PEPTUS

"Power Electronics Packaging – Training and Up Skilling"

Course Content:

Basic – Modules 1-4

Intermediate – Modules 5-8

Advanced – Modules 9-12

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WP1 - Key Topics

A. Basic Power Electronics Packaging Principles

1. **MODULE 1: Power Electronics Package Drivers**
   - Why Package
   - What is the driver
   - The basic packaging process

2. **MODULE 2: Basic Packaging Equipment and Processes**
   - Equipment
   - Standard Power Packages
   - How are they made

3. **MODULE 3: Design for Power Electronics Packaging**
   - Application Specific Packaging
   - Package design aspects
   - Which one to choose

4. **MODULE 4: Testing, Reliability and Future Trends**
   - Testing and Reliability Aspects
   - Package Roadmaps – Including Power Electronics Roadmap
   - Trends to Advanced Packaging

WP1 - Key Topics

B. Intermediate Aspects

5. Power Electronics Packaging Options

- Selection of devices (Si, SiC, GaN) and significance of voltage, Rds (on) and device topology
- Discrete packaged devices/bare chip on substrate/wafer level packaging
- Selection of substrates (PCB, IMS, DBC, etc) and heatsinks
- Integrated power modules (gate drivers, passives, etc)

6. Design issues:

- Why Power Electronics Packaging is different
- Design aspects (including thermal/mechanical/electrical simulation) and guidelines
- Understanding Power Switching and Parasitics (L, C, R)
- Thermal Management and High Temperature Operation
- Hermeticity and Voltage Isolation/breakdown
- Power electronics testing and reliability overview

7. Materials and Processes

- Die attach – Solder/Sinter
- Die Interconnection – Wire/ribbon bond, Clips/studs, sinter, solder
- Encapsulation – silicones, epoxy moulding, potting
- Terminal Connections – Ultrasonic/Laser/Solder/Mechanical

8. The Supply Chain

- Equipment
- Devices and Passive Components
- Materials
- Services – testing, failure analysis
- OSATs

WP1 - Key Topics

C. Advanced – Power Electronics Packaging Technologies

9. Understanding the Packaging Processes
   - Step by step
   - from Wafer/Substrate to Module
   - Material/Manufacturing/Test Costs and Value Chain

10. Device Packaging Constraints
   - Effects of Packaging on devices and modules
   - Effects of devices on Packages and packaging

11. Advanced Packaging Developments and Relevance to Power Electronics Packaging
   - Double sided assembly
   - 3D
   - TSV
   - Chiplets
   - Heterogeneous Integration

12. Power Electronics Packaging – Testing, Modelling, Reliability and Lifetime Prediction
   - Failure modes – device and package related
   - Functional, Characterisation and Environmental Tests
   - Failure analysis techniques and limitations
   - Lifetime predictions and assessment
   - Qualification and Certification