



Testing At The Right Time

Tommaso De Vivo

VP Business Development EMEA

Tips for:

Thinking about testing early in development

Effective production test

Saving money



XJTAG Boundary Scan
Boosts Speed and Efficiency
in High-Tech R&D

Mr. Nurettin Yilmaz
Electronics System Engineering Team Leader

aselsan

XJTAG Boundary Scan
Delivers High ROI for
Turkish Technology
Innovator

Oğuz Şen
Electronics Test Design Engineer

ARM

ARM selects XJTAG for
RealView development tools
debug and test

Spencer Saunders
Engineering Manager, Platforms, Development
Systems



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 **CAF**
Power &
Automation

Railway systems innovator
maximises value with XJTAG
boundary scan

Javier Gordo

Manufacturing Manager



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Curtiss-Wright selects
XJTAG to debug and test
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Alan McCormick

Managing Director, Video and Graphics Group



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XJTAG boundary scan
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Segio Navacerrada Castaño
Technology and Product Management



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KONGSBERG

Satellite ground systems
meet sky-high targets with
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Øyvind Undstad

Electronic Engineer



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Defence innovator increases
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THALES

Thales UK selects XJTAG for software radios

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SPEA and XJTAG combine
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Türkiye & Middle East



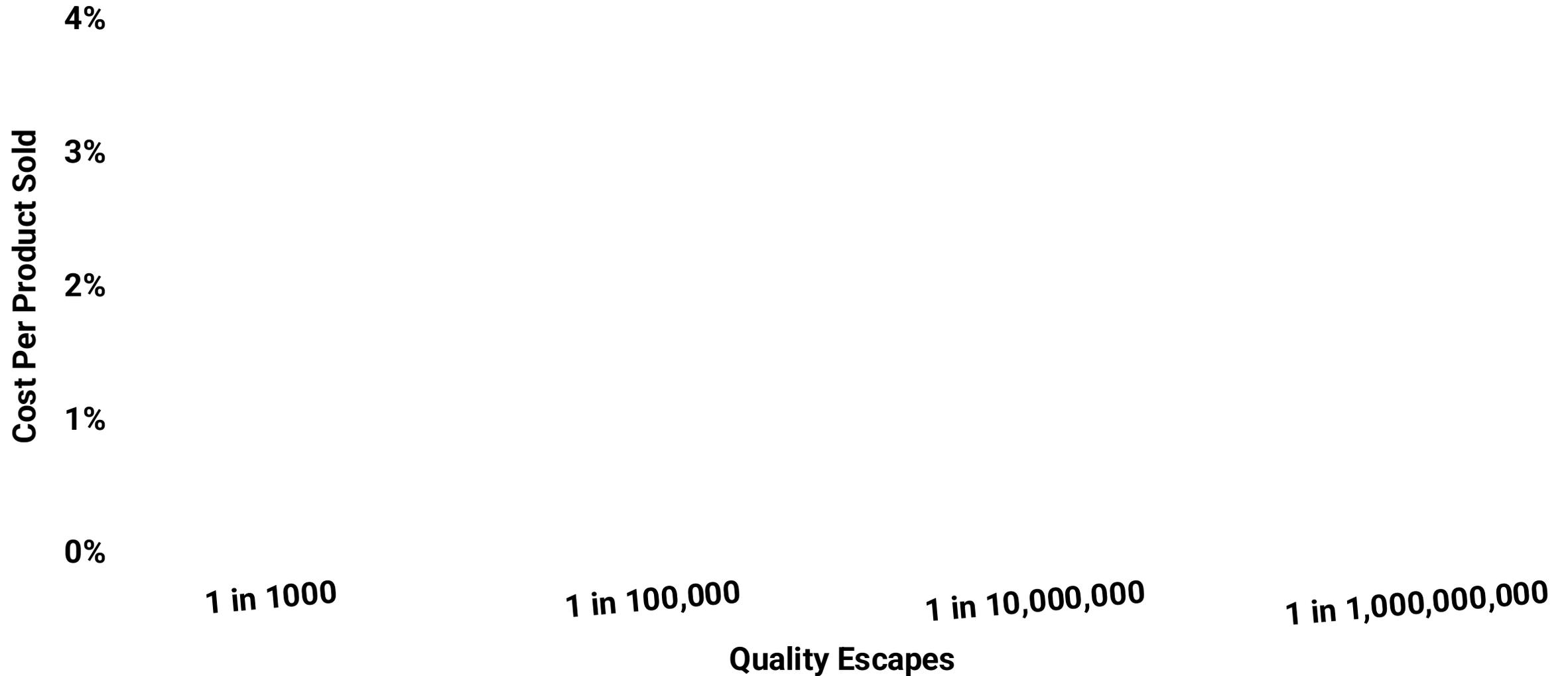
XJTAG Distributor

CDT

Türkiye & Middle East

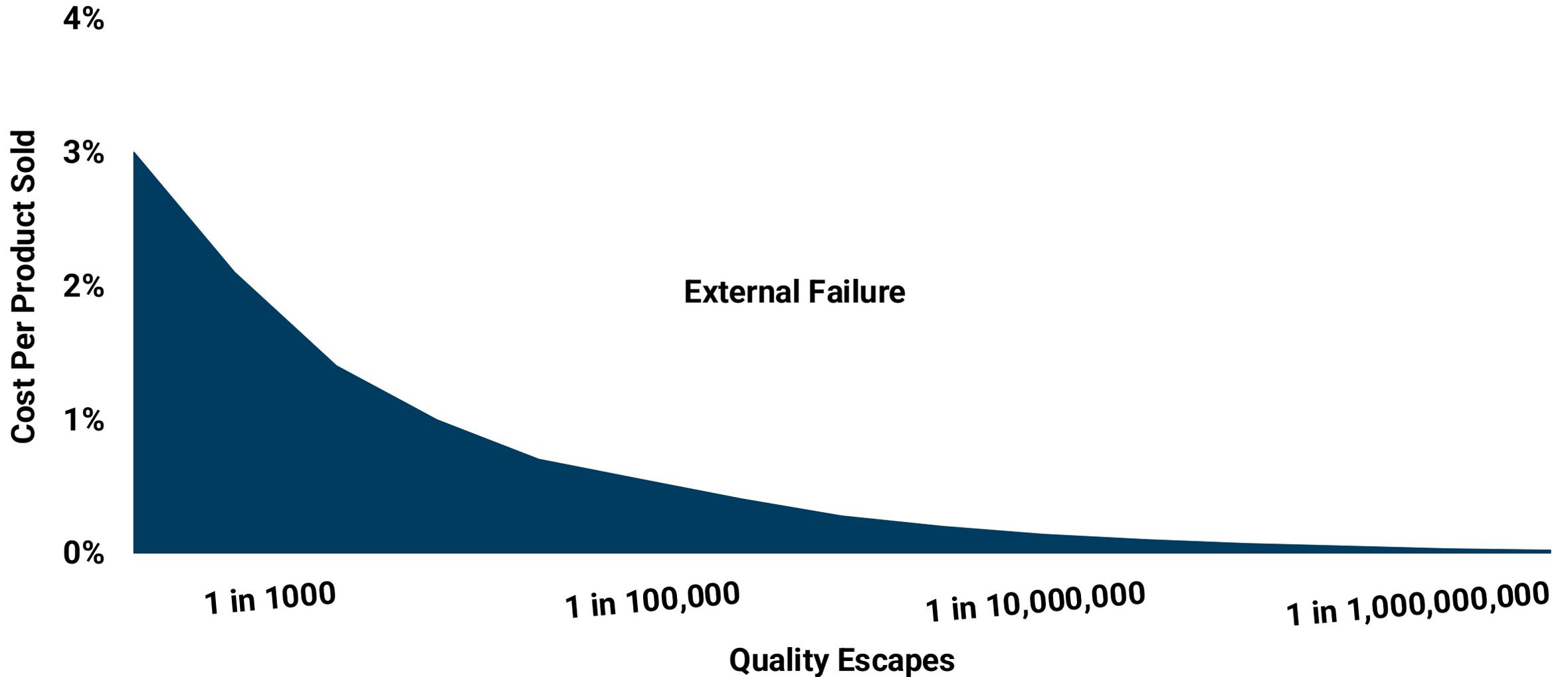


The Cost of Quality



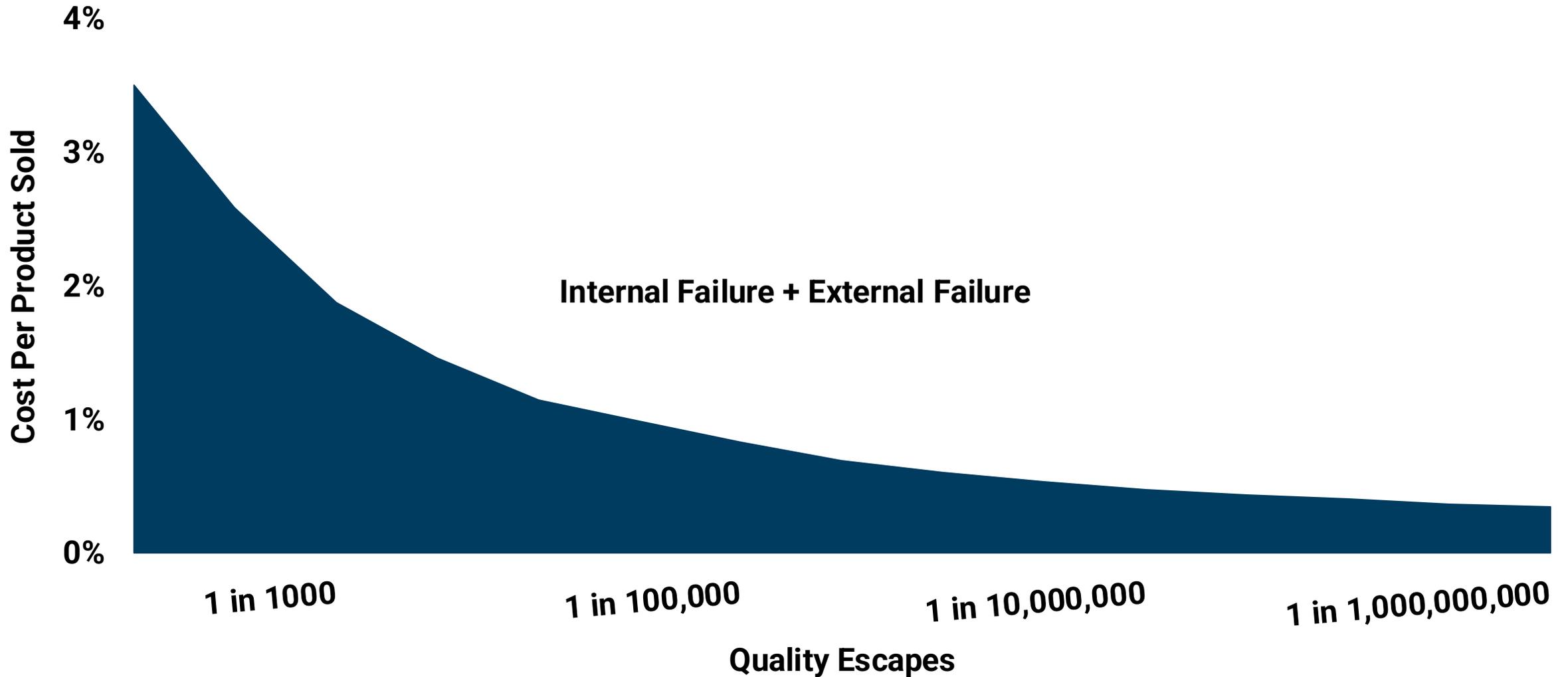


The Cost of Quality



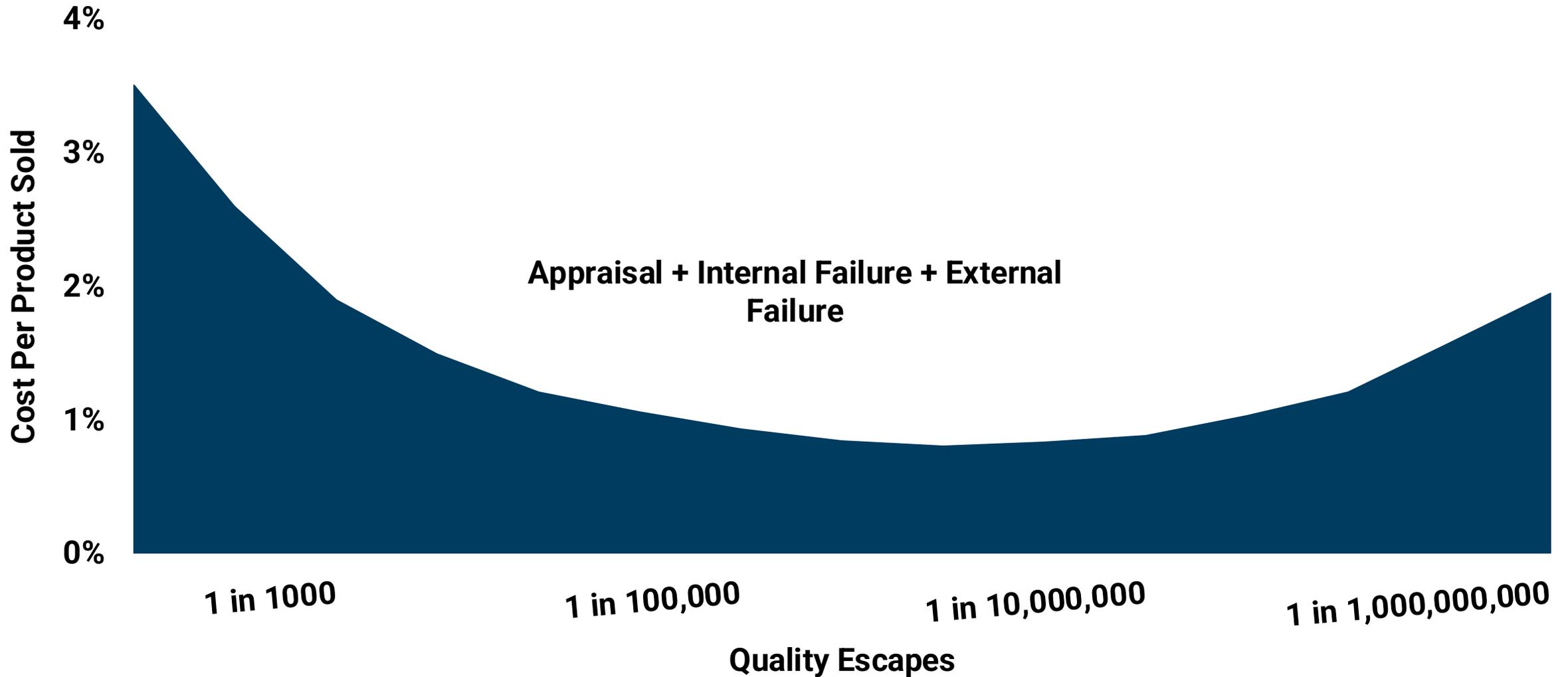


The Cost of Quality



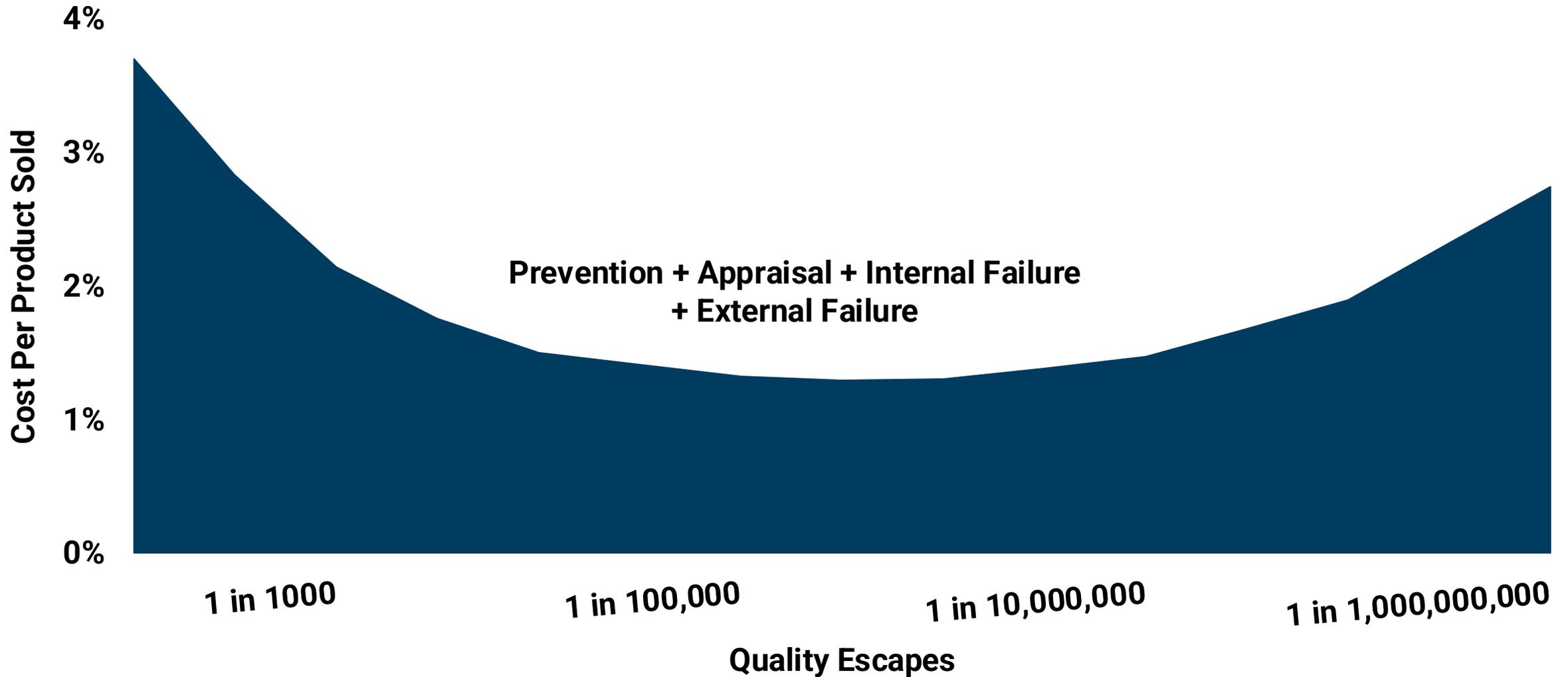


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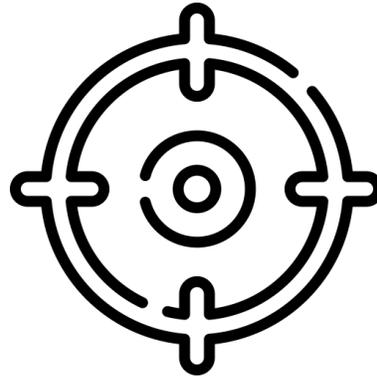
What Is A Quality Escape?

Representative



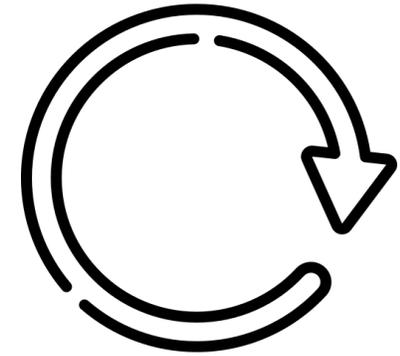
**Product escaped
because the test did not
test the right thing**

True



**Product escaped
because the test did not
give the correct result**

Consistent

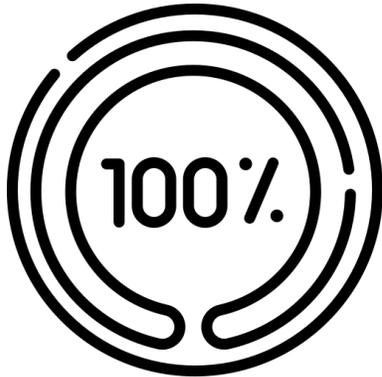


**Product escaped
because the test did not
assess the true state of
the product**



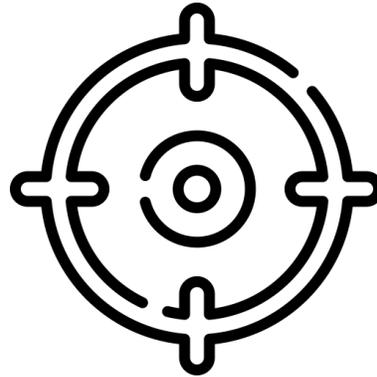
What Is Good Testing?

Test Coverage



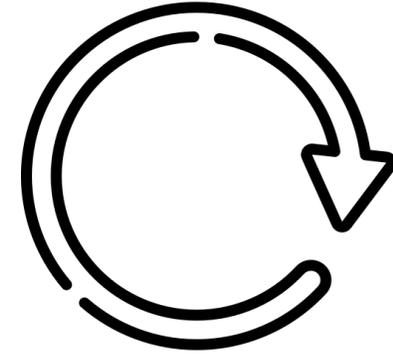
**Use cases and
reasonably foreseeable
misuse**

Test Recall

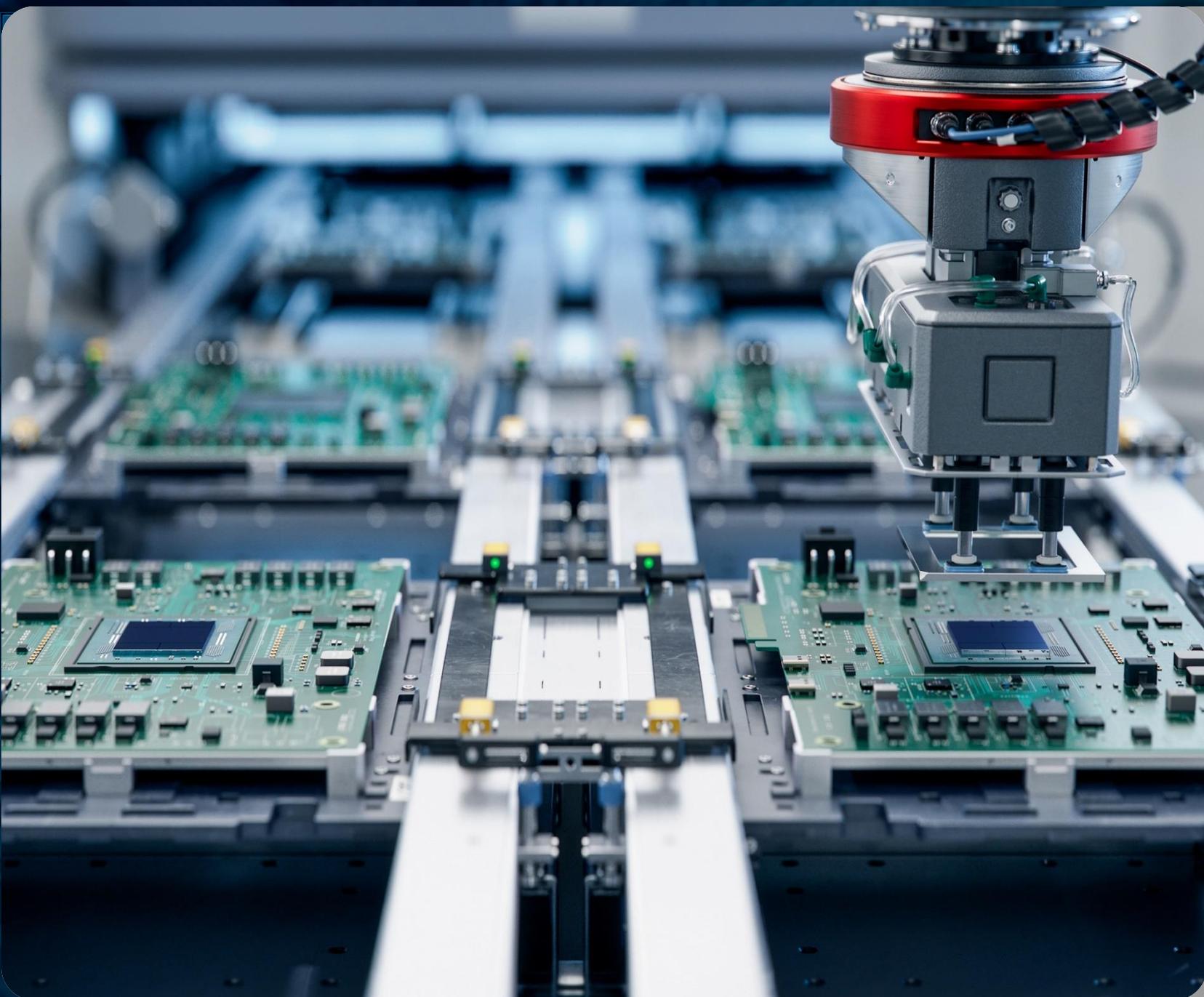


**True positives as a
proportion of all positive
results**

Test Repeatability



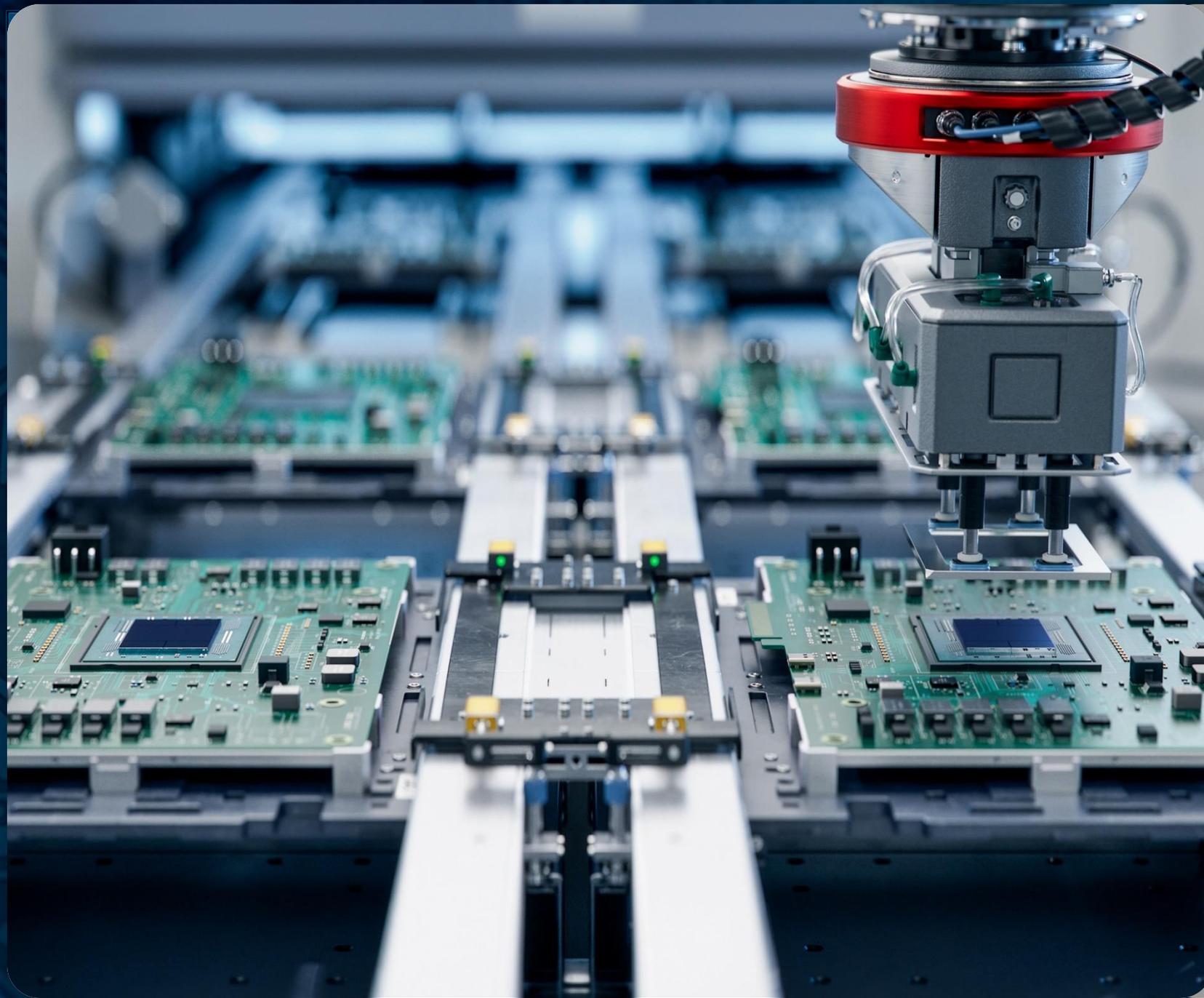
**Intermittent, developing
or condition-based
problems**



