EOS/ESD Association, Inc.
Online Academy Course
July 28-30,2020
10:00 A.M. - 11:30 A.M.
FC380: Electrostatic Calculations for the Program Manager and the ESD Engineer

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Terry Welsher, Dangelmayer Associates, LLC.

Abstract

This tutorial focuses on the basic mathematical formulae, calculations of use to the program manager. The content is at the introductory college pre-calculus and introductory college physics level with emphasis on electrostatics and basic electronics concepts. It is suggested that the student gain some familiarity with these subjects prior to the tutorial. Topics covered include the electrical charge, the electric field and Coulombs law, electric potential, and voltage, decay equations, and definitions and calculation of resistance and capacitance. Basic equations and relationships are explained to enable the application of the fundamental relationships. The fundamental equation, Q = CV, is used to explain charge sharing in real world situations. RC decay is discussed as it relates to ESD discharge from humans, devices, wrist straps, and materials and to air ionization. Simple models are used to compare models for various types of ESD (Human-Body Model, Charged Device Model and others) and provide a conceptual understanding of the differences among the calculations for peak current, power, energy, and threshold voltage for a simple device.

Learning Outcomes

Upon completion of this tutorial the student should:

- Understand the underlying physical relationships that are the basis for electrostatic phenomena important to the science and implementation of ESD controls.
- Become familiar with some basic concepts in electronics.
- Understand some basic mathematics such as rate equations, logarithmic and exponential functions, and simple integration of electrostatic functions.
- Be able to perform simple calculations for real world ESD applications.
- Understand how ESD events relate to measurements that can be made in the factory (electrostatic voltages and fields, discharge currents, material resistance and device capacitance)
- Understand differences among ESD failure models (HBM, CDM, etc.)
- Formulate mathematical solutions to a variety of problems in electrostatics, electrical measurements, and charge flow including ionization.

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