



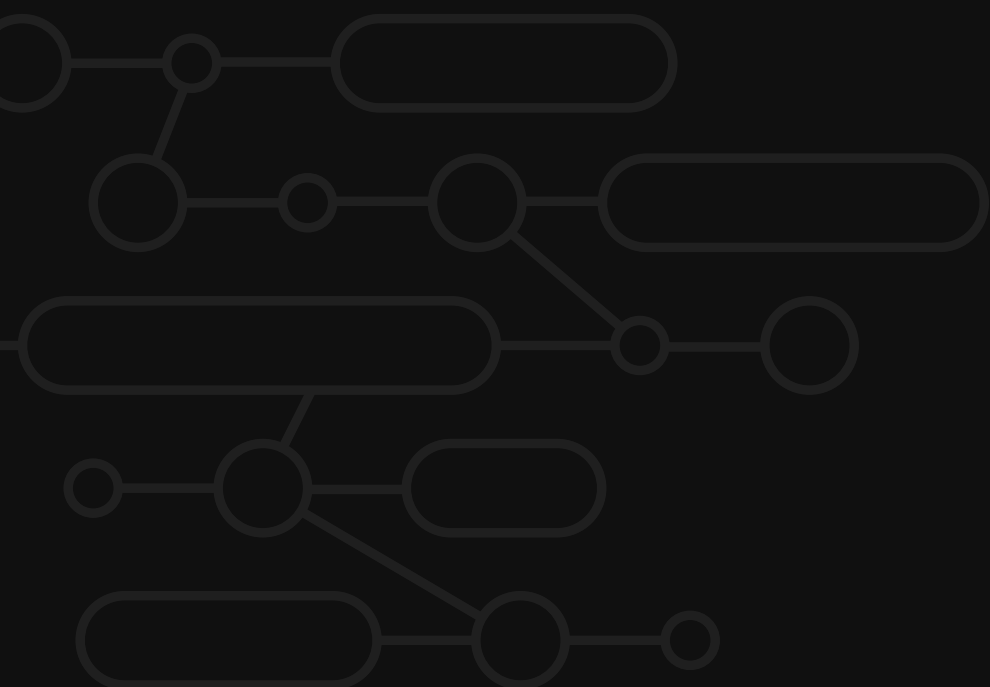
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DAY 5:

