EURO CIRCUITS

BRIDGING THE GAP BETWEEN CAD & CAM

WWW.WOTS.NL

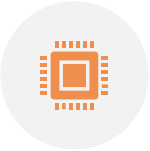
WORLD OF ELECTRONICS

PCB Design Flow

Defining your BOM (Bill Of Material)

Create Schematics

Size the PCB and Place Key Components



Make the PCB Layout

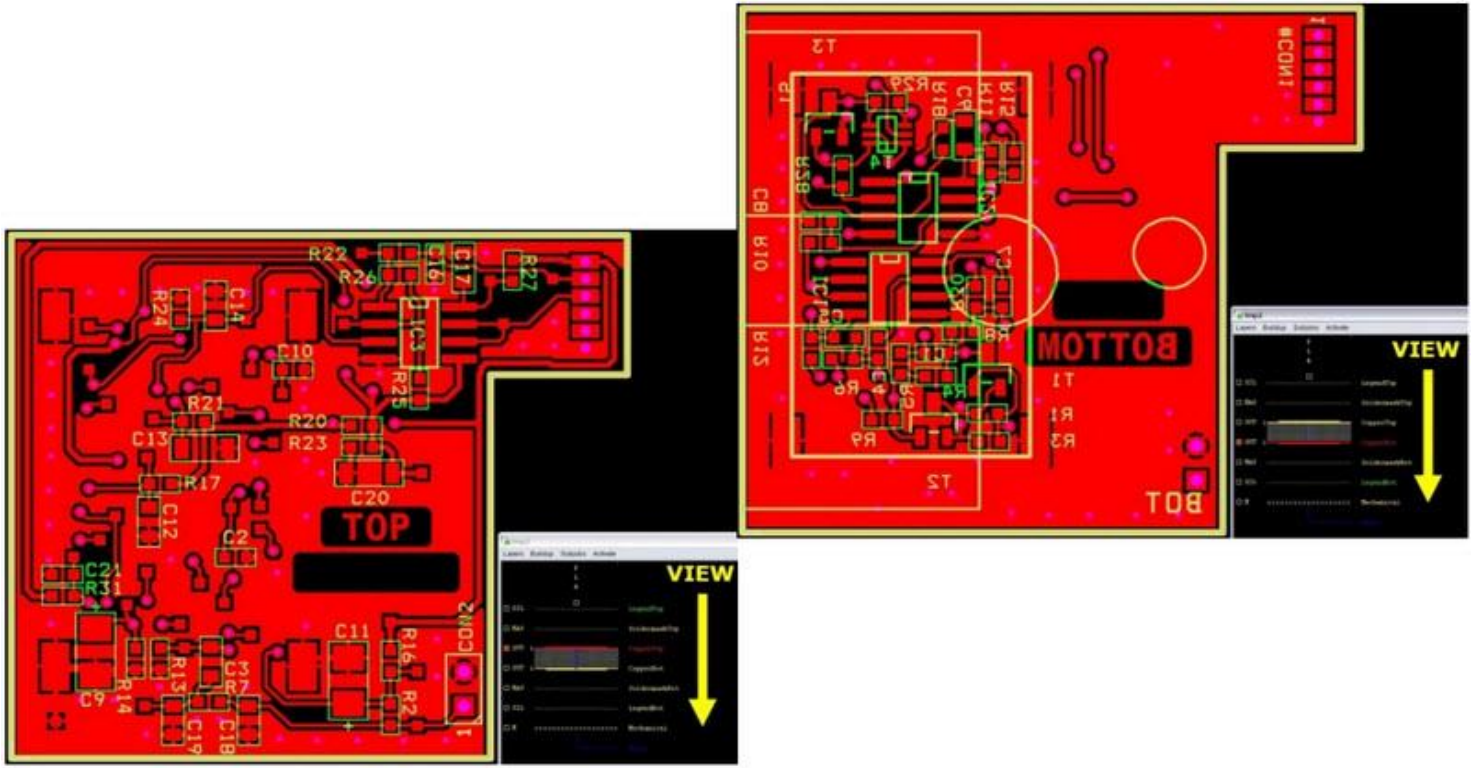
Export data from CAD for manufacturing

TOP DFM ISSUES Bare Board

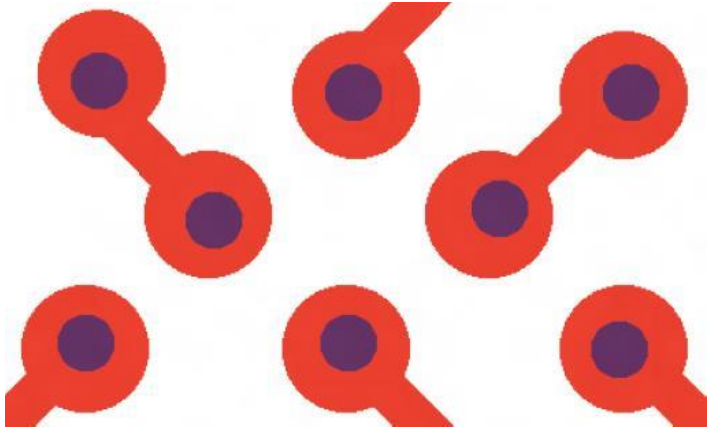
- CAD data not readable
- CAD data not complete
- Ambiguity between CAD data and included info files
- Ambiguity between CAD data and online chosen order details
- Ambiguity in the CAD data
  - More than 1 contour
  - Layer conventions
- Mixing Imperial and Metric units

- Copper to close to the edge or to routing
- Routing and contour issues
- Open tracks
- Annular ring problems
- Ambiguities in the Solder Mask
  - Exposed copper
  - Covered solder pads
- DRC violations in general
- Plating index not OK

