

YMTC 232L TLC 3D NAND

(YMTC 4th Gen, Xtacking 3.0, Parent Product: HikSemi CC700 2 TB SSD)

Disruptive Event Briefing

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Technology Agenda

Authoritative Semiconductor & Microelectronics Intelligence Platform

Leveraging a unique reverse engineering competency, we reveal innovations in technology products that provide advanced technical and market analysis to organizations which will help guide them to make fact-based technology and intellectual property decisions.



Reverse Engineering

We help decision makers in semiconductor, system, financial, and communication service provider companies make more informed decisions on their product roadmaps with competitive technical intelligence.

We also help supply chain and procurement professionals to more effectively negotiate with suppliers and understand true costs of technology products.

We also collaborate with IP professionals in global technology companies, licensing entities and legal firms to plan strategies on the assertion/defense on their patent portfolios and licensing negotiations.



Market Analysis

We help business and technology leadership de-risk strategic investment and procurement decisions with visibility into semiconductor manufacturing, silicon demand, and capacity.

We also enable more informed decision-making for product and market strategy with curated insight into the performance, application, and functionality across individual SoCs and aggregated across market segments.

All supported by building out stronger products from acquisitions (The Linley Group and VLSI) and most recently with Strategy Analytics. Read more about Strategy Analytics [here](#).

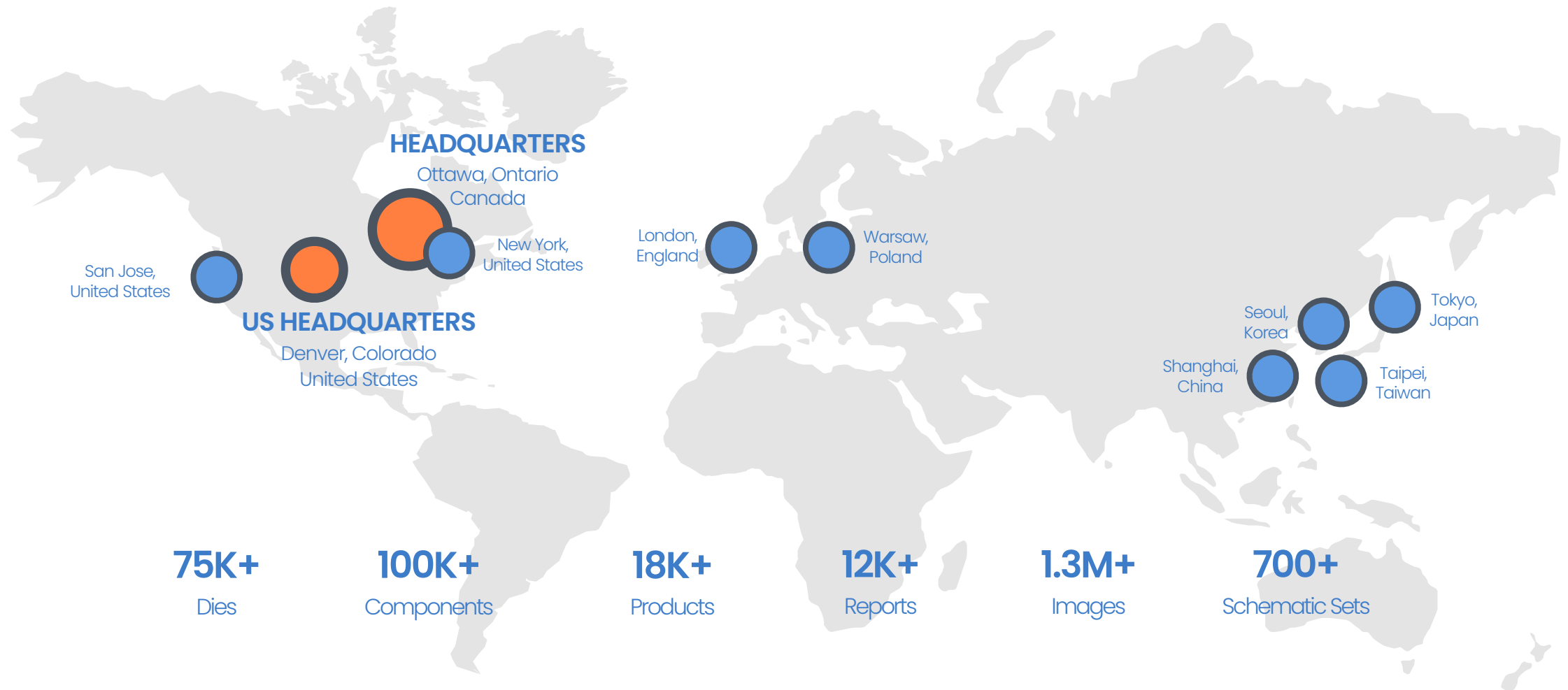


Spend Insights

We help competitive analysis teams at OEMs and component suppliers to understand design philosophies, and BOM costs through deep dive hardware teardowns of consumer electronics devices. This is delivered through the world's largest library of independent and non-biased teardowns.

