

High-Power Probes

High-voltage/current probes and accessories

DATA SHEET

Cascade Microtech's high-power probes provide a complete on-wafer solution for over-temperature, low-contact resistance measurements of power semiconductors. Together with Tesla on-wafer power device characterization system, Cascade Microtech's high-power probes achieve reliable and repeatable on-wafer measurements up to 300 A and 10,000 V.

Safety Notice: The probes discussed within this data sheet are designed to be used on Cascade Microtech Tesla on-wafer power device characterization systems that incorporate a light curtain, safety interlocks and other features required for the safe use of these types of probes. These probes are only meant to be used on Tesla systems or probing systems that have the same or substantially equivalent safety features. If there is any uncertainty with regard to the safety requirements for your application of these types of products or the safety features of your probing system(s), please consult with your company's safety officials.

HIGH-POWER PROBE SELECTION GUIDE

	UHP	HCP		HVP		
		HCP-1B	HCP-BNC	HVP-3T	HVP-3C	HVP-13
Current	Up to 300 A	100 A	40 A	2 A	5 A	2 A
Voltage	Up to 10,000 V	500 V	500 V	3,000 V (Triax)	3,000 V (Coax)	1,500 V (Triax) 3,000 V (Coax)
Typical residual resistance	≤ 5 mΩ	10 mΩ	10 mΩ	200 mΩ	30 mΩ	30 mΩ
Typical probe life	100,000 touchdowns	100,000 touchdowns	100,000 touchdowns	NA	NA	NA
Probe configuration	single, parallel	single, parallel	single	single	single	single
Typical pad material	AlSiCu, AlSi, Al	AlSiCu, AlSi, Al, Au*	AlSiCu, AlSi, Al, Au*	AlSiCu, AlSi, Al, Au*	AlSiCu, AlSi, Al, Au*	AlSiCu, AlSi, Al, Au*
Connector type	Insulated HV Banana plug	Dual Banana plug	BNC	Coaxial (Agilent HV Triax)	Coaxial (SHV)	Coaxial (Amphenol 11/16-24)
Replaceable tip	Yes	Yes	Yes	Yes	Yes	Yes
Configurable tip	Yes	No**	No**	No	No	No

* Can be used on Au with BeCu Tips.

** Configurable tip available as a special request.

UHP PROBE

Cascade Microtech's Ultra-High-Power Probe (UHP), a high-voltage parametric probe, handles both high voltage (up to 10,000 V) and high current (up to 600 A) at a wide temperature range (-55°C to 300°C). The UHP achieves full I-V characterization with one setup and one touchdown. Together with Tesla on-wafer power device characterization system, the UHP fully utilizes the high-voltage/current capability of Agilent B1505A and N1265A Ultra High Current Expanders.

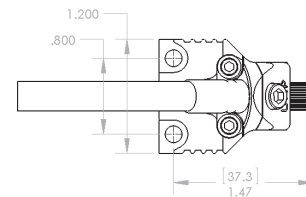
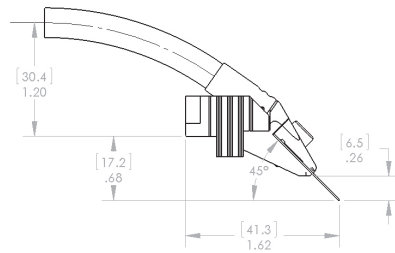
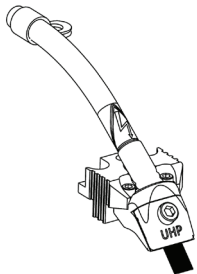


- Coaxial measurements up to 10,000 V and 300 A pulsed (20A DC), without the need for multiple probes and multiple measurement setup changes
- Innovative multi-finger tip design to achieve even distribution of current and minimize pad damage
- Probe current can be doubled up to 600 A when using double probe configuration
- Highly reliable, stable and repeatable measurements with Agilent B1505A and N1265A Ultra High Current Expander

UHP Probe Holder

Maximum voltage	10,000 V DC at 200°C, 8,000 V at 300°C
Maximum current	300 A pulse (600 A in a parallel configuration) / 20 A DC
Operating temperature range	-55°C to 300°C
Connector type	High-voltage Banana (4 mm)
Length of cable	1 m
Positioner compatibility	SUMMIT™ RF positioners
Probe residual resistance	≤ 5 mΩ
Probe insulation resistance	> 10 TΩ at 25°C (chuck temperature) > 3 TΩ at 200°C (chuck temperature) > 1 TΩ at 300°C (chuck temperature)

