Si2 Compact Model Coalition
2023 Updates

Peter M. Lee, CMC Chairman
(presented by Colin Shaw (SILVACO))
Notable Highlights

• First face-to-face quarterly meeting in three years occurred with our 2022Q4 quarterly meeting in the San Jose area in December, 2022
• New standard was created for the ESD Diode device and the first official standard model was released on December 8, 2022.
• 10 new versions of existing standard models were released.
• Four versions of the Verilog-A linter program were released.
• Phase 1 of the standardization process continuing for the following:
  • SiC Standard Model: Three model candidates.
  • RTN Standard Model: Two model candidates.
• Two new work groups were formed to investigate the need for standardization for (1) the memristor device; and (2) self-heating
• New CEO and team members from Si2 are supporting the CMC.
• CMC currently has 32 members, and is responsible for 20 official worldwide standards.
ESD Model Related

• New standard was created for the ESD Diode device, and after completing the four-phase standardization process, the first official model, the ASM-ESD Diode Model developed by Macquarie University, was announced on Dec. 8, 2022.
# Standard Releases

## 10 Standard Model Releases in 2023

<table>
<thead>
<tr>
<th>Model</th>
<th>Version</th>
<th>Release Date</th>
<th>Device Type</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-UTSOI</td>
<td>102.7.0</td>
<td>January 6</td>
<td>SOI MOSFET</td>
<td>CEA-Leti</td>
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<tr>
<td>HiSIM_HV</td>
<td>2.5.1</td>
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<td>HV MOSFET</td>
<td>Hiroshima Univ.</td>
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<td>MVSG_CMC</td>
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<td>GaN FET</td>
<td>Univ. of Waterloo</td>
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<td>ASM-HEMT</td>
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<td>May 2</td>
<td>GaN FET</td>
<td>MacQuarie Univ.</td>
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<td>Mextram</td>
<td>505.4.0</td>
<td>May 11</td>
<td>Bipolar</td>
<td>Auburn Univ.</td>
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<tr>
<td>R2_CMC</td>
<td>1.0.2</td>
<td>June 16</td>
<td>Resistor</td>
<td>CMC</td>
</tr>
<tr>
<td>R3_CMC</td>
<td>1.1.2</td>
<td>June 16</td>
<td>Resistor</td>
<td>CMC</td>
</tr>
<tr>
<td>HICUM_L0</td>
<td>2.1.0</td>
<td>August 15</td>
<td>Bipolar</td>
<td>ADM Enterprises</td>
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<tr>
<td>PSP</td>
<td>104.0.0</td>
<td>September 11</td>
<td>MOSFET</td>
<td>CEA-Leti</td>
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<td>BSIM-SOI</td>
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<td>October 17</td>
<td>SOI MOSFET</td>
<td>UC Berkeley</td>
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</table>
Verilog Linter
Developer: Geoffrey Coram (Analog Devices)

- Four versions of the VAMPyRE Verilog-A linter program were released.
  - Version 1.9.0 March 14, 2023
  - Version 1.9.1 August 3, 2023
  - Version 1.9.2 September 6, 2023
  - Version 1.9.3 December 5, 2023
- Continuous improvements to incorporate newly approved standards and new checks.
- Now available under Git.
SiC Phase 1 Evaluations
Work Group Chair: Colin Shaw (Silvaco)

- SiC now has three candidate models from the following model developer organizations:
  - MacQuarie University
  - University of Arkansas
  - India Institute of Technology, Kanpur
- Model code from two developers are now with the CMC for review and evaluation.
- SiC device measurement data to serve as a golden benchmark to evaluate the models are also now available.
RTN Phase 1 Evaluations
Work Group Chair: Colin Shaw (Silvaco)

- The CMC now has two candidate models for their inspection and evaluation.
  - Peking University
  - IMEC
- Model code from the two developers are now with the CMC for review and evaluation.
- RTN device measurement data to serve as a golden benchmark to evaluate the models is also now available (2 sets).
Memristor for Memory – New Work Group

Work Group Chair: Colin Shaw (Silvaco)

• Presented proposal for Memristor device in ReRAM, OxRAM etc., at the 2023Q4 meeting.

• Many manufacturers and developers interested in this restricted application of Memristor devices being currently fabricated in circuits.
  
  (Memristors can be used in such a wide set of applications with very different properties)

• Currently working on gathering scope and device data to formulate a requirement for a standard model.
Self-Heating Model — New Work Group

Work Group Chair: Richard Wachnik (IBM)

- Presented proposal to investigate the need to standardize modeling of self-heating at the 2023Q4 meeting.
- Group has been formed to study the scope of such a standard, and what features would be desirable.
Si2 Change in Management

• There has been a change in management at Si2, with the joining of a new CEO, Robert Aslett. Two new staff have also been hired to support the CMC.

<table>
<thead>
<tr>
<th>Area of Responsibility</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO</td>
<td>Robert Aslett</td>
</tr>
<tr>
<td>VP Technology: Si2/CMC Management Synchronization</td>
<td>Leigh Anne Clevenger (<a href="mailto:leighanne.clevenger@si2.org">leighanne.clevenger@si2.org</a>)</td>
</tr>
<tr>
<td>Executive Technical Assistant: Model and application release management and QA</td>
<td>Marc Rose (<a href="mailto:marc.rose@si2.org">marc.rose@si2.org</a>)</td>
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<tr>
<td>Member Relations: Member onboarding, CMC events, member access control</td>
<td>Alan LaRotonda (<a href="mailto:alan.larotonda@si2.org">alan.larotonda@si2.org</a>)</td>
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