The industry standard in on-wafer device characterization. Summit™ wafer probing systems.

Summit wafer probing systems allow you to access the full measurement range of your parametric test instrumentation. Noise, leakage, capacitance and measurement settling times have been greatly reduced, even when using a 48-pin probe card. Whatever your application: device characterization, wafer-level reliability, e-test, modeling, or yield enhancement, Summit probe stations assure best-in-the-world measurements.

CASCADE® MICROTECH

See It. Touch It. Measure It.®

Setting the Industry Standard for DC/CV Measurements

Superior Parametric Measurements

Your probe station should be "invisible" to your test results, allowing you to access the full measurement range of your parametric test instruments.

With Cascade, you get not only precision tools, but the analytical test experience, applications support, and continuing emphasis on advanced research that has led to the innovative Summit DC/CV Parametric Wafer Probing Systems. Cascade probe stations are designed for best-in-the-world measurements.

Noise, leakage, and measurement settling times have been greatly reduced with the 11000-series and 12000-series manual and semiautomatic stations, even when using a 48-pin probe card.

Cascade's Low-Leakage Probe Card System integrates directly with popular switches. The system offers up to 48-pin probing in a low-current, low-noise, and low-capacitance probing environment.

Patented MicroChamber®: Fast, Noise-Free, Measurements

By shielding the chuck from unwanted noise, and reducing stray capacitance, Cascade's patented MicroChamber eliminates electromagnetic and electrostatic interference, ensuring a dark, noise-free measurement environment.

Ideal for thermal applications, the MicroChamber's low volume allows fast dry air or nitrogen purging. All probe station controls reside outside the enclosed area so you can enjoy easy access to positioners, microscope, and chuck controls, while the DUT remains protected inside.

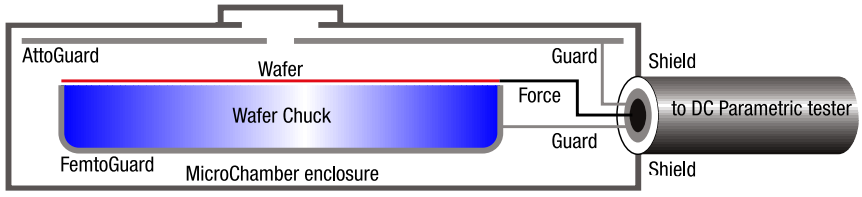
The patented MicroChamber revolutionized wafer probing. It enables over-temperature testing in a light-tight, noise-free, EMI-shielded environment.

Patented FemtoGuard®: Low Level DC Characterization

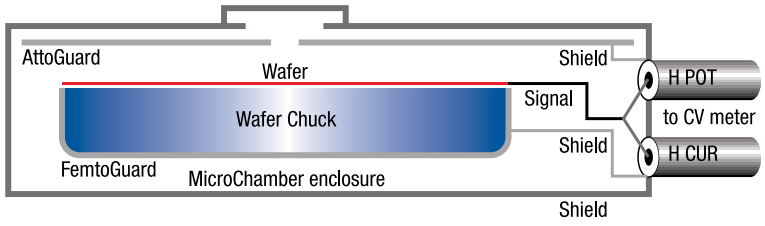
The FemtoGuard extends the IV instrument's triaxial guard around and under the wafer chuck, inside the shielded MicroChamber. With the FemtoGuard chuck and its triaxial connections, noise and leakage are significantly reduced to provide measurements down to 1 fA.

Patented AttoGuard®: Ultra Low Level CV and IV measurements

The new AttoGuard enhances measurement performance for both thermal and ambient characterization, even further than the FemtoGuard. Inside the MicroChamber the AttoGuard can be configured as an extended shield ground for CV or triaxial guard for IV measurements.



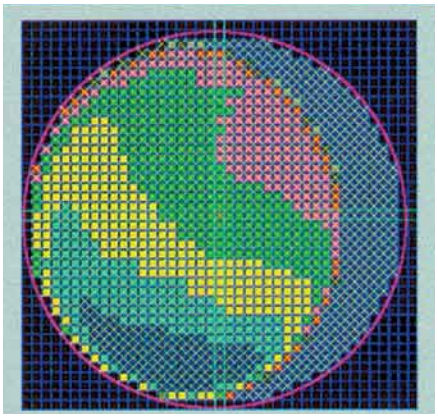
Patented AttoGuard configured for high-speed FemtoAmp IV measurements.