All layers ALWAYS viewed from the TOP



Drills versus copper pads

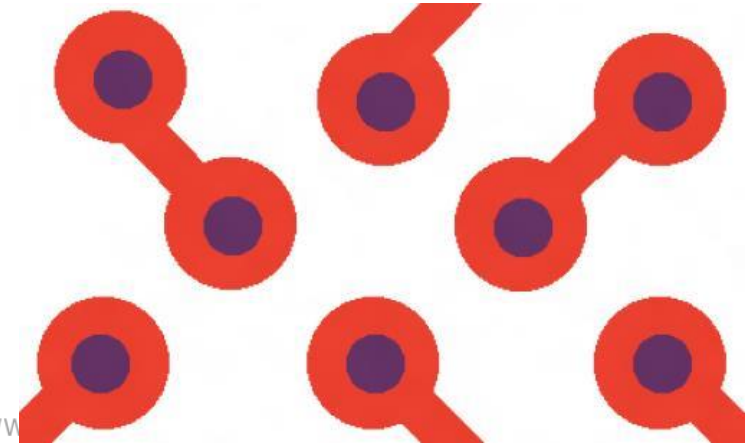


Same Unit - Resolution

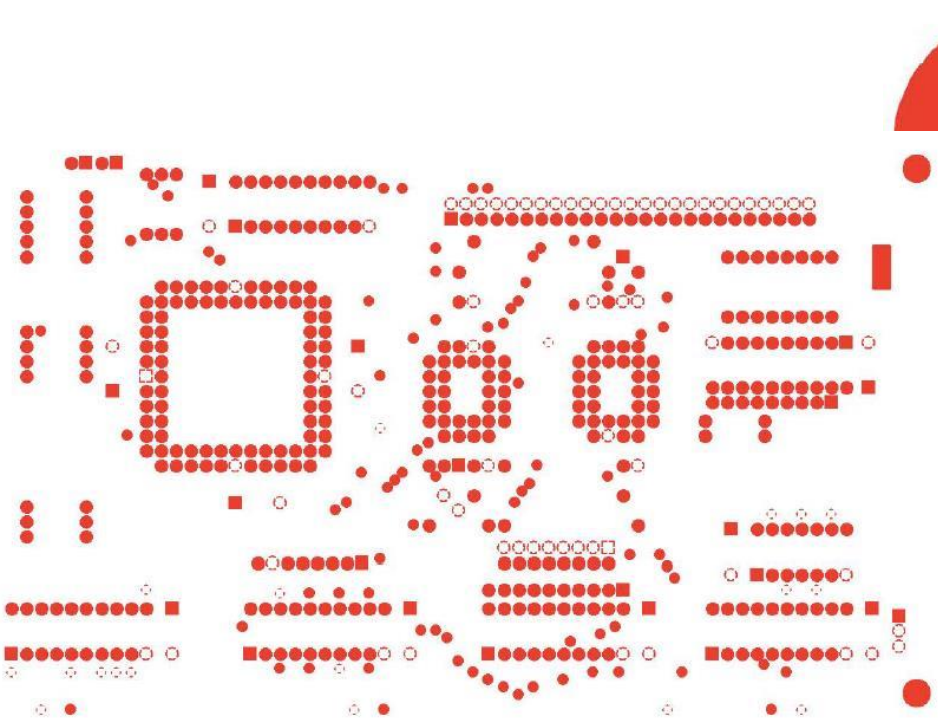
Centered

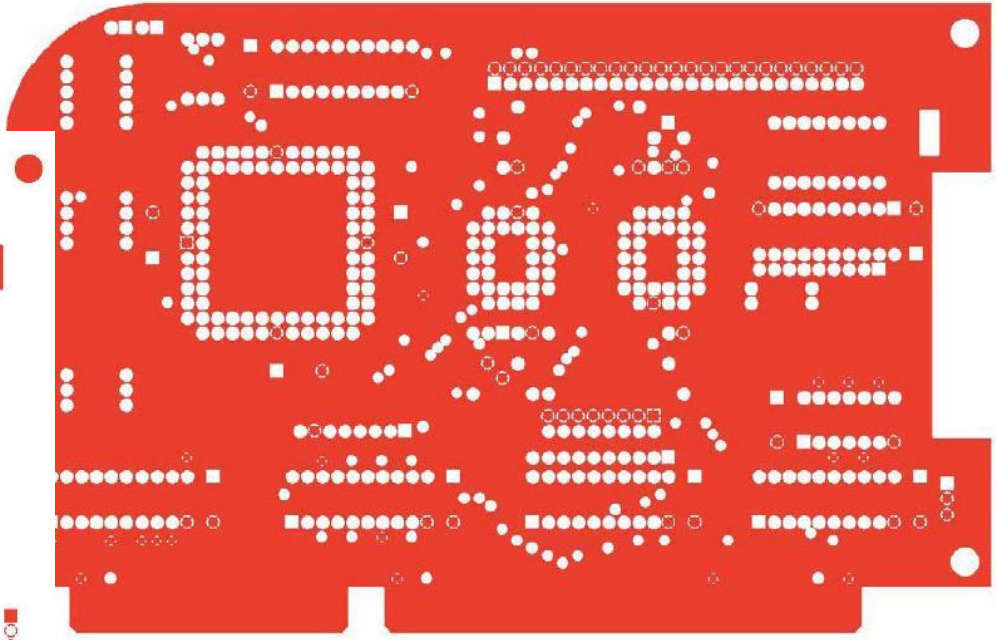
Different Unit - Resolution

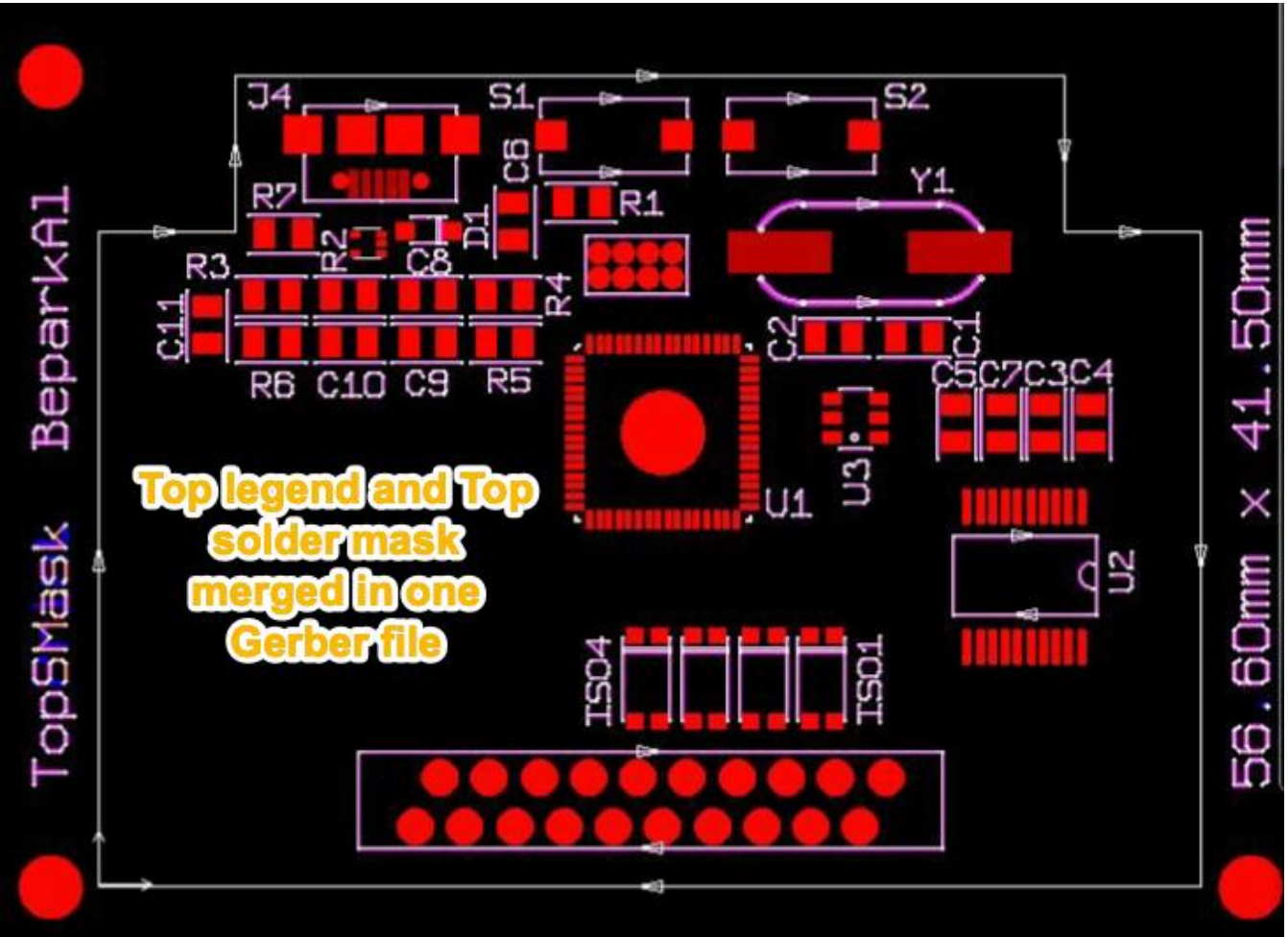
Non Centered



Layer polarity matters

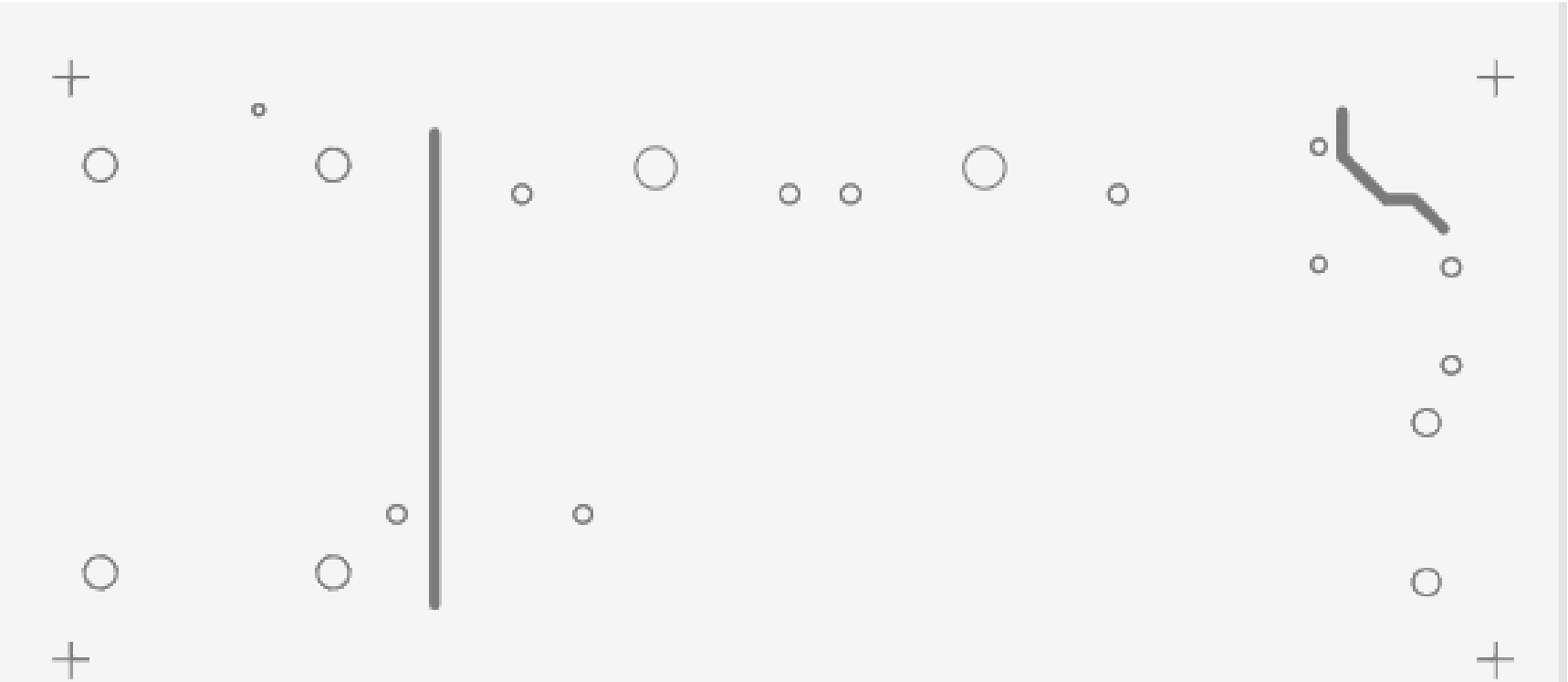




