

CAD to CAM – optimum PCB design flow

- First Think
- Then Act
- Achieve: “Right First Time”
 - In time
 - On Budget
- Dirk Stans, Eurocircuits

**DESIGN AUTOMATION
& EMBEDDED SYSTEMS**

7 NOV ←
TECHNOPOLIS, MECHELEN
8 NOV ←
VAN DER VALK HOTEL, EINDHOVEN



PCB Design Flow

- Defining your BOM (Bill Of Material)
- Create Schematics
- Size the PCB and Place Key Components
- Make the PCB Layout
- Export data from CAD for manufacturing

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FPGA - SECURITY - INTERNET OF THINGS - ELECTRONIC DESIGN & PRODUCTION - EMBEDDED DESIGN FOR EXCELLENCE - EMBEDDED DESIGN CHALLENGES

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First Think, Then Act, leads to "Right First Time"!

Defining your BOM (Bill Of Material)

Designer

- Functionality of components.
- Package to use ? Footprint definition.
- Testing implications ?
- Heat Management ?
- Etc....

Manufacturer

- Availability of components
- Pricing ?
- Effect on manufacturability and cost.
- Feasibility and cost
- Reliability
- Etc. ...

Defining your BOM (Bill Of Material)

Designer

- Search the web and choose on specification and taste

Manufacturer

- Use a proven and tested own data base of components
 - Manufacturable
 - reliable
 - available

Defining your BOM (Bill Of Material)

- Perform an early check of your BOM with your manufacturer
- Or...
- Build your BOM by selecting components out of your Manufacturers data base
(BOM-generator on the eC-Verified DB)

Size the PCB and Place Key Components

Designer

- Size the PCB according to design requirements or taste
- Place the Key Components

Manufacturer

- How does it fit on a PCB production panel?
Cost?
- Effect on manufacturability (solderability)

Defining your Printed Circuit Board

- What are the PCB cost drivers ?
- What makes a PCB hard/impossible to make ?
- Which tools are available to help me ?
 - Offline direct consulting Quotation - All
 - Online capability catalogues - All
 - Online smart menus - Eurocircuits

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Determine PCB parameters

- Material (spec – cost – poolable)
- Buildup (poolable or not)
- Copper thicknesses
- DRC values (TW, TT, TP, PP, OAR, IAR)
- PCB/Panel size <-> Production panel filling
- ...
- Non Gerber parameters
- => save all for later references and check
- => use DRC values in your CAD system for the layout

STANDARD pool



Delivery format

Single PCB

PCB quantity

10

Delivery term

7 working days

Number of layers

6

PCB width (X) (mm)

100.00

PCB height (Y) (mm)

80.00

eC-registration compatible PCB

☐

Stencils

Material definition

Select pre-defined buildup

Board thickness

1.55 mm

Board buildup

Standard

Material Tg

145-150 °C

Outer layer copper foil

18 µm (end 35 µm)

Inner layer copper foil

35 µm

Extra PTH runs

0

Extra press cycles

0

Board technology

Select classification

Outer layer trackwidth (OL-TW)

0.150 mm

Outer layer isolation distance (OL-TT-TP-PP)

0.150 mm

Outer layer annular ring (OAR)

0.125 mm

Inner layer trackwidth (IL-TW)

0.150 mm

Inner layer isolation distance (IL-TT-TP-PP)

0.150 mm

Inner layer annular ring (IAR)

0.125 mm

Smallest final hole

0.25 mm

Hole density

< 1000/dm²

Technology class

6C

Holes <= may be reduced

0.45 mm

Board definition

Top soldermask

Green

Bottom soldermask

Green

Top legend

White

Bottom legend

White

Surface finish

Any lead free finish

Milling

No

Bare Board Testing

☒

UL marking

☐

Advanced options

Summary

Business customer? Select here.

Service

STANDARD pool

Delivery term

7 working days

Estimated shipment date

01-10-2013

Quantity

10 PCBs

Board surface / Order surface

0.80 dm² / 8.00 dm²

Prices

Net

Gross*

Single PCB

€ 31.79

€ 38.47

Total boards

€ 317.92

€ 384.68

Express transport

€ 12.48

€ 15.10

Economy transport

€ 10.49

€ 12.69

Total

€ 330.39

€ 399.77

* The gross prices include 21.00% VAT.

Add to basket

Useful documents

PCB Calculator user guide

Read more...

PCB design guidelines

Read more...

Alternatives

Customized matrix

10 PCBs

7 working days

Net

Gross*

€ 31.79

€ 38.47

€ 317.92

€ 384.68

Select

20 PCBs

7 working days

Net

Gross*

€ 21.17

€ 25.62

€ 423.49

€ 512.43

Select

30 PCBs

7 working days

Net

Gross*

€ 17.00

€ 20.58

€ 510.13

€ 617.26

Select

10 PCBs

6 working days

Net

Gross*

€ 39.90

€ 48.28

€ 399.02

€ 482.81

Select

20 PCBs

6 working days

Net

Gross*

€ 26.58

€ 32.16

€ 531.53

€ 643.15

Select

30 PCBs

6 working days

Net

Gross*

€ 21.34

€ 25.82

€ 640.27

€ 774.73

Select

* The gross prices include 21.00% VAT.

The transport costs and total price are calculated and shown in the summary according to the selection.

Smart menu

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Make your board layout according

- Optimum Component packages placed at the right spot
- Optimum PCB size
- Optimum number of layers
- Optimum DRC values

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| PCB - details | Possible issues | Clearly defined in: | | | PCB Visualizer |
|---------------------------|--------------------------------|---------------------|-----------|--------------------|---------------------------------|
| | | Gerber X | Gerber X2 | Native EAGLE/KiCAD | defines |
| Base material | On stock / on offer | no | no | no | PCB Configurator |
| Number of layers | Layers complete or not | no | no | yes | Buildup editor |
| Definition of the layers | Clear definition / assignment | no | yes | yes | Buildup editor |
| Board size | Possible open or more contours | no | no | no | Outline editor |
| Customer panel | Definition not standardized | no | no | no | Panel editor |
| Copper thickness | Definition base/end Cu | no | no | no/yes | Buildup editor |
| build up | Definition not standardized | no | no | no/yes | Buildup editor |
| PTH | | no | yes | yes | Drill Editor |
| Via / component hole | | no | yes | yes | Drill Editor |
| NPTH | | no | yes | yes | Drill Editor |
| Slots & Cut outs | Definition not standardized | no | yes | yes | Outline editor / Drill editor |
| blind & burried vias | Define the layer name correct | no/yes | yes | yes | Buildup editor |
| Thermal pads | Defined in CAD or not | no | no/yes | no/yes | - |
| Surface finish | | no | no | no | PCB Configurator |
| Soldermask colour | | no | no | no | PCB Configurator |
| Legend colour | | no | no | no | PCB Configurator |
| press fit holes | Definition not standardized | no | no | no | PCB Configurator parameter |
| peelable mask | Definition not standardized | no | no | no | Buildup editor |
| Carbon contacts | Definition not standardized | no | no | no | Buildup editor |
| edge connector / beveling | Definition not standardized | no | no | no | PCB Configurator parameter |
| depth routing | Definition not standardized | no | no | no | PCB Configurator / Drill editor |
| via-fill | Definition not standardized | no | no | no | PCB Configurator / Drill editor |
| chamfered holes | Definition not standardized | no | no | no | PCB Configurator / Drill editor |
| PTH on the board edge | Definition not standardized | no | no | no | PCB Configurator parameter |
| round-edge plating | Definition not standardized | no | no | no | PCB Configurator parameter |
| heatsink paste | Definition not standardized | no | no | no | Buildup editor |

PCB data CAD

(Computer Aided Design)

to

CAM

(Computer Aided Manufacturing)

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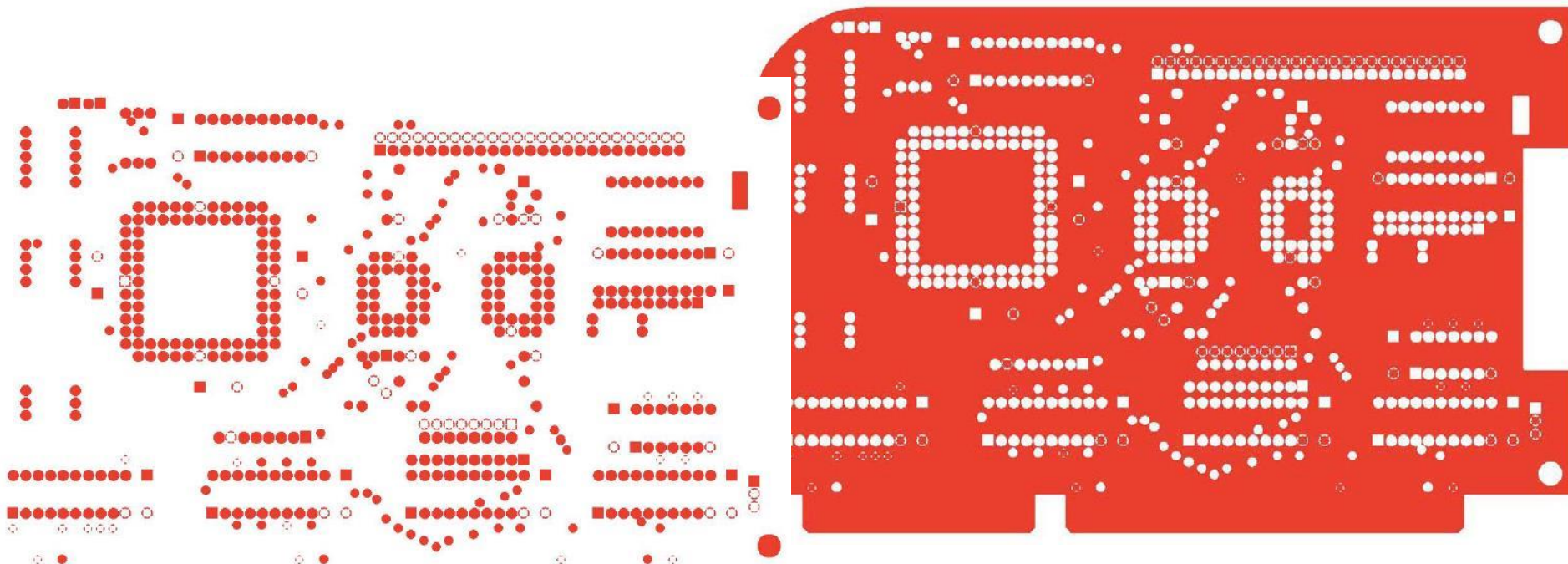
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Layer polarity matters



