

Design for Circularity

Steven Van Hout



VDL TBP ELECTRONICS

OUR IDENTITY



PRAGMATIC
ENTREPRENEURSHIP

INFORMAL
OPEN
ATMOSPHERE



FLAT ORGANISATION STRUCTURE
WITH SHORT LINES

STRENGTH THROUGH COOPERATION

STRENGTH OF A
MULTINATIONAL



EXCELLENT
CRAFTMANSHIP

RESULT
ORIENTED

CULTURE OF A
FAMILY COMPANY



COMMITTED
EMPLOYEES

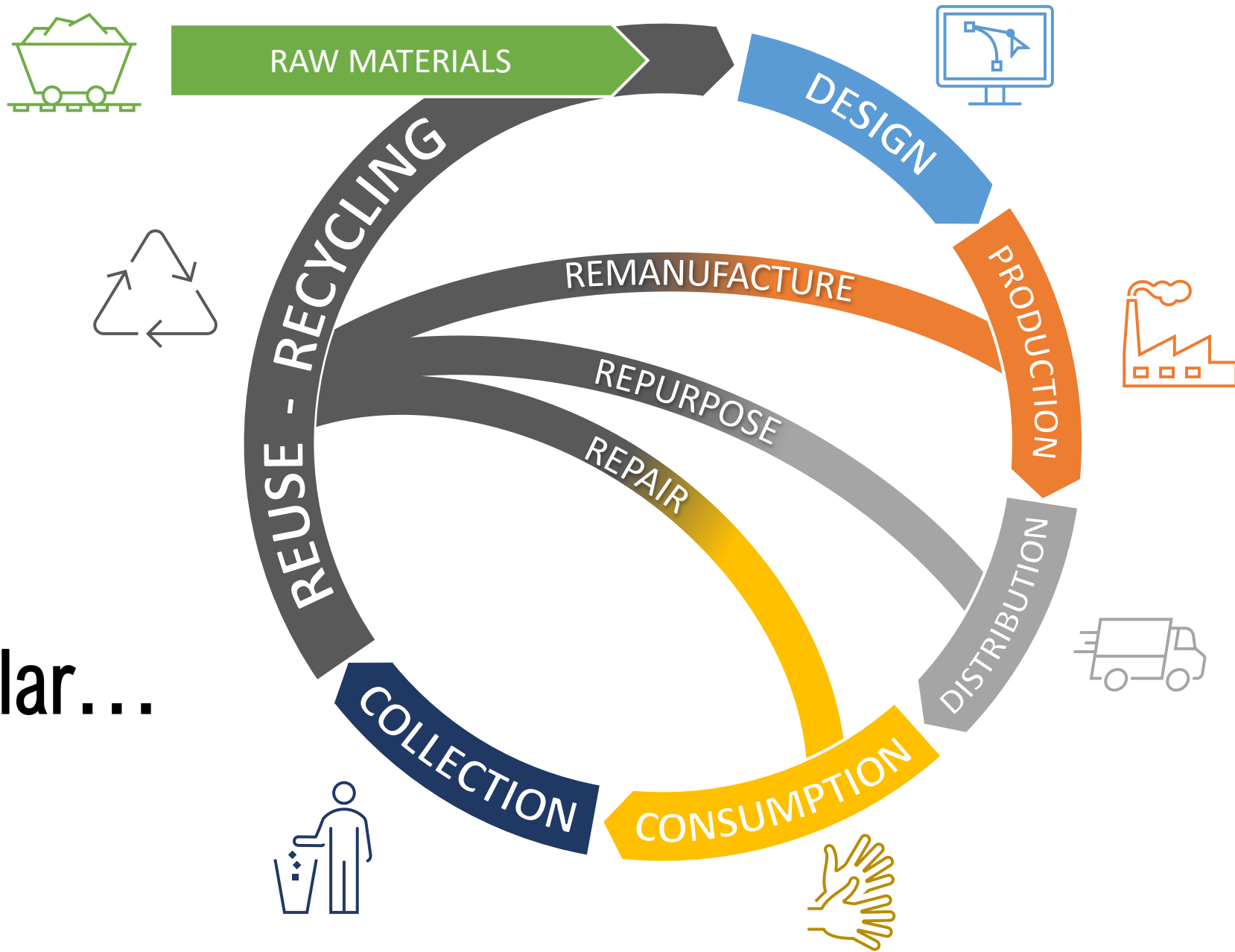
From linear economy...



VDL TBP Electronics

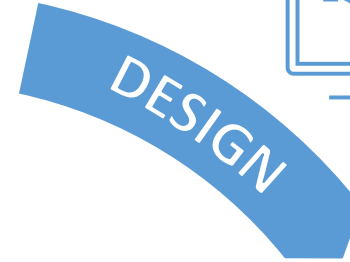


to circular...





DESIGN



VDL TBP Electronics





DESIGN



VDL TBP Electronics





DESIGN



DfX – PHASE 0



IDEA



BLOCK DIAGRAM



SCHEMATICS



COMPONENT PLACEMENT



LAYOUT

electronics design process



VDL TBP Electronics





Design for eXcellence (DfX) – PHASE 0

• Component choices

- ROHS, REACH compliant
- Energy-efficient
- Recyclable materials
- Longevity and durability
- Standardized connectors
- No custom-made components
- Eco-friendly packaging