ROBOCAMP

P W M S I G N A L A N D M O T O R C O N T R O L





PWM SIGNAL AND MOTOR CONTROL

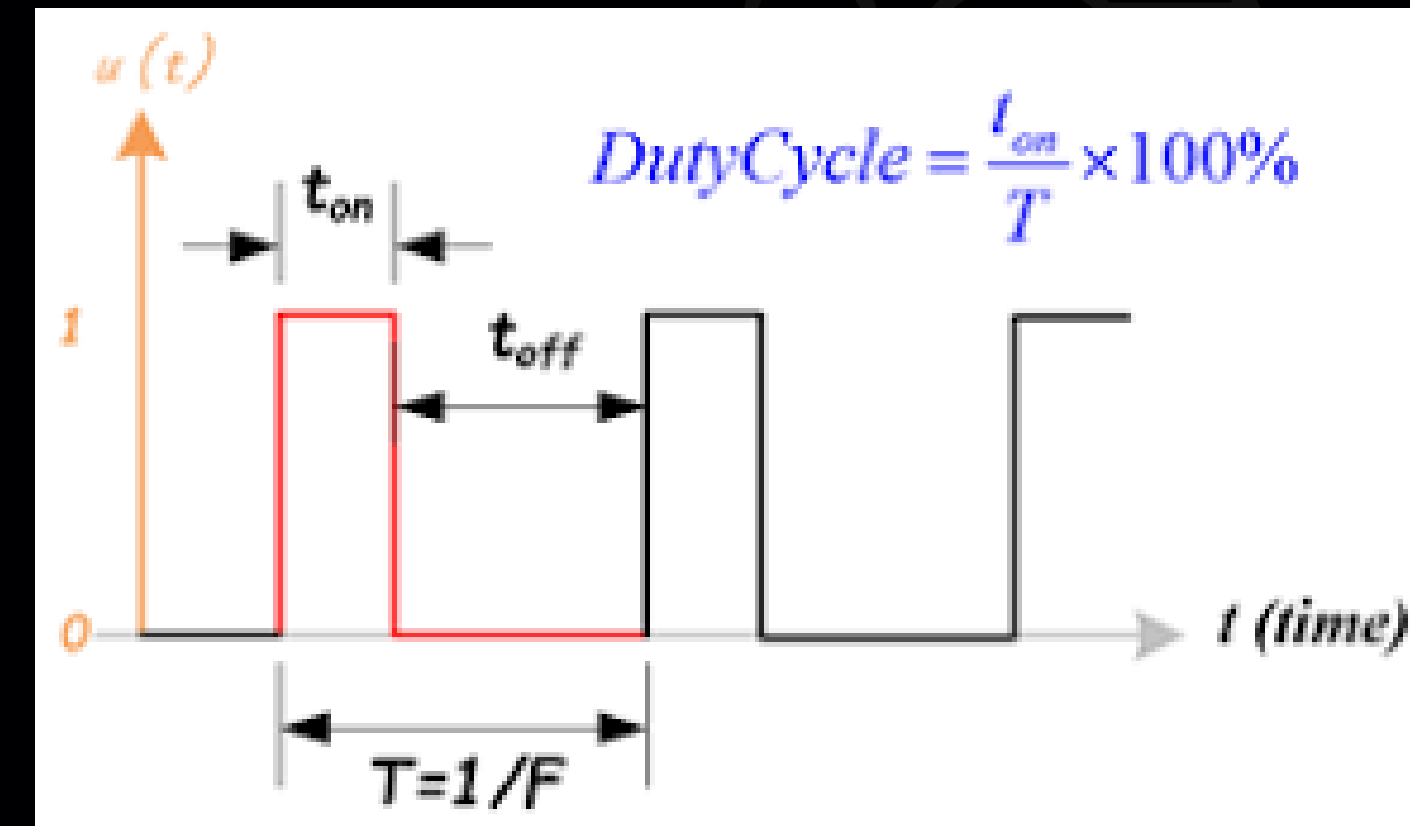
- PWM SIGNAL
 - What is PWM Signal
 - Generation of PWM signal
- MOTOR DRIVER
 - L293D Motor Driver
- Controlling Speed of Motor
 -
 -
- USB Human Interface Device
 - Manipulating keyboard and mouse inputs
 - Create your own mouse using Joystick module



WHAT IS PWM

PWM: Pulse width modulation.

- Amplitude is constant while width varies
- Square wave.
- Used for generation of fake analog signals.
- can control analog devices such as motors, lights, audio signal generation, power regulation in DC-DC converters etc
- Average output voltage of PWM signal is : **duty cycle * maximum amplitude**





PWM GENERATION IN PI PICO

```
from machine import Pin, PWM

LED_BUILTIN = 25

#initialize the PWM pin
pwm_led = PWM(Pin(LED_BUILTIN, mode=Pin.OUT))
#initialize the frequency of the pin
pwm_led.freq(1_000)

while True:
    #changing the duty cycle to visually observe
    #PWM in action
    for duty in range(0, 65_536, 5):
        #assigning the duty cycle value for PWM
        pwm_led.duty_u16(duty)
    for duty in range(65_536, 0, -5):
        pwm_led.duty_u16(duty)
```



