Using the LSI53C180 with the Qlogic GEM359

System Engineering Note

S11022

Version 1.0

Introduction

This system engineering note describes various situations that may occur when you use the LSI53C180 SCSI Bus Expander in a system with the Qlogic GEM359 device. The GEM359 SAF-TE device provides enclosure monitoring in a JBOD or other system configuration, which is also a very common location for the LSI53C180.

Description

During arbitration, the initiator asserts BSY and its SCSI ID on the data bus. After arbitration, the initiator asserts the target SCSI ID on the data bus. The initiator also asserts SEL and I/O to indicate selection phase and data direction. Next, the initiator deasserts BSY. In handshake fashion, the target then asserts BSY to acknowledge its selection. Finally, the initiator deasserts SEL to indicate receipt of the BSY handshake. After this interaction between the initiator and target, the message and command phases are entered. During the arbitration and selection phases, the initiator is in control of the SEL and I/O lines.

During these asynchronous arbitration and selection phases, the LSI53C180 SCSI Bus Expander operates in pass-through mode. As signals arrive on one side of the expander, they are passed through to the other side. The I/O signal determines if this is a selection or

reselection and steers the logic in the LSI53C180 accordingly. Figure 1 shows an example of normal arbitration and selection phases.

Figure 1   Normal Arbitration and Selection Phases
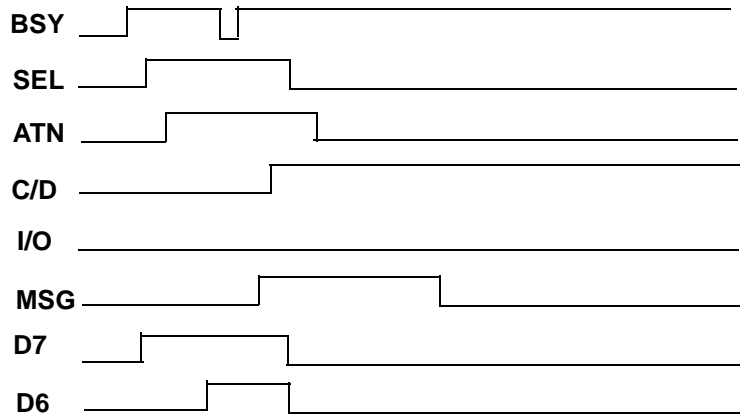
However, when the GEM359 device becomes the selected target, this device may assert the I/O line for a short period during the time BSY handshake occurs. The assertion pulse width is approximately 100 ns wide. This is wide enough to be considered a valid signal and will pass through any glitch filtering in the LSI53C180. Seeing this change in the I/O direction, the LSI53C180 interprets the change as a reselection and alters the internal steering logic of the device. After deassertion of the I/O signal, the LSI53C180 operates in an unknown state and may not function correctly until a bus free state is detected, which will reset the steering logic. Figure 2 illustrates the erroneous pulse on the I/O signal as seen on a SCSI analyzer.

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Figure 2   Erroneous Pulse on I/O Signal
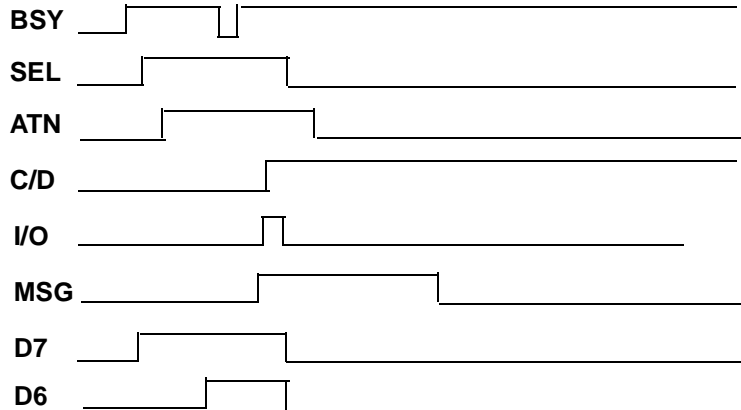
The SCSI specification states that the I/O signal must be stable 90 ns prior to the deassertion of BSY and must remain in that state until the deassertion of SEL. Thus, the GEM359 device generates a pulse that indicates a clear violation of the SCSI specification.

Recommendations

LSI Logic has used capacitive or resistive-capacitive filtering at the I/O pin of the GEM359 device to reduce the width of the erroneous pulse to an acceptable level and duration. This reduction causes the glitch filters in the LSI53C180 to disallow the expander steering logic from seeing the signal pulse. More elaborate filtering that actually switches the I/O signal from the GEM359 device off the bus when the initiator asserts SEL is also effective. As long as the I/O line is stable 25 ns before the target reasserts BSY and for 50 ns afterwards, the LSI53C180 SCSI Bus Expander will function correctly.