S680

The Next Generation of Parametric Test Performance

KEITHLEY

A GREATER MEASURE OF CONFIDENCE

Parallel test and adaptive testing

Minimize your test times

Lights-out 40GHz production RF testing

RF measurements as easy as DC

Modular per-pin electronics

Extendable platform

Sub-femtoamp noise

See more, faster

Flexible SECS/GEM automation

Integrates into your test floor operations

The S680's flexible architecture ensures that, no matter what tomorrow's devices look like or how they perform, you'll be able to upgrade or reconfigure your tester cost-effectively to handle them.

Taking on your next generation of test challenges

Keithley can build an S680 tester optimized for your emerging parametric test requirements, including:

- **Advanced transistor gate dielectrics.**
- **RF s-parameter measurements at up to 40GHz for high performance BiCMOS processes.**
- **Copper/low κ materials systems.**
- **Embedded memories, such as ferroelectric and magnetic-based devices.**
- **Measurements on advanced substrates like SOI and SiGe.**
- **Femtoamp-level DC measurements for low leakage mobile devices.**

The S600 Series parametric test platform on which the S680 is based is flexible and extendable, providing industry leading measurement capabilities for today, as well as for future technology generations. This flexible architecture ensures that, no matter what tomorrow's devices look like or how they perform, you'll be able to upgrade or reconfigure your tester cost-effectively to handle them. In fact, our design team is already at work on solving the parametric test challenges you'll face with the next two generations of devices.

We back up the S680 with a full staff of parametric test experts, who not only understand the physics of new materials and devices, but lead the industry in their knowledge of electrical test instrumentation and test setup. They'll work closely with you to develop new measurement capabilities as new test needs emerge, so you can meet your process development and process ramp goals.

Minimize your long-term cost of test by maximizing your capital equipment reuse

At Keithley, we're passionate about protecting your investment in our products. The S680's robust, modular design supports highly cost-effective field upgrades. That means it will go on meeting your emerging measurement needs for many years to come. For example, the per-pin electronics in the S680's testhead that let you to make lab-grade DC and AC measurements on all 64 pins of a production tester today will also support your on-wafer RF measurements to 40GHz on dedicated pins.

Control 300mm wafer processes in 200mm test times

S600 Series innovations like smart Source-Measure Units (SMUs) and the SimulTest™ parallel test software option (patent pending) help you maximize test throughput by measuring up to nine devices simultaneously in a single probe touchdown. The AdapTest Software Option allows changing test plans automatically in real time, based on site-level results. This adaptive testing approach can increase your test cell throughput by intelligently reducing the amount of data collected on good wafers or by automating first-level process diagnostics when unexpected results are obtained.

Superior measurement capability—today and tomorrow

S600 Series parametric testers have always combined high throughput with superior measurement integrity and broad testing flexibility. That's why they fit so well into a wide range of test environments:

- Production process control and equipment qualification.
- Process and equipment tuning and optimization.
- Wafer acceptance testing.
- Device modeling and characterization.

