SmartElex 10D Smart Motor Driver
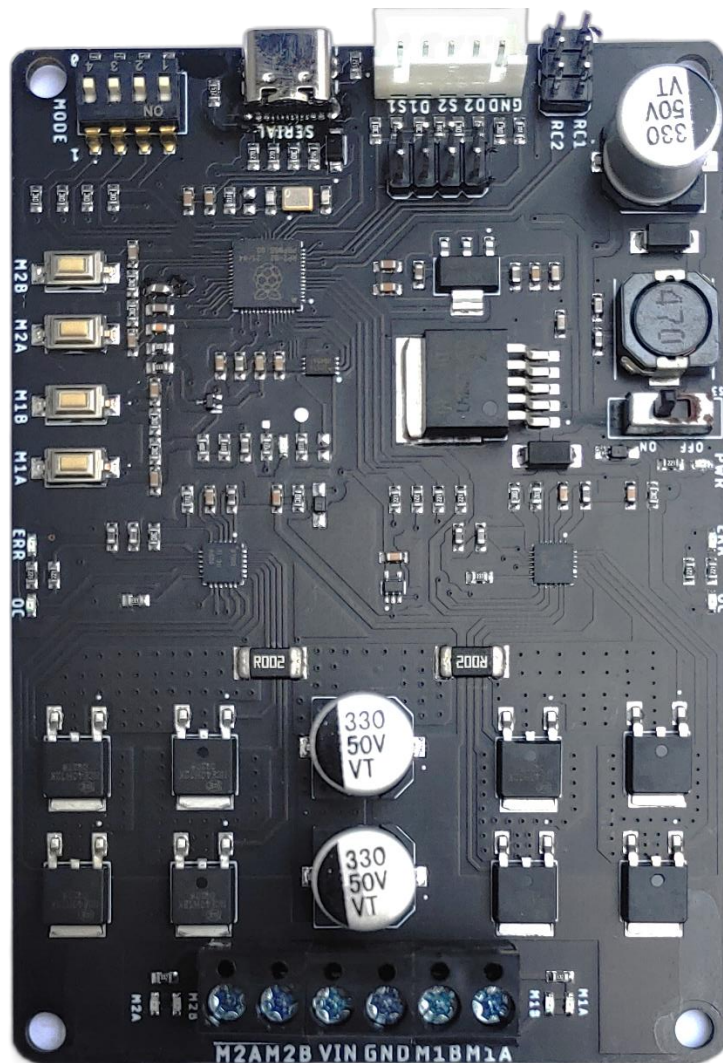
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Introduction:

SmartElex 10D is a dual channel motor driver capable of supplying 10 amps continuous with peak currents up to 25 amps (10Sec) per channel. It can be operated from radio control, analog, TTL serial and PWM. A variety of operating modes including with mixed and independent mode in radio control, analog and in PWM mode. Operating modes allow for operation, such as switching between radio controls and PWM mode or switching between any of 4 modes via 4 position DPDT mode switch. MOSFETs are switched at 16 KHz to ensure quiet operation and no annoying whining sound. Besides, it also equipped with a microcontroller unit to provide smart features such as multiple input modes and current limit and thermal protection. If temperature of board is reaches 80 degree then motor speed becomes half and speed will be normal once temperature reaches below 70 degree. Motor driver will be shut down at 100 degree.
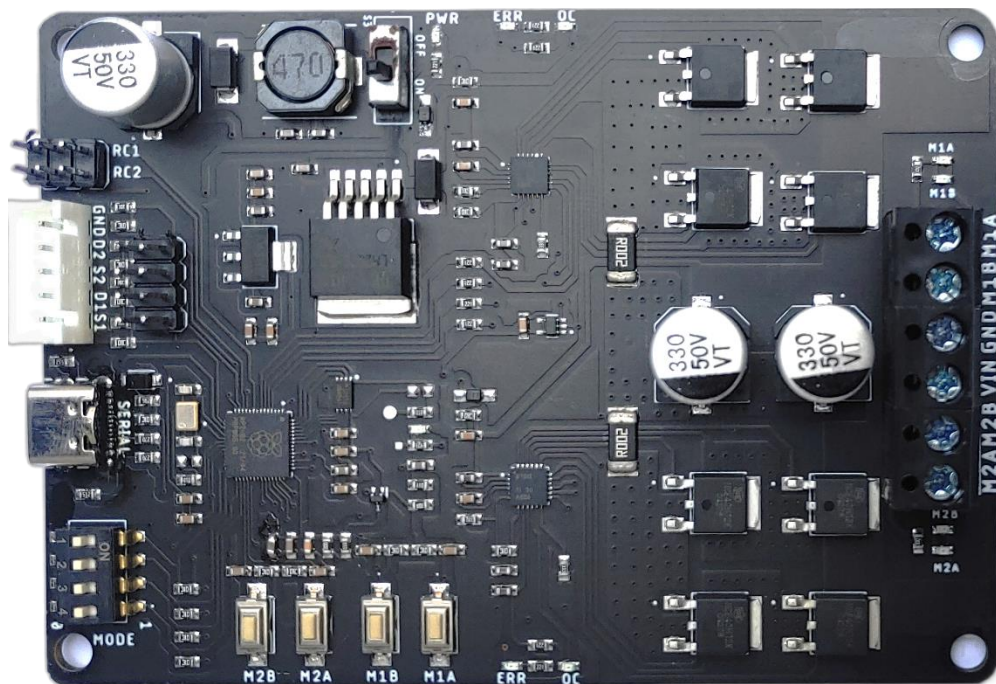
# Features:

