

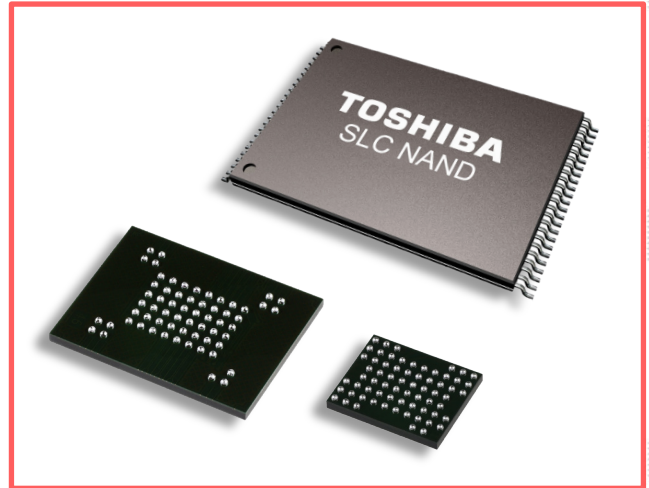
NAND FLASH MEMORY

> SLC NAND & BENAND™

Reliability and Performance

Toshiba'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, Toshiba SLC is the optimal solution.

Toshiba's new BENAND™ removes the burden of error correction code (ECC) from the host processor by offering ECC embedded in the hardware while keeping the same specification, high reliability and performance as a raw SLC.



> APPLICATIONS

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



> FEATURES

- **SLC NAND 24nm**
 - 1Gbit – 128Gbit
 - Extended temperature range
 - TSOP and BGA package
- **BENAND™ 24nm**
 - **Built in ECC SLC NAND**
 - 1Gbit – 8Gbit
 - On chip H/W ECC
 - Same reliability and performance as to raw SLC
 - Same Hardware interface and package as raw SLC

> ADVANTAGES

- Broad line up to cover customers demand for different densities
- Leading edge 24nm Technology for cost optimization
- Long data retention or extreme write/erase performance
- Small package variation available to reduce board space by 48% (up to 8Gbit)
- With BENAND™ no ECC operation is required on the host side
- Produced in the world's largest, leading edge technology flash factory

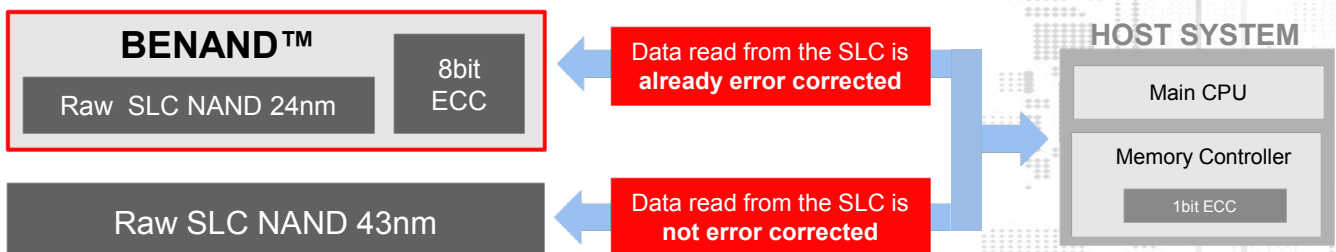
> BENEFITS

- Optimal storage solution for long lasting storage of significant data or very frequently changed data
- Reduced BOM cost due to latest 24nm production technology
- Supports smaller board size e.g. for mobile devices
- Using Toshiba BENAND™ it is possible to utilize the latest 24nm SLC NAND flash technology even if the existing platform cannot support higher bit ECC. **No hardware change necessary.**

> SPECIFICATIONS

Product / Features	SLC NAND	BENAND™ (SLC+ECC)
Density	1Gbit – 128Gbit	1Gbit – 8Gbit
Technology	24nm	
ECC (Error Correction Code)	Required on Host Side	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



