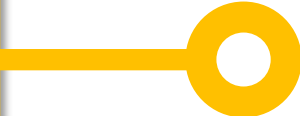


Early supplier involvement:
how and **when** to decide
about the test strategy

Steven Van Hout



The way to maximised delivery quality



VOLUME
PRODUCTION
& TEST






VOLUME PRODUCTION & TEST

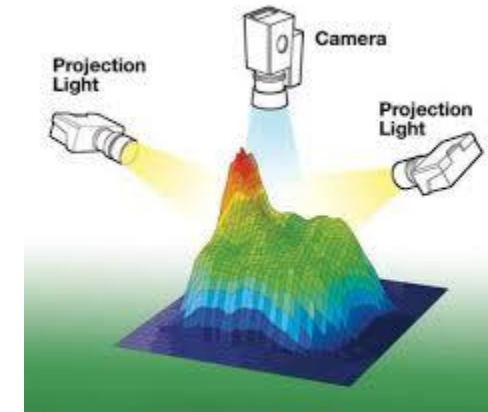
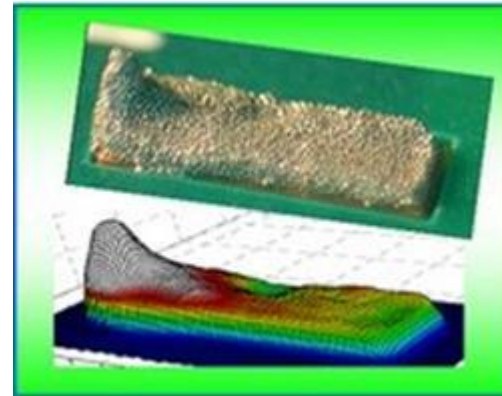
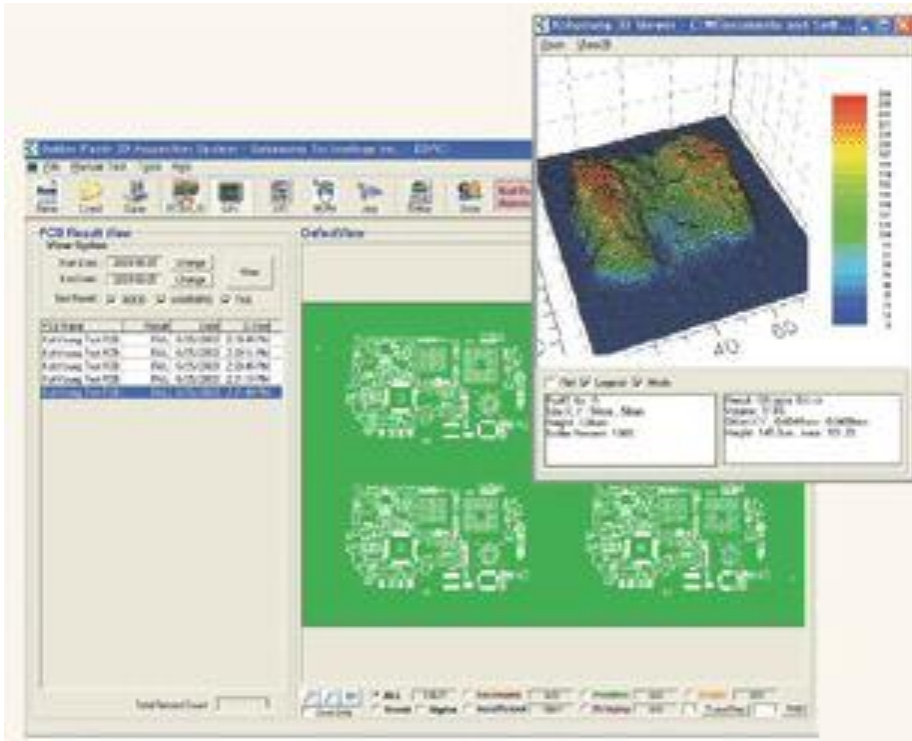
IN-LINE TESTING

Solder Paste Inspection (SPI)



VOLUME PRODUCTION & TEST

IN-LINE TESTING



SOLDER PASTE INSPECTION (SPI)

VOLUME PRODUCTION & TEST

IN-LINE TESTING

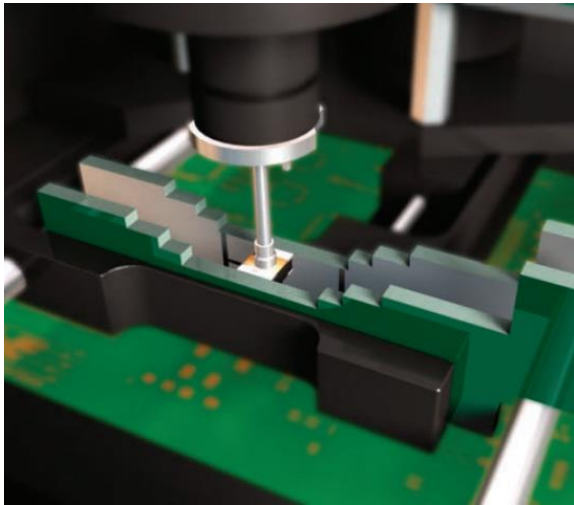
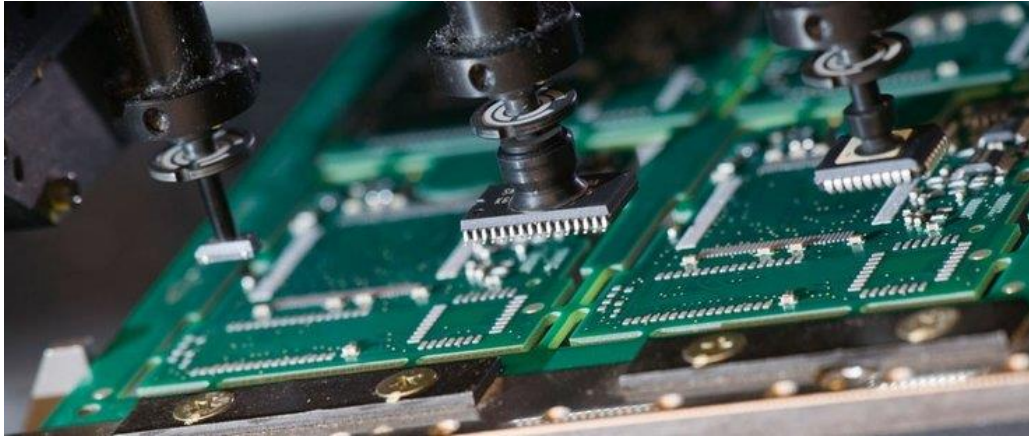
Solder Paste Inspection (SPI)

Automatic Placement Measurement (APM)



VOLUME PRODUCTION & TEST

IN-LINE TESTING



AUTOMATIC PLACEMENT MEASUREMENT (APM)



WORLD OF
TECHNOLOGY
& SCIENCE



VOLUME PRODUCTION & TEST

IN-LINE TESTING

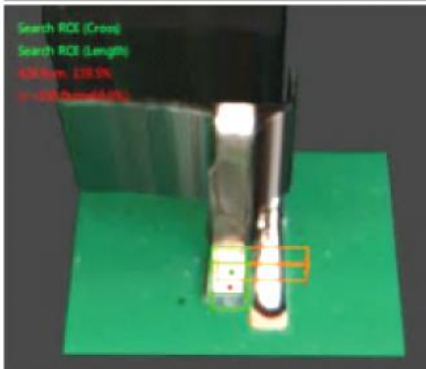
Solder Paste Inspection (SPI)
Automatic Placement Measurement (APM)
pre-reflow 3D AOI



