*SYM53C141* **Data Sheet**

# SYM53C141

## *LVD SCSI Bus Expander*

### Features

- Attaches single-ended SCSI devices to a Low Voltage Differential (LVD) SCSI bus
- Operates as a SCSI Bus Converter or Repeater
- Provides SCSI Bus electrical isolation for high availability and scalable server clustering technologies
- Targets and initiators can be located on either the A or B side of the device
- Via the pin level electrical isolation mode, each side of the device can be logically disconnected from the other
- Dynamic mode switching used to inform initiators of a transmission mode change
- Self-calibration mode supports variations in voltage, temperature, and silicon process
- Accepts any asynchronous or synchronous transfer speed up to Ultra SCSI
- Does not consume a SCSI ID
- On-chip multi-mode LVDlink™ transceivers
- Supports TolerANT® transceiver technology
- Can cascade up to three Symbios® SYM53C141s
- Complete support for SCSI-1, -2, & -3
- Completely independent of software

### Applications

- Server Clustering Environments
- Expanders create distinct SCSI cable segments which are electrically isolated from each other (See Figure 1)

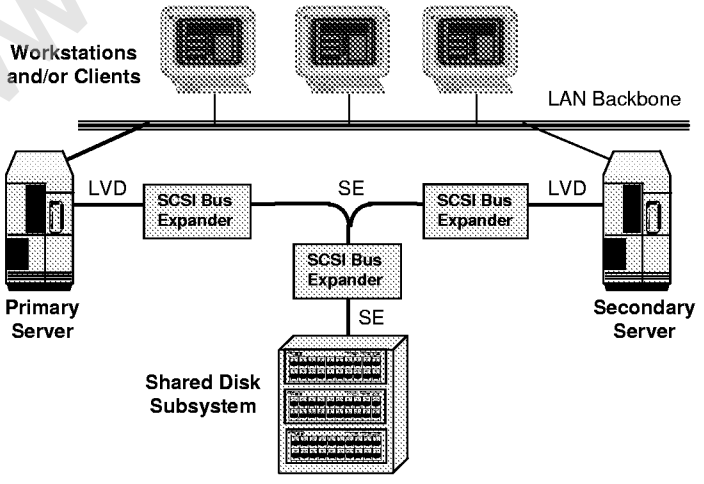



***Figure 1:*** *Example of server clustering using SYM53C141 devices*

## Overview

SCSI bus expanders are the way servers are clustered. A SCSI bus expander couples bus segments together without any impact to the SCSI protocol, software, or firmware. The SYM53C141 SCSI Bus Expander attaches single-ended (SE) SCSI peripherals to the Low Voltage Differential (LVD) signaling bus used by Ultra2 SCSI.

The SYM53C141 enables system architects to take advantage of the inherent cable distance, device connectivity, and data reliability benefits of LVD signaling while operating with peripherals designed for Ultra SCSI speeds.

The SYM53C141 operates in two modes: single-ended to single-ended (Repeater) or single-ended to Low Voltage Differential (Converter). For applications requiring SE to High Voltage Differential (HVD), the SYM53C120 Bus Expander should be used.

| Symbios Product | Repeater | Converter |
|---|---|---|
| SYM53C120 | SE to SE | SE to HVD |
| SYM53C141 | SE to SE | SE to LVD |

In both SCSI Bus Repeater and Converter modes, cable segments are electrically isolated from each other. This feature maintains the signal integrity of each cable segment. For bus isolation applications, the SYM53C141 is ideally suited for the SYM53C895 Ultra2 SCSI controller.

The SYM53C141 provides additional control capability through the pin level electrical isolation mode. This feature allows logical disconnection of both the A side bus and B side bus without disrupting SCSI transfers currently in progress. For example, devices on the logically disconnected B side can be swapped out while the A side bus remains active.

The SYM53C141 is based upon bus expander technology resulting in some signal filtering and re-timing to maintain signal skew budgets. In addition, the SYM53C141 has no programmable registers, therefore it does not require any software.

Refer to Figure 2 for the following block level description of the SYM53C141.

***Re-timing Logic:***

The SCSI signals, as they propagate from one side of the device to the other, are processed by logic which re-times them as necessary to guarantee SCSI bus signal timings. This logic is governed by the state machine control block. In addition, the re-timing logic contains numerous precision delay elements which are periodically calibrated by the precision delay control block.

