

RL Circuit

1 Theory

An RL circuit is formed by connecting in series a resistor and inductance, connected to a voltage source. An inductor in an electric circuit opposes the flow of current through it. When a positive source voltage is applied, current starts flowing through the circuit, but not at its maximum value, due to the emf induced in the coil (Lenz's law). The voltage drop across the inductance is proportional to the rate of change of the current flowing through it (di/dt). The current gradually reaches its maximum value, causing the voltage drop across the inductance to drop to zero, thus acting like a short.

The voltage drop across the inductance is

$$V_t = V (e^{-Rt/L}) \quad (1)$$

The voltage drop during discharge is

$$V_t = V (1 - e^{-Rt/L}) \quad (2)$$

2 Schematic Diagram

The schematic diagram of RL circuit in eSim is shown below

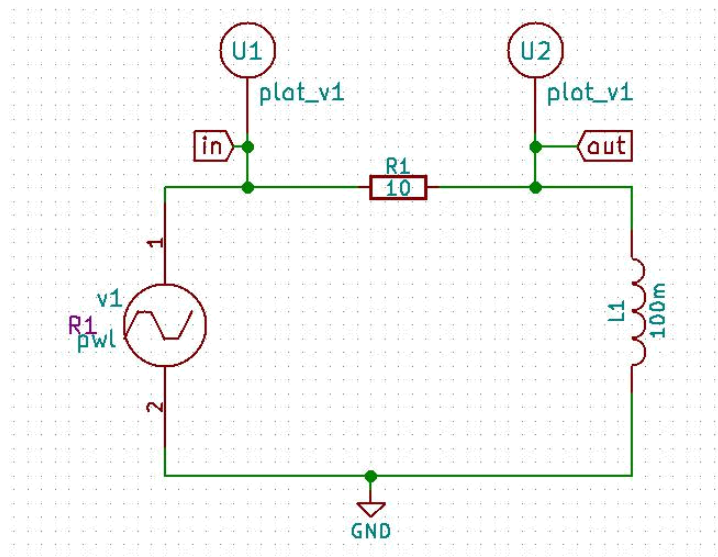


Figure 1: schematic diagram of RL circuit

3 Simulation Results

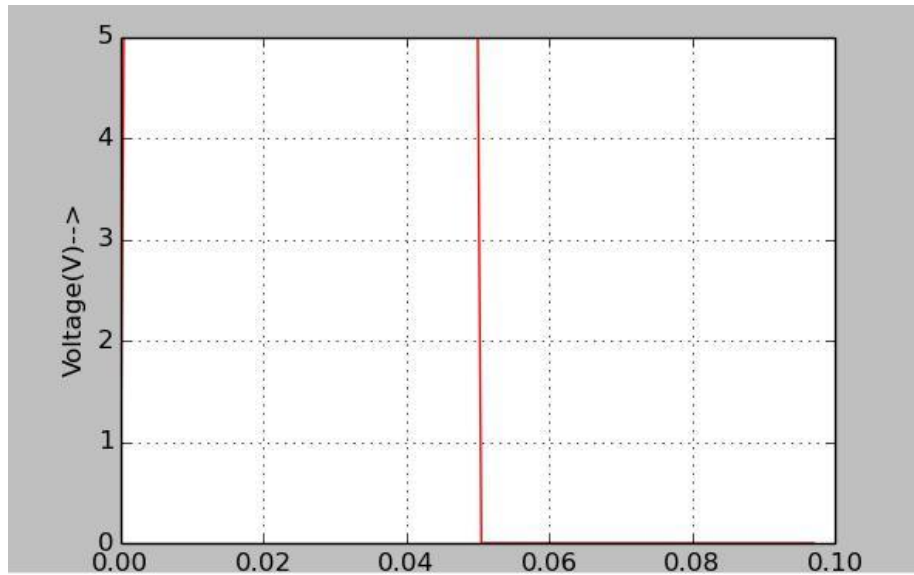


Figure 2: input plot

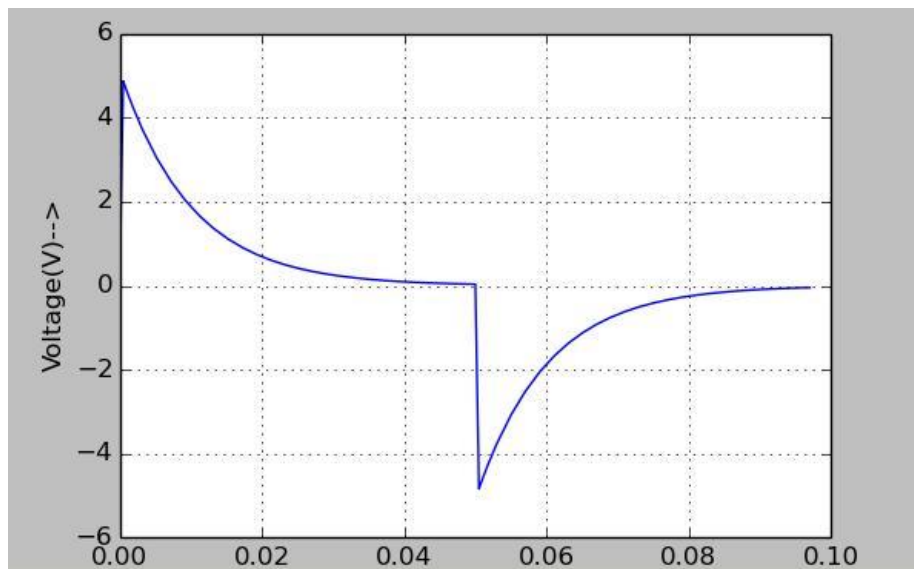


Figure 3: output plot

2. Ngspice plots:

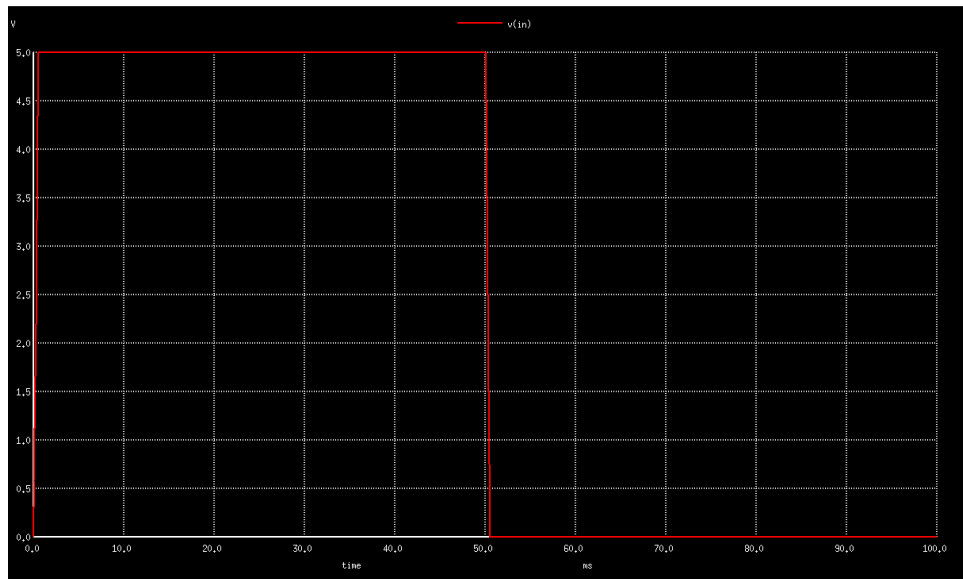


Figure 4: input plot

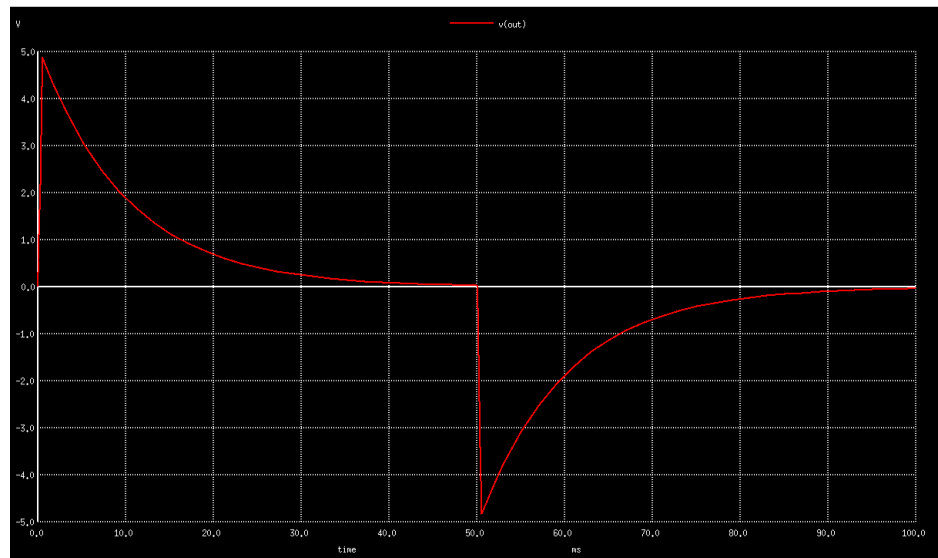


Figure 5: output plot

4 Reference:

[1] <http://www.electronics-tutorials.ws/inductor/lr-circuits.html> referred on 24/06/2017.