Standardizing GPU Radiation Test Approaches

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Abstract: A standardized test method has been created to characterize and stress graphics processing units (GPU) during radiation effects testing.

Device Preparation

The DUT description allows an ideal situation to be done for both solicited and asked components. Additionally, it is radiation tolerant by design so that the system can be used in open air, in a vacuum chamber, or in a TEM environment. A direct current (DC) voltage can be applied to the device. The cooling solution allows the device to operate under load while maintaining a temperature appropriate for the test environment (e.g., from 10°C to 25°C). The die can be thermally imaged and superimposed onto an optical image of the active region. For example, this can be the case of a flip-chip device, of course) to provide a feature map. A laser scan can correlate radiation response from a power or heat on a test to a very specific area on the die and be marked on the feature map.

Discussion & Conclusions

Testability plays a major role in standardizing a test. It isn’t beneficial to have an expensive test setup that can’t be affordable, and easily transported. Radiation testing often requires trips to other facilities. The single最主要的问题是当使用现成的GPU时在DUT和每串测试时。 Electrical control using network-based software that can be easily updated to accommodate new DUTs while minimizing the negative impact on other engineers. This standardized approach to testing mitigates the radiation technology itself is more susceptible to radiation effects.

Acknowledgment

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Table 1: Comparison of GPU Types

<table>
<thead>
<tr>
<th>Part Model</th>
<th>Technology</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>APQ8096 SOC</td>
<td>Under heatsink</td>
<td>nVidia</td>
</tr>
<tr>
<td>S5P54210</td>
<td>SOC</td>
<td>Qualcomm</td>
</tr>
<tr>
<td>TH1 SOM</td>
<td></td>
<td>nVidia</td>
</tr>
<tr>
<td>1GB PSRAM</td>
<td></td>
<td>nVidia</td>
</tr>
<tr>
<td>2GB GDDR5, &gt;8GB DDR4</td>
<td></td>
<td>nVidia</td>
</tr>
<tr>
<td>3GB LPDDR4</td>
<td></td>
<td>nVidia</td>
</tr>
<tr>
<td>4GB LPDDR4</td>
<td></td>
<td>nVidia</td>
</tr>
<tr>
<td>Windows 2016</td>
<td></td>
<td>nVidia</td>
</tr>
<tr>
<td>Android 6</td>
<td></td>
<td>nVidia</td>
</tr>
<tr>
<td>Linux for Tegra</td>
<td></td>
<td>nVidia</td>
</tr>
</tbody>
</table>

Table 2: Comparison of Software Payload Types

<table>
<thead>
<tr>
<th>Software Payload Types</th>
<th></th>
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<tbody>
<tr>
<td>Digital Signature</td>
<td></td>
</tr>
<tr>
<td>Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>Conditional Logic</td>
<td></td>
</tr>
</tbody>
</table>

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References

4. Joe F. A. and A. M. D. Topper, “Pixel Memory Mapping Accurate for Geographic Information Systems (GIS) and Analog,” National Map Urban Area Imagery collection for various urban areas in the USA. This material was based on work supported by the National Science Foundation’s Cyberinfrastructure for Geospatial Excellence (NSF/CybergEOS) and the National Aeronautics and Space Administration’s National and Regional Extensions for Land-Use Classification, ACSM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM GIS), 2010. The original satellite images were from the USGS National Map Urban Area Imagery collection for various urban areas in the USA. This material was based on work supported by the National Science Foundation’s Cyberinfrastructure for Geospatial Excellence (NSF/CybergEOS) and the National Aeronautics and Space Administration’s National and Regional Extensions for Land-Use Classification, ACSM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM GIS). The authors acknowledge the support of the effort: NASA Electronic Parts and Packaging Program (NEPP). The authors thank members of NASA’s GSFC’s Radiation Effects and Analysis Group (REAG) who contributed to the creation of the test bench. Stephen R. Cox, Noah Burton, Alyson D. Topper, Ray Ladbury and Martin Carts.

Acronyms

- SEFI: Single Event Functional Interrupt
- COTS: Consumer Off The Shelf
- KVM: Keyboard, Video & Mouse
- FTP: File Transfer Protocol
- LET: Linear Energy Transfer
- ROI: Region Of Interest
- CNN: Convolutional Neural Network
- YOLO: You Only Look Once
- GPU: Graphic Processing Unit
- TESLA: Technology Enhanced Space Launch
- JPL: Jet Propulsion Lab
- GSFC: Goddard Space Flight Center
- AMD: Advanced Micro Devices
- CMOS: Complementary Metal–Oxide–Semiconductor
- DUT: Device Under Test
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