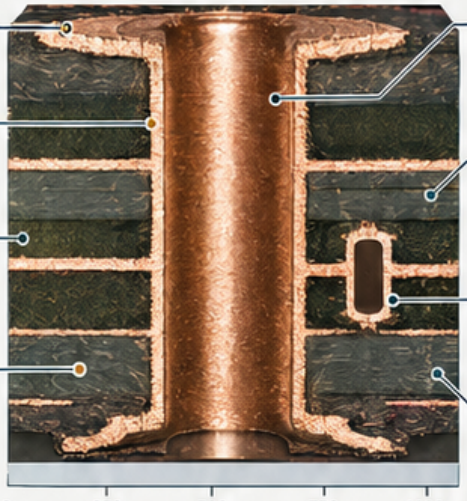
WHAT A PCB MICROSECTION REPORT SHOWS

PURPOSE • PREPARATION • EVIDENCE

A PCB microsection is a prepared slice through a printed board or representative coupopn that is mounted, ground, polished and examined under magnification to expose hidden structures.

WHAT YOU CAN SEE IN A MICROSECTION



WHY THE SECTION PLANE MATTERS



OFF-CENTER SECTION CAN DISTORT HOLE SIZE
A section not through the true center will skew measured features.



ONE PLANE DOES NOT DESCRIBE THE FULL CIRCUMFERENCE
Plating quality and features can vary around the hole.

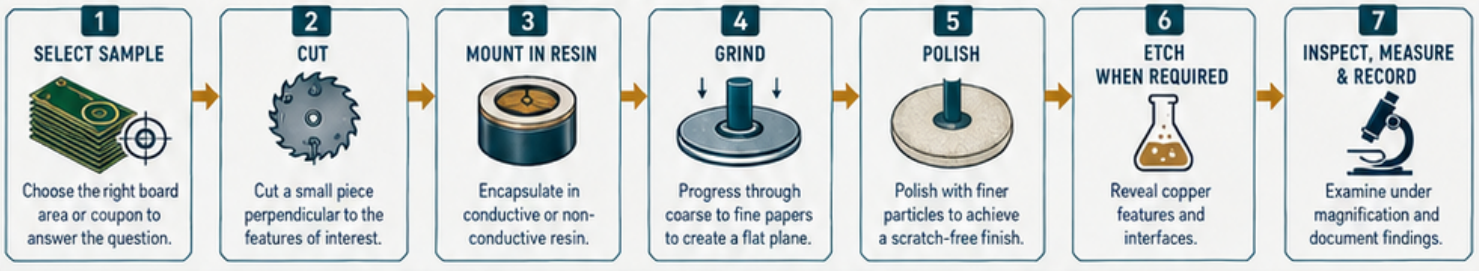


CRACKS AND VOIDS CAN BE MISSED
Defects outside the section plane may not be visible.



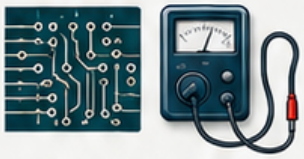
MULTIPLE LOCATIONS MAY BE NEEDED
Different areas, layers or features can behave differently.

MICROSECTION PREPARATION WORKFLOW



WHERE MICROSECTION FITS IN THE QUALITY EVIDENCE CHAIN

ELECTRICAL TEST
CONNECTIVITY TODAY



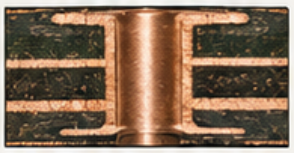
Confirms the board conducts as intended at the time of test.

VISUAL INSPECTION
EXTERNAL CONDITION



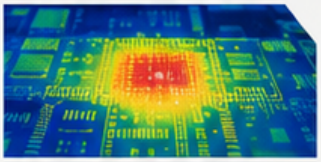
Confirms visible features, workmanship and surface condition.

MICROSECTION
INTERNAL STRUCTURE AT THE SECTION PLANE



Reveals how the connection was built inside the board.

THERMAL / IST
RESPONSE TO STRESS



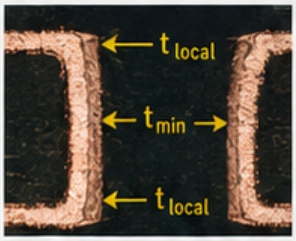
Confirms how the board and connections respond to stress.

A MICROSECTION SHOWS HOW THE CONNECTION WAS BUILT – NOT ONLY WHETHER IT CONDUCTS TODAY.

