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3D X-DRAM™

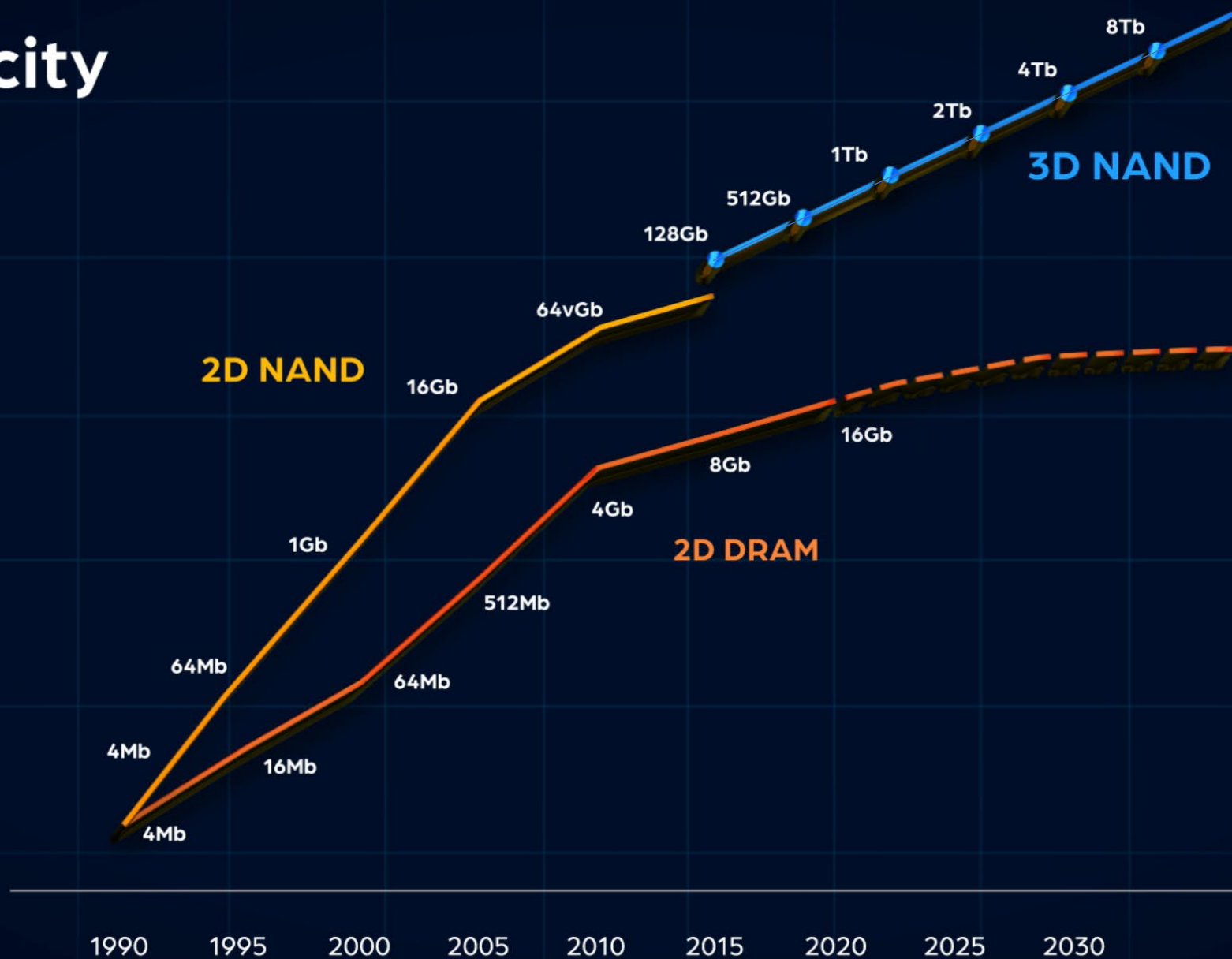
World's First 3D NAND-like DRAM

August 2023

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Presentation | 3D X-DRAM Technology

