



EASYLOGIX.DE



PCB Investigator

Technologietag 2014

Schindler & Schill GmbH

Bruderwöhrdstr. 15b
93055 Regensburg
Deutschland

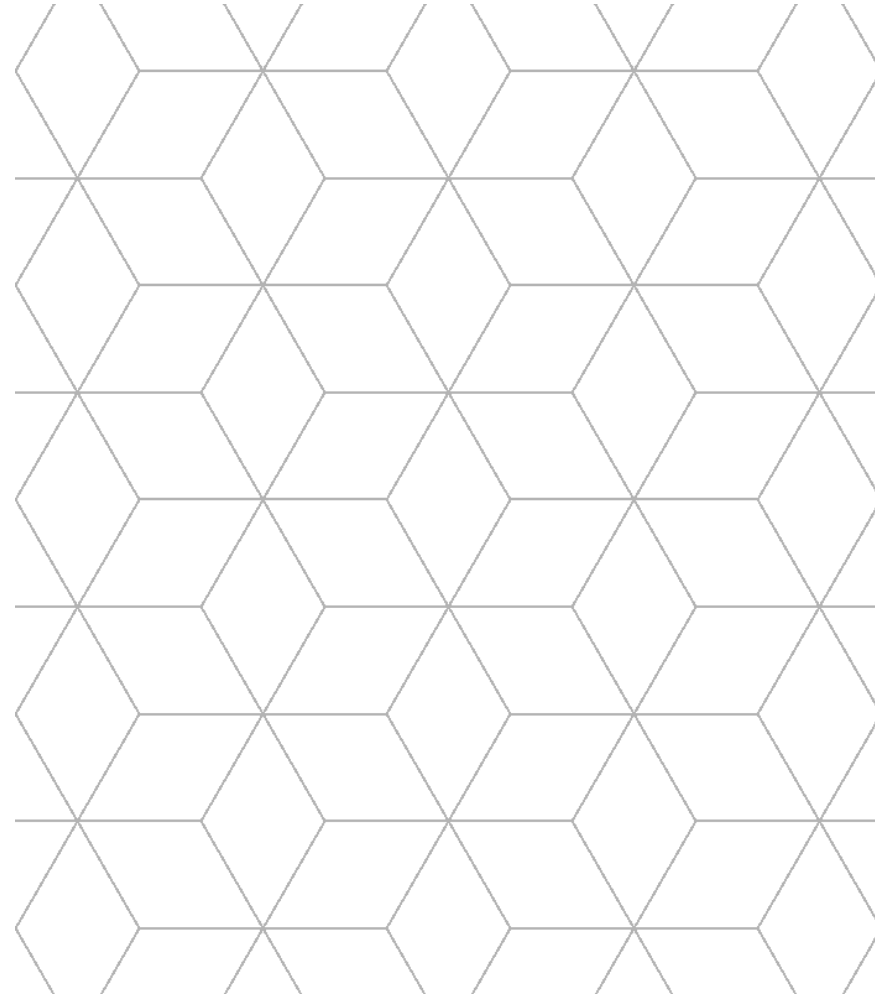
Tel: +49 941 604 889 719
Email: info@easyLogix.de
Web: www.easyLogix.de

Agenda



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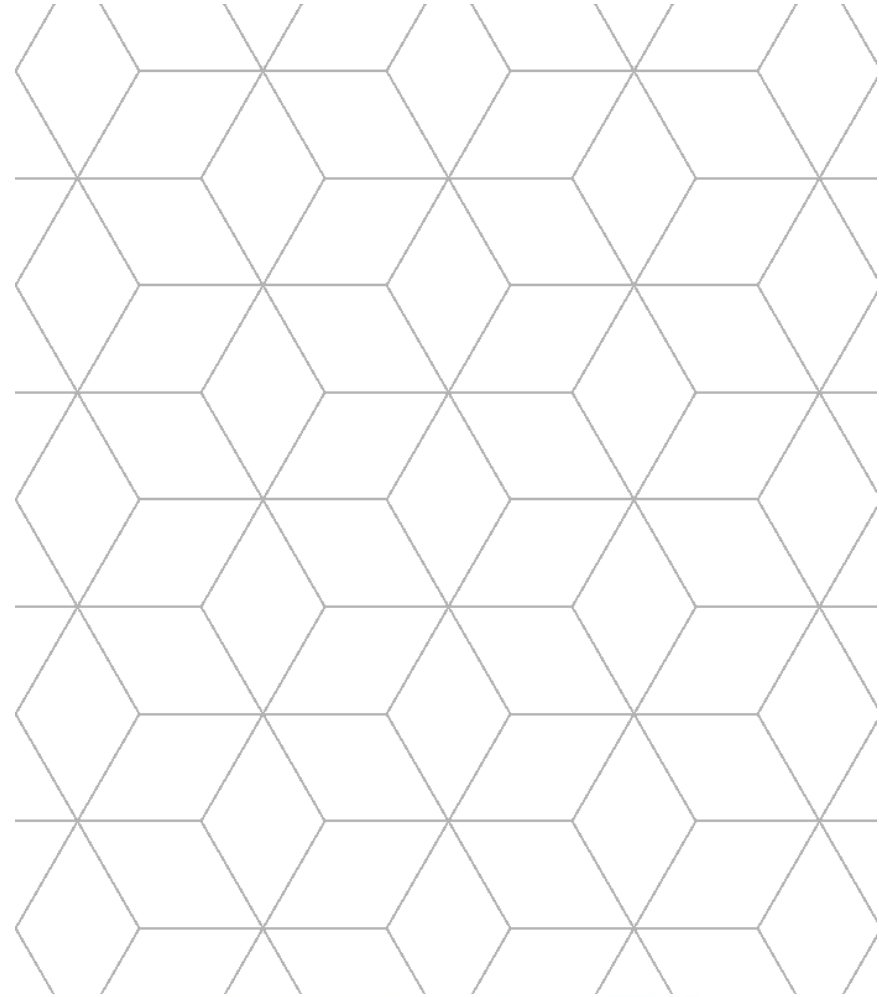
- EDA – CAM nur zur Datenaufbereitung?
- Warum Daten überprüfen?
 - Unterschiedliche Ausgaben von Gerber
 - Zusammen fügen Leiterplatte und Bauteile
 - Einzelteil Nutzen
 - Änderungsverfolgung
- Trend Miniaturisierung
- Papierlose Fertigung
 - Dokumentenverwaltung
 - Elektronisches Reparatur Konzept (Paperless Repair)
- Auswertungen
- Änderungsverfolgung
 - Graphisch
 - Stückliste und Netzliste



Agenda



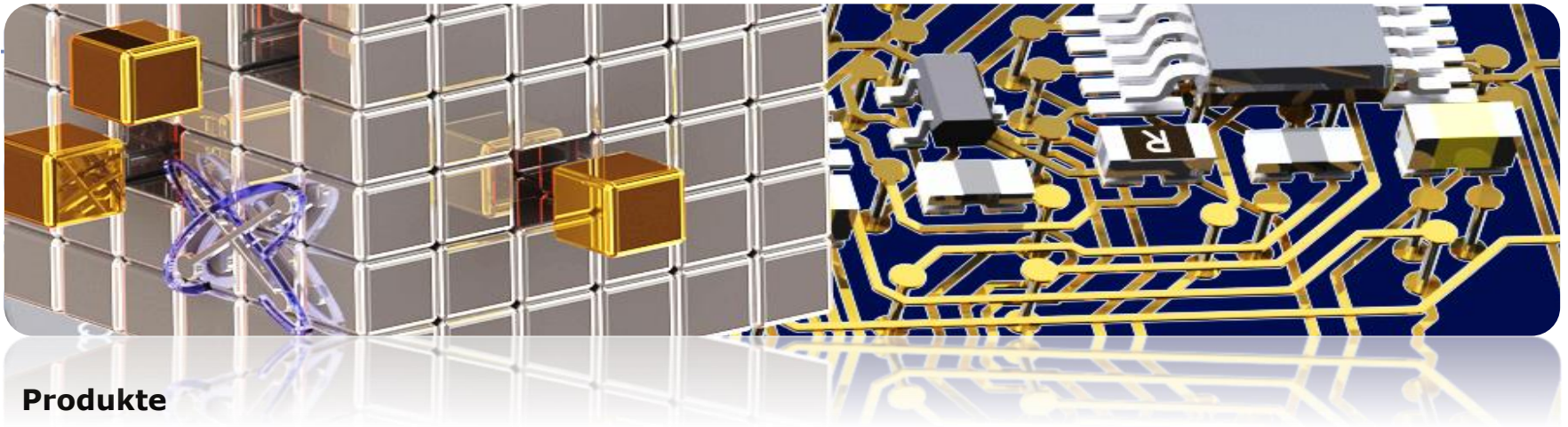
- Unterstützung Entwickler
- DRC / DFM Analysen
- Kommunikation
 - Lizenzfreier Viewer



Portfolio



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Produkte

CAD/CAM

- PCB-Investigator
- GerberLogix
- Web Gerber Viewer
- E-CAD Bibliothek .Net Framework
- NBI Native Board Import für Leiterplatten und Baugruppen

Service

- Datenkonvertierung 2D 3D für Leiterplatten und Baugruppen
- Beratung Leiterplatten und Baugruppen Fertigung
- Beratung zur Erstellung von DFM/DRC Analysen
- Embedded Software .NetMF, C++
- Cloud Anbindung ASP.Net, SQL Server

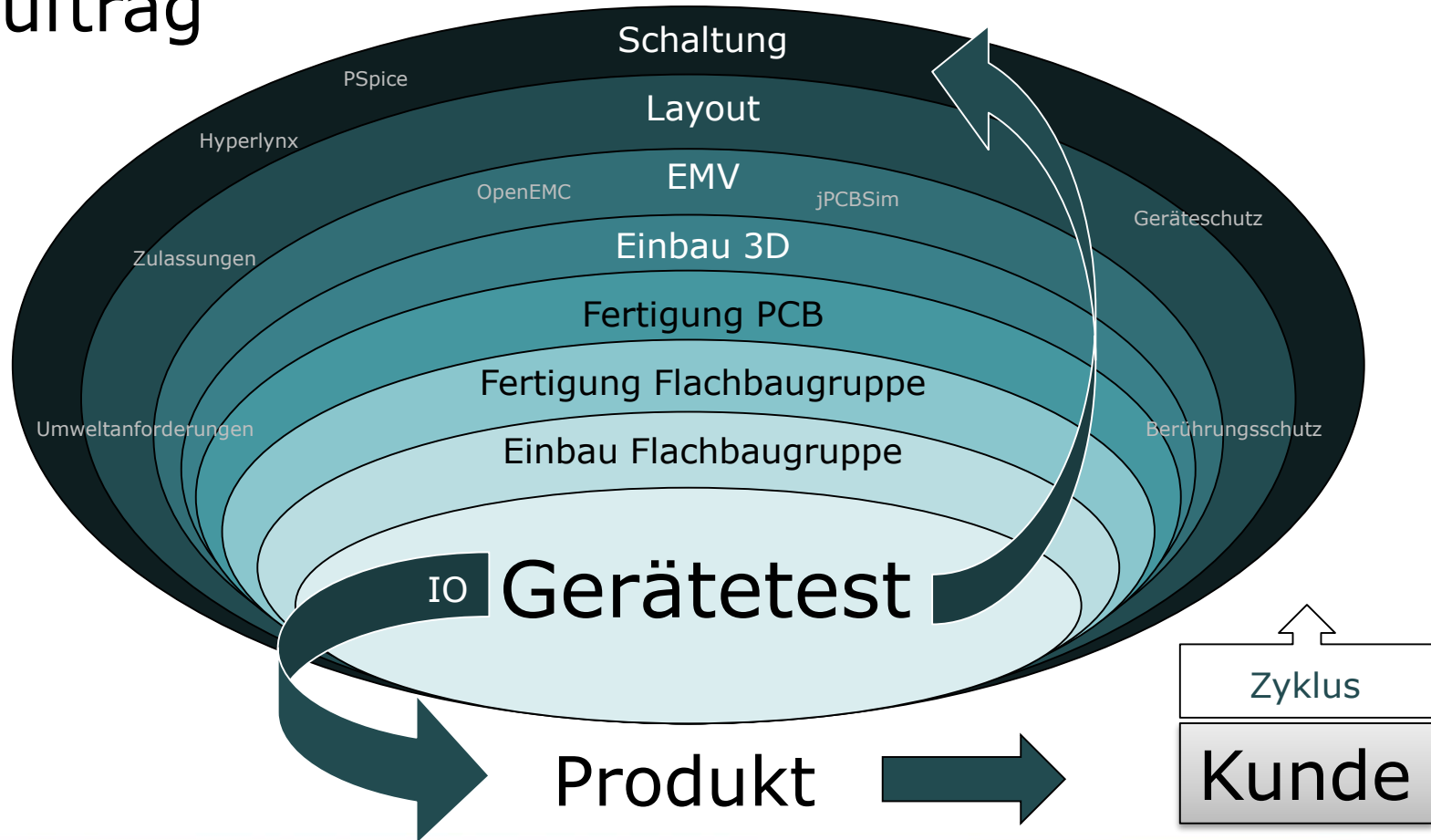


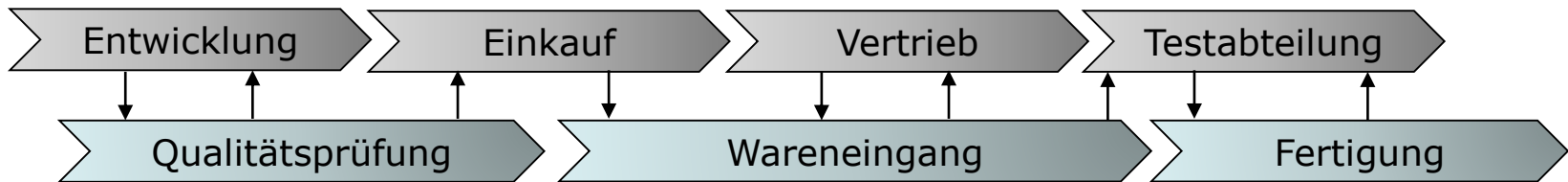
EDA – CAM

Nur zur Datenaufbereitung?



Auftrag





Ausgabe Daten vergleichen

- Unterschiede von verschiedenen Versionen protokollieren
- Optisch, Netzliste, ODB++, Gerber, IDF, DXF, IPC2581

Netze verfolgen

- Power Ground Anbindungen
- High Speed Verbindungen
- Impedanz kontrollierte Leitungen

Abstandsberechnungen

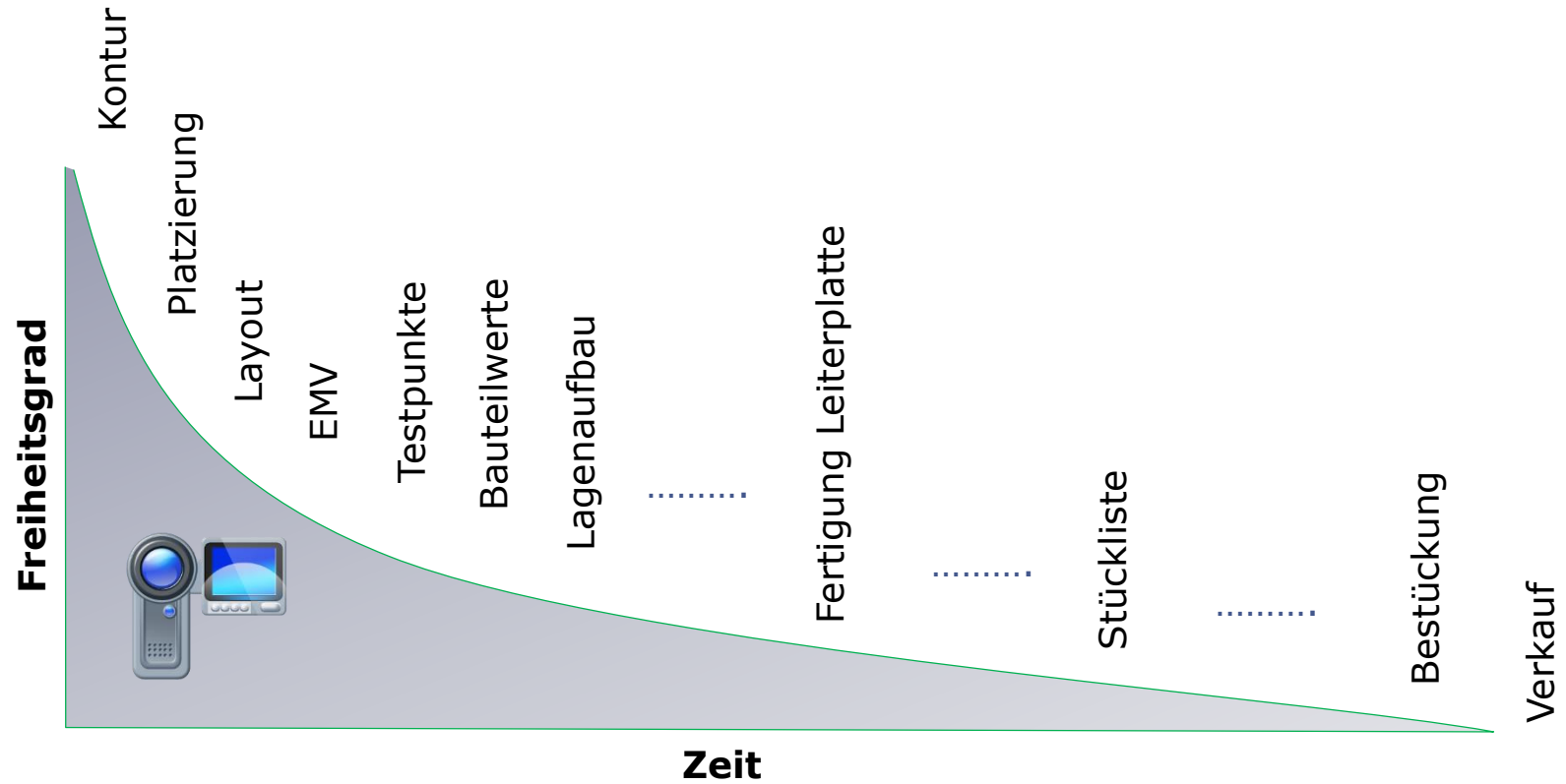
- Spannungsgruppen untereinander analysieren
- Kriechstrecken gegenüber Gehäuse
- Sicherheitsüberprüfungen für Hochspannungsnetze

Flächen Berechnungen

- Pasten Mengen kalkulieren
- Stecker Gold Anteil
- Kapazitäten von Netzen gegenüber Power / Ground



Definitionen





Warum Daten überprüfen?



Datenkonsistenz

Nutzung der Daten

Entwicklung

- Überprüfen von Schaltungsteilen im Layout
- EMV Kontrolle

Materialwirtschaft

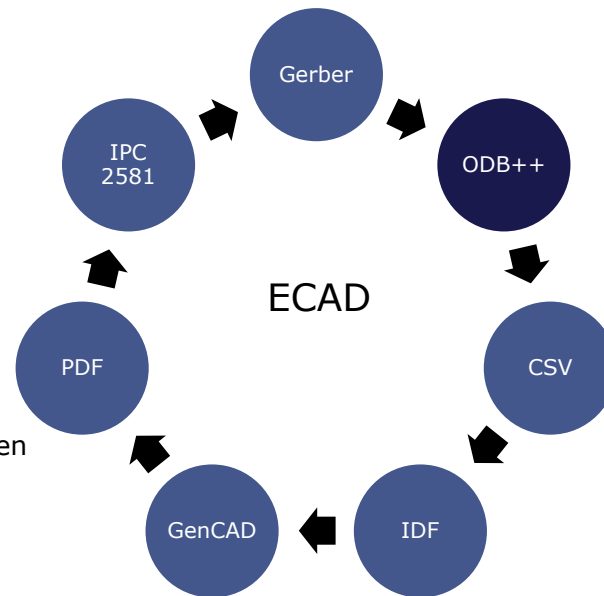
- Stücklistenkontrolle
- Verbrauchsmaterial berechnen

Mechanik

- Einbaukontrolle
- Wärmeanalyse

Fertigung

- Schablonenbestellung
- Maschinenanpassung
- Bestückung
- Ablaufsteuerung
- Reparatur

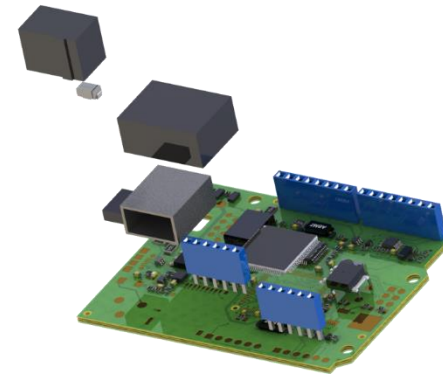


Achtung!