The easy answer to a new quality problem is a new test

The easy way to implement a test is at the end of the line

This quickly impacts cycle time (Takt time) and adds cost



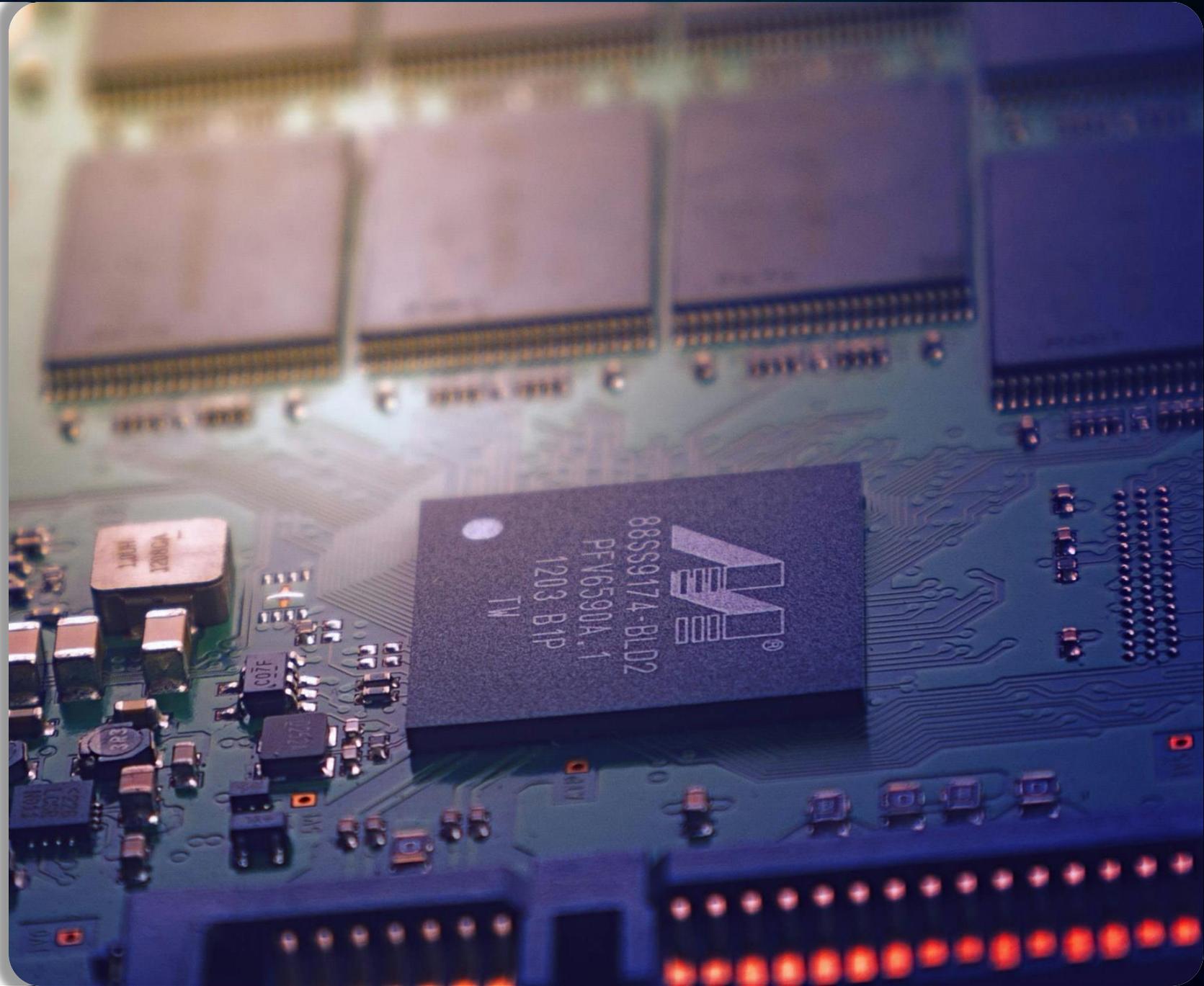
Does your test significantly reduce the risk of your customer getting bad product?

Can you reduce the same risk more effectively in another way?

**Introducing new tests
introduces new test
failures**

**This means either more
rework or more waste**

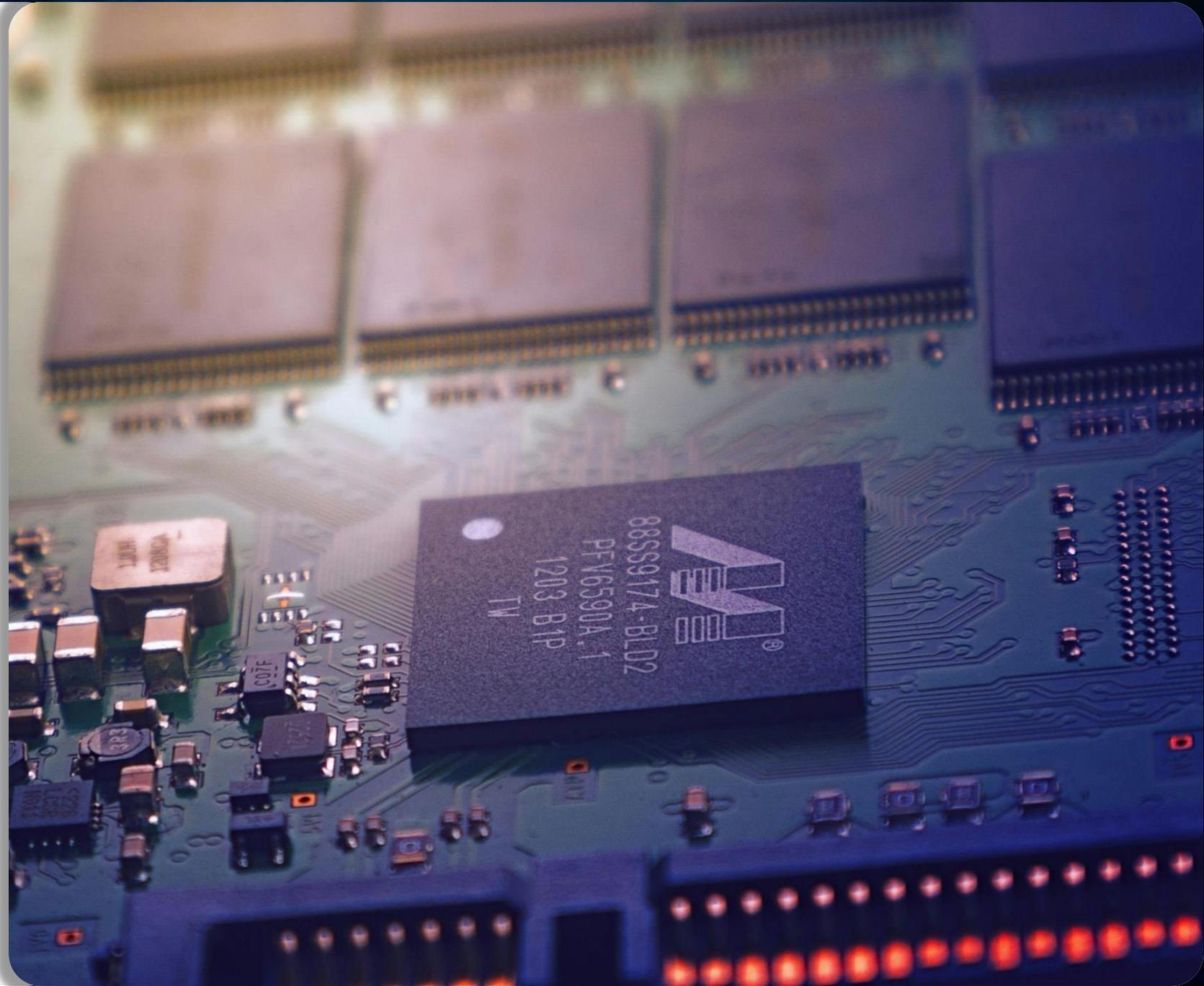
**More testing and more
rework means more
Work-In-Progress (WIP)**

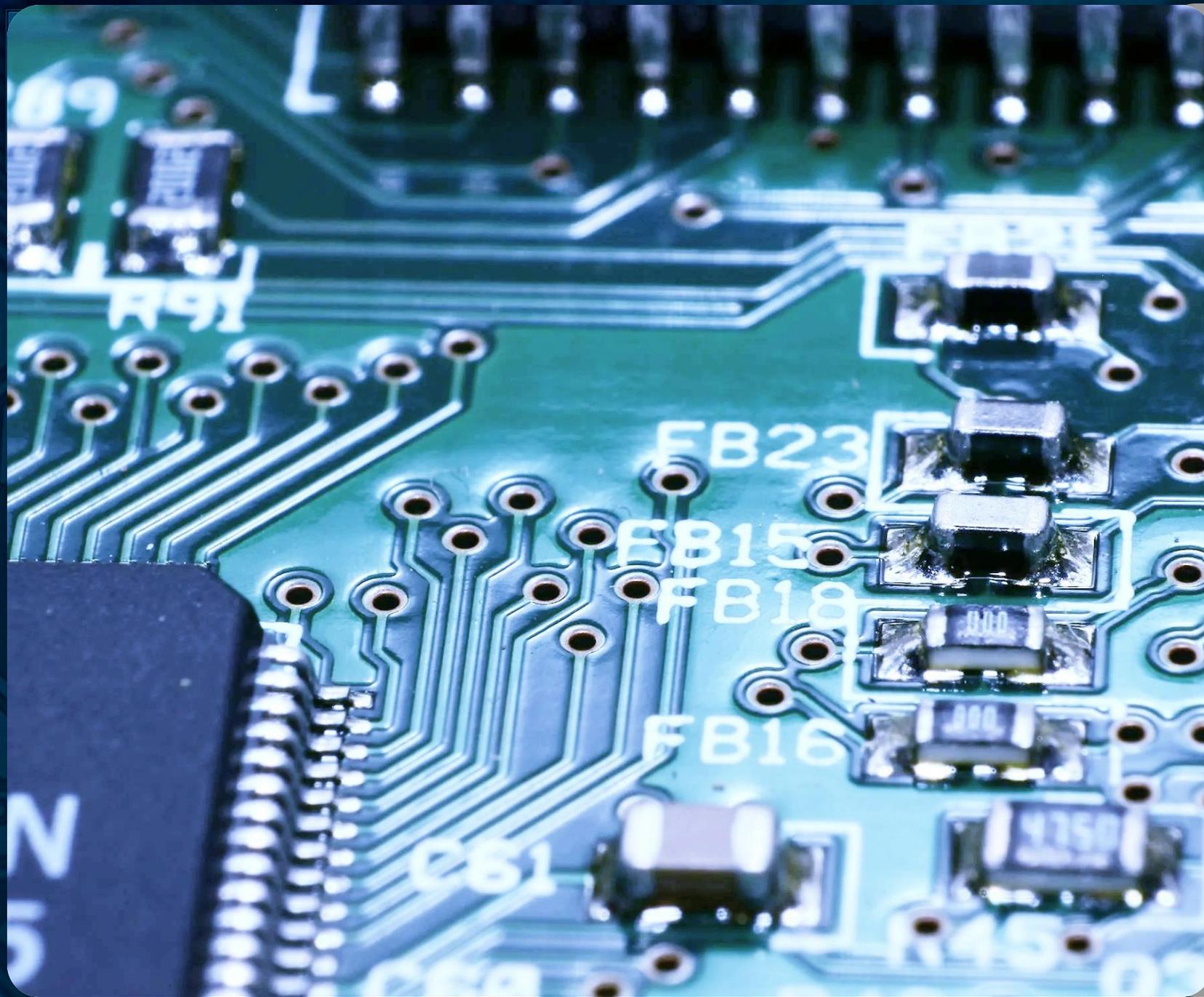


The value added between testing steps should be the same order of magnitude as:

The cost of rework

The cost of replacement up to that point



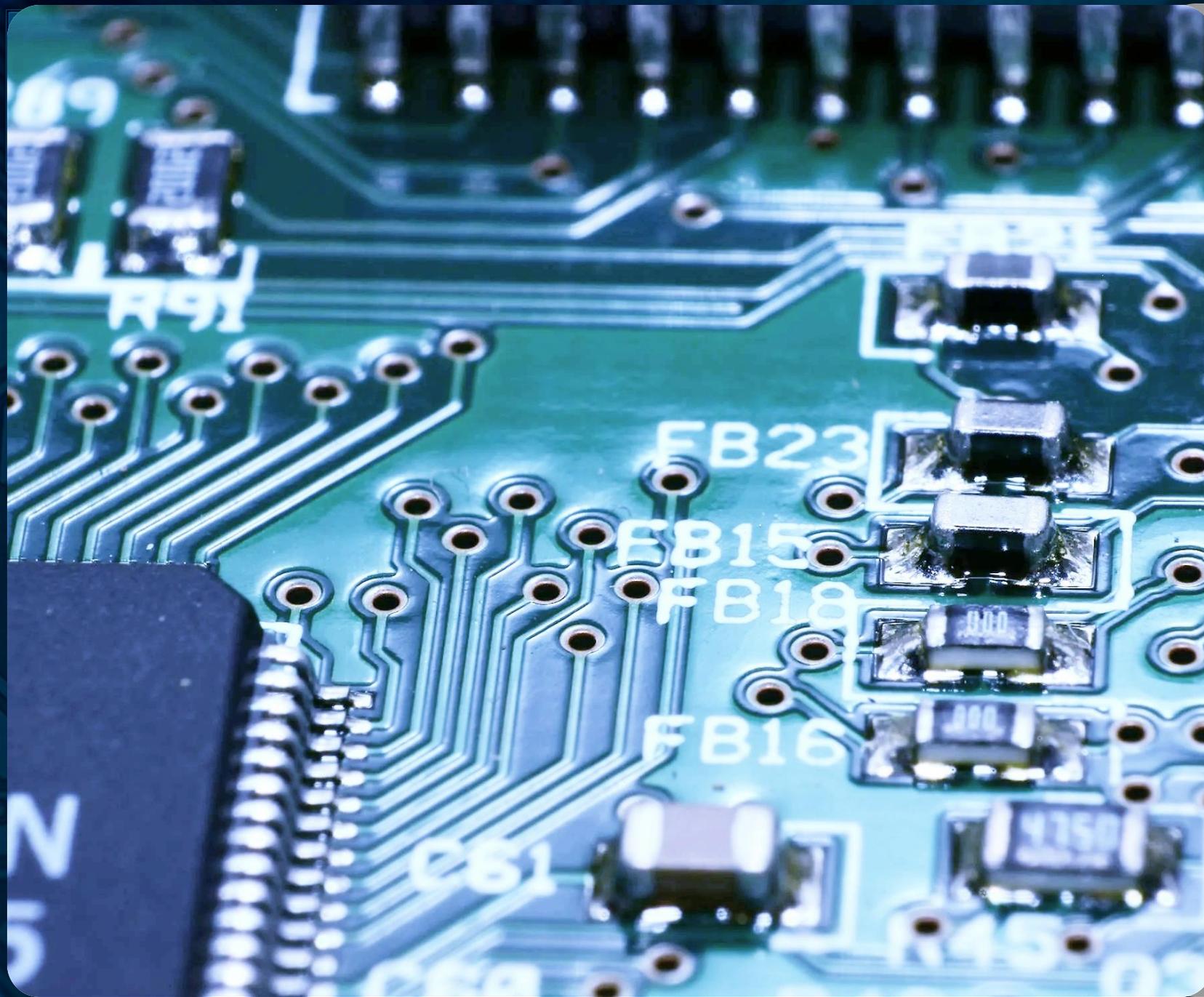


**Work In Progress grows
as more testing is
implemented**

Product awaiting rework

**Reworked product
awaiting re-entry**

Product help in buffer



Are you acting on test results with rework or corrective action fast?