We also help supply chain and category management teams to understand pricing and lead-time trends for commodity electronic components engineers are selecting for new designs.

Global Presence



YMTC Overview

YMTC's Xtacking 3.0 is disruptive from both a geopolitical and a technological perspective.

YMTC was founded in 2016 in China. Since then, their pace of innovation has outpaced that of the competition – they are developing at a remarkable speed – to the point where YMTC has just introduced the first 200+ layer 3D NAND Flash available on the market.

At their current rate of innovation, YMTC is poised to be the uncontested global NAND Flash technology leader before 2030.

In light of current world events, where many Chinese semiconductor companies have been subject to restrictions imposed by the West, this development furthers China's ability to operate independent of Western technology. Despite their achievements YMTC still faces an uphill battle, as the sanctions will dramatically impact their ability to produce devices at scale, and to progress quickly to the next generation.

The other leaders in this space – Samsung, SK hynix, and Micron – are all working on their own 200+ layer solutions. In YMTC's Xtacking, the memory array is flipped and bonded to the CMOS. This approach, claims YMTC, reduces product development time by at least 3 months, and shortens the manufacturing cycle time by 20%.



Disruptive Event Overview

What did we find?

- ✓ After a search through several SSD's, we found the YMTC (Xtacking 3.0) 232L 1 Tb 3D NAND Flash TLC die EET1A from the HikVision/HikSemi (CC700 HS-SSD-CC700) 2TB SSD.

Why is it exciting?

- ✓ YMTC, a Chinese and relatively young company (founded in 2016), has managed to produce a 232-Layer NAND Flash, ahead of its rivals and NAND market leaders, making them a serious contender and this advancement shows YMTC closing in on global memory giants, following COVID-19 Lockdowns, geo-political challenges and sanctions.

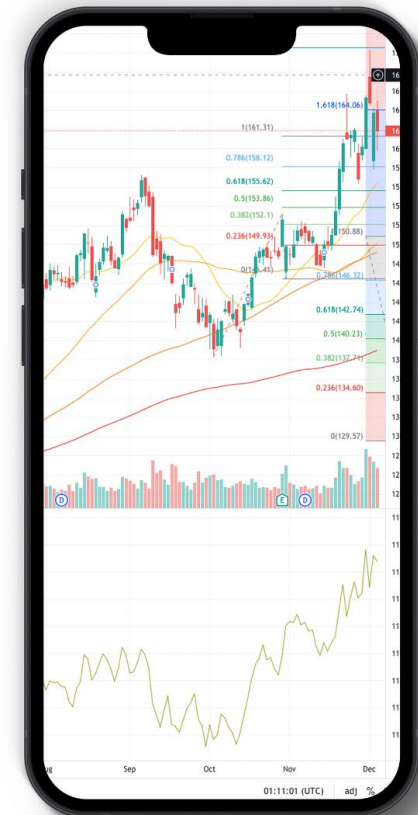


Market Overview

What market does this technology serve and who are the major players?

- ✓ This technology serves solid state drives, mobile handsets and tablets.

Major players include:



Market Overview

What is the manufacturer striving to accomplish with this development?

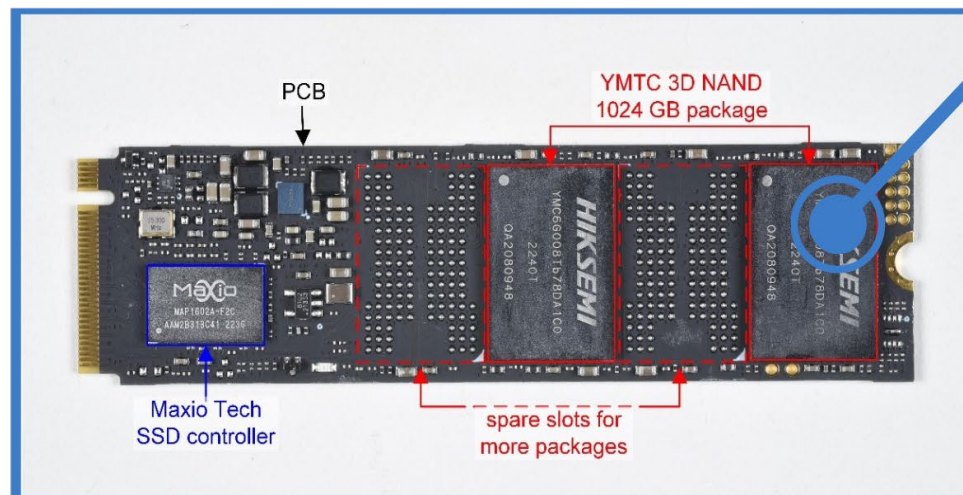
- ✓ Greater storage and bit density
- ✓ Short(er) development with Xtacking
- ✓ Greater cell efficiency and reliability
- ✓ Process simplification (with BSSC) – no SEG Si growth at source end & no ONO etch requirement
- ✓ 6 planes asynchronous multi-plane independent (AMPI) operations per plane with center X-decoder (X-DEC)



Market Overview

Are there any recent technology developments in this space that relates to this technology?

