EDGE Motor Drive Add-on

EDGE Motor driver add-on card is used to drive basic motors using EDGE FPGA kits via 2×10 pin female header.

Motor driver interface card is designed with Texas Instruments motor control driver **DRV8848** IC.

Add-on cards comes along with Stepper motor, DC Motor, Servo Motor and 2 channels Relay module. Also includes 12v power adaptor to provide power to motor driver add-on card.

Pin Details of Motor drive add-on 2x10 Connector

|			
--	1	2	--
--	3	4	GND
Dc 1 / Step 1	5	6	Dc 2 / Step 3
Step 3	7	8	Step 4
Enable	9	10	Servo
Relay 1	11	12	Relay 2
	13	14	
	15	16	
	17	18	
	19	20	

Stepper Motor

To connect Bipolar stepper motor, there are 4 pins are available at the motor connector add-on card. Those pins are named as step1, step2, step3 and step4.

Stepper Motor consists of wires black, green, red and blue. sometime white and yellow wires available along with remaining wires. Black and Green wire belongs to same winding and yellow is the centre tap wire which can left unconnected. Similarly Red and Blue wire belongs to same winding and white is the centre tap can be left unconnected.

We can connect step1 and step2 pins of add-on card to Red and Blue wires. step3 and step4 pins of add-on card to Black and Green wires.

To run the bipolar stepper motor we need to provide the following sequence.
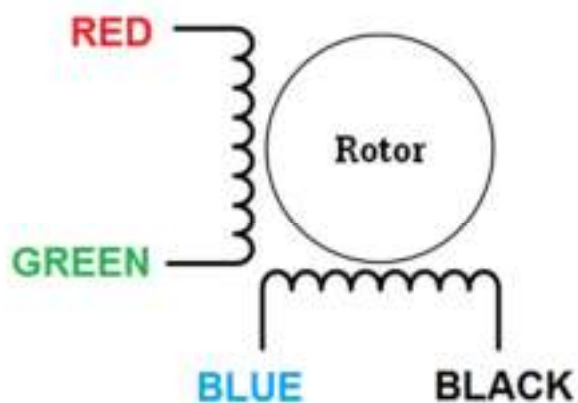
Bipolar stepper motor

Phase	Winding1		Winding2	
1	0	1	1	0
2	0	1	0	1
3	1	0	0	1
4	1	0	1	0

Pin details of Stepper Motor with EDGE FPGA kits

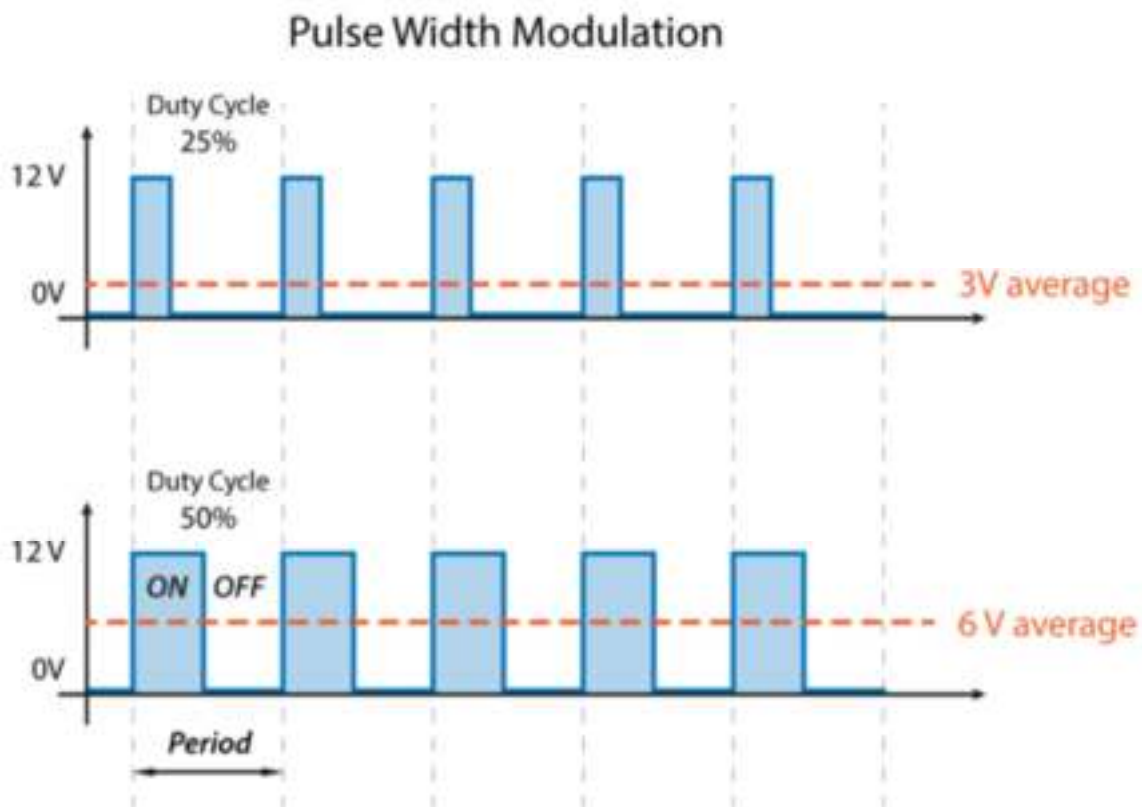| Add-on Pin out	Description	EDGE Spartan 6 Pin out	EDGE Artix 7 Pin out	EDGE ZYNQ Pin out
Dc1 / Step 1	Motor Winding 1	P75	M16	J20
Dc1 / Step 2	Motor Winding 1	P74	N16	H20
Step 3	Motor Winding 2	P67	P15	G19
Step 4	Motor Winding 2	P66	P16	G20
Enable	To enable motor make this pin high	P62	R15	H15

DC Motor

Motor driver add-on includes geared DC motor which can run at the speed of 300 RPM. To connect the DC motor to motor driver add-on card, DC1 and DC2 pin of J3 connector is directly connected to motor pins.

