MASER ENGINEERING

ESD Models and Protection Methods

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Sr. Reliability Test Engineer

Showcase 2011

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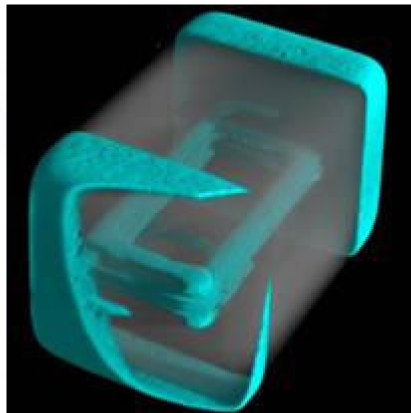
Contents

- Introduction of MASER Engineering today
- ESD Models and Protection Methods
- Human Body Model
- Machine Model
- Charge Device Model
- System Level ESD
- Electrical Overstress
- ESD and Latch-up Test Services
- ESD Failure Analysis
- Summary

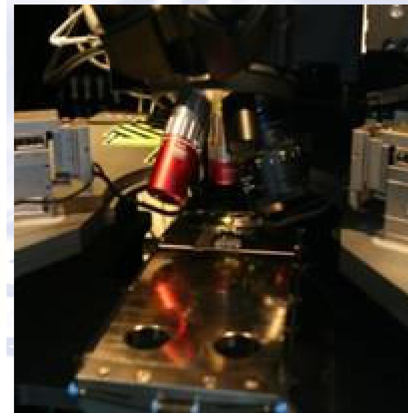
MASER Engineering today

- **Diagnostics of electronic components**
  - Failure Analysis → yield loss & field return analysis
  - Construction Analysis → competitor data and analysis
  - Nano-material Analysis → patent infringement



XRAY & SAM

45nm Circuit Edit



Failure Analysis

STEM analysis

MASER Engineering today

- **Test of electronic components and systems**
  - Strong base in semiconductor IC's test requirements
  - Product and supplier qualification and evaluation
  - Reliability and robustness improvement

Board Level drop

Full product Q&R test lab

Optical device test

ESD/LU test

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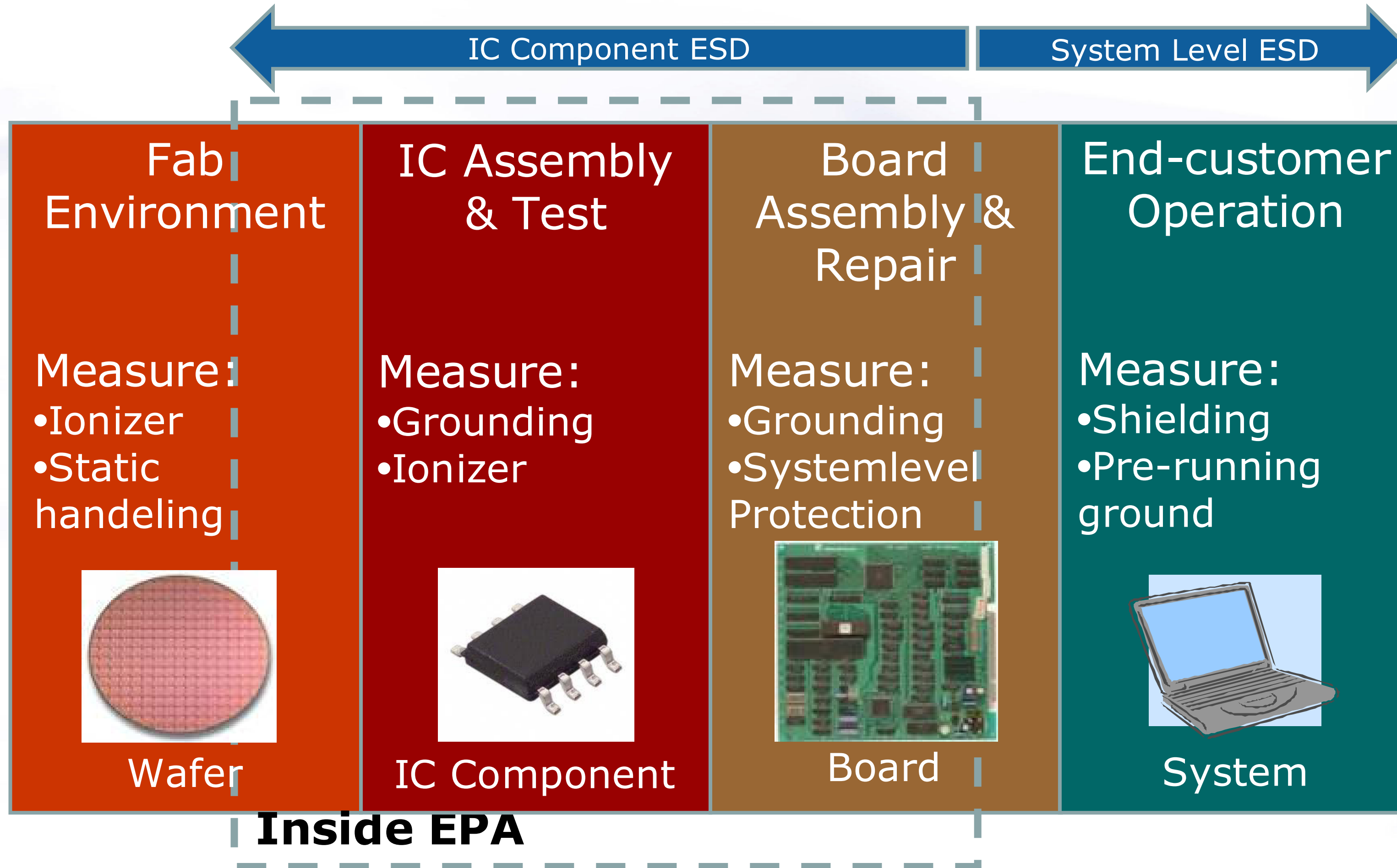
ESD Models and Protection Methods