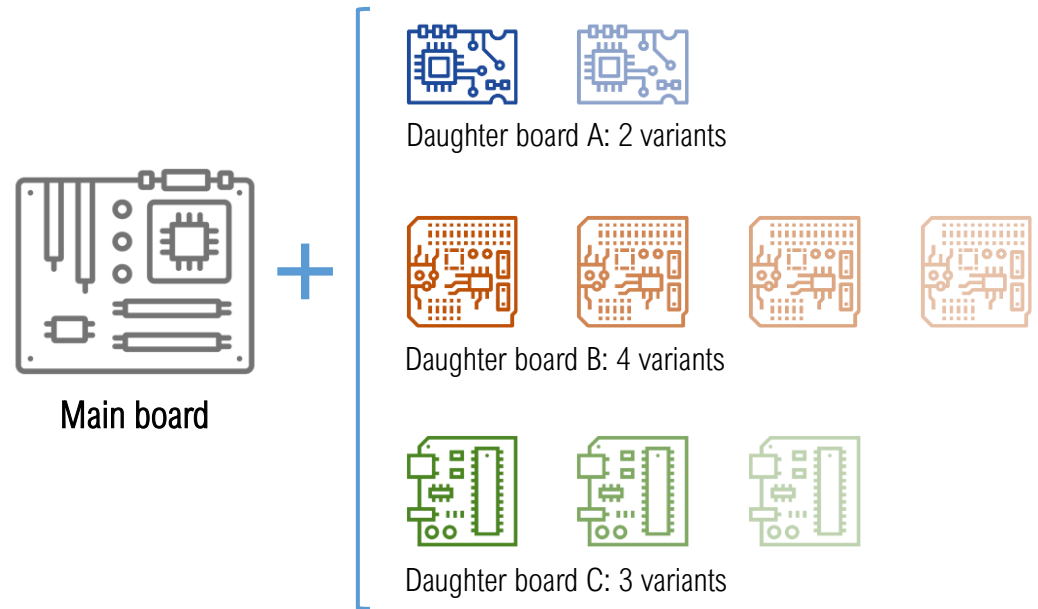
VDL TBP Electronics





Design for eXcellence (DfX) – PHASE 0

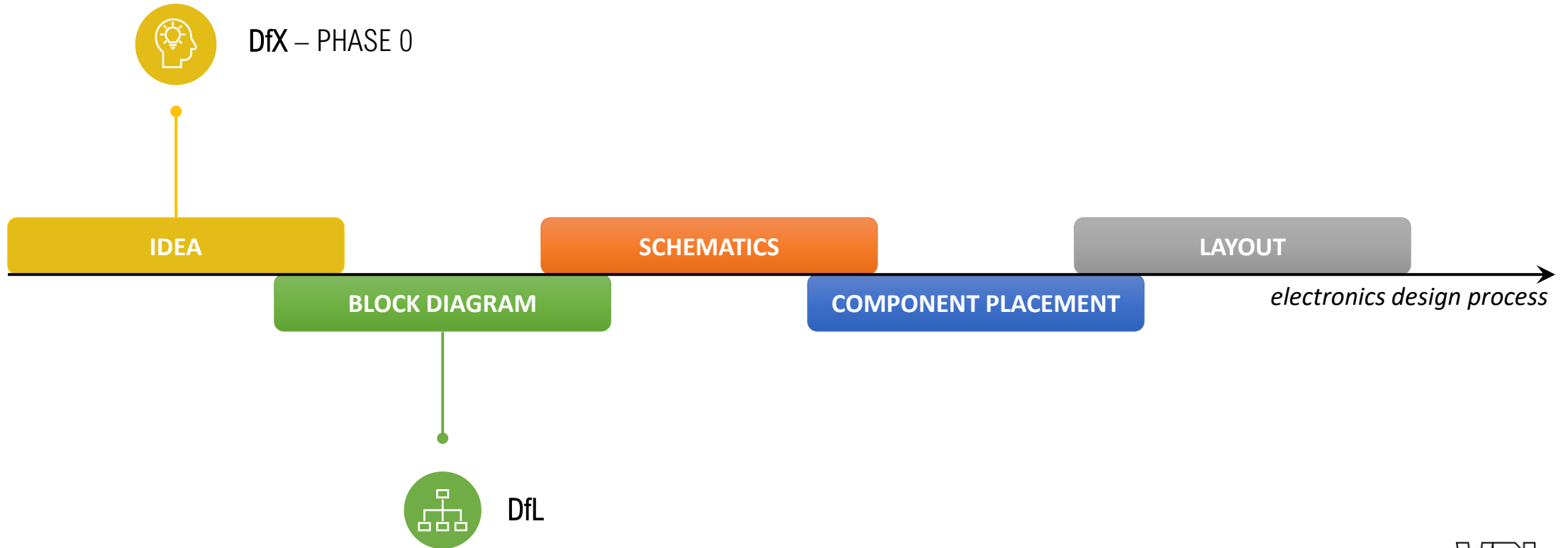
- Modular product design



- Standardized components and connectors
- Easier disassembly and replacement of faulty parts
- Reduced need for complete product replacements



DESIGN



VDL TBP Electronics





Design for Logistics (DfL)

- Analyze Bill Of Materials (BOM) for
 - ROHS, REACH compliant
 - Availability
 - Reliability
 - Sustainability
 - Responsible sourcing of materials and ethical manufacturing practices
 - End-Of-Life (EOL)
 - Obsolescence

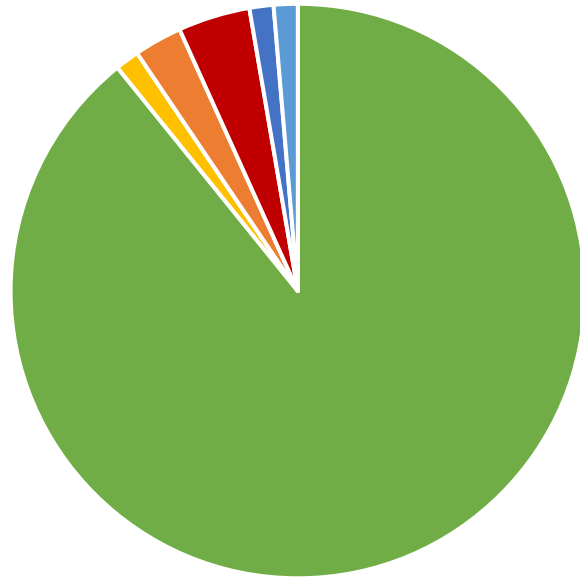


VDL TBP Electronics





Design for Logistics (DfL)

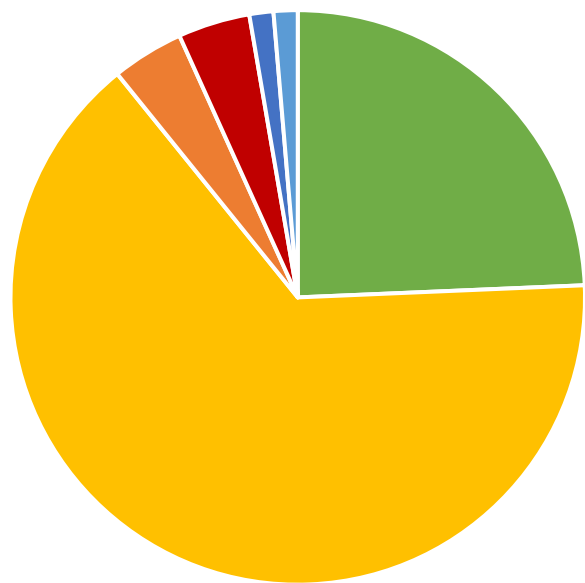


Lifecycle status

- Active (66) Active Part
- NRND (1) Not Recommended for New Designs. Try to avoid these parts.
- LTB (2) Last Time Buy: Part will be obsolete in a few months.
- Obsolete (3) Part is no longer available
- Unconfirmed (1) Part is active, but his lifecycle status is not clear
- Unknown (1) Status of part is unknown. This can have several causes, namely
 - Incorrect Manufacturing Part Number (MPN) in BOM
 - MPN is unknown in database
 - No information is found from this MPN



Design for Logistics (DfL)



Lifecycle risk

Prediction of risk on End Of Life (EOL)

- Low Risk (18)
- Medium Risk (48)
- High Risk (3)
- Obsolete (3)
- Unconfirmed (1)
- Unknown (1)

Low risk to EOL

Medium risk to EOL. Part could be EOL in the future.

High risk to EOL. Part could be EOL in the near future.

Part is no longer available.

Part is active, but his lifecycle risk is not clear

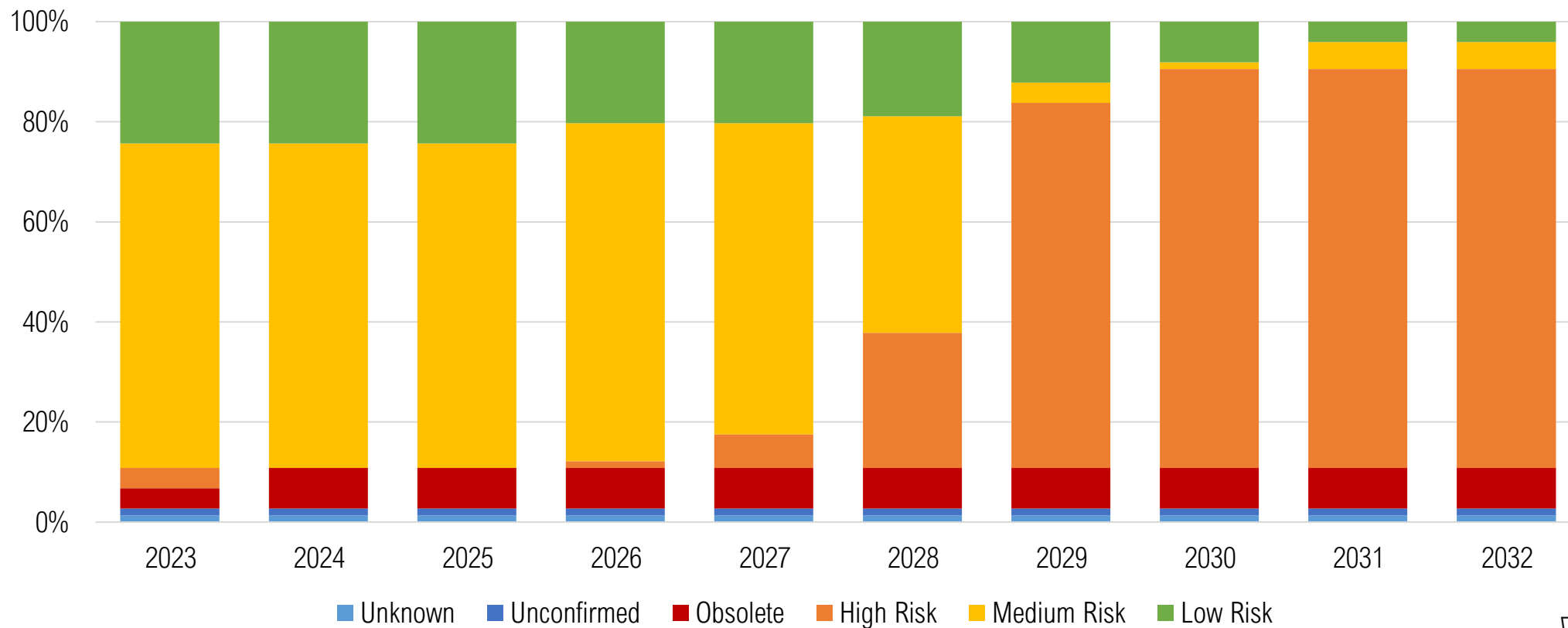
Risk of part is unknown. This can have several causes, namely

- Incorrect Manufacturing Part Number (MPN) in BOM
- MPN is unknown in database
- No information is found from this MPN



