KEITHLEY
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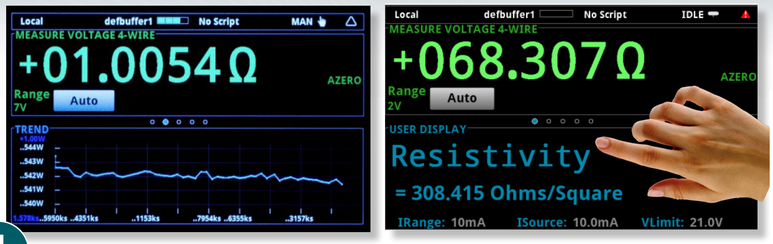
6 Common DC Tests to Maximize Productivity

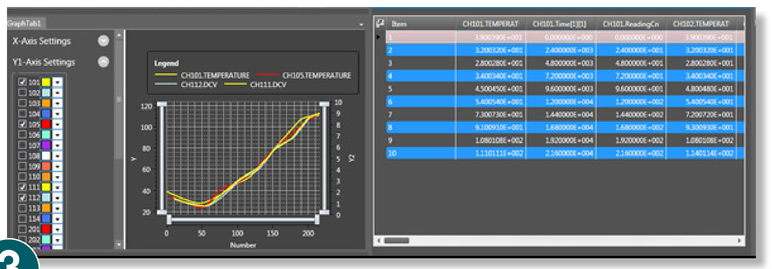
Tips for More Efficient DC I-V Characterization



1 Modern instruments, such as Keithley's Model 2450 Touchscreen SourceMeter® SMU Instrument, can display resistivity on the user interface.

Resistance Measurements: Configuring an Instrument to Properly Display Results

- Measuring resistance is important in understanding the effects of current changes on materials, drift, or resistivity on materials such as superconductors, graphene, polymers, new resistor designs, or semiconductors.
- Traditional instruments with a lot of buttons and deep menus can be challenging to configure a basic conductivity or resistivity measurement.
- Modern interfaces can trend plot resistance and display resistivity with the proper units right on the interface.



2 I-V Curve of an LED using a Model 2450 SourceMeter SMU Instrument.

Testing Two-Terminal Devices Requires:

- Sourcing either voltage or current
- Measuring resulting current or voltage at multiple points to create an I-V curve

I-V characterization can be setup from the instrument front panel or programmed using a computer. But, programming the application for a PC requires developing test software and learning the instrument's programming commands, which can be time consuming. First-time or even in-frequent users may find instrument setup from the front panel confusing.

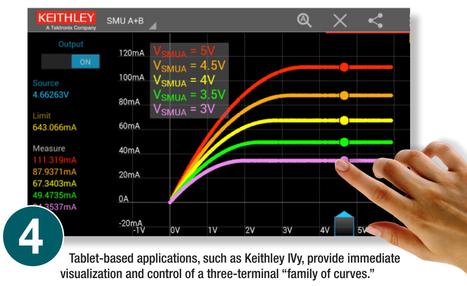
3 Data logging collecting temperature and DC voltages.

Logging Data over Time

For electronics, data logging monitors device behavior over time to identify device under test (DUT) problems that occur with changes in ambient conditions, such as temperature, lighting, self-heating, etc. Typical applications include:

- Sensor R&D
- Temperature monitoring
- Component drift testing
- Accelerated stress testing

It can be prohibitively complicated to setup an instrument to log data over time, particularly when there's no understanding of the configuration menus and buttons.



4 Tablet-based applications, such as Keithley IVy, provide immediate visualization and control of a three-terminal "family of curves."

Characterizing the I-V Parameters of Three-Terminal Devices

Characterizing FET current-voltage (I-V) parameters is crucial to ensuring proper operation in the intended application and in meeting specifications. Some of these I-V tests may include:

- Gate leakage
- Breakdown voltage
- Threshold voltage
- Transfer characteristics
- Drain current
- ON-resistance

FET testing often involves the use of several instruments, but integrating, programming, and synchronizing multiple instruments can be tedious and time consuming. Consider these parameters to obtain proper results:

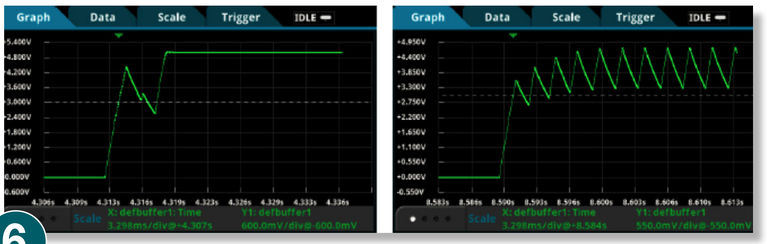
- Timing behaviors of the instruments and the device
- Setting the proper ranges
- Offset corrections

FET tests require writing programs or configuring test software to source voltage/current in a certain range, then measuring the current/voltage relationship.

5 Some instruments can directly display power and solar cell max power, short circuit current, and open circuit voltage.

Calculating Device Power and Efficiency

Greener, more efficient semiconductor devices, integrated circuits, and power systems require testing to evaluate parameters such as maximum power, battery discharge rates, power efficiency vs. current, or device off-state current. It takes time to properly configure multiple instruments to source and measure synchronously at multiple test points and can be difficult for the instrument to directly calculate power or efficiency from the front panel.clean or monotonic rise and fall.



6 Examples of power-up anomalies (temporary output voltage dip on the left and permanent failure to power-up on the right.)

Capturing Transient Measurements

- Voltage and current sizing, monitoring, sequencing, and tracking are essential to characterizing the transient performance of power supplies.
- Traditional measurement tools lack the ability to measure dynamic events.
- Transient measurements require a fast digitizing system that can quickly capture the transient.

Learn faster; Work smarter; Invent easier.

Modern test instruments feature intuitive operation and faster time to answer without sacrificing measurement accuracy. Graphical user interface-based touch screen instruments and software tools minimize the learning curve, resulting in faster time to answer and speeding up the research & development cycle. And, of course, Keithley instrumentation and software are at the forefront of this technology with groundbreaking Touch, Test, Invent® capabilities. Learn how they've changed the face of test instrumentation at **www.keithley.com.**

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