

Cascade Microtech, Inc.

SPECIFICATION SHEET



The industry's first
complete system for
on-wafer power device
characterization

Tesla

On-Wafer Power Device Characterization System

Designed specifically for accurate power device measurements at the wafer level, the Tesla on-wafer power device characterization system is engineered to provide probing levels of up to 3,000 V (triaxial), 10,000 V (coaxial) and 100 W/cm². It supports a measurement temperature range of -55 °C to 300 °C. In combination with Cascade Microtech's patented MicroChamber®, the Tesla features a high-power, gold-plated chuck to ensure low-contact resistance, thin-wafer handling and power dissipation; all while providing a low-noise, fully guarded and shielded test environment. To ensure the utmost safety during a high-voltage measurement, the Tesla employs an infrared laser light curtain and safety interlock system.



SYSTEM SPECIFICATIONS

POWER HANDLING (CHUCK)

Max voltage	3,000 V (triaxial), 10,000 V (coaxial)*
Max current	100 A (pulsed), 10 A (DC)
Power dissipation	100 W/cm ² at -40 °C

*Maximum 5,000 V (coaxial) with T200-STA-AP stations

MEASUREMENT PERFORMANCE (TRIAxIAL)

	10 V			1,100 V			3,000 V		
	25 °C	200 °C	300 °C	25 °C	200 °C	300 °C	25 °C	200 °C	300 °C
Chuck leakage	50 f	50 f	50 f	2 p	5 p	5 p	2 p	5 p	15 p
Probe leakage	< 10 f	150 f	300 f	< 1p	15 p	20 p	< 1p	15 p	20 p

MEASUREMENT PERFORMANCE (COAXIAL)

	10 V			3,000 V			10,000 V		
	25 °C	200 °C	300 °C	25 °C	200 °C	300 °C	25 °C	200 °C	300 °C
Chuck leakage	10 p	50 p	100 p	3 n	30 n	50 n	5 n	50 n	100 n
Probe leakage	1 p	15 p	30 p	100 p	500 p	1 n	N/A	N/A	N/A

PHYSICAL DIMENSIONS	DIMENSION	WEIGHT
300 mm probe station (anti-vibration table integrated)	128 cm (W) x 120 cm (D) x 165 cm (H) (51 inch x 47 inch x 65 inch)	1090 kg (2,400 lb.)
200 mm probe station (without anti-vibration table)	76 cm (W) x 68 cm (D) (30 inch x 27 inch)	165 kg (360 lb.)
200 mm probe station on anti-vibration table	117 cm (W) x 114 cm (D) x 166 cm (H) (46 inch x 45 inch x 65.5 inch)	651 kg (1,435 lb.)

MECHANICAL PERFORMANCE	200 MM	300 MM
Travel	203 mm x 203 mm (8 inch x 8 inch)	301 mm x 301 mm (11.9 inch x 11.9 inch)
Resolution	0.1 μm (0.004 mils)	0.1 μm (0.004 mils)
Repeatability	$< \pm 1 \mu\text{m}$ (0.04 mils)	$< \pm 1 \mu\text{m}$ (0.04 mils)
Speed	51 mm/second (2 inch/second)	100 mm/second (4 inch/second)
Accuracy	$< \pm 2 \mu\text{m}$ (0.08 mils)	Precision mode: $< \pm 0.3 \mu\text{m}$ (0.012 mils) Standard mode: $< \pm 2 \mu\text{m}$ (0.08 mils)
Bearings	Cross roller	Air
Z stage travel	5 mm (200 mils)	10 mm (400 mils)
Z stage resolution	1 μm (0.04 mils)	0.1 μm (0.004 mils)
Z stage repeatability	$\leq \pm 1 \mu\text{m}$ (0.04 mils)	$\leq \pm 1 \mu\text{m}$ (0.04 mils)