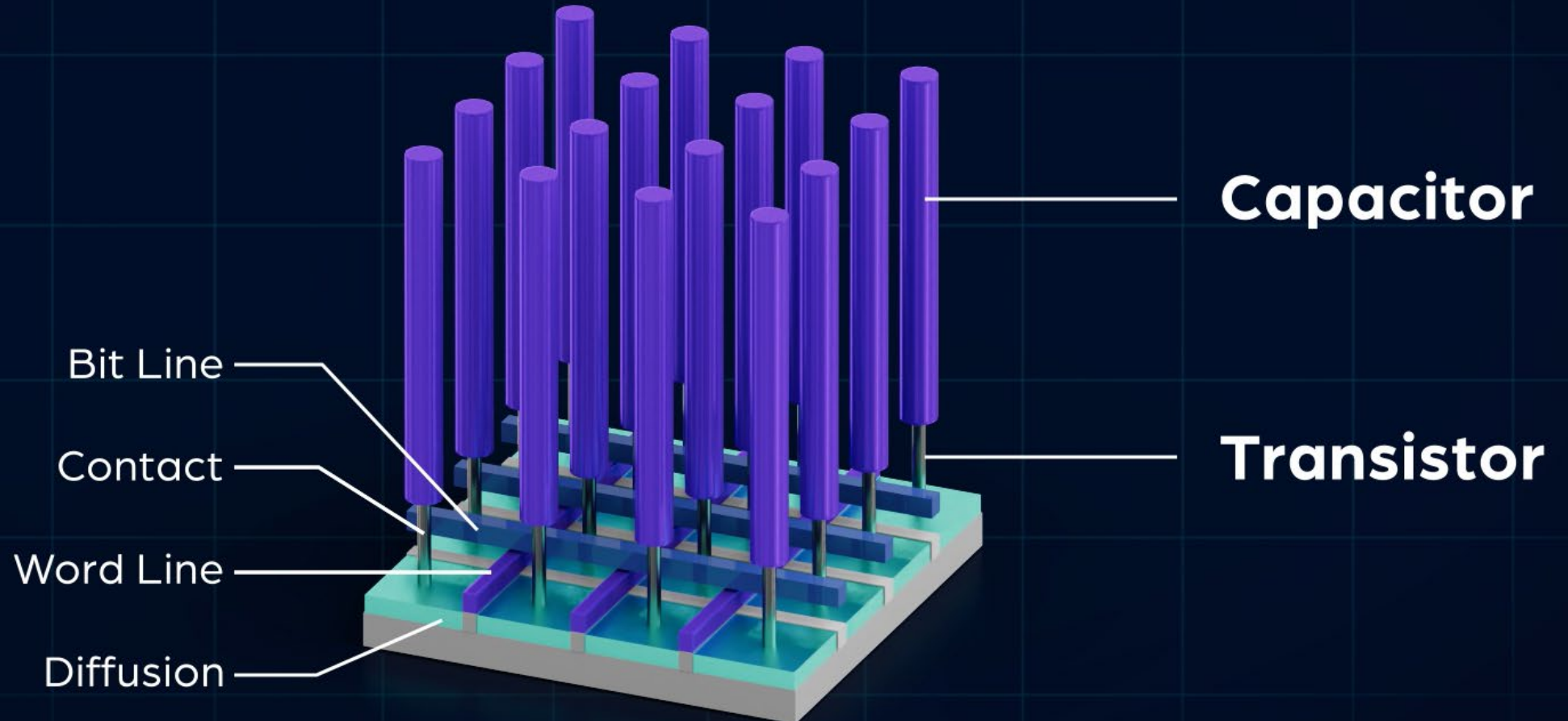
Capacity

2D DRAM

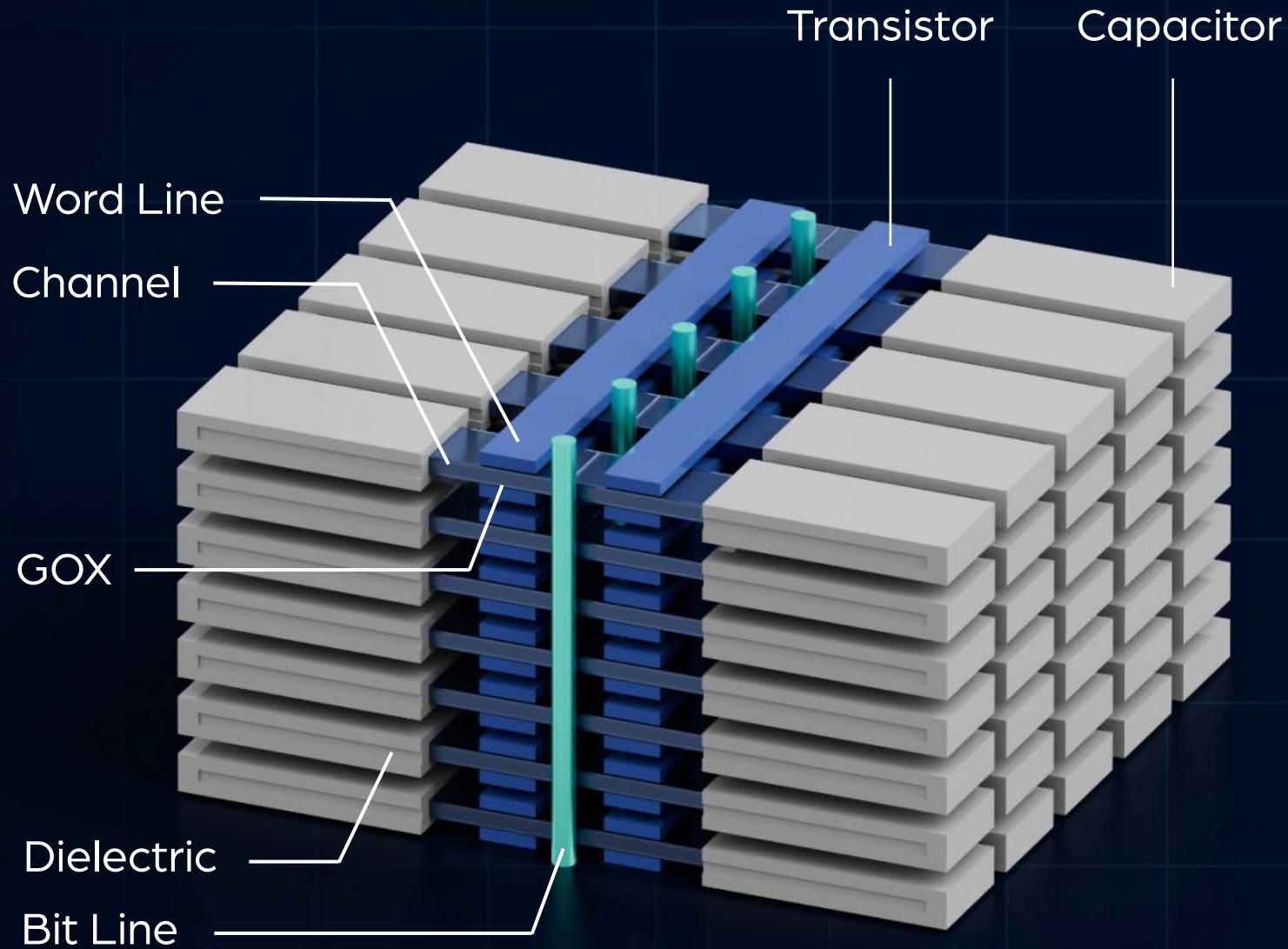


2D DRAM

Not Scalable
beyond **10 nm**



3D DRAM



Complicated

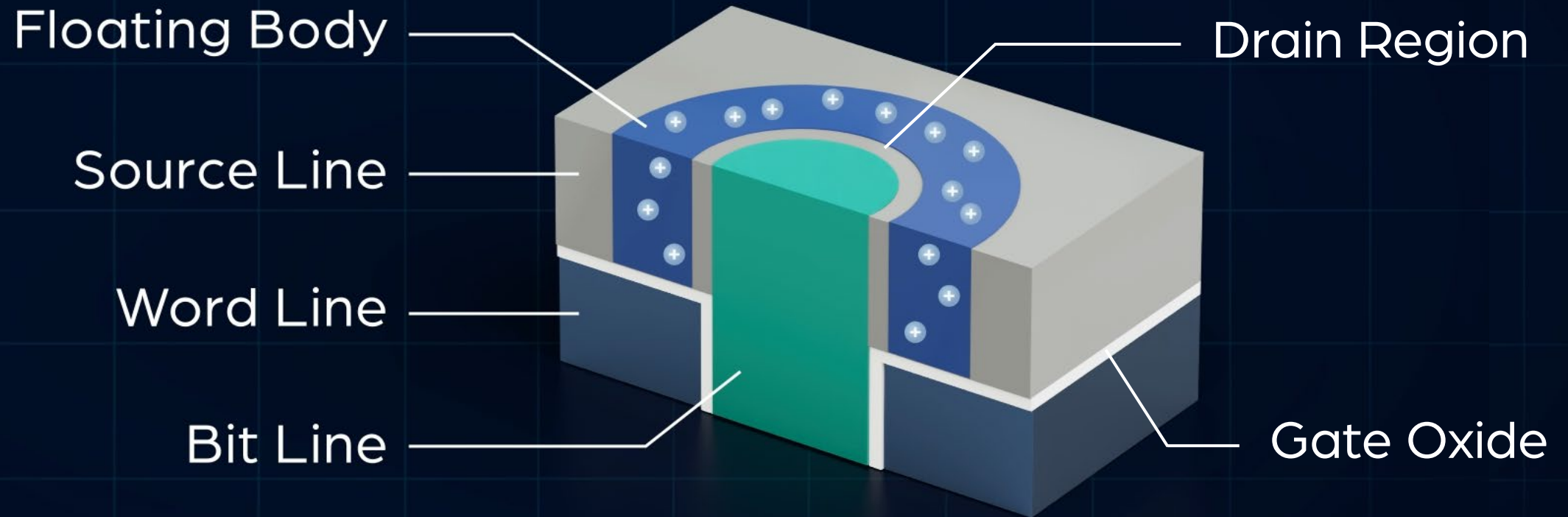
Large Cell Size

Process Challenge

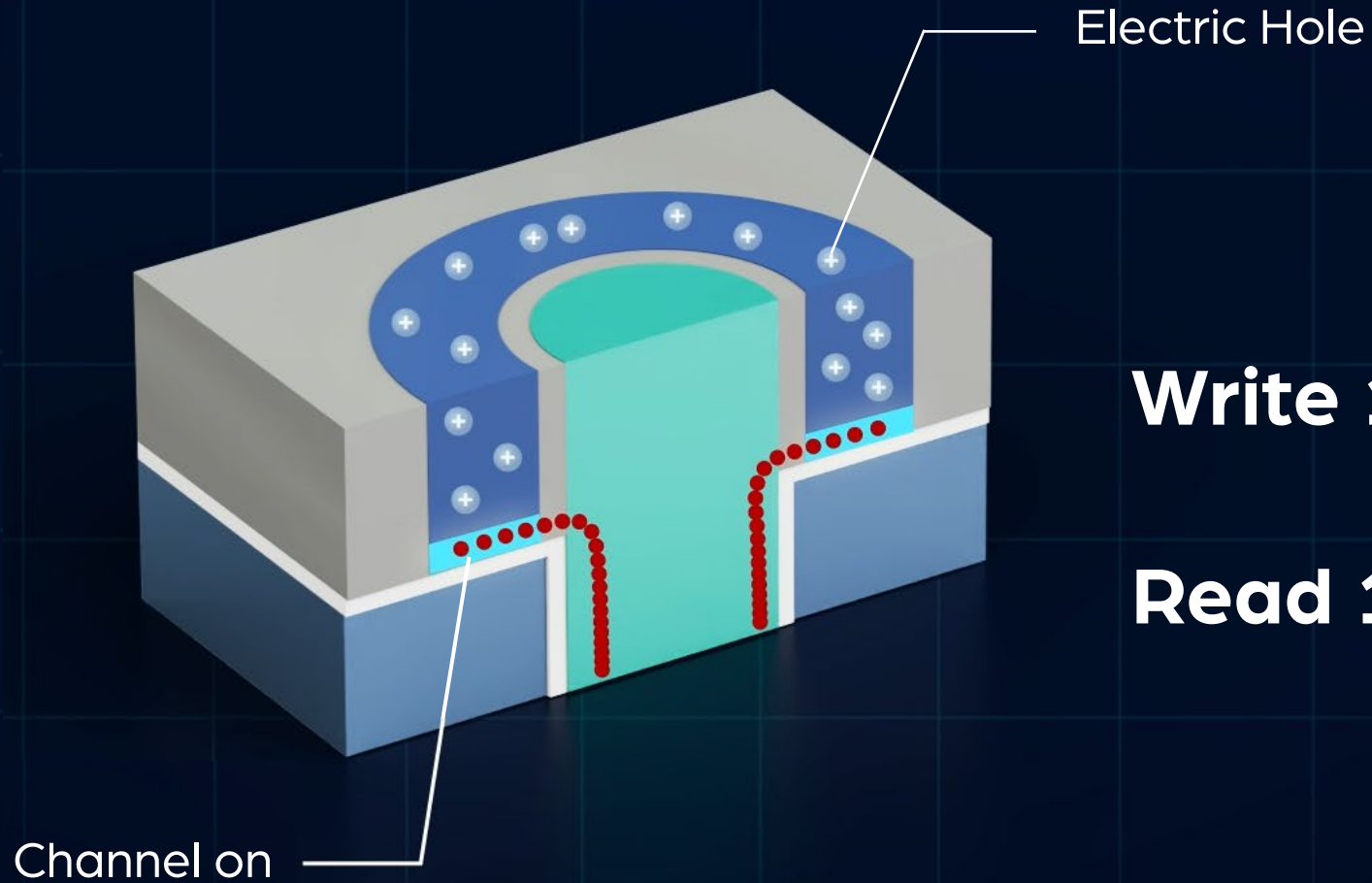
Low Yield

3D X-DRAM™ Cell Structure

Based on Capacitor-less
Floating Body Cell Technology



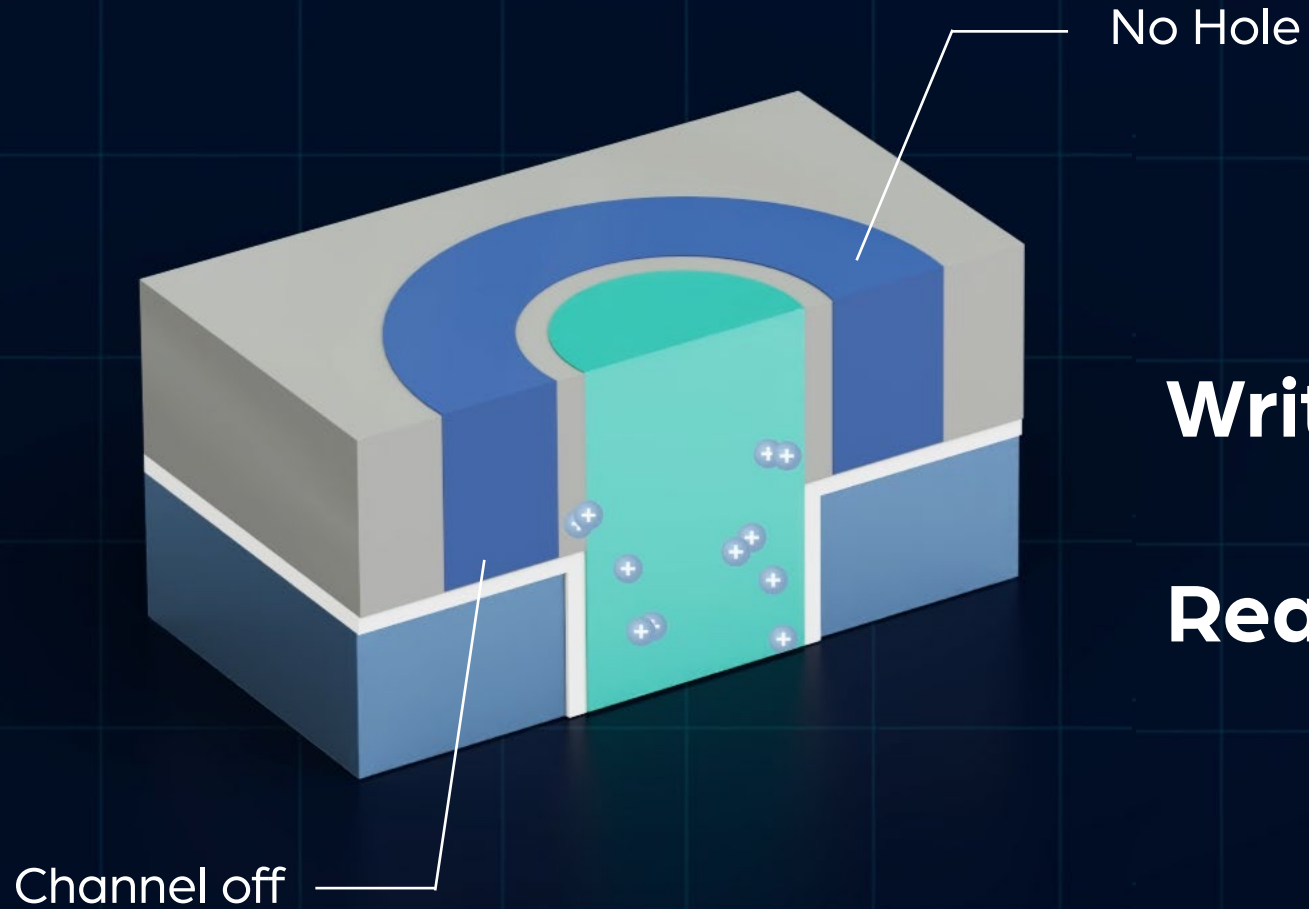
