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True Known Good Die (KGD) Solution for Silicon Carbide (SiC) Power Die Testing

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STS Testing Session

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xEV Adoption Boosts SiC Power Semiconductor Manufacturing

SiC power semiconductors are right on time to support fast-growing xEV market

SiC belongs to the Wide Bandgap (WBG) semiconductor material

- Ability to drive high current
- Excellent thermal behavior
- Extreme high switching frequency

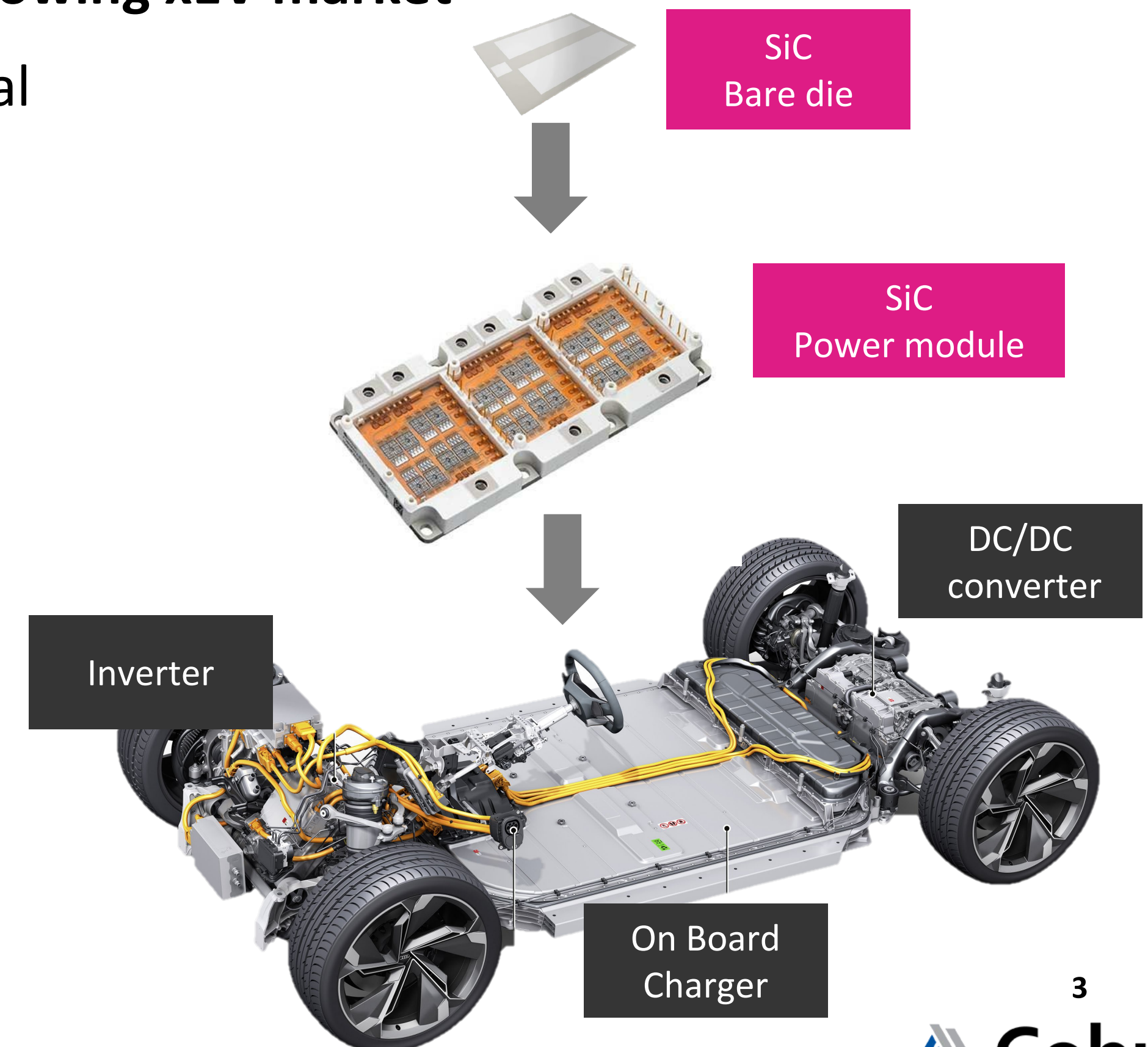
...resulting in a **reduction of thermal and power losses**

