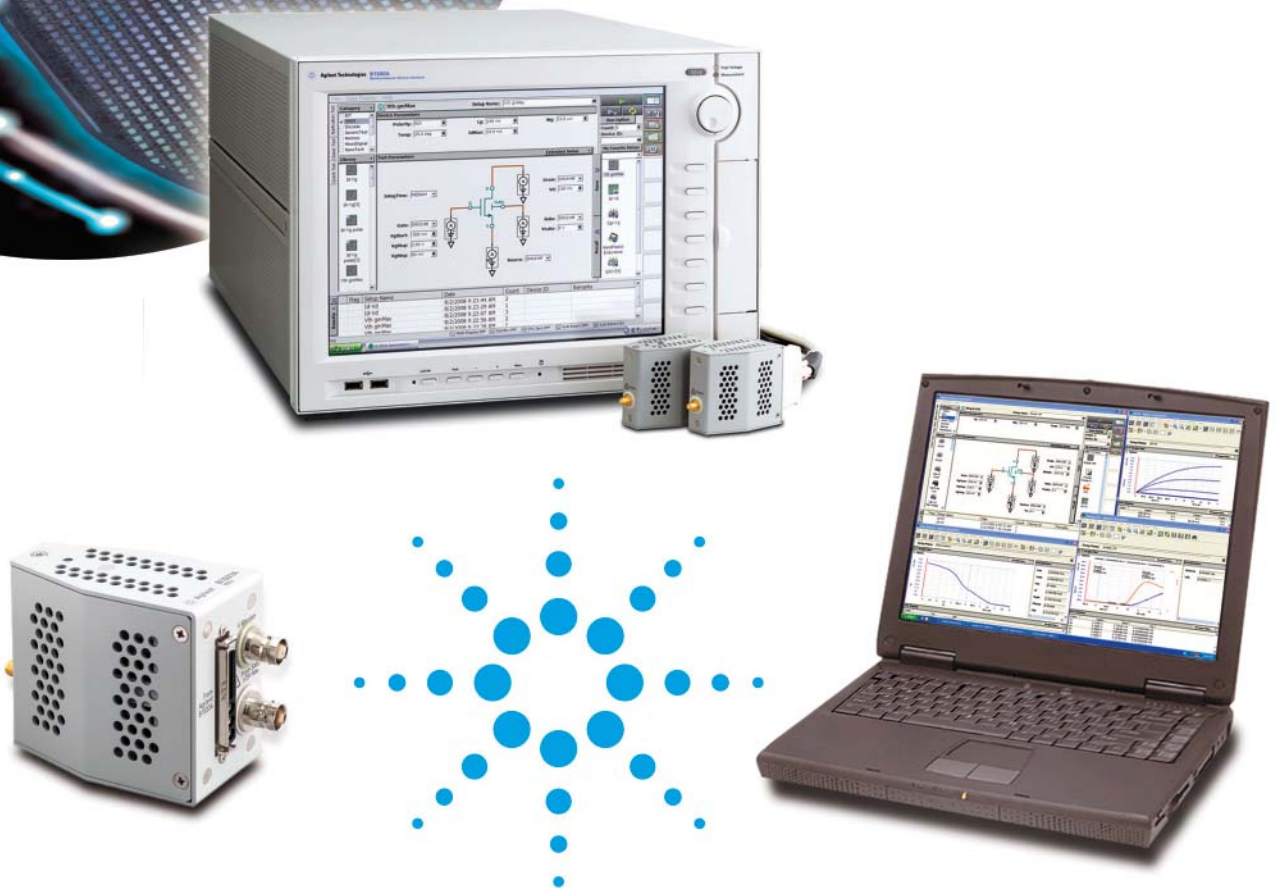




# Agilent B1500A Semiconductor Device Analyzer with EasyEXPERT Software

## Agilent Desktop EasyEXPERT Software



**Making Every User a  
Parametric Test Expert**

# The total parametric analysis environment ...

**More than 300 furnished application tests**

**Microsoft Windows-based EasyEXPERT software**

**Innovative, task-based approach to parametric test**

**Measure, append and repeat functions**

**Built-in semiautomatic wafer prober drivers**

**Integrated switching matrix control for the B2200A, B2201A and E5250A**

**Quick Test utility supports test sequencing without programming**

**Standby mode for circuit debug**

**My Favorite Setup feature for customized application tests**

**Intuitive, GUI-based application test setup window**

**Selectively display multiple data windows at the same time**

**Automatically or selectively export data to external drives**

**Automatically or selectively save data and setup information after each measurement**

| Flag | Setup Name                        | Date                   | Count | Device ID | Remarks |
|------|-----------------------------------|------------------------|-------|-----------|---------|
| ?    | Simple Vth                        | 12/18/2007 10:18:08 AM | 1     |           |         |
| !    | Cgd with Parameters               | 12/18/2007 10:17:07 AM | 3     |           |         |
| !    | I <sub>d</sub> -V <sub>d</sub>    | 12/18/2007 10:15:05 AM | 1     |           |         |
| !    | I <sub>d</sub> -V <sub>g</sub>    | 12/18/2007 10:14:28 AM | 1     |           |         |
| !    | Q <sub>min</sub> F <sub>min</sub> | 12/18/2007 10:14:28 AM | 1     |           |         |

## A complete solution from DC to fast pulsed measurement

The Agilent B1500A semiconductor device analyzer with EasyEXPERT software supports all aspects of parametric test, from basic IV and CV sweeps to advanced ultra-fast IV and pulsed IV measurements. The furnished library of over 300 user-modifiable application tests makes it easy to begin making complicated measurements immediately. Best of all, the B1500A's Microsoft® Windows® 7 operating system integrates easily into your PC-based work environment, and its familiar Windows GUI and convenient online help menus minimize the need for instrument training.

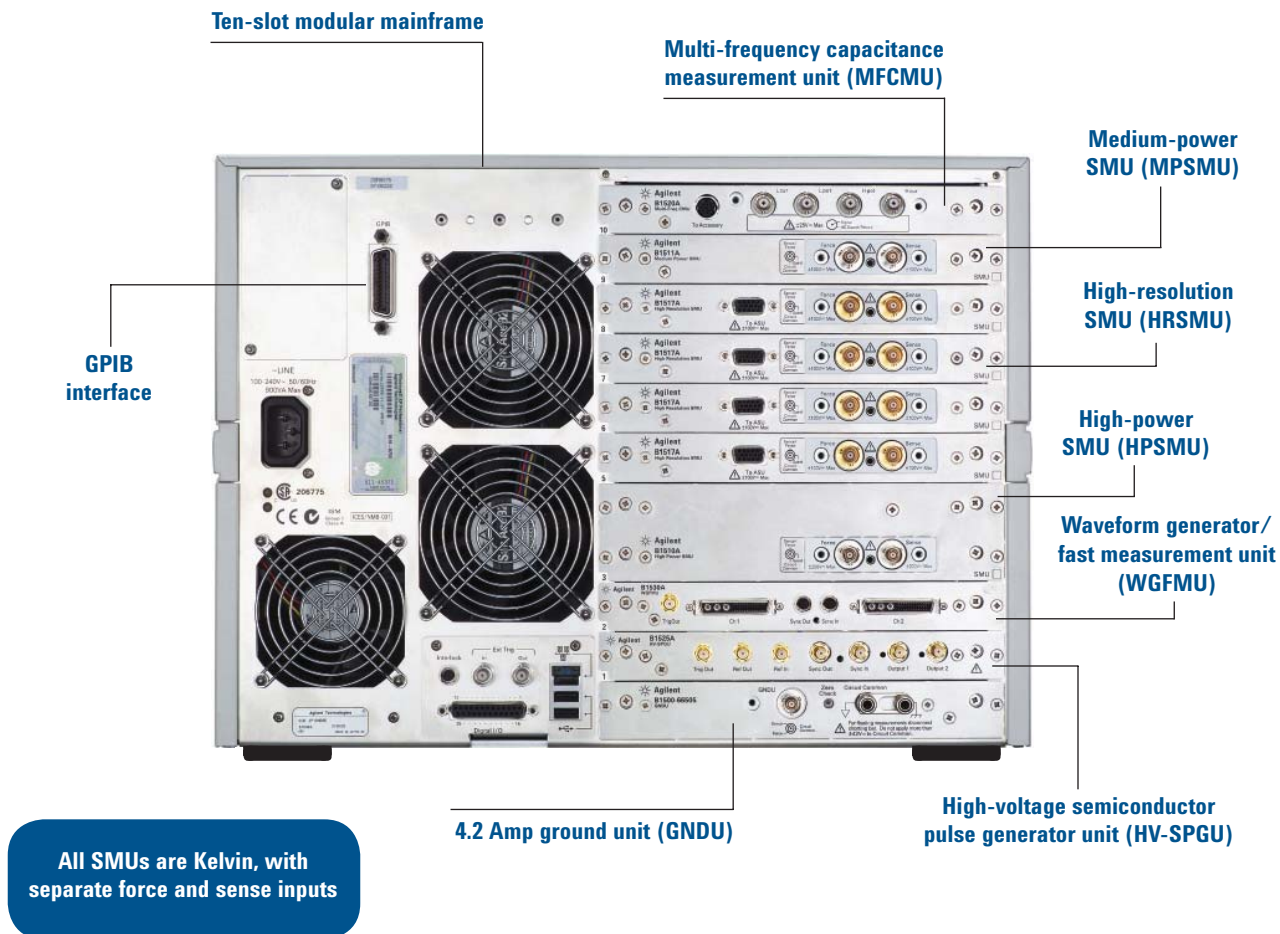
## Desktop EasyEXPERT improves productivity

Desktop EasyEXPERT provides a unified parametric measurement environment for the B1500A, 4155B/C (Semiconductor parameter analyzer) and 4156B/C (Precision semiconductor parameter analyzer). In online mode it can control these instruments and coordinate test automation in conjunction with a semiautomatic wafer prober. In offline mode it can be used to develop new application tests and to analyze data. This maximizes your efficiency and permits you to use your parametric instruments in their primary role of making measurements.

