

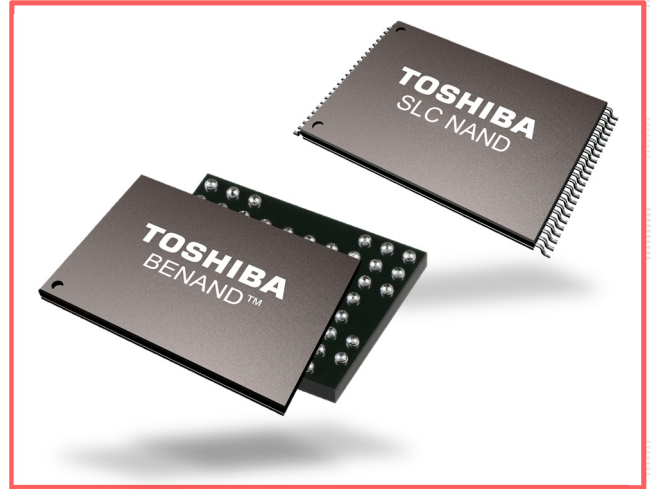
NAND FLASH MEMORY

> 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 for reduced board space
- 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 or software 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 | |

> SLC NAND - PRODUCT LIST

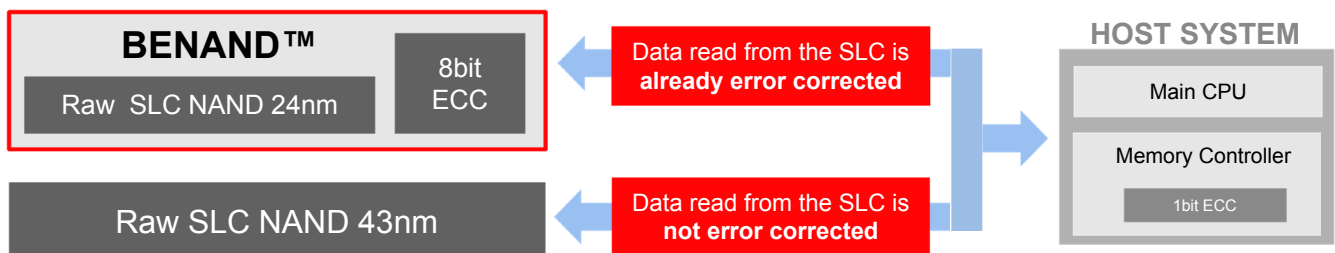
| Density | Part Number | Techn. | Page Size | Vcc | ECC | Temperature | Package |
|---------|-----------------|--------|-------------------|------|-------------|---------------|--------------|
| 1Gbit | TC58NVG0S3HTA00 | 24nm | (2048+128)x8 bit | 3.3V | 8bit/512B | 0°C to 70°C | 48TSOP 12x20 |
| | TC58NYG0S3HBAI4 | 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 |
| 2Gbit | TC58NVG1S3HTA00 | 24nm | (2048+128)x8 bit | 3.3V | 8bit/512B | 0°C to 70°C | 48TSOP 12x20 |
| | TC58NYG1S3HBAI4 | 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 |
| 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 |
| | TH58NYG2S3HBAI4 | 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 |
| | TC58NYG2S0HBAI4 | 24nm | (4096+256)x8 bit | 1.8V | 8bit/512B | -40°C to 85°C | 63BGA 9x11 |
| 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 |
| | TH58NYG3S0HBAI4 | 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 |
| 16Gbit | TH58NVG4S0FTA20 | 32nm | (4096+232)x8 bit | 3.3V | 4bit/512B | 0°C to 70°C | 48TSOP 12x20 |
| | TH58NYG4S0FBAID | 32nm | (4096+232)x8 bit | 1.8V | 4bit/512B | -40°C to 85°C | 63BGA 10x11 |
| | TH58NVG4S0FTAK0 | 32nm | (4096+232)x8 bit | 3.3V | 4bit/512B | -40°C to 85°C | 48TSOP 12x20 |
| | TH58NVG4S0FBAID | 32nm | (4096+232)x8 bit | 3.3V | 4bit/512B | -40°C to 85°C | 63BGA 10x11 |
| 32Gbit | TH58NVG5S0FTA20 | 32nm | (4096+232)x8 bit | 3.3V | 4bit/512B | 0°C to 70°C | 48TSOP 12x20 |
| | TH58NVG5S0FTAK0 | 32nm | (4096+232)x8 bit | 3.3V | 4bit/512B | -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 |
| 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 |
| 4Gbit | TH58BVG2S3HTA00 | 24nm | (2048+64)x8 bit | 3.3V | internal ECC | 0°C to 70°C | 48TSOP 12x20 |
| | TC58BVG2S0HTA00 | 24nm | (4096+128)x 8 bit | 3.3V | internal ECC | 0°C to 70°C | 48TSOP 12x20 |
| | TH58BYG2S3HBAI4 | 24nm | (2048+64)x8 bit | 1.8V | internal ECC | -40°C to 85°C | 63BGA 9x11 |
| | TC58BYG2S0HBAI4 | 24nm | (4096+128)x 8 bit | 1.8V | internal ECC | -40°C to 85°C | 63BGA 9x11 |
| | TH58BVG2S3HTAI0 | 24nm | (2048+64)x8 bit | 3.3V | internal ECC | -40°C to 85°C | 48TSOP 12x20 |
| | TC58BVG2S0HTAI0 | 24nm | (4096+128) x 8 bit | 3.3V | internal ECC | -40°C to 85°C | 48TSOP 12x20 |
| 8Gbit | TH58BVG3S0HTA00 | 24nm | (4096+128)x 8 bit | 3.3V | internal ECC | 0°C to 70°C | 48TSOP 12x20 |
| | TH58BYG3S0HBAI4 | 24nm | (4096+128)x 8 bit | 1.8V | internal ECC | -40°C to 85°C | 63BGA 9x11 |
| | TH58BVG3S0HTAI0 | 24nm | (4096+128)x 8 bit | 3.3V | internal ECC | -40°C to 85°C | 48TSOP 12x20 |
| | TH58BVG3S0HBAI4 | 24nm | (4096+128)x 8 bit | 3.3V | internal ECC | -40°C to 85°C | 63BGA 9x11 |

*Valid Q22014

> BENAND™ - SLC WITH EMBEDDED ECC FOR BOM REDUCTION AND SYSTEM FLEXIBILITY



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