PCB FA Root Cause Analysis

Systematic Flow for Root Cause Failure (RCF) Isolation

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START: Reported Failure Symptom

Phase 1: Non-Destructive Analysis (NDA)

SOP 3.1 (NDA)

Optical Inspection (OM)

Check for external defects: contamination, micro-cracks, or burn marks.

DECISION A: Visual RCF Confirmed? (Go to DPA 5.1 or XRM 3.2)

YES (Obvious Physical Damage)

PATH A: Direct DPA

Proceed directly to Cross-Sectioning (SOP 5.1).

NO (No External Defect Found)

Continue NDA

Follow vertical path to X-Ray Microscopy (SOP 3.2).

SOP 3.2 (NDA)

X-Ray Microscopy (XRM)

Check for BGA voids, wire bond issues, or misregistration (e.g., using IPC-7095 criteria).

SOP 3.3 (NDA)

Scanning Acoustic Microscopy (C-SAM)

Check for internal delamination, voids, or cracks near interconnects.

DECISION B: Structural RCF Confirmed by NDA (OM/XRM/C-SAM)? (Go to DPA 5.1 or I-V Trace 4.1)

YES (Structure Failure Isolated)

PATH B: Direct DPA

Proceed directly to Cross-Sectioning (SOP 5.1).

NO (Structure is Sound)

Start Isolation Phase

Follow vertical path to I-V Curve Trace (SOP 4.1).

SOP 4.1 (Isolation)

Curve Tracer (I-V Signature Analysis)

Measure I-V signature of suspect net against KGC for shorts, opens, or leakage.

DECISION C: Electrical Anomaly Found? (Go to Isolation Tools or END)

YES (Short/Leakage - Thermal)

Pinpoint: Thermal (SOP 4.2)

Follow path to IR Thermal Imaging.

YES (Open/Trace - Electrical)

Pinpoint: Electrical (SOP 4.3)

Follow path to TDR/TDT Analysis.

NO (Functional/Intermittent)

FLOW END: Failure Not Isolated

RCF not replicated. Analysis complete or further testing required.

SOP 4.2 (Isolation)

Thermal Imaging (IR/Liquid Crystal)

Apply reduced power to locate thermal hot spots/gradients (if ΔT > 5°C).

SOP 4.3 (Isolation)

TDR / TDT Analysis

Time Domain Reflectometry/Transmissometry for open/short distance-to-fault.

SOP 5.1 (DPA)

Cross-Sectioning (Metallographic Prep)

Destructive physical preparation of the Area of Interest (AOI).

SOP 5.2 (DPA)

SEM / EDS Analysis

Final RCF Confirmation: Analyze fractured surfaces and elemental composition.

RCF IDENTIFIED & REPORT GENERATED

Analysis Complete. Document the findings for RCF closure.