## Modular design minimizes costs and protects your investment

Ten module slots and a wide selection of source/monitor units (SMUs) and other state-of-the-art module types let you configure the B1500A exactly the way you want. You also have ample room for expansion if your measurement needs change in the future. And, as Agilent makes new modules available, you can easily add new test capabilities to your B1500A. The ability to meet both known and unanticipated test needs ensures that your parametric test investment is protected well into the future.

## ... that reduces cost and complexity



### Integrated capacitance module simplifies CV measurement

The B1500A's multi-frequency capacitance measurement unit (MFCMU) supports capacitance versus voltage (CV), capacitance versus time (C-t) and capacitance versus frequency (C-f) measurement. With sweeps of up to 1001 points, these capabilities allow in-depth characterization of novel devices such as solar cells. An optional SMU CMU unify unit (SCUU) supports capacitance versus voltage (CV) and current versus voltage (IV) switching in positioner-based wafer probing environments, eliminating the need to use an expensive switching matrix. The net result is a savings in money, bench space and complexity.

### HV-SPGU module provides powerful pulsing capabilities

The high-voltage semiconductor pulse generator unit (HV-SPGU) is specifically designed to meet the challenges posed by advanced non-volatile memory (NVM) testing needs. With a  $\pm 40$  V output capability, an arbitrary linear waveform generation (ALWG) function, and a built-in tri-state feature each supported independently on both channels, the dual-channel HV-SPGU provides unmatched performance that can improve write/erase cycle times by a factor of fifteen or more over that of previous solutions.

### Overcoming fast IV measurement challenges

The waveform generator/fast measurement unit (WGFMU) dual-channel module integrates ALWG voltage pulsing capability (10 ns programmable resolution) and fast IV measurement (200 Mega-samples/sec). Applications covered by this module include pulsed IV measurement, advanced NBTI/PBTI measurement, RTS noise measurement, MEMS capacitor characterization, new types of non volatile memory characterization, as well as other types of transient or time-domain measurement. To meet the faster pulsed requirements of SOI and high-k gate dielectric transistor characterization, the B1542A Pulsed IV option provides 10 ns pulsed IV capability.



# Quick startup with support for multi-user environments

EasyEXPERT makes parametric test as easy as 1-2-3.

**1**  
Select one or more technology categories

**2**  
Select desired application test from the library

**3**  
Click or press the Measure button

A graphical plot and data list are generated automatically in real time.

## Revolutionary task-oriented approach to parametric test

EasyEXPERT represents a paradigm shift from previous and competing parametric instruments. It allows you to focus on your goal of making efficient parametric measurements, without becoming an instrument hardware

expert. EasyEXPERT comes with more than 300 application tests (As of October 2011) conveniently organized by device type, application, and technology. In addition, you can easily modify and customize the furnished application tests to fit your specific

needs. Instead of spending hours or days learning how to set up the instrument hardware, you can begin making productive parametric measurements immediately.

**My Favorite Setup**

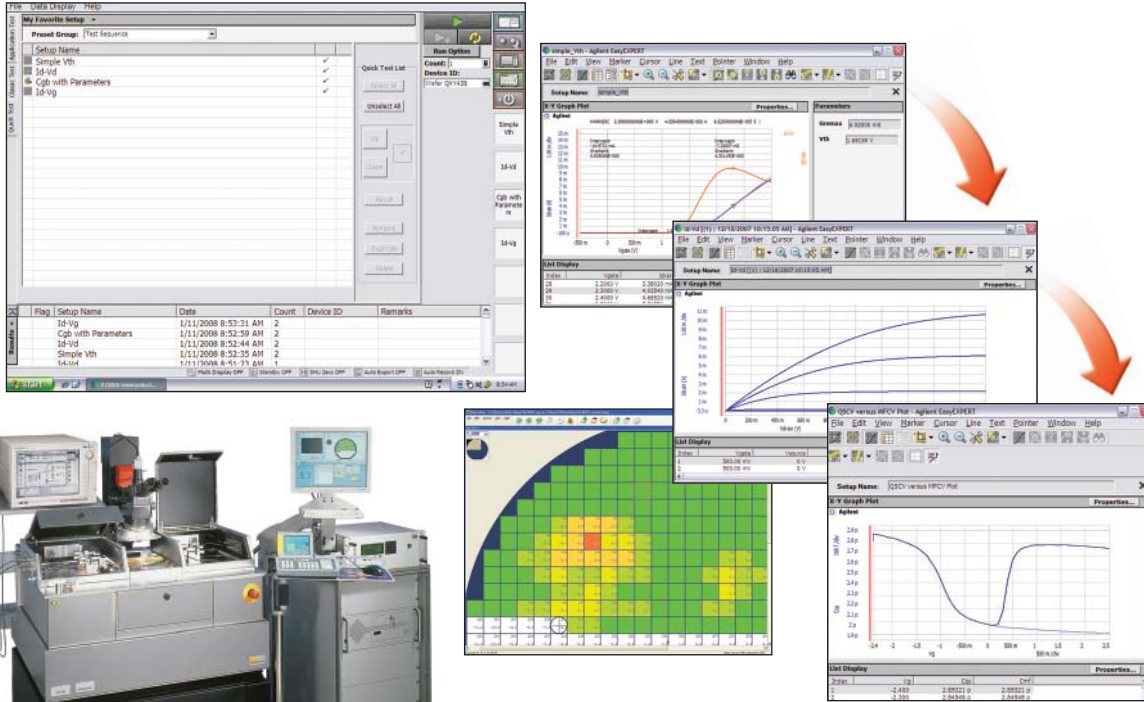
- Agilent Technologie
- Id-Vd
- Simple Vth
- Simple Cgb
- Id-Vg
- Cgb with Parameters

## Test the way you want every time you use the B1500A

Within a workspace, EasyEXPERT supports a “My Favorite Setup” feature that enables you to create, save and recall a set of unique customized application tests. These tests are saved directly to the hard drive, so they are readily available when needed. There is no need to remember setup parameters for each measurement or to re-enter parameters from scratch when recalling a measurement.

In addition, EasyEXPERT supports a feature that allows every user to have their own secured workspace on the hard drive. This allows you to perform device characterization and to create application tests without any interference from other users.

# Effortless test sequencing and automated test



*Quick Test enables you to perform test sequencing without having to do any programming. You can also use Quick Test with the built-in semiautomatic wafer prober drivers to automate testing across an entire wafer and with the data export feature to automatically save test data to any available storage device.*

## Quick Test allows fast and easy test sequencing

EasyEXPERT has a GUI-based Quick Test mode that enables you to perform test sequencing without programming. All you need to do is select an existing "My Favorite Setup." You can then select, copy, rearrange and cut-and-paste any application tests or Classic Mode tests from within the selected My Favorite Setup with a few simple mouse clicks. Once you have selected and ordered your tests, simply click on the measurement button to begin running an automated test sequence.

## Complete wafer test automation

All popular semiautomatic wafer probers are supported by EasyEXPERT. This makes it easy for you to define the wafer, die, and sub-die information for probing across an entire wafer. You can combine wafer prober control with either Quick Test mode or an application test-based test sequence to perform multiple testing on various devices across the wafer. If you are using a probe card and switching matrix, you can also call switching patterns automatically.

## Automatic data export

EasyEXPERT has the ability to automatically export measurement data in real time, and in a variety of formats, such as CSV, XML, etc. You can save data to any drive connected to the B1500A or, in the case of Desktop EasyEXPERT, any drive connected to a PC. If you wish, you can export data to a network drive and view test results on your desktop PC as your instruments are performing the testing in your lab.