Einstellungen für Ausgaben verändern den Inhalt
Einstellungen werden nicht für alle Formate gleichzeitig übernommen
Ausgaben erfolgen zu verschiedenen Zeitpunkten

Produktanlauf beschleunigen mit direktem zugriff auf

- Nutzengrößen
- Nutzenränder
- Bauteilhöhen
- Lagenaufbau
- Kennfelder Data Matrix
- Fangbohrungen
- Bestück Marker
- ICT Adapter Testpunkte
- Flying Probe Testpunkte



Qualitätssicherung

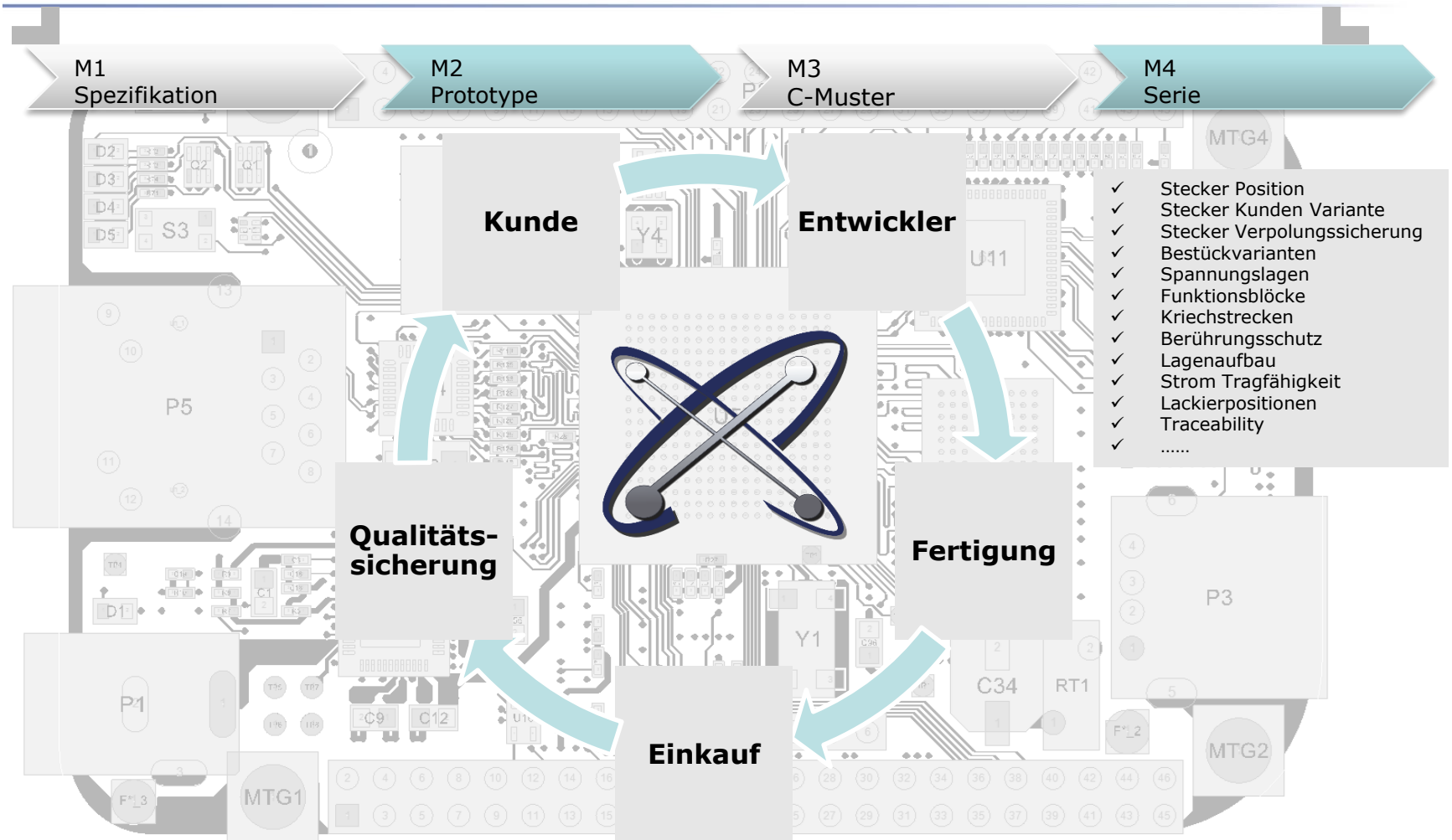
- Archivieren von Istzustand für spätere Nachfragen
- Zusammenführen von Bildern mit CAD Daten

Zusammenfügen der Bestückung und Leiterplatten Daten
Bestück Daten werden über Gerberdaten der Leiterplatte positioniert
Bestück Daten werden über eingescanntes Bild positionieren

Freigaben



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Fertigung Leiterplatte / Baugruppe



Datenkonsistenz

- Zeitpunkt der Ausgabe
- Qualität der Daten



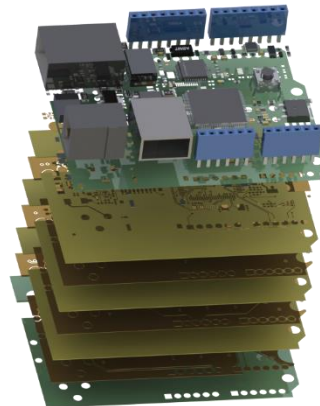
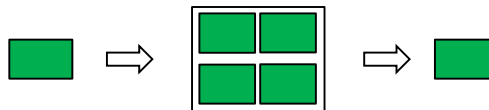
Leiterplatten Lieferant

Leiterplatten Daten

- Lagen Daten
- Lagen Aufbau
- Bohrdaten
- **Netzliste IPC356**

Leiterplattenfertiger

- Anpassung Kupfer
- Anpassung Bohrungen
- Anpassung Lötstoplack



Baugruppen Fertiger

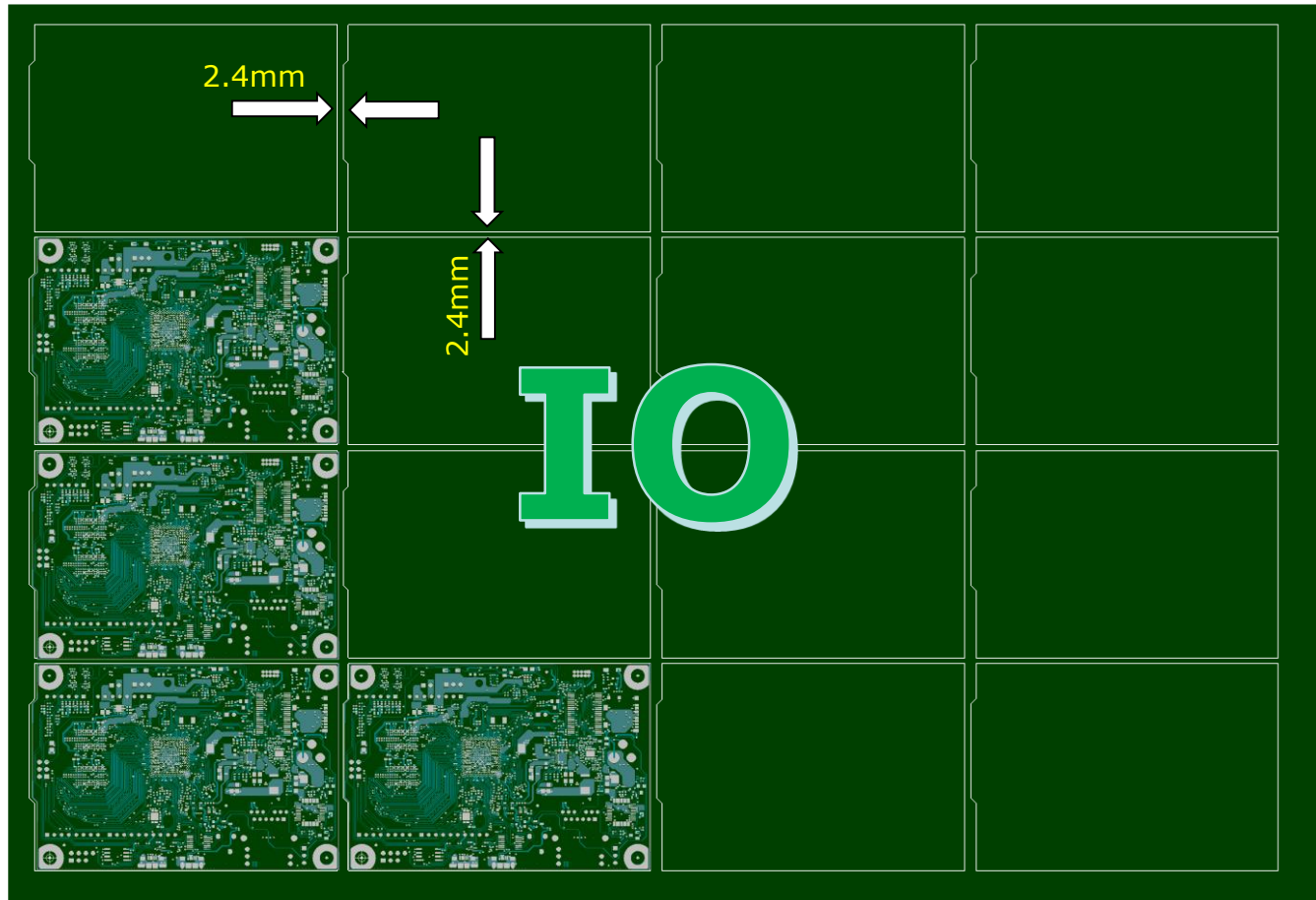
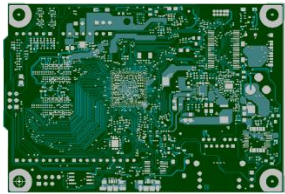
Bestück Daten

- Bestück Position
- Bauteil Geometrie
- Bauteil Lieferant
- Bauteil Bezeichnung
- Nutzenaufbau

Bestücker

- Aufbereitung Nutzen
- Bestückvariante
- Feeder pro Automat

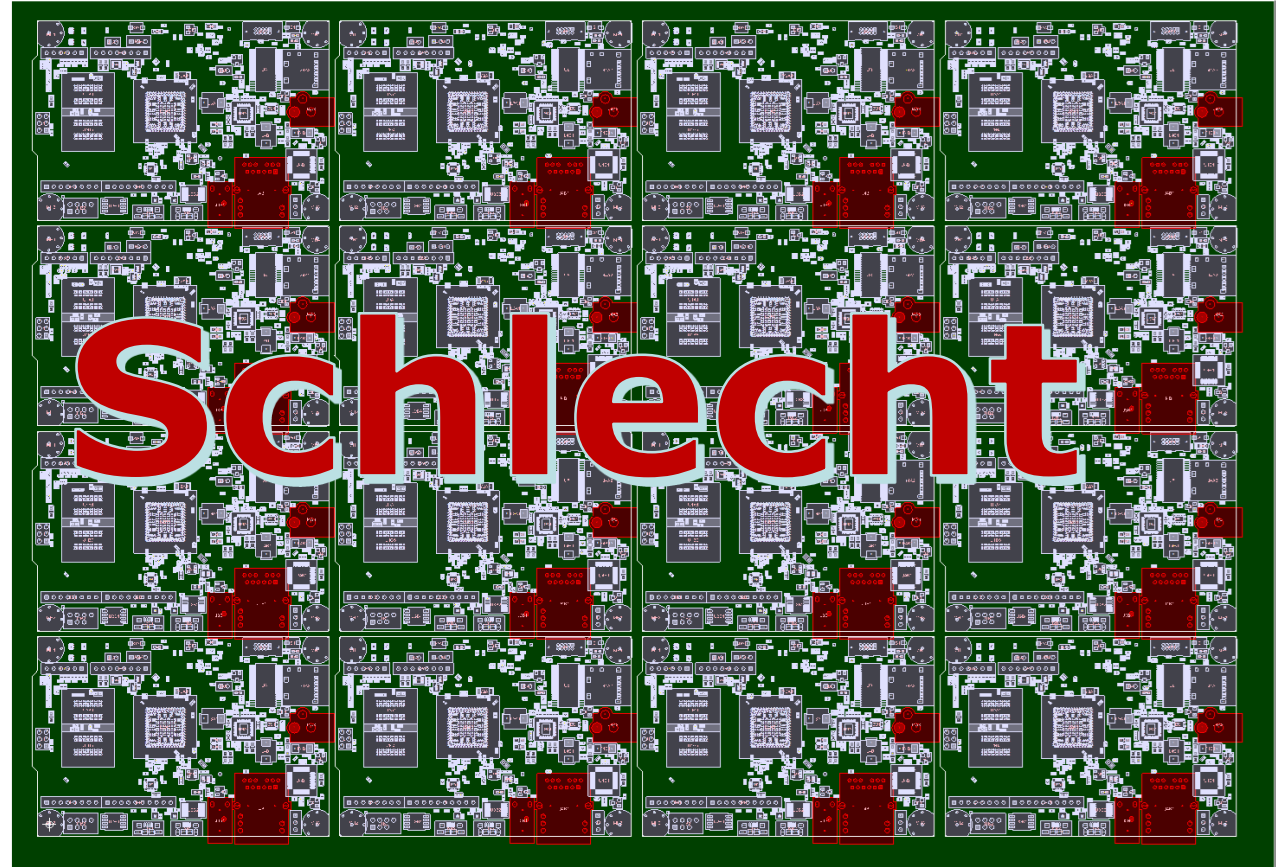
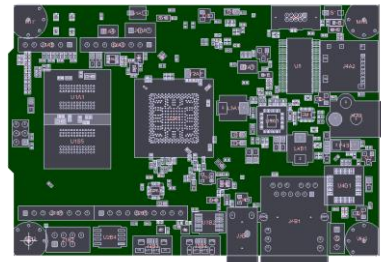
Leiterplatte



Bestückung



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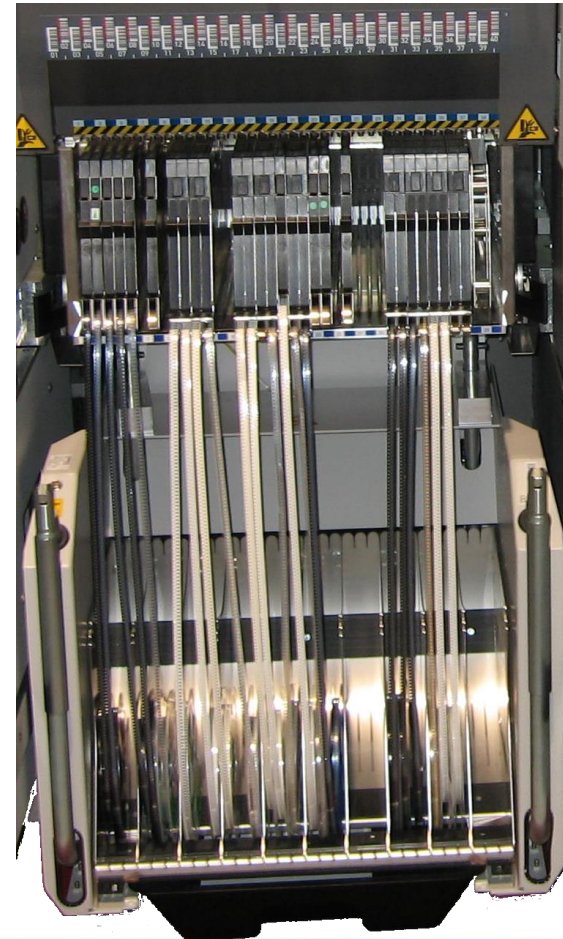
Rüstung optimieren

ARM Embedded Computer
108 verschiedene Bauteile
193 Belegte Feeder Slots

Oberseite 151 Slots
Unterseite 82 Slots



40 Feeder Stellplätze



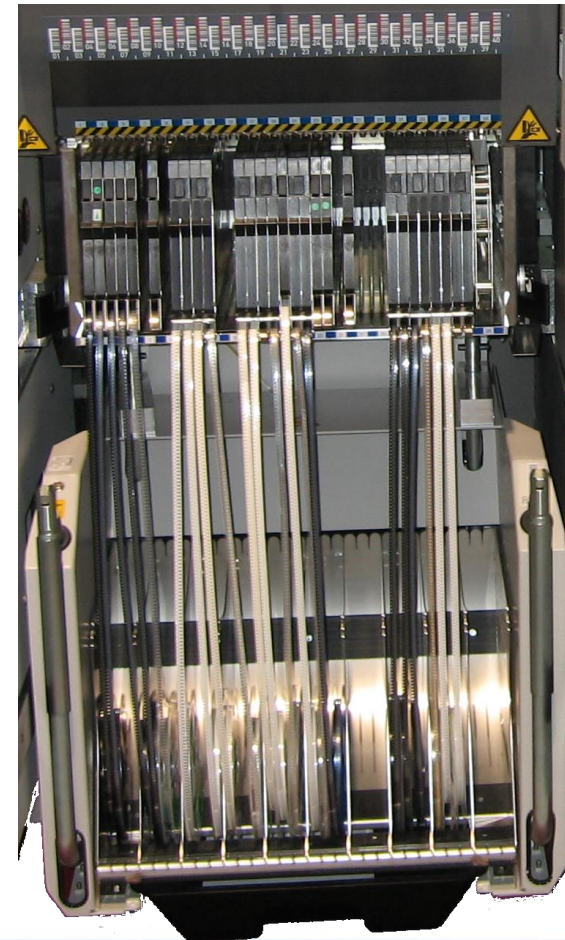
Randbedingungen

ARM Embedded Computer
108 verschiedene Bauteile
193 Belegte Feeder Slots



Oberseite 151 Slots
Unterseite 82 Slots

40 Feeder Stellplätze



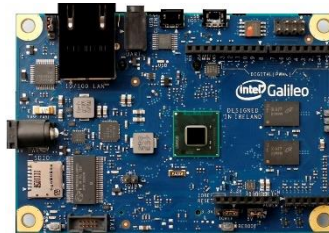
TECHNISCHE DATEN

Förderer Typ	Benötigte Stellplätze	Transportweg (mm)	Max. Höhe
8 mm X	1	1/2/4/8	3,5
2x8 mm X	2	1/2/4/8	3,5
12 mm X	2	4 – 16	6,5
16 mm X	3	4 – 20	25
24 mm X	3	4 – 32	25
32 mm X	4	4 – 40	25
44 mm X	5	4 – 52	25
56 mm X	6	4 – 64	25
72 mm X	7	4 – 80	25
88 mm X	9	4 – 96	25

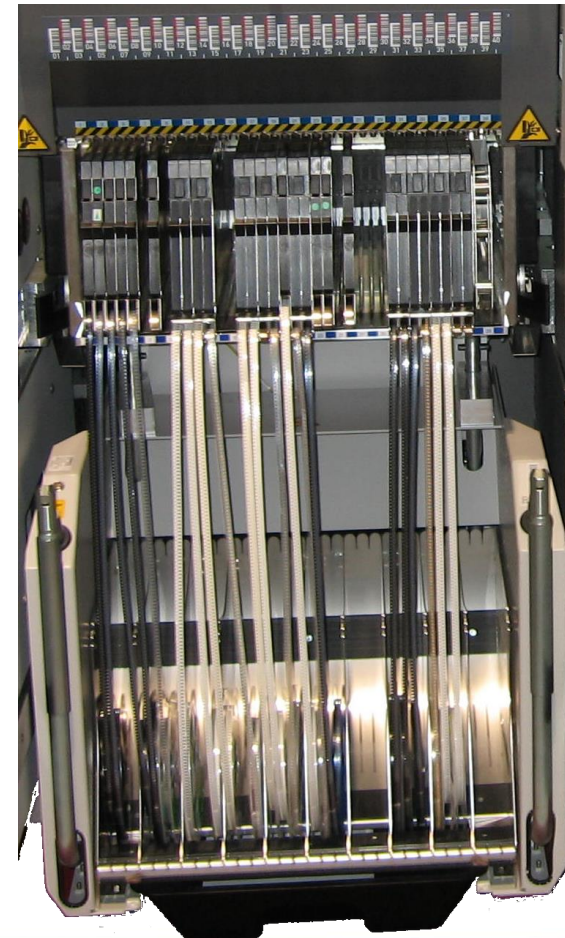
Beispiel

ARM Embedded Computer
108 verschiedene Bauteile
193 Belegte Feeder Slots

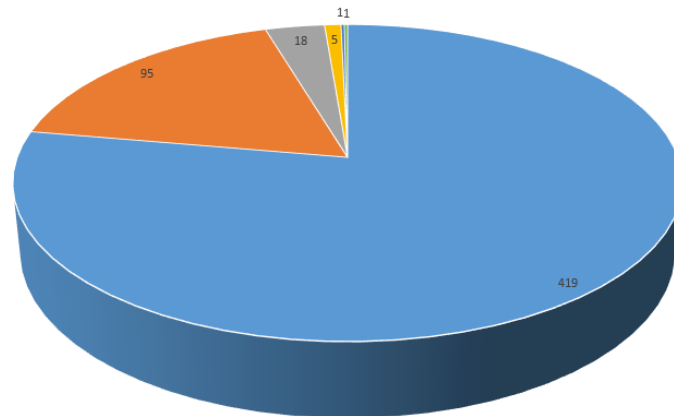
Oberseite 151 Slots
Unterseite 82 Slots



40 Feeder Stellplätze



Verteilung Slots



■ Feeder Slots 1 ■ Feeder Slots 2 ■ Feeder Slots 3 ■ Feeder Slots 4 ■ Feeder Slots 5 ■ Feeder Slots 6

