HP 4155/56 User Training

Technical Data

Course Overview

The HP 4155/56 User Training course provides hands-on experience using instrument features that automate benchtop DC semiconductor analysis. Understand concepts which will allow you to quickly make ultra low current measurements at the wafer level. Learn how to customize measurement modes which greatly simplify device characterization, failure analysis, and reliability testing. Use front panel features for creating PC-Windows compatible graphs and spread sheet analysis. Use the built-in controller to run advanced factory supplied applications or your own customer code.

Course Features

- The HP 4155/56 is compared to the industry standard HP 4145 analyzer. All new features are explained through lecture, lab and course software.
- Concepts of driven guard (low current) and kelvin connection (low resistance) are illustrated with practical ultra low level examples.
- V-Ramp and Fowler Nordheim plots are made using the new IV mode clock.
- Hot carrier injection, TDDB, flash memory, and other stress life tests are covered using factory supplied fixturing and software.
- Semiconductor interface state integrity is explained and monitored using the optional pulse generator plug-in for the HP 4155/56.
- Four types of programming are discussed from simple on-the-spot automation (ASP-like programming) to advanced SCPI applications.
- New spreadsheet and graphics functions are used to quickly output data to printers, plotters, or PC-DOS based applications.
- Learn how to migrate algorithms and code from the HP 4145 to HP 4155/56.
- The course application disk includes an extensive library of bipolar and MOS algorithms for device characterization and reliability testing.

Specifications

Course Length

2 days

Audience

Device engineers, process engineers, reliability engineers, technicians.

The course is designed for users who want to master features which go well beyond the capabilities of the HP 4145.

Prerequisites

Familiarity with the HP 4155 Parameter Analyzer is helpful. No previous programming experience is required.

Delivery Method

Classroom, Dedicated

Format

Instruction consists of 60% lecture and 40% hands-on lab exercises. Lab algorithms and software are designed to be used later on the student's own semiconductor wafers with minimal modification.

Emphasis is on practical hands-on training which includes all front panel capabilities, use of factory software, and an introduction to programming. Advanced programming information and examples are included but not discussed.

Course Number: 4156A+24C (scheduled)
4156A+24Y (dedicated)

HP Education Services: Your Key to Higher Productivity

Classroom Training Benefits

Experienced HP Instructors
Learn from an experienced HP instructor.

Available at HP Classrooms
Take advantage of HP's learning facilities, equipment, and interactive learning environment by attending class at an HP facility.

Regularly Scheduled Classes
Plan training months in advance.

Extensive Hands-on Practice
HP classroom training is characterized by extensive hands-on experience and interactive class discussion. HP classroom training pays off immediately because it is geared to real-world solutions.

Comprehensive Student Materials
Copies of course materials are provided for future reference on the job.

Ordering Information
To order HP 4155/56 User Training (4156A+24C) course in the U.S. call 1-800-HPCLASS (800-472-5277).

HP's Customer Registration Center can provide you with price, scheduling, and enrollment information about dedicated class delivery or customizing a class to meet your specific needs

Outside the U.S., contact your nearest local HP sales office.

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Course Agenda

Module 1
Course Description

Module 2
Overview

- What is the 4155/4156?
- Product Family Concept
- Key Specifications
- Applications Guide
- Configuration Options
- Current Manual Set
- Current ROM Set

Module 3
Basic Concepts

- SMU Fundamentals
- Front Panel Page Controls
- Cabling and Fixture Issues
- Kelvin and Driven Guard
- Probes and Prober Connections
- Triax and Coax Adapters
- Safety Interlock Issues
- HP 16058A Fixture Compatibility
- Class Exercises
  - MOSFET Id vs Vd Basic Measurement
  - Bipolar Re Using A Kelvin SMU

Module 4
Low Current Measurement

- Low Current Measurement Challenges
- Calibration and Zero Adjust
- Effect of Cable Movement
- Low Current Subthreshold
- Trade-Off Speed vs. Accuracy
- Low Current Gummel Plot
- Low Current Gate Oxide Leakage
- Class Exercises
  - Measurements Near Zero fa
  - Low Current Subthreshold
  - Low Current Gummel Plot

Module 5
New Features

- Standby Mode
- SMU Pulse Mode
- Knob Sweep Mode
- Abort Sweep
- Auto-Analysis
- Graphics Overlay
- Sampling Modes
- Differential VM Mode
- Resistance Box
- Class Exercises
  - Standby Mode
  - SMU Pulse Mode
  - Knob Sweep
  - Auto Analysis
  - Graphics Overlay
  - Thinned-Out Sampling
  - DVM Mode

Module 6
Time Measurement

- Overview - Concept of Time Measurement in IV Mode
- Trigger Function
- INDEX Function
- Check List For Making a Time Plot
- V-RAMP Measurement Using IBASIC
- Fowler - Nordheim Plots
- Class Exercises
  - Time Plot
  - V-Ramp JEDEC Procedure

Module 7
Stress Measurement

- Overview - Manual Stress vs IBASIC Controlled
- Stress Output Channels
- Stress Force Timing
- Manual Stress Example - MOS Vth Shift
- Hot Carrier Injection
- Flash Memory Test
- Charge Pumping
- IBASIC Stress Example - Charge Pumping
- Class Exercises
  - Manual Stress/Measure
  - Square Pulse Charge Pumping

Module 8
Printing and Plotting

- What's In The Printer Guide?
- ROM Revision 1.02
- Recommended Printers
- PCL Versus HP-GL
- Necessary Converters and Cables
- The HP 4155/4156A Printer Guide
- Class Exercise
  - LaserJet Plot With Setup Data

Module 9
File Management and HELP

- System Filer Functions
- Filer Limitations
- 4155 and 4156 File Types
- Special Initialization Files
- Using MEM Files For Fast Testing
- 4145 Compatibility
- Creating Spreadsheet Files
- Hints For Best Graphics Export
- HELP Screens and Typing Aids
- Class Exercise
  - Copy Files to MEM for Fast Access
  - ASCII Save Function
  - Screen Dump - Vector and Bitmap

Module 10
Programming

- HP Instrument BASIC (IBASIC)
- Four Ways To Program
- Programming Guides
- ASP-Like Programming
- 4145 Syntax System Mode Programming
- 4145 Syntax User Mode Programming
- SCPI Mode Programming
- Mixed Mode Programming Using a CMOS Latchup Test
- Class Exercise
  - Finding Vth Using EXECUTE Method
  - 4145 Syntax Mode Program
  - Latchup Program Example

Module 11
Software Support

- Interactive Characterization Software (ICS)
- Sample Applications Software
- User Contributed Software (Shareware)
- IC Characterization and Analysis Program (ICCAP)
- Virtual Engineering Environment (VEE)

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