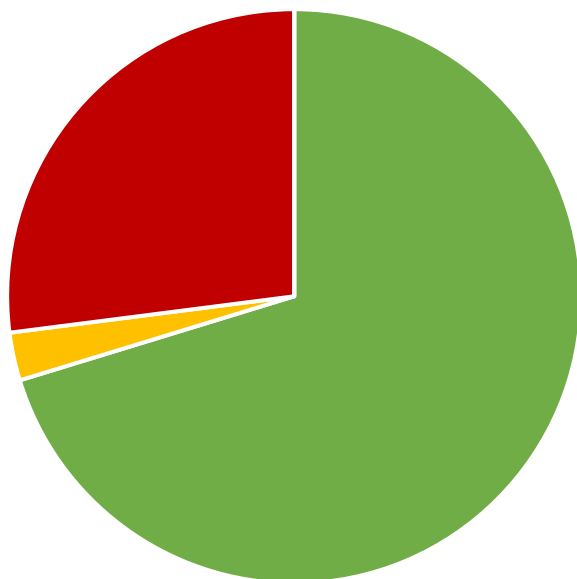


Design for Logistics (DfL)





Design for Logistics (DfL)



Availability risk

- Low Risk (52)
- Medium Risk (2)
- High Risk (20)
- Unknown (0)

These components have sufficient stock

These components have a risk of insufficient stock

These components have a risk of no stock

Risk of part is unknown. This can have several causes, namely

- Incorrect Manufacturing Part Number (MPN) in BOM
- MPN is unknown in database
- No information is found from this MPN

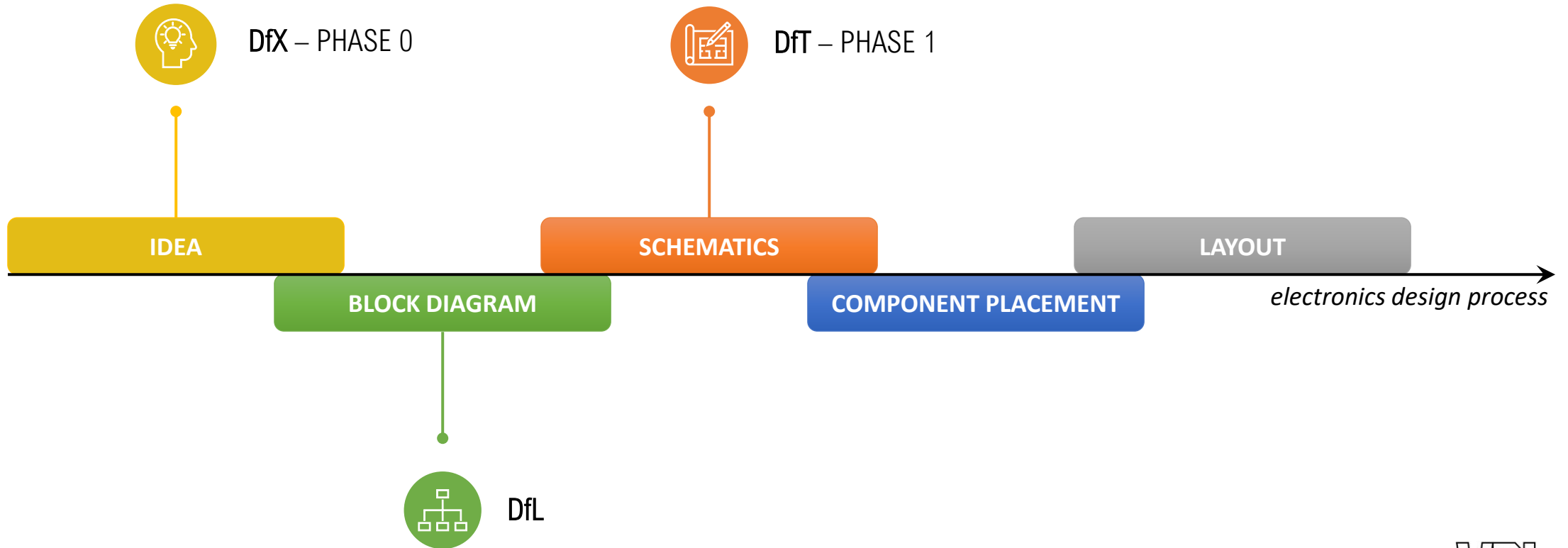


Design for Logistics (DfL)

PART CODE	DESCRIPTION	STATUS	LIFE CYCLE RISK		LEAD TIMES (in weeks)	Availability Risk
			2023	2029		
B82462A2102M000	Inductor Power Wirewound 1uH 20% 100KHz Ferrite 3A 0.024Ohm DCR Autom	Obsolete	Obsolete	Obsolete	No Info	High
IRFL024NPBF	Trans MOSFET N-CH Si 55V 4A 4-Pin(3+Tab) SOT-223 Tube	Obsolete	Obsolete	Obsolete	No Info	High
N25Q064A13ESE40E	NOR Flash Serial (SPI, Dual SPI, Quad SPI) 3V/3.3V 64M-bit 64M/32M/16M x	Obsolete	Obsolete	Obsolete	No Info	High
BL02RN2R1M2B	Ferrite Beads Radial 7A 0.020Ohm DCR Bulk	LTB	High Risk	Obsolete	Min 18	Medium
9C-8.000MAAJ-T	Crystal 8MHz ±30ppm (Tol) ±30ppm (Stability) 18pF FUND 800hm 2-Pin HC-4	LTB	High Risk	Obsolete	Min 38	Medium
APDS-9301	Light to Digital Ambient Light Sensor Digital 3V Automotive 6-Pin Chip LED	NRND	High Risk	Obsolete	No Info	High
KM-23ID	LED Uni-Color Hi-Eff. Red 627nm 3-Pin SOT-23 T/R	Unconfirmed	Unconfirmed	Unconfirmed	Min 15, Max 18	Medium
XQERDO-H0-CORG-B00000801		Unknown	Unknown	Unknown	No Info	High
7803SR-C	Module DC-DC 1-OUT 3.3V 0.5A 1.65W 3-Pin SIP	Active	Medium Risk	High Risk	Min 35, Max 40	Medium
T83-A90X	Surge Arrestor 3-Electrode Surge Arrestor 90VDC 15KA Thru-Hole	Active	Medium Risk	High Risk	No Info	High
STM32F427ZIT6	MCU 32-bit ARM Cortex M4 RISC 2MB Flash 2.5V/3.3V 144-Pin LQFP Tray	Active	Low Risk	Medium Risk	Min 90	Medium
C0805X225K4RAC	Cap Ceramic 2.2uF 16V X7R 10% Pad SMD 0805 Flexible Termination 125°C M	Active	Low Risk	Low Risk	Min 22	Medium

