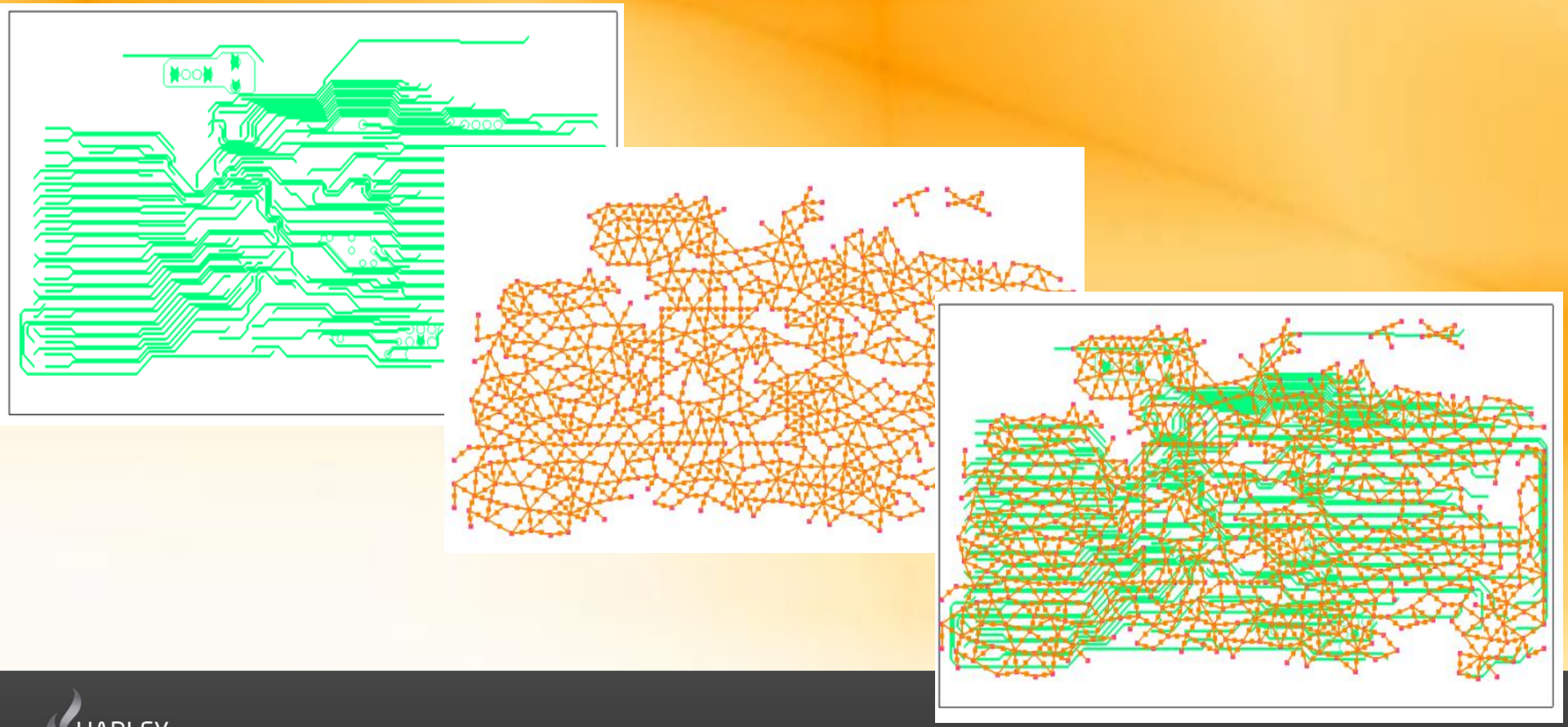
Trace representation in SolariaPCB

- The board is first meshed exactly representing the PCB outline, components, stiffeners, thermal contact areas, surface heat loads and other geometry. Traces and vias do not influence the mesh. The user can define a general mesh size constraint.
- After the board is meshed, for each metal layer, the traces crossing each triangle in the mesh is thermally represented by three resistors. The metal layer thickness, material and the width of every trace is used in the calculations. This methodology gives an accurate trace representation yet solution times are in minutes.



