

LSI53C180

SCSI BUS EXPANDER

The Communications Company™

ULTRA160 SCSI BUS EXPANDER



OVERVIEW

The LSI53C180 is the industry's first Ultra160 SCSI bus expander. Based upon the LSI53C120, LSI53C140 and LSI53C141 bus expanders, it incorporates all of the features found in these popular devices plus support for Ultra160 (LVD to LVD) SCSI transfer rates. Unlike some solutions, SCSI bus expanders from LSI Logic automatically self-calibrate to adjust for periodic variations in voltage, temperature and silicon process. The signals between buses are regenerated, reshaped and transmitted transparently to the SCSI subsystem. Without this feature, it is very difficult to take advantage of Ultra160 SCSI performance and distance capabilities. It is capable of supporting either combination of bus mode: single-ended (SE) or low-voltage differential (LVD) on either the A or B side port. This device provides the system designer with maximum flexibility in designing SCSI bus segments to accommodate any SCSI bus mode.

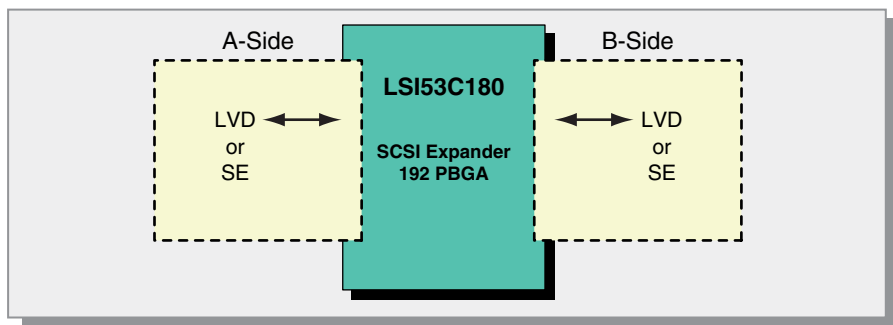


Figure 1: SCSI bus modes

Figure 1 shows the SCSI bus modes available with the LSI53C180. The LSI Logic LVDlink™ transceivers provide the multi-mode LVD and SE capability. The LSI53C180 operates either as a repeater or converter. In both SCSI bus repeater and converter modes, bus segments are electrically isolated from each other. This feature maintains the signal integrity of each bus segment.

BENEFITS

- Drives high-availability SANs – Enables bus isolation in cluster environments
- Supports margin checking
- Automatically adjusts for environmental variations
- Re-times SCSI signals
- Easy migration from Ultra2 SCSI

LSI LOGIC®

LSI53C180 SCSI Bus Expander

FEATURES

- Ultra160 support
 - Domain validation
 - Level 1 (Basic)
 - Level 2 (Enhanced)
 - Level 3 (Margining)
 - Dual transition clocking
 - Cyclic Redundancy Check (CRC)
- Self-calibration
 - Adjust for periodic variations in voltage, temperature and silicon process
 - Signals between buses are regenerated, reshaped and transmitted transparently to the SCSI bus subsystem
- A flexible SCSI expander that supports LVD and SE
- Creates distinct SCSI bus segments that are isolated from each other
- Fully integrated LVDlink transceivers for direct attach to either LVD or SE
 - Does not require external precision regulators to operate in LVD mode
- Operates as a SCSI bus repeater
 - LVD to LVD (Ultra2/160 SCSI)
 - SE to SE (Ultra SCSI)
- Operates as a SCSI bus converter
 - LVD to SE (Ultra SCSI)
 - SE to LVD
- Targets and initiators can be located on either the A or B side of the device

APPLICATIONS

The LSI53C180 bus expander is ideal for high availability and scalable server clustering environments. The examples below demonstrate how SCSI bus expanders are used to couple and isolate bus segments without any impact to the protocol or software. Configurations that use the LSI53C180 SCSI bus expander in Ultra160 mode (LVD to LVD) allow the system designer to take advantage of the inherent cable distance, device connectivity, data reliability, and increased transfer rate benefits of LVD signaling with Ultra160 SCSI peripherals.

