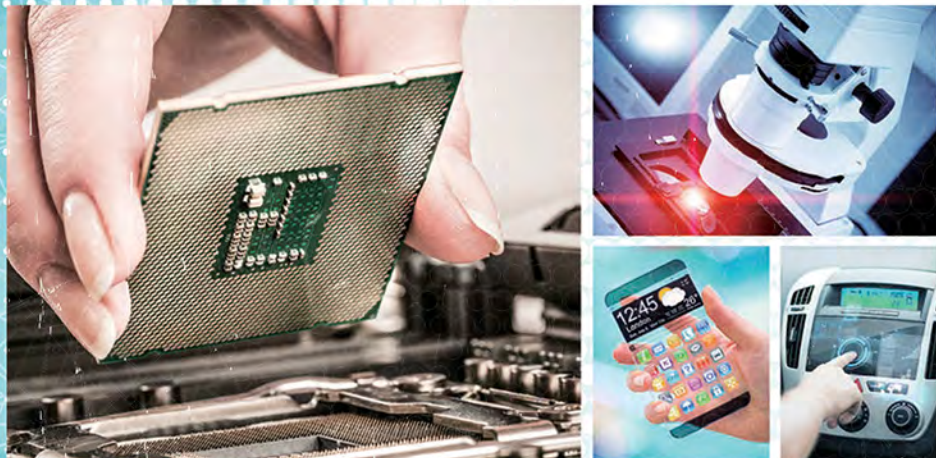


# *Advanced Technology Services at Affordable Price*



Materials Analysis



Reliability Testing



Failure Analysis



Reverse Engineering



**MA** Materials Analysis**RT** Reliability Testing

CEO and Founder  
Sang Lee, PhD

**Message from our CEO:**

I have built my career primarily in Silicon Valley, working for major tech companies including Applied Materials and Intermolecular. Engineers like myself have high expectations for high quality data and in-depth reports at affordable price. However, there are multiple obstacles preventing the combination of these three requirements in one service: high cost of quality data, lack of in-depth analysis, and misalignment of the output with the analysis goals.

Outermost Technology delivers services that meet the requirements through an innovative business model. We have contributed to hundreds of projects for 20+ Silicon Valley technology companies since our inception in 2017. Please feel free to contact us for your technical needs and challenges. Our team of experts is fully ready to assist. Thank you.

**MISSION STATEMENT**

Helping companies gain easy access to various advanced technologies at affordable price with fast turnaround time and high quality.

