



**Sn/Pb Conversion and Up Screening
of Surface Mount COTS Components
and Lessons Learned**

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Content Focus

- ✓ Sn/Pb Electroplating Applicability
- ✓ Advantages of Sn/Pb Plating
- ✓ Overview of Typical Sn/Pb Plating Conversion Process Flow
- ✓ Component Types Generally Compatible with Sn/Pb Plating Conversion Process
- ✓ Lessons Learned – Case Examples from 2025 – GEM (Gold Embrittlement Mitigation)
- ✓ Screening options for passive and actives – customer driven

Sn/Pb Electroplating Applicability

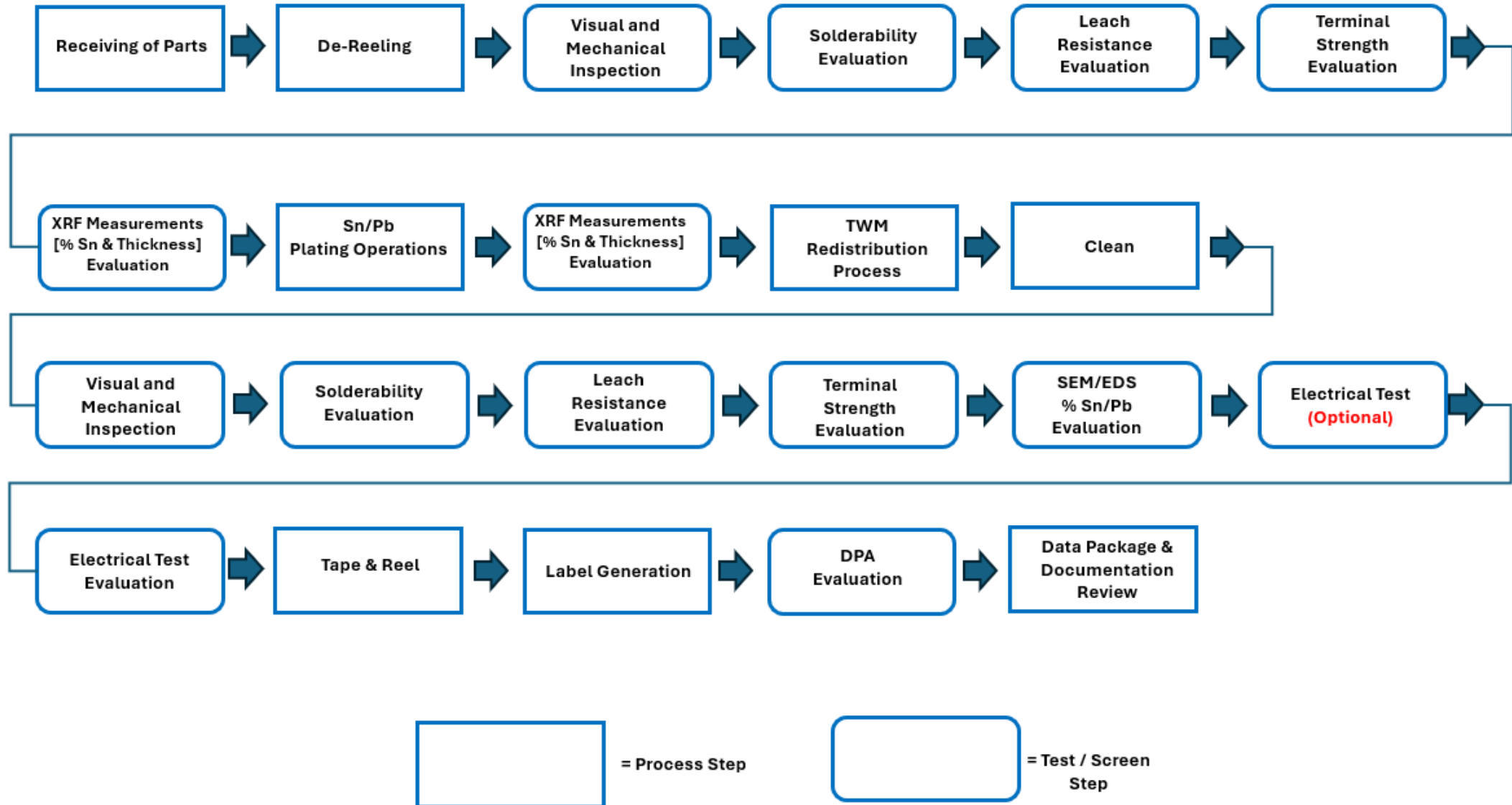
- Sn/Pb plating is ideally suited for the Sn/Pb conversion of surface mount chip style components.
- Sn/Pb plating is an effective means of Sn/Pb conversion for many other surface mount component types which have external terminals that wrap closely around the component body.
- Sn/Pb plating is an effective means of Sn/Pb conversion for many plastic encapsulated components with a sealed body construction.
- Sn/Pb plating is an effective means of Sn/Pb conversion for many QFN or other high pad count components where PCB mounting coplanarity is a concern.
- Sn/Pb plating may be an effective means of Sn/Pb conversion when the surface mount component type is susceptible to soldering heat and/or the thermal shock of RHSD processing.
- Sn/Pb plating is not suitable for Sn/Pb conversion of most through hole (radial/axial terminated devices) or surface mount components with terminals extending away from the component body.
- Sn/Pb plating is not suitable for BGA Sn/Pb conversion.
- Sn/Pb plating may not be an effective means for Sn/Pb conversion when the component construction is not compatible with plating bath chemistry.

Advantages of Sn/Pb Electroplating

- For most chip style packages (chip capacitors, chip resistors, chip inductors, chip ferrite beads etc.) the Sn/Pb electroplating processing follows closely the OEM's Sn electroplating process.
- The component under processing is not subject to the thermal shock and temperature extremes typically associated with RHSD Sn/Pb conversion.
- OEM's mechanical outline dimensional limits are maintained post Sn/Pb plating.
 - Coplanarity and mounting integrity following Sn/Pb conversion processing are assured
 - Components can be repackaged in OEM original carrier tape
- Metallization surfaces are completely Sn/Pb covered (no Sn surfaces remaining).
- Effective as a means of converting Au plated and thick film terminations in many instances.

