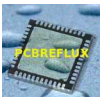


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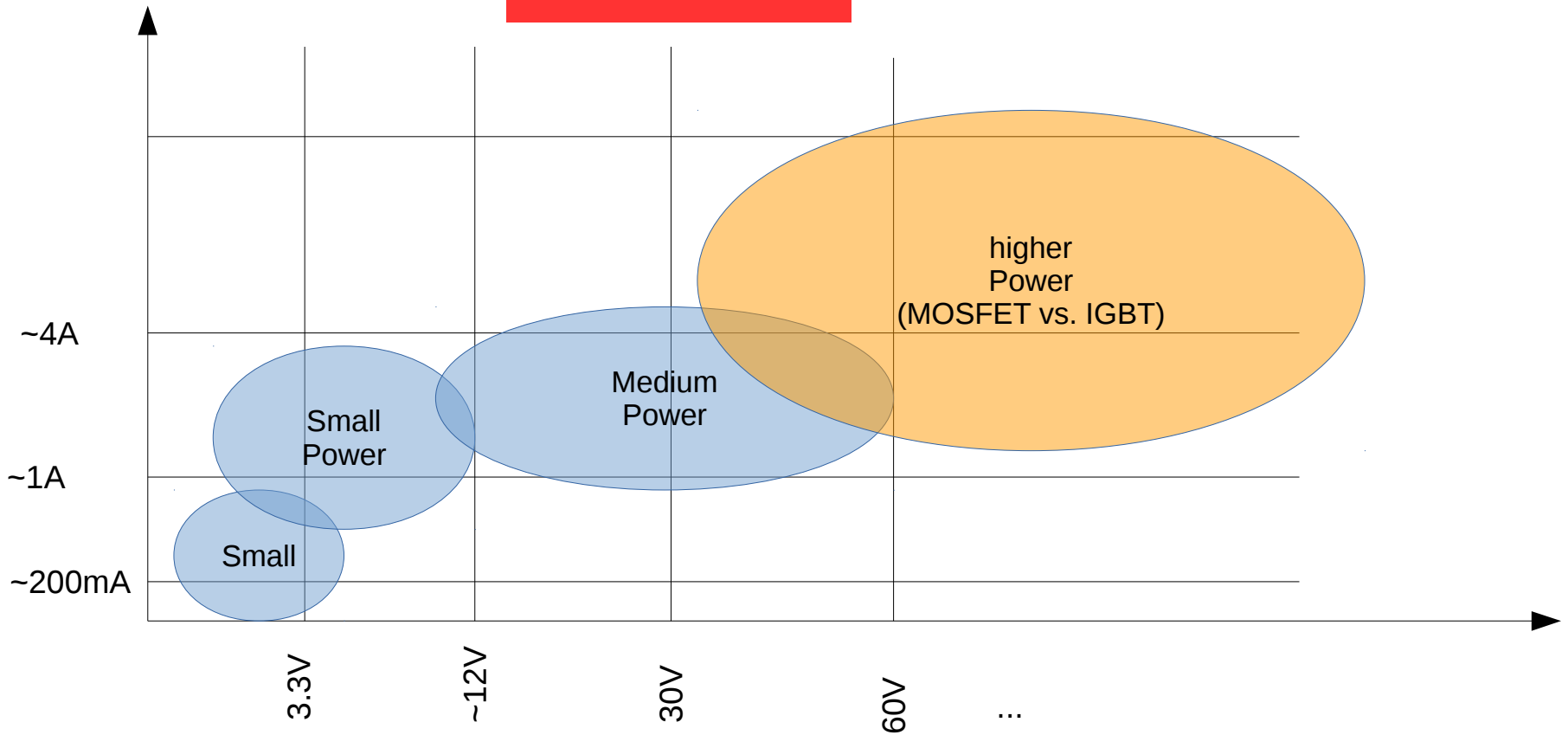
MOSFET metal–oxide–semiconductor field-effect transistor

depletion mode and enhancement mode

Using the MOSFET as a Switch ($< 1\text{kHz}$)