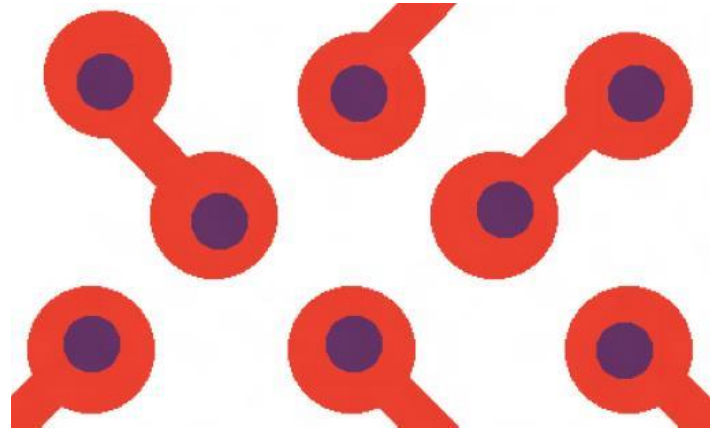
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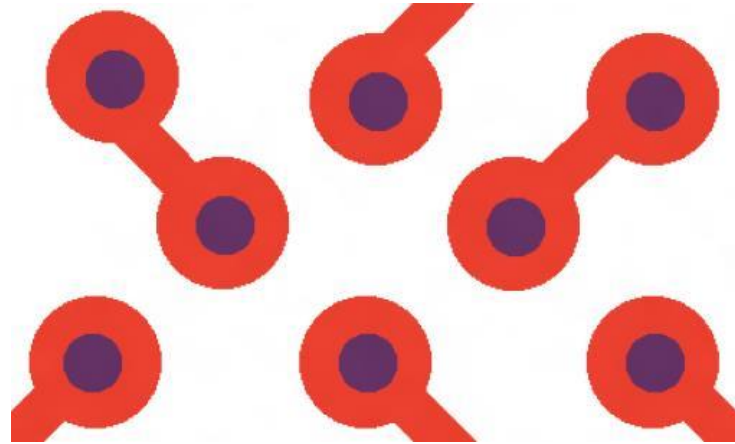
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Drills versus copper pads



Different Unit -
Resolution

Non Centered



Same Unit -
Resolution

Centered

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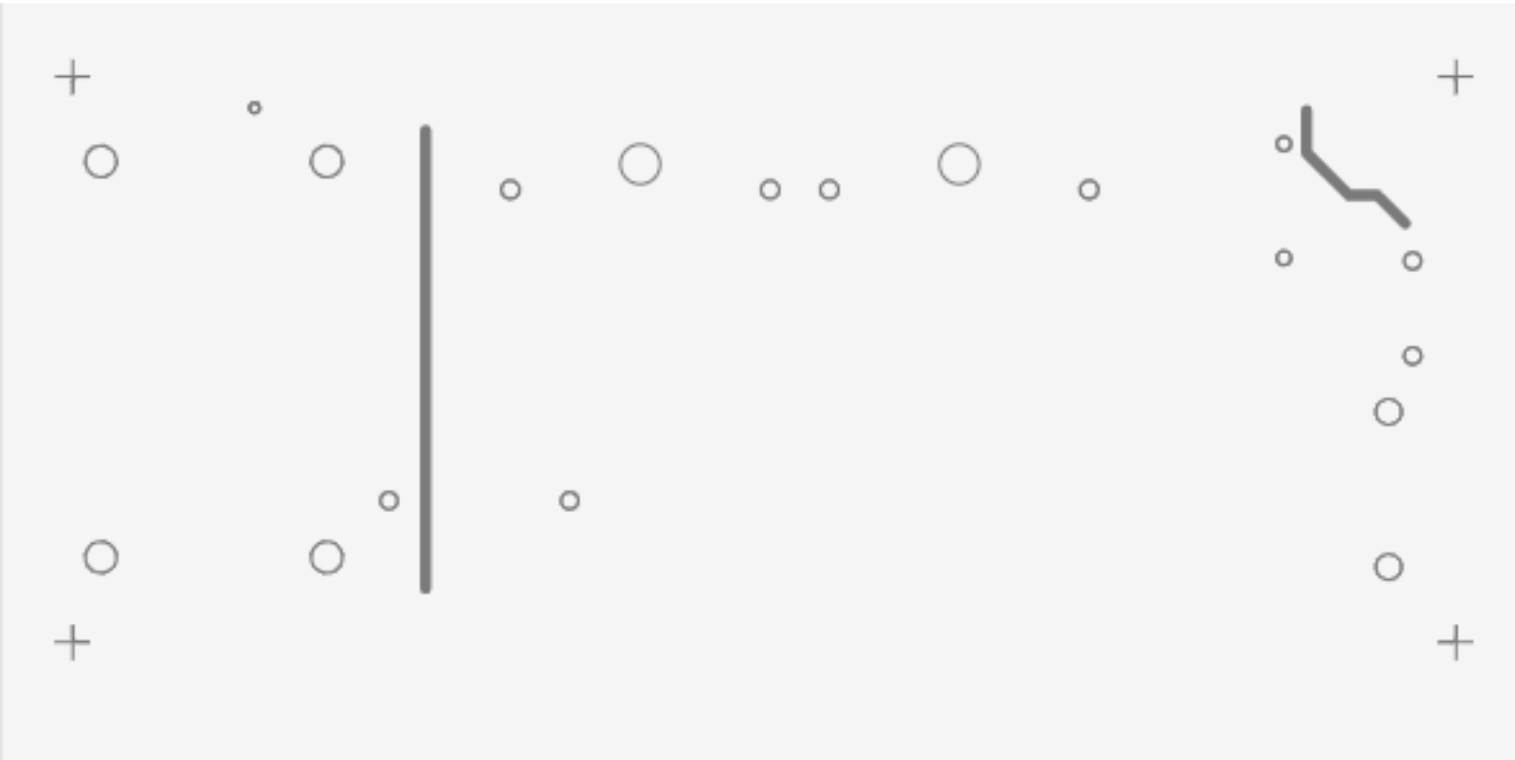
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Bad outline



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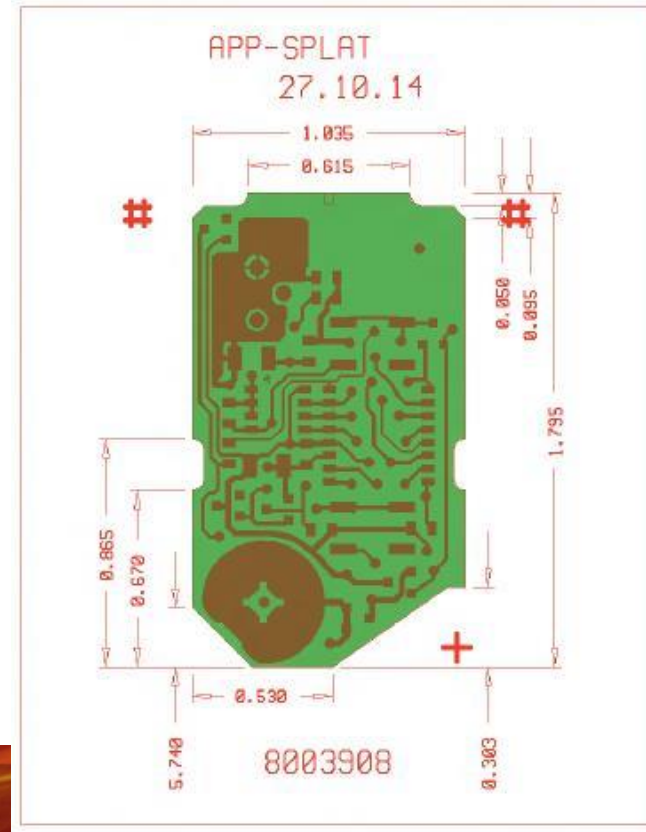
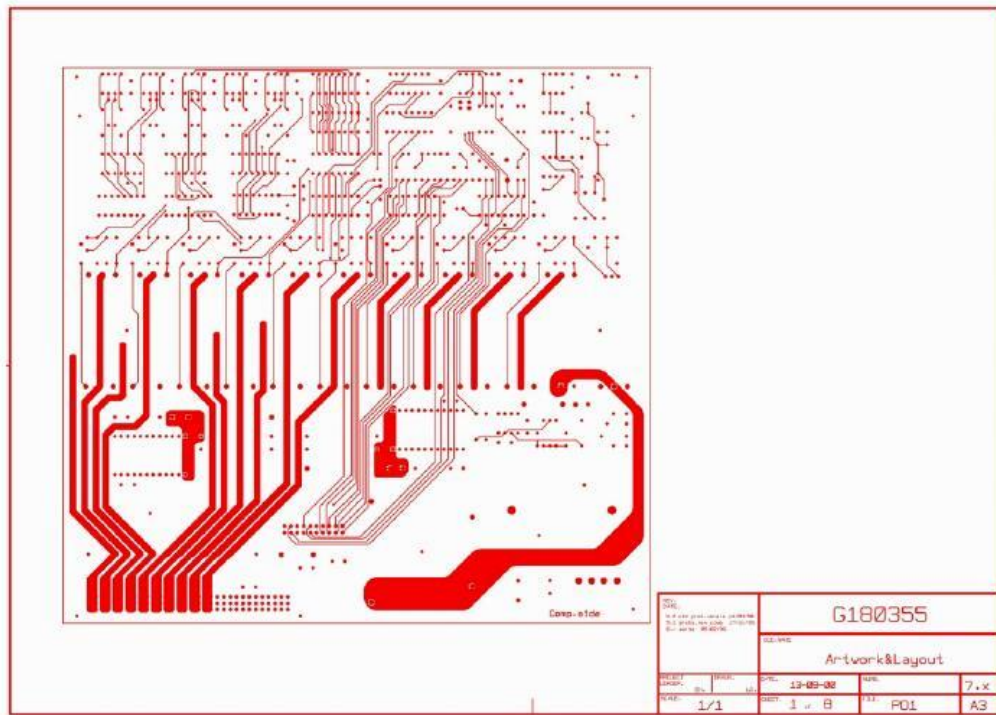
FGPA - SECURITY - INTERNET OF THINGS - ELECTRONIC DESIGN & PRODUCTION - EMBEDDED - DESIGN FOR EXCELLENCE - EMBEDDED DESIGN CHALLENGES