## Powerful measurement capabilities made easy to use

| B1500A capabilities                     | Benefits   |
|---|--|
| Multichannel sweep                      | Allows you to sweep all of the SMUs in synchronization in any combination of current and voltage modes. Also permits simultaneous parallel measurement on all SMUs.  |
| Time sampling                           | Allows you to measure time-dependent phenomena (in linear or log time) with sampling intervals as short as 100 $\mu$ s, and to intelligently end testing when a predetermined stop condition has been met. You can store up to 100,001 sample points, and can also sample before and after the application of stress. These features provide an unparalleled ability to characterize device response           |
| List sweep                              | Enables the creation of arbitrary sweep vectors via a spreadsheet-compatible entry method or by using the built-in programming capabilities of EasyEXPERT.   |
| Quasi-static CV (QSCV)                  | Yields information about the behavior of MOS devices in the important inversion regime and allows the calculation of important parameters such as surface state density (Nss).   |
| Multi-frequency capacitance measurement | Provides ac capacitance measurement (CV, C-t, and C-f) up to the maximum usable frequency for dc probes and switching matrices.  |
| HV-SPGU GUI                             | Simplifies the creation of complicated waveforms via the ALWG feature and provides a means of easily sequencing these waveforms over hundreds of thousands of cycles without having to do any programming.   |
| Fast IV time domain measurement (WGFMU) | Enables ultra-fast IV measurement by combining an ALWG function (with 10 ns programmable resolution) and high speed sampling capability (200 Mega-samples/sec). This module's unique high-speed source/measurement capabilities support a variety of low noise and fast measurements, including ultra-fast NBTI, pulsed IV, and random telegraph signal (RTS) noise, without exhibiting any load line effects. |

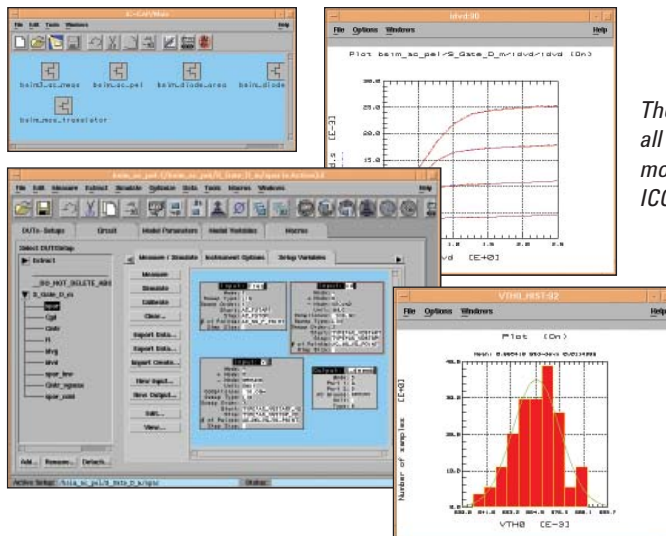
### GUI-based programming environment



EasyEXPERT provides a convenient GUI-based programming environment for the creation of application tests that does not require you to know or learn a complicated programming language such as C or BASIC.

### Parameter extraction for modeling

The B1500A is supported by all of the popular software modeling tools, including Agilent ICCAP, ProPlus Design Solution BSIMProPlus, and Silvaco UTMOST. Using these tools you can utilize the superb accuracy and resolution of the B1500A to extract extremely accurate modeling parameters without any programming or instrument interaction.



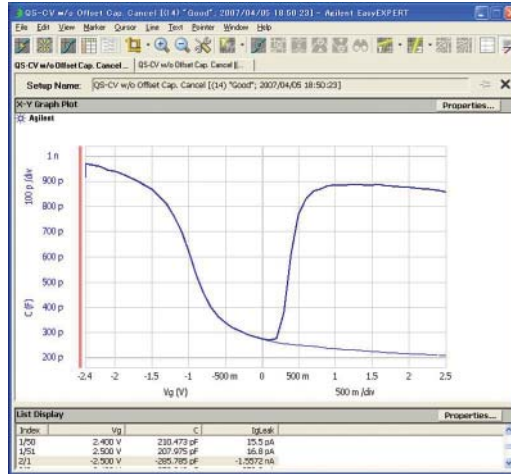
The B1500A is supported by all of the popular software modeling packages, including ICCAP.



# Overcoming your most extreme parametric testing challenges

## QSCV and MFCV combined in a single instrument

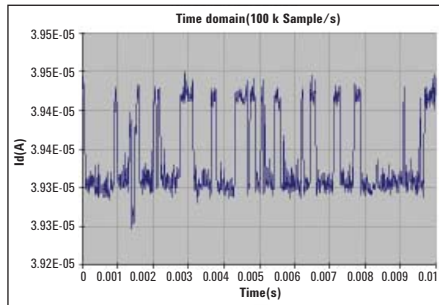
The B1500A allows you to make both QSCV measurements (using SMUs) and MFCV measurements (using the MFCMU) on a single instrument. Built-in compensation routines make it easy to remove parasitic effects and correlate the two measurements. This fusion of QSCV and MFCV in a single instrument provides a compact, convenient, and complete capacitance measurement solution.



You can obtain excellent correlation between QSCV and MFCV measurements made on the B1500A.

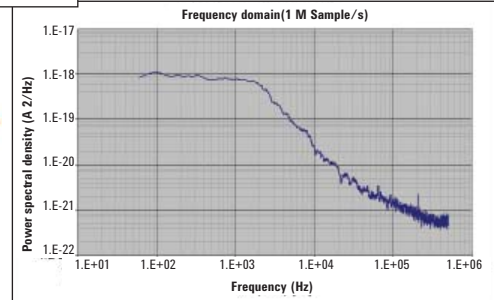
## Accurate and ultra-fast IV measurement

The B1500A's WGFMU module combines ultra-fast measurement (5 ns sampling rate) with 1 nA current measurement capability. Its integrated low noise voltage source (0.1 Vrms\*) and high speed measurement capability overcome many previously unsolvable measurement challenges, such as ultra-fast NBTI and random telegraph signal (RTS) noise measurement. Best of all, the B1500A can accommodate up to five WGFMU modules, providing 10 independent channels for parallel measurement.



Random telegraph signal (RTS) noise measurement is possible using the B1500A WGFMU module

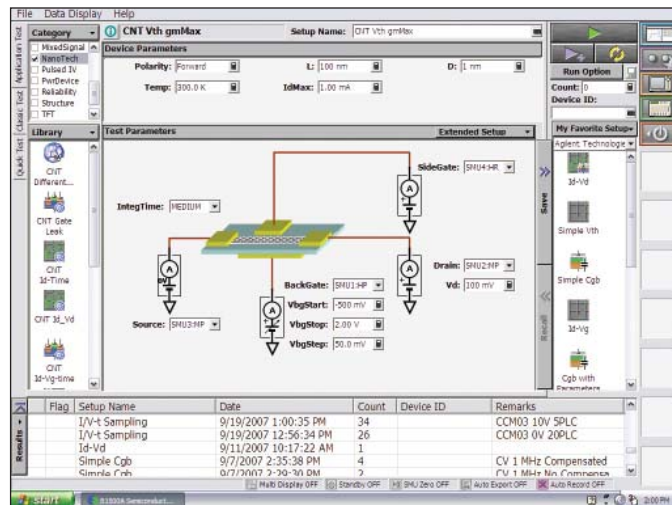
Convert to frequency domain



\*Supplemental characteristics

## Easy-to-use nanotechnology measurement solutions

The B1500A comes with application tests specifically designed for the dynamic field of nano device electrical characterization. For nano device researchers not familiar with all of the nuances of electrical characterization, this application test library enables the rapid and accurate measurement of structures such as carbon nanotube (CNT) field effect transistors (FETs) without having to spend lots of time learning how to set up the hardware.



Even users unfamiliar with parametric test can easily characterize exotic structures such as carbon nanotube (CNT) field effect transistors (FETs) using the B1500A.

## SCUU and ASU overcome positioner-based switching challenges

### Positioner-based CV-IV solutions for every need

The B1500A supports two positioner-based CV-IV switching solutions. Depending upon the SMU resources chosen, Agilent can supply solutions with 0.5  $\mu\text{V}$  voltage measurement resolution and 10 fA, 1 fA or 0.1 fA current measurement resolution.

