UNITY SEMICONDUCTOR

Storage Class Memory

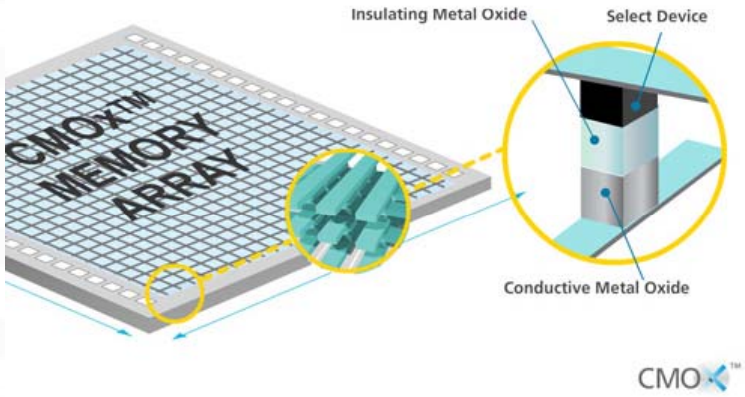
CMOx™ Memory Technology - Applications & Products

October 2009

Memory Cell Advantages

CMOx™ MEMORY TECHNOLOGY

- World's first R/W passive cross-point memory array
- No transistor in memory cell
- Non-volatile
- Multi-layer memory
- Multi-level cell (MLC)
- 0.5F² memory cell size
- 4x the density of today's NAND Flash
- Fast write speed



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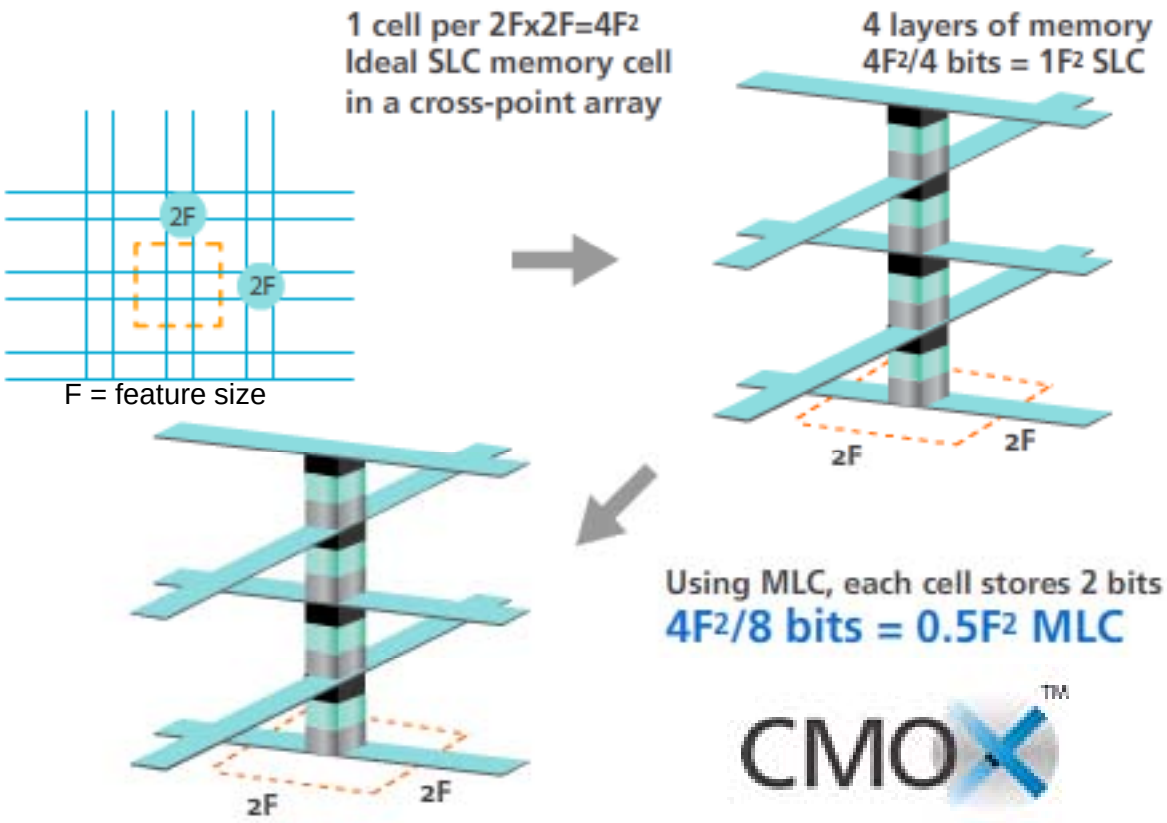
The 0.5F² Memory Cell



Unity achieves a 0.5F² cell size by fabricating 4 physical layers of transistor-less CMOx™ memory in a cross-point array, and storing 2 bit/cell MLC.