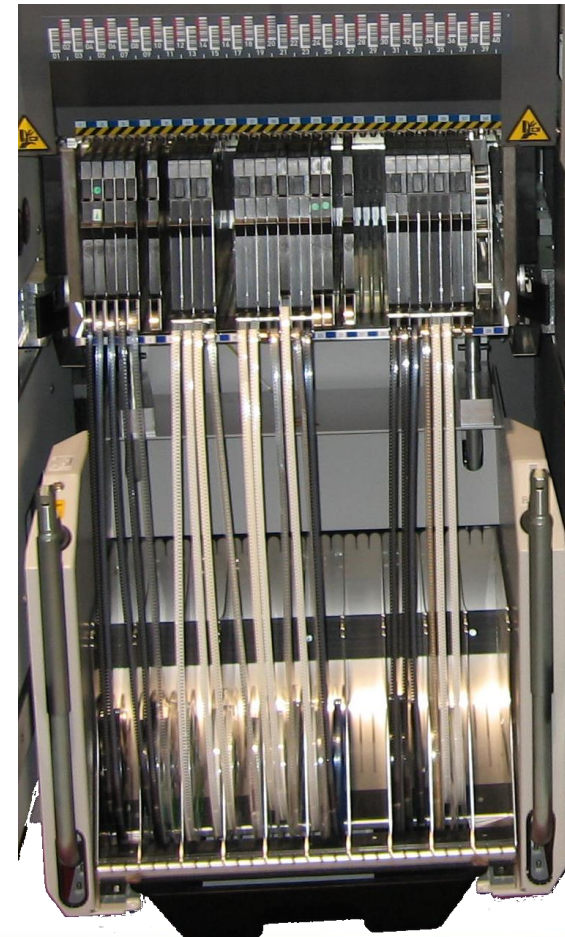
Beispiel

ARM Embedded Computer
108 verschiedene Bauteile
193 Belegte Feeder Slots



Oberseite 151 Slots
Unterseite 82 Slots

40 Feeder Stellplätze



Component Manager pcb

Count Top: 294; Bot: 245

ID	VALUE	Count	Component Ref.	TOL
11	10K	43	R3M22, R3L1, ...	5%, 1%
11	100K	5	R6, R5, R1A21, ...	5%, 1%
35	2.2K	7	R2M2, R1M4, R...	5%
26	4.7K	6	R4M2, R4M15, ...	5%
13	10PF	4	C3L5, C3L5, C2...	5%
40	10PF	3	C3A16, C3B2, C...	5%
17	330	3	R9, R8, R4A9	5%
15	220PF	2	C2M9, C2M8	5%
44	10M	1	R2A9	5%
19	1M	1	R19	5%
2	1UF	35	C3L28, C3L29, ...	20%, 10%
5	22UF	11	C2L11, C2L5, C...	20%
4	47UF	3	C3M11, C4B2, C...	20%
1	100UF	1	C2M7	20%
3	10UF	14	C3L7, C3L4, C3...	10%, 20%
9	0.1UF	62	C5, C6, C7, C6...	10%
11	1000PF	13	C3L27, C3L25, ...	10%
14	0.01UF	10	C3L19, C2L2, C...	10%
10	4700PF	7	C2L14, C2M6, C...	10%
38	0.15UF	6	C1A18, C1A17, ...	10%
7	2.2UF	6	C3M4, C3L23, C...	10%
36	047UF	3	C4A2, C3A19, C...	10%
39	1UF	2	C3A8, C3A9	10%
8	4.7UF	2	C4M6, C3L2	10%
37	470PF	1	C3B14	10%
15	33.2	56	R15, R4M7, R4...	1%
24	36.5	25	R4L17, R4L7, R...	1%
28	1K	17	R4L2, R4L1, R2...	1%
41	4.99K	14	R1A15, R1A17, ...	1%
20	49.9	9	R2L21, R3L13, ...	1%
48	24.9K	5	R3A2, R3A1, R...	1%
21	40.2K	4	R2L19, R2M4, ...	1%
45	1.5K	3	R3B5, R4B3, R...	1%
23	110	3	R3L11, R1M1, ...	1%
43	22.5	3	R3B2, R3A6, R...	1%
42	7.5K	3	R2A8, R2A10, ...	1%
49	147K	2	R3A21, R4A7, ...	1%

Beispiel

Component Manager pcb

Count Top: 294; Bot: 245

sum up show

ID	VALUE	Count	Component Ref...	TOL
19	10K	43	R3M22, R3L1, ...	5%, 1%
18	100K	5	R6, R5, R1A21, ...	5%, 1%
35	2.2K	7	R2M2, R1M4, R...	5%
26	4.7K	6	R4M2, R3M15, ...	5%
13	18PF	4	C3L6, C3L5, C2...	5%
40	10PF	3	C3A16, C3B2, C...	5%
17	330	3	R9, R8, R4A9	5%
15	220PF	2	C2M9, C2M8	5%
44	10M	1	R2A9	5%
32	1M	1	R3L2	5%
2	1UF	35	C3L28, C3L29, ...	20%, 10%
5	22UF	11	C2L11, C2L6, C...	20%
4	47UF	3	C3M11, C4B2, C...	20%
1	100UF	1	C2M7	20%
3	10UF	14	C3L7, C3L4, C3...	10%, 20%
9	0.1UF	82	C9, C8, C7, C6, ...	10%
11				
14				
10				
38				
7				
36				
39				
8				
37	470PF	1	C3B14	10%
16	33.2	56	R15, R4M7, R4...	1%
24	36.5	25	R4L17, R4L7, R...	1%
28	1K	17	R4L2, R4L1, R2...	1%
41	4.99K	14	R1A15, R1A17, ...	1%
20	49.9	9	R2L21, R3L13, ...	1%
48	24.9K	5	R3A2, R3A1, R...	1%
21	40.2K	4	R2L19, R2M4, ...	1%
45	1.5K	3	R3B5, R4B3, R...	1%
23	110	3	R3L11, R1M1, ...	1%
43	22.6	3	R2B2, R3A6, R...	1%
42	7.5K	3	R2A8, R2A10, ...	1%
49	147K	2	R3A21, R4A7	1%
22	150K	2	R3L22, R3L15, ...	1%

Wenn möglich zusammenfassen von Bauteilen mit gleichen Werten und unterschiedlicher Toleranz

Vereinfachung

Component Manager pcb

Both mm Count Top: 294; Bot: 245

ID	VALUE	Count	Component Ref...	Package	TOL
6	0	15	R1M6, R3L14, ...	SMR0603, SMR0402A...	0, 5%
45	1.5K	3	R3B5, R4B3, R...	SMR0402A, SMR0402A...	1%
18	100K	5	R6, R5, R1A21, ...	SMR0402A, SMR0402A...	5%, 1%
19	10K	43			
44	10M	1			
47	12.7K	1			
49	147K	2			
22	158K	2			
46	180K	2	R3B2, R3A19	SMR0402A, SMR0402A	1%
28	1K	17	R4L2, R4L1, R2...	SMR0402A, SMR0402A...	1%
32	1M	1	R3L2	SMR0402A	5%
35	2.2K	7	R2M2, R1M4, R...	SMR0402A, SMR0402A...	5%
43	22.6	3	R2B2, R3A6, R...	SMR0402A, SMR0402A...	1%
48	24.9K	5	R3A2, R3A1, R...	SMR0402A, SMR0402A...	1%
27	30.1	2	R4L10, R4L11	SMR0402A, SMR0402A	1%
30	32.4	1	R3L5	SMR0402A	1%
16	33.2	56	R15, R4M7, R4...	SMR0402A, SMR0402A...	1%
29	34	1	R3L7	SMR0402A	1%
24	36.5	25	R4L17, R4L7, R...	SMR0402A, SMR0402A...	1%
23	110	3	R3L11, R1M1, ...	SMR0402A, SMR0402A...	1%
25	240	2	R4M1, R4L19	SMR0402A, SMR0402A	1%
31	274	1	R3L6	SMR0402A	1%
17	330	3	R9, R8, R4A9	SMR0402A, SMR0402A...	5%
26	4.7K	6	R4M2, R3M15, ...	SMR0402A, SMR0402A...	5%
50	4.87K	1	R4B4	SMR0402A	1%
41	4.99K	14	R1A15, R1A17, ...	SMR0402A, SMR0402A...	1%
21	40.2K	4	R2L19, R2M4, ...	SMR0402A, SMR0402A...	1%
34	45.3K	1	R2M6	SMR0402A	1%
20	49.9	9	R2L21, R3L13, ...	SMR0402A, SMR0402A...	1%

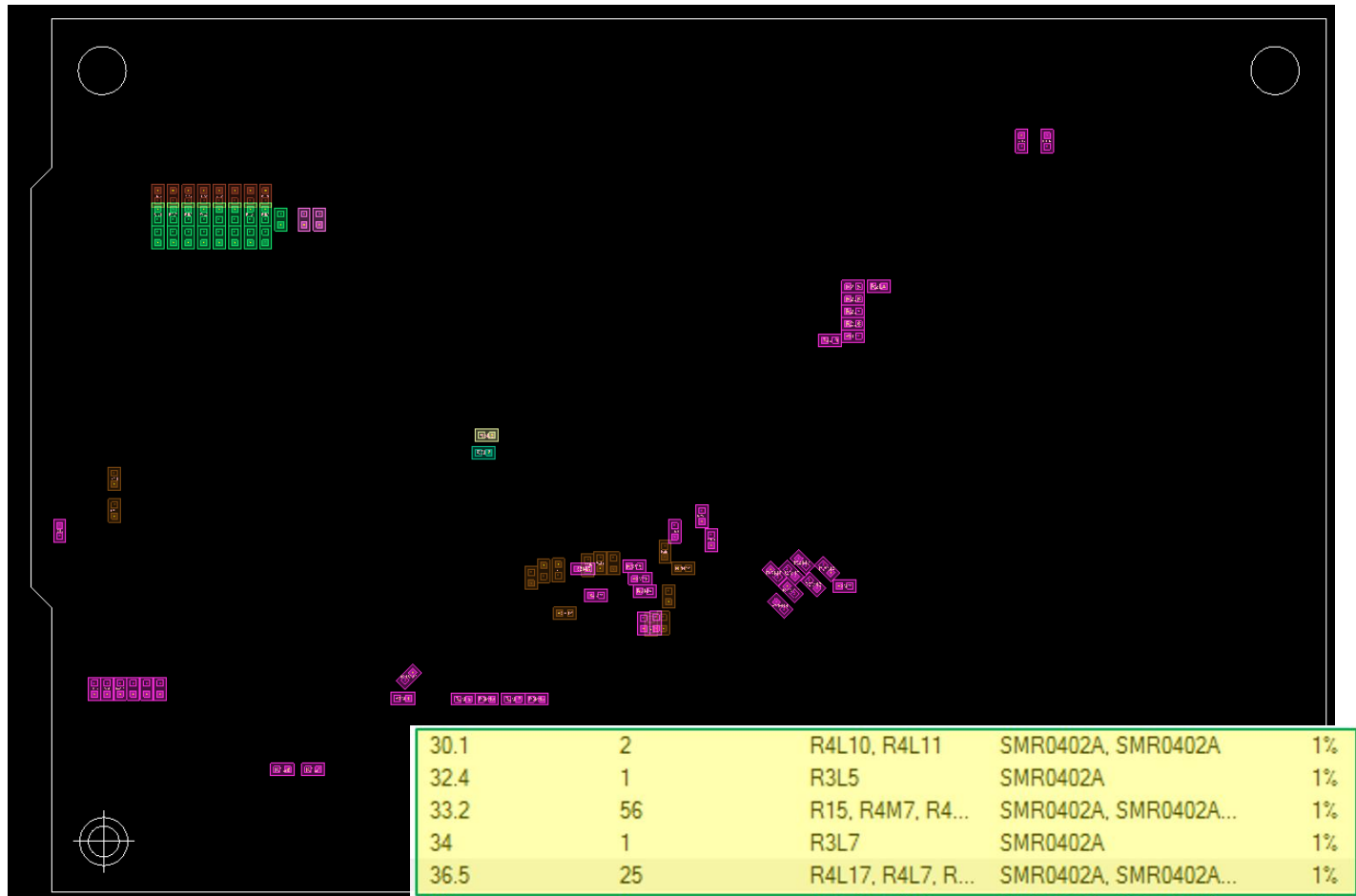
sum up show

CenterpointY
PlacementpX
PlacementpY
OnTop
MirrorX
MirrorY
PART_NAME
PARENT_PART_TYPE
Geometry.Height
PARENT_PPT
PART_NUMBER
PARENT_PPT_PART
.comp_mount_type
.comp_height
SIGNAL_MODEL
VALUE
TOL
ALT_SYMBOLS
WATTAGE
.color
PACKAGE_HEIGHT_MAX
HEIGHT
.comp_height_area

Wenn möglich zusammenfassen von Bauteilen mit geringem unterschied in den Werten

5%
Nenn: 4700 Ohm
Min: 4935 Ohm
Max: 4465 Ohm

Widerstände

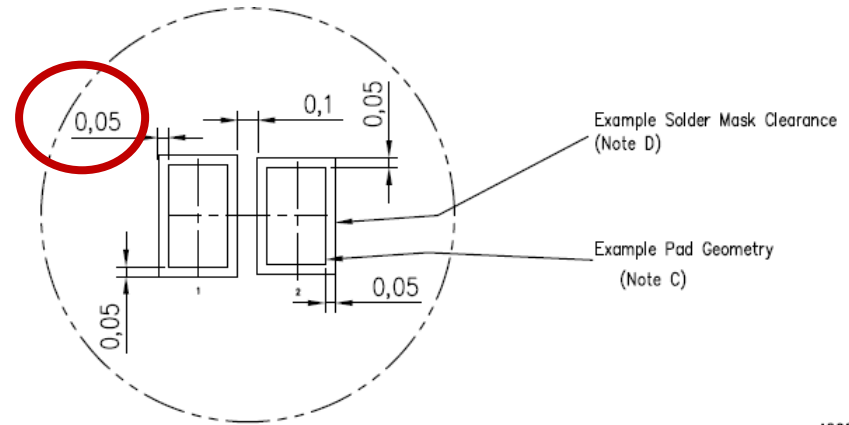




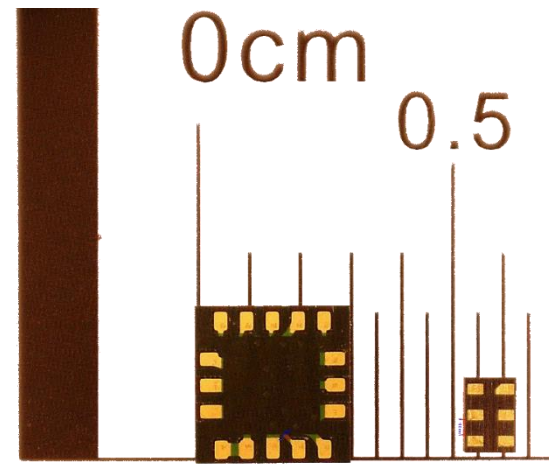
Trend Miniaturisierung

Treibende Bereiche

- Internet of Things
- Wearables
- Medizin
- Roboter
- Industrie 4.0
- Netztechnik



42083



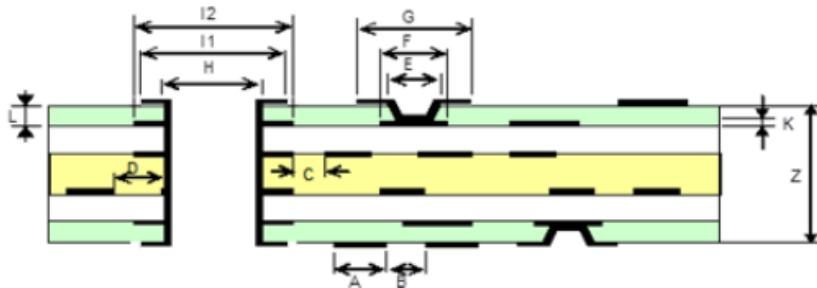
Drahtlose Körpersensorlösung

Strukturen Treiber

Beispiele verschiedener BGA-Typen:

- BGA – Raster 0,7 mm – 2,5 mm
- FBGA – Fine Line BGA, BGA-Package mit verringertem Lötpunktabstand (0,5 mm – 0,7 mm)
- MBGA – Micro Fine Line BGA Raster 0.5 mm
- VFBGA - Very Fine BGA, Raster < 0,5 mm

Design rules for Microvia layer - MVL:



Symbol	Description	HDI (1)	High End (2)
A	Line width at copper thickness of $\geq 36 \mu\text{m}$ Cu	100 μm	80 μm
A 1	Line width at copper thickness of 25 – 35 μm Cu	90 μm	75 μm
A 2	Line width at copper thickness of 10 – 18 μm Cu	75 μm	50 μm
B	Spacing at copper thickness of $\geq 36 \mu\text{m}$ Cu	125 μm	100 μm

B 1	Spacing at copper thickness of 25 – 35 μm Cu	100 μm	85 μm
B 2	Spacing at copper thickness of 10 – 18 μm Cu	75 μm	75 μm
C	Distance line to pad on inner layer	100 μm	85 μm
D	Insulation spacing line to pth-drilling	300 μm	< 200 μm
E	Drill size laser drilling on outer layer	125 μm	< 100 μm
F	Pad size diameter landing pad on inner layer	330 μm	250 μm
G	Diameter capture pad outer layers	330 μm	250 μm
H	Diameter CNC-hole	250 μm	150 μm
I 1	Diameter Pad CNC-hole outer layers	350 μm	250 μm
I 2	Pad diameter CNC-hole inner layers (annular ring > 0 μm)	450 μm	350 μm
K	Base copper outer layer	max. 18 μm	max. 12 μm
L / E	Aspect ratio microvia	1 : 2	1 : 1,5
Z / H	Aspect ratio pth-holes	6 : 1	10 : 1

(1) process capability ($CpK > 1,33$)

(2) realisation after clarification

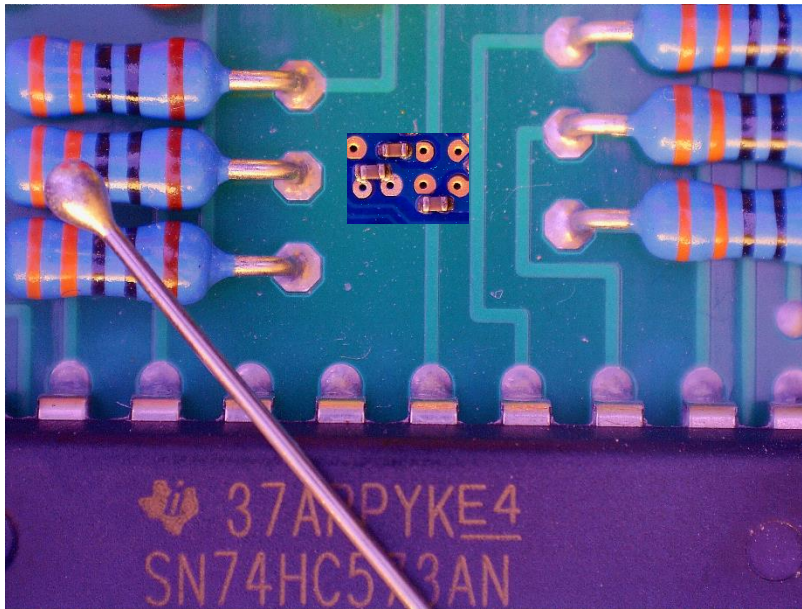
Quelle: Schweizer Electronics

Strukturen



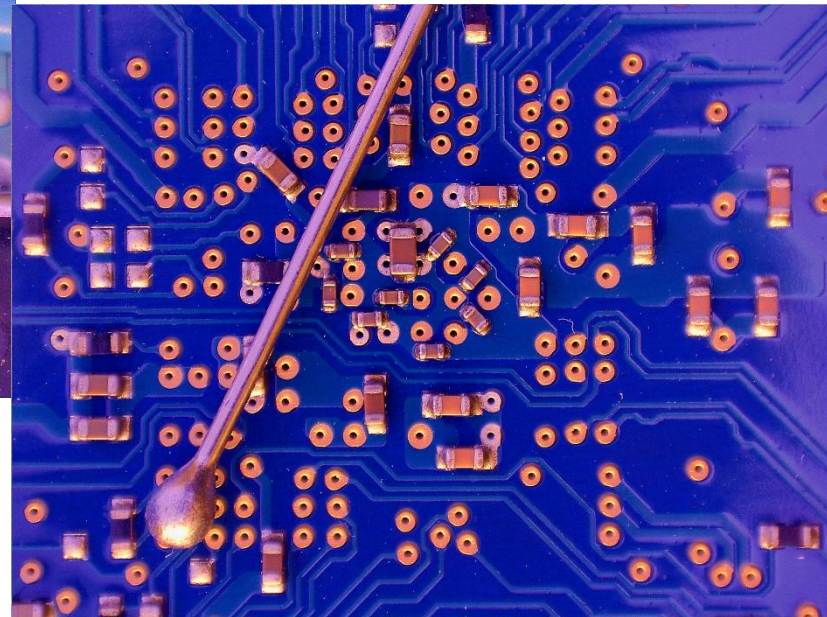
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2014



Bauteilgröße
Leiterbahnen

0.8 mm * 0.3mm
0.08mm



Bauteilgröße
Leiterbahnen

8mm * 3mm
0.3mm



Papierlose Fertigung

Elektronisches Fertigungskonzept



Informationsinhalt

- Bestück Zeichnungen
- Bauteil Informationen
- Netzinformationen
- Messpunkte
- BOM
- Netzliste

Digitale Stempel

- Zentral steuerbar
- Elektronische Arbeitsfreigaben
- Sicherung vor Manipulation