**CORE VALUES**

**Committing** to help customers solve technological challenges

**Committing** to make the access to technological resources easy and affordable

**Committing** to provide in-depth interpretation of data

**Committing** to introduce new technologies to industrial applications

# Advanced Technology Services at Affordable Price



**FA** Failure  
Analysis



**RE** Reverse  
Engineering

## Why work with us?



### Affordable Price

Up to 40% lower than industry pricing



### Free Consultation

Before and after service



### In-Depth Data Interpretation

As a second opinion to yours



### Quality Assurance Program

Free remeasurement\* if not satisfied

## How to work with us?



Consult with Our  
Technologists



Provide Your  
Samples



Receive In-Depth  
Report



Debrief with Our  
Technologists

\*Applies to selected services

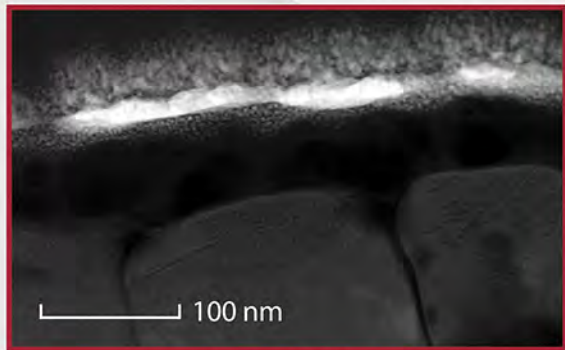


## One Stop Shop for All Services

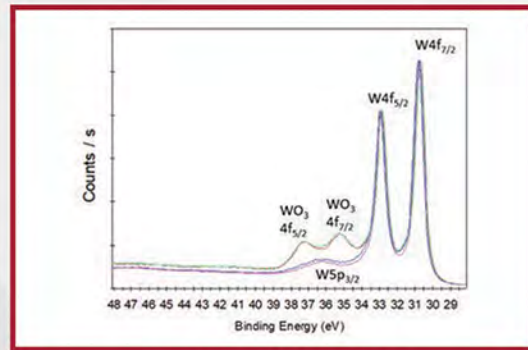
Materials Analysis from Outermost Technology is a turnkey solution offering a wide range of services. These are performed in parallel across multiple measurement types from a centralized point of contact. Reports will include in-depth interpretation across the various measurements.



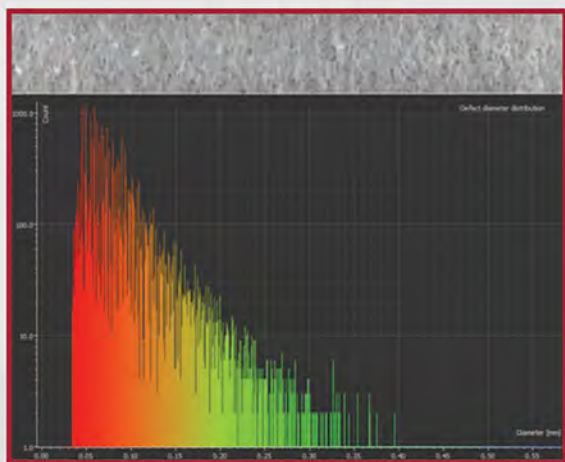
|                                 |                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Microscopy</b>               | Visualization from macroscopic to atomic level<br>3D-CT, AFM, C-SAM, Dual Beam FIB/SEM, SQUID, SEM, TEM     |
| <b>Scattering</b>               | Analysis of material structure and composition<br>DBS, PALS, RBS, HFS, NRA, ToF SIMS, XRR, XRD, XRF         |
| <b>Chemical Analysis</b>        | Identification of elements and chemical bonding states<br>d-AES, d-XPS, ICP, NMR, MALDI ToF, EDS, EELS      |
| <b>Spectroscopy</b>             | Characterization of materials based on their interaction with light<br>Fluorescence, FTIR, Raman, UV-VIS    |
| <b>Chromatography</b>           | Analysis of Composition including trace impurities in liquids and gases<br>GC-MS, TGA GC-MS, IC-MS, HPLC-MS |
| <b>Thermal &amp; Mechanical</b> | Qualification of physical properties of materials<br>Porosimetry, TMA, DSC, TGA, Nanoindenter               |



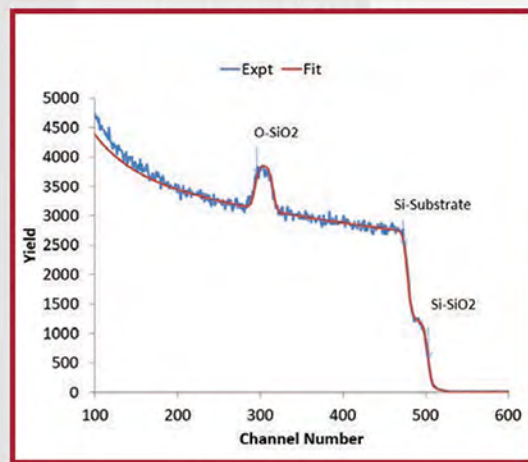
TEM-HAADF



W and WO<sub>3</sub> by XPS



Pore Size Distribution by 3D X-ray



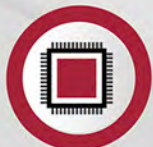
RBS Profile



SEMICONDUCTOR



AUTOMOTIVE



IC CHIP



LED



OTHER



# All Reliability Tests from NPI to Obsolescence

Outermost Technology's goal is to help customers solve all hardware issues in order to achieve robust product design with world class quality. Reliability tests provided by Outermost Technology are governed by JEDEC and are ISO 9001:2018, ISO 17025:2015, ISO 26262, AEC, IPC certified.