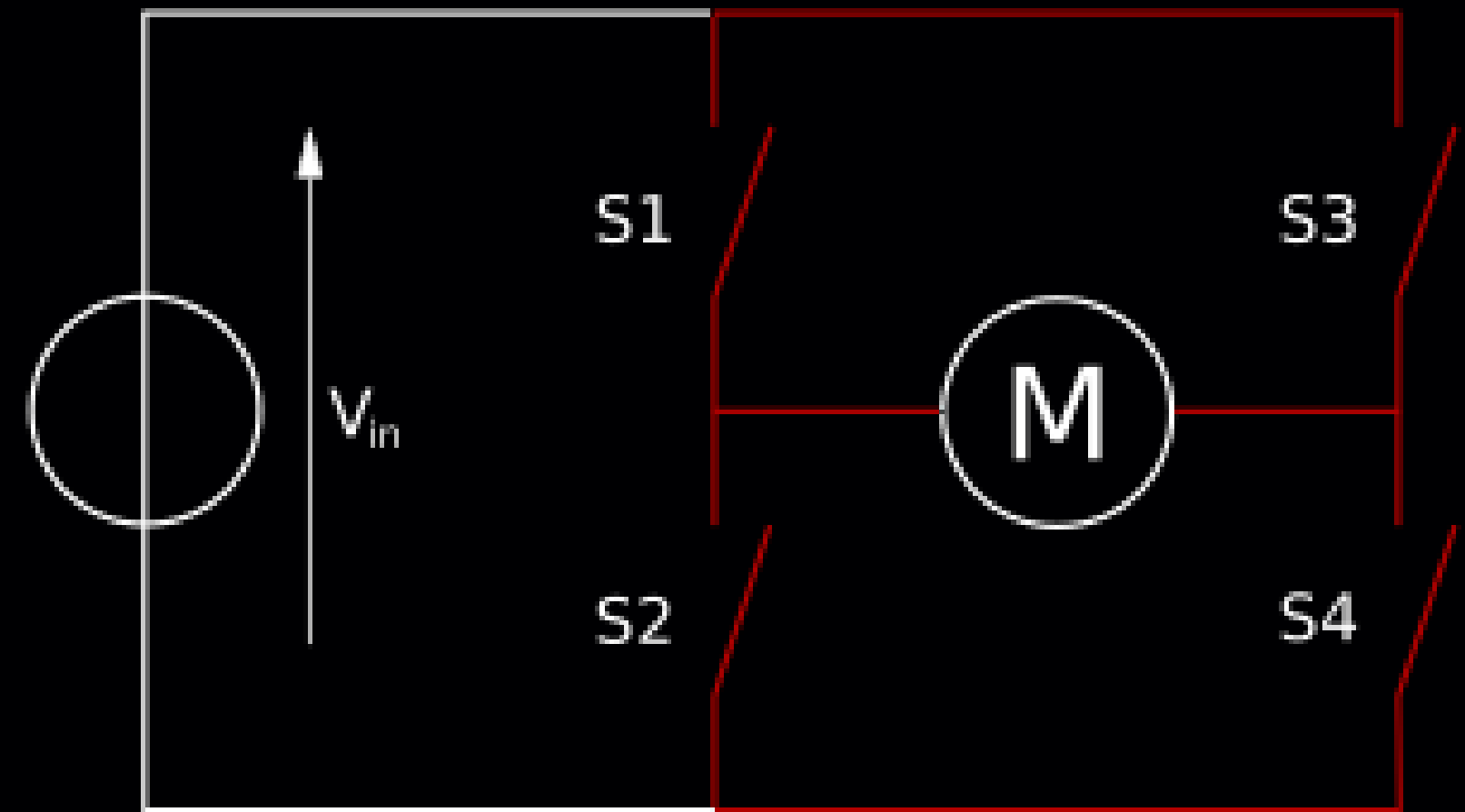
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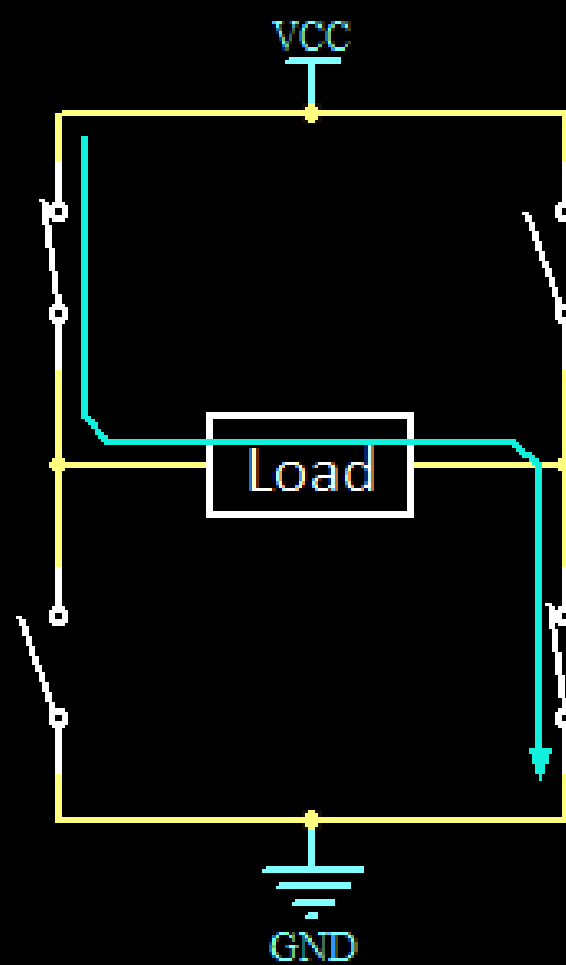
H-BRIDGE