WHAT A PCB MICROSECTION REPORT SHOWS

BARREL PLATING • INTERCONNECTION • DEFECTS ///

1 PLATING THICKNESS & DISTRIBUTION



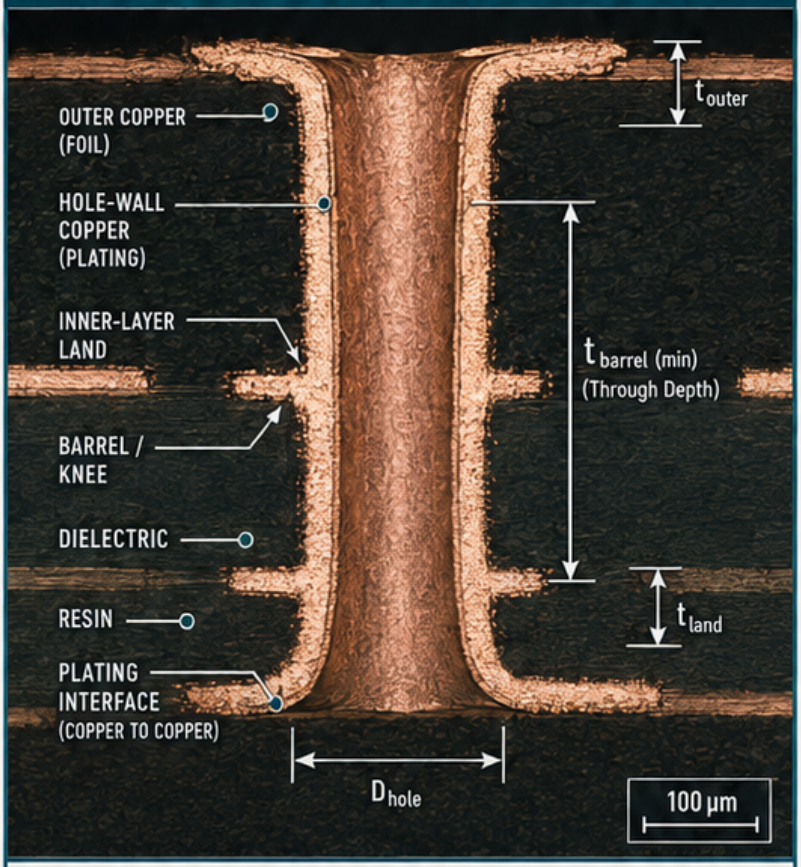
- Local, minimum and average thickness must be identified.
- Uniformity through depth is critical—thin central regions are common.
- Aspect ratio and process variables influence thickness distribution.

3 BARREL CRACKS



- Cracks may occur at the knee, along the barrel, or at internal interfaces.
- May be process-induced, mechanical, or post-thermal stress related.
- Location and extent drive interconnection risk.

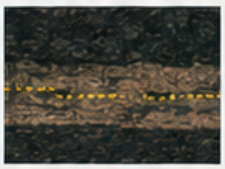
PLATED-THROUGH HOLE MICROSECTION (TYPICAL)



SPECIMEN ID: PTH-01 **LAYER COUNT:** 6L **BOARD THICKNESS:** 1.60 mm **HOLE DIAMETER:** 0.30 mm
PLATING PROCESS: ELECTROPLATED COPPER **IMAGING:** BRIGHTFIELD OPTICAL MICROSCOPY

5 SMEAR / DESMEAR / ETCHBACK

AS-DRILLED (SMEAR PRESENT)



Smear layer covers copper. Interconnection risk elevated.

DESMEAR (SMEAR REMOVED)



Desmear process removes smear, exposing copper.

ETCHBACK (WHERE SPECIFIED)



Etchback is a separate, controlled process where specified.

2 VOIDS & DISCONTINUITIES



- Voids, inclusions and other discontinuities reduce cross-sectional copper.
- Size, location and frequency determine impact to the interconnection.
- Disposition is based on invoked requirements and criticality.

4 INNER-LAYER INTERCONNECTION



- Verify copper continuity between barrel and inner-layer land.
- Assess separation, lift or insufficient wrap where applicable.
- Confirms effective current path at layer transitions.

DO NOT CONFUSE STARTING FOIL, FINISHED OUTER COPPER AND HOLE-WALL PLATING.

- Starting foil is the base material.
- Finished outer copper is the surface circuit layer.
- Hole-wall plating is the electroplated copper deposit on the barrel.

These are not interchangeable.