Tin Whisker Mitigation

Sn/Pb Conversion – Process Flow of Standard Operations



Most Common Component Types Suitable for Sn/Pb Plating Conversion Processing

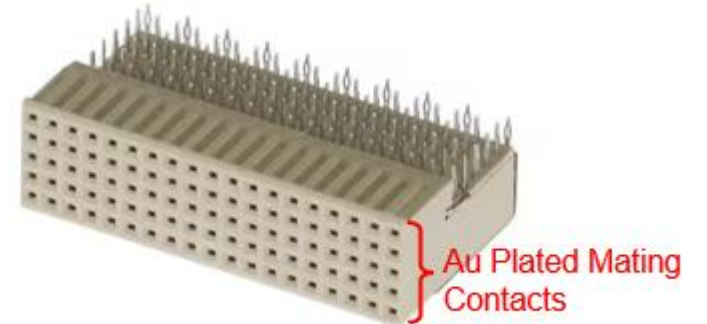
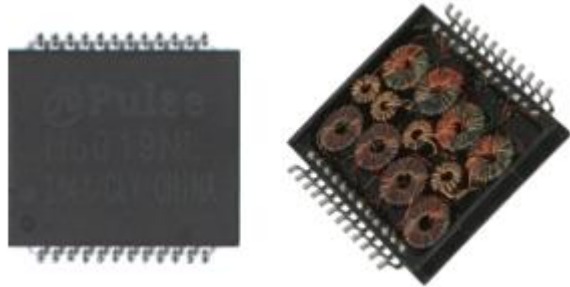
- Chip Capacitors – SMD, 01005 to 2220 package size or larger
- Chip Resistors – SMD, 0201 to 2220 package size or larger
- Chip Inductors – SMD, 0201 to 1812 package size or larger
- Chip Beads – SMD, 0201 to 1812 package size or larger
- Fuses – SMD, 0402 to 1812 package size or larger
- Varistors – SMD, 0603 to 1812 package size or larger
- Resistor Arrays / Capacitor Arrays / Chip Bead Arrays
- Molded Body Diodes – SMA, SMB, SMC, SMD pkgs with reverse J Leads
- Molded Body MOSFETS
- DPAK packages
- SOT-23 / SOT-223 packages
- DO-214AB packages / QFN packages
- Tantalum Capacitors – All standard sizes
- Lug Connectors
- EMIFL packages and most chip and molded body filters
- Active Components – Mosfets, Diodes, QFN's, etc..





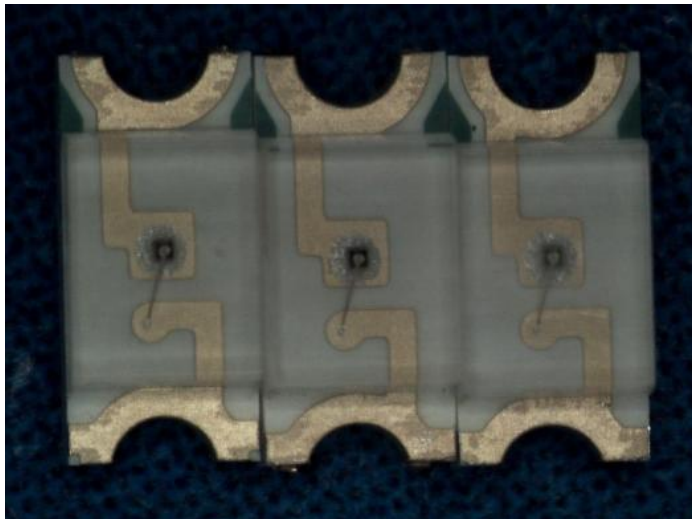
Tin Whisker Mitigation

Other Component Types Suitable for Sn/Pb Plating Conversion Processing

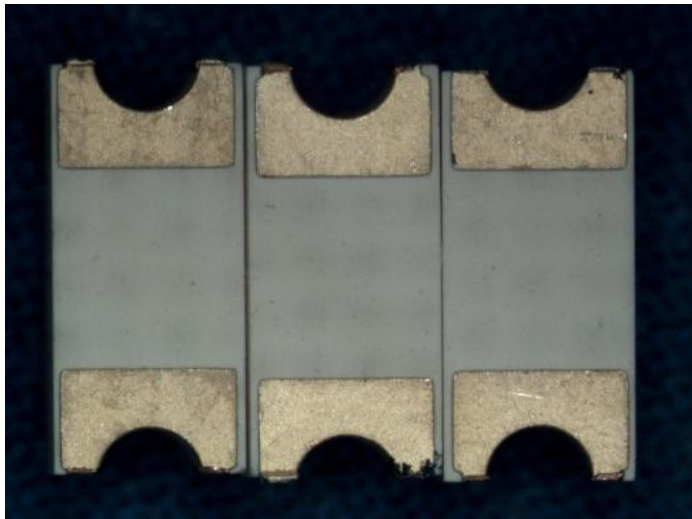
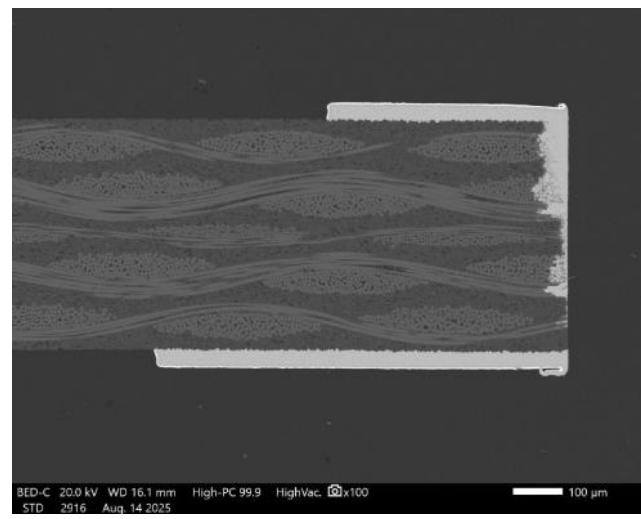
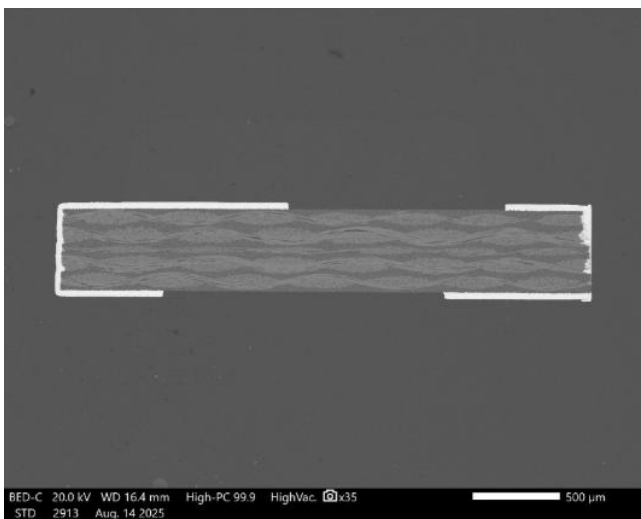