The benefits

- Longer driving range
- Faster charging time
- Smaller Battery size



¹Source: Power Electronics for Automotive 2022 Focus on Passenger and Light Commercial Vehicles | Product Brochure | www.yole.fr | ©2022



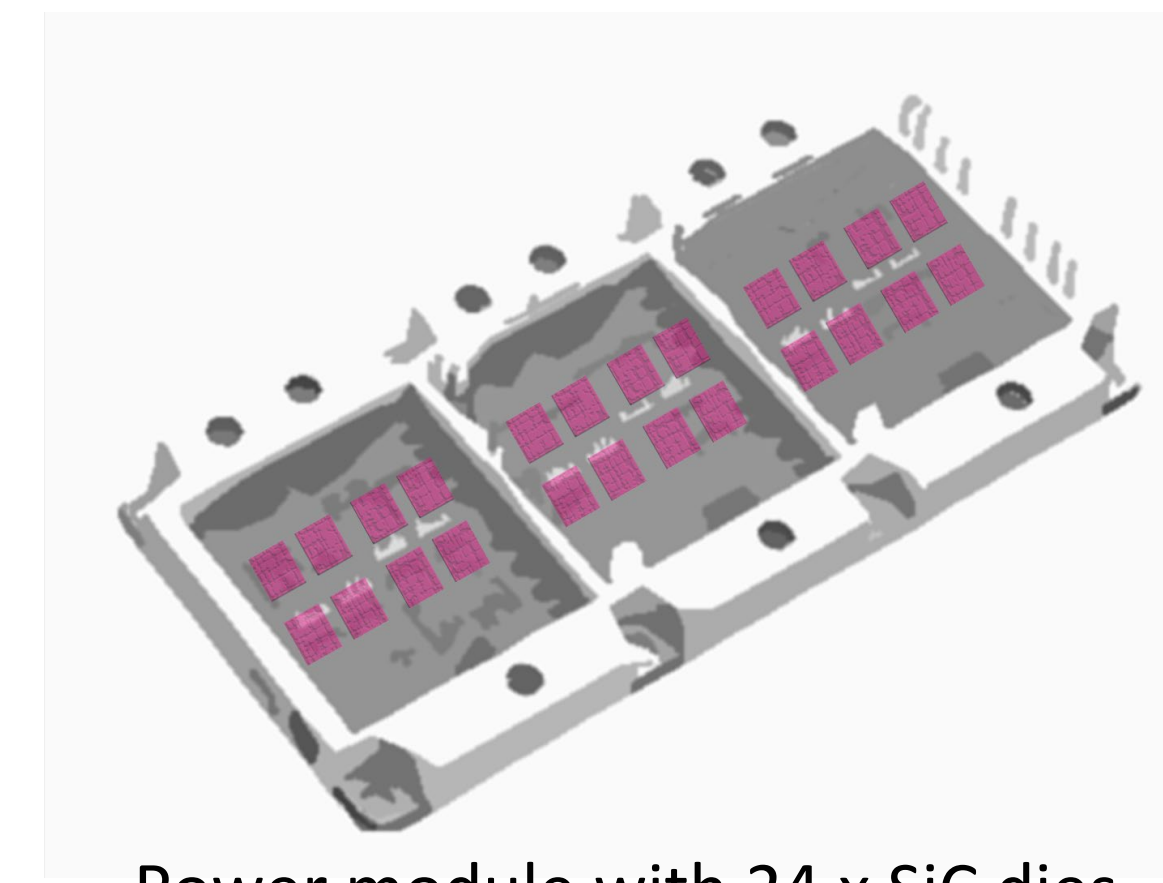
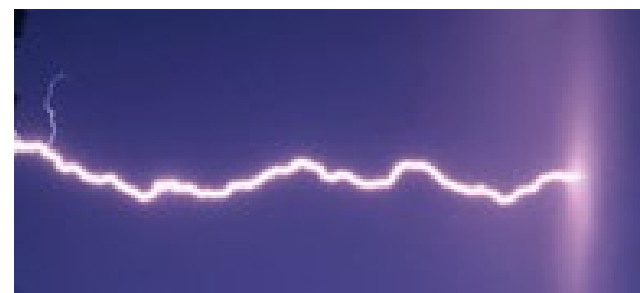
What are the Challenges?