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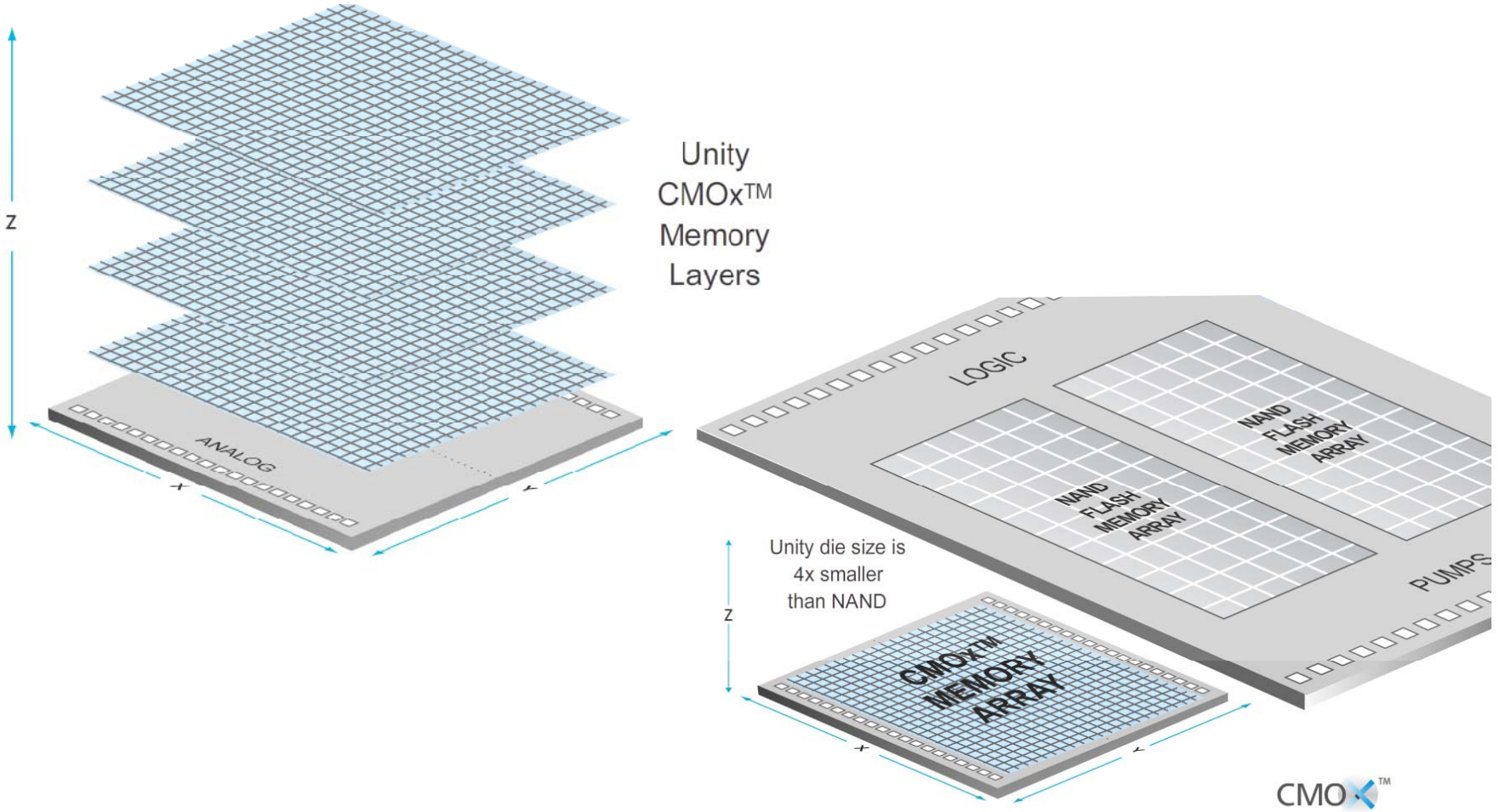
4x Density Advantage



Since CMOx™ memory technology uses 4 memory layers, Unity memory products have a 4x density advantage over today's NAND Flash.