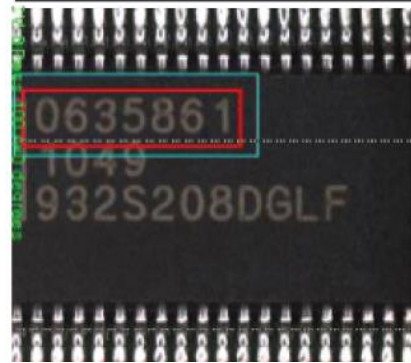
VOLUME PRODUCTION & TEST

IN-LINE TESTING

Offset

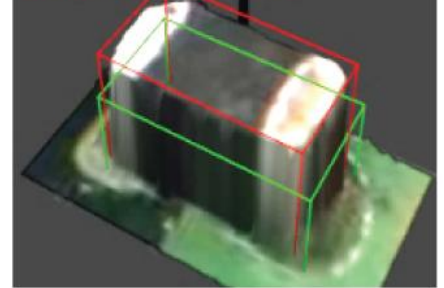


OCV/OCR

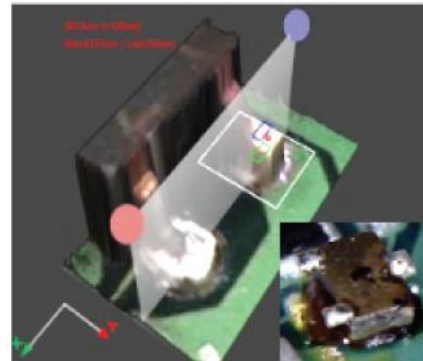


Dimension

(W) 97.4% [80.0%, 120.0%], 486.7um (CAD500um)
(L) 96.5% [80.0%, 120.0%], 916.4um (CAD950um)
(D) 141.7% [80.0%, 120.0%], 14.2um (CAD10um)



Upside down



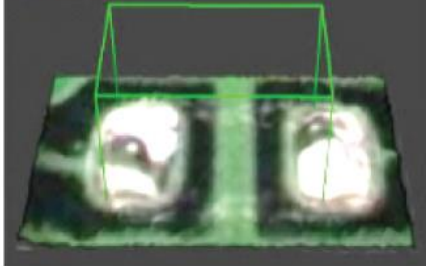
Rotation

Off Leng: 38.3um(+ 2000um)
Off Ang: 200.0um(+ 2000um)
Off Rot: 4.8Deg(+ 1.0Deg)



Missing

Volume (V)
0.0% (-10.0%)
Height / Cal Work
3.4um (100.00%)



PRE-REFLOW 3D AUTOMATIC OPTICAL INSPECTION (AOI)

VOLUME PRODUCTION & TEST

IN-LINE TESTING

Solder Paste Inspection (SPI)

Automatic Placement Measurement (APM)

pre-reflow 3D AOI

post-reflow 3D AOI





VOLUME PRODUCTION & TEST

IN-LINE TESTING



Dimension

(W) 97.4% [80.0%, 120.0%], 486.7um (CAD500um)
 (L) 96.5% [80.0%, 120.0%], 916.4um (CAD950um)
 (D) 141.7% [80.0%, 120.0%], 141.7um (CAD100um)

Rotation

Off Leng: 38.3um (+ 200.0um)
 Off Wid: 200.0um (+ 200.0um)
 Off Rot: 6.40deg (+ 0.0deg)

Bridging

Lead Coplanarity

MaxLen: 0.00mm
 MaxOffLen: 1.00mm

Missing

Volume (R)
 0.0% (-0.0%)
 Depth / Cap Thick
 3.4um (+ 0.0um)

Solder Fillet

Vol:
 Steep Area: 73.8% (> 50.0%)
 Peak Flat: 100.0% (100.0% - 100.0%)
 BareCopper: 15.2% (< 10.0%)

Billboarding

(W) 61.2% [80.0%, 120.0%], 311.6um (CAD300um)
 (L) 91.2% [80.0%, 120.0%], 118.3um (CAD100um)
 (D) 130.0% [80.0%, 120.0%], 484.0um (CAD500um)

Upside down

MaxLen: 0.00mm
 MaxOffLen: 1.00mm

OCV/OCR

063586 1
 1049
 932S208DGLF

Offset

Search ROI (Cross)
 Search ROI (Length)
 0.00mm, 1.00mm
 0.00mm, 0.00mm

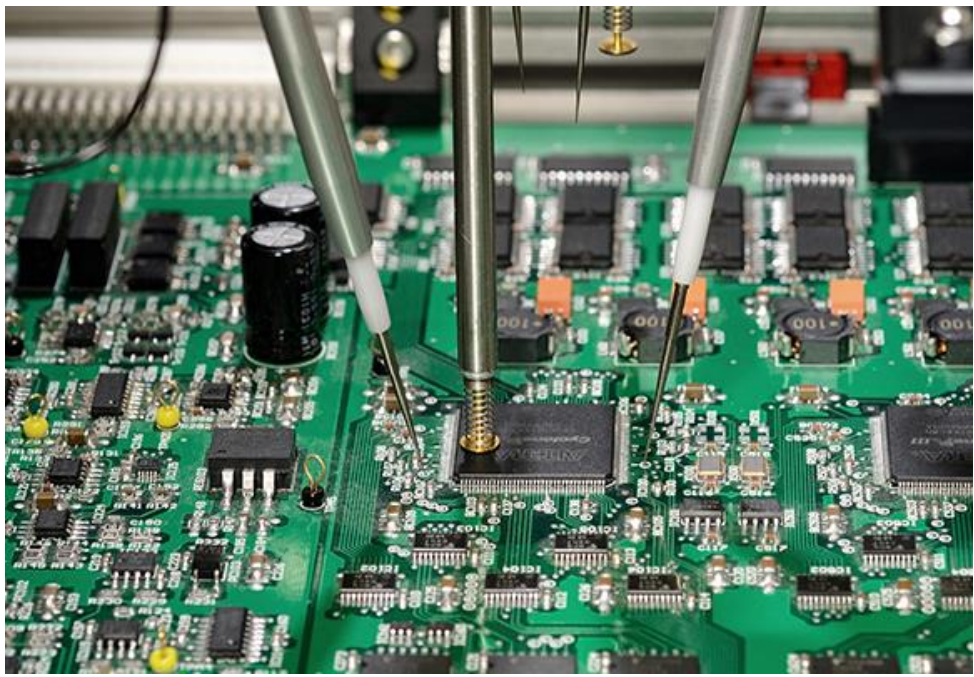
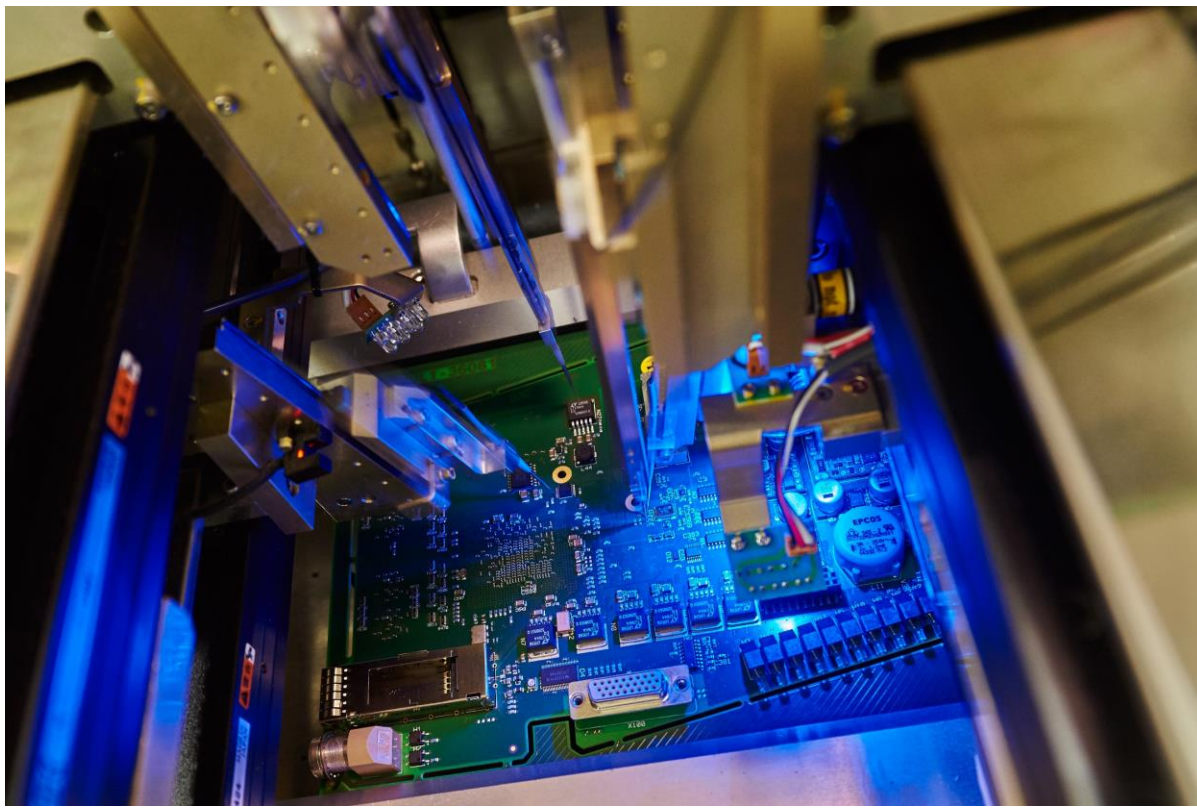
POST-REFLOW 3D AUTOMATIC OPTICAL INSPECTION (AOI)