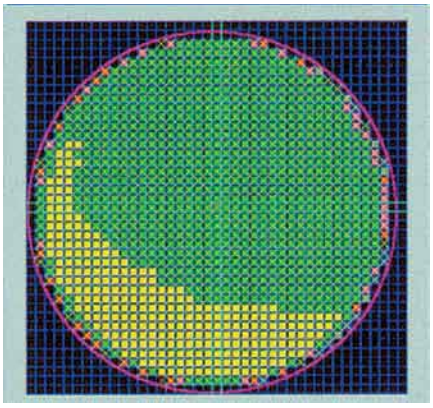
Patented AttoGuard configured for AttoFarad resolution CV measurements.

The AttoGuard®enhances system performance in 4 critical ways:

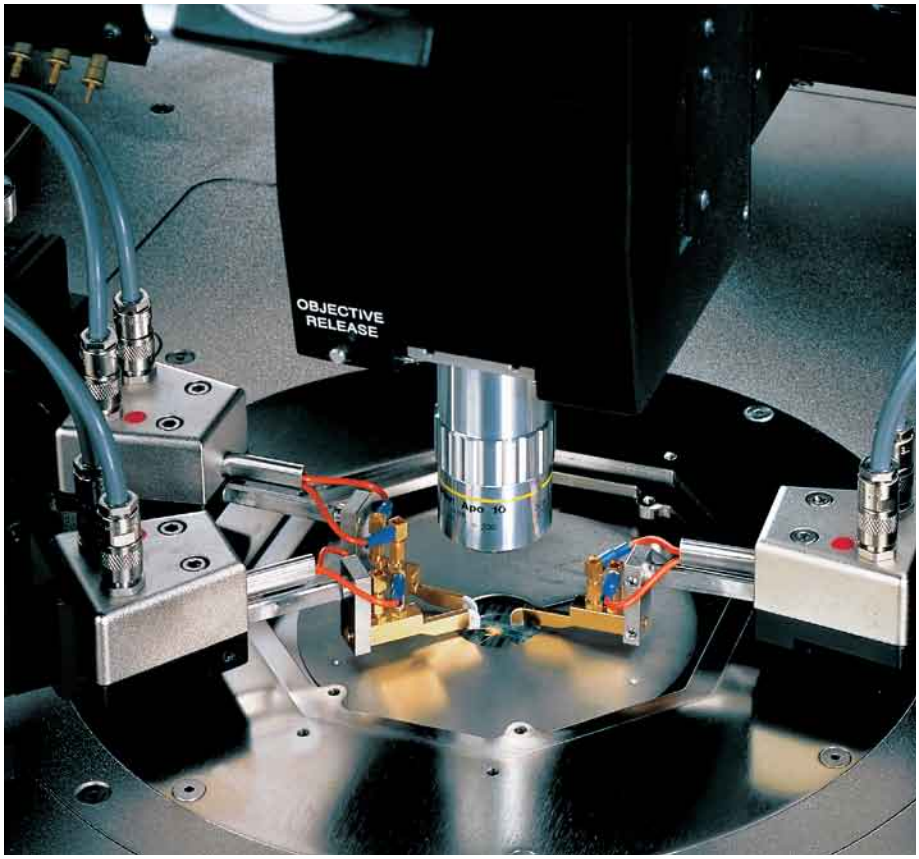
- 10 attofarad capacitance resolution: The AttoGuard surrounds the DUT with the CV instrument's quiet ground providing a complete shield. The full measurement range of high resolution CV meters is now attainable.
- Femtoamp level IV measurements: The AttoGuard is augmented with triaxial chuck connections for low noise IV measurements down to 1 fA.



Due to chuck positioning, residual capacitance variations are typically >30 fF without an AttoGuard. (Each colored bin on wafer map represents 1 fA.)

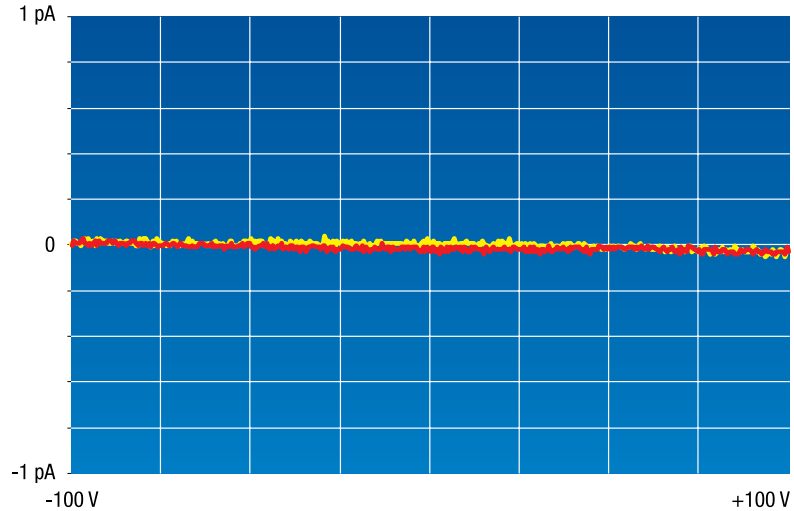


The AttoGuard reduces the residual capacitance variation of the chuck to <3 fF.