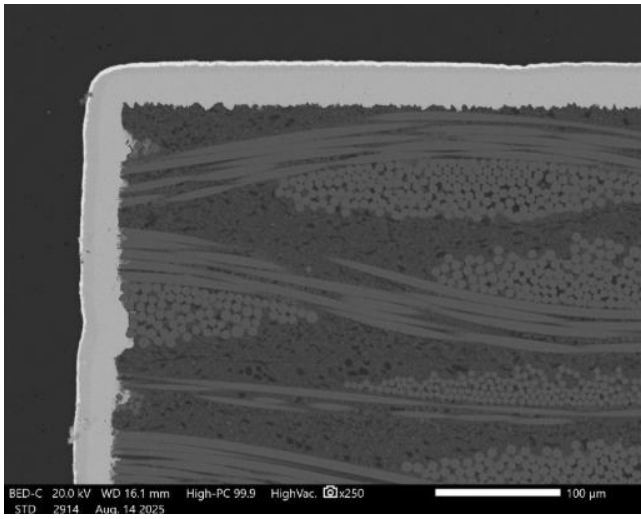
LED with Au Plated Termination Finish



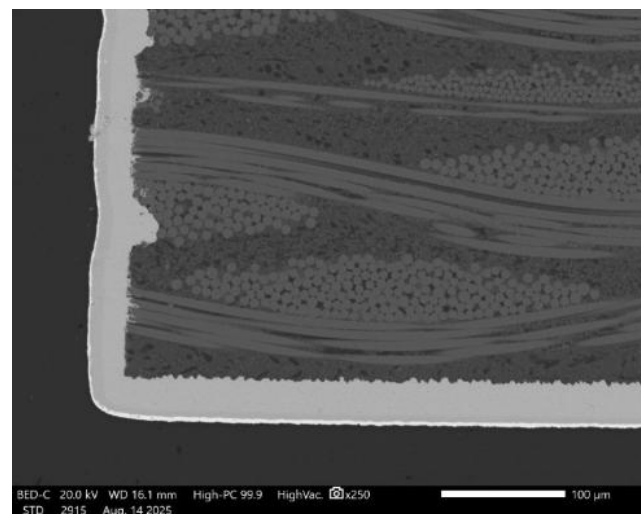
As received top view



As received bottom view



Termination layers are Au/Ni/Cu

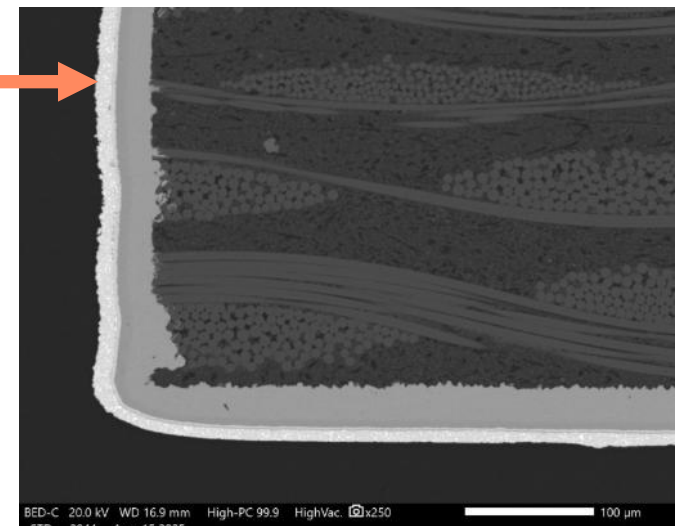
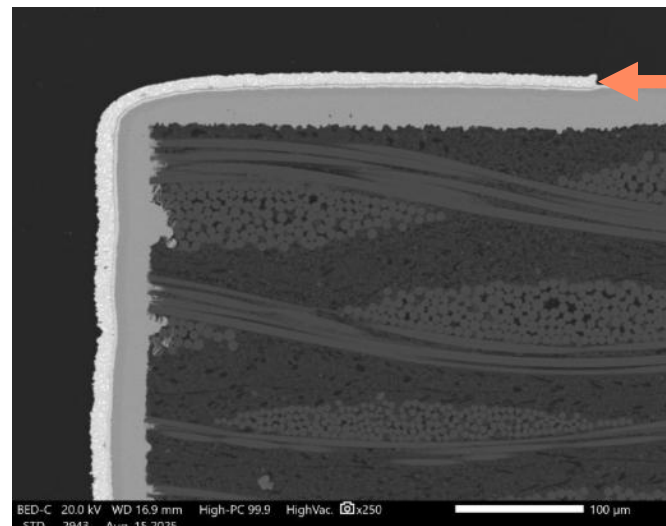
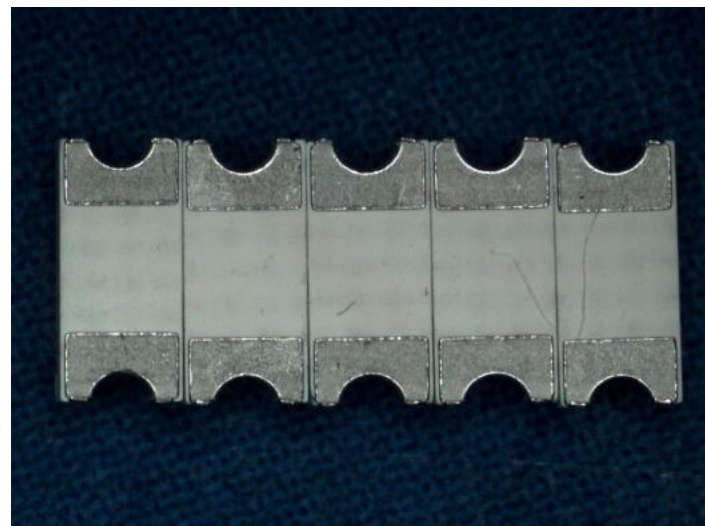
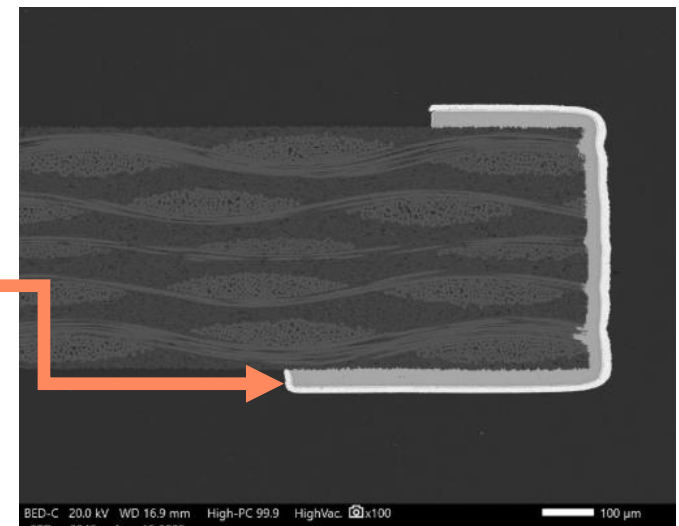
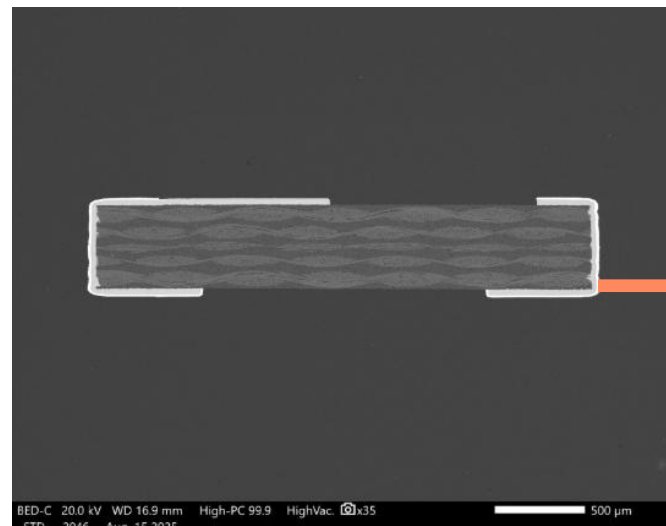




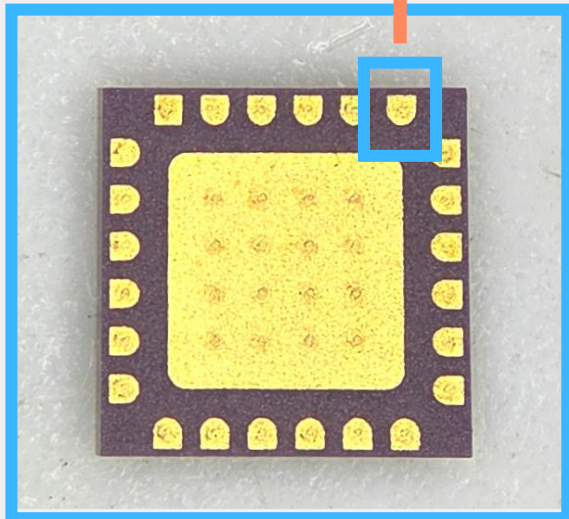
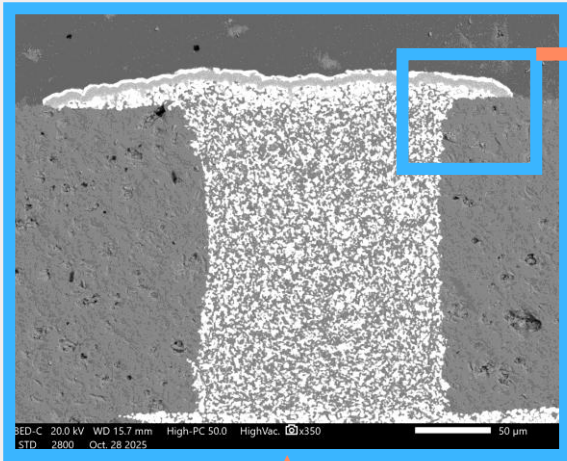
LED with Sn/Pb Solder Termination Finish Post-Processing



