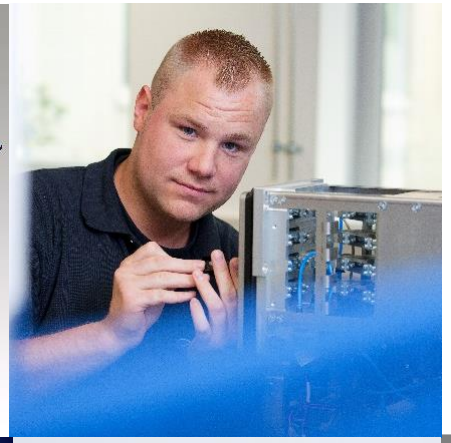
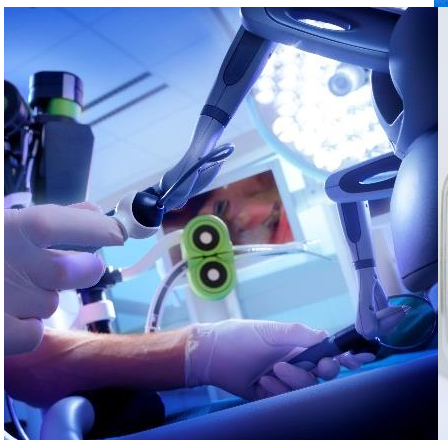

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Toegevoegde waarde DfX in het designproces - Businesscase

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VOORSTELLEN HARRY ROEWEN

BUSINESS UNIT MANAGER EMBEDDED SYSTEMS @ DEMCON

Persoonlijke achtergrond

Persoonlijk

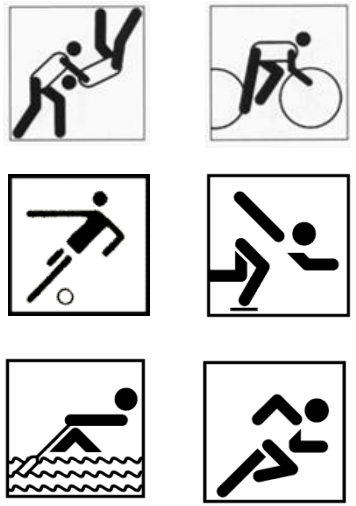
Getrouwd met Annemarie

3 kinderen

3 stiefkinderen

6 kleinkinderen

Hobby



Opleiding

Universiteit Twente

Werk

VREDESTEIN DESIGNED TO PROTECT YOU

IACS solutions

PANDATA Capgemini CONSULTING.TECHNOLOGY.OUTSOURCING

NEWAYS®

ProfTech® MECHATRONICS

DEMCON

CONTROL SYSTEMS Arro

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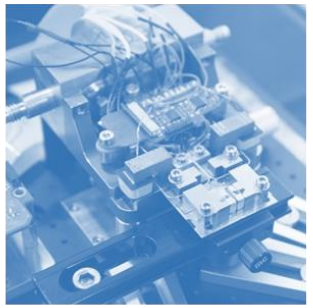
ORGANISATIE DEMCON

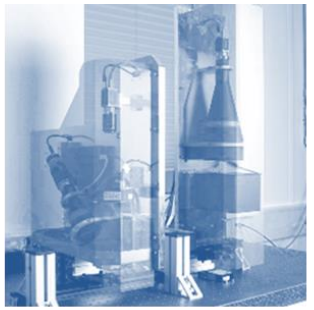
DEMCON groep

- Opgericht in 1993
- Hoofdkantoor in Enschede
- Vestigingen Son, Delft, Groningen, Münster (D)
- > 350 experts
- Privately owned
- ISO 9001 & ISO 13485

Business Units

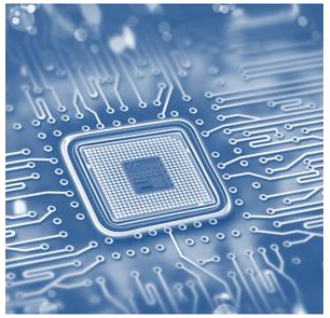


HIGHTECH SYSTEMS

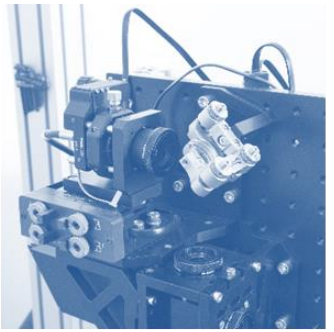


INDUSTRIAL SYSTEMS & VISION

MEDICAL SYSTEMS



EMBEDDED SYSTEMS



FOCAL OPTOMECHATRONIC SYSTEMS

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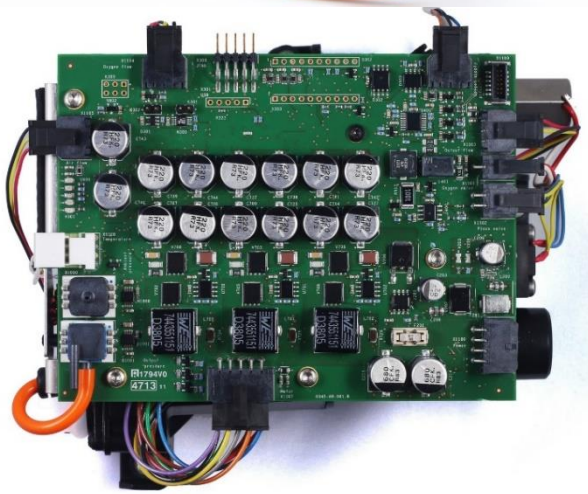
BUSINESS CASE

MACAWI BEADEMINGSMODULE

MACAWI BEADEMINGSMODULE



APPLICATIES

- OEM en klantspecifieke beademingsmodules
  - Ventilatoren voor (sub)acute hulp of thuishulp
  - Ventilatoren tbv te vroeg geboren baby's (Neonataal)
  - Ventilatoren tbv spoedeisende hulp of tbv vervoer

TECHNOLOGIE/KENMERKEN

- Medisch systeem met klasse C software
- Control op basis van flow en dynamisch blower gedrag
- Behandeling van kleine kinderen vanaf 0,5 Kg (RR <200 br./min. Vt >5ml) tot en met volwassenen (één systeem)
- Laag energieverbruik (< 25W)
- Laag geluids nivo (< 40 dBa)