MOSFET





MOSFET

Important Parameter

I_D Continuous Drain Current

$V_{GS(th)}$ Gate Threshold Voltage

V_{GS} Gate-Source Voltage

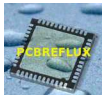
V_{DS} Drain-Source Voltage

$R_{DS(ON)}$ Drain-Source On-Resistance

Thermal considerations

P_D Power Dissipation

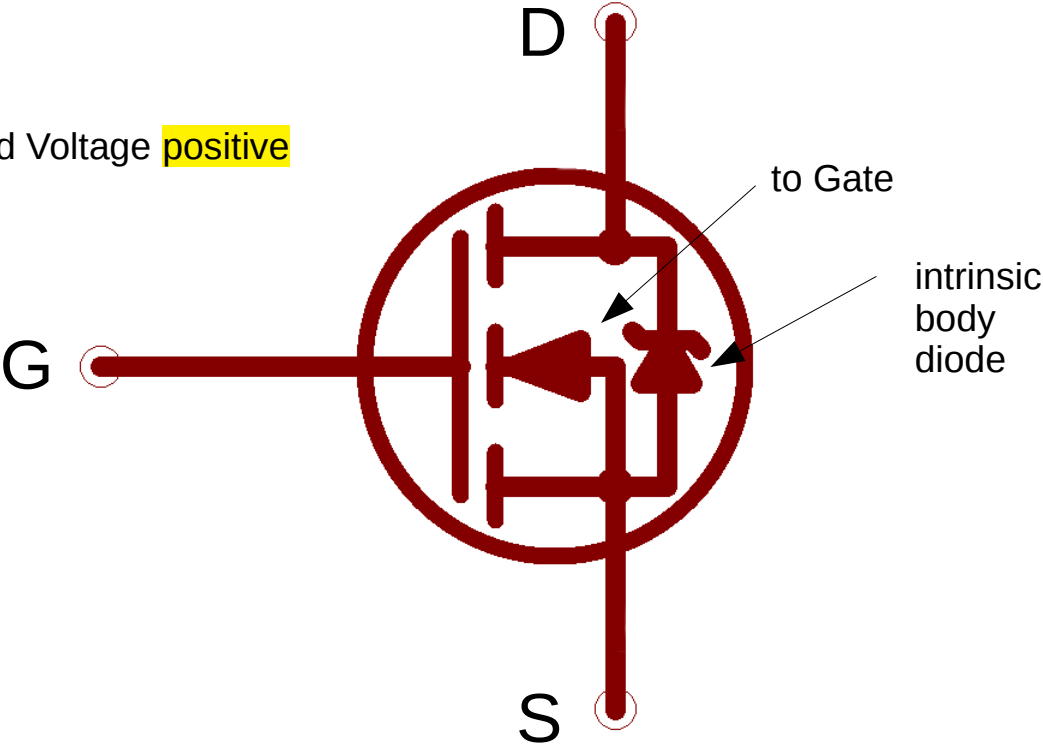
$R_{\theta JA}$ (R_{THJA}) Junction-to-Ambient



