Class AB Power Dissipation


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→ phi:atan(2·%pi·f·L/R_L);
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(phi) $$atan\left(\frac{2\,\pi\,L\,f}{R_L}\right)$$

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→ Im:V_m/sqrt(R_L^2+(2·%pi·f·L)^2);
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(Im) $$\frac{V_m}{\sqrt{4\,\pi^2\,L^2\,f^2+R_L{}^2}}$$

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→ Vce:V_CC-V_m·sin(2·%pi·f·t);
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(Vce) $$V_{CC}-V_m\,sin(2\,\pi\,f\,t)$$

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→ Ic:I_Q+Im·sin(2·%pi·f·t-phi);
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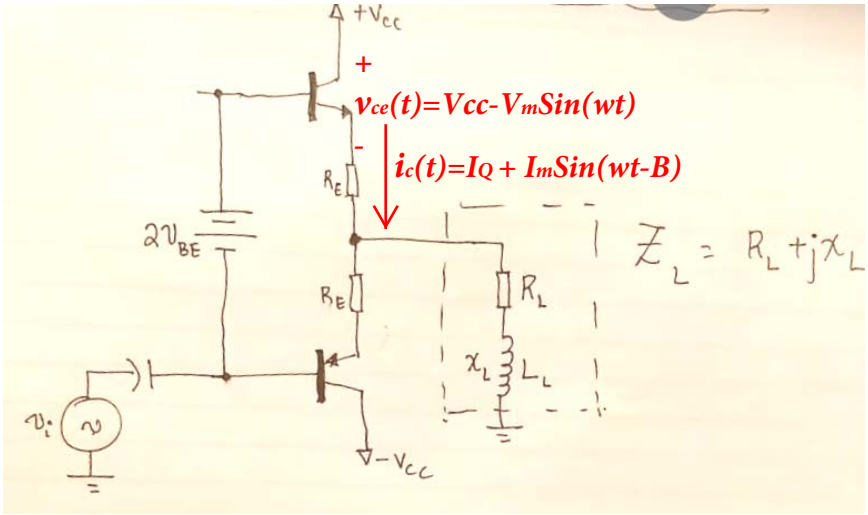
(Ic) $$\frac{V_m\,sin\left(2\,\pi\,f\,t-atan\left(\frac{2\,\pi\,L\,f}{R_L}\right)\right)}{\sqrt{4\,\pi^2\,L^2\,f^2+R_L{}^2}}+I_Q$$




```
→ Pd:trigreduce(Vce·Ic);
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(Pd) $$\frac{V_m{}^2\,\sqrt{4\,\pi^2\,L^2\,f^2+R_L{}^2}\,cos\left(4\,\pi\,f\,t-atan\left(\frac{2\,\pi\,L\,f}{R_L}\right)\right)}{8\,\pi^2\,L^2\,f^2+2\,R_L{}^2}+\frac{V_{CC}\,V_m\,sin\left(2\,\pi\,f\,t-atan\left(\frac{2\,\pi\,L\,f}{R_L}\right)\right)}{\sqrt{4\,\pi^2\,L^2\,f^2+R_L{}^2}}-I_Q\,V_m\,sin(2\,\pi\,f\,t)-\frac{|R_L|\,V_m{}^2}{8\,\pi^2\,L^2\,f^2+2\,R_L{}^2}+I_Q\,V_{CC}$$

```
→ E1:subst([V_CC=18,V_m=15,L=100e-6,R_L=4,f=1e3,I_Q=39e-3],Pd);
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(E1) $$\frac{225\,\sqrt{0.04\,\pi^2+16}\,cos(4000.0\,\pi\,t-atan(0.05\,\pi))}{0.08\,\pi^2+32}+\frac{270\,sin(2000.0\,\pi\,t-atan(0.05\,\pi))}{\sqrt{0.04\,\pi^2+16}}-0.585\,sin(2000.0\,\pi\,t)-\frac{900}{0.08\,\pi^2+32}+0.702$$

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→ E2:wxplot2d(E1,[t,0,1e-3],[y,0,25]);
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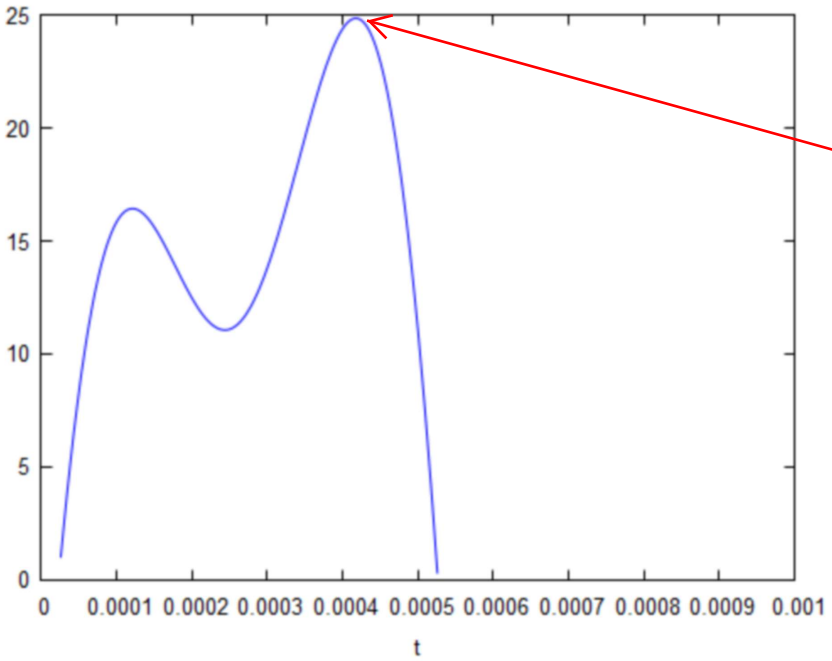
(E2)



Pd,max ~ 25W for
R-_L=4ohms & L=100uH

Plot of Pd in the upper tranistor vs time

The average power is the average of the instantaneous power over one period.

$$P = \frac{1}{T}\int_0^T p(t)dt$$

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→  E3:float(1/1e-3·integrate(E1,t,0,0.5e-3));
(E3)     7.409451153313438
```

(Average power dissipated)