3D X-DRAM™ Operations



Write 1 > Impact Ionization

Read 1 > On cell

3D X-DRAM™ Operations



Write 0 > Forward Bias

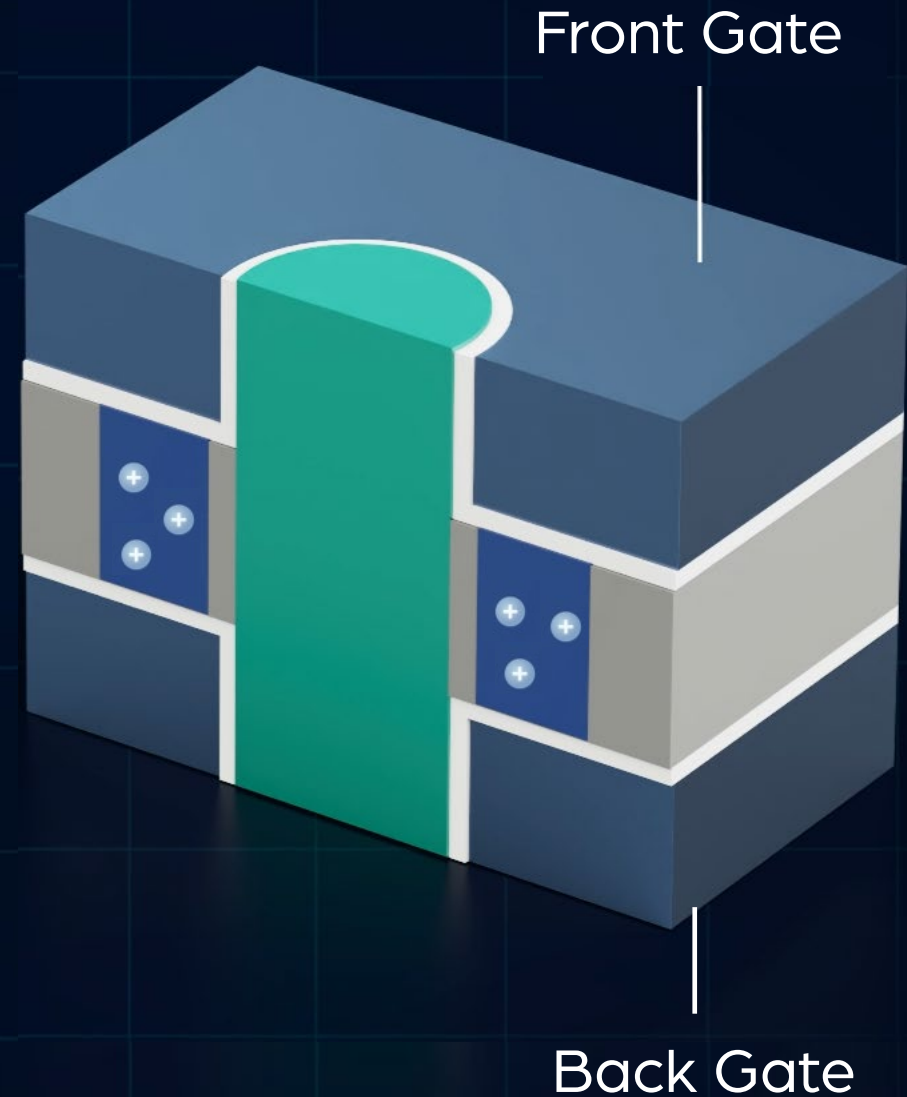
Read 0 > Off cell

3D X-DRAM™ Performance

Non-destructive
Read

Dual-Gate
Structure

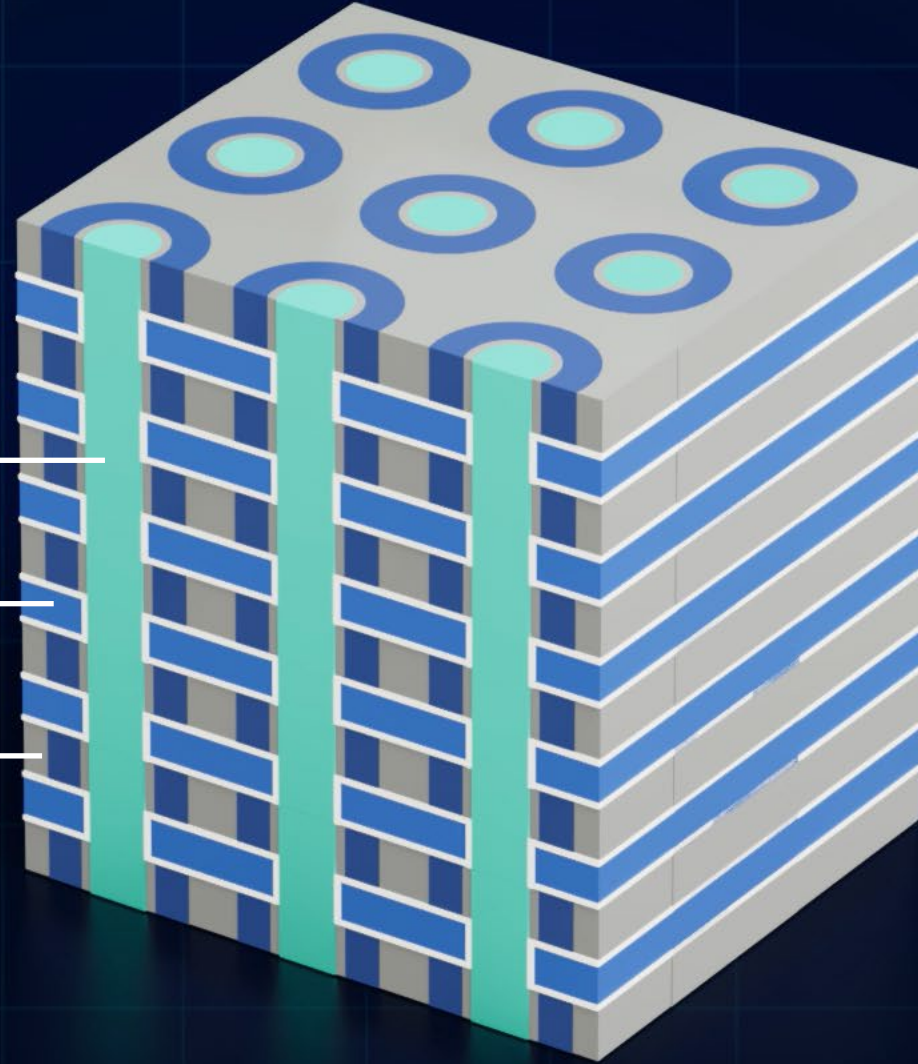
Increase
Data Retention Time



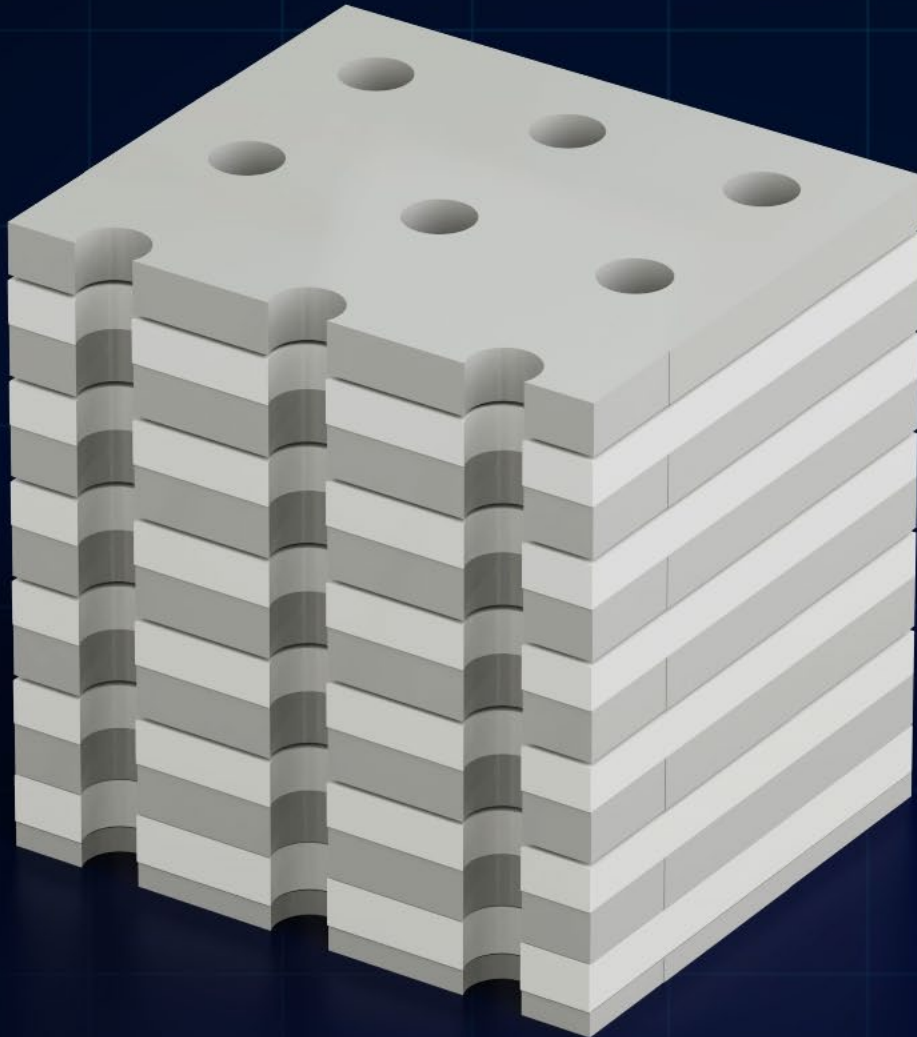
3D X-DRAM™ Array Structure

3D NAND-like Array

Vertical Bit Line