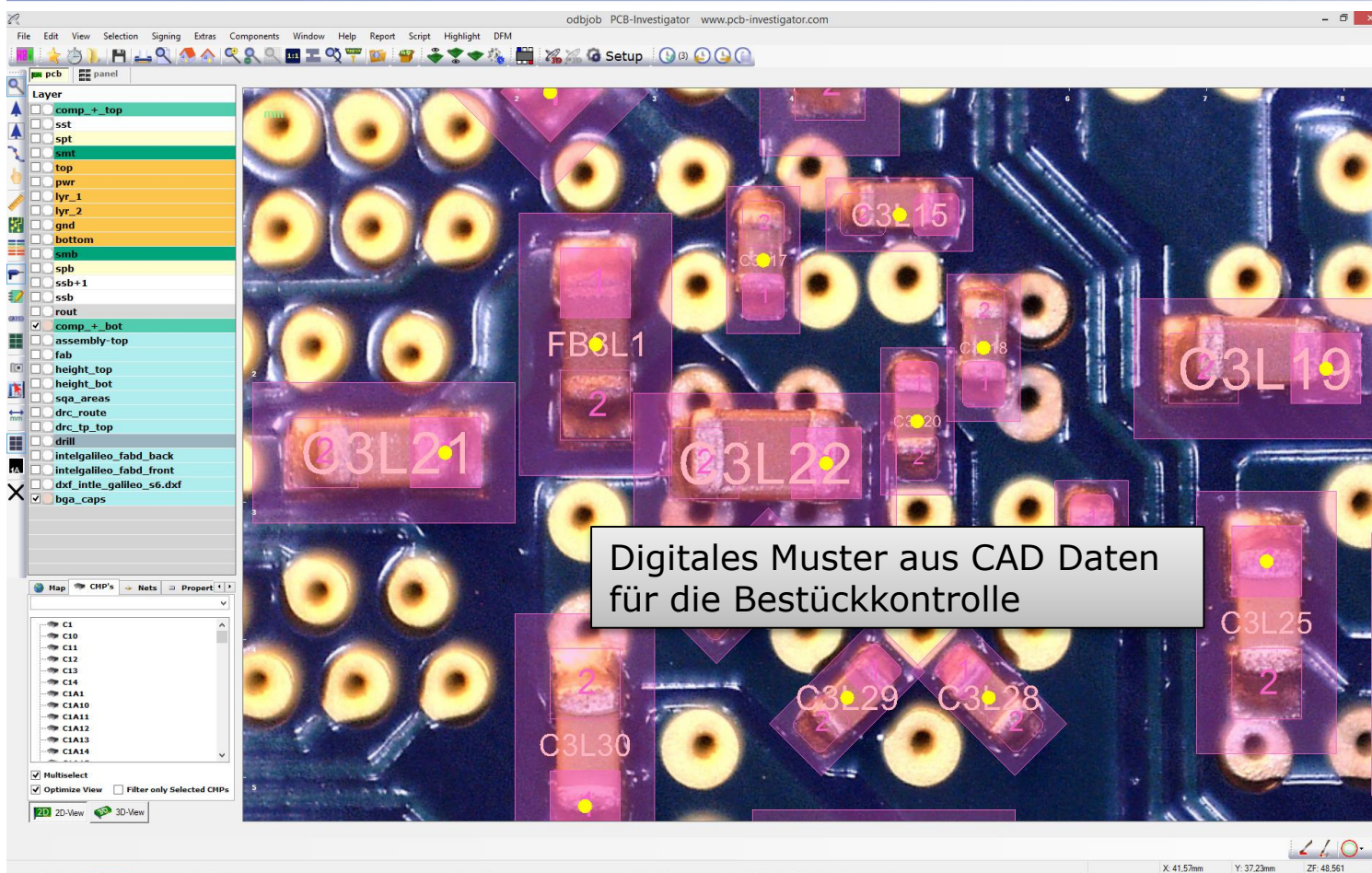


Vorteile gegenüber Zeichnungen

- Zugriff auf CAD Daten aus ERP
- Detailierung der Darstellung unbegrenzt
- Verknüpfen mit live Bildern
- Reparatur Protokollierung
- Flexibler Produktwechsel



Produkt Anlauf



Lesbarkeit



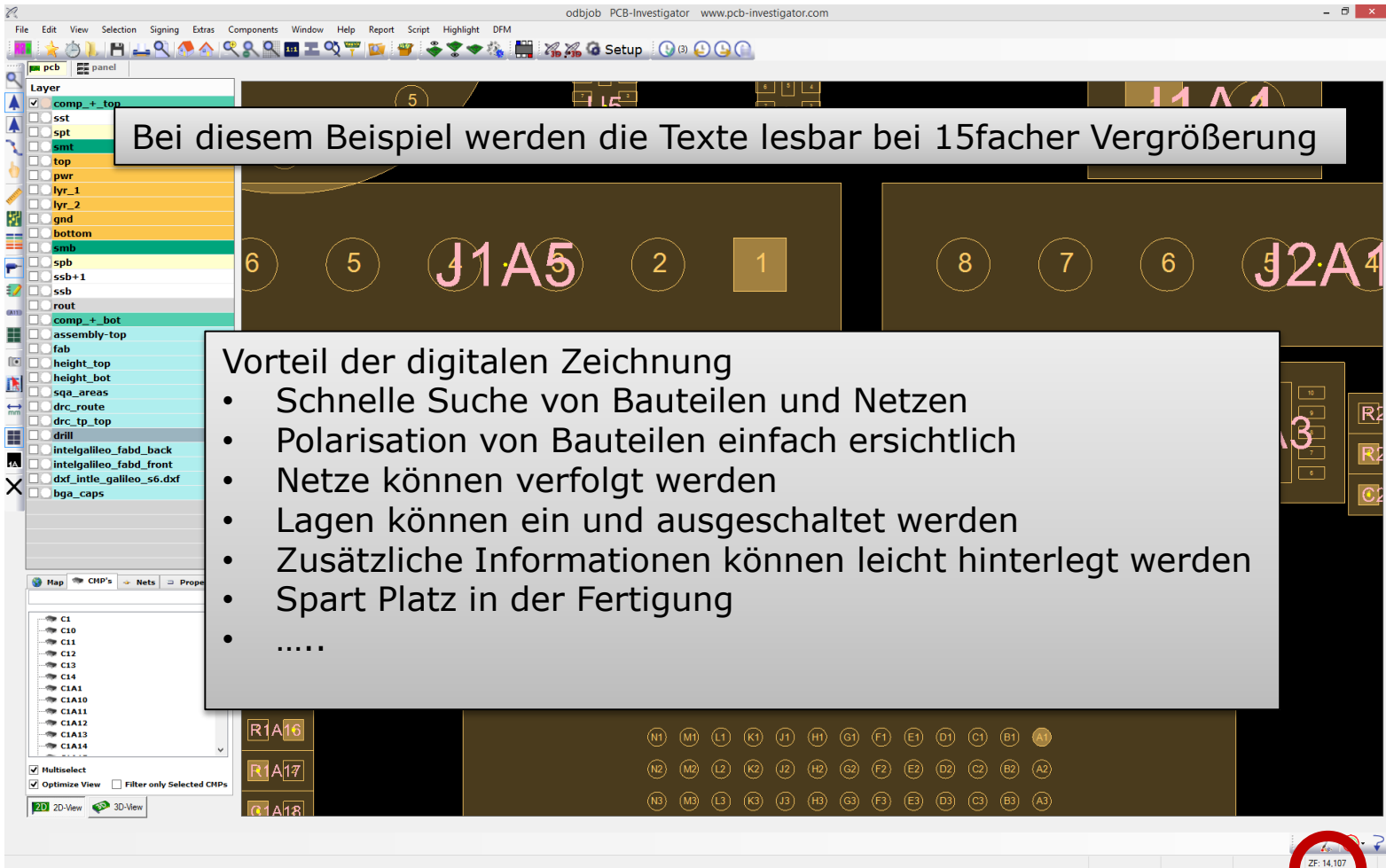
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The screenshot shows the PCB-Invigator software interface. The main window displays a PCB layout with various components labeled, such as U1A1, U2A5, U3A1, U4B1, U4B2, U8, J1A5, J2A1, J3A1, J4A1, J4A2, J4A3, J4B1, J4B2, J4B3, J4B4, J1B1, J1B2, J2B1, J2B2, J2B3, J2B4, J3B1, J3B2, J3B3, J3B4, J1A6, J2A2, J2A3, J2A4, J2A5, J2A6, J2A7, J2A8, J2A9, J2A10, J2A11, J2A12, J2A13, J2A14, J2A15, J2A16, J2A17, J2A18, J2A19, J2A20, J2A21, J2A22, J2A23, J2A24, J2A25, J2A26, J2A27, J2A28, J2A29, J2A30, J2A31, J2A32, J2A33, J2A34, J2A35, J2A36, J2A37, J2A38, J2A39, J2A40, J2A41, J2A42, J2A43, J2A44, J2A45, J2A46, J2A47, J2A48, J2A49, J2A50, J2A51, J2A52, J2A53, J2A54, J2A55, J2A56, J2A57, J2A58, J2A59, J2A60, J2A61, J2A62, J2A63, J2A64, J2A65, J2A66, J2A67, J2A68, J2A69, J2A70, J2A71, J2A72, J2A73, J2A74, J2A75, J2A76, J2A77, J2A78, J2A79, J2A80, J2A81, J2A82, J2A83, J2A84, J2A85, J2A86, J2A87, J2A88, J2A89, J2A90, J2A91, J2A92, J2A93, J2A94, J2A95, J2A96, J2A97, J2A98, J2A99, J2A100. The text overlay provides the following information:

Größe: 100mm x 70mm
Bauteile Oberseite: 294
Bauteile Unterseite: 245

The software interface includes a menu bar (File, Edit, View, Selection, Signing, Extras, Components, Window, Help, Report, Script, Highlight, DFM), a toolbar, a layer list on the left, and a component list at the bottom left. The status bar at the bottom right shows coordinates (X: 66.65mm, Y: 51.65mm) and a zoom level (ZF: 3.359).

Lesbarkeit



odbjob PCB-Inspector www.pcb-inspector.com

Bei diesem Beispiel werden die Texte lesbar bei 15facher Vergrößerung

Vorteil der digitalen Zeichnung

- Schnelle Suche von Bauteilen und Netzen
- Polarisation von Bauteilen einfach ersichtlich
- Netze können verfolgt werden
- Lagen können ein und ausgeschaltet werden
- Zusätzliche Informationen können leicht hinterlegt werden
- Spart Platz in der Fertigung
-

Map CMP's Nets Prop

C1
C10
C11
C12
C13
C14
C1A1
C1A10
C1A11
C1A12
C1A13
C1A14

Multiselect
Optimize View Filter only Selected CMP's

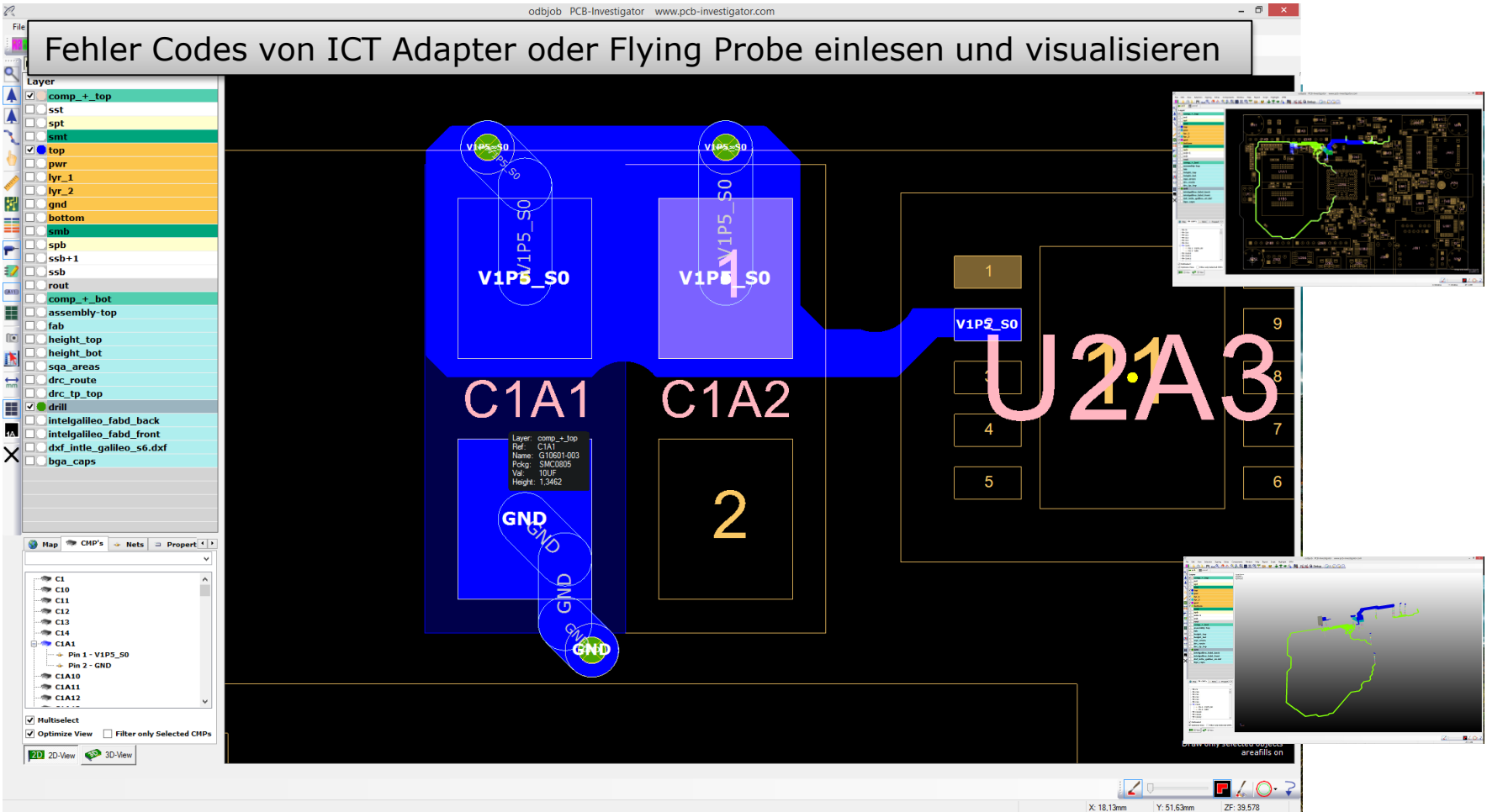
2D-View 3D-View

ZF: 14,107

Reparatur

odtjob PCB-Investigator www.pcb-investigator.com

Fehler Codes von ICT Adapter oder Flying Probe einlesen und visualisieren



The screenshot displays the PCB-Investigator interface. The main workspace shows a PCB layout with several components highlighted in blue and yellow. Labels include V1P5_S0, C1A1, C1A2, GND, and U2A3. A large pink '2.1' is overlaid on the U2A3 component. The left sidebar shows a layer stack with 'comp_top' selected. The bottom left shows a component list for C1A1, including pin connections: Pin 1 - V1P5_S0 and Pin 2 - GND. The bottom right shows a zoomed-in view of the U2A3 component. The status bar at the bottom indicates dimensions: X: 10.13mm, Y: 51.63mm, ZF: 39.578.

Layer

- comp_top
- sst
- spt
- smt
- top
- pwr
- lyr_1
- lyr_2
- gnd
- bottom
- smb
- spb
- ssb+1
- ssb
- rou
- comp_bot
- assembly-top
- fab
- height_top
- height_bot
- sqa_areas
- drc_route
- drc_tp_top
- drill
- intelgalileo_fabd_back
- intelgalileo_fabd_front
- dxl_intle_galileo_s6.dxf
- bga_caps

Map CMP's Nets Propert

- C1
- C10
- C11
- C12
- C13
- C14
- C1A1
 - Pin 1 - V1P5_S0
 - Pin 2 - GND
- C1A10
- C1A11
- C1A12

Multiselect
Optimize View Filter only Selected CMPs

2D-View 3D-View

X: 10.13mm Y: 51.63mm ZF: 39.578

Reparatur



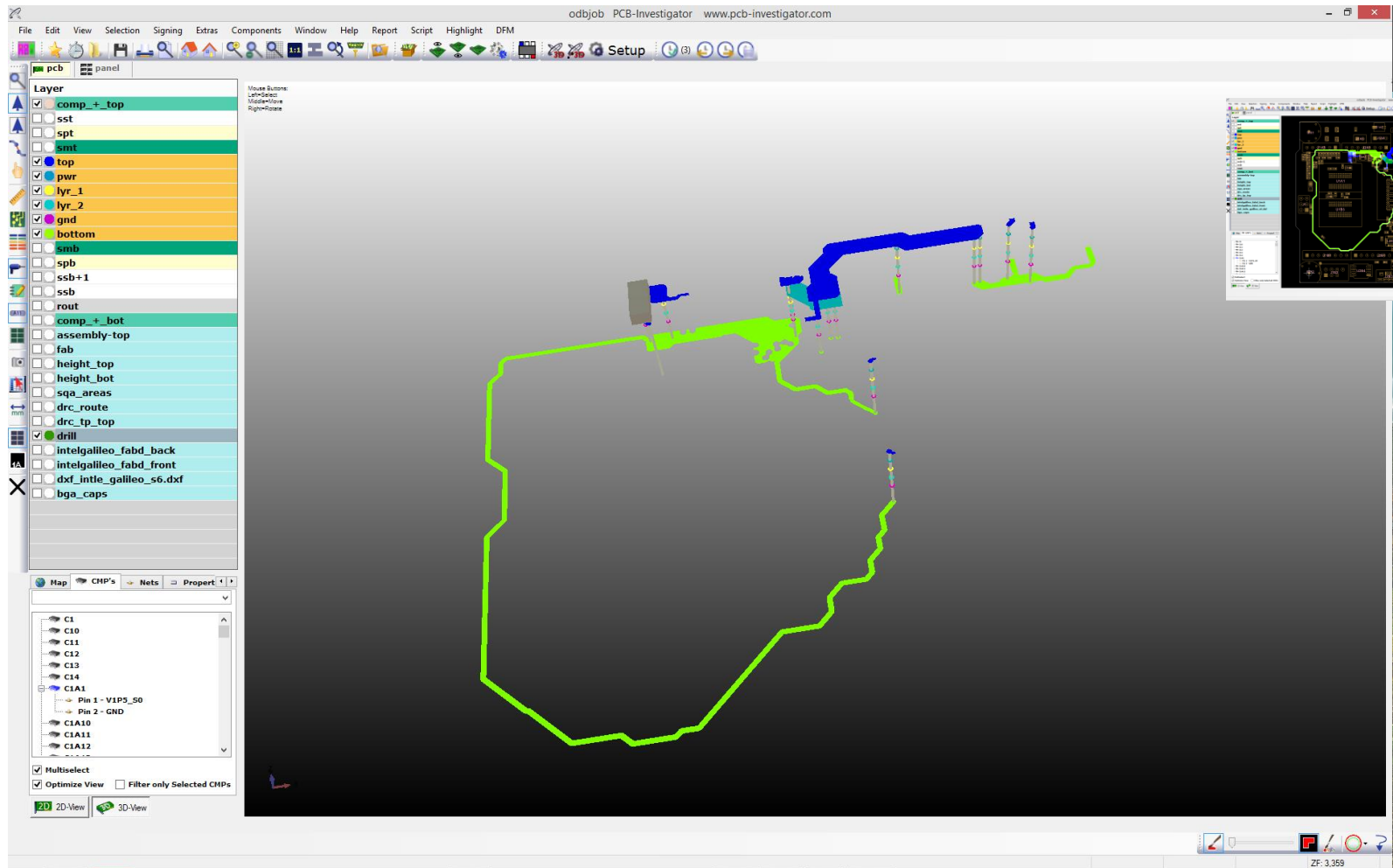
EASYLOGIX.DE

The screenshot displays the PCB-Investigator software interface. The main window shows a detailed PCB layout with various components labeled, including U1A1, U2A5, U3A1, U3B1, U3B2, U4, J1A2, J1A3, J1A4, J1A5, J1A6, J2A1, J2B1, J2B2, J2B3, J2B4, J3A1, J3B1, J4A1, J4A2, J4A3, J4B1, J4B2, J4B3, J4B4, J4B5, J4B6, J4B7, J4B8, J4B9, J4B10, J4B11, J4B12, J4B13, J4B14, J4B15, J4B16, J4B17, J4B18, J4B19, J4B20, J4B21, J4B22, J4B23, J4B24, J4B25, J4B26, J4B27, J4B28, J4B29, J4B30, J4B31, J4B32, J4B33, J4B34, J4B35, J4B36, J4B37, J4B38, J4B39, J4B40, J4B41, J4B42, J4B43, J4B44, J4B45, J4B46, J4B47, J4B48, J4B49, J4B50, J4B51, J4B52, J4B53, J4B54, J4B55, J4B56, J4B57, J4B58, J4B59, J4B60, J4B61, J4B62, J4B63, J4B64, J4B65, J4B66, J4B67, J4B68, J4B69, J4B70, J4B71, J4B72, J4B73, J4B74, J4B75, J4B76, J4B77, J4B78, J4B79, J4B80, J4B81, J4B82, J4B83, J4B84, J4B85, J4B86, J4B87, J4B88, J4B89, J4B90, J4B91, J4B92, J4B93, J4B94, J4B95, J4B96, J4B97, J4B98, J4B99, J4B100. The traces are highlighted in green and blue. The left sidebar shows a layer list with 'comp_+_top' selected. The bottom status bar shows coordinates: X: 66.62mm, Y: 49.38mm, ZF: 3.359.