High measurement integrity plus high throughput

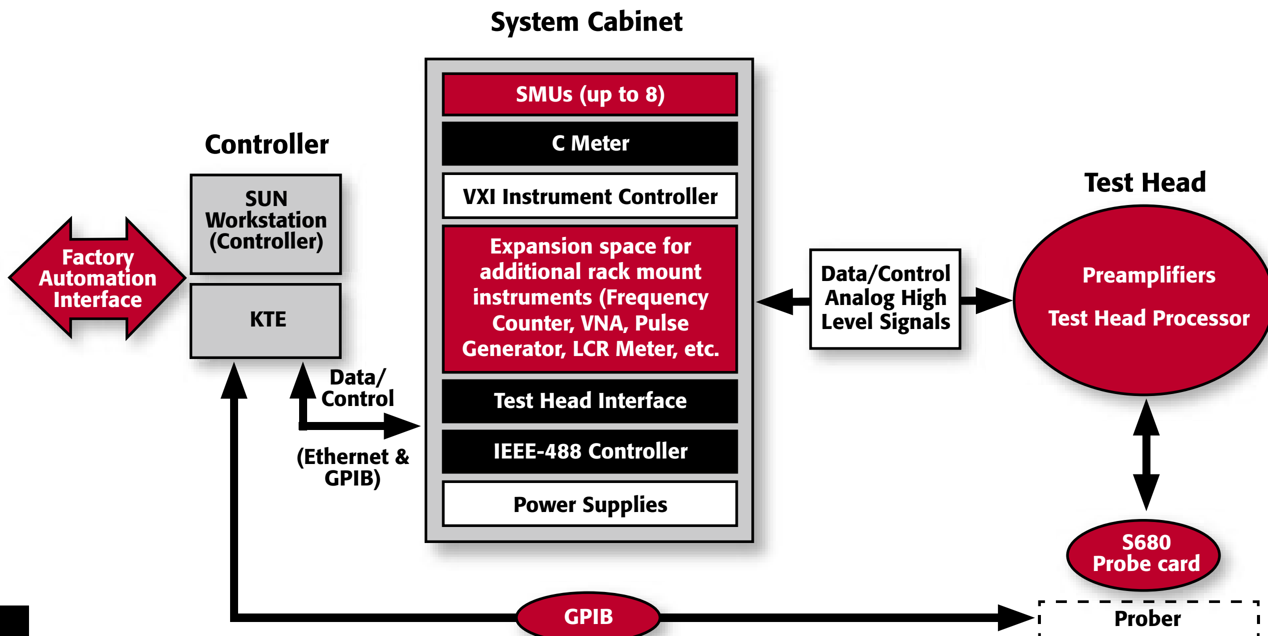
Keithley understands that, out on the production floor, time really is money. However, maintaining high measurement integrity is just as critical to achieving your business goals as high throughput is. That's why we designed the S680 with identical, high resolution paths for all tester pins (up to 64). In fact, the S680 is the only parametric tester on the market that can combine lab-grade sensitivity (attoamp and microvolt resolution) with high speed for all your DC device measurements.

The S680 also includes a wide range of instrumentation options for non-DC measurements:

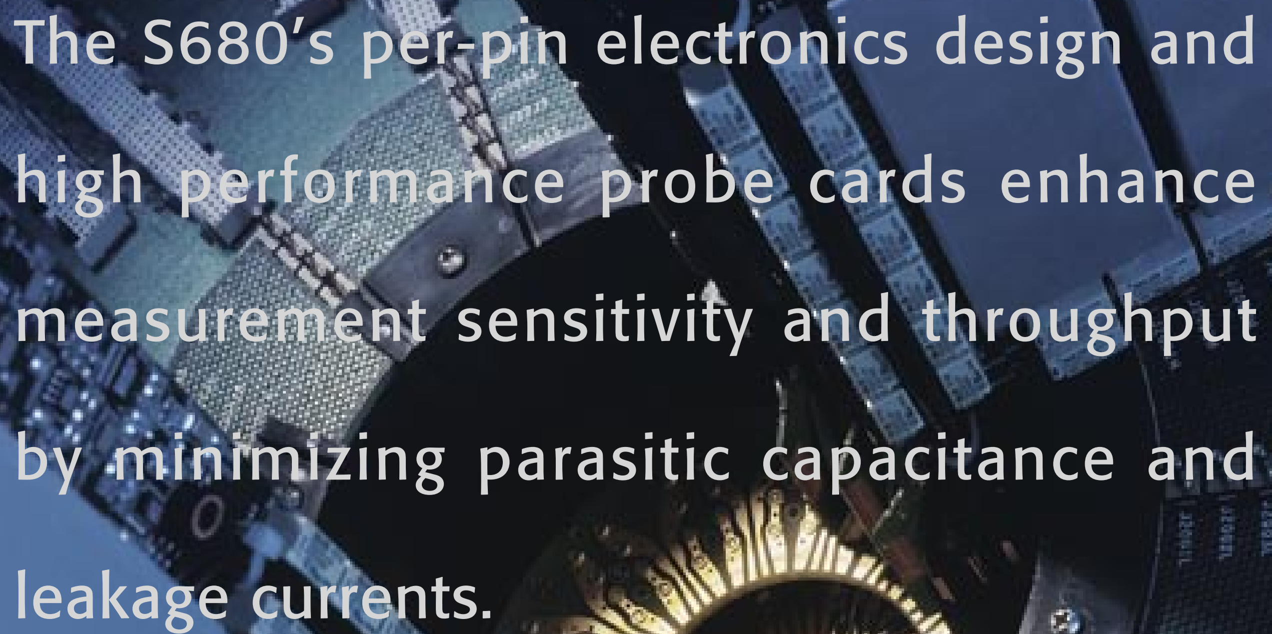
- 2-port s-parameters up to 40GHz using a vector network analyzer for RF device modeling and testing of sub-13Å advanced gate dielectrics.
- 100kHz C-V using remote testhead pre-amplifier for fast dielectric layer measurements.
- Frequency counter and spectrum analyzers for ring oscillator measurements.
- Single- and dual-channel pulse generators for embedded memory measurements.
- Multi-frequency LCR for dielectric layer measurements.
- Wafer level reliability toolkit.

