



# SYM201F40

## *Ultra2 SCSI Hard Disk Controller*

The SYM201F40 is the industry's first hard disk drive controller with Ultra2 SCSI support. It provides industry-leading performance of 80 MB/s SCSI transfer rate, 140 MB/s burst buffer bandwidth, and 40 MB/s disk transfer rate. High data integrity is provided from SCSI through the buffer to disk. All buffer data, including tables, is protected by parity, VRC, or CRC.

The SYM201F40 is comprised of a SCSI Protocol Controller, Host DMA/Multi-Context Engine, Buffer Manager, Disk Formatter, Data ECC, and Microprocessor Interface. Each major block is designed with Symbios Logic's core methodology to facilitate integration with other logic, such as customer ASIC logic, microprocessor, servo/spin functions, or embedded memory.

The SYM201F40 is available in a 176-pin TQFF package and supports greater device connectivity and longer cables with Low Voltage Differential (LVD). This allows transfers over distances that once required differential SCSI and the added expense of external transceivers. Backward compatibility is supported with Symbios Logic LVDlink™ universal I/O transceivers that allow the device to switch between LVD and single-ended mode.

### **SCSI Features**

- LVDlink integrated transceivers
- Supports all combinations of Asynchronous, Fast, Ultra and Ultra2, both Narrow/Wide
- Supports up to 80 MB/s data rate
- Supports automatic write and read coalescing, including non-sequential coalesces
- Supports resumable automation after exceptions

- Supports XOR and Initiator functionality
- Supports SCAM master/slave, levels 1 and 2
- Complete, stacked, and maskable interrupt status within three accesses
- Single interrupt per I/O capable
- Complies with SCSI-1, -2, -3 standards
- Supports logical block sizes up to 4096 bytes

### **Host DMA/Multi-Context Engine**

- Automatically manages 2 on-chip and up to 4 buffer-based contexts
- Full firmware control and interrupts available
- Separate, linkable host and disk contexts

### **Buffer Manager**

- EDO DRAM support up to 4 MB
- Buffer Bandwidth up to 140 MB/s (burst)
- Configurable clock speeds optimize bandwidth for all EDO speed grades
- Supports VRC/parity protection of buffer tables
- 32-bit CRC protection with encoded Logical Sector Address for data integrity check

### **Disk Formatter**

- Supports headerless formats using efficient buffer-based defect/skip, split, and position look-up tables
  - Simple servo interface - no custom requirements
  - Maintains data integrity in headerless environment
- Supports 8-bit NRZ interface up to 40 MB/s (320 Mb/s)

## Disk Formatter (con't)

- Writable Control Store (WCS) allows flexible sequencing
- Supports multiple-track data transfers in one operation
- Supports Read/Write coalescing, including non-sequential coalesces
- Built-in support for defect mapping
- Supports physical sector sizes up to 1241 bytes

## ECC

- Provides on-the-fly triple burst correction
  - Each error burst correction can be up to 5 bytes and can be combined for up to a maximum correction of 15 bytes
  - Uses 272-bit redundancy code
- Supports error logging
- Supports flexible correction burst length limiting

## Microprocessor Interface/Global Features

- Supports 16-bit Intel® style device interfaces
- Highly flexible microprocessor access to buffer data

