



Agilent B1500A Semiconductor Device Analyzer

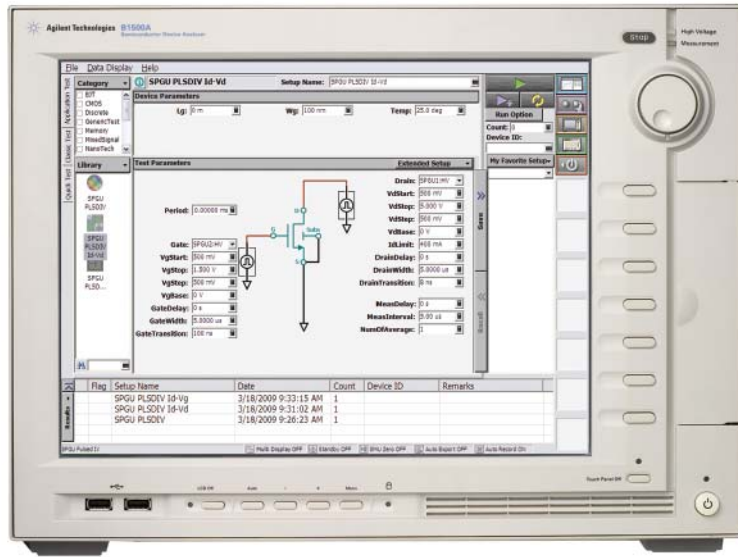
Easy High Power Pulsed IV Measurement Using the Agilent B1500A's HV-SPGU Module

Technical Overview

Introduction

Characterizing high power devices such as high electron mobility transistors (HEMTs) requires extremely high voltage and current measurement capabilities. Unfortunately, conventional DC measurement techniques can create device self-heating and charge trapping effects that cause the measured device behavior to deviate from that exhibited under normal operating conditions. Accurate characterization of these types of high-power devices requires pulsed current (I) and voltage (V) measurements with short measurement times and small duty cycles.

Until recently, solutions for fast pulsed IV measurement consisted of a collection of equipment that typically included a precision pulse generator, an oscilloscope, and some sort of DC source/monitor. This solution has many drawbacks, including complex cabling arrangements and the need for some sort of software to integrate everything together. The Agilent B1525A high voltage semiconductor pulse generator unit (HV-SPGU), which is a plug-in module for B1500A semiconductor device analyzer mainframe, eliminates these issues and allows you to focus on your real goal: parametric measurement and analysis.



Features

- **Simple system configuration**
Figure 1 illustrates the differences between the B1500A's HV-SPGU solution and a conventional rack-and-stack pulsed IV testing system. The HV-SPGU solution is much easier to implement due to the following features.
 - Each HV-SPGU module has two channels that can apply synchronized dual pulses. One HV-SPGU module is therefore sufficient to evaluate a 3-terminal device.
 - The HV-SPGU's output voltage monitor function can measure the voltage which eliminates the need for external equipment (e.g. oscilloscope) and complex cabling.
- **Maximum ± 40 V and 400 mA output**
The HV-SPGU can source 40 V pulses into an open load with excellent pulse level accuracy. It can also supply 400 mA of current when sourcing 20 V pulses into a 50 ohm load.