The S680 is also the only parametric tester that delivers NIST-traceable calibration all the way to the probe tip.

Modular, flexible hardware architecture



The S680's per-pin electronics design and high performance probe cards enhance measurement sensitivity and throughput by minimizing parasitic capacitance and leakage currents.

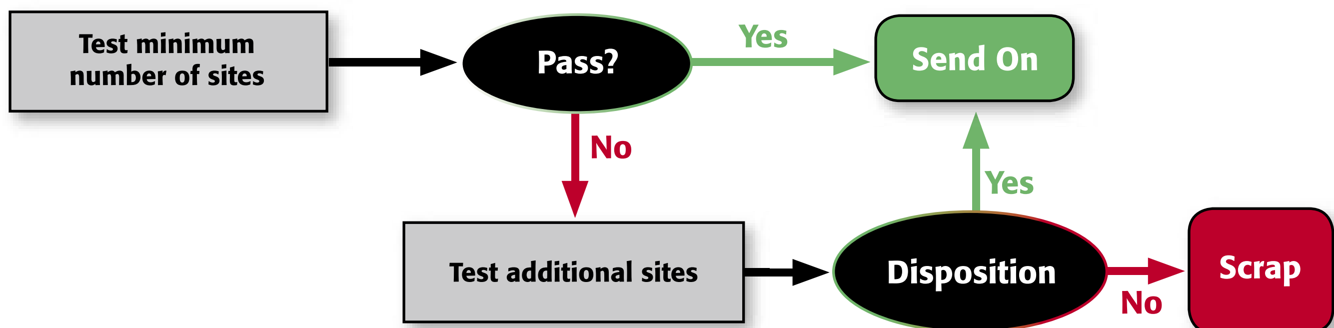


300mm process control in 200mm test times

The S680's upgraded Source-Measure Units (SMUs) and new SimulTest™ parallel test software option (patent pending) work together to boost test speed and minimize overall cost of test by supporting measurements of as many as nine devices at once. The hardware upgrade not only enhances throughput, but ensures your analog test results from new or upgraded testers will correlate with results from S600 Series testers already in the field.

By giving the S680 the ability to change test plans in real time, the AdapTest Software Option adds intelligence to the wafer testing process. It's ideal for scenarios such as automating first-level process diagnostics when you obtain unexpected results, for re-measuring a previous known-good site, and for eliminating measurements of non-critical parameters on good wafers. By automating manual reprobing for process diagnostics, one fab was able to decrease their cycle time for disposition from hours to minutes with no need for operator intervention. They also improved the throughput of their test cell significantly.

Change test plans in real time with AdapTest



This robust system is designed for easy operation and data analysis—there's no need for an expert to analyze and filter the data before the fab's engineering and manufacturing community can use it.