Word Line Layer
Source Line Layer



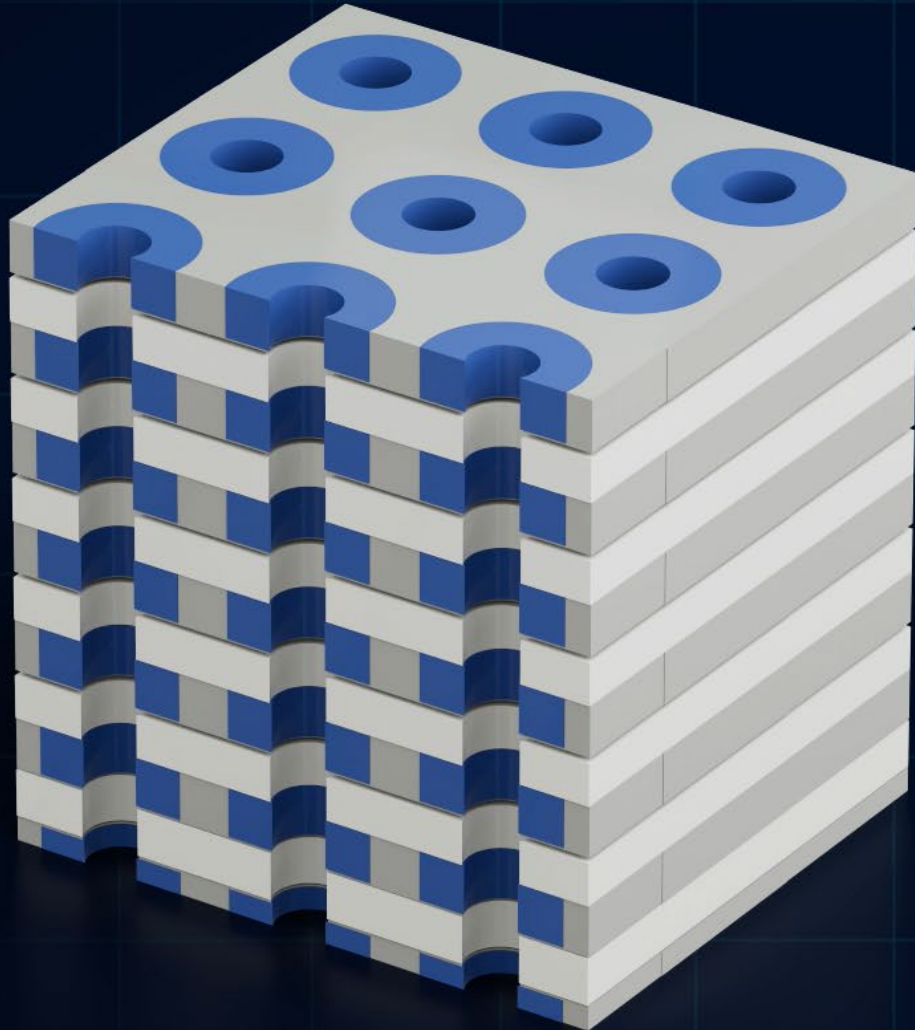
3D X-DRAM™ Process Steps



3D NAND-like Process

- 1 Deposit Multiple Layers
- 2 Deep Trench Bit Line Holes

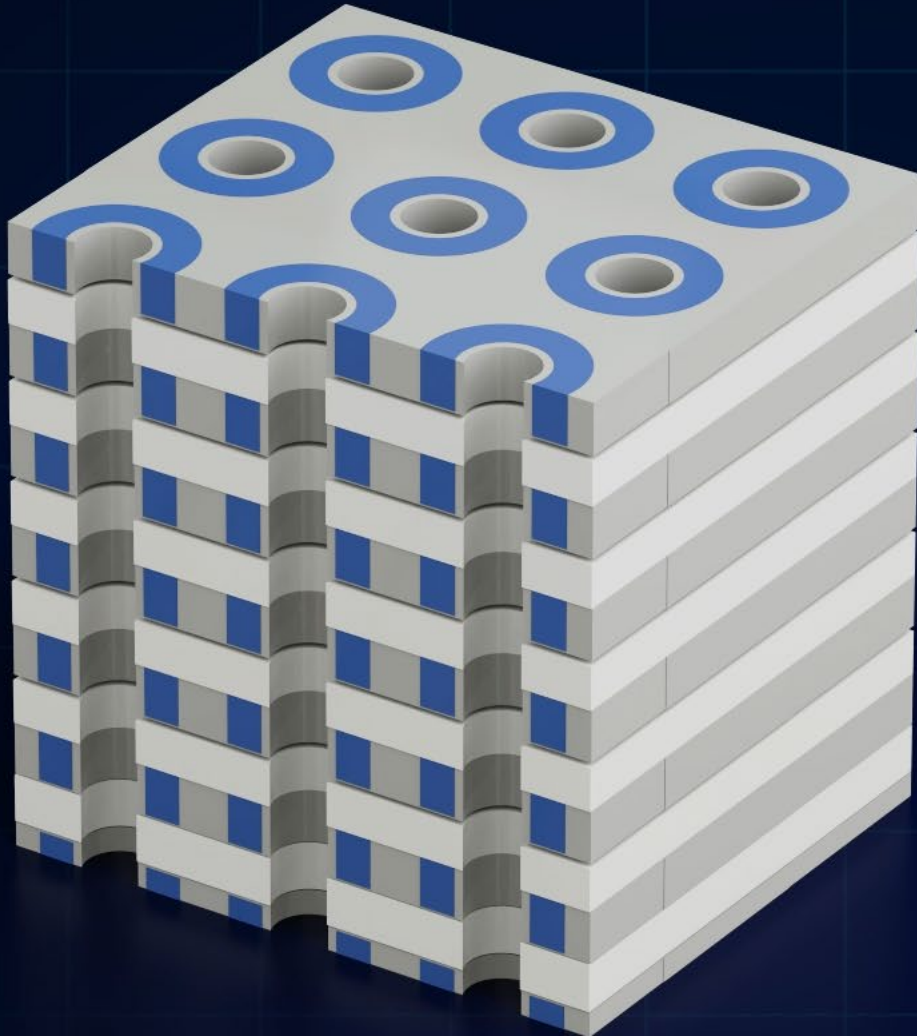
3D X-DRAM™ Process Steps



3D NAND-like Process

- 1 Deposit Multiple Layers
- 2 Deep Trench Bit Line Holes
- 3 Plasma Doping for Floating Body

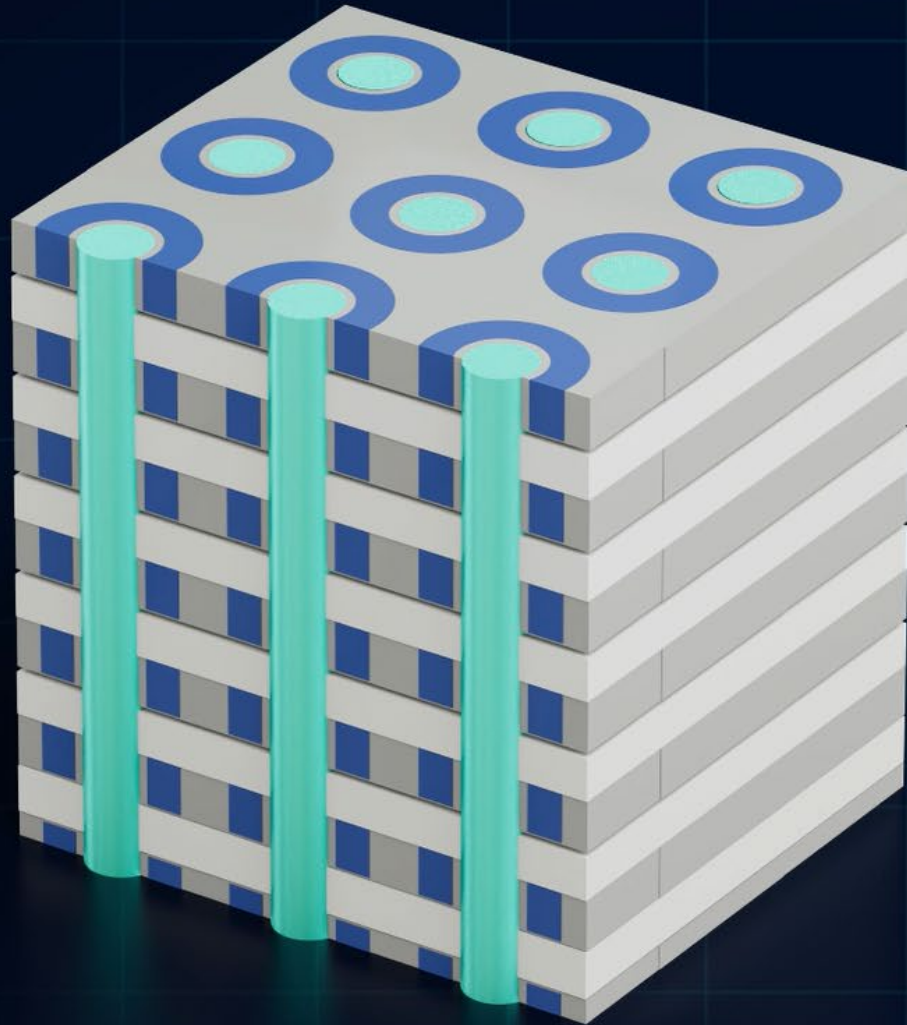
