The high power Model 2651A is the newest addition to the Series 2600A family of System SourceMeter instruments. Specifically designed to characterize and test high power electronics, it can help you improve productivity in applications across the R&D, reliability, and production spectrums, including high brightness LEDs, power semiconductors, DC-DC converters, batteries, and other high power materials, components, modules, and subassemblies.

The Model 2651A, like every Series 2600A SourceMeter instrument, offers a highly flexible, four-quadrant voltage and current source/load coupled with precision voltage and current meters. It can be used as:

- Semiconductor characterization instrument
- V or I waveform generator
- V or I pulse generator
- Precision power supply
- True current source
- Digital multimeter (DCV, DCI, ohms, and power with 5½-digit resolution)
- Precision electronic load

The Model 2651A can source or sink up to ±40V and ±50A.

Two Measurement Modes: Digitizing or Integrating

Precisely characterize transient and steady-state behavior, including rapidly changing thermal effects, with the two measurement modes in the Model 2651A. Each mode is defined by its independent analog-to-digital (A/D) converters.

Captures 1,000,000 readings/second, continuous 1μs per point sampling, in the Digitizing Measurement mode. Its 18-bit A/D converters allow you to precisely measure transient characteristics. For more accurate measurements, use its Integrating Measurement mode, which is based on 22-bit A/D converters. The Integrating Measurement mode is provided in all Series 2600A instruments.
2651A
High Power System SourceMeter® Instrument

Expansion Capabilities
Through TSP-Link® technology, multiple Model 2651As and other Series 2600A instruments can be combined to form a larger integrated system with up to 64 channels. Precision timing and tight channel synchronization are guaranteed with built-in 500ns trigger controllers. True SMU-per-pin testing is assured with the fully isolated, independent channels of the SourceMeter instruments.

Also, when two Model 2651As are connected in parallel with TSP-Link, the current range is expanded from 50A to 100A. When two units are connected in series, the voltage range is expanded from 40V to 80V. Built-in intelligence simplifies testing by enabling the units to be addressed as a single instrument, thus creating an industry-best dynamic range (100A to 1μV). This capability enables you to test a much wider range of power semiconductors and other devices.

Keithley’s TSP and TSP-Link technology enables true SMU-per-pin testing without the power and/or channel limitations of a mainframe-based system.

1μV measurement resolution and current sourcing up to 50A (100A with two units) enable low-level Rds measurements to support next-generation devices.

Standard Capabilities of Series 2600A Instruments
Each Model 2651A includes all the features and capabilities provided in the other Series 2600A instruments, such as:

- Ability to be used as either a bench-top IV characterization tool or as a building block component of multiple-channel IV test systems
- TSP Express software to quickly and easily perform common IV tests without programming or installing software
- ACS Basic Edition software for semiconductor component characterization (optional). ACS Basic now features a Trace mode for generating a suite of characteristic curves.
- Keithley’s Test Script Processor (TSP®), which enables creation of custom user test scripts to further automate testing, and also supports the creation of programming sequences that allow the instrument to operate asynchronously without direct PC control.
- Parallel test execution and precision timing when multiple Series 2600A instruments are connected together in a system
- LXI class C compliance
- 14 digital I/O lines for direct interaction with probe stations, component handlers, or other automation tools
- USB port for extra data and test program storage via USB memory device
2651A

High Power System SourceMeter® Instrument

Condensed Specifications

**VOLTAGE ACCURACY**

<table>
<thead>
<tr>
<th>Range</th>
<th>Programming Resolution</th>
<th>Accuracy ±(%rdg. + volts)</th>
<th>Display Resolution</th>
<th>Integrating ADC Accuracy ±(%rdg. + volts)</th>
<th>High Speed ADC Accuracy ±(%rdg. + volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.000 mV</td>
<td>5 µV</td>
<td>0.02% + 500 µV</td>
<td>1 µV</td>
<td>0.015% + 500 µV</td>
<td>0.015% + 600 µV</td>
</tr>
<tr>
<td>1.00000 µA</td>
<td>20 µA</td>
<td>0.1% + 2 mA</td>
<td>10 µV</td>
<td>0.015% + 300 µV</td>
<td>0.015% + 600 µV</td>
</tr>
<tr>
<td>10.0000 mA</td>
<td>200 mA</td>
<td>0.08% + 60 mA</td>
<td>100 µV</td>
<td>0.015% + 3 mV</td>
<td>0.015% + 8 mV</td>
</tr>
<tr>
<td>100.0000 A</td>
<td>2000 µA</td>
<td>0.08% + 3.5 mV</td>
<td>100 µV</td>
<td>0.015% + 8 mV</td>
<td>0.015% + 15 mV</td>
</tr>
</tbody>
</table>