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Data outside the PCB contour



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Buildup selector - (STANDARDpool)

Material

Number of layers: 4
 Reversed buildup: ☐
 Extra press cycles: 1
 Top soldermask: Green
 Top legend: White
 Peelable mask: No
 Viafill: No
 Bottom heatsink paste: No

Board thickness: 1.55 mm
 Blind/Buried via runs: 1
 Special buildup: ☐
 Bottom soldermask: Green
 Bottom legend: None
 Carbon contacts: No
 Top heatsink paste: No

| Core thickness | Outer layer copper foil | Inner layer copper |
|----------------|-------------------------|--------------------|
| 0.710 mm | 12 µm (end 30 µm) | 12 µm |
| 0.710 mm | 12 µm (end 30 µm) | 18 µm |
| 0.710 mm | 18 µm (end 35 µm) | 18 µm |
| 0.710 mm | 18 µm (end 35 µm) | 35 µm |
| 0.710 mm | 35 µm (end 60 µm) | 35 µm |
| 0.710 mm | 35 µm (end 60 µm) | 70 µm |
| 0.710 mm | 70 µm (end 95 µm) | 70 µm |
| 0.360 mm | 12 µm (end 30 µm) | 12 µm |
| 0.360 mm | 12 µm (end 30 µm) | 18 µm |
| 0.360 mm | 18 µm (end 35 µm) | 18 µm |
| 0.360 mm | 18 µm (end 35 µm) | 35 µm |
| 0.360 mm | 35 µm (end 60 µm) | 35 µm |
| 0.360 mm | 35 µm (end 60 µm) | 70 µm |
| 0.360 mm | 70 µm (end 95 µm) | 70 µm |
| 0.200 mm | 12 µm (end 30 µm) | 12 µm |
| 0.200 mm | 12 µm (end 30 µm) | 18 µm |
| 0.200 mm | 18 µm (end 35 µm) | 18 µm |
| 0.200 mm | 18 µm (end 35 µm) | 35 µm |
| 0.200 mm | 35 µm (end 60 µm) | 35 µm |
| 0.200 mm | 35 µm (end 60 µm) | 70 µm |
| 0.200 mm | 70 µm (end 95 µm) | 70 µm |
| 0.100 mm | 12 µm (end 30 µm) | 12 µm |
| 0.100 mm | 12 µm (end 30 µm) | 18 µm |
| 0.100 mm | 18 µm (end 35 µm) | 18 µm |
| 0.100 mm | 18 µm (end 35 µm) | 35 µm |

Buildup

Total material thickness: 1.536 mm

Top legend
 Top soldermask
 Top copper
 Prepreg - PR7628 - 0.18mm
 Prepreg - PR7628 - 0.18mm
 Inner copper 1
 Core - FR4-Improved - 0.71mm
 Inner copper 2
 Prepreg - PR7628 - 0.18mm
 Prepreg - PR7628 - 0.18mm
 Bottom copper
 Bottom soldermask
 Plated drill
 Non Plated Through Hole (NPTH)
 Blind/buried via (Top - Inner 1)

Remarks

Blind/buried via (Top - Inner 1) ends at the top side of a core. Select the via in the buildup and use the buttons in the toolbar to correct the drill span or choose a different board buildup.

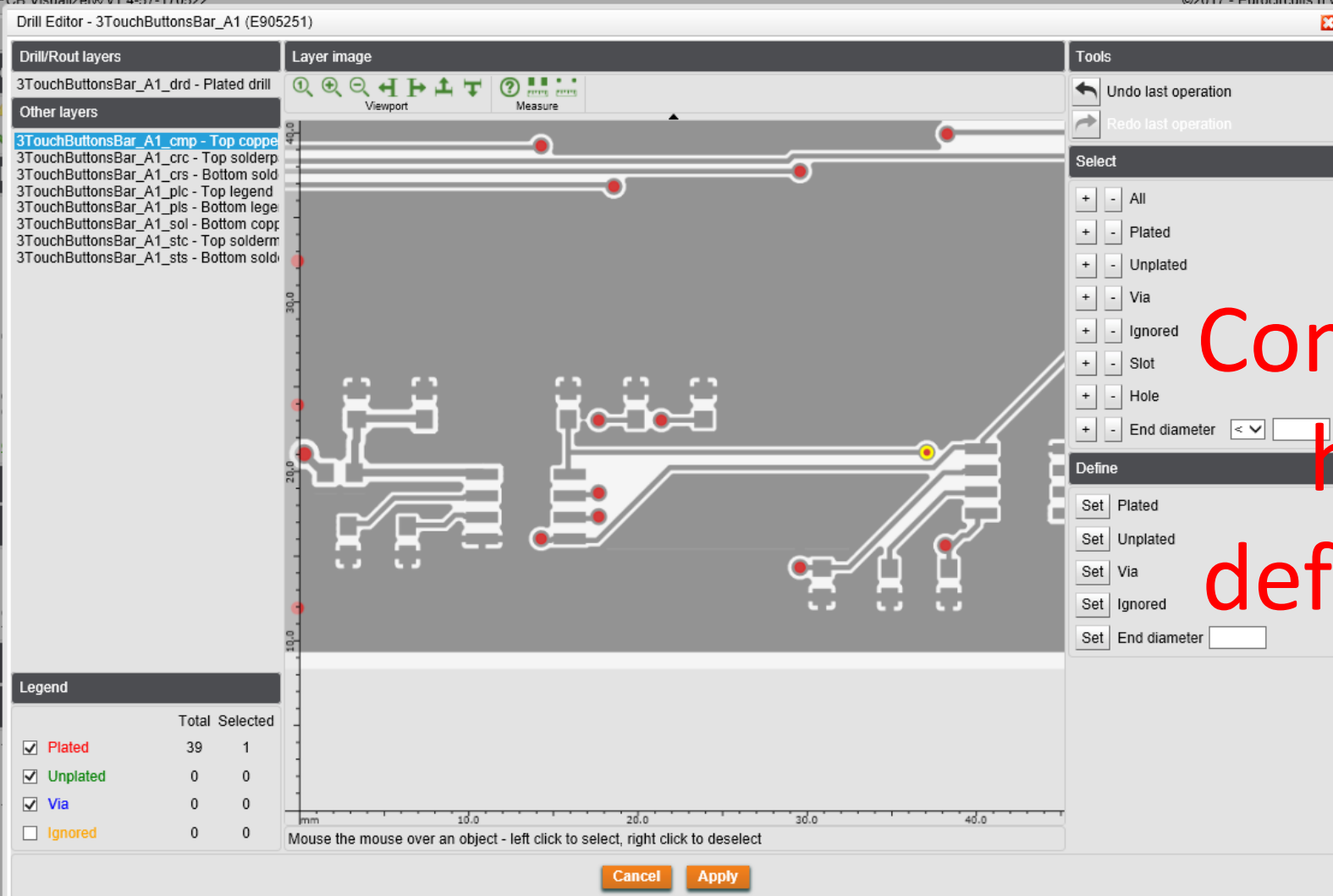
Cancel Apply [Click here for more information](#)

Bad buildup edited with buildup editor

892 combinations possible

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Confusing
hole
definition

OV ←
ECHELEN
OV ←
NDHOVEN

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Auto repair annular ring issues

Board technology Select classification


| | | | |
|--------------------------------|------------|--|----------|
| Outer layer trackwidth (OL-TW) | 0.150 mm | Outer layer isolation distance (OL-TT-TP-PP) | 0.150 mm |
| Outer layer annular ring (OAR) | 0.125 mm | Smallest final hole | 0.25 mm |
| Hole density | < 1000/dm² | Technology class | 6C |
| Holes <= may be reduced | 0.45 mm | | |

Fault view

Outer layer annular ring (OAR) - Top copper

☒ 0 ☒ 0 ☒ 0 ☒ 22

Current issue



| | specified | repaired |
|--------------------------|-----------|----------|
| Measured annular ring: | 0.025 mm | 0.150 mm |
| Required annular ring: | 0.125 mm | |
| Tool diameter: | 0.60 mm | 0.35 mm |
| Hole diameter: | 0.50 mm | 0.25 mm |
| Calculated pad diameter: | 0.650 mm | |

1 2

1/22

$AR = (Pad\ D - Tool\ D) / 2$ (Tool D = D drill bit)