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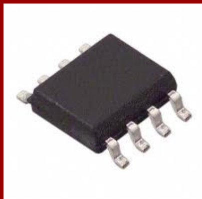
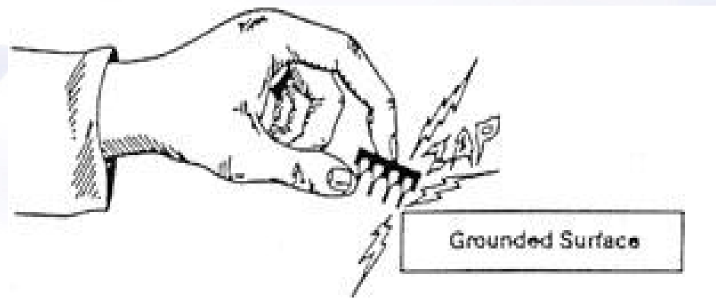
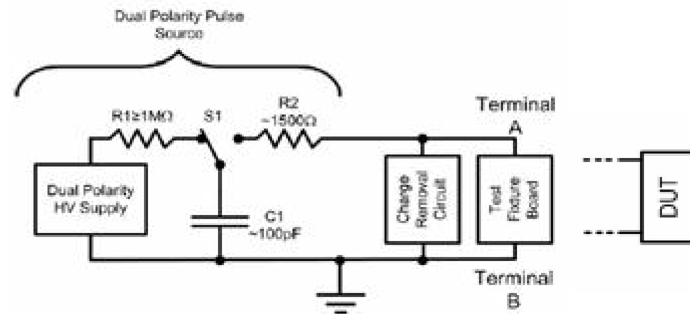
Human Body Model (HBM)