#### 10 fA/0.5 $\mu\text{V}$ solution

1 x MFCMU  
2 x MPSMU  
1 x SCUU

#### 1 fA/0.5 $\mu\text{V}$ solution

1 x MFCMU  
2 x HRSMU  
1 x SCUU

#### 0.1 fA/0.5 $\mu\text{V}$ solution

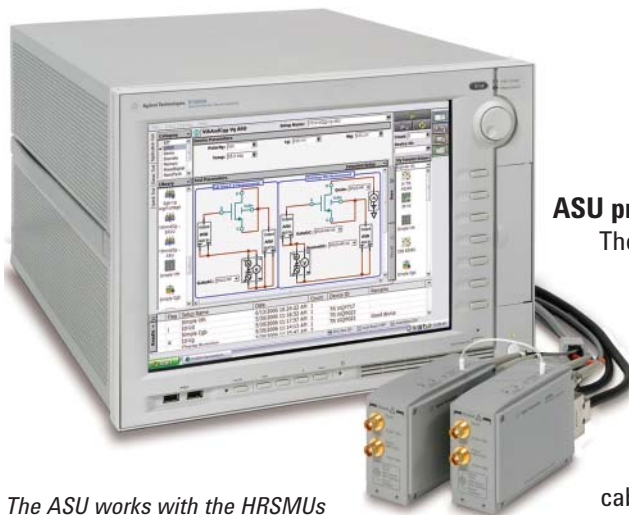
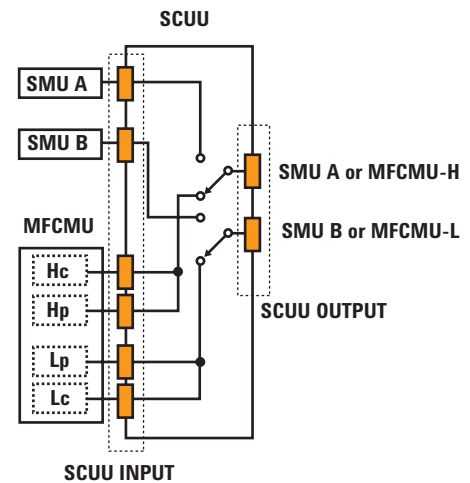
1 x MFCMU  
2 x HRSMU  
2 x ASU

Kelvin measurement  
Multi-frequency capacitance measurement  
CV-IV switching  
Integrated capacitance compensation

You can combine the B1500A's MFCMU and MPSMUs or HRSMUs with the SCUU or ASUs to create positioner-based CV-IV switching solutions to meet a variety of needs. All solutions are Kelvin, they support CV-IV switching, and they have integrated capacitance compensation.

### SCUU makes accurate CV-IV measurements fast and effortless

The SMU CMU unify unit (SCUU) works with the B1500A's MFCMU and MPSMUs or HRSMUs. The SCUU enables you to switch between CV and IV measurements without sacrificing measurement accuracy. Besides taking care of switching and accuracy issues the B1500A and SCUU combination also solves CV measurement compensation, connection and return path issues. This is all done automatically, without requiring you to have a detailed understanding of the theory involved in making CV measurements.



The ASU works with the HRSMUs and the MFCMU to provide flexible and precise IV and CV measurements.

### ASU provides 0.1 fA measurement with CV-IV switching

The B1500A's HRSMU accepts an optional attosense and switch unit (ASU), which increases its low-current measurement resolution to 100 attoamps (0.1 fA).

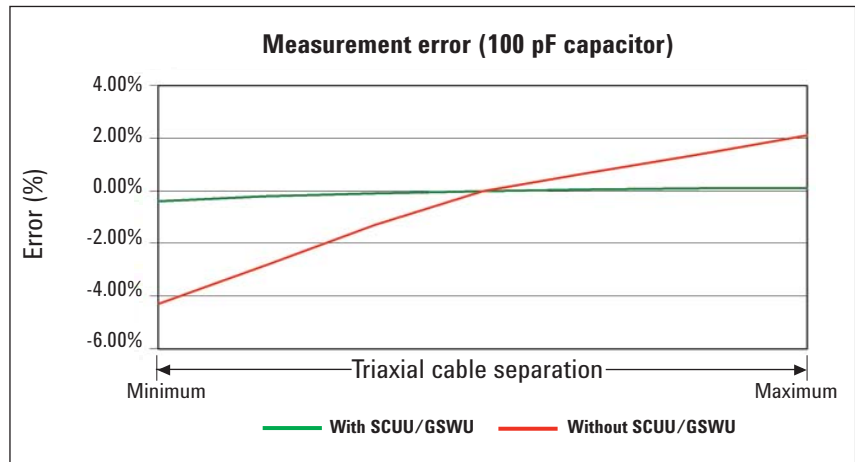
The ASU also has two BNC inputs that can work with the B1500A's MFCMU, as well as other instruments. This makes it easy to switch between ultra-low current measurements (IV) and capacitance measurements (CV) without having to change any cables. When joined via the optional connector cable, the ASUs also automatically short the guards during CV measurements to improve measurement accuracy.



## CV-IV switching solutions without compromise

### Measurement integrity maintained in all measurement environments.

An accurate capacitance meter is useless without equally accurate methods for switching between CV and IV measurements. You can easily create CV-IV switching solutions for both positioner-based and probe card-based environments that do not degrade capacitance measurement accuracy using off-the-shelf components provided by Agilent. The SCUU and GSWU combination for positioner-based systems enables shielded two terminal capacitance measurement, yielding the most accurate on-wafer capacitance measurement solution available. All solutions maximize accuracy by supporting cable length compensation as well as phase, open, short, and load calibration.



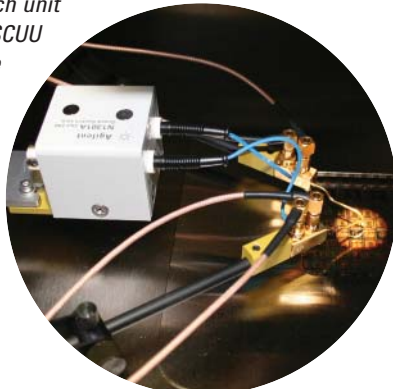
*Shorting the guards together using the SCUU and GSWU stabilizes the series inductance and greatly improves the accuracy of the measurement data.*

**B1500A EasyEXPERT software supports B2200A and B2201A compensation.**

**The B2200A and B2201A have two inputs optimized for CV measurements.**

**The B2220A interface is available for probe card environments.**

*The optional guard switch unit (GSWU) works with the SCUU to automatically short the guards together during CV measurements.*



*Agilent can provide the components to build complete CV-IV solutions.*

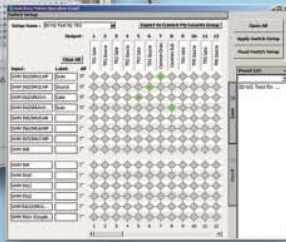
# EasyEXPERT and Desktop EasyEXPERT in the Lab ...



