## Technical Specifications of Semiconductor Parameter Analyzer

### 1.0 Bidder Eligibility Criteria-I

| Sl. No | Bidder Eligibility Criteria-I | Complied / Not Complied | Reference Page No. | Remarks, If any |
|---|---|---|---|---|
| 1 | The bidder/OEM should have supplied at least 2 similar items to IITs, NITs, IISERs, CSIR Labs or other Govt. R&D organizations in the last 5 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation. | | | |

### 2.0 Technical Specifications II

| Sr. No | Unit | Specifications | | | | No. | Complied / Not Complied | Ref, Page No. |
|---|---|---|---|---|---|---|---|---|
| 1 | **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 ±200V (or higher) with a resolution of 5 | ±200V (or higher) with a resolution of 200 | | | |

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| | | | | mV. | µV or better. | | | |
| | | **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. | | | |
| | **(ii)**Medium Power SMU | **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 ±200V (or higher) with a resolution of 5 mV. | ±200V (or higher) with a resolution of 200 µV or better. | | | |
| | | • All SMU should provide voltage/current in Bias; Common; Sweep; List sweep (custom point-by-point user-defined sweep); Step mode. <br>• SMU should able to apply pulse in ms range. | | | | | | |
| **2** | **Ground Unit** | A separate ground unit (not occupying any of the 9 slots) must be available with at least 4A sink current. | | | | | | |
| **3** | **Pulse generator /fast measurement /waveform generator unit** | For pulse stress characterizations, Flash memory characterizations and NBTI, PBTI measurements.<br><br>**No. of channels:** 2 (with the ability to obtain synchronized or independent fast current and voltage (I-V) measurements)<br><br>**Frequency range:** at least 1Hz (or lower) to 30 MHz (or higher).<br>• Voltage amplitude range: Up to ±40 V or more for source and measure.<br>• Current range: 100nA (or smaller) to 10mA (or higher) for fast IV measurement.<br><br>**Pulse period programmable:** from at least 20 ns to higher.<br><br>**Pulse width programmable:** Should be able to offer a minimum pulse width of 70 ns @ 10V source.<br><br>**Minimum Transition time:** 20ns @ 10V range and 100 ns for higher voltage range.<br>**Sampling rate :** 200 MS/s Programmable parameters: Pulse width, duty cycle, rise time, fall time, amplitude, offset. System should have built in current measurement facility. | | | | **1** | | |

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| **4** | **SMU-PMU switching unit.** | System should have built in Capability to switch the measurements from IV 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. | | | |
| **5** | **I-V Sweep Mode with lab view controlled programs.** | At least the following: <br> 1. single and double staircase sweep, pulsed sweep, staircase sweep with pulsed bias, I/V-t sampling: at least 4000 measurement points, or more <br> 2. list sweep, linear and log interval, bias hold and negative hold tim | | | |

**Other General specifications:**

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| **6** | **System must have convenient user interface preferably windows based. Interface for remote control:** <br> System should be supplied with the following interface and ports. <br> 1. GPIB, interlock, USB, LAN, trigger in/out, digital I/O <br> 2. User interface options: Touch panel, knob, soft keys, USB, keyboard and mouse | | | | |
| **7** | **The instrument software/firmware must have both offline and online capability.** | Same software must be able to run on user computer to control the instrument and perform measurements. Also software must be able to 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. | | | |
| **8** | **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. | | | |
| **9** | **Sequencing** | Must have the capability to sequence multiple tests without any programming effort. | | | |
| **10** | Must have capability to sweep the source enabling real time device characterization. | | | | |
| **11** | System should have USB port to safely take the data out of the instrument. | | | | |
| **12** | **Control from Remote PC** | built-in graphical programming environment | | | |
| **13** | **Support: Device modeling software, instruments, and prober** | The equipment should be compatible with: <br> **a.** device modeling software <br> **b.** network analyzer, <br> **c.** Must be able to control standard prober system, including but not limited to probe stations from Ever Being, Cascade, Form Factor, Lakeshore, Jenis, etc,. | | | |
| **14** | **Future Upgradability** | System should be upgradable to: <br> 1. high current device measurement (at least 40 A, or higher). <br> 2. high voltage device measurement (at least 3kV, or higher) | | | |