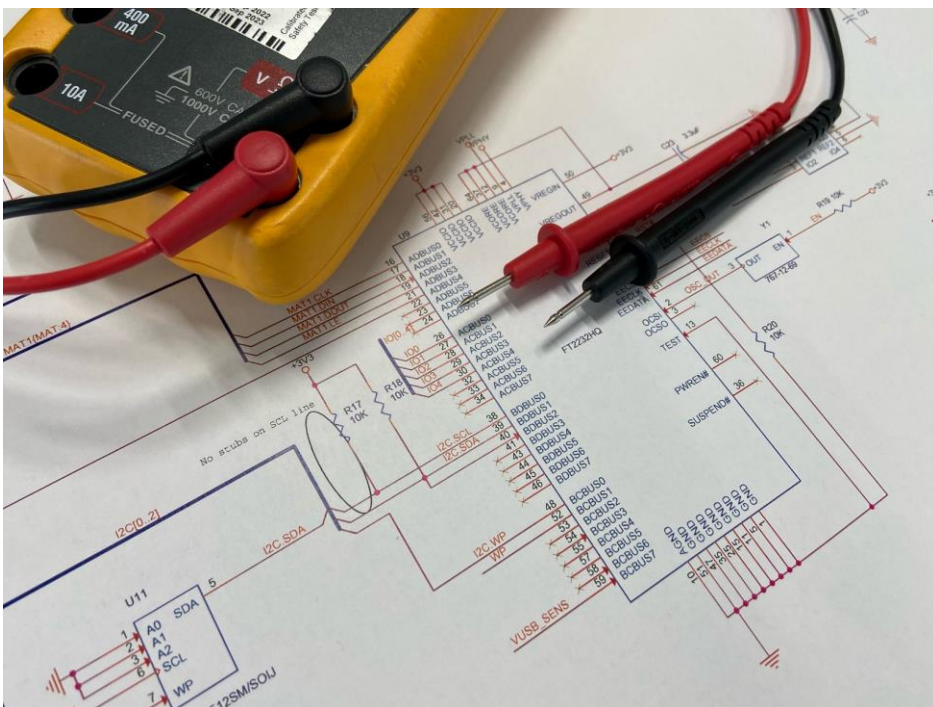


DESIGN





Design for Testing (DfT) – PHASE 1

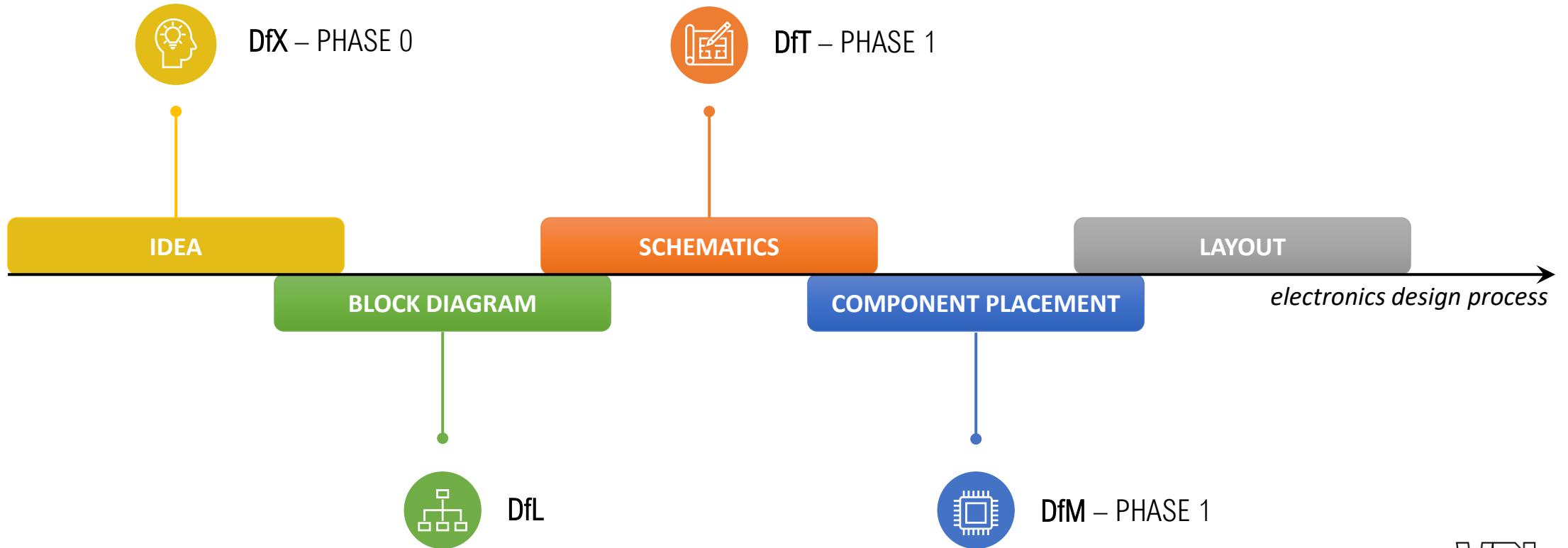


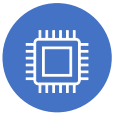
- List with required test points
- Test access recommendations
- Preliminary test coverage
- Preliminary test strategy
- Preliminary delivery quality