> SLC NAND - PRODUCT LIST

Density	Part Number	Techn.	Page Size	Vcc	ECC	Temperature	Package
1Gbit	TC58NVG0S3HTA00	24nm	(2048+128)x8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12x20
	TC58NVG0S3HBAI4	24nm	(2048+128)x8 bit	1.8V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TC58NVG0S3HTAI0	24nm	(2048+128)x8 bit	3.3V	8bit/512B	-40°C to 85°C	48TSOP 12x20
	TC58NVG0S3HBAI4	24nm	(2048+128)x8 bit	3.3V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TC58NVG0S3HBAI6	24nm	(2048+128)x8 bit	1.8V	8bit/512B	-40°C to 85°C	67BGA 6.5x8
2Gbit	TC58NVG1S3HTA00	24nm	(2048+128)x8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12x20
	TC58NVG1S3HBAI4	24nm	(2048+128)x8 bit	1.8V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TC58NVG1S3HTAI0	24nm	(2048+128)x8 bit	3.3V	8bit/512B	-40°C to 85°C	48TSOP 12x20
	TC58NVG1S3HBAI4	24nm	(2048+128)x8 bit	3.3V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TC58NVG1S3HBAI6	24nm	(2048+128)x8 bit	1.8V	8bit/512B	-40°C to 85°C	67BGA 6.5x8
4Gbit	TH58NVG2S3HTA00	24nm	(2048+128)x8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12x20
	TC58NVG2S0HTA00	24nm	(4096+256)x8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12x20
	TC58NVG2S0HTAI0	24nm	(4096+256)x8 bit	3.3V	8bit/512B	-40°C to 85°C	48TSOP 12x20
	TH58NVG2S3HTAI0	24nm	(2048+128)x8 bit	3.3V	8bit/512B	-40°C to 85°C	48TSOP 12x20
	TH58NVG2S3HBAI4	24nm	(2048+128)x8 bit	3.3V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TH58NVG2S3HBAI4	24nm	(2048+128)x8 bit	1.8V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TC58NVG2S0HBAI4	24nm	(4096+256)x8 bit	3.3V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TC58NVG2S0HBAI4	24nm	(4096+256)x8 bit	1.8V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TC58NVG2S0HBAI6	24nm	(4096+256)x8 bit	3.3V	8bit/512B	-40°C to 85°C	67BGA 6.5x8
	TC58NVG2S0HBAI6	24nm	(4096+256)x8 bit	1.8V	8bit/512B	-40°C to 85°C	67BGA 6.5x8
8Gbit	TH58NVG3S0HTA00	24nm	(4096+256)x8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12x20
	TH58NVG3S0HBAI4	24nm	(4096+256)x8 bit	3.3V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TH58NVG3S0HBAI4	24nm	(4096+256)x8 bit	1.8V	8bit/512B	-40°C to 85°C	63BGA 9x11
	TH58NVG3S0HTAI0	24nm	(4096+256)x8 bit	3.3V	8bit/512B	-40°C to 85°C	48TSOP 12x20
	TH58NVG3S0HBAI6	24nm	(4096+256)x8 bit	3.3V	8bit/512B	-40°C to 85°C	67BGA 6.5x8
	TH58NVG3S0HBAI6	24nm	(4096+256)x8 bit	1.8V	8bit/512B	-40°C to 85°C	67BGA 6.5x8
16Gbit	TH58NVG4S0HTA20	24nm	(4096+256)x8 bit	3.3V	8bit/512B	0°C to 70°C	48TSOP 12x20
	TH58NVG4S0HTAK0	24nm	(4096+256)x8 bit	3.3V	8bit/512B	-40°C to 85°C	48TSOP 12x20
32Gbit	TC58NVG5H2HTA00	24nm	(8192+1024)x8 bit	3.3V	24bit/1024B	0°C to 70°C	48TSOP 12x20
	TC58NVG5H2HTAI0	24nm	(8192+1024)x8 bit	3.3V	24bit/1024B	-40°C to 85°C	48TSOP 12x20
64Gbit	TH58NVG6H2HTAK0	24nm	(8192+1024)x8 bit	3.3V	24bit/1024B	-40°C to 85°C	48TSOP 12x20
128Gbit	TH58NVG7H2HTA20	24nm	(8192+1024)x8 bit	3.3V	24bit/1024B	0°C to 70°C	48TSOP 12x20