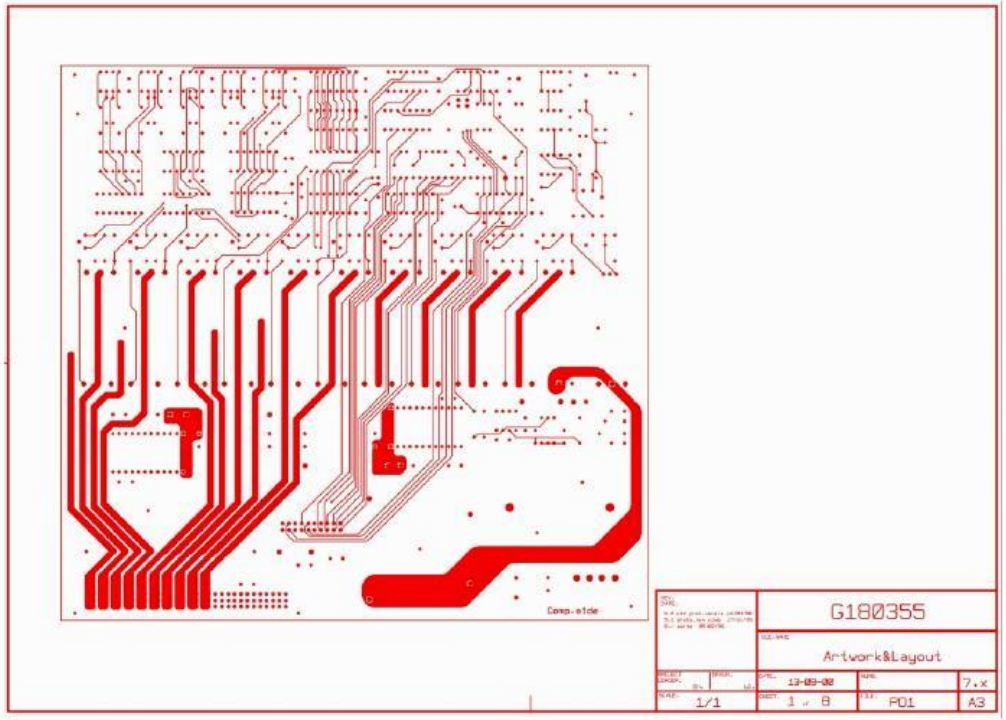


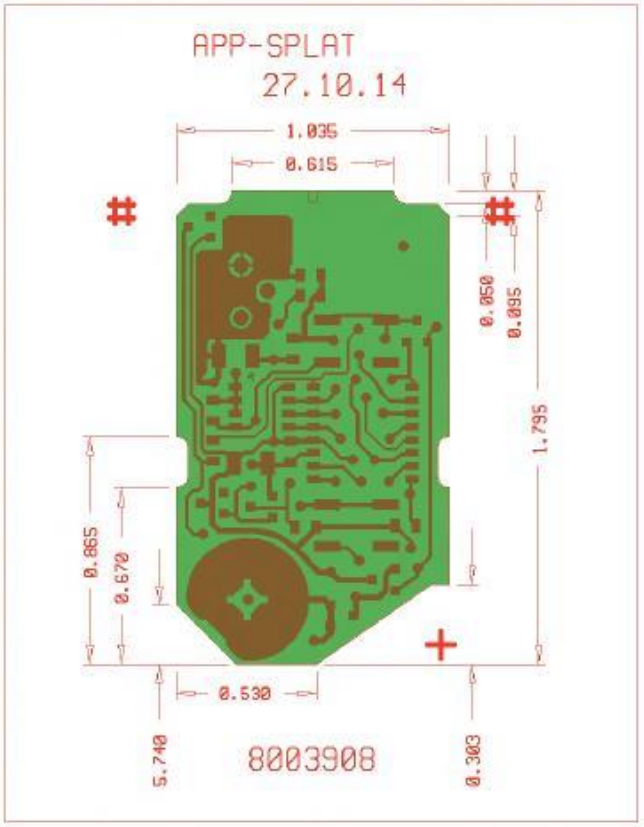
Bad output generated from CAD

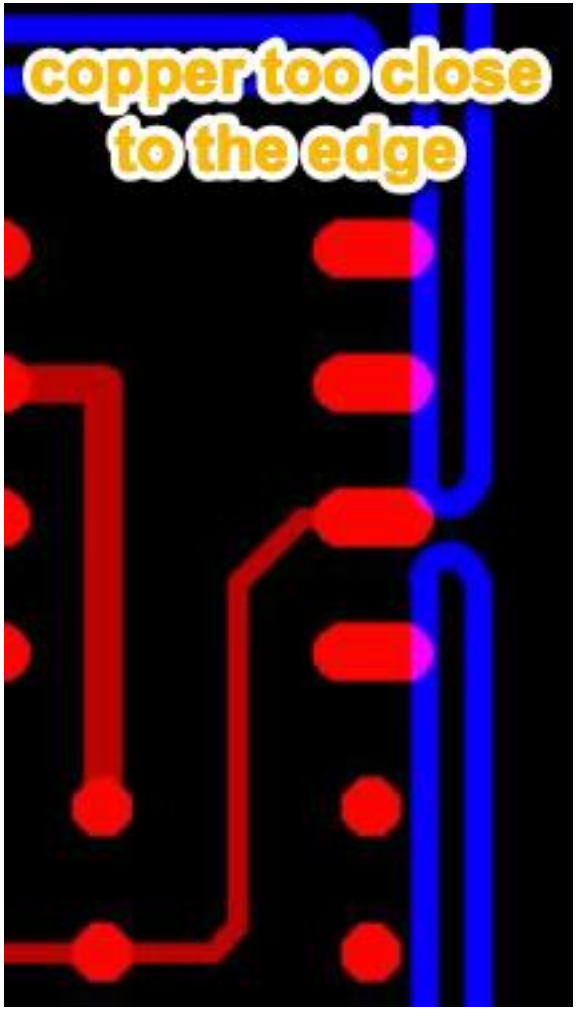
Bad outline



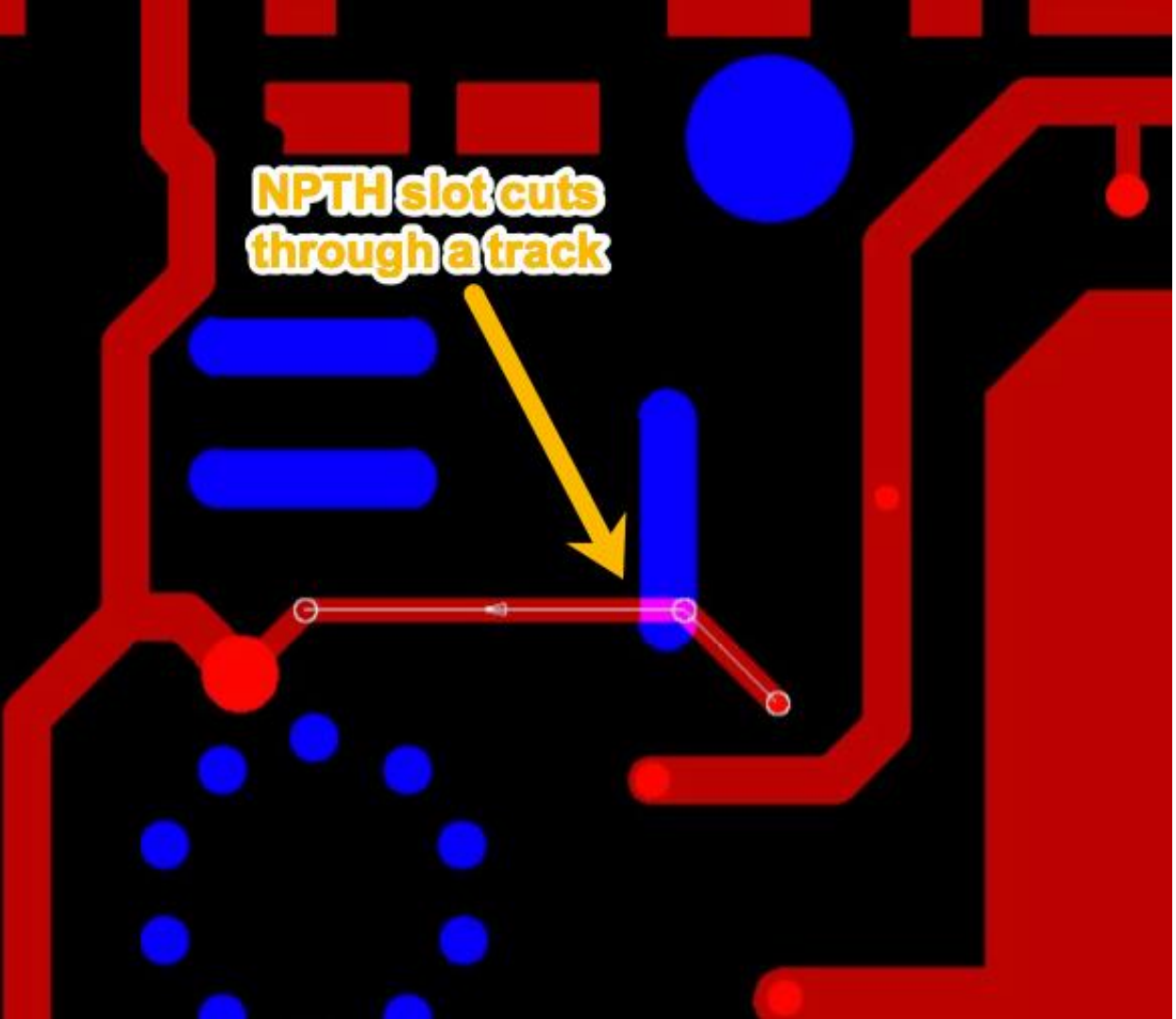
Data outside the PCB contour





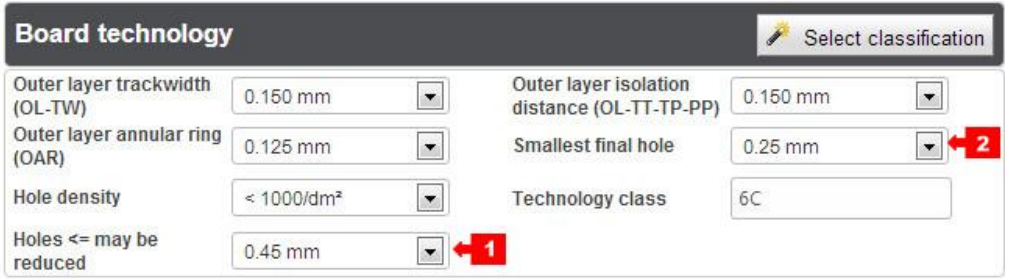


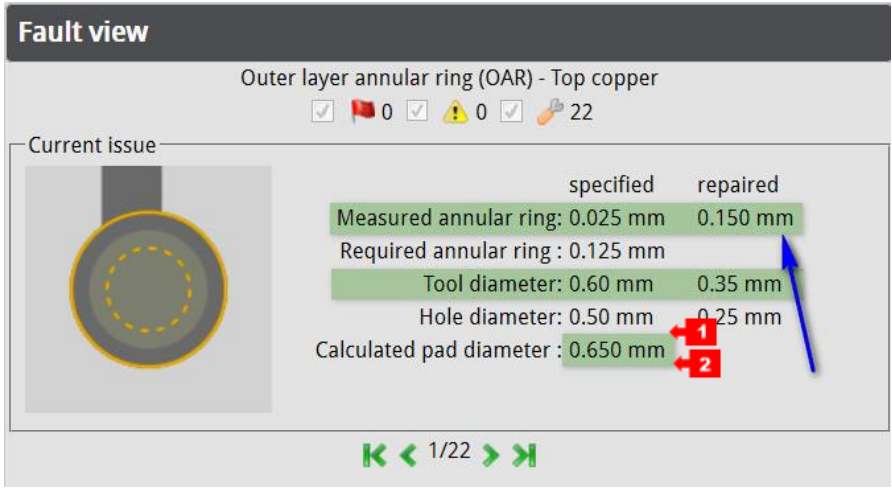
Not respecting the design rules



“track cut through”

