

L293NE quad half-H driver

The L293NE driver chip is ideal for use with inductive loads like the DC motors used on the cars. This driver can receive four independent inputs and uses two different supply voltages. The driver uses four push-pull amplifiers and two enables that take the input signals with respect to V_{CC1} and send four outputs at corresponding voltages with respect to V_{CC2} . The two enables control the output in pairs as shown in the table below, thus providing two driver pairs: Input/Output pairs 1 and 2 are enabled by $EN_{1,2}$; Input/Output pairs 3 and 4 are enabled by $EN_{3,4}$.

In a 12V DC motor application, one driver pair can be utilized to send a control signal to the motor. The driver chip is necessary to “amplify” the PWM signal from the EVB’s digital output port because *alone*, these ports *cannot* provide the necessary power ($P = i V$) for the drive motor. The EVB is capable of sending a digital 5V signal, which can be used as inputs for the driver chip. The 12V supply voltage can be used for V_{CC2} to provide the current and voltage necessary to power the motor. A pulsewidth modulated signal can then be sent by the EVB to control the state of the appropriate enable pin. When this signal is low, a high impedance is connected to the motor, and when the PWM signal is high, the digital values on the input pins is sent as output at a 12V level to the motor. This creates a 12V pulsewidth modulated signal that provides the variable average control voltage for the motor. By changing the polarity of the values on the inputs, the motor can be made to spin in either direction. If the input signals are the same (high or low), the motor will not have a voltage drop across its terminals and will not spin.

Table 0.1 - Function Table for the L293NE

L = Low Voltage Level, H = High Voltage Level, X = Immaterial, Z = High Impedance

Inputs <i>with respect to V_{CC1}</i>		Output <i>with respect to V_{CC2}</i>
A	En	Y
H	H	H
L	H	L
X	L	Z

Push-Pull amplifier

A push-pull amplifier (see Figure 0.1) usually consists of two transistors where the npn transistor is on for positive V_{in} and off for negative V_{in} . The pnp transistor is on for negative V_{in} and off for positive V_{in} . This allows current to flow through the resistor, R , thus creating a voltage drop, V_{out} . This leads to a characteristic curve similar to that shown in Figure 0.2. The 1.4 volt deadband is caused by the fact that the transistors will not turn on until the voltage drop $V_{in}-V_{out}$

is greater than the turn-on voltage for the device which happens to be 0.7 volts for the npn transistor and -0.7 volts for the pnp transistor. There are ways to reduce this deadband, but that is not a focus of this course and not necessary for proper operation of the car.

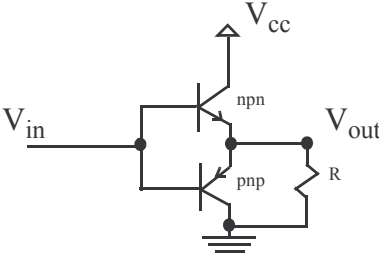


Figure 0.1 - A push-pull amplifier

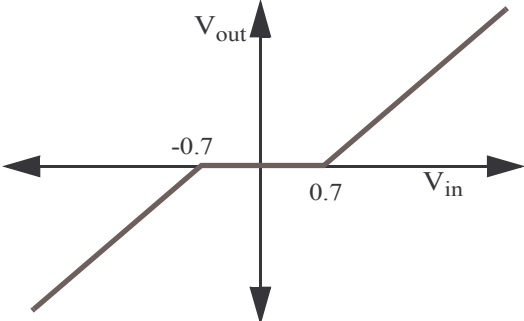


Figure 0.2 - Voltage characteristic for push-pull amplifier