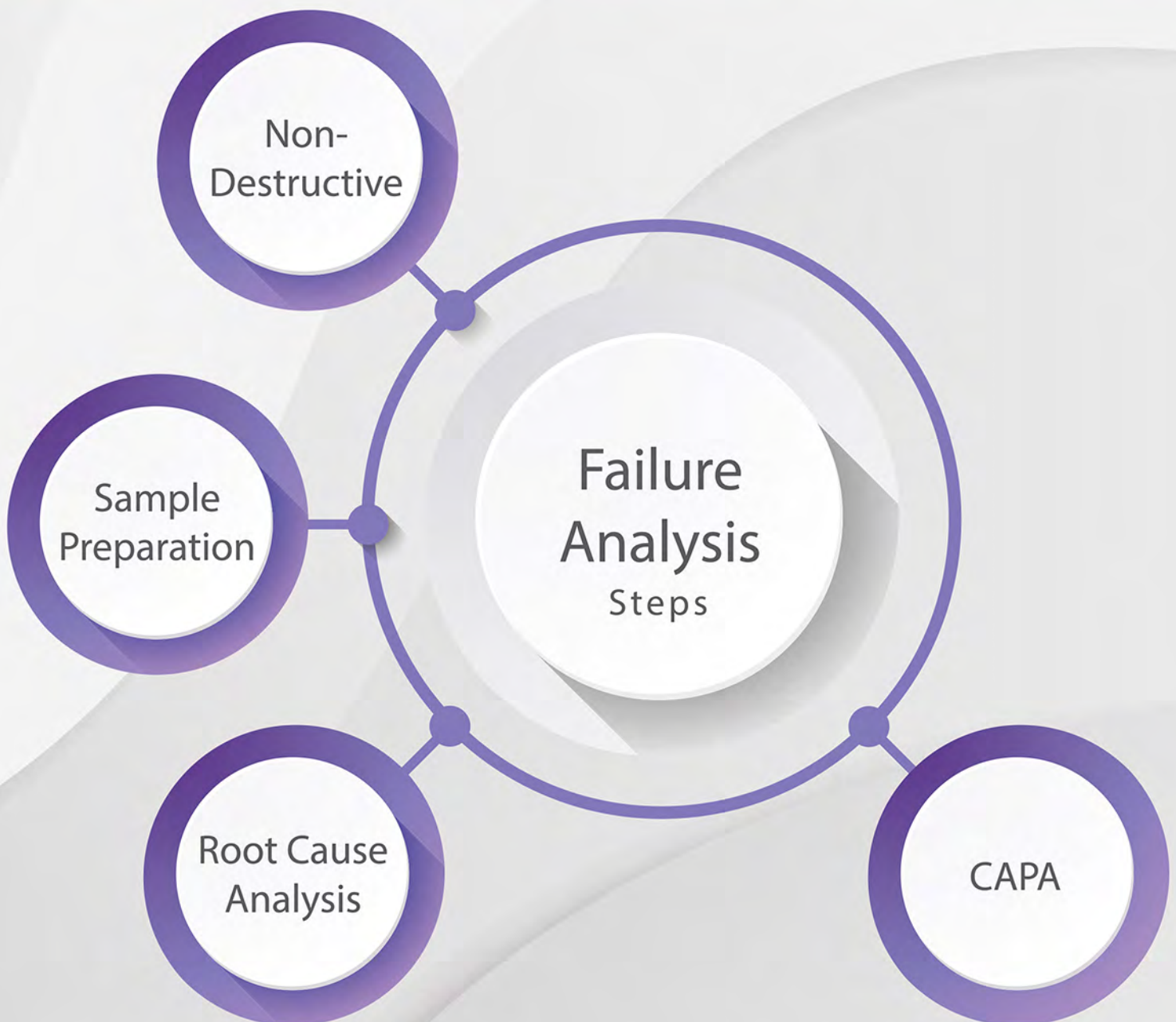
|                                |                                                                |
|--------------------------------|----------------------------------------------------------------|
| <b>ESD/EOS Test</b>            | HBM, MM, CDM, TLP, Latch up, System Level ESD Test, EMC, EMI   |
| <b>Electrical/Thermal Test</b> | Burn-In, Damp Heat, HTGB, HTFB, HTRB, TC                       |
| <b>Mechanical Test</b>         | Shock, Vibration, Drop, Solderability, Memory Twist            |
| <b>Environmental Test</b>      | Altitude, MSC, MSL, THB, THS, HAST                             |
| <b>Lifetime Test</b>           | ELFR, HTOL, LTOL, HALT, HASS                                   |
| <b>Advanced Consulting</b>     | DFX, FMEA, MTBF, Weibull Analysis, QMS/Pursue ISO Certificates |