VOLUME PRODUCTION & TEST

OFFLINE TESTING



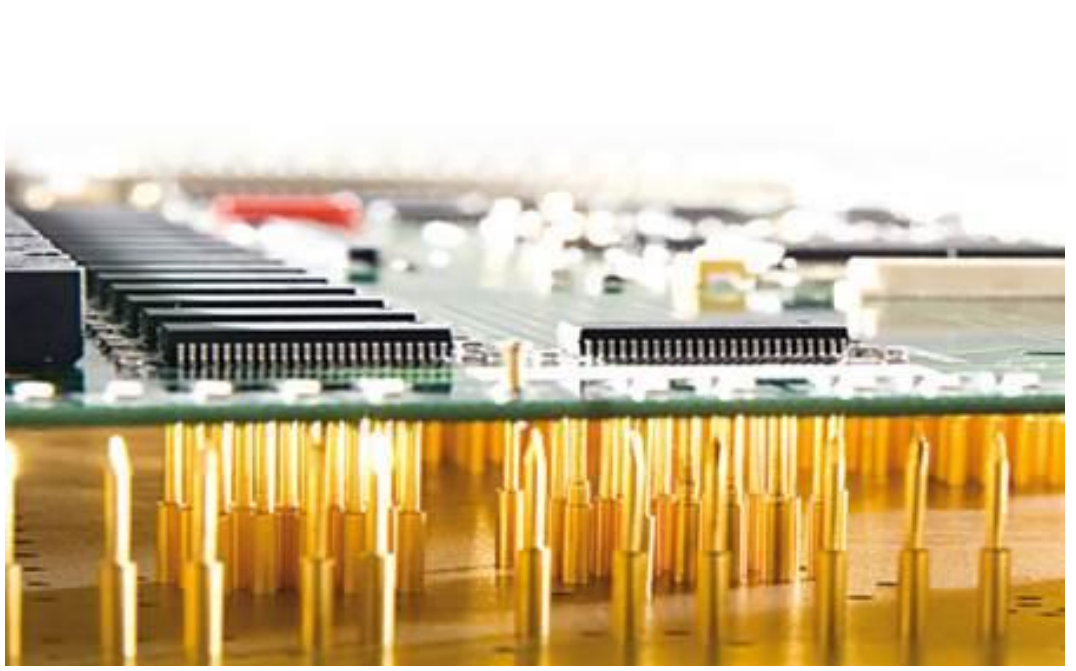
FLYING PROBE TESTER (FP)





VOLUME PRODUCTION & TEST

OFFLINE TESTING

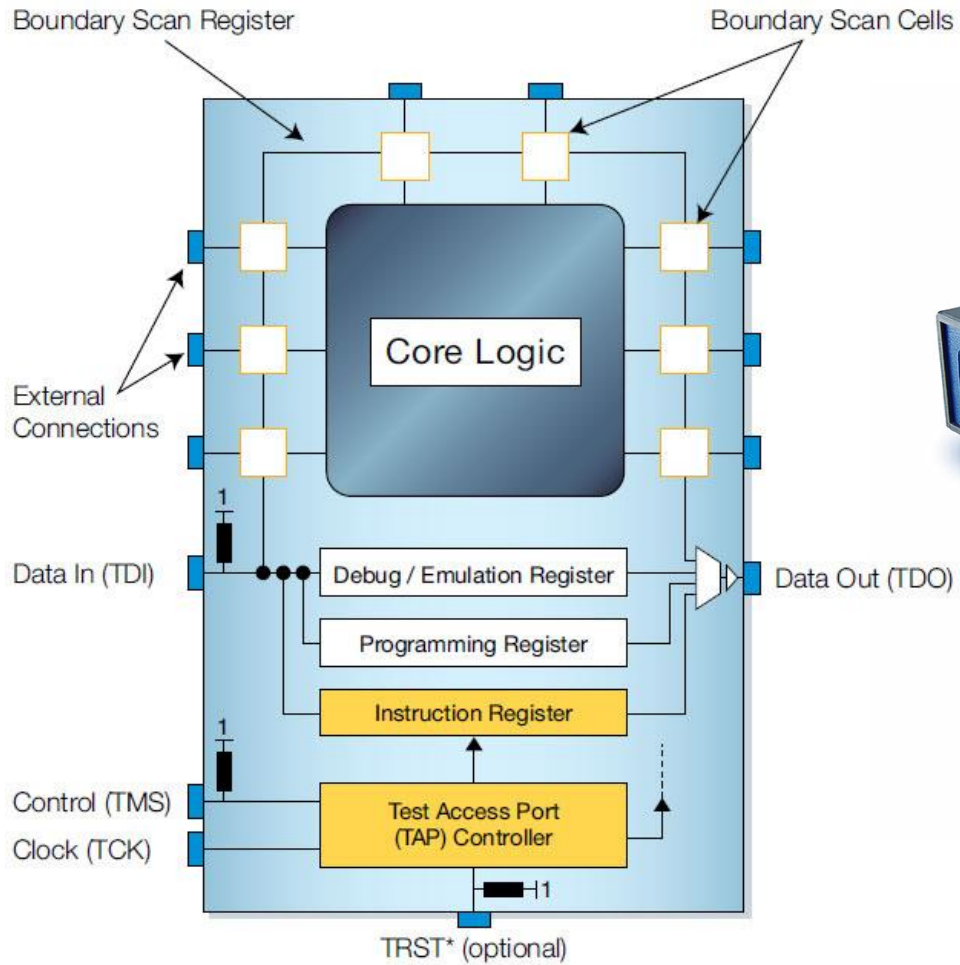


IN-CIRCUIT TESTER (ICT)