Are you continually re-evaluating that you are not rejecting good product?

Seek And You Shall Find

Every time you test, you might find something you didn't want to

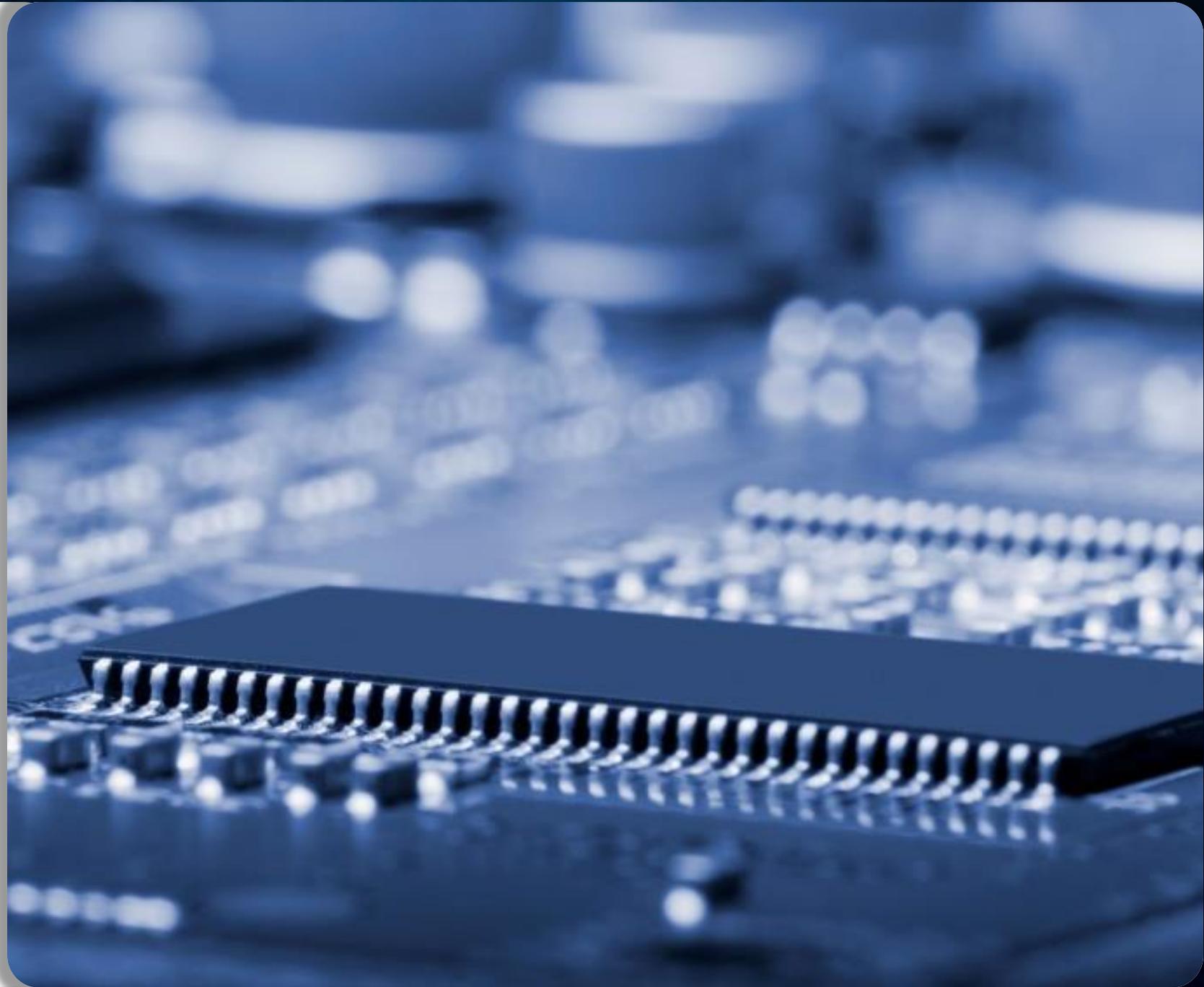


- **Inappropriate testing**
- **Inaccurate testing**
- **Destructive testing**

**Every test implemented
adds time and cost**

**Tests should be
implemented as early as
possible in the
production line**

**Tests should be
designed by the people
who understand how the
product is likely to fail**

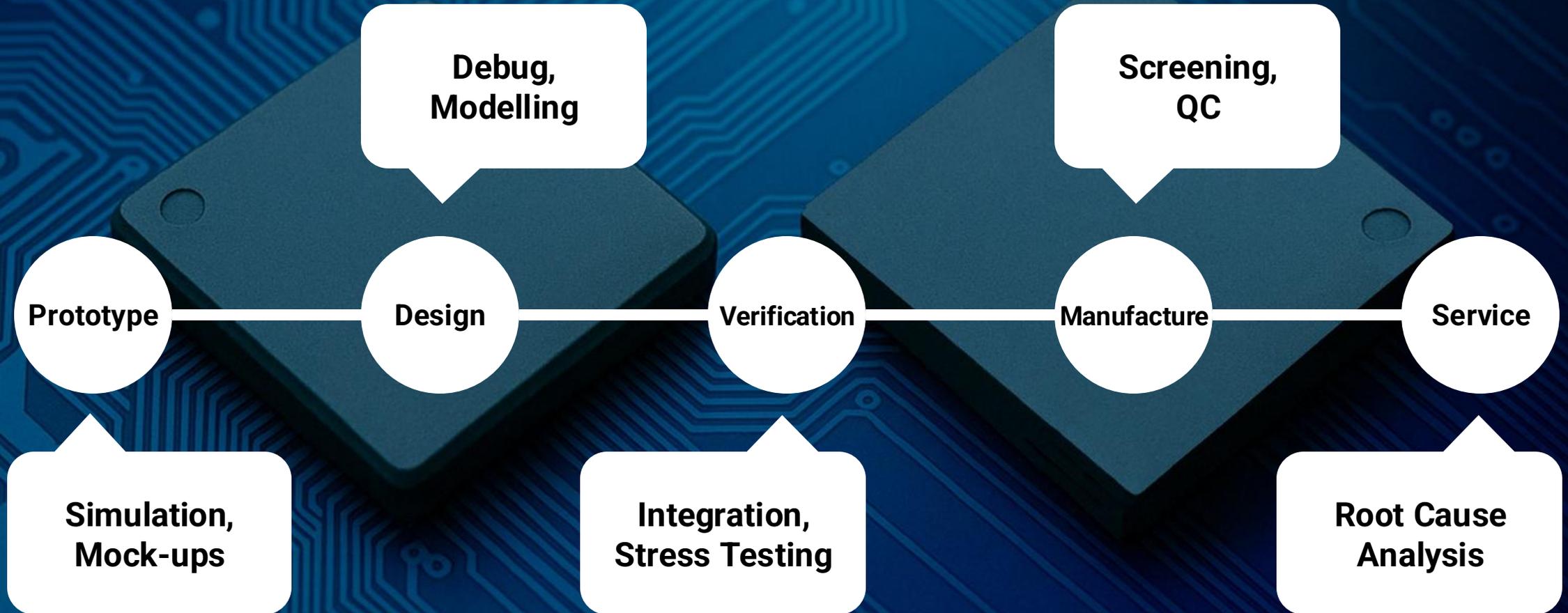


Shift-Left Testing Is Nothing New



It's Called Design For Test

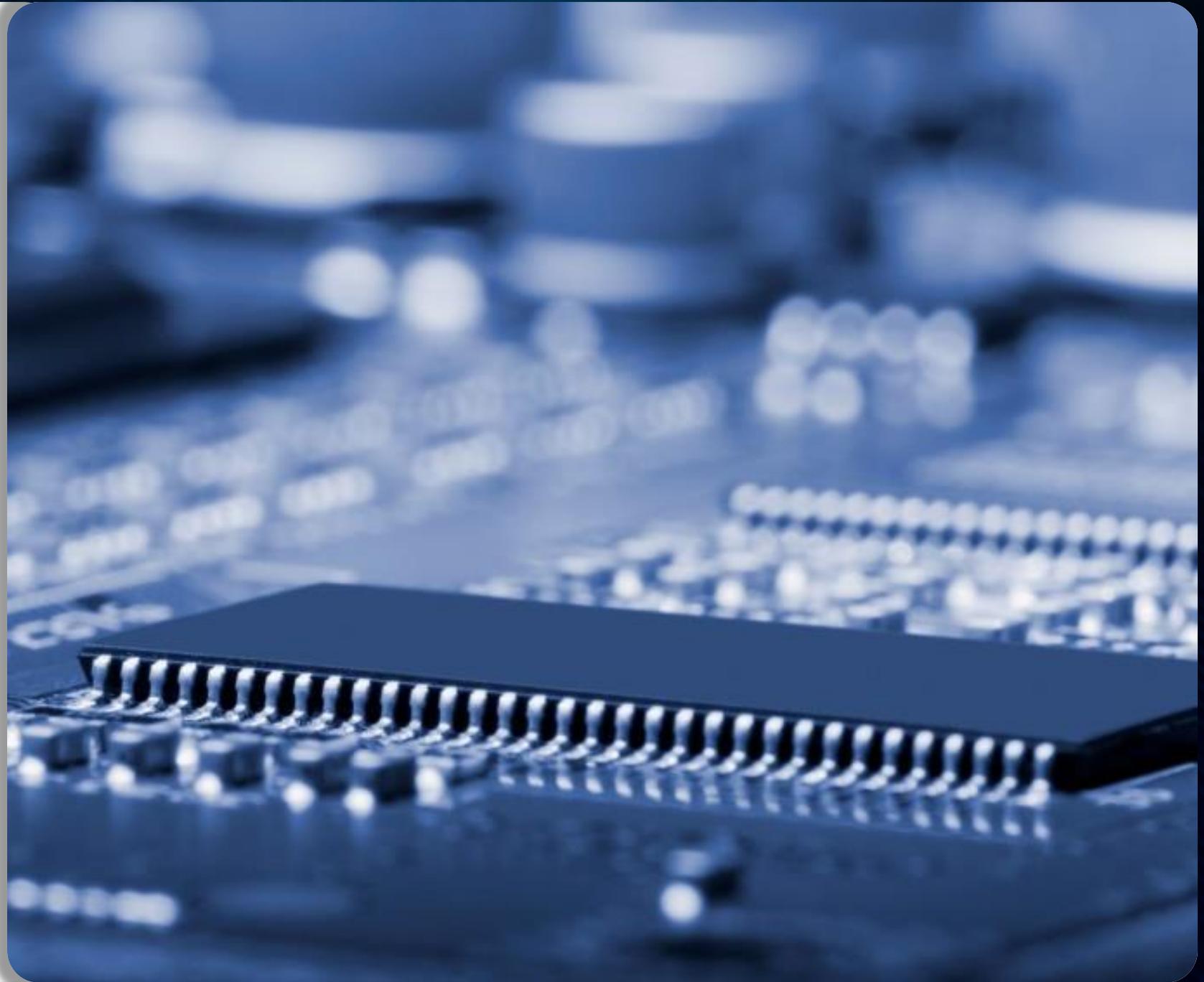
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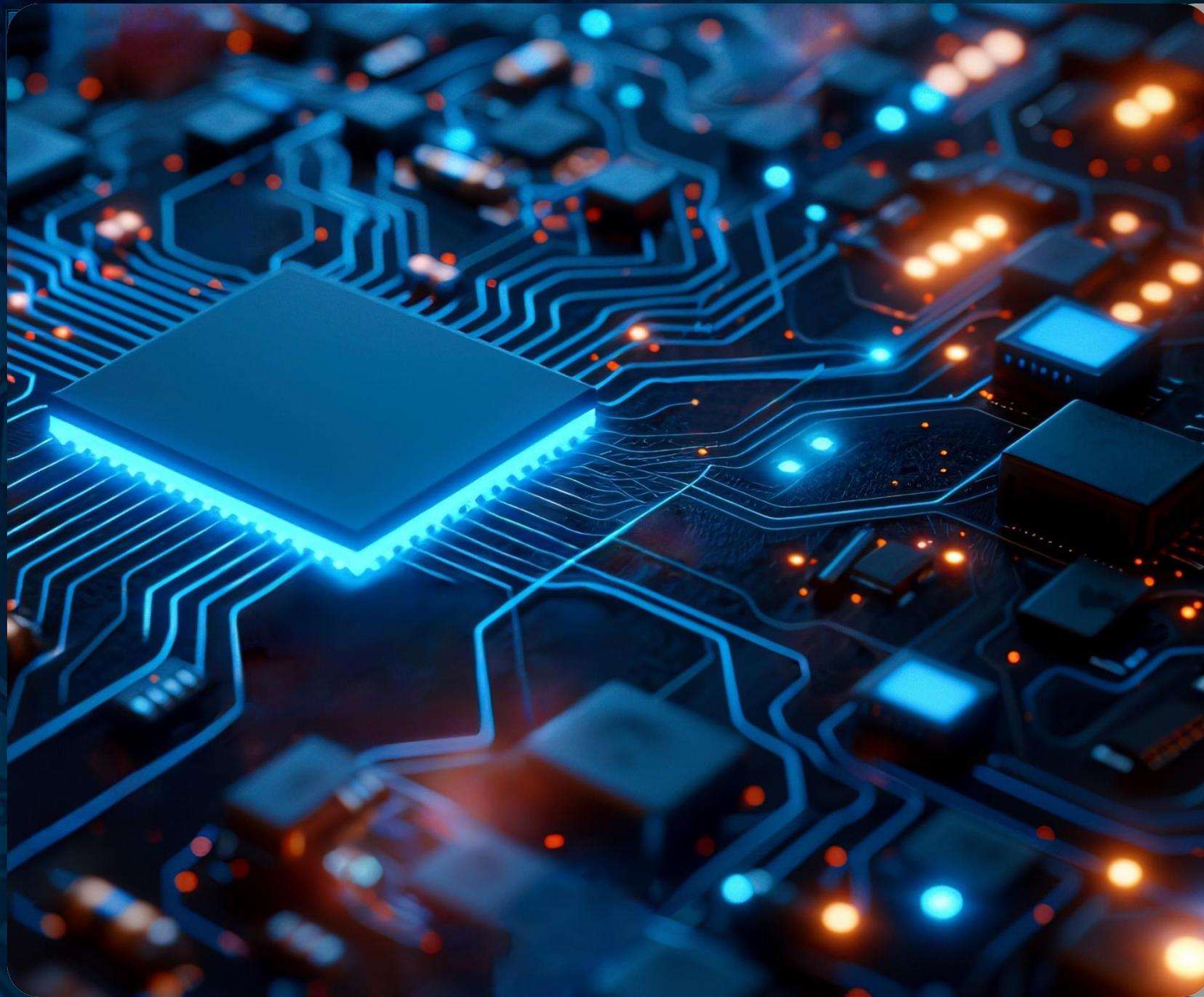


