

SLC-lite

White paper

Version 1.1

September 18th, 2014

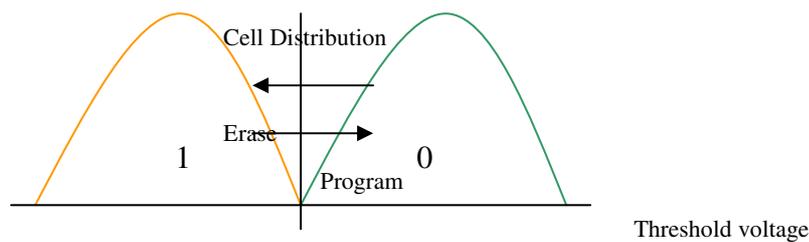


Apacer Technology Inc.

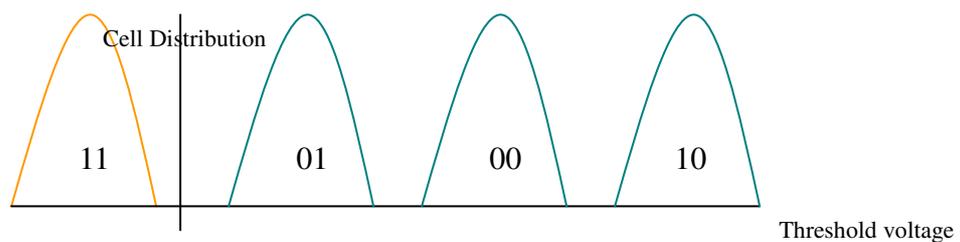
SLC v.s. MLC

The basic idea behind SLC-lite technology is mainly the management of cell distribution. In a SLC NAND flash, only one bit is stored in each cell and therefore there are only two flash states “0” or “1” (0 for Programmed or 1 for Erase). The simple cell management of SLC makes it ideal for mission critical embedded or industrial applications.

SLC Cell Management



MLC Cell Management



SLC & MLC Cell Status

SLC	MLC	
0 (programmed)	11	10
1 (erased)	01	00

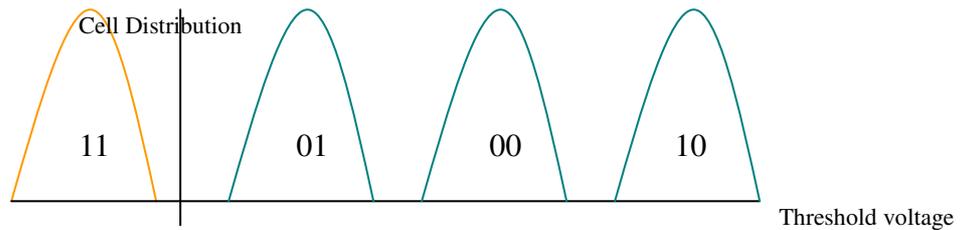
Since MLC can store two bits per cell, doubling the storing amount of SLC, MLC offers higher density and lower cost per bit. However, with more cells in the flash, it results in higher power consumption, lower endurance due to higher voltage delta required and the need of more precise charge placement and rigid controls of programming to ensure proper data flow. Therefore, SLC based storage media is often employed in industrial and embedded applications whereas MLC is often seen in consumer electronics.