Variable PWM is generated to increase or decrease the speed of the DC motor and HDL code is provided to demonstrate the same.

The average DC voltage value for 0% duty cycle is zero; with 25% duty cycle the average value is 3V (25% of 12V). With a 50% duty cycle the average value is 6V, and so on. The maximum duty cycle can be 100%, which is equivalent to a DC waveform. Thus by varying the pulse-width, we can vary the average voltage across a DC motor and hence its speed.

Both Stepper Motor and DC motor operate at 12V power supply connected at the motor drive add-on.

Pin details of Stepper Motor with EDGE FPGA kits

Add-on Pin out	Description	EDGE Spartan 6 Pin out	EDGE Artix 7 Pin out	EDGE ZYNQ Pin out
Dc1 / Step 1	DC Motor pin 1	P75	M16	J20
Dc1 / Step 2	DC Motor pin 2	P74	N16	H20
Enable	To enable motor make this pin high	P62	R15	H15

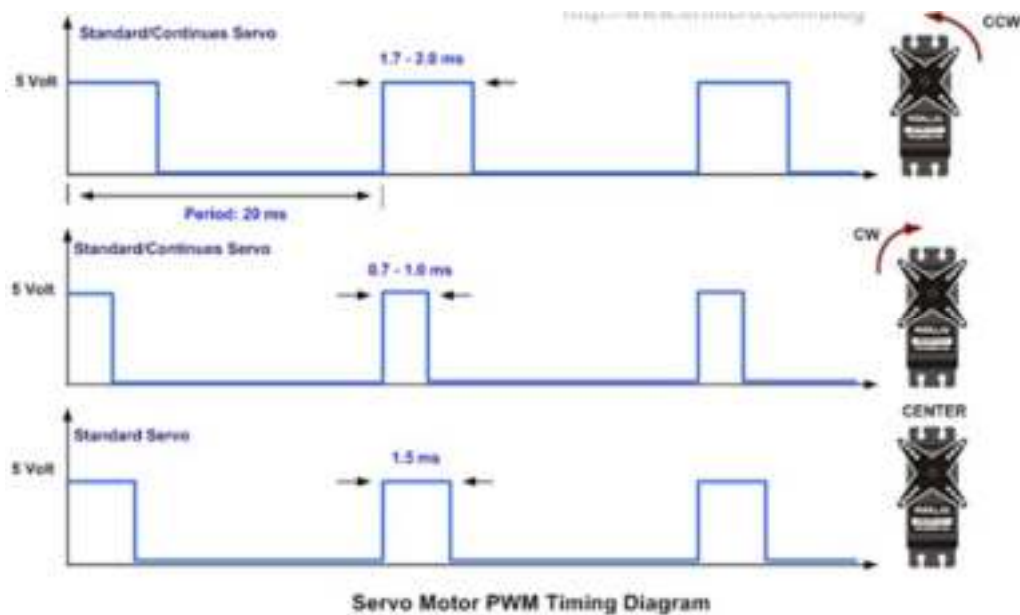**Servo Motor**

Motor drive addon also includes metal geared Servo Motor. Servo Motor can be used to move an object in high precision. Object can be moved at an exact angle with the help of servo motor.

Motor drive addon card contains 3 pins. Ground, VCC(5v) and PWM pins. We can directly connect brown to ground pin, red to vcc pin and orange to PWM pin.

EDGE Motor Drive add-on consist of 5v regulator to provide VCC to servo motor

Example HDL code is provided to demonstrate the servo Motor movement in a specific angle.
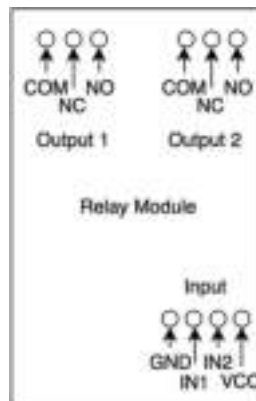

Servo Motor PWM Timing Diagram

Pin details of Servo Motor with EDGE FPGA kits

Add-on Pin out	Description	EDGE Spartan 6 Pin out	EDGE Artix 7 Pin out	EDGE ZYNQ Pin out
Servo PWM	Servo PWM pin	P61	R16	G15

2 channel Relay

Motor drive add-on also provided with 2 channel 5v relay interface with EDGE FPGA kits. These relays can control external appliances of upto 250VAC 10A or 30VDC 10A.

The relay has two outputs-normally open and normally closed (NO and NC). When the IN1 or IN2 pin is connected to ground, NO will be open and NC will be closed, and when IN1 or IN2 is not connected to ground the opposite occurs. Connecting a circuit or device between one of these two pins, the common pin on the relay output, and a power source will allow you to toggle power to a circuit or device.

EDGE Motor Drive add-on consist of 5v regulator to provide VCC to relay module

Example HDL code provided to control these relays via Bluetooth devices. Relay can be ON/OFF via mobile device.

Pin details of Relay with EDGE FPGA kits

Add-on Pin out	Description	EDGE Spartan 6 Pin out	EDGE Artix 7 Pin out	EDGE ZYNQ Pin out
Relay 1	Relay pin channel 1	P59	T14	K14
Relay 2	Relay pin channel 2	P58	T15	J14