

Technical Specifications for the Semiconductor Parameter Analyzer

1. Overview :

The Semiconductor Device Parameter Analyzer should have:

- I. 1 Multi-Frequency Capacitance Measure Unit (MFCMU).
- II. 4 Medium Power Source Measure Units (MPSMUs), out of which at least 2 SMUs should be of high resolution type (capable to measure minimum current of 10pA with a resolution of 1fA).
- III. 1 Pulse generator/pulse measure/Fast measurement unit.
- IV. An upgradability and support of at least 9 slot modules, or more and must allow upgrading with more SMUs if empty slots are available.
- V. System should have Kelvin connection at GND unit.
- VI. Ground unit with at least ± 4 A sink current, or higher
- VII. Must have a inbuilt touch screen display
- VIII. The same main frame must be upgradable to be used for high power device characterization in future up to 3kV and 1500A.
- IX. Must include necessary number of all kinds of connectors to connect various part of the system to other ports and 1.5m and 3m cables for connections.
- X. The capability to connect to standard probe stations, including but not limited to probe stations from, Ever Being, Cascade, Lakeshore, Jenis, etc,...

2. Detailed Specifications:

Sr. No	Unit	Specifications	No.
1	Multi frequency CV unit	<p><u>C-V measurement test signal:</u></p> <p><u>Frequency:</u></p> <ul style="list-style-type: none"> • 1 kHz to 5 MHz (or higher) frequency range with minimum 1 kHz frequency resolution. <p><u>AC amplitude</u></p> <ul style="list-style-type: none"> • Range: at least 10 mV (or lower) to 100 mV (or higher): rms • Resolution: at least 1 mV (rms), or better (higher resolution) <p><u>DC bias:</u></p> <ul style="list-style-type: none"> • Range: at least range -25 V to +25V, or higher • Resolution: at least 1 mV, or better (higher resolution) <p>Measurement parameters; Cp-G, Cp-D, Cp-Q, Cp-Rp, Cs-Rs, Cs-D, Cs-Q, Lp-G, Lp-D, Lp-Q, Lp-Rp, Ls-Rs, Ls-D, Ls-Q, R-X, G-B, Z-q, Y-q</p> <p>Sweep Characteristics:</p> <ul style="list-style-type: none"> • AC voltage, DC bias voltage, frequency • Sweep type: Linear, custom • Sweep direction: Up sweep, down sweep 	1

2	Quasi-static C-V (QSCV) Measurement	QSCV measurement with leak compensation.			--	
3	Medium Power SMUs (Power delivery 2W or more) (i) Medium Power High resolution SMU	Parameter	Source		Measure	2
	Current	Min.	±10 pA (or lower) with a resolution of 5fA.		±10 pA (or lower) with a resolution of 1fA.	
	Max.	at least ±100 mA (or higher) with a resolution of 5µA.		at least ±100 mA (or higher) with a resolution of 100 nA.		
Voltage	Min.	±500 mV (or lower) with a resolution of 25µV (or better).		±500mV (or lower) with a resolution of 0.5 µV (or better).		
	Max.	at least ±100V (or higher) with a resolution of 5 mV.		±100V (or higher) with a resolution of 200 µV or better.		
(ii) Medium Power SMU	Current	Min.	At least ±100 nA (or lower) with a resolution of 5 pA, or better.		At least ±100 nA (or lower) with a resolution of 100 fA, or better.	2
		Max.	±100 mA (or higher) with a resolution of 5 µA, or better.		±100 mA (or higher) with a resolution of 100 nA, or better.	
Voltage	Min.	±500 mV (or lower) with a resolution of 25µV (or better).		±500mV (or lower) with a resolution of 0.5 µV (or better).		
	Max.	at least ±100V (or higher) with a resolution of 5 mV.		±100V (or higher) with a resolution of 200 µV or better.		
<ul style="list-style-type: none"> All SMU should provide voltage/current in Bias; Common; Sweep; List sweep (custom point-by-point user-defined sweep); Step mode. SMU should able to apply pulse in mS range. 						
4	Ground Unit	A separate ground unit (not occupying any of the 9 slots) must be available with at least 4A sink current.				
5	IV- CV measurement switching unit	To switch between SMUs and CMU (including cables), to be able to perform I-V and C-V measurements without physically changing the connection.				