- ✓ Micron 232L NAND Mass production announced July 2022
- ✓ SK hynix debut of a 238L (Announced at FMS 2022), with mass production in 1H2023



Market Overview

What are competitors doing in this space?

Micron



Recent and similar developments include Micron moving from 128L (2020 Q1) to 232L (2022 Q3)

SK hynix



SK hynix expected to mass produce a 238L in 1H2023

Samsung



Samsung is preparing to mass produce its 8th generation V-NAND Memory which will feature 2xx layers, after sampling V-NAND with over 200L in mid-2021

YMTC Comparison

Metrics	YMTC 128L	YMTC 128L	YMTC 232L
Die markings	CDT1B	CDT2A	EET1A
Die size (Seal) Length (mm)	9.44	12.01	12.62
Die size (Seal) Width (mm)	6.40	4.99	5.40
Die size (Seal) Area (mm ²)	60.42	59.93	68.15
Memory capacity (Gb)	512	512	1024
Bit density (Gb/mm ²)	8.47	8.54	15.03
Number of Active Layers	128	128	232
Number of Total Layers (Gates)	141	141	253
Number of Extra Layers (Gates)	13	13	21
Number of Metals	11	11	11
WL pitch (nm)	58	58	48
BL pitch (nm)	39	39	39
VC height (μm)	8.5	8.5	12.4
Slit depth (μm)	8.8	8.8	12.7

The YMTC 128L Die CDT1B was found in the Asgard AN4 SSD, obtained by TechInsights on August 23, 2021. MFR-2109-801

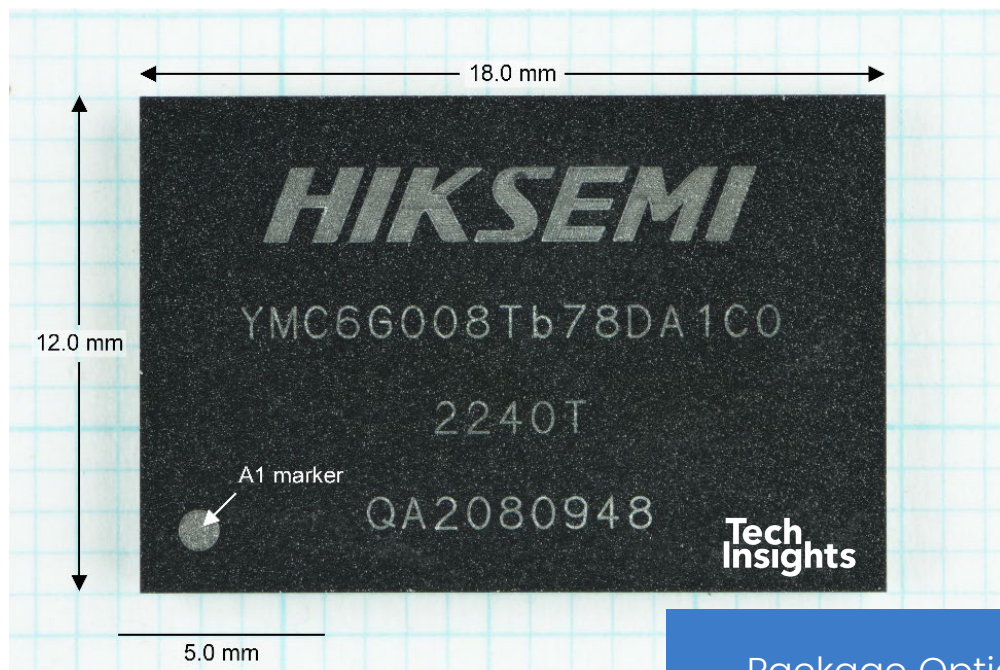
The YMTC 128L Die CDT2A was found in the TiPlus7100, obtained by TechInsights on November 9, 2022. MFR-2211-801 will be published to the TechInsights Platform in early December 2022.

The YMTC 232L Die EET1A was found in the HikSemi CC700 2 TB SSD, obtained by TechInsights on November 24, 2022.

