

Discover Today's Solutions for Tomorrow's Nano Characterization Challenges

A GREATER MEASURE OF CONFIDENCE

KEITHLEY

The leader in nanotechnology measurement solutions



Keithley is **helping advance the state of the art** in a growing list of nanotechnology applications—yours may be one of them. **Six decades of experience in designing ultra-sensitive measurement tools** allow us to provide university, corporate, and government labs around the world with solutions for investigating new material and device properties. Just as important, these solutions are designed for intuitive operation, so you'll get the results you need quickly and simply. That means you can focus on your research, not on your test hardware.

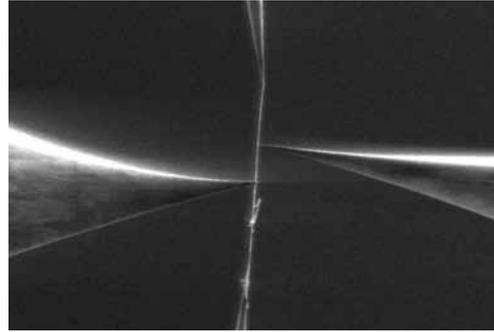
We partner with organizations like the Institute of Electrical and Electronics Engineers (**IEEE**), leading Nanotechnology Centers of Excellence, Keithley **customers**, and other leading nanotechnology measurement tool vendors to create more complete solutions. The **insight into emerging needs** these working partnerships provide helps us deliver new capabilities faster.

What kinds of measurement challenges do your nanotechnology applications present?

Nanotechnology research is advancing so rapidly that many scientists find that their existing measurement tools simply lack the sensitivity or resolution needed to characterize low level signals effectively. Others are scrambling to keep up with the rapid changes in measurement requirements that new discoveries create. No matter which challenge you're facing, Keithley can help.

Need wider ranges for your nanoscale materials research?

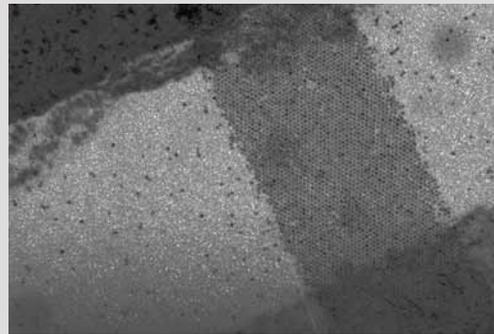
Understanding how building block materials like nanocrystals, nanotubes, nanowires, and nanofibers will perform in tomorrow's electronics demands instrumentation that can characterize resistance and conductivity over wide ranges. Keithley combines all the necessary sourcing and measurement tools into a variety of easy-to-use test solutions. Many are designed for easy integration with other instruments to extend system ranges and capabilities even further.



A four-wire connection to a carbon nanotube. Image reproduced here courtesy of Zyvex Corporation.

Experimental nanostructures can't take the heat?

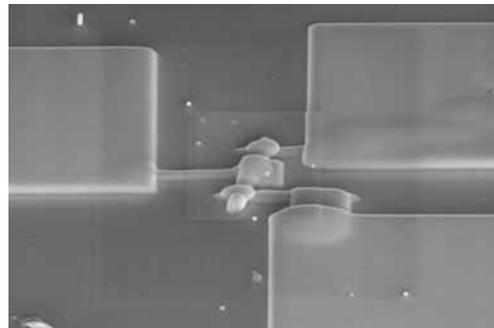
During device development, structures like single electron transistors (SETs), sensors, and other experimental devices often display unique properties. Characterizing these properties without damaging one-of-a-kind structures requires systems that provide tight control over sourcing to prevent device self-heating. Keithley instrumentation combines this tight control with exceptional measurement speed and sensitivity in flexible, modular architectures that make it easy to adapt to changing test requirements.



A device formed by an array of gold nanoparticles. Photo courtesy of K. Elteto and X.M. Lin, the University of Chicago.

Preparing to make the leap into production?

Our growing line of I-V characterization tools can help you make the jump from the lab into commercial production sooner. Their wide sourcing and measurement ranges allow you to study how next-generation nanoelectronics like carbon nanotube field-effect transistors (CNTFETs), SETs, and other exotic devices will perform under a variety of conditions.



TiO₂ nanotube image courtesy of Dr. Jiyong Kim, University of Texas at Dallas.