VOLUME PRODUCTION & TEST

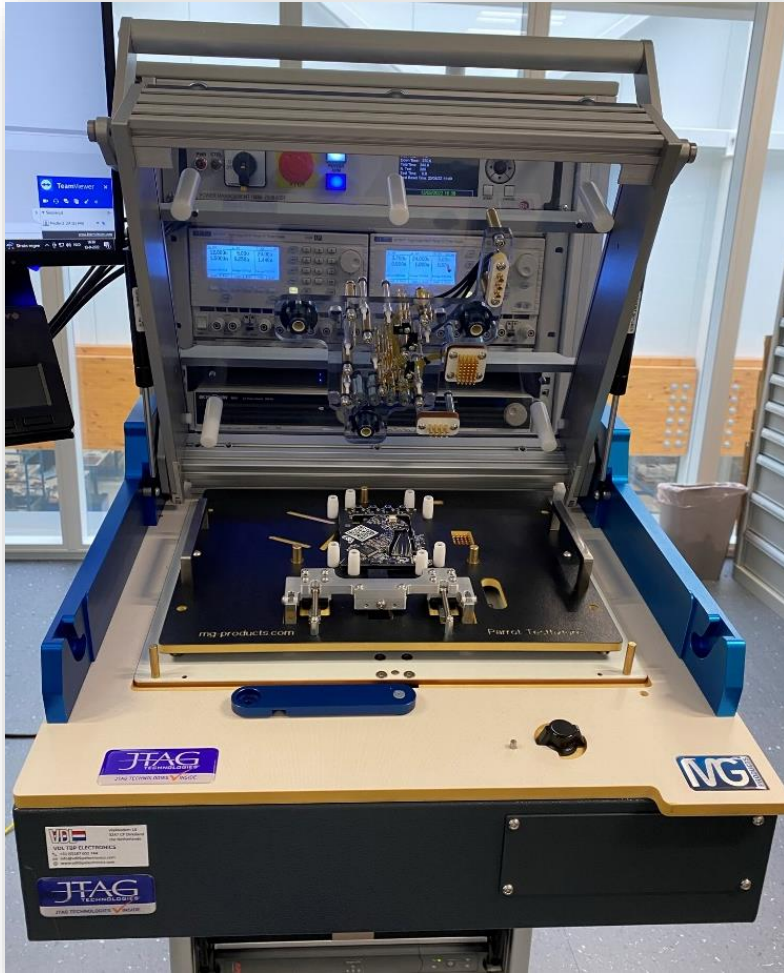
OFFLINE TESTING



BOUNDARY SCANTESTER (BS)

VOLUME PRODUCTION & TEST

OFFLINE TESTING



WOTS parrot



EXTENDED BOUNDARY SCANTESTER (EBS)



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VOLUME PRODUCTION & TEST



TEST LOGGING

Manufacturing Execution System (MES)





VOLUME PRODUCTION & TEST

TEST LOGGING

Manufacturing Execution System (MES)

First Pass Yield (FPY) and amount of rejects control



test data
repair actions
RMA



forced routing
full traceability
process quality control

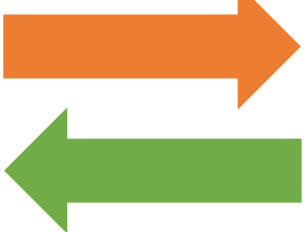


VOLUME PRODUCTION & TEST

TEST LOGGING

early supplier involvement

production yield
test strategy
amount of rejects
production flow



Manufacturing Execution System (MES)

First Pass Yield (FPY) and amount of rejects control



test data
repair actions
RMA



forced routing
full traceability
process quality control



VOLUME PRODUCTION & TEST

Design for Testing (DfT)

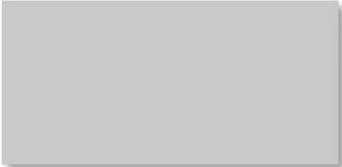
DfX	Production Yield	Applied teststrategy	Slip through	Quality improvement factor (x)	Runtime/brd (min)	NRE costs
No DfX	89%	No test	11,00 %	0,00	0,00	€ -
DfM	93%	No test	7,00 %	1,57	0,00	€ 2.200,00
DfM + DfT	93%	3D AOI	1,58 %	6,96	0,91	€ 4.599,10
DfM + DfT	93%	3D AOI + FP	1,44 %	7,64	6,60	€ 5.688,10
DfM + DfT	93%	3D AOI + FP + BS	0,80 %	13,75	7,58	€ 7.118,10
DfM + DfT	93%	3D AOI + EBS	0,10 %	110,00	2,51	€ 30.154,06
DfM + DfT	93%	3D AOI + FP_S + EBS	0,05 %	157,14	2,96	€ 30.924,06

VOLUME PRODUCTION & TEST

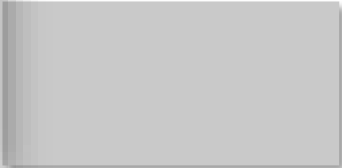
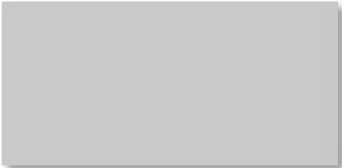
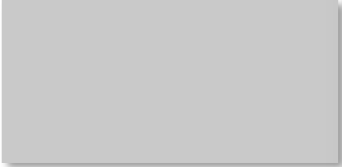
Design for Testing (DfT)

DfX	Production Yield	Applied teststrategy	Slip through	Quality improvement factor (x)	Runtime/brd (min)	NRE costs
No DfX	89%	No test	11,00 %	0,00	0,00	€ -
DfM	93%	No test	7,00 %	1,57	0,00	€ 2.200,00
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DfM + DfT	93%	3D AOI + FP	1,44 %	7,64	6,60	€ 5.688,10
DfM + DfT	93%	3D AOI + FP + BS	0,80 %	13,75	7,58	€ 7.118,10
DfM + DfT	93%	3D AOI + EBS	0,10 %	110,00	2,51	€ 30.154,06
DfM + DfT	93%	3D AOI + FP_S + EBS	0,05 %	157,14	2,96	€ 30.924,06