4155B/C and  
4156B/C control



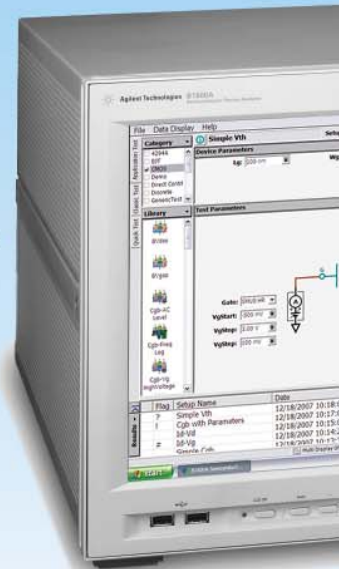
Switching matrix control



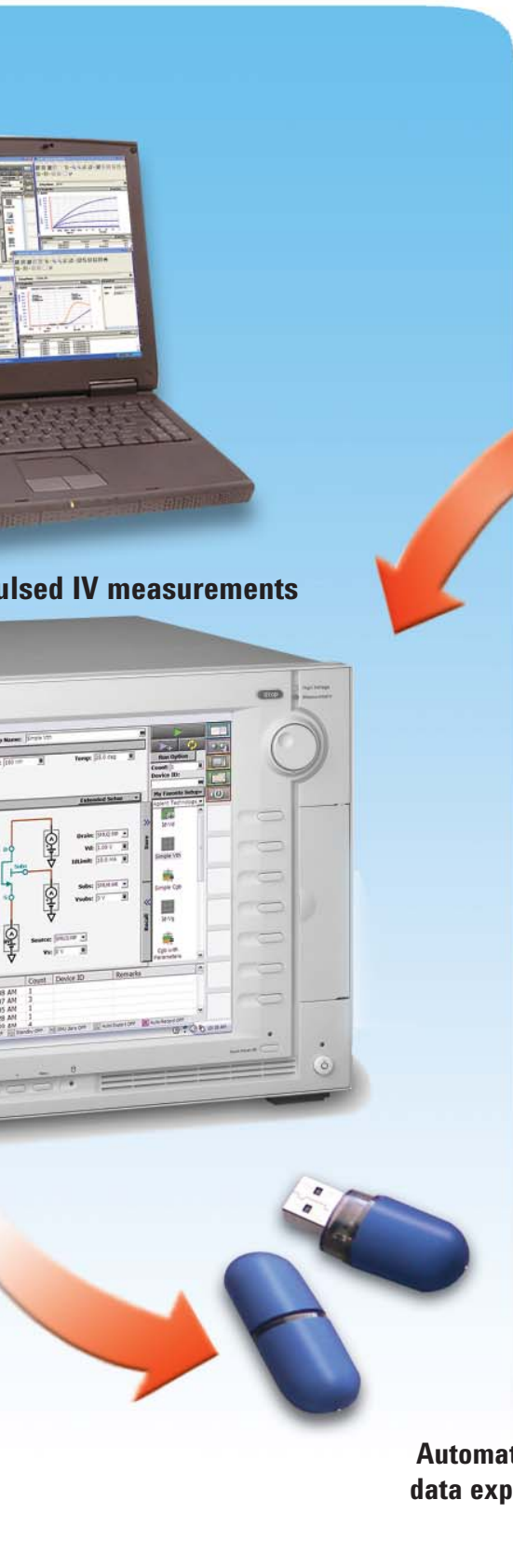
Wafer prober control



CV-IV, Fast IV and P



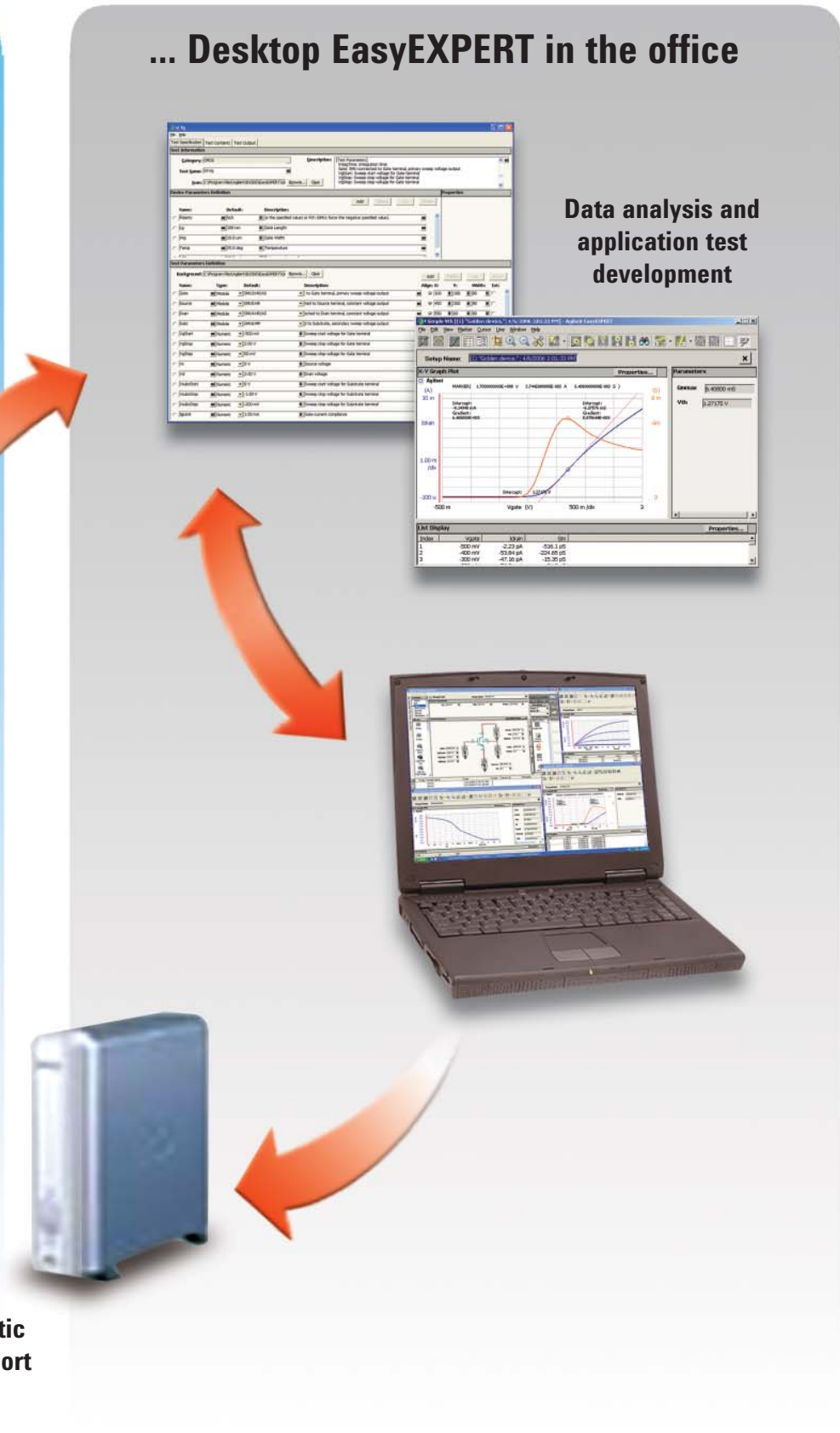
**ONLINE IN THE LAB** EasyEXPERT software running on the B1500A or Desktop EasyEXPERT running on an external PC lets you control manual measurements to test automation across a wafer in conjunction with a semiautomatic wafer prober. It is easy to start with a B1500 solution containing switching matrices and other instruments. This solution removes the limitations of traditional instrument-based parametric



Controlled IV measurements

Automatic data export

## ... Desktop EasyEXPERT in the office



Data analysis and application test development

all aspects of parametric test, from basic I-V characterization and gradually build up a racked, integrated test environment for device characterization and maximizes your efficiency.

**OFFLINE IN THE OFFICE** Desktop EasyEXPERT software running on a stand alone PC provides all the benefits of the B1500A EasyEXPERT interface. In offline mode you can perform tasks such as analyzing data and creating new application tests.

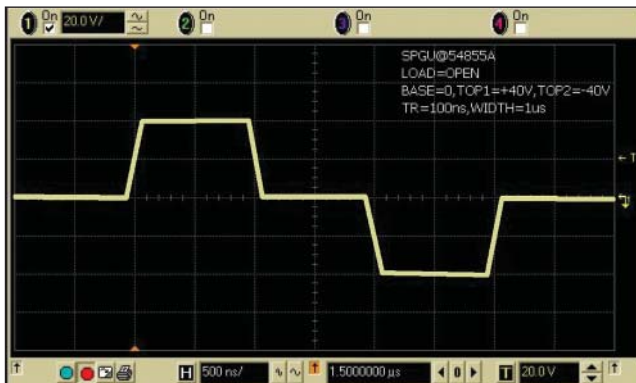


# HV-SPGU provides a complete NVM cell testing solution

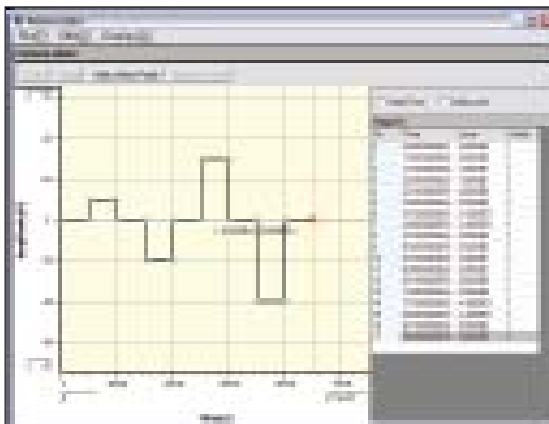
## Fast and flexible non-volatile memory (NVM) cell evaluation

The B1500A's high-voltage semiconductor pulse generator unit (HV-SPGU) offers best-in-class pulse generation capability designed to meet the NVM testing challenges posed by even the most advanced semiconductor processes. The powerful features shown below enable you to meet virtually any NVM cell testing need.

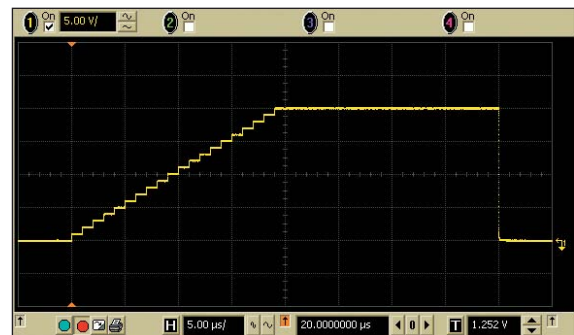
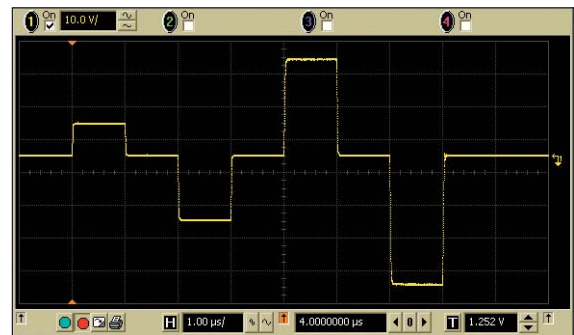
| Feature   | Benefit  |
|---|--|
| Voltage output from -40 V to +40 V (80 Vpp) with two-level and three-level pulse capability | Meets the needs of modern NAND flash memory test   |
| Highly accurate voltage forcing with 0.4 mV resolution                                      | Enables the creation of waveforms with accurate and precise pulse levels to characterize multilevel cell (MLC) structures and other advanced flash devices   |
| Two independent channels per module; up to five modules can be installed in a B1500A        | Allows you to have up to ten independent, synchronized pulse channels for NVM cell testing   |
| Arbitrary Linear Waveform Generation (ALWG)   | Supports creation of customized waveforms with four or more levels to characterize MLC structures and next-generation flash devices using trapped-charge schemes. Can also create small staircase pulses to prevent device damage and to deactivate damage caused by stress during the erase sequence of flash memory cells. |



The B1500A's HV-SPGUs can output three-level waveforms at  $\pm 40$  V (80 V peak-to-peak), which enables the characterization of advanced NAND cell flash memory processes.