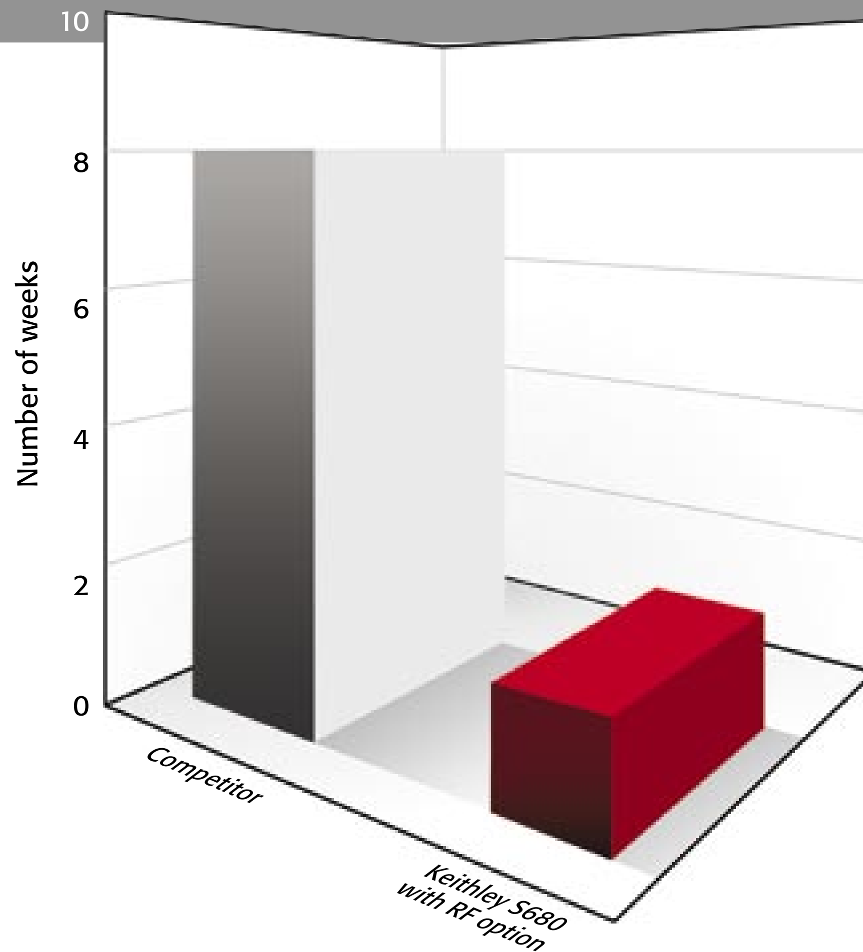
RF measurements as easy as DC

The RF Option for the S680 dramatically increases overall throughput by combining two critical test functions in a single system. DC and RF tests can be combined in the same test sequence. This integrated approach eliminates the long calibration and test times typical of rack and-stack RF test solutions. It also eliminates the need for a separate, costly RF-only prober.

The RF Option is ideal for testing analog and BiCMOS ICs, like those used in mobile wireless consumer products. It supports on-wafer RF s-parameter testing at up to 40GHz with 1Hz frequency resolution and 70dB dynamic range. Typical measurement times for RF library tests (Ft, Fmax, Rbb, Q, L, C, etc.) are less than 300ms.

This robust system is designed for easy operation and data analysis. The software supports full automation of calibration, de-embedding, RF parameter extraction, probe contact resistance compensation, consumables tracking, data analysis, and revision control in a SEMI-compliant 300mm system. There’s no need for an expert to analyze and filter the data before the fab’ s engineering and manufacturing groups can use it. Built-in operational features support industry best practices for device modeling, technology development, and high volume manufacturing environments.