MOSFET

N-Channel

$V_{GS(th)}$ Gate Threshold Voltage **positive**

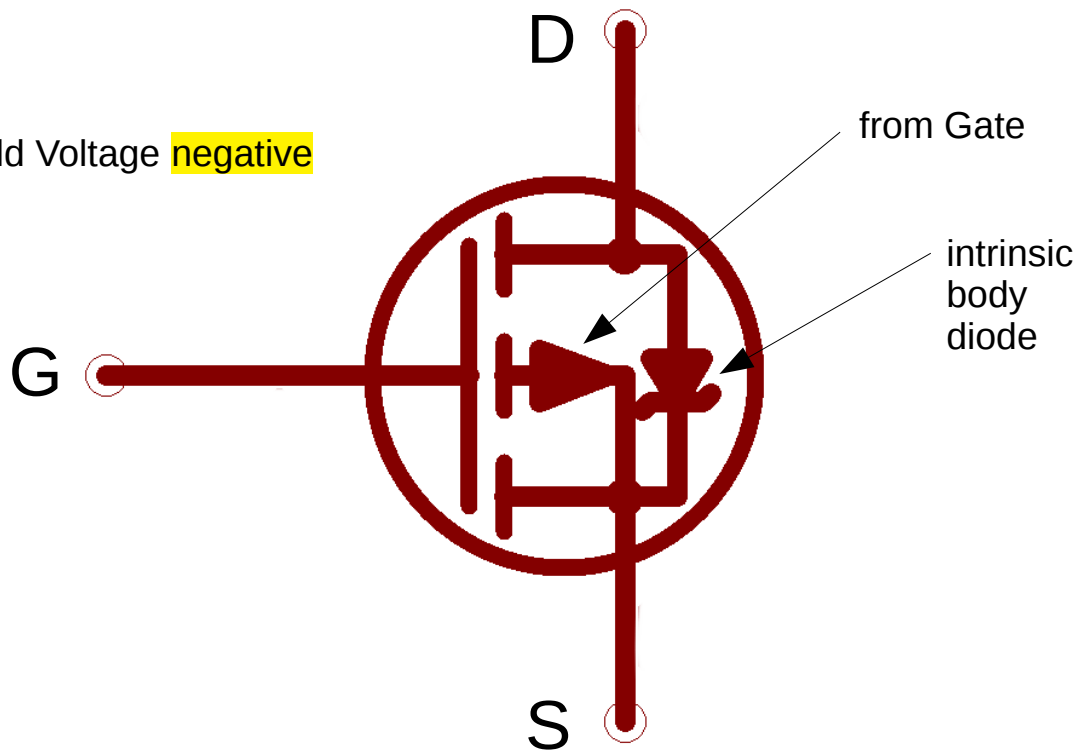


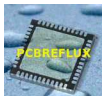


MOSFET

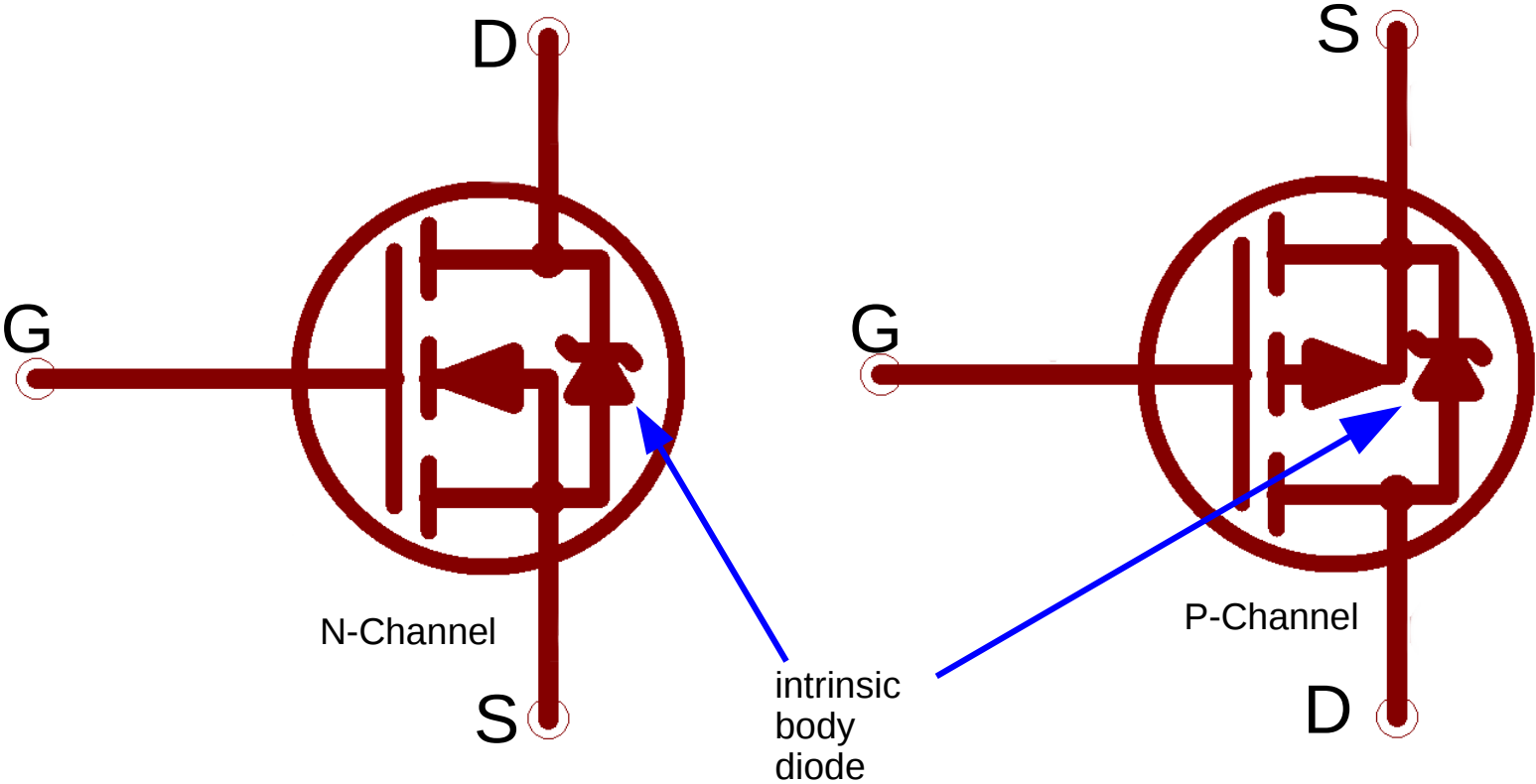
P-Channel

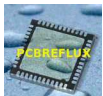
$V_{GS(th)}$ Gate Threshold Voltage **negative**



