

S600 Series S630

Automatic DC Parametric Test Systems



- Up to 10x higher tester speed for lower cost of ownership
- Faster, more sensitive current and capacitance measurements
- Easy-to-use software for quicker and more flexible test plan definition
- High frequency FLASH and ring oscillator measurements

Ordering Information

S630 Automatic DC
Parametric Test
System

Engineered for Today's Production Needs and Tomorrow's Technologies

Keithley's S600 Series Automatic DC Parametric Test Systems are designed to help fabs keep pace with technical demands such as increasing wafer size, growing device complexity, and rapid start-up times. The S630 combines high throughput and superior DC measurement capability with a high frequency bandwidth for FLASH and ring oscillator measurements.

The S600 Series delivers unparalleled speed at greater sensitivities through a new system architecture and per pin electronics. For example, compared to other systems on the market today, it can measure μA -level currents four times faster and fA -level currents ten times faster, in both cases with significantly better sensitivity. A high-speed capacitance meter uses the same per pin electronics to deliver highly repeatable measurements at up to ten times the speed of other GPIB-controlled LCR meters.

For FLASH characterization, the S630 offers pulsing capability with up to 20ns pulse rise and fall times. For ring oscillator measurements, options are available for up to 1GHz frequency measurements.

Simply taking data faster is not enough today; the sampling rate must balance the manufacturer's need for throughput against the need for process control

data. Some tests, such as Q_{BD} , take too long to perform at every parametric test site. The KTE software for the S600 Series allows for flexible sampling plans, which can be used to vary the sampling of a parameter across a wafer. Similarly, the cassette test plans allow different sampling plans for each wafer in a lot.

A New Testing Approach for New Device Challenges

The S600 Series' design makes it possible to present instrumentation for current/voltage source/measurement and capacitance measurement to each Device Under Test (DUT) pin. Each pin can also provide a quiet analog ground connection or a nearly perfect open circuit, minimizing second-order effects such as leakage and parasitic capacitance, also eliminating noise artifacts.

By eliminating the long cables and the reed relay matrix found in other systems, the S600 Series reduces the capacitive load and dielectric absorption effects on the circuit being measured. This allows faster settling times for current measurements and reduced background for capacitance measurements. The reed relays, connectors, and cables are the leading causes of system failures in other system designs. By reducing the number of these components, the S600 Series' design improves system reliability.

Accurate Low Level Current Measurements Without Sacrificing Throughput

The S600 Series is engineered to help fabs keep pace with new device technologies and changing test requirements. High performance probe cards are used to interface the testers' instrumentation to the wafer. These cards have been designed for low leakage, low capacitance, and fast, simple installation. While typical probe cards have up to 500fA/V leakage, there are S600 Series cards that have less than 1fA/V. Similarly, earlier probe card designs added 50 to 100pF of capacitance, while the S600 Series' cards contribute just 1pF. Dielectric absorption has also been minimized. These dramatic error reductions are made possible by the cards' unique two-layer design. Teflon[®]-insulated coaxial feed-throughs and ceramic blade needle mounts isolate the source and measure lines from the board material, eliminating potential leakage paths.

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A GREATER MEASURE OF CONFIDENCE

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Higher Wafer Throughput for Lower Cost of Ownership

In the past, many fabs have not included low current measurements in production test sequences because of the time needed to get accurate, repeatable results. By offering ten-fold speed improvements on current measurements of less than 10pA, the S600 Series enlarges the measurement capabilities in production.

The S600 Series is designed for high testing speed at all signal levels, not just low ones. The S600 Series instrumentation is based on Source-Measure Units (SMUs) interfaced to a VXI backplane. The S600 Series incorporates a high speed PowerPC computer for real-time tester control. The VXI rack can be configured with up to eight SMUs. Each is capable of sourcing and measuring over voltage ranges from $\pm 200\text{mV}$ to $\pm 200\text{V}$ and current ranges from $\pm 100\text{pA}$ to $\pm 1\text{A}$. The SMUs draw on the latest Keithley A-to-D conversion technology from our high resolution digital multimeter line.