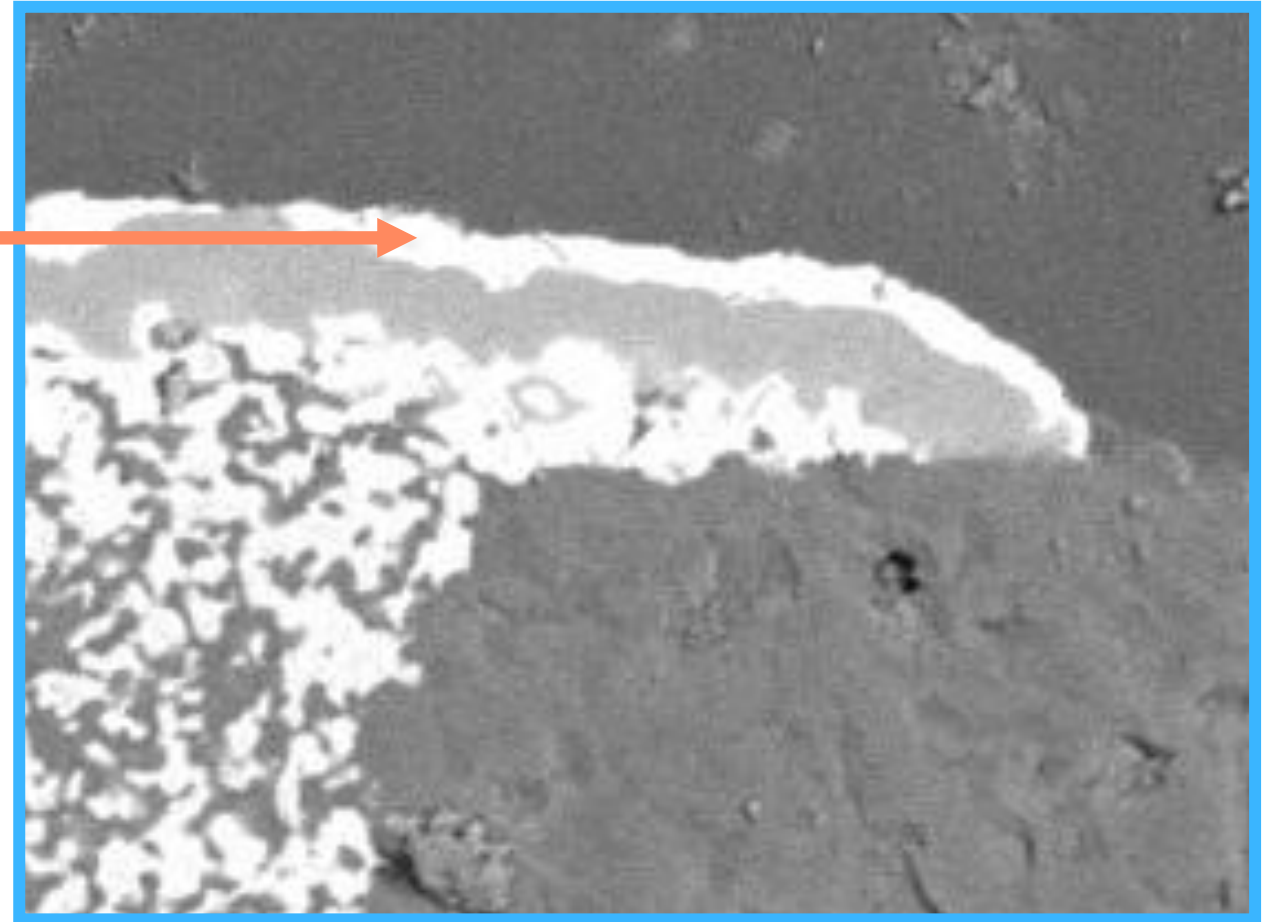
Post Sn/Pb Conversion of External Terminals



