RMV TECHNOLOGY GROUP LLC
A NASA Industry Partner

Initial Material Qualification must be Reinforced with Periodic Verification Testing Throughout the Product Life Cycle Due To Supplier Noncompliance & Suspect Counterfeiting!

ERAI: 19 April 2013 Time: 12:00 PM to 12:30 PM
Suspect Counterfeiting Transcends...

Materials

Equipment

Components

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Microprocessor Transistor Counts 1971-2011 & Moore's Law

1971 4004 = 2300
2008 Dual-Core Itanium 2 = 2 Billion
2011 10-Core Xeon Westmere-EX = 2.6 Billion

Transistor count

1,000,000,000
2,000,000,000
3,000,000,000
4,000,000,000
5,000,000,000
6,000,000,000
7,000,000,000
8,000,000,000
9,000,000,000
10,000,000,000


Intel Website

Date of introduction


curve shows transistor count doubling every two years

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Is ESD Testing Compliant to ANSI/ESD S20.20?

Will a Suspect Counterfeiter Take Shortcuts and make BOGUS Claims?

Touch Screen Display Film
Asian Supplier Bogus Testing Technique for Touch Screen Film Testing Procedures which are not ANSI/ESD STM11.11 Compliant!

Wrong Electrodes!

Crushing And Crossing Leads

Polymer Film Not Planar!

No Relative Humidity Chamber!

Tested on wrong Test Bed
How did the Touch Screen Film Test When Pulled?

Peak Voltage with Film Pulled: 20,479 volts

Surface Resistance: $5.1 \times 10^{12}$ ohms

Voltage Generation Test Information

- Test Date: 11/11/2010 6:18:58PM
- Conditions:
  - Temperature [°C]: 25.57 (25.50 - 25.61)
  - Temperature [°F]: 78.03 (77.90 - 78.10)
  - Humidity [%RH]: 32.92 (32.60 - 33.30)

Data Summary:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min [V] Data</th>
<th>Max [V] Data</th>
<th>Global</th>
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<tbody>
<tr>
<td>Number of Full Test Cycles:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Peak Recorded Values [V]:</td>
<td>-267.00</td>
<td>10,257.50</td>
<td>2,732.80</td>
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<tr>
<td>Average Voltage [V]:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Standard Deviation:</td>
<td>100.41</td>
<td>14,455.40</td>
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<tr>
<td>Minimum Voltage [V]:</td>
<td>-338.00</td>
<td>36.00</td>
<td>-338.00</td>
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<tr>
<td>Maximum Voltage [V]:</td>
<td>-196.00</td>
<td>20,479.00</td>
<td>20,479.00</td>
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How did the Touch Screen Film Test When Pulled?

Peak Voltage with Film Pulled:
-20,480 volts

Surface Resistance
7.2 x 10^{12} ohms

Data Summary:

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<td>Peak Recorded Values [V]:</td>
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<td>Average Voltage [V]:</td>
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<td>Standard Deviation:</td>
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<td>Minimum Voltage [V]:</td>
<td>-36.00</td>
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<tr>
<td>Maximum Voltage [V]:</td>
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Test Date: 11/11/2010 6:11:22PM
Temperature [F] 75.66 (75.60 - 75.90)
Humidity [%Rh] 31.97 (31.60 - 32.90)
ANSI/ESD STM11.11 Proper Method of Testing

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Mapping ESD Events and Electrostatic Decay

Validate Your Film!
Utilize Proper ESD Practices and Validate before Testing

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Issue: User Discovered Insulutive Dip Tubes

Non-Compliant Dip Tubes Found in Long Term Storage

Fox Guarding the Henhouse
By labsquad

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What Happened?  
*Product placed in Quarantine*

What was Found?  
*Insulative Dip Tubes*

What was the resolution?  
*CM Repacked Tubes*

What are the Consequences?  
*ESD Events during repack can and will take place.*  
*Shock and Vibration during shipment are a cause of FIM Events.*
Field Test using 2-Point Resistance of Dip Tube

Failed

4/28/2013
Suspect Dip Tube Charging at 35%RH

Charge Generation of Dip Tube

- 2240 volts
- -7315 volts

Failed
Suspect Counterfeit Risks

- Recycled Dip Tubes: Loss of ESD Properties
- Knock off Dip Tubes: Not ESD Safe
- Failures: Handling/Inspection
- Failures: Manufacturing
- Antistatic Migration

Compliant

Suspect

Antistatic Transfer

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Suspect Dip Tubes = ESD Events

Electrostatic Field Lines

ESD Events and Voltage In-Process

The Cost of Non-Compliance!
What Are the Consequences of Suspect Counterfeit Materials used in Manufacturing, Long Term Storage and Shipping?

According to JPL/NASA Website, ESD Represents a 40 billion dollar Annual Problem!