- an electronic circuit
- switches the polarity of a voltage applied to a load.
- allows DC motors to run forwards or backwards

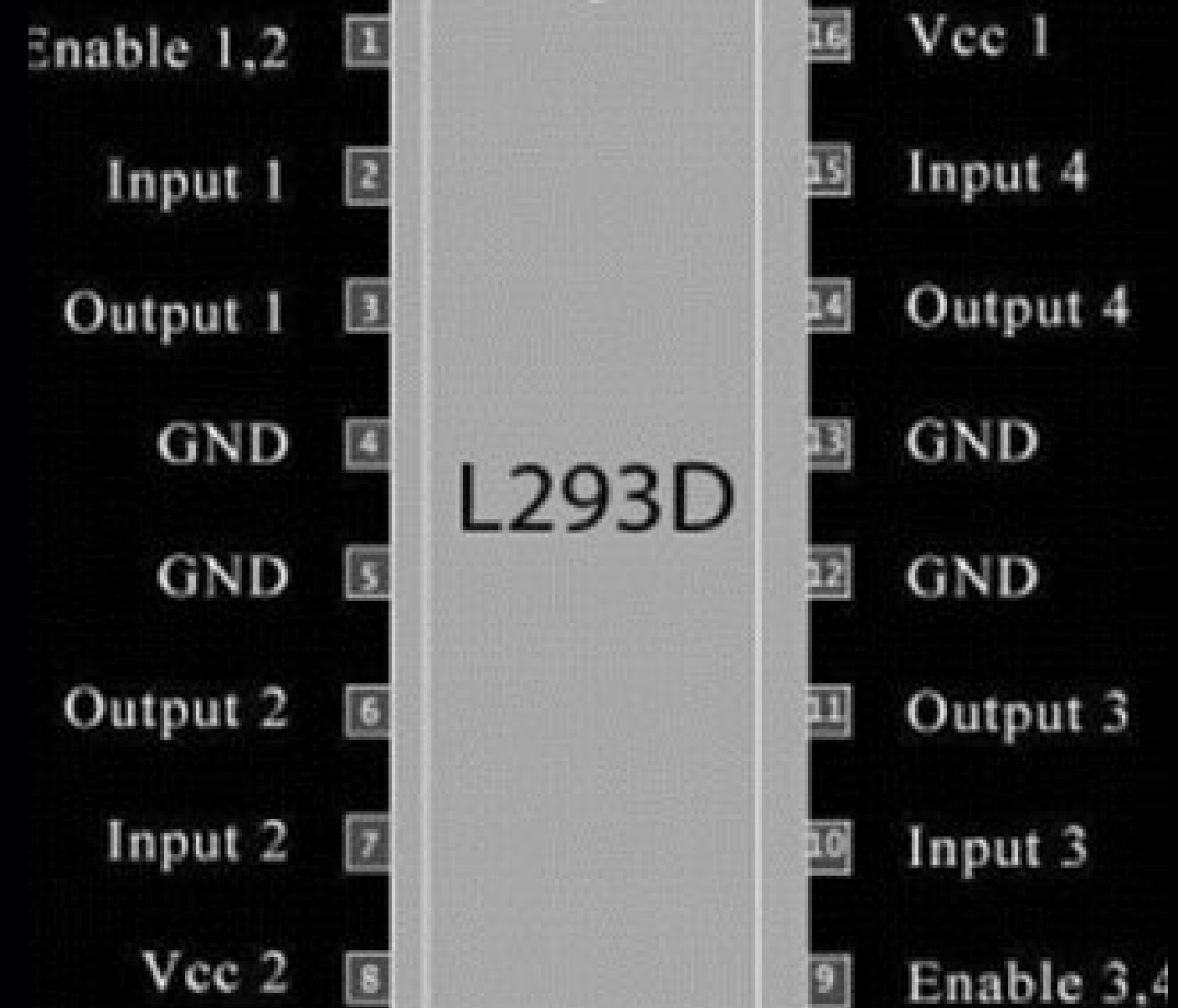
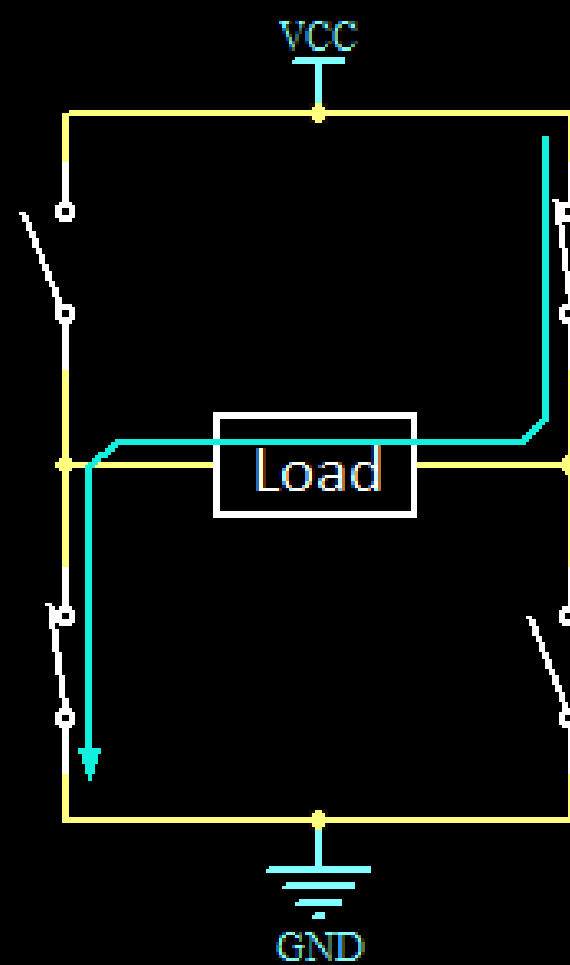