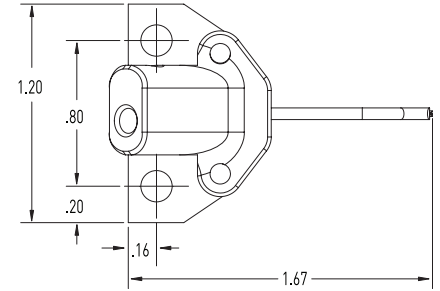
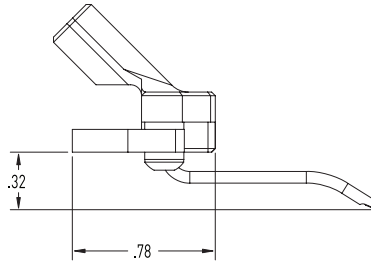
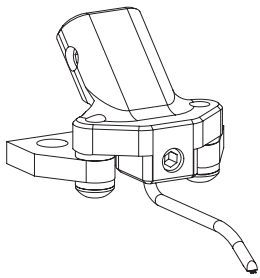
THERMAL CHUCK SYSTEM	200 MM	300 MM
Size	8 inch (203 mm) diameter	12 inch (301 mm) diameter
Material	Gold-plated	Gold-plated
Flatness	$< 15 \mu\text{m}$ at ambient, $< 40 \mu\text{m}$ at 200 $^{\circ}\text{C}$	$< 10 \mu\text{m}$ at ambient, $< 30 \mu\text{m}$ at 200 $^{\circ}\text{C}$
Supported wafer thickness	$\geq 100 \mu\text{m}$	$\geq 100 \mu\text{m}$
Supported wafer diameter	Shards or wafers from 3 inch (76.2 mm) through 8 inch (203 mm)	Shards or wafers from 2 inch (50 mm) through 12 inch (301 mm)
Temperature range	-55 $^{\circ}\text{C}$ to 300 $^{\circ}\text{C}$, 20 $^{\circ}\text{C}$ to 300 $^{\circ}\text{C}$, 20 $^{\circ}\text{C}$ to 200 $^{\circ}\text{C}$, ambient	-55 $^{\circ}\text{C}$ to 300 $^{\circ}\text{C}$, 20 $^{\circ}\text{C}$ to 300 $^{\circ}\text{C}$, 20 $^{\circ}\text{C}$ to 200 $^{\circ}\text{C}$, ambient
Accuracy	$\pm 1.0 \text{ }^{\circ}\text{C}$	$\pm 1.0 \text{ }^{\circ}\text{C}$
Thermally controlled area	$\pm 1.5 \text{ }^{\circ}\text{C}$	$\pm 1.5 \text{ }^{\circ}\text{C}$
Transition rate (from -55 $^{\circ}\text{C}$ to 300 $^{\circ}\text{C}$)	36 minutes	49 minutes

STATION CONTROLLER	200 MM	300 MM
System controller with Intel processor (standard)	P/N 125-014	P/N E3-CTL1
System controller with AMD processor (optional)	P/N 125-013	P/N E3-CTL2

FACILITY REQUIREMENTS	200 MM	300 MM
Vacuum	400 mm (15 inch) of Hg minimum	400 mm (15 inch) of Hg minimum
Clean Dry Air (CDA) for station	250 liters/minute (Dew point: -40 $^{\circ}\text{C}$ at 8 STP)	2-8 liters/second (6 SCFM)
Clean Dry Air (CDA) for thermal system	350 liters/minute (Dew point: -40 $^{\circ}\text{C}$ at 8 STP)	
Power	115/230 VAC at 10 A (at power outlet strip)	100/120 V at 2-5 A (50/60 Hz), 200/240 V at 1 A (50/60 Hz)
Safety interlock	Instrument interface for electrical interlock	Instrument interface for electrical interlock

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
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
Positioner compatibility	Summit™ RF Positioner

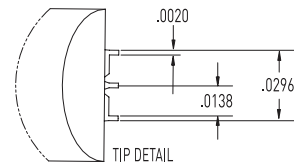
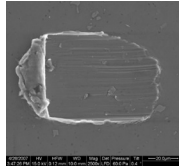


