The Next Innovation in High Density and Low Pin Count

SpiStack® is Winbond's new W25M series developed to meet the demand for higher density, while maintaining a low pin count of the SpiFlash® packages. This innovation brought about the advantages of concurrent operations, i.e., Read while Program or Erase functions and added combination of two technologies, NOR and NAND flash memories.

Key features

The SpiStack® Die Selectability. The Chip Select signal is ganged across all dies. Each die has its own unique factory programmed 8-bit Die ID. A Software Die Select command code, C2h followed by the 8-bit die address 0x00 thru 0x03, in the case of a four die stack configuration. Die 0x00 is always active after power-up or after a Reset command. The Software Die Select command can be issued at any time regardless of its operating state to select another die in the stack.

A performance benefit feature of the SpiStack® is Concurrent Operations, which allows reading the contents of one die while programing or erasing another. In the case of three or more die, Multi-Die Program/Erase while Read is possible.

The SpiStack® allows for Homogenous or Heterogeneous Multiple Chip Packages (MCP) configurations. Homogeneous configurations, stack identical densities either in stack dies of SpiFlash® NOR or stack dies of SpiFlash® NAND. Heterogeneous SpiStack® , combines the two technologies of NOR and NAND, that consist of a smaller density and high reliability Code Storage NOR and a higher density, faster program and erase speeds Data Storage NAND.

Software Die Selection (C2h)

The Software Dies Select is used to select any die within the Multiple Chip Package (MCP). The 8-bit command C2h, followed by the 8-bit die address can be issued at any time to activate another die, deactivating the current die regardless of their operating state allowing the single Chip Select (/CS) to be recognized by the active die.

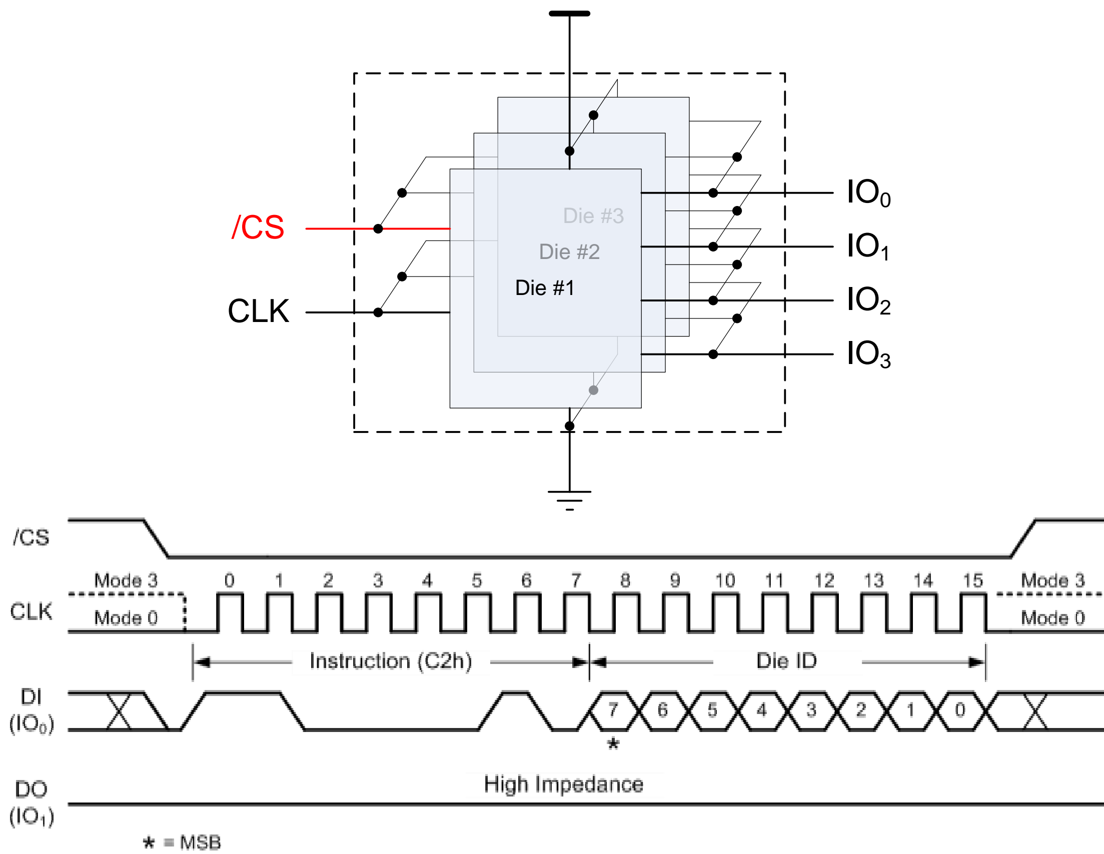

Figure 1: Die Selectability

Concurrent Operations

Typical *SpiFlash®* operates in a sequential pattern of commands, addresses and data. Where Read operations will have control of the SPI Bus and Program or Erase functions leave the SPI bus idle while the time is spent executing the operation.

In the case of a SpiStack® MCP, Concurrent Operations can be realized by assigning the current Active Die to perform an Erase/Program operation which requires some amount of time to finish. While the internal Program/Erase operation is on-going, the controller can issue a “Software Die Select (C2h)” instruction to select another die to be active. Depending on the system requirement, a Read, Program or Erase operation can be performed on the newly selected Active Die. “Read while Program/Erase” or “Multi-Die Program/Erase” can be performed in such fashion, to improve system Program/Erase throughput and to avoid constant Program/Erase Suspend and Resume activities in certain applications.