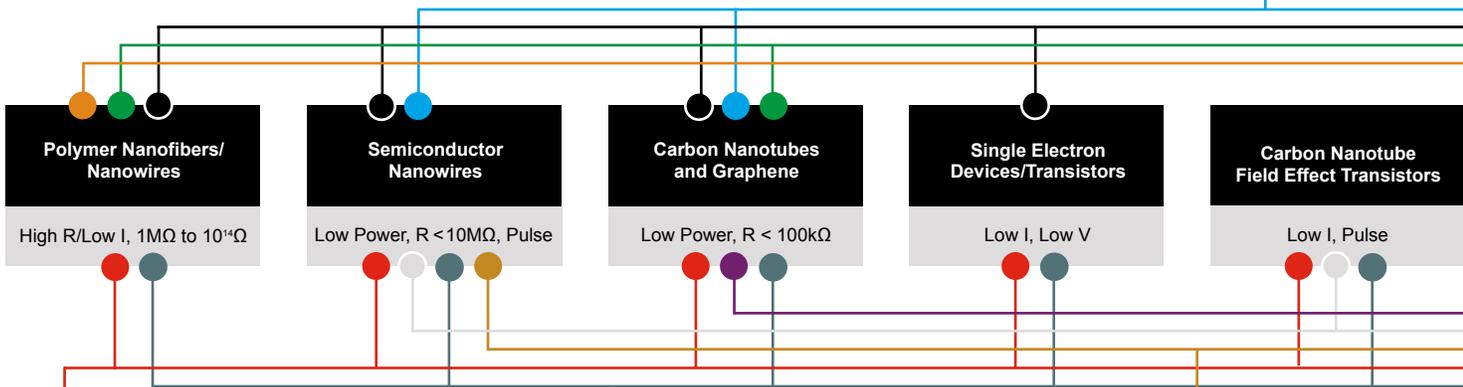
Visit www.keithley.com/nano to learn more about why we're leading the industry in the development of measurement solutions for nanotechnology research and production test.

Which Keithley nanotechnology solution is best for your sourcing or measurement application?

Keithley instrumentation is being used in a growing list of nanotechnology research and production test settings. The applications shown here are only a sampling of the nanotechnology test and measurement tasks for which our instruments and systems are suitable. If your tests require sourcing or measuring low level signals, Keithley instrumentation can help you perform them more accurately and cost-effectively.

Want seamless control over current pulse sourcing and measurement?

When linked together, the **Model 6221 AC+DC Current Source** and **Model 2182A Nanovoltmeter** are designed to operate like a single instrument to make high speed pulse mode measurements. **Learn more on pages 10 – 11.**



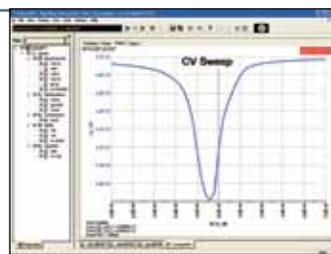
Want multiple channels of sourcing and measurement?

The fully integrated **Model 4200 Semiconductor Characterization System** brings together all three core measurement types, DC-IV, AC Impedance and transient I-V, in one easy-to-operate package. It's used in many phases of nano research, development, characterization, and production. **Learn more on pages 6 – 8.**



Need to characterize mobility, carrier density, and device speed?

The **Model 4210-CVU Option** takes the guesswork out of obtaining valid capacitance-voltage (C-V) measurements quickly and easily, with intuitive point-and-click setup, complete cabling, and built-in element models. **Learn more on page 8.**



Need tighter control over your pulses?

The **Series 3400 Pulse/Pattern Generators** can output voltage pulses with widths as short as 3ns with independently adjustable rise and fall times as short as 2ns. **Learn more on page 13.**



The Model 4200-SCS conforms to and supports the new IEEE Standard 1650™-2005: "IEEE Standard Test Methods for Measurement of Electrical Properties of Carbon Nanotubes," the world's first electrical measurement standard for these devices.

Studying highly resistive nanowires?

The **Model 6430 Sub-Femtoamp Remote SourceMeter®** instrument's low noise and drift performance make it ideal. It measures currents with 400aA (400×10^{-18} A) sensitivity. **Learn more on page 9.**



Trying to characterize high resistance nanomaterials?

The **Model 6517B Electrometer/High Resistance Meter's** built-in 1kV source, 200TΩ input resistance, and low current sensitivity make it an ideal solution. **Learn more on page 9.**



Want low current measurements without the high price tag?

With $<200\mu\text{V}$ burden voltage, the cost-effective **Model 6485 Picoammeter** ensures accurate low current measurements, even in circuits with very low source voltages. The **Model 6487 Picoammeter/Voltage Source** adds a 500V bias source for high resistance and resistivity measurements. **Learn more on page 12.**



Nanobatteries
Low I, Low Power

Nanophotonics
Low I, Pulse

Synthesized Molecular Electronics/Wires
Low I, Low Power

Nanosensors & Arrays
Low I, Low V

Thermal Transport
Low I, Low Power, Pulse

Troubled by overheating problems?

The Model 4225-PMU option for the Model 4200-SCS performs pulsed I-V testing on a variety of devices for many different purposes, including preventing device self-heating by using narrow pulses and/or low duty cycle pulses rather than DC signals. **Learn more on page 7.**



Testing lots of devices?