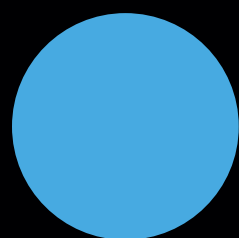


Connecting the load
in one direction



Connecting the load
in the other direction



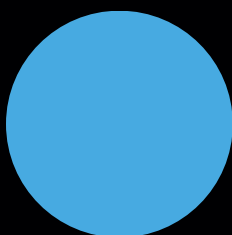


L293D

Pin Number	Pin Name	Description			
1	Enable 1,2	This pin enables the input pin Input 1(2) and Input 2(7)	9	Enable 3,4	This pin enables the input pin Input 3(10) and Input 4(15)
2	Input 1	Directly controls the Output 1 pin. Controlled by digital circuits	10	Input 3	Directly controls the Output 3 pin. Controlled by digital circuits
3	Output 1	Connected to one end of Motor 1	11	Output 3	Connected to one end of Motor 2
4	Ground	Ground pins are connected to ground of circuit (0V)	12	Ground	Ground pins are connected to ground of circuit (0V)
5	Ground	Ground pins are connected to ground of circuit (0V)	13	Ground	Ground pins are connected to ground of circuit (0V)
6	Output 2	Connected to another end of Motor 1	14	Output 4	Connected to another end of Motor 2
7	Input 2	Directly controls the Output 2 pin. Controlled by digital circuits	15	Input 4	Directly controls the Output 4 pin. Controlled by digital circuits
8	Vcc2 (Vs)	Connected to Voltage pin for running motors (4.5V to 36V)	16	Vcc1 (Vss)	Connected to +5V to enable IC function

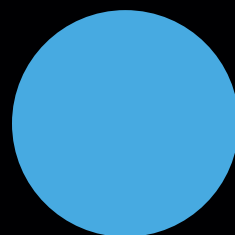


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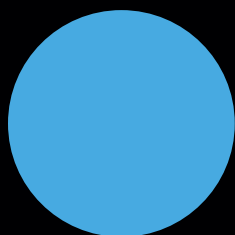


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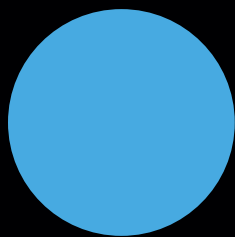


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THANK YOU

