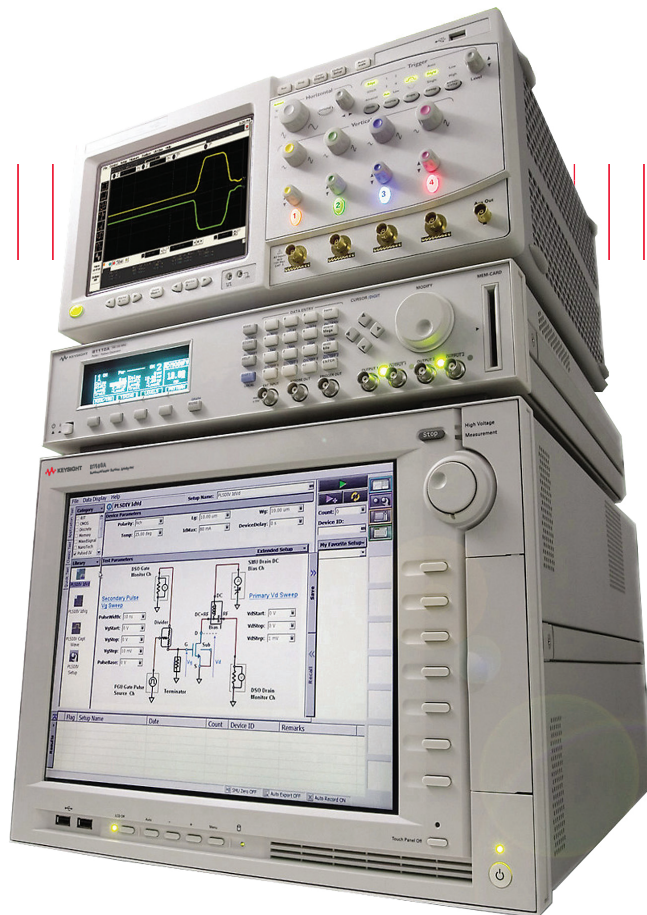


Keysight B1542A

Ten Nanosecond Pulsed IV Parametric Test Solution

Proven, Accurate High-k/SOI Characterization
by 10 nsec Pulse Width



Technical Overview

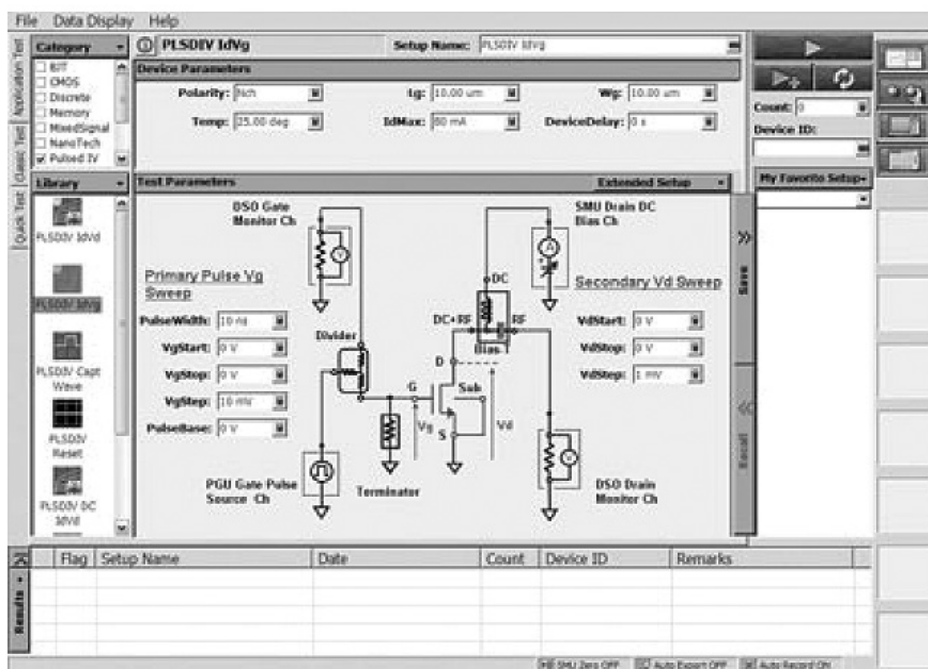
- Keysight B1500A – Semiconductor Device Analyzer
- Keysight 4156B/4156C – Precision Semiconductor Parameter Analyzer
- Keysight 4155B/4155C – Semiconductor Parameter Analyzer
- Keysight E5260A/E5270B 8 slot Measurement Mainframe



