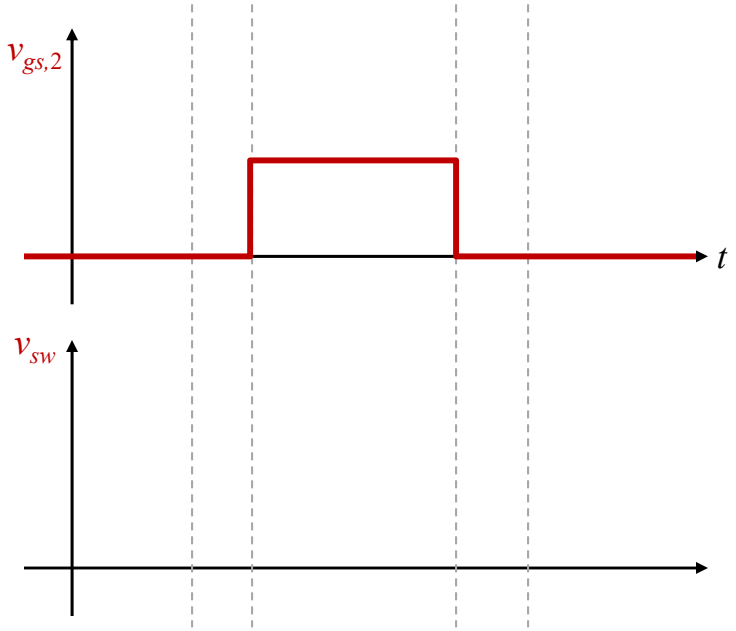
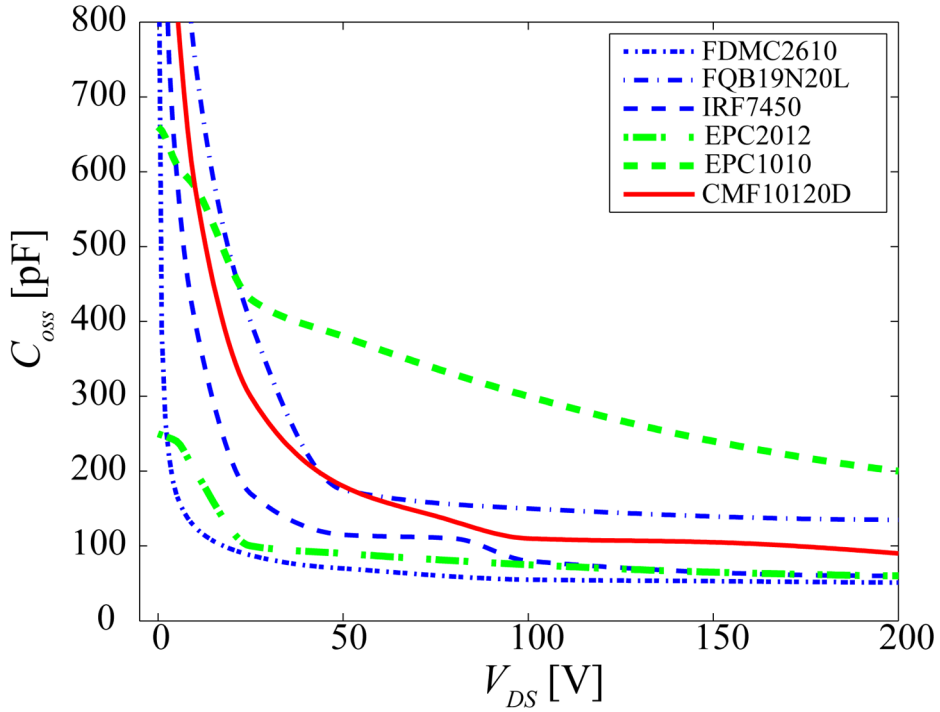
Ideal Switching Waveforms