Major challenges

- Power module yield losses linked to multiple die integration

Wafer probing challenges

- Dynamic switching tests, Avalanche energy test tests (Unclamped Inductive Switch)
- Arcing challenges with high Voltage parallel tests
- Multiple insertion of thinner SiC dies at higher power levels with full device integrity



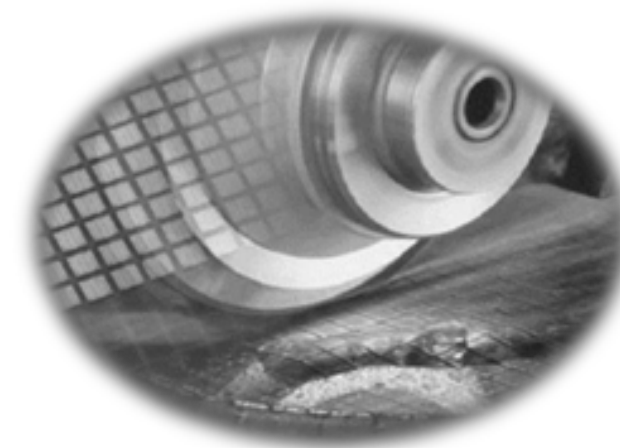
Power module with 24 x SiC dies

Sawing challenges

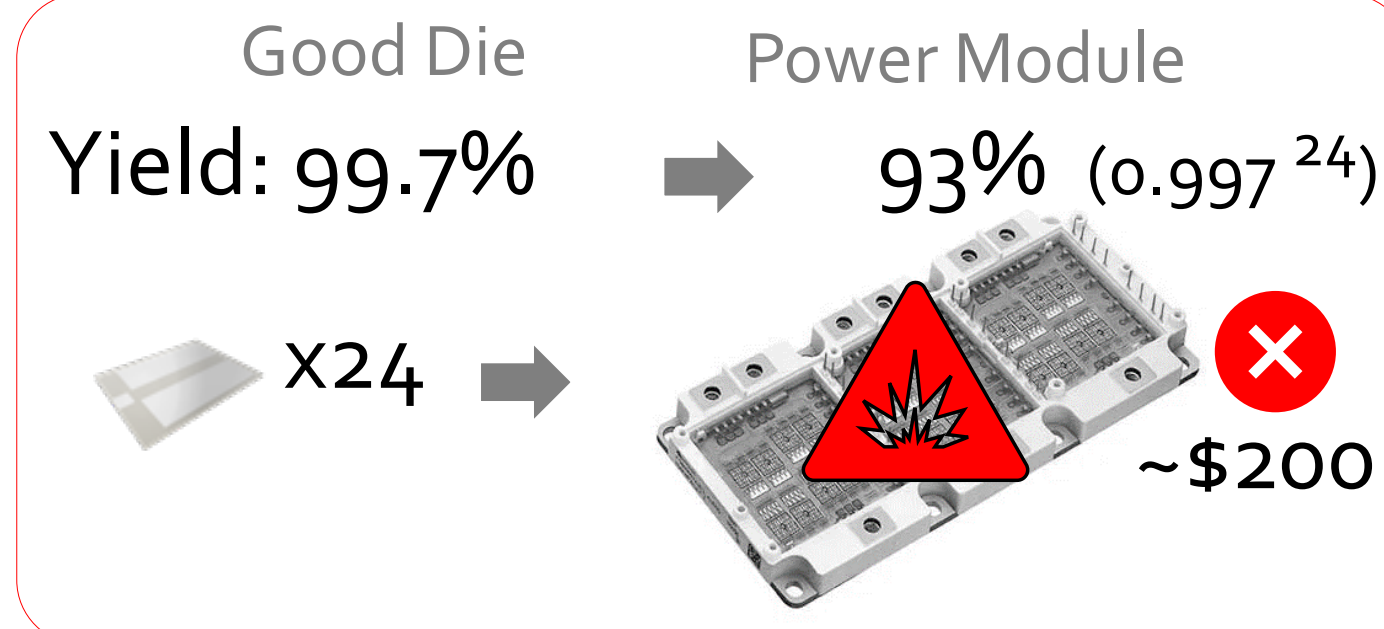
- Wafer sawing can induce latent defects barely detectable without high-end inspection or post saw electrical test