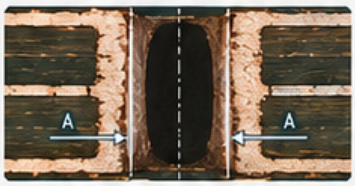
CONTINUITY ALONE IS NOT STRUCTURAL EVIDENCE.
A COMPLETE MICROSECTION REPORT EVALUATES COPPER THICKNESS, INTERCONNECTION INTEGRITY, DISCONTINUITIES AND PROCESS EFFECTS TO SUPPORT RELIABILITY AND PERFORMANCE. ///

WHAT A PCB MICROSECTION REPORT SHOWS

REGISTRATION • DIELECTRIC • LAMINATION ///

1 ANNULAR RING & HOLE REGISTRATION

CENTERED (IDEAL)



Hole centered within pad.
Balanced annular ring.

REDUCED RING



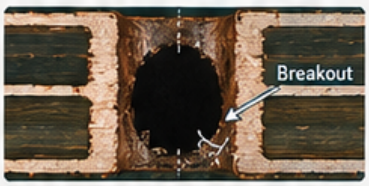
Hole offset.
Annular ring reduced on one side.
A > B

TANGENCY (ZERO RING)



Hole edge is tangent to pad.
No annular ring at this side
in the observed section.

BREAKOUT AT OBSERVED PLANE



Copper pad is broken at this plane.
Insufficient annular ring;
risk of open circuit.

A SINGLE 2D MICROSECTION CANNOT PROVE MINIMUM ANNULAR RING AROUND THE ENTIRE 360° CIRCUMFERENCE.
Multiple locations and statistical review are required.

360°

2 INTERNAL-LAYER REGISTRATION

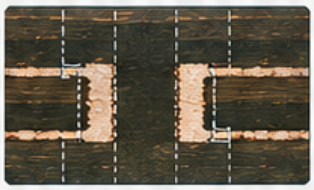
ALIGNED (IDEAL)



Layer-to-layer features are
properly registered.

Layer Shift

SHIFTED (POOR REGISTRATION)

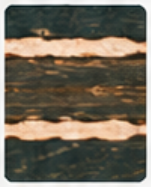


Layer shift consumes process margin and can reduce clearances to adjacent features, increasing the risk of shorting.

REGISTRATION AFFECTS THE RELATIONSHIP BETWEEN ALL LAYERS — NOT JUST THE LAYERS YOU SEE.

3 DIELECTRIC SPACING & FINISHED BUILD

MEASURED DIELECTRIC SPACING



Measure dielectric spacing between copper layers. Local reductions can occur due to copper topography and resin flow during lamination.

FINISHED THICKNESS COMPARISON



Compare outer copper, inner copper, core thickness and total board thickness to the approved stack-up (nominal targets).

THE ACTUAL MEASURED BUILD DETERMINES PERFORMANCE, NOT THE NOMINAL INTENT.

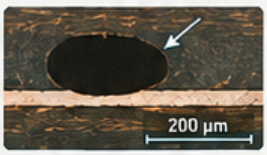
4 LAMINATION QUALITY

SOUND LAMINATE



Good resin flow and adhesion.
No voids or separations.
Uniform interfaces.

VOID



Entrapped void within dielectric.
Reduces reliability.

DELAMINATION



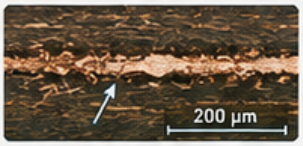
Separation between layers or within dielectric.
Critical reliability risk.

RESIN STARVATION / RECESSION



Insufficient resin at interface.
Can lead to lower adhesion and reliability issues.

ABNORMAL INTERFACE



Contamination, incomplete cure or degraded interface condition observed.

MICROSECTION EVALUATION REQUIRES ETCHED AND POLISHED SPECIMENS FOR ACCURATE OBSERVATION.
Measurements depend on preparation quality and magnification.

TYPICAL SCALE BARS
100 µm 200 µm 500 µm

FAILURE-ANALYSIS CONTEXT

INTERPRET DELAMINATION WITH MATERIAL PROPERTIES
Resin system, Tg, CTE, chemistry compatibility.

REVIEW MOISTURE HISTORY
Bake history, storage conditions, time at temperature.

ASSESS REFLOW PROFILE
Thermal profile, peak temperature, ramp rates, soak time.

CHECK FABRICATION RECORDS
Laminate lot traceability, press cycle data, process deviations, rework.