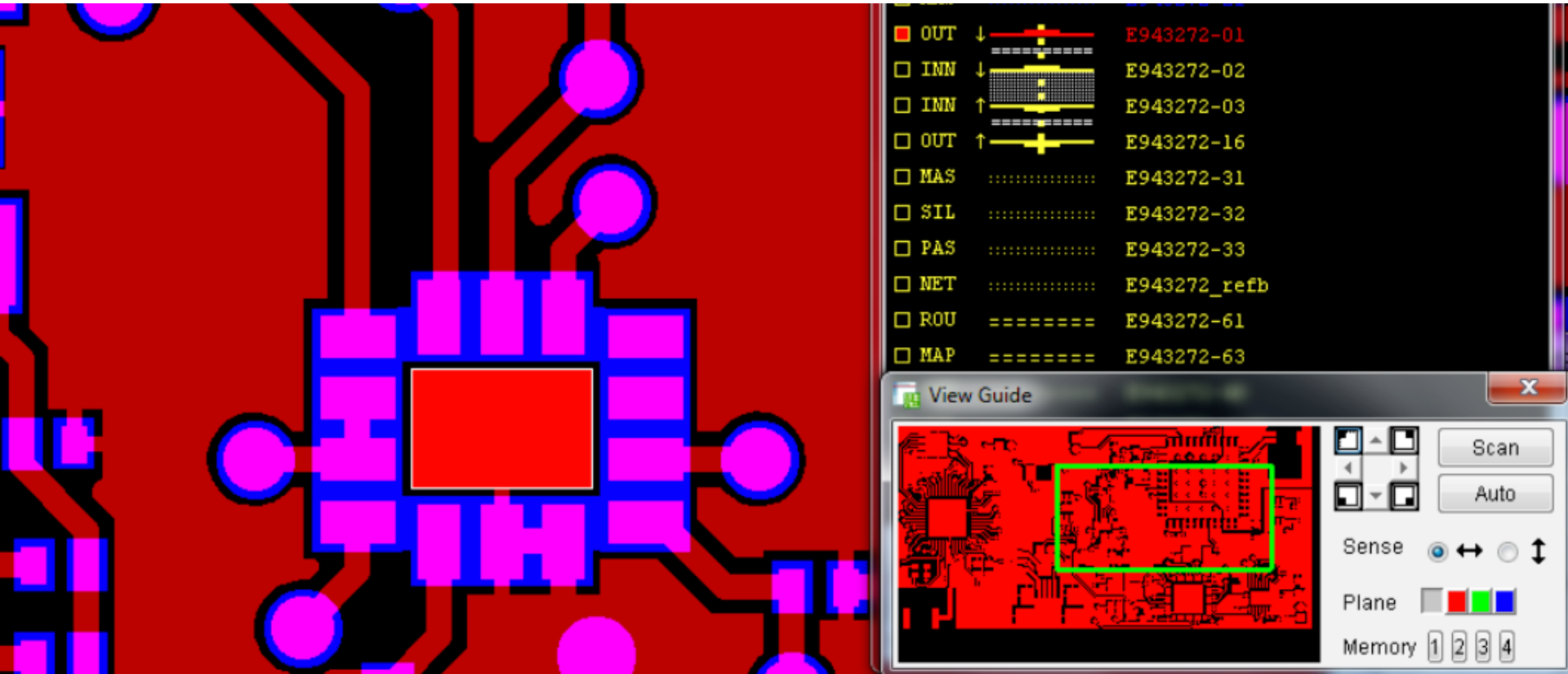
annular ring issues



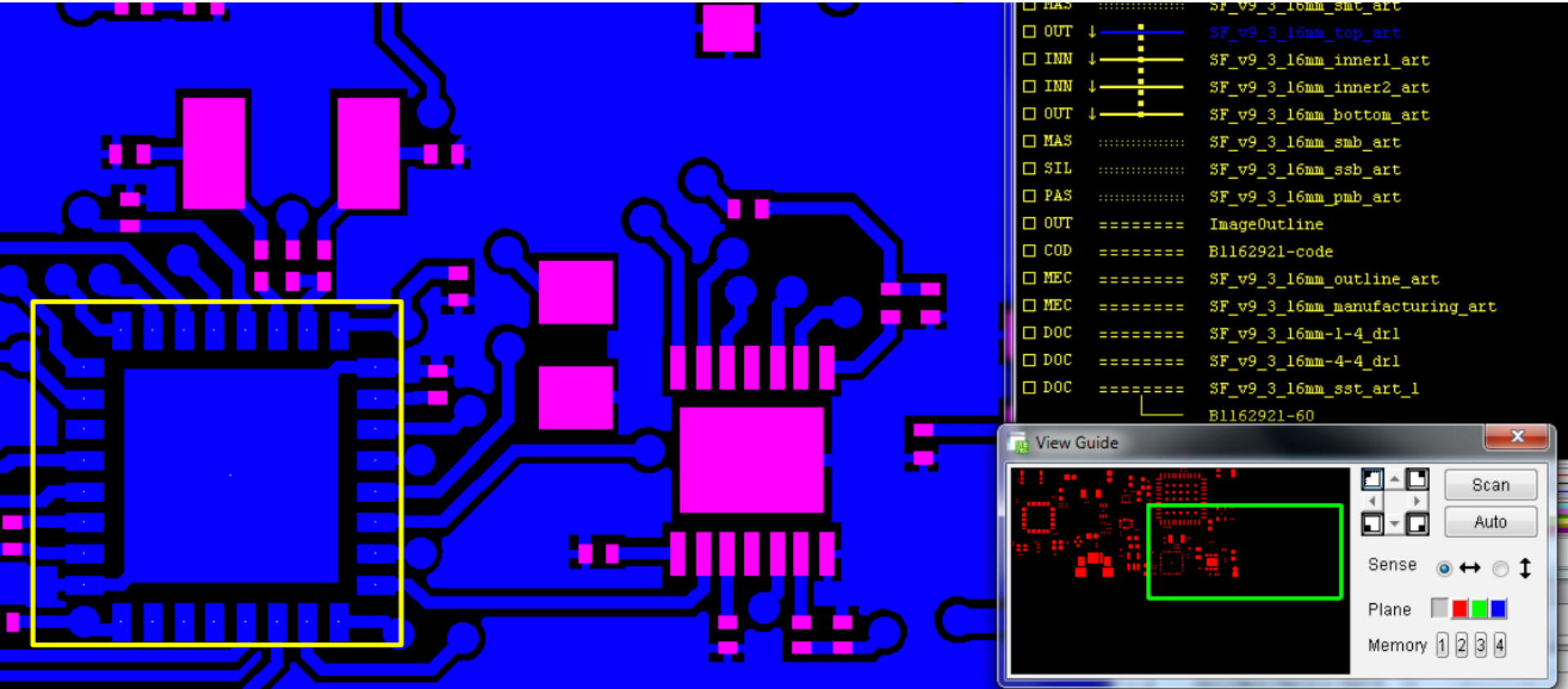


AR = (Pad D – Tool D) / 2 (Tool D = D drill bit)
Faulty AR = (0.650mm – 0.60mm) / 2 = **0.025mm**
Repaired AR = (0.650mm – 0.35mm) / 2 = **0.150mm**