The B1500A's GUI-based arbitrary linear waveform generation utility makes it easy to create complex waveforms.

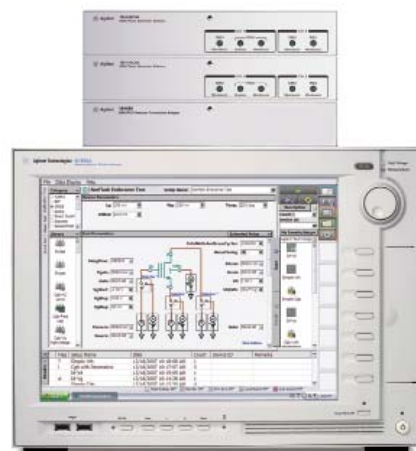


# Ultra-fast Write/Erase endurance testing

## New capabilities dramatically improve measurement times

The HV-SPGU has several new features that reduce the time needed to perform a series of Write/Erase cycles by a factor of fifteen or more over that of previous generation solutions. These improvements include built-in output tri-state capability, shorter pulse generation periods, and three-level pulse generation capability. You can also use the B1500A with the optional 16440A and 16445A to switch between the SMUs and HV-SPGUs on up to four channels,

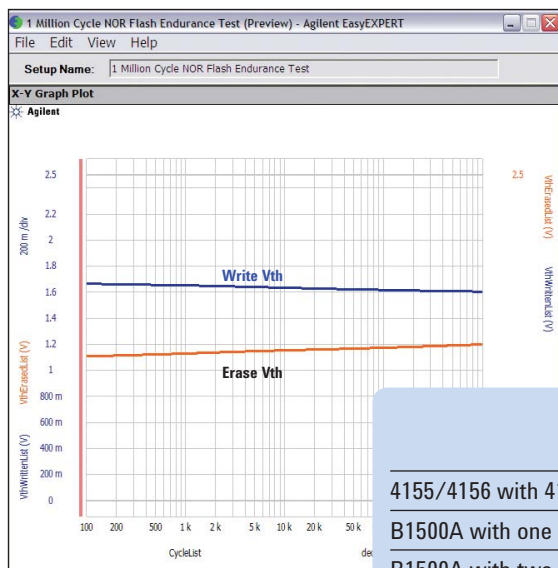
eliminating the need for an external switching matrix. Additional switching channels can be added by using the ASU in combination with an HRSMU. The net result is a fast, compact, and cost-effective laboratory solution for NVM cell endurance testing.



The 16445A SMU/PGU Selector Connection Adapter and the 16440A SMU/Pulse Generator Selector can be used with the B1500A to switch effortlessly between the HV-SPGUs and SMUs.



You can display multiple windows and monitor the progress of your Write/Erase endurance test in real time.



A one-million cycle Write/Erase endurance test can be performed >15x or faster on the B1500A, which means test time is reduced from days to hours.

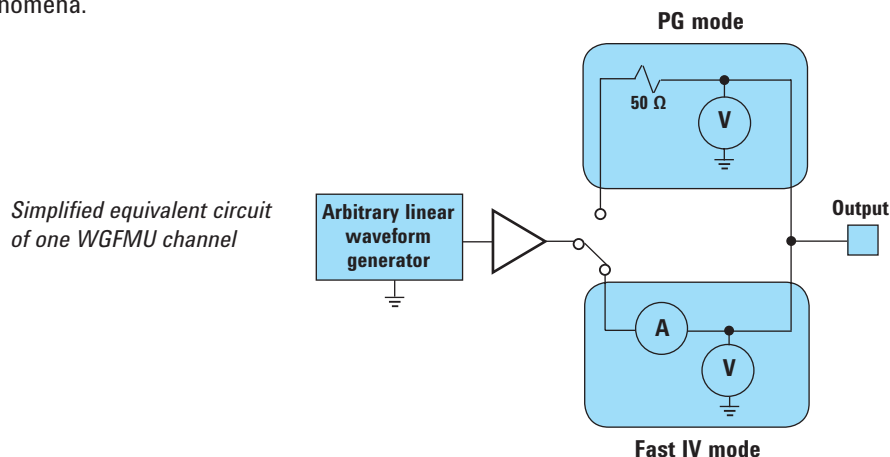


|                          | NAND Flash test time | NOR Flash test time |
|--------------------------|----------------------|---------------------|
| 4155/4156 with 41501B    | 5 days               | 4 days              |
| B1500A with one HV-SPGU  | 1.7 hours            | 24 hours            |
| B1500A with two HV-SPGUs | NA                   | 6 hours             |

## WGFMU provides an all-in-one high-speed IV characterization solution

### Powerful combination of DC/AC waveform generation and synchronized fast measurement

The WGFMU is a powerful multipurpose parametric module with DC and AC waveform generation functionality (10 ns programmable resolution) and simultaneous high-speed IV measurement capability (up to 200 Mega-samples/sec). Unlike pulse generators that have characteristic output impedances (typically 50 Ohms), the WGFMU module can operate as an ideal voltage source which eliminates load line effects. The unique design and combination of waveform generation and high-speed IV measurement into a single, dual channel module enables characterization of complex high-speed phenomena without the need to switch between different resources to do the DC/AC voltage forcing and the current or voltage measurement. This makes the WGFMU a powerful solution for a wide range of transient and time-domain phenomena.



| WGFMU features   | Benefits  |
|--|---|
| Fast and flexible DC/AC waveform generation (ALWG) combined with accurate, high-speed synchronized IV measurement in a single module | Solves many complex test challenges without the need for additional equipment and complicated external cabling. A single module can do the job of a PGU and oscilloscope. |
| High accuracy current measurement (down to nanoamps) and 0.2% range resolution without averaging                                     | Much better measurement resolution than that obtained using a PGU and oscilloscope without any load line effects..  |
| The WGFMU module behaves like an ideal voltage source  | Prevents unexpected load line effects.  |
| Low forcing voltage noise level  | Can perform noise sensitive measurements (such as RTS noise) without interference from the voltage source.  |
| Up to five two-channel modules supported by the B1500A (up to ten independent test channels)   | One module meets most single-device testing needs. Multiple devices can be tested in parallel, reducing the cost of test.   |
| Versatile architecture supports a wide range of applications   | Pulsed IV, Fast NBTI, RTS noise and many other tests can be done with the same module.  |

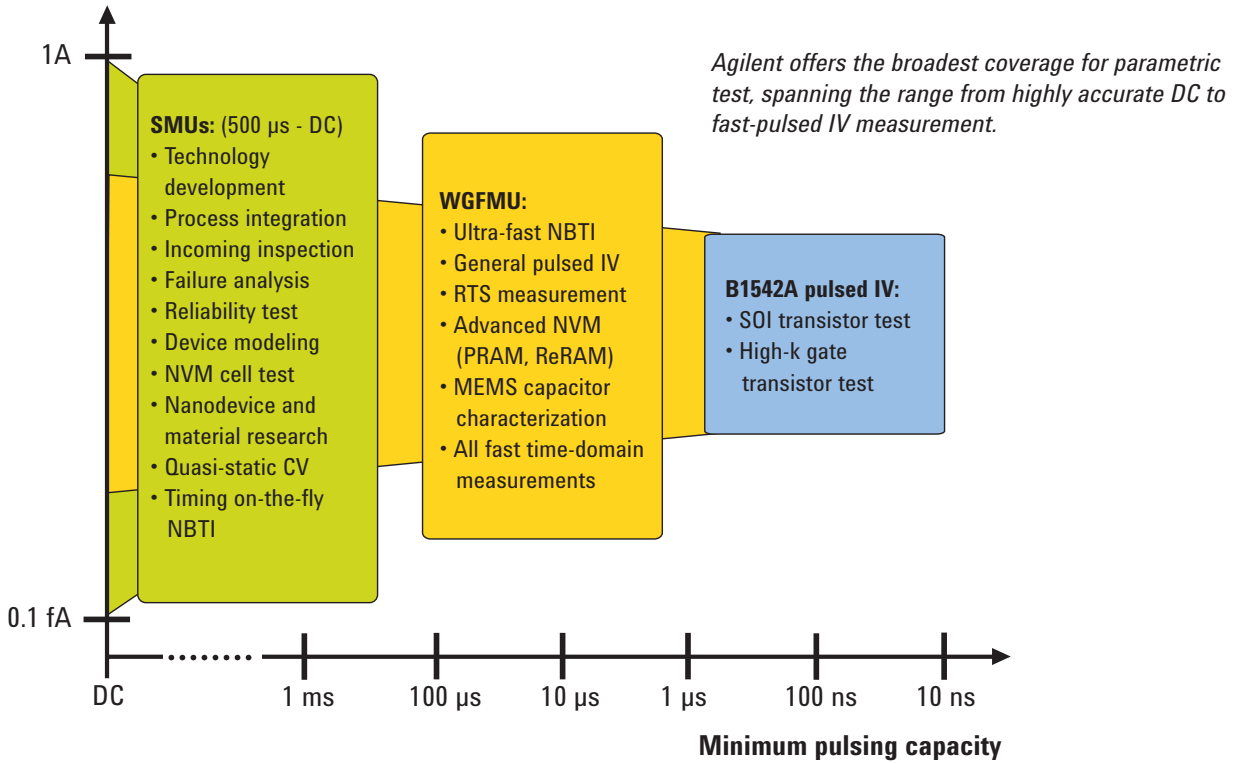
*The remote-sense and switch units (RSUs) that accompany each WGFMU channel mount directly on the wafer prober to minimize cabling and parasitic effects and to maximize measurement accuracy.*