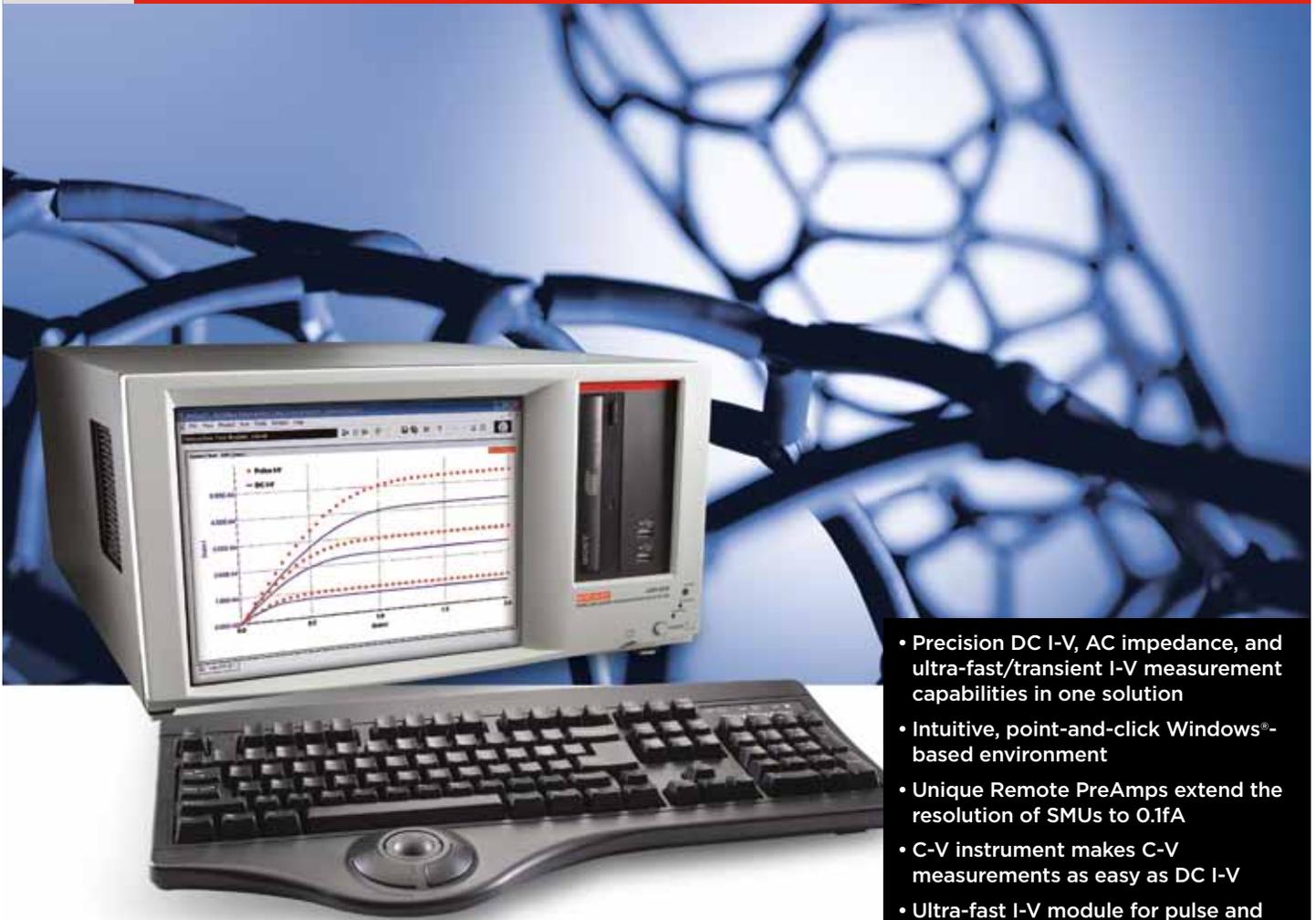
Series 2600A System SourceMeter® instruments let you make precision DC, pulse, and low frequency AC source-measure tests quickly, easily, and economically. They offer virtually unlimited flexibility to scale the system's channel count up or down to match changing application needs. **Learn more on pages 14 – 15.**



Looking for just a single channel?

Each **Series 2400 SourceMeter** instrument is a complete, single-channel DC parametric tester. Choose from a variety of ranges and functions to suit specific application needs. The Model 2430 can be programmed to produce individual pulses or pulse trains up to 5ms wide. **Learn more on page 13.**

To discuss how we can work with you to configure a solution for a specific nanotechnology application, contact Keithley's Applications Engineering department and ask to speak with one of our nano measurements experts. In the U.S., call us toll free at 1-888-KEITHLEY (534-8453).



- Precision DC I-V, AC impedance, and ultra-fast/transient I-V measurement capabilities in one solution
- Intuitive, point-and-click Windows™-based environment
- Unique Remote PreAmps extend the resolution of SMUs to 0.1fA
- C-V instrument makes C-V measurements as easy as DC I-V
- Ultra-fast I-V module for pulse and pulse I-V capabilities

Complete pulse and DC solution

Model 4200-SCS Semiconductor Characterization System

The Model 4200-SCS Semiconductor Characterization System is the industry-standard tool in nanotechnology labs around the world for applications ranging from materials research and nanostructure development to I-V characterization of nanoelectronic devices. This powerful and easy-to-use system performs lab grade DC I-V, C-V, and pulse device characterization, real-time plotting, and analysis with high precision and sub-femtoamp resolution. It combines unprecedented measurement speed and accuracy with an embedded PC and the Keithley Interactive Test Environment (KITE) to offer the most advanced capabilities available in a fully integrated characterization system.

The Model 4200-SCS includes powerful test library management tools that allow standardizing test methods and extractions to ensure consistent test results. It offers tremendous flexibility with hardware options that include four different switch matrix configurations and a variety of LCR meters and pulse generators.