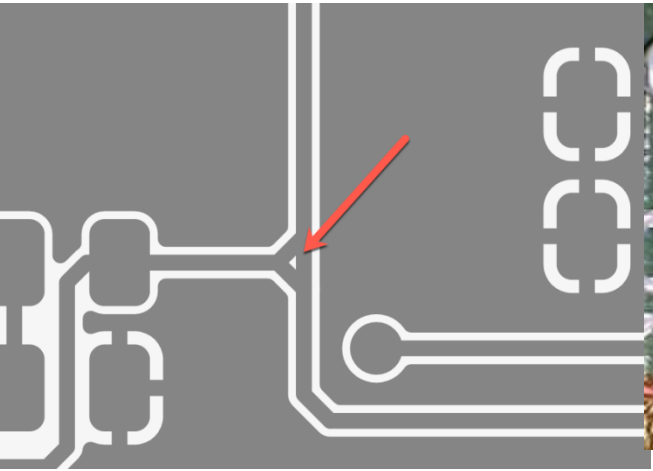
Soldermask issues

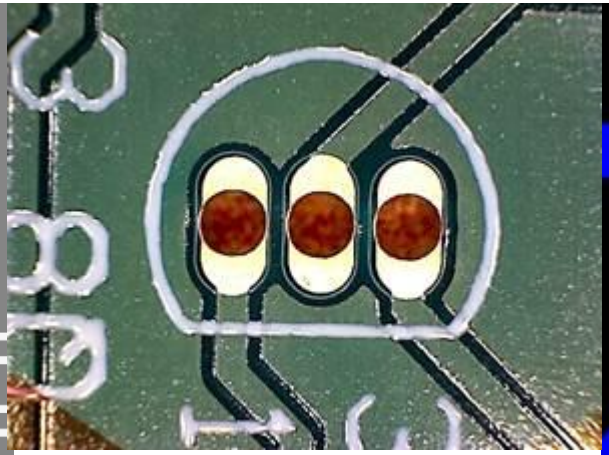


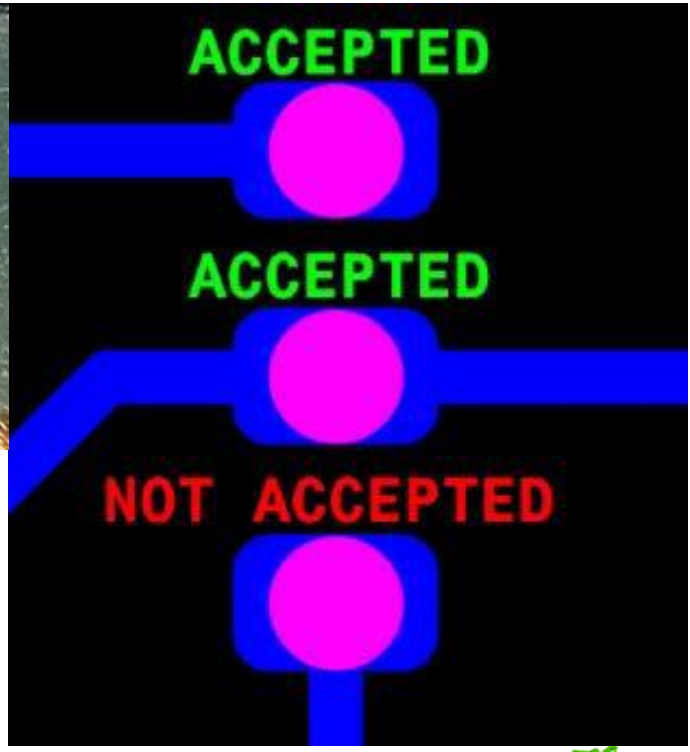
Solder paste issues



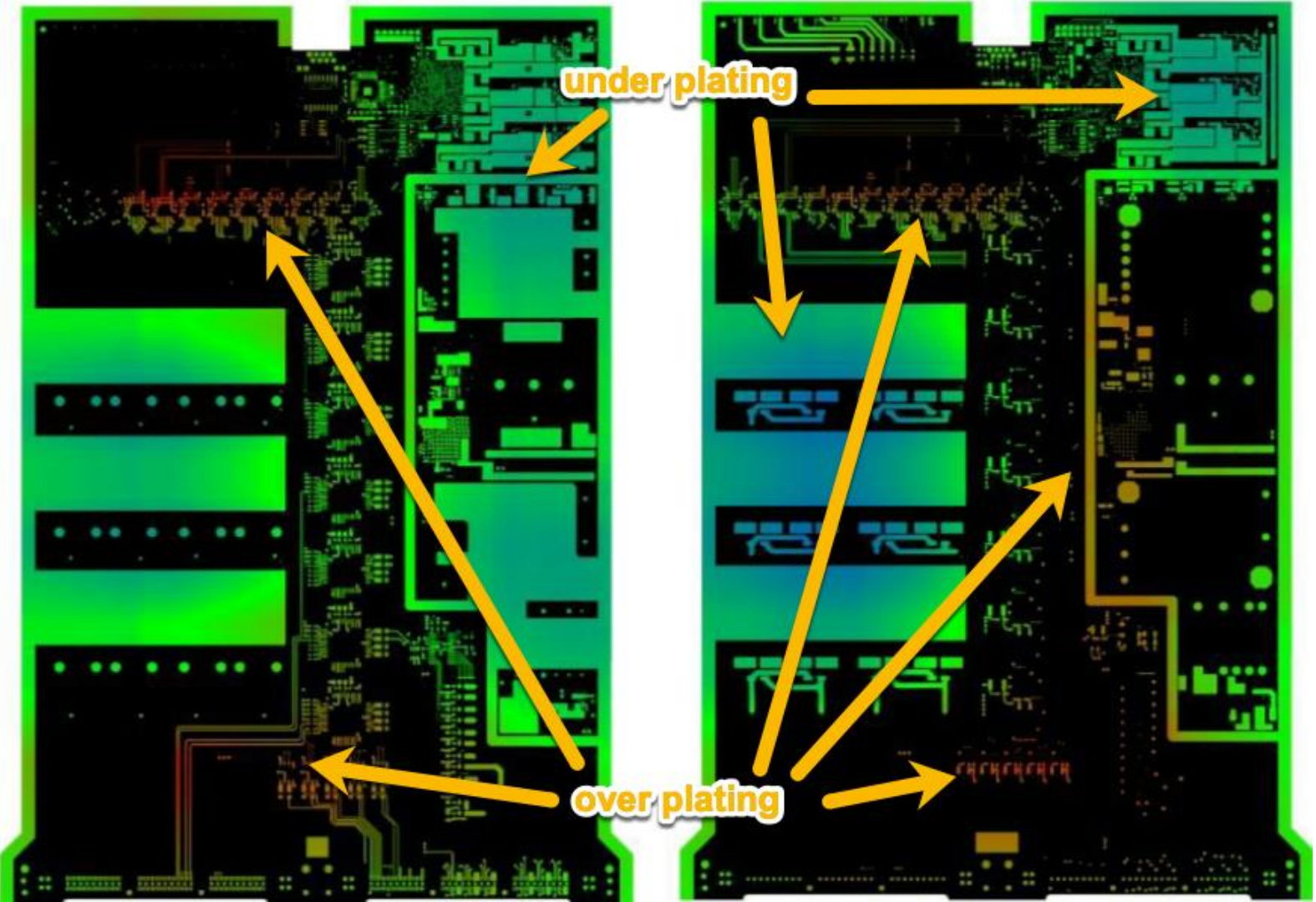
PCB production issues







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)



Plating issues

TOP DFM ISSUES assembly

- 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

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	POLARIZED CAPACITOR, European symbol
17	2	1u	C_0603	0603_TYPE_B	C36, C39	
18	2	2.2u	CPOL-EUSMCA	SMC_A	C25, C28	POLARIZED CAPACITOR, European symbol
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	INDUCTOR, European symbol
22	4	4.7u	CPOL-EUSMCA	SMC_A	C1, C33, C35, C37	POLARIZED CAPACITOR, Europe
23	1	40_PIM_CON_0.5_MM WURTH	40_PIM_CON_0.5_MMWURTH	CON_FFC_40-PIN_0.5MM_WURTH-687140149022	CN2	
24	1	5	R_0603	0603_TYPE_B	R15	
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-TTL,13	EMIF_4CH_IP4252	EMIF_4CH_IP4252	IC7	
29	2	IRLML2246TRPBF	BSS84	SOT23	T1, T2	P-CHAN
30	1	LD-BZEN-0803	BUZZER_01	BUZZER_01	BZ1	
31	1	M95512-WMN6P	EEPROM_SPI_SO8	SO08	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	200 W T Suppre
35	1	SMLVT3V3	DIODE_SUPRESSOR_UNIDRECTION ALDO-214AA	DO-214AA	D1	
36	1	STM32F429NI	STM32F429N	TFBGA	IC1	
37	1	TSC2046	TSC2046	TSSOP16	IC11	
38	1	W25Q32FVSSIG	EEPROM_SPI_SO8SOIC8_WIDE	SO08W	IC6	

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

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_MMWURTH	40_PIM_CON_0.5_MMWURTH	CON_FFC_40-PIN_0.5MM_WURTH-687140149022	CN2	
1	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-TTL,13	EMIF_4CH_IP4252	EMIF_4CH_IP4252	IC7	
2	IRLML2246TRPBF	BSS84	SOT23	T1, T2	P-CHANNEL MOS FET
1	LD-BZEN-0803	BUZZER_01	BUZZER_01	BZ1	
1	M95512-WMN6P	EEPROM_SPI_SO8	SO08	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_SUPRESSOR_UNIDRECTIONALDO-214AA	DO-214AA	D1	
1	STM32F429NI	STM32F429N	TFBGA	IC1	
1	TSC2046	TSC2046	TSSOP16	IC11	
1	W25Q32FVSSIG	EEPROM_SPI_SO8SOIC8_WIDE	SO08W	IC6	

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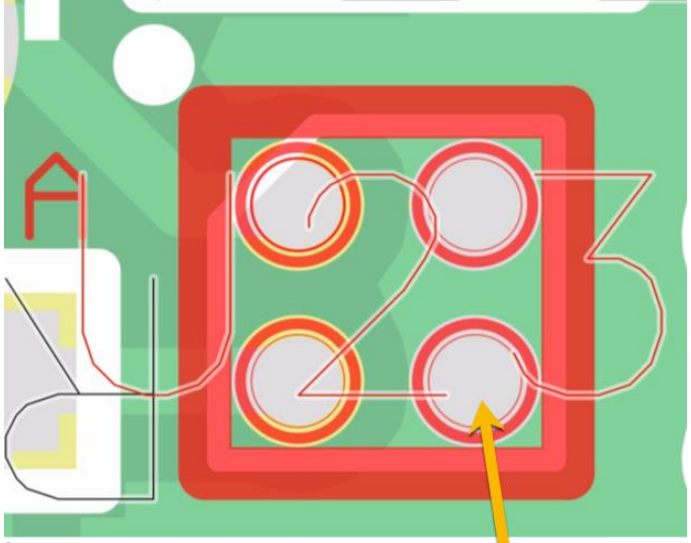

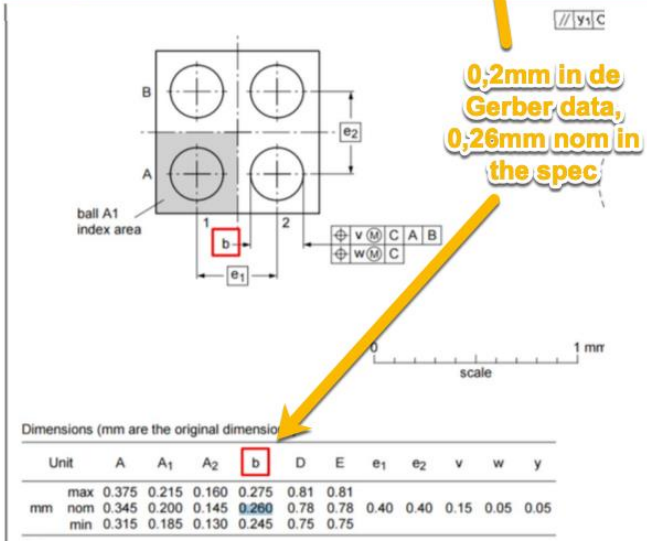

Dimensions (mm are the original dimensio

Unit		A	A_1	A_2	b	D	E	e_1	e_2	v	w	y
mm	max	0.375	0.215	0.160	0.275	0.81	0.81	0.40	0.40	0.15	0.05	0.05
	nom	0.345	0.200	0.145	0.260	0.78	0.78					
	min	0.315	0.185	0.130	0.245	0.75	0.75					