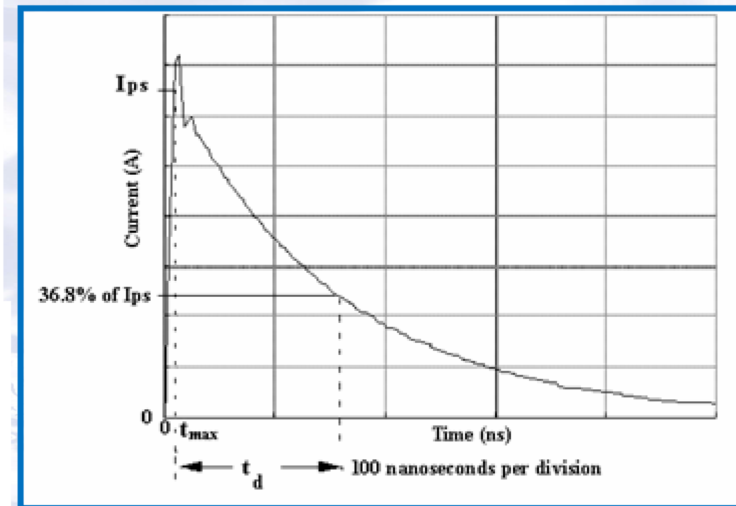
IC Assembly & Test



Board Assembly & Repair

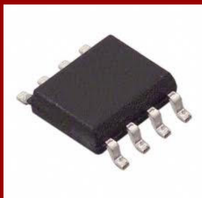




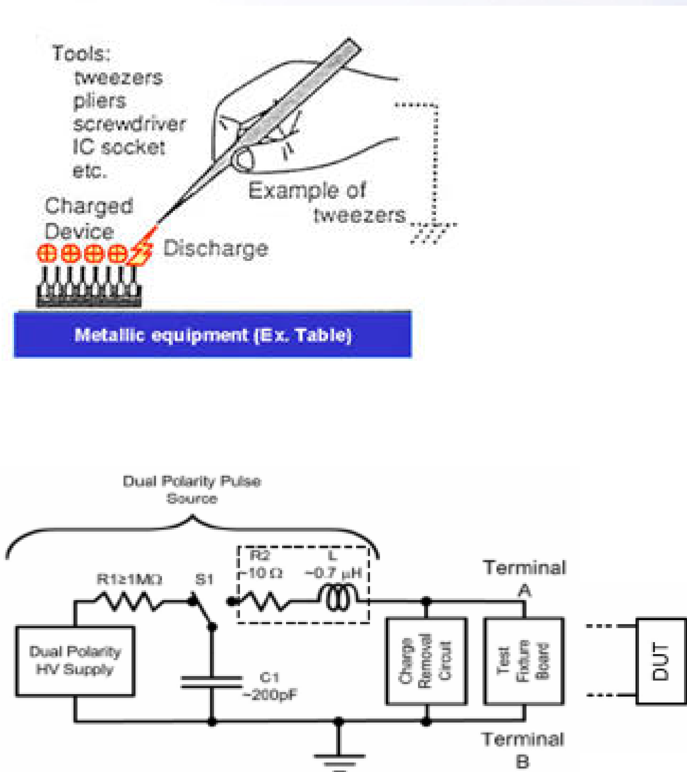


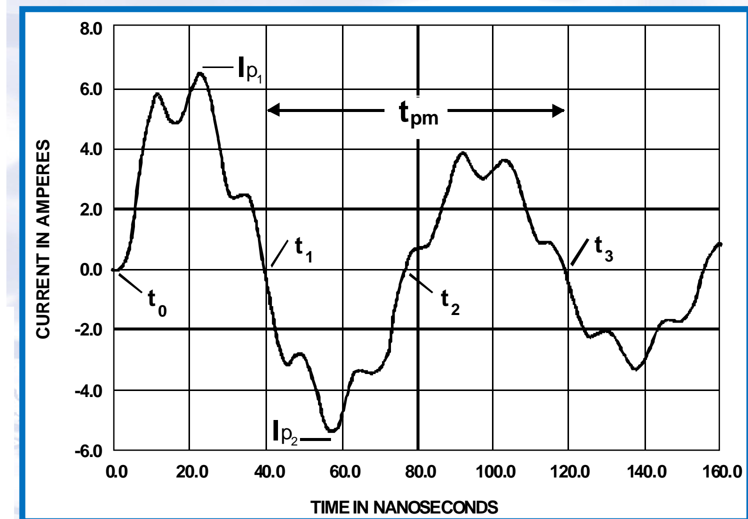
Machine Model (MM)

