

**KIOXIA**

# Embedded Flash Memory

RAW NAND

MANAGED NAND

AUTOMOTIVE SOLUTIONS

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# Leading Supplier and Inventor of Flash Memory

## INNOVATION IS OUR TRADITION

In 1984 Toshiba invented a new type of semiconductor memory called flash memory. Later in 1987, NAND flash memory was developed that raised electronic equipment to the next level. The NAND flash market has grown rapidly, with flash memory becoming an internationally standardised memory device. KIOXIA, the inventor of flash memory, has thus carved out a path to a new era in which innovations are increased by the opportunities of NAND flash.

Under its new name, KIOXIA keeps this invention and continues to provide embedded memory solutions. Embedded memory connects us with the things that surround and serve us – for more efficiency, comfort and sustainability.

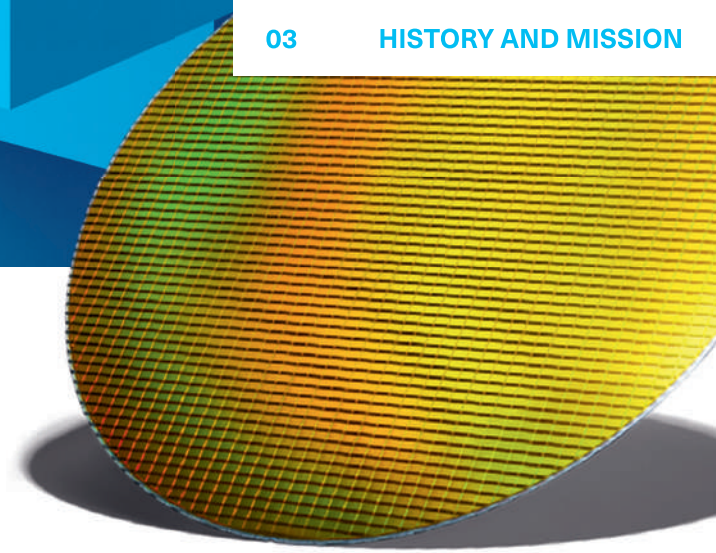
## SPEED UP DIGITAL PROCESSES

Storing and processing data has always been an important aspect of all digital processes. But in the last years it increased to one of the key technologies for industry 4.0, smart mobility, cloud technology and artificial intelligence, because smart ideas and innovations have to be ready for markets right away – with high reliability of storage components.

With our embedded memory solutions, KIOXIA is the partner for all smart markets and fast moving industries. KIOXIA provides a highly grade of innovation combined with highly reliable security – now and in the future.

## PARTNERSHIP IS OUR PASSION

Our success is based on our strong customer focus: Your metrics are our metrics. The result is a broad range of industry-leading flash-based storage solutions. Our products are designed to meet your specific engineering demands.



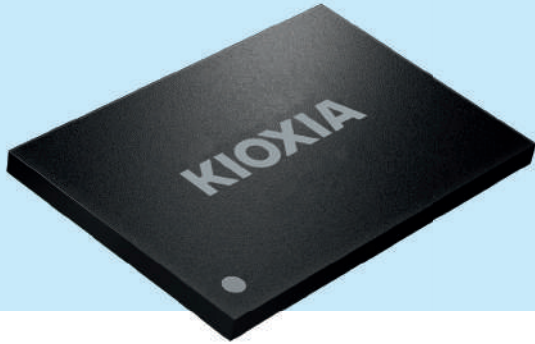
Silica wafers are formed from highly pure, nearly defect-free single crystalline material: the starting point for any integrated circuits.

## KIOXIA EMBEDDED MEMORY – THE KEY TO A SMART FUTURE

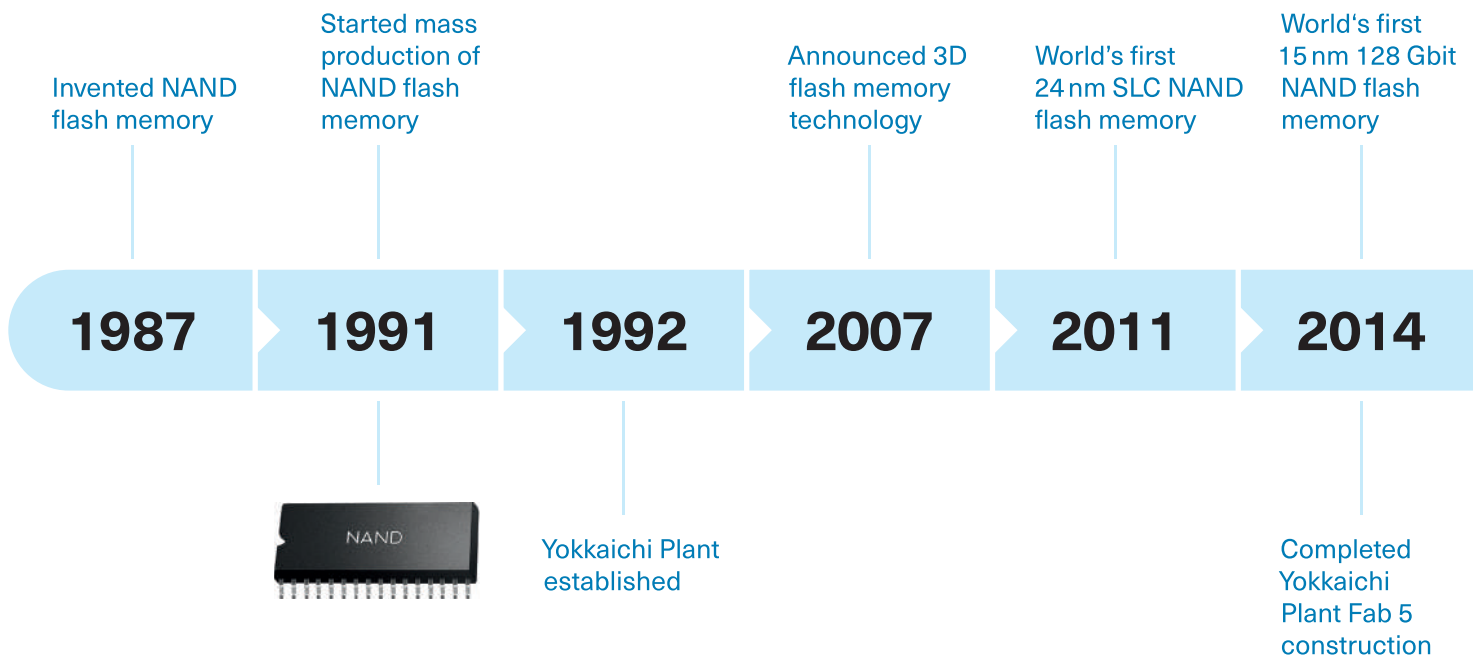
*“With progressive memory technology at the core, we offer products, services, and systems that create choice and define the future.”*