### All Your FA Needs Covered

Outermost Technology provides full service in failure analysis from non-destructive analysis to root cause identification. The combination of highly trained experts and leading-edge equipment provides cost efficiency and fast turnaround time with the best quality. Our FA8D report includes CAPA, ECO, FCO, and SCAR in addition to standard content.



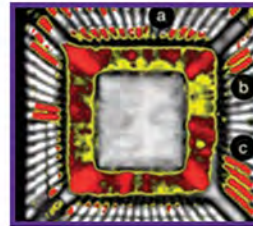


|                            |                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------|
| <b>Non-Destructive</b>     | Curve Tracer, C-SAM, SIMM, TDR, SQUID, Optical Microscope, X-Ray Imaging                        |
| <b>Sample Preparation</b>  | Decapsulation, Ion Milling, Parallel Lapping, RIE, Cross-Section, Dye and Pry Analysis          |
| <b>Root Cause Analysis</b> | 3D-CT, AFM, APT, EBSD, EMMI, FIB/EDX, FTIR, LSM, OBIRCH, PICA, SEM/EDX, SCM, SSRM, TEM/EDX/EELS |
| <b>CAPA</b>                | Generate CAR, PAR, SCAR, ECO, FCO, Training                                                     |

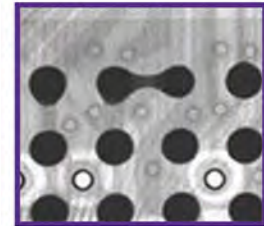
## STEP 1

### Non-Destructive

FA usually starts with non-destructive analysis, visual and electrical, to locate the failures. The samples are handled with extreme care to prevent any additional damage during analysis and storage.



Scanning Acoustic Microscope

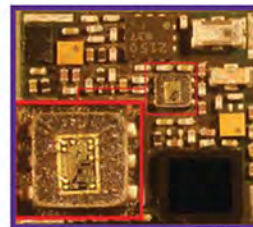


X-Ray

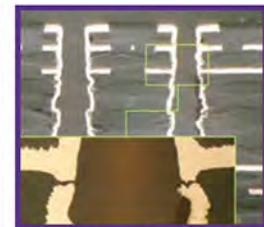
## STEP 2

### Sample Preparation

Depending on the packaging material types and the findings from non-destructive analysis, various methods are available for sample preparation. These methods include mechanical, chemical and laser decapsulation as well as parallel lapping and cross-section.



Package Removed



Crack on Via

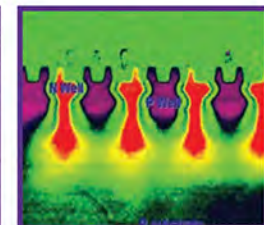
## STEP 3

### Root Cause Analysis

Leveraging our expertise in analytical technologies, we perform FA on micron to nanometer scale devices for AI, ASIC, automotive, LED, semiconductor industries. Our services will locate the issues, isolate the fault, and identify the root cause, quickly and economically.