The Model 4200-SCS is modular and configurable. It supports up to nine source-measure units (SMUs) in any combination of medium and high power SMUs. A high-power SMU provides 1A/20W capability. The C-V option and ultra-fast I-V modules are also available. The C-V option includes the C-V Power package, which supports high power C-V measurements up to 400V and 300mA, up to 60V of differential DC bias, and quasistatic C-V measurements.

The Model 4200-SCS conforms to and supports the new IEEE Standard 1650™ - 2005: "IEEE Standard Test Methods for Measurement of Electrical Properties of Carbon Nanotubes."

Keep your finger on the pulse of new nano testing technologies

New materials, miniscule device dimensions, and higher operating speeds have all combined to make characterizing nanostructures more challenging than ever. Traditional DC I-V techniques can lead to joule heating of the device, affecting device response and masking the phenomenon of interest, or even destroying priceless experimental devices. By minimizing the amount of energy pumped into a device, Keithley's growing line of pulse testing solutions offers valuable alternatives to DC characterization methods.

Save time and money with the Model 4225-PMU Ultra-Fast I-V

Now, incorporating a pulse I-V characterization system into your nano lab is no longer a do-it-yourself project or a major strain on the capital equipment budget. Our new 4225-PMU is a comprehensive package of hardware and software (including patented cable and load-line compensation utilities), designed to integrate seamlessly with the Model 4200-SCS workstation. It includes everything you need to implement a turnkey system for pulsed I-V testing of nanostructures:

- Integrated dual-channel ultra-fast I-V module
- Optional remote amp/switch
- Control software
- Optional multi-measurement performance cables support I-V, C-V, and ultra-fast I-V
- Pulse I-V sample project created for isothermal testing
- Broad range of sample projects

Control the amount of energy transmitted to the device precisely with independently controllable pulse rise and fall times. Source pulses as short as 40ns.

View results in the way that's best suited to your application— V or I vs. time, DC bias current vs. pulse voltage response, etc. DC and pulse operation are fully integrated.

Compare results from DC measurements and pulse response measurements easily in the same window.

To device

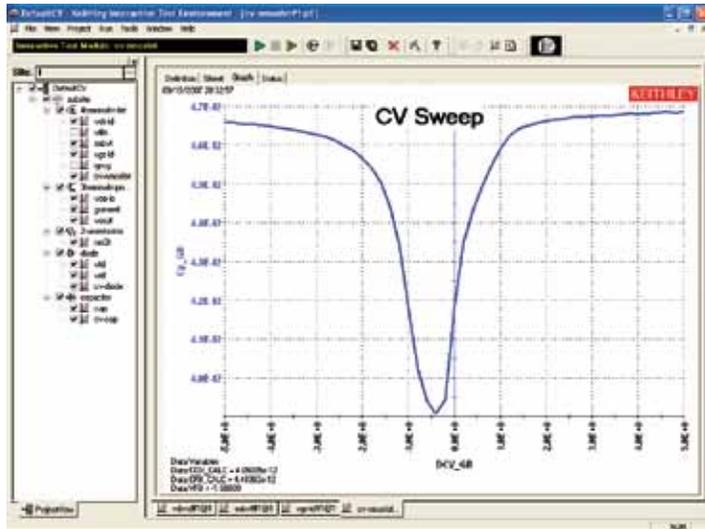
Model 4225-RPM remote amplifier/switch improves ultra-fast I-V current sensitivity and acts as a switch for I-V and C-V.

Inset Graph Data:

Current (mA)	Pulse I-V (V)	DC I-V (V)
0.0000	0.0000	0.0000
0.5000	~1.5000	~1.0000
1.0000	~2.5000	~1.5000
1.5000	~3.5000	~2.0000
2.0000	~4.5000	~2.5000

Integrated C-V Option Speeds and Simplifies Device and Materials Characterization

The Model 4210-CVU Integrated C-V Option is designed for integration with the Model 4200-SCS, so it brings together DC I-V, C-V, and pulse testing capabilities in one easy-to-use tool that can support all of a lab's characterization, modeling, and reliability testing needs.



Now, C-V is as simple as I-V

When combined with the Model 4200-SCS's intuitive point-and-click interface and powerful Keithley Interactive Test Environment (KITE), the Model 4210-CVU and its supporting software make C-V tests as easy to set up and run as I-V tests. The system's flexible, powerful test execution engine makes it simple to combine I-V, C-V, and pulsed tests into the same test sequence, so the Model 4200-SCS can replace a variety of electrical test tools with a single, tightly integrated characterization solution.

Powerful C-V test libraries and parameter extraction examples

There's much more to the Model 4210-CVU than hardware and interface software. By building on decades of experience in C-V test technology, Keithley is backing up the Model 4210-CVU with an extensive set of sample programs, test libraries, and built-in parameter extraction examples. The sample tests included range from simple capacitance measurements to capacitance vs. frequency sweeps. Parameter extraction algorithms such as doping profiles and oxide thickness are provided ready to run right out of the box. The open source code for these algorithms is included, allowing easy user customization.