Reparatur



EASYLOGIX.DE



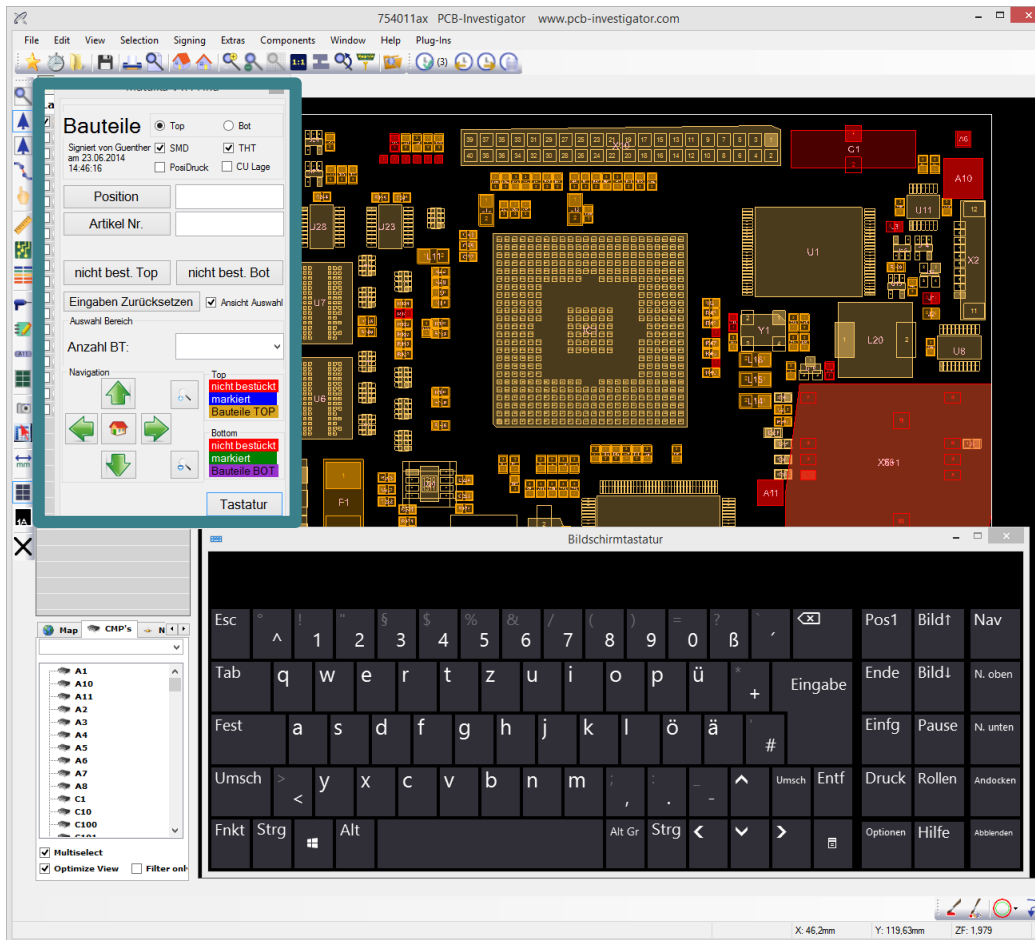
Reparatur



EASYLOGIX.DE

The screenshot displays the PCB-Investigator software interface. The main workspace shows a PCB layout with several components highlighted in blue and purple. The components are labeled as V1P5_S0, C1A1, C1A2, and U2A3. A blue net is connected to the V1P5_S0 components, and a purple net is connected to the C1A1 and C1A2 components. The U2A3 component is highlighted in pink. The software interface includes a menu bar (File, Edit, View, Selection, Signing, Extras, Components, Window, Help, Report, Script, Highlight, DFM), a toolbar, and a layer panel on the left. The layer panel lists various layers such as comp_+_top, sst, spt, smt, top, pwr, lyr_1, lyr_2, gnd, bottom, smb, spb, sssb+1, sssb, rout, comp_+_bot, assembly-top, fab, height_top, height_bot, sqa_areas, drc_route, drc_tp_top, drill, intelgalileo_fabd_back, intelgalileo_fabd_front, dx_f_intle_galileo_s6.dxf, and bga_caps. The bottom status bar shows the dimensions X: 10.13mm, Y: 51.63mm, and ZF: 39.578.

Bestückung

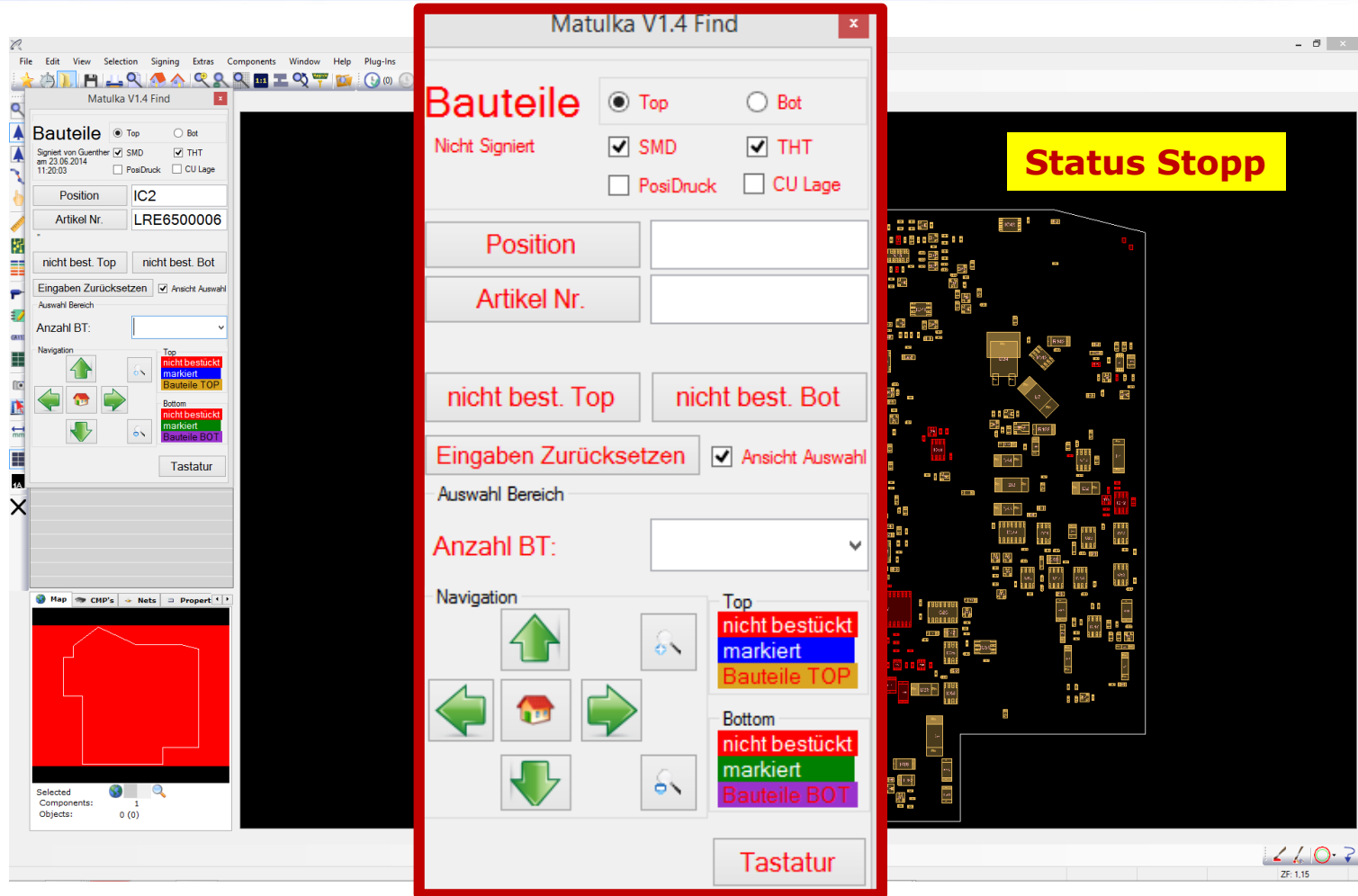


Anpassung für

- Fertigung
- Touchscreen
- Ein Finger o. Multi Finger Bedienung

Status Freigabe

Signierung



Matulka V1.4 Find

Bauteile Top Bot

Nicht Signiert SMD THT

PosiDruck CU Lage

Position

Artikel Nr.

nicht best. Top nicht best. Bot

Eingaben Zurücksetzen Ansicht Auswahl

Auswahl Bereich

Anzahl BT:

Navigation

Top

nicht bestückt
markiert
Bauteile TOP

Bottom

nicht bestückt
markiert
Bauteile BOT

Tastatur

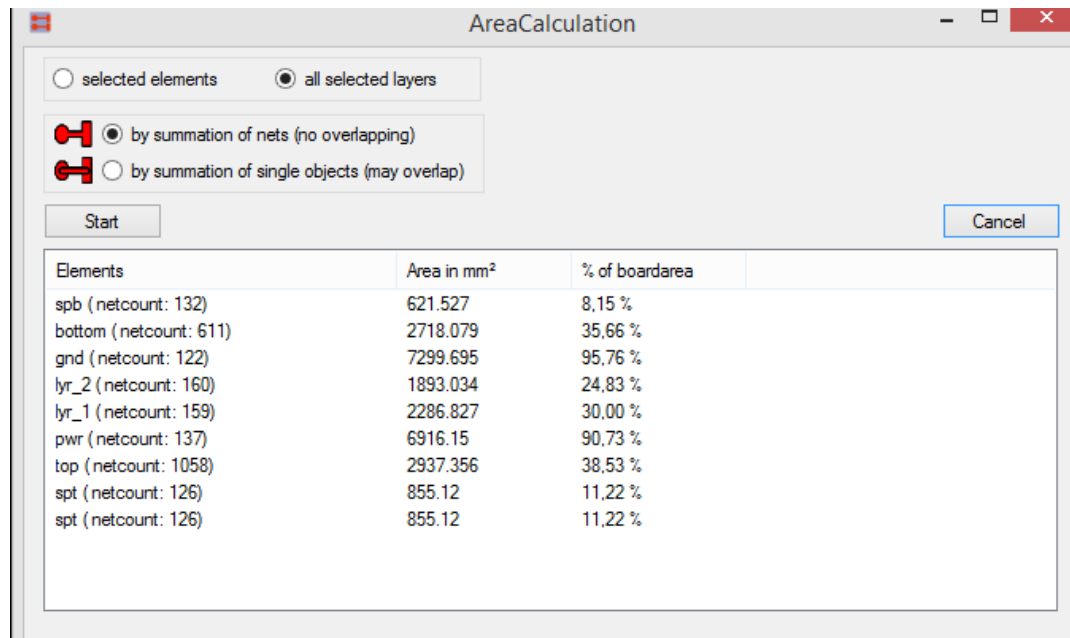
Status Stopp

ZF: 1.15

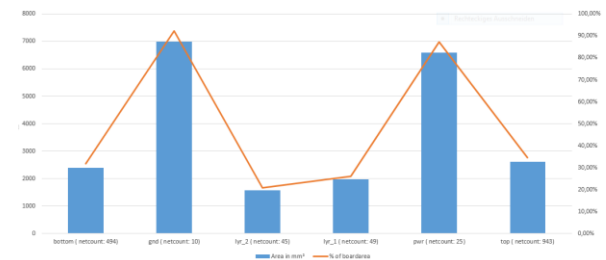


Auswertungen

Berechnungen



Lagen Symmetrie



Nutzen

- Einfluss auf den Verzug und Isolierabstand zwischen den Lagen einer Leiterplatte vorhersagbar
- Berechnung des Pastenverbrauches zum Kalkulieren von Produkten
- Kupfergewicht zum Berechnen der möglichen Wärmeaufnahme von Power Bauteilen
- ...

Vergleich



EASYLOGIX.DE

BLE_Mini_Schematic_v1.0 PCB-Investigator www.pcb-investigator.com

File Edit View Selection Signing Extras Components Window Help Report Script Highlight DFM

Layer

- ble_mini_schematic_v1.0.pdf_1
- ble_mini_schematic_v1.0.pdf_1...
- comp_ble_mini_schematic_v1....

Vektor Daten

PDF Schaltpläne einlesen und vergleichen

Pin	Signal
29	GND
28	/REST
27	P0_0
26	P0_1
25	MOSI/P0_2
24	MISO/P0_3
23	SSN/P0_4
22	CLK/P0_5
21	P0_6

Map CMP's Nets Property

- Net_1
- Net_10
- Net_100
- Net_101
- Net_102
- Net_103
- Net_104
- Net_105
- Net_106
- Net_107

Multiselect

Optimize View Filter only Selected Nets

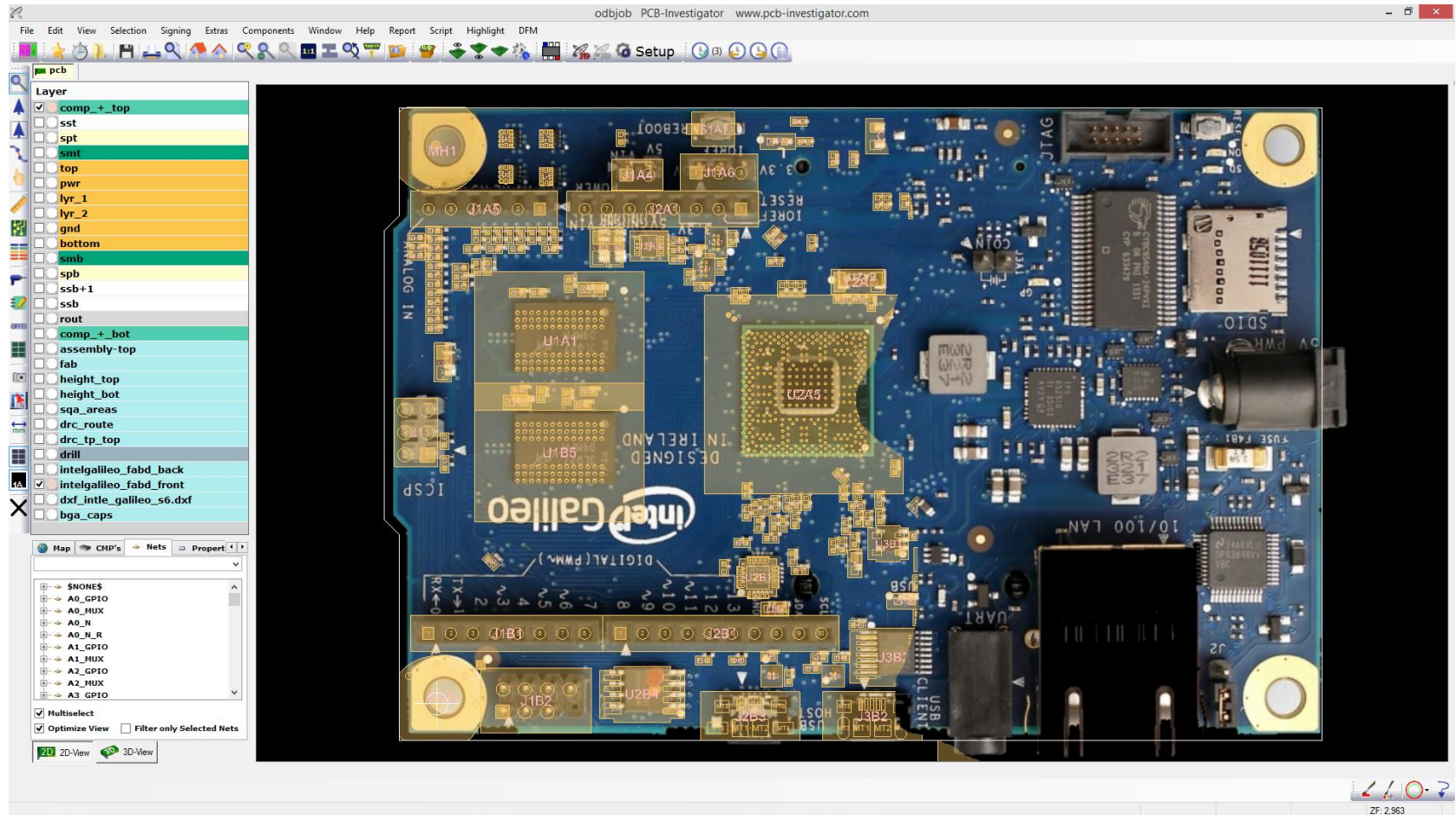
2D-View 3D-View

X: 175.9mm Y: 166.35mm ZF: 2.887

Bilder und CAD Daten kombinieren



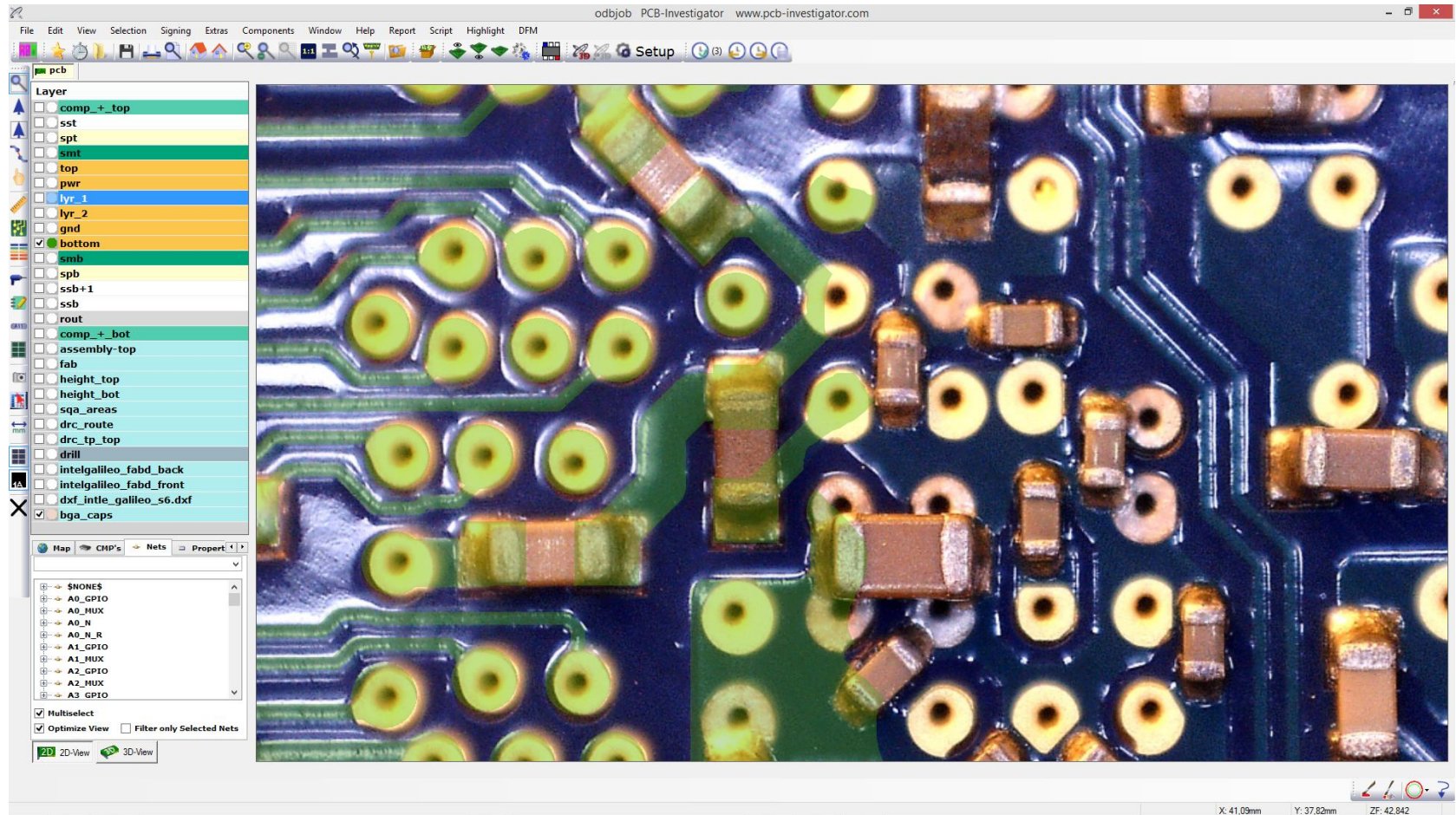
EASYLOGIX.DE



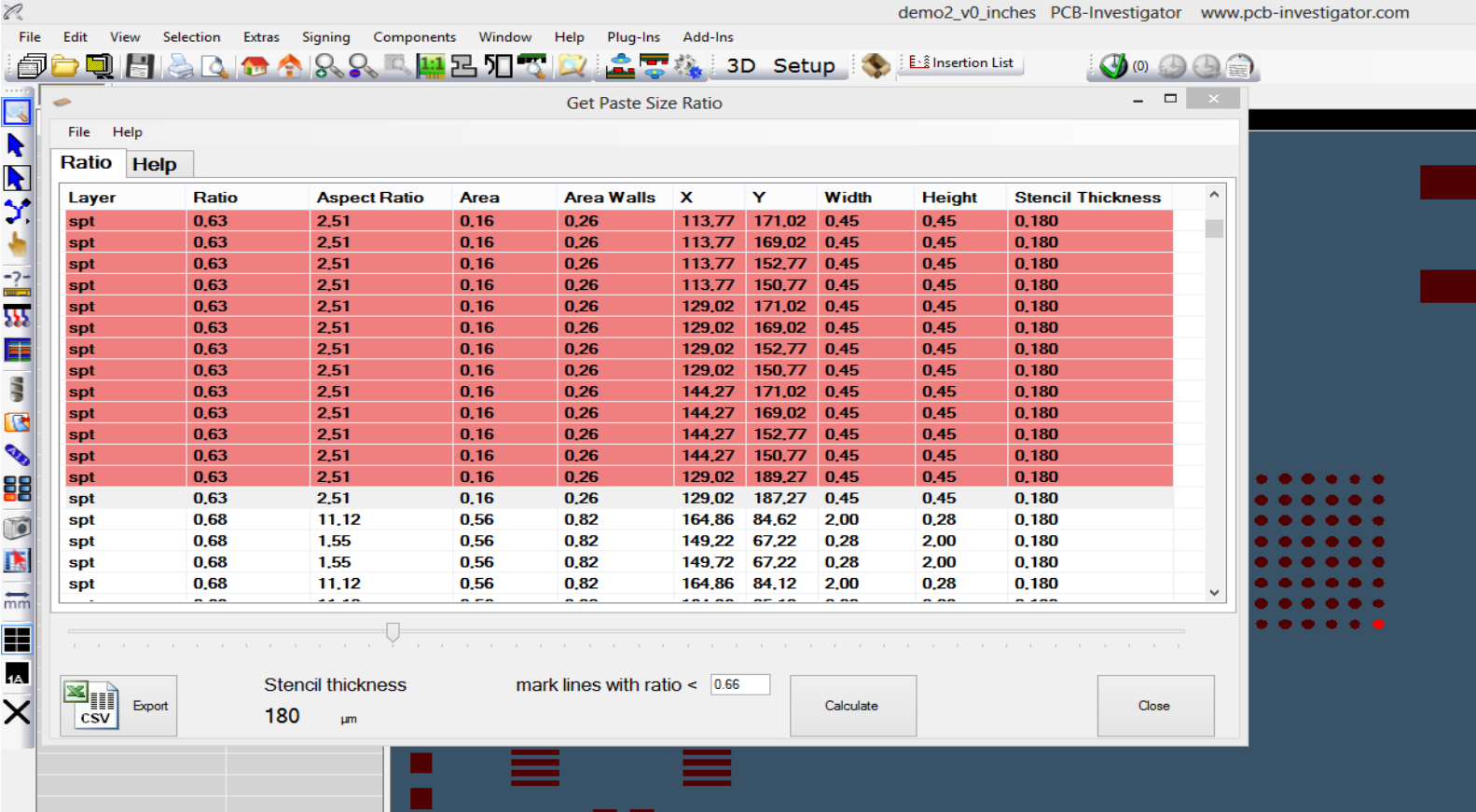
Bilder und CAD Daten kombinieren



EASYLOGIX.DE



Schablonen



demo2_v0_inches PCB-Investigator www.pcb-investigator.com

File Edit View Selection Extras Signing Components Window Help Plug-Ins Add-Ins

3D Setup Insertion List

Get Paste Size Ratio

File Help

Ratio Help

Layer	Ratio	Aspect Ratio	Area	Area Walls	X	Y	Width	Height	Stencil Thickness
spt	0.63	2.51	0.16	0.26	113.77	171.02	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	113.77	169.02	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	113.77	152.77	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	113.77	150.77	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	129.02	171.02	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	129.02	169.02	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	129.02	152.77	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	129.02	150.77	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	144.27	171.02	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	144.27	169.02	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	144.27	152.77	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	144.27	150.77	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	129.02	189.27	0.45	0.45	0.180
spt	0.63	2.51	0.16	0.26	129.02	187.27	0.45	0.45	0.180
spt	0.68	11.12	0.56	0.82	164.86	84.62	2.00	0.28	0.180
spt	0.68	1.55	0.56	0.82	149.22	67.22	0.28	2.00	0.180
spt	0.68	1.55	0.56	0.82	149.72	67.22	0.28	2.00	0.180
spt	0.68	11.12	0.56	0.82	164.86	84.12	2.00	0.28	0.180