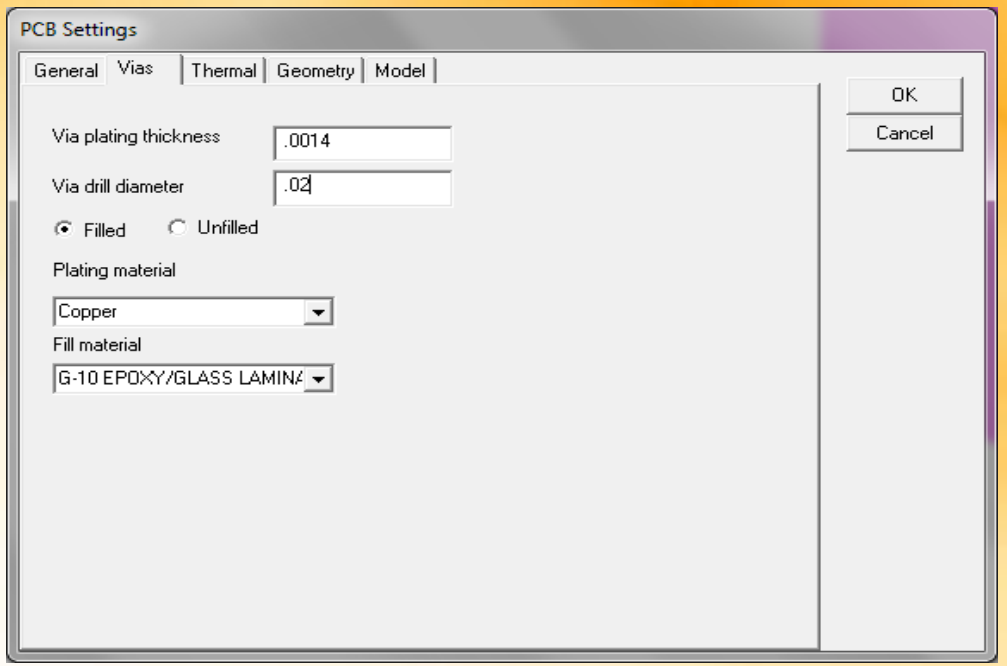
Trace representation in SolariaPCB

The left picture below shows traces. The middle picture shows the thermal resistors that represent them. The right picture shows them overlaid.



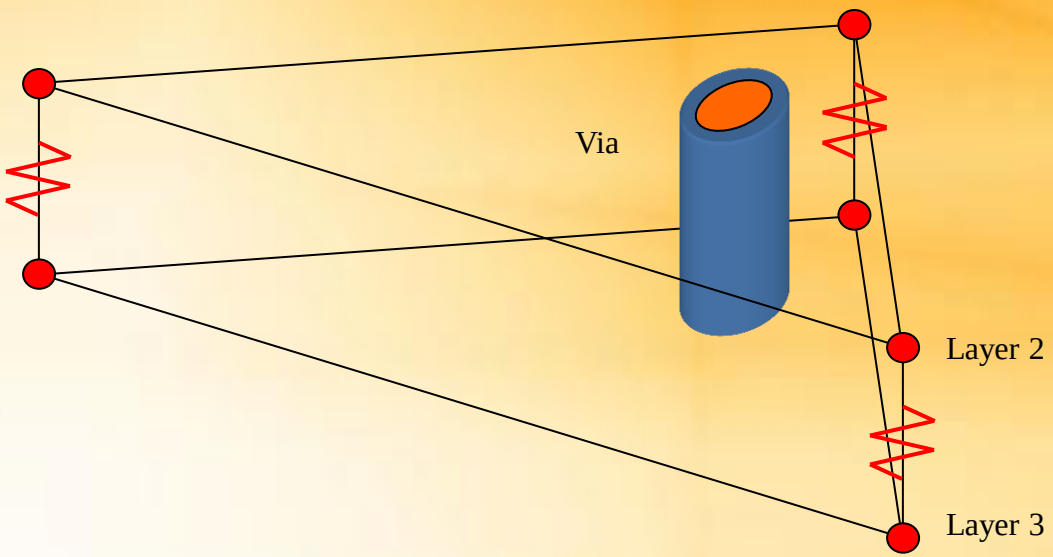
Via representation in SolariaPCB

- The location and diameter of every via is imported. The via plating thickness and material and whether the via is filled or not is defined by the user.