SLC-lite: The Balanced Solution

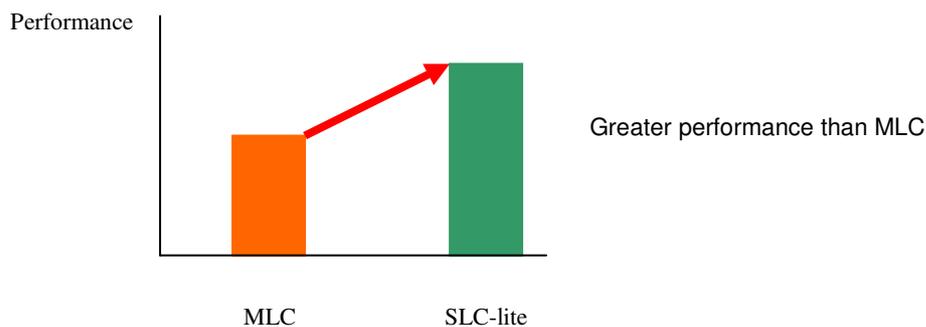
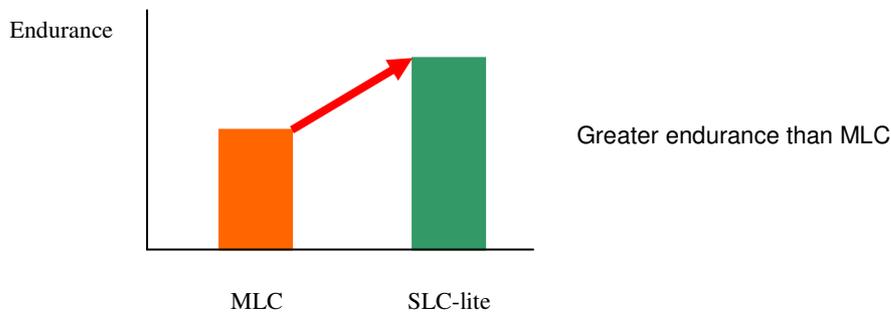
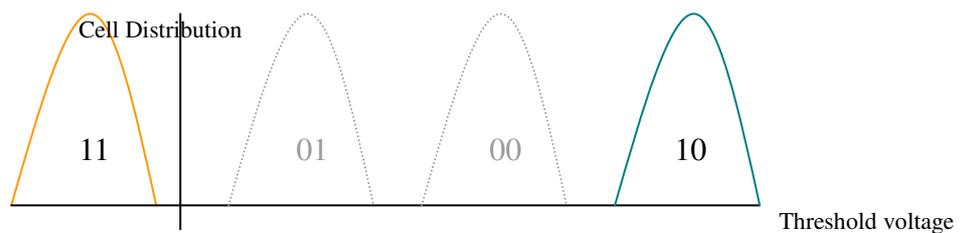
The central concept behind Apacer SLC-lite is to make MLC behave like SLC. To achieve SLC-like performance and endurance, cell distribution management for MLC is necessary in order to greatly adjust the voltage delta and charge sensing. By programming only the least

significant bit (LSB), the cell distribution behaves almost identical to that of SLC flash. This highly improves the precision of delta and the threshold voltage of each cell. Thus, the MLC performance and endurance, especially in P/E cycles, will be escalating by multiplies, to the level almost on par with SLC. In this case, users would get all the benefits of both the quality and the cost.

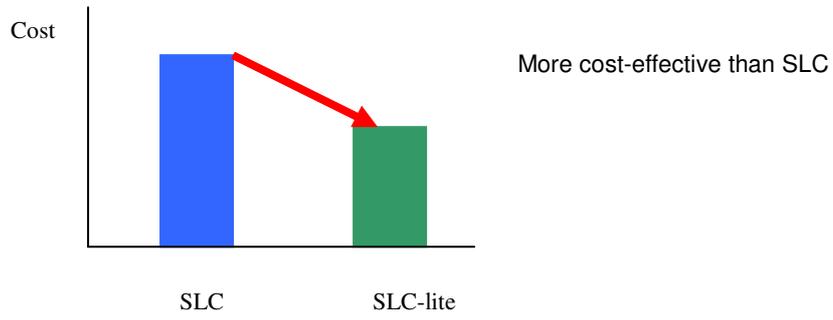
- How MLC works: programming both LSB (least significant bit) and MSB (most significant bit)



- By only programming the LSB, MLC will behave similar to SLC. **This is SLC-lite.**



Notes: the results are estimated by experiments



Notes: SLC-lite is available in Apacer SATA 3.0 Gbps and SATA 6.0 Gbps product series.

Revision History

Revision	Date	Description	Remark
0.1	03/13/2014	Preliminary	
0.2	03/24/2014	Added SLC v.s. MLC comparison	
1.0	03/31/2014	Official release	
1.1	09/18/2014	Added notes about SLC-lite product availabilities	