Component specs not respected in the PCB layout

2022 WORLD OF TECHNOLOGY & SCIENCE

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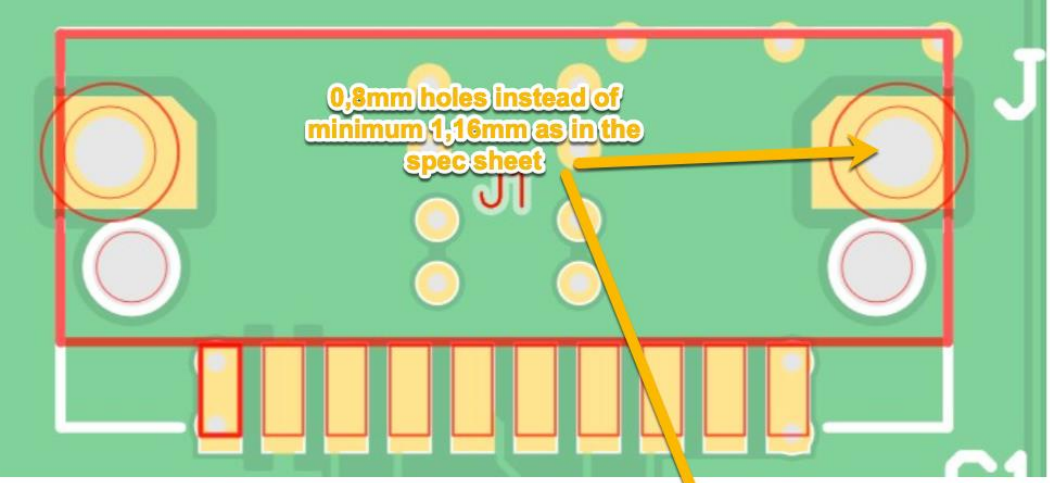
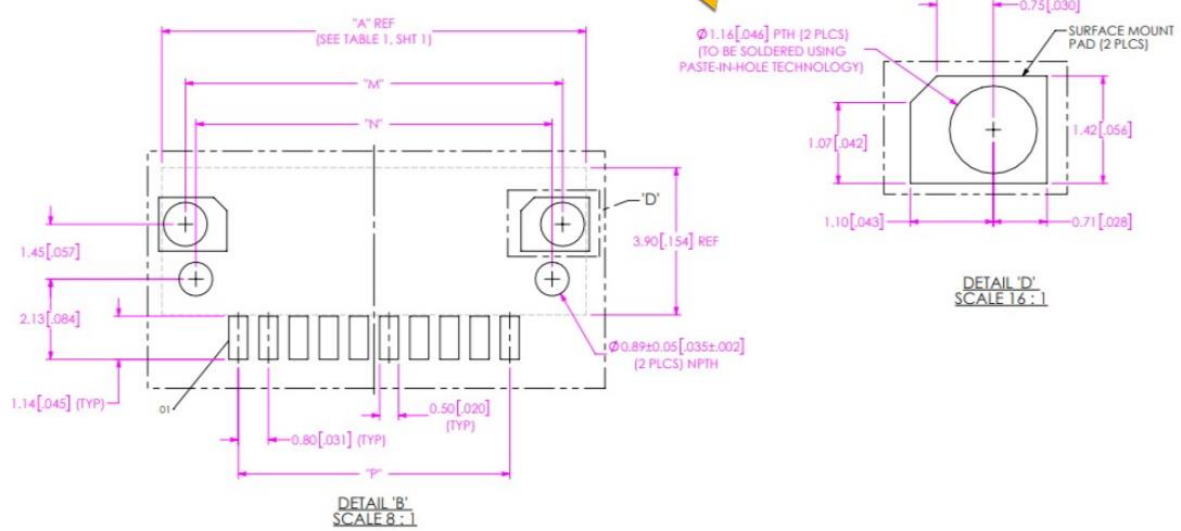
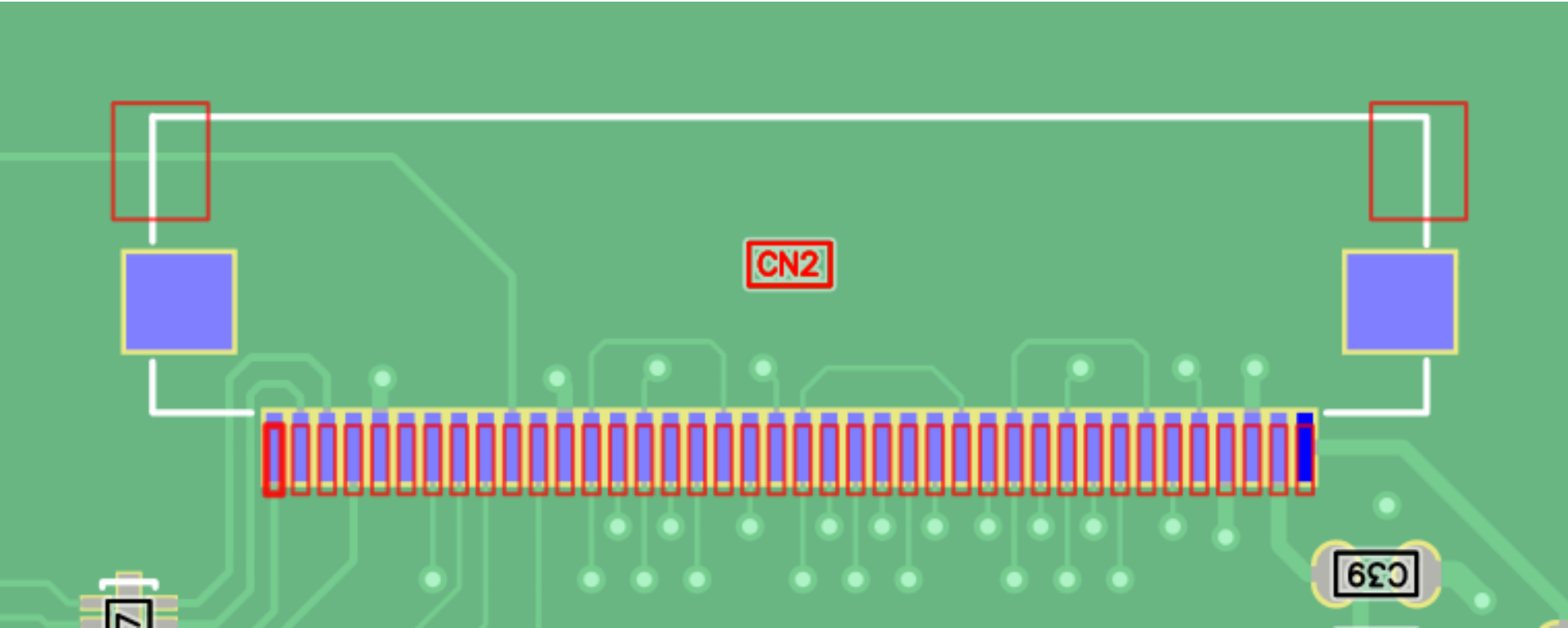
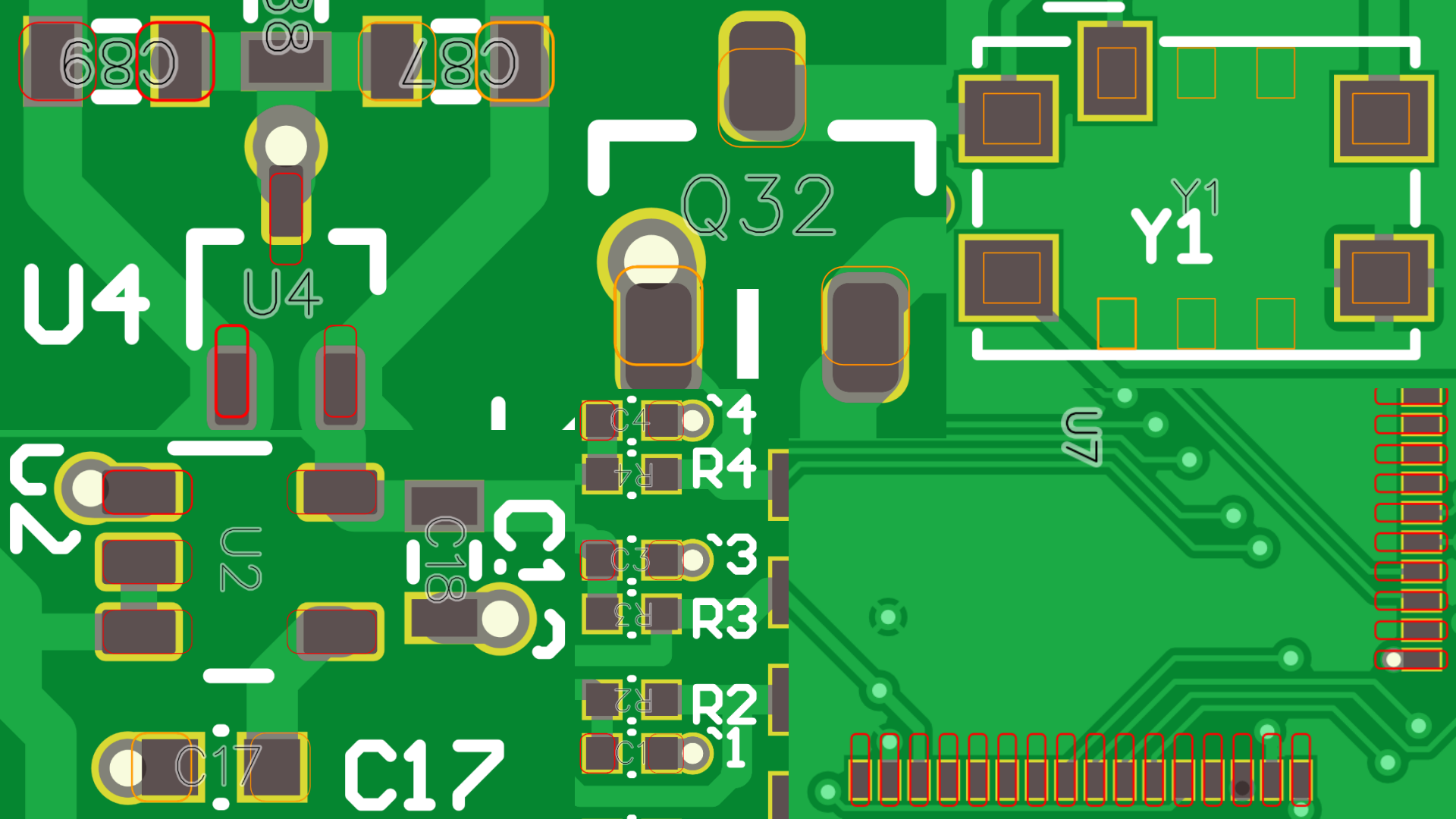