# OUR LEGACY OF INNOVATION



## THE INVENTOR OF FLASH MEMORY.



**INNOVATIVE.  
AWARD-WINNING.  
TRUSTED.**

### Memory Solutions

Extensive product lineup

Excellent reliability & quality

Leading density & capacity

# ON COMES WITH US

With our proven track record of success and reputation for innovation, KIOXIA will build on our history as we continue our journey as an independent company...



Started mass production of 48-layer BiCS FLASH™

Prototyped QLC BiCS FLASH™ memory

Started mass production of 96-layer BiCS FLASH™

**KIOXIA**  
Est. Oct 2019

Announced 162-layer BiCS FLASH™

**2016**

**2017**

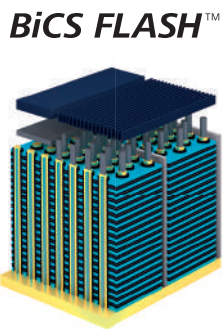
**2018**

**2019**

**2021**

**2022**

Completed Yokkaichi Plant new Fab 2 construction



**BiCS FLASH™**

Completed Yokkaichi Plant Fab 6 construction

Completed Kitakami Plant K1 construction

Yokkaichi Plant Y7 construction started

Completed first phase of Yokkaichi Plant new Fab 7 construction  
Started construction of Kitakami Plant K2

## SSD Solutions

In-house SoC & firmware

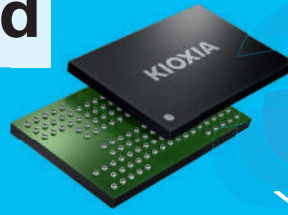
Latest interfaces & form factors

Broad portfolio of SSDs

## Software Solutions



# Flash Memory Has Forever Changed Our World



# 35

YEARS OF INNOVATION

## UPLIFTING THE WORLD WITH “MEMORY” SINCE 1987

35 years ago KIOXIA introduced a new technology that has forever changed the way we live, work and play: **Flash Memory**

As the inventor of the first NAND Flash Memory, KIOXIA has been leading a new era by providing advanced memory solutions to enrich people's lives.
















Back in 1987, it would have been hard to imagine all of the ways that this brand-new technology would impact the world. NAND Flash Memory has introduced an entire new technological era. New applications, such as smartphones, tablets and notebooks, automotive infotainment systems, gaming, wearables, data centers and so much more, have been developed that would not exist in the form they are today without this flash memory technology.

From the invention of flash memory to today's renowned BiCS FLASH, KIOXIA continues to pioneer innovative memory solutions with high quality and reliability. The company's BiCS FLASH 3D flash memory technology is an important component in almost all electronic devices where data needs to be stored.

By evolving “memory”, KIOXIA creates uplifting experiences and changes the world.

### The Evolution of Applications – From Then to Now

Some of the first flash applications are almost unrecognizable today. And, many new applications have been born that would not have been possible without KIOXIA's invention.

<p><b>THE EARLIEST USERS OF FLASH – IN THE 1990S:</b></p>						<p>THEN</p>
	<p>Digital telephone answering machines</p>	<p>Barcode Scanners</p>	<p>Digital Cameras</p>	<p>MP3 Players</p>	<p>Personal Digital Assistants</p>	
<p><b>FLASH APPLICATIONS TODAY:</b></p>						<p>NOW</p>
	<p>Smartphones</p>	<p>Tablets and Notebooks</p>	<p>Automotive</p>	<p>Smart Homes/ Buildings/Cities</p>	<p>SSDs</p>	
						
	<p>Cloud/Edge Computing</p>	<p>Gaming/ AR/VR</p>	<p>Wearables &amp; Digital Health</p>	<p>Industrial Automation</p>	<p>Security/ Surveillance</p>	

... and so much more

# Embedded Flash Memory

SLC NAND  
BENAND™

e-MMC  
UFS

KIOXIA offers a wide range of advanced Flash Memory technology for all kind of applications like consumer electronics, mobile technology and industrial applications such as robotics.

NAND Flash Memory requires an appropriate management, which has to cover tasks like Bad Block Management, Wear Leveling, Garbage Collection and ECC Error Correction. Either these functions are supported by the host system in combination with raw NAND Memory, or it is covered instantly inside a managed NAND by utilizing an integrated memory controller.

The selection between these basic different approaches to control a NAND memory defines the individual host requirements and interface options. For managed NAND there are JEDEC specified Standard-Interfaces supported, enabling the developer to easily design the required memory solution.