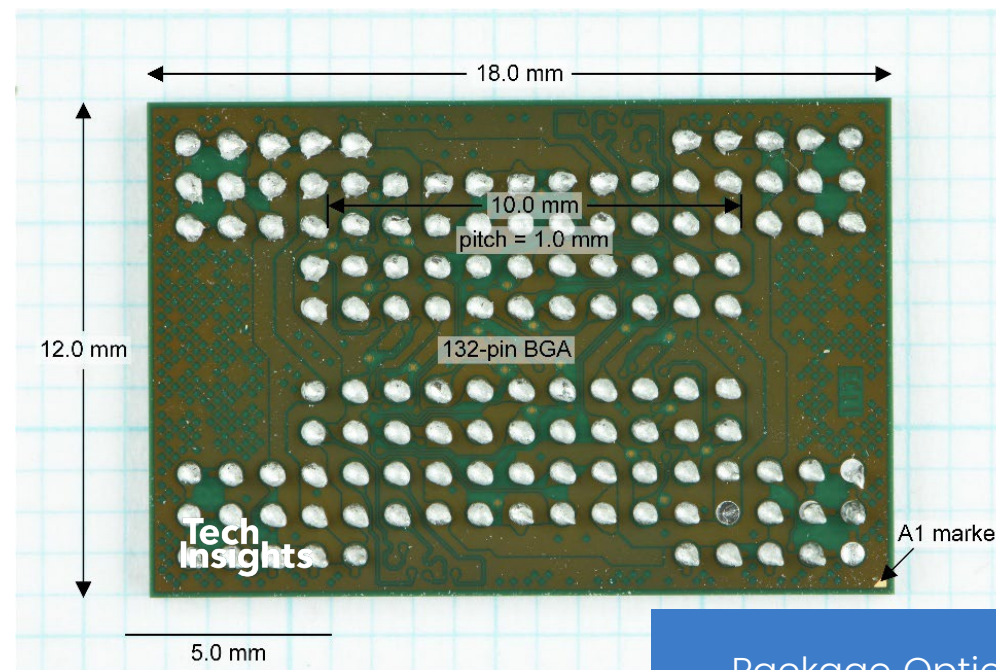
WIP Analyses

YMTC 232L TLC 3D NAND

TechInsights Analysis (Package Images – Work in Progress)



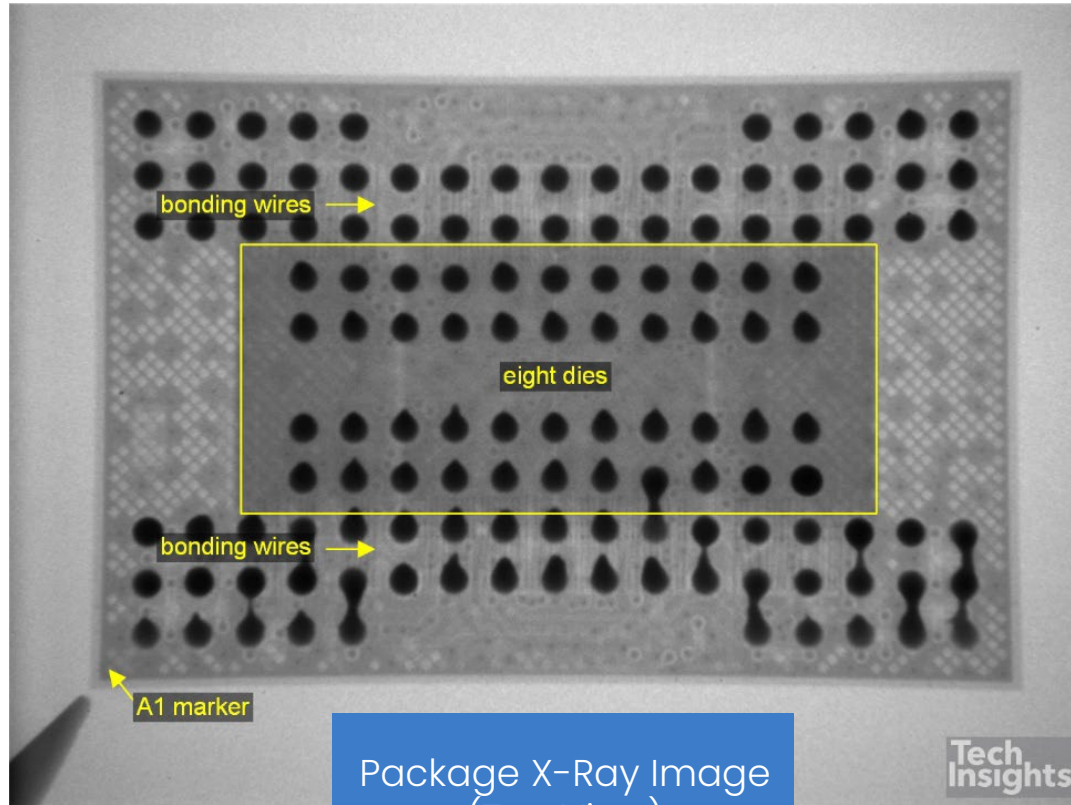
Package Optical Image (Top)



Package Optical Image (Bottom)

YMTC 232L TLC 3D NAND

TechInsights Analysis (Package X-Ray – Work in Progress)



