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Detailed Technical Specifications for Power Device Characterization System

1. **Power Device Characterization System- Parameter Analyzer (Power device curve tracer/analyser mainframe)**

• Key Generic Requirements:

a. The tenderer must provide an installation scheme showing the physical space (footprint) of the item(s) as well as space required for routine access and all installations including related accessories.

b. The vendor should have installed at least two similar types of systems in centrally funded technical institutes or government research labs. Purchase order (PO) and user list should be provided as supporting evidence.

c. The compliance sheet should be provided by the vendor. The absence of the compliance sheet may result in the cancellation of the purchase order.

d. For each compliance, supporting evidence such as manuals and other necessary and supporting documents needs to be provided.

a. The vendor should have an Indian representative which can take care of the urgent troubleshooting or any queries on an urgent basis.

e. Installation and training of the system should be demonstrated.

• Technical Specifications (Generic):

The primary purpose of the equipment is to measure high voltage and high current data of on-wafer as well as packaged high power devices such as transistors, diodes, IGBTs based on conventional and emerging wide-bandgap semiconductors such as GaN, SiC, Ga_2O_3, diamond etc.

i. High Voltage and High current Parameter Analyzer

ii. High Voltage and High current Probe Station

iii. Accessories

The above components can be from different manufacturers but should be quoted item-wise in a single bid/quotation.

- **Technical Specifications (Specific):**

A. PARAMETER ANALYZER

1. The mainframe system should include automated measurement collection and data storage/extraction with latest analysis software. Software upgrades should be assured for the first three years after installation for the mainframe. (Power device curve tracer/analyser mainframe)

2. Rack mount kit for Power device curve tracer/analyser mainframe.
3.0m cable
50Hz Line Frequency

3. Medium Power Source/Monitor Unit Module

4. High Voltage Source Monitor Unit

5. Medium Current Source Monitor Unit

6. Multi Frequency Capacitance Measurement Unit Module

7. Ground Unit with Triax Cable

8. High Voltage Source Monitor Unit Cable (1.5m), Packaged DUT Test Fixture and Associated Accessories, Accessories for instruments and fixtures

9. HV Plug connector Panel Mount

10. SHV Cables (3 Nos., Minimum length of 1.5m)

11. Cable for 500A Ultra High Current Probing

12. High voltage Bias Tees

13. High voltage Bias Tees- STD

14. Protection adapter for High Power Source Monitor Unit (HV-Triaxial output), R-BOX for Power Device Analyser

15. HV Triaxial to SHV Adapter

16. Ultra-High Current Expander Fixture and Adapter

17. Ultra-High Current Expander Fixture and Adapter 001

18. Universal R-Box

19. Thermocouple, Type K

20. High Voltage Source Monitor Unit Current Expander

21. On-Wafer Gate Charge Measurement Adapter

22.On-site installation and training, Free mainframe calibration should be included for the first three years

Measurement Modules, Numbers and Specifications as given in Table below

No.	Measurement Module	Quantity	Main Specifications
1	Medium Power SMU	1	• Up to 100 V, 100 mA force • 10 fA current resolution
2	High Voltage SMU	1	• 1500 V/8 mA;3000 V/4 mA (Pulsed & DC)
3	Medium current SMUs	6	• 1 A/30 V (Pulsed); 100 mA/30 V (DC)
4	High Voltage SMU Current Expander	1	• 1500 V / 2.5 A (Pulsed), 2200 V/ 1.1 A (Pulsed)
5	Ultra-High Current Expander	1	• 500 A/60 V (Pulsed), 7.5 kW peak power
6	Multi Frequency CMU	1	• 1 kHz to 5 MHz • 0 to ±25 V using internal DC bias • 0 to± 3000 V using HVSMU and High Voltage Bias-Tee
7	On-Wafer Gate Charge Measurement	1	-

B. PROBE STATION

22	**Probe System - FEATURES / BENEFITS**			
	A) Operator safety and device protection			
		i) Safety category 1 interlocks on a dark box door		
		ii) Dedicated chuck design for highest isolation		
		iii) Unique high-voltage probe arm design with protected guard area		
	B) Measurement accuracy			
		i) Low-noise test environment with EMI-shield concept extended for high-voltage, high-current and high-power applications		
		ii) Seamless integration with measurement equipment (parameter analyser) for best measurement accuracy		
	C) Low cost-of-ownership			
		i) Probe concept allows expansion for other applications such as RF (S-parameter) measurements		
		ii) Unique high-voltage and high-current probe arms designed for standard probe tips and/or replaceable HCP probe tips		
	Emi-Shielded Safety Enclosure Mounted on Table			
23	**POWER HANDLING (CHUCK)**			
		i) Maximum voltage: 3,000 V (triax) and 10 kV (coax) (Thermal Chuck: capable of 3 kV @ 200°C and 2.5 kV @ 300°C with triax)		
		ii) Maximum current: 100 A (pulsed) iii) Power cord		
	MEASUREMENT PERFORMANCE – Chuck Triaxial Configuration			
	Chuck (Triaxial Configuration)			
			Thermal Chuck*	
	i)	Chuck leakage	@ Ambient	@ 300 C
		a) 10V (typical)	100 fA	200 fA
		b) 3kV (typical)	10 pA	50 pA
	ii)	Chuck resistance	Ambient	
		a) Force-Guard (10 V)	25 TΩ	
		b) Force-Shield (10 V)	3 TΩ	
		c) Guard-Shield (10 V)	500 GΩ	
	iii)	Probe leakage	Ambient	
		a) 0 V (typical)	< 10 fA	
		b) 3 kV (typical)	< 1 pA	
	CHUCK SYSTEM			
		i) Diameter: 150 mm		
		ii) DUT sizes supported: 10 mm x 10 mm, 2 inch, 4 inch and 6 inch wafers		
		iii) Surface: Gold-plated		
		iv) Supported wafer thickness: ≥100 µm		
		v) Configuration: Triaxial design		

