

Assignment 3

Due Tuesday, April 10. Submit your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Question 1

The data sheet for the Analog Devices ADXL345 accelerometer that is used on the DE0-Nano board is available on the course web site. Assume the interface is configured in 4-wire SPI mode. Using the pin functions described in Table 5, the timing diagrams given in Figures 37 and 38, and the timing specifications given in Table 10 answer the following questions:

- (a) Which signals (pins) are inputs (don't include supply and ground pins)?
- (b) Which signals are outputs?
- (c) Fill in a table for timing specifications t_{SCLK} through t_{SDO} (10 total) with values for the following columns for each specification:

- the specification symbol
- the signal from which the time is measured (starting point)
- the signal to which the specification is measured (ending point)
- whether the specification is a requirement (if the end point is an input) or a guaranteed response (if the end point is an output)
- whether it's a maximum or minimum
- the value in nanoseconds

- (d) Write a `create_clock` SDC statement that defines a 50 MHz clock named `clock50` present at an input port named `clock`.
- (e) Write a `create_generated_clock` SDC statement that defines clock named `clock2` with a source at the input port `clock` with a frequency of $50/25 = 2$ MHz assigned to a target pin in your design called `spiclk` (i.e. use `[get_pins spiclk]`).

- (f) Write a `set_input_delay` SDC statement that defines the input delay for a target input port named `miso`, a clock named `clock2` and the value of t_{SDO} . Use the maximum and/or minimum delay value(s) from the datasheet.
- (g) Write a `set_output_delay` SDC statement that defines a `-max` maximum output delay equal to t_{SETUP} , a clock `sclk` and a target output port called `mosi`. Use the t_{SETUP} value from the datasheet.

The syntax for the `create_clock`, `create_generated_clock`, `set_input_delay` and `set_output_delay` are available on-line and in the [reference manual](#).