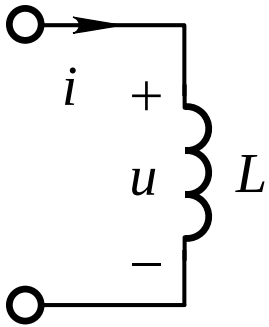
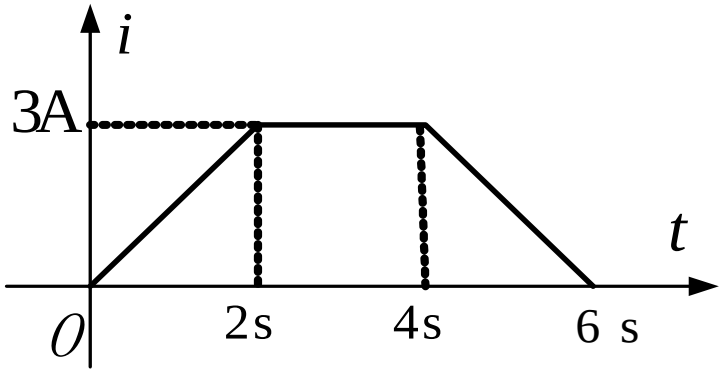
电感元件

例1 电路如图 (a)所示， 0.1H电感通以图 (b)所示的电流。求时间t>0电感电压、吸收功率及储存能量的变化规律。



(a)



(b)

解：根据电流的变化规律，分段计算如下

(1) $0 < t < 2\text{s}$： $i = 1.5t$ A

$$u = L\frac{\mathrm{d}i}{\mathrm{d}t} = (0.1\times 1.5)\mathrm{V} = 0.15\mathrm{V}$$

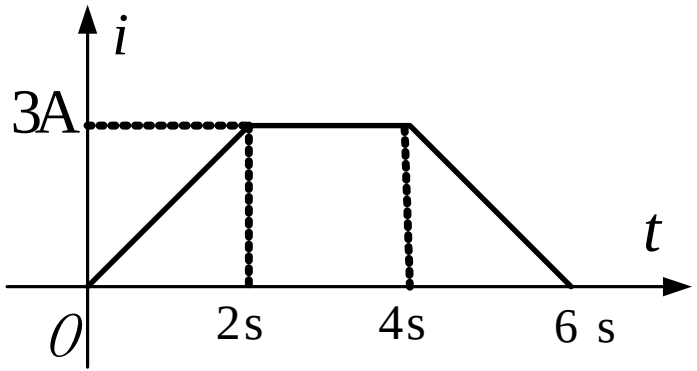
$$p = ui = 0.225t\ \mathrm{W} \qquad w_{\mathrm{m}} = \frac{1}{2}Li^2 = 0.1125t^2\ \mathrm{J}$$

(2) $2\mathrm{s} < t < 4\mathrm{s}$: $i = 3\ \mathrm{A}$

$$u = L\frac{\mathrm{d}i}{\mathrm{d}t} = 0$$

$$p = ui = 0$$

$$w_{\mathrm{m}} = \frac{1}{2}Li^2 = 0.45\ \mathrm{J}$$



(b)

(3) 4s < *t* < 6s： $i=(-1.5t+9)\ \mathrm{A}$　　(4) $t>6\mathrm{s}$： $i=0$

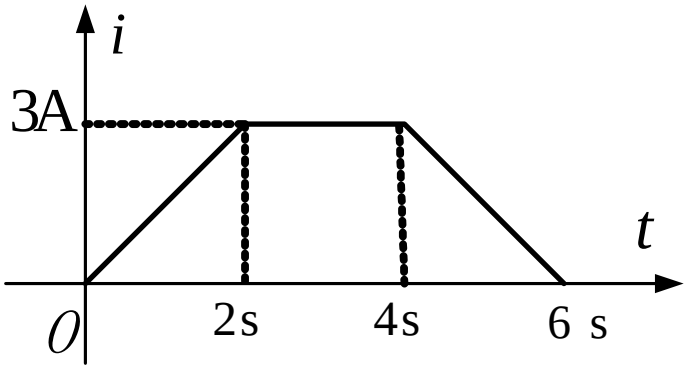
$$u=L\frac{\mathrm{d}i}{\mathrm{d}t}=-0.1\times1.5\mathrm{V}=-0.15\mathrm{V}$$

电压、功率及能量均为零。

$$p=ui=(0.225t-1.35)\mathrm{W}$$

$$w_{\mathrm{m}}=\frac{1}{2}Li^2$$

$$=(0.1125t^2-1.35t+0.45)\ \mathrm{J}$$



(b)