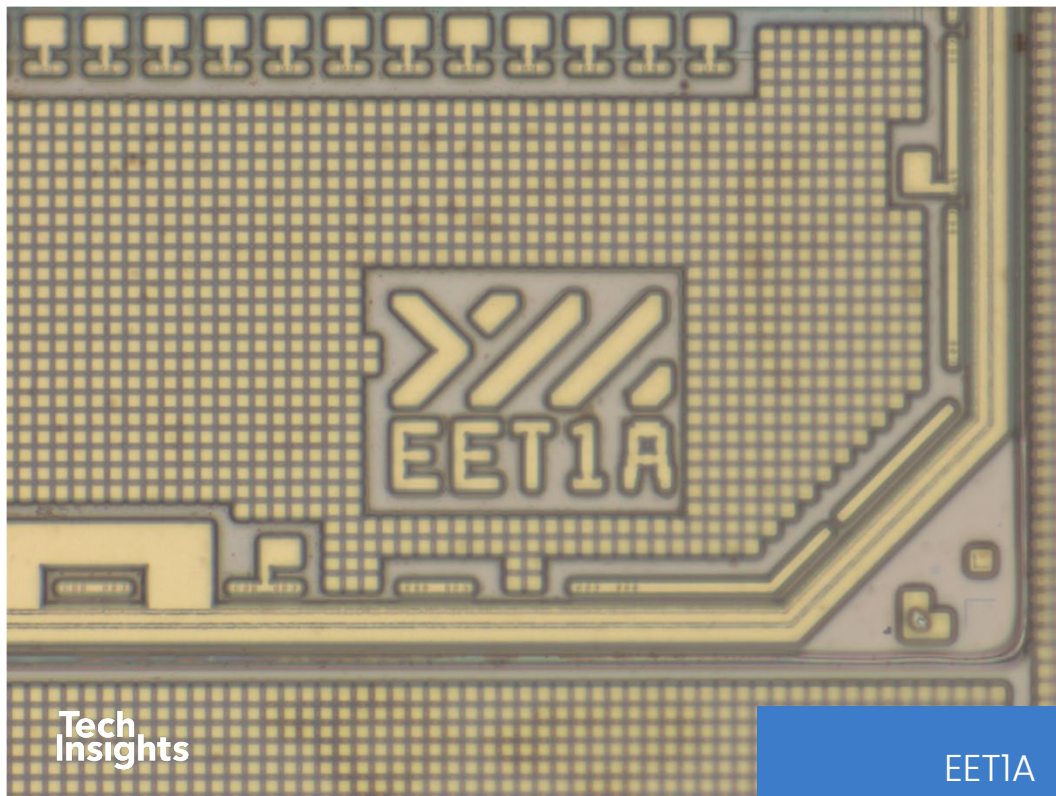
Package X-Ray Image
(Top View)



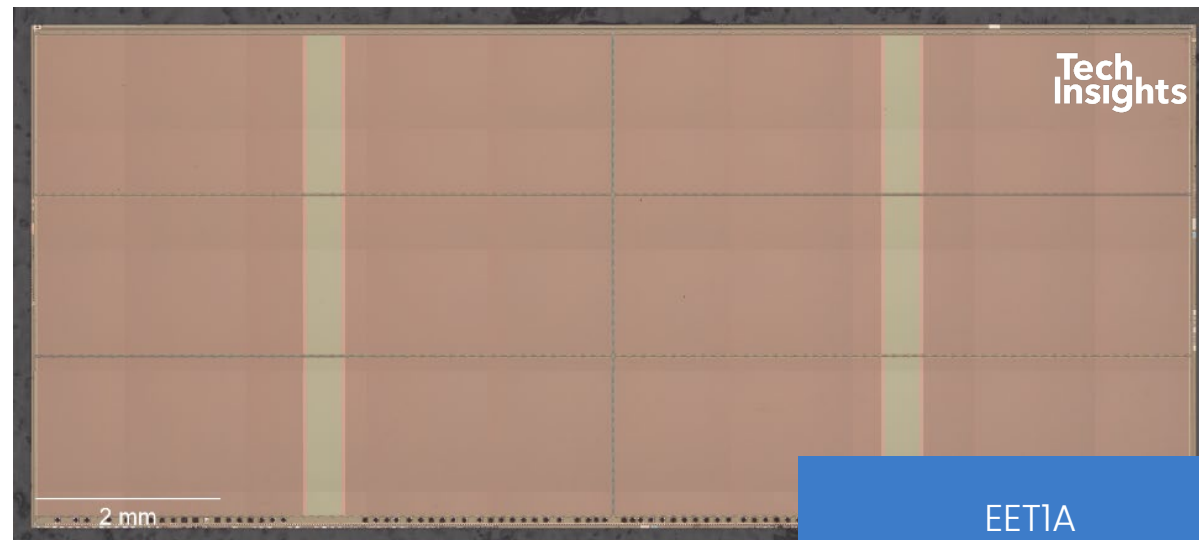
Package X-Ray Image
(Side View)