Cascade's AttoGuard completely shields the probes from the influence of the chuck and wafer below.

- Single zero CV measurements: Like a Faraday cage, the AttoGuard presents a constant potential to the wafer regardless of the position of the chuck minimizing capacitance variation to typically less than 1 fF. Complete wafer, topside-to-substrate measurements can be made with a single zeroing of the capacitance metering system reducing test time and errors.
- Faster ramped IV measurements: The AttoGuard reduces residual chuck capacitance from hundreds of pF to below 1pF. Orders of magnitude lower capacitive error currents and chuck settling time allow for very fast ramped IV substrate measurements.



Measurement data derived from 12860 AttoGuard chuck swept from -100V to +100 V and back in 0.5 V steps at 2V/second using an Agilent 4156B exhibits <50 fA total leakage noise and chuck hysteresis.

Leading Edge Probes and Probe Cards

Probe at 300°C Without Compromised Measurements

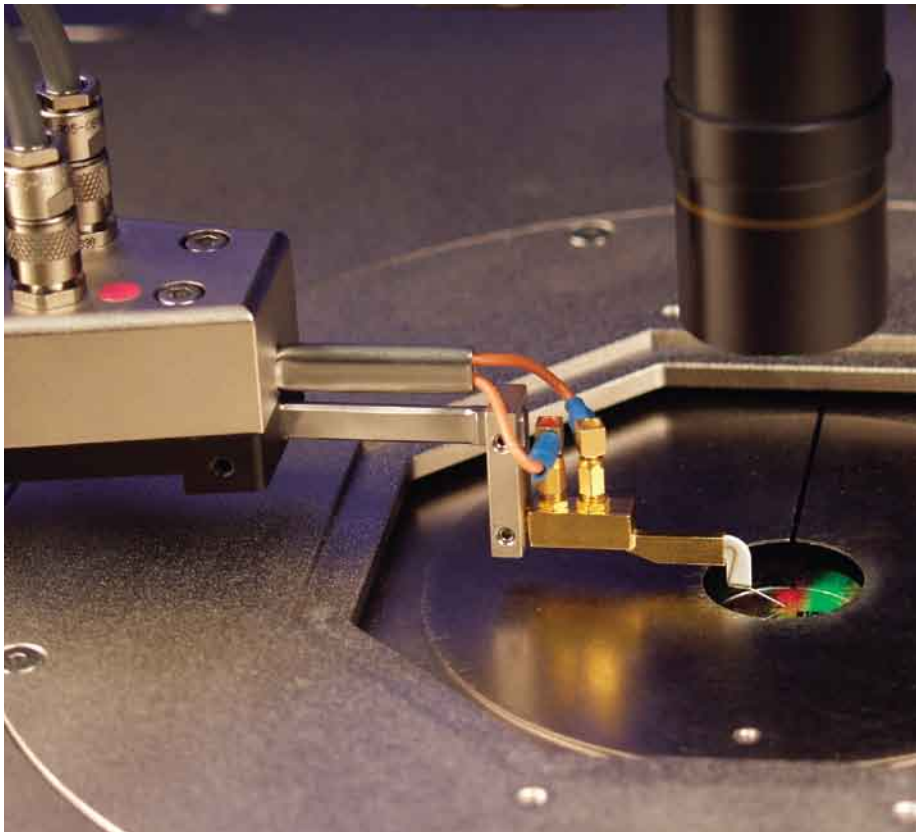
In addition to the standard -65°C to +200°C temperature range, Cascade offers wafer probing systems with up to 300°C operation and <50 fA probe and substrate noise.

The stations feature:

- High-temperature ceramic low-noise probes
- Electrically quiet thermal chuck
- Robust, integrated chuck service loop
- <50 fA noise and leakage over the complete temperature range

The new high-temperature systems are ideal for measurements such as those used to detect mobile ionic impurities, accelerate data-charge-loss-rate, measure electromigration, or characterize special high-temperature devices.

Plus, the system allows you to make femtoamp-level measurements with the thermal unit on. Most temperature units must be cycled off to make low-leakage measurements.