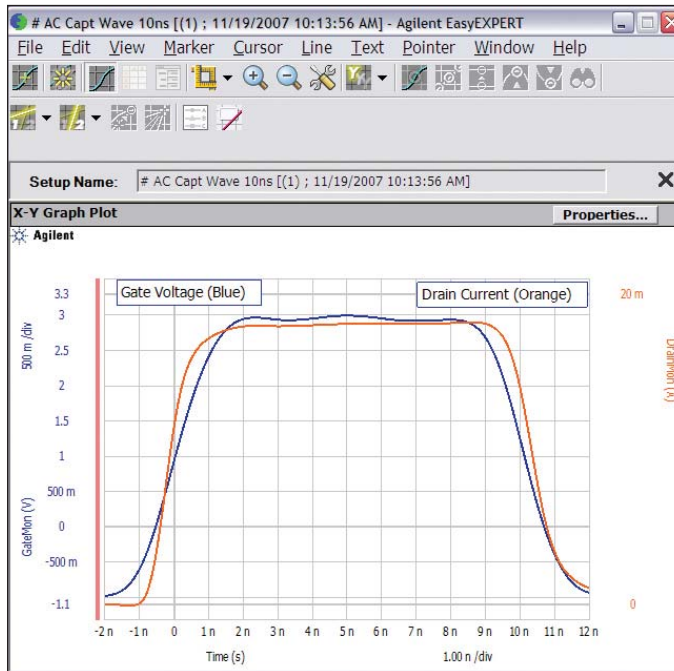
# Complete measurement coverage from DC to ultra-fast pulsed IV

## Measurement range



## Wide range of pulsed IV application coverage

The B1500A has two pulsed IV measurement solutions: the WGFMU and the B1542A Pulsed IV option. The WGFMU can cover a wide range of pulsed IV applications using its powerful ALWG and fast IV measurement capabilities. The B1542A solution provides faster pulsed IV measurement capability, supporting a 10 ns pulse width (with 2 ns rise and fall times). This is important for characterizing SOI and high-k gate dielectric CMOS transistors. The B1542A solution consists of a pulsed IV application test library, an Agilent Digital Storage Oscilloscope and Pulse Generator, as well as cables and DC/RF connector modules. An optional switch module is also available to enable you to toggle between DC and pulsed measurement without having to change any cables. Both the WGFMU and B1542A solutions are completely integrated and ready to use.

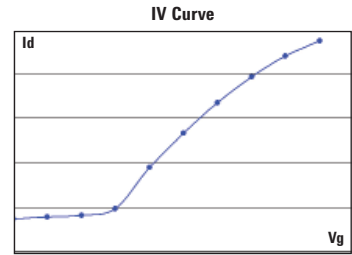


Agilent's B1542A Pulsed IV solution allows you to measure gate voltage and drain current pulses down to 10 ns.

# Meeting the needs of advanced NBTI testing

## A 1 $\mu$ s ultra-fast NBTI solution

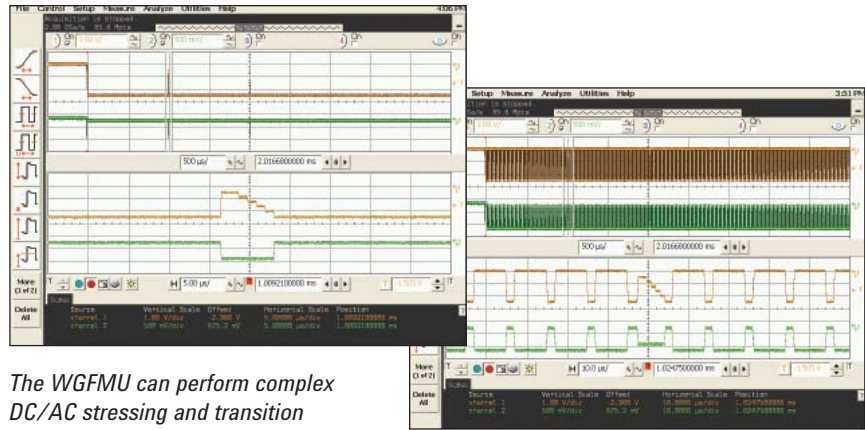
Negative bias temperature instability (NBTI) testing is very challenging, since the transistors can recover within a few microseconds after removal of the stress condition. The WGFMU enables ultra-fast NBTI measurements starting within 1  $\mu$ s after stress removal. It can also perform fast sweep measurements, creating a 10-point IV curve in 10  $\mu$ s. The integrated all-in-one architecture smoothly transitions between stress and measurement without any glitches. This protects the DUT from damage and ensures that the measurement data taken is accurate.



*The WGFMU module can make a 10 point IV sweep in 10  $\mu$ s, which captures  $V_{th}$  degradation characteristics before the transistor can recover from the applied stress.*

## WGFMU supports both DC and AC stress

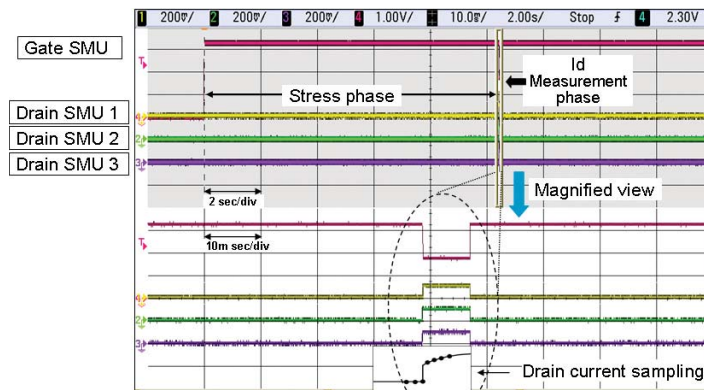
Many NBTI studies show that the measured threshold-voltage shift depends strongly on the type of applied stress. Variations in the applied stress affect the magnitude of the threshold-voltage degradation which, in turn, impacts the device life-time estimates. Accordingly, accurate life-time estimation requires the measurement of not only DC stress but also various types of AC stress.



*The WGFMU can perform complex DC/AC stressing and transition between stress and measurement without creating any glitches.*

## 100 $\mu$ s timing-on-the-fly NBTI using SMUs

The B1500A can also perform timing-on-the-fly NBTI measurement at the rate of 100  $\mu$ s per point using only SMUs. This solution provides unmatched measurement speed and accuracy while also maintaining bias between stress and measure transitions to prevent device relaxation. These features allow you to obtain accurate NBTI data on devices that do not require the ultra-fast measurement capabilities of the B1500A's WGFMU module

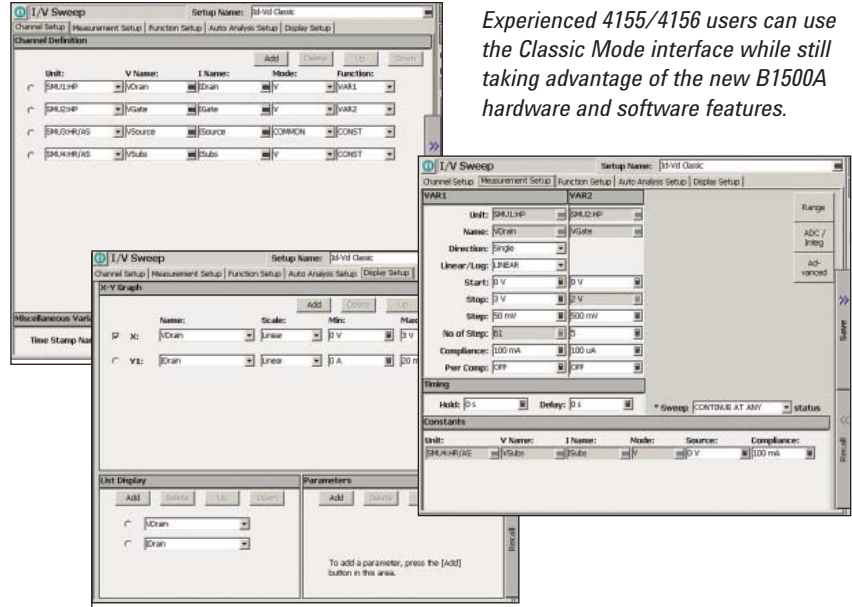


*The bias-hold function on Agilent's timing-on-the-fly NBTI solution prevents device relaxation and ensures accurate measurement results.*

## Convenient migration paths for 4155 and 4156 users

### Classic Test mode offers a familiar yet improved user interface

For users who prefer the 4155/4156 user interface, the B1500A offers a classic test mode. This mode not only maintains the look, feel, and terminology of the 4155/4156 interface, it enhances user interaction by taking full advantage of Microsoft Windows GUI features. If you are an experienced 4155 or 4156 user, you can enjoy all of the benefits of the B1500A hardware and software, without having to change your work preferences.