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MACAWI BEADEMINGSMODULE

STATUS BEGIN VAN HET PROJECT

- Functioneel werkend systeem
- Product validatie gedeeltelijk gereed
- Geschikt maken voor serieproductie bij DEMCON

WAT WILLEN WE VOORKOMEN

- Functionele test van PCBA uitvoeren in eindassemblage
- Repair/retouren door niet functionerende PCBA's
- Rework door niet functionerende PCBA's
- Hoge eindassemblage- en testkosten
- Uitval in het veld

OPLOSSING

- Kwaliteit van de PCBA's zo optimaal mogelijk →
  - DfM en DfT analyse
  - Resultaten verwerken in de PCBA's en productietest

DESIGN FOR MANUFACTURING - DFM

DEMCON advanced mechatronics			Projectnr. 1040	Project name XXX YYY NNN					
			Document Nr. D1143859	Title 1040_BOM_100 XXX YYY NNN					
Institutenweg 25			Revision 01	Status Final	Revision date 09-11-2016	Creation Date 11-01-2016			
7521 PH Enschede									
Tel: 088 - 115 2000			Version 05	Doc Type 0540 EL Supporting informa	Author JZI				
www.demcon.nl									
Item	Qty	Part Nr:	Reference	Value	Description	Manufacturer part number	Manufacturer	Remarks	Assembly information
1	22	55.01.083	C100 C101 C202 C205 C206 C208 C209 C304 C305 C306 C307 C308 C309 C310 C311 C313 C315 C318 C403 C500 C503 C504	100nF	Ceramic Capacitor SMD X7R 0402	C0402C104K4RAC	Kemet		
2	8	55.10.1001	C200 C201 C204 C314 C402 C501 C502 C505	22uF	Ceramic Capacitor SMD X7R 1206	GRM31CR71A226KE15L	Murata		
3	2	55.09.010	C302 C303	2.2uF	Ceramic Capacitor SMD X5R 0805	C0805C225K8PAC	Kemet		
4	1	EC006207	C400	3.0pF	C0G 0402 General Purpose	GRM1555C1H3R0CA01D	Murata		
5	1	EC006208	C401	1.0pF	C0G 0402 General Purpose	GRM1555C1H1R0CA01D	Murata		
6	2	EC006205	C405 C407	68pF	NPO 0402 General Purpose	GRM1555C1H680JA01D	Murata		
7	1	EC006210	C406	22pF	NPO 0402 General purpose	GRM1555C1H220JA01J	Murata		
8	2	EC006206	C408 C409	5.6pF	NPO 0402 General Purpose	GRM1555C1H5R6DA01D	Murata		
9	1	EC006213	C412	2.0pF	C0G 0402 General Purpose	GRM1555C1H2R0CA01J	Murata		
10	1	52.02.1142	D300	STM32F207VC	ARM-based 32-bit MCU, 100 pins	STM32F207VC	ST Microelectronics		
11	1	EC006189	D301	AT25SF321-SSHD	32Mbit SPI Serial Flash SOIC-8	AT25SF321-SSHD	Adesto Technologies		
12	1	EC006187	D400	SI4461-C	EZRadioPro subGHz transceiver	Si4461-C2A-GM	Silicon Labs		
13	1	EC006211	D500	KSZ8081RNACA	PHY RMII 10base-T 100base-TX 25MHZ XI	KSZ8081RNACA	Microchip		
14	6	15.06.058	FI1 FI2 FI3 FI4 FI5 FI6	FIDUCIAL15-30	Fiducial;w/1.5mm pad,3mm soldermask clearance	na	Not Applicable		
15	1	EC006215	G400	25MHz 10ppm	Crystal , 25MHz, 3.2x2.5mm	WTL3M02510	WTL		
16	3	56.01.092	L201 L300 L500	600E@100MHz	Wurth SMD 0805 EMI Ferrite Beads WE-CBF	742792040	Wurth		
17	1	EC006212	L202	2.2uH	Inductor wirewound unshielded	NLCV32T-2R2M-PFR	TDK		
18	1	EC006216	L400	22nH	Multilayer Inductor, 0.42 Ohm@100MHz	LQG15HS22N	Murata		
19	1	EC006217	L401	18nH	Multilayer Inductor, 0.36 Ohm@100MHz	LQG15HS18N	Murata		
20	1	EC006220	L403	120nH	Multilayer Inductor, 1.3 Ohm@100MHz	LQG15HSR12	Murata		
21	1	EC006218	L404	6n8H	Multilayer Inductor, 0.24 Ohm@100MHz	LQG15HS6N8	Murata		
22	1	EC006219	L406	8n2H	Multilayer Inductor, 0.24 Ohm@100MHz	LQG15HS8N2	Murata		