It's Called Design For Test

**Does your testing
method work through the
whole product
development lifecycle?**

**Do the people who can
reduce the cost of quality
also feel that cost?**

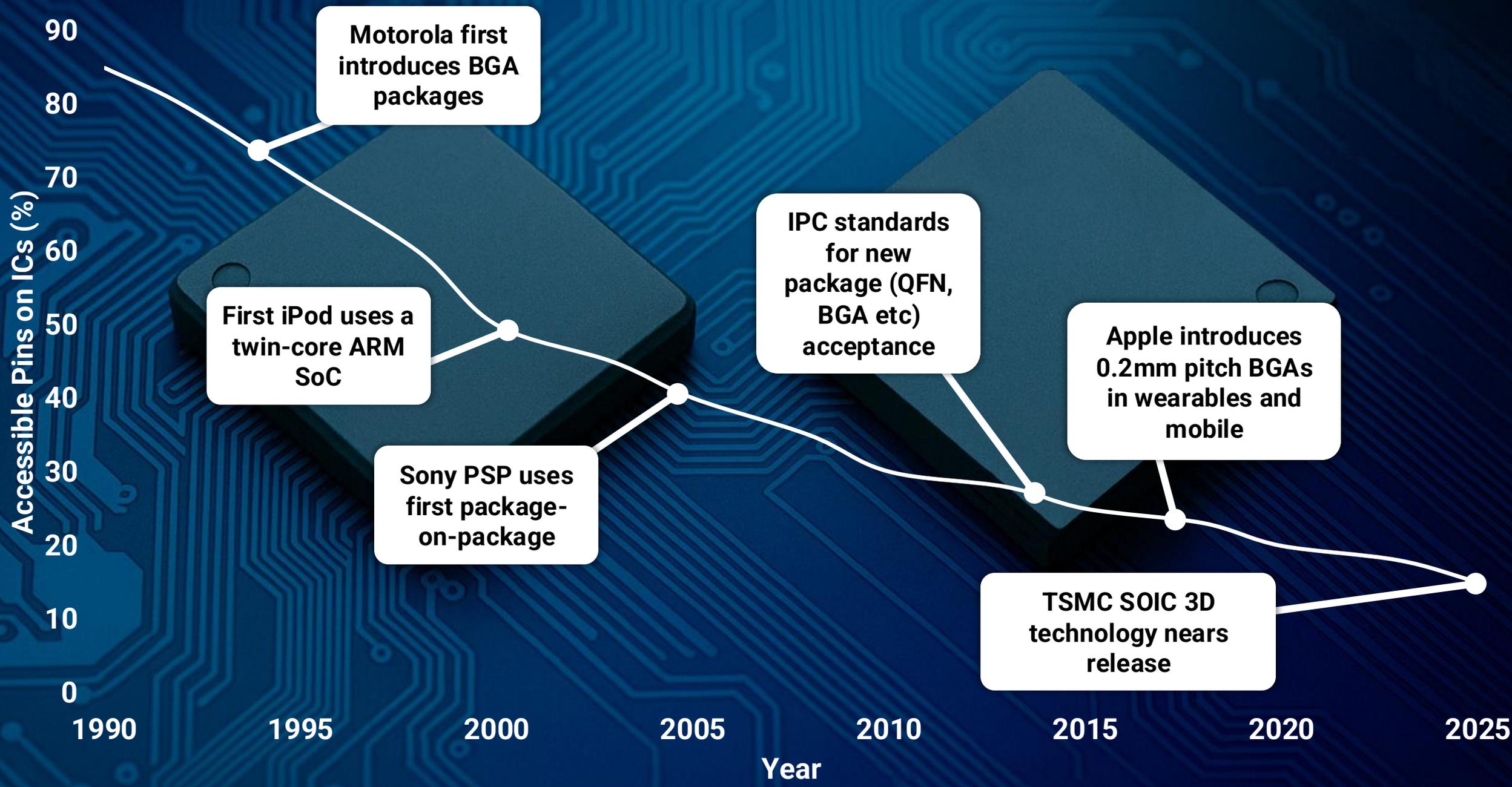




Software, firmware and hardware are becoming more closely integrated

Products are becoming more complex, more powerful and smaller

Greater standardisation and less accessibility for testing



Accessible Pins on ICs (%)

Year

Motorola first introduces BGA packages

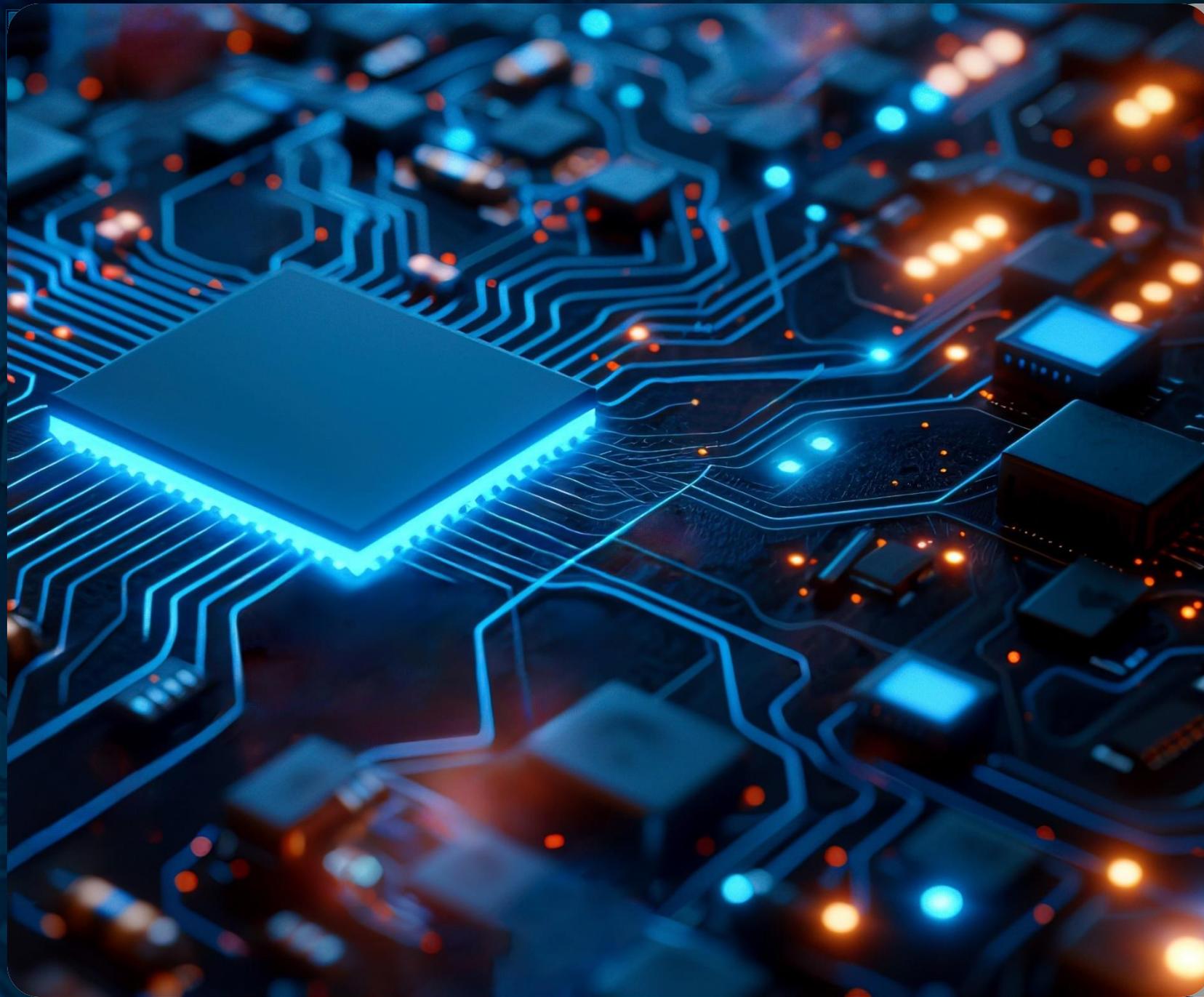
First iPod uses a twin-core ARM SoC

Sony PSP uses first package-on-package

IPC standards for new package (QFN, BGA etc) acceptance

Apple introduces 0.2mm pitch BGAs in wearables and mobile

TSMC SOIC 3D technology nears release



Does your testing let you easily find the causes of faults?

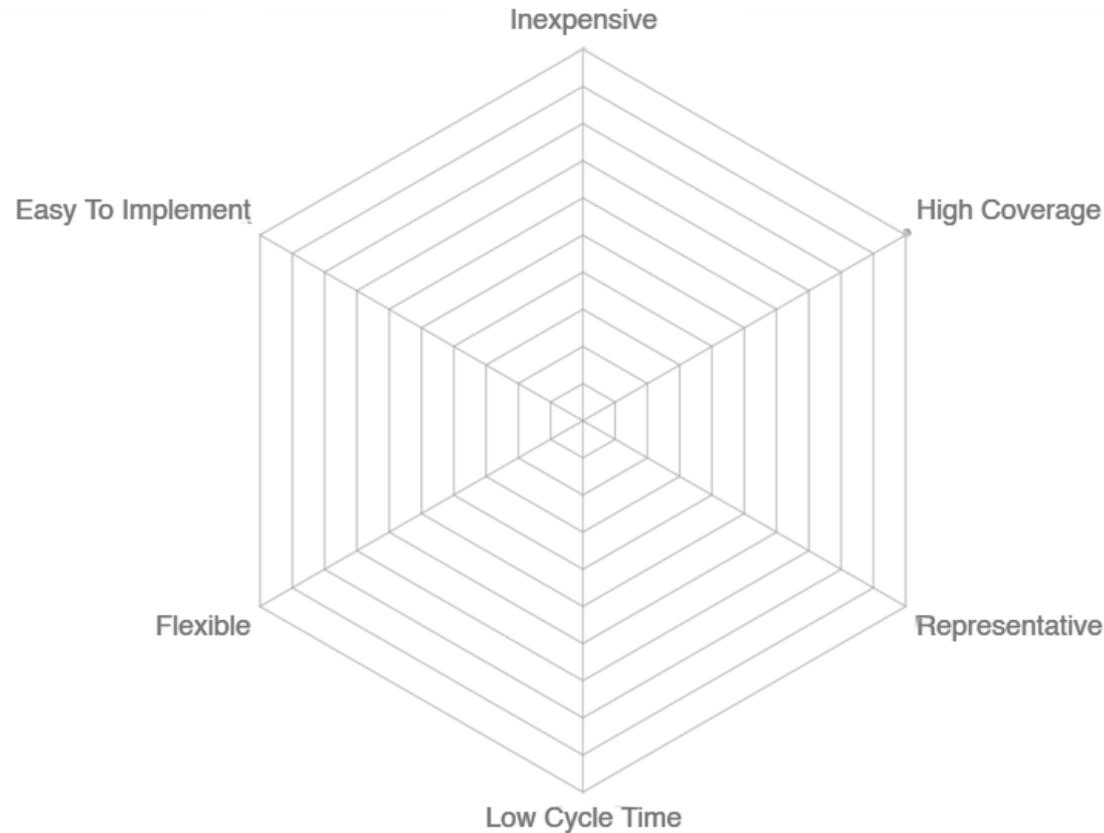
Is your testing expertise future-proof for trends in testing?

Can your testing handle reducing test access and still achieve the coverage you need?

How quickly do you need to implement your testing?

How often will you need to change your testing setup?

How many units are you producing?