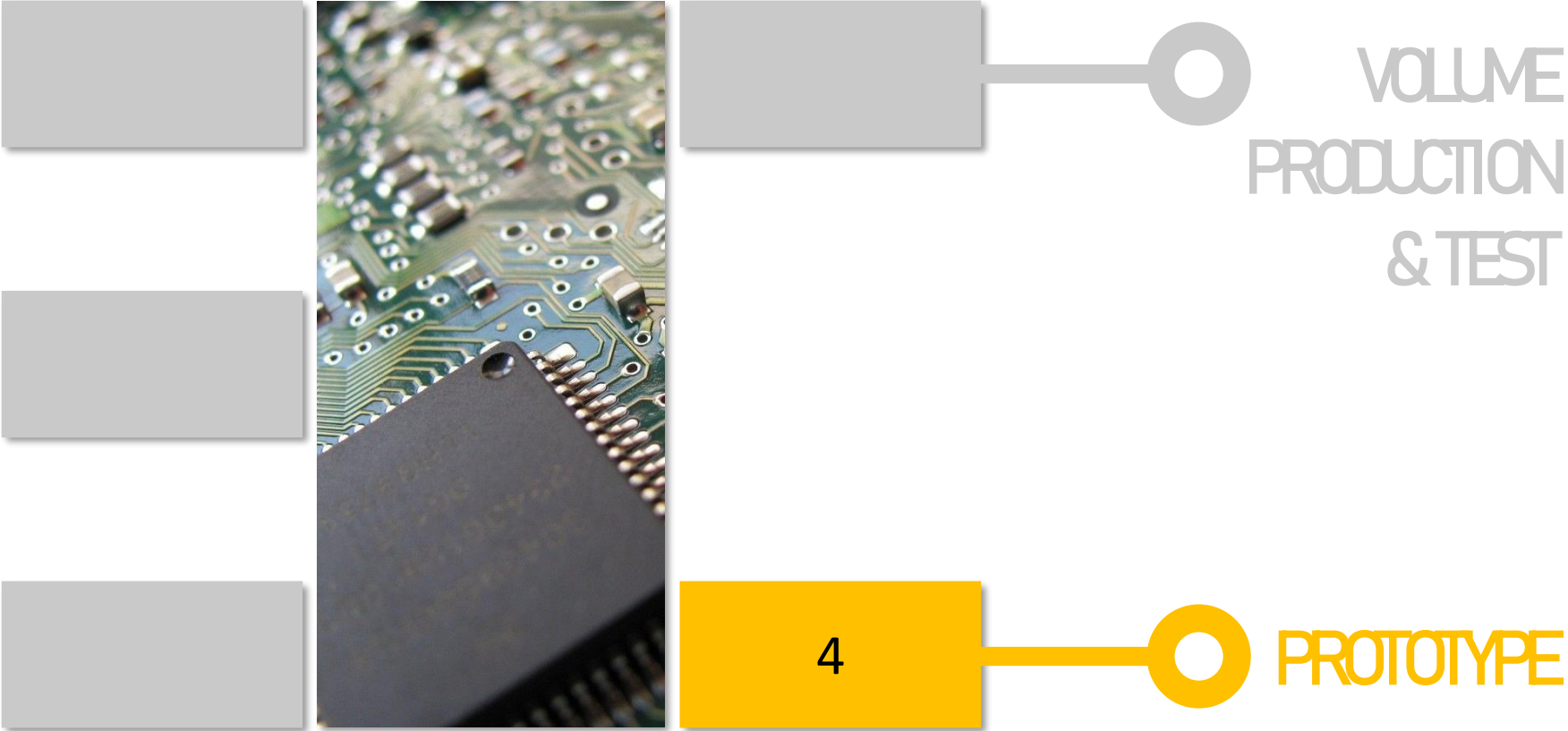
The way to maximised delivery quality



VOLUME
PRODUCTION
& TEST



The way to maximised delivery quality

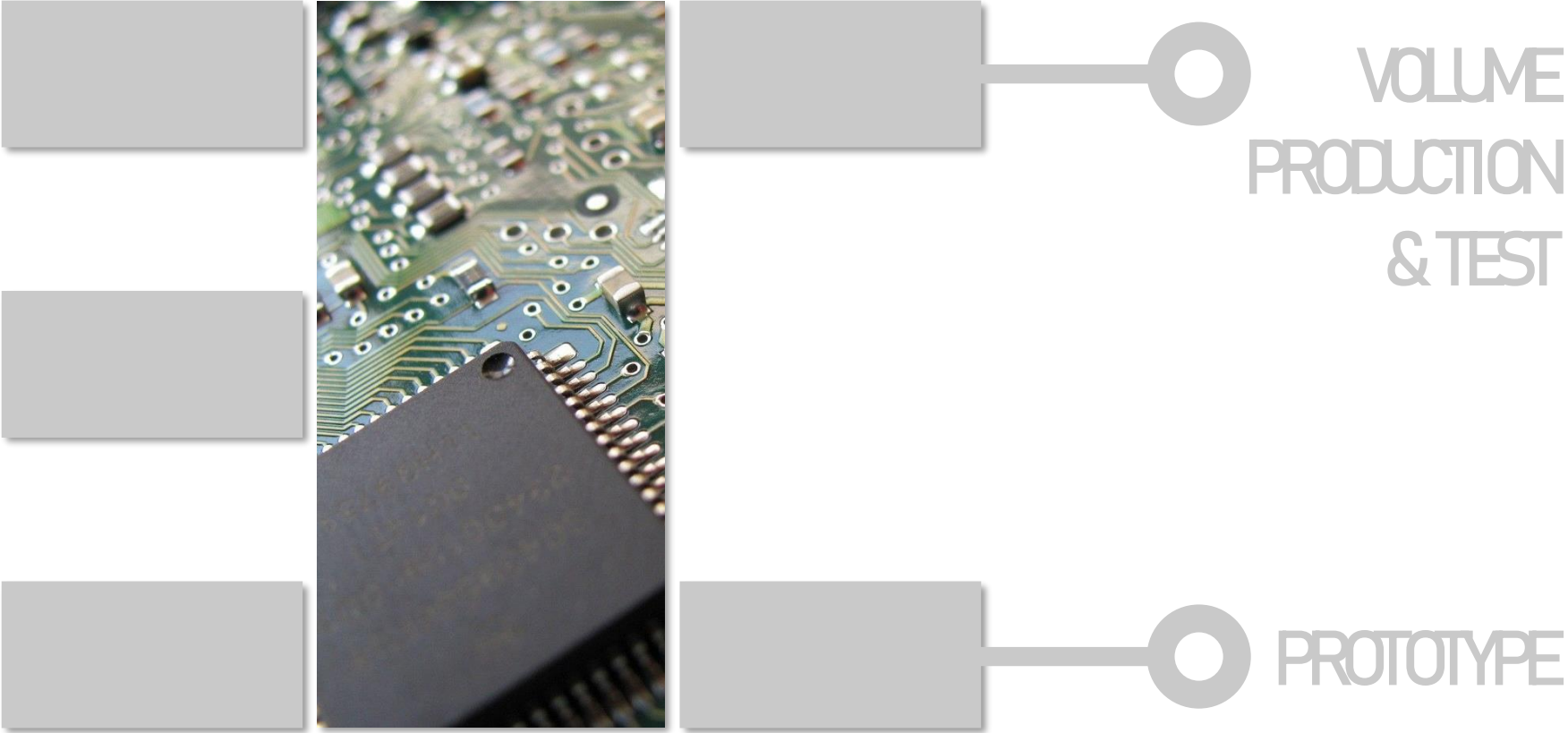


PROTOTYPE

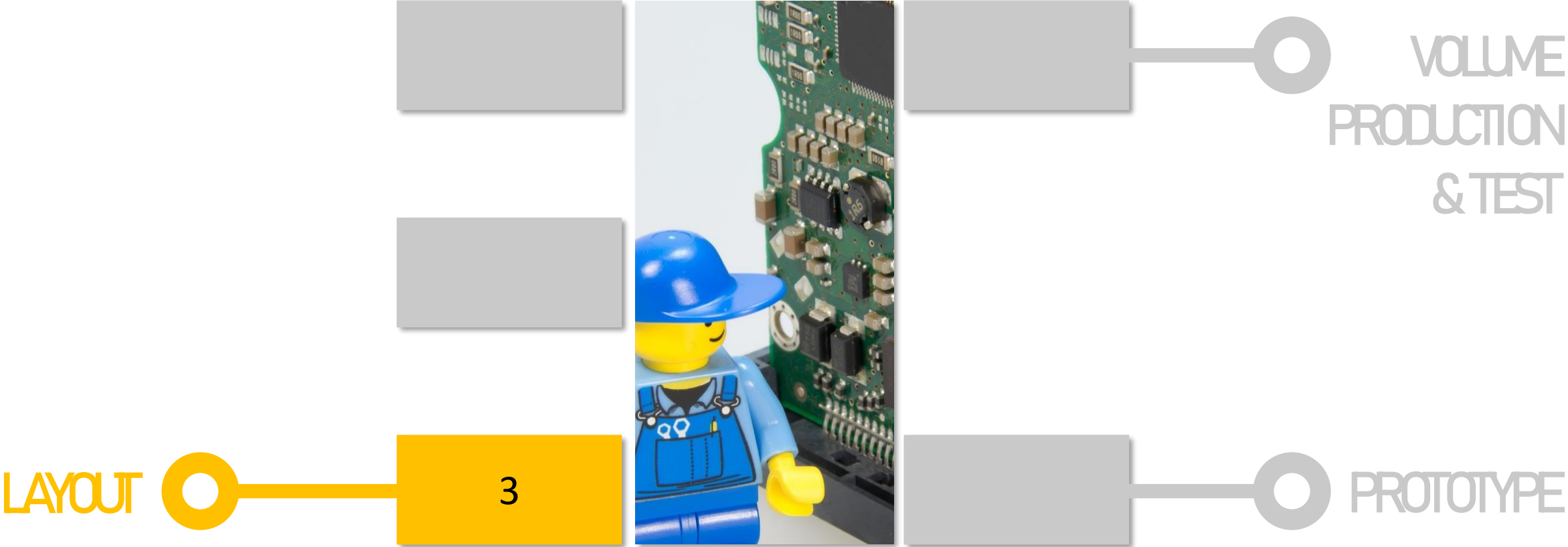
Design for Testing (DfT)