→ Maximise the delivery quality to reduce the amount of boards with homesickness

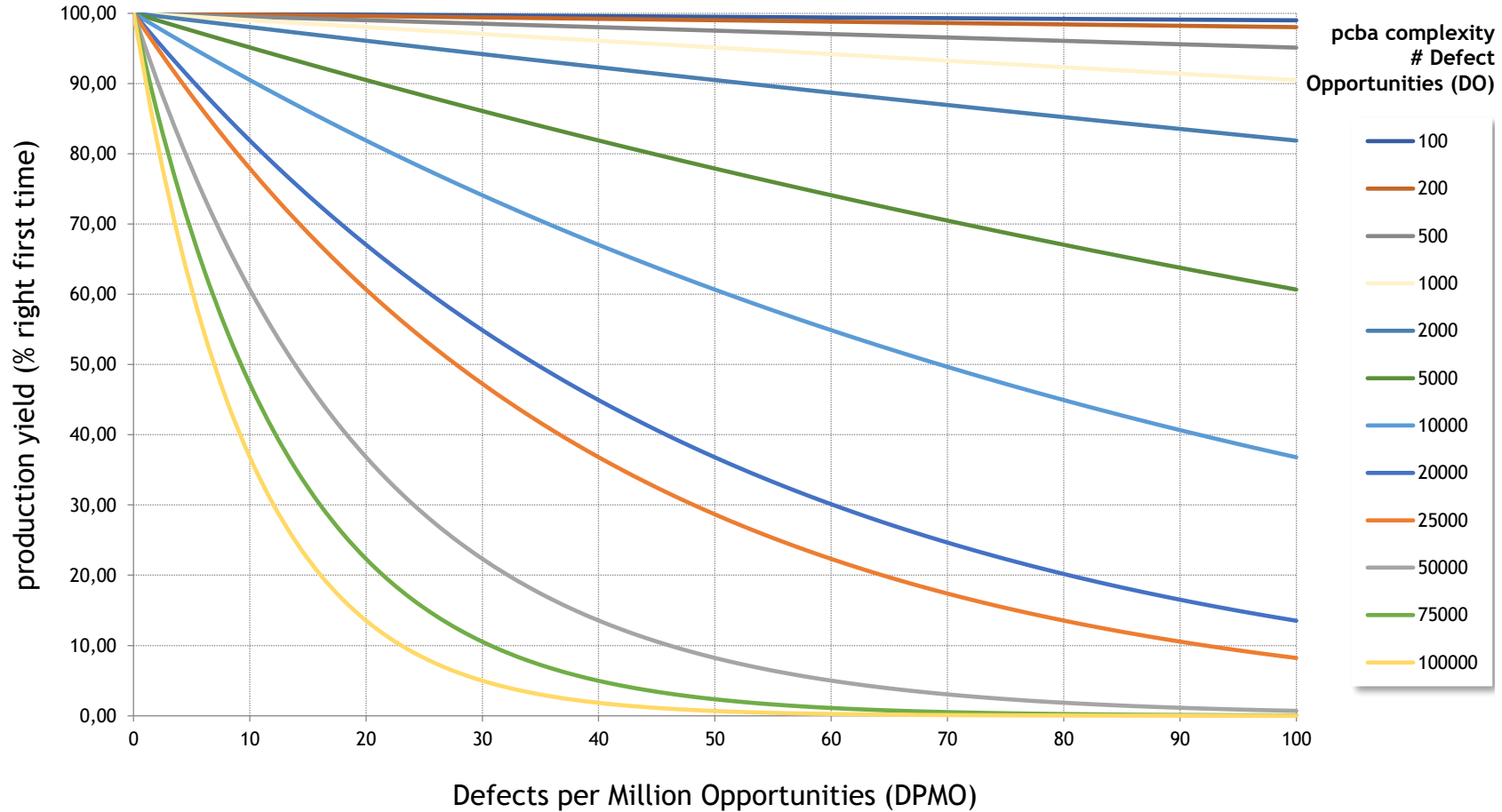


DESIGN



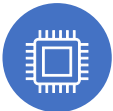


Design for Manufacturing (DfM) – PHASE 1

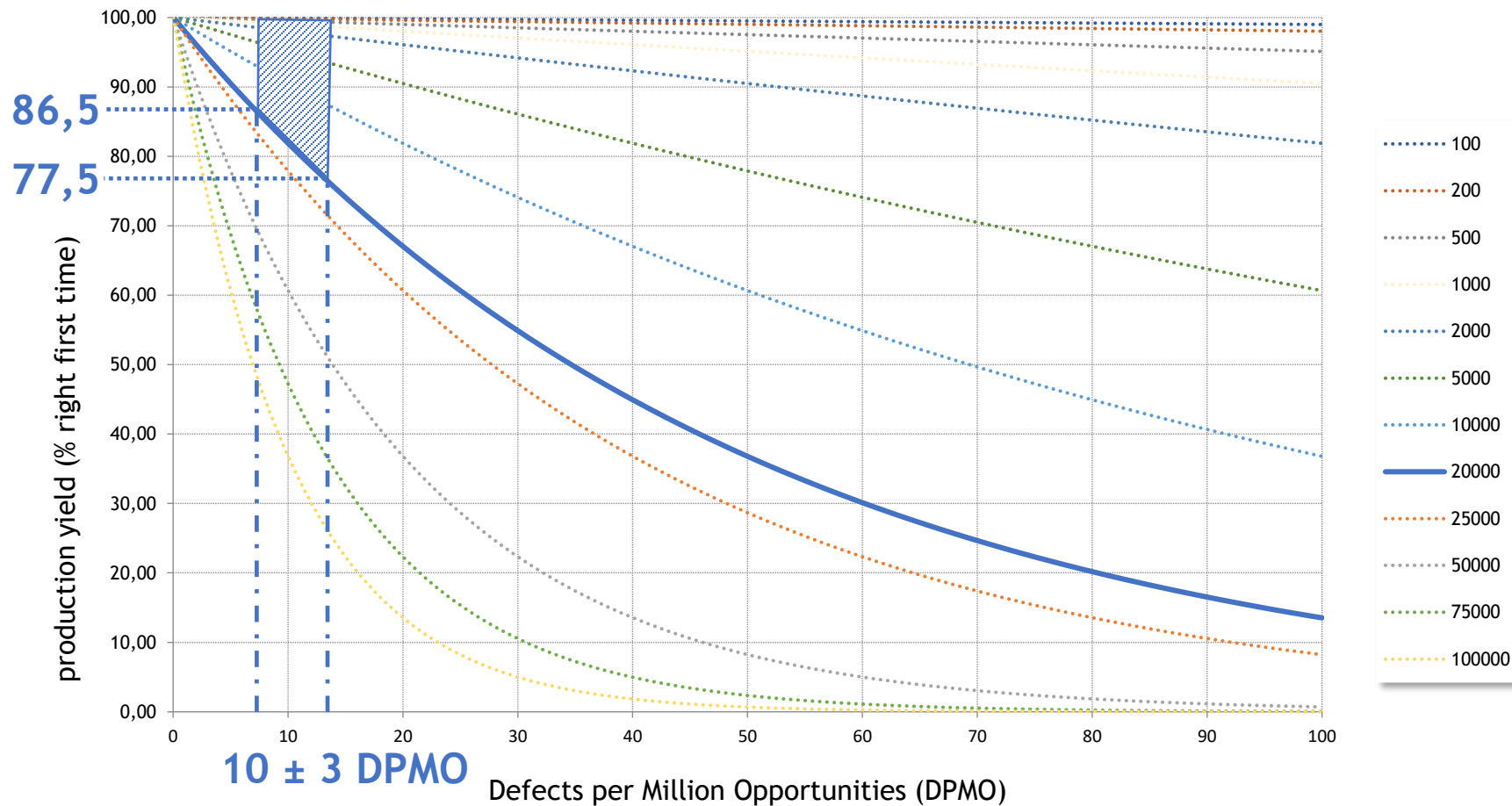


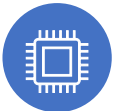
VDL TBP Electronics



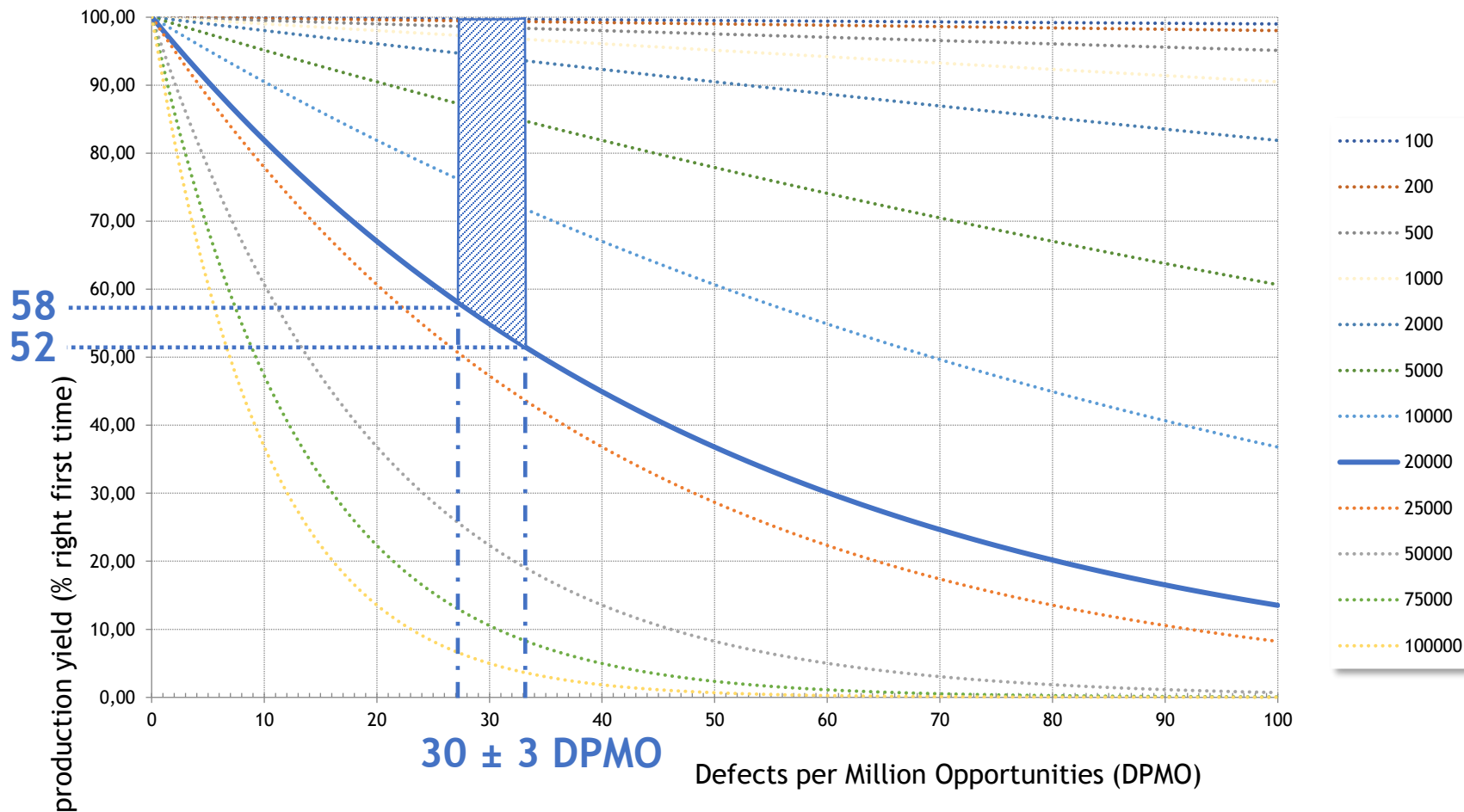


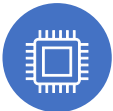
Design for Manufacturing (DfM) – PHASE 1