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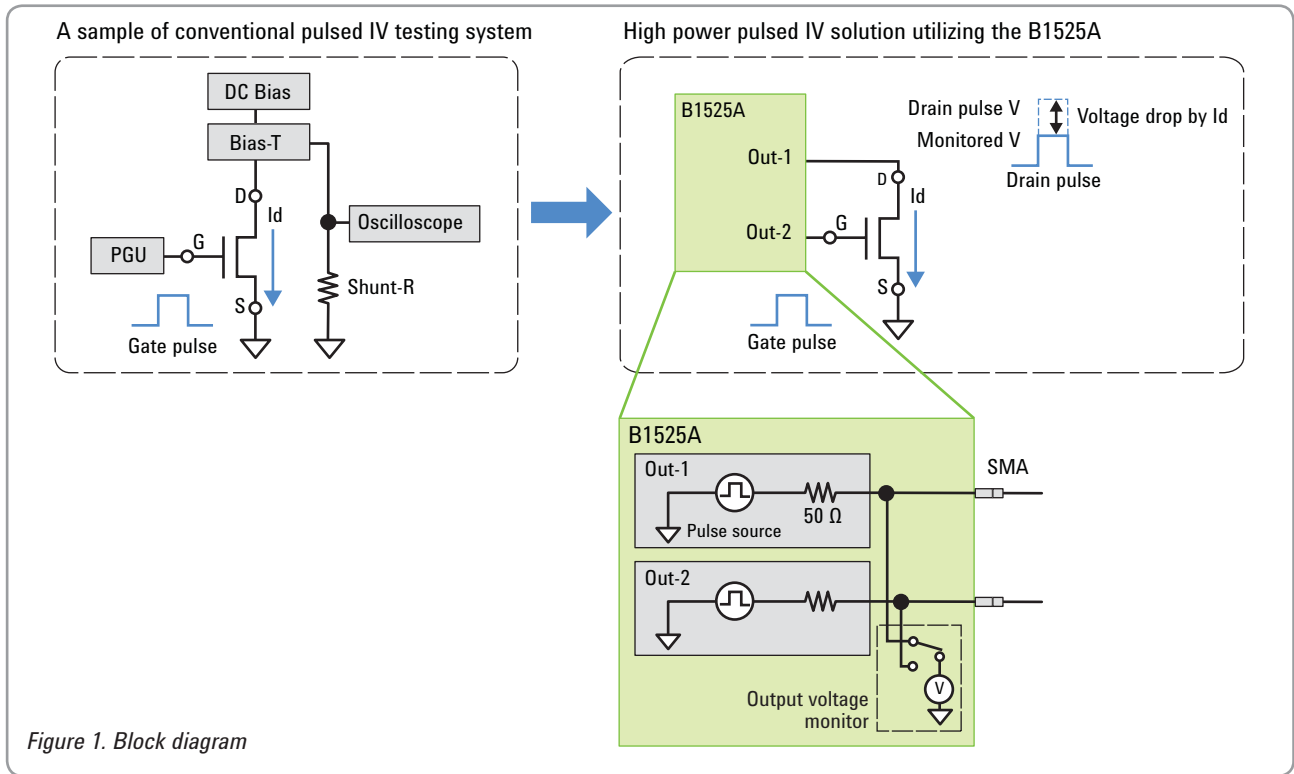


Figure 1. Block diagram

- **Minimum 5 μ s pulse width**
When performing pulsed IV measurements, the HV-SPGU's minimum pulse width is 5 μ s and its maximum pulse period is approximately 10 seconds.

- **40 μ A current measurement resolution**

- **Easy setup using Agilent EasyEXPERT software**
Agilent EasyEXPERT software, included with the B1500A, is a powerful environment for device evaluation and data analysis. For pulsed IV measurements using the HV-SPGU module, two application tests for high-power pulsed IV (Id-Vd, Id-Vg) are available as well as a general purpose application test for HV-SPGU's output voltage monitor function.