Physical Dimensions



UHP Probe Tips

Typical contact resistance on AlSiCu	<p>< 2 mΩ (AlSiCu metal layer) for 12 fingers</p> <p>< 3 mΩ (AlSiCu metal layer) for 8 fingers tip</p> <p>< 6 mΩ (AlSiCu metal layer) for 4 fingers tip</p> <p>< 30 mΩ (AlSiCu metal layer) for 1 fingers tip</p>	
Tip material	Tungsten	
Recommended range of overtravel	125-250 μm	
Scrub	~150 μm (at 300 μm overtravel)	
Finger width	Approximately 250 μm	
Finger pitch	650 μm	
Probe tip layouts	12 fingers (300 A)	7400 μm width
	8 fingers (200 A)	4800 μm width
	4 fingers (100 A)	2200 μm width
	1 finger (25 A)	250 μm width

HCP PROBE

Cascade Microtech's High-Current Probe (HCP) reduces probe and/or device destruction at high currents. It supports 10 A DC and up to 100 A of pulsed current. By design, the probe tip minimizes contact resistance at the wafer-to-probe interface to prevent device heating at the tip. The innovative multi-finger probe tip design distributes current evenly over multiple contact points and is joined by a single heat sink that pulls heat from the probe tip.

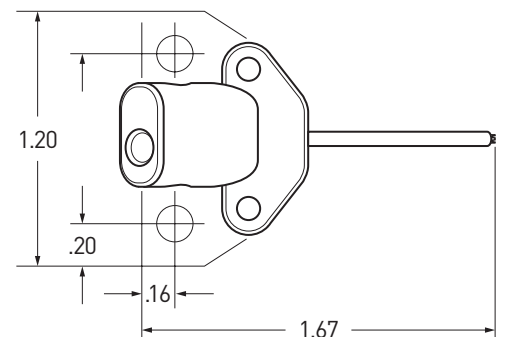
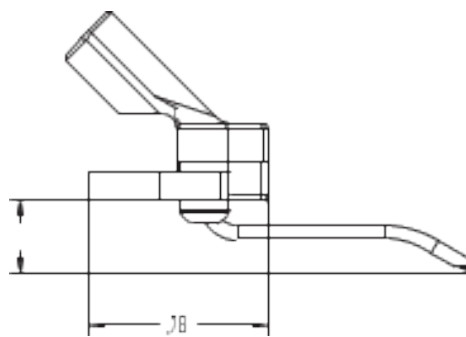
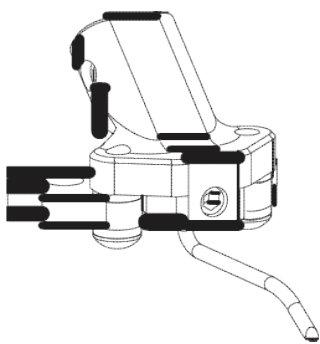
- Minimal contact resistance at the pad-tip junction to reduce heating during measurements, with fewer probe marks
- Measure devices on wafer at high-current conditions over a wide temperature range (-55°C to 300°C)
- Small scrub minimizes damage on Al pad
- Small footprint - tip for small pad probing down to 1 mm x 1 mm pad



HCP Probe Holder

Maximum voltage	500 V DC
Maximum current (DC)	10 A
Maximum current (pulse)	100 A, 1 msec max PW, 1% max duty cycle (BNC: 40 A, 1 msec max PW, 1% max duty cycle)
Total resistance with tip	10 mΩ (typical)
Operating temperature range	-55°C to 300°C
Isolation resistance	> 100 GΩ at 500 V
Connector type	Dual banana jack or BNC
Length of cable	1 m (BNC: 0.76 m)
Positioner compatibility	Summit RF positioner

Physical Dimensions

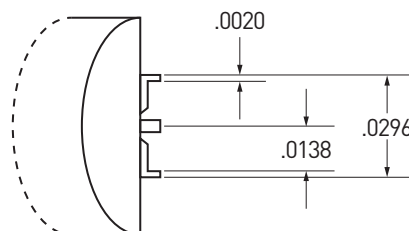
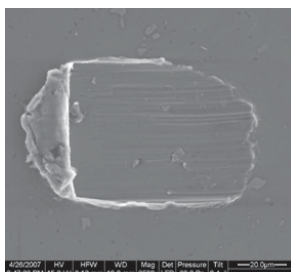


HCP Probe Tips

Typical contact resistance on Al	20 mΩ
Tip material	Tungsten
Recommended range of overtravel	75-125 μm
Contact force	20 grams per tip (60 grams total) at 100 μm overtravel
Scrub	75 μm

Typical Scrub Mark on Al Pads

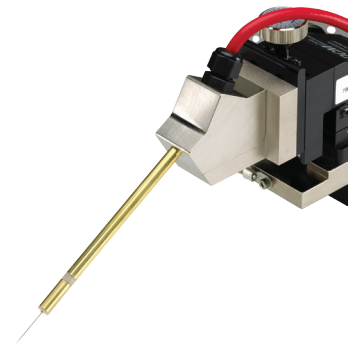
The Tesla system HCP probe has been specifically designed for the purpose of minimizing contact resistance, while reducing the amount of probe damage and/or destruction of the device under test. Pictured here is a typical scrub mark on Al pads.