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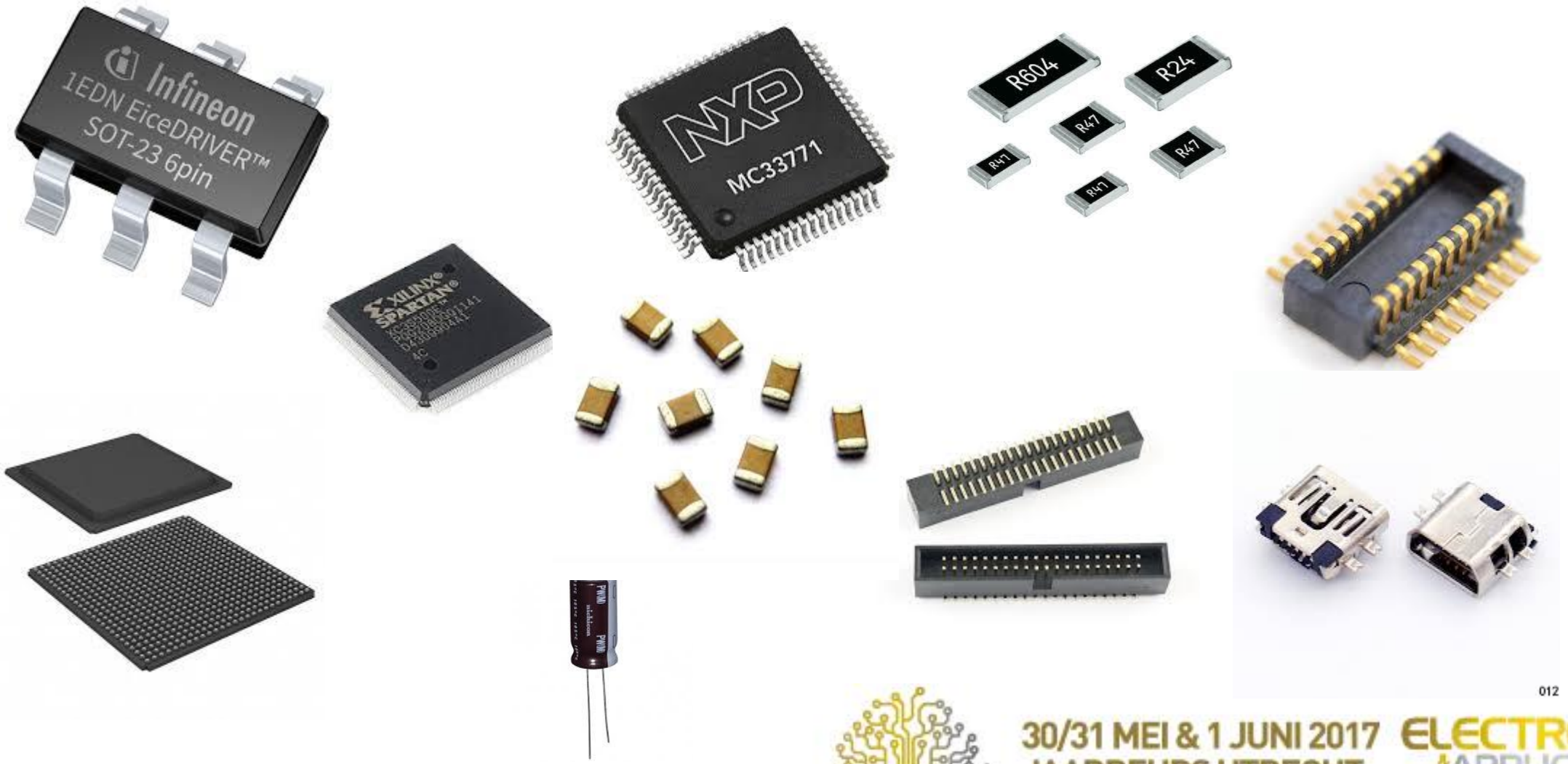

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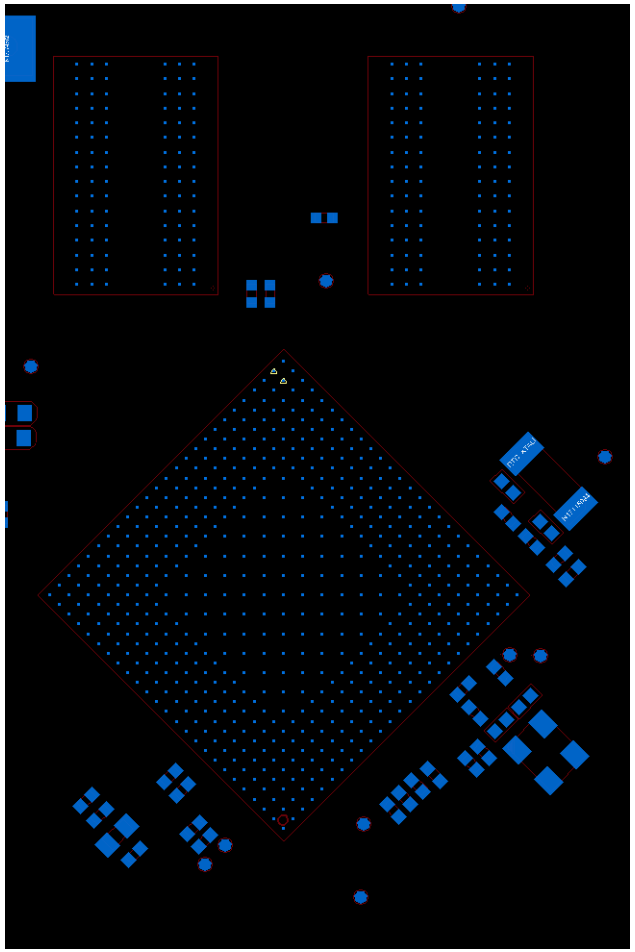