Compatible with High Performance Hardware

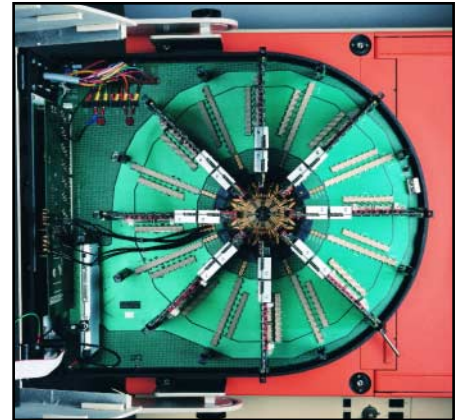
Prober performance is critical to maintaining high throughput, so the S600 Series is designed for use with the industry's leading high-speed probes, including models made by Tokyo Electron Limited (TEL), Electroglas (EG), and Tokyo Semitsu (TSK). Keithley constantly extends this control set; customers should contact Keithley for a complete list.

As new testing needs evolve, it's easy to expand the test configuration by plugging in new instrumentation modules. The S600 Series can incorporate up to sixteen pin electronic modules to accommodate 64 pins and up to eight SMUs for more complex test plans. There are also eight analog high-frequency 50Ω inputs for adding other types of instruments, such as capacitance meters, frequency counters, pulse generators, etc. Up to four instruments can be connected to the DUT pins at once, in addition to the SMUs.

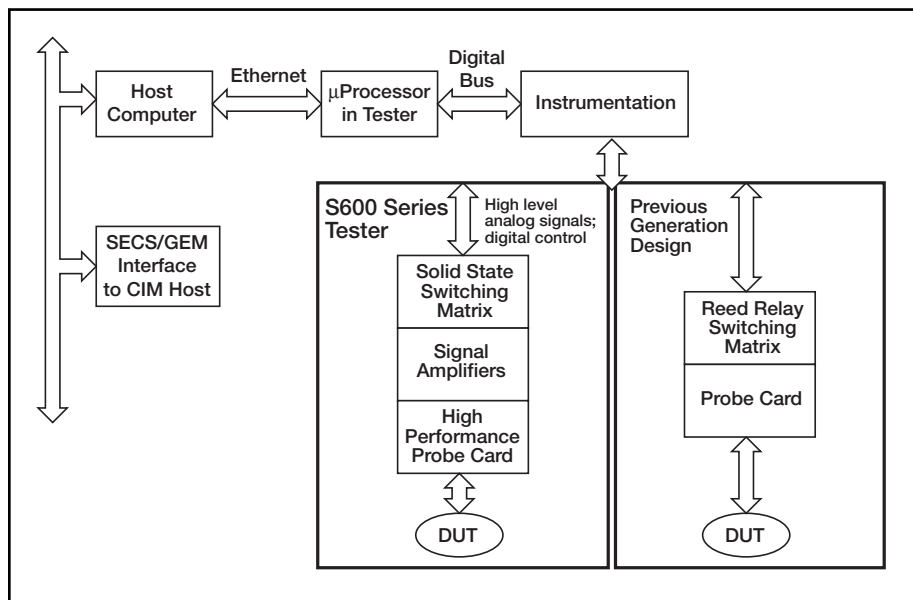
High Speed Testing

In side-by-side comparisons, the S600 Series testers can execute all of the measurements in a typical CMOS test suite up to four times faster than the S400, including prober time. Typical throughput improvements for test times can be as high as 10x, depending on the number and type of parameters measured. Test plans that incorporate a higher number of low current tests offer greater opportunities for throughput improvement with the S600 Series.

Furthermore, head-to-head benchmark comparisons with state-of-the-art competitive systems have shown the S600 Series to be more than 2x faster for a typical production monitoring application.



The S600 Series uses active electronics on each tester pin inside a test head, which mounts on top of the prober. Each probing pin has its own amplifier for bi-directional scaling of currents. The S600 Series systems use a high performance probe card to reduce parasitic leakage and capacitance. The amplifiers, which are located within centimeters of the wafer, boost the low-level analog signals far above the noise "floor" of the system. The amplified signals then pass through a high speed, solid-state switch matrix on their way to the measurement instruments.



The S600 Series' per pin electronics design minimizes the parasitic capacitance and leakage currents associated with older designs that used long cables and a reed-relay-based switching matrix located between the DUT and the measurement circuitry.

Designed for high speed DC parametric testing

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