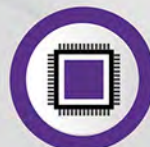
Optical Beam Induced Resistance Change



Scanning Capacitance Microscope



AUTOMOTIVE



IC CHIP

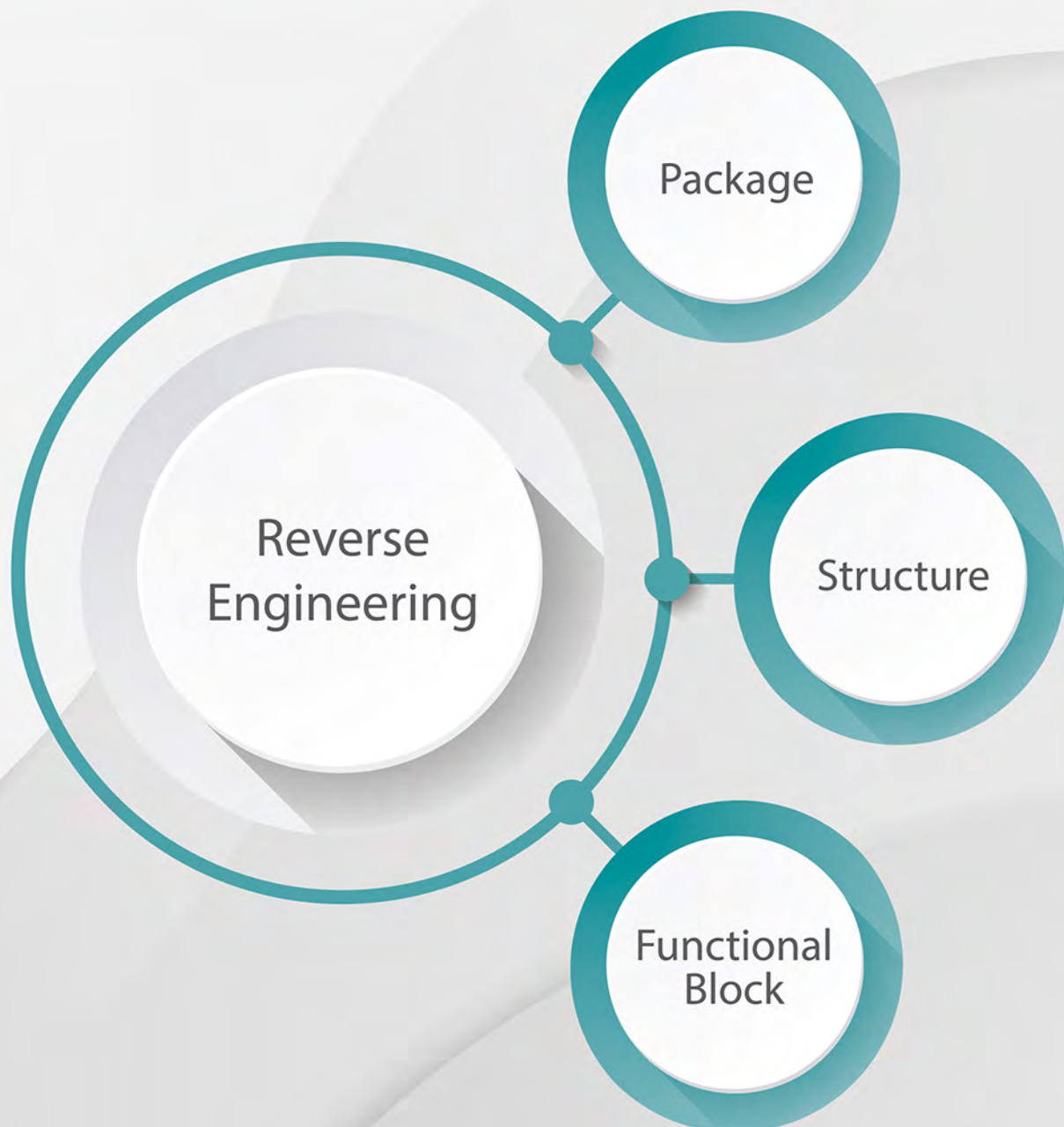


LED



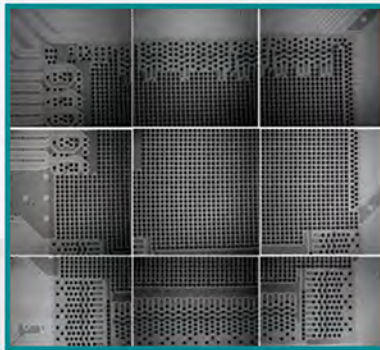
# You Pick a Device, We Provide All from A to Z

Outermost Technology provides services to IC design & manufacturing, display, sensor, and IP licensing companies. As our services include traditional approaches and the advanced ones such as TEM/EELS and SCM/SSRM, we can cover all your needs in reverse engineering and litigation.