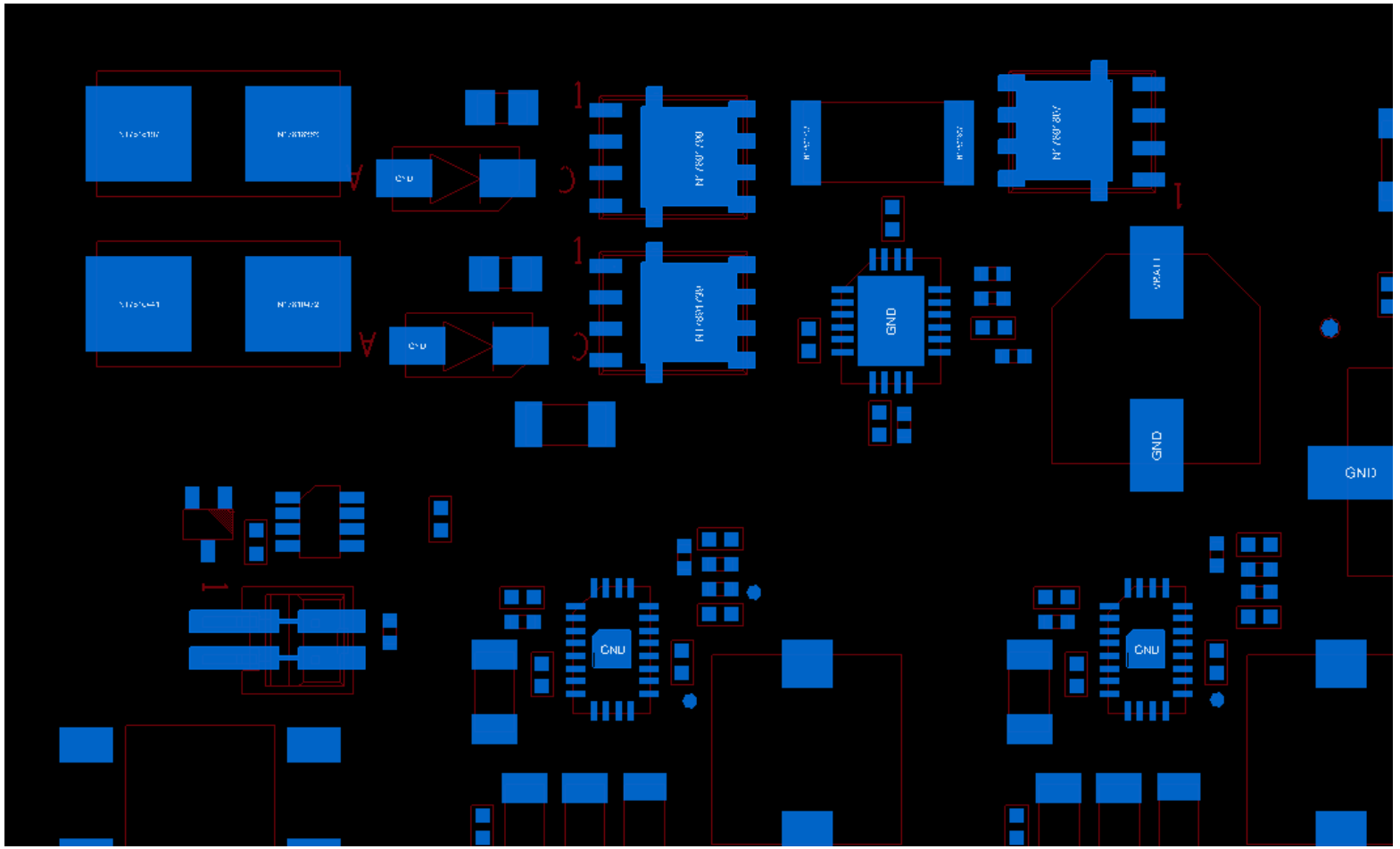

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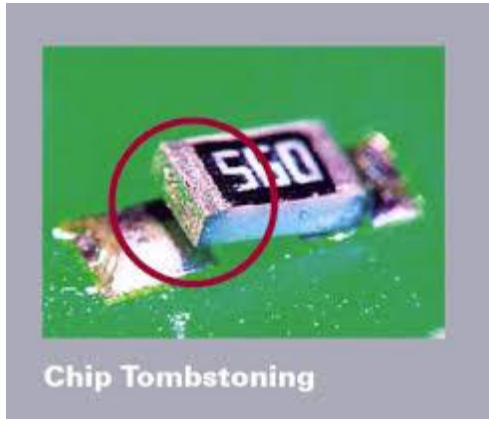

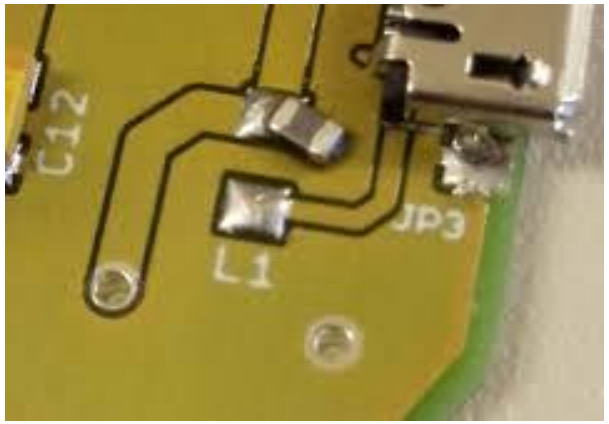

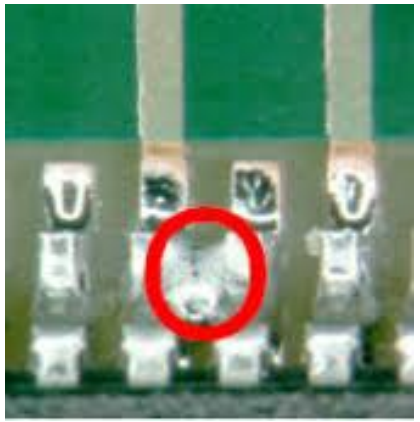

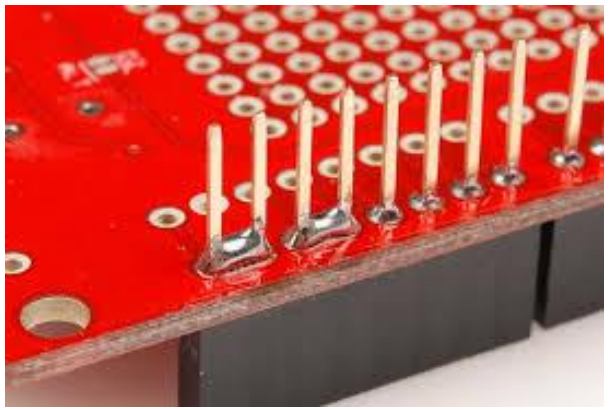

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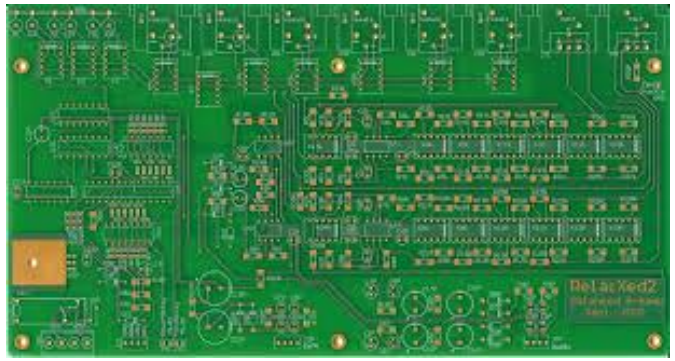

