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Pulsed IV

Tri-State | Pulsed S-Parameters | Long Pulse

AURIGA AU6 - 6th Generation Pulsed IV / RF Characterization System



Streamlined Architecture
One fully integrated enclosure. Compact footprint, dramatically less cabling.

Superior Measurement Fidelity
Best-in-class voltage and current accuracy - a major precision upgrade over the AU5.

Factory-Calibrated Pulse Heads
Pre-calibrated out of the box. Plug in and measure - no routine calibration.

AURIGA
PULSED IV

Introduction | Pulsed IV Measurements with Auriga AU6

Auriga's 6th generation AU6 pulsed IV/RF characterization system delivers unparalleled performance, capturing measurements with incredible speed and accuracy. Pulsed IV (current-voltage) measurements have emerged as the preferred method of capturing current-voltage characteristics of active devices such as field effect (FETs) and bipolar junction (BJTs) transistors. With the growing popularity of higher-power devices, like GaN HEMTs, LDMOS, SiC, and graphene transistors, current and voltage requirements are constantly being pushed higher and higher. The AU6 answers those demands with a fully integrated architecture. The mainframe, the quiescent and non-quiescent bias supplies for both the gate (or base) and the drain (or collector), and the measurement electronics are consolidated into a single enclosure. The external power supplies and the interconnect harness required by the AU5 are gone, taking with them a significant amount of bench space, setup time, and cabling complexity. The AU6 Pulsed IV/RF characterization system is supplied with a set of two external and interchangeable pulser heads. Their interchangeability enables this system to provide a variety of pulsed voltage and current ranges to provide the greatest resolution in the dynamic range of interest. External heads allow the pulser circuitry to be located closer to the device under test (DUT), minimizing any signal degradation due to transmission line effects. External heads enable the AU6 mainframe to reside up to six feet away from the DUT.

Every AU6 pulser head is characterized and calibrated at the factory. The system is ready to measure as soon as it is connected, without the routine pre-measurement calibration cycle that preceded each AU5 session, and it delivers a step change in absolute voltage and current accuracy over the previous generation.

What's New | AU6 at a glance

Streamlined Architecture

A fully integrated enclosure delivers a compact footprint and dramatically reduced cabling complexity. Mainframe, bias supplies, and measurement electronics live in one chassis, so a complete pulsed IV bench occupies a fraction of the rack space and presents far fewer connections to make, route, and troubleshoot.

Superior Measurement Fidelity

Best-in-class voltage and current accuracy, representing a major precision upgrade over the legacy AU5. Voltage is accurate to within 7 mV across the full 220 V range and current to within 10 µA on the lowest range. Low-level gate leakage, sub-threshold behavior, and dynamic on-resistance are resolved with confidence.

Factory-Calibrated Pulse Heads

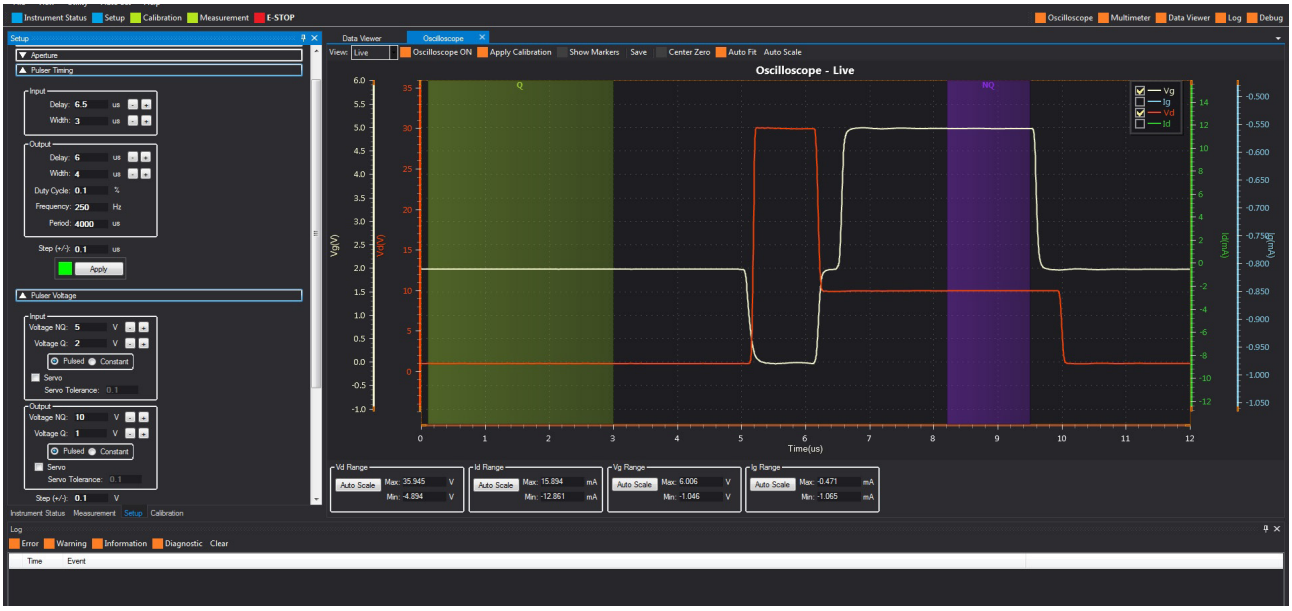
Pulse heads arrive pre-calibrated out of the box, eliminating routine pre-measurement calibration for faster, plug-and-play pulsed IV characterization. Swap a head to change range and start measuring — no calibration standards, no warm-up ritual, and no operator-to-operator variation in the calibration step.