DfX	Production Yield	Applied teststrategy	Slip through	Quality improvement factor (x)	Runtime/brd (min)	NRE costs
No DfX	89%	No test	11,00 %	0,00	0,00	€ -
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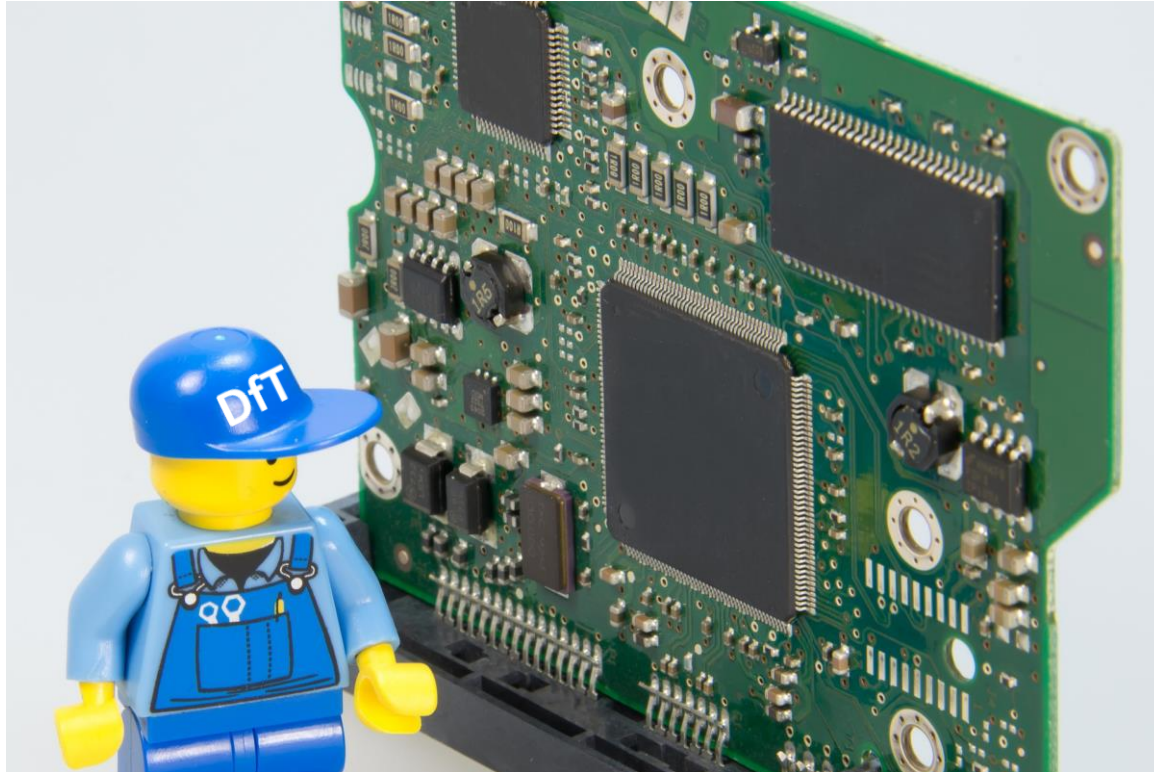
The way to maximised delivery quality



The way to maximised delivery quality



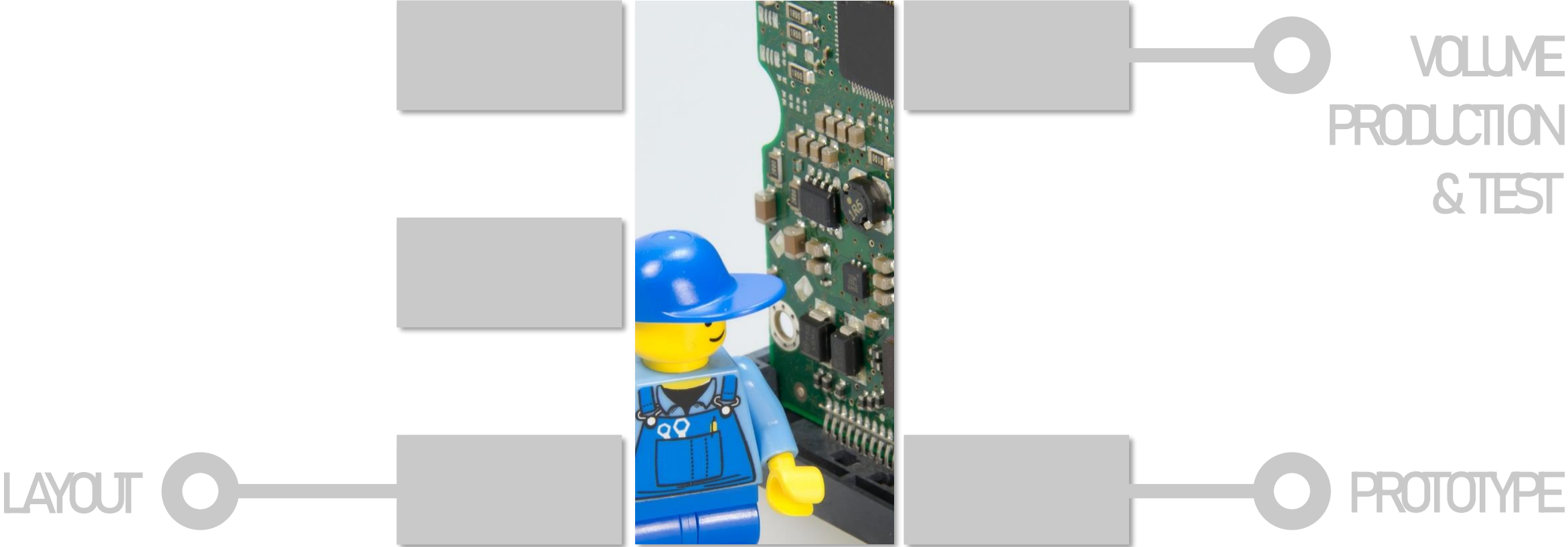
LAYOUT



Design for Testing (DfT):