YMTC 232L TLC 3D NAND

TechInsights Analysis (EET1A Die Images – Work in Progress)



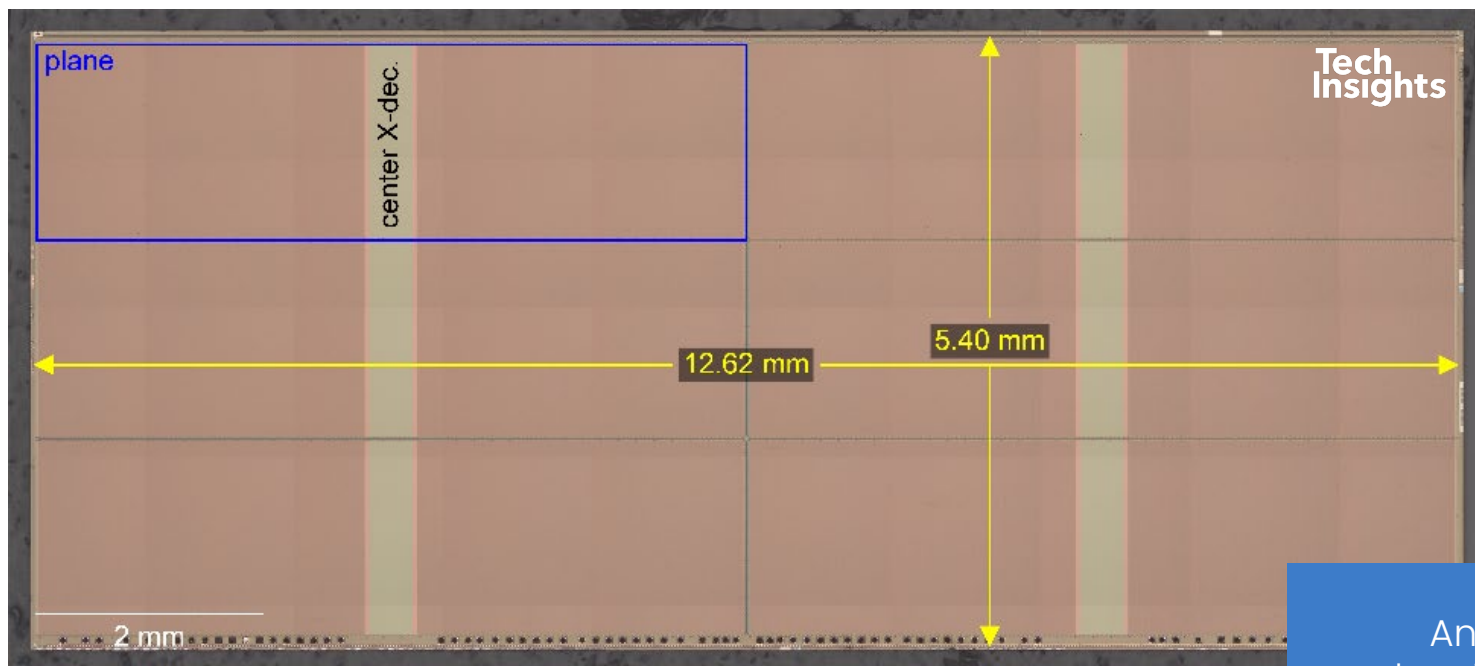
EET1A
Die Markings



EET1A
Die Image

YMTC 232L TLC 3D NAND

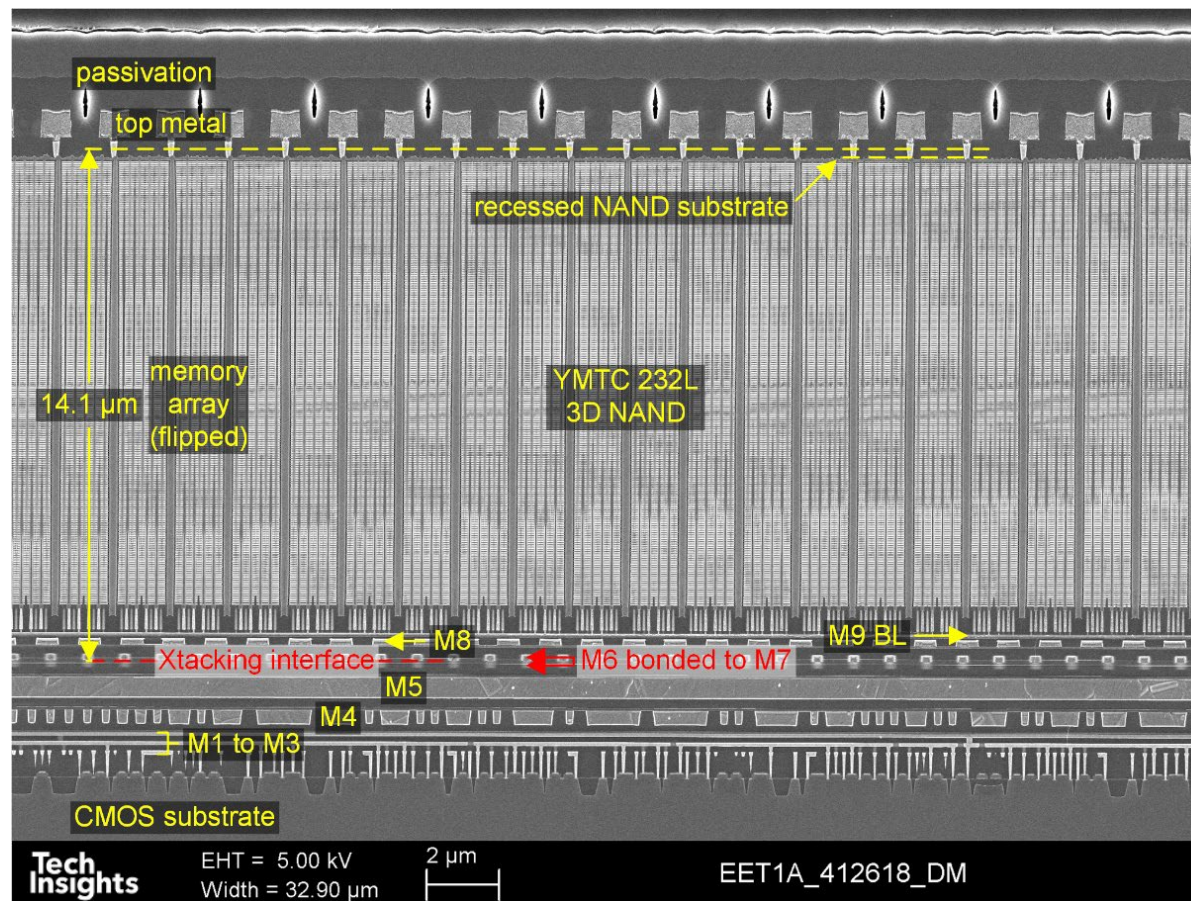
TechInsights Analysis (EET1A Annotated Die Image)



Annotated Die Image,
showing 2x3 plane & center
X-decoder within each plane

YMTC 232L TLC 3D NAND

TechInsights Analysis (Die Cross-Section SEM Image)



Product Details

TechInsights

TechInsights has analysis planned for this part, including the report listed below:

Report Name	Description	Report Code	Subscription Channel
YMTC 232L TLC 3D NAND Memory Floorplan Analysis	A layout of major functional blocks supported by high resolution imagery and observations by TechInsights experts. Costing analysis is included.	MFR-2211-804	NAND Floorplan Analysis
YMTC 232L TLC 3D NAND Advanced Memory Essentials	Executive summary supported by large image sets; SEM cross-sectional and bevel imaging; TEM cross-sectional analysis with TEM EDS; Dimensional analysis and Materials analysis.	AME-2211-803	Advanced Process
YMTC 232L TLC 3D NAND Process Flow Analysis	Spreadsheets showing process architecture, mask list, and integration-level process steps, tool type and material	Coming Soon	Process Flow Analysis
