

Design for Testability (DfT) Seminar

OBJECTIVES

Our DfT course is based on Pat O'Connor's book "Test Engineering" and covers the following topics: Stress-strength and failure of materials and electronics, Variation and reliability, Design analysis, Development test principles, Materials and systems test, Electronics test, Software, Manufacturing test, Testing in service, Data collection and analysis, Managing tests, and Laws, regulations, standards.

WHO SHOULD ATTEND

This course is intended for those involved in manufacturing, design, or test, who want a better understanding of how to design a product to make it easier to test once in manufacturing.

OUTLINE

Introduction

- Why test
- Causes of failures
- How to test

Stress, Strength, and Failure of Materials

- Material Properties
- Causes of Strength Deterioration
- Design against Fatigue
- Wear Mechanisms
- Wear Reduction
- Corrosion
- Other Mechanical Failure Mechanisms
- Material Selection for Reliability/Durability

Stress, Strength, and Failure of Electronics

- Stress Effects
- Temperature Effects on Reliability
- Semiconductor Device Technologies
- Microcircuit Mounting and Connection
- Semiconductor Device Failure Mechanisms

- Passive Device Failure Mechanisms
- Solder
- Insulation
- EMI
- Electrical Overstress (EOS)
- Electrostatic Discharge (ESD)

Variation and Reliability

- Different Types of Distributions
- Distributed Load and Strength

Design Analysis

- Multiple variations/Design of Experiments
- Confidence and risk
- Statistical, scientific, and engineering confidence
- Measures of reliability
- Patterns of failure

Development Test Principles

- Fundamental Principle of Test Development
- Limits
- Environments
- Accelerated Stress Test
- Highly Accelerated Life Test (HALT)
- Accelerated Test vs. DOE

Electronics Test

- Circuit Test Principles: Analog
- Circuit Test Principles: Digital
- Manual Test Equipment
- Automated Test Equipment (ATE)
- Test Capability
- Design for Test (DfT)
- Layout for ICT
- Built-in Test (BIT)
- EMI/EMC Test
- Test Control and Data Acquisition
- IC Test

Software

- Hardware/Software Reliability Differences
- Software Reliability
- Error Reduction
- Fault Tolerance
- Languages
- Software Testing
- Documentation
- Software Reliability Prediction and Measurement

Manufacturing Test

- Test in Manufacturing
- Manufacturing Test Principles
- Test Capability
- Manufacturing Test Economics
- Stress Screening
- HASS
- Electronics Manufacturing Faults
- Fault Proportions and Coverage
- Assembly Test
- Burn-In (ESS)
- Integrating Stress Screening

Test in Service

- Test schedule (continuous, operating cycles, calendar time)
- BIT/BIST
- No Fault Found
- Reliability Centered Maintenance (RCM) Objectives
- Maintenance Categories
- Stress Screens for Repairs
- Calibration

Data Collection and Analysis

- FRACAS
- Failure review board
- Different types of databases
- Linking databases across divisions/suppliers

Managing Tests

- Test Procedures
- Developing a Test Program
- Testing Purchased Items
- In-House vs. External Facilities
- Project Test Plan
- Manufacturing Test Plan
- Management Issues
- Future of Test