- Supplying 10 amps continuous with peak currents up to 25 amps (10 Sec) per channel

- Support motor voltage from 7V to 22V.

- On board Low Internal resistance MOSFETs are switched at 16 KHz frequency.

- Over current protection and indication.

- Thermal protection.

- Multiple input modes: RC, Analog, PWM, Serial Packetized.

- On board push buttons for test and manual operation.

Overview:
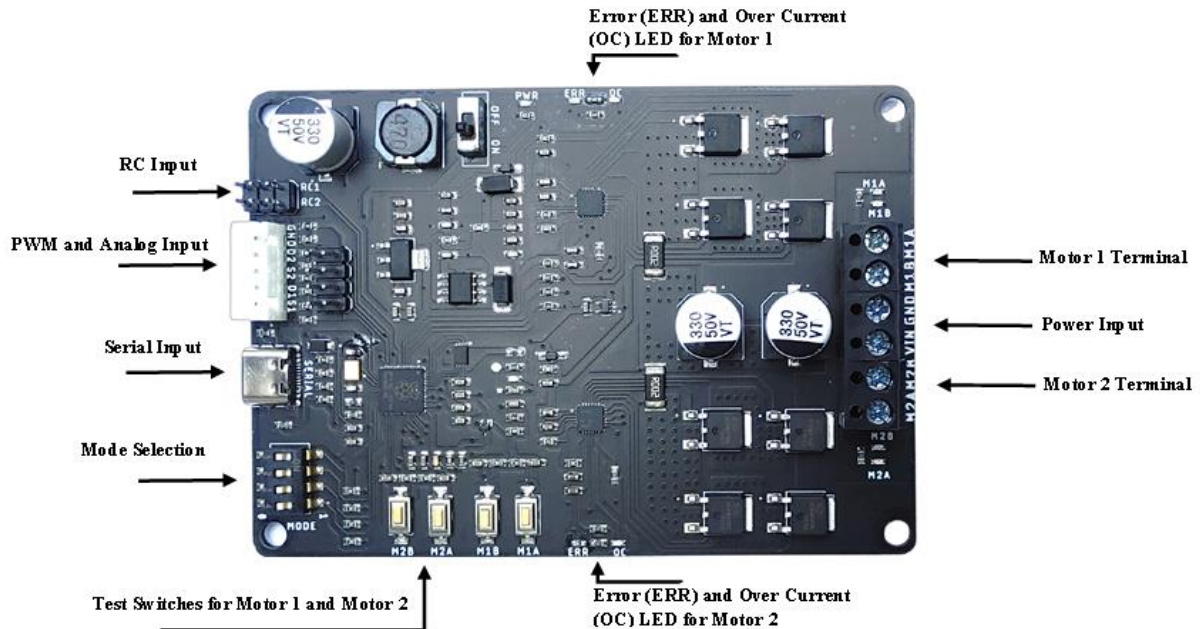
Power Input: Connect to a 7V-22V Battery or Power Supply.

Motor 1 and Motor 2 Terminal: Connect Motor 1 to Motor 1 Terminal. Connect Motor 2 Motor 2 Terminal.

Mode Selection: These are used to set the operating mode and options.

Error (ERR) and Over Current (OC) LEDs: Error LED glows when Under Voltage Lockout (Input Voltage less than 7V) .Overcurrent LEDs glows due to current greater than 30 AMP.