IC Assembly & Test



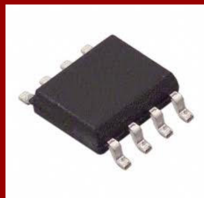
Board Assembly & Repair



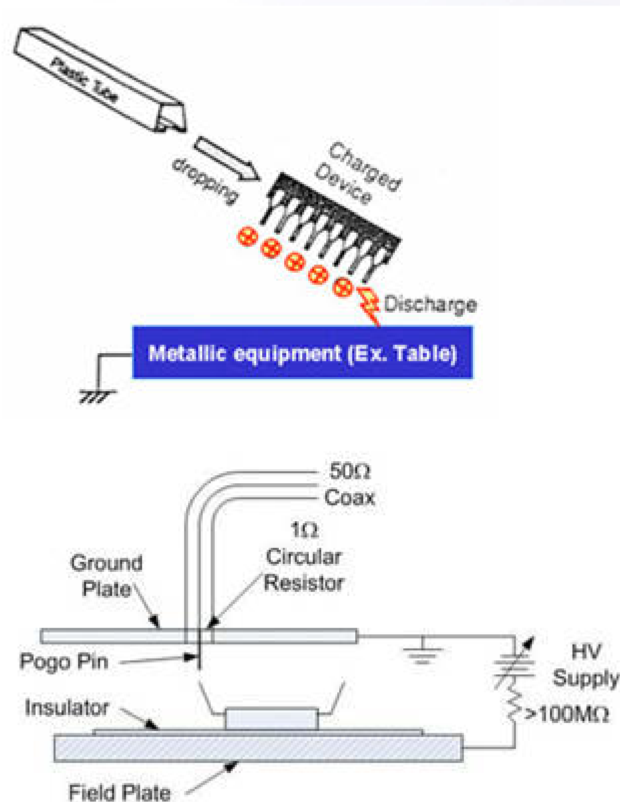


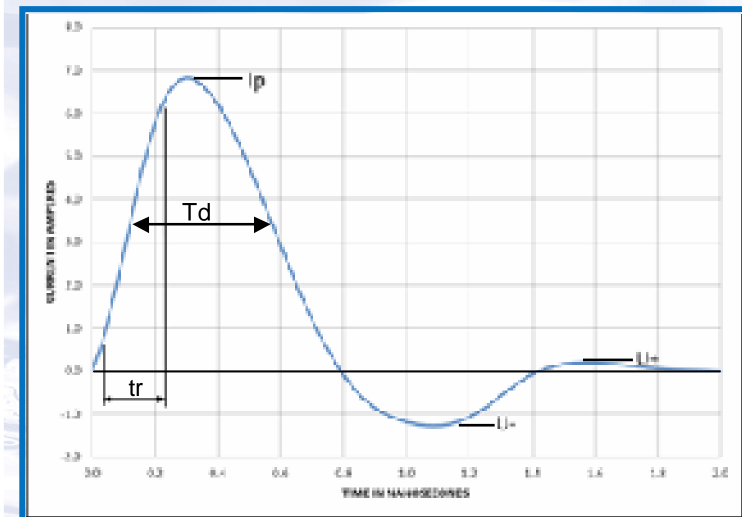
Charge Device Model (CDM)