MEASURE THE ACTUAL CONSTRUCTION —
THEN COMPARE IT WITH THE CONTROLLED STACK-UP AND INVOKED REQUIREMENTS. ////

WHAT A PCB MICROSECTION REPORT SHOWS

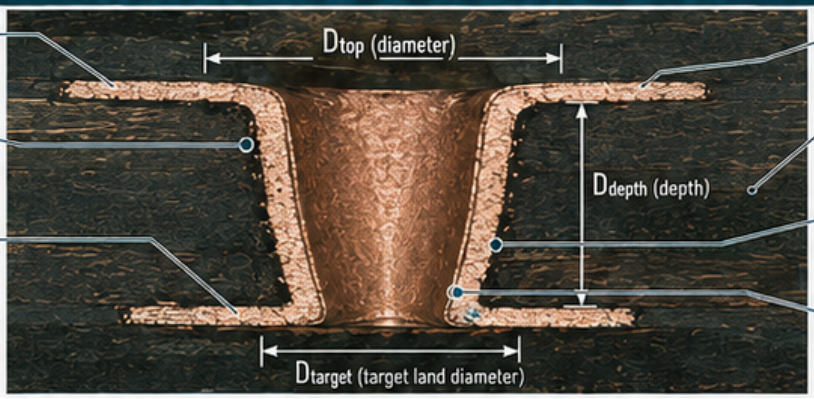
MICROVIAS • HDI • SPECIAL STRUCTURES

MICROVIA ANATOMY (TYPICAL LASER MICROVIA IN HDI)

LASER MICROVIA DIAMETER (TOP)
Measured at the top opening.

WALL PLATING
Copper deposit thickness along the via wall.

CAPTURE (ENTRY) LAND
Dielectric area surrounding the via that anchors plating.



LASER MICROVIA DEPTH
Measured from entry surface to via bottom.

TARGET (EXIT) LAND & INTERFACE
Plating continuity where microvia opens to target land.

FILL VOID
Entrapped voids within fill material (if present).

COPPER CAP (IF APPLIED)
Thickness, continuity and overlap at the top.

1 STACKED VS STAGGERED MICROVIAS



- Each stacked copper-to-copper interface is a reliability concern.
- Section through intended axis.

100 µm

2 VIA-IN-PAD / FILLED & CAPPED



FILL COMPLETENESS
No voids at critical locations.

VOIDS
Entrapment can reduce reliability.

COPPER CAP
Continuity, coverage and thickness.

FILL-TO-PLATING SEPARATION
Check for gaps or debonding.

PLANARITY
Cap surface relative to surrounding pad.

COMPONENT-LAND RELATIONSHIP
Confirm land size, placement and clearances.

100 µm

3 BLIND & BURIED VIAS



START LAYER
Where the via begins.

CAPTURE LAND
Anchors plating at the start.

PLATING & LAMINATION INTERFACE
Evaluate adhesion at transitions.

STOP LAYER
Where the via terminates.

CAPTURE LAND
Anchors plating at the stop.

Coupon must reproduce the production build sequence.

100 µm

4 BACKDRILLED VIA



BACKDRILL DEPTH
Extent of material removed.

RESIDUAL STUB
Remaining via stub height.

CLEARANCE TO LAST CONNECTED LAYER
Distance from stub to next layer up.

REGISTRATION
Alignment of drill within annular ring.

DAMAGE / OVERDRILL
Check for pad damage or missing copper.

100 µm

5 COPPER WRAP & SPECIAL STRUCTURES

COPPER WRAP



EDGE PLATING / RING



EMBEDDED COMPONENT



Evaluate exact locations defined by invoked requirements.

THERMAL STRESS — BEFORE (AS BUILT) VS AFTER (AFTER CONDITIONING)

BARREL CRACK

BEFORE AFTER



Cracks along via barrel can appear after thermal stress.

50 µm

MICROVIA TARGET SEPARATION

BEFORE AFTER

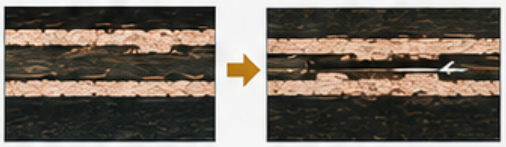


Separation between microvia target and land can develop after conditioning.

50 µm

DELAMINATION AT INTERFACE

BEFORE AFTER



Delamination between layers can initiate and grow after thermal cycling or reflow exposure.