Complete RF-BiCMOS model verification in weeks, not months



High data integrity at high throughput rates

The correct recipe every time

We created the Keithley Recipe Manager (KRM) Option to help your engineers create and modify recipes quickly and help operators choose and execute the correct recipe every time. Built-in version control tools prevent unintentional or undocumented code changes and ensure ISO-9001 traceability. Recipes can be fanned out to other testers automatically.

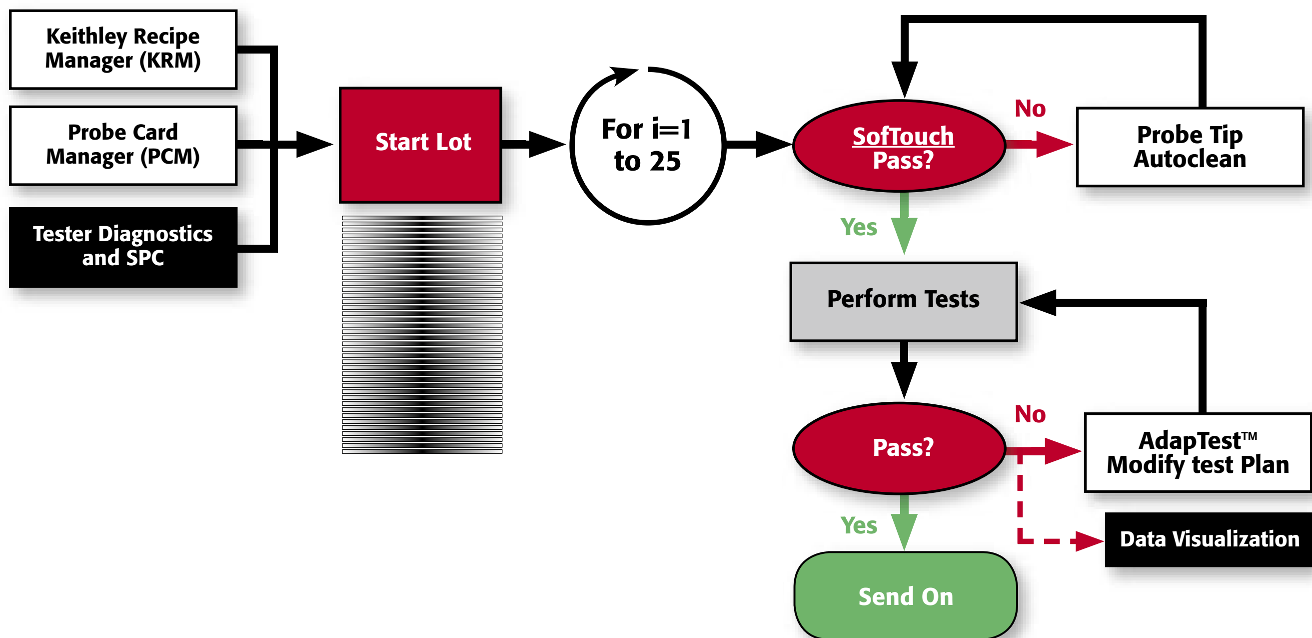
The correct probe card for every lot

Managing probe card inventories with paper records is time-consuming and expensive. The Probe Card Manager (PCM) Option lets you track each card independently because information on serial number, touchdown counts, and leakage is stored in an on-card EEPROM, which the tester updates automatically. The S680 can query a probe card before starting a test plan, then stop testing if the wrong card is installed or if it needs maintenance.