Wafer probing



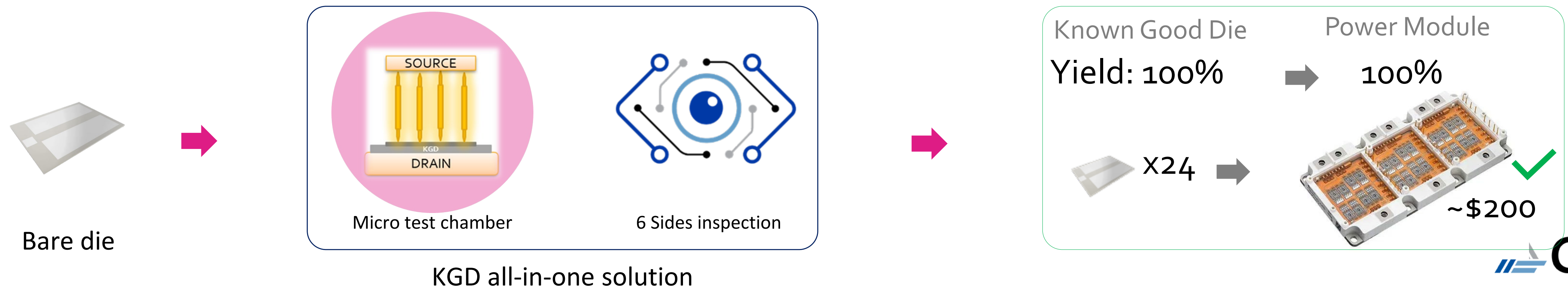
Wafer dicing



Solution Through Post Singulation Test

Bare die post singulation test is the only way to guarantee Known Good Die

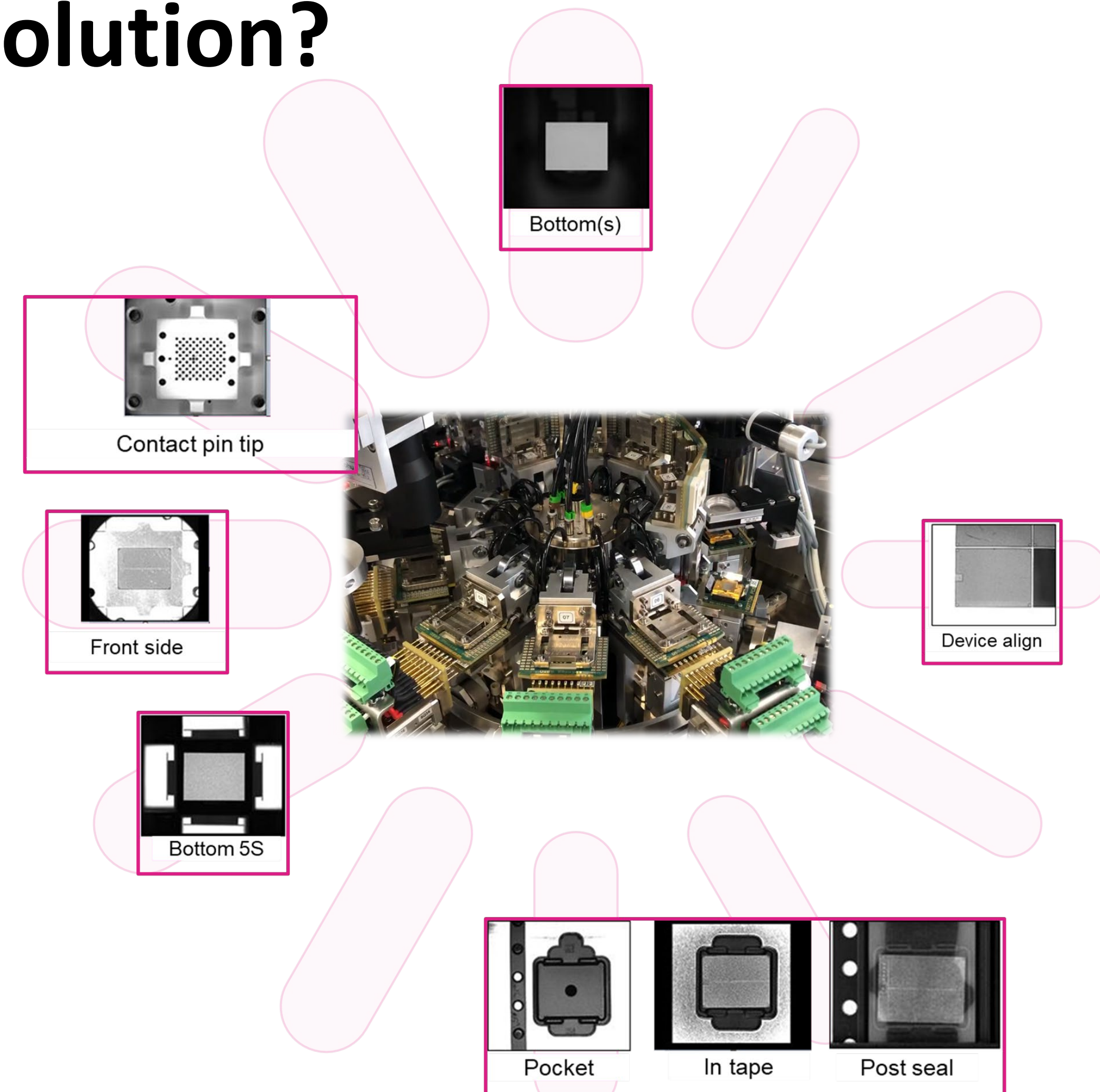
- Tests are performed at individual die level after singulation
- x4 test sites parallelism through **single die insertion**
- Micro test chamber to support high-voltage isolation up to **3.5 kV**
- Static, dynamic tests up to **500 A** *(die size dependent)*
- Nitrogen purging to prevent oxidation
- Full **6 sides inspection** and metrology



Why Know Good Die all-in-one solution?

