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Proof of reliability using Interconnect Stress Test

Reliability

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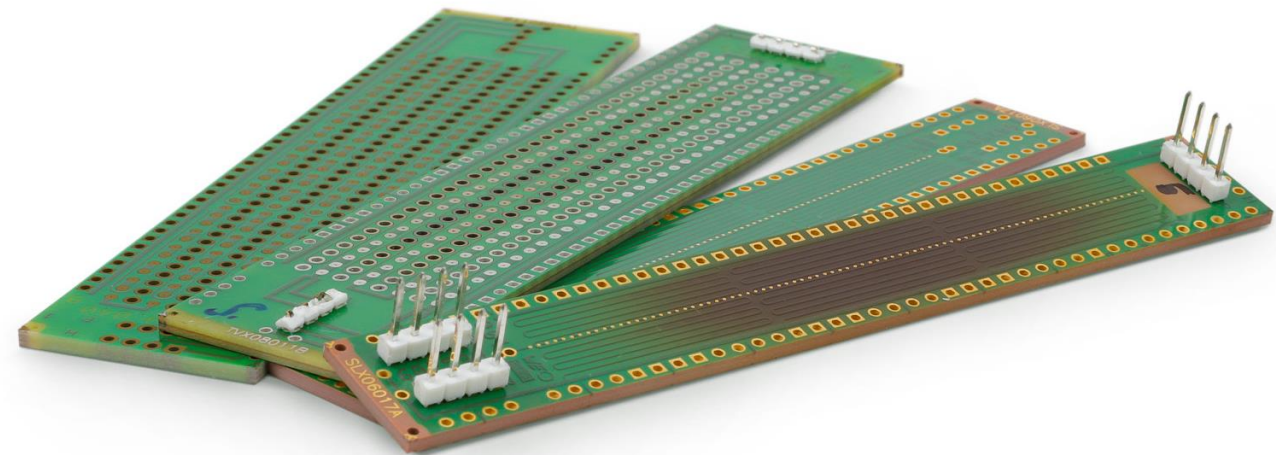
Reliability

- **What consequences can a lack of reliability have on your products?**

- **Have there been cases where reliability expectations were not met?**
  What part did the printed circuit board play in this?

- **How do you currently ensure the reliability of your products?**

- **How do you ensure the reliability of new technologies?**

Reliability is the probability that a product will perform its intended function for a specified time interval under specified conditions.

„The reliability of a product is ...also the result of combining knowledge and experience during the design phase.“

Short survey no.1

- Have you heard about the Interconnect Stress Test? Have you already used it yourself?

?

Product classification according to IPC

Class 1

General Electronic Products

Includes **limited life** products suitable for applications where the requirement is function of the completed product.

Class 2

Dedicated Service Electronic Products

Includes products where continued performance and extended life is required, and for which **uninterrupted service** is desired but not critical.

Class 3

High Reliability Electronic Products

Includes products where **continued high performance** or performance-on-demand is critical, product downtime cannot be tolerated, and the product must function when required.

Source: IPC

Short survey no.2

- **What branch are you from?**

?

