

Technical Change Notice (TCN)

Purpose:

Due to the evolution of NAND flash generation, Toshiba 24nm and 32nm SLC will be phased in to replace Samsung 42nm SLC. In order for better understanding about the changes, the following contents will be focused on:

- Technical comparison between 42nm and 32/24nm based on the *component level* and *SSD level*.

Samsung EOL Parts

| Capacity | Flash Vendor | P/Ns |
|----------|------------------------|---------------------------|
| 1Gb | Samsung 2K/42nm | K9F1G08U0D-PC(I)B0 |
| 2Gb | Samsung 2K/42nm | K9F2G08U0C-PC(I)B0 |
| 4Gb | Samsung 2K/42nm | K9F4G08U0D-SC(I)B0 |
| 8Gb | Samsung 2K/42nm | K9K8G08U0D-SC(I)B0 |
| 16Gb | Samsung 2K/42nm | K9WAG08U1D-SC(I)B0 |

New Flash Successor

| Capacity | Flash Vendor | P/Ns |
|----------|------------------------|------------------------|
| 1Gb | Toshiba 2K/24nm | TC58NVG0S3HTA00 |
| 2Gb | Toshiba 2K/24nm | TC58NVG1S3ETA00 |
| 4Gb | Toshiba 4K/32nm | TC58NVG2S0FTA00 |
| 8Gb | Toshiba 4K/32nm | TC58NVG3S0FTA00 |
| 16Gb | Toshiba 4K/32nm | TH58NVG4S0FTA20 |

Component Level

Key Parameters in Design & Feature Specification

The following contents are the comparison tables between Samsung 42nm and Toshiba 24/32nm in 1G / 2G / 4G / 8G / 16G bit NAND flash.

<1G bit SLC>

| Item | | 42nm | 24nm |
|---------------------------|---------|------------|-----------|
| Die Capacity | | 1Gb | 1Gb |
| Page Size | | 2 KB | 2 KB |
| Block Size | | 128 KB | 128 KB |
| Operating Characteristics | Read | Max 35mA | Max 30mA |
| | Program | | |
| | Erase | | |
| P/E Endurance | | 100K cycle | 60K cycle |
| tR (max) | | 40 us | 25 us |
| tPROG (typical) | | 250us | 300 us |
| tBERS (typical) | | 2 ms | 2.5 ms |

<2G bit SLC>

| Item | | 42nm | 24nm |
|---------------------------|---------|------------|-----------|
| Die Capacity | | 2Gb | 2Gb |
| Page Size | | 2 KB | 2 KB |
| Block Size | | 128 KB | 128 KB |
| Operating Characteristics | Read | Max 35mA | Max 30mA |
| | Program | | |
| | Erase | | |
| P/E Endurance | | 100K cycle | 60K cycle |
| tR (max) | | 40 us | 30 us |
| tPROG (typical) | | 250 us | 300 us |
| tBERS (typical) | | 2 ms | 2.5 ms |

<4G bitSLC>

| Item | | 42nm | 32nm |
|----------------------------------|----------------|------------|-----------|
| Die Capacity | | 4Gb | 4Gb |
| Page Size | | 2 KB | 4 KB |
| Block Size | | 128 KB | 256 KB |
| Operating Characteristics | Read | Max 35mA | Max 30mA |
| | Program | | |
| | Erase | | |
| P/E Endurance | | 100K cycle | 60K cycle |
| tR (max) | | 40 us | 30 us |
| tPROG (typical) | | 250 us | 300 us |
| tBERS (typical) | | 2 ms | 3 ms |

<8G bitSLC>

| Item | | 42nm | 32nm |
|----------------------------------|----------------|------------|-----------|
| Die Capacity | | 8Gb | 8Gb |
| Page Size | | 2 KB | 4 KB |
| Block Size | | 128 KB | 256 KB |
| Operating Characteristics | Read | Max 35mA | Max 30mA |
| | Program | | |
| | Erase | | |
| P/E Endurance | | 100K cycle | 60K cycle |
| tR (max) | | 40 us | 30 us |
| tPROG (typical) | | 250 us | 300 us |
| tBERS (typical) | | 2 ms | 3 ms |

<16G bitSLC>

| Item | | 42nm | 32nm |
|---------------------------|---------|------------|-----------|
| Die Capacity | | 16Gb | 16Gb |
| Page Size | | 2 KB | 4 KB |
| Block Size | | 128 KB | 256 KB |
| Operating Characteristics | Read | Max 35mA | Max 30mA |
| | Program | | |
| | Erase | | |
| P/E Endurance | | 100K cycle | 60K cycle |
| tR (max) | | 40 us | 30 us |
| tPROG (typical) | | 250 us | 300 us |
| tBERS (typical) | | 2 ms | 3 ms |

Summary

When the NAND has changed from Samsung 42nm SLC to Toshiba 32/24nm SLC, there are the changes on cell and chip size:

1G bit and 2G bit

- The operating characteristics with 5mA decreased
- The P/E cycle with 40K cycles decreased (flash vendor guaranty)
- The Read time with 15us decreased
- The Page Program time with 50us increased
- The Block Erase time with 0.5ms increased

4G bit, 8G bit and 16G bit

- The Page Size change from 2KB to 4KB
- The Block Size change from 128KB to 256KB
- The operating characteristics with 5mA decreased
- The P/E cycle with 40K cycles decreased (flash vendor guaranty)
- The Read time with 10us decreased
- The Page Program time with 50us increased
- The Block Erase time with 1ms increased

On the SSD level, there will be no impacts and controller firmware support is compatible with these changes.