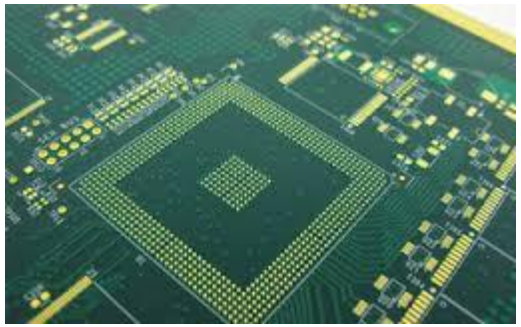

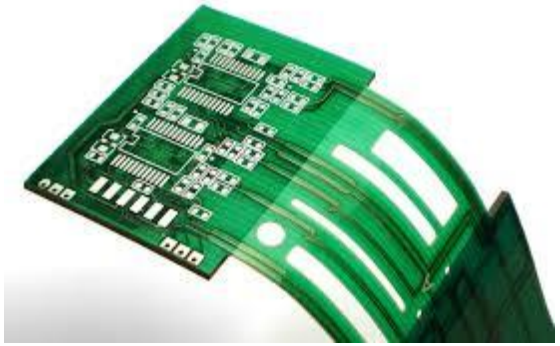

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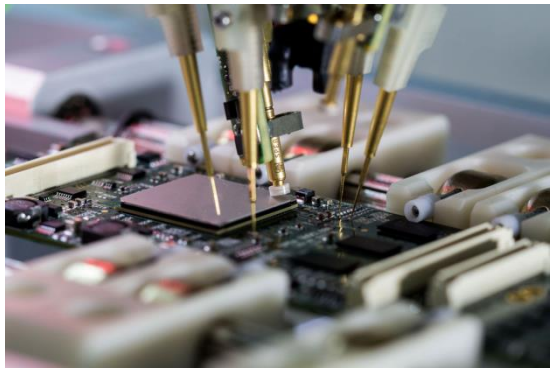
DESIGN FOR MANUFACTURING - DFM



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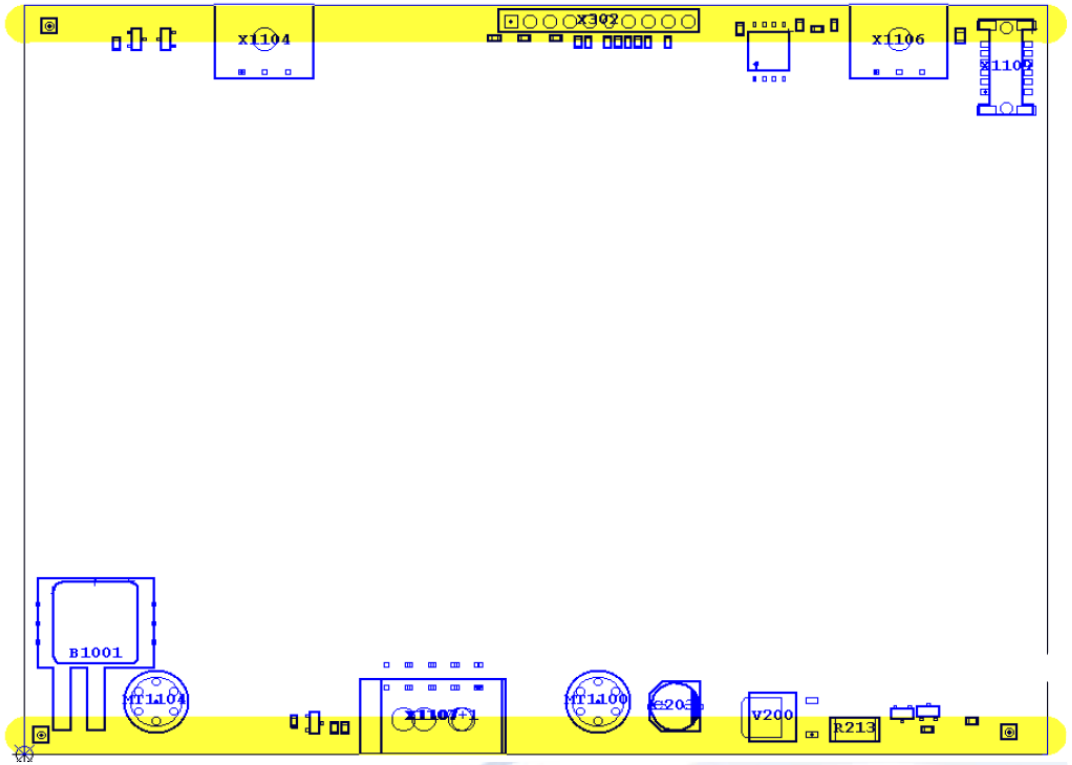
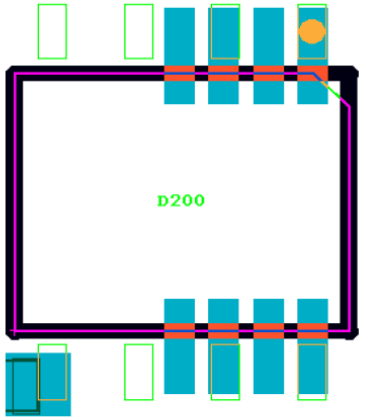
DFM – ENKELE RESULTATEN

SMT Component to conveyed edge Warning



Problem: Components in 5mm transport zone. No automatic placement possible.
Proposed solution: Move components out of the 5mm transport zone or extra breakaways/multipanel are required.

Wrong footprint for D200 (CPN 52.01.1021)



CAD pitch: 0,65mm (SOP65P490X110-8N)
Component pitch: 1,27mm
See datasheet: http://www.ti.com/lit/ds/sbos410e/sbos410e.pdf

