Common Hardware Mistakes by Embedded System Designers **½ Day Course**

ABSTRACT
Embedded system designers are constantly expected to do more with less, more computational power, smaller space, at a lower cost. In this rush to meet customer requirements, common and costly hardware design mistakes are often made. Examples include capacitor selection, component placement, board layout and specifications, and understanding the role design plays in ensuring long-term reliability. This class presents hardware designers with case studies of some common mistakes and why they caused failure. The course also provides a checklist to avoid these mistakes, why these mistakes caused failures, and optimized corrective actions necessary to avoid these problems, but still ensure a successful product launch.

OUTLINE

- Embedded Systems and Reliability
- Who Controls Hardware Design
- When and Where Hardware Mistakes Occur
- Parts Selection
    - Component Rating (Voltage, Current, Power, Temperature)
        - Switches
        - Relays
        - Capacitors
        - Resistors
        - Diodes
    - Derating Goals, Guidelines, and Recommendations
        - Ceramic Capacitors
        - Tantalum and Polymeric Capacitors
        - Electrolytic Capacitors
- Mechanical Layout
    - Understanding Design for Manufacturability (DfM)
        - MELF Packaging
        - Flex Cracking
        - Plated Through Hole
- Long-Term Reliability
    - PoF Analysis and Reliability Assurance
    - Desired Lifetime and Use Environment
    - PoF and Wearout
    - Alternatives to PoF
        - Rules of Thumb (for Constant Temperature, Temperature Cycling, Vibration)
        - Best Practices
        - Norris-Landzberg (SnPb)
    - PoF Example: SnAgCu Life Model
- Conclusion
    - Design for Excellence (DfX)
    - Design for Manufacturability (DfM)
    - Design for Sourcing (DfS)
    - Design for Reliability (DfR)

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