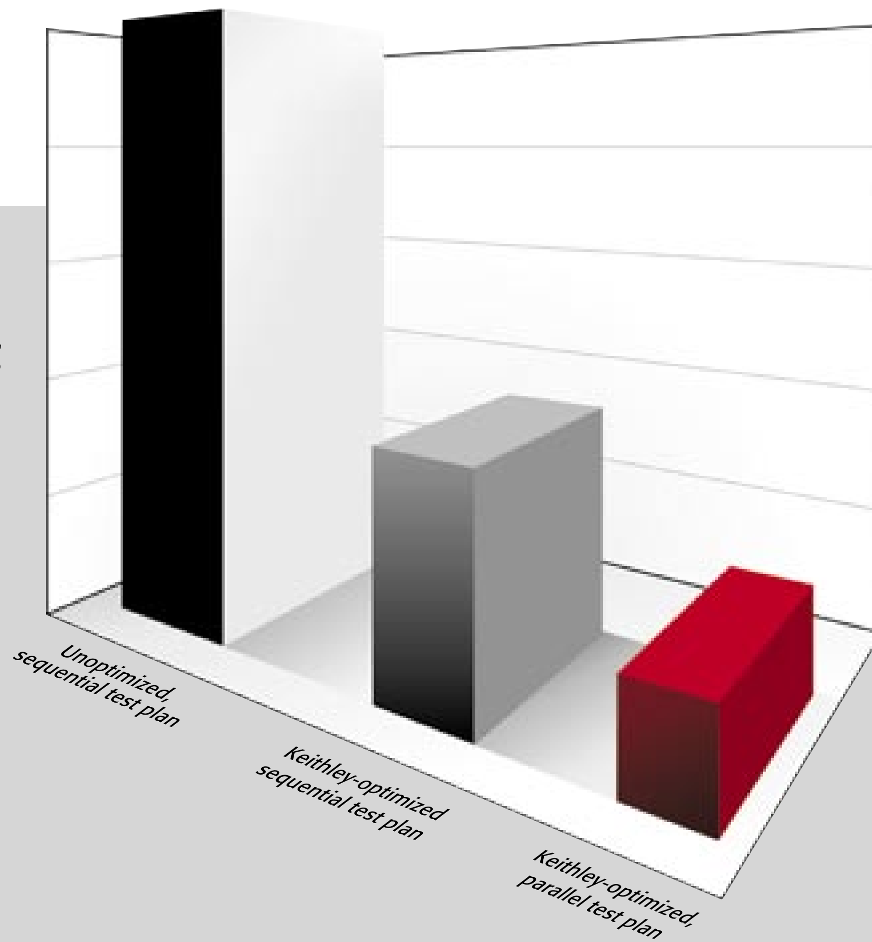
The correct probe-to-pad contact

All too often, apparent process failures are actually due to probing problems. The SofTouch solution included in the AdapTest and RF Options automates electrical verification of good probe-to-pad contact and extends card life by minimizing overdrive. Contaminated probe needles can also produce misleading results. A probe tip cleaning feature lets you program the S680 to initiate a cleaning cycle after a pre-set number of touchdowns or after SofTouch detects a probe contact failure. Together, these functions ensure tester-related effects are eliminated before AdapTest reconfigures the test sequence.

Complete, fully integrated operational model for the parametric test cell



Parallel testing shortens test times



Higher measurement sensitivity starts at the probe tip

The S680 supports all major 200mm and 300mm probers from prober manufacturers that include Accretech/TSK, TEL, and Electroglas. Keithley offers several probe card options for DC testing and two options for combined DC and RF testing, all manufactured by leading probe card suppliers. A patented card design ensures faster measurements, minimizes dielectric absorption, and delivers fully guarded Kelvin connections to all pins. Our highest performance card, the Model 60239-PCC, features ceramic micro-strip blades to ensure low leakage and superior low current sensitivity.