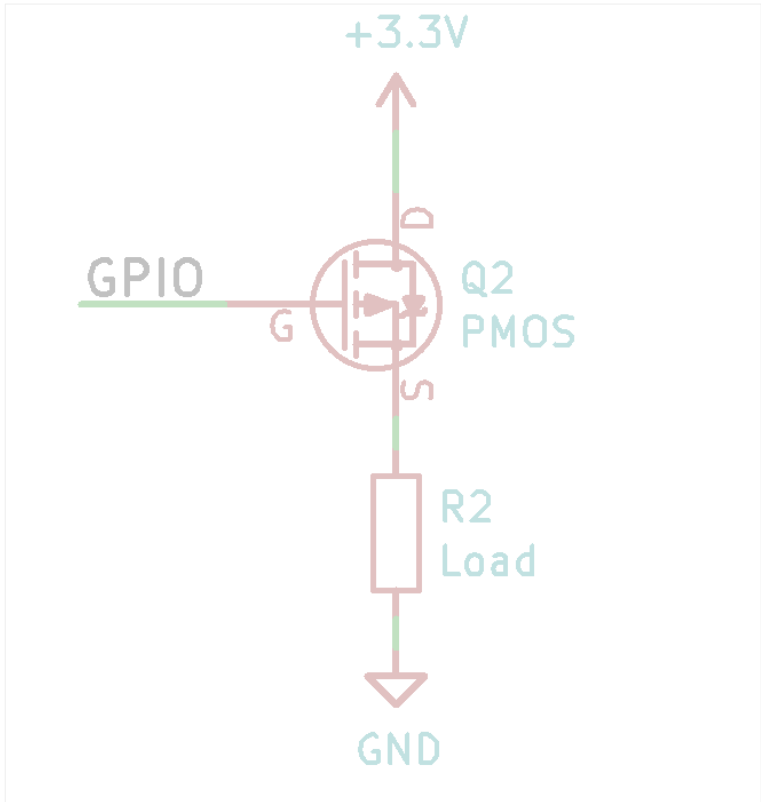
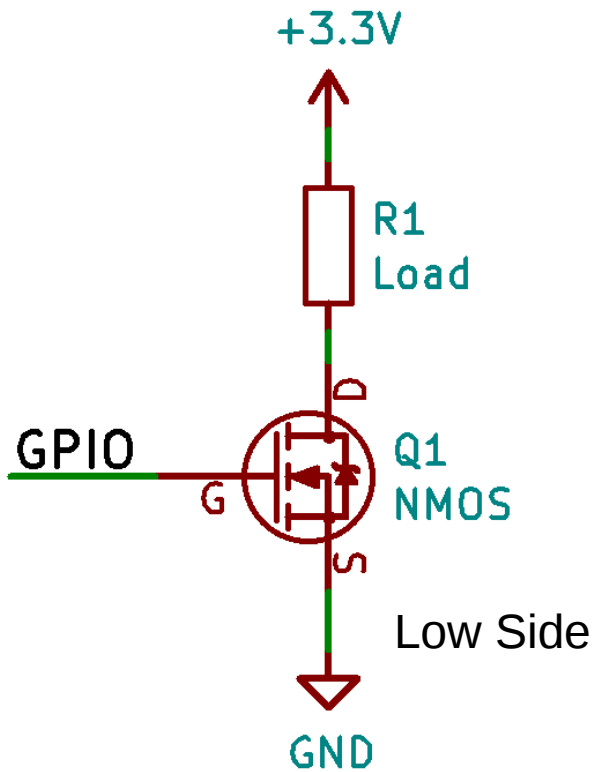