Where are robustness and safety critical?
Typical applications

- **Medical Technology**
  - Implants
  - Endoscopes
  - Radiotherapy
- **Military**
- **Aerospace**
- **Commercial vehicles**
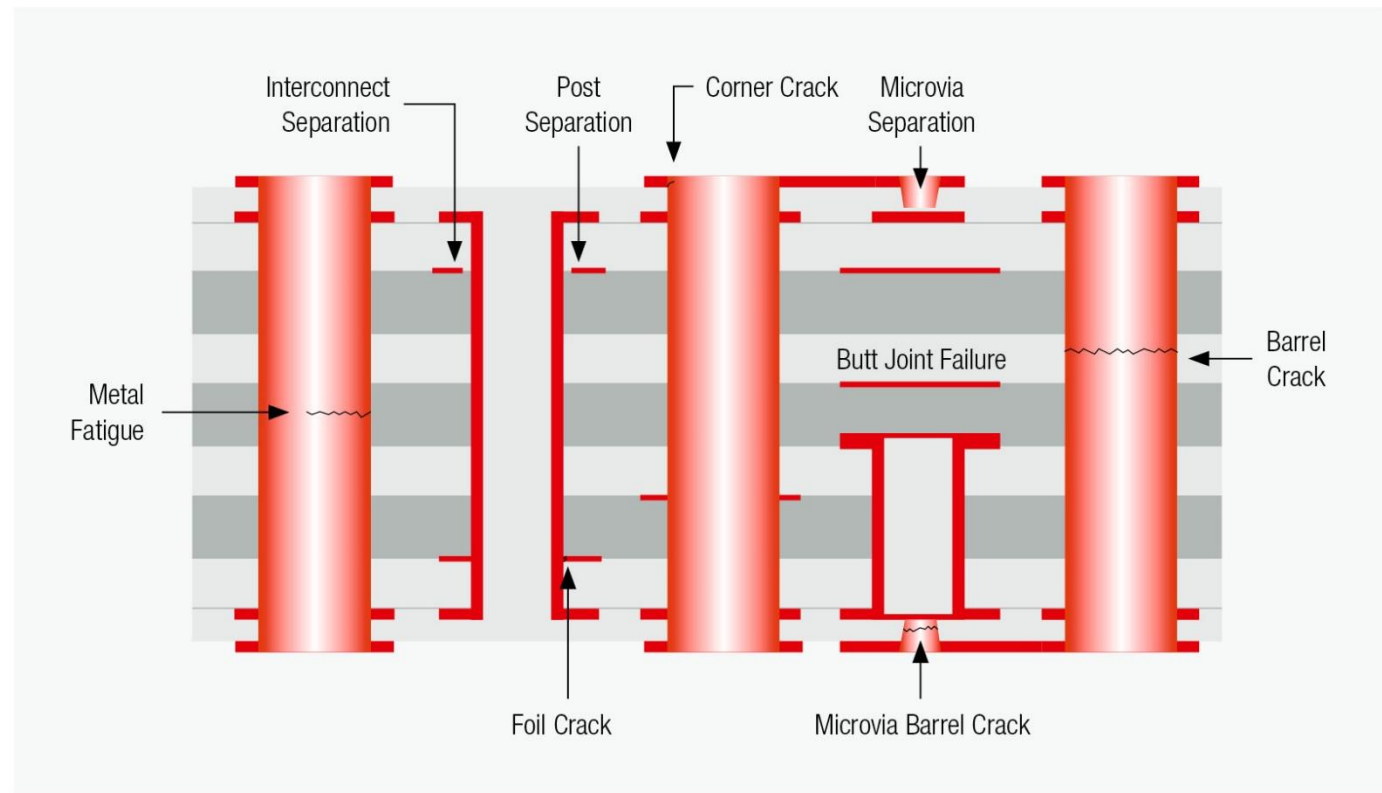- **Motorsports**
- **...**

Interconnect Stress Test (IST)
Fields of application

- Proof of reliability for product qualification
- Securing the introduction of new technologies
- Investigation of design and technology changes
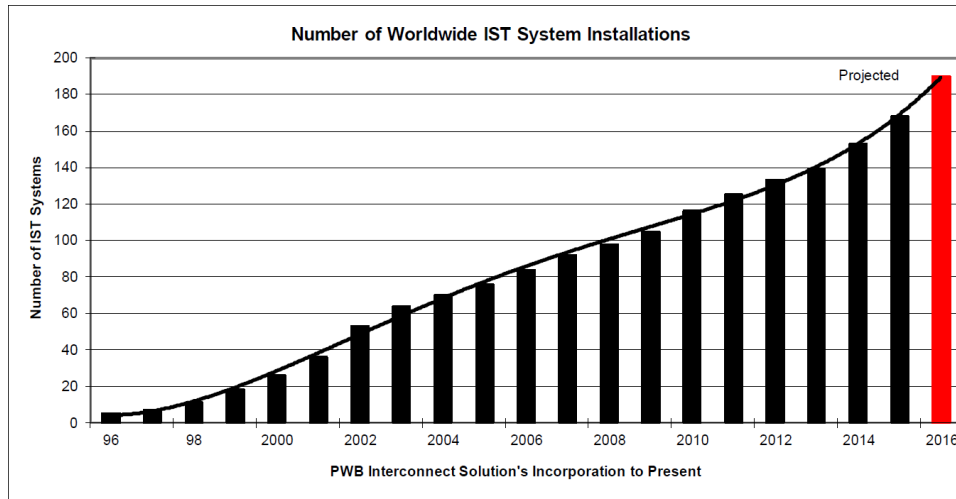- Process and product troubleshooting (optimization)

Failure due to cycling thermal stress

Interconnect Stress Test (IST)
Experience and references

Number of Worldwide IST System Installations

Source: PWB Inc.