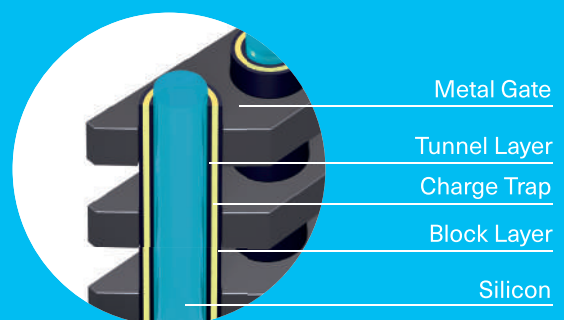
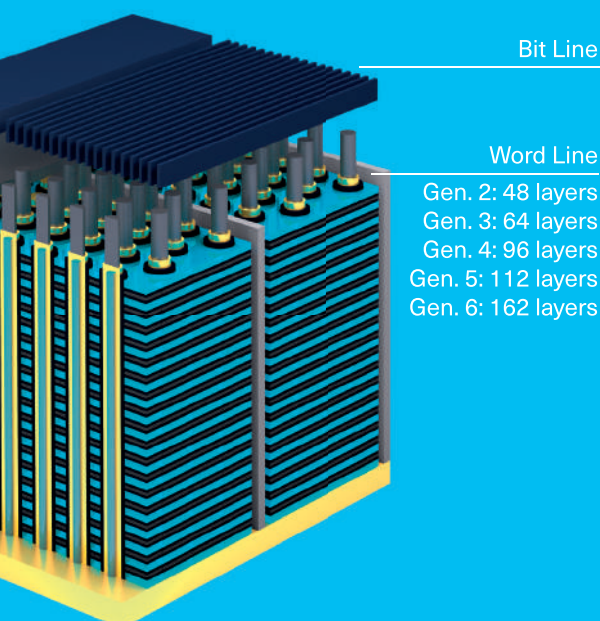
## RAW NAND

With raw SLC NAND and BENAND™ we provide high endurance and data retention for sensitive or frequently used data.

## MANAGED NAND

For efficient and easy to integrate storage systems, managed NAND like e-MMC and UFS are the preferred solutions. Offering broadly accepted standard interfaces and packages, in combination with high speed interfaces, they are the optimal selection for many application in the industrial, mobile and automotive market.

## KIOXIA 3D- Technology BiCS FLASH™



Our BiCS FLASH™ technology with 64-, 96-, 112- and 162-layer stacking make a powerful memory solutions possible. It gives BiCS FLASH™ far higher die area density compared to 2D NAND. BiCS FLASH™ reduces the chip size by optimizing both circuit technology and the manufacturing process.

As a result, this technology can achieve similar reliability as 2D MLC (2bit/cell) while utilizing 3D TLC (3bit/cell) structure.



# BENAND™

## SLC NAND with embedded ECC

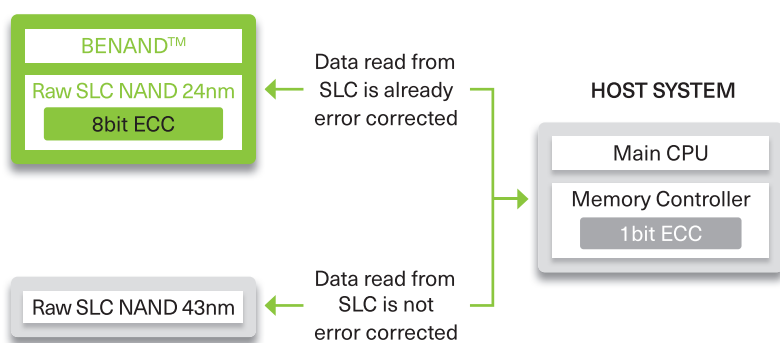
BENAND™ (Built-in ECC NAND) is a SLC NAND memory device which has an internal hardware ECC engine.

Using BENAND™ it is possible for customers to use the 24nm SLC NAND flash memory technology even when their platform cannot support higher bit ECC.

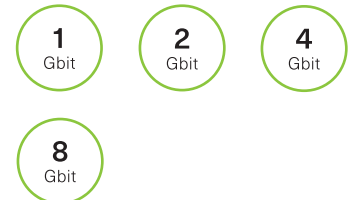
## SPECIFICATIONS

FEATURES	BENAND™ (SLC+ECC)
Density	1 Gbit – 8 Gbit
Technology	24nm
ECC (Error Correction Code)	Embedded on Memory Chip
Temperature	-40° C to 85° C 0° C to 70° C
Package	TSOP and BGA

## BENAND™ – SLC WITH EMBEDDED ECC FOR BOM REDUCTION AND SYSTEM FLEXIBILITY



## CAPACITIES:



## KEY FEATURES:

- 1 Gbit – 8 Gbit
- Compatibility of SLC NAND Interface, basic functions and command sequence follows SLC NAND.
- Same hardware interface and package as raw SLC

## ADVANTAGES

- Broad line-up to cover customers' demands for different densities
- 24nm technology for cost optimisation
- Long data retention or high write/erase performance
- Small package variation available to reduce board space by 48% (up to 8 Gbit)
- With BENAND™ no ECC operation is required on the host side

## APPLICATIONS:

- Industrial Applications
- Consumer Electronics
- Multimedia Applications
- Smart Metering & Intelligent Lighting
- Smart Applications





# SLC NAND

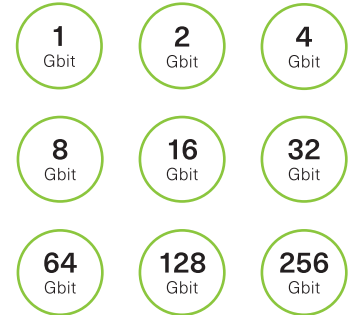
## Reliability and Performance

KIOXIA's advanced Flash Memory technology offers SLC NAND providing best in class endurance and data retention for sensitive or frequently used data in a system. For long lasting products or systems working with extremely high data throughput between the host and the memory, KIOXIA SLC is the optimal solution.