Stencil thickness 180 µm

mark lines with ratio < 0.66

Calculate Close

Export CSV

Vorlage IPC 7525



Änderungsverfolgung

Änderungen auf Lagen



Compare Graphically

File Options Compare Help

Freigabe Markierung

Only Job 1 Only Job 2 Identical

comp_+_top <=> comp_+_top smt <=> smt top <=> top bottom <=> bottom smb <=> smb comp_+_bot <=> comp_+_bot

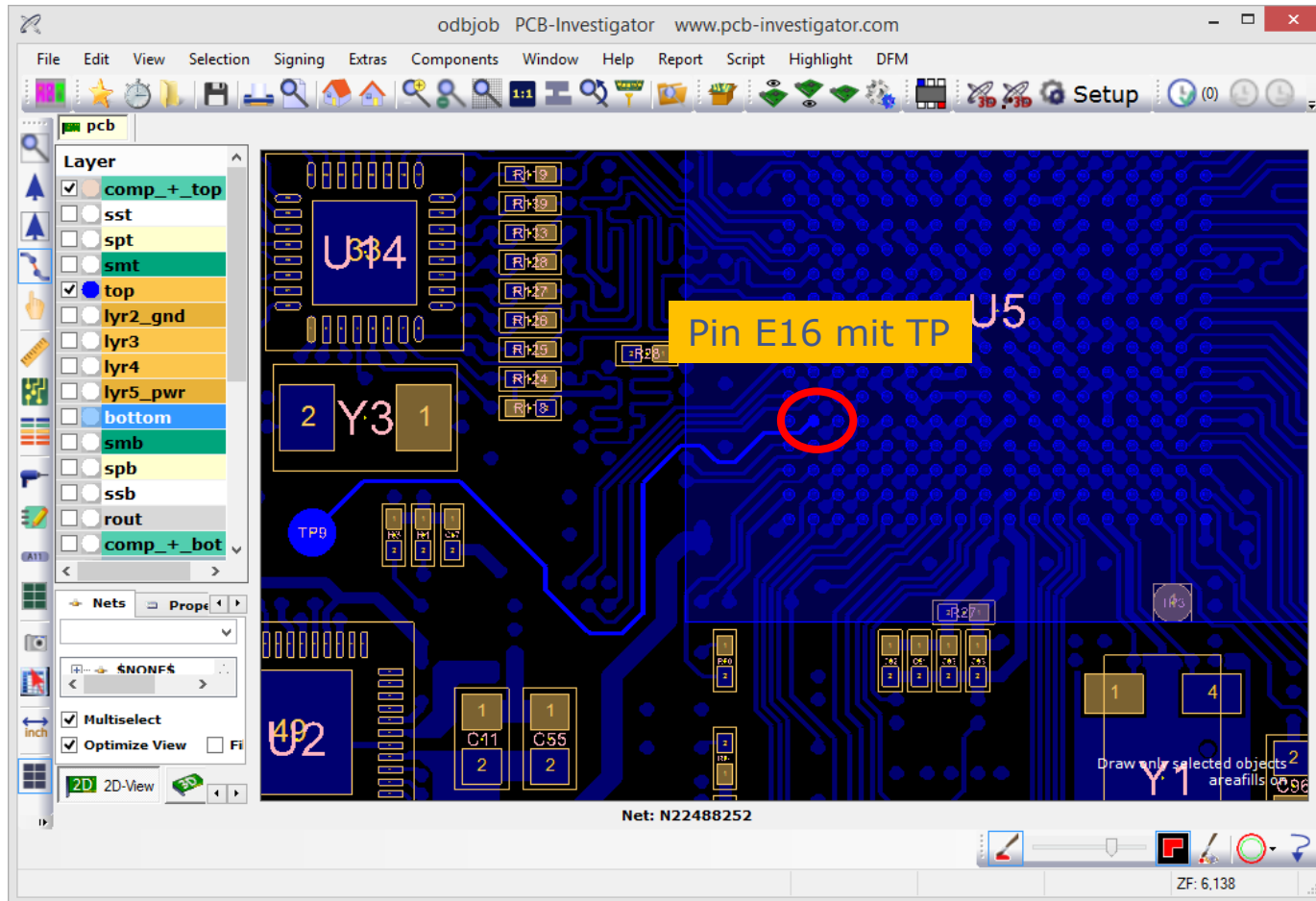
Exportierbar

- RTF
- TXT

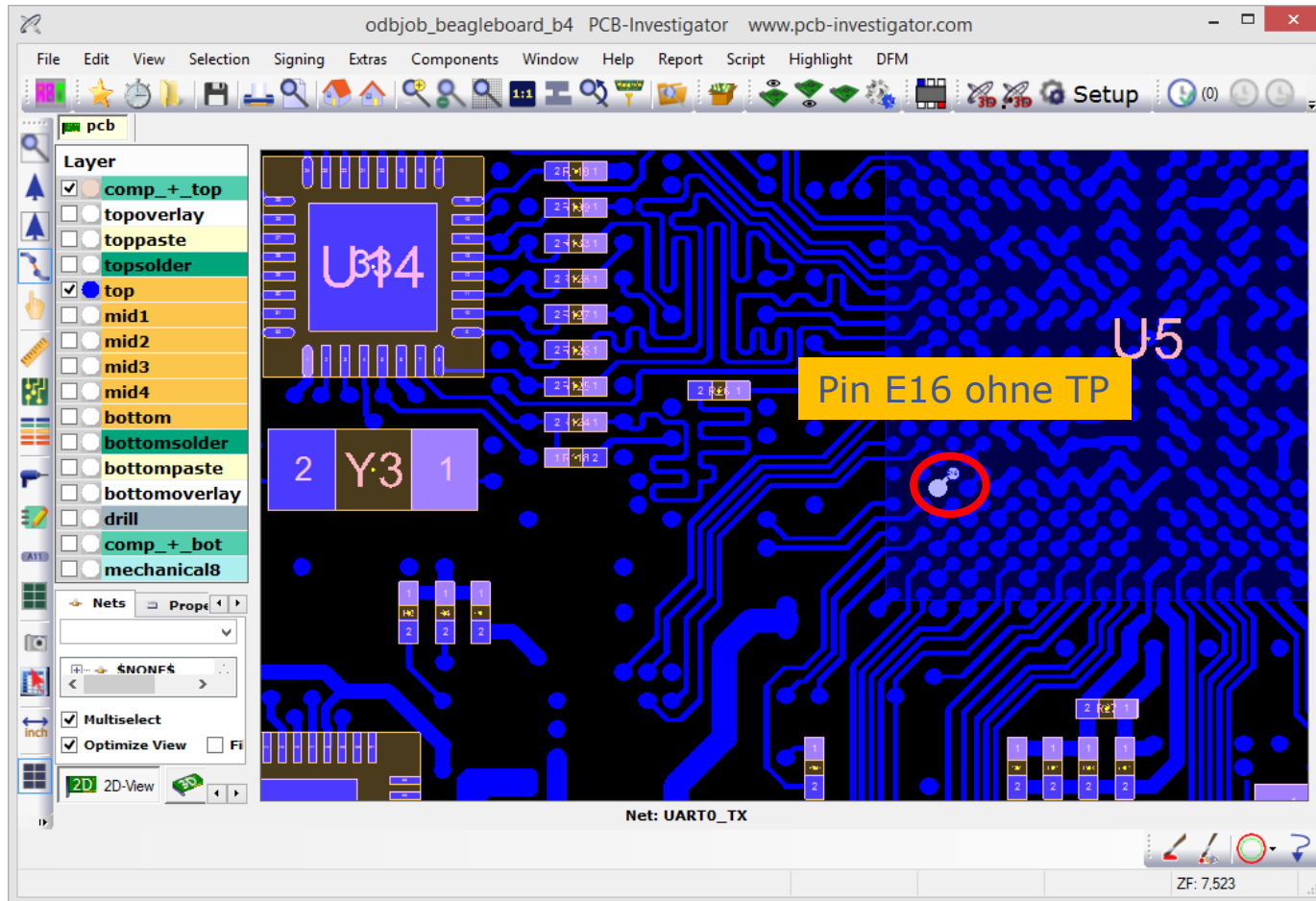
Änderungen auf Lagen



EASYLOGIX.DE



Änderungen auf Lagen



Änderung Bauteile



EASYLOGIX.DE

Compare Jobs

File View Options

Active Job: Choose step: pcb
odbjob

Compared Job: Choose step: pcb
odbjob

Compare Components

Elements Count

Components:	390
Equal:	365
Different:	14
Similar:	7
Only in active job:	4
Only in compared job:	0

List only differences

Components Nets

State	Reference	X	Y	Value	Nets	Attributes
different!	R48	50.165	40.386	0	LCDDE, LCD_DE	VALUE '0', PART_NAME 'RES_33_0402', comp_mount_ty
different!	R47	51.435	40.386	0	LCDVHNC, LCD_HSYNC	PART_NAME 'RES_33_0402', SIGNAL_MODEL '33OHMF
different!	R46	51.435	43.942	0	LCDVSYNC, LCD_VSYNC	VALUE '0', PART_NAME 'RES_33_0402', comp_mount_ty
different!	R45	50.165	43.942	22	LCDPCLK, LCD_PCLK	VALUE '22', PART_NAME 'RES_33_0402', comp_mount_t
different!	U5	45.72	29.21	XAM3359A2C2...	DGND, VDD_MPUON, TESTOUT, OSC1_OUT, G...	VALUE 'XAM3359A2CZ100', PART_NAME 'IC_AM335X_Z
different!	R74	6.35	45.4025	4.75K,5%	SYS_5V, LEDCA	VALUE '4.75K,5%', PART_NAME 'RES_470_1/10W_5%_C
different!	R73	6.35	46.355	4.75K,5%	SYS_5V, LEDBA	VALUE '4.75K,5%', PART_NAME 'RES_470_1/10W_5%_C
different!	R72	6.35	47.3075	4.75K,5%	SYS_5V, LEDAA	VALUE '4.75K,5%', PART_NAME 'RES_470_1/10W_5%_C
different!	R71	6.35	44.45	4.75K,5%	SYS_5V, LEDDA	VALUE '4.75K,5%', PART_NAME 'RES_470_1/10W_5%_C
different!	U4	13.6525	16.51	TL5209	VDD_3V3A, SYS_5V, VDD_3V3B, N21757673, D...	VALUE 'TL5209', PART_NAME 'PWR_TLV70233DBV_0'
different!	C106	43.72001	36.81095	1uF,10V	VDD_PLL, DGND	VALUE '1uF,10V', PART_NAME 'CAP_1.0UF_X5R_10V_1'
different!	C102	53.6575	16.1925	0.1uF,6.3V	VDD5_DDR, DGND	VALUE '0.1uF,6.3V', PART_NAME 'CAP_0.1UF_X5R_6.3V'
different!	R1	21.59	21.9075	100K,1%	VDD_3V3A, PMIC_INT	VALUE '100K,1%', PART_NAME 'RES_100K_1/16W_1%_C
different!	R12	3.81	16.51	4.75K,5%	DGND, PWR_LED	VALUE '4.75K,5%', PART_NAME 'RES_470_1/10W_5%_C
equal	MTG1	14.605	3.175	MHOLE	GND_EARTH	VALUE 'MHOLE', PART_NAME 'MHOLE', comp_mount_ty
equal	MTG2	80.645	6.35	MHOLE	GND_EARTH	VALUE 'MHOLE', PART_NAME 'MHOLE', comp_mount_ty

Selected Item	Active Job	Compared Job
Reference	U5	U5
Part Number	???	???
Location	45.72 : 29.21	45.72 : 29.21
Value	XAM3359A2CZ100	XAM3359A2CZ100
VALUE	XAM3359A2CZ100	XAM3359A2CZ100
PART_NAME	IC_AM335X_ZCZ	IC_AM335X_ZCZ
comp_mount_type	1	1
Pin 1	DGND	DGND
Pin 2	VDD_MPUON	VDD_MPUON
Pin 3	TESTOUT	TESTOUT
Pin 4	OSC1_OUT	OSC1_OUT
Pin 5	GND_OSC1	GND_OSC1
Pin 6	OSC1_IN	OSC1_IN

Änderung im Netz

Compare Jobs

File View Options

Active Job: Choose step: pcb
odbjob

Compared Job: Choose step: pcb
odbjob

Compare Nets List only differences

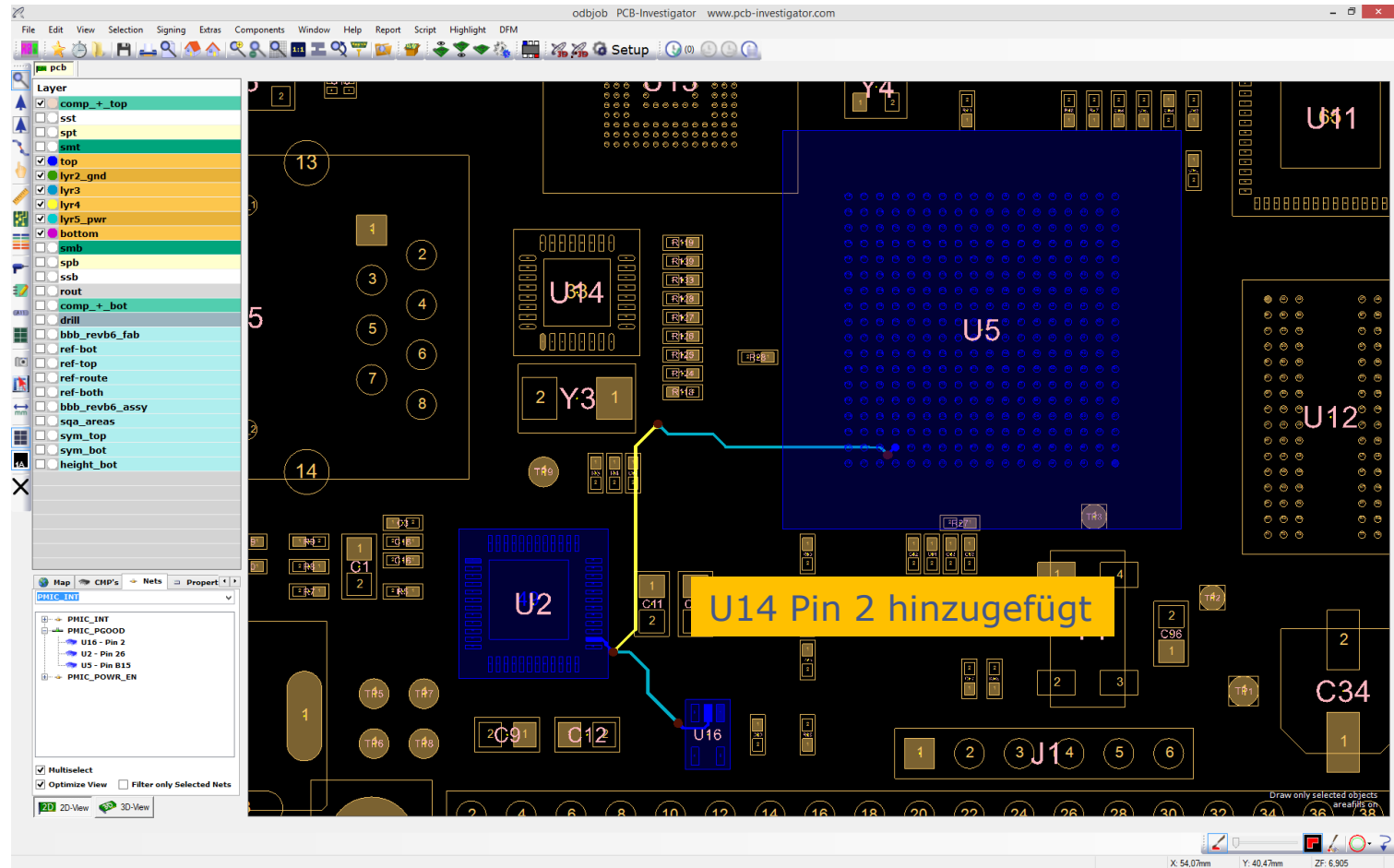
Elements	Count
Nets:	312
Equal:	303
Different:	9

Components Nets

State	Netname	Netname Job2	Matches %
different!	\$NONES	\$NONES	95.45
different!	DGND	DGND	99.18
different!	GND_OSC0	GND_OSC0	60.00
different!	GND_OSC1	GND_OSC1	75.00
different!	N22488252	\$NONES	50.00
different!	PMIC_PGOOD	PMIC_PGOOD	66.67
different!	SYS_RESETN	SYS_RESETN	88.89
different!	VDD_3V3A	VDD_3V3A	98.18
different!	VIO	VIO	66.67
- match found in -	VDD_3V3A	VDD_3V3AUX	1.82
	12M_LOOP	12M_LOOP	100.00
	12MHZ	12MHZ	100.00
	AIN0	AIN0	100.00
	AIN1	AIN1	100.00
	AIN2	AIN2	100.00
	AIN3	AIN3	100.00
	AIN4	AIN4	100.00
	AIN5	AIN5	100.00

	Active job	Compared job
Netnumber	306	306
Netname	PMIC_PGOOD	PMIC_PGOOD
Components	3	2
Inherited Components	U5 - B15 U2 - 26	U5 - B15 U2 - 26
Dividing Components	U16 - 2	