**CURRENT ACCURACY**

<table>
<thead>
<tr>
<th>Range</th>
<th>Programming Resolution</th>
<th>Accuracy ±(%rdg. + amps)</th>
<th>Display Resolution</th>
<th>Integrating ADC Accuracy ±(%rdg. + amps)</th>
<th>High Speed ADC Accuracy ±(%rdg. + amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.000 nA</td>
<td>2 nA</td>
<td>0.1 % + 500 nA</td>
<td>1 nA</td>
<td>0.08% + 500 nA</td>
<td>0.08% + 800 nA</td>
</tr>
<tr>
<td>1.00000 µA</td>
<td>20 µA</td>
<td>0.1% + 2 nA</td>
<td>10 µA</td>
<td>0.08% + 8 nA</td>
<td>0.08% + 10 nA</td>
</tr>
<tr>
<td>10.0000 mA</td>
<td>200 µA</td>
<td>0.08% + 8 nA</td>
<td>100 µA</td>
<td>0.08% + 8 nA</td>
<td>0.08% + 10 nA</td>
</tr>
<tr>
<td>100.0000 A</td>
<td>2000 A</td>
<td>0.08% + 8 nA</td>
<td>100 µA</td>
<td>0.08% + 8 nA</td>
<td>0.08% + 10 nA</td>
</tr>
</tbody>
</table>

**ADDITIONAL SOURCE SPECIFICATIONS**

NOISE (10Hz–20MHz): <100mV peak-peak (typical); <3mV RMS (typical).

OVERSHOOT: Voltage: <±0.1% + 10mV (typical).

CURRENT: <±0.1% (typical).

**REMOTE SENSE OPERATING RANGE:**

Maximum voltage between HI and SENSE HI = 3V

Maximum voltage between LO and SENSE LO = 3V

**VOLTAGE SOURCE OUTPUT SETTLING TIME:** <500µs best response.

**CURRENT SOURCE OUTPUT SETTLING TIME:** <500µs best response.

**MAXIMUM IMPEDANCE PER SOURCE LEAD:** Maximum impedance limited by 3V drop by Remote Sense Operating Range. Maximum Resistance = 3V/Source Current Value (Amps). 3V = 1 digit.

**ADDITIONAL METER SPECIFICATIONS**

**MAXIMUM LOAD IMPEDANCE:**

Normal Mode: 10mOhm (typical), 3µH (typical).

High Capacitance Mode: 50µF (typical), 3µH (typical).

**MEASURE INPUT IMPEDANCE:** >10Gohms

**COMMON MODE VOLTAGE:** 250 VDC.

**CONTACT CHECK:** Built-in.

**MEASUREMENT SPEED SPECIFICATIONS**

**MAXIMUM SWEEP OPERATION RATES (operations per second) FOR 60Hz (50Hz):**

<table>
<thead>
<tr>
<th>A/D Converter Speed</th>
<th>Trigger Origin</th>
<th>Measure to Memory via user scripts</th>
<th>Measure to GPiB via user scripts</th>
<th>Source Measure to Memory via user scripts</th>
<th>Source Measure to GPiB via user scripts</th>
<th>Source Measure to Memory using sweep API</th>
<th>Source Measure to GPiB using sweep API</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001 NPLC</td>
<td>Internal</td>
<td>20000 (20000)</td>
<td>10000 (10000)</td>
<td>5000 (5000)</td>
<td>1000 (1000)</td>
<td>1000 (1000)</td>
<td>5000 (5000)</td>
</tr>
<tr>
<td>0.001 NPLC</td>
<td>Digital I/O</td>
<td>8100 (8100)</td>
<td>7100 (7100)</td>
<td>5000 (5000)</td>
<td>11200 (11200)</td>
<td>5700 (5700)</td>
<td>5700 (5700)</td>
</tr>
<tr>
<td>0.1 NPLC</td>
<td>Internal</td>
<td>580 (480)</td>
<td>560 (470)</td>
<td>550 (465)</td>
<td>560 (470)</td>
<td>5100 (5100)</td>
<td>5100 (5100)</td>
</tr>
<tr>
<td>1.0 NPLC</td>
<td>Internal</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
</tr>
<tr>
<td>0.001 NPLC</td>
<td>Internal</td>
<td>38500 (38500)</td>
<td>20000 (20000)</td>
<td>10000 (10000)</td>
<td>14300 (14300)</td>
<td>6500 (6500)</td>
<td>6500 (6500)</td>
</tr>
<tr>
<td>0.001 NPLC</td>
<td>Digital I/O</td>
<td>38500 (38500)</td>
<td>20000 (20000)</td>
<td>10000 (10000)</td>
<td>14300 (14300)</td>
<td>6500 (6500)</td>
<td>6500 (6500)</td>
</tr>
</tbody>
</table>