RC Input: 2 channel Radio Controller receiver connected to these pins.

I/P Logic Select: For 3V3 Logic- Place Jumpers

For 5V Logic- Keep Open

Specifications:

Sr.No	Parameter	Min	Max	Unit
1	Input Voltage	7	22	V
2	Maximum Continuous Current I_{max}	-	10	A
3	Peak Motor Current for 10 Sec	-	25	A
4	V_{IOH} (Logic Input – High Level)	3	5.5	V
5	V_{IOL} (Logic Input – Low Level)	0	0.5	V
6	PWM frequency	-	490	Hz

Dimensions:
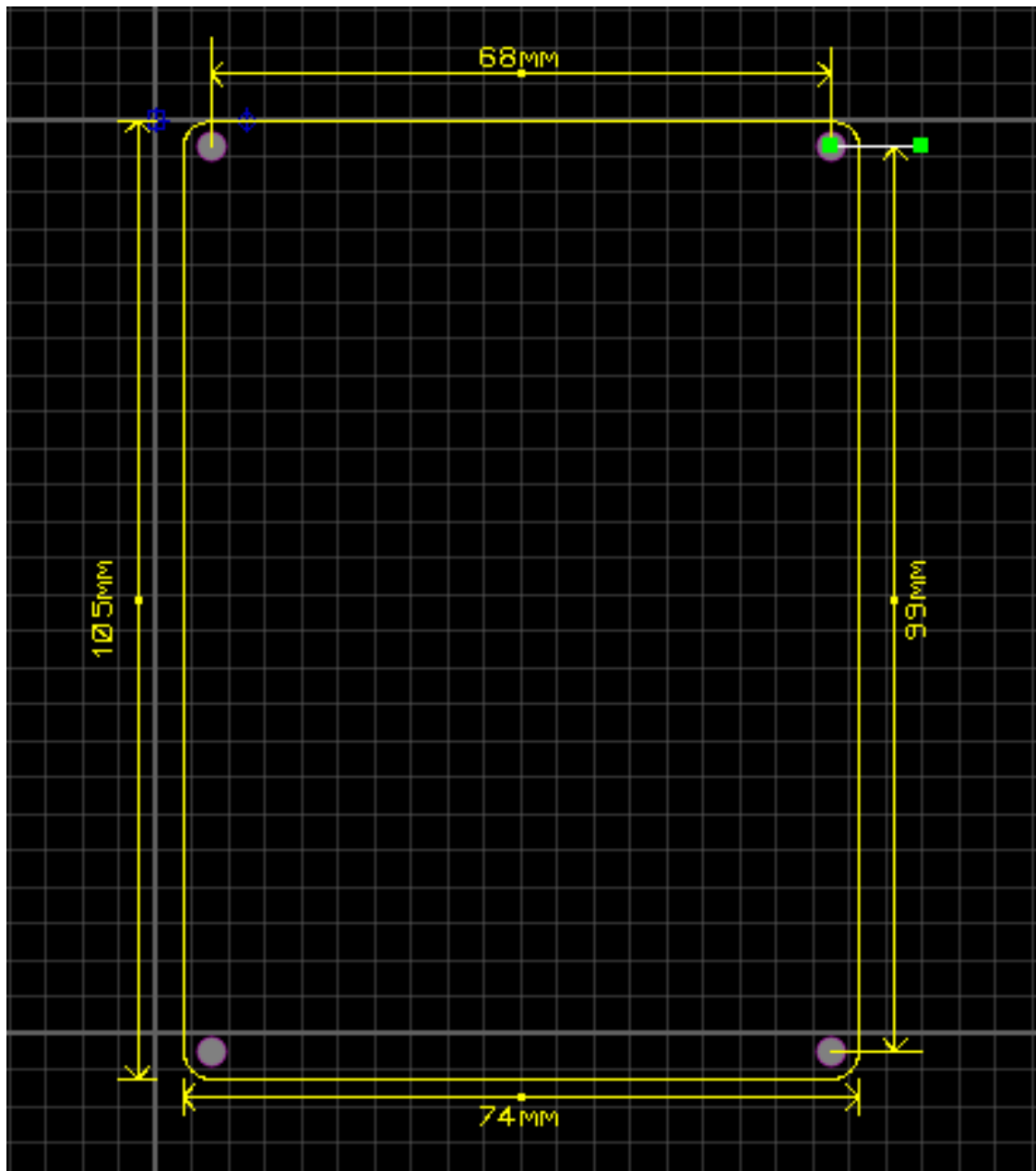
Connections/Wiring:
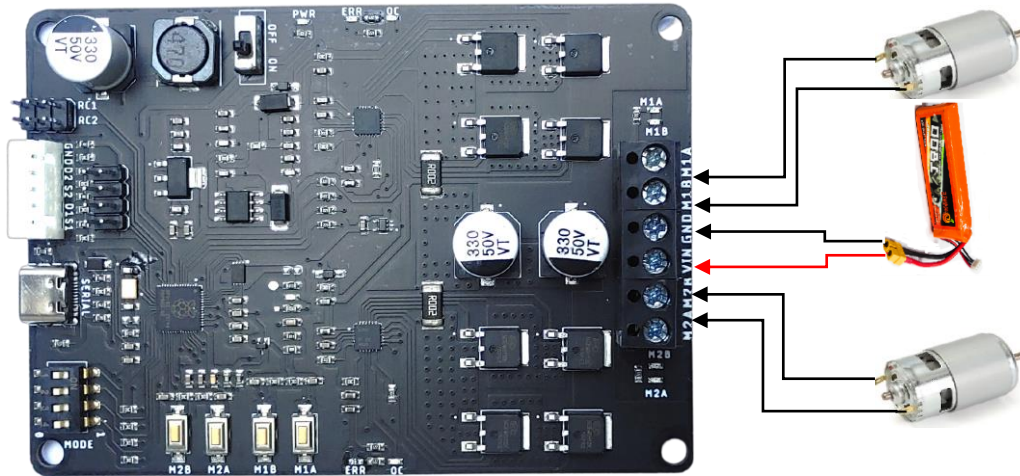
SmartElex 10D can be used with power supplies or batteries. Input power is connected to the center power terminals labeled VIN and GND. The input voltage range is 7V to 22V. The input current is dependent on the motors being used and the load placed upon them.