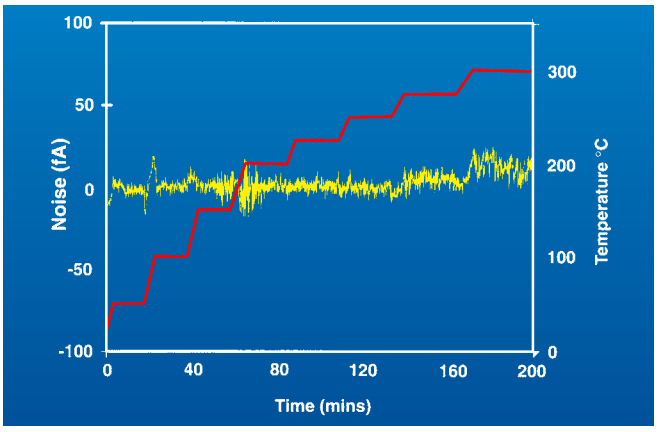
High-performance ceramic DCP Probes ensure less than ±10 fA of leakage + noise current over a -65°C to 300°C operating range.

Shorter Settling Times: Faster Throughput

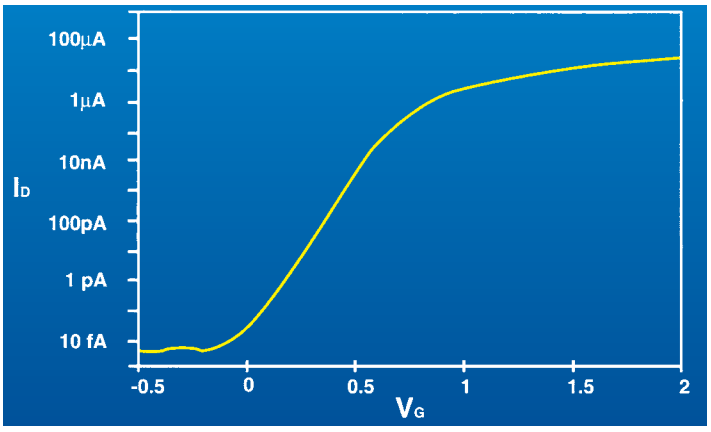
Cascade's new thermal chuck solves many of the challenges that plague existing 300°C systems. Chuck capacitance is reduced 25 times over existing systems, resulting in much shorter settling times and faster throughput. In addition, measurement integrity is increased by reducing the risk of test equipment oscillation.

High Performance Thermal DCP Probes

High-performance, thermal DCP probes (recommended for our 300°C systems) provide less than 10 fA leakage current over a -65°C to 300°C temperature range. With superior guarding and shielding, these probes overcome the performance limitations of non-coaxial needles.



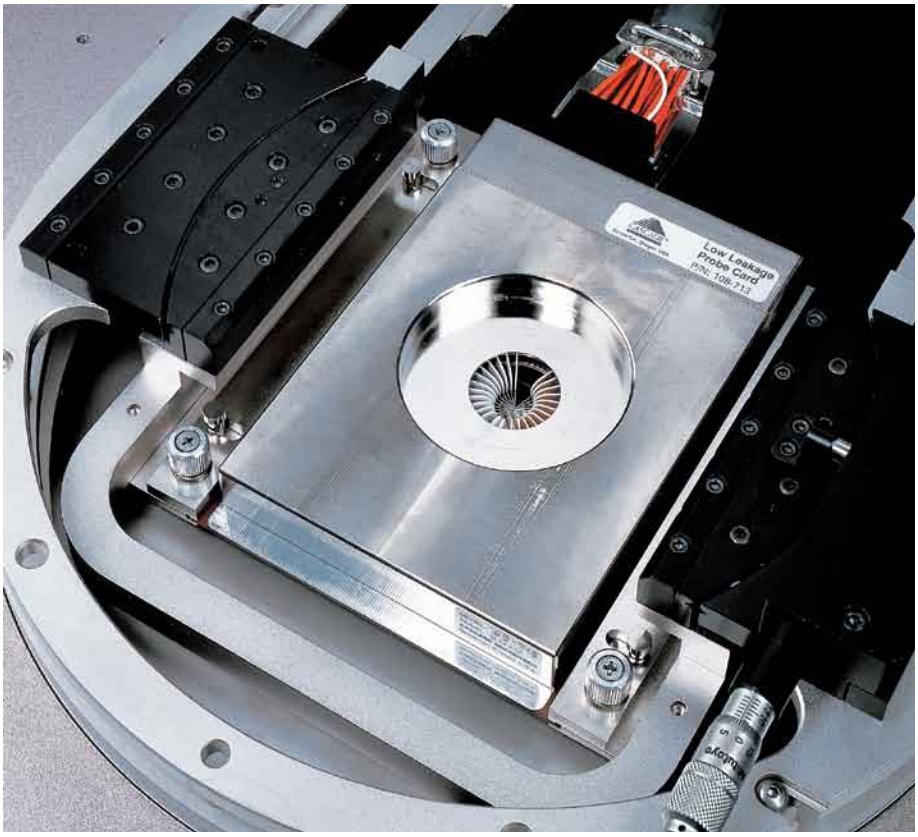
Even at 300°C the new system maintains low-noise, low-leakage performance on the chuck.