Capacitive switching loss

ANALYSIS OF NONLINEAR CAPACITANCES

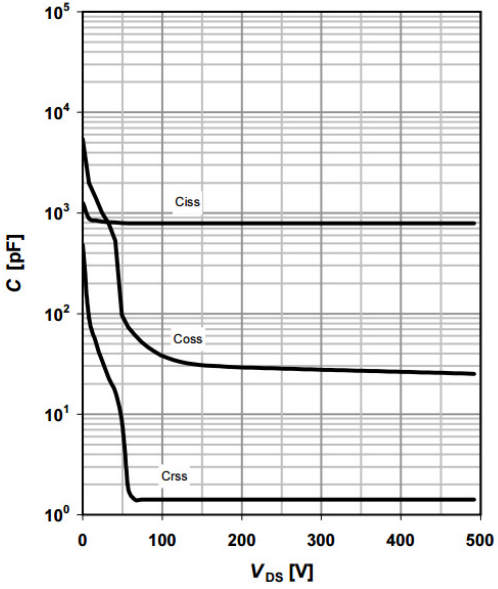
Example Device C_{oss}



Datasheet Reported Capacitance

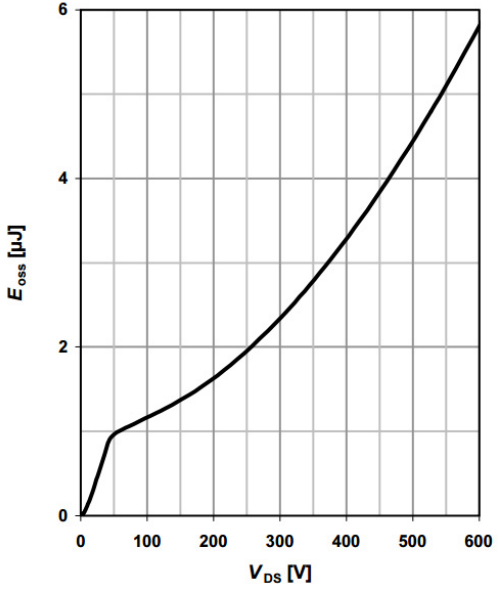
13 Typ. capacitances

$C = f(V_{DS})$; V_{GS}=0 V; f=1 MHz



14 Typ. Coss stored energy

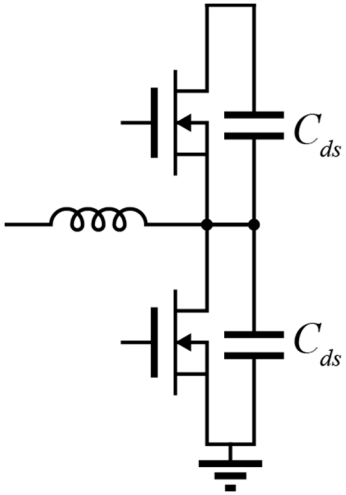
$E_{oss} = f(V_{DS})$



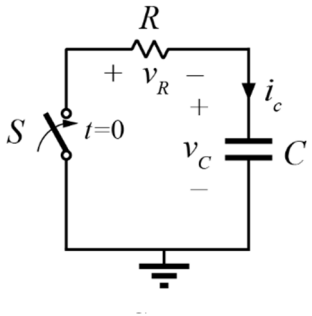
Modeling Nonlinear Capacitances

Energy and Charge Equivalents

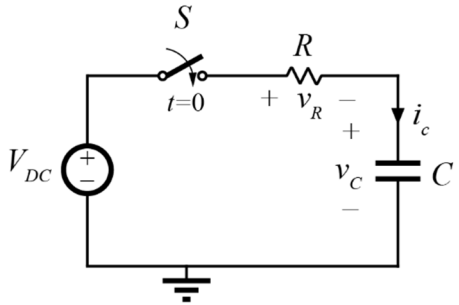
C_{oss} Losses in a Half Bridge



M_2 Energy Loss

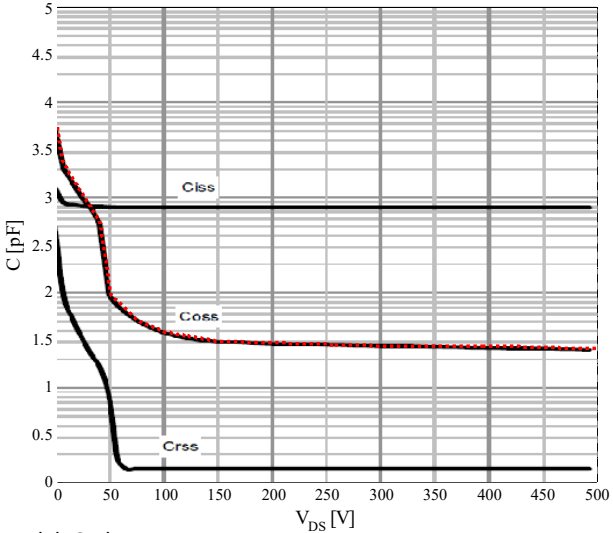


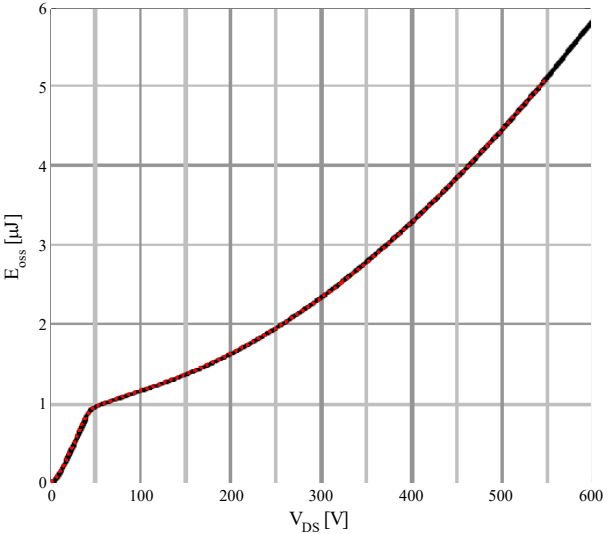
M_1 Energy Loss



Total Half Bridge C_{oss} Loss

Energy Equivalent





Matlab Code:

```
Vdc = 550;

Vds = [0    5    10   40  50 75 100 150 200 300 400 500 600];
Coss = [5500 2500 1900 550 95 50 38  30  29  27  27  25  24]*1e-12;

vx = 0.01:.01:Vdc;
Cx = 10.^interp1(Vdc,log10(Coss),vx,'linear');

E = cumtrapz(vx, Cx.*vx);
Ceq_e = 2*(E)./vx.^2;
```