Sequential Operations

Concurrent Operations

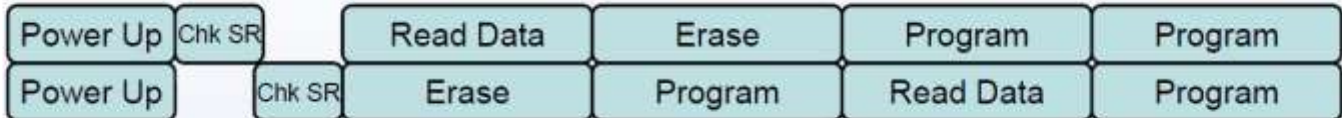

Figure 2: SpiStack® Concurrent Operations vs Conventional SpiFlash® Operations

Homogenous and Heterogeneous Configurations

SpiStack® allows the choice of two types of configurations, Homogenous and Heterogeneous where small pin count, small form factors and flexible combination of densities and flash technologies are certainly possible.

Homogeneous SpiStack® , stacks either the same SpiFlash® (NOR + NOR) or Serial SLC NAND Flash (NAND + NAND) die densities in a convenient low pin-count packages while significantly increasing the memory density by a factor of the number die contained in the specified package. Sometimes the increase in density is proportional to the increase in die size that just fits in a particular package, but with the SpiStack® you can double or even quadruple the density with only the package height being the limiting factor.

Heterogeneous SpiStack® , stacks the serial NOR and SLC NAND flash technologies of different densities in the same MCP package. This allows for the choice of code storage from the SpiFlash® memory dies of a smaller density to be combined with the high performance and high density data storage from the Serial SLC NAND Flash dies all sharing the same SPI Bus.

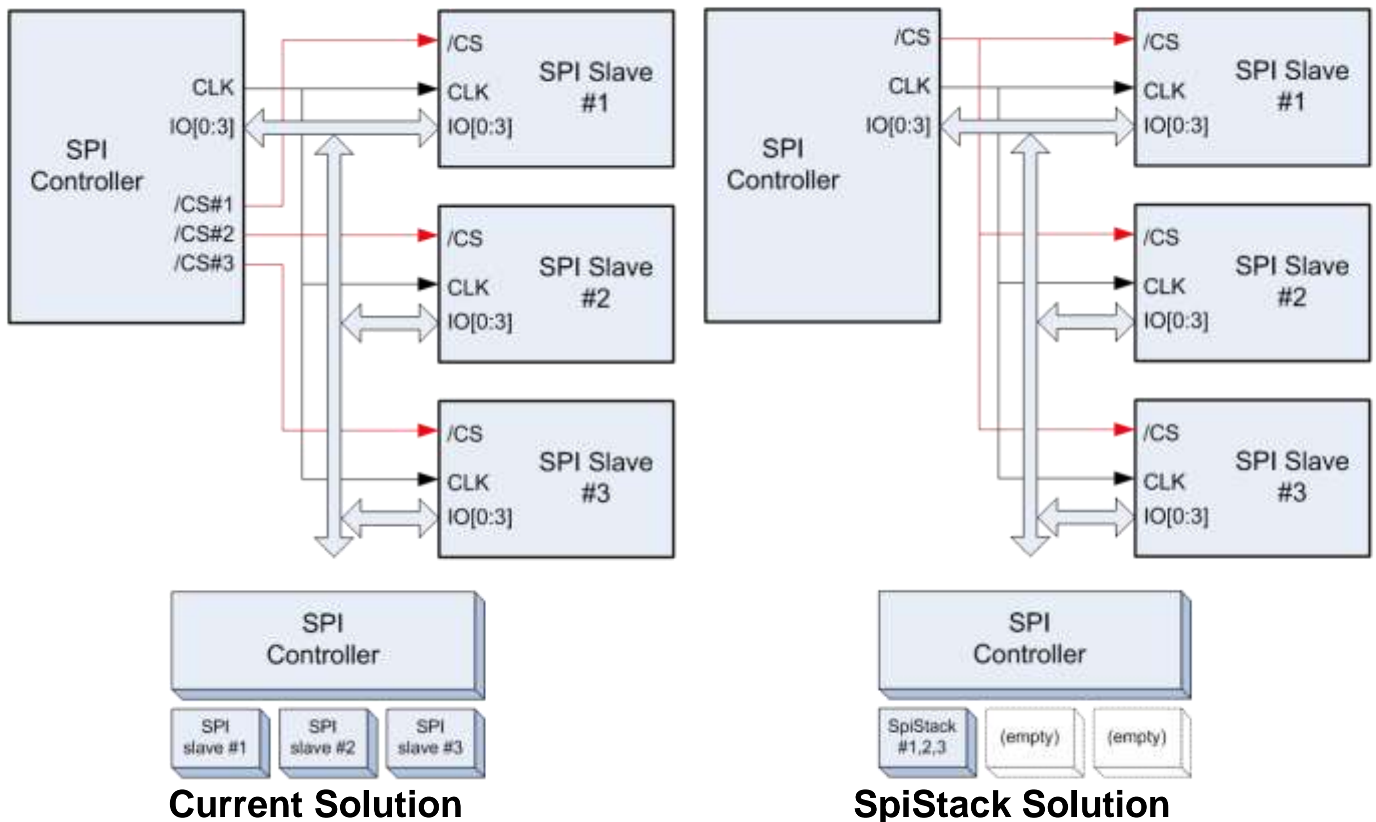

Figure 3: SpiStack® Comparison

Drivers and Simulation Models

Drivers and Simulation Models can be obtained by contacting the Winbond Electronic Corporation of America Technical Support. (Click Here)

Revision History

Version	Date	Page	Description
1.0	04/06/2017	NA	Original

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