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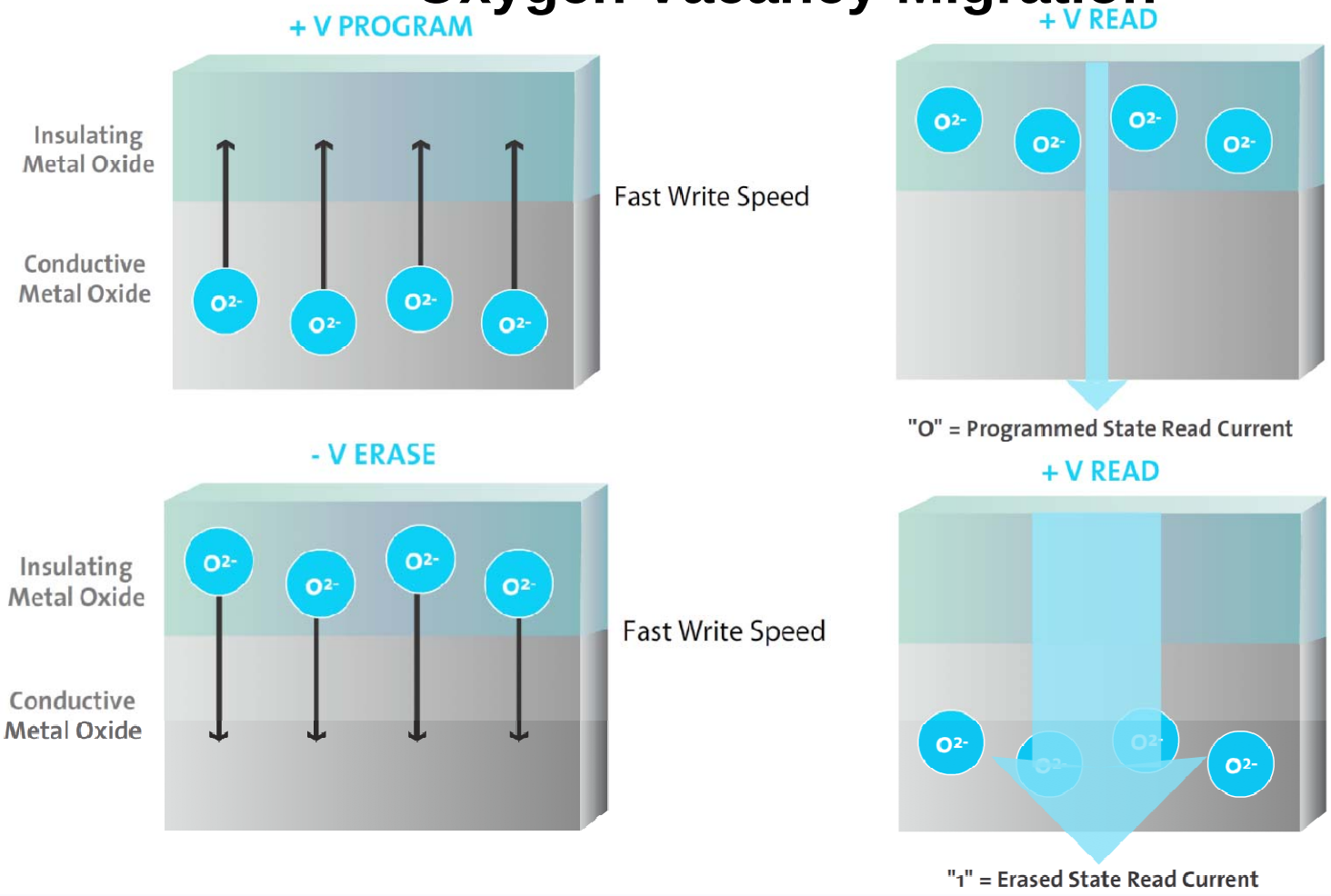
Ionic Charge Movement

Oxygen Vacancy Migration



Unity CMOx™ memory technology works by the uniform movement of ionic charge under electric field control.

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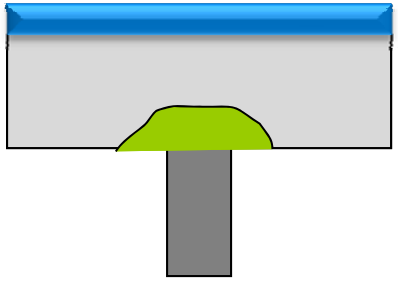
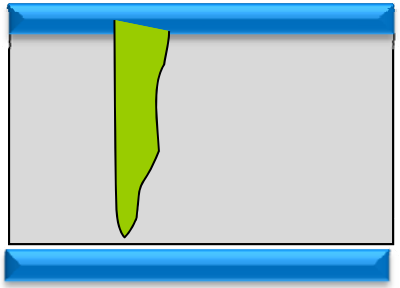
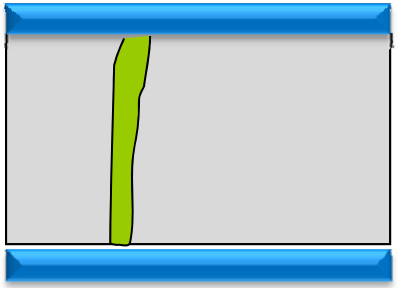
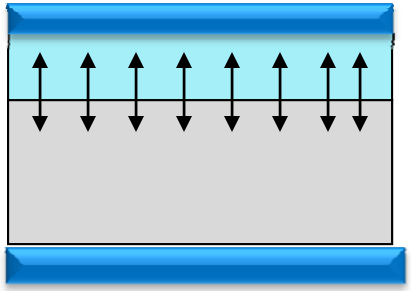
Competing Next Generation NVM Technologies: Scaling

Write current >100ua	Write current >5ua	Write current >50ua	Write current <500na
Phase Change	Kozicki	RRAM	CMOx
			
Ovonyx, Intel	Adesto, Qimonda, Micron	Sandisk/Toshiba Samsung	Unity
Melting	Metal / Ion Movement	Melting	Oxygen Vacancy Re-distribution