As a general rule of thumb, you should use the thickest wire that is practical to make power connections, especially on the battery leads. Using undersized wire will lead to the wire getting hot, and can lead to elevated temperatures on the SmartElex 30D as well.

The main power connections to the SmartElex 10D are on the rear edge of the board. Connections are made to large black screw terminals. These terminals will accept 10 to 28 gauge wire. Using stranded wire it is possible to run twinned 10 gauge wire connections to the battery terminals. This is often a good idea if your design will be running both motors near or above the 10 amp continuous limit. For the motor connections, single 12 gauge wires should be sufficient for all applications.

Control Mode:

SmartElex 10D supports four different types of input mode:
1. Radio Control (RC)
2. Microcontroller PWM.
3. Analog
4. Serial USB.

The DIP switch settings for each mode and the function for input pin are summarized on the table below.

Mode	Mode Name	DIP Switch			
		Sw1	Sw2	Sw3	Sw4
0	Test Mode	0	0	0	0
1	RC Liner Independent	0	0	0	1
2	Analog Liner Independent	0	0	1	0
3	PWM Liner Independent	0	0	1	1
4	Serial 9600	0	1	0	0
5	RC Exponential Independent	0	1	0	1
6	Analog Exponential Independent	0	1	1	0
7	PWM Exponential Independent	0	1	1	1
8	Serial 115200	1	0	0	0
9	RC Linear Mixed	1	0	0	1
10	Analog Linear Mixed	1	0	1	0
11	PWM Linear Mixed	1	0	1	1
12	RC Exponential Mixed	1	1	0	0
13	Analog Exponential Mixed	1	1	0	1
14	PWM Exponential Mixed	1	1	1	0
15	Test Mode	1	1	1	1

