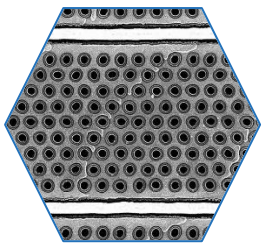
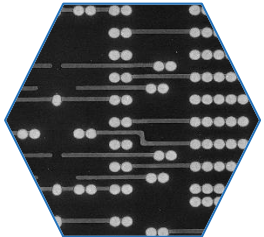


Samsung 128-layer V-NAND Memory

Samsung's 6th-generation 3D NAND TLC with 128 active wordlines in a single deck array with side peripheral logic.



Samsung is a giant in the NAND market, dominating for several years. In 2020, the company was the world's top NAND flash maker with a market share of 34%, followed by Japan's Kioxia Corp. with 21% and U.S. chipmaker Western Digital Corp. with 18%.

There is an explosive worldwide growth of data production causing the demand for high-performing, reliable non-volatile memory. NAND memory providers are continuously pushing the limits of 3D stacking to provide improved storage density with each generation of 3D NAND memories.

Samsung's vertical-NAND flash technology satisfies rising data demands by increasing the number of stacked layers. Vertical stacking of memory cells or wordlines creates a three-dimensional structure which overcomes the capacity limitations. Samsung first commercialized its 24-layered V-NAND in 2013 and today has reached 128 layers in its 6th-generation V-NAND. This 6th-generation design stacks a total of 136-layer wordlines in a single tier. Meanwhile, NAND memory competitors are using a double-stack technology to develop their 3D NAND stacked memories, yet Samsung sticks to using a single stack which requires a more advanced etching technique and results in an increased high-aspect ratio. The company's sixth-generation V-NAND adds almost 40% more cells to the previous 92-layer 5th-generation V-NAND, resulting in an almost 25% chip area reduction.

This report presents a detailed study of Samsung's latest 128-layer V-NAND using

charge trap flash and triple-level cell NAND memory cells. The high-quality optical images and high-resolution scanning electron microscope (SEM) images are extracted to give physical details of the package and die cross-sections, including material identification. Also included are process details to better understand the major fabrication steps. Additionally, this report provides a cost estimation for producing the memory wafer with multiple wordlines, the die cost, and the packaging cost.

Finally, this report features a comparison of Samsung's previous-generation memories: this includes Gen 4 with 64 layers, Gen 5 with 92 layers, and Gen 6 with 128 layers. This comparison summary comprises the package and die physical comparison, die density, wafer cost, and die cost. It also identifies the similar physical features and the evolution of Samsung's V-NAND with each generation.

Title: Samsung 128-layer V-NAND Memory

Pages: 112

Date: November 2021

Format: PDF & Excel file

Price: EUR 3,990

Reference: SPR21584

COMPLETE TEARDOWN WITH:

- Detailed optical and SEM photos
- Precise measurements
- Materials analysis
- Manufacturing process flow
- Supply chain evaluation
- Manufacturing cost analysis
- Comparison between 4th Gen (64-layer), 5th Gen (92-layer), and 6th Gen (128-layer)

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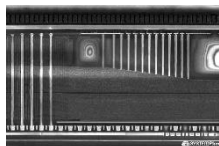


Belinda Dube is working for System Plus Consulting as an Engineer & Analyst, Semiconductor Memories, especially DRAM and 3D NAND flash memory. At the same time, she also investigates IC technologies as well as advanced packaging. Belinda is also engaged in the development of reverse engineering & costing analyses with the power electronics and compound semiconductors team.



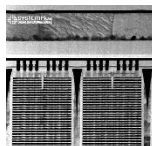
Véronique Le Troadec has joined System Plus Consulting as a laboratory engineer. Coming from Atmel Nantes, she has extensive knowledge in failure analysis of components and in deprocessing of integrated circuits.

RELATED ANALYSES



Intel 144-layer 3D NAND Memory

Intel's Quad-Level Cell 3D NAND with 144 active wordlines in three decks, with CMOS under array and floating gate technology.
November 2021 - EUR 3,990*



SK hynix 128-Layer NAND Memory

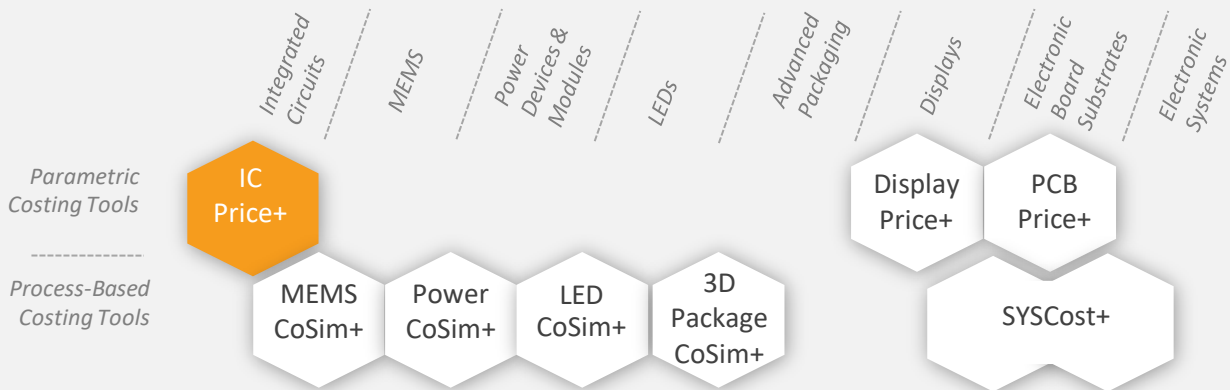
Second-generation PuC 3D NAND memory and cost comparison to 72-layer with periphery on the side.
August 2021 - EUR 3,990*



Status of the Memory Industry 2021

NAND consolidation, China's bet on two key players, the rise of the CXL interface: as the memory business narrows, the market keeps growing and is poised to exceed \$200B in 2026.
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ABOUT SYSTEM PLUS CONSULTING

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Reverse Costing® is the process of disassembling a device (or a system) in order to identify its technology and calculate its manufacturing cost, using in-house models and tools.



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