24-QFN with Au Termination Finish

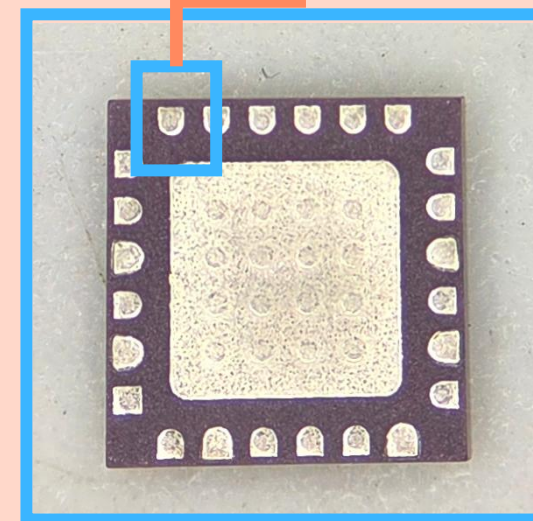
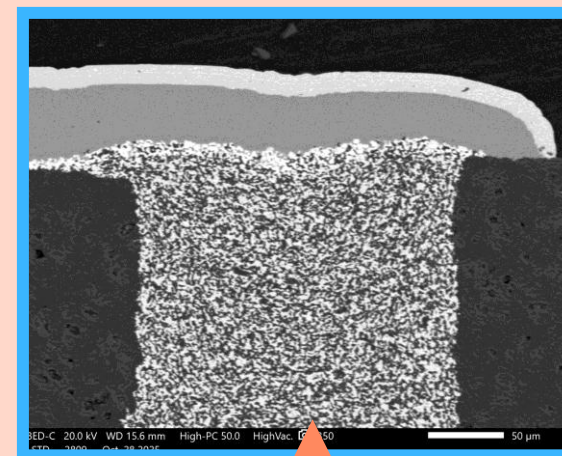
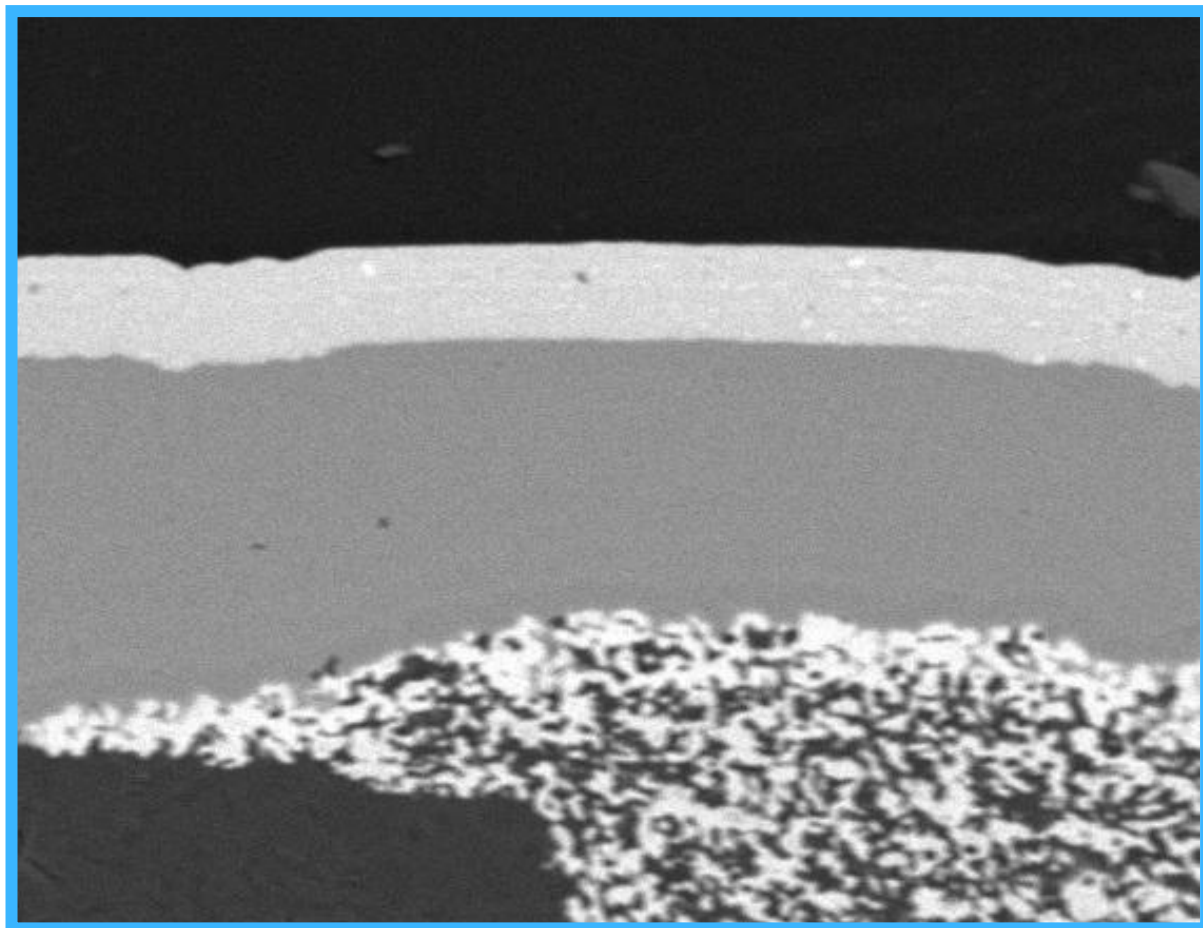


As received Au plating



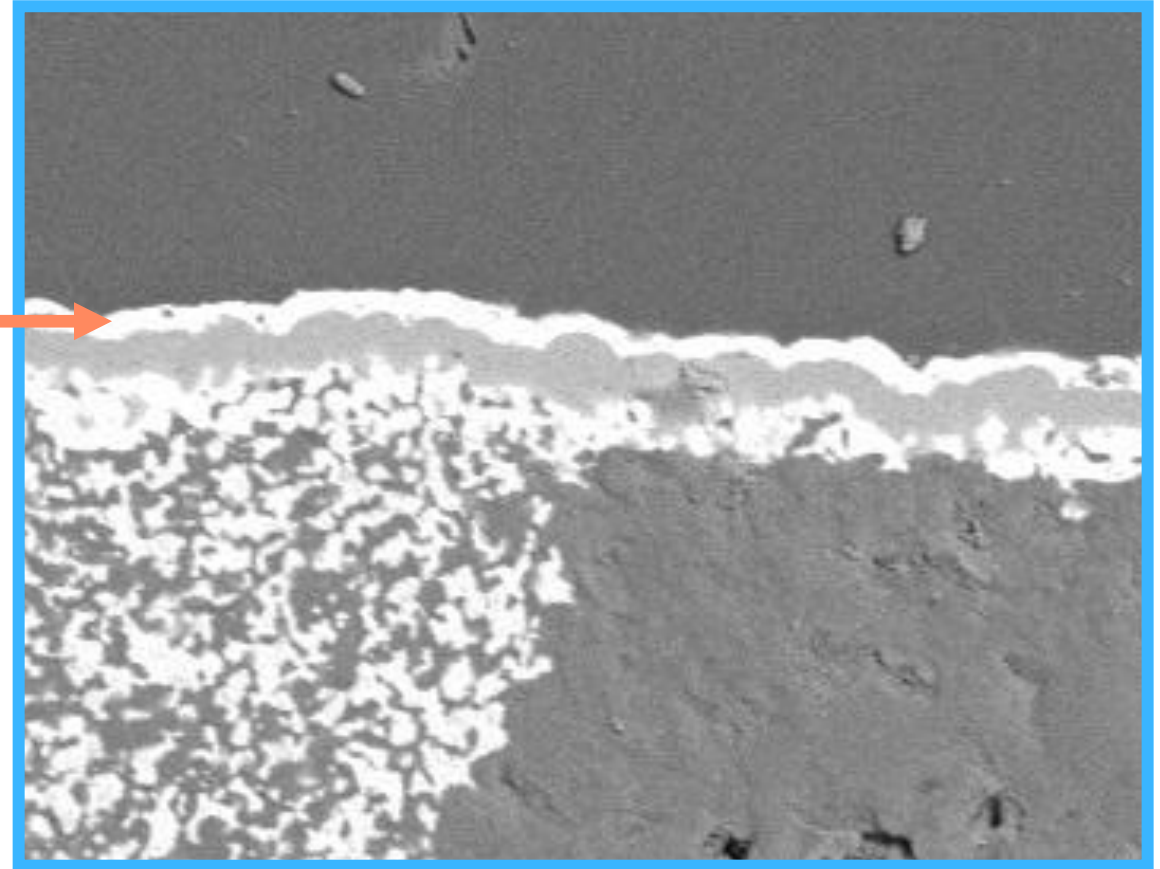
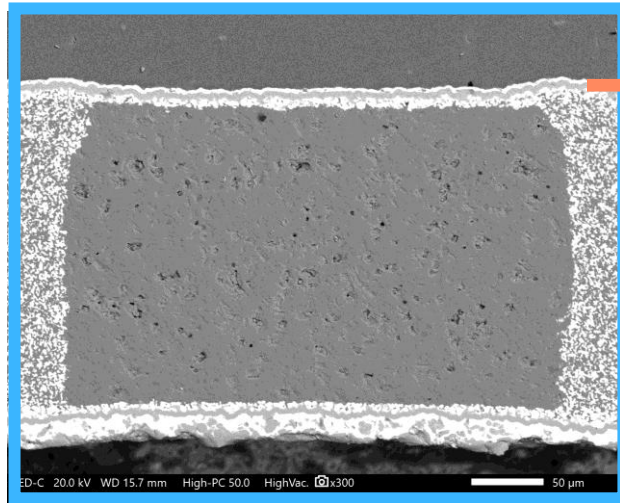
Sectional view of “as received” termination finish (Au/Ni/W)

