LSI53C140
SCSI BUS EXPANDER

The Communications Company™

ULTRA2 SCSI BUS EXPANDER

OVERVIEW

The LSI53C140 is an Ultra2 SCSI bus expander from LSI Logic. Based upon the LSI53C120 and LSI53C141 bus expanders, it incorporates all of the features found in these popular devices plus support for Ultra2 (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 Ultra2 SCSI's performance and distance capabilities. It is capable of supporting any combination of bus mode single-ended (SE), high-voltage differential (HVD), 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.

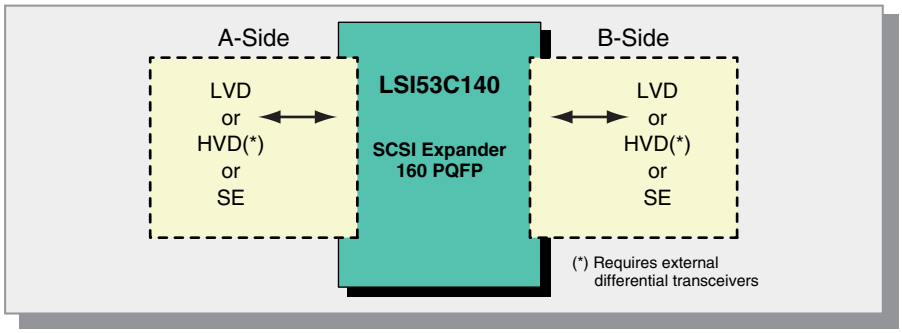

Figure 1: SCSI bus modes

Figure 1 shows the three SCSI bus modes available with the LSI53C140. The LSI Logic LVDlink™ transceivers provide the multi-mode LVD, SE and HVD capability. The LSI53C140 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.

FEATURES

- 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 any combination of LVD, SE or HVD transceivers
- Creates distinct SCSI bus segments that are electrically isolated from each other
- Fully integrated LVDlink transceivers for direct attach to either LVD, SE or HVD (requires external transceivers)
  - Does not require external precision regulators to operate in LVD mode
- Operates as a SCSI bus repeater
  - LVD to LVD (Ultra2 SCSI)
  - HVD to HVD (Ultra SCSI)
  - SE to SE (Ultra SCSI)

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FEATURES (Continued)

- Operates as a SCSI bus converter
  - LVD to HVD (Ultra SCSI)
  - LVD to SE (Ultra SCSI)
  - HVD to SE (Ultra SCSI)
- Targets and initiators can be located on either the A or B side of the device
- Accepts any asynchronous or synchronous transfer speed up to Ultra2 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

APPLICATIONS

The LSI53C140 is ideal for high availability and scalable server clustering environments. The examples below demonstrate how SCSI bus expanders are used to couple bus segments together without any impact to the SCSI protocol or software. Configurations that use the LSI53C140 SCSI bus expander in Ultra2 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 Ultra2 SCSI peripherals.

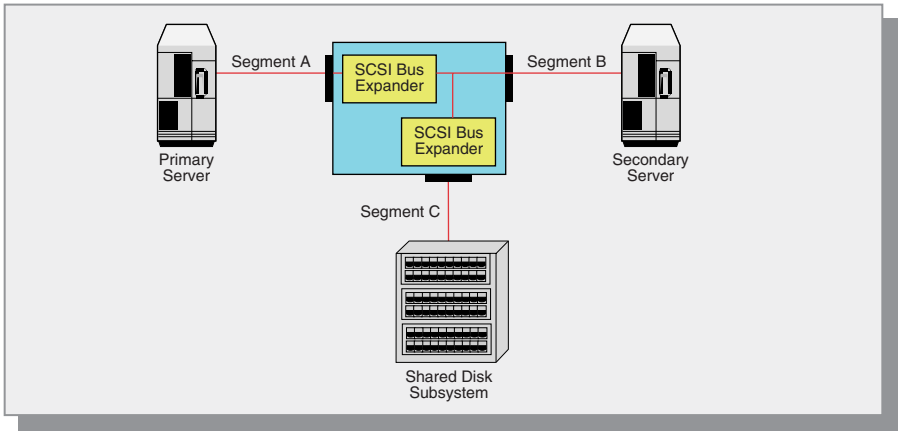

Figure 2: example of server clustering

In Figure 2, the LSI53C140 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″ 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)	25m
	SE (Ultra)	3m
	HVD (Ultra)	25m
Segment C	LVD (Ultra2)	12m
	SE (Ultra)	1.5m
	HVD (Ultra)	25m

*Data obtained from EPI document:
ftp://ftp.symbios.com/pub/standards/io/x3t10/drafts/epi

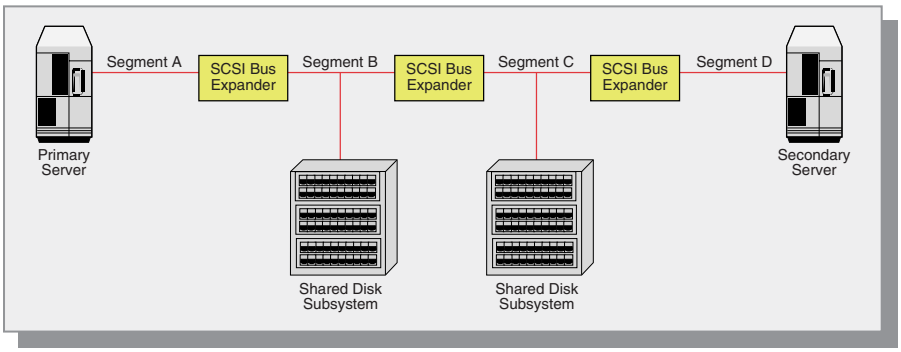

Figure 3: example of server clustering

In Figure 3, the LSI53C140 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" 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)	25m
	SE (Ultra)	1.5m
	HVD (Ultra)	25m
Segment B, C	LVD (Ultra2)	12m
	SE (Ultra)	1.5m
	HVD (Ultra)	25m

* Data obtained from EPI document

BLOCK DESCRIPTION

The following is a block level description of the LSI53C140.