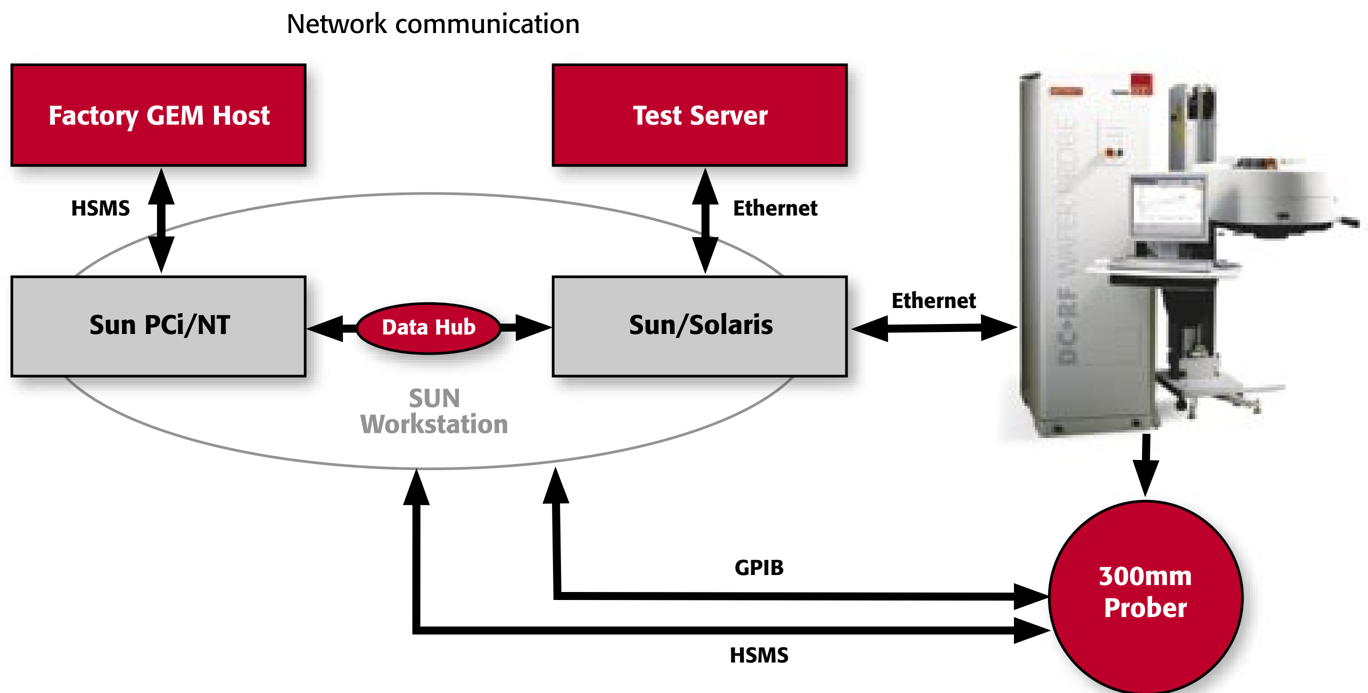
The S680 can query a probe card before starting a test plan, then stop testing if the wrong card is installed or if it needs maintenance.

Complete, compliant SECS/GEM automation

The S680 is fully compliant with SEMI and GJG automation standards for 300mm factory automation, including E5, E30, E37, E39, E40, E84, E87, E90, E94 and E95. The robust single-wire implementation is flexible for local and remote use cases. It also allows the S680 to deliver a complete operational model that's fully integrated with your overall automation environment, so you can take full advantage of the capabilities in our Probe Card Manager, Recipe Manager, and AdapTest software options.

We customize our standard automation package to match your unique operational needs and workflow, so you'll never have to change your operating methods to match our solution. We'll also work with the suppliers of your prober, Manufacturing Execution System (MES), and yield management database to deliver a complete, integrated solution that's right for you.