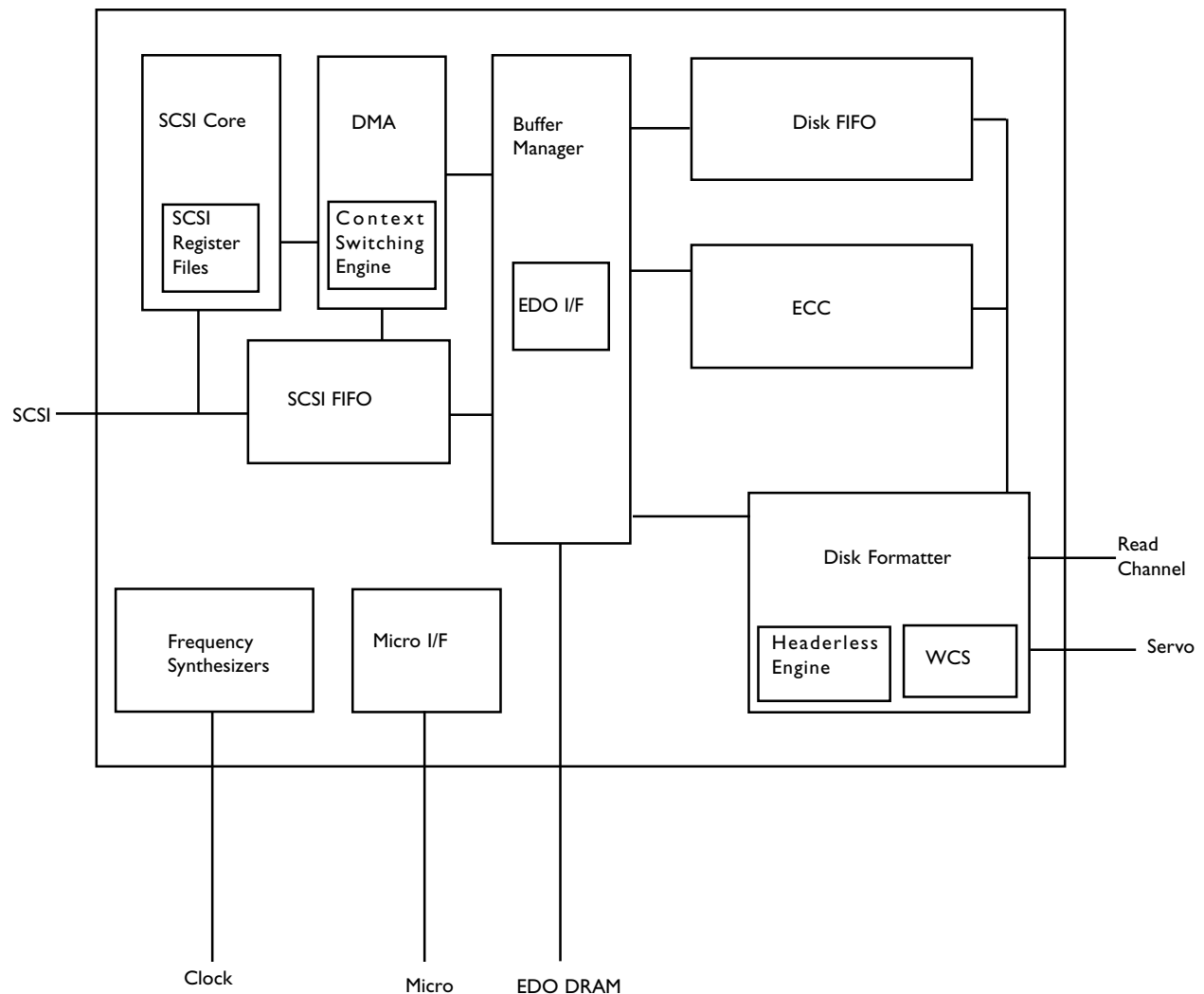


Figure 1. SYM201F40 Block Diagram

## Product Description

The Automated Context Switching Engine of the SYM201F40 optimizes SCSI bus utilization and minimizes command latency for disk drives in high performance systems. This engine allows the SYM201F40 to employ the full Ultra2 SCSI performance. To accomplish this, the microprocessor is removed from real time management of SCSI commands. Instead, the microprocessor queues commands through the use of Host DMA context structures. The Automated Context Switching Engine intelligently swaps contexts, connects/disconnects from the SCSI bus, and transfers data.

To safely harness the power of the Automated Context Switching Engine, the SCSI core allows context switches based on the state of command execution and SCSI bus, while maintaining absolute data integrity. This protection also enables the configurable SCSI Auto-Data Engine to use existing contexts and create new contexts without the disruption of currently executing DMA contexts. After receiving a command, the SCSI Auto-Data Engine automatically selects the most efficient transition method into the data transfer phase. It then directs the Automated Context Switching Engine to load the appropriate DMA context.

Other key features of the SCSI core:

- easy exception handling through queued instructions
- resume capability
- automatic multi-byte message handling automation
- consistent context interrupt reporting

The simple and efficient headerless engine optimizes headerless formats while assuring maximum data integrity. It does not require any change from most previous headered servo systems, nor does it rely on firmware for real-time critical functions. Built-in checks assure data integrity. The headerless engine, in conjunction with the WCS-based Sequencer, does not restrict the architecture of any firmware algorithms, such as defect management. So any current or future drive requirements can be easily implemented.

## Support

Training is available at your location or at Symbios Logic. Support is available to assist the integration of the SYM201F40 into a functional disk drive.

## Extensive Storage and I/O Bus Expertise

Symbios Logic is a leading supplier of disk, optical, and tape semiconductors. The SYM201F40 is part of Symbios Logic's family of high performance hard disk drive controllers, which include FC-AL and Ultra2/Ultra SCSI optimized versions. These products are developed in synergy with Host I/O and RAID products to assure high

performance and industry compatibility. Symbios Logic's unique solutions offer complete connectivity between Host I/O to RAID to disk using the latest I/O technologies.

## Key Advantages Assure Your Success

Symbios Logic has a long history of helping customers succeed by taking a collaborative approach to getting their solutions into high volume manufacturing. We provide leading analog functions, embedded microprocessor cores, and embedded memory. You select the best performance/cost solution. This relationship, built on Symbios Logic's expertise in providing ASIC development design environments, allows you to incorporate your choice of value-add functions. By combining the latest semiconductor manufacturing technology and in-house production capacity with our unique design philosophy, Symbios Logic offers a complete solution to ensure your success in the volatile storage market. Getting your product to market quickly is one of our primary goals.

## *Symbios Logic* **Sales Locations**

### **North American Sales Locations**

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