Faulty AR = $(0.650mm - 0.60mm) / 2 = \mathbf{0.025mm}$

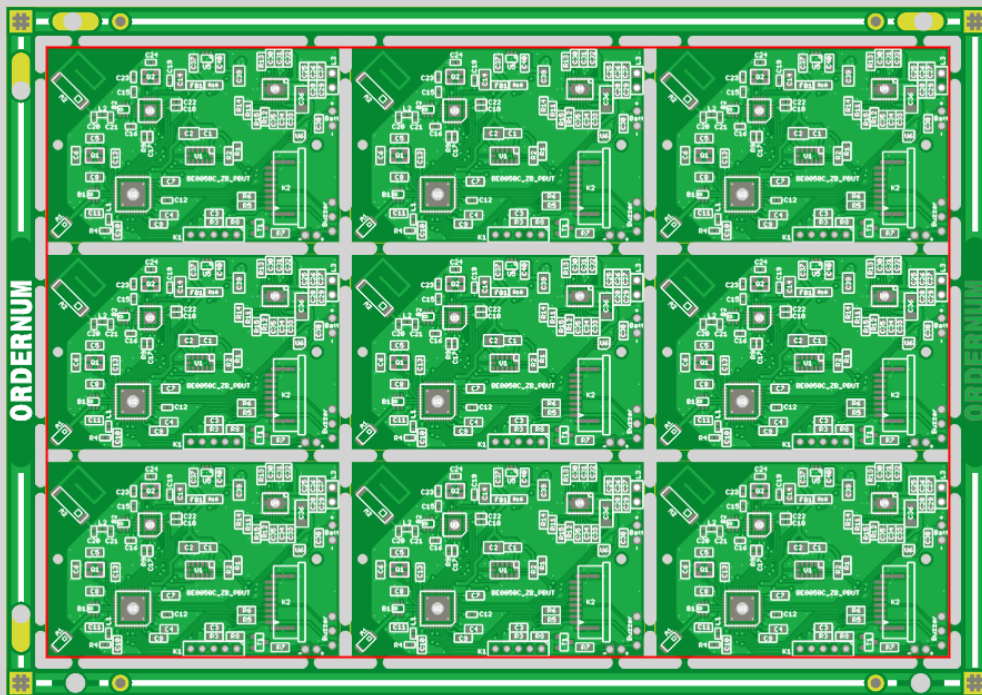
Repaired AR = $(0.650mm - 0.35mm) / 2 = \mathbf{0.150mm}$

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Panel and board properties

Panel size (161 x 110 mm)X size (mm) ☒ Automatic Y size (mm) ☒ Automatic **Panel border**Left border (mm) Right border (mm) Top border (mm) Bottom border (mm) **Board size** Measured: 51.0 x 34.0 mmX size (mm) Y size (mm) **Board separation method**Board spacing in X Board spacing in Y X board separation Y board separation **Tools**

- Select the object to edit
- Delete the selected object
- Undo the last operation
- Redo the last operation
- Add a step/repeat block
- Add a spacer
- Add a drill hole border element
- Add a copper clearance border element

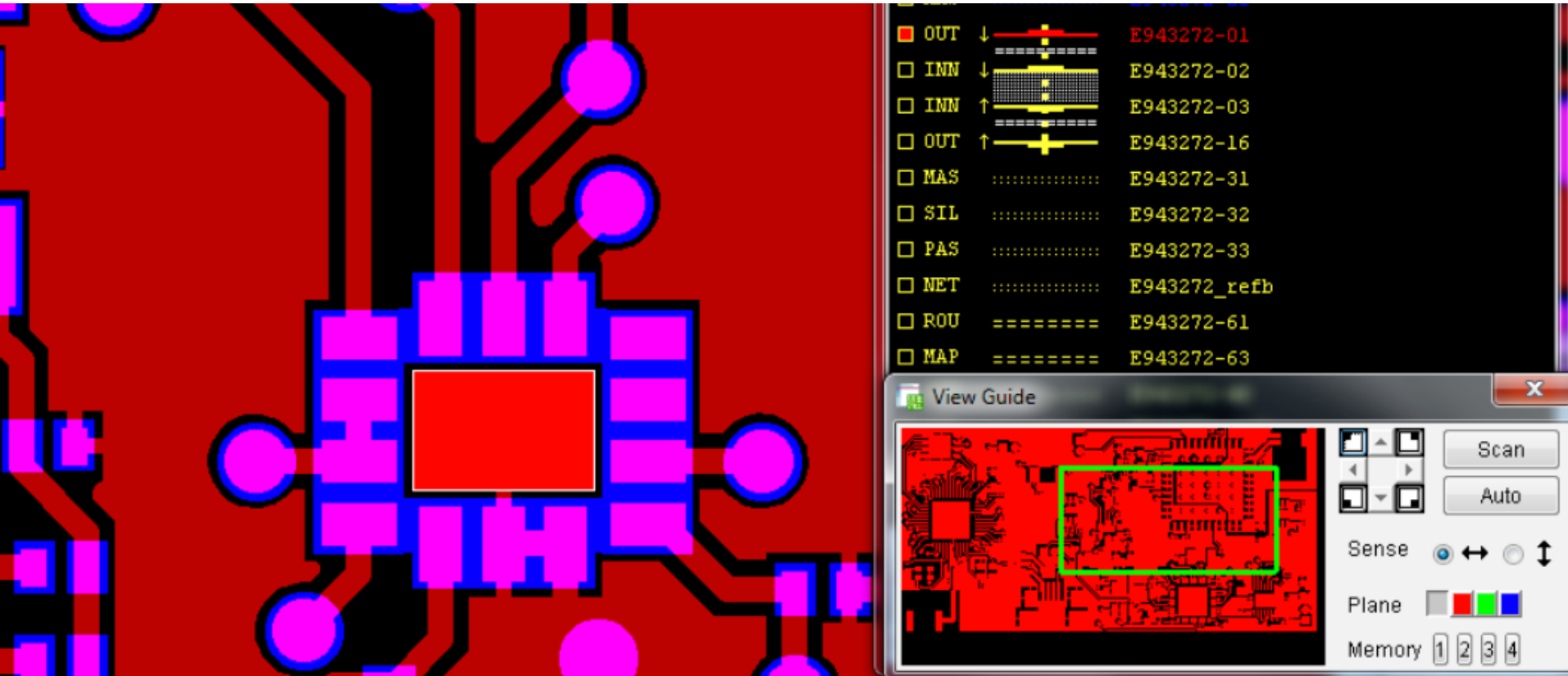
Block properties☒ Simple block ☐ Nested blockRepeat in X Repeat in Y Board rotation

Edit the properties of the selected object or click another object to edit it.

Cancel

Apply

Soldermask issues



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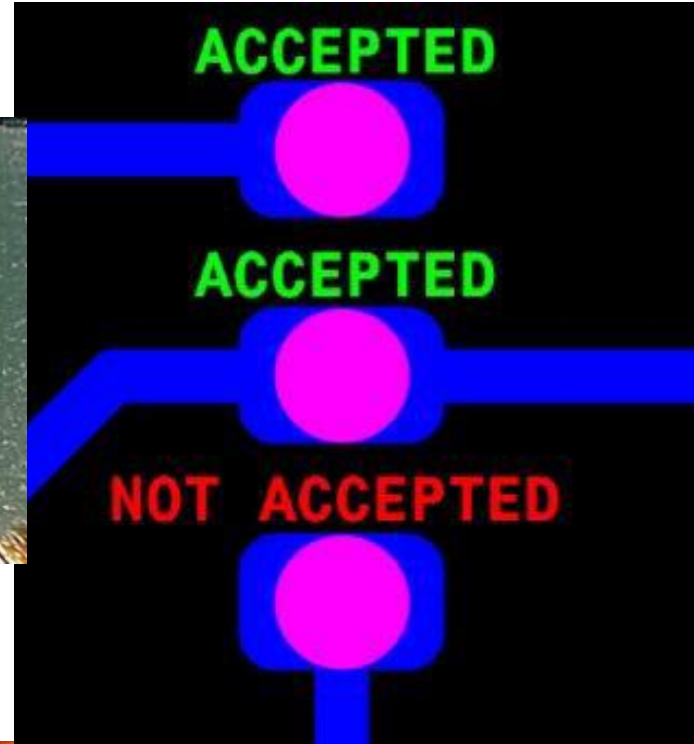
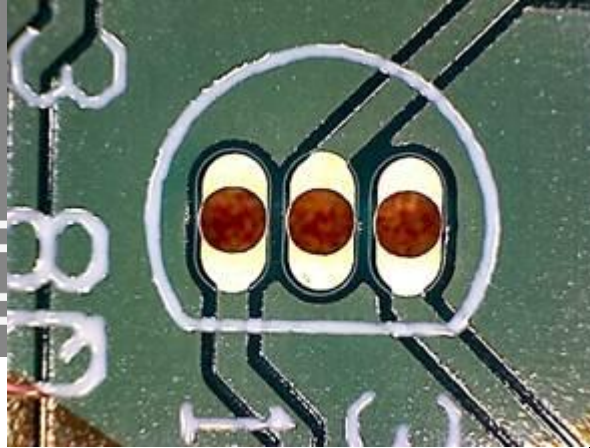
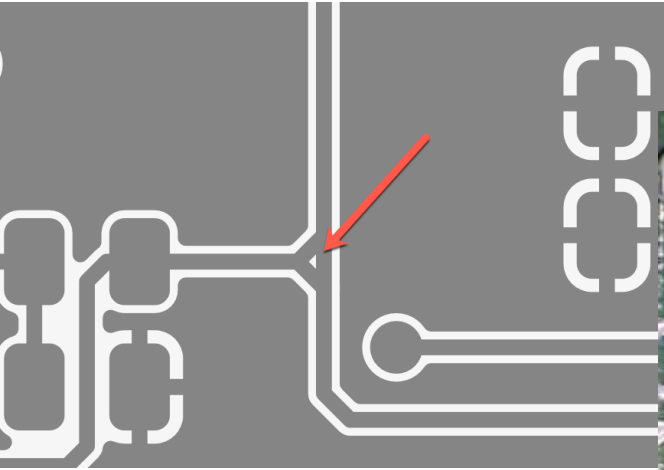
A stylized, high-contrast image of a circuit board. The background is a solid blue color. The circuit components are represented by black and white shapes. A large, central black rectangle is surrounded by various other black shapes, including smaller rectangles and circles. A yellow rectangular box is drawn around a specific area on the left side of the image, highlighting a section of the circuit. The overall style is graphic and minimalist, focusing on the layout and connectivity of the components.