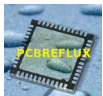
MOSFET



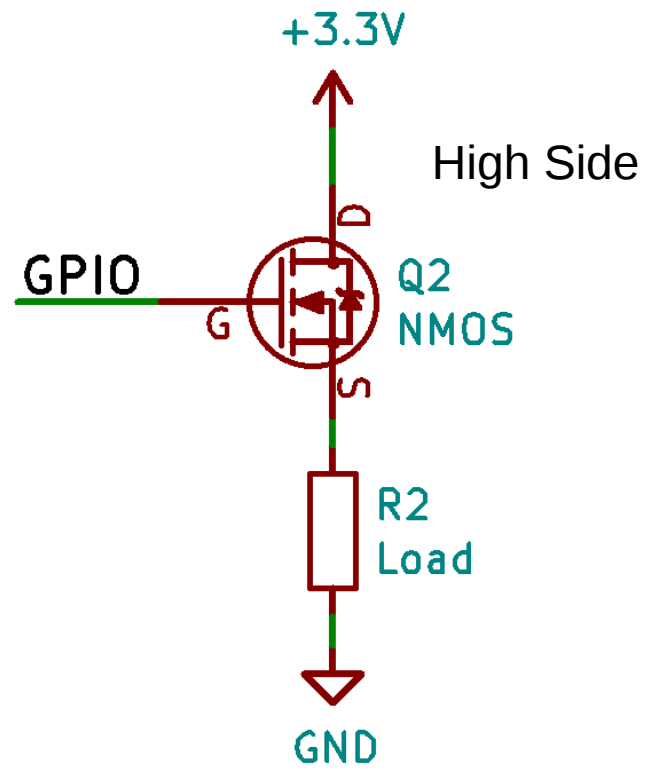
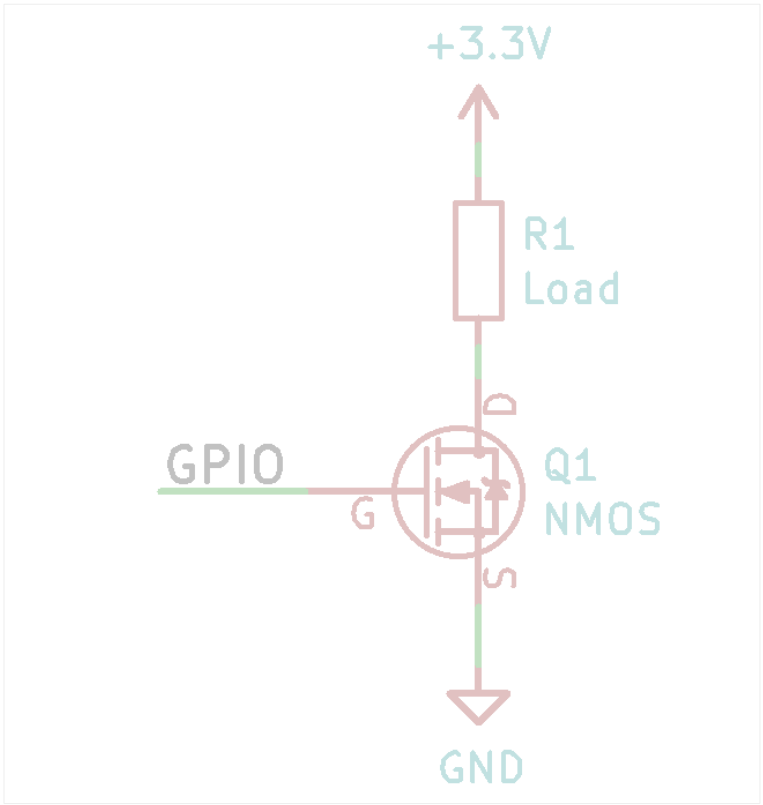


