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INTRODUCTION

RAID (Redundant Array of Independent Disks) consists of multiple hard drives in one system that appear like a single drive. The multiple drives provide better performance and fault tolerance than single drive systems. Examples of where RAID is used include servers (internet, email, news, database, file), embedded systems, telecommunications, workstations, and mission-critical applications.

In RAID systems, Dallas Semiconductor NV SRAMs (nonvolatile SRAMs) offer protection of mission-critical data, as well as immediate access to the data after loss of main power. Dallas NV SRAMs are well suited for RAID applications because they provide unlimited write and read cycles with access speeds as fast as 70ns. Dallas NV SRAMs also reliably store data for up to 10 years, solely on battery power.

NV SRAMs in RAID CONTROLLERS

Dallas Semiconductor NV SRAMs provide a superior method of protecting mission-critical data from power losses. Dallas NV SRAMs operate as an ordinary SRAM and are viewed as such by RAID systems. Utilizing the internal lithium power source and the self-contained control circuitry, the NV SRAMs ensure that all data is preserved by constantly monitoring V_{CC} for an out-of-tolerance condition. When such a condition occurs, the lithium power source is automatically switched on and write protection is enabled to prevent data corruption. Figure 1 shows how Dallas NV SRAMs can be integrated into a RAID controller.

Figure 1. NV SRAMs in a RAID Controller
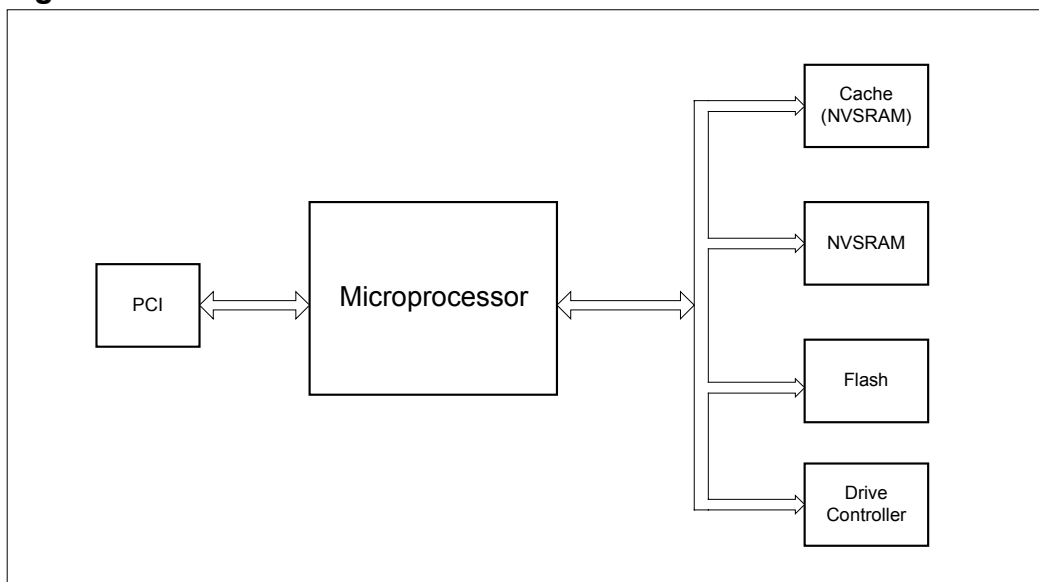
In RAID systems, system information (restart vectors, controller parameters, system configuration data, and parity information) can be stored in NV SRAM. In case of a power failure, the system information can be quickly located once power is restored. NV SRAMs can also be used for the cache and flash memory.

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DS3832 (32Mb) and DS3816 (16Mb): NV SRAM with Clock

The DS3832C-311 module is currently the highest density (32Mb) NV SRAM module available on the market. The DS3832 has a 32-bit data path with a separate 8-bit data bus for the real-time clock (RTC). The DS3832 also contains internal control circuitry that constantly monitors V_{CC} for an out-of-tolerance condition. When such a condition occurs, the NV SRAM module makes use of an attached lithium power source to maintain the clock information and preserve the stored data, while protecting the data by preventing all memory accesses.