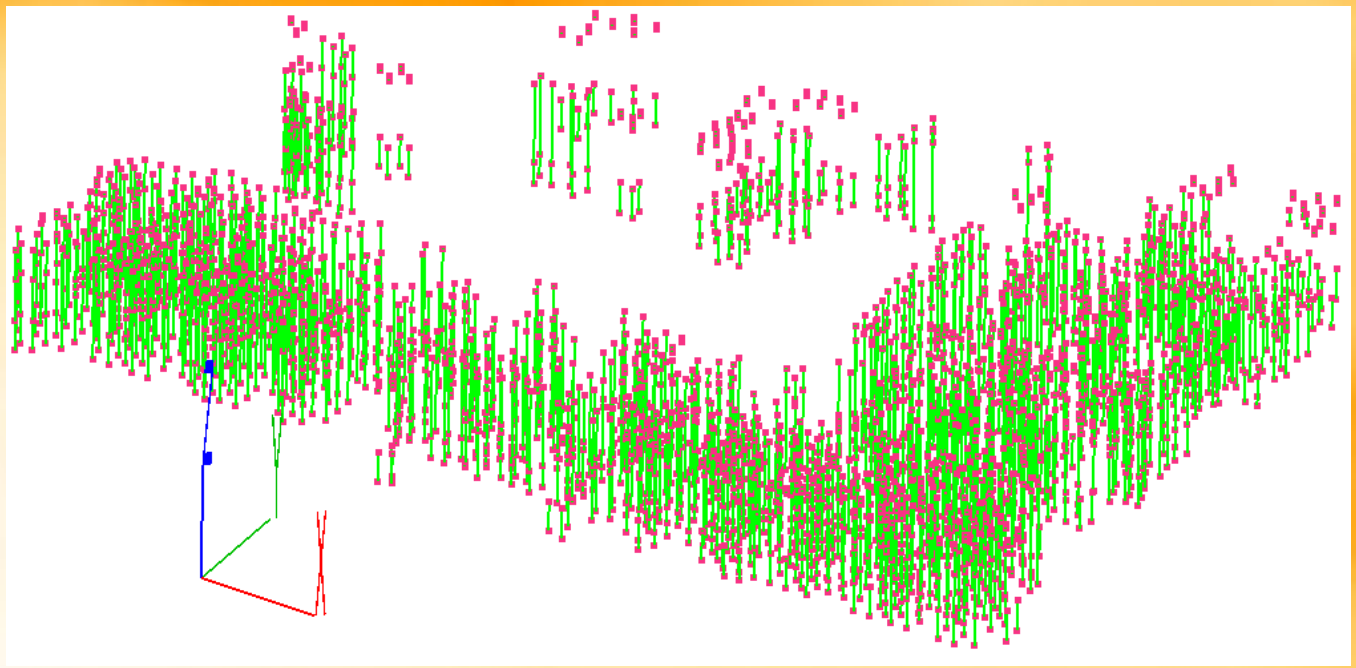
Via representation in SolariaPCB

- For each via, the software determines which meshed triangle it lies within. From the ECAD file, the layers the via is electrically connected to is known. Using this information, thermal resistors connecting the nodes on the connected layers are generated.



