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Electrostatic Discharge (ESD) Susceptibility Analysis

Description:

ESD analysis determines the degree of susceptibility of parts, products or systems to electrostatic discharge. ESD assessments provide valuable insight into parts to avoid and precautionary steps to take. Often considered a subset of electrical overstress (EOS), ESD represents an insidious threat to

How It Can Benefit You:

Modern electronic equipment is inherently susceptible to transient electrical overstress. These transients can originate from a variety of sources, including electrostatic discharges from humans or machines, lightning, system-generated transients and nuclear explosion-generated electromagnetic pulses.

As a subset of EOS, workers and users at every level are, more often than not, either unaware of the ESD problem, or skeptical of its existence for several reasons:

- ESD voltages sufficient to damage semiconductor devices are often lower than the threshold of human sensory perception, making a person unaware that a static discharge has taken place
- Real ESD events are not readily repeatable or subject to experimental control
- A static sensitive device may be grossly mishandled and subjected to ordinarily fatal ESD and still survive if the discharge does not occur at sensitive sites within the part
- Detection of ESD damage is a time-consuming and expensive effort requiring

most semiconductor devices (i.e., microcircuits, transistors, diodes), primarily through a lack of worker/user awareness of the problem. ESD damage voltages are often lower than human sensory perception thresholds, resulting in undetected failures during handling of parts.

sophisticated techniques and equipment

- Damage is not necessarily catastrophic, but may result in early field failures (i.e., the so-called latent defect or "walking wounded" syndrome) that can be costly to repair and/or result in customer dissatisfaction

An ESD analysis can be performed using a variety of data analysis techniques and tools to determine the ESD susceptibility levels of parts, products or systems. These techniques and tools typically include statistical analysis-of-variance (ANOVA), hypothesis testing, and graphical techniques. The ESD sensitivity assessments provide the user with a means to compare different test techniques, different test equipments, and the sensitivity of different devices. The results of the assessment also provide insight into specific technologies or parts that should be avoided, and precautionary steps that can and should be taken during product/system manufacturing, testing and customer use in order to avoid ESD-related problems.

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RAC Capability:

RAC was instrumental in recognizing and characterizing ESD failure mechanisms and providing ESD awareness in the mid-1970's, and has successfully leveraged that experience into a significant knowledge base. Through its data collection charter, RAC has amassed an extensive amount of ESD susceptibility data and transformed it into a structured database containing detailed information on product/system vendors, semiconductor devices (including their manufacturers), and independent test houses.

RAC engineers have the capability and supporting data to perform ESD analysis through the application of various statistical tools and techniques, including ANOVA, hypothesis testing and graphical methods. RAC can, therefore, provide technical assistance in:

- the definition, development, implementation and maintenance of a comprehensive ESD control program

- the development of part-level ESD characterization test methods and procedures

RAC has also periodically published data-books containing characterization data on thousands of electronic parts, as well as a component application guide that discusses the characteristics of electrical transients, ESD protection devices, and ESD-protection design principles for parts, products and systems. An additional application handbook discusses guidelines for controlling ESD in the manufacturing environment in the context of understanding and meeting ISO 9000 quality requirements.

RAC has developed and provided ESD-related training to industry. These training sessions, which can be tailored to suit a particular company's interests and needs, emphasize appropriate packaging and handling procedures, such as the use of electrical connector covers, wrist straps, non-conductive clothing, proper flooring materials and coatings, and the use of ionized air.

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