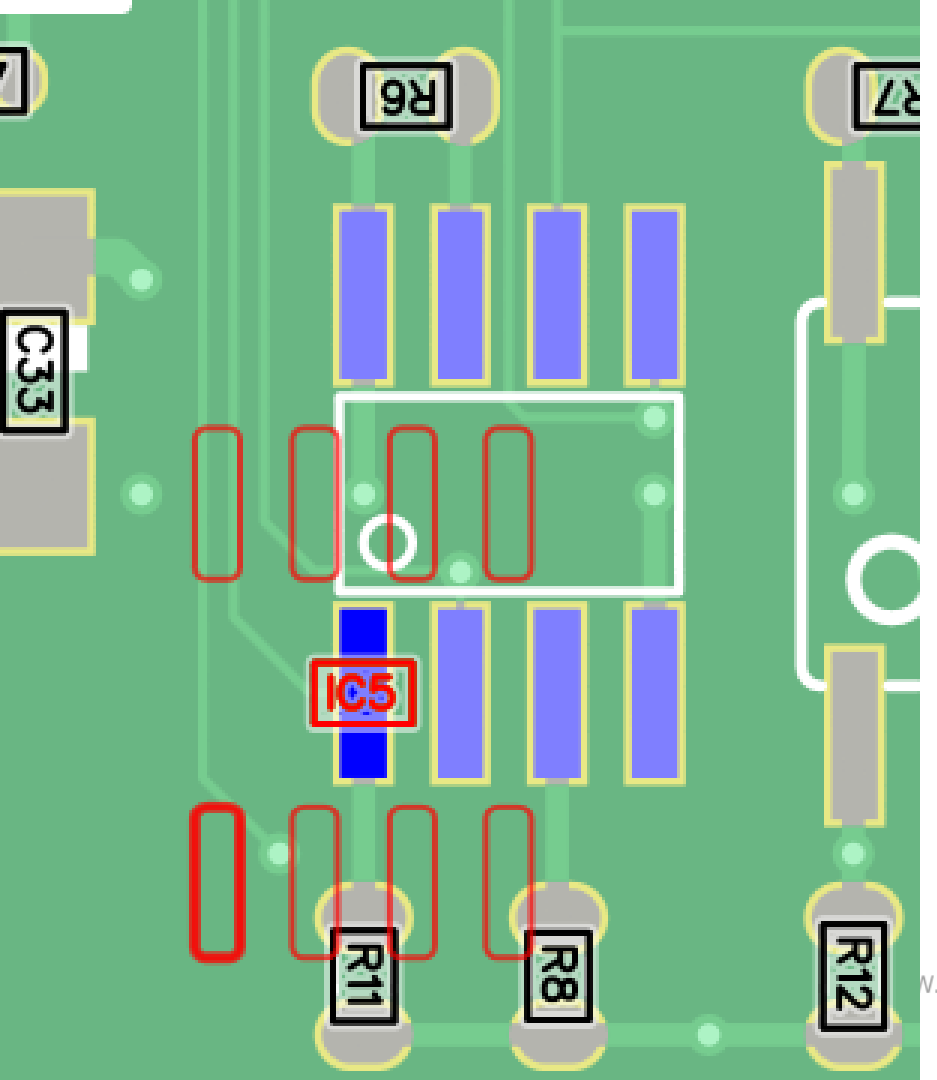


Component specs not respected in the PCB layout

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

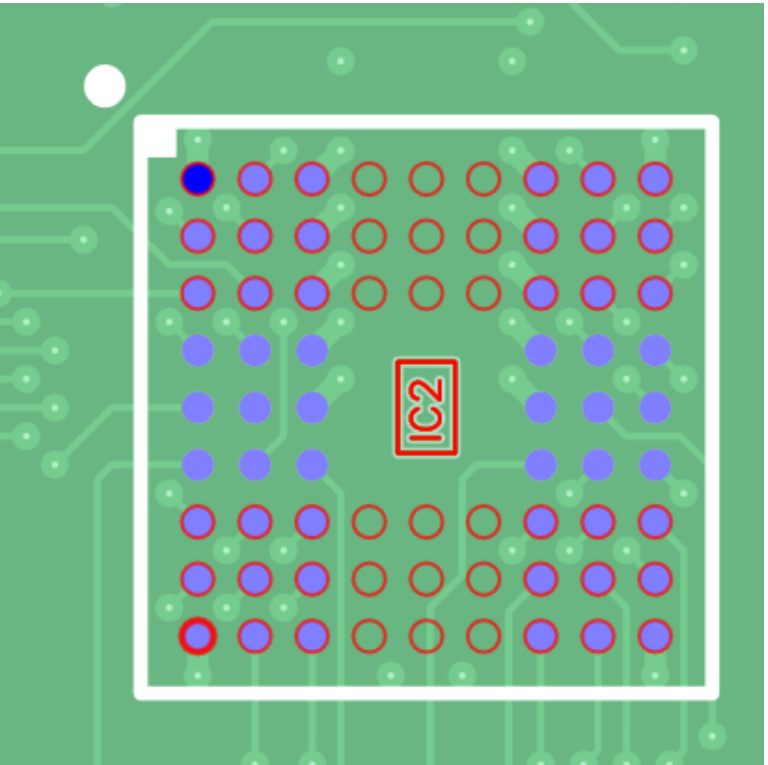


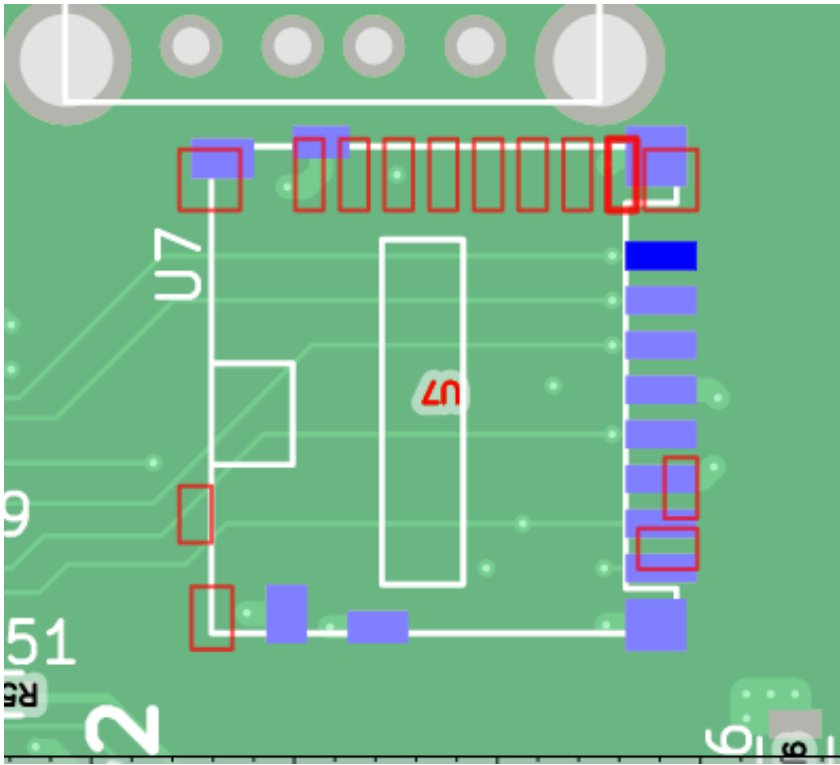

C89
C88
C87
U4
U4
Q32
Y1
Y1
C4
R4
4
R4
C3
3
R3
R3
C18
C2
2
R2
R2
C1
1
C17
C17

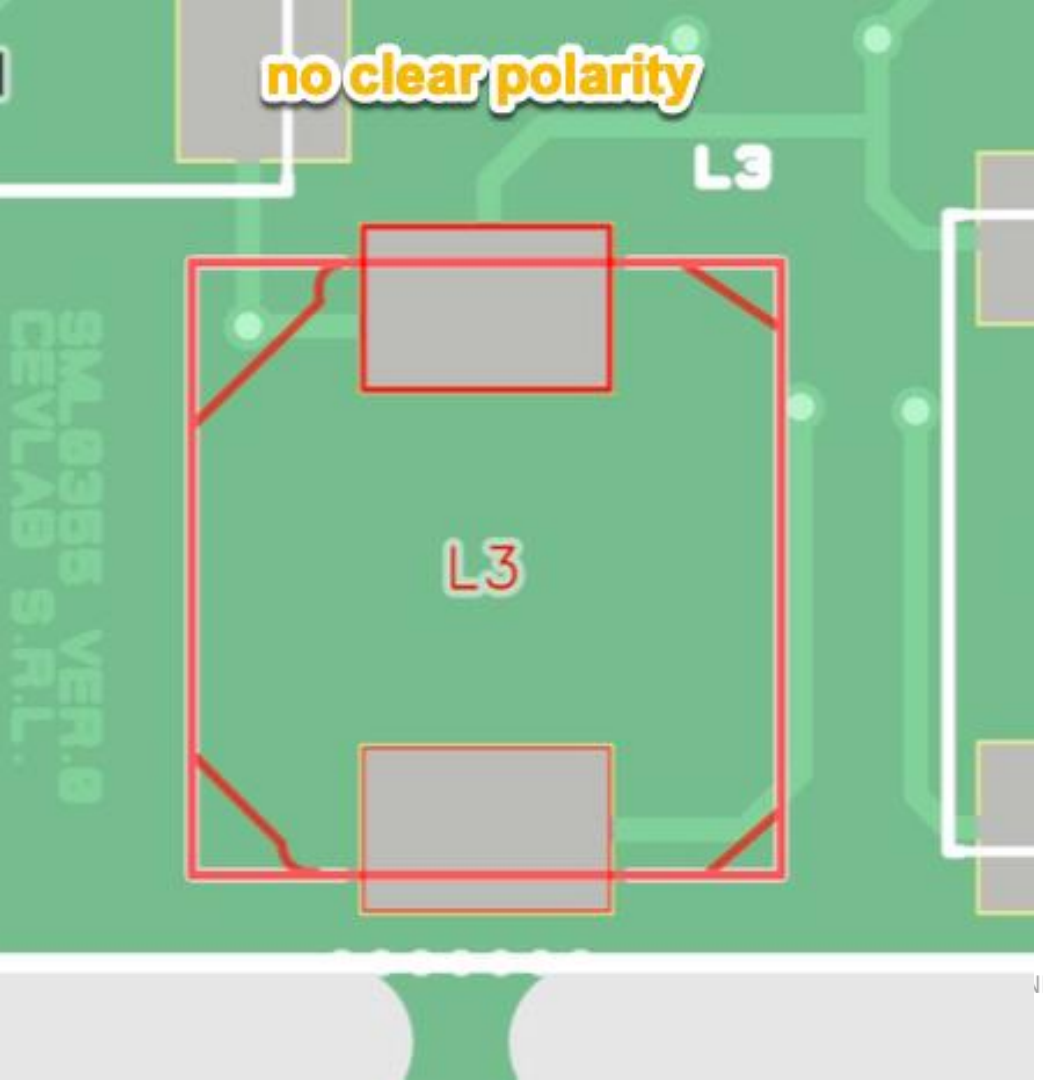


- Location
  - PIN1 vs centroid location in Component Placement List file

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

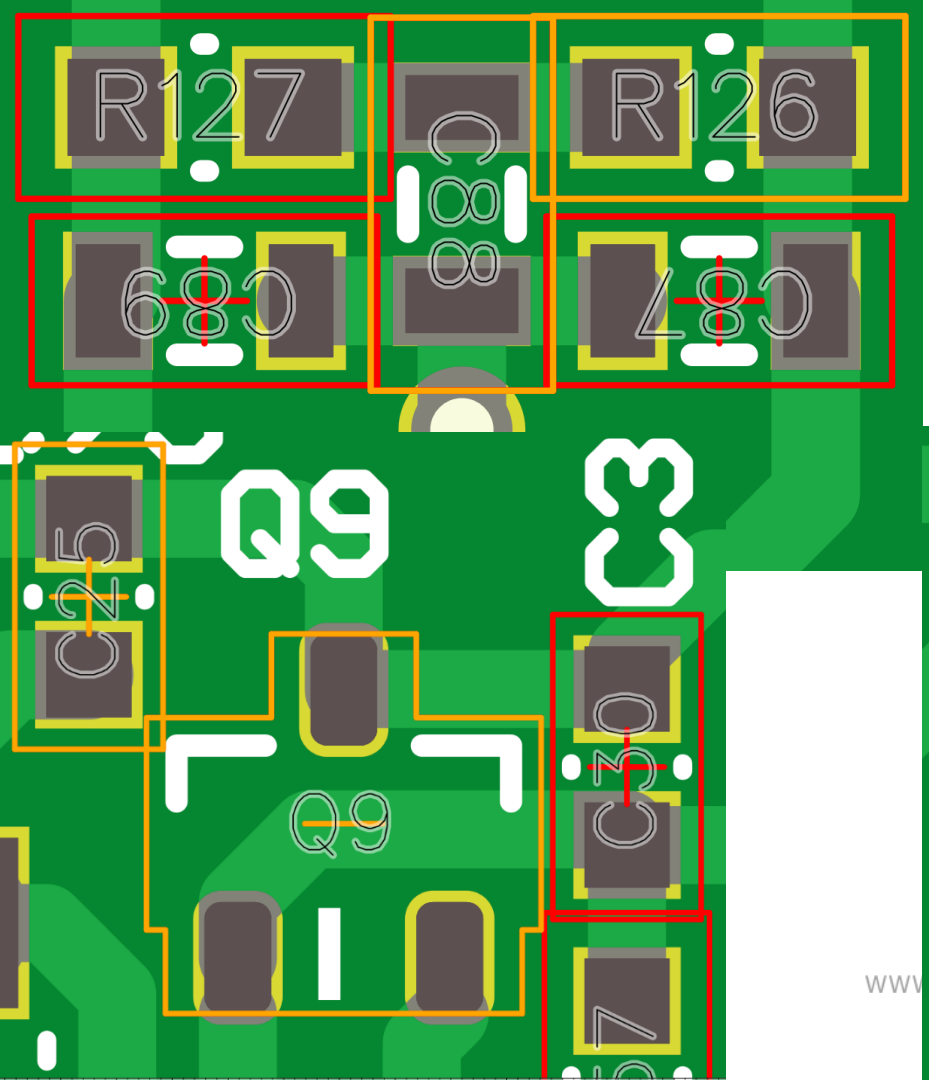




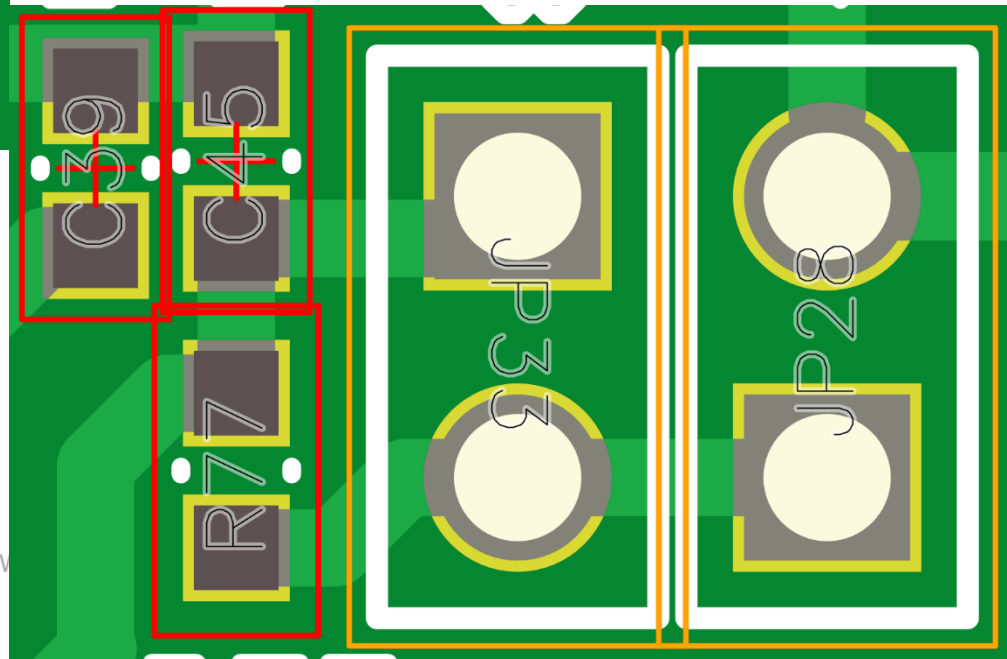


No polarity indication between Component Placement List and Gerber data

Contradictory data in Component Placement List and legend (Gerber data)



IPC component contour/keep out not respected



CAD to CAM

optimum PCB design flow

01

First Think