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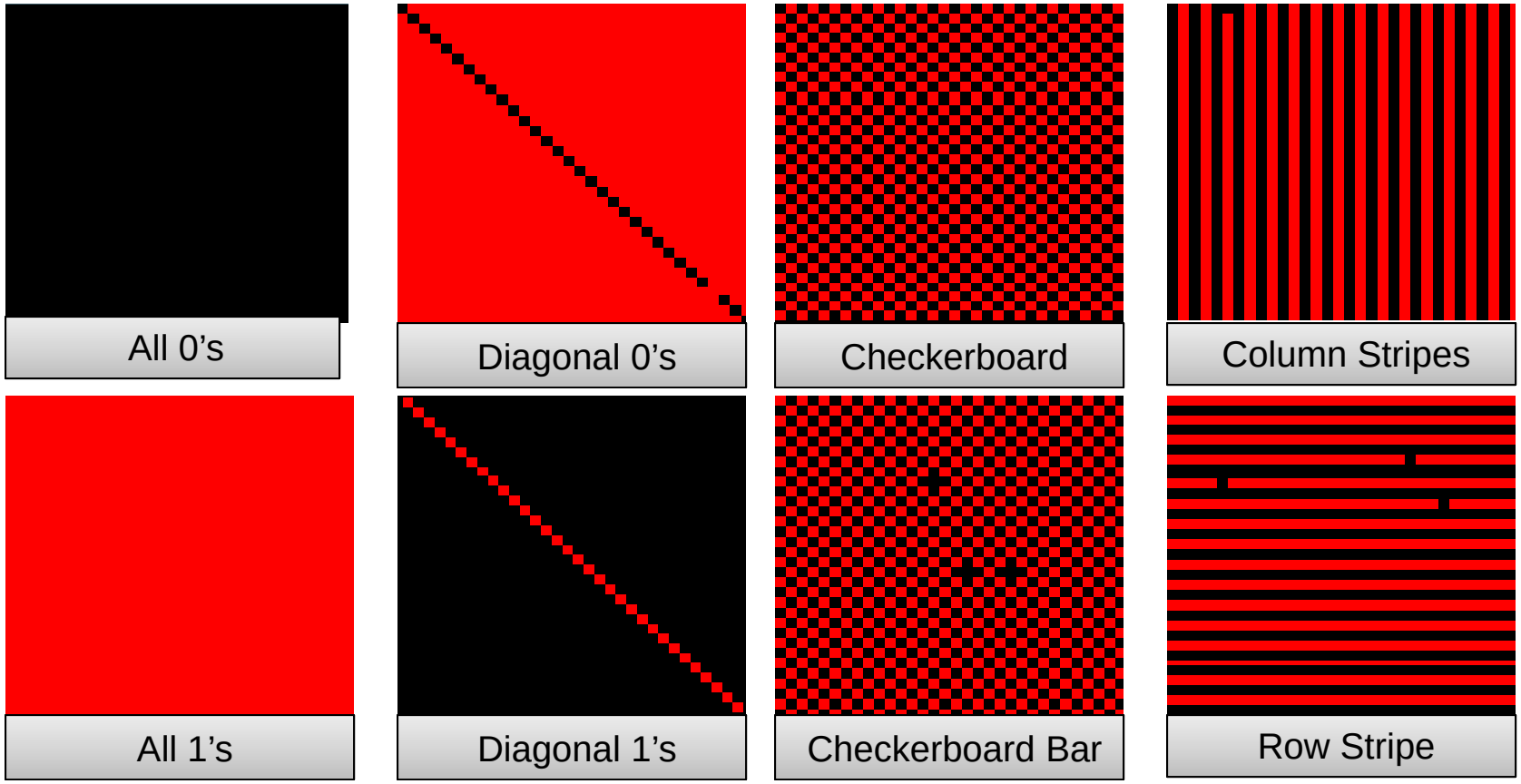
Write & Read Data Patterns



Only Unity has achieved successful data pattern writes and reads on a passive cross-point memory array. Each data pattern represents 1024 bits.

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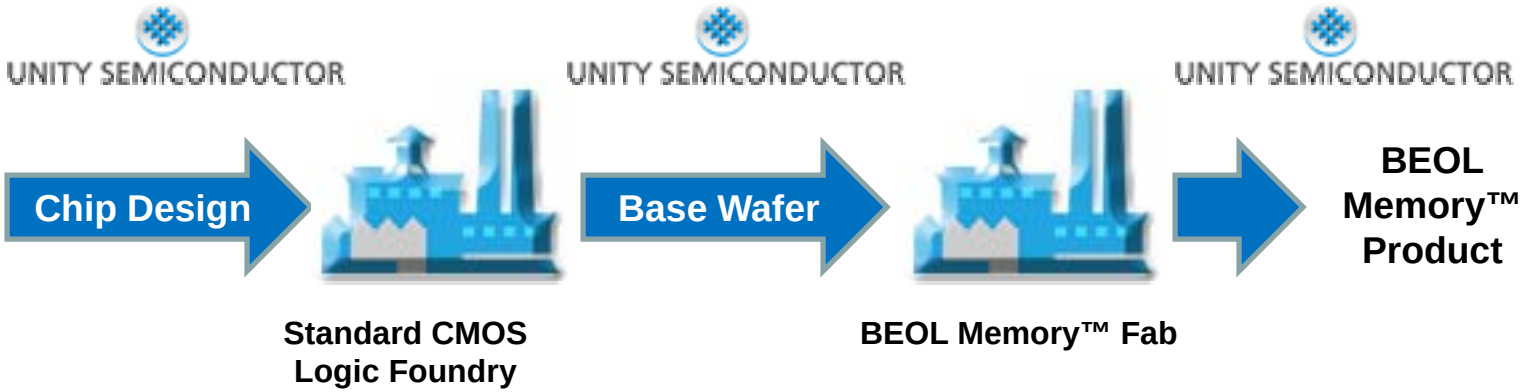
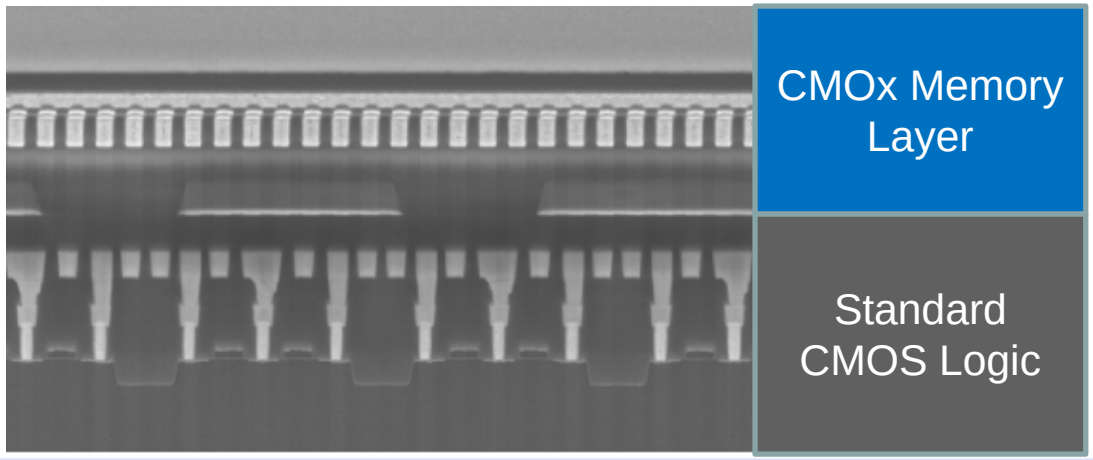
Manufacturing Model