		vi) Universal connector for high-voltage and high-current measurements	
	THERMAL CHUCK SYSTEM		
		(i) Flatness: ≤10 µm at ambient, ≤ 30 µm at 200°C	
		(ii) Temperature range: +30°C to 300°C	
		(iii) Resolution: 0.1°C	
		(iv) Accuracy: ± 1°C and ± 1% above 100°C	
		(v) Transition rate (from 30°C to 300°C): ATT: 25 min	
		(vi) Dual triax connector for low leakage and vacuum structures for thin wafers	
	INTERFACE WITH PARAMETER ANALYSER		
24	Complete kit for interfacing with parameter analyser		
25	Test equipment interface to mount parameter analyser accessories and protection adapters- 2 HV Triax measurement Feed-throughs, support for HV-bias-T		
26	Mount for parameter analyser module selector		
27	Test Equipment Interface plate to mount accessories of ultra-high current/ultra-high voltage modules of parameter analyser		
28	**VIBRATION ISOLATION PLATFORM**		
29	**DIGITAL Camera with Monitor**		
		1/2.8" CMOS with C-Mount and mounting thread - Capture Resolution on SD-card: Still image: 8.0MP (3840 x 2160) Video: Full HD 1920 x 1080 - Live Display Mode through out USB: 1920 x 1080 (Full HD) @ 30 frames per second or HDMI: 1920 x 1080 (Full HD) @ 60 frames per second - Pixel Size: 2.8 x 2.8 microns Data transfer: HDMI (1080p) and USB 2.0 - SD card slot (maximal: 32 GB) Motic Images Plus 3.0 application software for PC and Mac 24" LCD monitor: HDMI, DisplayPort, VGA inputs - 178° wide-angle view, C-RING, Dust cap, Macro Tube, power supply, 4-dot calibration slide, Cord AC	
	MECHANICAL PERFORMANCE		
	A) Chuck Stage		
		i) Travel: 155 mm x 155 mm (6 inch x 6 inch)	
		ii) Resolution: 5 µm	
		iii) Planarity over 150 mm (6 inch): < 10 µm	
		iv) Load stroke, Y axis: 90 mm	
		v) Z height adjustment range: 10 mm	
		vi) Z contact / separation / load stroke: 0-3 mm adjustable	
		vii) Theta travel (fine): ± 8°	
	B) Platen		

		i) Platen space (typical): Universal platen: space for up to eight positioners	
		ii) Z-Height adjustment range: Maximum 20 mm (depending on configuration)	
		iii) Minimum platen-to-chuck height: 16 mm (universal platen)	
		iv) Separation lift: 200 µm	
		v) Separation repeatability: < 1 µm	
		vi) Vertical rigidity / force: 5 µm / 10 N (0.2 mils / 2.2 lb.)	
		vii) Accessory mounting: Magnetic	
	C) Manual Microscope Stage (On Bridge)		
		i) Travel range: 50 mm x 50 mm (2 inch x 2 inch)	
		ii) Resolution: ≤ 5 µm (0.2 mils)	
		iii) Microscopes: For stereo microscopes with large working distance	
	MICROSCOPE		
		i) Type: Trinocular stereo zoom	
		ii) Zoom range: 1 : 6.7	
		iii) Magnification: 15-100x	
		iv) Camera port For cameras with C-mount	
		v) Illumination: Long life-time LED ring light	
	SAFETY - Interlock		
		i) Interlock: Hardware (safety category 1)	
		ii) Interlock connector: BNC-Twinax (specific interlock cables available for various measurement instruments)	
31	**RF positioners, tips and cables (compatible for DC and RF setup)**		
		i) 6x Probe posnr, HV, 100tpi, magnetic base, left	
		(ii) HV/HC cables	
		iii) 2x High current probe holder with BNC connection and 5 replaceable probetips (up to 100A current)	
		iv) 6 probe holders with 2 x HVTriax and 3 x HV Coax (3KV) probes	
		v) 2 boxes of 12um and 25um tungsten needles (25 tips per box)	
		vi) 2x East/West RF arms	
		vii) High-voltage tesla chuck connection cable, high voltage chuck connector-Keysight	
		(viii) Hi-current probe holder (500V/10A DC/60A pulse) with operating temperature from -55C to 300C and isolation resistance >100G Phms @500V with cable and positioner capability	
		(ix) Tweezers, Tools and Accessories	
32		**One year system warranty and Two years extended warranty should be included. 3-year Warranty on the probe station and its accessories (except probe tips) should be included**	
33		**ON-SITE INSTALLATION AND TRAINING**	

- **Demonstration for onsite acceptance**

  Complete, integrated installation of the parameter analyser and the probe station should be demonstrted on-site. Full capability of the parameter analyser (current, voltage, capacitance and charge measurements) and its various modules and fixtures should be demonstrated on a test device (packaged and on-wafer) supplied by the vendor. Similarly, probe station capability in terms of the chuck temperature range (30 to 300 C) and high current, high voltage capability must be demonstrated.