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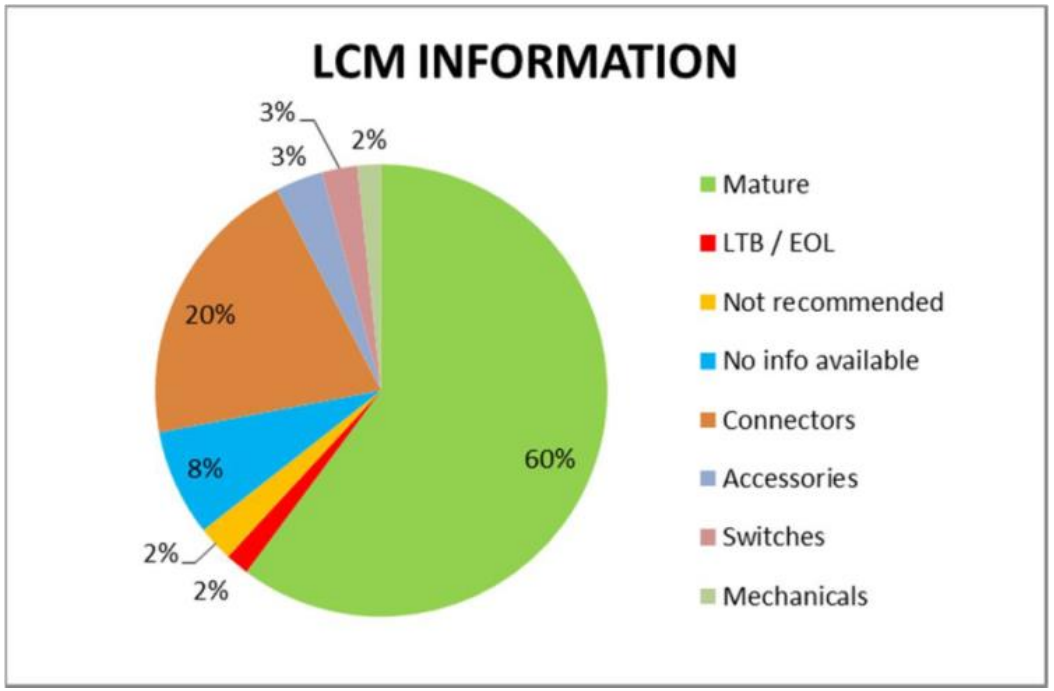
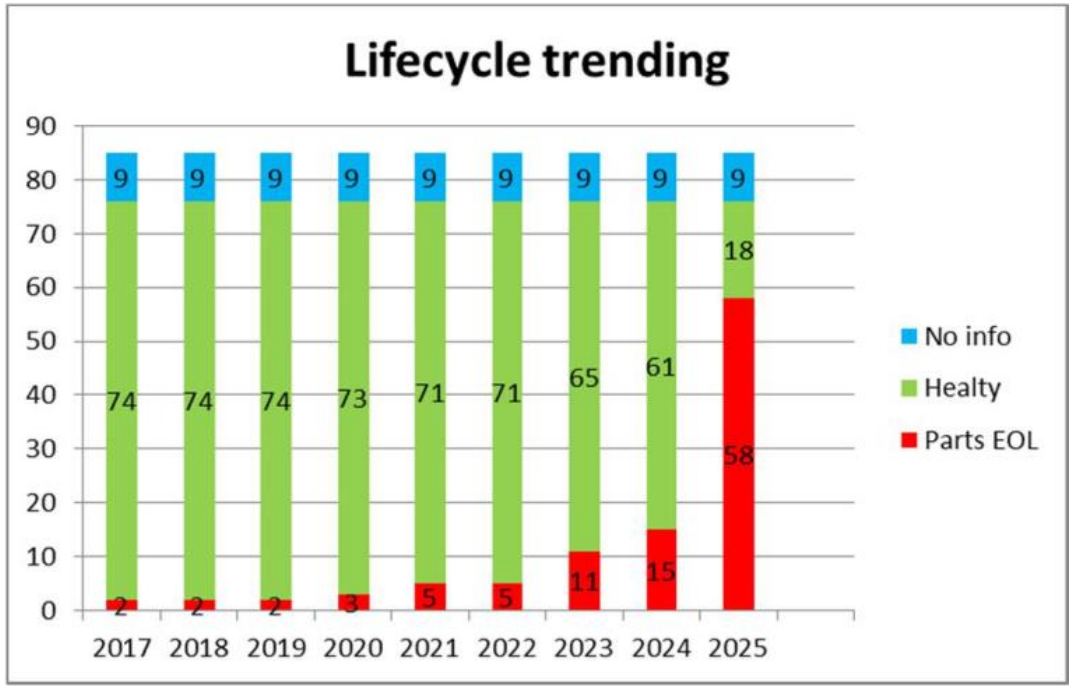
DFM – ENKELE RESULTATEN





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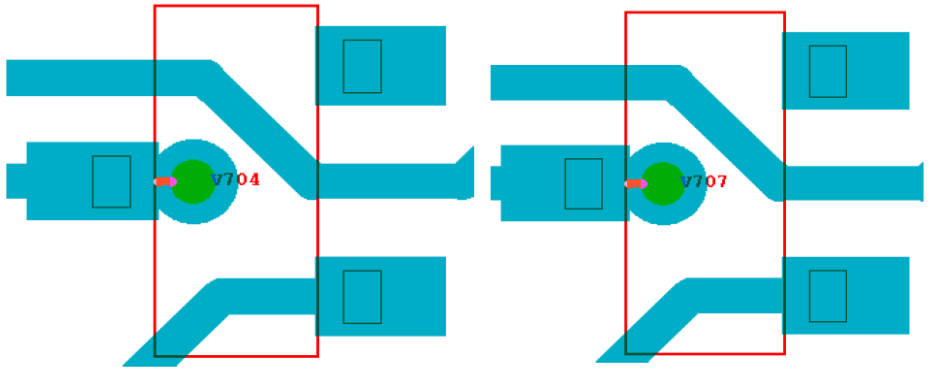
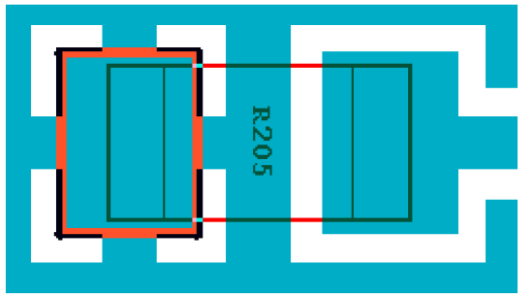
DFM – ENKELE RESULTATEN

Vias in a SMD-pad Major



Problem: Risk to bad (weak) solderjoints. Pasta will flow away through the via hole and will create solderballs on the opposite side. The solderballs will create a stencil-standoff.
Proposed solution: vias in a smd pad are not allowed

Thermal unbalance Minor



Problem: Risk to bad solderjoints / tombstoning due to the thermal unbalance between pads..
Proposed solution: Improve thermal balance between pads.
See chk:Trace Width Ratio for all error locations.