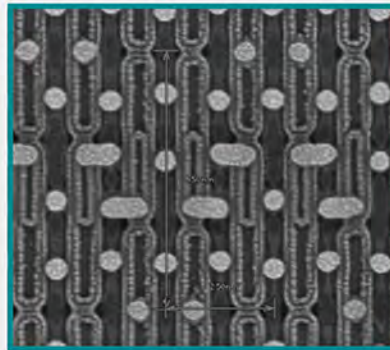




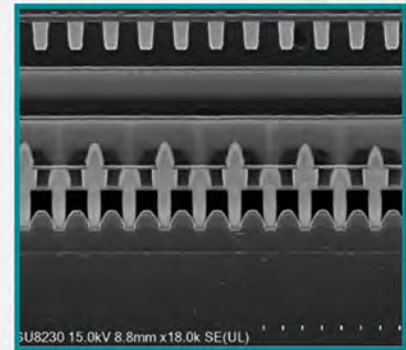
|                         |                                                                                                                                                                           |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Package</b>          | Parallel Lapping, Dual Beam FIB/SEM, High Resolution Optical Microscope, Polishing/Ion Milling, SEM/EDS, TEM/EDS/EELS, APT, SCM, Wet/Dry Etching, X-ray Imaging, FIB, SEM |
| <b>Structure</b>        | Bump Pitch/Pad, Metal Layer/Via, Package Layer, Pin Connection Configuration, Pin Mapping, Polyimide, Solder Ball/Pad, UBM Size                                           |
| <b>Functional Block</b> | Block Identification, Chip/Pad Dimensions, IO Pads, Technology Node, Memory Block/Size, Memory Type, Metal Structure, Material Identification                             |



