

Fig 3. Ultrasonic Rangefinder schematic

A combination of CNT/DLYs and DFFs performs the conversion of HC-SR04 ECHO pulse width to the number of LEDs indicating the distance. The GreenPAK converts the distance in steps of 10cm in the range of 10 to 30cm. The step size then becomes 20 cm in the range of 40 to 100cm. CNT1/DLY1 count settings makes a 580µs delay generator (10cm step distance equivalent). The combination of CLK and CNT setting allows for many other step and range settings available to the designer.

The DLY1 delay generator together with Pipe Delay can perform 3 conversions of ECHO (pulse width) into distance information for the 10, 20, 30cm range. CNTs/DLYs 3, 4, 5, 7 each form independent converters of ECHO (pulse width) 40 to 100 cm range by virtue of their CLK source and DLY count settings. The converters operate as follows: when input signal ECHO is HIGH for longer than the CNTs/DLYs configured delay, the outputs of CNTs/DLYs go HIGH and clocks the DFFs, then the corresponding LED outputs go HIGH.

The functionality waveforms that describe the device operation are shown in Fig 4 and 5.

Related Files

Programming code for [GreenPAK Designer](#).

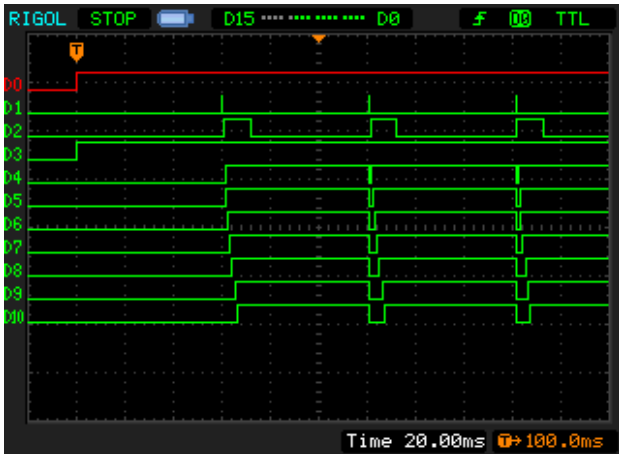


Fig 4. Timing waveforms when the object distance is >100cm

- D0 – PIN#2 (EN)
- D1 – PIN#12 (TRIG)
- D2 – PIN#3 (ECHO)
- D3 – PIN#20 (LED0)
- D4 – PIN#19 (LED1)
- D5 – PIN#18 (LED2)
- D6 – PIN#17 (LED3)
- D7 – PIN#16 (LED4)
- D8 – PIN#15 (LED5)
- D9 – PIN#14 (LED6)
- D10 – PIN#13 (LED7)

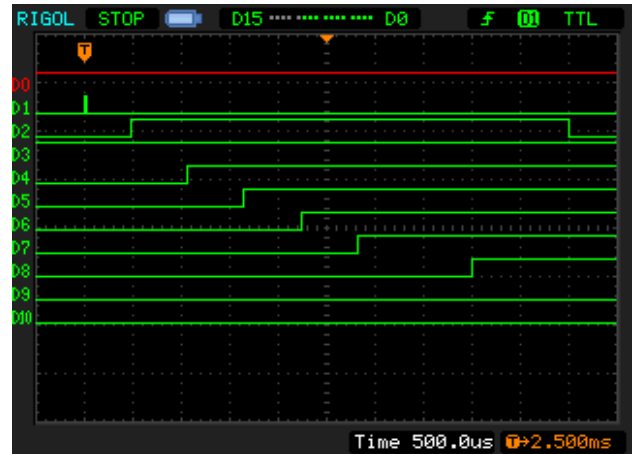


Fig 5. Timing waveforms when the object distance is =65cm

- D0 – PIN#2 (EN)
- D1 – PIN#12 (TRIG)
- D2 – PIN#3 (ECHO)
- D3 – PIN#20 (LED0)
- D4 – PIN#19 (LED1)
- D5 – PIN#18 (LED2)
- D6 – PIN#17 (LED3)
- D7 – PIN#16 (LED4)
- D8 – PIN#15 (LED5)
- D9 – PIN#14 (LED6)
- D10 – PIN#13 (LED7)

Conclusion

An ultrasonic rangefinder can be easily implemented using a GreenPAK3 programmable mixed-signal ASICs. This design can be very useful in applications such as: automotive parking sensors, industrial distance approximation, robotics, etc. Using GreenPAK3 minimizes the use of external components, and its low power consumption provides power savings.

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