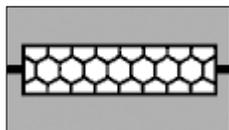


Explore nanotechnology applications

With 16 Interactive Test Modules (ITMs) for characterizing the seven most common nanodevice structures, the sample project and sample tests included in the Model 4200-SCS bring together the capabilities you need to create powerful nanotech R&D software applications. They can help you to focus on your research by slashing the time needed to develop new applications or to refine them as new test requirements emerge.

Supported nanodevices and their associated Interactive Test Modules:

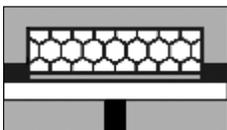
- Carbon Nanotube
 - I-V characteristics
- BioComponent
 - I-V characteristics
- Nanowire
 - Low Resistance Nanowire Sweep
 - Low Resistance Nanowire Differential
- Carbon Nanotube FET
 - +Drain Voltage vs. Drain Current
 - -Drain Voltage vs. Drain Current
 - Linear Threshold Voltage Sweep
 - Gate Voltage vs. Drain Current
 - Sub-Threshold Voltage Sweep
 - Threshold Voltage Max GM Sweep
 - Gate Leakage vs. Voltage Sweep
- Conductance Sweep
 - High Resistance Nanowire Sweep
 - High Resistance Nanowire Differential Conductance Sweep
- Molecular Wire
 - Current, Conductance vs. Voltage I-V Sweep
- Molecular Transistor
 - Drain Voltage vs. Drain Current Sweep
- Multi-Pin Nanocell
 - Input/Output Characteristics Sweep



Carbon Nanotube



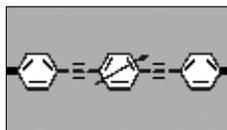
BioComponent



Carbon Nanotube FET



Nanowire



Molecular Wire



Molecular Transistor

Learn more by downloading "I-V Measurements of Nanoscale Wires and Tubes with the Model 4200-SCS and Zyvex S100 Nanomanipulator" at www.keithley.com/nano.

Low Current/High Resistance Measurements

Sources and measures the lowest currents in the world

Model 6430 sub-femtoamp remote SourceMeter® instrument



- 0.4fA p-p (4E-16A) noise
- Remote PreAmp can be located at the signal source to minimize cable noise
- >10¹⁶Ω input resistance on voltage measurements
- High speed—up to 2000 readings/second
- Up to 6½-digit resolution
- Fast characterization of components with programmable digital I/O and interfaces

The Model 6430 combines the voltage and current sourcing and measurement functions of Keithley's SourceMeter and Source-Measure Unit (SMU) products with sensitivity, noise, and input resistance specifications superior to electrometers. This unique combination of broad functionality and exceptional measurement integrity is made possible by the Model 6430's Remote PreAmp, which offers a very sensitive bi-directional amplifier with sensitive feedback elements for measuring or sourcing currents at the device being tested. The Model 6430 makes voltage, current, and resistance measurements at speeds no electrometer can match. It can read up to 2000 source/measure readings per second into internal memory. Currents can be measured in as little as 5ms on the 100nA range, decreasing to just a few hundred microseconds on the higher ranges.

“The capabilities of the 6430 allow us to measure with a resolution and ease that was previously unavailable in this type of experiment.”

—Heinrich Jaeger, Professor of Physics, The University of Chicago



The ultimate tool for measuring low currents and high resistances

Model 6517B electrometer/high resistance system

The Model 6517B Electrometer/High Resistance Meter combines exceptional accuracy and sensitivity with a variety of features that simplify measuring high resistances and the resistivity of insulating materials. With reading rates of up to 125 readings/second, it's also significantly faster than competitive electrometers. The Model 6517B's low current input amplifier has an input bias current of <3fA with just 0.75fA p-p (peak-to-peak) noise and <20μV burden voltage on the lowest range. The input impedance for voltage and resistance measurements is 200TΩ, for near-ideal circuit loading. These specifications give the Model 6517B the accuracy and sensitivity needed for accurate low current and high impedance voltage, resistance, and charge measurements. A built-in ±1kV voltage source with a sweep capability simplifies leakage, breakdown, and resistance testing, as well as volume (Ω-cm) and surface resistivity (Ω/square) measurements on insulating materials.

Several instrument features help ensure the accuracy of high resistance measurement applications. For example, the built-in voltage source simplifies determining the relationship between an insulator's resistivity and the level of source voltage used. It is well suited for capacitor leakage and insulation resistance measurements, tests of the surface insulation resistance of printed circuit boards, voltage coefficient testing of resistors, and diode leakage characterization. A built-in test sequence incorporates a voltage reversal method for measuring very high resistances, especially in materials and devices where the inherent background currents in the sample once made accurate measurements impossible.



- Measures
 - Currents from 1fA to 20mA
 - Voltages from 10μV to 200V
 - Resistances up to 10¹⁶Ω
 - Charges from 10fC to 2μC
- Simple, DMM-like interface
- <20μV burden voltage on the lowest current ranges
- 200TΩ input impedance
- <3fA bias current
- 0.75fA p-p noise
- Built-in 31kV source



Visit www.keithley.com/nano for complete product information.