## SPECIFICATIONS

FEATURES	SLC NAND
Density	1 Gbit – 256 Gbit
Technology	24nm
ECC (Error Correction Code)	Required on Host Side
Temperature	-40° C to 85° C 0° C to 70° C
Package	TSOP and BGA

## CAPACITIES:



## KEY FEATURES:

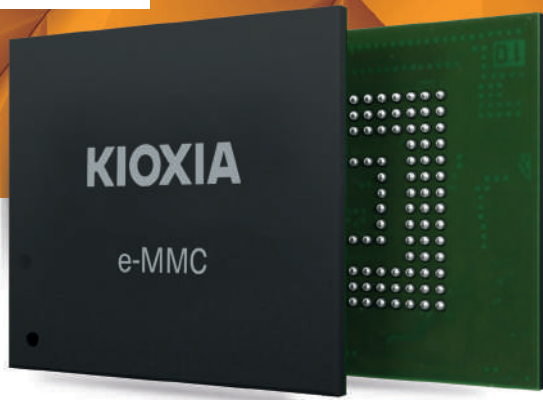
- 1 Gbit – 256 Gbit
- Extended temperature range
- TSOP and BGA package

## ADVANTAGES

- Broad line up to cover customers' demands for different densities
- 24nm technology for cost optimisation
- Long data retention or high write/erase performance
- Small package variation available to reduce board space by 48% (up to 8 Gbit)

## APPLICATIONS:

- Industrial Applications
- Consumer Electronics
- Multimedia Applications
- Smart Metering & Intelligent Lighting
- Smart Applications



# e-MMC

## Highly-efficient Storage

e-MMC is a family of advanced and highly efficient NAND flash memory with an integrated controller for enhanced memory management. Based on an interface standardised by JEDEC, KIOXIA's e-MMC offers the optimal solution for applications where higher data volumes need to be stored in an efficient way.

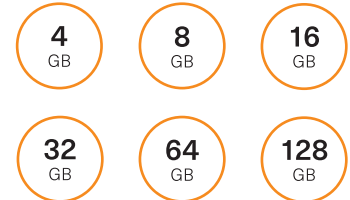
### SPECIFICATIONS

FEATURES	e-MMC	EXTENDED TEMP. e-MMC
<b>Density</b>	4 GB – 128 GB	8 GB – 64 GB
<b>Technology</b>	15nm / BiCS FLASH™	15nm
<b>JEDEC Version</b>	5.0 / 5.1	5.1
<b>Temperature</b>	-25° C to 85° C	-40° C to 105° C
<b>Package</b>	153 ball FBGA (11.5 x 13 mm)	

### e-MMC - NEW GENERATION WITH BiCS FLASH™

Utilizing the innovative BiCS FLASH™ technology in combination with the new Charge Trap cell structure, KIOXIA introduces the best-in-class family of reliable, easy to integrate, and efficient e-MMCs. These new e-MMCs (4 to 128 GB) represent an attractive alternative with superior price competitiveness, longevity, and higher performance.

### CAPACITIES:



### KEY FEATURES:

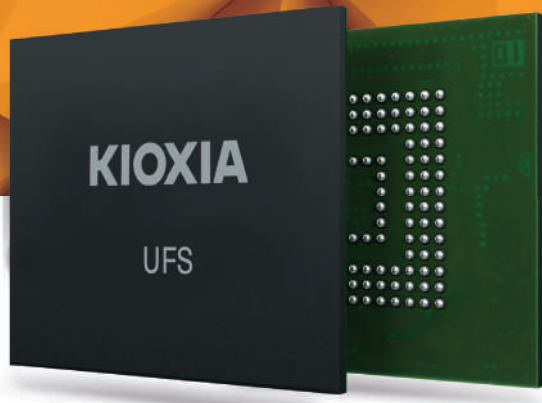
- 4 GB – 128 GB
- 15nm / BiCS FLASH™
- 2D-MLC / 3D-TLC technology
- e-MMC Version 5.0 and 5.1
- Integrated memory management:
  - Error correction code
  - Bad block management
  - Wear-levelling
  - Garbage collection
- Standard and extended temperature range of up to 105° C
- FBGA package

### ADVANTAGES

- Higher interface speed HS400 in accordance with JEDEC 5.x
- Managed memory
- Package, interface, features, commands, etc. are standard

### APPLICATIONS:

- Industrial Applications
- Consumer Electronics
- Multimedia Applications
- Smart Metering & Intelligent Lighting
- Smart Applications



# UFS

## High Performance Storage

For applications demanding for superior interface performance, KIOXIA is offering a broad line-up of new UFS Memory products. Utilizing a full duplex serial high-speed interface, it is compliant with the latest UFS Version 3.1 and 4.0. In combination with the embedded memory management, it offers a highly efficient and excellent performing storage solution. UFS memory enables next generation mobile devices to take full advantage of the connectivity benefits of 5G, leading to faster downloads and reduced lag time – and improved user experience.

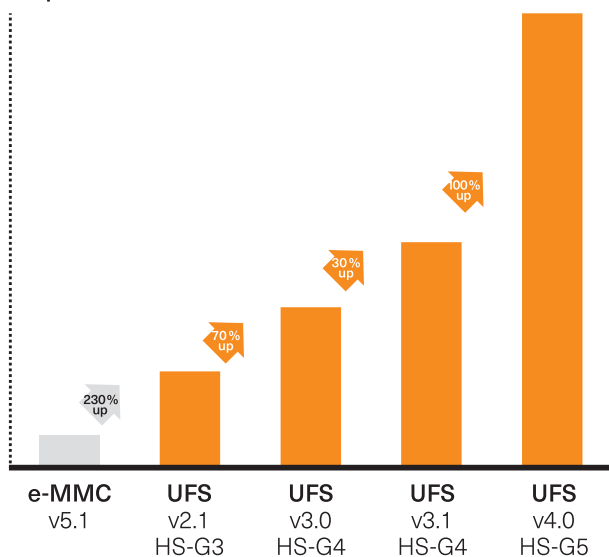
## SPECIFICATIONS

FEATURES	UFS – UNIVERSAL FLASH STORAGE
Density	128 GB – 1 TB
Technology	BiCS FLASH™
JEDEC Version	3.1 and 4.0
Temperature	-25° C to 85° C
Package	153 ball FBGA (11.5 x 13 mm and 11 x 13 mm)

