

ELITE System

Non-destructive 3D electrical fault localization

Packaging and assembly-related defects are growing more difficult to identify, as “More than Moore” technology proliferates. Interconnects are finer and more intricate; chips and packages are stacked and tiled into complex structures. Bump pitch has decreased and substrates feature higher pattern density and embedded components. Defectivity is growing and defect detection is becoming more difficult.

Using high resolution Lock-in Thermography (LIT) with the highest sensitivity, the Thermo Scientific™ ELITE™ System provides a critical solution for through package, on-die or even on-board electrical defect localization for the widest range of defect types, including power or line shorts, ESD defects, current leakage, oxide damage, defective transistors and diodes, device latch-up and resistive opens.

The ELITE is the first fully integrated system to offer dynamic non-destructive real-time LIT for both 2D and 3D devices. As the market leader, the ELITE System is designed with a proprietary high sensitivity InSb camera, customized optics, and advanced algorithms, in order to deliver superior performance and the fastest time to results, which drives faster learning cycles by providing failure analysis engineers with the critical information they need for root cause analysis.

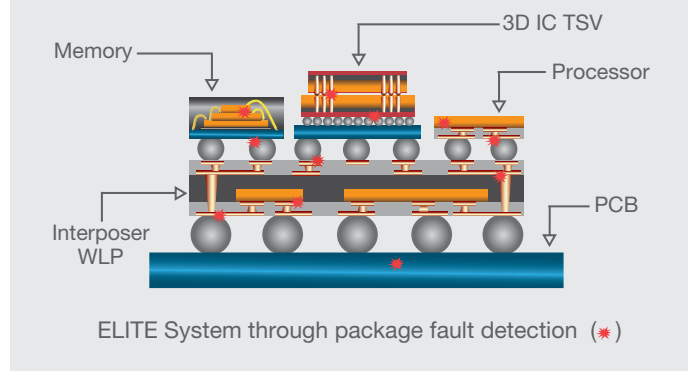
Additionally, the ELITE System, by delivering the highest thermal sensitivity of any non-destructive technique, is able to detect the most challenging defects without de-capsulation, removal of chips from packages or even delayering of the IC device, thereby removing the risk of accidentally losing the fault due to destructive methods.

Key benefits

Completely non-destructive, no de-capping, no de-processing, no risk of losing defect evidence

Quickly identifies defective component on assembly board for accurate dispositioning

Localizes defect in x-y with micrometer accuracy, with depth location accurate to 20 μm



Moreover, the ELITE System can be combined with other non-destructive techniques, such as scanning acoustic microscopy (SAM) or 2D and 3D X-ray technologies, to accelerate time to results and increase success rate through transfer of precise x, y, and z coordinates of the fault location, thereby significantly narrowing down the search radius and inspection time needed by the X-ray and SAM as whenever depth information is needed or small features are present. The ELITE System also offers high resolution optics with the Solid Immersion Lenses (SIL) and S-LSM options, enabling the highest level of resolution and image quality.

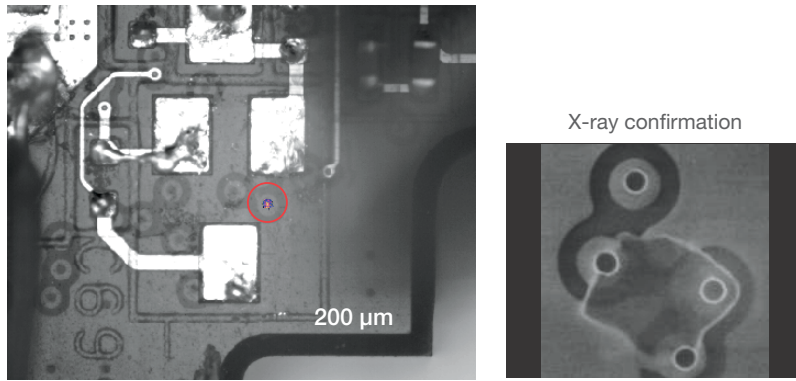


Figure 1. Debris caused shorts inside motherboard - On motherboard (left), ELITE observed a hot spot in a through hole within 5 minutes. X-ray measurements (right) concluded that foreign matter between through holes caused the short failure.

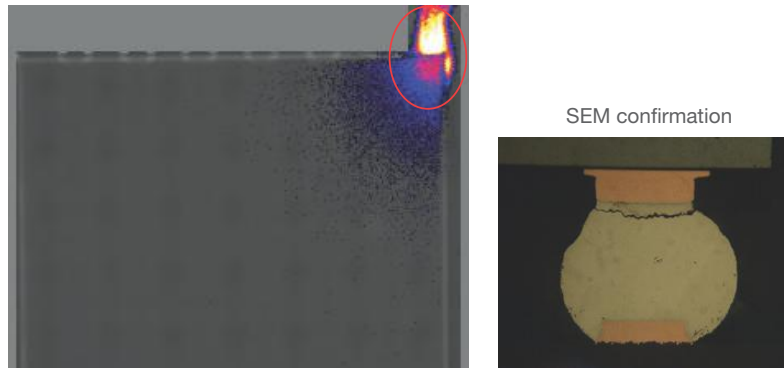


Figure 2. WLCSP drop test resulted in cracked solder ball - After drop test qualification of WLCSP JEDEC board, chain resistance increased from $< 1 \Omega$ to 6Ω . ELITE System found a hotspot on the WLCSP in 4 minutes and SEM confirmed a crack in the solder ball.