Low Current/High Resistance Measurements



Sources that simplify device characterization

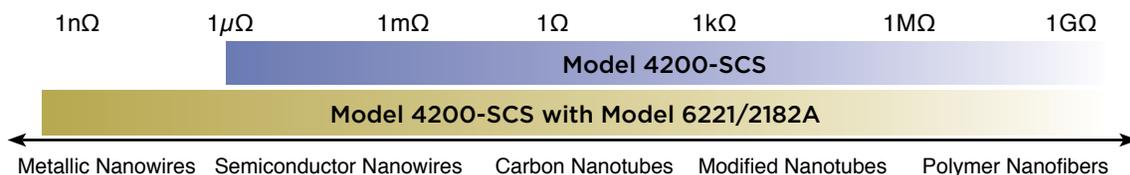
Model 6220 DC current source

Model 6221 AC and DC current source

The Model 6220 DC Current Source and Model 6221 AC and DC Current Source combine ease of use with exceptionally low current noise. Low current sourcing is critical to applications in test environments ranging from R&D to production, especially in the nanotechnology, semiconductor, and superconductor industries. High sourcing accuracy and built-in control functions make the Models 6220 and 6221 ideal for applications like Hall measurements, resistance measurements using delta mode, pulsed measurements, and differential conductance measurements.

Device testing and characterization for today's very small and power-efficient electronics require sourcing low current levels, which demands the use of a precision, low current source. Lower stimulus currents produce lower - and harder to measure - voltages across the device. When a Model 6220 or 6221 is combined with a Model 2182A Nanovoltmeter both of these challenges can be addressed. In fact, these instruments are natural measurement partners for applications such as characterizing nanotubes and nanowires. The Model 6221 can produce current pulses as short as $5\mu\text{s}$ when used as a stand-alone pulse source or as short as $50\mu\text{s}$ when used with the Model 2182A. This high speed pulsing capability reduces the power dissipated in the device, minimizing device self-heating and preventing device damage. The Model 2182A nanovoltmeter combines low noise, thermoelectric EMF cancellation, fast measurement rates, and 2ppm accuracy. When linked together and operated in pulse mode, the current source configures the nanovoltmeter over the RS-232 interface, controls it through the Trigger Link interface, and then automatically retrieves the data for calculation.

- Source and sink (programmable load) 100fA to 100mA
- $10^{14}\Omega$ output impedance ensures stable current sourcing into variable loads
- 65000-point source memory allows executing comprehensive test current sweeps directly from the current source
- Built-in RS-232, GPIB, Trigger Link, and digital I/O interfaces



To read “Low-Level Pulsed Electrical Characterization with the Model 6221/2182A Combination,” visit www.keithley.com/nano.

Low Current/High Resistance Measurements

When you just need to measure current

Model 6485 picoammeter



- Cost-effective low current measurement solution
- 20fA lowest noise
- 5½-digit resolution
- <200 μ V burden voltage
- Up to 1000 readings/second
- Built-in Model 485 emulation mode
- IEEE-488 and RS-232 interfaces
- Analog output

The 5½-digit Model 6485 picoammeter is a cost-effective instrument that can measure currents from 20fA to 20mA, taking measurements at speeds up to 1000 readings per second. Its 10fA resolution and superior sensitivity make it well suited for characterizing low current phenomena, while its 20mA range lets it measure currents high enough for applications such as measuring 4–20mA sensor loops. Although it employs the latest current measurement technology, it is significantly less expensive than other instruments that perform similar functions, such as optical power meters, competitive picoammeters, or user-designed solutions. With a price that's comparable to a general purpose DMM, the Model 6485 makes picoamp-level measurements affordable for virtually any laboratory or production floor. While DMMs typically employ shunt ammeter circuitry to measure current, the Model 6485 is a feedback picoammeter. This design reduces voltage burden by several orders of magnitude, resulting in a voltage burden of less than 200 μ V on the lower measurement ranges. The low voltage burden makes the Model 6485 function much more like an ideal ammeter than a DMM, so it can make current measurements with high accuracy, even in circuits with very low source voltages.

Adds voltage sourcing and resistance measurement to the Model 6485's capabilities

Model 6487 picoammeter/voltage source



With eight current measurement ranges and high speed autoranging, the Model 6487 Picoammeter/Voltage Source instrument can measure currents from 20fA to 20mA, take measurements at speeds up to 1000 readings per second, and source voltage from 200 μ V to 505V. Its 10fA resolution, superior sensitivity, voltage sweeping, and Alternating Voltage resistance measurements make it well suited for characterizing low current devices. Using the latest current measurement technology, it is significantly less expensive than other instruments that perform similar functions, such as optical power meters, tera-ohmmeters, competitive picoammeters, or user-designed solutions. With a price that's comparable to a high end DMM, the Model 6487 makes picoamp-level measurements affordable for virtually any laboratory or production floor.