Interconnect Stress Test (IST)
Customer benefits

Fast, time-saving simulation of manufacturing and operating conditions

- Multiple reflow simulation, accelerated life testing

Intensive monitoring for the precise detection of weak points

- Permanent recording of the "state of health" of the test coupons
- Time of occurrence of failure precisely identifiable, 100% documented
- Exact localisation of the fault position, precise microsection preparation

Statistical analysis

- Lifetime data
- Failure types

Identification of impact variables and definition of design recommendations

Interconnect Stress Test (IST)
Procedure and options

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- **Coupon design based on your PCB**
  - Material, stack-up and design
  - Via types, drill hole diameters and distances
  - Solder surface
- **Determination of test scope and test parameters in coordination with you**
  - Number of IST test cycles
  - Soldering simulation
  - Test temperature
- **Test preparation and execution (8 test coupons at the same time)**
- **IST Test Report**
  - Microsection analysis of the faults (first, middle and last failure)
  - Statistical analysis
  - Thermomechanical analysis of the stack-up
  - Design recommendations (optional)
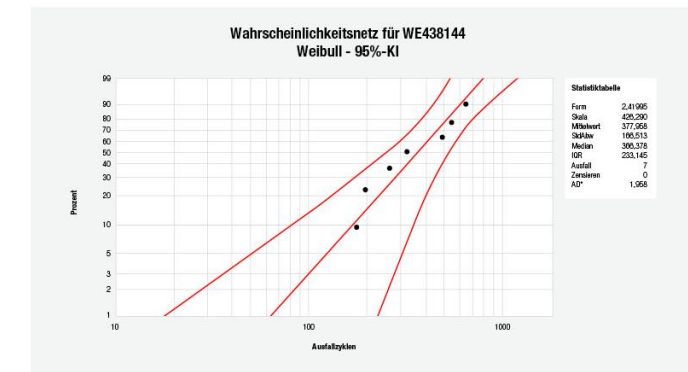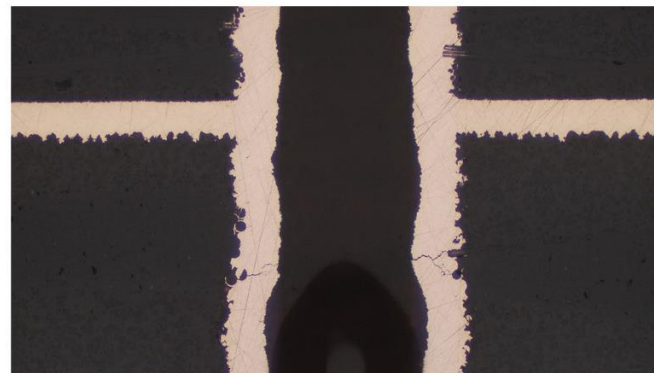
Interconnect Stress Test (IST)
Example test report

- Product documentation
- Description Test coupon
- Test sequence and test parameters
- Measurement data
- Statistical analysis
- Microsection documentation
- Thermomechanical analysis (CTE, Tg)
- Optional: Recommendations for further action
- Summary

Customer Solution Assessment
Objectives and benefits

Concept
for project-related, transparent visualization and evaluation of different electronic interconnection systems

An early support
of the customers in the development process of an electronic system

Identification and documentation
of project-specific requirements, e.g. reliability requirements

