

# 1. Introduction

This document illustrates how to setup the Servo Motor demo on the DE10-Nano and the SMK(Servo Motor Kit) as shown in shown in **Figure 1**. The basic design content is also included. In this demonstration, please refer to the DE10-Nano user manual. For details about the SMK, please refer to the user manual of Servo Motor Kit(SMK).

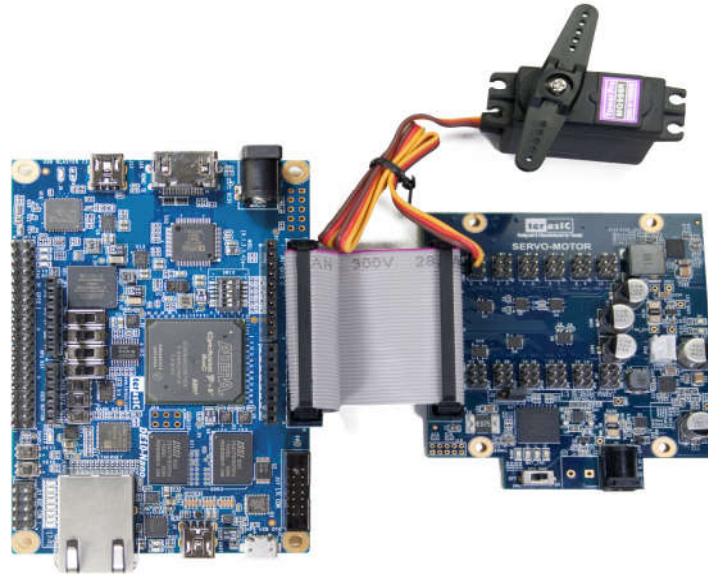


Figure 1 Servo Motor Demo

## 2. System Requirements

The following items are required to perform this demonstration:

- DE10-Nano and power supply
- SMK

## 3. Execute Demonstration

Please follow the procedures below to setup the demonstration

1. Make sure both Quartus II and USB-Blaster II driver are installed on the host PC.
2. Make sure Quartus Prime 16.0 Standard or later is installed on your host PC.
3. Power off the DE10-Nano board
4. Make sure the MSEL[4:0] is set to 10010.
5. Power off the servo motor card.
6. Connect servo motor to the **PWM0** on the servo motor card.
7. Connect the GPIO 0 output of the DE10-Nano board to the servo motor card.
8. Plug 12V DC to the servo motor card.
9. Power on the servo motor.
10. Execute the batch file “test.bat” under the demo\_batch folder of DE10\_NANO\_SMK\_RTL project.

11. Press KEY0 to increase servo angle.
12. Press KEY1 to decrease servo angle.
13. Adjust the speed by SW0 SW1

## 4. Project Description

**Figure 2** shows the System block diagram of Servo Motor demonstration. The FPGA board generate 3.3V PWM signal and send the signal to the Servo Motor Card through GPIO interface. The Server motor will translate the 3.3V PWM signal to 5.0V PWM signal, and send the 5.0V PWM signal to the servo motor. The servo motor will rotate to an angle specified by the duty cyclone of PWM signal

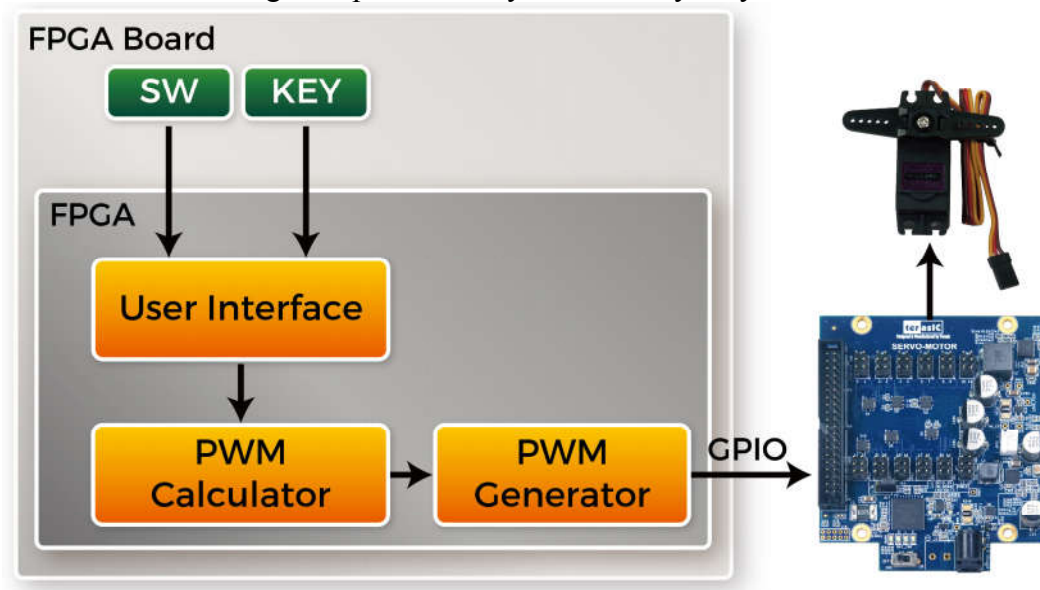


Figure 2 System Block Diagram

In this demonstration, users use the KEY and SWITCH on FPGA mainboard to control the behavior of the servo motor. Switches SW [0] and SW [1] are used to set the rotation speed of SERVO, button KEY [0] is used to increase the angle, and button KEY [1] is used to decrease the angle. The User Interface module will initially send the inputted angle to the PWM (Pulse Width Modulation) Calculator module for calculations. After the PWM Calculator has converted the angle into pulsing signals, the signals are sent to a PWM Generator module. Finally, the PWM Generator module will output PWM signals to the GPIO header to drive the servo.