X-ray Image of a SoC Chip



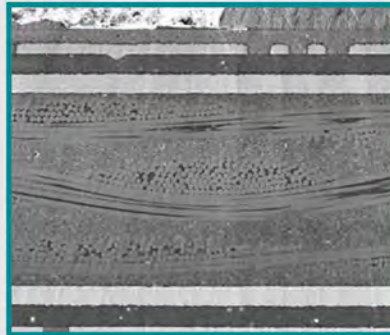
Unit Cell from SRAM Block



SEM Cross-Section



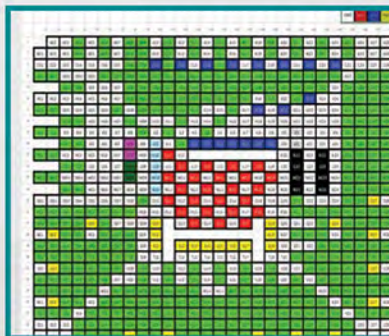
TEM Cross-Section



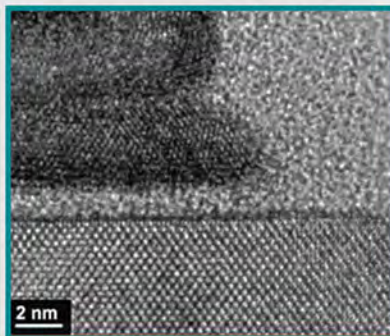
Cross-Section by Ion Milling



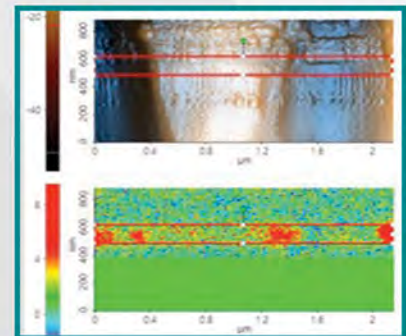
Metal Layers by FIB/SEM



Pin Connections



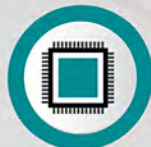
Atomic Resolution TEM



SCM of Poly CG - 20nm



AUTOMOTIVE



IC CHIP



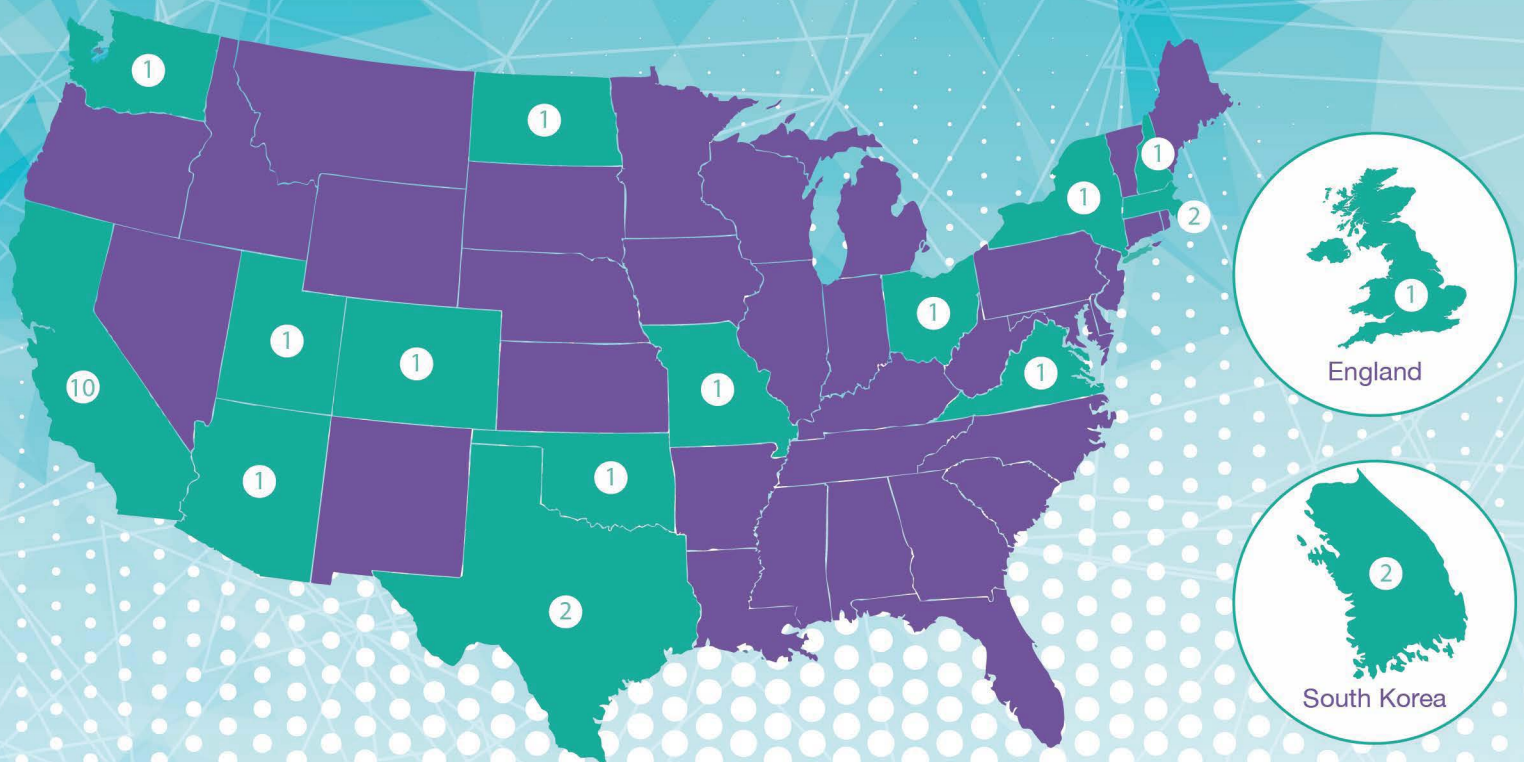
LED



OTHER



## Global Network



## Outermost Technology



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