Make FemtoAmp subthreshold measurements with Cascade's high performance DCP Series Probes or 48-pin low-leakage probe cards.

Fast Settling, Low-leakage Probe Card

The Summit Low-Leakage Probe Card system, for use on Summit series probe stations, easily integrates with popular switches. It offers up to 36 pin probing in a fast settling, low-leakage, low-noise environment. Performance is not degraded when used with Cascade thermal probe stations. Its high temperature design allows it to be used at wafer chuck temperatures up to 300ºC. When used with the low-noise cable harness and the Microchamber, leakage is less than 1 fA per volt. A guarded connector block allows cards to be interchanged quickly and easily.



The Probe Card provides up to 48 low-leakage probes for measurements below 5 fA.

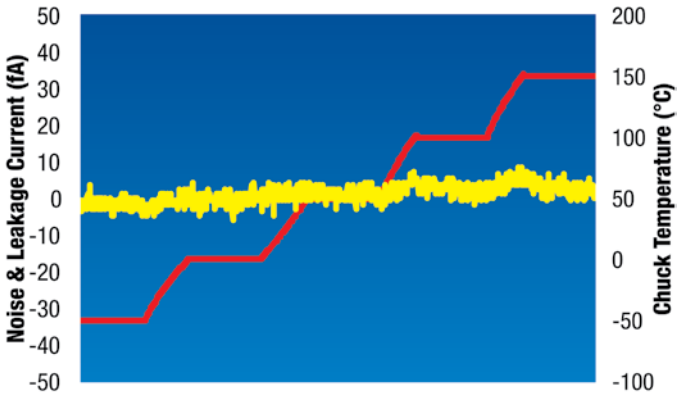
Probe Card Specifications

Dimensions:
  Width: 11.43cm (4.5 inch)
  Length: 15.24cm (6 inch)
Max. number of needles: 36
Tip diameter: 25 µm-(1 mil)
Tip Shape: Round polished
Probe needle material:
  Tungsten-Rhenium
Probe tip draft (below card):
  4.7mm-(.185-inch)

Max Operating Temperature: +300ºC
Recommended Overtravel:
  25-µm-(1-mil)
Max current/needle: 1 A
Leakage: 1-fA/Volt

Note: Operational performance is specified for MicroChamber stations only.

Hinges allow Cascade's Probe Card Holder to tilt up for easy probe card insertion.



Probe Card noise and leakage current from -50 C to 150 C is <5 fA.

Summit wafer probing systems allow you to access the full measurement range of your parametric test instrumentation

Sturdy Optics Mount Options

- 25 x 25 mm (1 x 1 in.) High stability tilt-back ideal for probing fine structures (shown in photo)
- 203 x 127 mm (8 x 5 in.) Linear lift ideal for array and large-area probing

Convenient Connection Panels

- Solid anchor for triax, dual triax and quadrax SMU cables - CV meter BNC cables
- Fast reconfigurability for various IV/CV test needs

High Performance DCP-Series Guarded Coax Probes

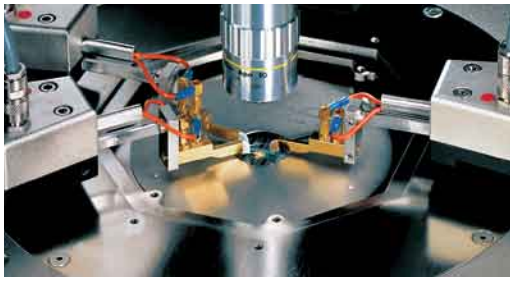
- <3 fA @ 100V leakage 100 fF capacitance
- -65 to +300°C
- Replaceable tips

Optional High Temperature Low-Leakage Thermal Chucks

- <20 fA noise + leakage
- Options include -65°C to +400°C
- Fast transition times