Early clarification
of feasibility, cost trends and testability

Customer Solution Assessment
Assessment procedure

Members of the group   Criteria system   Evaluation

Explanation of the decision-making problem   Weighting

BENEFIT ESTIMATION

Customer Solution Assessment
Assessment procedure

Reliability in Harsh Environment Applications

Proof of reliability by IST

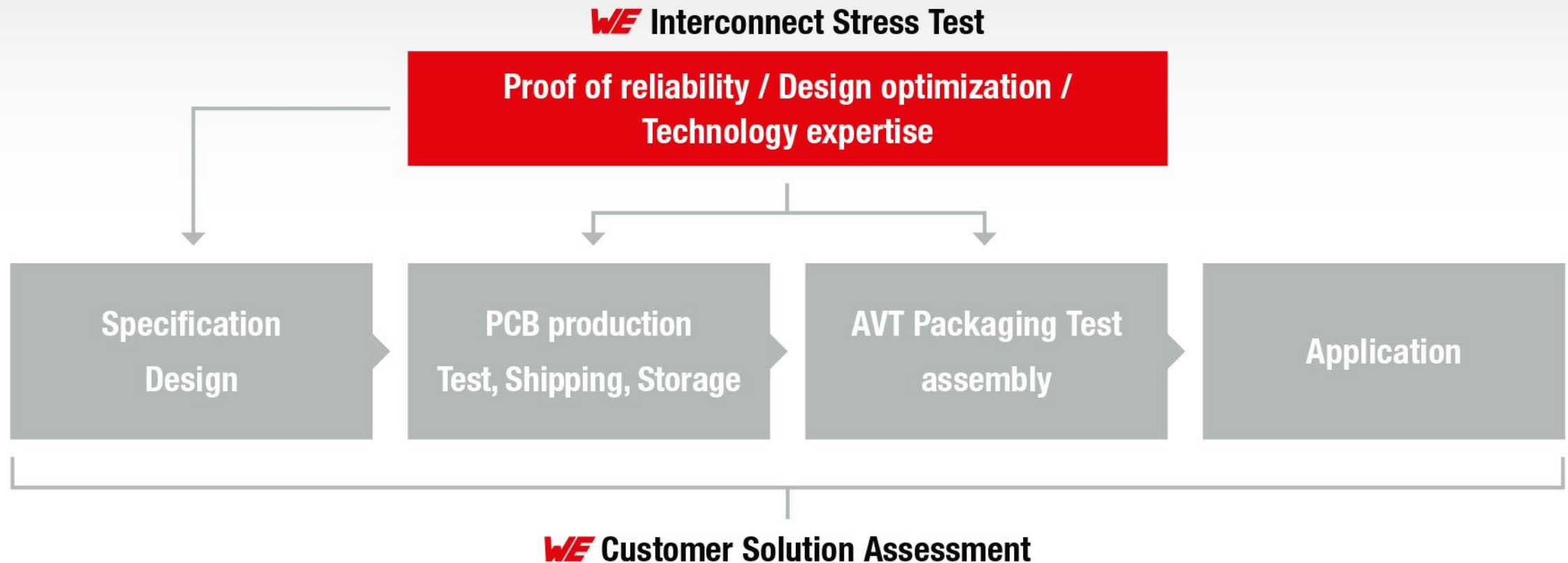| Decision criteria	Weighting	Homogeneous system		Inhomogeneous system	
	G	B	G x B	B	G x B
1. Assembly production	5				
1.1 Design	5	5	25	1	5
2. Assembly	40				
2.1 Complexity	10	5	50	2	20
2.2 Reduction of errors during installation	20	6	120	5	100
2.3 Service (Removing)	10	5	50	1	10
3. Conditions of use	30				
3.1 Dynamic bending	5	6	30	6	30
3.2 Wiring Reliability	25	6	150	2	50
4. Electrical requirements	10				
4.1 Signal integrity	10	6	60	5	50
5. Cost of the non populated system	5	5	25	3	15
6. Awareness / experience with flex-rigid	10	5	50	5	50

Short survey no.3

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- Do you currently see opportunities for using the Interconnect Stress Test?

?

Developing reliability step by step
The life cycle of a PCB

WE Interconnect Stress Test

Proof of reliability / Design optimization / Technology expertise

Specification Design	PCB production Test, Shipping, Storage	AVT Packaging Test assembly	Application

WE Customer Solution Assessment