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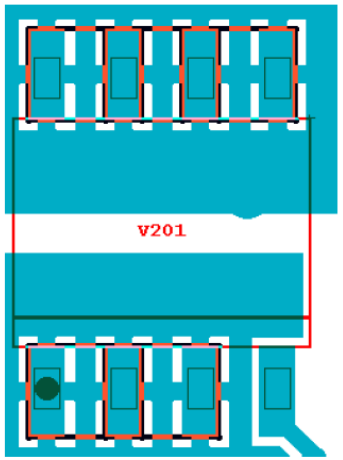
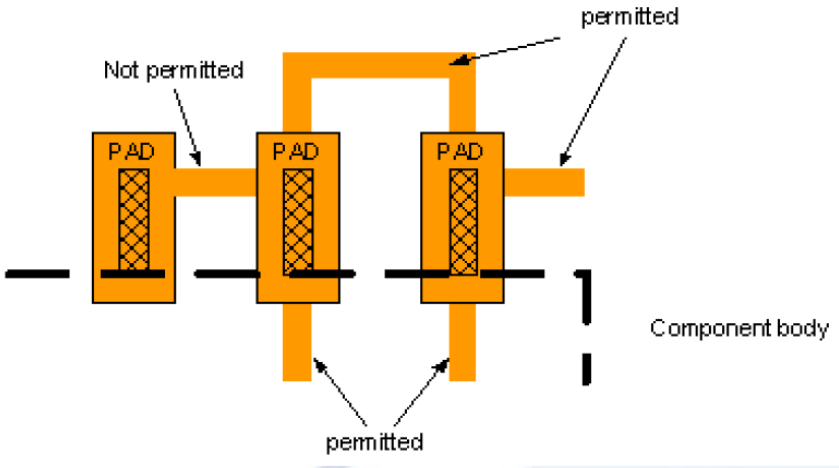
DFM – ENKELE RESULTATEN

Visual shorts



Problem: Tracks between adjacent pads can be seen as a visual short or solder bridge.
Proposed solution: The exit direction must be 90 degrees to the related body edge.

Improvement



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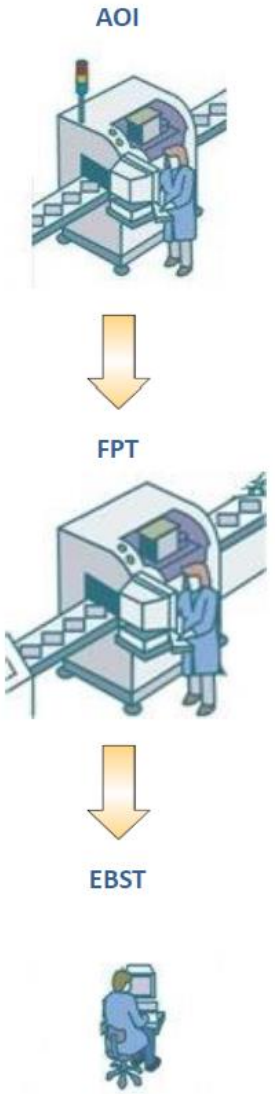
DESIGN FOR TESTING - DFT

- ONDERZOEK:
  - Test strategie op basis van testvoorzieningen in assemblagelijn: AOI, FPT, (E)BST
  - Analyse van de testdekking

- RESULTAAT:
  - Bepalen van de teststrategie
  - Ontwikkelen van aanvullende testtools