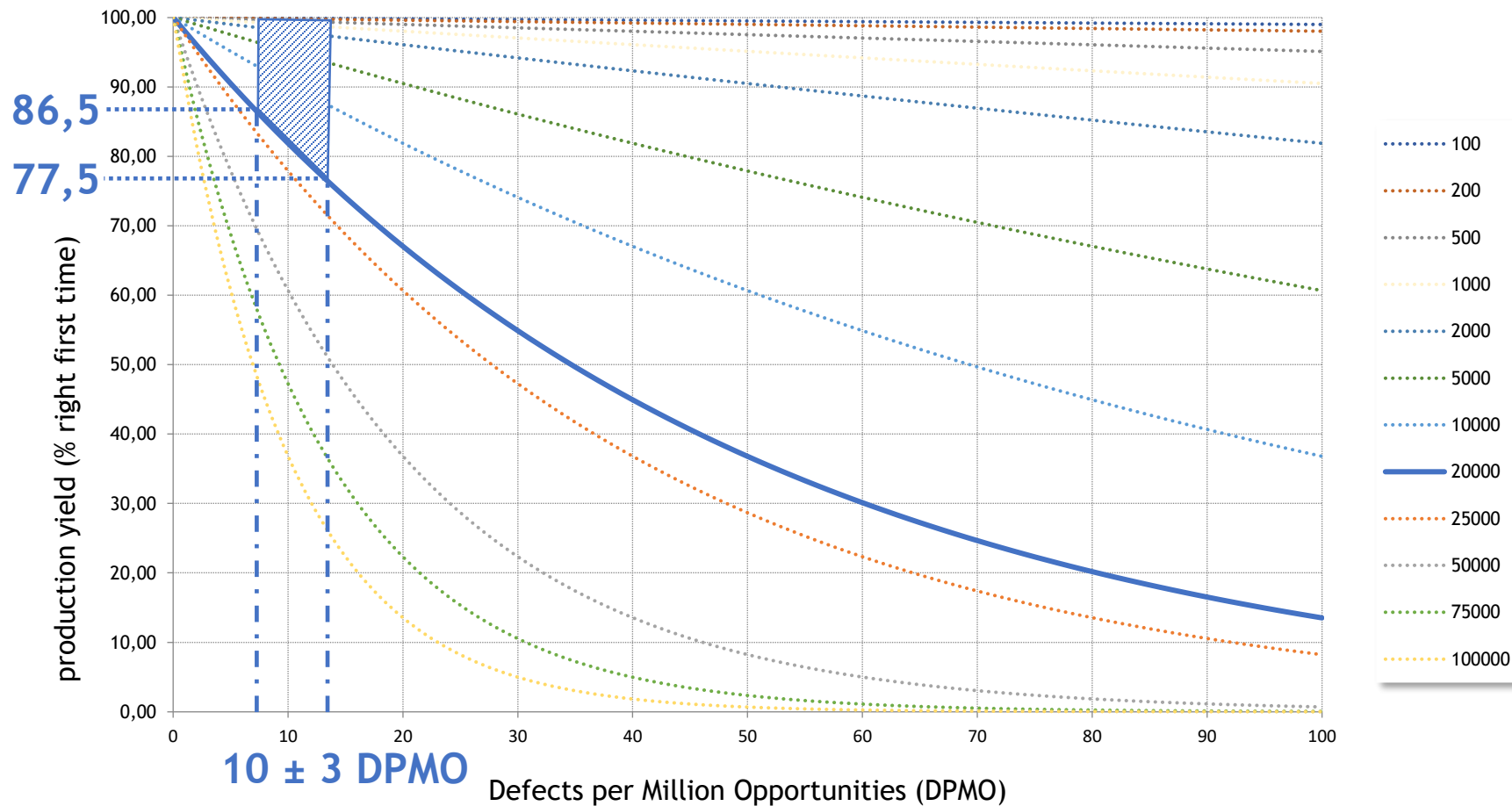


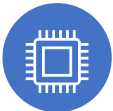
Design for Manufacturing (DfM) – PHASE 1



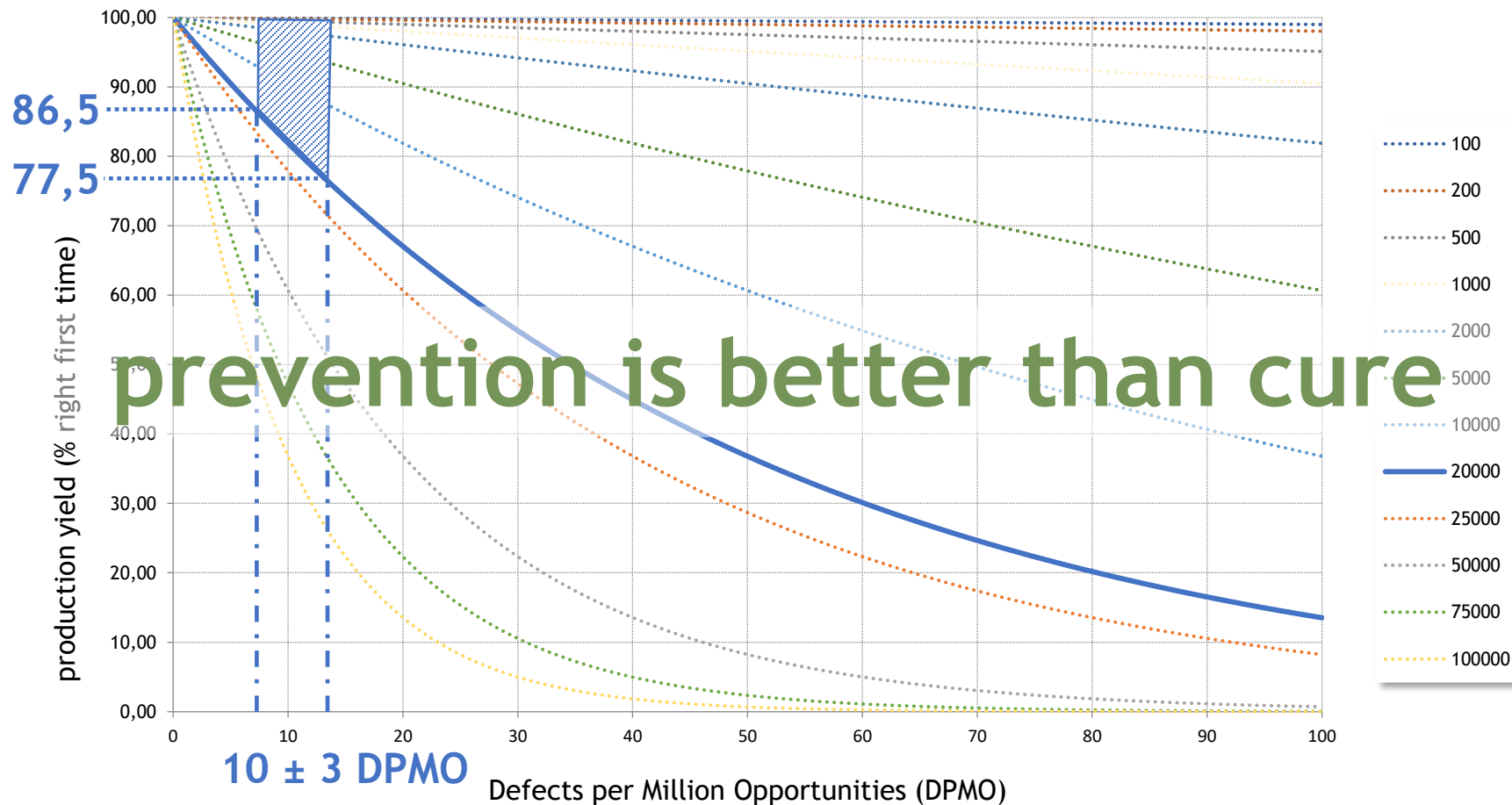


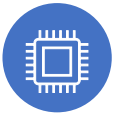
Design for Manufacturing (DfM) – PHASE 1





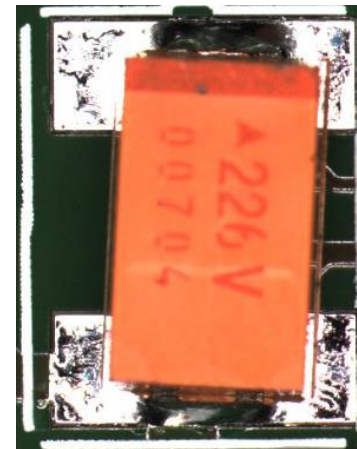
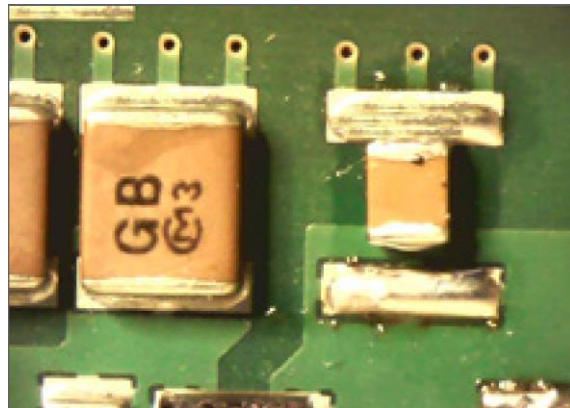
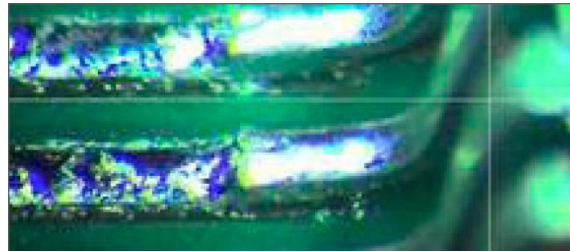
Design for Manufacturing (DfM) – PHASE 1