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

The way to maximised delivery quality



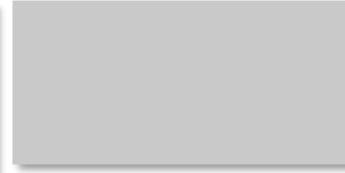
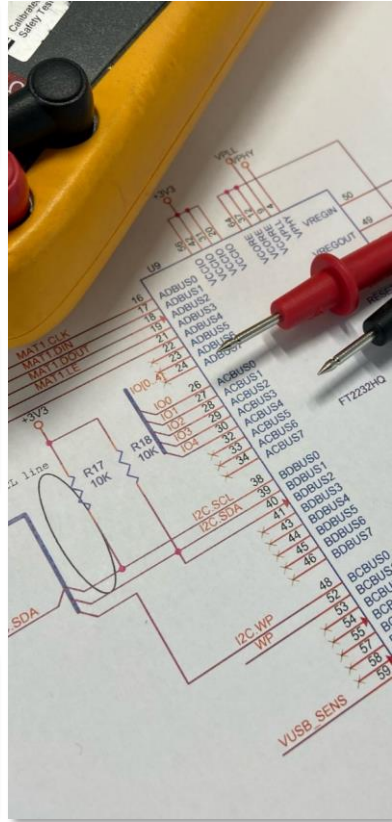
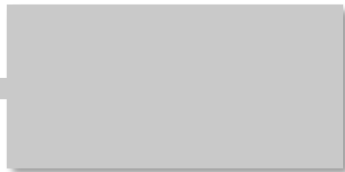
The way to maximised delivery quality

BOM &
SCHEMATICS

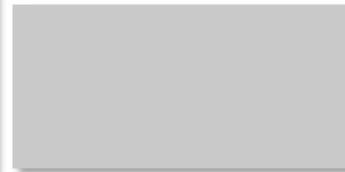


2

LAYOUT



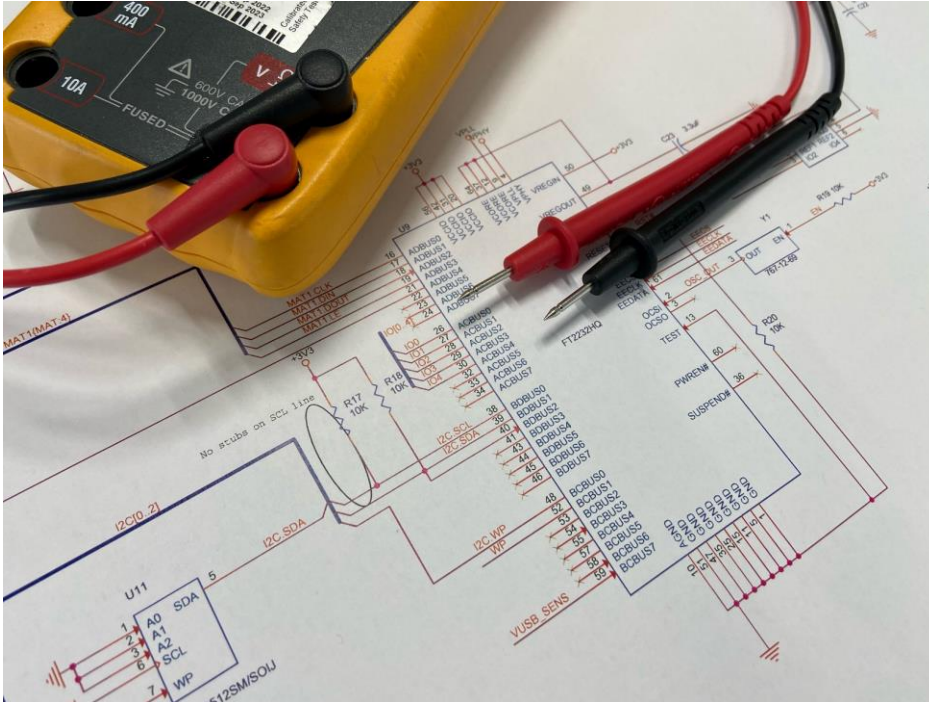
VOLUME
PRODUCTION
& TEST



PROTOTYPE



SCHEMATICS & BOM



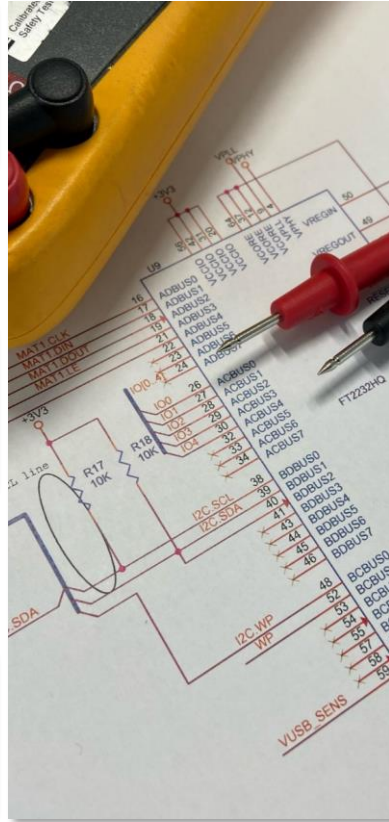
Design for Testing (DfT):

- List with required test points
- Test access recommendations
- Preliminary testcoverage
- Preliminary teststrategy
- Preliminary delivery quality