HCP PROBE TIPS

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

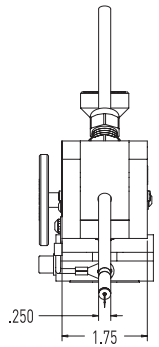
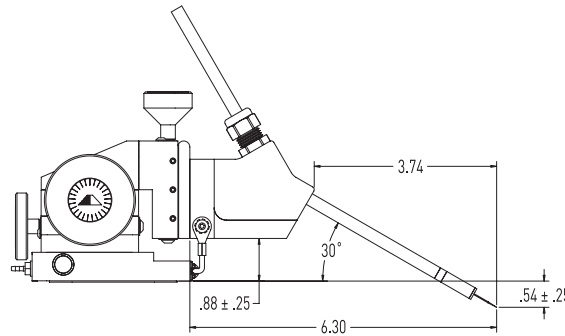
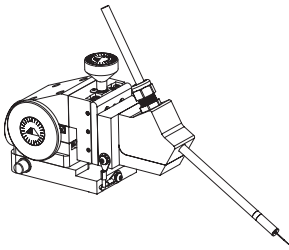
TYPICAL SCRUB MARK ON AL PADS

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 HOLDER

Maximum voltage guarded (triaxial)	3,000 V DC
Maximum voltage unguarded (coaxial)	3,000 V DC
Maximum current	20 A pulse / 1 A DC
Operating temperature range	-55 °C to 300 °C
Isolation resistance (force to guard)	> 1 TΩ at 3,000 V (with optional triax-to-coax cable: P/N 144-526)
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, or Agilent high-voltage triaxial connector
Replaceable tip type	Straight PTT style needles
Recommended range of overtravel	50 μm to 100 μm
Scrub	20 μm to 40 μm
Positioner compatibility	DCM family positioner
Physical dimensions	



HIGH-VOLTAGE CABLES

	144-527 (TRIAxIAL)	144-526 (COAXIAL)
Maximum voltage	3,000 V	3,000 V
Maximum current	10 A	10 A
Length	3 m	3 m
Isolation resistance	1 TΩ at 1,100 V (F-G) 100 GΩ at 1,100 V (G-S)	1 TΩ at 3,000 V (F-G)
Connector style	Jumbo amphenol triaxial RG58A type, threaded, 11/16-24 high-voltage BNC triaxial plug	Jumbo amphenol triaxial RG58A type, threaded, 11/16-24 high-voltage MHV cable plug

AVAILABLE STATION MODELS

Tesla Semi-Automatic 200 mm Probe Station	P/N T200-STA-AP	P/N T200-STA-M
MicroChamber for dark, dry and enhanced EMI-shielding enclosure	●	●
PureLine™ technology for premium signal path fidelity	●	N/A
AttoGuard® for enhanced I-V and C-V testing	●	N/A
Roll-out wafer stage for safe and easy wafer loading	●	●
High-stability platen with linear lift	●	●
Four-axis precision motorized stage	●	●
User guides, tools and accessories	●	●
Universal power cord kit	●	●
Nucleus™ Prober Control Software	●	●
Complete automation tools – AutoAlign, AutoDie, AutoXYZT correction	●	●
Thermal control, video window, wafer map, remote access	●	●

Tesla Manual 200 mm Probe Station	P/N T200M-STA-AP	P/N T200M-STA-M
MicroChamber for dark, dry and enhanced EMI-shielding enclosure	●	●
PureLine technology for premium signal path fidelity	●	N/A
AttoGuard for enhanced I-V and C-V testing	●	N/A
Roll-out wafer stage for safe and easy wafer loading	●	N/A
High-stability platen with linear lift	●	●
Precision manual X-Y stage	●	●
User guides, tools and accessories	●	●

Tesla Semi-Automatic 300 mm Probe Station	P/N T300-STA-AP	P/N T300-STA-M
Microscope bridge/transport – programmable, 75 mm (3 in. x 3 in.) – E3-ST75P	●	●
Microscope bridge/transport – motorized, 75 mm (3 in. x 3 in.) – E3-ST75	N/A	●
Premium control kit (LCD, manual XY controls) – E3-PCK	●	N/A
AUX chuck kit – E3-AUX	●	N/A
Computer accessory mount kit, 20 inch LCD monitor and ergonomic arm	●	●
Intel controller – E3-CTL1	●	●
Standard height kit – E3-SHK	●	●

AVAILABLE CHUCK MODELS

To complete the station configuration:

1. Select a modular chuck from the following non-thermal or thermal list.
2. Select a matching thermal system if a thermal chuck is desired.