3D X-DRAM™ Process Steps



3D NAND-like Process

- 1 Deposit Multiple Layers
- 2 Deep Trench Bit Line Holes
- 3 Plasma Doping for Floating Body
- 4 Deposit Polysilicon Layer

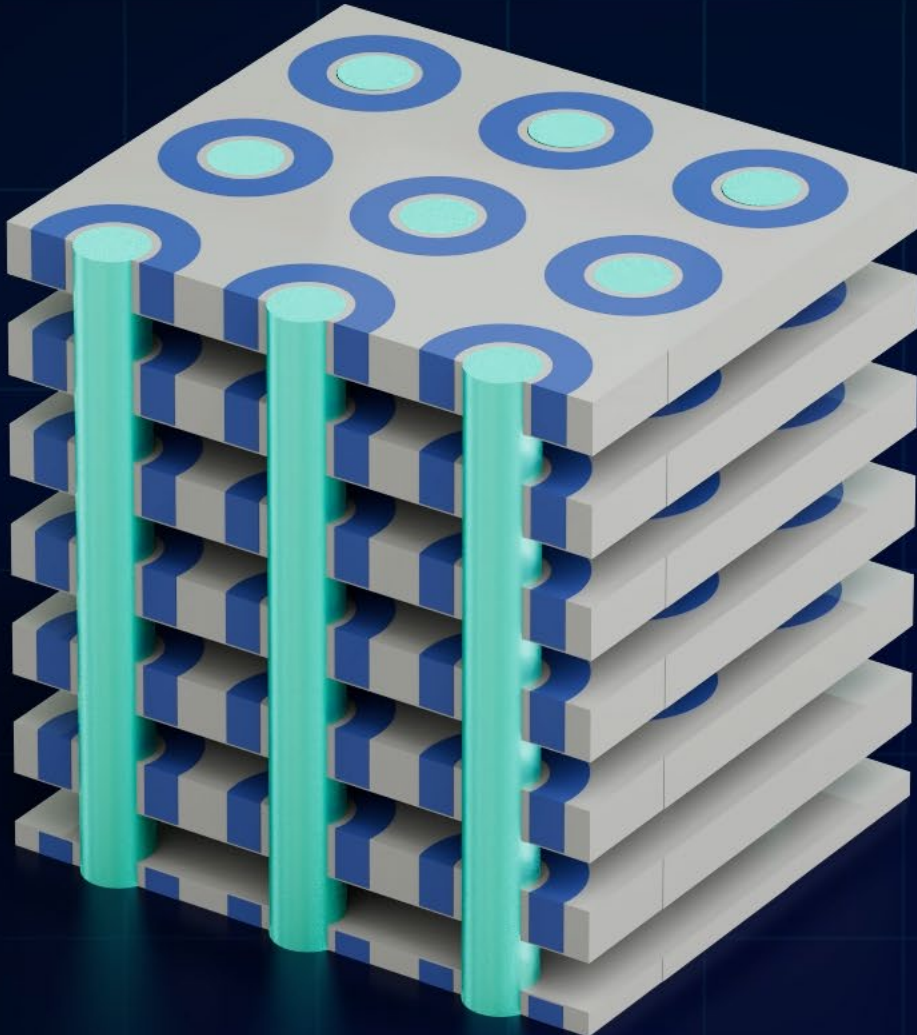
3D X-DRAM™ Process Steps



3D NAND-like Process

- 1 Deposit Multiple Layers
- 2 Deep Trench Bit Line Holes
- 3 Plasma Doping for Floating Body
- 4 Deposit Polysilicon Layer
- 5 Metal Fill Bit Line Hole