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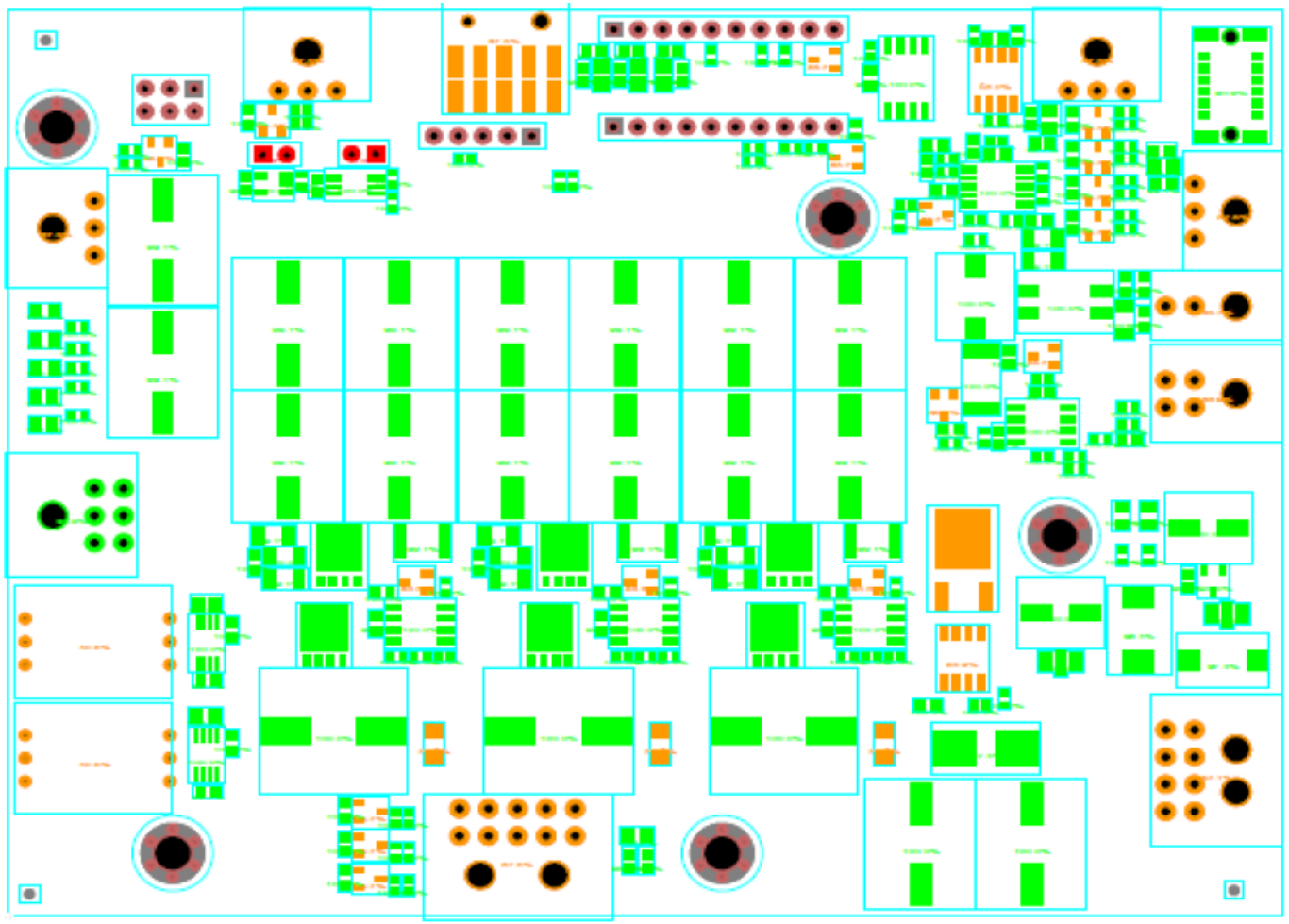
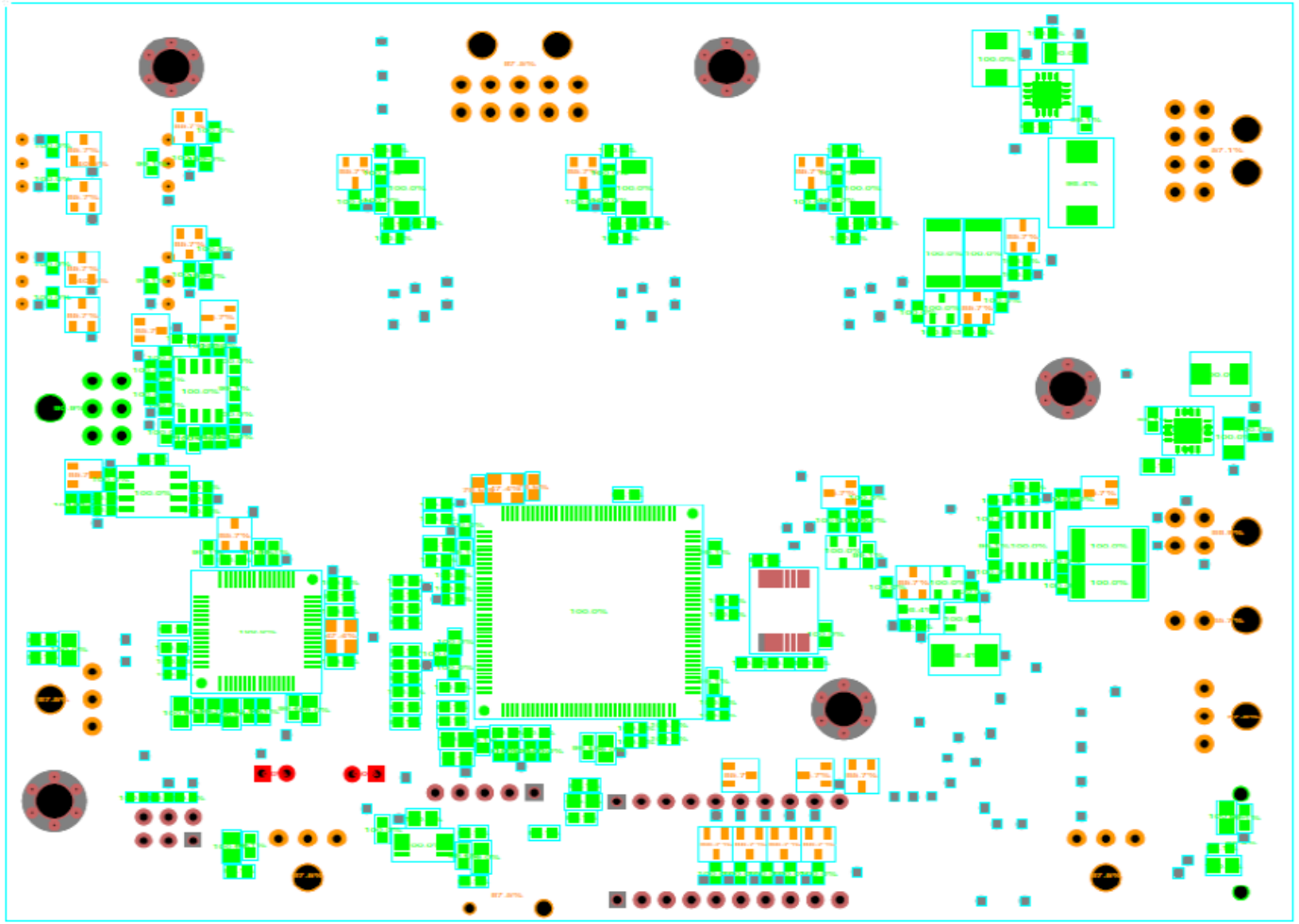
DFT – RESULTAAT



LEGENDA:

- Rood: testdekking < 50%
- Oranje: testdekking >50% , < 95%
- Groen: testdekking >95%

DFT – RESULTAAT



LEGENDA:

- Rood: testdekking < 50%
- Oranje: testdekking >50% , < 95%
- Groen: testdekking >95%

EINDRESULTAAT EN CONCLUSIE

EINDRESULTAAT

- Maakbaarheid incl. leverbetrouwbaarheid van de PCBA is gegarandeerd
- Van 20.000 PPM (alleen AOI) → 1600 PPM (EBST)
- Inzicht in componenten die mogelijke fouten veroorzaken
  - Voorbeeld: Key component (druksensor) 100% goed getest, niet te testen met alleen AOI
- Inkomende goederen test PCBA niet meer nodig
- Eenvoudige eindtest complete product volstaat
- Development-team is niet meer nodig in het productieproces
- Productie is autonoom proces geworden en daardoor efficiënter te organiseren

CONCLUSIE

- Zeer nuttige analyse methode voor complexe boards en serie productie; onderdeel van ontwikkeling
- Fouten opsporen en oplossen waar ze ontstaan, spaart tijd en kosten
- Hogere kwaliteit PCBA, minder assemblage- en testtijd in eindassemblage
- Lagere productiekosten

BEDANKT VOOR UW AANDACHT

DEMCON

STAND 7B108