Patented AttoGuard

- Makes the station invisible to your IV and CV instruments
- <1 fA noise in triaxial IV measurement
- 10 aF resolution CV measurements



Patented MicroChamber

- Light-tight
- EMI/RFI shielded
- <15 minute purge

Versatile Nucleus™ Prober Control Software

- Easy-to-use GUI
- Extensive on-line help
- Customizable setups
- Voice Feedback

Fast Test/Measurement Automation

- Network, IEEE, DDE/OLE support
- Real-time wafer mapping
- Point-and-shoot probe plan

Seamless Test Software Integration

- Metrics IC/V
- HP VEE and IC-CAP
- LabVIEW and Windows/CVI

Improved Top Hat

- Set up in <1 minute
- 20% larger working area
- Optimized for all DC and AC measurement probes

Flexible Seals

- Accommodates up to 8 low noise probe positioners
- 53 mm *X-Y* microscope adjustment range
- Ensures light-tight and EMI integrity

Convenient Vacuum Control

- Primary chuck: selectable 0.5 in. to 8 in. diameter zones
- Auxiliary chucks: two independent switches

Safely Load and Unload Wafers

- *X-Y* motion control safety interlock
- IV instrument high voltage safety interlock
- Full wafer access via locking roll out stage

User-friendly Motion Control

- Closed loop *X-Y* stepper motors
- Full manual knob control
- Outside MicroChamber for noise-free measurements

Summit 1286X Probe Station complete with high-stability tilt-back bridge mount, microscope, positioners and Nucleus software.

Completing the Parametric Test Solution

Test Automation and Software

A complete DC/CV parametric test solution is composed of much more than just the best prober measurement system, and the best parameter analyzer, it's also the best test software and automation tools.

The Cascade Microtech parametric system can be expanded from a precision manual benchtop prober and parametric analyzer to a fully integrated automated measurement system complete with low leakage probe card, switch matrix, Summit semi-automatic Parametric prober, and Windows based software for maximum accuracy, productivity, and easy to use.

Integration Tools

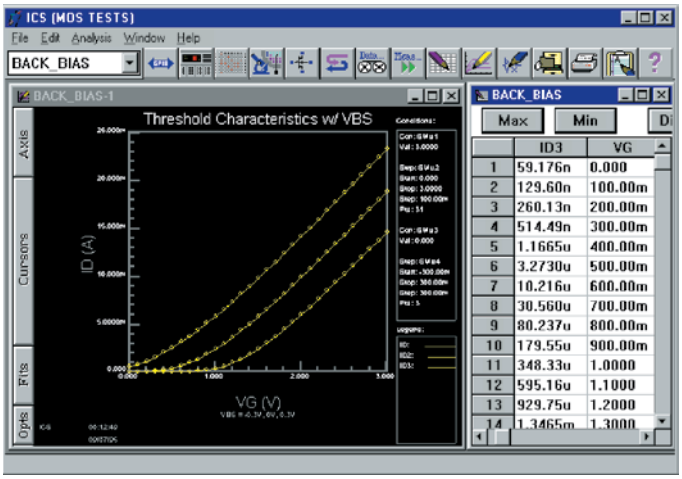
We partner with key semiconductor companies to provide integration tools to develop complete solutions. Whether you want to use an existing test software package or develop your own test software environment, Cascade provides a complete set of tools for an integrated solution.

A typical test solution includes the Summit Probe Station, Agilent Technologies test instrumentation, and compatible test executive software.

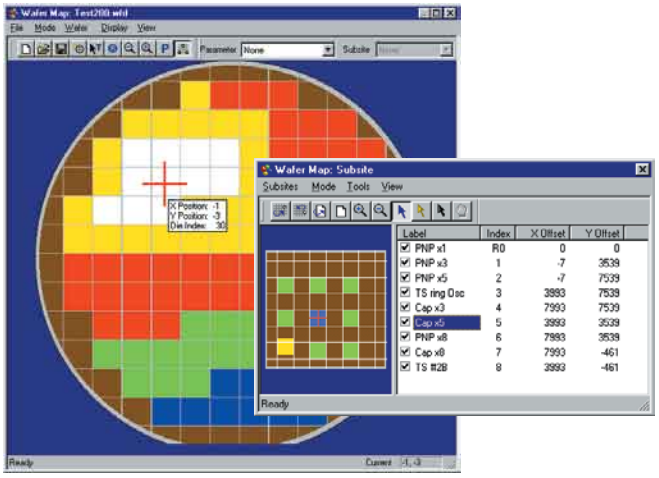
Support for Industry standard test software includes Wavevue, Metrics IC/V, HP IC-CAP, BTA Technology BSIMPro, RelPro+, Silvaco and UTMOST.

