

Summary of IRPS Memory and Product Workshop – April 2017

Moderators: Chandra Mouli – Micron Technology; Xiaoyu Yang –Western Digital; Shosuke Fujii – Toshiba

Approx. 30 people attended this workshop. It started with a brief introduction from moderators to introduce the topic of NAND, 2D to 3D transition in technology and SSD reliability.

The floor was then open for discussions. It was a lively, open discussion on many topics in this area – broadly summarized below.

- 1) SSD is now widely used in many applications. The simplified JEDEC standard is a good fundamental starting point, but it might not represent all usage cases. Usage models, junction temperature could vary a lot depending on product application as well as system design on air flow. In addition, there are more variations with multi-die package/multi-chip operation and high power. Comprehending all this is becoming very important.
- 2) SSD reliability is not just intrinsic NAND Flash reliability. There are hundreds if not, thousands of components in a SSD. In addition, firmware (FW) plays a big role. FW effectiveness and reliability is very important. The controller architecture and error correction recovery flow play the important role in SSD reliability. SSD qualification starts with PVT, RDT and user corner case testing to ensure reliable FW. These tests focus mainly on extrinsic defects. FW has become more complex and needs to be tuned/verified for each generation.
- 3) It is good to get the system usage visibility for effective qualification as well as targeted controller design. However, different data centers might have different usage models. The usage and load are different for different customers. Big IDM's typically work closely with their big customers for their usage cases and qualify for them. It is becoming important to have closer interactions between technology developers, assembly and packaging, system software/firmware developers and customers/end-users. This kind of complexity didn't exist in earlier technologies and it is important to comprehend to ensure reliability.
- 4) The concerns around thermal issues and packaging are becoming important.

The workshop concluded with recommendations for technology developers in the industry, customers/end-users, academic community to work together in addressing some of these challenges and tap into the opportunities. SSD will mature and find greater applications in the future – we are only in the starting point on this. It is also a great opportunity to explore application of ideas that exist in different disciplines (such as communication & information

theory, signal processing, coding and error correction schemes in communication, etc.) and find creative application of these in addressing SSD reliability.