24-QFN Sn/Pb Solder Final Termination Finish

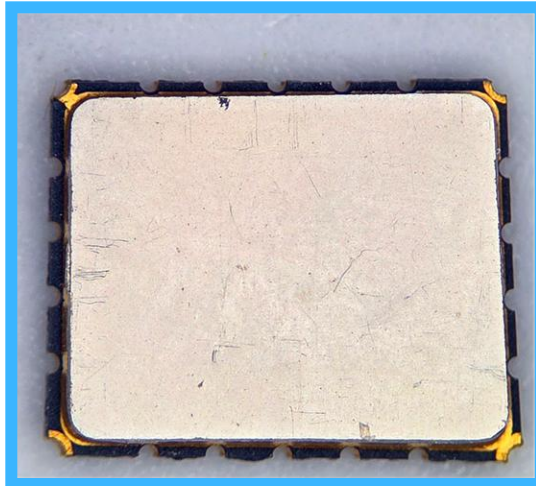


Post Sn/Pb
Conversion
Processing

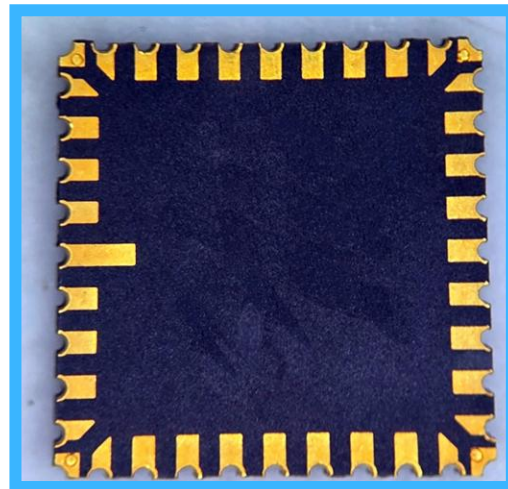
40-QFN with Au Termination Finish – Top Cover Required Masking



Sectional view of “as received” termination finish (Au/Ni/W)

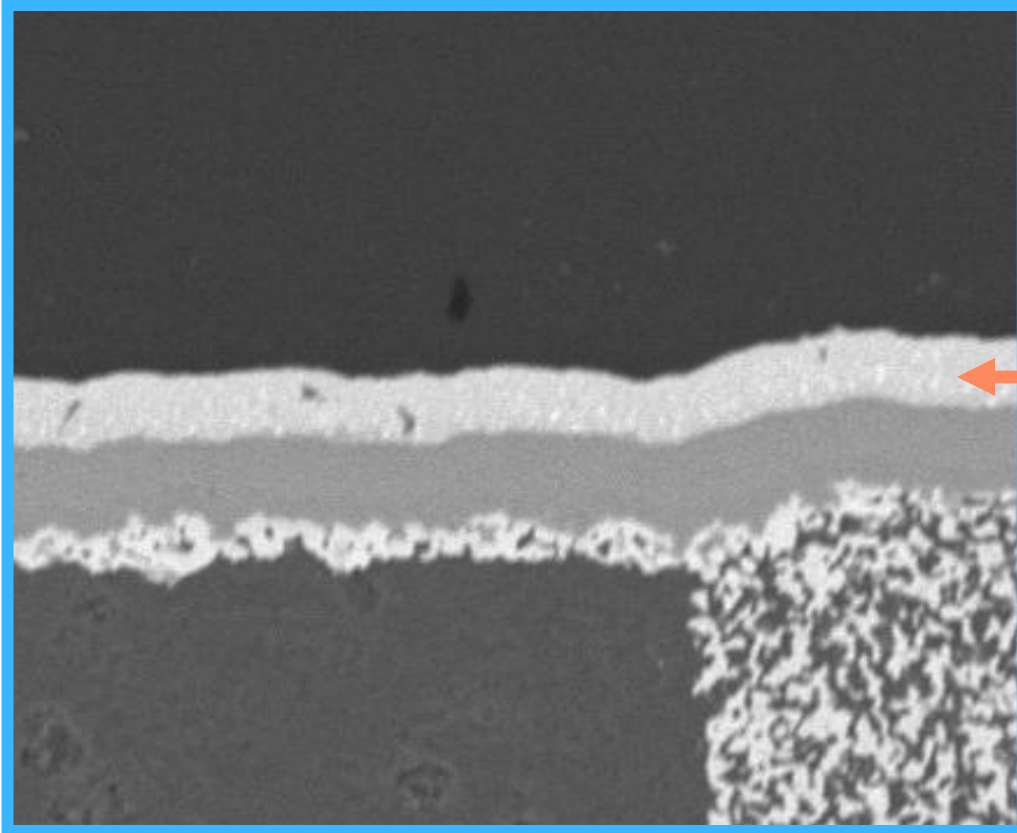


Top cover Ni Alloy

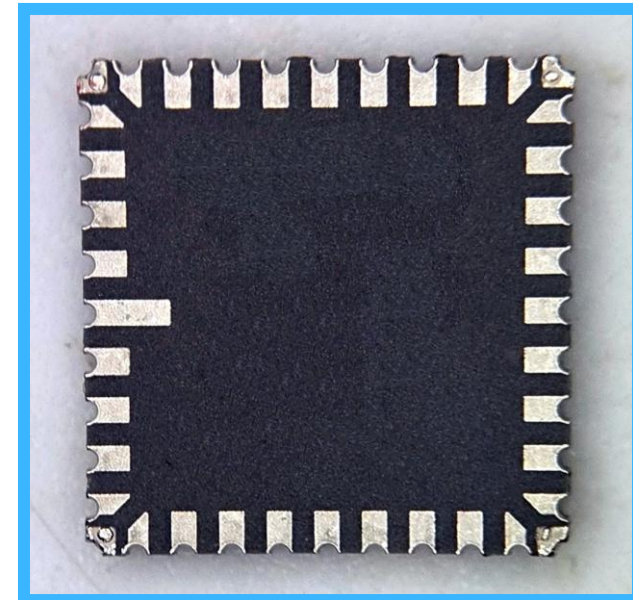
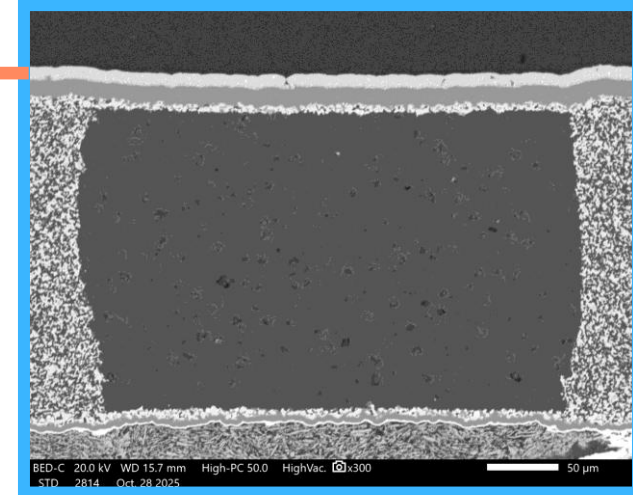