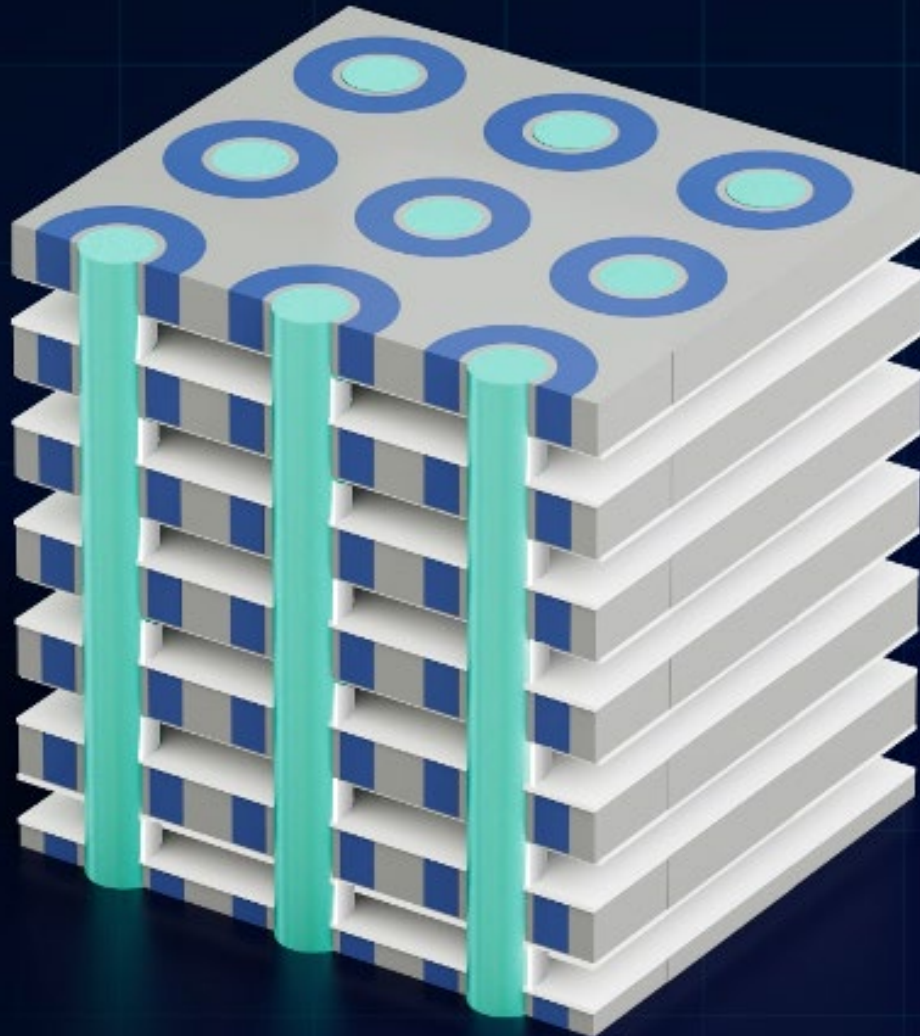
3D X-DRAM™ Process Steps



3D NAND-like Process

- 1 Deposit Multiple Layers
- 2 Deep Trench Bit Line Holes
- 3 Plasma Doping for Floating Body
- 4 Deposit Polysilicon Layer
- 5 Metal Fill Bit Line Hole
- 6 Wet Etch Nitride Layers

3D X-DRAM™ Process Steps

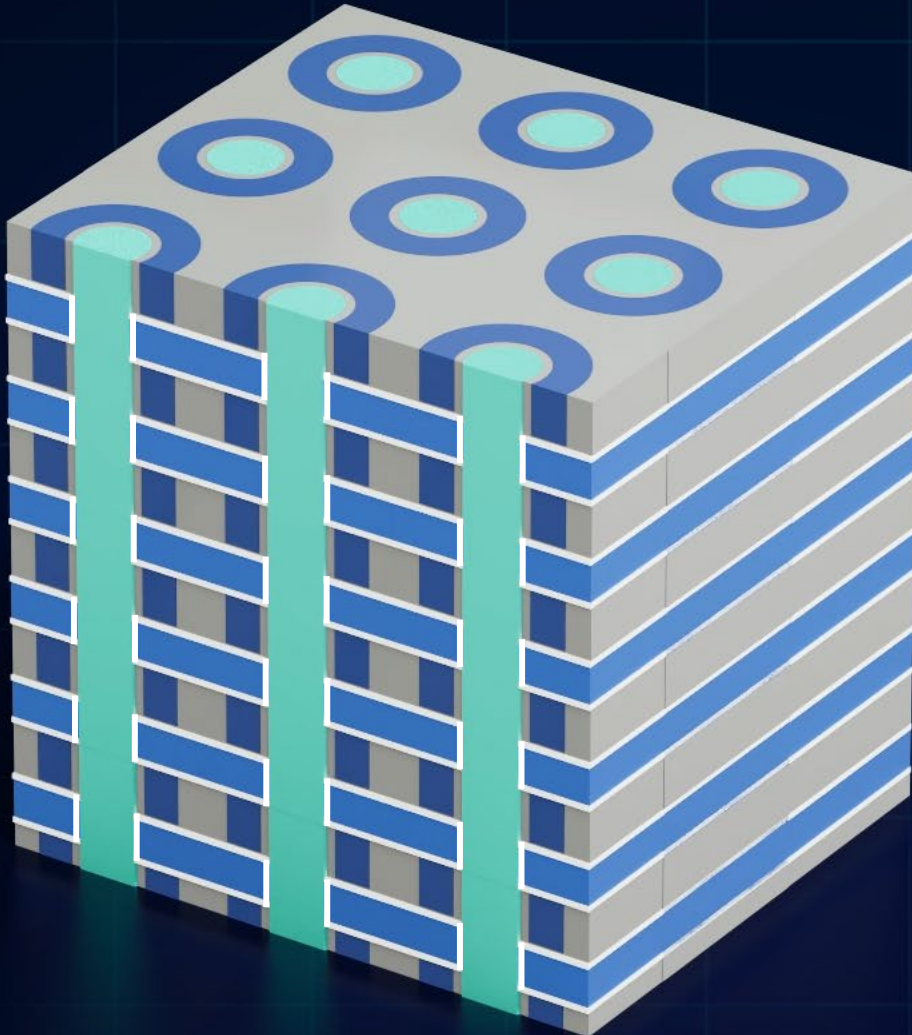


3D NAND-like Process

- 1 Deposit Multiple Layers
- 2 Deep Trench Bit Line Holes
- 3 Plasma Doping for Floating Body
- 4 Deposit Polysilicon Layer
- 5 Metal Fill Bit Line Hole
- 6 Wet Etch Nitride Layers
- 7 Deposit Gate Oxide Layer

3D X-DRAM™

Process Steps



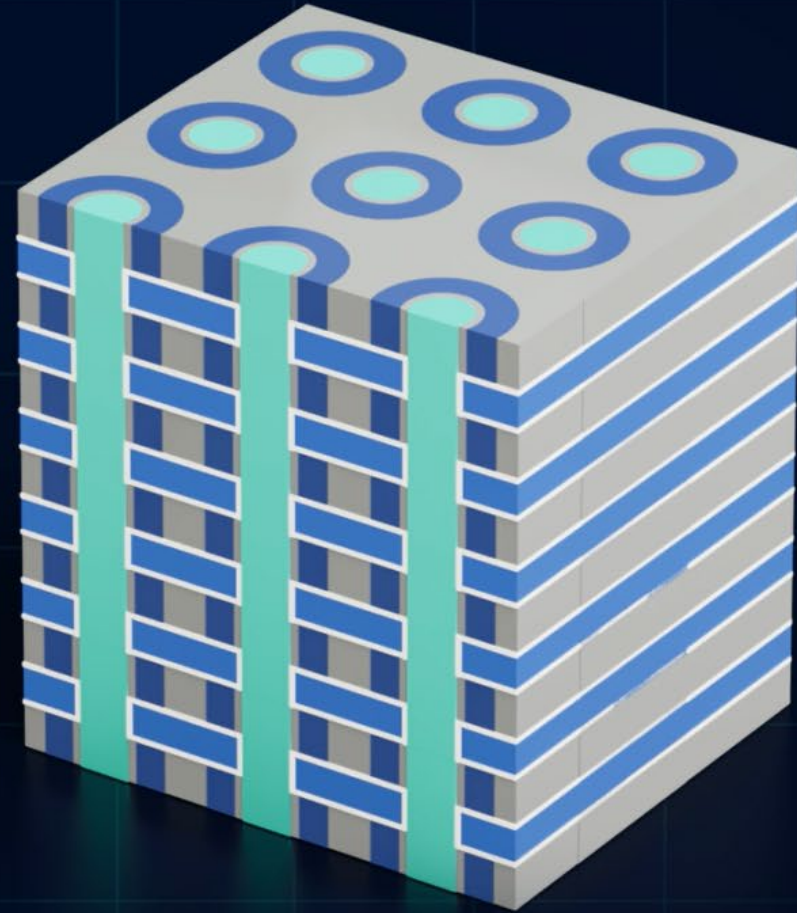
3D NAND-like Process

- 1 Deposit Multiple Layers
- 2 Deep Trench Bit Line Holes
- 3 Plasma Doping for Floating Body
- 4 Deposit Polysilicon Layer
- 5 Metal Fill Bit Line Hole
- 6 Wet Etch Nitride Layers
- 7 Deposit Gate Oxide Layer
- 8 Deposit Metal Word Lines