Unlocking Measurement Insights

Overview

State of the art semiconductor processes continue to meet market demands requiring smaller lithography, faster switching times, and lower power consumption. Accompanying the transition to the 45 nanometer node is the use of high-k gate dielectrics and silicon-on-insulator (SOI) transistors. The Keysight B1500A is well-positioned to act as the focal point for the parametric characterization of these devices in laboratory environments. Already possessing superb dc measurement performance, the B1500A with EasyEXPERT software now supports a pulsed IV measurement solution utilizing an Keysight pulse pattern generator and Keysight Infiniium series scopes that can characterize MOSFETs with an unprecedented gate pulse width of 10 nanoseconds.



Application Library on the B1500AEasyEXPERT

Features

10 nanosecond gate pulse width

This solution provides a 10 ns gate pulse width with 2 ns rise and fall times. It produces a clean rectangular waveform with minimal overshoot and undershoot.

1 μA current measurement resolution

This solution gives 1 μA current measurement resolution using a 10 ns pulse width, enabling more precise characterization of high-k and SOI devices.

Feedback loop enables accurate

ID-VD and ID-VG measurement This solution monitors the actual MOSFET drain voltage and automatically corrects the applied drain voltage to insure that the actual drain voltage (on the transistor side of the load resistor) is correct for each measurement point. This is supported for both ID-VD and ID-VG measurements.

Easy switching between dc and pulsed measurements

A dc to pulsed IV switching option is available to enable you to toggle between dc measurements and pulsed IV measurements without having to change any cables. This makes it easy to correlate dc measurements with pulsed measurements, and it also permits the automation of this process.

Support 4155/4156 (B, C series)

The application supports not only the B1500A but also Keysight 4155/4156 (B, C series), Keysight E5260A, Keysight E5270B. If you already have these instruments, you can utilize them for the Pulsed IV solution with Desktop EasyEXPERT software.value can be set in the Properties area.

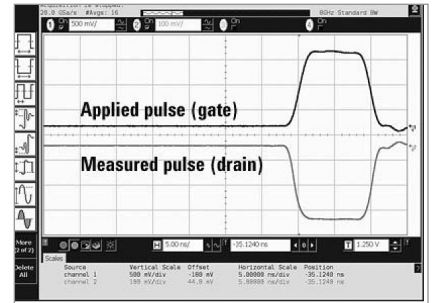
Can reuse existing instruments to lower costs

If you already have the Keysight pulse generator and oscilloscope you can use them with the pulsed IV solution. This reduces the total cost of the solution.

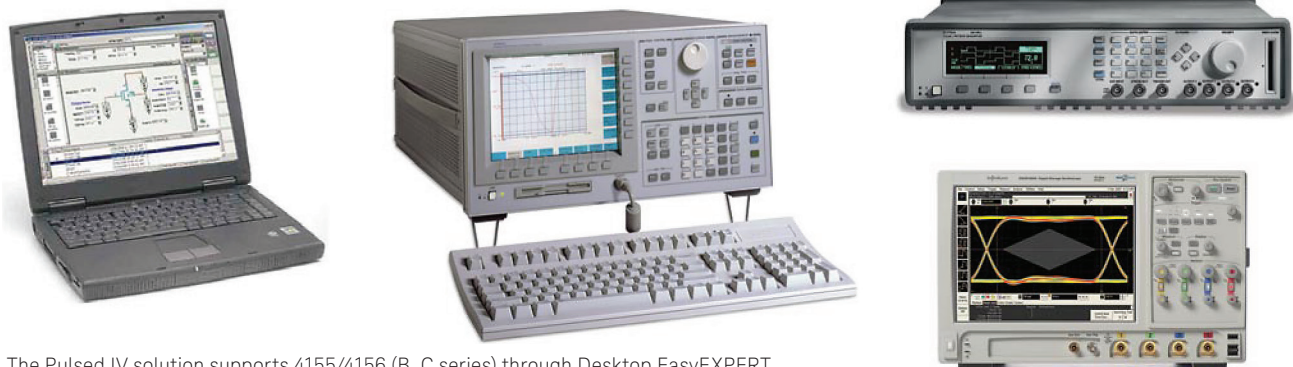
Easy setup using Keysight EasyEXPERT software

Keysight EasyEXPERT software, which is included on the B1500A and is also available in a desktop version, makes it easy for even neophyte users to make pulsed IV measurements. After selecting a pulsed IV application test, an intuitive GUI-based test setup window displays a complete schematic of the test equipment, making it easy to connect the components correctly. Following a straightforward “fill-in-the-blanks” process, the user clicks the “measure” button and begins making pulsed IV measurements. A graph and list of the data are generated automatically, and the user can export the data into a variety of data-analysis tools such as Microsoft Excel.