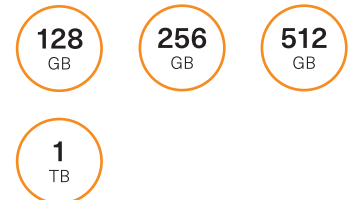
## COMPARING THE PERFORMANCE:

■ e-MMC   ■ UFS

### Sequential Read



## CAPACITIES:



## KEY FEATURES:

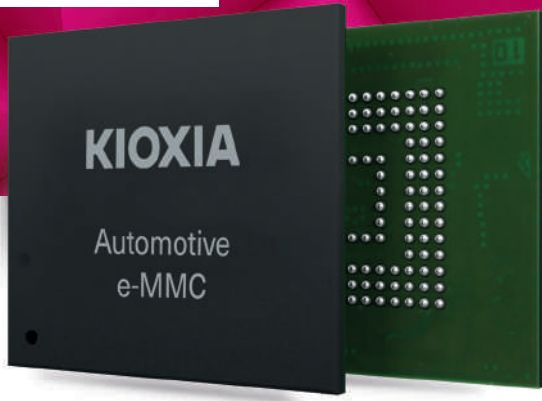
- 128 GB – 1 TB
- BiCS FLASH™
- 3D-TLC technology
- UFS Version 3.1 and 4.0
- Integrated memory management:
  - Error correction code
  - Bad block management
  - Wear-levelling
  - Garbage collection
- WriteBooster: Enables significantly faster write speeds
- Standard temperature range up to 85°C
- FBGA package
- High Speed Serial interface

## ADVANTAGES

- High speed interface up to 1160 MB/sec / 2320 MB/sec / 4640 MB/sec
- Managed memory
- Package, interface, features, commands, etc. are standard
- Utilises high quality KIOXIA BiCS FLASH™ memory in combination with a KIOXIA origin developed controller

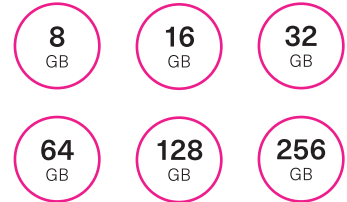
## APPLICATIONS:

- Consumer Electronics
- Multimedia Applications
- Industrial Applications
- Smart Applications



# e-MMC Automotive

## CAPACITIES:



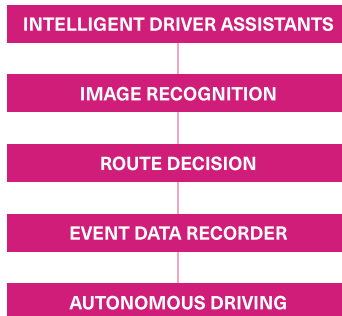
### e-MMC for Automotive Demands

E-mobility, autonomous driving, higher demands on safety and sustainability – automotive industries are once more leading in innovation and technology. For these smart and connected vehicles, reliable storage solutions are mandatory. KIOXIA provides one of the key technologies for wireless communication, information systems and Advanced Driver Assistance Systems (ADAS).

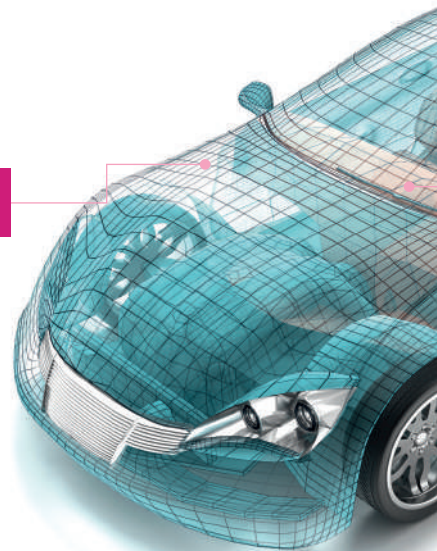
DENSITY	PART NUMBER	JEDEC VERSION	POWER SUPPLY VOLTAGE		TEMPERATURE	PACKAGE
			VCC (V)	VCCQ (V)		
8 GB	THGBMJG6C1LBAB7	e-MMC 5.1	2.7 – 3.6	1.7 – 1.95 2.7 – 3.6	-40° C to 105° C (Automotive Grade 2)	FBGA153
16 GB	THGBMJG7C2LBAB8					
32 GB	THGBMJG8C4LBAB8					
64 GB	THGBMJG9C8LBAB8	e-MMC 5.1	2.7 – 3.6	1.7 – 1.95	-40° C to 85° C (Automotive Grade 3)	
32 GB	THGAMVG8T13BAA7					
64 GB	THGAMVG9T23BAA8					
128 GB	THGAMVT0T43BAA8	e-MMC 5.1	2.7 – 3.6	1.7 – 1.95	-40° C to 105° C (Automotive Grade 2)	
256 GB	THGAMVT1T83BAA5					
32 GB	THGAMVG8T13BAB7					
64 GB	THGAMVG9T23BAB8	e-MMC 5.1	2.7 – 3.6	1.7 – 1.95	-40° C to 105° C (Automotive Grade 2)	
128 GB	THGAMVT0T43BAB8					
256 GB	THGAMVT1T83BAB5					