3D X-DRAM™

Process Advantages

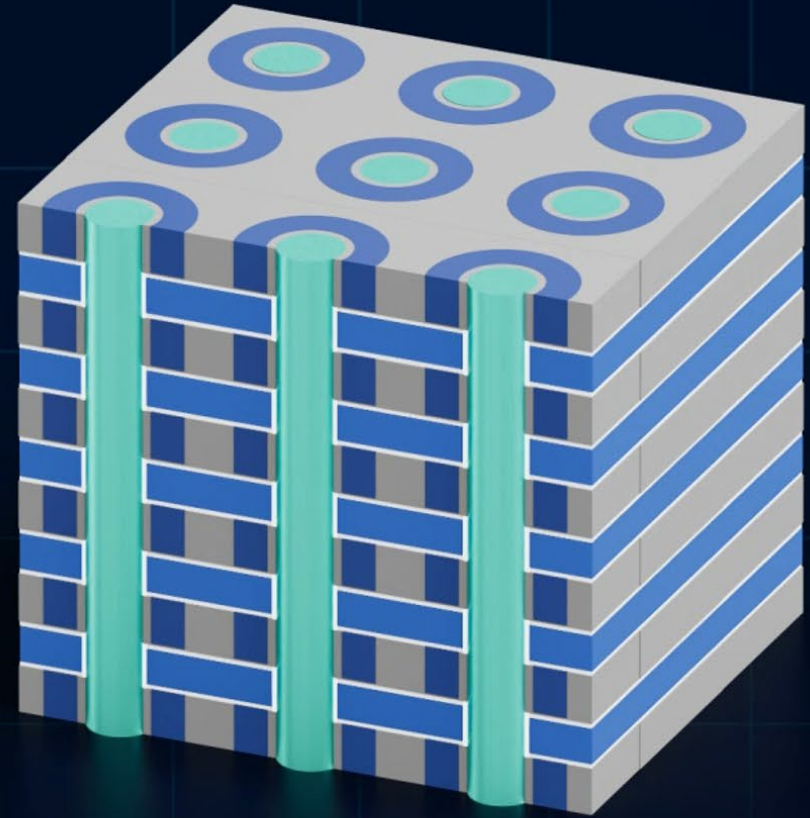
- 1 Bit Line Mask
- 8 Key Steps
 - Self-Aligned