As received Au plating

40-QFN Sn/Pb Solder Final Termination Finish

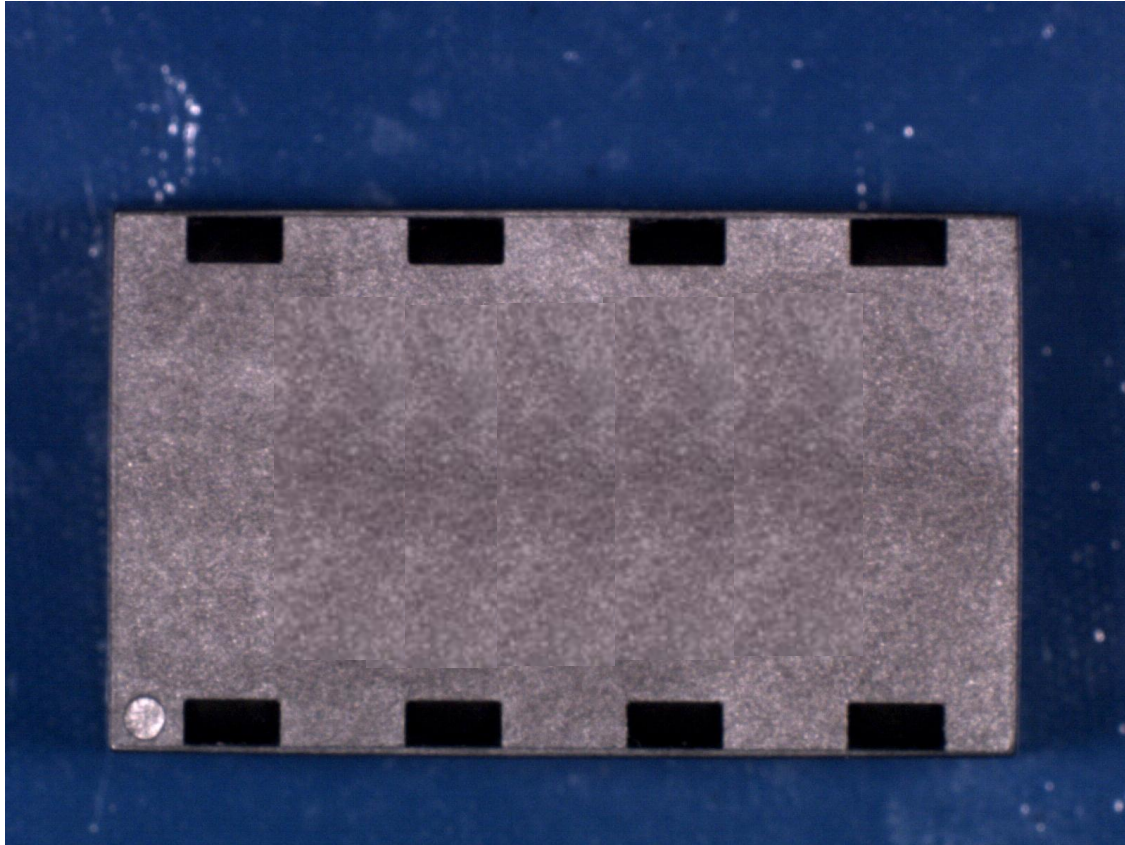


Sectional view showing Tin/Lead (Sn/Pb)

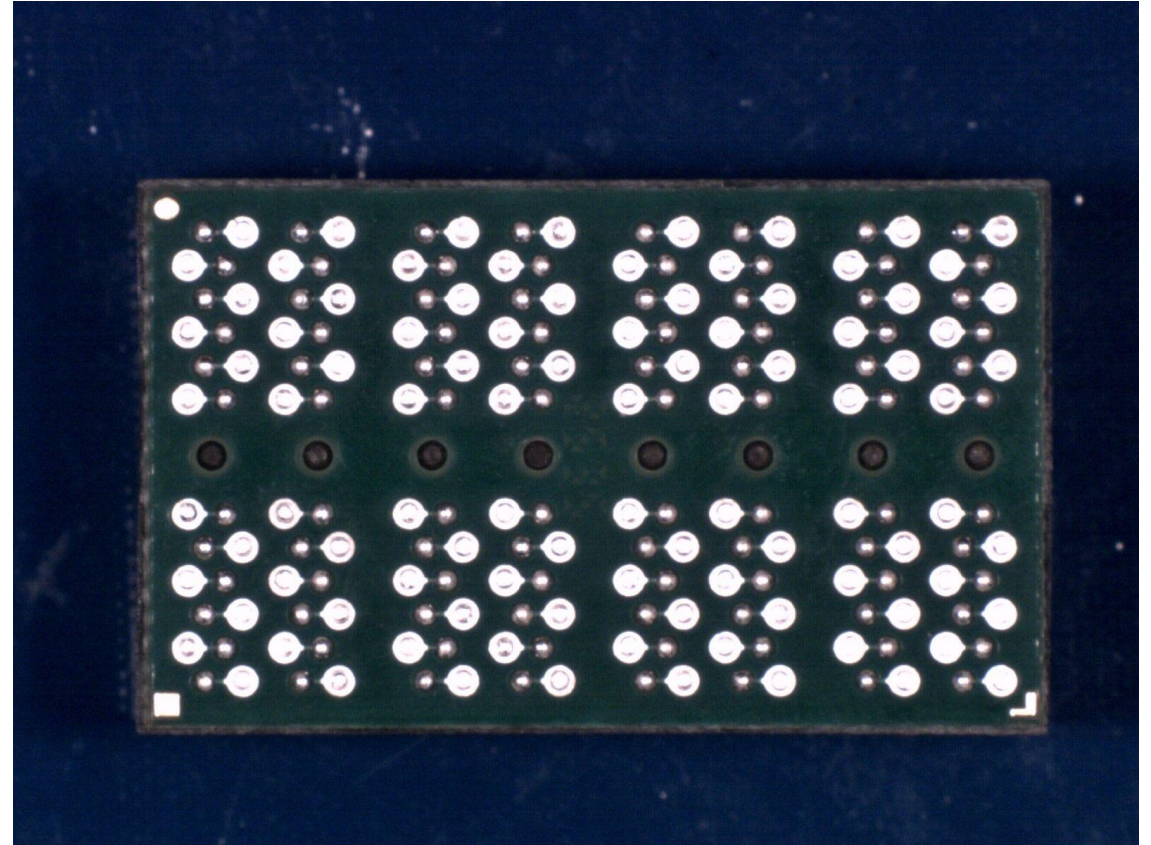
Post Sn/Pb
Conversion
Processing

Case Study – Solder Ball Termination

96-Ball – Quad Transformer Module



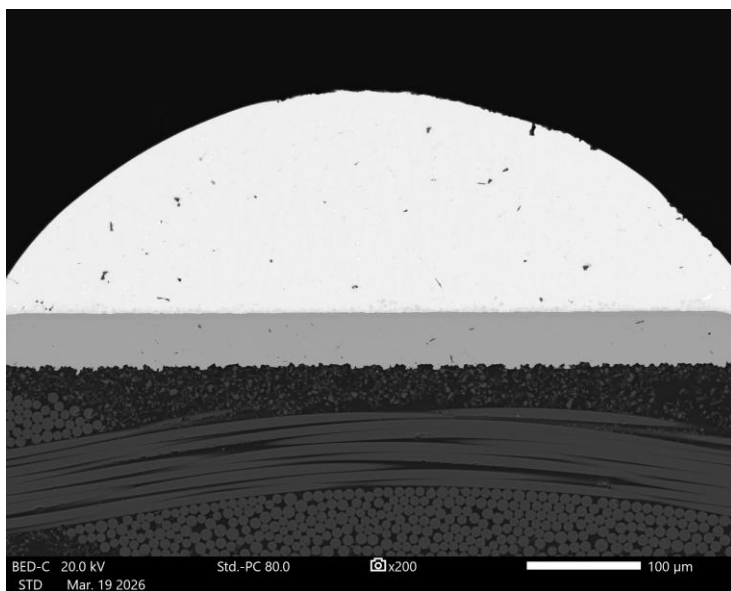
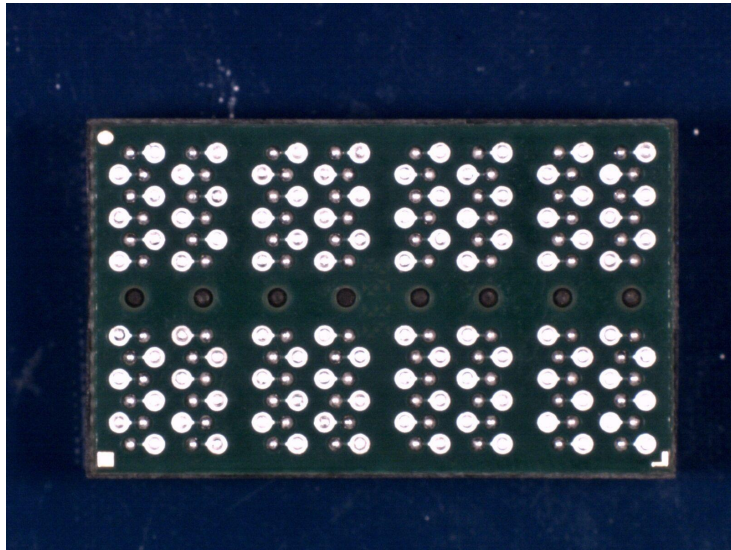
Top Housing -
Thermoplastic