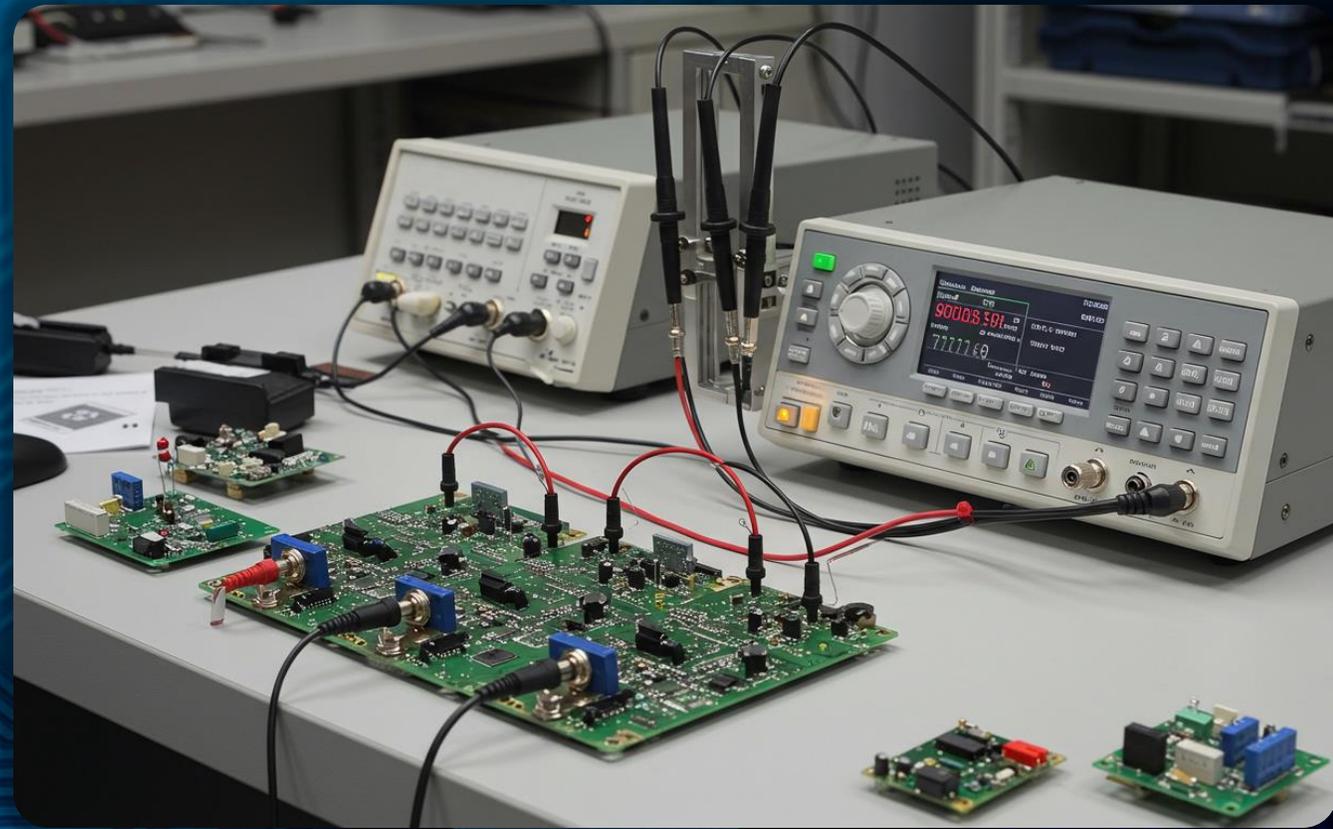
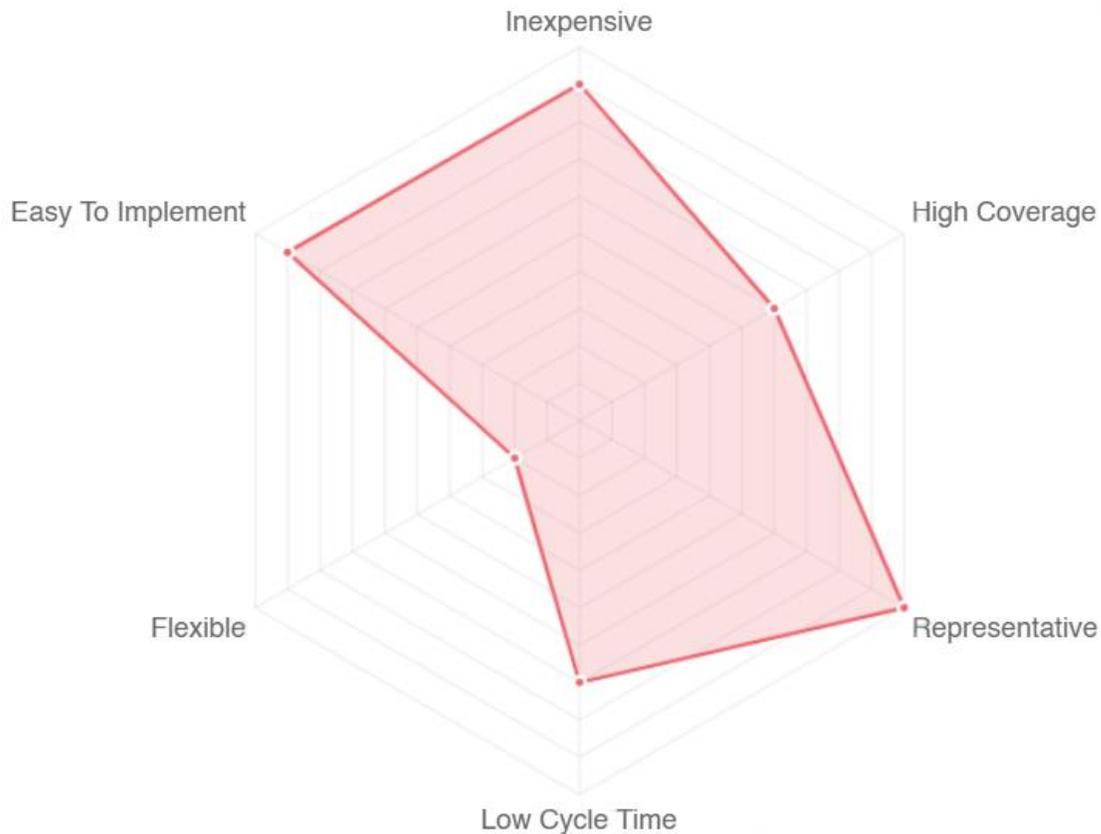


What is your budget and the cost of getting it wrong?

What proportion of faults do you need to cover?

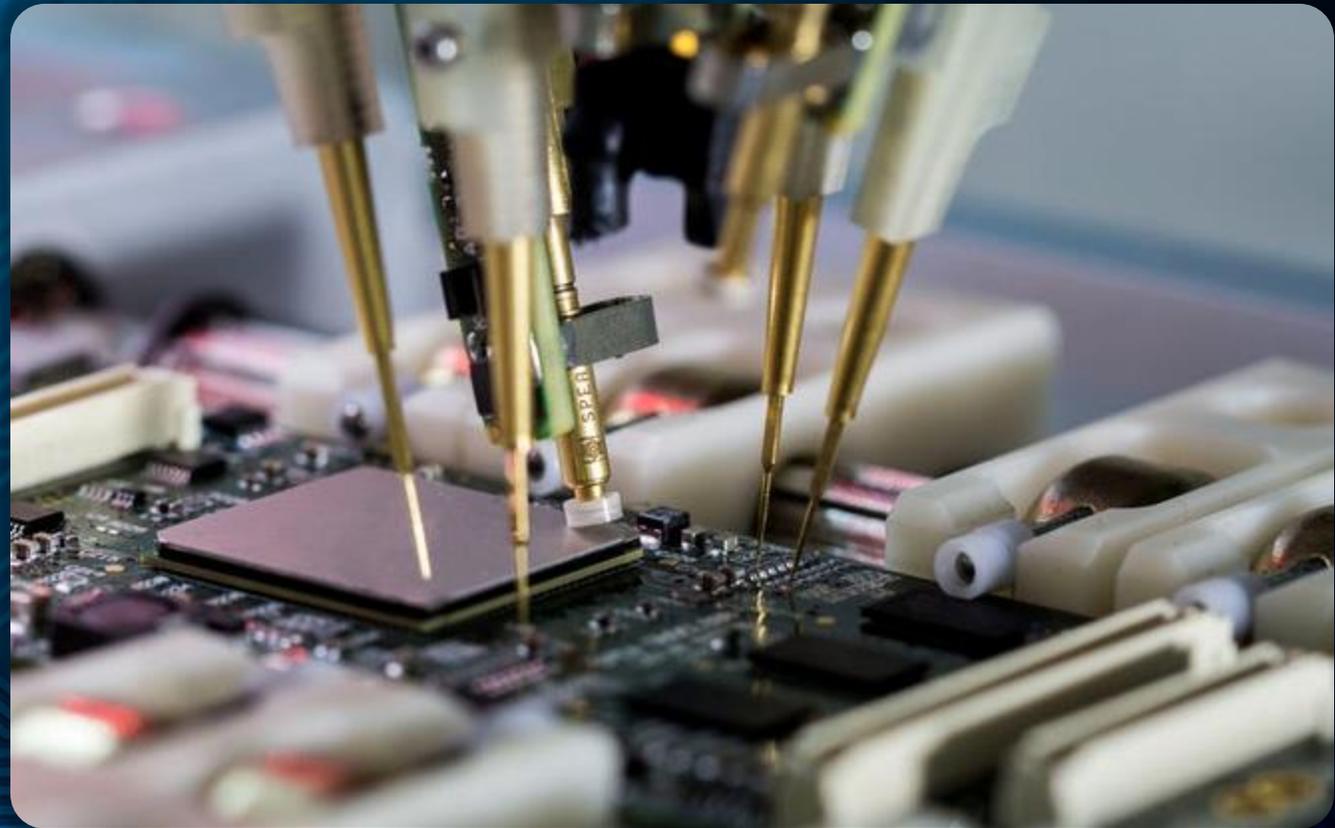
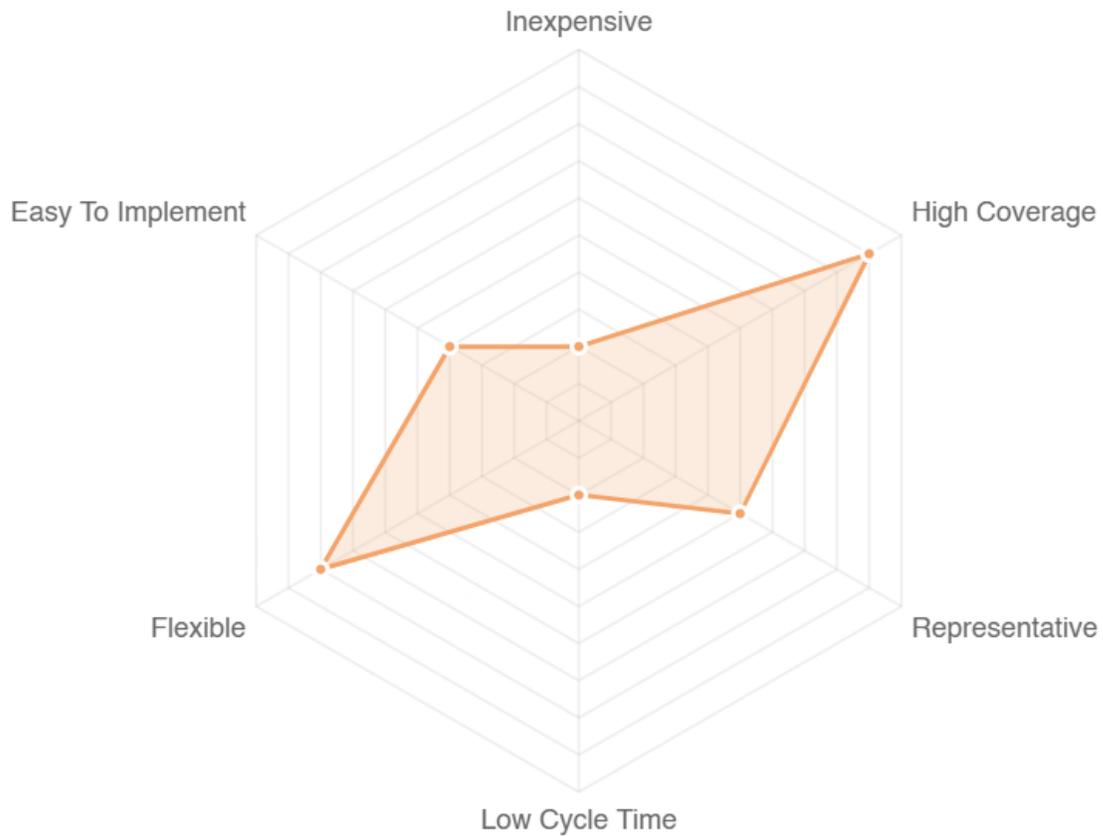
How consistent and true does it need to be?

Functional Test



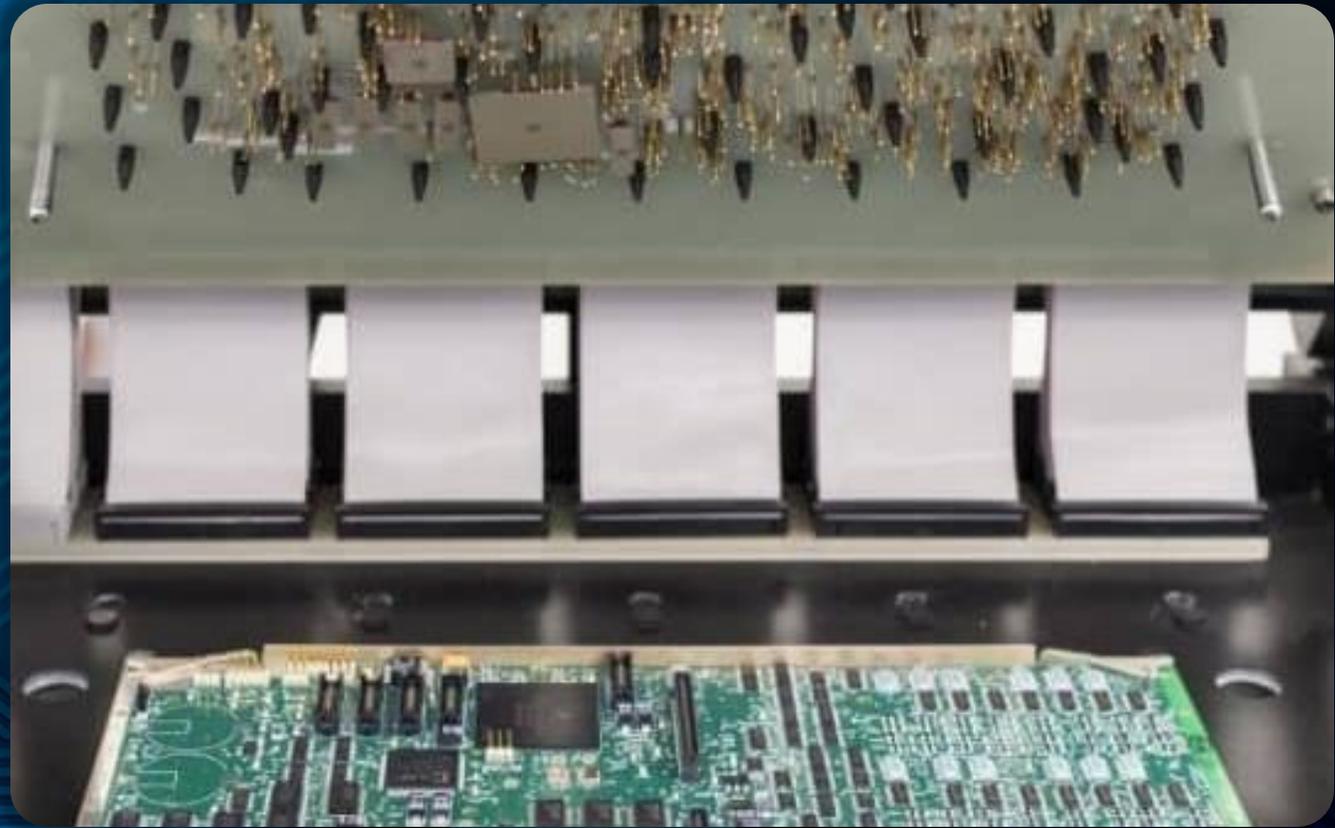
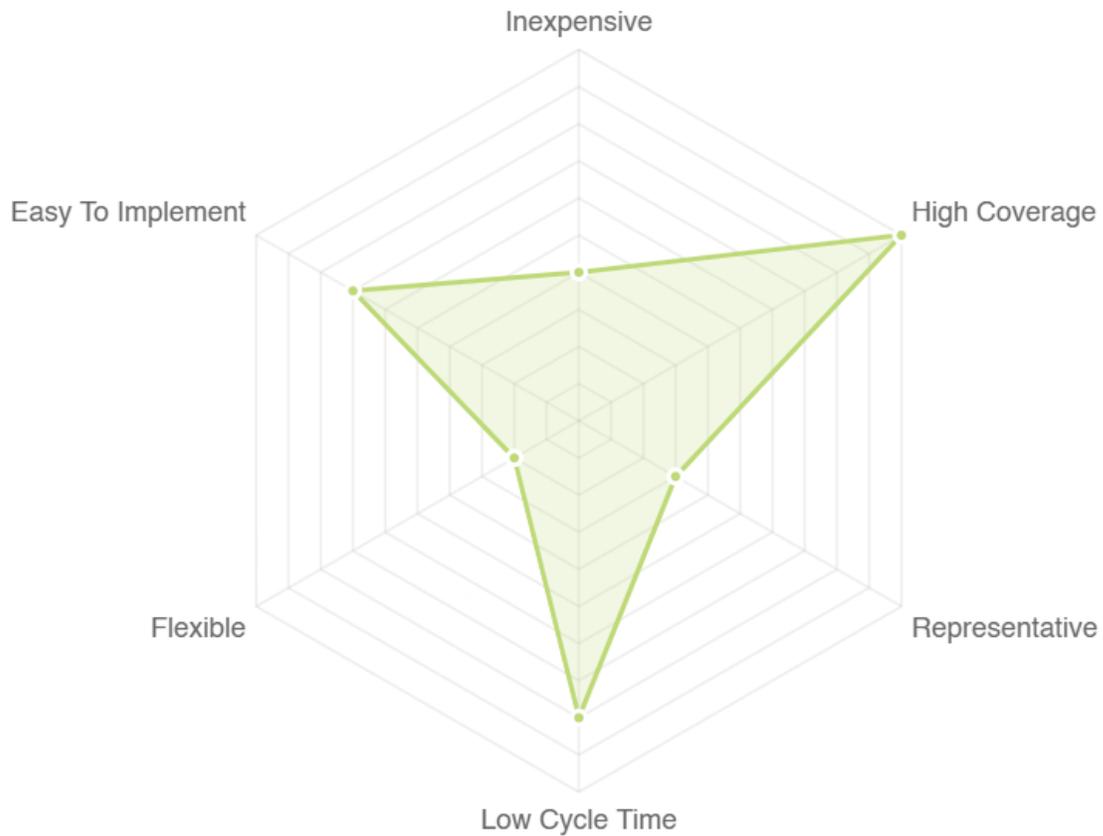
- + Tests devices at the full operating speed
- + Can be used in conjunction with test fixtures to get good test coverage
- Requires custom test development
- Requires minimum functionality or tests will not run
- Failure diagnosis can be difficult