1. Radio Control (RC) Mode:

In this mode, Speed and direction of Motor is controlled by RC1 and RC2 channel of receiver or anything that can generate servo signals can be used to drive a SmartElex 10D in Radio Control mode.
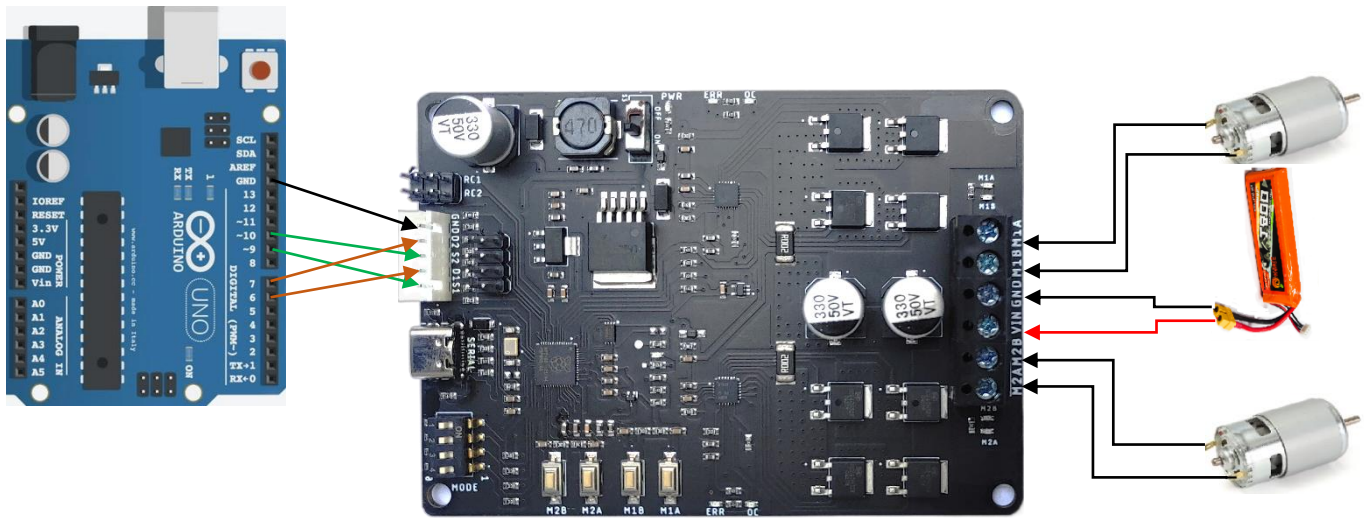
Mode
RC
Independent Linear Mode RC1 control Speed(Linear) and Direction of Motor 1 RC2 control Speed(Linear) and Direction of Motor 2
Independent Exponential Mode RC1 control Speed(Exponential) and Direction of Motor 1 RC2 control Speed (Exponential) and Direction of Motor 2
Mixed Linear Mode RC1 control Speed (Linear) in Forward and Reverse Direction of Motor1 and Motor 2 Simultaneously. RC2 control Speed (Linear) in Left and Right Direction of Motor 1 and Motor 2 Simultaneously.
Mixed Exponential Mode RC1 control Speed (Exponential) in Forward and Reverse Direction of Motor 1 and Motor 2 Simultaneously. RC2 control Speed (Exponential) in Left and Right Direction of Motor 1 and Motor 2 Simultaneously.
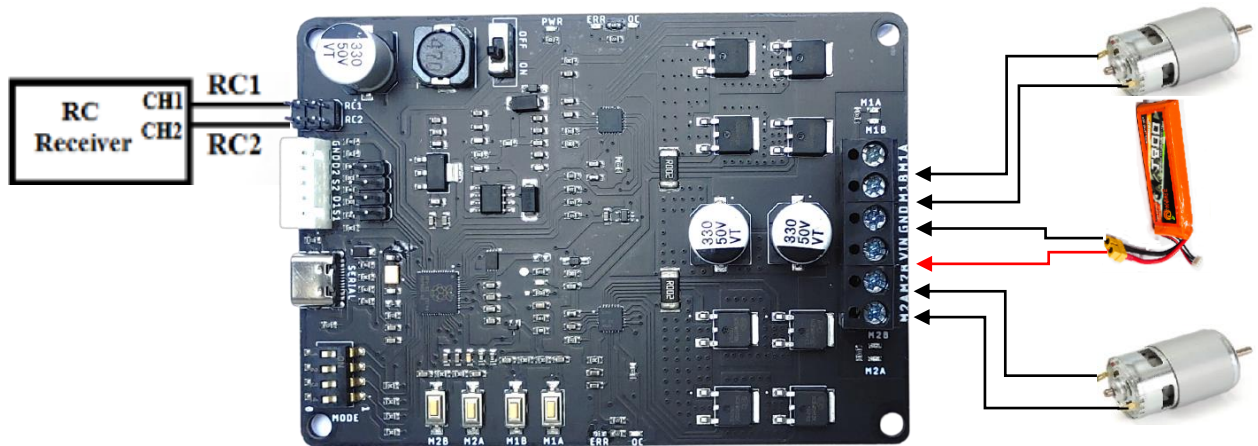
**Sample Connection Diagram of RC receiver and motor with SmartElex
10D.**