***Precision Delay Control:***

The precision delay control block provides calibration information to the re-timing logic block for it to maintain precise SCSI bus timing such as output pulse widths, setup and hold times, and etc. As the system

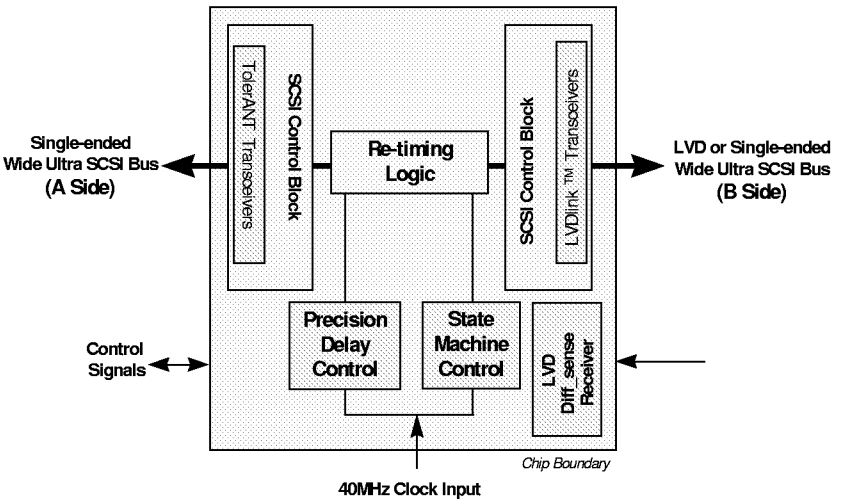



***Figure 2:*** *SYM53C141 Block Diagram*

voltage and temperature conditions vary over time, the precision delay control block will periodically update the delay settings in the re-timing logic to maintain constant and precise control over bus timing.

***State Machine Control:***

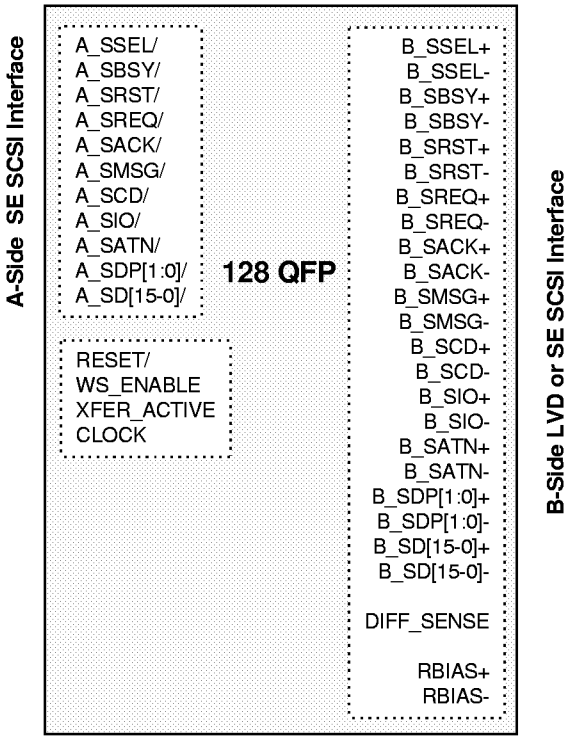
The state machine control block monitors SCSI bus protocol and other internal operating conditions such as SCSI phase, location of initiator and target, and various timer functions. This block provides input to the re-timing logic which identifies how to properly handle SCSI bus signal re-timing and protocol based on observed bus conditions.

***Dynamic Mode Switching:***

The SYM53C141 is designed to support dynamic transmission mode changes on bus segments which support both LVD and SE. The DIFFSENS line is used to detect a valid mode switch on the multi-mode LVD bus segment. For instance, when a SE device is plugged onto an LVD bus, the dynamic mode switch feature is used to inform any initiators residing on the opposing bus segment of the change in transmission mode. These initiators may then analyze the integrity of this mode change versus performance capabilities and conduct any necessary re-negotiations.

## Signal Grouping

The following diagrams the functional signal groupings of the SYM53C141:




## Specifications

- 40 MHz Input Clock
- Package: 128-pin Plastic Quad Flat Pack (PQFP)
- Compliant with the Reference Specifications shown below:

| Symbios Product | Repeater | Converter |
|---|---|---|
| SYM53C120 | SE to SE | SE to HVD |
| SYM53C141 | SE to SE | SE to LVD |

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