3D NAND

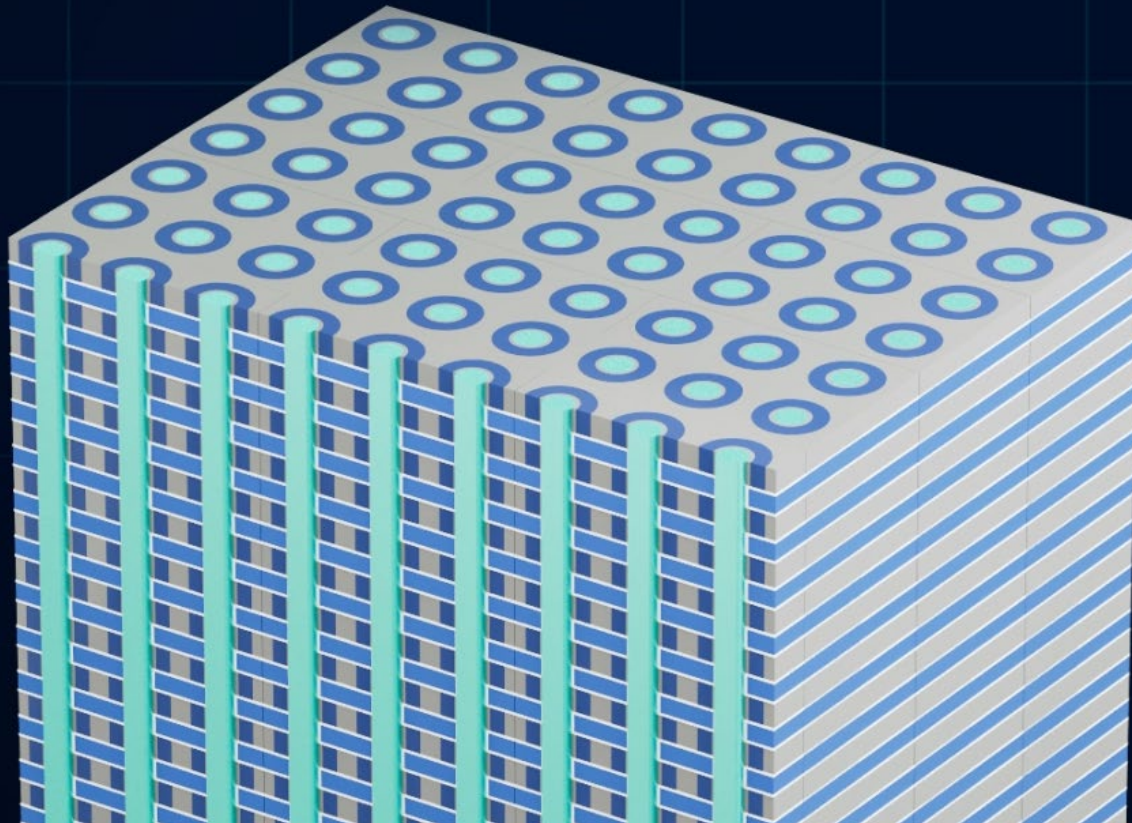


3D X-DRAM



Similar Processes

3D X-DRAM™ Memory Density



230 Layers

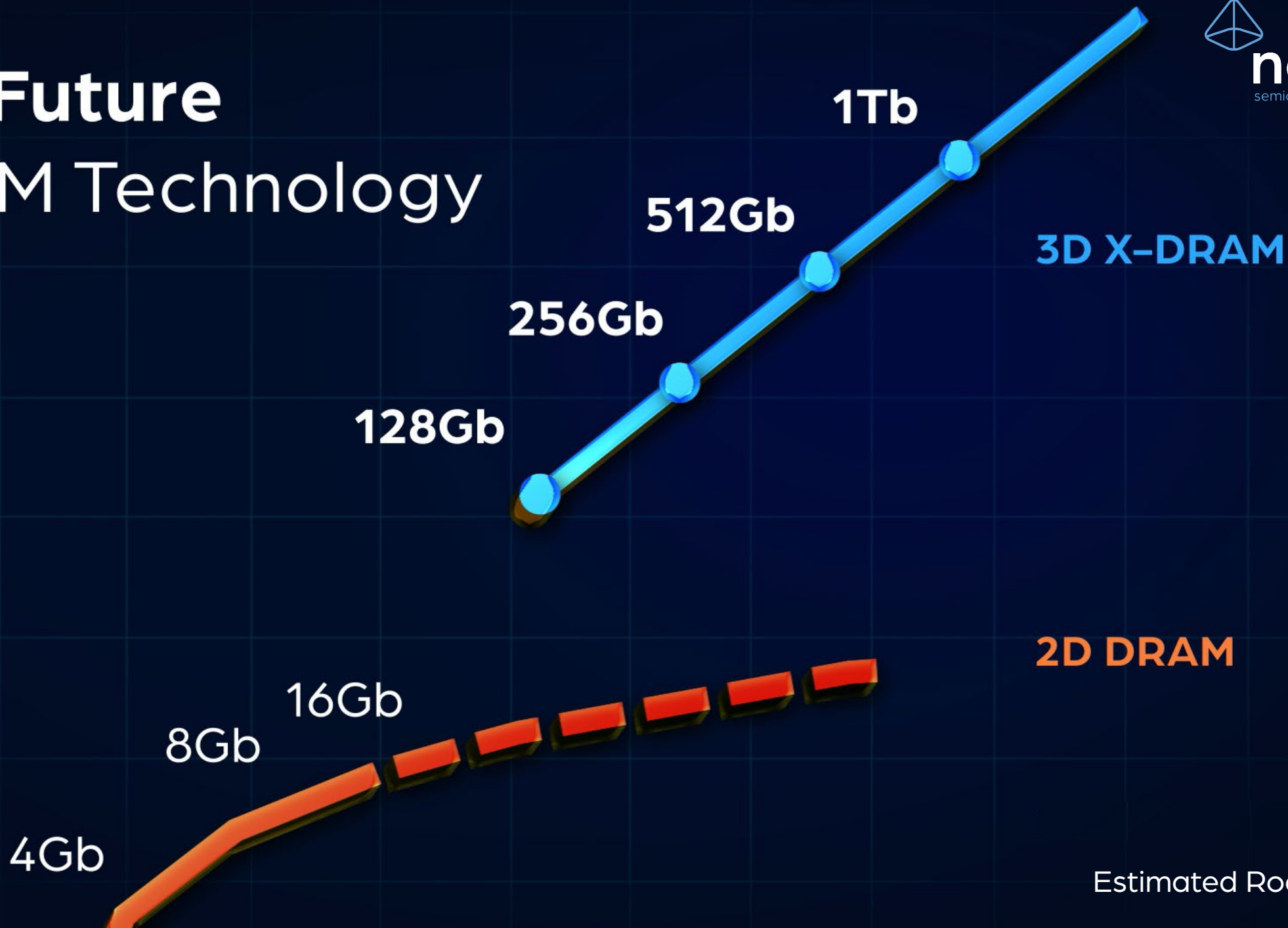
128 Gb

8X Density

Estimated Density

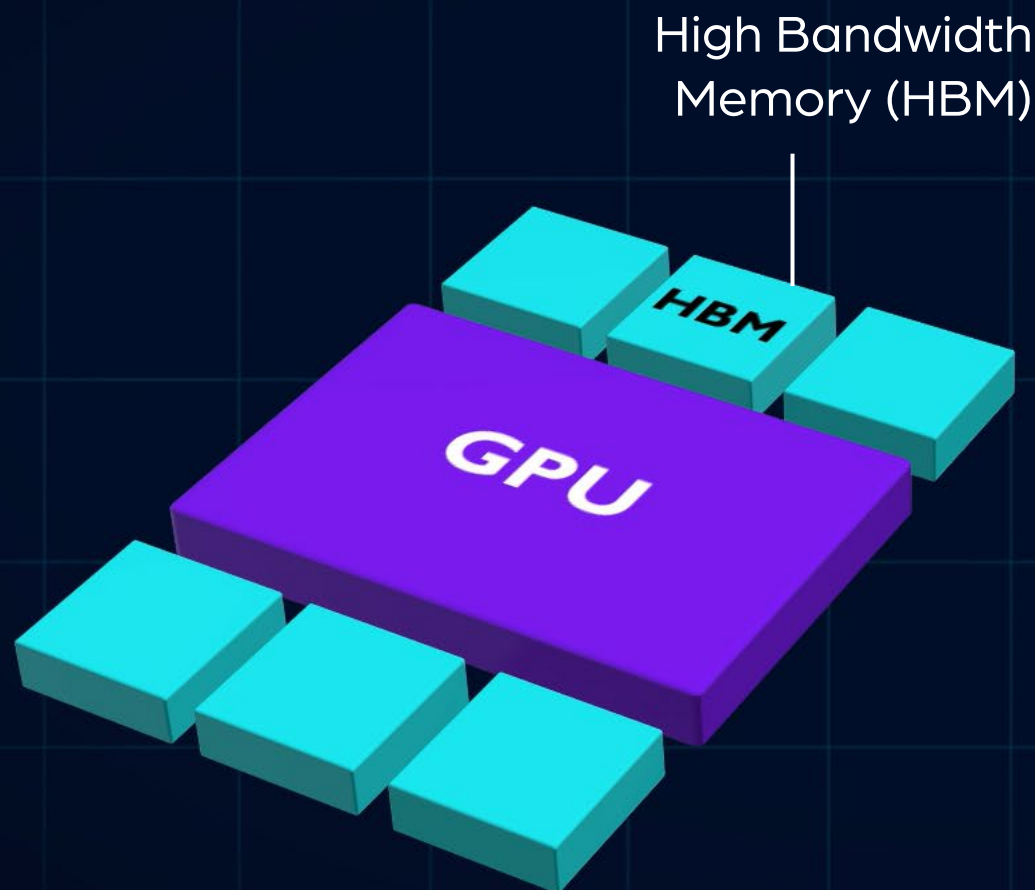
The Future DRAM Technology

3D X-DRAM



Estimated Roadmap

More Memory for AI Chip



High Bandwidth
Memory (HBM)

3D X-DRAM

1.5 TB

2D DRAM

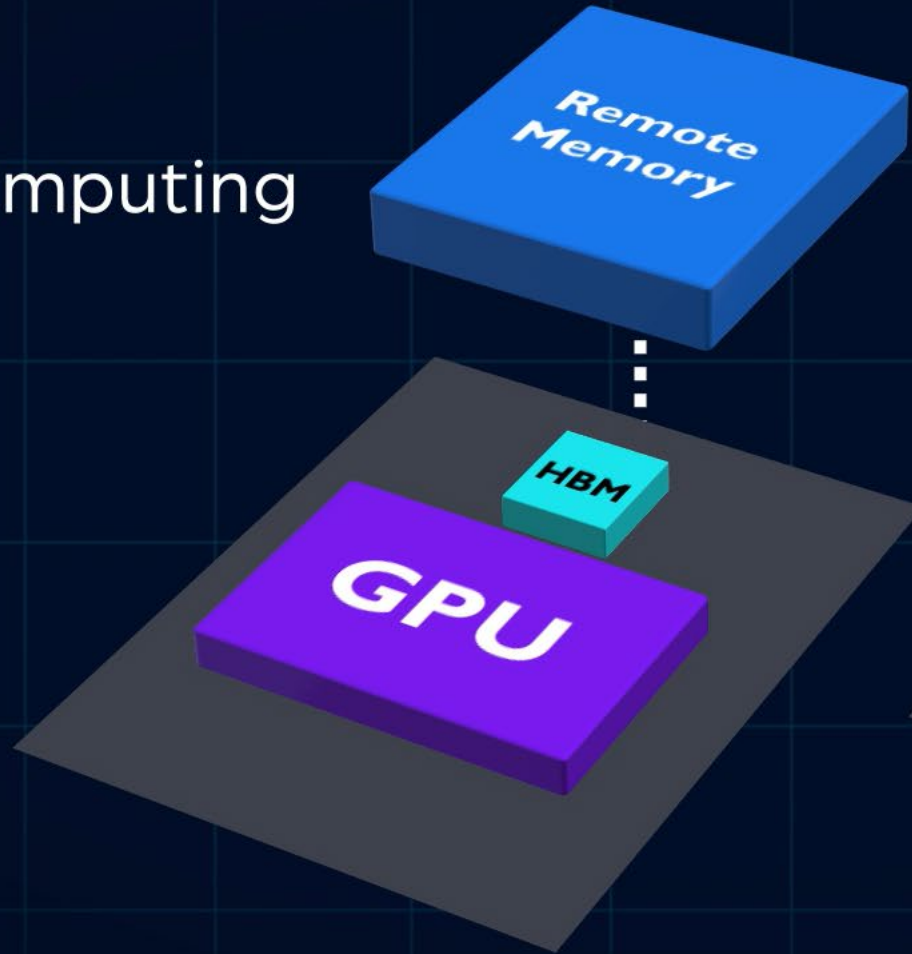
192 GB

Estimated
Capacity

AI Revolution

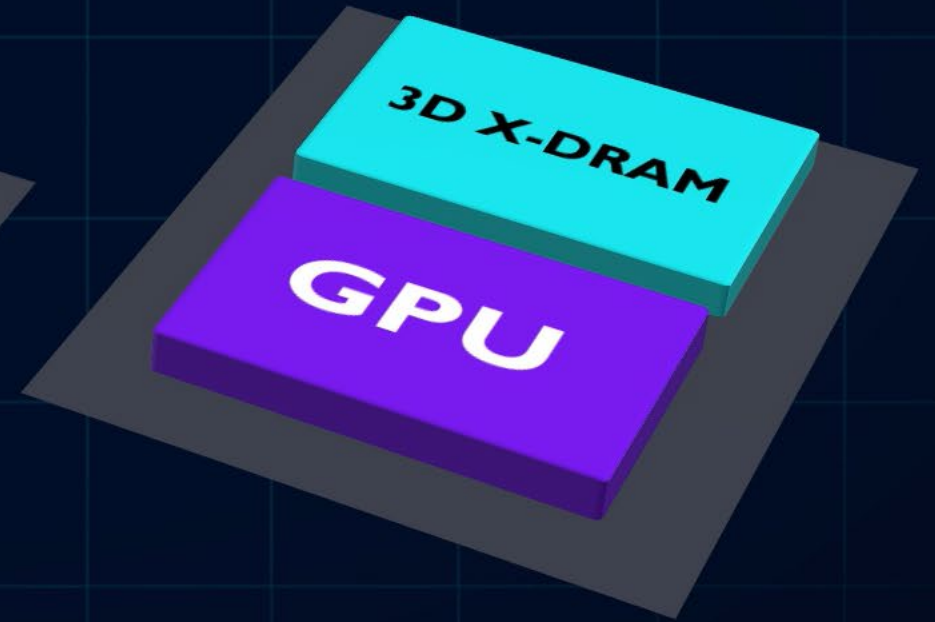
Remote

Memory Computing



Local

Memory Computing





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Thank You

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3D X-DRAM Tech 5G