Unity leverages existing standard CMOS logic foundries to reduce the capital required to build CMOx™ memory.

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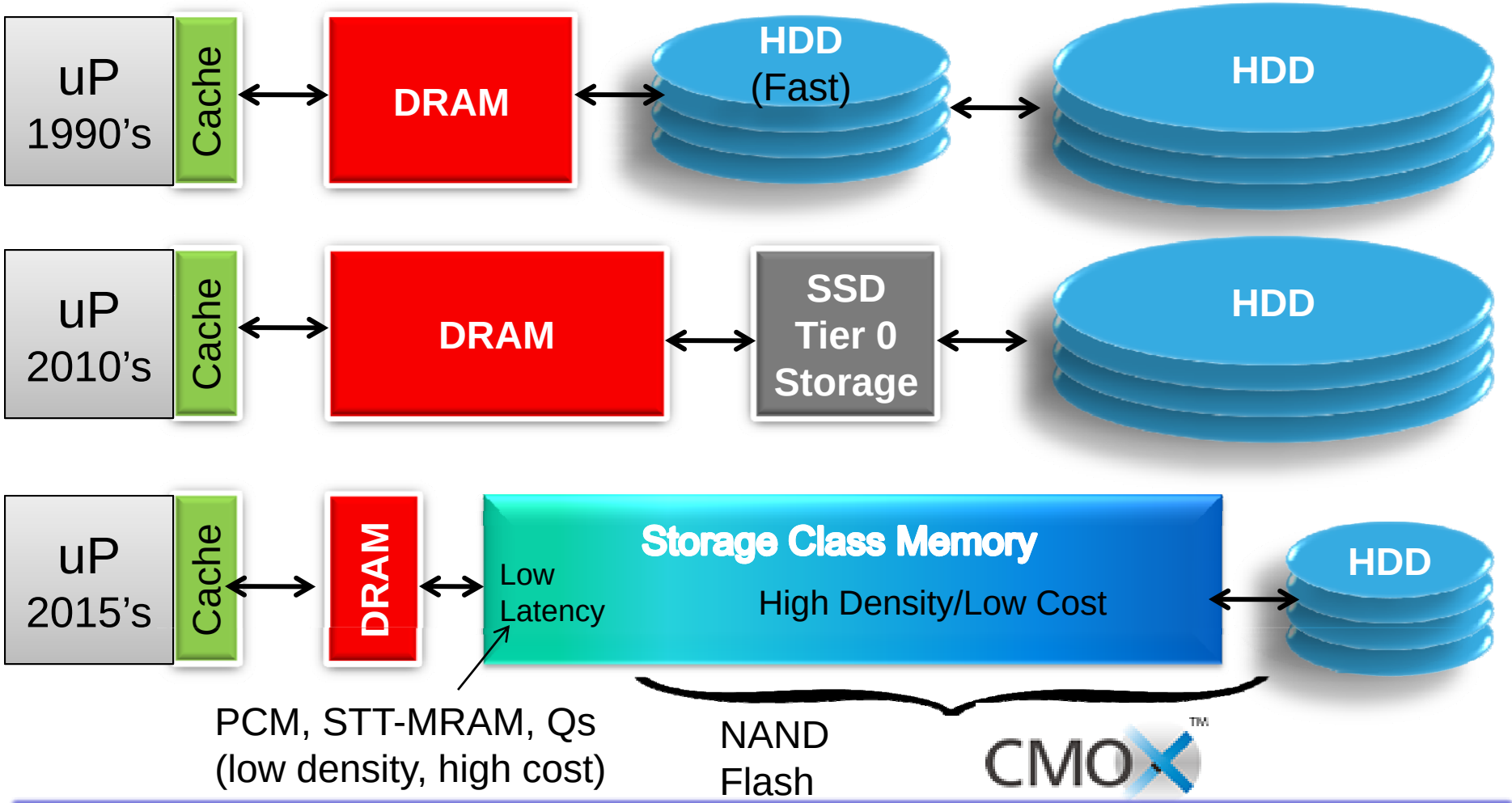
Enterprise Storage Evolution
IBM's Vision