Via representation in SolariaPCB

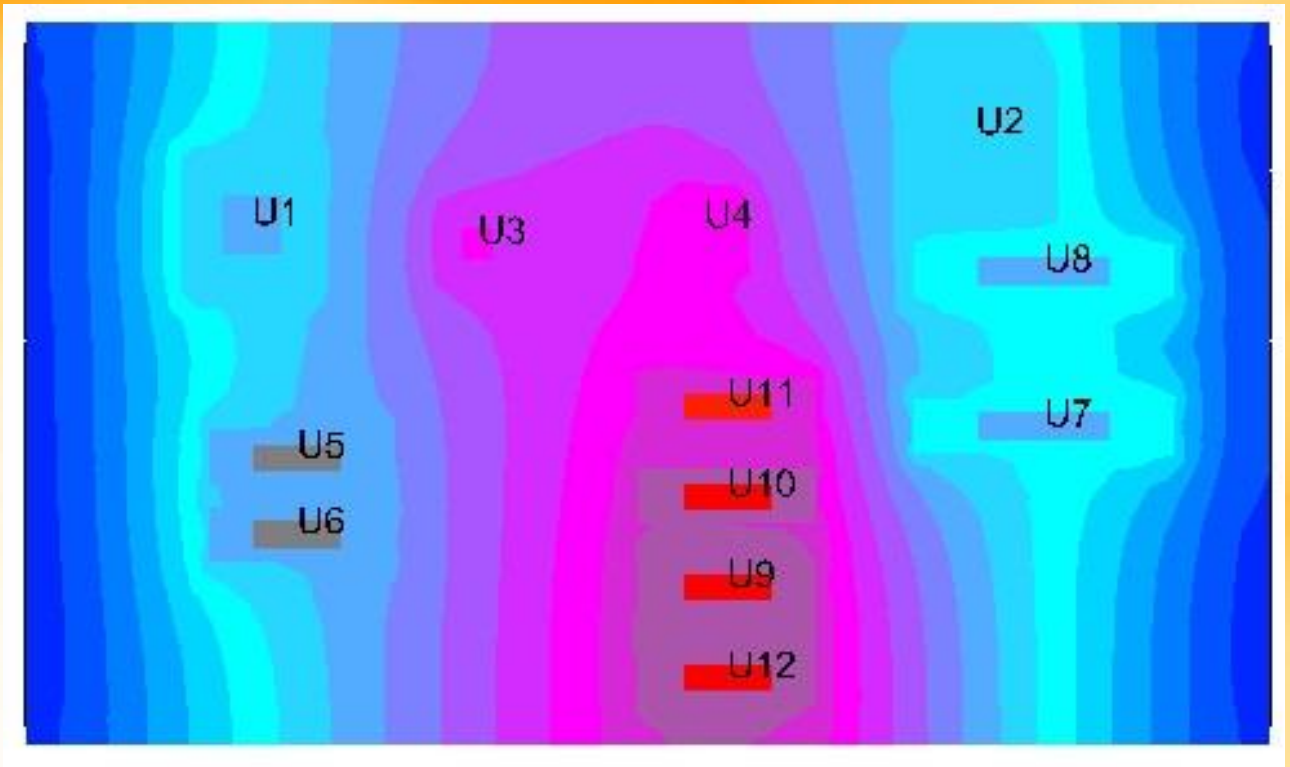
- Via representation, 1041 vias



Red dots are nodes, green lines are resistors
View has been stretched in the Z direction to better show the resistors.

Post processing Needed

- View component Junction temperatures



SOLARIA THERMAL

Post processing Needed

Tabular summary of component temperatures

SolariaPCB Results Summary

RefDes	Name	Pdiss	Junction	Case	Board	Air	C-B Res
U1	BGA100PCD.05	2	103.36	98.76	98.62		.02
U2	BGA100PLDCD.05	1	92.85	90.85	90.92		.02
U3	BGA16PCD.06	2	113.98	111.58	111.01		.13
U4	BGA16PCD.06	2	107.38	104.98	104.59		.13
U5	DIP16P.3W	1	145.88	90.87	91.16		.9
U6	DIP16P.3W	1	144.67	89.67	89.8		.9
U7	DIP24PSB.3W	.5	89.01	78.01	76.82		.6
U8	DIP24PSB.3W	.5	94.61	83.61	81.89		.6