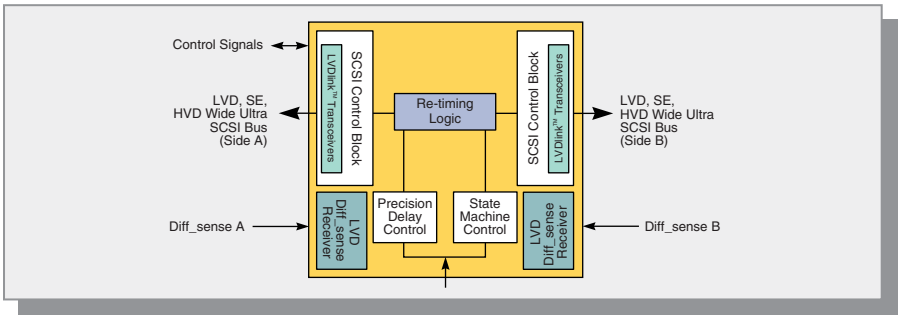

Figure 4: LSI53C140 block diagram

The LSI53C140 is based upon bus expander technology resulting in maintenance of skew budgets through signal filtering and re-timing. In addition, the LSI53C140 does not require any software.

FEATURES (Continued)

- Does not consume a SCSI ID
- Up to four LSI53C140s can be cascaded
- Completely independent of software
- Packaged in a 160 PQFP or 192PBGA

SPECIFICATIONS

- 40 MHz Input Clock
- Compliant with reference documents below:
  - SCSI Parallel Interconnect 2 (SPI-2): *ftp://ftp.symbios.com/pub/standards/io/x3t10/drafts/spi2*
  - SCSI Enhanced Parallel Interface (EPI): *ftp://ftp.symbios.com/pub/standards/io/x3t10/drafts/epi*

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 LSI53C140.

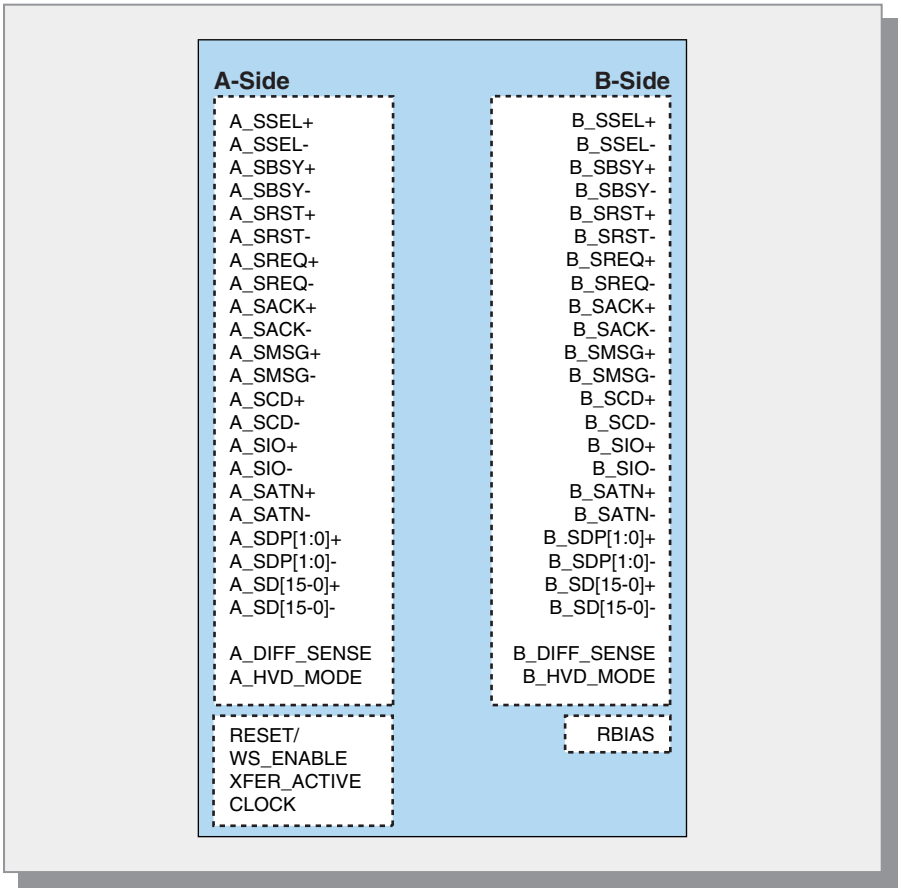

Figure 5: functional signal groupings

For more information please visit the LSI Logic web site at:
www.storageio.lsilogic.com

LSI Logic Corporation
North American Headquarters
Milpitas, CA
Tel: 800 574 4286

LSI Logic Europe Ltd.
European Headquarters
United Kingdom
Tel: 44 1344 426544
Fax: 44 1344 481039

LSI Logic KK Headquarters
Tokyo, Japan
Tel: 81 3 5463 7165
Fax 81 3 5463 7820

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