High-Power 200 mm Chuck	PART NUMBER	DESCRIPTION
Non-thermal chuck	TC-002-402	FemtoGuard™ triaxial chuck, 200 mm (8 inch)
Thermal chuck	TC-302-402	FemtoGuard triaxial chuck, -55 °C to 200 °C (direct-cooled ESPEC), 200 mm (8 inch)
	TC-212-402	FemtoGuard triaxial chuck, -55 °C to 300 °C (air-cooled ERS), 200 mm (8 inch)
	TC-202-402*	FemtoGuard triaxial chuck, 20 °C to 300 °C (air-cooled ERS), 200 mm (8 inch)
	TC-202-402*	FemtoGuard triaxial chuck, ambient to 300 °C (air-cooled ERS), 200 mm (8 inch)

*Select 20 °C to 300 °C chuck for TS-202-05T thermal system, and ambient to 300 °C chuck for TS-202-02T thermal system.

High-Power 300 mm Chuck	PART NUMBER	DESCRIPTION
Non-thermal chuck	TC-001-402	FemtoGuard triaxial chuck, 300 mm (12 inch)
Thermal chuck	TC-211-402	FemtoGuard triaxial chuck, -55 °C to 300 °C (direct-cooled ERS), 300 mm (12 inch)
	TC-311-402	FemtoGuard triaxial chuck, -50 °C to 300 °C (air-cooled CMI), 300 mm (12 inch)

AVAILABLE CHUCK MODELS

CONTINUED

Tesla Thermal System (200 mm)

PART NUMBER	DESCRIPTION
TS-302-07P	Thermal system, -55 °C to 200 °C, direct-cooled ESPEC (200/230 VAC, 50/60 Hz)
TS-212-14P	Thermal system, -55 °C to 300 °C, air-cooled ERS (200/230 VAC, 50/60 Hz)
TS-202-05T	Thermal system, 20 °C to 300 °C, air-cooled ERS (100/230 VAC, 50/60 Hz)
TS-202-02T	Thermal system, 30 °C to 300 °C, air-cooled ERS (100/230 VAC, 50/60 Hz)

Tesla Thermal System (300 mm)

PART NUMBER	DESCRIPTION
TS-211-14P	Thermal system, -60 °C to 300 °C, air-cooled ERS (200/230 VAC, 50/60 Hz)
TS-211-05T	Thermal system, 20 °C to 300 °C, air-cooled ERS (100/230 VAC, 50/60 Hz)
TS-211-02T	Thermal system, 30 °C to 300 °C, air-cooled ERS (100/230 VAC, 50/60 Hz)
TS-311-02T	Thermal system, 30 °C to 300 °C, air-cooled CMI (200/230 VAC, 50/60 Hz)
TS-311-14P	Thermal system, -50 °C to 300 °C, air-cooled CMI (200/230 VAC, 50/60 Hz)

MICROSCOPE MOUNT OPTIONS

Tesla T200 Station Platform (200 mm)

	P/N 123-224	P/N 149-950
High-stability bridge/transport	Programmable	Manual
Travel X-Y	50 mm x 50 mm (2 inch x 2 inch)	50 mm x 50 mm (2 inch x 2 inch)
Travel X-Y in TopHat™	13 mm x 13 mm (0.5 inch x 0.5 inch)	13 mm x 13 mm (0.5 inch x 0.5 inch)
Type	Stepper motor with closed-loop encoder system	N/A
Resolution X-Y	0.4 µm (0.016 mils)	5 mm (0.2 inch)/turn, coaxial XY control
Repeatability X-Y	≤ 2 µm (0.08 mils)	N/A
Accuracy X-Y	≤ 5 µm (0.2 mils)	N/A
Speed X-Y	5 mm (0.2 inch)/second	N/A
Planarity	10 µm (0.4 mils) over full travel with 5 kg (11 lb.) load	10 µm (0.4 mils) over full travel with 5 kg (11 lb.) load
Z gross lift	Tilt-back, pneumatic with up/down, for easy probe access	Tilt-back, pneumatic with up/down, for easy probe access
Z gross repeatability	1 µm (0.04 mils)	1 µm (0.04 mils)
Z focus	Coarse/fine focus uses microscope system, programmable focus available	Coarse/fine focus uses microscope system
LASER compatible	Yes	Yes

Tesla T300 Station Platform (300 mm)