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PCB production issues



NPTH : 0.15mm on toolsize (0.15mm on endsize)

PTH - Same net : 0.15mm on toolsize (0.25mm on endsize)

PTH - Diff net : 0.25mm on toolsize (0.35mm on endsize)

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Design For Manufacturing

- At your supplier
 - Operator
 - Offline CAM system
- Online tools
 - ?
 - eC Smart Tools – PCB Visualizer

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DRC - DFM information

| DRC information | |
|---|-------------------------|
| DFM information | |
| Layer | Values |
| Plating | |
| Top copper | 0.80 |
| Bottom copper | 0.71 |
| Solderpaste surface | |
| Top solderpaste | 1335.75 mm ² |
| Not-connected soldermask-free pads - Potential fiducials | |
| Top copper | 16 |
| Bottom copper | 0 |
| Copper free of soldermask | |
| Top copper | 14.80% |
| Bottom copper | 3.04% |

Plating

Top plating index 0.8

0. PCB Checker - DFM information

1. Plating index
2. Detailed info on the plating index of the chosen layer
3. Image of the plating index of the chosen layer
4. Calculated solder paste surface (SMD)
5. Potential fiducials
6. % Copper, free of soldermask against the board surface
7. On page online chat support

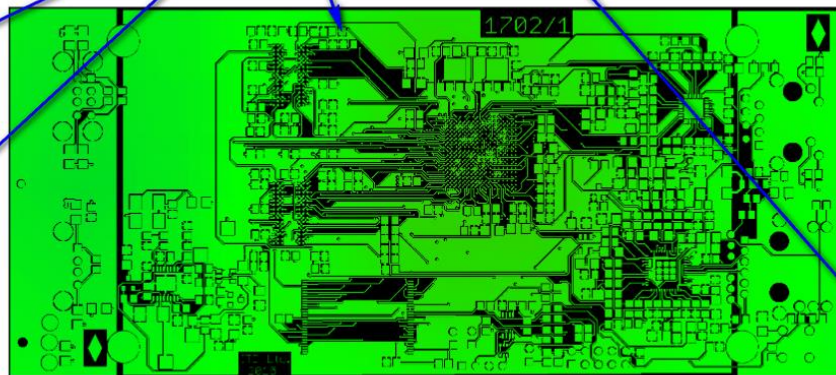
Fault view

Plating - Top copper

Current issue
Plating index : 0.80

The plating index measures the uniformity of copper density on the board. A completely uniform board has an index of 1 which means that no plating problems are expected. Lower values show less uniformity, highlighted on the visual image by the red and blue areas. If the index falls to 0.4 or less, then special attention is required.

More information can be found [here](#).



Underplating

Normal plating

Overplating

Summary

| | |
|-------------------------------|--|
| Service | STANDARD pool |
| Delivery term | 7 working days |
| Estimated shipment date | 22-10-2015 |
| Quantity | 10 PCBs |
| Board surface / Order surface | 1.11 dm ² / 11.09 dm ² |
| Prices | Net |
| Single PCB | € 42.27 |
| Total boards | € 422.69 |
| Express transport | € 0.00 |
| VAT 21.00% | € 88.77 |
| Total gross | € 511.46 |

Save changes

Click the 'Launch inquiry' button in case you are having troubles configuring your PCB. Our sales team will review your input and generate an offer.

Launch Inquiry

Remarks

The measured value for Outer layer annular ring (OAR) (0.050 mm) does not match any of the available options. ☐ Ignore

The measured value for Inner layer annular ring (IAR) (0.050 mm) does not match any of the available options. ☐ Ignore

Alternatives

Customized matrix

| 10 PCBs | 20 PCBs | 30 PCBs |
|----------------|----------------|----------------|
| 7 working days | 7 working days | 7 working days |
| Net | Net | Net |
| € 42.27 | € 27.92 | € 22.87 |
| € 422.69 | € 558.34 | € 686.09 |
| Select | Select | Select |
| 10 PCBs | 20 PCBs | 30 PCBs |
| 6 working days | 6 working days | 6 working days |
| Net | Net | Net |
| € 52.95 | € 34.07 | € 28.65 |
| € 529.50 | € 699.48 | € 859.58 |
| Select | Select | Select |

Contact support

Board name LSA-tstEagle (B0503230) Data set: Customer data

Customer data

Imported 21 layers

STANDARD pool

Delivery format: eC-panel by Eu Panel quantity: 10
 Delivery term: 7 working days Number of layers: 6
 PCB width (X) (mm): 158.75 Measured: 158.75 mm
 PCB height (Y) (mm): 69.85 Measured: 69.85 mm
 eC-registration compatible PCB: ☒
 Commercial details: 0

Stencils

Panel

Repeat in X: 2 Repeat in Y: 2
 Panel width (X) (mm): 333.50 Panel height (Y) (mm): 155.70
 PCBs per panel: 4 PCB separation method: Break routing
 Panel border: 5.00 mm PCB spacing: 2.00 mm
 Panel without cross outs: ☐ Panel outline: Routing

Material

Technology

PCB definition

Top soldermask: Green Bottom soldermask: Green
 Measured: Detected Measured: Detected
 Top legend: White Bottom legend: None
 Measured: Detected Measured: Not detected
 Surface finish: Any lead free fi Milling: No
 Bare Board Testing: ☒

Advanced options

Board buildup

Top view
 Top solderpaste
 Top legend
 Top soldermask
 Top copper
 Inner copper 1
 Inner copper 2
 Inner copper 3
 Inner copper 4
 Bottom copper
 Bottom soldermask
 Plated drill
 Non Plated Through Hole (NPTH)
 Bottom view
 Total material thickness: 1.56 mm

Detailed View

0. All Order details of your PCB.
1. Imported layers and the Buildup editor.
2. Graphical presentation of the Buildup.
3. Panel editor to define customer panels.
4. Classification wizard to determine the technology class of the PCB.
5. PCB PIXtore editor to integrate graphics onto your PCB.
6. Marking editor to manipulate all markings on the board.
7. The Visualization of your data, your virtual PCB.
8. The shown data set, customer data or production data.
9. The PCB Visualizer help function.
10. The price for your chosen combination of quantity and delivery term.
11. Save all changes to the basket item.
12. Launch an inquiry to be processed by our engineers and sales.
13. Remarks on your data versus order details, actions required.
14. Customized matrix to input your choice of quantity and delivery terms.
15. Automatically Chosen alternatives for Quantities and delivery terms.
16. On page online chat support.

Summary

| | |
|-------------------------------|----------------------|
| Service | STANDARD pool |
| Delivery term | 7 working days |
| Estimated shipment date | 22-10-2015 |
| Quantity | 10 panels |
| Board surface / Order surface | 5.19 dm² / 51.93 dm² |
| Price | Net |
| Single panel | € 113.62 |
| Total boards | € 1136.18 |
| Express transport | € 0.00 |
| VAT | € 238.60 |
| Total gross | € 1374.78 |

[Save changes](#)

Click the 'Launch inquiry' button in case you are having troubles configuring your PCB. Our sales team will review your input and generate an offer.

Remarks

The panel is marked as eC-registration compatible, but no stencils are ordered.

The measured value for Outer layer annular ring (OAR) (0.050 mm) does not match any of the available options.

The measured value for Inner layer annular ring (IAR) (0.050 mm) does not match any of the available options.

Alternatives

Customized matrix

| 10 panels | 20 panels | 30 panels |
|------------------------|------------------------|------------------------|
| 10 working days | 10 working days | 10 working days |
| Net | Net | Net |
| € 985.89 | € 68.45 | € 56.29 |
| € 1369.10 | € 1369.10 | € 1688.76 |
| Select | Select | Select |
| 10 panels | 20 panels | 30 panels |
| 8 working days | 8 working days | 8 working days |
| Net | Net | Net |
| € 108.61 | € 75.41 | € 62.02 |

[Contact support](#)

DESIGN AUTOMATION & EMBEDDED SYSTEMS

Remove data ambiguities online

PCBAssembly data - CAD to CAM

| PCBA - details | Possible issues | Clearly defined in: | | | PCBA Visualizer defines |
|---------------------------------|---|---------------------|-----|--------------------|-------------------------|
| | | BOM | CPL | Native EAGLE/KiCAD | |
| File format | Definition not standardized | no | no | yes | BOM editor / CPL editor |
| Component description | Definition not standardized | no | no | no | BOM editor |
| Manufacturing Part Number | Not clear or partial description | no | no | no | BOM editor |
| Supplier Part Number | Not clear or partial description | no | no | no | BOM editor |
| Component package | Poor definition leads to different package link in manufacturing DB | no | no | no | BOM editor |
| Component origin (Offset) | Different origin than manufacturing DB | no | no | no | CPL editor |
| Component Rotation (pin 1) | Different rotation than manufacturing DB | no | no | no | CPL editor |
| Component centroid | Different centroid than manufacturing DB | no | no | no | CPL editor |
| Component footprint | Poor definition leads to different footprint link in manufacturing DB | no | no | no | - |
| IPC definition of the footprint | Almost never available | no | no | no | show |
| Component Packaging | Need to be decided by the manufacturer | no | no | no | removed in BOM editor |

