KEITHLEY

Semiconductor Characterization System FAQs

Q. How are semiconductor characterization systems used?

A. Semiconductor characterization systems are used in product and process development, reliability testing, and process monitoring. Typical applications involve device modeling and reliability testing via semiconductor device I-V and C-V characterization.

Q. What are the elements of a semiconductor characterization system?

A. Principal hardware requirements are source-measure units (SMUs) covering a wide range of voltage and current outputs, highly sensitive measurements, a computer-based controller, and display system. In many cases, an application requires additional instruments and third-party software, such as a pulse generator, C-V meter, switching system, and device modeling package. The resulting test system must interface to a semiconductor probe assembly (SPA) that makes contact with the device under test (DUT). Data analysis and display software are also needed.

Q. I've heard of the Keithley Model 4200-SCS Semiconductor Characterization System, but what is it?

A. The Model 4200-SCS is a benchtop parametric analyzer that provides a total system solution for DC characterization of semiconductor devices, test structures, and materials. It is the leading instrument for semiconductor device characterization and can be configured with from 2-8 SMUs and optional sub-fA Remote PreAmps. It also has a fully integrated industrial-grade PC that runs Windows-based characterization software.

Q. I know lots of companies are using the Keithley 4200 for device characterization; what makes it so effective?

A. A number of factors make the 4200 highly effective in a variety of test environments:

- The Windows interface is extremely intuitive and reduces training time significantly while improving productivity.
- The included software – KTE Interactive – is specifically designed for characterization applications and consistently wins raves for its user friendliness.
- The system comes configured with a set of standard libraries and sample projects that cover the majority of devices and tests needed for semiconductor device testing.

- The 4200 was designed and built, and is currently supported by, engineers who are leading experts in the test and measurement industry. They know exactly what you need to test your devices successfully, and can talk your language when a new measurement need arises

Q. Do I need any other hardware or software to analyze my data and test outputs?

A. With an industrial-grade PC integrated into the Model 4200, you can analyze your data right on the system. Powerful graphing tools and Excel-like spread sheet capabilities allow the most complicated data analysis, and the large flat panel display makes seeing your data easy.

Q. What are the provisions for storing and sharing raw data and analysis results?

A. The Model 4200-SCS has a standard Ethernet 10/100BASE-T network interface and can be integrated directly onto your company intranet. Not only can you upload test results to your computer or your network, but the 4200 directly outputs data in Excel (.xls) format for analysis by any Excel-enabled PC. The powerful built-in graphing and analysis tools can also print directly to Windows-supported printers and output graphs in .bmp, .jpg, and .tif formats. You can upload a graph and insert it directly into your document in a matter of seconds. Built-in CD-R/W and floppy drives give maximum flexibility for transporting and backing up data, and the large on-board hard drive will store a multitude of tests and results.

Q. Most of my testing is on other types of components, not semiconductor transistors; is the 4200 set up for these other devices?

A. The Model 4200-SCS is well suited for almost any kind of electrical characterization. Standard libraries include a variety of typical devices, and user-defined devices are extremely easy to create and incorporate into the system. Current measurement capabilities go down to atto-amp resolutions, but current sources are available up to 1A. Voltage can be measured down to the microvolt range, and voltage sources can output up to 210V. Devices can range from two-terminal devices to devices requiring eight independent source/measure channels.

Q. I don’t work with silicon; can the 4200 characterize other materials?

A. The Model 4200 has found great success in III-V applications and nanotechnology materials and structures. With current sensitivity lower than any other characterization system in its class (i.e., atto-amp resolution); the 4200 is particularly well suited to nanotechnology and molecular electronics R&D.

Q. What if my measurement needs change in the future?

A. The Model 4200-SCS is flexible in a variety of ways. The integrated software allows many different customizations, from new bitmaps of your devices in the GUI to writing custom C code for extremely complex testing. The system has an integrated GPIB controller and can extend measurement capabilities by controlling a variety of external instruments, such as C-V meters and matrix switches. Other instruments can easily be added with either user-written or Keithley-written drivers. Finally, the Model 4200-SCS is a platform that is continuously being upgraded and enhanced. New software versions with added capabilities and features are regularly released and a variety of hardware additions are in development. The Model 4200-SCS will grow with you as your test measurement needs grow and change.

Q. Can I install a third-party software package on my 4200-SCS?

A. The 4200-SCS Technical Data Sheet lists many third-party software packages that have been tested and approved for installation, including Microsoft® Excel, Word, and various anti-virus programs. Any 4200-SCS user that has access to the system administrative privileges has the ability to install third-party software. However, this software should be thoroughly tested to make sure it does not affect the operation and stability of the system.

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