Tri-State PIV | Isothermal and Isodynamic Characterization

Due to the asymmetry in the time constants associated with capture and release of charges in “traps” in GaN devices, a conventional pulsed characterization is not sufficient in order to keep both the thermal and trapping states fixed.

To keep the trap state constant for a conventional PIV characterization, a tri-state control of the standard pulses is developed where both at the gate and drain side a third state is excited just before the main pulse which acts as a pre-pulse. The pre-pulse is a non-overlapping pulse and is fully user controllable in terms of timing and voltage settings. The user can apply this voltage pre-pulse independently to impose a fixed, directly controllable trap state. The Pre-State is a short high voltage pulse used to activate the traps in the semiconductor. This short high voltage pre-pulse with no current flow pre-conditions the state of charges trapped at the conduction layer interface. Under these conditions of tri-state excitation both thermal and charge trapping states are kept constant, and hence it can be said that measurements are conducted in both isothermal and isodynamic states.

The width of the pre-pulse, the Quiescent and Non-Quiescent voltage states, and the parameters of the main pulse are all independently adjustable. The user can adjust the delay (Δt) between the two pulses (Pre-State and On-State) down to 0 s. All timing settings of the Tri-State Gate Pulser and Drain Pulser are independently adjustable.



Tri-state pulse sequence displayed live in the AU6 software — pre-state, on-state, and quiescent levels are set independently on both gate and drain.

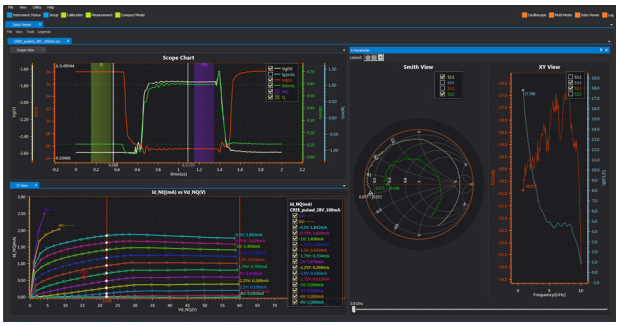
Basic Pulsed IV | Integrated Software

The AU6 system comes with the integrated AU6 software for a streamlined setup and measurement flow. Because the pulse heads ship factory-calibrated, the calibration step is reduced to a verification the operator can skip entirely on a routine run.
The interface supports easy pulse adjustments and offers a preview before pulse application. Measurement scenarios can be easily switched, and measurement results are displayed in real time. The software comes with integrated drivers for setup, measurement and viewing of S-parameters with the Vector Network Analyzers on the market. API access is provided for generating custom integration programs.



Pulsed S-Parameters | Optional RF Measurement Feature

The AU6 has advanced triggering capabilities allowing the user to trigger a Vector Network Analyzer for linear S-parameter measurements used for compact model generation.
The pulsed synchronization features can also be used to define the sequences for intricate applications like hybrid pulsed active load pull and behavioral model generation. The AU6 also supports an external triggering feature to operate in slave mode.



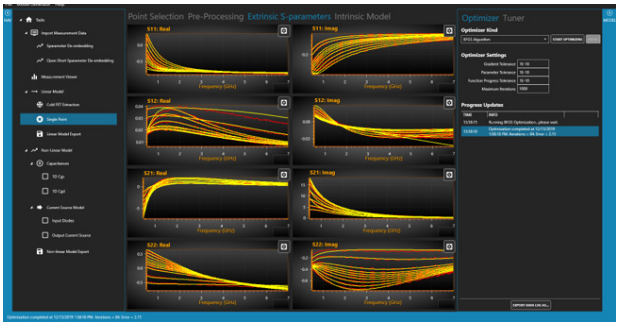
Long Pulse | Optional Measurement Feature

Transient pulse measurements are performed by sampling the signal at high speed to create a waveform of the signal versus time. These measurements are often made by oscilloscopes, but they can also be made by traditional DC-measurement equipment with ADCs running at very high speeds. Transient pulse measurements are very useful as they allow investigation of various device behaviors like self-heating and charge trapping.
Using the long memory depth of Auriga, the AU6 can measure a single pulse spanned over seconds or minutes and capture data over the time span set by the user. The software offers complete control of the pulse and sampling parameters. This feature is ideal for examining the effects of rapid bias changes on recovery performance.