**DESIGN AUTOMATION
& EMBEDDED SYSTEMS**

FP6A - SECURITY - INTERNET OF THINGS - ELECTRONIC DESIGN & PRODUCTION - EMBEDDED - DESIGN FOR EXCELLENCE - EMBEDDED DESIGN CHALLENGES

7 NOV ←
TECHNOPOLIS, MECHELEN
8 NOV ←
VAN DER VALK HOTEL, EINDHOVEN



Bill Of Material - Jibberish

| | A | B | C | D | E | F |
|----|---|-------------------------|-------------------------------|-----------------------------|---|---|
| 10 | 9 | 10k | R_0603 | 0603_TYPE_B | R6, R7, R8, R9, R10, R11, R12, R25, R26 | |
| 11 | 6 | 10n | C_0603 | 0603_TYPE_B | C45, C46, C47, C48, C49, C50 | |
| 12 | 1 | 10u | C_0805 | 0805_TYPE_A | C34 | |
| 13 | 1 | 15EDGRC-3.5/6P | CON_TERMINAL_3.5MM_6-PIN | CON_TERMINAL_3.5MM_6-PIN | CN6 | |
| 14 | 2 | 18p | C_0603 | 0603_TYPE_B | C56, C57 | |
| 15 | 1 | 1k | R_0603 | 0603_TYPE_B | R13 | |
| 16 | 1 | 1u | CPOL-EUSMCA | SMC_A | C31 | |
| 17 | 2 | 1u | C_0603 | 0603_TYPE_B | C36, C39 | |
| 18 | 2 | 2.2u | CPOL-EUSMCA | SMC_A | C25, C28 | |
| 19 | 3 | 20k | R_0603 | 0603_TYPE_B | R16, R19, R22 | |
| 20 | 4 | 22 | R_0603 | 0603_TYPE_B | R2, R3, R4, R14 | |
| 21 | 1 | 22uH | L-EUL3225M | L3225M | L1 | |
| 22 | 4 | 4.7u | CPOL-EUSMCA | SMC_A | C1, C33, C35, C37 | |
| 23 | 1 | 40_PIM_CON_0.5_MM WURTH | 40_PIM_CON_0.5_MM WURTH | CON_FFC_40-PIN_0.5MM_WURTH- | | |
| 24 | 1 | 5 | R_0603 | 0603_TYPE_B | CN2 | |
| 25 | 1 | 8MHz | CRYSTAL_2PIN | CRYSTAL_3.2MM_2PIN | Q1 | |
| 26 | 1 | AP5724WG-7 | AP5724 | SOT23-6 | IC4 | |
| 27 | 1 | AS4C4M16S-6BIN | SDRAM_16-BIT | TFBGA-54 | IC2 | |
| 28 | 1 | IP4252CZ8-4-TTL13 | EMIF_4CH_IP4252 | EMIF_4CH_IP4252 | IC7 | |
| 29 | 2 | IRLML2246TRPBF | SOT23 | T1, T2 | P-CHAN | |
| 30 | 1 | LD-BZEN-0803 | BUZZER_01 | BUZZER_01 | BZ1 | |
| 31 | 1 | M95512-WMN6P | EEPROM_SPI_S08 | S008 | IC5 | |
| 32 | 3 | MAX31856MUD+ | MAX31856MUD+ | TSSOP14 | IC8, IC9, IC10 | |
| 33 | 1 | MCP130T-300 | MCP130 | SOT-23-II | IC3 | |
| 34 | 2 | PMEG4005AEA.115 | SMF5.0AT1 | SOD123FL | D2, D3 | |
| 35 | 1 | SMLVT3V3 | DIODE_SUPPRESSOR_UNIDIRECTION | DO-214AA | D1 | |
| 36 | 1 | STM32F429NI | STM32F429N | TFBGA | IC1 | |
| 37 | 1 | TSC2046 | TSC2046 | TSSOP16 | IC11 | |
| 38 | 1 | W25Q32FVSSIG | EEPROM_SPI_S08SOIC8_WIDE | S008W | IC6 | |

| Qty | Value | Device | Package | Parts | Description |
|-----|-------------------------|---------------------------------|---|--|--------------------------------------|
| 1 | JP_1X14 | JP_1X14 | CN1 | | |
| 1 | JP_1X4 | JP_1X4 | CN5 | | |
| 1 | JP_1X5 | JP_1X5 | CN3 | | |
| 1 | JP_1X6 | JP_1X6 | CN4 | | |
| 1 | JUMPER_SMD_ROUND | JUMPER_SMD_ROUND | JP1 | | |
| 6 | 100 | R_0603 | 0603_TYPE_B | R17, R18, R20, R21, R23, R24 | |
| 2 | 100k | R_0603 | 0603_TYPE_B | R1, R27 | |
| 40 | 100n | C_0402 | 0402_TYPE_C | C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17 | |
| 9 | 10k | R_0603 | 0603_TYPE_B | R6, R7, R8, R9, R10, R11, R12, R25, R26 | |
| 6 | 10n | C_0603 | 0603_TYPE_B | C45, C46, C47, C48, C49, C50 | |
| 1 | 10u | C_0805 | 0805_TYPE_A | C34 | |
| 1 | 15EDGRC-3.5/6P | CON_TERMINAL_3.5MM_6-PIN | CON_TERMINAL_3.5MM_6-PIN | CN6 | |
| 2 | 18p | C_0603 | 0603_TYPE_B | C56, C57 | |
| 1 | 1k | R_0603 | 0603_TYPE_B | R13 | |
| 1 | 1u | CPOL-EUSMCA | SMC_A | C31 | POLARIZED CAPACITOR, European symbol |
| 2 | 1u | C_0603 | 0603_TYPE_B | C36, C39 | |
| 2 | 2.2u | CPOL-EUSMCA | SMC_A | C25, C28 | POLARIZED CAPACITOR, European symbol |
| 3 | 20k | R_0603 | 0603_TYPE_B | R16, R19, R22 | |
| 4 | 22 | R_0603 | 0603_TYPE_B | R2, R3, R4, R14 | |
| 1 | 22uH | L-EUL3225M | L3225M | L1 | INDUCTOR, European symbol |
| 4 | 4.7u | CPOL-EUSMCA | SMC_A | C1, C33, C35, C37 | POLARIZED CAPACITOR, European symbol |
| 1 | 40_PIM_CON_0.5_MM WURTH | 40_PIM_CON_0.5_MM WURTH | CON_FFC_40-PIN_0.5MM_WURTH-687140149022 | CN2 | |
| 5 | R_0603 | 0603_TYPE_B | R15 | | |
| 1 | 8MHz | CRYSTAL_2PIN | CRYSTAL_3.2MM_2PIN | Q1 | |
| 1 | AP5724WG-7 | AP5724 | SOT23-6 | IC4 | |
| 1 | AS4C4M16S-6BIN | SDRAM_16-BIT | TFBGA-54 | IC2 | |
| 1 | IP4252CZ8-4-TTL13 | EMIF_4CH_IP4252 | EMIF_4CH_IP4252 | IC7 | |
| 1 | IRLML2246TRPBF | BSS84 | SOT23 | T1, T2 | P-CHANNEL MOS FET |
| 1 | LD-BZEN-0803 | BUZZER_01 | BUZZER_01 | BZ1 | |
| 1 | M95512-WMN6P | EEPROM_SPI_S08 | S008 | IC5 | |
| 3 | MAX31856MUD+ | MAX31856MUD+ | TSSOP14 | IC8, IC9, IC10 | |
| 1 | MCP130T-300 | MCP130 | SOT-23-II | IC3 | |
| 2 | PMEG4005AEA.115 | SMF5.0AT1 | SOD123FL | D2, D3 | 200 W Transient Voltage Suppressor |
| 1 | SMLVT3V3 | DIODE_SUPPRESSOR_UNIDIRECTIONAL | DO-214AA | D1 | |
| 1 | STM32F429NI | STM32F429N | TFBGA | IC1 | |
| 1 | TSC2046 | TSC2046 | TSSOP16 | IC11 | |
| 1 | W25Q32FVSSIG | EEPROM_SPI_S08SOIC8_WIDE | S008W | IC6 | |

- Different file formats used
- BOM output from CAD system is limited - Cryptic description of component and package