IC Assembly & Test



Board Assembly & Repair

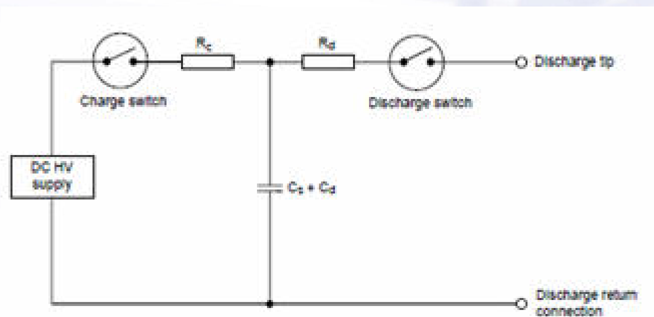


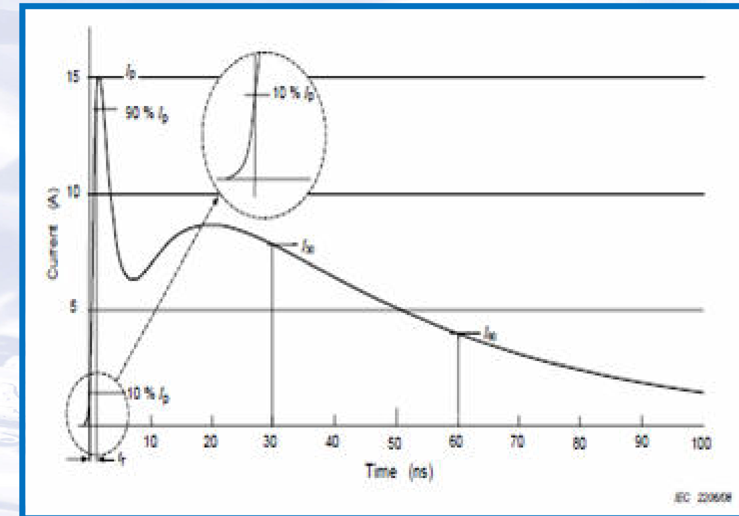


System Level ESD

Board Assembly & Repair

End-customer Operation





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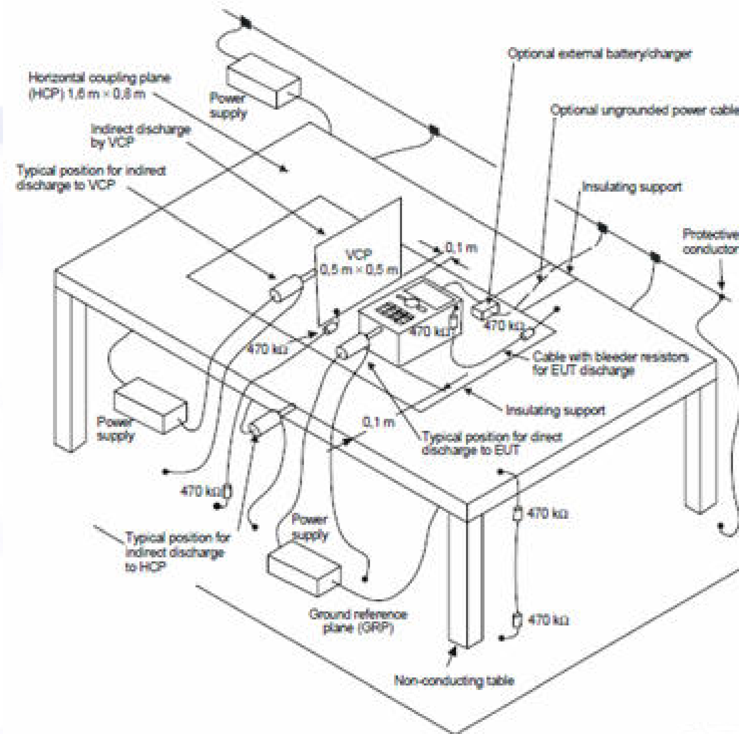
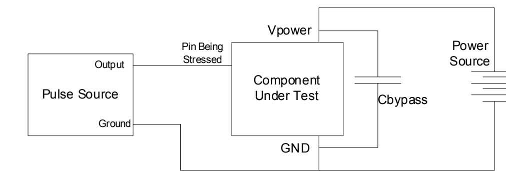
System Level ESD