Figure 6 shows how easy it is to increase the maximum value of the input parameter (in this case from 5 V to 10 V). Of course, this operation must be repeated for each of the input parameters to be modified.



Applied 10 nsec gate pulse and measured drain current



The Pulsed IV solution supports 4155/4156 (B, C series) through Desktop EasyEXPERT

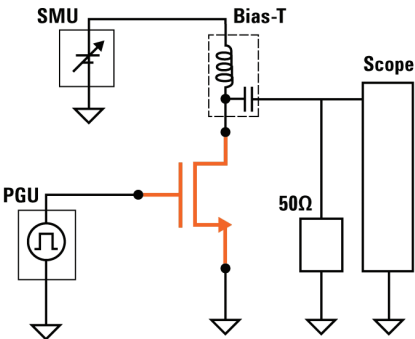
Typical technical information

Gate pulse width:	10 ns to 1 μ s
Gate pulse width:	- 4.5 V to 4.5 V
Drain pulse measurement current:	Max. 80 mA
Drain pulse measurement current resolution:	1 μ A
Drain voltage range:	- 10 V to 10 V

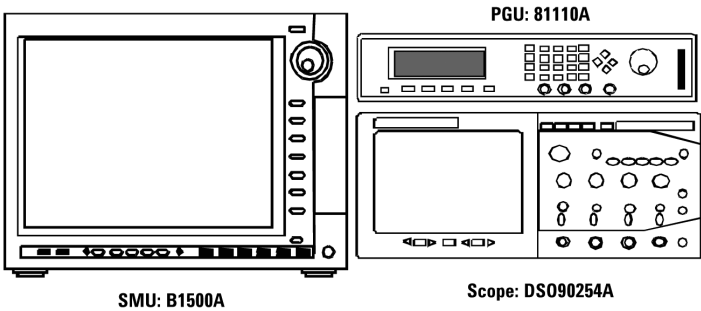
Block diagram for ultra-short pulsed IV

This block diagram shows a basic overview of the pulsed IV measurement. The drain voltage (or calculated current going into the drain) of the MOSFET is measured by the oscilloscope while an ultra-short pulse is applied to the gate by the PGU. The benefits of this for each technology type are:

1. For SOI transistors, the short duty cycle reduces self-heating effects that adversely impact the measurement results.
2. For high-k gate dielectric transistors, the short duty cycle reduces the incidence of electron trapping that distorts measurement results.



System configuration



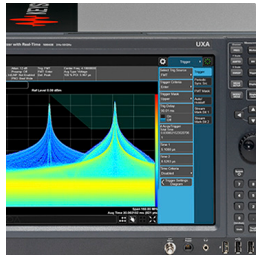
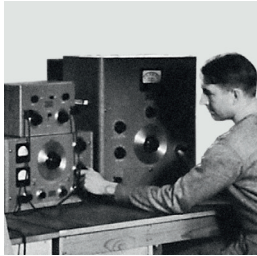
Operation environment

Supported instrument	
Keysight B1500A	Semiconductor Device Analyzer
Keysight 4156B/4156C	Precision Semiconductor Parameter Analyzer
Keysight 4155B/4155C	Semiconductor Parameter Analyzer
Keysight E5270B	8 slot Precision Measurement Mainframe
Keysight E5260A	8 slot High Speed Measurement Mainframe
Keysight 8110A/81101A/81110A/81150A	Pulse Pattern Generator
Keysight 54850 series/DSO8000 series, MSO 8000 series/DSO80000 series/DSO9000 series/MSO 9000 series/DSO90000 series/DSO S series/MSO S series	Infiniium Oscilloscope
Supported instrument	
B1542A	Pulsed IV Package for B1500/EasyEXPERT (B1542A does not include any DSO/PGU.)
B1542AU	Upgrade kit for B1542A
B1542AU-001	B1542A Pulsed IV software upgrade media for Windows 7

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