DESIGN AUTOMATION & EMBEDDED SYSTEMS

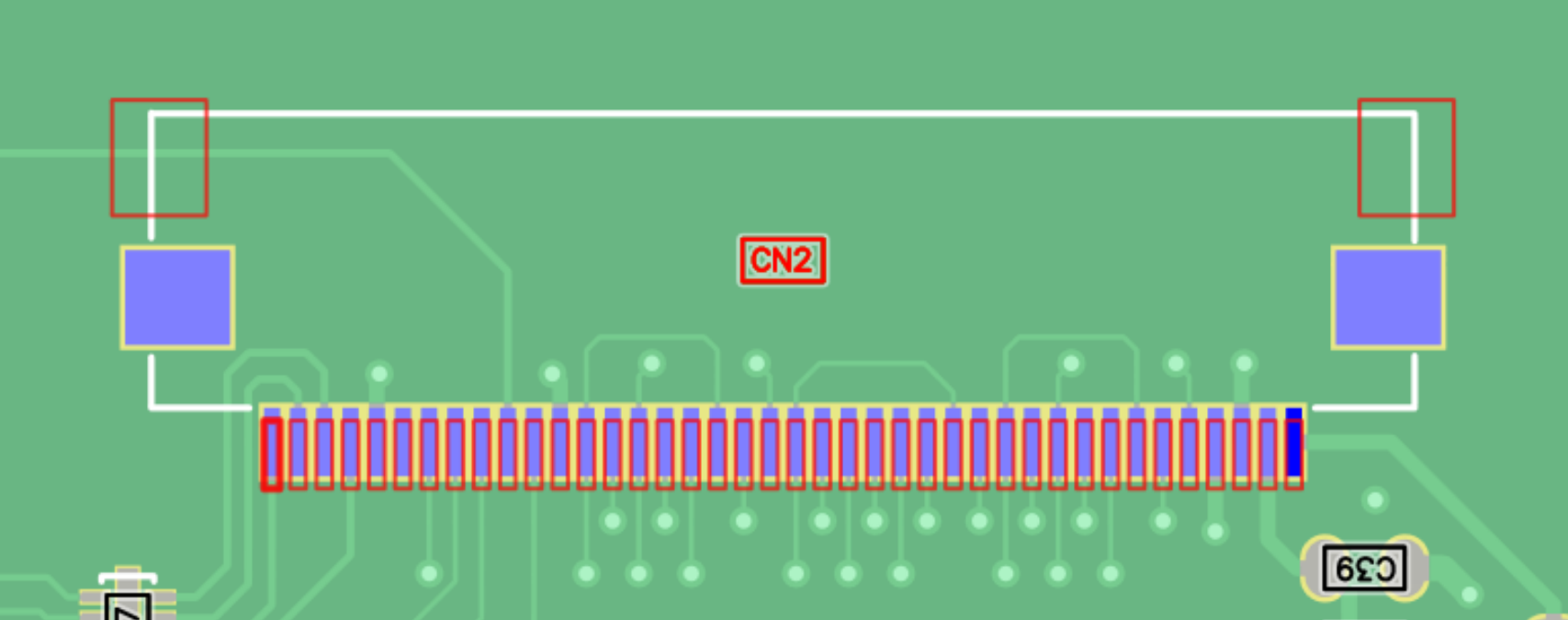
FPGA - SECURITY - INTERNET OF THINGS - ELECTRONIC DESIGN & PRODUCTION - EMBEDDED - DESIGN FOR EXCELLENCE - EMBEDDED DESIGN CHALLENGES