The DS3832 operates from a 3.3V supply, has an industrial temperature range, and 100ns access time. The DS3816 has 16Mb of memory, 5V supply, industrial temperature range, and 70ns access time. Both devices have an attached, replaceable lithium battery (the DS3802). The battery life is a minimum of 10 years.

DESIGN CONSIDERATIONS

During system definition, many design considerations are made. In addition to replacing the SRAM with NV SRAM, Dallas NV SRAM can also be used in place of flash to enhance performance and for cache to produce a more reliable and better performing system.

Flash

Flash is typically used to store firmware, operating system, and management applications. NV SRAM can be used in place of flash memory. NV SRAM is faster to read/write, will not wear out from too many write cycles, and bytes of data can be written instead of blocks of data.

Cache

To improve performance in systems with large files such as graphics, audio, or video files, a larger cache should be used. Using multiple DS3832s or DS3816s (see Figure 2) is a common way of increasing the cache memory. RAID is not immune to failures so using a battery backed NV SRAM is useful. With a NV SRAM battery backed cache, if the system crashes before the cached data is written, the data will be saved.

Figure 2. Connecting Multiple NV SRAMs
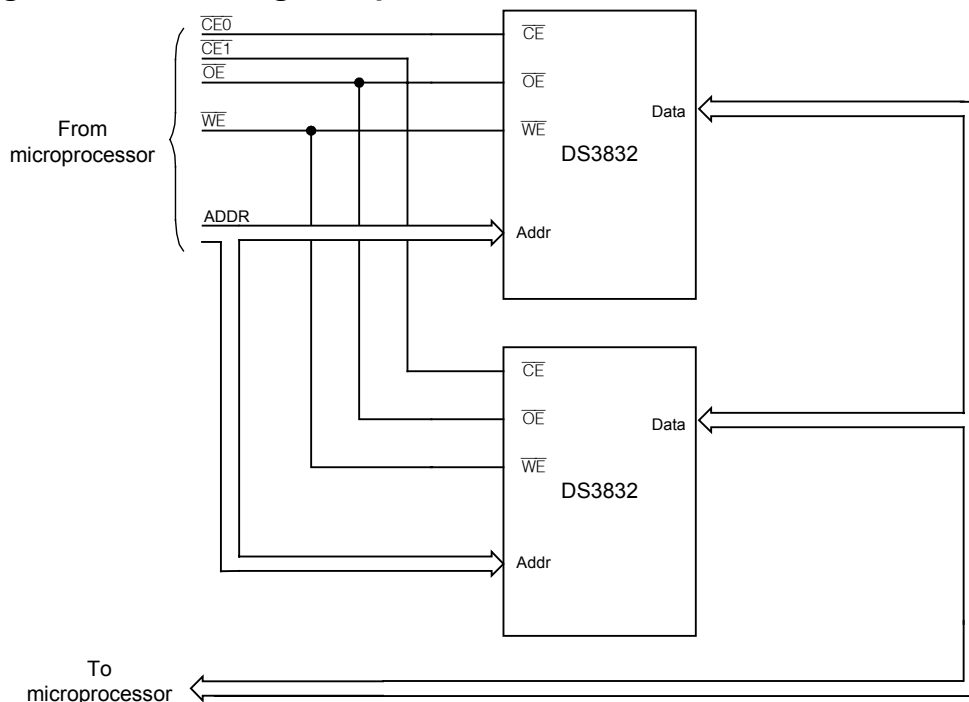
CONCLUSION

RAID systems are popular due to their reliability and ability to store large amounts of data. Dallas Semiconductor's NV SRAMs, such as the DS3832 and DS3816, are ideal for RAID applications due to their fast speeds, unlimited write capability, and battery backup. Their features can improve the reliability and performance of a RAID system. For assistance in choosing an NV SRAM for your application, contact Applications Support at MixedSignal.Apps@dalsemi.com.

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