Maxim Integrated Global Failure Analysis (FA)

Vision
Empower industry leading technologies, protect product brand promises, and be the competitive advantage for Maxim Integrated.

Mission
Deliver timely, innovative, and cost effective failure analysis solutions to empower industry leading technologies and delight our customers.

Strategies
• Develop innovative failure analysis solutions to drive manufacturing and design improvements.
• Deliver cost effective systems and methods to reduce cycle time.
• Provide the highest quality services to internal and external customers through investigations into device performance and failures.
• Develop a community of world class technical leaders through competence training, career development, and team work.

Facilities
Maxim Integrated maintains three, state-of-the-art, failure analysis facilities to support our global customers and manufacturing base. Like the rest of Maxim, the FA labs use the ISO 9001:2008/TS16949:2009 and ISO14001:2004 quality system guidelines to help drive continuous improvement, reduce defects, and maintain an environmentally-friendly workplace. Compliance to these quality and automotive system specifications is confirmed through regular, independent audits.
To ensure the highest level of success, a step-by-step approach is used.

Basic Analysis Flow
Tools and Techniques

To unravel the most complicated issues, Maxim Integrated invests in the latest failure analysis equipment to maintain its state-of-the-art capabilities. A few examples are included below.

Emission Microscopy
With this technique, sample light emission is imaged while the device is in the failing state; anomalous sites often indicate damage to the silicon.

Optical Beam Induced Resistive Change (OBIRCH)
Changes in sample current are monitored while a laser scans across the suspect region; anomalous sites generally indicate shorts/leakages.
Thermography
Differential temperature resolution of < 1 mK can be imaged after a few seconds; < 10 µK after a few hours. Thermal hot spots, possibly indicating failure sites, can be identified on stacked die or through packages.

3D X-Ray with Computer Tomography
Numerous x-ray images are systematically collected and assembled into a three-dimensional (3D) model; software is then used to “slice” the images to better view possible defects. This technique is very effective at identifying shorts, cracks, and opens.
Nanoprober
Electrical measurements on small, individual transistors are possible with this tool; technologies ≤ 90 nm are routinely investigated.

Scanning Capacitance Microscopy
Using atomic force probes, the diffusion regions for a single transistor can be imaged.
Dual Beam Focused Ion Beam (FIB) with STEM Detector
With both electron and ion beams, this failure analysis workhorse can both cut and image. Laminae are created, removed, thinned, and then imaged with the Scanning Transmission Electron Microscopy detector. This equipment is routinely used to thin samples for improved resolution.

Plasma Focused Ion Beam (FIB)
Using an inductively coupled Xe+ plasma, this FIB cuts up to twenty-times faster. High milling rates are needed to investigate package issues and perform large area device modifications.
Bench Testing

Failure analysis electrical verification includes more than just Production testing. If Automated Test Equipment (ATE) results do not confirm the customer’s complaint, Maxim Failure Analysis, working in conjunction with other company experts, does their best to duplication the customer’s conditions during bench testing. If it is determined that Maxim’s Production screens missed something, a corrective action request is generated and the test coverage issue is addressed.

A bench testing example, Transmitter OFDM 64QAM error vector magnitude (EVM) testing, using the MAX2832 2.4 GHz to 2.5 GHz, 802.11g RF Transceiver with Integrated Power Amplifier (PA), is included below.

Data Reporting

At the conclusion of an investigation, a comprehensive written report is generated, reviewed extensively by Maxim Integrated management, and then shared with the customer. If deficiencies in Maxim’s product or procedures were uncovered, an Eight-Discipline (8D) corrective action request is generated and tracked through completion by a dedicated staff of Maxim engineers and managers. All results are stored in a searchable database to make sure failure patterns and past results are not overlooked; this procedure and database has been in service since 1988.

Request for Failure Analysis

If a customer believes that product does not meet contractual requirements, they can return material for failure analysis. Maxim will respond with a complete and timely report that addresses the customer’s complaint and possible causes for any non-conformance; a formal, 8D, corrective action response is issued, when appropriate.

To return material for failure analysis and/or credit:

- Contact your regional Maxim Direct Offices.
- A Customer Operations representative will provide a Returns Material Authorization number (RMA No.), the proper shipping address, and routing instructions. There are multiple failure analysis labs so it is important to confirm the laboratory location with your Customer Operations representative prior to shipment.
- Please ensure the RMA No. and "ATTN. RECEIVING" is clearly marked on the outside of each box.
- FA Request Form (DOC, 56kB)