Introduction

This example shows the design of a servomotor controller. The specific servo used in this design is the TowerPro SG90 - Micro Servo, as shown in Fig.1.

Fig. 1. TowerPro SG90 - Micro Servo

This servo can rotate approximately 180 degrees (90 in each direction), and works just like a standard radio control (RC) model servo. This design will be useful for those wanting simple functionality in a compact space, and not needing the overhead of a microcontroller and dedicated motor controller. Typical with RC servos, the position is determined by PWM. The middle position "0" ~1.5 ms pulse width. The right most position "90" ~2.5 ms, and the most left position "-90" ~0.5 ms. The application circuit of this servomotor design is shown in Fig. 2.

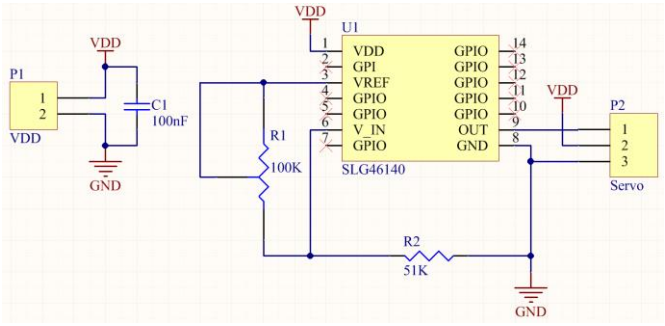

Fig. 2. Servo Control typical application

Servo Control circuit design

As shown in Fig.3 a controller for the servomotor can be implemented using the following cell blocks: PGA, ADC, CNT1/DLY1, DCMP2/PWM2, OSC and VREF.

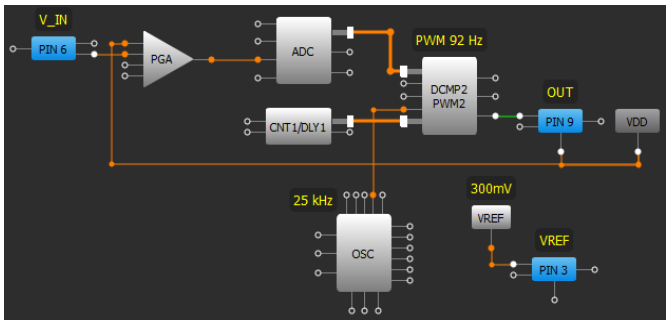

Fig. 3. Servo Control schematic

Servo Control circuit analysis

V_IN input voltage should range from 101 mV to 300 mV in order to cover the desired PWM positive duty cycle range of 0.5ms (101mV), and 2.5ms (300mV). CNT1/DLY sets the PWM frequency, ADC sets the duty cycle value. VREF is necessary to limit the upper voltage into the ADC. If VDD voltage were used then most of the potentiometer position setting would be outside the allowed input control range of the servomotor. On the OUT output we see the PWM signal with 92 kHz frequency and range of positive pulse width from 0.5ms to 2.5ms.

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

Related Files

Programming code for **GreenPAK Designer**.

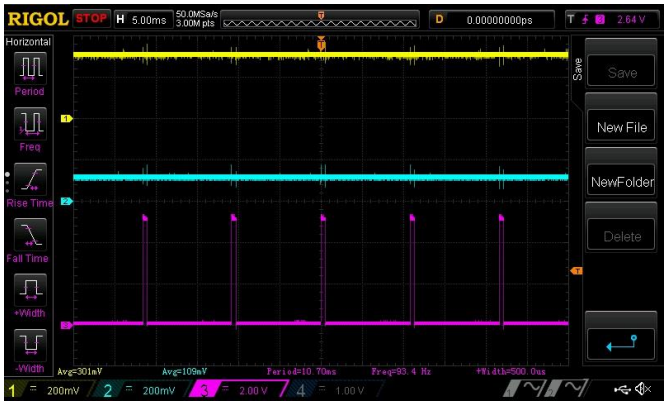

Fig 4. Timing waveforms for servomotor position -90 degrees

Channel 1 (yellow/top line) – PIN#3 (VREF)

Channel 2 (light blue/2nd line) – PIN#6 (V_IN)

Channel 3 (magenta /3rd line) – PIN#9 (OUT)

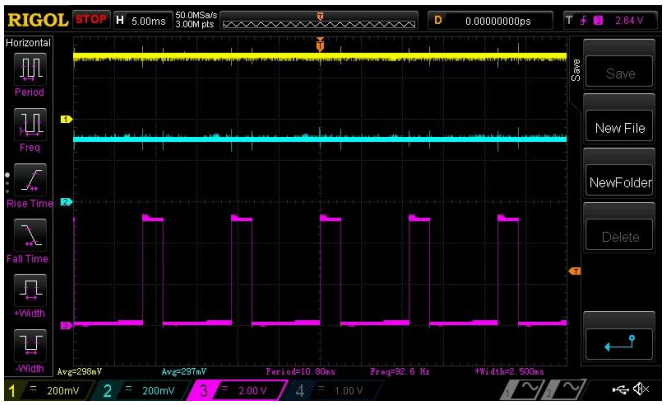

Fig 5. Timing waveforms for servomotor position 90 degrees

Channel 1 (yellow/top line) – PIN#3 (VREF)

Channel 2 (light blue/2nd line) – PIN#6 (V_IN)

Channel 3 (magenta /3rd line) – PIN#9 (OUT)

Conclusion

A Servo Motor Control can be easily implemented using a GreenPAK4 CMIC. This design can be very useful in applications such as: RC models, robotics, etc. Using GreenPAK4 minimizes the use of external components, and lowers the power consumption.

About the Author

Name: Oleg Gorodechny

Background: Oleg Gorodechny received Bachelor's degree in "Computer Science" in 2009 and Master's degree in "Information Control Systems and Technologies" in 2011 from Lviv Polytechnic National University. Since 2011 he has been working as a design engineer. From 2013 he began work for Silego Technology Inc. as an application engineer. Currently he designs analog CMIC circuits and their applications.

Contact: **appnotes@silego.com**

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A	Oleg Gorodechny	02/10/2015	New application note

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SILEGO TECHNOLOGY

Silego Technology Inc.
1515 Wyatt Drive
Santa Clara, CA 95054

Phone : 408-327-8800
Fax : 408-988-3800
Website : ww.silego.com