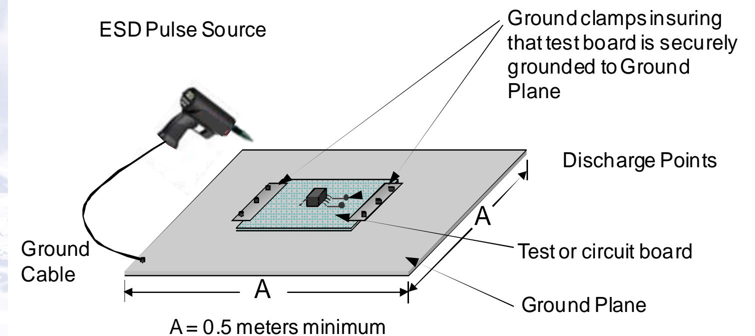
Board Assembly & Repair

End-customer Operation



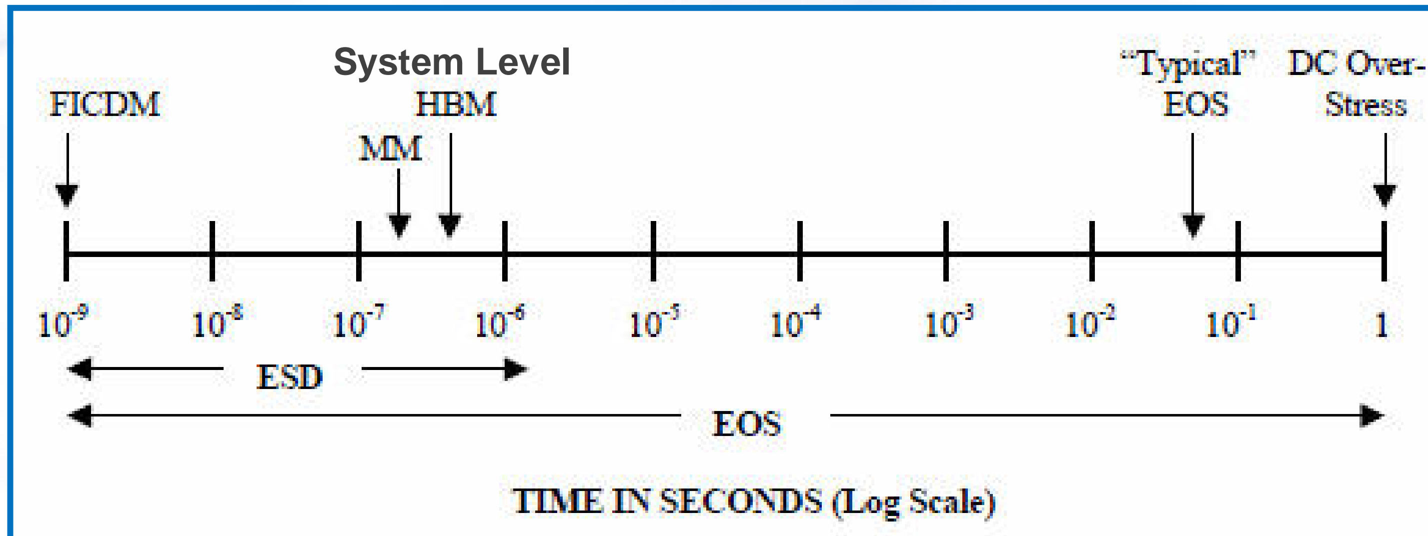
IEC 61000-4-2





ANSI/ESD SP5.6-2009

Electrical Overstress



High Voltage (1V-15kV)	Low Voltage (16V)
Short Duration	Longer Duration
Very Low Power	Low Power
Fast Riste Time (1–10 ns)	Riste Time (1–10 ms)

ESD and Latch-up Test Services

Keytek Zapmaster Mk.2 SE

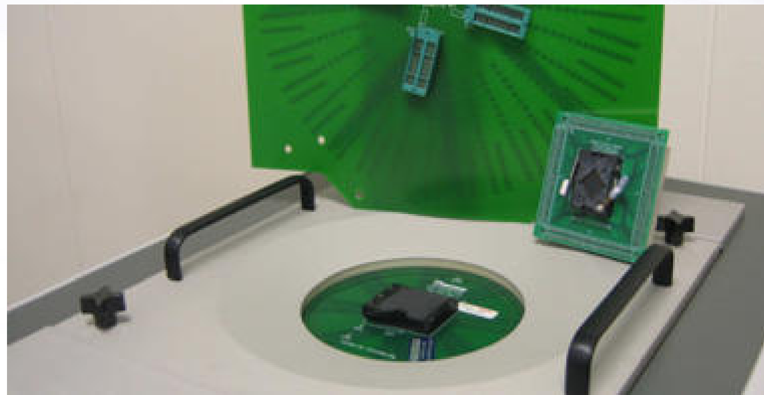
- Quick turn-around times
- HBM & MM testing up to 512 pins
- Spot Measure Capability
- Curve Tracing Capability
- Six Separate V/I Supplies
- Latch-Up Testing with 64k/pin