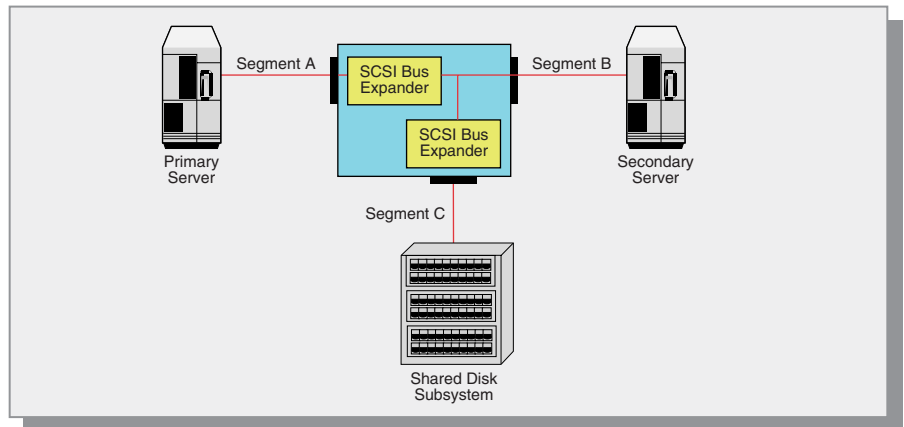


Figure 2: example of server clustering

In Figure 2, the LSI53C180 is configured as a three port expander board. This configuration allows segments A and B to be treated as a point-to-point segment. Segment C is treated as a load segment with at least 8 inches between every node. The following table* shows the various distance requirements for each SCSI bus mode.

Segment	Mode	Length Limit
Segment A, B	LVD (Ultra2 and 3)	25m
	SE (Ultra)	3m
	LVD (Ultra2 and 3)	12m
Segment C	SE (Ultra)	1.5m

* Data obtained from EPI document:
<ftp://ftp.t10.org/t10/drafts/epi>

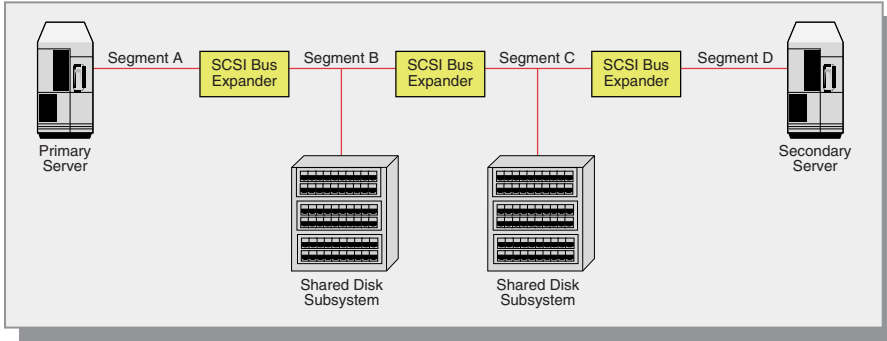


Figure 3: example of server clustering

In Figure 3, the LSI53C180 is cascaded to achieve four distinct SCSI segments. Segments A and D can be treated as point-to-point segments. Segments B and C are treated as load segments with at least 8-inch spacing between every node. The following table* shows the various distance requirements for each transmission mode.

Segment	Mode	Length Limit
Segment A, D	LVD (Ultra2 and 160)	25m
	SE (Ultra)	1.5m
	LVD (Ultra2 and 160)	12m
Segment B, C	SE (Ultra)	1.5m

* Data obtained from EPI document

BLOCK DESCRIPTION

The following is a block level description of the LSI53C180.

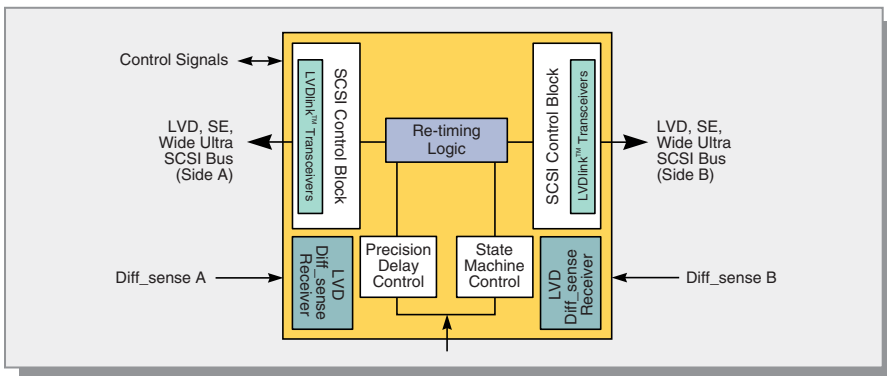


Figure 4: LSI53C180 block diagram

The LSI53C180 is based upon bus expander technology resulting in maintenance of skew budgets through signal filtering and re-timing.