7 NOV ←

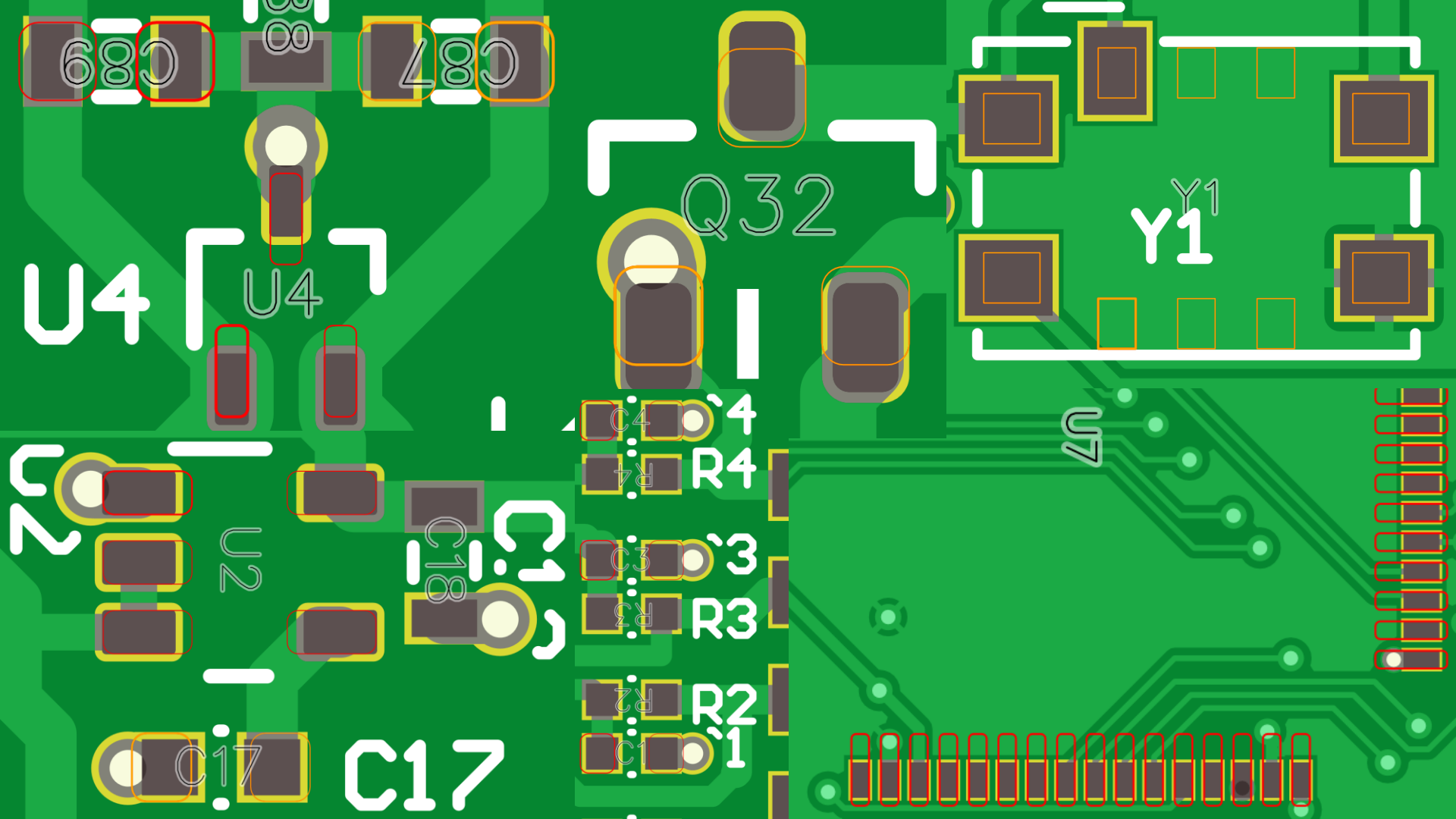
TECHNOPOLIS, MECHELEN

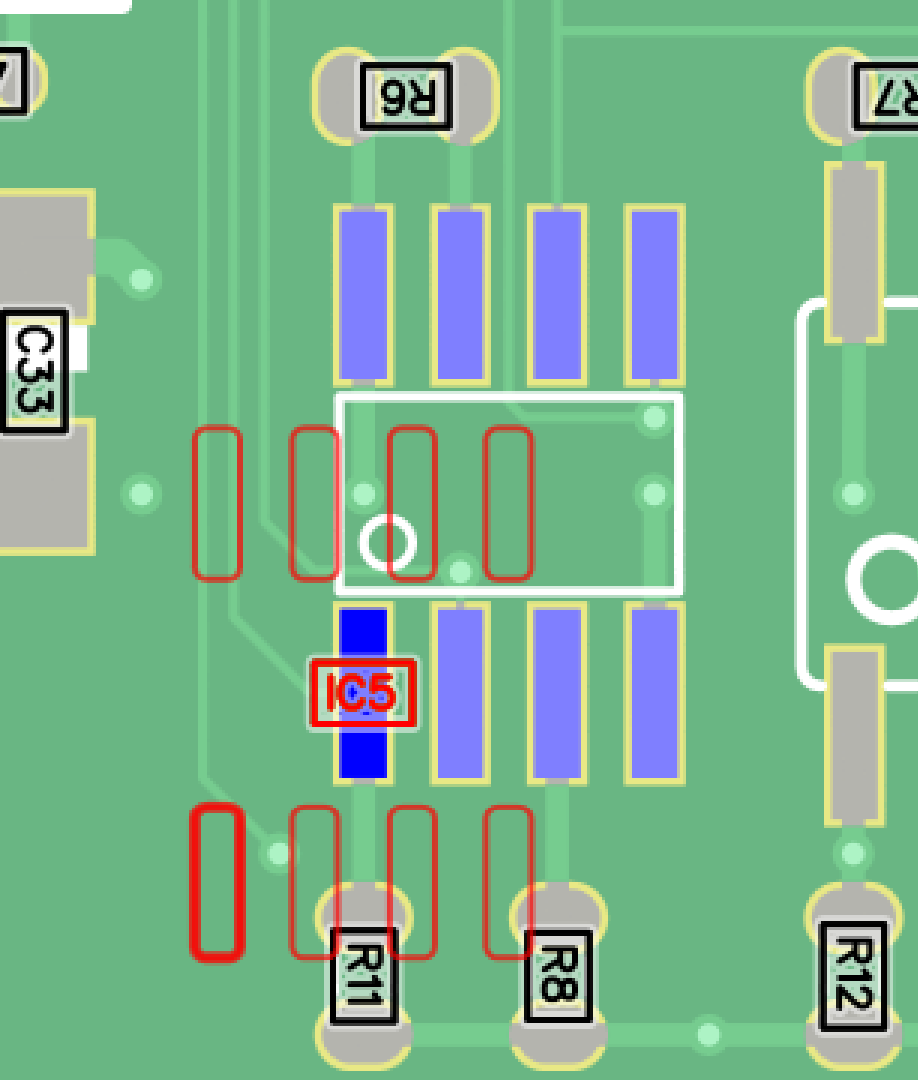
8 NOV ←

VAN DER VALK HOTEL, EINDHOVEN

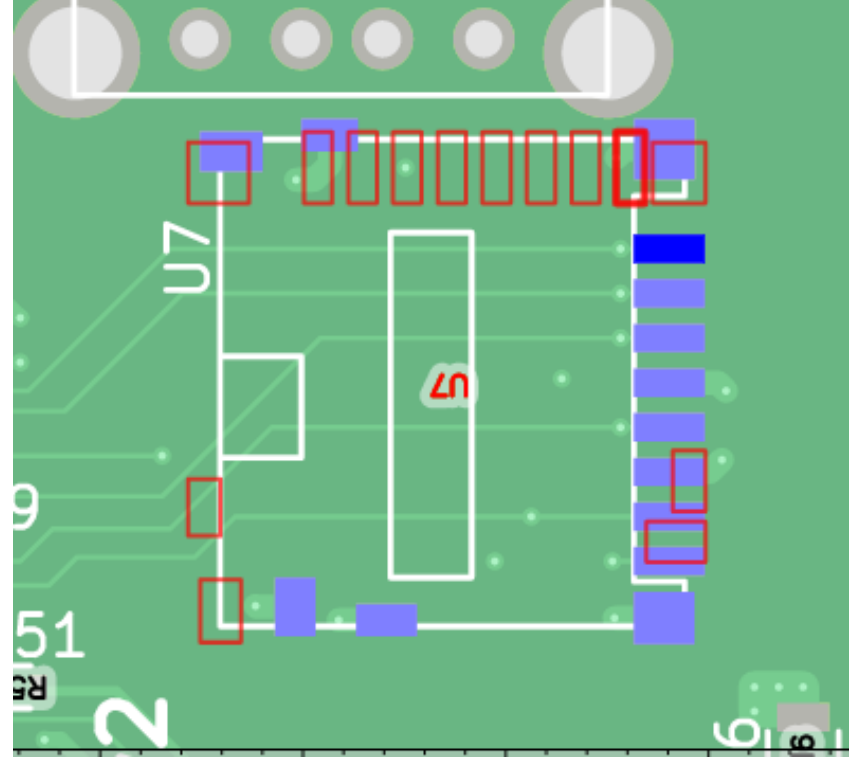
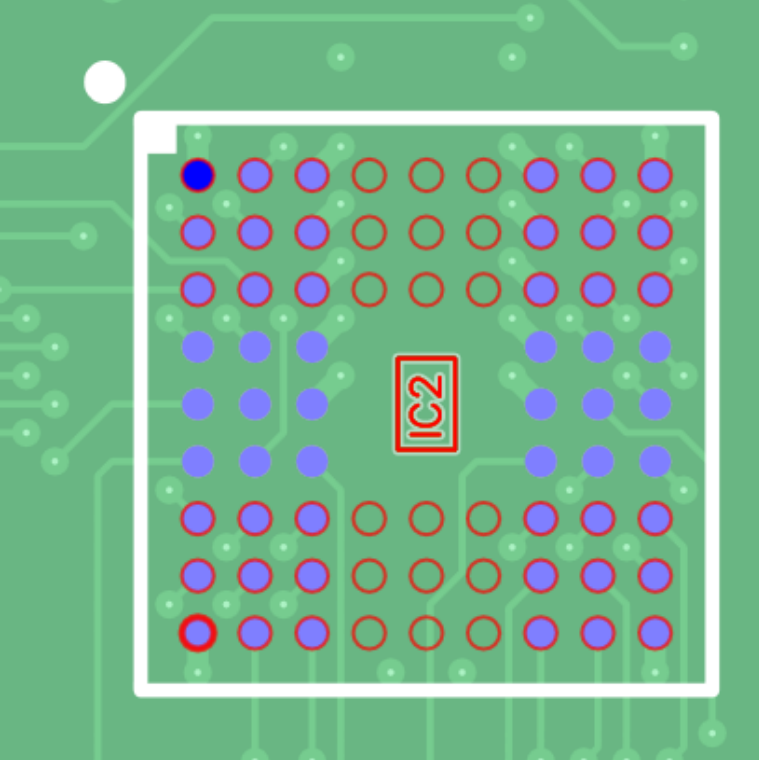


- Footprint – check CAD-info against other database
 - Incorrect component chosen. Same device available with different packages
 - Incorrect footprint definition in CAD library





- Location
 - PIN1 vs centroid location in CPL file



- Rotation
 - Each library can define its own default rotation
 - CAD – ERP - Machine

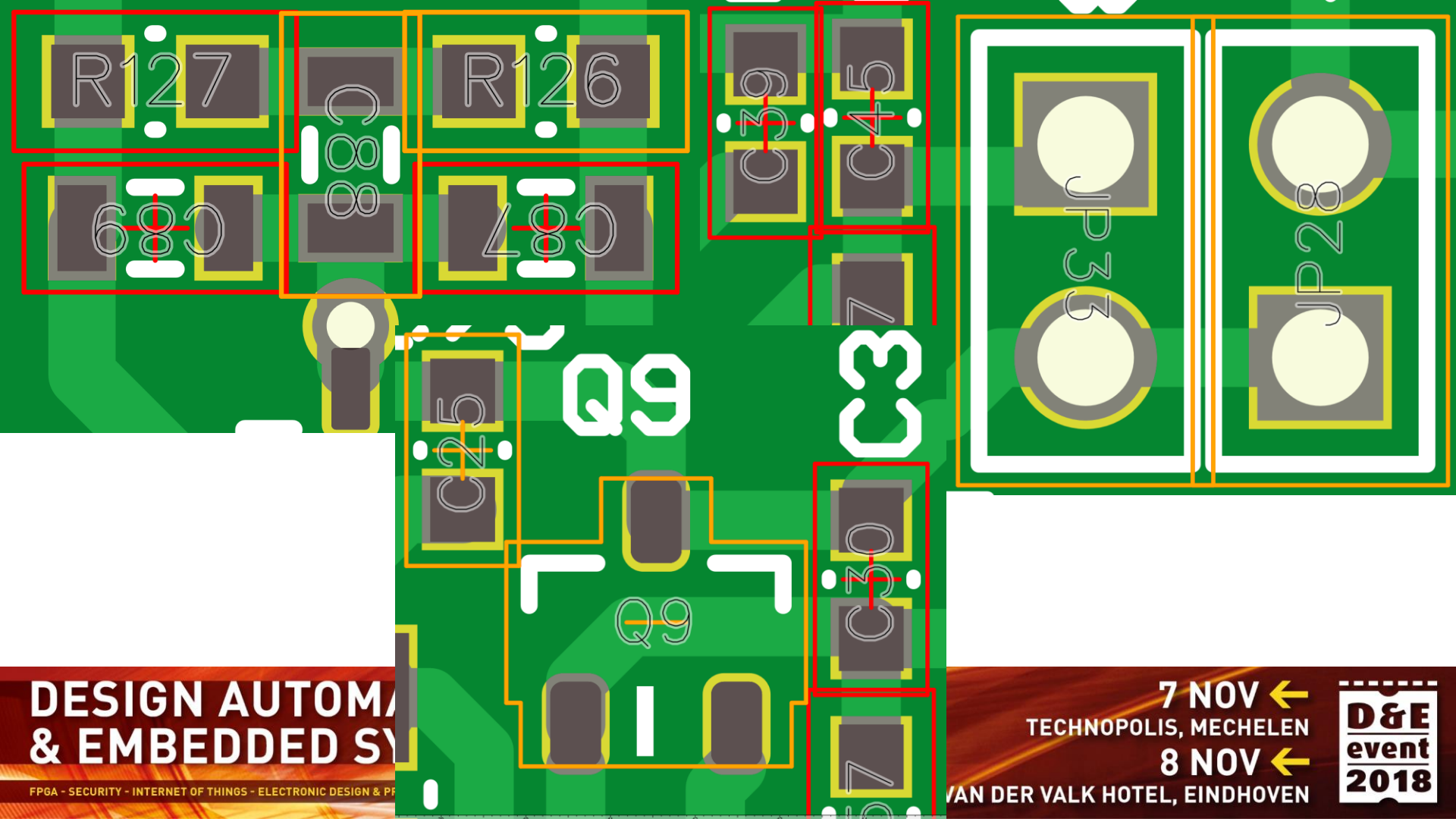
DESIGN AUTOMATION & EMBEDDED SYSTEMS

FPGA - SECURITY - INTERNET OF THINGS - ELECTRONIC DESIGN & PRODUCTION - EMBEDDED - DESIGN FOR EXCELLENCE - EMBEDDED DESIGN CHALLENGES

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TECHNOPOLIS, MECHELEN

8 NOV ←
VAN DER VALK HOTEL, EINDHOVEN

D&E
event
2018



DESIGN AUTOMATION & EMBEDDED SYSTEMS

FPGA - SECURITY - INTERNET OF THINGS - ELECTRONIC DESIGN & PRODUCTION

7 NOV ←
TECHNOPOLIS, MECHELEN
8 NOV ←
VAN DER VALK HOTEL, EINDHOVEN



TOP DFM ISSUES

- Solder escapes
- Cold spot - Hot spot
- Copper unbalanced per comp (tomb stoning)
- Pad sizes <-> geometry component
- Footprint: component vs PCB
- Rotation
- Pin1 + polarity
- Solder mask problems - Bridges not manufacturable etc...
- BGA - QFN - LGA ≤ 0.5 mm -> finish Che Ni/Au or Ag
- Via in pad -> adapt layout or Via filling or No Go
- Fiducials?
 - Panel
 - PCB
 - Component
- Overhanging components?
 - V-Cut
 - Break bridges
 - Panel border width
 - IPC component clearance

**DESIGN AUTOMATION
& EMBEDDED SYSTEMS**

FPGA - SECURITY - INTERNET OF THINGS - ELECTRONIC DESIGN & PRODUCTION - EMBEDDED - DESIGN FOR EXCELLENCE - EMBEDDED DESIGN CHALLENGES

7 NOV ←
TECHNOPOLIS, MECHELEN

8 NOV ←
VAN DER VALK HOTEL, EINDHOVEN



PCBA Visualizer does your DFM

BOM

CPL

Review component placements (showing all)
[168 components defined](#), of which [35 components to be approved](#).

Bird's Eye View - Top

Detailed View - Top

Viewpoint

Measure

Footprint

3D

Markup

Bird's Eye View - Bottom

IC1

IC2

IC3

L1

L10

L11

R4

R5

R7

R8

R9

R10

R11

R12

R13

R14

R15

R16

R17

R18

R19

R20

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