2. PWM Mode:

I. Mixed PWM Mode:

PWM Pin	Input PWM Range	Speed/Acceleration of Motor	Direction of motor		
			Motor 1 Direction	Motor2 Direction	Bot Direction
PWM2(S2)	5% to 40%	100% to 0%	Counterclockwise	Counterclockwise	Reverse
PWM2(S2)	57% to 92%	0% to 100%	clockwise	clockwise	Forward
PWM1(S1)	5% to 40%	100% to 0%	Counterclockwise	clockwise	Left
PWM1(S1)	57% to 92%	0% to 100%	clockwise	Counterclockwise	Right
If PWM is less than 5% Speed of motor is 100% **If PWM is greater than 92% speed of motor is 0%**					

II. Independent PWM Mode:

PWM Pin	Direction Pin		Input PWM Range	Speed/Acceleration of Motor	Direction of motor	
	DIR1	DIR2			Motor 1 Direction	Motor2 Direction
PWM1(S1)	HIGH	x	8% to 94%	8% to 100%	clockwise	x
PWM1(S1)	LOW	x	8% to 94%	8% to 100%	counterclockwise	x
PWM2(S2)	x	HIGH	8% to 94%	8% to 100%	x	clockwise
PWM2(S2)	x	LOW	8% to 94%	8% to 100%	x	counterclockwise
If PWM is less than 8% Speed of motor is 0%						
If PWM is greater than 94% speed of motor is 100%						

3. Analog Mode:

In Analog input mode, the speed and direction of the motor is controlled by the analog voltage. Analog Input voltage range is from 0V to 5V.

I.   Independent Analog Mode:

Analog Pin	Input range (0-3.3V)	Input range (0-5V)	Speed of Motor	Direction Of Motor	
				Motor 1 Direction	Motor 2 Direction
ANG1(S1)	1.45V to 0.165V	2.2V to 0.25V	10% to 100%	Counterclockwise	x
	1.45V to 1.84V	2.21V to 2.79V	0%(dead band)	Stopped	x
	1.84V to 3.168V	2.8V to 4.8V	10% to 100%	clockwise	x
ANG2(S2)	1.45V to 0.165V	2.2V to 0.25	10% to 100%	x	Counterclockwise
	1.45V to 1.84V	2.21V to 2.79V	0%(dead band)	x	Stopped
	1.84V to 3.168V	2.8V to 4.8V	10% to 100%	x	clockwise
Note: If Analog voltage is less than 0.25V (0.165 for 3.3V) and greater than 4.8V(3.168 for 3.3V) then Motor speed is 100%					

II.   Mixed Analog Mode:

Analog Pin	Input range (0-3.3V)	Input range (0-5V)	Speed of Motor	Direction Of Motor		
				Motor 1 Direction	Motor 2 Direction	Bot Direction
ANG1(S1)	1.45V to 0.165V	2.2V to 0.25	10% to 100%	Counterclockwise	Counterclockwise	Reverse
	1.45V to 1.84V	2.21V to 2.79V	0%(dead band)	Stopped	Stopped	Stopped
	1.84V to 3.168V	2.8V to 4.8V	10% to 100%	clockwise	clockwise	Forward
ANG2(S2)	1.45V to 0.165V	2.2V to 0.25	10% to 100%	Counterclockwise	clockwise	Left
	1.45V to 1.84V	2.21V to 2.79V	0%(dead band)	Stopped	Stopped	Stopped
	1.84V to 3.168V	2.8V to 4.8V	10% to 100%	clockwise	Counterclockwise	Right
Note: If Analog voltage is less than 0.25V (0.165 for 3.3V) and greater than 4.8V(3.168 for 3.3V) then Motor speed is 100%						

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4. Serial Mode:

In Serial mode, connect motor driver board with PC using USB and open Serial terminal software like Putty (Recommended). In seral Tab select COM port and Baud rate (Supported baud rates are 9600,115200) and use following steps.

STEP 1 – Enter '*' for Configuration

STEP 2 – Enter '1' for Motor1 Forward

'0' for Motor1 Reverse

STEP 3 – Enter '0-9' for Motor1 speed 0% to 100%

STEP 4 – Enter '1' for Motor2 Forward

'0' for Motor2 Reverse

STEP 5 – Enter '0-9' for Motor2 speed 0% to 100%

STEP 6 – Enter '#' for Apply all changes

WARRANTY

- Standard warranty of product is 6 months.
- No warranty will apply if the Product has been subject to misuse, static discharge, neglect, accident, modification, or has been soldered or altered in any way.
- Warranty only applies to manufacturing defect.