HBM (30V – 8kV)

- ANSI/ESDA/JEDEC JS-001-2011
- AEC-Q100-002-REV-D
- MIL-STD 883H Method 3015.8

MM (30V – 2kV)

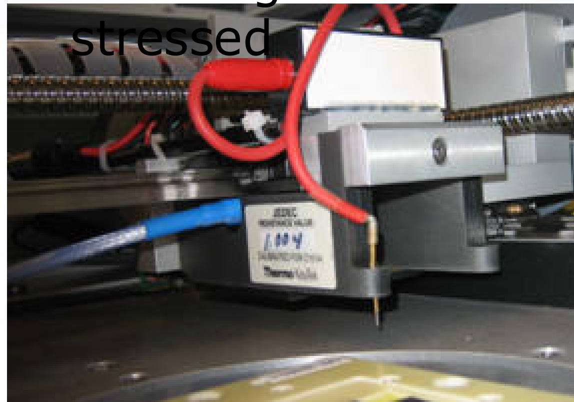
- EIA/JESD22-A115-C
- AEC-Q100-003-REV-E
- ANSI/ESD S5.2-2009

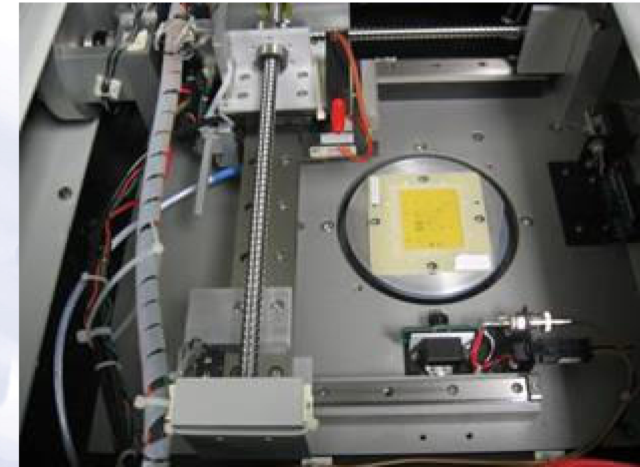


ESD and Latch-up Test Services

Keytek RCDM3 (CDM)

- Quick turnaround times
- Field or Direct Charge Method
- Positioning accuracy of 0.01 mm
- Three independent video cameras
- Devices of virtually any size or configuration can be stressed





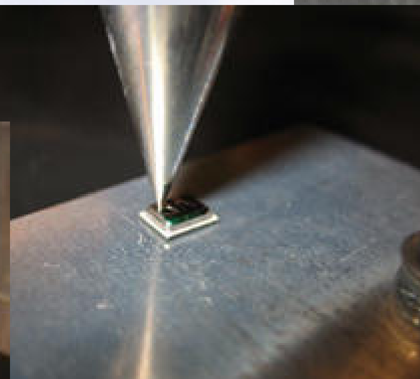
CDM (10V – 4kV)

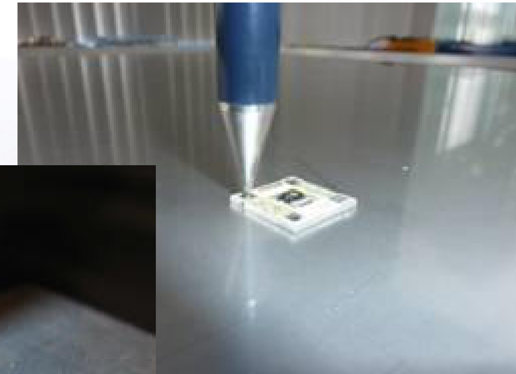
- EIA/JESD22-C101-E
- AEC-Q100-011-REV-B
- ANSI/ESD S5.3.1-2009