> BENAND™ - PRODUCT LIST

Density	Part Number	Techn.	Page Size	Vcc	ECC	Temperature	Package
1Gbit	TC58BVG0S3HTA00	24nm	(2048+64)x8 bit	3.3V	internal ECC	0°C to 70°C	48TSOP 12x20
	TC58BYG0S3HBAI4	24nm	(2048+64)x8 bit	1.8V	internal ECC	-40°C to 85°C	63BGA 9x11
	TC58BVG0S3HTAI0	24nm	(2048+64)x8 bit	3.3V	internal ECC	-40°C to 85°C	48TSOP 12x20
	TC58BVG0S3HBAI4	24nm	(2048+64)x8 bit	3.3V	internal ECC	-40°C to 85°C	63BGA 9x11
	TC58BYG0S3HBAI6	24nm	(2048+64)x8 bit	1.8V	internal ECC	-40°C to 85°C	67BGA 6.5x8
	TC58BVG0S3HBAI6	24nm	(2048+64)x8 bit	3.3V	internal ECC	-40°C to 85°C	67BGA 6.5x8
2Gbit	TC58BVG1S3HTA00	24nm	(2048+64)x8 bit	3.3V	internal ECC	0°C to 70°C	48TSOP 12x20
	TC58BYG1S3HBAI4	24nm	(2048+64)x8 bit	1.8V	internal ECC	-40°C to 85°C	63BGA 9x11
	TC58BVG1S3HTAI0	24nm	(2048+64)x8 bit	3.3V	internal ECC	-40°C to 85°C	48TSOP 12x20
	TC58BVG1S3HBAI4	24nm	(2048+64)x8 bit	3.3V	internal ECC	-40°C to 85°C	63BGA 9x11
	TC58BYG1S3HBAI6	24nm	(2048+64)x8 bit	1.8V	internal ECC	-40°C to 85°C	67BGA 6.5x8
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4Gbit	TH58BVG2S3HTA00	24nm	(2048+64)x8 bit	3.3V	internal ECC	0°C to 70°C	48TSOP 12x20
	TC58BVG2S0HTA00	24nm	(4096+128)x8 bit	3.3V	internal ECC	0°C to 70°C	48TSOP 12x20
	TC58BVG2S0HTAI0	24nm	(4096+128)x8 bit	3.3V	internal ECC	-40°C to 85°C	48TSOP 12x20
	TH58BVG2S3HTAI0	24nm	(2048+64)x8 bit	3.3V	internal ECC	-40°C to 85°C	48TSOP 12x20
	TH58BVG2S3HBAI4	24nm	(2048+64)x8 bit	3.3V	internal ECC	-40°C to 85°C	63BGA 9x11
	TH58BYG2S3HBAI4	24nm	(2048+64)x8 bit	1.8V	internal ECC	-40°C to 85°C	63BGA 9x11
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	TC58BYG2S0HBAI6	24nm	(4096+128)x8 bit	1.8V	internal ECC	-40°C to 85°C	67BGA 6.5x8
8Gbit	TH58BVG3S0HTA00	24nm	(4096+128)x8 bit	3.3V	internal ECC	0°C to 70°C	48TSOP 12x20
	TH58BYG3S0HBAI4	24nm	(4096+128)x8 bit	1.8V	internal ECC	-40°C to 85°C	63BGA 9x11
	TH58BVG3S0HTAI0	24nm	(4096+128)x8 bit	3.3V	internal ECC	-40°C to 85°C	48TSOP 12x20
	TH58BVG3S0HBAI4	24nm	(4096+128)x8 bit	3.3V	internal ECC	-40°C to 85°C	63BGA 9x11
	TH58BVG3S0HBAI6	24nm	(4096+128)x8 bit	3.3V	internal ECC	-40°C to 85°C	67BGA 6.5x8
	TH58BYG3S0HBAI6	24nm	(4096+128)x8 bit	1.8V	internal ECC	-40°C to 85°C	67BGA 6.5x8

* Valid 4Q2016

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