02

Then Act

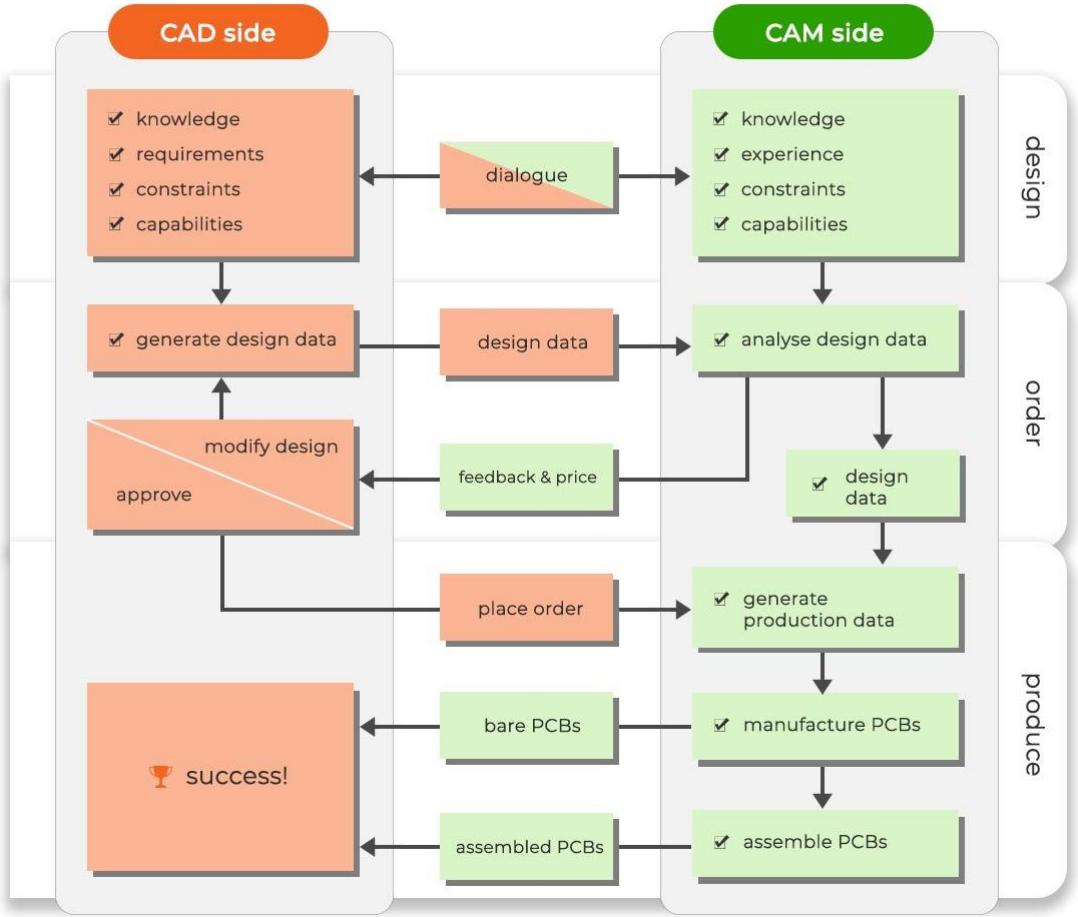
03

Achieve “Right First Time”

- **In time**
- **On Budget**

BRIDGING THE GAP

BETWEEN CAD AND CAM



Virtual production of your electronics

How?

EURO CIRCUITS

- Your board “right first time”
  - on time
  - accurate to your intentions
  - at best total cost
- Thanks
- Visit us at booth 9C090

Who are we?

- Prototypes & Small Series, produced & assembled in house
- Almost 100% of our sales = online
- 2022 figures:
  - +/- 500 Eurocircuits colleagues
  - + 12.000 professional customers (20.000 users) in Europe
  - + 110.000 orders
  - +/-40 M€ consolidated sales
- Started 1991, is Belgian and is privately owned
- Factories in Hungary and Germany & Engineering in India
- Local sales in Belgium (HQ), France, Germany, UK, Switzerland, Italy, Spain and Hungary