*Experienced 4155/4156 users can use the Classic Mode interface while still taking advantage of the new B1500A hardware and software features.*

### Agilent 4155/4156 setup converter provides easy transition to the B1500A

Agilent supplies a free setup converter tool that runs on any Windows-based PC. This enables effortless transfer of existing 4155/4156 measurement setup files to the B1500A. The tool takes the 4155 and 4156 setup files (MES and DAT files) and converts them into equivalent EasyEXPERT 4155/4156 classic test mode setup files. By eliminating the need to recreate measurement setups, you can accelerate your transition to the B1500A.

*The 4155/4156 setup converter tool makes it easy to use your existing 4155 and 4156 measurement setup files on the B1500A.*



### Convenient PC-based control of legacy parameter analyzers

Desktop EasyEXPERT can control the 4155B/C and 4156B/C. The standard version of Desktop EasyEXPERT allows you to make I/V sweeps using the 4155B/C or 4156B/C. In addition, you can upgrade to Desktop EasyEXPERT Plus, which adds additional functionality such as I/V time sampling, VSU/VMU control, and 41501 PGU control. No matter which version you use, you still enjoy all of the powerful benefits of Desktop EasyEXPERT software.



*Desktop EasyEXPERT provides a convenient means of controlling the 4155B/C and 4156B/C from a PC.*



## Mainframe characteristics and module information

### Mainframe characteristics

|                                 |  |
|---------------------------------|--|
| Available slots                 | 10   |
| Ground unit sink capability     | 4.2 A  |
| USB 2.0 ports                   | 2 front and 2 rear   |
| Instrument control              | GPIB   |
| Networking                      | 100BASE-TX/10BASE-T LAN port                                       |
| External trigger inputs/outputs | 1 BNC trigger in; 1 BNC trigger out; 8 programmable trigger in/out |

### SMU/ASU key specifications

| Module                         | HPSMU<br>(B1510A) | MPSMU<br>(B1511A) | HRSMU<br>(B1517A) | ASU<br>(E5288A) |
|--------------------------------|-------------------|-------------------|-------------------|-----------------|
| Maximum force voltage          | ±200 V            | ±100 V            | ±100 V            | ±100 V          |
| Maximum force current          | ±1 A              | ±100 mA           | ±100 mA           | ±100 mA         |
| Voltage measurement resolution | 2 µV              | 0.5 µV            | 0.5 µV            | 0.5 µV          |
| Current measurement resolution | 10 fA             | 10 fA             | 1 fA              | 0.1 fA          |

### MFCMU (B1520A) key specifications

|                        |   |
|------------------------|---|
| Frequency range        | 1 kHz to 5 MHz  |
| Maximum dc bias        | ± 100 V*  |
| Supported measurements | Easy-Cp-G, Cp-D, Cp-Q, Cp-Rp, Cs-Rs, Cs-D, Cs-Q, Lp-G, Lp-D, Lp-Q, Lp-Rp, Ls-Rs, Ls-D, Ls-Q, R-X, G-B, Z-θ, Y-θ |

\*When used in combination with the SCUU and SMUs

### HV-SPGU (B1525A) key specifications

|                                 |                         |
|---------------------------------|-------------------------|
| Vout (50 Ω load)                | -20 V to +20 V          |
| Vout (open load)                | -40 V to +40 V          |
| Channels per module             | 2                       |
| Pulse width programmable range  | 10 ns to (Period 10 ns) |
| Pulse period                    | 30 ns to 10 s           |
| Output relay switching time     | <100 µs                 |
| ALWG maximum points per channel | 1024                    |

### WGFMU (B1530A) key specifications

|  |  |
|--|--|
| Operation modes                                  | Fast IV mode or PG mode  |
| Waveform timing resolution                       | 10 ns  |
| Minimum pulse width                              | 100 ns (PG mode); 300 ns (Fast IV mode)  |
| Waveform level                                   | -5 V to 5 V, 0 V to 10 V, 0 V to -10 V   |
| Current measurement ranges                       | 1 µA, 10 µA, 100 µA, 1 mA, 10 mA   |
| Current or voltage measurement sampling interval | Minimum 5 ns (200 Mega-Samples/sec)  |
| Effective resolution                             | 0.2% of the range (without averaging)  |
| Number of channels                               | 2 channels per module; up to 5 modules (10 channels) are supported   |
| Maximum voltage force noise                      | 0.1 mVrms*   |
| Software   | Easy-to-use Instrument Library is provided as DLL to control the WGFMU from a variety of programming environments. |

\*Supplemental characteristics

## EasyEXPERT features and options

### Data acquisition and control

|                             |  |
|-----------------------------|--|
| User interface              | Windows GUI  |
| User interface options      | 15-inch touchscreen, softkeys, clickable knob, USB keyboard and mouse            |
| Data viewing                | View multiple graphs in tile, tab, or overlay display formats                    |
| Data storage                | Data and test settings automatically or selectively saved after each measurement |
| Test sequencing             | Test sequencing without programming via Quick Test mode                          |
| Switching matrix control    | Integrated switching matrix control for B2200A/B2201A and E5250A* (E5252A cards) |
| Wafer prober control        | Integrated semiautomatic wafer prober control supports die/sub-die moves         |
| Supported wafer probers     | Cascade Microtech, SUSS MicroTec, Vector Semiconductor                           |
| CV measurement              | Integrated capacitance compensation  |
| Application test support    | More than 300 furnished application tests conveniently organized by technology   |
| Application test management | Workspace feature allows creation of public/private application test libraries   |
| Alternative user interface  | Agilent 4155/4156 Classic Test mode  |

\*Integrated E5250A switching control is supported only under EasyEXPERT Plus

### Plotting and reporting

|                 |   |
|-----------------|---|
| Data analysis   | Automated real-time graphical data analysis                 |
| Data comparison | Append feature displays multiple measurements on same graph |
| Data export     | Automatic data export to any available drive                |
| Printing        | Print to any Windows-supported printer (via LAN or USB)     |

### Environment and connectivity

|                       |                                |
|-----------------------|--------------------------------|
| Operating system      | Windows 7                      |
| Hardcopy media        | DVD-ROM / CD-ROM / CD-RW Drive |
| Networking            | Windows 7                      |
| Supported peripherals | Any PC peripheral using USB    |

## Comparison of key EasyEXPERT and Desktop EasyEXPERT supported features

| Instrument                       | EasyEXPERT Standard   | EasyEXPERT Plus   | Desktop EasyEXPERT Standard   | Desktop EasyEXPERT Plus   |
|----------------------------------|---|---|---|---|
| B1500A                           | I/V Sweep<br>Multi-channel I/V Sweep<br>I/V List Sweep<br>I/V-t Time Sampling<br>1 kHz to 5 MHz CV, C-f, C-t<br>Quasi-static CV<br>Direct control<br>HV-SPGU control<br>B2200A/B2201A GUI | Everything supported on EasyEXPERT Standard<br>E5250A GUI (E5252A cards only) | I/V Sweep<br>Multi-channel I/V Sweep<br>I/V List Sweep<br>I/V-t Time Sampling<br>1 kHz to 5 MHz CV<br>Quasi-static CV<br>Direct control<br>HV-SPGU control<br>B2200A/B2201A GUI | Everything supported on Desktop EasyEXPERT Standard<br>E5250A GUI (E5252A cards only)   |
| 4155B<br>4156B<br>4155C<br>4156C | Not applicable; these instruments are not PC-based  | Not applicable; these instruments are not PC-based                            | I/V Sweep<br>B2200A/B2201A GUI  | Everything supported on Desktop EasyEXPERT Standard<br>V-t Time Sampling (except thinned-out and logarithmic modes)<br>E5250A GUI (E5252A cards only)<br>VSU/VMU (except differential mode)<br>41501B PGUs (including 16440A control) |



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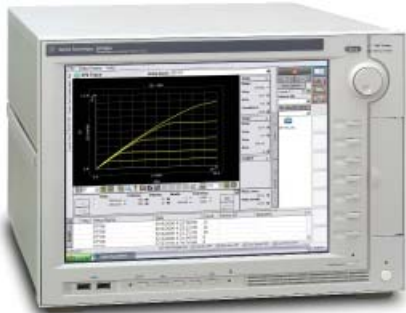


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