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| **15** | **Cables** | The following cables (supporting low current measurements at least below 1 pA) should be supplied.<br><br>Triaxial cables:  1.5 m length | 10 | | |
| | | Coaxial cables: at least 3-m-length, or longer | 10 | | |
| | | GPI cable of at least 2-m-length | 2 | | |
| **16** | **Adaptors/ Connectors** | The following connectors (supporting low current measurements, at least below 1 pA) should be supplied.<br>**i.** Triax to BNC connectors:<br>**1.** Triax (M) to BNC (F) connectors | 5 | | |
| | | 1. Triax (F)  to BNC (M) connectors | 10 | | |
| | | 2. Triax (F)  to BNC (F) connectors | 5 | | |
| | | **ii.** BNC tee connectors | 10 | | |
| | | **iii.** Banana connectors (Banana to alligator) | 10 | | |
| **17** | **Other adaptors / connectors** | Supplier should provide all kinds of adaptors/connectors and cables required to use all features of the system. | | | |
| **18** | **Warranty** | Service and warranty for a minimum period of three years for the equipment must be provided. | | | |
| **19** | **Optional** | 1.  Multi-frequency C-V measurement unit<br>      C-V measurement test signal:<br><br>**Frequency:**<br>• 1 kHz to 5 MHz (or higher) frequency range with minimum 1 kHz frequency resolution.<br><br>**AC amplitude**<br>• Range: at least 10 mV (or lower) to 100 mV (or higher): rms<br>• Resolution: at least 1 mV (rms), or better (higher resolution)<br><br>**DC bias:**<br>• Range: at least  range -25 V to +25V, or higher<br>• Resolution: at least 1 mV, or better (higher resolution)<br><br>**Measurement parameters;**<br>CP–G, CP–D, CS–RS, CS–D, R–jX, Z-theta , Y-theta<br>**Optional: Cp-Q, Cs-Q, Lp-G, Lp-D, Lp-Q, Lp-Rp, Ls-Rs, Ls-D, Ls-Q, R-X, G-B, Z-q, Y-q**<br><br>**Sweep Characteristics:**<br>• AC voltage, DC bias voltage, frequency<br>• Sweep type: Linear, custom<br>• Sweep direction: Up sweep, down sweep<br><br>    **2.  SMU- PMU- CVU switching unit-** System should have built in Capability to switch the measurements | 1 | | |

| | | 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. | | | |
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| **Other Terms and Conditions** | | | | | |
| 1 | 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. | | | | |
| 2 | 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. | | | | |

| **General Terms and Conditions** | | | |
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| 1. | The Semiconductor Device Parameter Analyzer should have: | | |
| 2. | 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). | | |
| 3. | 1 Pulse generator/pulse measure/Fast measurement unit. | | |
| 4. | An upgradability and support of at least 9 slot modules, or more and must allow upgrading with more SMUs if empty slots are available. | | |
| 5. | System should have Kelvin connection at GND unit. | | |
| 6. | Ground unit with at least ±4 A sink current, or higher | | |
| 7. | Must have a inbuilt touch screen display | | |
| 8. | The setup must be upgradable to be used for high power device characterization in future up to 3kV and 1500A. | | |
| 9. | Must include necessary number of all kinds of connectors to connect various part of the system to other ports and 1.5m cables for connections. | | |
| 10. | The capability to connect to standard probe stations, including but not limited to probe stations from, Ever Being, Cascade, Lakeshore, Jenis, etc,.. | | |

(Note: It is mandatory for the bidders to provide the compliance statement in tabular column format along with catalogue page number (comply/not comply) for the Above points with document proof as required. Failing which bidders will be technically disqualified)