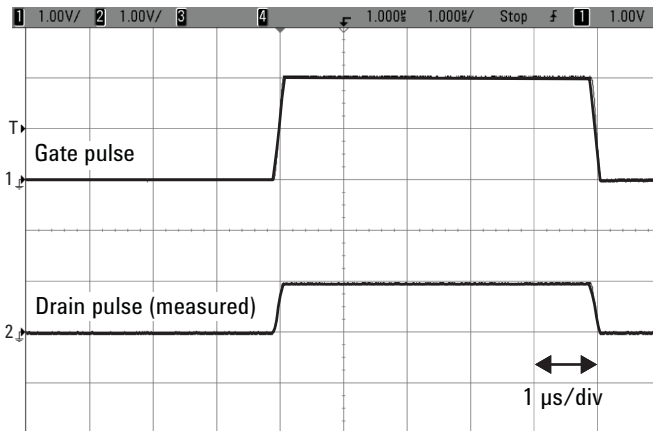


Figure 2. Applied 5 μ s gate/drain pulse

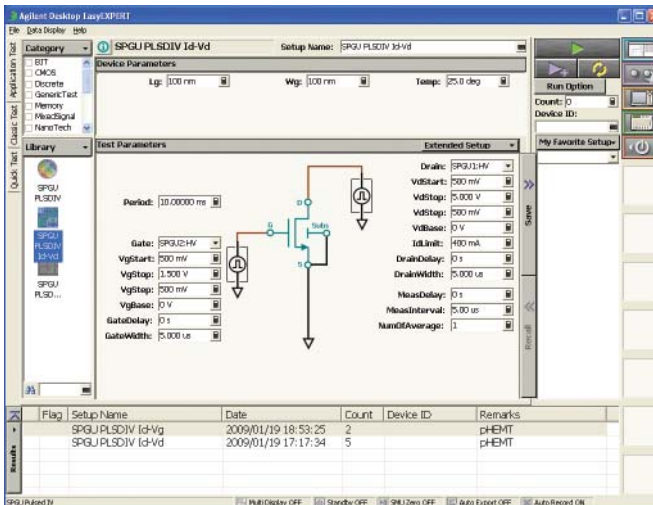


Figure 3. EasyEXPERT HV-SPGU pulsed IV application tests

Example of Pulsed Id-Vd and Id-Vg Curves

Figure 4 shows examples of pulsed Id-Vd and Id-Vg measurements on a pseudomorphic HEMT (pHEMT) performed on wafer.

Note.

- Microsecond pulse widths were used: 6 μ s (Drain), 7 μ s (Gate).
- The measurements cover a wide current range (from 40 μ A to 400 mA).
- Measurement setup is easy using EasyEXPERT and the HV-SPGU pulsed Id-Vd and Id-Vg application tests which are downloadable from Agilent.com free of charge.

System Configuration

The solution consists of the following items:

- B1500A Semiconductor Device Analyzer
- B1525A HV-SPGU Module
- EasyEXPERT/Desktop EasyEXPERT 3.2 or later* (Included with the B1500A)
- EasyEXPERT HV-SPGU pulsed IV application tests*
- SMA cables to connect the B1525A outputs to the DUT.

* Available for download free of charge from www.agilent.com

Conclusion

Using the HV-SPGU's output voltage monitor function, high power pulsed IV testing can be achieved without any other external equipment or complex cabling. You can get measurement results easily and quickly by connecting the HV-SPGU's SMA outputs directly to your DUT and by using the EasyEXPERT HV-SPGU pulsed IV application tests that Agilent provides free of charge.

Agilent has several pulsed IV solutions to meet a wide variety pulse width and measurement requirements, so please refer to the *Agilent Pulsed-IV Parametric Test Solution Selection Guide* (5990-3672EN) to determine the best solution to meet your needs. <http://cp.literature.agilent.com/litweb/pdf/5990-3672EN.pdf>

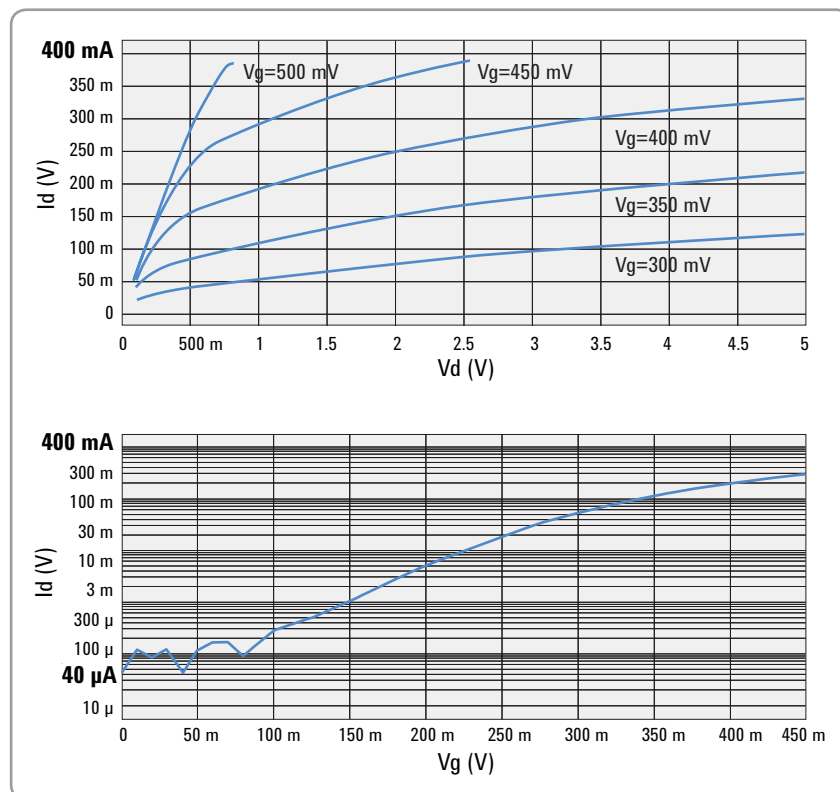


Figure 4. Example of pulsed Id-Vd and Id-Vg curves

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