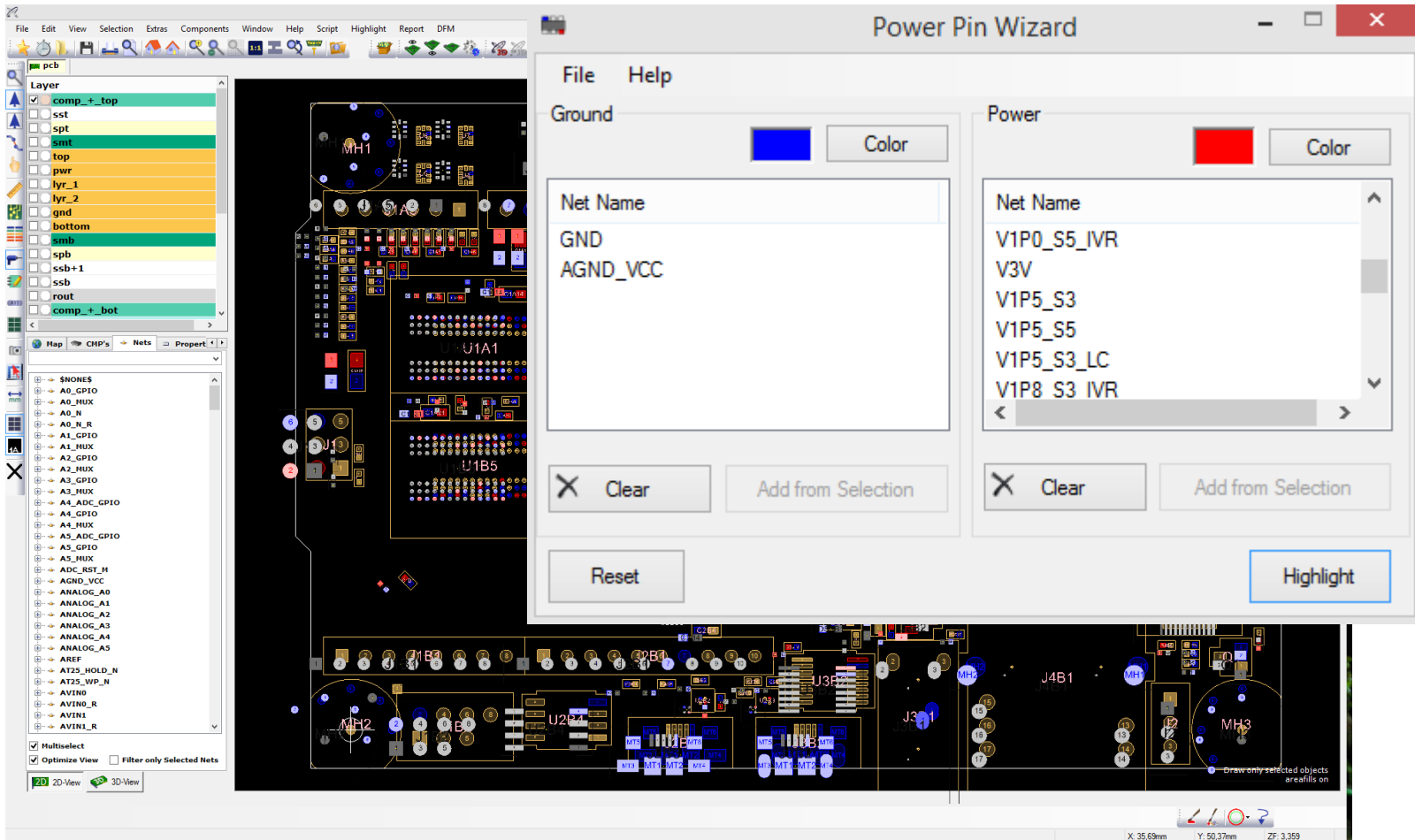
Änderung im Netz





Unterstützung für Entwickler

Power Pins definieren

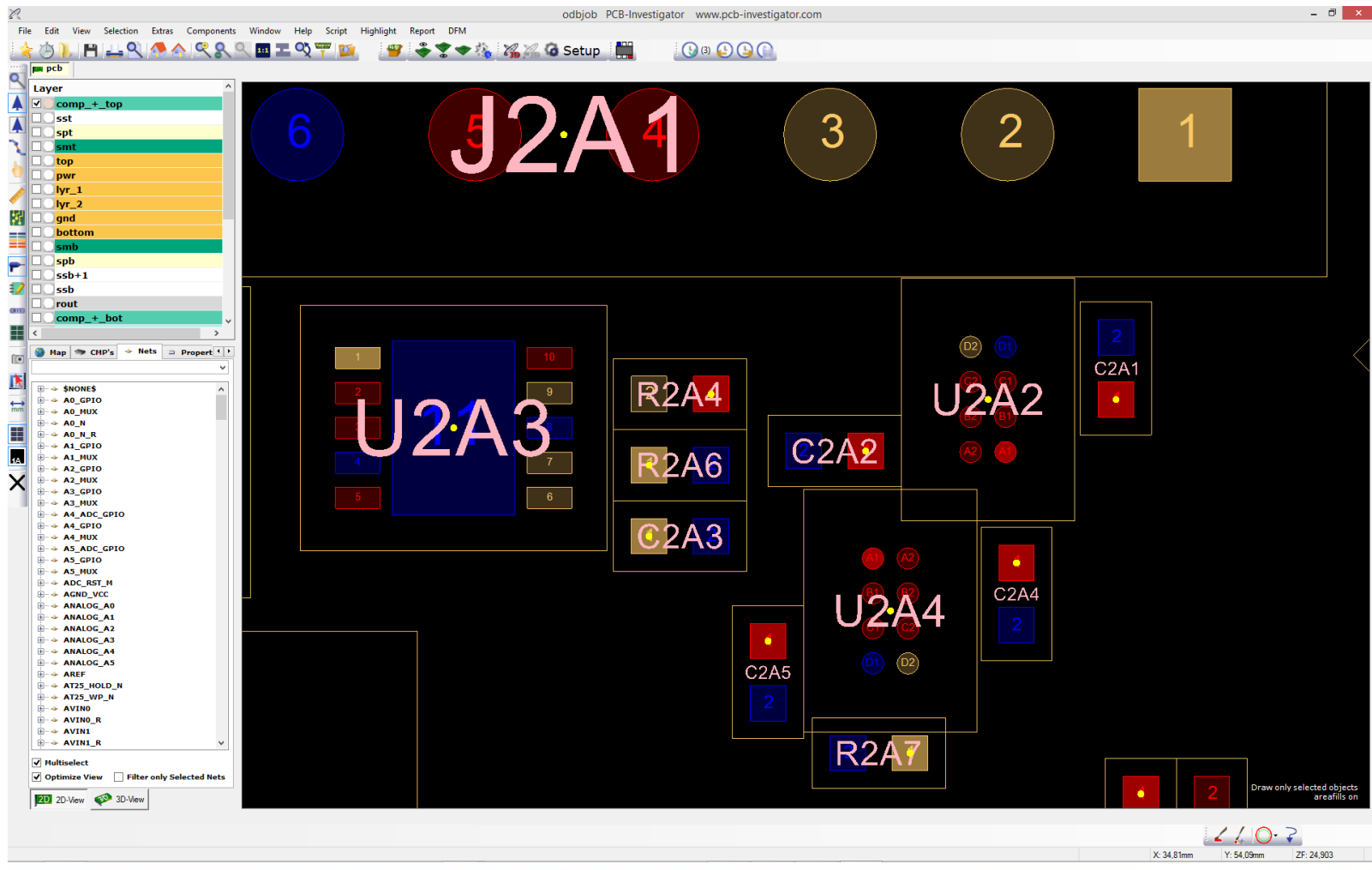


The screenshot displays a PCB design software interface with a "Power Pin Wizard" dialog box open. The background shows a PCB layout with components like U1A1, U1B5, U2, U3, J3, J4, J4B1, and M1, M2, M3. The wizard dialog has the following sections:

- File Help**
- Ground**: A blue color swatch and a "Color" button.
- Power**: A red color swatch and a "Color" button.
- Net Name** (Ground): A list containing "GND" and "AGND_VCC".
- Net Name** (Power): A list containing "V1P0_S5_IVR", "V3V", "V1P5_S3", "V1P5_S5", "V1P5_S3_LC", and "V1P8_S3_IVR".
- Buttons**: "Clear" (with an X icon), "Add from Selection", "Reset", and "Highlight".

At the bottom of the software window, the status bar shows: X: 35.69mm Y: 50.37mm ZF: 3.359.

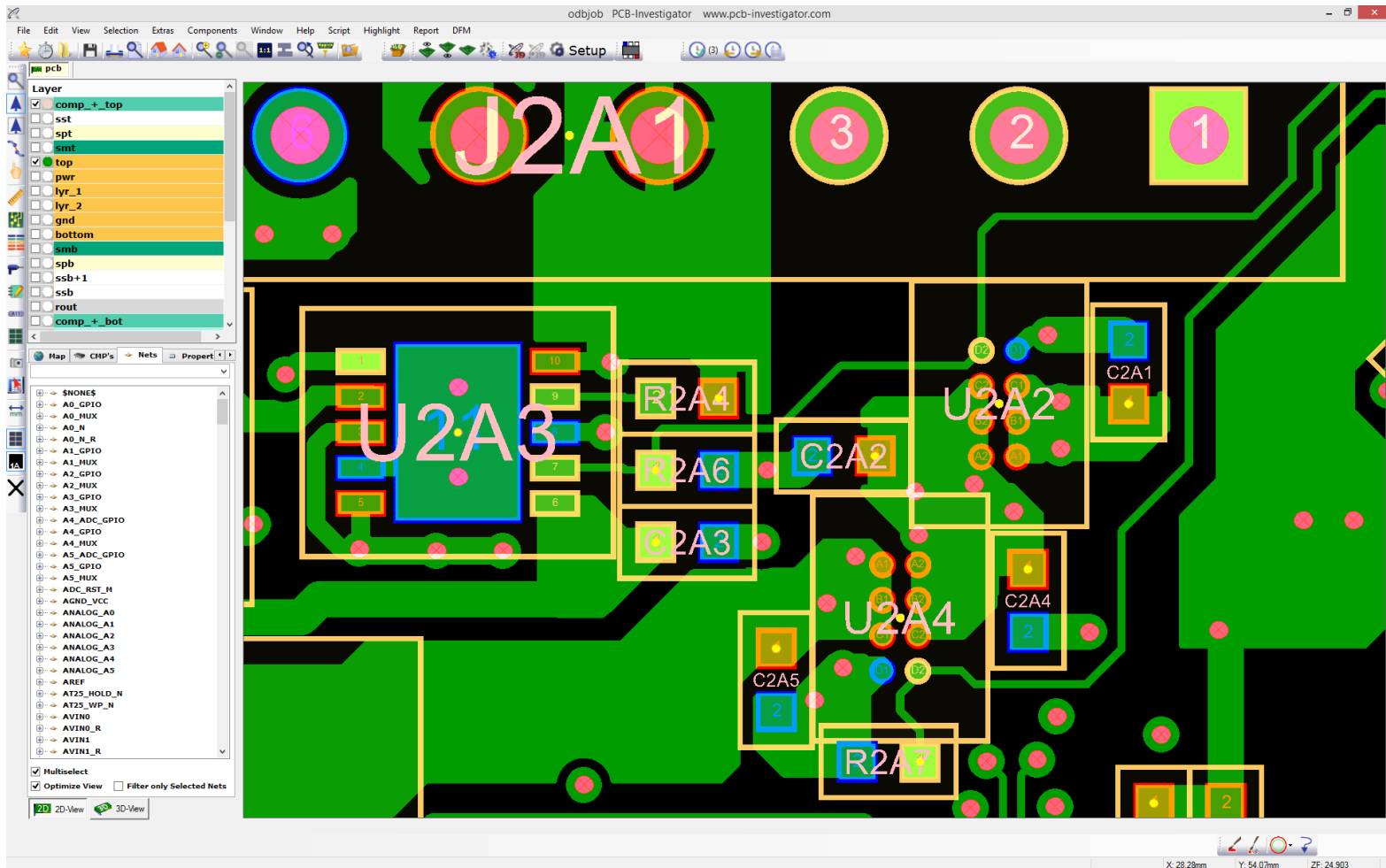
Power Pins



Power Pins



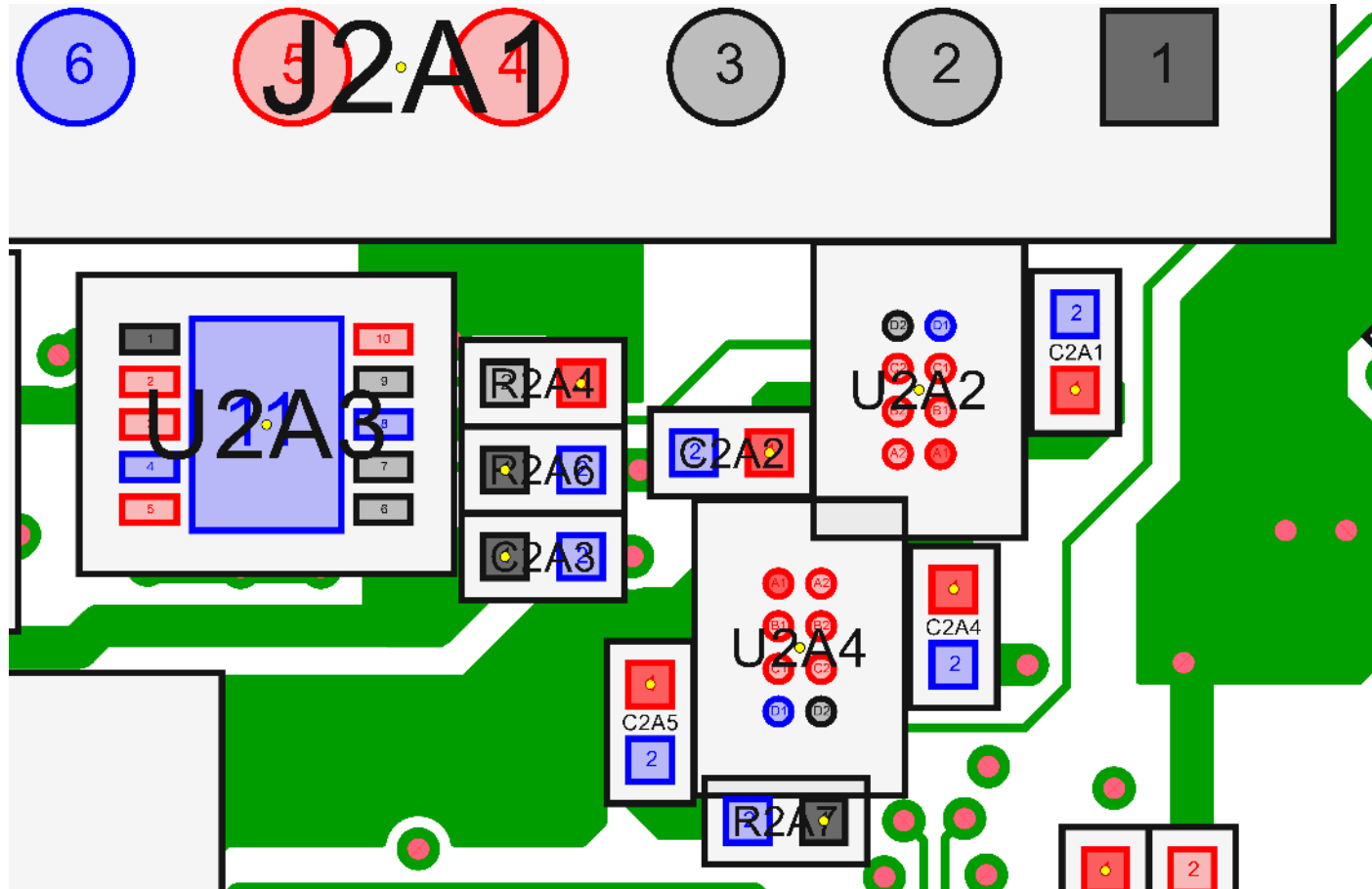
EASYLOGIX.DE



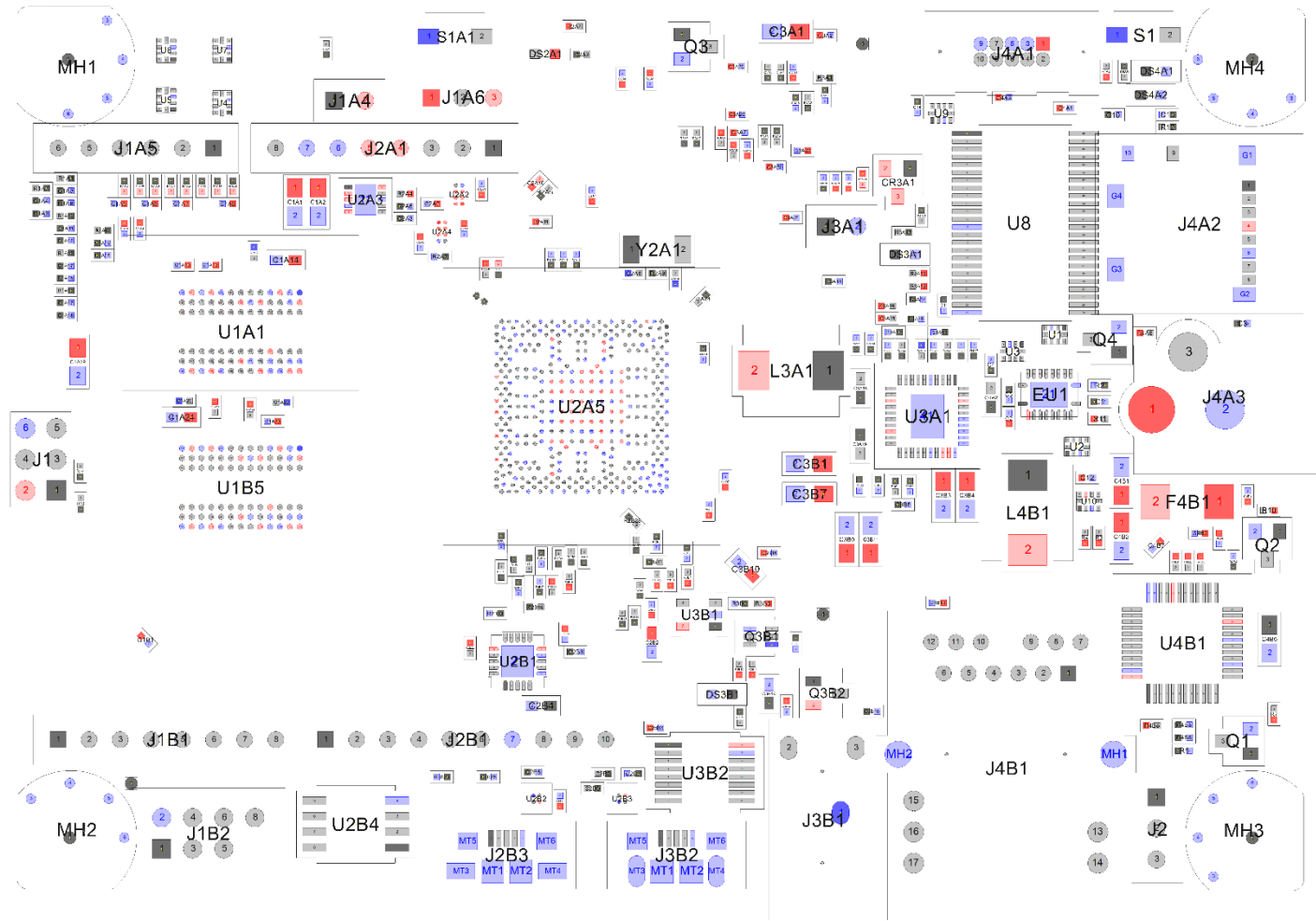
Ausdruck Power Pins



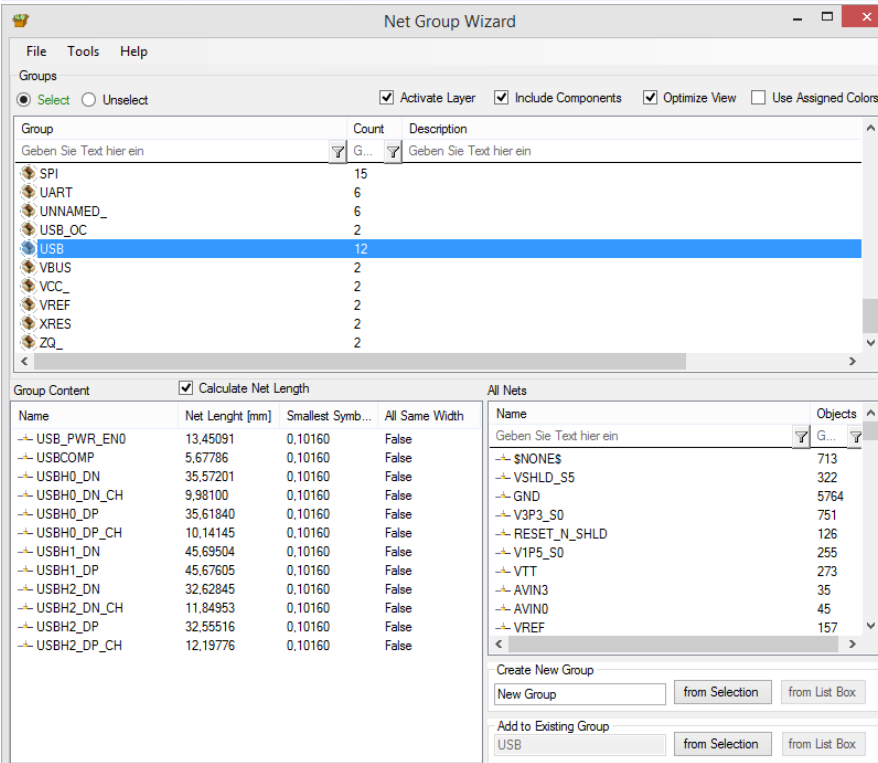
EASYLOGIX.DE



Ausdruck Power Pins



Netz Gruppen



Net Group Wizard

File Tools Help

Groups

Select Unselect Activate Layer Include Components Optimize View Use Assigned Colors

Group	Count	Description
Geben Sie Text hier ein	G...	Geben Sie Text hier ein
SPI	15	
UART	6	
UNNAMED_	6	
USB_OC	2	
USB	12	
VBUS	2	
VCC_	2	
VREF	2	
XRES	2	
ZQ_	2	

Group Content Calculate Net Length

Name	Net Length [mm]	Smallest Symbol	All Same Width
USB_PWR_END	13.45091	0.10160	False
USBCOMP	5.67786	0.10160	False
USBH0_DN	35.57201	0.10160	False
USBH0_DN_CH	9.98100	0.10160	False
USBH0_DP	35.61840	0.10160	False
USBH0_DP_CH	10.14145	0.10160	False
USBH1_DN	45.69504	0.10160	False
USBH1_DP	45.67605	0.10160	False
USBH2_DN	32.62845	0.10160	False
USBH2_DN_CH	11.84953	0.10160	False
USBH2_DP	32.55516	0.10160	False
USBH2_DP_CH	12.19776	0.10160	False