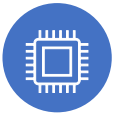




Design for Manufacturing (DfM) – PHASE 1

Wrong footprints lead to bad soldering reliability





Design for Manufacturing (DfM) – PHASE 1

Small distance between high components lead to hardly repairable components

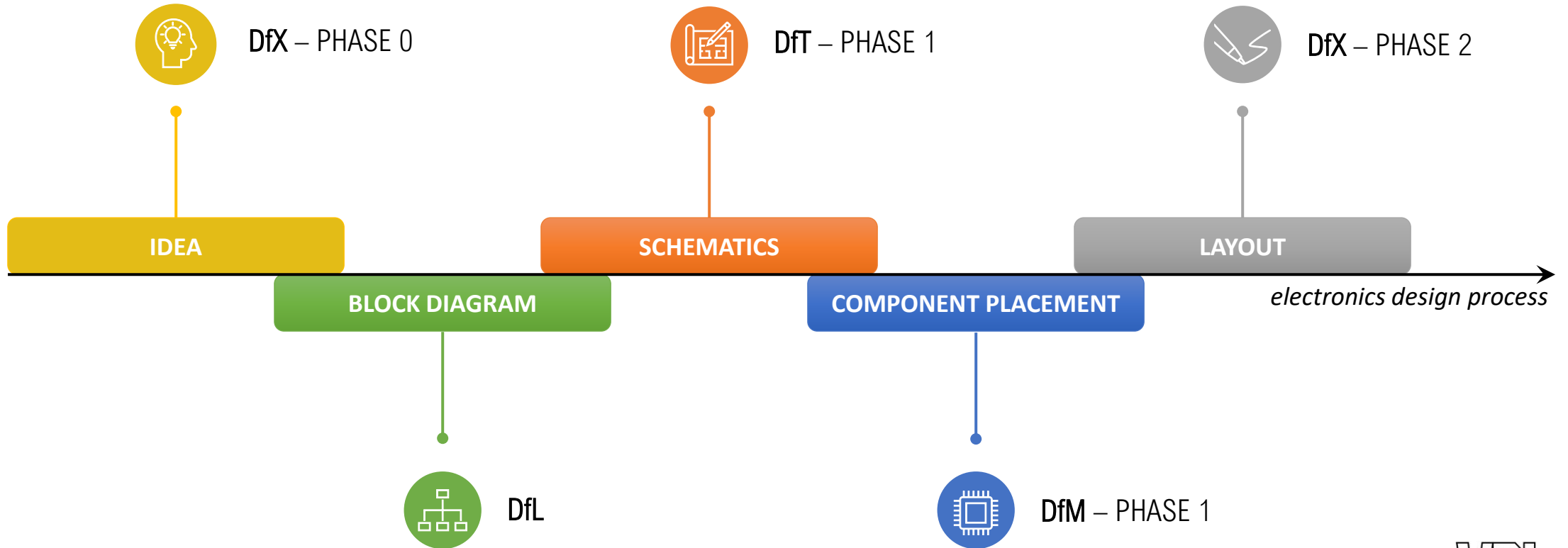


VDL TBP Electronics





DESIGN

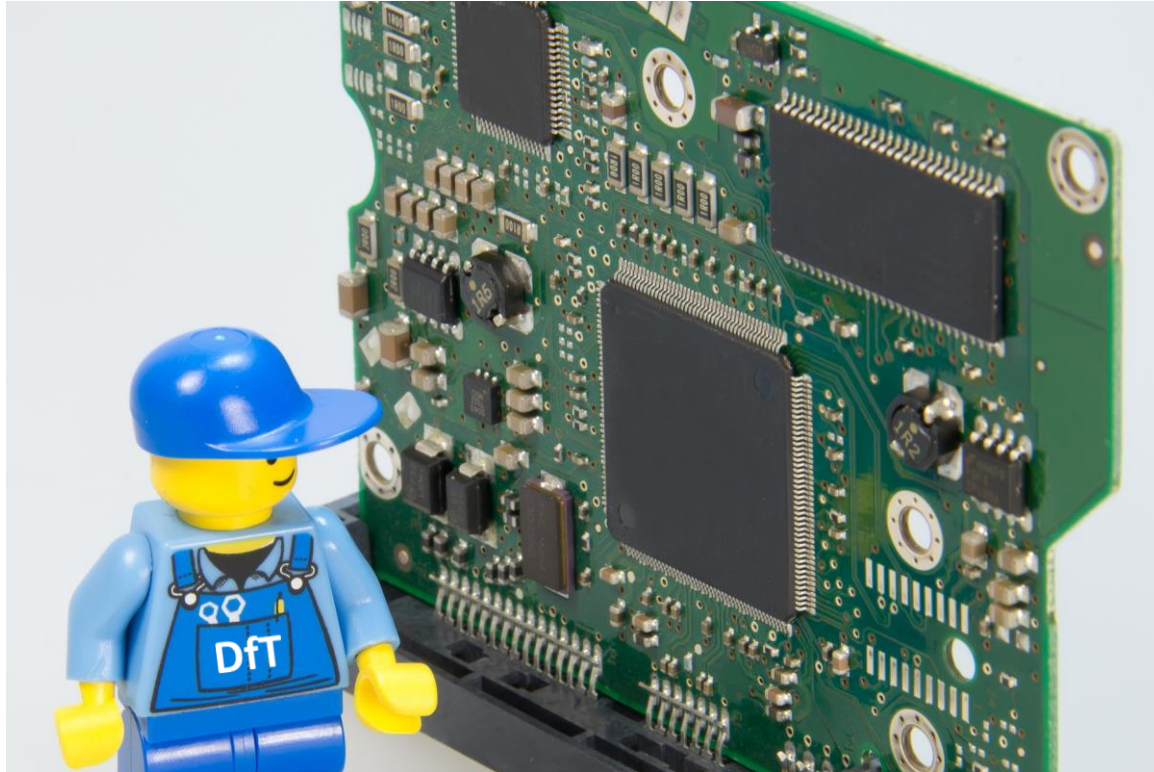


VDL TBP Electronics





Design for Testing (DfT) - PHASE 2



- Test access recommendations
- Final test strategy
- Final test coverage
- Final delivery quality

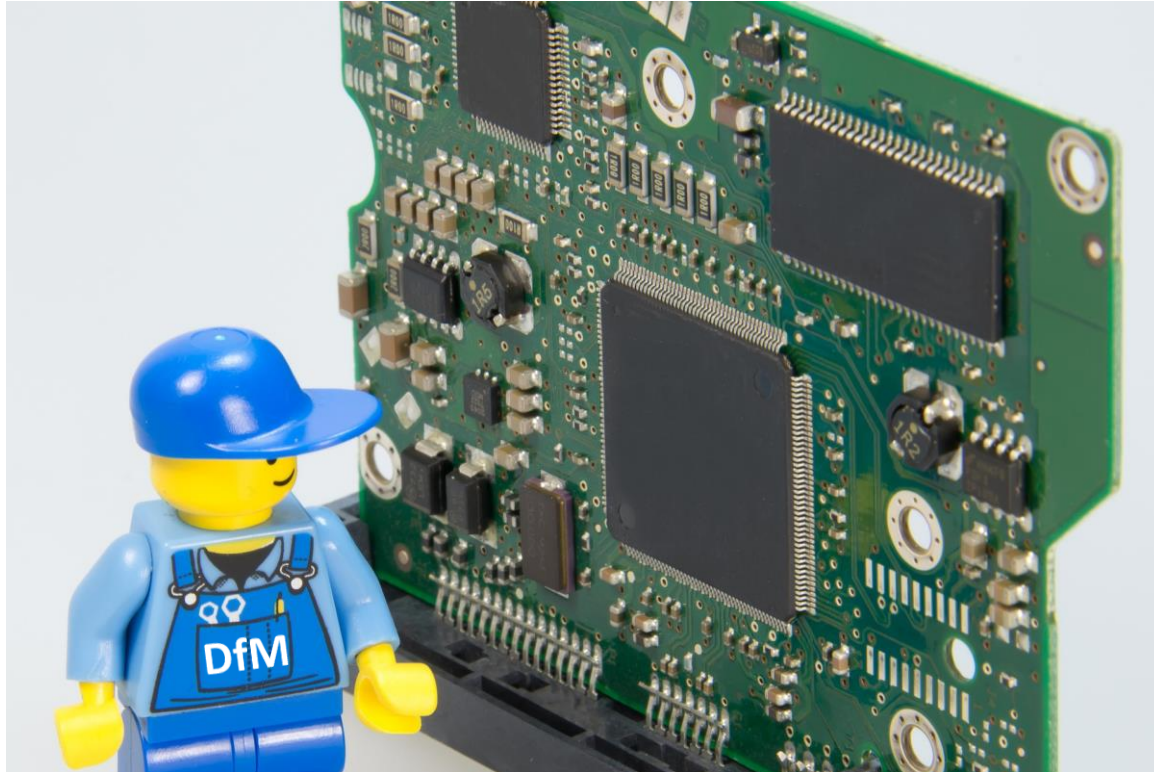


VDL TBP Electronics





Design for Manufacturing (DfM) - PHASE 2



- Manufacturability recommendations
- Footprint issues
- Component placement issues
- Netlist verification
- Final production yield



VDL TBP Electronics





Design for eXcellence (DfX) - PHASE 2

DfX	Production Yield	Applied test strategy	Slip through	Quality improvement factor (x)
No DfX	89%	No test	11,00 %	0,00
DfM	93%	No test	7,00 %	1,57
DfM + DfT	93%	3D AOI	1,58 %	6,96
DfM + DfT	93%	3D AOI + FP	1,44 %	7,64
DfM + DfT	93%	3D AOI + FP + BS	0,80 %	13,75
DfM + DfT	93%	3D AOI + EBS	0,10 %	110,00
DfM + DfT	93%	3D AOI + FP_S + EBS	0,05 %	157,14



VDL TBP Electronics





Design for eXcellence (DfX) - PHASE 2

DfX	Production Yield	Applied test strategy	Slip through	Quality improvement factor (x)
No DfX	89%	No test	11,00 %	0,00
DfM	93%	No test	7,00 %	1,57
DfM + DfT	93%	3D AOI	1,58 %	6,96
DfM + DfT	93%	3D AOI + FP	1,44 %	7,64
DfM + DfT	93%	3D AOI + FP + BS	0,80 %	13,75
DfM + DfT	93%	3D AOI + EBS	0,10 %	110,00
DfM + DfT	93%	3D AOI + FP_S + EBS	0,05 %	157,14