Flying Probe



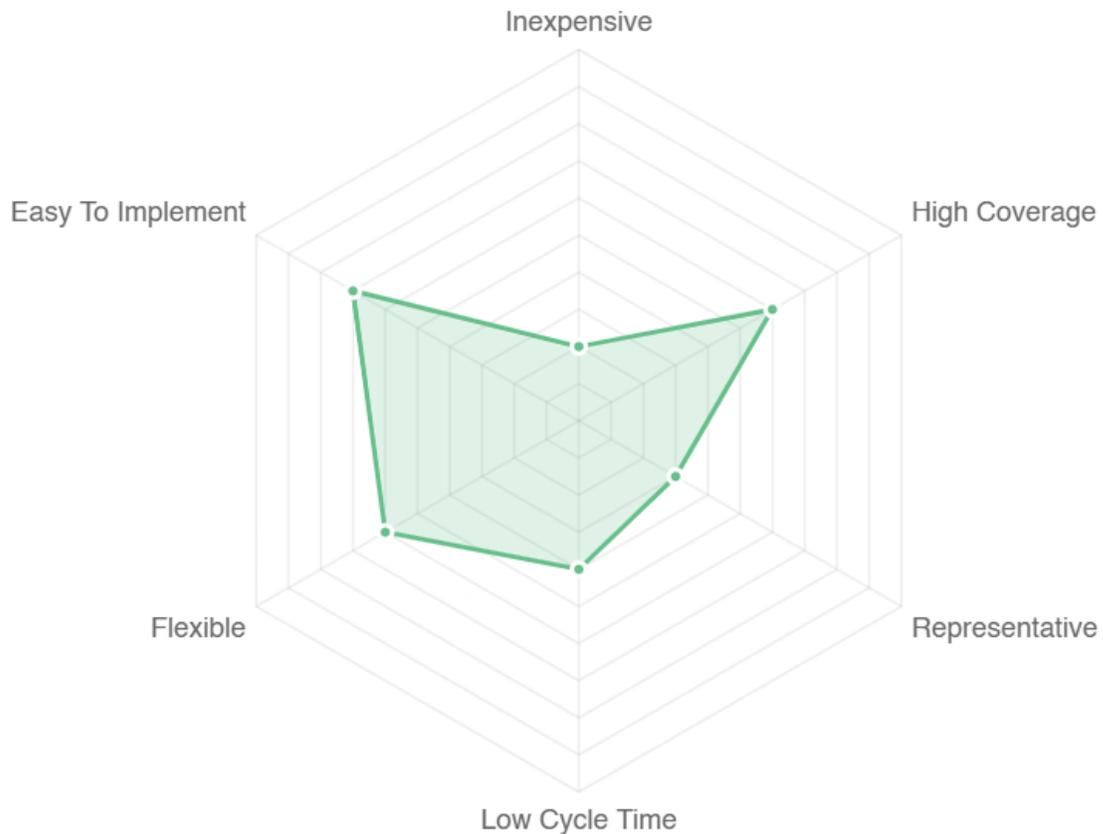
- + **Checks for shorts, opens, resistance, capacitance to show whether the assembly was correctly fabricated**
- **Requires pin access**
- **Requires test points and extra PCB space**
- **Long test times**

Bed of Nails



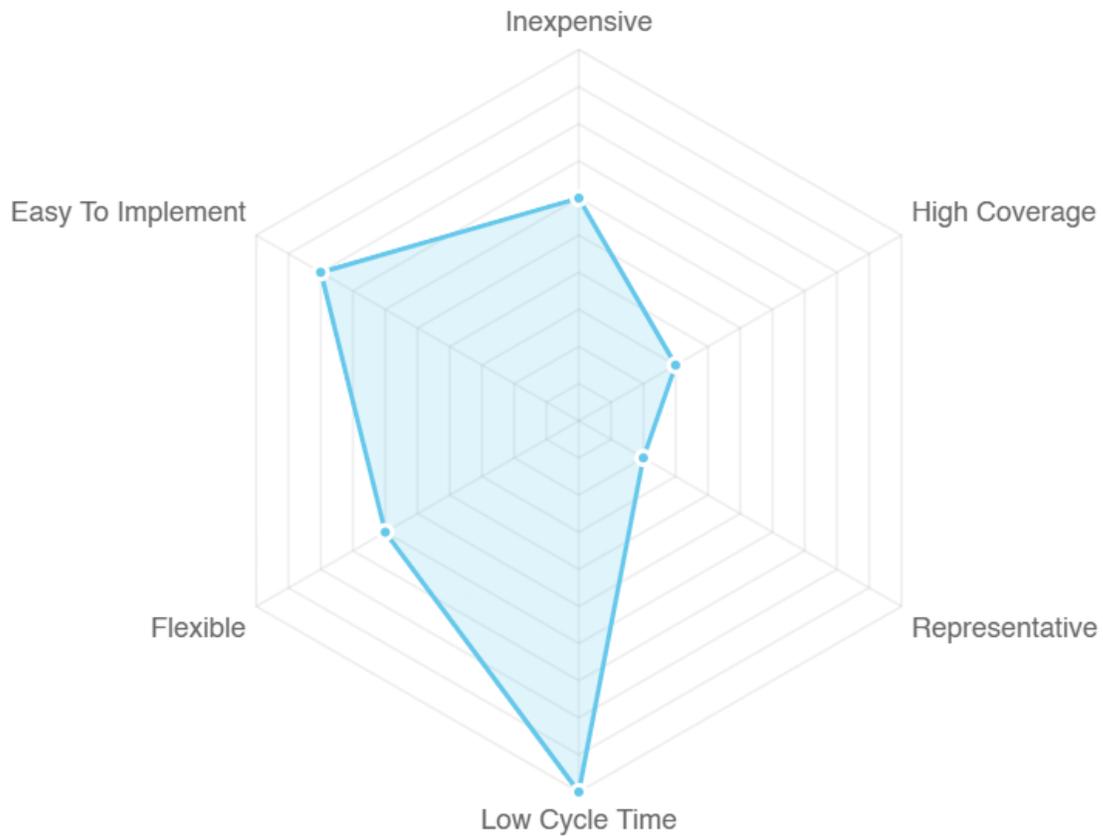
- + Checks for shorts, opens, resistance, capacitance to show whether the assembly was correctly fabricated
- Requires pin access
- Requires test points and extra PCB space
- High fixture costs and poor flexibility for design changes

Automated X-Ray Inspection



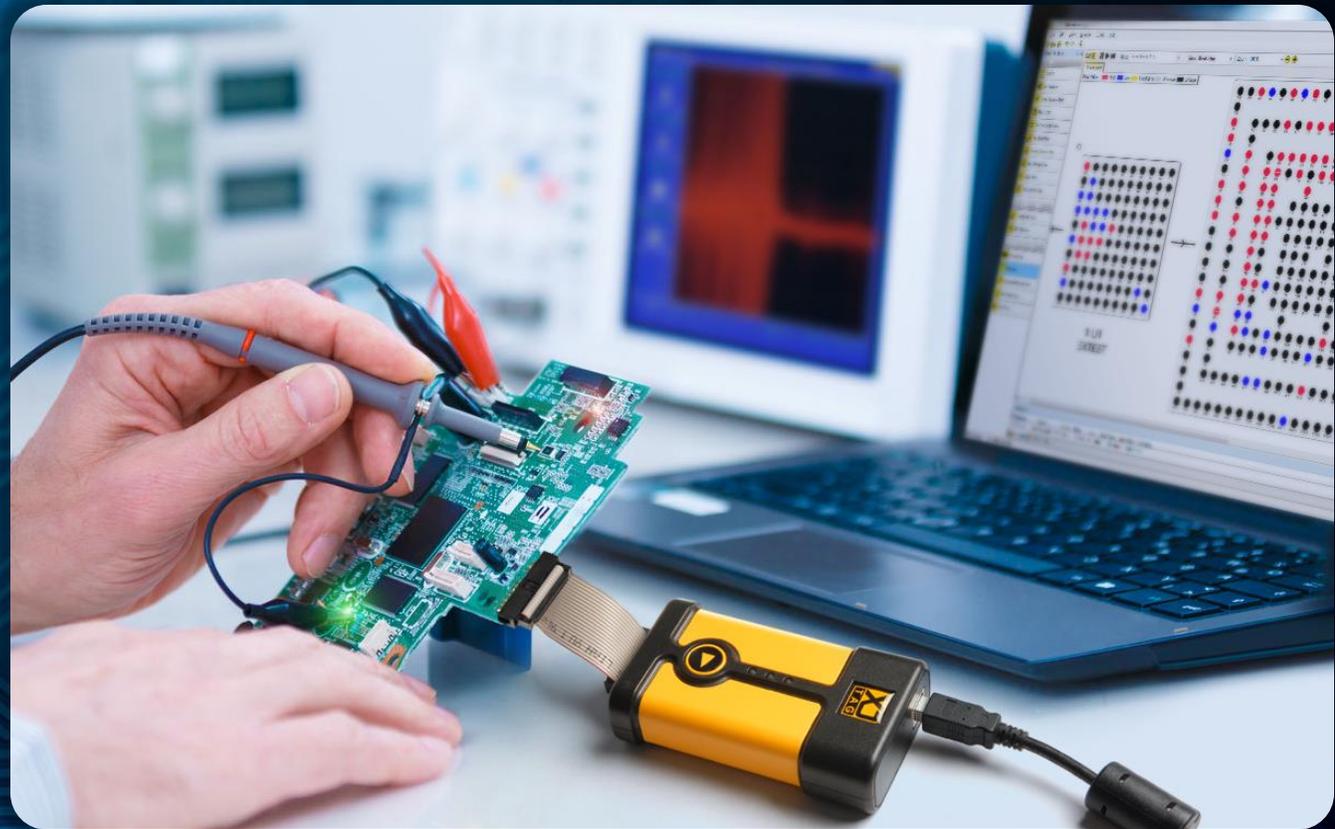
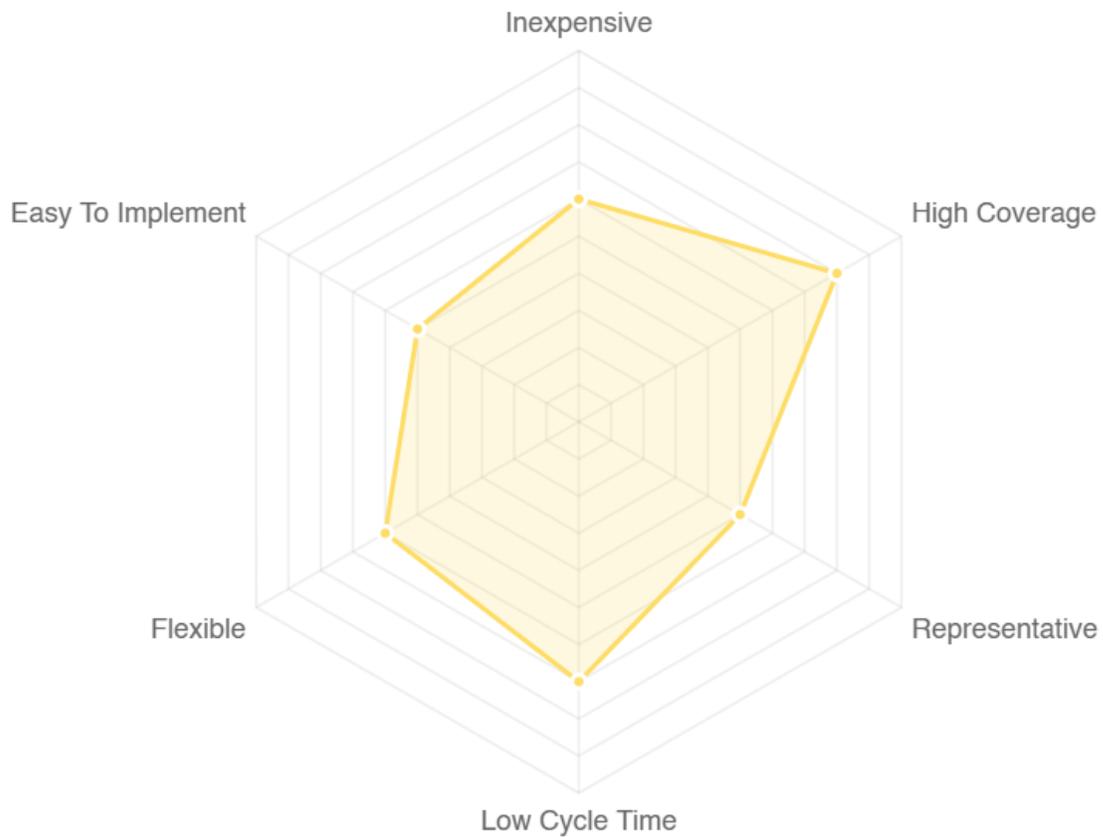
- + **Non-contact test**
- + **Can observe solder quality or component skew problems**
- **No functional testing**
- **No programming**
- **Ambiguous results, hard to troubleshoot**

