

MOSFET Power losses

There are several possible power loss sources in a MOSFET

1.PS: Switching Transition Losses

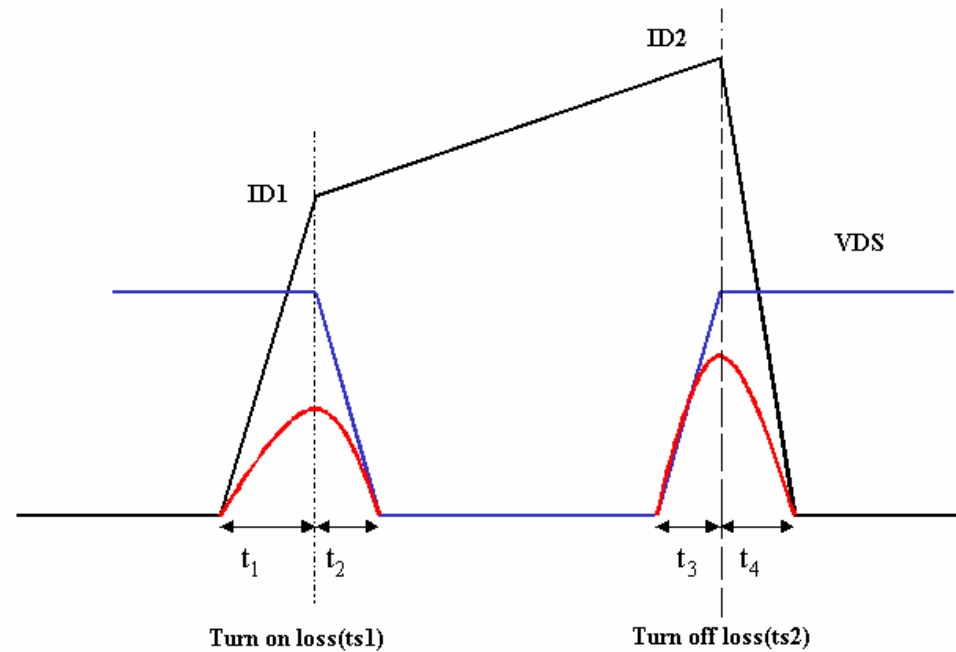
2.PG: Gate Drive Losses

3.PC: Conduction Losses

4.PL: Drain to Source Leakage Current Losses

5.PD: Internal Diode Losses

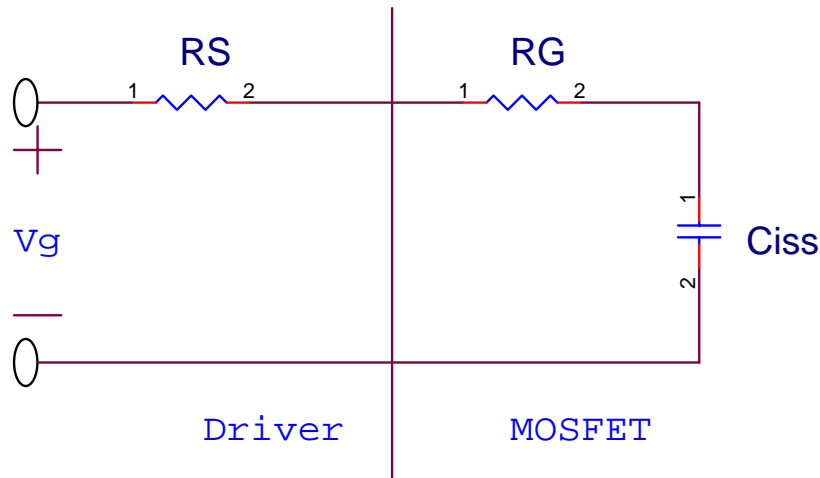
Switching Transition Losses



$$PS = fs \left[ts1 \int_0^{ts1} VDS \times ID dt + ts2 \int_0^{ts2} VDS \times ID dt \right]$$

$$PS = \frac{VDS (ID1 \times ts1 + ID2 \times ts2) fs}{2}$$

PG: Gate Drive Losses



$$PG = V_g Q_{gfs} \left(\frac{R_G}{R_S + R_G} \right)$$

MOSFET others losses

$$PC = [ID(rms)]^2 \times RDS(on) \quad PL = IDSS \times VDS(1 - D)$$

$$PD = IRD(avg) \times VF(avg)$$

How to Calculate T_j ?

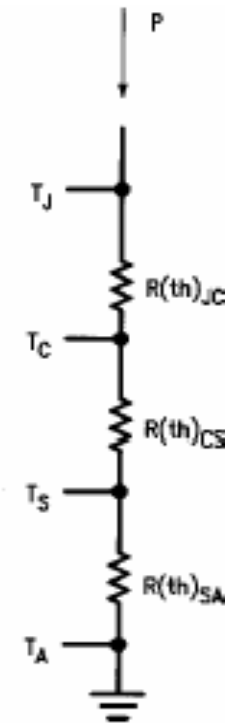
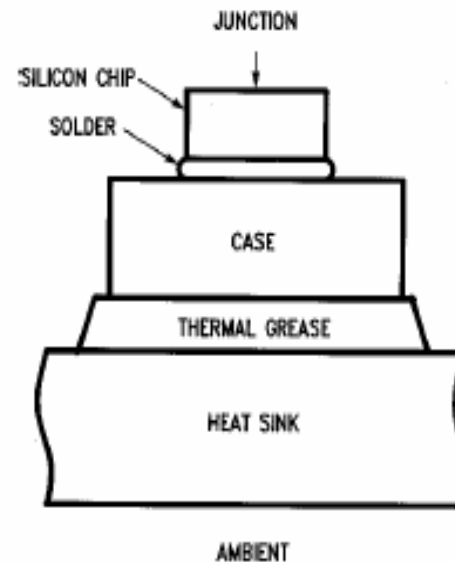
$$R_{\theta JC} = \frac{T_J - T_{case}}{P}$$

$$T_J = T_{case} + P \times R_{\theta JC}$$

$$P = P_s + P_c + P_g$$

T_J : Junction Temperature

T_{case} : Case Temperature



Junction and Storage Temperature do not over 150°C — AOS recommend