HVP PROBE

To ensure precision measurements of today's high-voltage devices, Cascade Microtech's High-Voltage Probes (HVP) provide increased isolation resistance and dielectric strength by incorporating advanced internal isolation materials, as well as custom cabling and connectors. When used with Tesla on-wafer characterization system, the HVP assures low-noise electrical performance and full triaxial capability at high voltage without any breakdowns.

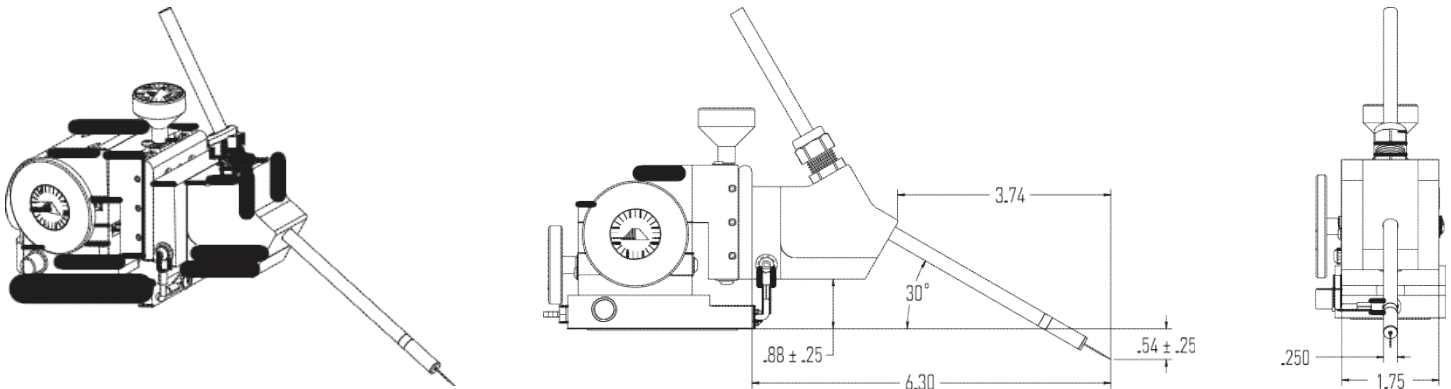
- Accurate coaxial and triaxial measurements up to 10,000 V for a much better understanding of device leakage in the off state
- Highly reliable, stable and repeatable measurements over a wide temperature range (-55°C to 300°C)
- Field-replaceable tips available in a variety of diameters to accommodate device dimensions



HVP Probe Holder

Maximum voltage guarded (triaxial)	3,000 V DC
Maximum voltage unguarded (coaxial)	10,000 V DC
Maximum current	5 A pulse / 1 A DC
Operating temperature range	-55°C to 300°C
Isolation resistance (force to guard)	> 1 TΩ at 3,000 V
Typical residual capacitance (with PTT needle)	> 0.5 pF
Cable characteristics	Approximately 50 Ω (48 Ω)
Connector type	Amphenol triax threaded 11/16-24 , SHV, UHV, or Agilent high-voltage triaxial connector (connector may limit maximum voltage performance)
Replaceable tip type	Straight PTT style needles
Recommended range of overtravel	50 μm to 100 μm
Scrub	20 μm to 40 μm
Positioner compatibility	DPP series positioners

Physical Dimensions



Typical High-Voltage Triaxial Probe Noise (HVP-3T)*

	10 V				3,000 V			
	- 55°C	25°C	200°C	300°C	- 55°C	25°C	200°C	300°C
Noise	30 fA	30 fA	30 fA	30 fA	100 fA	100 fA	100 fA	100 fA

Typical High-Voltage Coaxial Probe Leakage (HVP-3C)

	10 V				3,000 V			
	- 55°C	25°C	200°C	300°C	- 55°C	25°C	200°C	300°C
Noise	≤ 10 pA	≤ 10 pA	≤ 10 pA	≤ 10 pA	≤ 200 pA	≤ 200 pA	≤ 200 pA	≤ 200 pA

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Data subject to change without notice

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