Other Model 6487 features include:

- Direct resistance measurements using the Source Voltage/Measure Current method
- Alternating Voltage method, which improves resistance measurements on devices with high background current or high noise, and extends the measurable resistance range up to 10¹⁵ Ω
- 500V overload protection
- Scaled voltage analog output, which allows the Model 6487 to transmit measurement results to devices like DMMs, data acquisition cards, oscilloscopes, or strip chart recorders
- Display on/off switch for use in research on light-sensitive components

- 20fA lowest noise
- 5½-digit resolution
- <200 μ V burden voltage
- Alternating Voltage method ohms measurements
- Automated voltage sweeps for I-V characterization up to 10¹⁵ Ω
- Floating measurements up to 500V
- Up to 1000 readings/second
- Built-in Model 486 and 487 emulation mode
- IEEE-488 and RS-232 interfaces
- Digital I/O





- Five instruments in one (IV Source, IVR Measure)
- Six models: 20 - 100W DC, 1000W pulsed, 1100V to 1QV, 10A to 10pA
- Source and sink (4-quadrant) operation
- 0.012% basic measure accuracy with 5½-digit resolution
- 2-, 4-, and 6-wire remote V-source and measure sensing
- 1700 readings/second at 4½-digits via GPIB

Widest I-V dynamic range for high speed automated and benchtop testing

Series 2400 SourceMeter® line

The Series 2400 SourceMeter® instrument family is designed specifically for test applications that demand tightly coupled precision voltage and current sourcing and measurement. All SourceMeter models combine a precision, low noise, highly stable DC power supply with readback and a low noise, highly repeatable, high impedance, 5½-digit multimeter. The result is a compact, single-channel, DC parametric tester. In operation, these instruments can act as a V-Source, an I-Source, a V-Meter, an I-Meter, and an ohmmeter. They offer a variety of advantages over systems configured with separate source and measurement instruments. For example, their compact half-rack size conserves precious space

in the test rack or bench. They also minimize the test station development, set-up, and maintenance time required, while lowering the overall cost of system ownership. In addition, SourceMeter instruments simplify the test process itself by eliminating many of the complex synchronization and connection issues associated with using multiple instruments. All SourceMeter instruments are suitable for making a wide range of DC measurements, including resistance at a specified current or voltage, breakdown voltage, leakage current, insulation resistance, and electrical characterization.

Control a wide range of pulse parameters

Series 3400 pulse/pattern generators

Voltage pulsing can produce much narrower pulse widths than current pulsing, so it's often used in experiments such as thermal transport, in which the timeframe of interest is shorter than a few hundred nanoseconds. High amplitude accuracy and programmable rise and fall times are necessary to control the amount of energy delivered to a nanodevice. Series 3400 Pulse/Pattern Generators can simplify simulating serial data patterns for use in testing devices to characterize their performance when operated under sub-optimal conditions like low supply voltage, propagation delay, and slow edge slew. They offer extensive control over a wide variety of pulse parameters, including pulse amplitude, rise time, fall time, width, and duty cycle via the instrument's flexible user interface or over the GPIB and USB interfaces. Both the single-channel Model 3401 and the dual-channel Model 3402 can output



voltage pulses with pulse widths as short as 3ns, with independently adjustable rise and fall times. The Model 3402's dual outputs allow tight synchronization of pulses to multi-pin devices. For applications that require generating multi-step pulses, the Series 3400 makes it easy to combine multiple channels, with fully independent control over each channel. Trigger outputs simplify synchronizing the operation of multiple units.

MEASURE LOW CURRENTS
WITH 1fA RESOLUTION WITH
OUR NEWEST SERIES 2600A
INSTRUMENTS

- Combines a precision power supply, true current source, DMM, arbitrary waveform generator, V or I pulse generator with measurement, electronic load, and trigger controller—all in one instrument
- TSP-Link™ master/slave connection seamlessly integrates multiple Series 2600A SourceMeter channels into a system that can be programmed and controlled as a single instrument
- Free Test Script Builder software simplifies creating powerful test scripts for programming custom test functions



Scalable solutions for high speed R&D and functional testing

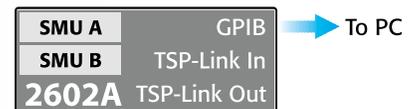
Series 2600A System SourceMeter® multi-channel I-V test solutions

The Series 2600A System SourceMeter instruments provide high speed source-measure capability plus advanced automation features and time-saving software tools, making them ideal solutions for I-V testing of a wide range of devices.

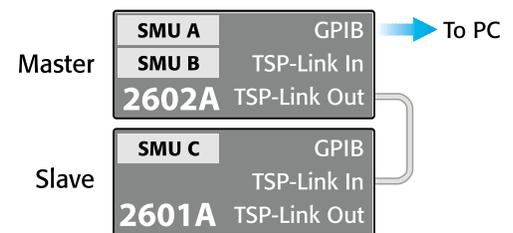
Each System 2600A combines all this functionality in one compact unit: precision power supply, true current source, digital multimeter, arbitrary waveform generator, V or I pulse generator, electronic load, and trigger controller.

For bench top use, Series 2600A instruments feature an embedded TSP Express® Software Tool that allows users to quickly and easily perform common I-V tests without programming or installing software. For system level applications, Series 2600A's Test Script Processor (TSP®) architecture along with other new capabilities such as parallel test execution and precision timing provides the highest throughput in the industry, lowering the cost of test. To simplify the testing, verification, and analysis of semiconductor components, optional ACS Basic Edition software is also available.