Key success factors

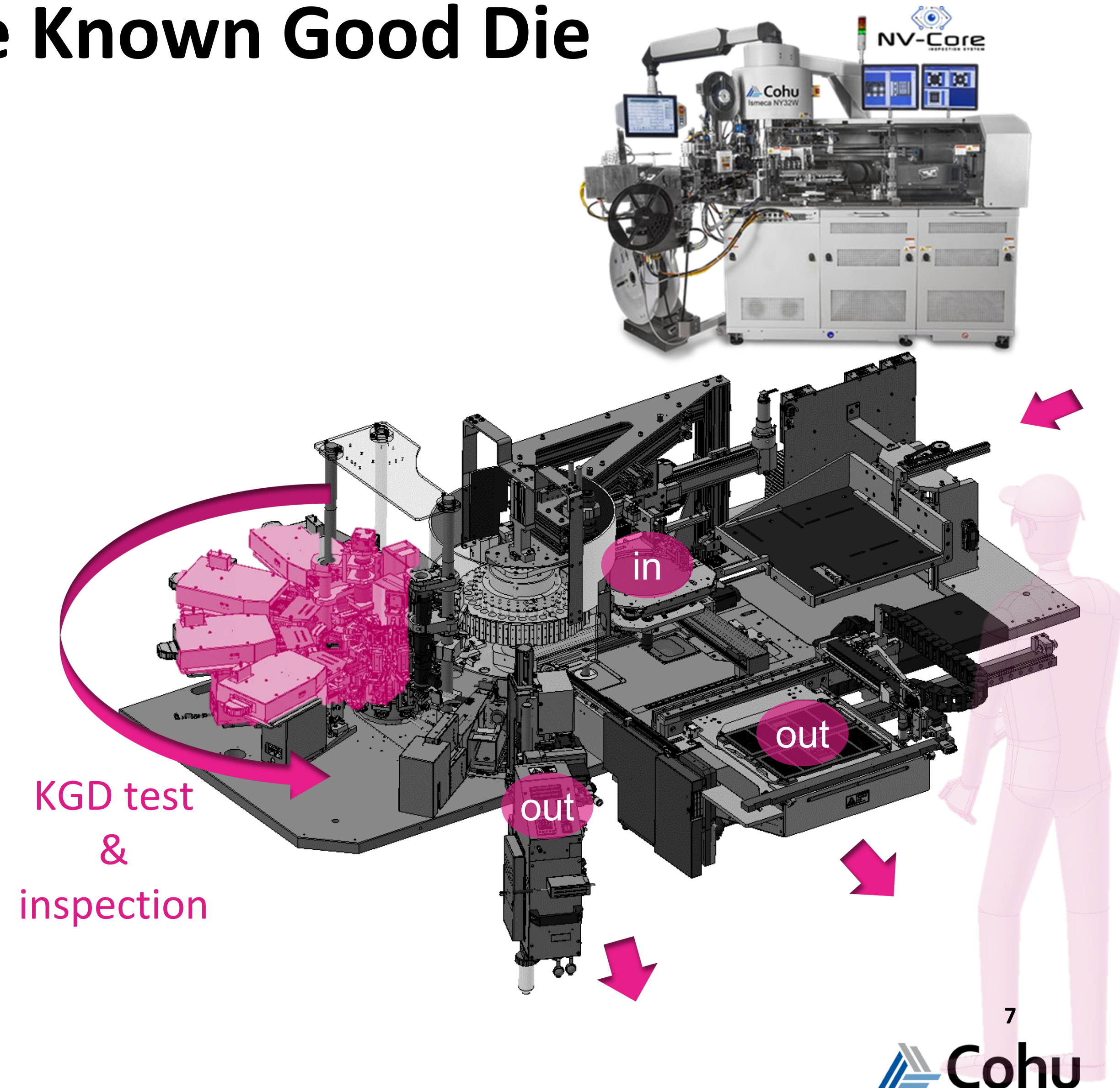
- Up to **7,000 UPH** with test time up to 150 ms
- Probe Imprint controlled down to **1 μm** .
- All ruggedized tests are performed after singulation
- Inspection & metrology is performed before and after testing
- **Unit traceability** is guaranteed from the input to the final output



The Shortest Path to SiC True Known Good Die for Automotive Applications

Know Good Die all-in-one solution

- Single insertion to cover all tests
- Top bottom high-power contactor
- Enhanced inspection & metrology
- Multiple sorting output media
 - Tape & Reel
 - Wafer reconstruction
 - Waffle Pak
- Integrated solution has a smaller footprint



Thank you