Digital scope implemented on DE1-SoC

Electrical and Computer Engineering
MEng Program Design project
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Motivation
— Digital designs at home/dormitory
— Wrong output happens, but …
  Oscilloscope is unavailable!

Too Expensive to buy…
— We are engineers. So~

Just Design One!

Hardware
— 12-bit 500Ksps 8-channel ADC converter
— 85K programmable logic elements
— 4,450 Kbits embedded memory
— VGA DAC (8-bit high-speed triple DACs) with VGA-out connector
— 10 slide switches
— 4 push buttons

$175
For Academic

Digital Scope Functions

Digital Scope User Guide
(1) SW9: mode selection--"1" AC mode; "0" DC mode
(2) SW8: run_stop function--"1" stop; "0" run
(3) SW7: peak voltage cursor, available under AC mode--"1" on; "0" off
(4) SW6: enable trigger adjustment, also display the trigger voltage--"1" on; "0" off
  KEY2: increase the trigger value; KEY3: decrease the trigger value
(5) SW5: horizontal position adjustment for lower SEC/DIV--"1" on; "0" off
(6) SW4: horizontal position adjustment for higher SEC/DIV--"1" on; "0" off
  KEY2: increase the degree of regulation; KEY1: decrease the degree of regulation
(7) SW3: reset--"1" display waveform; "0" reset whole system
(8) SW2:0-- ADC converter channel selection
  default: [SW2,SW1,SW0] = 000-- channel 0
  ADC channel available on DE1 SoC: channel 0 to 7 selected by SW2:0

Tips: SW9 *0* + SW6 *1* = Display this User Guide

Digital Scope Display

Implementation
1. Input signals desired to measured

2. ADC converter: LTC2308

3. FPGA logic: Paralleled Floating Operation
  ● Frequency calculation

4. VGA output : VGA(60Hz) 640x480@25MHz
  ● Static notes
  ● Dynamic waveform
  ● Font library for
    ▶ Dynamic notes
    ▶ Dynamic numbers

5. Video DAC: ADV7123
  ● Three high speed 10-bit video DAC

6. VGA output - monitor

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