Only Unity CMOx™ memory competes with HDD via high density and low cost.
Other next-generation SCM technologies are targeted at low latency (DRAM).

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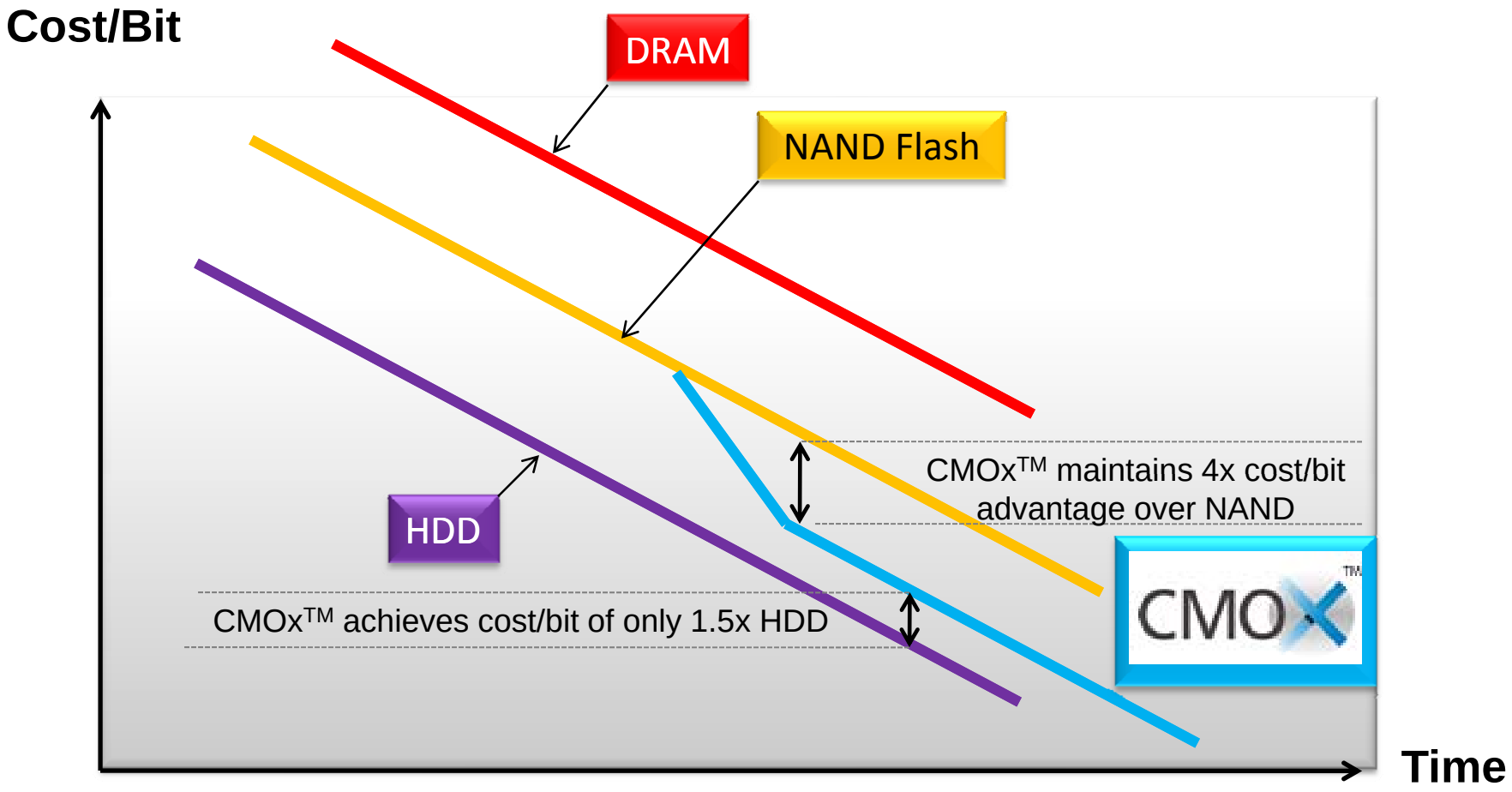
Cost Learning Curves



On the cost learning curves, Unity's CMOx™ achieves a cost per bit of only 1.5 times HDD bit costs, while maintaining a cost per bit advantage of 4x over NAND.