- Tape & Reel Package
Insulative Reel

Figure 1. Tape-and-Reel Packing
-15,080 volts
The Risks of Non-Compliance

Non-Compliant Tape and Reel ESD Events without Ionization

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Aerospace & Defense are using <50 volt ESD Sensitive Devices

Actual Production Run of Suspect Reel with ESD Components
Compliance = No Failures in Populating a Circuit Card

Compliant Static Dissipative Tape & Reel In-Process

Peak Voltage

Without Ionization
JEDEC Tray, An Overview

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<tr>
<th>Product Name</th>
<th>Pallet Group-Cases/Trays/Units</th>
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<tr>
<td>Datafile Name</td>
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<tr>
<td>Load Ref.</td>
<td>3 I</td>
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<tr>
<td>Cube Used</td>
<td>69.0 %</td>
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<tr>
<td>Area Used</td>
<td>100.0 %</td>
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<tr>
<td>Pallet type</td>
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<table>
<thead>
<tr>
<th>Case (ID)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Net</th>
<th>Gross</th>
<th>Volume</th>
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<td>48.000</td>
<td>49.000</td>
<td>480.000</td>
<td>480.000</td>
<td>53.33 cubic ft</td>
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<tr>
<td>Load</td>
<td>49.000</td>
<td>49.000</td>
<td>45.000</td>
<td>490.000</td>
<td>532.000</td>
<td>60.00 cubic ft</td>
</tr>
</tbody>
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1-Point Resistance through JEDEC on Grounded Surface

BOGUS Trays
Implementing ANSI/ESD S4.1 & ANSI/ESD S3.1

Quarantined
While grounded, conduct the strapping process to stabilize JEDEC tray and contents. Most often, Charge Generating strapping is utilized (a Risk). Therefore, insure the use of shielding top & bottom ESD corrugated cover pads and strapping takes place under high volume velocity air ionization.

**JEDEC Tray Strapping Charge Generation**

**Strapping:**

2260 and -1295 volts without Ionization

Note: Probe Placed in First Top Tray
Improper Use of Kraft Corrugated Pads

Kraft Corrugated Pads do not have a Shielding Barrier

Charge Generating Strapping

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ESD Peak from Nylon Strapping Process into JEDEC Tray without a Conductive Shielding Barrier

1.4x10^{12} ohms
Take ESD Precautions During Device Inspection
Be Aware that Counterfeit Packaging is also an Indicator!

561 volts

= “hot spot”

Failed
ESD Peaks during Strapping Process of JEDEC Tray Using Black Static Dissipative Straps

Volts

10
9
8
7
6
5
4
3
2
1
0

1
9

Courtesy of Albert Escusa
Member, Group Technical Staff
Worldwide Purchasing & Logistics
Texas Instruments
Texas Instruments ESD Integrity

Black Strapping is the Real McCoy!

Black Static Dissipative Strapping!

Picture:
Courtesy of Albert Escusa
Member, Group Technical Staff
Worldwide Purchasing & Logistics
Texas Instruments

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Recommendations

1. Trust but Verify beyond visual inspection for ESD packaging and materials utilizing ANSI and Mil Standards

2. Traceability to the Country of Origin from Supplier needs to be known as well as using a 3rd party or DoD ESD/Packaging Test Lab

4. All ESD Suppliers Need to Provide CoC per Manufacturer Production Run and require physical ESD testing to Insure compliance

5. Insure DoD Personnel are Properly Trained for ESD Packaging Compliance Including auditors which Need to Take Measurements!

6. ESD Materials Qualification and Verification Testing are Essential!
4.5 U.S. Air Force. U.S. Air Force activities have been instructed to utilize ANSI/ESD S20.20 instead of MIL-STD-1686 and ANSI/ESD S541 instead of MIL-HDBK-263

MIL-DTL-81997D, DETAIL SPECIFICATION: POUCHES, CUSHIONED, FLEXIBLE, ELECTROSTATIC-PROTECTIVE, TRANSPARENT (18-FEB-2004) [SUPERSEEDING MIL-P-81997B
Nested References:
Mil-STD-81705
Mil-STD-2073-1

Mil-STD-2073-1E w/Change 1, 7 January 2011
Nested References:
Mil-STD-3010
Mil-PRF-81705

Mil-PRF-81705E X/Amdt 1, 8 February 2010
Nested References:
Mil-STD-3010
ASTM D257
ANSI/ESD STM11.31

NASA MMA-1985-79, Revision 3
23 February 1998
Standard Test Method for Evaluating Triboelectric Charge Generation and Decay

NASA-HANDBOOK 8739.21
This NASA-HANDBOOK is published by NASA to provide standardized guidance for implementing ANSI/ESD S20.20 requirements.
Nested Documents pertaining to packaging:
ANSI/ESD S20.20
ESD TR20.20
ANSI/ESD S541 (includes: ANSI/ESD STM11.11, STM11.12, STM11.13 & STM11.31)

Mil-STD-3010B, Test Method 4046, 31 March 2012
Nested Reference:
Mil-PRF-81705
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