Drivers and sample programs are available for Agilent-VEE, LabVIEW, MS-Visual BASIC, and Agilent/TransEra BASIC for Windows.

The user-friendly, iconic-based Visual Engineering Environment, Agilent VEE is ideal for repetitive measurement automation, and custom test development.



Data collection and analysis are easy using the IC/V built-in graphical analysis and database, especially designed for semiconductor applications.



Automate test sequences with a wafer probe plan. Point and click to easily add or remove a test die, then start the probe plan using real-time graphical wafer mapping.

Extensive Probing Accessories for all Your Test Applications

Whether you need premium low-leakage triaxial cables, BNC to Triax adapters, or motorized probe positioners, Cascade has the accessories to complete your test solution. We thoroughly test and integrate both standard everyday accessories (like microscopes, and thermal tools) through to the highest performance accessories needed for critical CV/IV measurements.

Customization Solutions

Even though a full range of accessories are available, custom solutions are often needed to solve specific customer tests or applications.

Therefore, we have a special group of engineers dedicated to developing custom solutions. Specific examples of CV/IV solutions include Agilent 4062 test head docking, custom triax wiring harness for low leakage probe cards, and Keithley probe ring and MOSAID tester integration.

The Agilent 4062 fully integrates with the Summit line of probe stations.

We provide system installation, and system verification, on-site training, and extensive application support through our worldwide application engineering group, and application note publications.

Probe on the fly with fully automated MS1 positioners.

Worldwide Customer Training and Applications Support

A complete solution also involves customer training and worldwide seminars, which are a big part of Cascade's commitment to increase our customers' productivity. Cascade offers responsive, in-depth, superior, analytical test experience and applications support.

A wide range of technical bulletins, application notes, and technical briefs can be accessed on our World Wide Web site.

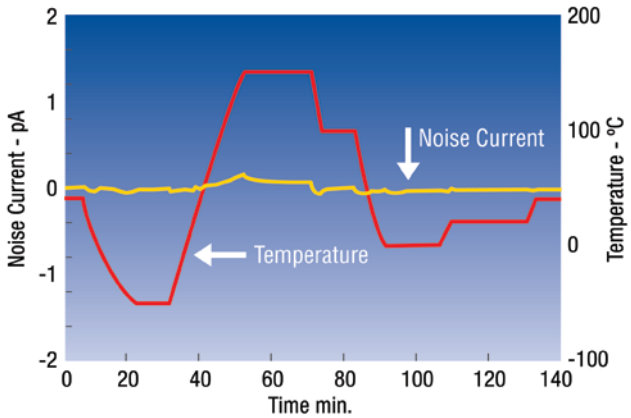
One-on-one applications support is available on the phone and through on-site visits. Plus on-site installation and training is available worldwide.

A worldwide presence enables us to respond quickly and comprehensively to the changing needs of an international marketplace.

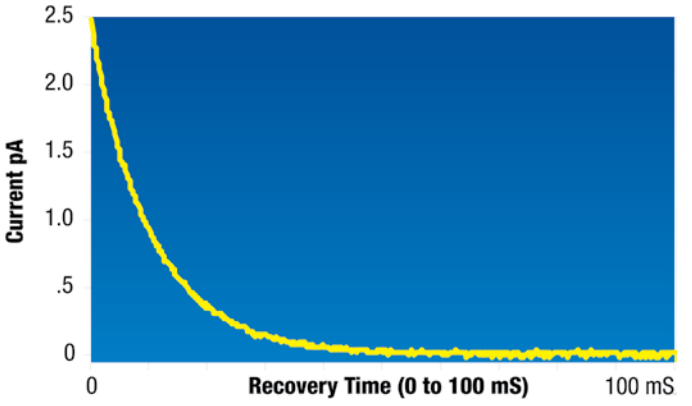
We offer complete test cables accessories for uncompromised measurement integrity.