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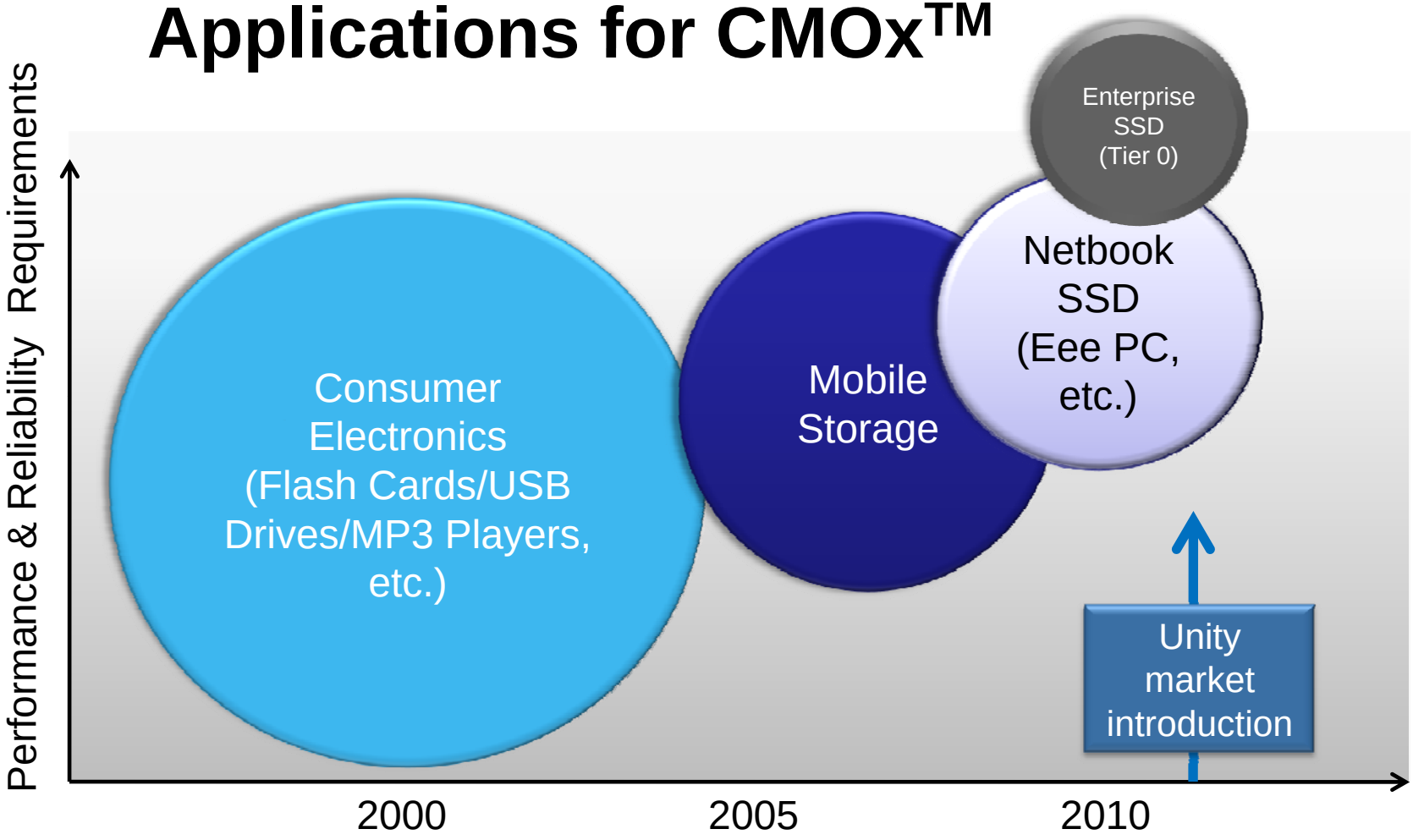
Applications for CMOx™



Performance & reliability requirements are increasing with each new application. CMOx™ is designed to address even the most demanding requirements.

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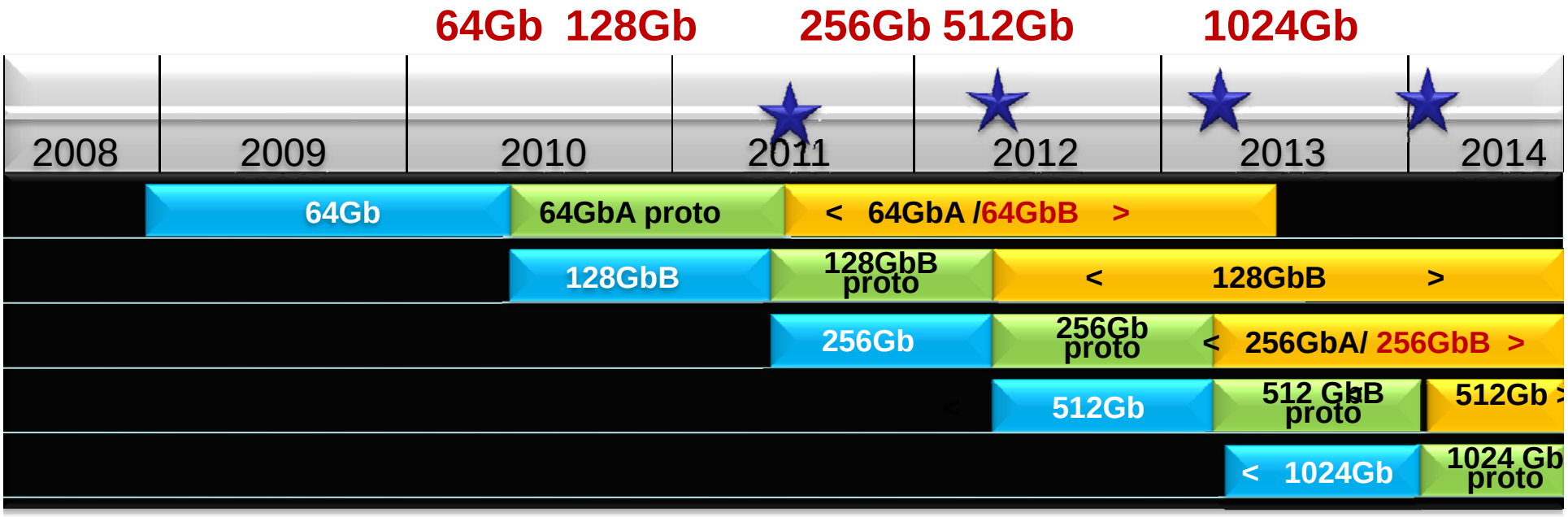
2009-2014 Product Plan