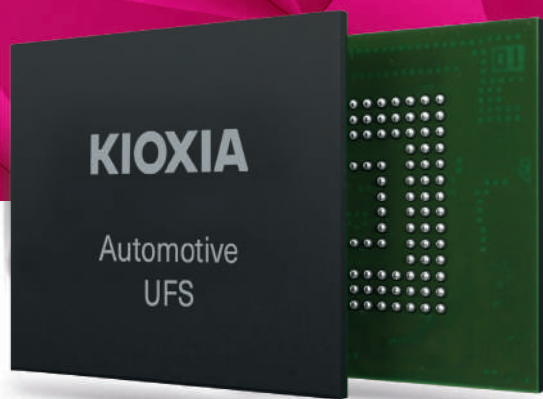
### KEY FEATURES:

- AEC-Q100 qualified
- Compliant with IATF16949
- Temperature range: Automotive Grade 2 & Grade 3 (-40° C ~ +105° C & -40° C ~ +85° C)
- Compliant with e-MMC 5.1
- Highly reliable technology 15nm MLC and 3D-TLC
- Integrated memory management:
  - Error correction code
  - Bad block management
  - Wear-levelling
  - Garbage collection
- Automotive specific functions



ADAS DOMAIN CONTROLLER





# UFS Automotive

## UFS for Automotive Demands

Accelerated processing power and increased data storage capacity are the keys to enabling the next generation of automotive systems. For applications demanding for superior interface performance, KIOXIA is offering a line-up of new UFS automotive Memory products. Utilizing a full duplex serial high-speed interface, it is compliant with the UFS Version 3.1.

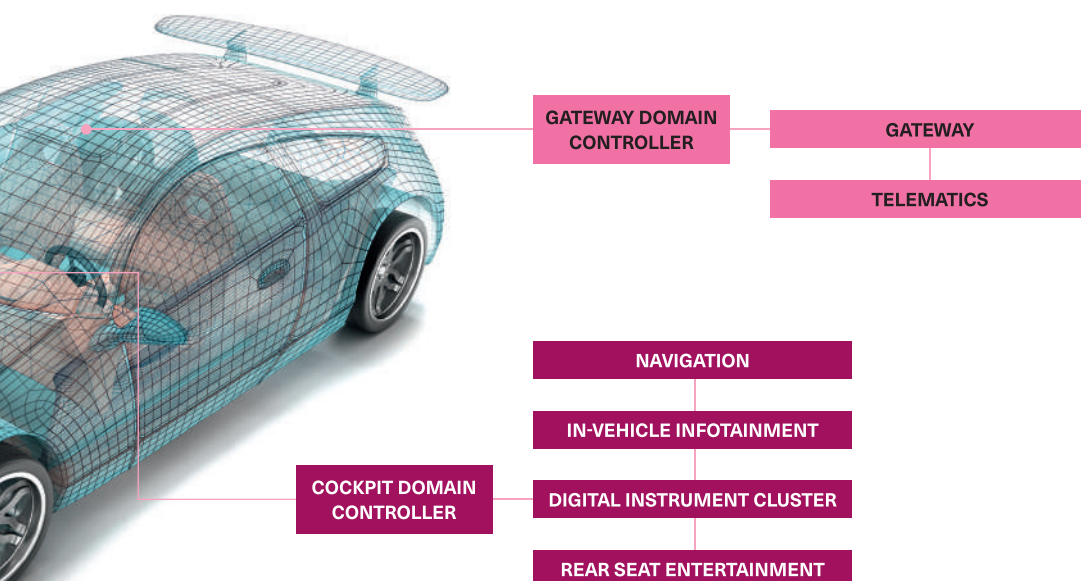
## CAPACITIES:

64  
GB128  
GB256  
GB512  
GB

DENSITY	PART NUMBER	JEDEC VERSION	POWER SUPPLY VOLTAGE		TEMPERATURE	PACKAGE
			VCC (V)	VCCQ (V)		
64 GB	THGJFGG9T15BAA8	UFS 3.1	2.4 – 2.7 2.7 – 3.6	1.14 to 1.26V	-40°C to 85°C (Automotive Grade 3)	FBGA153
128 GB	THGJFGT0T25BAA8					
256 GB	THGJFGT1T45BAA8					
512 GB	THGJFGT2T85BAA5					
64 GB	THGJFGG9T15BAB8	UFS 3.1	2.4 – 2.7 2.7 – 3.6	1.14 to 1.26V	-40°C to 105°C (Automotive Grade 2)	FBGA153
128 GB	THGJFGT0T25BAB8					
256 GB	THGJFGT1T45BAB8					
512 GB	THGJFGT2T85BAB5					

## KEY FEATURES:

- AEC-Q100 qualified
- Compliant with IATF16949
- Temperature range:
  - Automotive Grade 3 (-40°C ~ +85°C)
  - Automotive Grade 2 (-40°C ~ +105°C)
- Highly reliable technology 3D-TLC
- Compliant with UFS 3.1
- Integrated memory management:
  - Error correction code
  - Bad block management
  - Wear-levelling
  - Garbage collection
- Automotive specific functions



Sample of NAND flash storage uses within assisted and self-driving vehicles.