Cancel

Help

1 PCB2

1 PCB2
2 PCB3
3 Board1
4 PCB2
5 PCB3

Results.txt - Notepad

File Edit Format View Help

```
Board name= PCB2
RefDes      Name           Dissipation   Junction    Case        Board       Air         Case to Board Resistance
U1          BGA100PCD.05    2             103.36      98.76       98.62       0           .02
U2          BGA100PLDCD.05  1             92.85       90.85       90.92       0           .02
U3          BGA16PCD.06     2             113.98      111.58      111.01      0           .13
U4          BGA16PCD.06     2             107.38      104.98      104.59      0           .13
U5          DIP16P.3W       1             145.88      90.87       91.16       0           .9
U6          DIP16P.3W       1             144.67      89.67       89.8        0           .9
U7          DIP24PSB.3W     .5            89.01       78.01       76.82       0           .6
U8          DIP24PSB.3W     .5            94.61       83.61       81.89       0           .6
Board name= PCB3
RefDes      Name           Dissipation   Junction    Case        Board       Air         Case to Board Resistance
U1          BGA100PCD.05    2.1           115.34      110.51      110.27      0           .02
U2          BGA100PLDCD.05  1             110.84      108.84      108.9       0           .02
U3          BGA16PCD.06     2             143.64      141.24      140.54      0           .13
U4          BGA16PCD.06     2             148.19      145.79      145.51      0           .13
U5          DIP16P.3W       1             170.45      115.45      116.77      0           .9
U6          DIP16P.3W       1             169.77      114.77      115.75      0           .9
U7          DIP24PSB.3W     .5            114.08      103.08      100.04      0           .6
U8          DIP24PSB.3W     .5            112.63      101.63      98.88       0           .6
U9          DIP16P.3W       2.3           284.55      158.05      155.43      0           .9
U10         DIP16P.3W       2.3           281.8       155.3       152.25      0           .9
U11         DIP16P.3W       2.3           276.94      150.44      146.96      0           .9
U12         DIP16P.3W       2.3           284.85      158.35      156.11      0           .9
Board name= Board1
RefDes      Name           Dissipation   Junction    Case        Board       Air         Case to Board Resistance
U2          EPM7256S_7      5.6           258.89      246.01      246.01      0           0
U3          74ALS08         1.2           232.08      226.68      226.66      0           .1
C2          _1UF_CAP        0             0           0           243.99      0           0
C3          _1UF_CAP        0             0           0           242.98      0           0
C4          _1UF_CAP        0             0           0           217.39      0           0
C5          _1UF_CAP        0             0           0           246         0           0
C7          _01UF_CAP       0             0           0           244.88      0           0
C8          _01UF_CAP       0             0           0           237.56      0           0
C9          _01UF_CAP       0             0           0           209.13      0           0
C1          220UF_CAP_16V   0             0           0           0           0           0
C10         _01UF_CAP       0             0           0           240.23      0           0
R1          1K_RES          0             0           0           176.14      0           0
JTAG        10_PIN_HDR      0             0           0           242.45      0           0
J4          4_PIN_PWR_CON   0             0           0           204.62      0           0
F1          FUSE_HOLDER     0             0           0           238.25      0           0
D1          GRN_ORG_LED     0             0           0           120.59      0           0
S1          SPDT_SWITCH     0             0           0           88.57       0           0
J5          HDR_1           0             0           0           154.61      0           0
J6          HDR_1           0             0           0           242.23      0           0
J7          HDR_1           0             0           0           242.51      0           0
R0          560_RES         0             0           0           184.7       0           0
R2          560_RES         0             0           0           179.66      0           0
Board name= PCB2
RefDes      Name           Dissipation   Junction    Case        Board       Air         Case to Board Resistance
U1          BGA100PCD.05    2             154.36      149.76      149.62      0           .02
U2          BGA100PLDCD.05  1             143.85      141.85      141.92      0           .02
```

Summary

- The ODB++ interface is seamless, simple and fast.
- Every trace, via, component and layer is imported.
- The board mesh is not influenced by the traces or vias but every trace and every via is thermally represented at the meshed triangle level.
- Traces and vias may add tens of thousands of thermal resistors to the model but they are in parallel to those representing the dielectric so the thermal model in the solution is no larger.
- The resulting thermal model is 3D yet solves in minutes.

Summary

- This model has five boards that were generated by SolariaPCB and air flow along the side walls.
- It solved in 12 seconds using the Solaria GCG solver.