100 µm

MICROSECTION IS STRUCTURAL EVIDENCE —
IT DOES NOT REPLACE RELIABILITY TESTING OF COMPLEX HDI ARCHITECTURES.

WHAT A PCB MICROSECTION REPORT SHOWS

REPORT CONTENT • MEASUREMENTS • DISPOSITION

REPORT IDENTITY

CUSTOMER / SUPPLIER
Customer Name
Supplier Name

PCB PART & REVISION
Part Number
Revision

PO / WORK ORDER
PO Number
Work Order

LOT / PANEL / DATE CODE
Lot or Panel ID
Date Code

COUPON ID / LOCATION
Coupon ID
Hole ID(s)
Location

SPECIFICATION / REV / CLASS / ADDENDUM
Specification
Revision
Class
Addendum

WHAT A GOOD REPORT CONTAINS

PREPARATION & TEST METHOD
How the coupon was prepared and examined.

CONDITIONING
Bake / moisture exposure / temperature conditioning when applicable.

MAGNIFICATION & CALIBRATED SCALE
Magnification used and calibrated scale bar on every image.

MEASUREMENT EQUIPMENT TRACEABILITY (WHERE REQUIRED)
Instrument ID, calibration date and traceability reference.

ANNOTATED IMAGES
Images clearly labeled with features and measurement locations.

ACTUAL VALUES WITH UNITS
All measured dimensions reported with units and significant figures.

ACCEPTANCE CRITERIA
Applicable requirements, limits or ranges used for evaluation.

PASS / FAIL DISPOSITION
Clear statement of disposition for each requirement evaluated.

INSPECTOR / REVIEWER / DATE / REVISION
Who performed and reviewed the work, date of issue and report revision.

HOW TO READ THE IMAGES



SHARP, WELL-FOCUSED INTERFACES
Distinct copper–dielectric boundaries are essential for valid measurements.



SCALE OR MAGNIFICATION
Always verify the calibrated scale bar or magnification is present.



VISIBLE ENDPOINTS
Measurements must start and end on definable, visible interfaces.



BOTH PTH SIDES WHERE REQUIRED
Top and bottom of plated-through holes must be captured when required.



IDENTIFIABLE INTERNAL LAYERS
Layer order and features should be clearly recognizable.



OVERVIEW + DETAIL MAGNIFICATIONS
Use appropriate overviews and details for context and verification.

C-07 / PTH-12

IMAGE LABELS MATCH COUPON / HOLE IDS
Image IDs must match the report identity and measurement table.

MEASUREMENT QUESTIONS — WHAT TO EXPECT

FEATURE	WHERE MEASURED?	MINIMUM / LOCAL / AVERAGE?	REFERENCE / SECTION PLANE?	WHAT TO CONFIRM
HOLE-WALL COPPER	Barrel wall (PTH)	Minimum, Local (any), Average	Plated-through hole section plane	Lowest local wall meets requirement
ANNULAR RING	Around PTH	Minimum, Average	As specified: Centered, Reduced, Tangency (Zero Ring), Breakout	All required rings meet requirement
DIELECTRIC (SPACING)	Between features (layers)	Minimum	Between specified conductors / features in section plane	Clearance meets requirement
MICROVIA	Via wall; target; fill/cap	Minimum wall, Via target (% fill), Fill/cap coverage	Microvia section plane	Construct / fill criteria met
BACKDRILL	Residual stub below pad	Maximum residual	Referenced to nearest layer	Residual stub within requirement
COPPER THICKNESS	Foil, Plated, or Finished Total	Minimum, Average	As specified (foil / plated / total)	Thickness meets requirement

DISPOSITION CHAIN

MEASURED RESULT
Actual measured value with units.

→

CONTRACTUAL LIMIT
Requirement or limit from specification / addendum.

→

CLASS / ADDENDUM
Applicable class and addendum, if any.

→

PASS, FAIL OR DOCUMENTED DEVIATION
Clear disposition with justification.

"LOOKS GOOD" IS NOT AN ACCEPTANCE CRITERION.
ONLY MEASURED RESULTS COMPARED TO APPLICABLE REQUIREMENTS DETERMINE ACCEPTANCE.