# Product List

## SLC NAND

DENSITY	PART NUMBER	TECHN.	PAGE SIZE	VCC	ECC	TEMPERATURE	PACKAGE
1 Gbit	TC58NVG0S3HTA00	24nm	(2048+128) x 8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12 x 20
	TC58NYG0S3HBAI4		(2048+128) x 8 bit	1.8V		-40°C to 85°C	63BGA 9 x 11
	TC58NVG0S3HTAIO		(2048+128) x 8 bit	3.3V		-40°C to 85°C	48TSOP 12 x 20
	TC58NVG0S3HBAI4		(2048+128) x 8 bit	3.3V		-40°C to 85°C	63BGA 9 x 11
	TC58NYG0S3HBAI6		(2048+128) x 8 bit	1.8V		-40°C to 85°C	67BGA 6.5 x 8
	TC58NVG0S3HBAI6		(2048+128) x 8 bit	3.3V		-40°C to 85°C	67BGA 6.5 x 8
2 Gbit	TC58NVG1S3HTA00	24nm	(2048+128) x 8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12 x 20
	TC58NYG1S3HBAI4		(2048+128) x 8 bit	1.8V		-40°C to 85°C	63BGA 9 x 11
	TC58NVG1S3HTAIO		(2048+128) x 8 bit	3.3V		-40°C to 85°C	48TSOP 12 x 20
	TC58NVG1S3HBAI4		(2048+128) x 8 bit	3.3V		-40°C to 85°C	63BGA 9 x 11
	TC58NYG1S3HBAI6		(2048+128) x 8 bit	1.8V		-40°C to 85°C	67BGA 6.5 x 8
	TC58NVG1S3HBAI6		(2048+128) x 8 bit	3.3V		-40°C to 85°C	67BGA 6.5 x 8
4 Gbit	TH58NVG2S3HTA00	24nm	(2048+128) x 8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12 x 20
	TC58NVG2S0HTA00		(4096+256) x 8 bit	3.3V		0°C to 70°C	48TSOP 12 x 20
	TC58NVG2S0HTAIO		(4096+256) x 8 bit	3.3V		-40°C to 85°C	48TSOP 12 x 20
	TH58NVG2S3HTAIO		(2048+128) x 8 bit	3.3V		-40°C to 85°C	48TSOP 12 x 20
	TH58NVG2S3HBAI4		(2048+128) x 8 bit	3.3V		-40°C to 85°C	63BGA 9 x 11
	TH58NYG2S3HBAI4		(2048+128) x 8 bit	1.8V		-40°C to 85°C	63BGA 9 x 11
	TC58NVG2S0HBAI4		(4096+256) x 8 bit	3.3V		-40°C to 85°C	63BGA 9 x 11
	TC58NYG2S0HBAI4		(4096+256) x 8 bit	1.8V		-40°C to 85°C	63BGA 9 x 11
8 Gbit	TH58NVG3S0HTA00	24nm	(4096+256) x 8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12 x 20
	TH58NVG3S0HBAI4		(4096+256) x 8 bit	3.3V		-40°C to 85°C	63BGA 9 x 11
	TH58NYG3S0HBAI4		(4096+256) x 8 bit	1.8V		-40°C to 85°C	63BGA 9 x 11
	TH58NVG3S0HTAIO		(4096+256) x 8 bit	3.3V		-40°C to 85°C	48TSOP 12 x 20
	TH58NVG3S0HBAI6		(4096+256) x 8 bit	3.3V		-40°C to 85°C	67BGA 6.5 x 8
	TH58NYG3S0HBAI6		(4096+256) x 8 bit	1.8V		-40°C to 85°C	67BGA 6.5 x 8
16 Gbit	TH58NVG4S0HTA20	24nm	(4096+256) x 8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12 x 20
	TH58NVG4S0HTAKO		(4096+256) x 8 bit	3.3V		-40°C to 85°C	48TSOP 12 x 20
32 Gbit	TC58NVG5H2HTA00	24nm	(8192+1024) x 8 bit	3.3V	24bit/1024B	0°C to 70°C	48TSOP 12 x 20
	TC58NVG5H2HTAIO		(8192+1024) x 8 bit	3.3V		-40°C to 85°C	48TSOP 12 x 20
64 Gbit	TH58NVG6H2HTAKO	24nm	(8192+1024) x 8 bit	3.3V	24bit/1024B	-40°C to 85°C	48TSOP 12 x 20
	TH58NVG6H2HTA20		(8192+1024) x 8 bit	3.3V		0°C to 70°C	48TSOP 12 x 20
128 Gbit	TH58NVG7H2HTAKO	24nm	(8192+1024) x 8 bit	3.3V	24bit/1024B	-40°C to 85°C	48TSOP 12 x 20
	TH58NVG7H2HTA20		(8192+1024) x 8 bit	3.3V		0°C to 70°C	48TSOP 12 x 20
256 Gbit	TH58TEG8H2HBA89	24nm	(8192+1024) x 8 bit	3.3V	24bit/1024B	0°C to 70°C	132BGA 12x18
	TH58TEG8H2HBAS9		(8192+1024) x 8 bit	3.3V		-40°C to 85°C	132BGA 12x18

