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Case Study: "No Test Specs? No Problem. How We Hit 97.78% Coverage Anyway"

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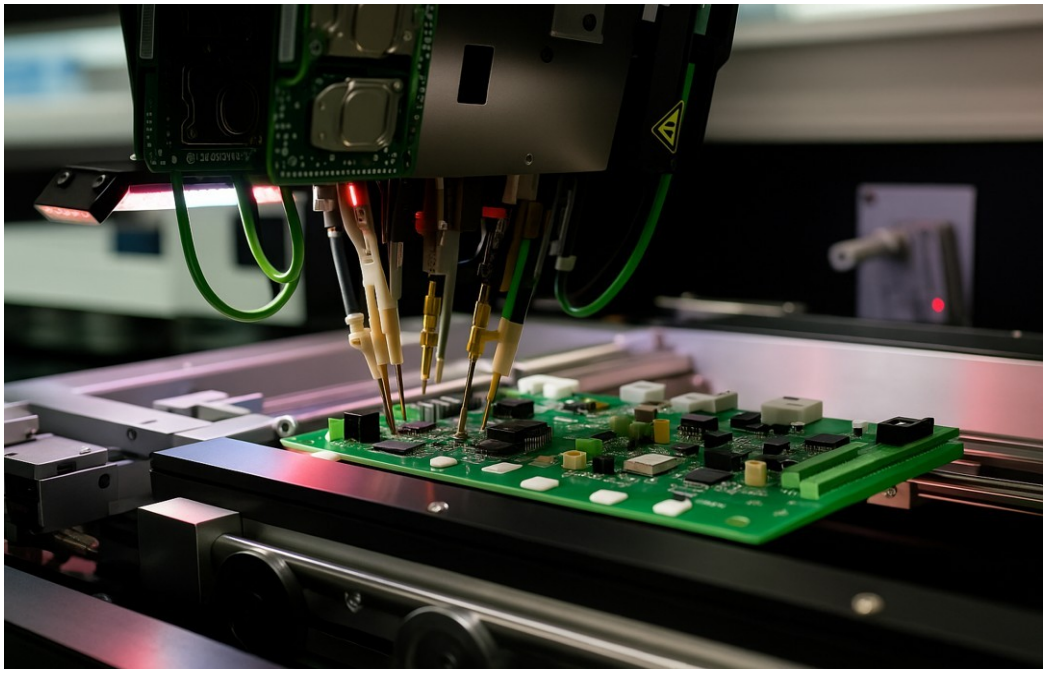
A leading smart city solution provider from a highly developed market engaged us to manufacture a complex 4-board PCBA module for their intelligent street lighting system—part of a larger IoT-driven urban infrastructure. The boards were multilayer, densely populated, and lacked predefined test specifications, with limited access for traditional testing. To ensure uncompromised quality, we implemented Flying Probe Testing (FPT) - a precise, fixtureless method using programmable probes to assess electrical continuity and component performance. This enabled us to achieve 97.78% test coverage, ensuring the reliability required for a mission-critical, field-deployed application. This case study showcases how adaptive test strategies can maintain engineering excellence under stringent conditions.



Challenges:

During the initial production phase, our team encountered several critical issues:

- **Lack of Test Specifications:** The customer supplied only the Gerber files and Bill of Materials (BOM), requesting PCBA manufacturing without defining any functional testing or in-circuit testing criteria. This created a major gap in defect prevention and quality validation processes.
- **Limited Test Point Accessibility:** The board design featured very few accessible test points, making it difficult to perform even standard in-circuit testing. This limitation constrained traditional testing methods and increased the risk of undetected defects.
- **Low Initial Test Coverage:** Basic testing approaches, such as visual inspection and manual continuity checks, yielded low coverage and failed to meet the expected quality assurance benchmarks. This inadequacy raised concerns about long-term product reliability in the field.

Solutions:

To overcome these challenges, a structured two-phase testing strategy was developed:

- **Phase 1: Outsourced MDA (Manufacturing Defect Analyzer):** As an initial measure, MDA testing was outsourced to verify PCBA-level defects such as shorts, opens, and basic component placements. While useful, this method achieved only around **50% test coverage,** primarily due to the limited number of accessible test points and the constraints of the MDA methodology.

- **Phase 2: Implementation of Flying Probe Testing (FPT):** Recognizing the need for more robust and flexible testing, we adopted Flying Probe Testing (FPT) to dramatically improve coverage.

  Key benefits included:

  - **No Need for Custom Fixtures**: FPT allowed non-intrusive testing without the need for expensive or time-consuming fixture development.
  - **Probing Both Components and Test Points**: Enabled access to multiple nodes on the board, including areas unreachable by MDA.
  - **High Test Coverage**: Achieved a **test coverage of 97.78%**, significantly reducing the risk of undetected defects.
  - **Adaptability**: The dynamic probing capability allowed seamless adjustment to the board layout, facilitating faster iterations and better fault detection.

Impact:

The strategic implementation of FPT yielded tangible improvements across key metrics:

- **Improved Defect Detection:** Enhanced test coverage led to the identification and rectification of previously undetectable issues, ensuring only high-quality boards progressed through the production cycle.
- **Increased Product Quality:** The improved fault isolation and testing depth resulted in a significant uptick in board reliability, critical for a high-availability application like smart city lighting control.

- **Customer Satisfaction:** By proactively addressing the lack of test specifications and introducing a sophisticated test methodology, we were able to not only meet but exceed customer expectations—strengthening our long-term relationship and establishing trust in our engineering capabilities.

Case Study Conclusion:

Transitioning from limited testing to Flying Probe Testing resulted in a significant enhancement in PCBA test coverage and defect detection capabilities. This proactive quality assurance approach not only met the manufacturing challenges but also elevated the end-product reliability—ultimately leading to greater operational efficiency and customer trust.

Learn more about Indic EMS Electronics:

MDA (Manufacturing Defect Analyzer)