YMTC 232L TLC 3D NAND Process Flow Full Analysis	3D Emulation, Layout GDS fully decomposed into process layers, Detailed explanation of process integration from wafer-in through wafer-out	Coming Soon	Process Flow Analysis
YMTC 232L TLC 3D NAND Memory Peripheral Design	Circuit schematic diagram of a page buffer: decoder, switch, and controller; Circuit schematic diagram of a wordline driver: decoder and switch; Detailed stacked plan view SEM images of a beveled NAND page buffer and wordline driver delivered in CircuitVision. Includes calibrated measurement and annotation tools	Coming Soon	NAND Peripheral Design
YMTC 232L TLC 3D NAND Internal Waveform Analysis Overview	This channel examines the waveforms used on NAND memory cells during program, read and erase cycles.	Coming Soon	NAND Internal Waveform Analysis
YMTC 232L TLC 3D NAND Transistor Characterization	10 types of transistors characterized at 85°C	Coming Soon	NAND Transistor Characterization
YMTC 232L TLC 3D NAND Full Circuit Analysis	Full circuit analysis	Coming Soon	NAND Circuit Analysis

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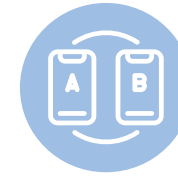
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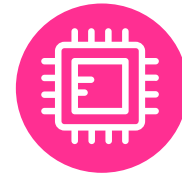
TEARDOWN

Look inside the latest electronic products to understand hardware design, component selection, and cost structure - with a bill of materials that identify key semiconductor design wins.