	P/N E3-ST75P	P/N E3-ST75	P/N E3-ST50
High-stability bridge/transport	Programmable	Motorized	Manual
Travel XYZ	76 mm x 76 mm x 152 mm (3 inch x 3 inch x 6 inch)	76 mm x 76 mm x 152 mm (3 inch x 3 inch x 6 inch)	51 mm x 51 mm x 51mm (2 inch x 2 inch x 2 inch)
Travel in TopHat	13 mm x 13 mm (0.5 inch x 0.5 inch)	13 mm x 13 mm (0.5 inch x 0.5 inch)	13 mm x 13 mm (0.5 inch x 0.5 inch)
Z lift	152 mm (6 inch)	152 mm (6 inch)	152 mm (6 inch)
Resolution X-Y	0.4 µm (0.02 mils)	0.4 µm (0.02 mils)	N/A
Resolution Z	0.08 µm(0.003 mils)	0.08 µm(0.003 mils)	N/A
Repeatability X-Y	≤ 2 µm (0.08 mils)	N/A	N/A
Repeatability Z	≤ 1 µm (0.04 mils)	≤ 1 µm (0.04 mils)	N/A
Accuracy X-Y	≤ 5 µm (0.2 mils)	N/A	N/A
Accuracy Z	≤ 4 µm (0.16 mils)	N/A	N/A
Speed	5 mm (0.2 inch)/second	5 mm (0.2 inch)/second	N/A

STATION ACCESSORIES

Microscope/video system
Vibration isolation table
Integrated infrared light curtain and safety interlock system
LCD monitor and stand kit
Key board and mouse tray
Side shelf
Scope mount
Objective lens
Probe card holders
RF and DC probes, needles and probe cards
RF and DC cables and adapters
RF and DC probe positioners
Calibration software and standards
Vacuum pump and air compressor

PROBING KIT

Probing kit includes necessary accessories, such as high-current/voltage probes, probe holders, positioners and interconnect cables for typical vertical and lateral device measurement setup.

High-voltage and high-current probing kits are available for both 200 mm and 200 mm Tesla systems.

Probing Kit for Agilent B1505A

ITEM	DESCRIPTION
High-current probe package	HCP high-current parametric probe holder with BNC connector (quantity of two) Replaceable probe tips (box of five) Probe micropositioner (quantity of two)
High-voltage probe package with Kelvin sense capability	HVP high-voltage parametric probe holders with SHV connectors (quantity of three), or with Agilent triaxial connectors (quantity of two) Replaceable probe tips (box of 25) Probe micropositioner (quantity of five)
System interface panels	Agilent B1505A accessory mounting kit
Cables	Basic cable kit for Agilent B1505A accessory connection, including probe-to-panel, panel-to-chuck and chuck-to-instruments cables

Probing Kit for Iwatsu CS 3xxx Curve Tracers

ITEM	DESCRIPTION
High-current probe package	HCP high-current parametric probe holder with banana jack (quantity of two) Replaceable probe tips (box of five) Probe micropositioner (quantity of two)
High-voltage probe package with Kelvin sense capability	HVP high-voltage parametric probe holders with SHV connectors (quantity of five) Replaceable probe tips (box of 25) Probe micropositioner (quantity of five)
System interface panels	Iwatsu CS 3xxx front panel connection assembly
Cables	High-voltage triaxial/coaxial interconnect cables, including probe-to-panel and chuck-to-panel cables

Probing Kit for Keithley Equipment

ITEM	DESCRIPTION
High-current probe package	HCP high-current parametric probe holder with banana jack (quantity of two) Replaceable probe tips (box of five) Probe micropositioner (quantity of two)
High-voltage probe package with Kelvin sense capability	HVP high-voltage parametric probe holders with Amphenol triaxial connectors (quantity of three) Replaceable probe tips (box of 25) Probe micropositioner (quantity of three)
System interface panels	High-voltage interface panel (triaxial) High-current interface panel
Cables	High-voltage triaxial cable package, including probe-to-panel, panel-to-instrument and chuck-to-instruments cables

REGULATORY COMPLIANCE

Certification	NRTL, CE, Semi S2
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WARRANTY

Warranty*	Fifteen months from date of delivery or twelve months from date of installation
Service contracts	Single and multi-year programs available to suit your needs

*See Cascade Microtech's Terms and Conditions of Sale for more details.

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