Advised test strategy for PROTOTYPE production



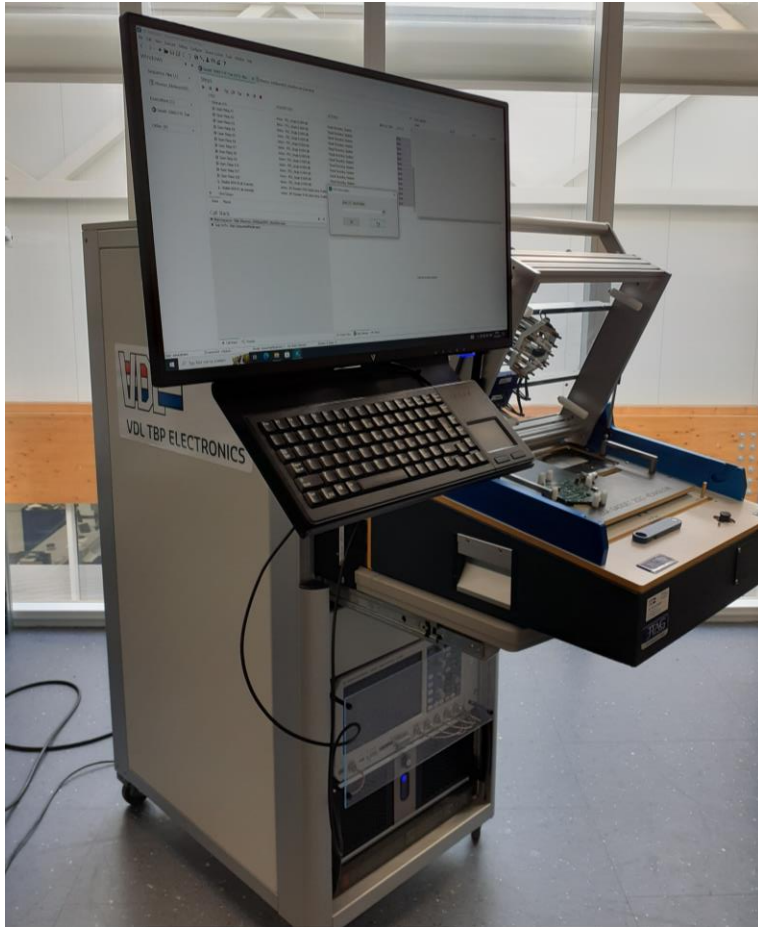
Design for eXcellence (DfX) - PHASE 2

DfX	Production Yield	Applied test strategy	Slip through	Quality improvement factor (x)
No DfX	89%	No test	11,00 %	0,00
DfM	93%	No test	7,00 %	1,57
DfM + DfT	93%	3D AOI	1,58 %	6,96
DfM + DfT	93%	3D AOI + FP	1,44 %	7,64
DfM + DfT	93%	3D AOI + FP + BS	0,80 %	13,75
DfM + DfT	93%	3D AOI + EBS	0,10 %	110,00
DfM + DfT	93%	3D AOI + FP_S + EBS	0,05 %	157,14

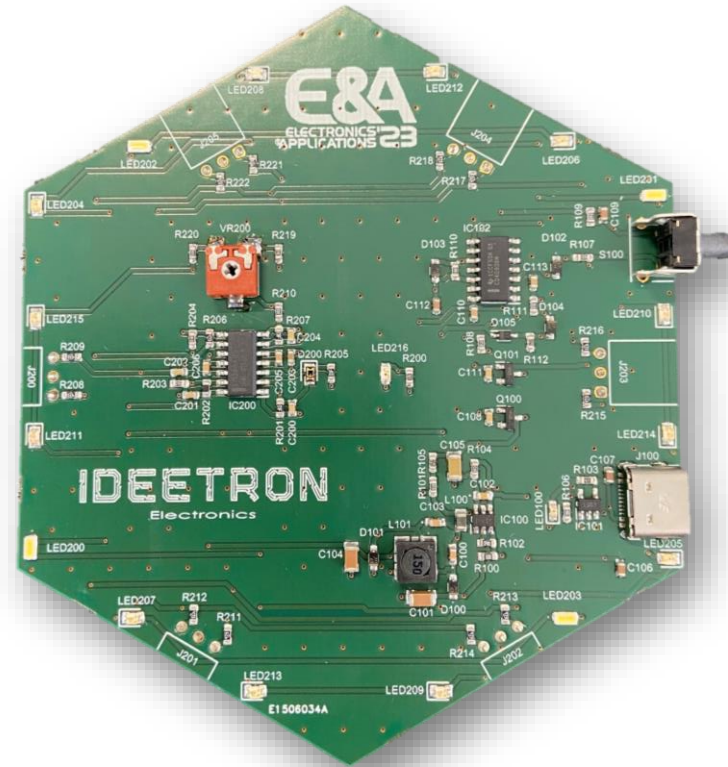
Advised test strategy for VOLUME production



Design for eXcellence (DfX) - PHASE 2



Extended Boundary Scan test (EBS)



E&A GADGET - HEXAGLOW

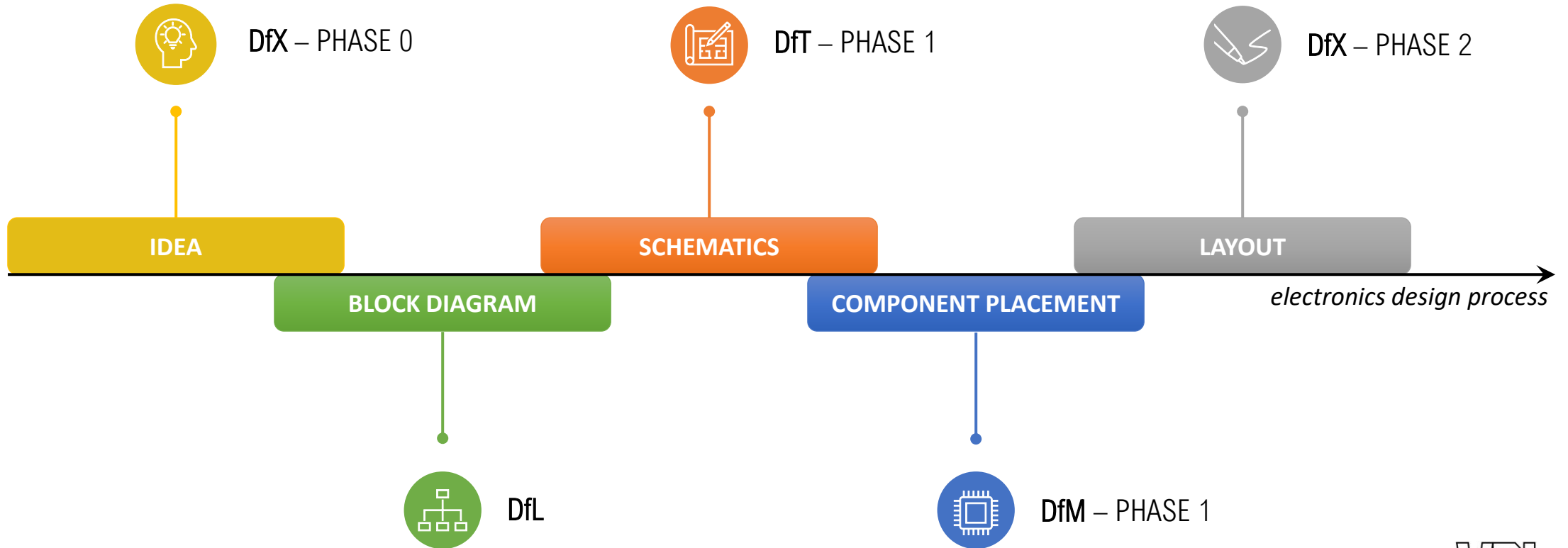


VDL TBP Electronics





DESIGN



Any 1.7 Questions



VDL TBP Electronics



**"EARLY SUPPLIER INVOLVEMENT ...
THAT'S ONE SMALL STEP FOR US,
ONE GIANT LEAP FOR MANUFACTURING"**



CONTACT INFORMATION



VDL TBP ELECTRONICS



Visit us @ boot 7E071

Steven Van Hout

Manager Test Engineering
Electronics Test Development

+31 (0)6 57 88 39 33 | +31 (0)187 602 744

s.van.hout@vdltbpelectronics.com

www.vdltbpelectronics.com



26 T/M 28
SEPTEMBER '23
JAARBEURS UTRECHT