All Nets

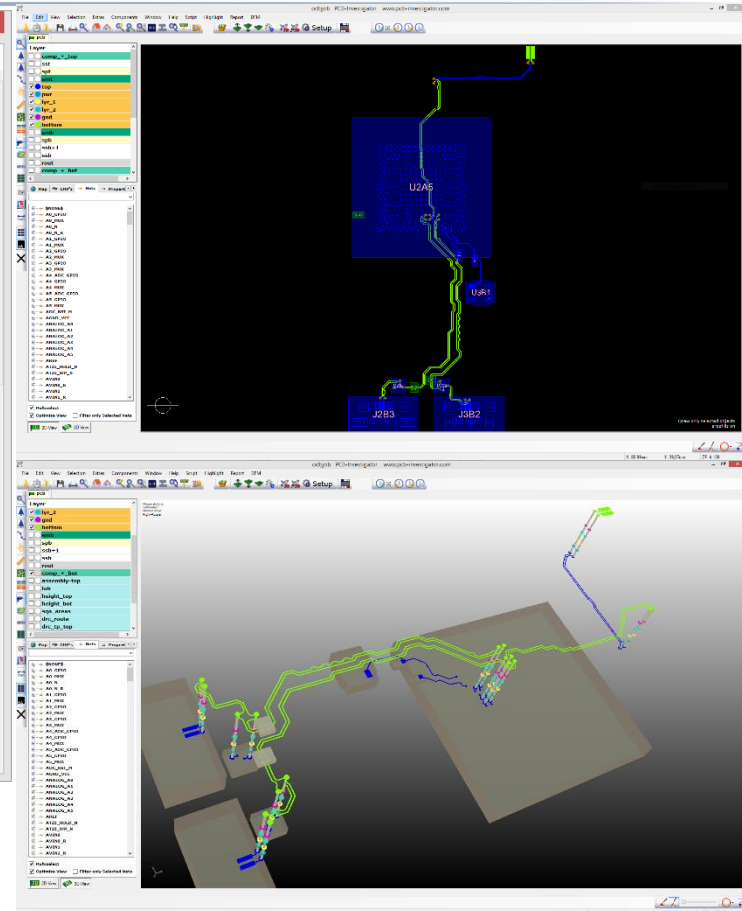
Name	Objects
Geben Sie Text hier ein	G...
\$NONES	713
VSHLD_S5	322
GND	5764
V3P3_S0	751
RESET_N_SHLD	126
V1P5_S0	255
VTT	273
AVIN3	35
AVIN0	45
VREF	157

Create New Group

New Group

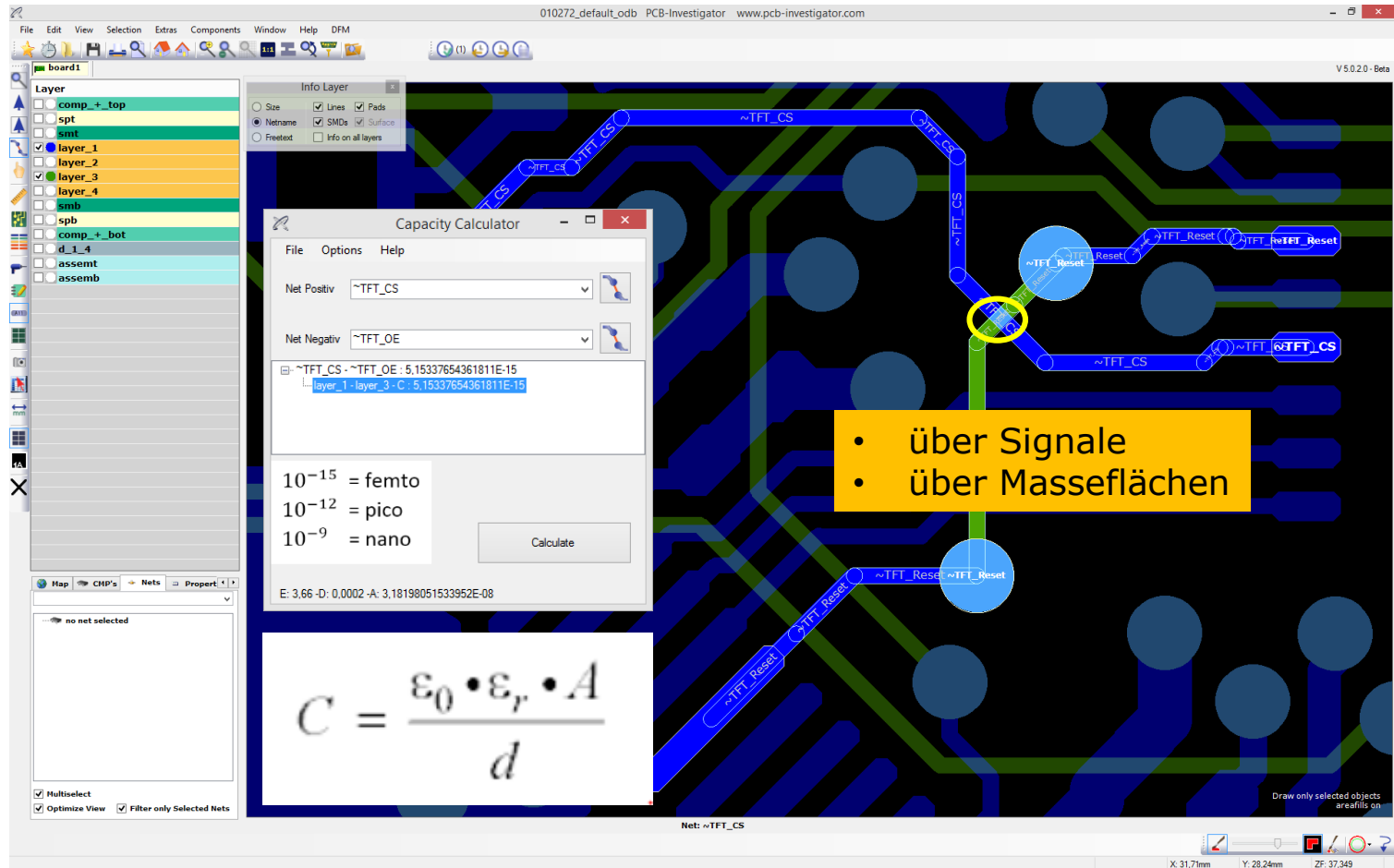
Add to Existing Group

USB



Leitungsinduktivitäten auf der Leiterplatte
1mm Leiterbahn $\approx 1\text{nH}$
Via $\approx 0,5\text{nH}$

Kapazitäten



010272_default_odb PCB-Investigator www.pcb-investigator.com

board1

Layer

- comp.+_top
- spt
- smt
- layer_1
- layer_2
- layer_3
- layer_4
- spb
- spb
- comp.+_bot
- d_1_4
- assemb
- assemb

Info Layer

- Size
- Lines
- Pads
- Netname
- SMDs
- Surface
- Freetext
- Info on all layers

Capacity Calculator

File Options Help

Net Positiv ~TFT_CS

Net Negativ ~TFT_OE

~TFT_CS - ~TFT_OE : 5,15337654361811E-15
layer_1 - layer_3 - C : 5,15337654361811E-15

10⁻¹⁵ = femto
10⁻¹² = pico
10⁻⁹ = nano

Calculate

E: 3.66 - D: 0.0002 - A: 3,18198051533952E-08

• über Signale
• über Masseflächen

$$C = \frac{\epsilon_0 \cdot \epsilon_r \cdot A}{d}$$

Net: ~TFT_CS

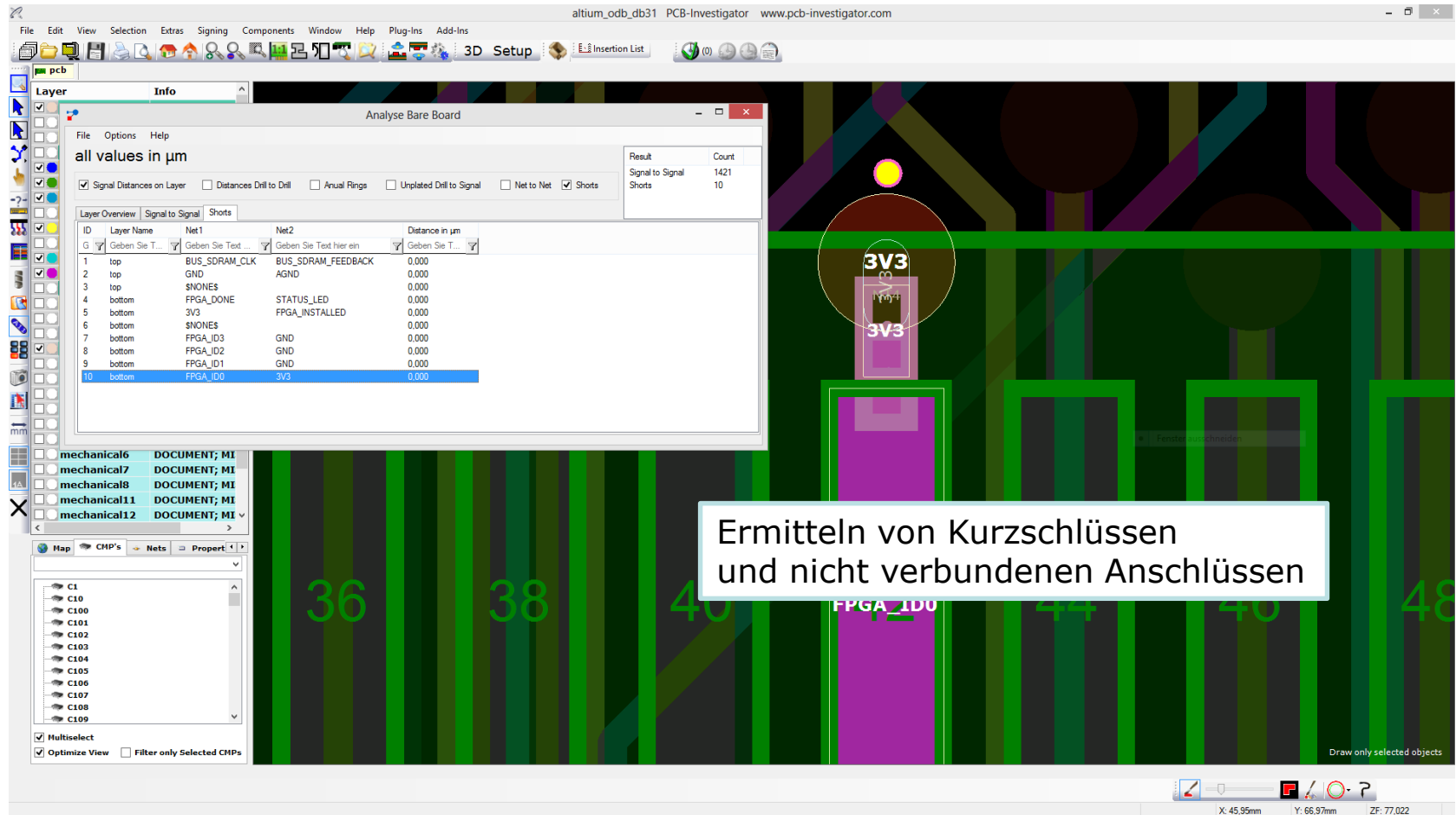
Draw only selected objects
areafills on

X: 31.71mm Y: 28.24mm ZF: 37.349



DRC / DFM

Netzinformationen

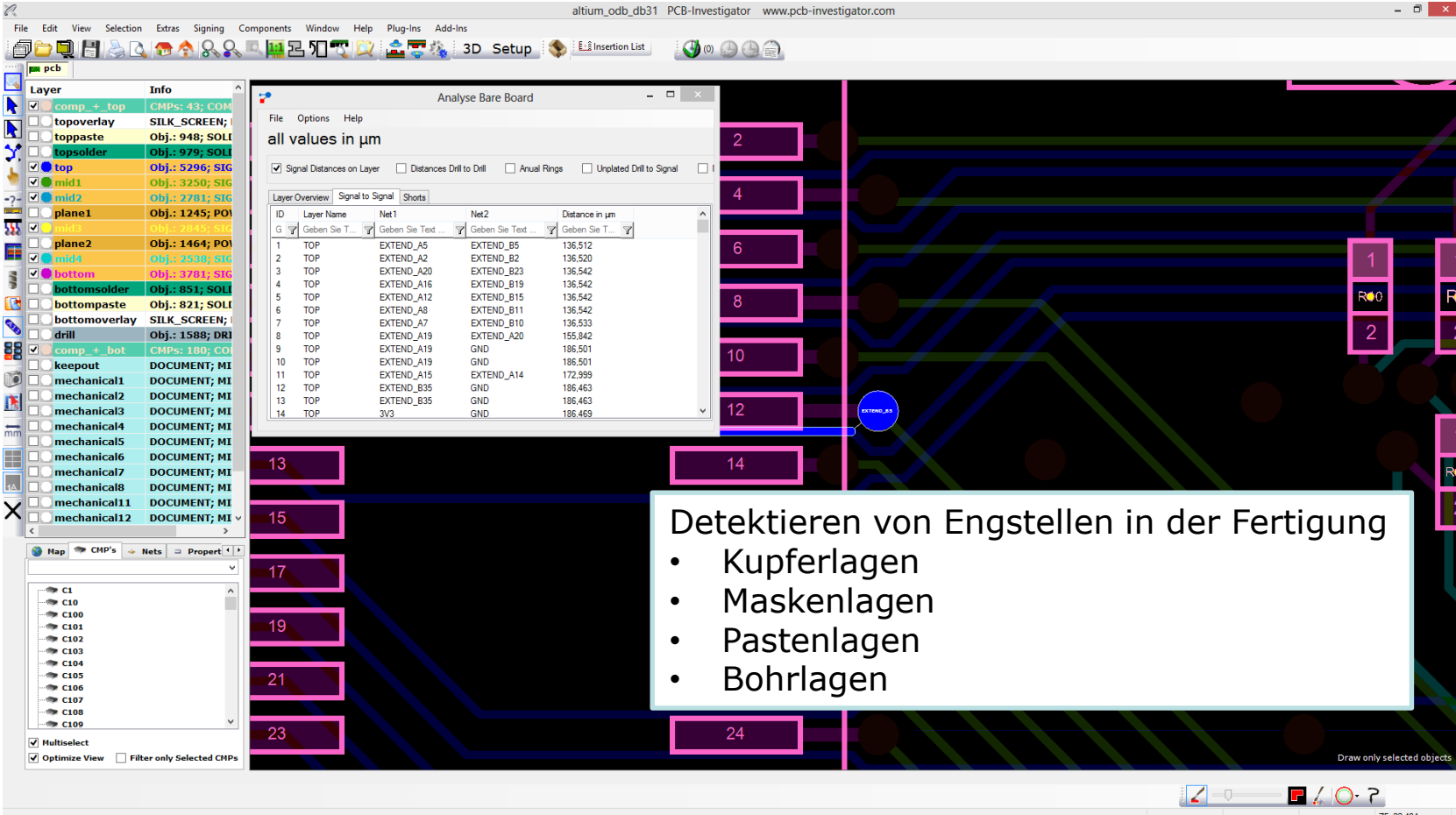


The screenshot shows the PCB-Inspector software interface. The main window displays a PCB layout with various components and traces. A component labeled '3V3' is highlighted with a red circle. A dialog box titled 'Analyse Bare Board' is open, showing a table of net information. The table has columns for ID, Layer Name, Net1, Net2, and Distance in µm. The table lists various nets and their distances, with the last row (ID 10) highlighted in blue. A text box in the foreground contains the text: 'Ermitteln von Kurzschlüssen und nicht verbundenen Anschlüssen'.

ID	Layer Name	Net1	Net2	Distance in µm
1	top	BUS_SDRAM_CLK	BUS_SDRAM_FEEDBACK	0.000
2	top	GND	AGND	0.000
3	top	\$NONES		0.000
4	bottom	FPGA_DONE	STATUS_LED	0.000
5	bottom	3V3	FPGA_INSTALLED	0.000
6	bottom	\$NONES		0.000
7	bottom	FPGA_ID3	GND	0.000
8	bottom	FPGA_ID2	GND	0.000
9	bottom	FPGA_ID1	GND	0.000
10	bottom	FPGA_ID0	3V3	0.000

Ermitteln von Kurzschlüssen
und nicht verbundenen Anschlüssen

Qualitätssicherung



The screenshot shows the PCB-Invigator software interface. The main window displays a PCB layout with various layers and components. A table titled "Analyse Bare Board" is open, showing the following data:

ID	Layer Name	Net1	Net2	Distance in µm
1	TOP	EXTEND_A5	EXTEND_B5	136.512
2	TOP	EXTEND_A2	EXTEND_B2	136.520
3	TOP	EXTEND_A20	EXTEND_B23	136.542
4	TOP	EXTEND_A16	EXTEND_B19	136.542
5	TOP	EXTEND_A12	EXTEND_B15	136.542
6	TOP	EXTEND_A8	EXTEND_B11	136.542
7	TOP	EXTEND_A7	EXTEND_B10	136.533
8	TOP	EXTEND_A19	EXTEND_A20	155.842
9	TOP	EXTEND_A19	GND	186.501
10	TOP	EXTEND_A19	GND	186.501
11	TOP	EXTEND_A15	EXTEND_A14	172.399
12	TOP	EXTEND_B35	GND	186.463
13	TOP	EXTEND_B35	GND	186.463
14	TOP	3V3	GND	186.469

Below the table, a list of manufacturing constraints is shown, numbered 2 through 24. A text box in the foreground contains the following text:

Detektieren von Engstellen in der Fertigung

- Kupferlagen
- Maskenlagen
- Pastenlagen
- Bohrlagen



Kommunikation

Möglichkeiten zur Kommunikation

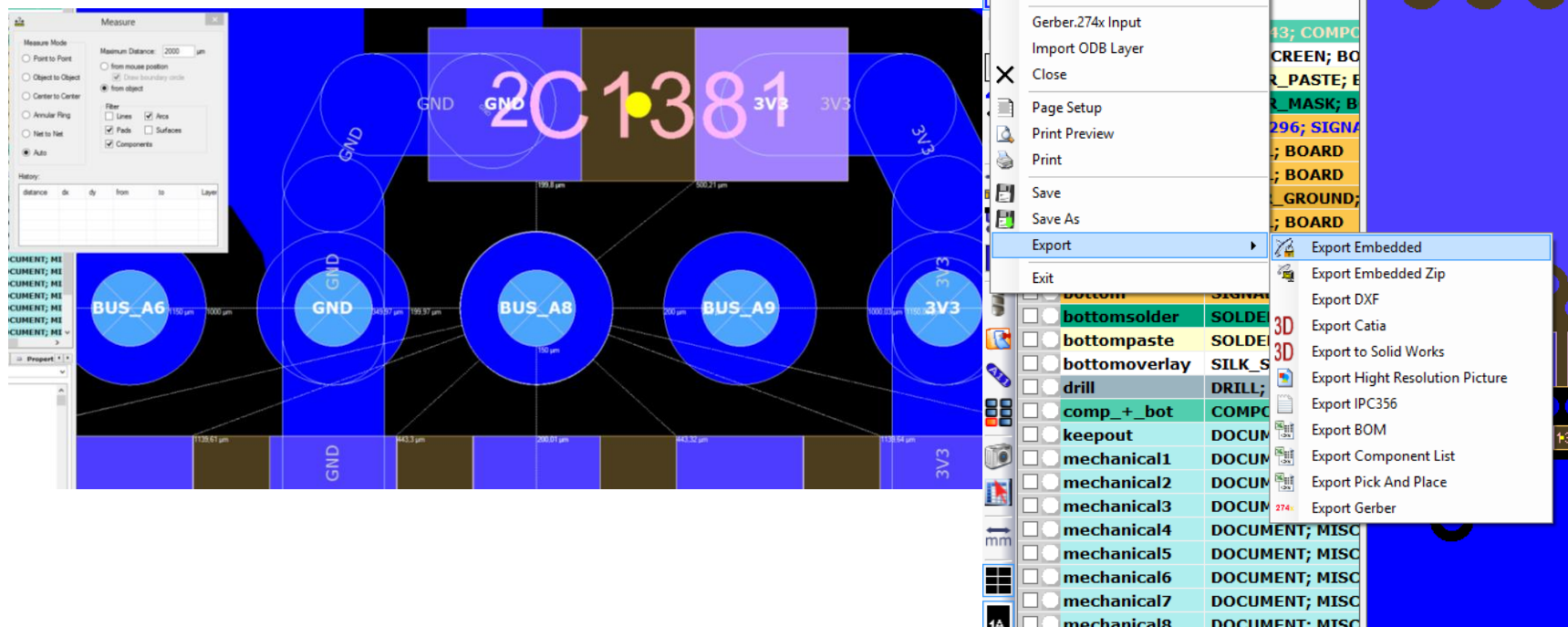


EASYLOGIX.DE

The screenshot displays the PCB-Investigator software interface. The main workspace shows a PCB layout with various components and nets. A 'View-List' dialog box is open, showing a list of components and their properties. The 'Info' panel shows details for the selected component, including a note: 'Please change C127 to 4u7F'. The 'Map' panel shows a list of components, including C1, C10, C100, C101, C102, C103, C104, C105, C106, C107, C108, and C109. The 'Net' panel shows a list of nets, including US_A20, BUS_D24, BUS_D25, GND, 3V3, 3V3, GND, BUS_D28, and BUS_D29. The 'Properties' panel shows options for 'Multiselect' and 'Optimize View'. The 'Layer' panel shows a list of layers, including comp_+, topoverl, toppaste, topsolde, top, mid1, mid2, plane1, mid3, plane2, mid4, bottom, bottoms, bottomp, bottomo, drill, comp_+, keepout, mechani, and mechani. The '3D Setup' panel shows options for '3D Setup'. The 'Tools' panel shows icons for various tools, including a green checkmark, a red checkmark, a red X, and a red question mark. The 'Status Bar' shows the file name 'altium_odb_db31', the software name 'PCB-Investigator', and the website 'www.pcb-investigat'. The 'Page-Footer' shows the number '63'.

Kommunikation

- Wichtige Details im Fokus behalten
 - Erstellen eines lizenzfreien Viewers mit Daten
 - Wichtige Punkte flexibel visualisieren
 - Informationen weitergeben für die Entwicklung und Fertigung





Vielen Dank für Ihre Aufmerksamkeit!

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