Compact Modeling | Optional RF Measurement System

The Focus Compact Model (FCM) utility is a streamlined software package designed to be used with Focus' AURIGA high-end Pulsed-IV system, and is used to generate compact models for transistors from their pulsed-IV and wideband pulsed S-parameter data. This is achieved by generating a network of lumped circuit elements that accurately represent the fundamental linear and non-linear behavior of the device over a broad range of bias and power.
The improved accuracy of the AU6 system feeds directly into model quality: cleaner low-current data means better-constrained extraction at sub-threshold and in the knee region. The result of the modeling is a netlist compatible with CAD tools commonly used in RF design, such as AWR Microwave Office (MWO) and Keysight PathWave Advanced Design System (ADS).



Models & Specifications | Pulser Heads

All AU6 pulser heads are factory-calibrated and interchangeable. Heads can be mixed and matched to place the greatest resolution in the dynamic range of interest.

AU6 Standard Pulser Heads

Specifications	AU6-PHG20	AU6-PHG100*	AU6-PHD220-2	AU6-PHD220-30*
Max Voltage	±20 V	±100 V	220 V	220 V
Voltage Accuracy	3 mV (V≤20 V) 2.5 mV (V≤2 V)	7 mV (V≤220 V) 2.5 mV (V≤2.5 V)	7 mV (V≤220 V) 2.5 mV (V≤2.5 V)	7 mV (V≤220 V) 2.5 mV (V≤2.5 V)
Max Current Pulsed	±0.1A	±2 A	2 A	30 A
Max Current DC	±0.1 A	±0.5 A	0.75 A	2.5 A
Current Accuracy	100 uA (I≤0.1 A) 30 uA (I≤25 mA) 10 uA (I≤1 mA)	1 mA (I≤2 A) 60 uA (I≤25 mA) 10 uA (I≤1 mA)	1 mA (I≤2 A) 60 uA (I≤25 mA) 10 uA (I≤1 mA)	10 mA (I≤30 A) 60 uA (I≤200 mA)
Max Power	2 W	40 W	40 W	1000 W
Min Pulse Width**	200 ns	200 ns	200 ns	200 ns
Max Pulse Repetition Frequency (PRF)	310 KHz(V ≤20 V)	310 KHz (V≤100V)	80 KHz (V ≤220 V) 155 KHz (V ≤160 V) 310 KHz (V ≤110 V)	20 KHz (V ≤220 V) 70 KHz (V ≤110 V) 220 KHz (V ≤60 V)
Max Duty Cycle***	100 % (I ≤0.1 A)	5 % (I ≤2 A) 35 % (I ≤1.5 A) 70 % (I ≤0.75 A)	5 % (I ≤2 A) 35 % (I ≤1.5 A) 70 % (I ≤0.75 A)	1 % (I ≤30 A) 50 % (I ≤5 A) 80 % (I ≤2.5 A)
Min Output Rise/Fall**	23 ns	26 ns	30 ns	45 ns
Test Port Connector	BNC (f)	BNC (f)	BNC (f)	BNC (f)

AU6 Tri-State Pulser Heads

Specifications	AU6-TPHG20	AU6-TPHD220-2	AU6-TPHD220-30*
Max Voltage	±20 V	220 V	220 V
Voltage Accuracy	3 mV (V≤20 V) 2.5 mV (V≤2V)	7 mV (V≤220 V) 2.5 mV (V≤2.5 V)	7 mV (V≤220 V) 2.5 mV (V≤2.5 V)
Max Current Pulsed	±0.1A	2 A	30 A
Max Current DC	±0.1 A	0.75 A	2.5 A
Current Accuracy	100 uA (I≤0.1 A) 30 uA (I≤25 mA) 10 uA (I≤1 mA)	1 mA (I≤2 A) 60 uA (I≤25 mA) 10 uA (I≤1 mA)	10 mA (I≤30 A) 60 uA (I≤200 mA)
Max Power	2 W	40 W	1000 W
Min Pulse Width**	200 ns	200 ns	200 ns
Max Pulse Repetition Frequency (PRF)	310 KHz(V ≤20 V)	80 KHz (V ≤220 V) 155 KHz (V ≤160 V) 310 KHz (V ≤110 V)	20 KHz (V ≤220 V) 70 KHz (V ≤110 V) 220 KHz (V ≤60 V)
Max Duty Cycle***	100 % (I ≤0.1 A)	5 % (I ≤2 A) 35 % (I ≤1.5 A) 70 % (I ≤0.75 A)	1 % (I ≤30 A) 50 % (I ≤5 A) 80 % (I ≤2.5 A)
Min Output Rise/Fall**	23 ns	30 ns	45 ns
Test Port Connector	BNC (f)	BNC (f)	BNC (f)

* Preliminary data
** Measured at 50% Vmax, open-circuit
*** Tested with 20us pulse width