NOVATRONIC PCB

PCB QUALITY GUIDE 02

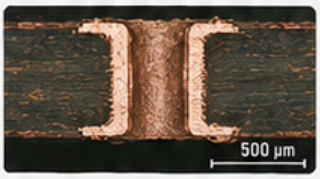
QUALITY RESOURCE • SHEET 6 OF 6

WHAT A PCB MICROSECTION REPORT SHOWS

SAMPLING • QUALIFICATION • FINAL REVIEW

1 REPRESENTATIVE SAMPLING — THE FOUNDATION OF TRUSTED MICROSECTION DATA

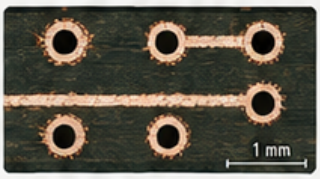
PRODUCTION COUPON



ADVANTAGES
- Same panel, process and location
- Best reflects shipped product

LIMITATIONS
- May not show edge/rare features
- Access can be difficult

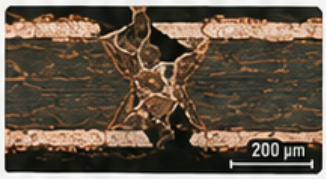
SACRIFICIAL BOARD



ADVANTAGES
- Built for analysis access
- Can target critical structures

LIMITATIONS
- Not in the production population
- May not capture process drift

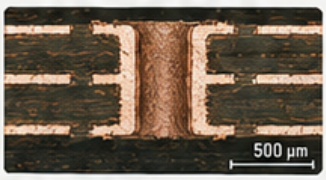
FAILURE-ANALYSIS SAMPLE



ADVANTAGES
- Shows actual failure condition
- Reveals failure mechanisms

LIMITATIONS
- Not representative by definition
- Destructive and location-limited

QUALIFICATION VEHICLE



ADVANTAGES
- Controlled features and matrix
- Enables baselining and margins

LIMITATIONS
- May not match real product mix
- Does not prove production control

THE BEST ANSWERS COME FROM THE RIGHT SAPLE. DOCUMENT WHY THE SAMPLE IS REPRESENTATATVE.

2 SUPPLIER QUALIFICATION EVIDENCE CHECKLIST

1. Representative of production technologies and feature mix
2. Claimed capability versus measured results and criteria
3. Consistency demonstrated across multiple lots/panels
4. Lot/panel traceability and unique identification
5. Preparation and equipment calibration quality
6. Process margin, not only "pass" at the limit
7. Correlation with electrical, impedance, material and reliability evidence
8. Trial-build baseline established for new designs/processes

3 MICROSECTION REPORT REVIEW WORKFLOW (12 STEPS)

1. Verify sample identity and traceability
2. Verify invoked requirements and specs
3. Confirm sample is representative
4. Check method, conditioning and magnification
5. Review overview images and context
6. Examine PTH plating, interfaces and registration
7. Review dielectric quality and laminate structure
8. Check HDI structures and backdrill quality (if present)
9. Compare every measurement with stated criteria
10. Look for trends, data near limits and distribution
11. Record deviations, root cause and actions
12. Archive report against lot and supplier history

EACH STEP BUILDS CONFIDENCE. SKIPPING STEPS LEAVES RISK.

4 RED FLAGS — REPORTS THAT CANNOT BE TRUSTED

- Missing traceability or lot identification
- No specification or class invoked
- No scale bar or magnification shown
- Endpoints hidden or cropped
- Only one "best" showcase image
- "PASS" without criteria or measurements
- Missing units on measurements or axes
- Hole-wall vs surface copper not clear
- Coupon not representative of product
- Microvia/HDI targets not shown
- Compressed, stitched or edited images
- Repeated values equal to limit (no margin)

IF YOU SEE ANY OF THESE, STOP AND GET CLARITY BEFORE MAKING A QUALITY DECISION.

5 WHAT MICROSECTIONING CANNOT PROVE ALONE

WHOLE-BOARD UNIFORMITY
A single location does not prove uniformity across the entire board.

LIFETIME RELIABILITY
Does not prove long-term performance in service.

OPENS / SHORTS
Low-voltage defects may not be visible in cross-section.

IMPEDANCE PERFORMANCE
Requires electrical verification, not cross-sectional observation.

IONIC CLEANLINESS
Chemical residue requires lab testing, not microsection.

MATERIAL IDENTITY
Composition verification needs material analysis techniques.

ASSEMBLY WORKMANSHIP
Placement, soldering and rework quality are outside the scope of microsection.

TOTAL COMPLIANCE
Microsection is one piece of evidence — not the complete quality picture.

THE CLOSING PRINCIPLE

VERIFY WHAT WAS BUILT • COMPARE WITH WHAT WAS SPECIFIED
UNDERSTAND PROCESS MARGIN • RETAIN TRACEABILITY