Summit Measurement Advantage

Measurement	Common Problem	Summit Measurement Advantage
Cox- C-V measurement	Capacitance varies depending on probe or chuck location. LCR meter must be zeroed at each site	Extended probe tip shielding along with MicroChamber assures <3 fF capacitance variation over entire chuck surface. No need for zeroing
Hot-Carrier Induced Gate Leakage	Long measurement settling time	Ultra-low-capacitance Summit probes and probe cards reduce settling time to milliseconds
Icp - Gate Charge-Pumping	Wafer chuck adds noise to substrate, limiting substrate current measurement	Summit AttoGuard chuck allows 1 fA substrate current measurements
TVS - Triangular Voltage Sweep	EMI from thermal chuck heater perturbs DUT measurement area	Summit FemtoGuarded thermal chuck reduces perturbations providing up to 3,000x more sensitivity for mobile charge detection
Hfe - Gummel Plot	High capacitance (pF range) causes DV/DT errors; very slow voltage sweeps must be used	Ultra-low capacitance probes and accessories allow fast, error-free sweeps
High-temperature device characterization	High-capacitance chuck results in long measurement settling times and possible test equipment oscillation	Guarded chuck reduces chuck capacitance by 50 times. Guaranteed compatibility with Agilent parametric testers
WLR high-temperature reliability measurements	Temperature unit must be cycled off to make low-leakage measurements	fA level leakage measurements can be made with the thermal unit on, providing increased throughput
High-voltage measurement tests	Wafer chuck breakdown at high voltage	Summit stations can be provided with high isolation, high-voltage chucks and accessories



Cascade's 12860 probe station chuck noise over-temperature.



Due to the PicoFarad residual capacitance of the AttoGuard chuck, the recovery time from 100 V step is <50 fA in <50 milliseconds.

Parametric System Performance

Model Number	Thermal Systems	Probe Leakage + Noise P-P		Probe Card Leakage + Noise		Chuck Leakage + Noise P-P		Chuck Residual Capacitance	C variation
		off	on	off	on	off	on		
11550, 12550		1 fA	—	<5 fA	—	<20 fA	—	20 pF	30
11560, 12560		1 fA	—	<5 fA	—	<1 fA	—	0.2 pF	3
11740, 11740-6, 12740, 11740-6	✓	1 fA	<10 fA	<5 fA	<10 fA	<20 fA	<200 fA	75 pF	30
11750, 11750-6, 11750HT, 12750, 12750-6, 12750HT	✓	1 fA	<10 fA	<5 fA	<10 fA	<1 fA	<50 fA	50 pF	30
11860, 12860	✓	1 fA	<10 fA	<5 fA	<10 fA	<1 fA	<20 fA	1 pF	3

Probe Station Performance

Travel: 203 mm x 203 mm (8 in. x 8 in.)
Resolution:
11000-Series: 5 mm/turn (0.2 in.)
12000-Series: 0.1 µm (.004 mils)
Repeatability: < ±1 µm (0.04 mils)
Speed: >51 mm/sec (2 in./sec.)
Accuracy: < ± 2 µm (0.08 mils)
Bearings: crossroller

Z stage

Travel: 5 mm (200 mils)
Resolution: 1 µm (0.04 mils)
Repeatability: ≤ ±1 µm (0.04 mils)

Chuck

Size: 203 mm (8 in.) diameter or 152 mm (6 in.)
Material:
Nickel or gold-plated aluminum
2 integrated auxiliary stages: independent vacuum controls
Flatness: thermal chuck 25 µm non-thermal 10 µm

Facility Requirements

Vacuum: 400 mm (15 in.) of Hg min.
Dry air purge: (thermal systems only) 4.3 liters/sec (9 SCFM)
Compressed air (tilt-back bridge only): 0.1 liters/sec (0.2 CFM @ 55 psi. min.)
Power: 115 V @ 2 A, 230 V @ 1 A

Dimensions

Station: 76 cm (W) x 68 cm (D) (30 in. x 27 in.)
Typical height to eyepieces: 58 cm (23 in.)
Net weight: 165 kg (360 lb.)

Typical Probe System Configuration

- Bridgemount
- Microscope
  - StereoZoom
  - Mitutoyo FS60
  - A-Zoom
- System Controller
- Positioners
- Thermal Controller
- Probes
- Video System

Typical CV/IV System Configuration

- Summit 12000-series station
- Low-Leakage Probe Card
- Probe Card Holder
- Agilent E5250 Switching Matrix
- Metrics IC/V Software
- Agilent 4156 DC Parameter Analyzer
- Agilent 4284 LCR Meter

Regulatory Compliance

All Summit series stations conform to CE mark and are ETL listed.

For More Information

Refer to the *DC/CV Configuration Guide* and the *Summit Station Configuration Guide* for accessories and the *Technical Specifications for Summit Stations* for more in-depth specifications.

Also, refer to the *Nucleus Prober Control Software Data Sheet* for more information on station control software.

Ordering Information

Please refer to the 200 mm System Ordering Sheet for ordering information (SUMMIT-TO-0706).

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