The way to maximised delivery quality

BOM &
SCHEMATICS

LAYOUT



VOLUME
PRODUCTION
& TEST

PROTOTYPE

The way to maximised delivery quality

BOM
KEY
COMPONENTS



VOLUME
PRODUCTION
& TEST

BOM &
SCHEMATICS



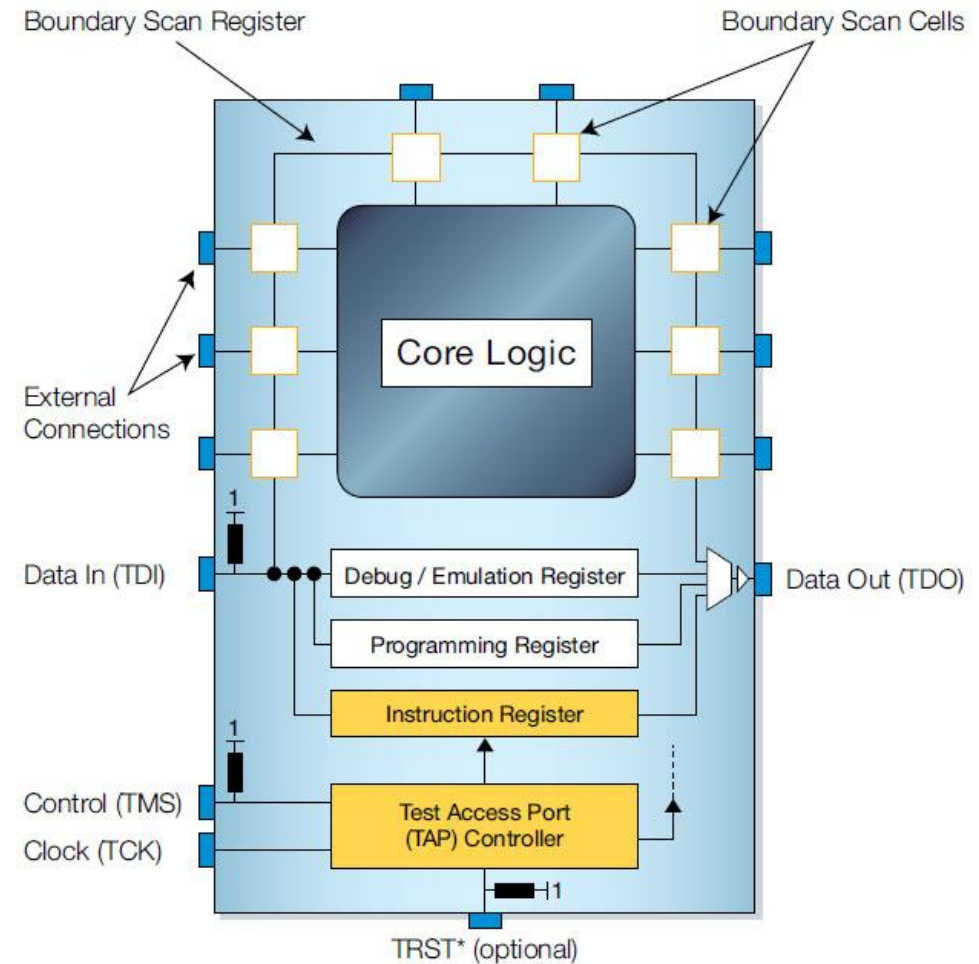
LAYOUT



PROTOTYPE

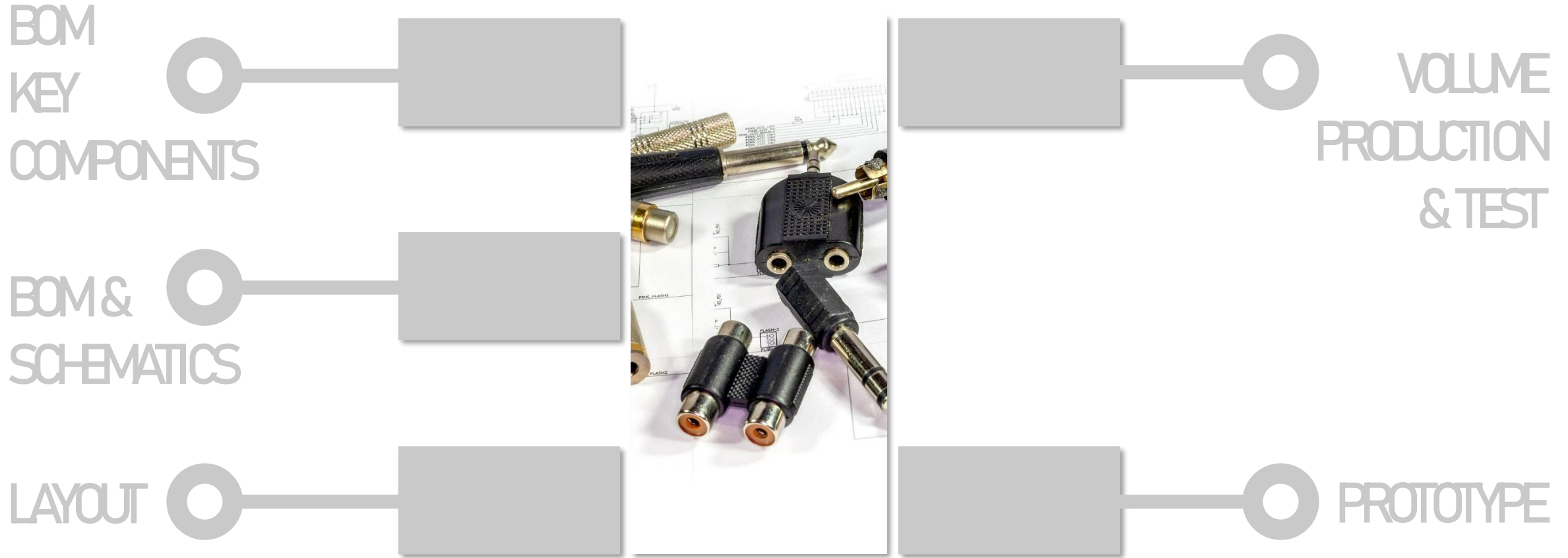
BOM KEY COMPONENTS

Choose key components which are IEEE1149.1 compatible (boundary scan)

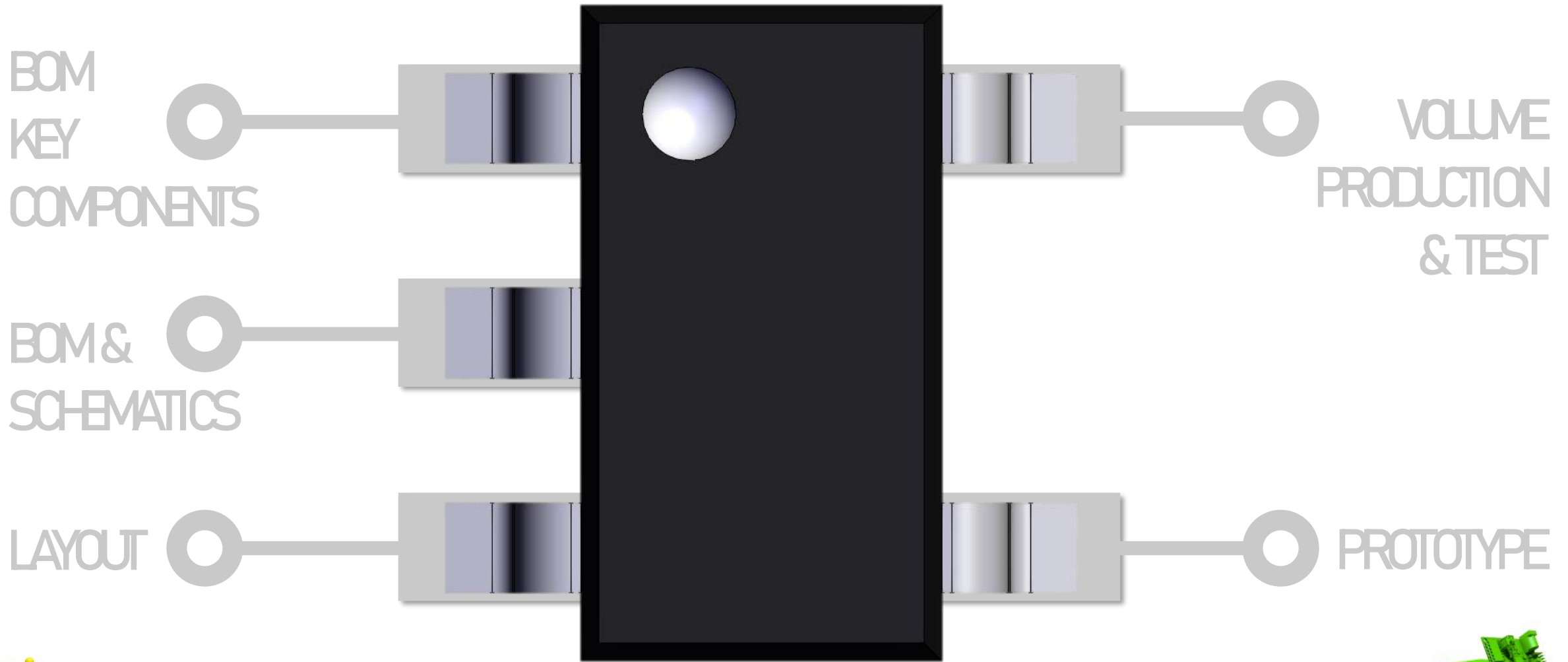


Design for Testing - DfT

The way to maximised delivery quality

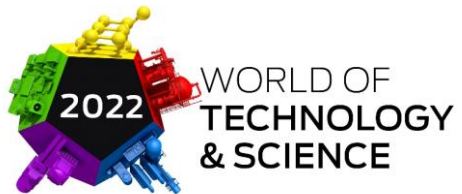
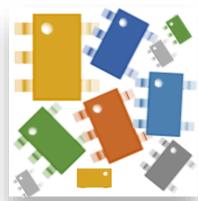


The way to maximised delivery quality



*focus on cost
drives out quality*

*focus on quality
drives out cost*



Contact information hall 9, booth C084



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Electronics Test Development

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