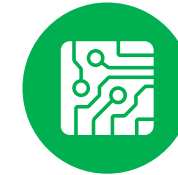
PACKAGE ANALYSIS

See how technology choices used by leading chipset manufacturers to package their advanced chipsets is evolving



FLOORPLAN ANALYSIS

Understand die layout, IP block and cache area, I/O placements, power grids, and standard cell library choices made by the leading SoC designers.



CIRCUIT ANALYSIS

See how circuit designers have implemented address and data paths, control blocks, and voltage generators of state-of-the-art devices.



PROCESS & PROCESS FLOW ANALYSIS

Learn how the structural and materials choices by the leading IC manufacturers are evolving to support new advances in technology generations



PERFORMANCE & BENCHMARKING

See how evolution of process and technology generations impact performance of advanced chipsets.

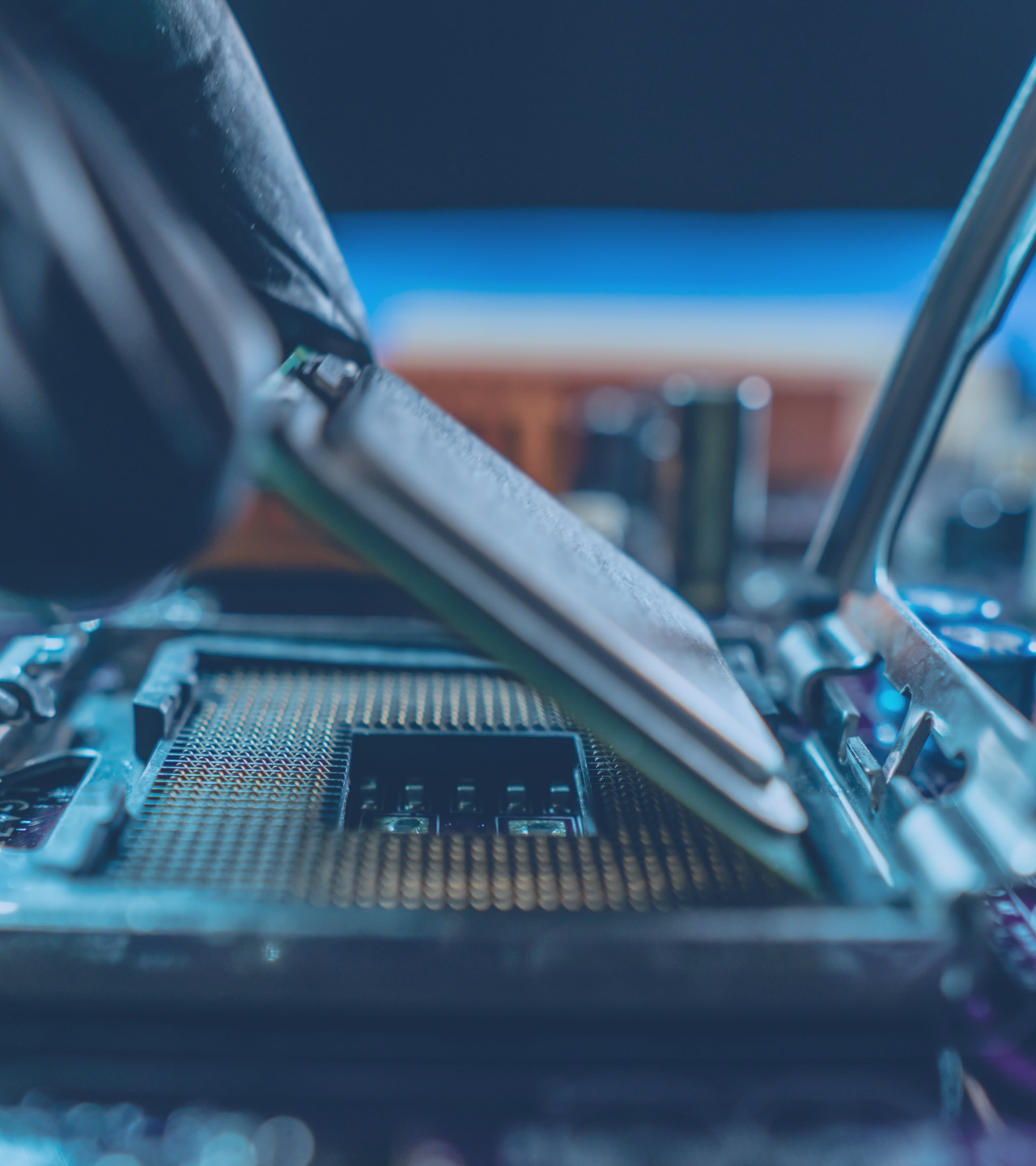
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Our unmatched reverse engineering analysis, images, and expert commentary are accessed through the TechInsights Platform, the world's largest research library of semiconductor and market analysis. Our customers include the most successful technology companies, who rely on TechInsights analysis to make informed business decisions faster and with greater confidence.

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