# Product List

## BENAND™

DENSITY	PART NUMBER	TECHN.	PAGE SIZE	VCC	ECC	TEMPERATURE	PACKAGE
1 Gbit	TC58BVG0S3HTA00	24nm	(2048+64) x 8 bit	3.3V	internal ECC	0° C to 70° C	48TSOP 12 x 20
	TC58BYG0S3HBAI4		(2048+64) x 8 bit	1.8V		-40° C to 85° C	63BGA 9 x 11
	TC58BVG1S3HTAIO		(2048+64) x 8 bit	3.3V		-40° C to 85° C	48TSOP 12 x 20
	TC58BVG0S3HBAI4		(2048+64) x 8 bit	3.3V		-40° C to 85° C	63BGA 9 x 11
	TC58BYG0S3HBAI6		(2048+64) x 8 bit	1.8V		-40° C to 85° C	67BGA 6.5 x 8
	TC58BVG0S3HBAI6		(2048+64) x 8 bit	3.3V		-40° C to 85° C	67BGA 6.5 x 8
2 Gbit	TC58BVG1S3HTA00	24nm	(2048+64) x 8 bit	3.3V	internal ECC	0° C to 70° C	48TSOP 12 x 20
	TC58BYG1S3HBAI4		(2048+64) x 8 bit	1.8V		-40° C to 85° C	63BGA 9 x 11
	TC58BVG1S3HTAIO		(2048+64) x 8 bit	3.3V		-40° C to 85° C	48TSOP 12 x 20
	TC58BVG1S3HBAI4		(2048+64) x 8 bit	3.3V		-40° C to 85° C	63BGA 9 x 11
	TC58BYG1S3HBAI6		(2048+64) x 8 bit	1.8V		-40° C to 85° C	67BGA 6.5 x 8
	TC58BVG1S3HBAI6		(2048+64) x 8 bit	3.3V		-40° C to 85° C	67BGA 6.5 x 8
4 Gbit	TH58BVG2S3HTA00	24nm	(2048+64) x 8 bit	3.3V	internal ECC	0° C to 70° C	48TSOP 12 x 20
	TC58BVG2S0HTA00		(4096+128) x 8 bit	3.3V		0° C to 70° C	48TSOP 12 x 20
	TC58BVG2S0HTAIO		(4096+128) x 8 bit	3.3V		-40° C to 85° C	48TSOP 12 x 20
	TH58BVG2S3HTAIO		(2048+64) x 8 bit	3.3V		-40° C to 85° C	48TSOP 12 x 20
	TH58BVG2S3HBAI4		(2048+64) x 8 bit	3.3V		-40° C to 85° C	63BGA 9 x 11
	TH58BYG2S3HBAI4		(2048+64) x 8 bit	1.8V		-40° C to 85° C	63BGA 9 x 11
	TC58BVG2S0HBAI4		(4096+128) x 8 bit	3.3V		-40° C to 85° C	63BGA 9 x 11
	TC58BYG2S0HBAI4		(4096+128) x 8 bit	1.8V		-40° C to 85° C	63BGA 9 x 11
	TC58BVG2S0HBAI6		(4096+128) x 8 bit	3.3V		-40° C to 85° C	67BGA 6.5 x 8
	TC58BYG2S0HBAI6		(4096+128) x 8 bit	1.8V		-40° C to 85° C	67BGA 6.5 x 8
8 Gbit	TH58BVG3S0HTA00	24nm	(4096+128) x 8 bit	3.3V	internal ECC	0° C to 70° C	48TSOP 12 x 20
	TH58BYG3S0HBAI4		(4096+128) x 8 bit	1.8V		-40° C to 85° C	63BGA 9 x 11
	TH58BVG3S0HTAIO		(4096+128) x 8 bit	3.3V		-40° C to 85° C	48TSOP 12 x 20
	TH58BVG3S0HBAI4		(4096+128) x 8 bit	3.3V		-40° C to 85° C	63BGA 9 x 11
	TH58BVG3S0HBAI6		(4096+128) x 8 bit	3.3V		-40° C to 85° C	67BGA 6.5 x 8
	TH58BYG3S0HBAI6		(4096+128) x 8 bit	1.8V		-40° C to 85° C	67BGA 6.5 x 8

## e-MMC

DENSITY	PART NUMBER	TECHN.	VCCQ	JEDEC VERSION	TEMPERATURE	PACKAGE
4 GB	THGBMNG5D1LBAIT	2D MLC	1.8V or 3.3V	e-MMC 5.0	-25° C to 85° C	153FBGA 11 x 10
	THGBMTG5D1LBAIL				-25° C to 85° C	153FBGA 11.5 x 13
8 GB	THGBMUG6C1LBAIL	2D MLC	1.8V or 3.3V	e-MMC 5.1	-25° C to 85° C	153FBGA 11.5 x 13
	THGBMJG6C1LBAU7				-40° C to 105° C	153FBGA 11.5 x 13
16 GB	THGBMUG7C1LBAIL	2D MLC	1.8V or 3.3V	e-MMC 5.1	-25° C to 85° C	153FBGA 11.5 x 13
	THGBMJG7C2LBAU8				-40° C to 105° C	153FBGA 11.5 x 13
	THGAMVG7T13BAIL	3D TLC	1.8V	-25° C to 85° C	153FBGA 11.5 x 13	
32 GB	THGBMUG8C2LBAIL	2D MLC	1.8V or 3.3V	e-MMC 5.1	-25° C to 85° C	153FBGA 11.5 x 13
	THGBMJG8C4LBAU8				-40° C to 105° C	153FBGA 11.5 x 13
	THGAMVG8T13BAIL	3D TLC	1.8V		-25° C to 85° C	153FBGA 11.5 x 13
64 GB	THGBMJG9C8LBAU8	2D MLC	1.8V or 3.3V	e-MMC 5.1	-40° C to 105° C	153FBGA 11.5 x 13
	THGAMVG9T23BAIL	3D TLC	1.8V		-25° C to 85° C	153FBGA 11.5 x 13
	<b>NEW</b> THGAMSG9T24BAIL				153FBGA 11.5 x 13	
128 GB	THGAMVT0T43BAIR	3D TLC	1.8V	e-MMC 5.1	-25° C to 85° C	153FBGA 11.5 x 13
	<b>NEW</b> THGAMST0T24BAIL					153FBGA 11.5 x 13

## UFS

DENSITY	PART NUMBER	TECHN.	VCC   VCCQ (3.X)	JEDEC VERSION	TEMPERATURE	PACKAGE
128 GB	THGJFAT0T44BAIL	3D TLC	2.5V   1.2V	UFS 3.1	-25° C to 85° C	153FBGA 11.5 x 13
	<b>NEW</b> THGJFJT0E25BAIP			UFS 4.0		153FBGA 11 x 13
256 GB	THGJFGT1E45BAIP	3D TLC	2.5V   1.2V	UFS 3.1	-25° C to 85° C	153FBGA 11 x 13
	<b>NEW</b> THGJFJT1E45BATP			UFS 4.0		153FBGA 11 x 13
512 GB	THGJFGT2T85BAIU	3D TLC	2.5V   1.2V	UFS 3.1	-25° C to 85° C	153FBGA 11 x 13
	<b>NEW</b> THGJFJT2T85BAT0			UFS 4.0		153FBGA 11 x 13
1 TB	THGJFHT3T84BAIF	3D TLC	2.5V   1.2V	UFS 3.1	-25° C to 85° C	153FBGA 11.5 x 13

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KIOXIA Europe GmbH  
Hansaallee 181  
40549 Düsseldorf, Germany

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