**MAXIMUM SINGLE MEASUREMENT RATES (operations per second) FOR 60Hz (50Hz):**

<table>
<thead>
<tr>
<th>A/D Converter Speed</th>
<th>Trigger Origin</th>
<th>Source Measure to GPiB</th>
<th>Source Measure to GPiB</th>
<th>Source Measure to GPiB Pass/Fail to GPiB</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001 NPLC</td>
<td>Digital I/O</td>
<td>1900 (1800)</td>
<td>1400 (1400)</td>
<td>1400 (1400)</td>
</tr>
<tr>
<td>0.001 NPLC</td>
<td>Internal</td>
<td>58 (48)</td>
<td>57 (48)</td>
<td>57 (48)</td>
</tr>
</tbody>
</table>

**HIGH SPEED ADC BURST MEASUREMENT RATES:**

<table>
<thead>
<tr>
<th>Burst Length (rdgs.)</th>
<th>Readings/s</th>
<th>Bursts/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1M</td>
<td>400</td>
</tr>
<tr>
<td>500</td>
<td>1M</td>
<td>80</td>
</tr>
<tr>
<td>1000</td>
<td>1M</td>
<td>40</td>
</tr>
<tr>
<td>2500</td>
<td>1M</td>
<td>16</td>
</tr>
<tr>
<td>5000</td>
<td>1M</td>
<td>8</td>
</tr>
</tbody>
</table>
**TRIGGERING AND SYNCHRONIZATION SPECIFICATIONS**

**TRIGGERING:** Trigger in to Trigger Out: 0.5μs, typical.

**SYNCHRONIZATION:** Single- or multi-node synchronized source change: <0.5μs, typical.

**PROGRAMMING**

**TEST SCRIPT BUILDER:** Integrated development environment for building, running, and managing TSP scripts.

**TSP EXPRESS (EMBEDDED):** Tool that allows users to quickly and easily perform common I-V tests without programming or installing software.

**OTHER SOFTWARE INTERFACES:** TSP Express (Embedded), Direct GPIB/VISA, Read/Write with VB, VC+++, VC#, LabVIEW, LabWindows/CVI, etc.

**SYSTEM EXPANSION**

The TSP-Link expansion interface allows TSP-enabled instruments to trigger and communicate with each other. See figure below:

![Diagram of TSP-Link expansion interface](image)

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**GENERAL**

- **USB:** USB 2.1 Host Controller, supports external data storage.
- **CONTACT CHECK:** 1ms minimum measurement time; 5% basic accuracy.
- **PC INTERFACE:** IEEE-488.1 and 2, LXI Class C Ethernet, RS-232.
- **DIGITAL I/O INTERFACE:** Input/Output Pins: 14 open drain I/O bits, 5.25V max.
- **POWER SUPPLY:** 100V to 250VAC, 50Hz – 60Hz (auto sensing), 550VA max.
- **COOLING:** Forced air. Side and top intake and rear exhaust.
- **EMC:** Conforms to European Union EMC Directive.
- **SAFETY:** UL listed to UL61010-1:2004 (PENDING). Conforms to European Union Low Voltage Directive.
- **WARRANTY:** 1 year.
- **DIMENSIONS:** 89mm high × 435mm wide × 549mm deep (3.5 in × 17.1 in × 21.6 in). Bench Configuration (with handle & feet): 104mm high × 483mm wide × 620mm deep (4.1 in × 19 in × 24.4 in)
- **WEIGHT:** 9.98kg (22 lbs).
- **ENVIRONMENT:** For indoor use only.
- **CALIBRATION PERIOD:** One year.

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