2 Channel System



3 Channel System



TSP-Link, a high speed system expansion interface, makes it easy to scale the system's channel count to match the application.

Quick and Easy Lab and Bench-Top Use

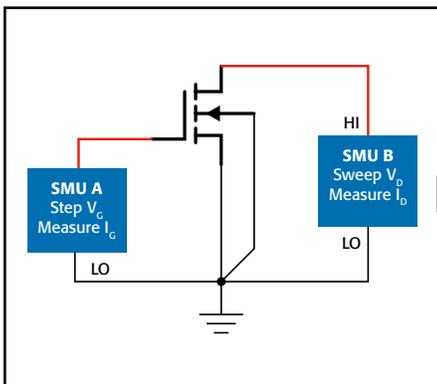
Each Series 2600A SourceMeter instrument is a complete IV measurement solution with unmatched ease of use, capability, and flexibility. They simplify the process of making high-performance measurements.

The TSP Express Software Tool quickly sets up and runs basic and advanced tests, including: nested step/sweeps, pulse sweeps, and custom sweeps for device characterization applications. The resulting data can be viewed in graphical or tabular format and exported to a .csv file for use with spreadsheet applications.

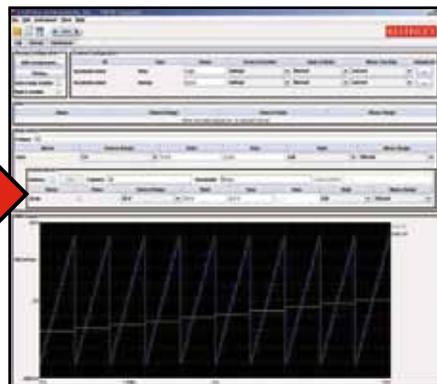
TSP Express runs on a PC connected to the SourceMeter instrument via an Ethernet cable (provided with the instrument). The intuitive user interface resides on the built-in LXI web page, so no software installation is needed.



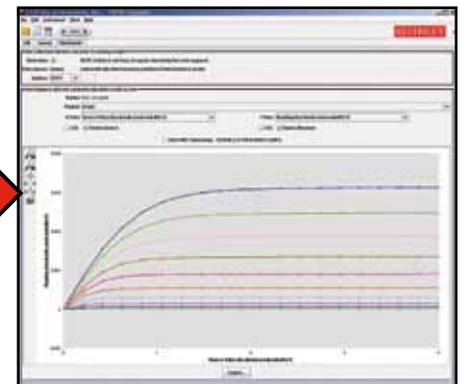
CONNECT DUT



CONFIGURE Test



COLLECT Data



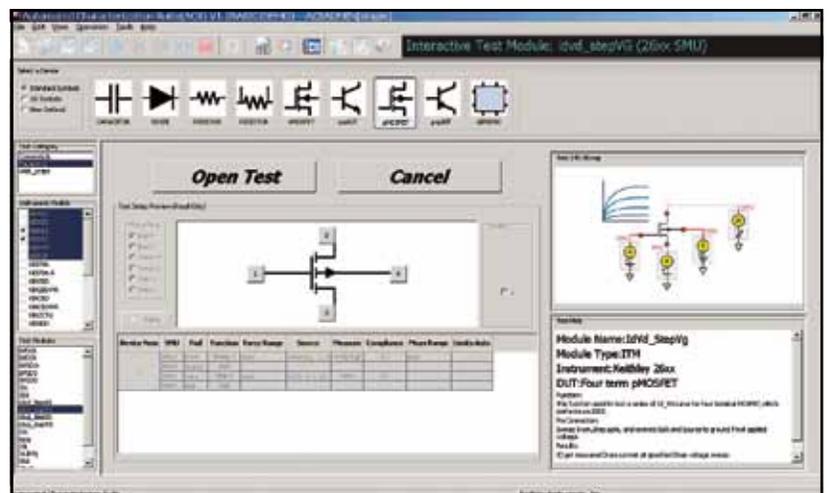
Performing nested sweeps to characterize a transistor with TSP Express is quick and easy. Data can be exported to a .csv file for use with spreadsheet applications such as Excel.

Simplify Semiconductor Component Test, Verification, and Analysis

The optional ACS Basic Edition software maximizes the productivity of customers who perform packaged part characterization during development, quality verification, or failure analysis, with:

- Rich set of easy-to-access test libraries
- Script editor for fast customization of existing tests
- Data tool for comparing results quickly
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For more information about ACS Basic Edition software, please refer to the ACS Basic Edition data sheet.



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We've compiled all our nanotechnology resources in one convenient location: www.keithley.com/nano. There, you'll discover our growing library of low level measurement white papers, application notes, articles, and other literature. Even if you've visited our site previously, we encourage you to revisit it often because we're constantly developing and posting new materials on this topic. While there, you may want to request a copy of our Nanotechnology Measurement Handbook: *A Guide to Electrical Measurement for Nanoscience Applications*. It is useful both as a reference and as an aid to understanding low level phenomena observed in the lab. It provides an overview of the theoretical and practical consideration involved in measuring low currents, high resistances, low voltages, and low resistances.



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