6	Pulse generator /fast measurement /waveform generator unit	<p>For pulse stress characterizations, Flash memory characterizations and NBTI, PBTI measurements.</p> <p>No. of channels: 2 (with the ability to obtain synchronized or independent fast current and voltage (I-V) measurements)</p> <p>Frequency range: at least 1Hz (or lower) to 30 MHz (or higher).</p> <ul style="list-style-type: none"> • Voltage amplitude range: Up to ± 10 V or more for source and measure. • Current range: 100nA (or smaller) to 10mA (or higher) for fast IV measurement. <p>Pulse period programmable: from at least 20 ns to higher.</p> <p>Pulse width programmable: Should be able to offer a minimum pulse width of 50 ns @ 10V source.</p> <p>Minimum Transition time: 20ns @ 10V range and 100 ns for higher voltage range.</p> <p>Sampling rate : 200 MS/s</p> <p>Programmable parameters: Pulse width, duty cycle, rise time, fall time, amplitude, offset. System should have built in current measurement facility.</p>	1
7	SMU- PMU- CVU switching unit.	System should have built in Capability to switch the measurements from IV, CV to Pulsed IV from select menu without changing the connections on the DUT. Must provide the switching capability between two SMUs and the pulse generator channels.	
8	I-V Sweep Mode with lab view controlled programs.	<p><u>At least the following:</u></p> <ol style="list-style-type: none"> 1. single and double staircase sweep, pulsed sweep, staircase sweep with pulsed bias, I/V-t sampling: at least 4000 measurement points, or more 2. C-V sweep, C-t Sweep, C-f sweep: at least 1000 measurement points, or more 3. list sweep, linear and log interval, bias hold and negative hold time 	
Other General specifications:			
9	<p>System must have convenient user interface preferably windows based.</p> <p>Interface for remote control: System should be supplied with the following interface and ports.</p> <ol style="list-style-type: none"> 1. GPIB, interlock, USB, LAN, trigger in/out, digital I/O 2. User interface options: Touch panel, knob, soft keys, USB, keyboard and mouse 3. Cable and any other accessory/software to interface USB to GPIB ports to control the unit using laptop etc.,_ 		
10	The instrument software/firmware	Same software must be able to run on user computer to control the instrument and perform measurements. Also software must be able to	

	must have both offline and online capability.	run on user computer for offline setup and analysis of collected data. The software/firmware must be capable to control the instrument from external PC.	
11	Must have readymade setups for most commonly used devices.	For testing FETs, Flash memory, NBTI/PBTI, BJTs, diodes, etc,.. System should have feasibility to write different customized test routine for hardware configuration. System should have facility to modify or write user test modules.	
12	Sequencing	Must have the capability to sequence multiple tests without any programming effort.	
13		Must have capability to sweep the source using the scroll knob on the instrument enabling real time device characterization	
14		System should have CD/DVD writer and USB port to safely take the data out of the instrument.	
15	Control from Remote PC	FLEX, VXI plug & play, built-in graphical programming environment	
16	Support: Device modeling software, instruments, and prober	The equipment should be compatible with: a. device modeling software b. network analyzer, c. Must be able to control standard prober system, including but not limited to probe stations from Ever Being, Cascade, Lakeshore, Jenis, etc.,.	
17	Future Upgradability	System should be upgradable to: 1. high current device measurement (at least 40 A, or higher). 2. high voltage device measurement (at least 3kV, or higher)	
18	Cables	The following cables (supporting low current measurements at least below 1 pA) should be supplied. Triaxial cables: 1.5 m length 3 m length Coaxial cables: at least 3-m-length, or longer GPIB cable of at least 2-m-length	10 4 10 2
19	Adaptors/ Connectors	The following connectors (supporting low current measurements, at least below 1 pA) should be supplied. i. Triax to BNC connectors: 1. Triax (M) to BNC (F) connectors 2. Triax (F) to BNC (M) connectors 3. Triax (F) to BNC (F) connectors ii. BNC tee connectors iii. Banana connectors iv. GPIB adapter	5 10 5 10 10 2
20	Other adaptors / connectors	Supplier should provide all kinds of adaptors/connectors and cables required to use all features of the system.	

21	Warranty	Service and warranty for a minimum period of three years for the equipment must be provided. AMC for additional three years must be quoted separately.	
22	Anti virus	System should have the provision to install an antivirus in it. Preferably supplier should provide the system with antivirus installed in it.	

Others:

23. Compliance sheet for the technical specification and OEM Brochure have to be attached along with the Technical bid. Vendor has to fill the compliance sheet and mention page number or reference number in OEM brochure. Unfilled/partially filled sheets may lead to disqualification.

24. The bidder should be either an Original Equipment Manufacturer (OEM) of semiconductor parameter analyzer or should be an authorized representative (provide documentary proof) of an OEM.

25. The bidder should have documentary evidence of having supplied at least 1 no. of semiconductor parameter analyzer to a Centrally Funded Technical Institution (e.g., IIT, NIT, IISc, IISER, etc.) in the recent past. Contact details of the faculty-in-charge of the installed setup must also be provided.