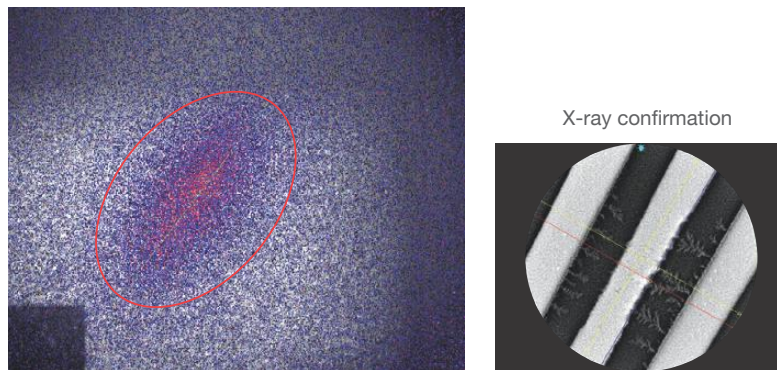
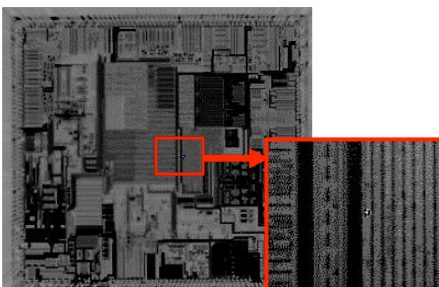
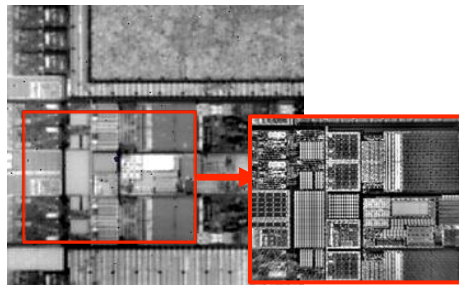


Figure 3. Dendrite identified inside leadframe package - Package part developed small leakage after 2000 hours of high temperature, high humidity qualification test. ELITE System found a hot spot inside the package without decap. X-ray identified dendrites as root cause.

10x MWIR Lens



10x SIL



S-LSM

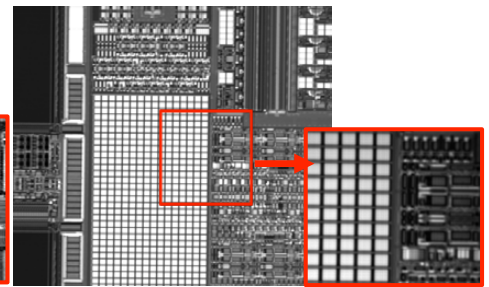


Figure 4: Die level analysis with 10x MWIR lens, SIL and S-LSM options with superior imaging and highest resolution for precise navigation and localization.

ELITE DX



Benefits and typical applications

- Best in class thermal sensitivity for fastest time to results
- Industry leading XY and Z depth localization accuracy
- Easy & quick setup for front and backside probing
- Advanced 2.5D and 3D packages, conventional wirebond and leadframe packages, exposed die and piece parts

ELITE VX



Benefits and typical applications

- Unique 10KV high voltage capable with fully featured user and DUT safety mechanisms
- Uncompromised thermal sensitivity for fastest time to results
- Laser marking with direct view objective
- Power devices, IGBT, power MOSFET and various high voltage devices

ELITE Lite



Benefits and typical applications

- Most cost effective system based on industry leading technology
- Compact footprint with fully integrated operation
- PCB & PCBA, displays, solar panels, and electronic modules

Specifications*

- Lateral resolution
 - Down to 1 μm
- Depth resolution
 - Down to 20 μm
- Defect types
 - Wide range of shorts (2 m Ω to 2 G Ω), leakage (power dissipation as low as 1 μW), resistive opens
- Sample types
 - Board assemblies, modules, packages, full wafers, wafer coupons, die
- FOV
 - Max 200 mm x 160 mm; min 0.62 mm x 0.51 mm
- DUT stimulation
 - Internal DC power supply; ATE, CAN bus, boundary scan tester, system level tester
- Time to results
 - Minutes to seconds, depending on applied power and sample

*Performance may vary depending on sample and specific setup.