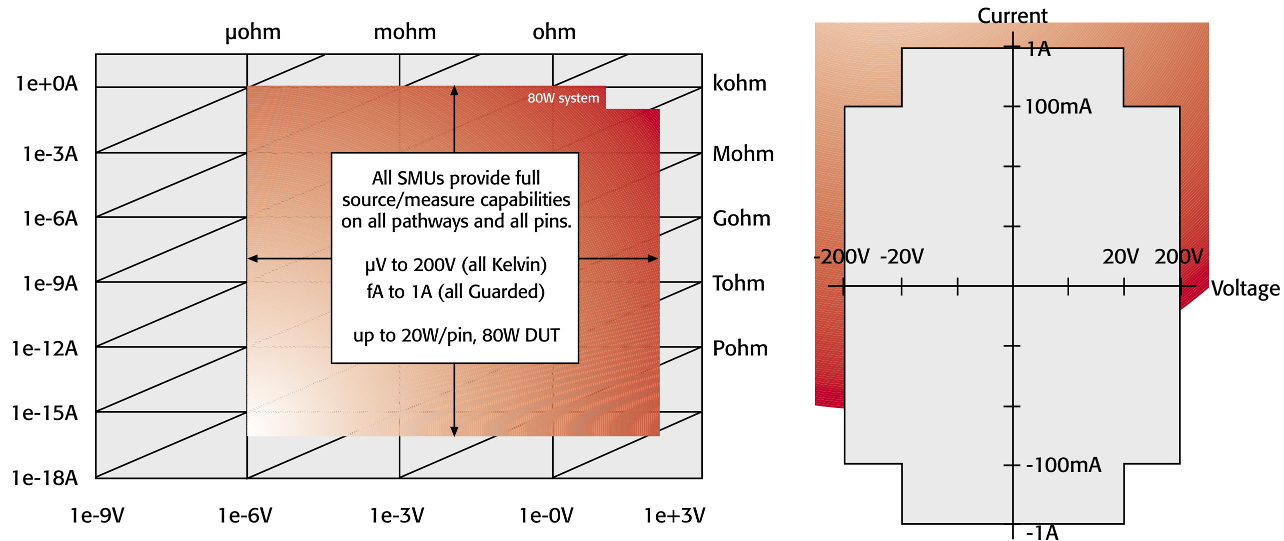
Fully compliant 300mm SECS/GEM automation



We customize our standard automation package to match your unique operational needs and workflow, so you'll never have to change your operating methods to match our solution.

Condensed specifications

DC capability (up to 8 SMUs)	• 0.1fA and 0.1µV measurement resolution • 1A and 200V maximum output • All channels and all pins are high resolution and high power
Parallel testing	• Up to nine devices within a single probe touchdown
RF	• 40GHz (non-extrapolated) • Uses standard production prober
Fast C-G per-pin testhead option	• 1fF to 2nF measurement range • 1nS to 1000µS measurement range • 100kHz frequency, 45mV AC bias • Compensation includes probe card
LCR option	• 1pF to 100nF measurement range • 1kHz, 10kHz, 100kHz, and 1MHz frequencies • Compensation includes probe card
Spectrum analyzer option	• 9kHz to 3GHz frequency range • 1kHz to 1MHz resolution bandwidth • <100µV noise level (typical)
Frequency counter option	• 1MHz to 225MHz measurement range (AC coupled) • 50mV sensitivity (RMS sine wave at frequency counter input)
Pulse generator option	• 50ns to 999ms pulse width • 20ns to 200ms fall/rise time • ±20V output amplitude (20V peak-to-peak)
Standard Reference Unit option	• NIST-traceable calibration to the probe tip
Switching matrix (8 to 64 pins)	• All paths active guarded, shielded low current, and Kelvin • 60MHz (-3dB) bandwidth, eight 50Ω inputs available to all pins • 1GHz bypass option • Dedicated, guarded triax chuck connection • Built-in diagnostics requiring no external fixture
Probe card	• Ultra low leakage Kelvin probe card (1fA/V) • Standard Kelvin probe card



Are you ready to step up to S680 performance?

No matter where you're located, Keithley has the technology and the people nearby to meet the parametric test needs of your 200mm and 300mm fabs. Our growing list of successful parametric test customers located around the world, including Japan, Korea, China, Taiwan, Europe, and the United States, is your assurance of Keithley's commitment to support your current parametric test needs, as well as your emerging measurement requirements.

Tired of scrapping your testers every few years?
Keithley's extendable architecture offers you a cost-effective, long-term approach to parametric testing. Our world-class experts can help you choose the capabilities you need to handle today's test challenges, adapt them for tomorrow's emerging measurement needs, and control your cost of ownership dramatically.

Call Keithley 1-888-KEITHLEY (534-8453) or visit www.keithley.com to receive your FREE S680 technical data sheet.

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