Note: “Version A” is un-shrunk product and “Version B” is a linear shrink.

Internal Qual Complete

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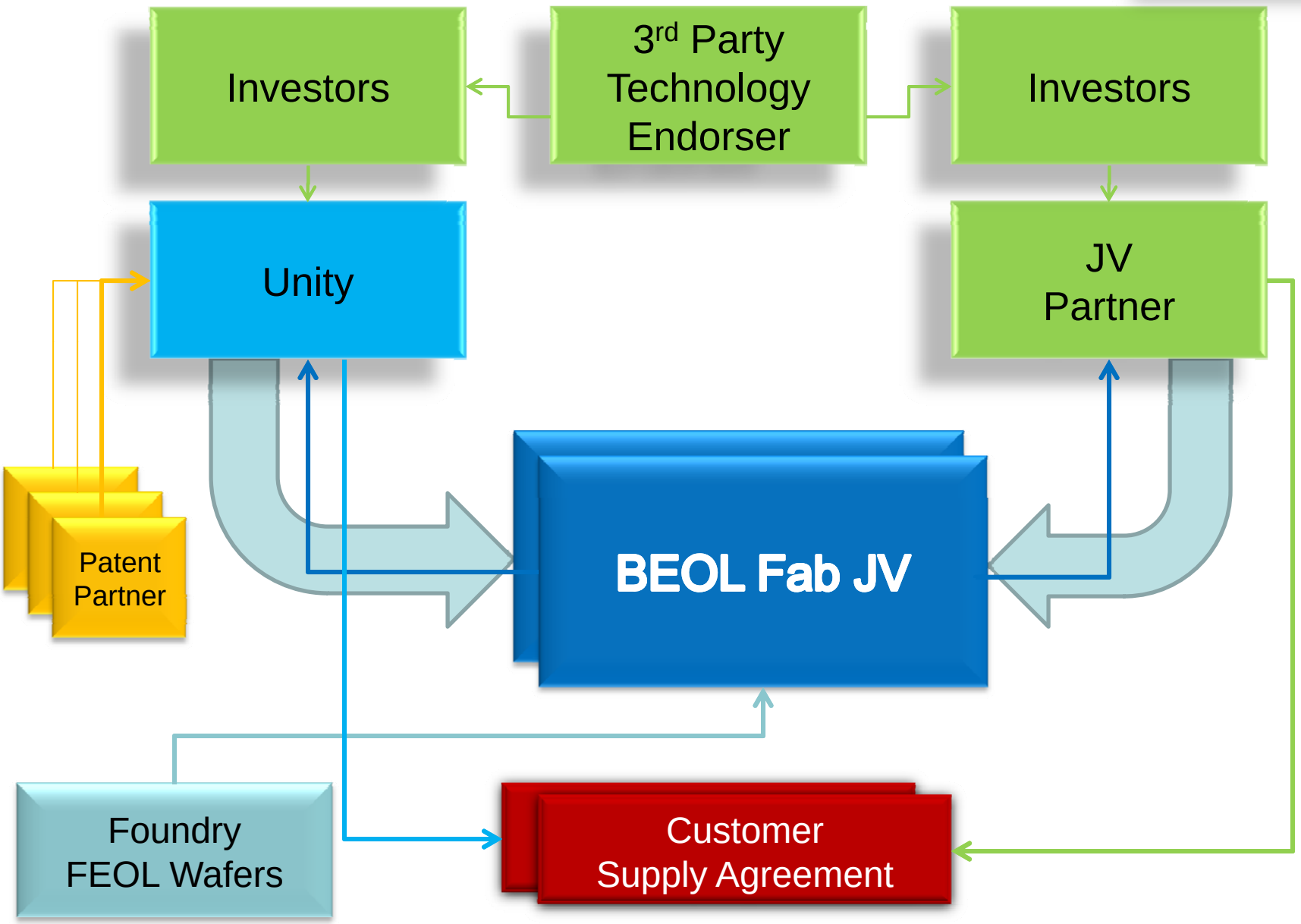
Unity Business Model



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Additional information located at:

http//:www.unitysemi.com

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