Automated Optical Inspection



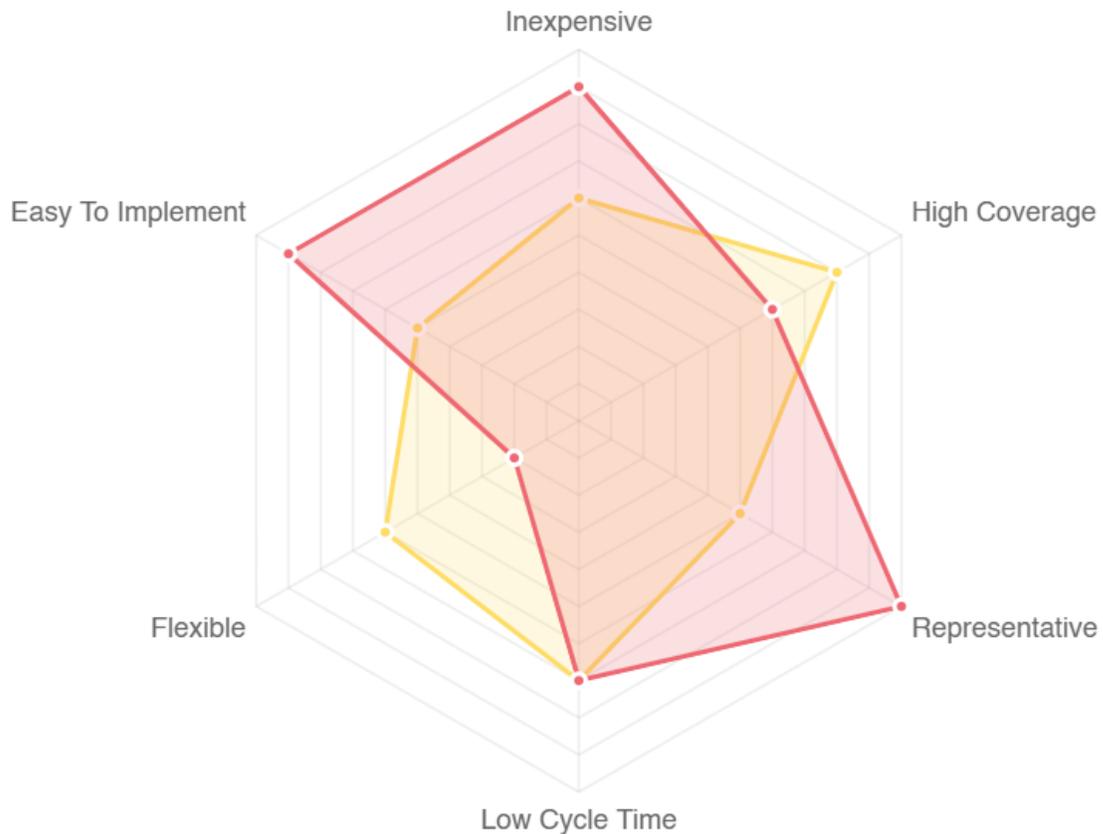
- + **Non-contact test**
- + **Fast test times**
- **Can't check underneath components or inaccessible pins**
- **No functional testing**
- **No programming**
- **Ambiguous results, hard to troubleshoot**

JTAG Boundary Scan



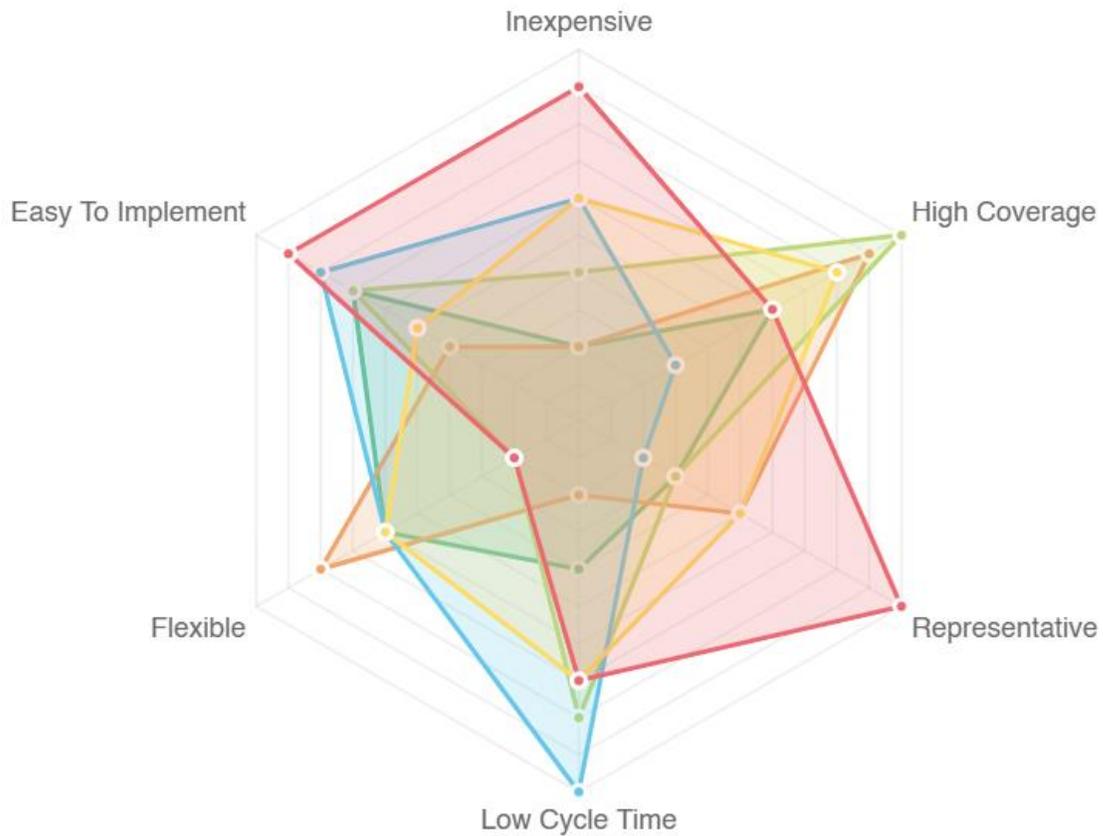
- + **No physical access required**
- + **Easy integration with other in-circuit and functional testing methods**
- + **Program devices with the same tool**
- **Can't test component values**

Combining Methods



- + **Get the benefits of boundary scan**
- + **Get the test access of bed-of-nails**
- + **Get the representative, full-speed benefit of functional test**
- **More expensive**

Comparison



- Functional Test
- Flying Probe
- Bed of Nails
- Automated X-Ray Inspection
- Automated Optical Inspection
- JTAG Boundary Scan



Testing At The Right Time

Start Thinking Early



**And Know What Might
Go Wrong**

Don't Test Too Much



Don't Test Too Little

Talk To Us



**And Find the Right Test
Method For You**

Try Our Electronics Test Method Finder

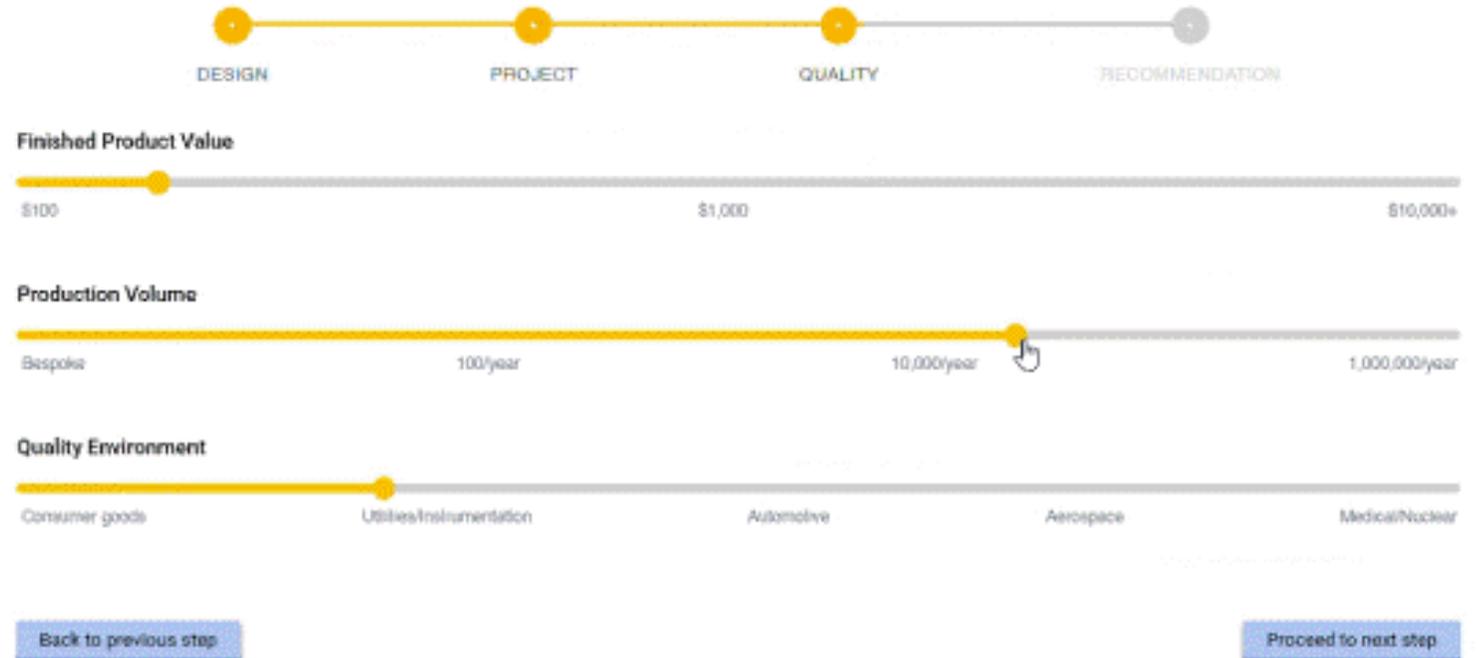


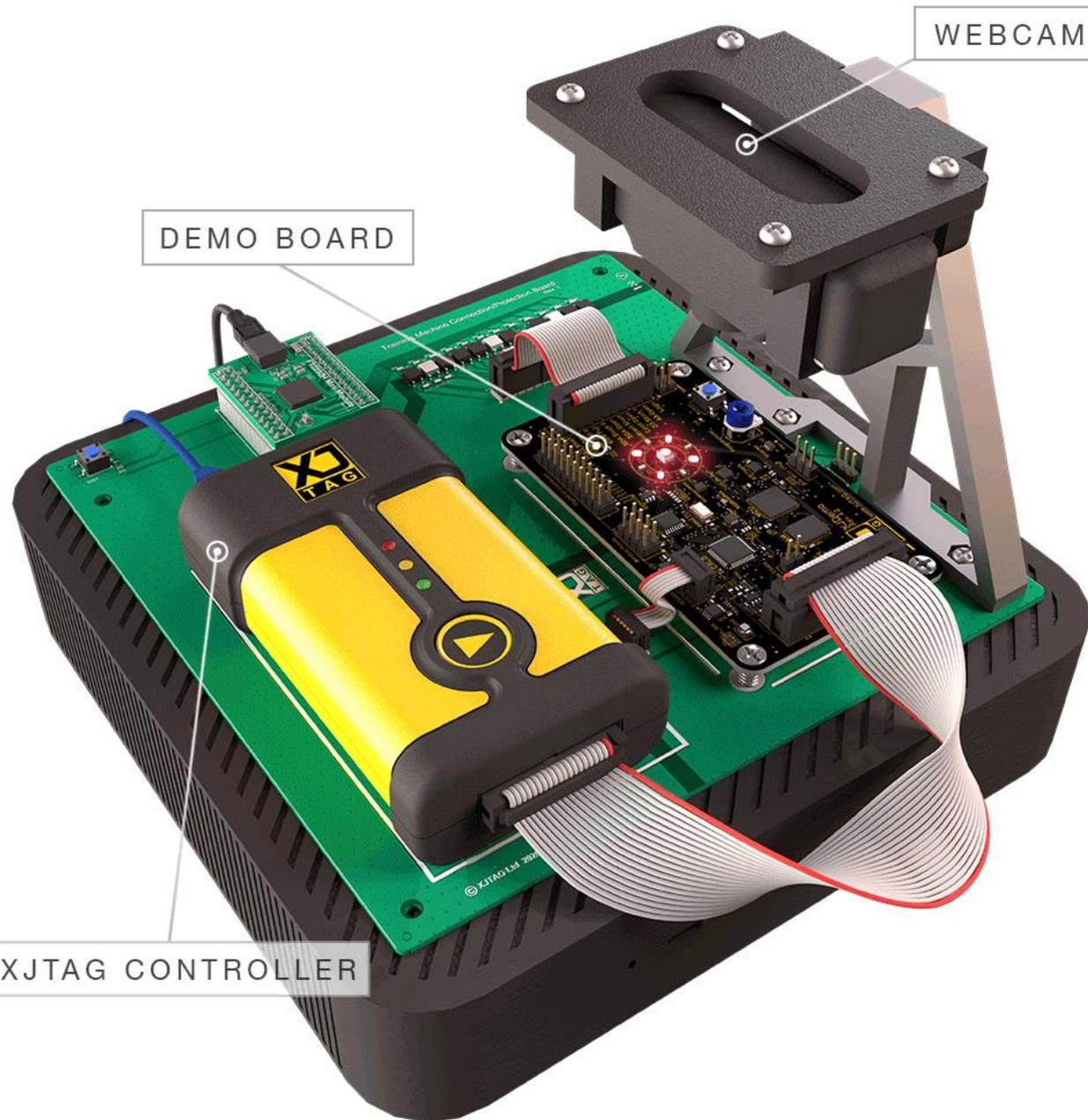
Compare:

- Functional Test
- JTAG Boundary Scan
- Automated Optical Inspection
- Bed of Nails
- Flying Probe
- Automated X-Ray Inspection

Electronics Test Method Finder

Use the sliders to set your requirements to compare key PCB testing methods including AOI, AXI, Bed of Nails, Functional Test, Flying Probe and JTAG Boundary Scan





Hands-On Workshop



We built an interactive workshop where you:

- Run boundary scan tests
- Inject faults on a real (demo) board
- Identify shorts and opens in seconds
- Have a quick play or take a deep dive – up to you

You'll control pins and inject faults in real-time in our lab, accessed remotely – this isn't a simulation.

Test Method Finder



Hands-On Workshop