ESD and Latch-up Test Services

Teseq NSG438 (System Level)

- Air-discharge
- Contact-discharge
- 100 V step increase
- 150pF/330Ω & 330pF/330 Ω Discharge Networks

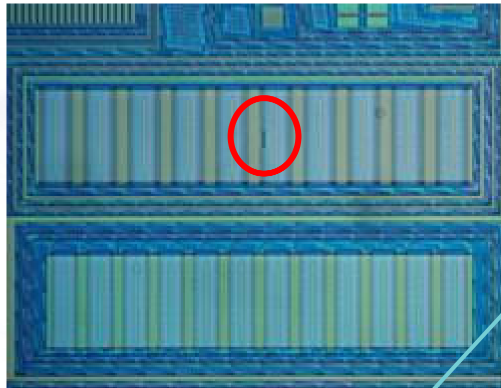




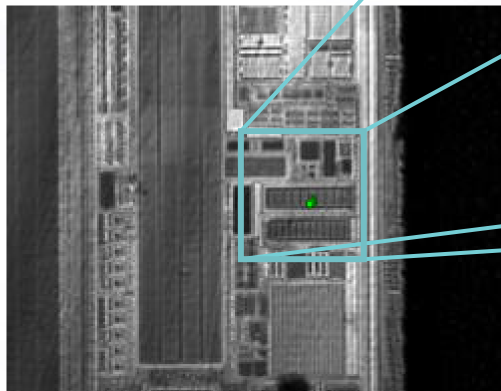
System Level (200V – 30kV)

- IEC 61000-4-2-2008
- ISO 10605-2008
- ANSI/ESD SP5.6-2009

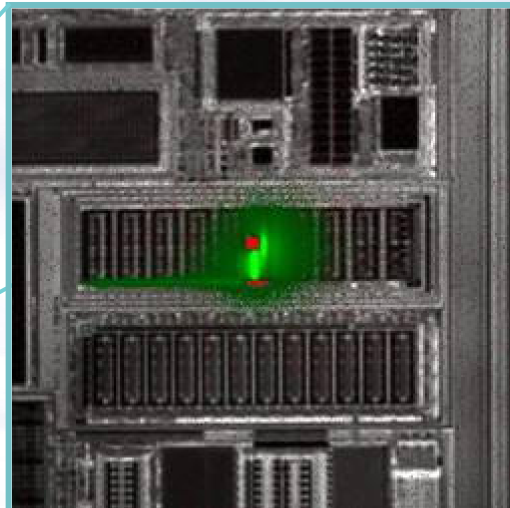
ESD Failure Analysis

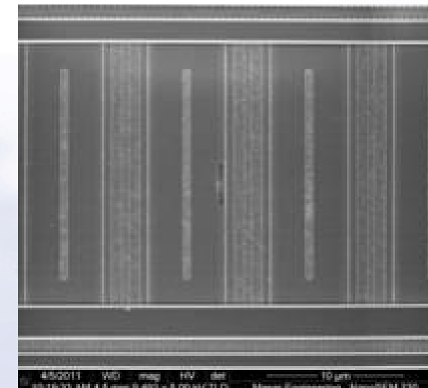


Optical Inspection

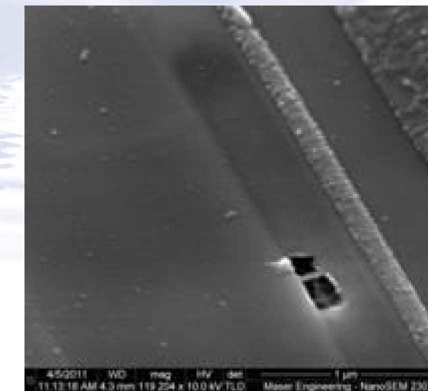


OBirch 20x





SEM 9.500x



SEM 120.000x

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Summery

- Correlation factor between HBM and MM is around 20 and not a factor of 10.
- MM should not be used as a requirement for IC ESD qualification.
- For ESD Qualification, use HBM and CDM.
- No correlation between HBM and System level robustness.

Thank you for your attention!

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