FEATURES (Continued)

- Pin compatible with the LSI53C140 PBGA (using the LSI53C180 pinout)
- Accepts any asynchronous or synchronous transfer speed up to Ultra160 SCSI (for LVD to LVD mode only)
- Propagates RESET signal from one segment to the other regardless of the SCSI bus state
- Notifies initiator(s) of changes in transmission mode (SE/LVD/HVD) on A or B side segments via SCSI bus RESET
- SCSI busy LED driver for activity indicator
- Supports dynamic addition/removal of SCSI bus segments via electrical bus isolation mode
- Does not consume a SCSI ID
- Cascades up to four LSI53C180s
- Packaged in a 192 PBGA

SPECIFICATIONS

- 40 MHz input clock
- Compliant with reference documents below:
 - SCSI Parallel Interconnect 3 (SPI-3): <ftp://ftp.t10.org/t10/drafts/epi>
 - SCSI Enhanced Parallel Interface (EPI): <ftp://ftp.t10.org/t10/drafts/spi3>

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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.

Precision Delay Control

The precision delay control block provides calibration information to the re-timing logic block to maintain precise SCSI bus timings.

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 targets, and various timer functions.

SIGNAL GROUPING

Figure 5 below shows the functional signal groupings of the LSI53C180.

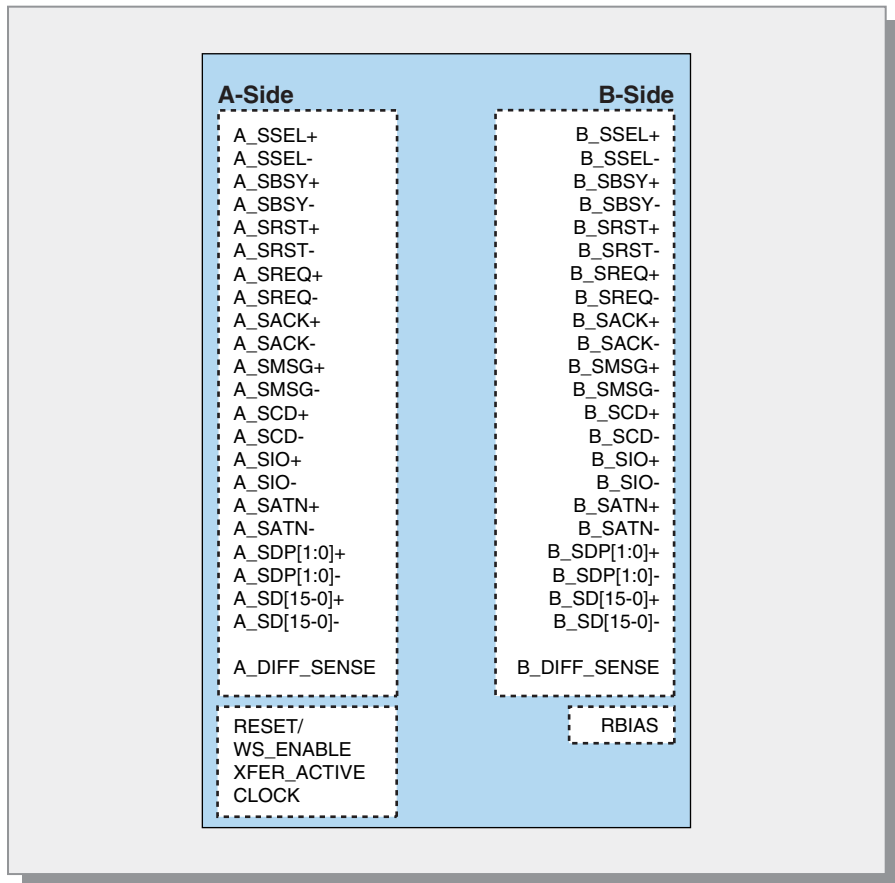


Figure 5: functional signal groupings

For more information please visit the LSI Logic web site at:

www.storageio.lsillogic.com

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