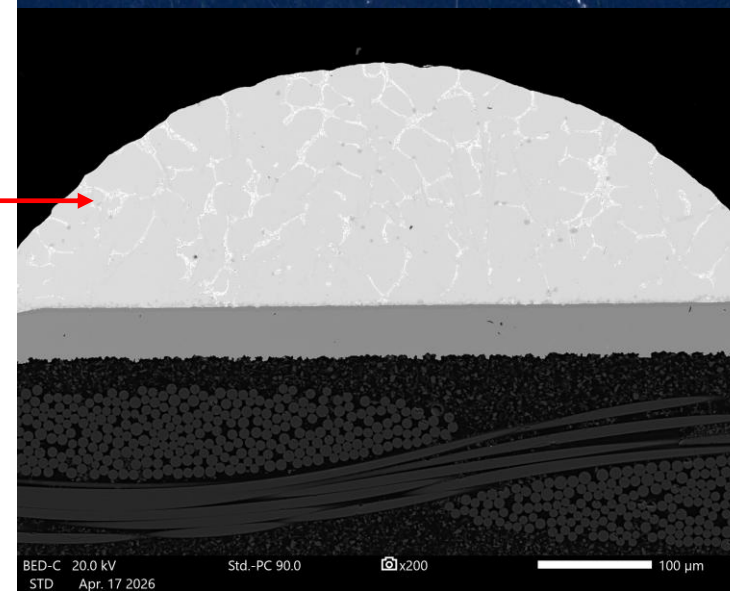
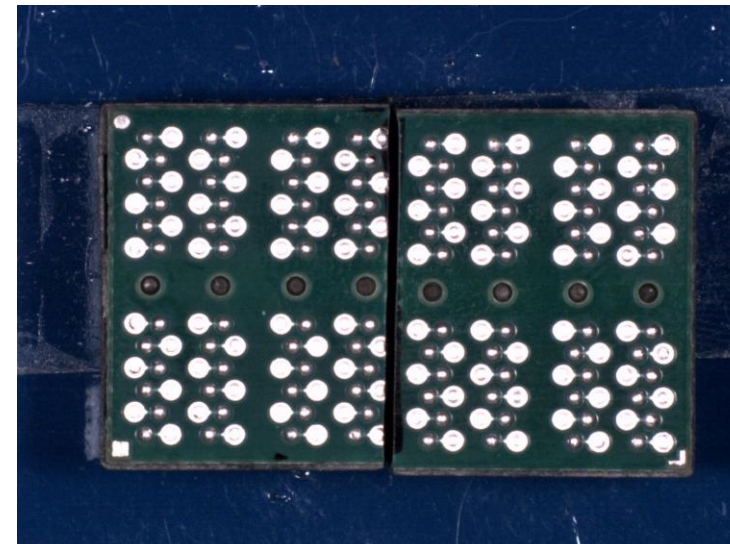
Bottom Side – 96 Solder
Balls

Case Study – Solder Ball Termination

96-Ball – Quad Transformer Module



Solder Ball Pre-Conversion (Sn/Ag Eutectic)



Sn/Pb Plating + Fusion
Processing Required to
Distribute Pb throughout
entire solder ball

Solder Ball Post Sn/Pb Conversion (Sn/Ag/Pb) 15

Minimum Standardized Incoming / Outgoing Quality & Performance Verification Passive Devices



Basic Mid-Rel

Screening / Metallization (Standard)

- TWM/RoHS/Gold
- 100% Vis./Mech. MIL-PRF-55342
- Sample Electrical Inspection
- MIL-STD-1580 DPA
- AS9102 FAIR
- Customer SCD (simple 1-2 pages)



Basic Mid-Rel + 100% Screening

Screening / Metallization (Standard + 100% Electrical/Mechanical)

- 100% Group A per MIL-PRF-55342
- Group B per MIL-PRF-55342
- Customer SCD (typ. 6-12 pages)



Basic Mid-Rel + DLA Drawing Compliant

Screening / Metallization

(Standard + 100% Electrical/Mechanical + Qual)

- Group C per MIL-PRF-55342
- DLA/DSCC Drawing
- Customer SCD typ. 8-15 pages)



Basic Mid-Rel + DLA + "S" Level

Screening / Metallization

(Standard + 100% Electrical/Mechanical + Qual + 981)

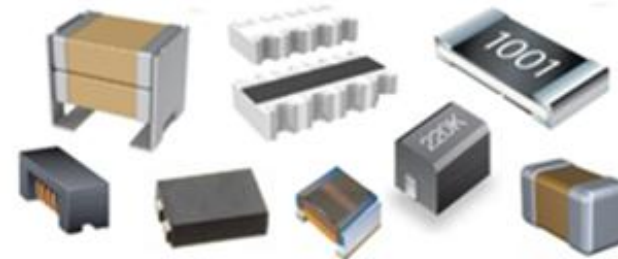
- QPL (Possible for AEM Mfg. Products)
- MIL-STD-981 / Class S
- Customer SCD (typ. 10-20 pages)

Screening examples above applicable to resistors (MIL-PRF-55342)

Fuses – MIL-PRF-23419 / MIL-STD-981

Capacitors – MIL-PRF-123 / MIL-PRF-32535 / MIL-STD-981

Ferrite Chip Beads / Inductors – DLA 03024 / MIL-PRF-27 / MIL-PRF-83446 / MIL-STD-981



Minimum Standardized Incoming / Outgoing Quality & Performance Verification Active Devices



Screening / Metallization (Standard)

- TWM/RoHS
- 100% Vis./Mech. per applicable MIL-Spec
- Sample Electrical Inspection
- MIL-STD-1580 DPA
- AS9102 FAIR
- Customer SCD (simple 1-2 pages)



Screening / Metallization (Standard + 100% Electrical/Mechanical)

- Group B per applicable MIL-SPEC
- Customer SCD (typ. 6-12 pages)



Screening / Metallization

(Standard + 100% Electrical/Mechanical + Qual)

- 100% Group A per MIL-Spec
- Group B and C per applicable MIL-Spec/ DLA/DSCC Drawing
- Customer SCD typ. 8-15 pages)





Thank You

Questions?

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