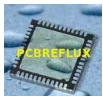
MOSFET



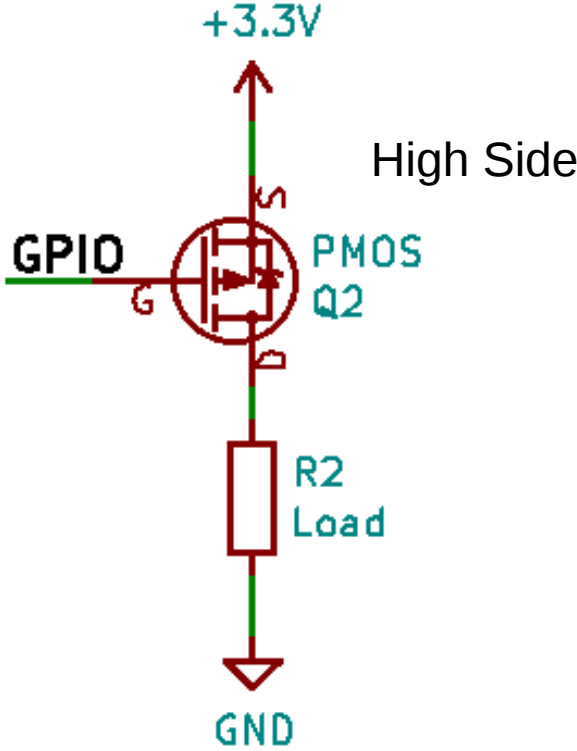
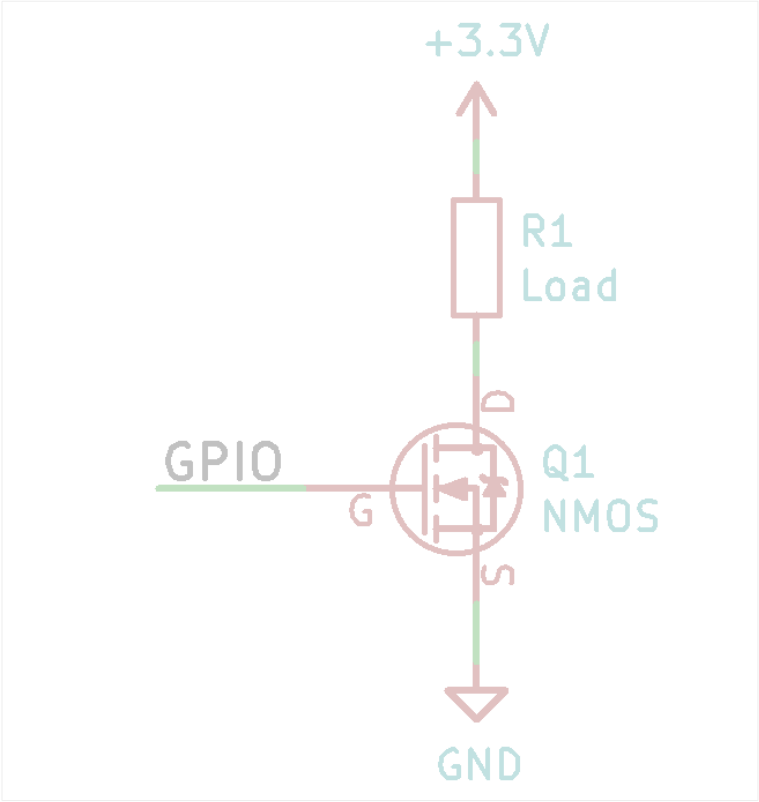


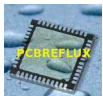
MOSFET



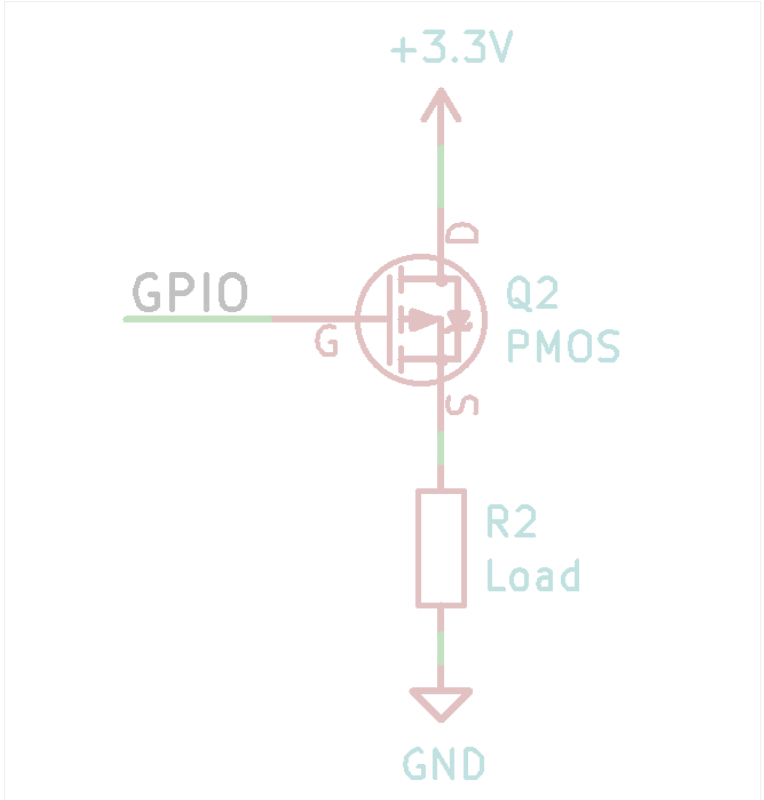
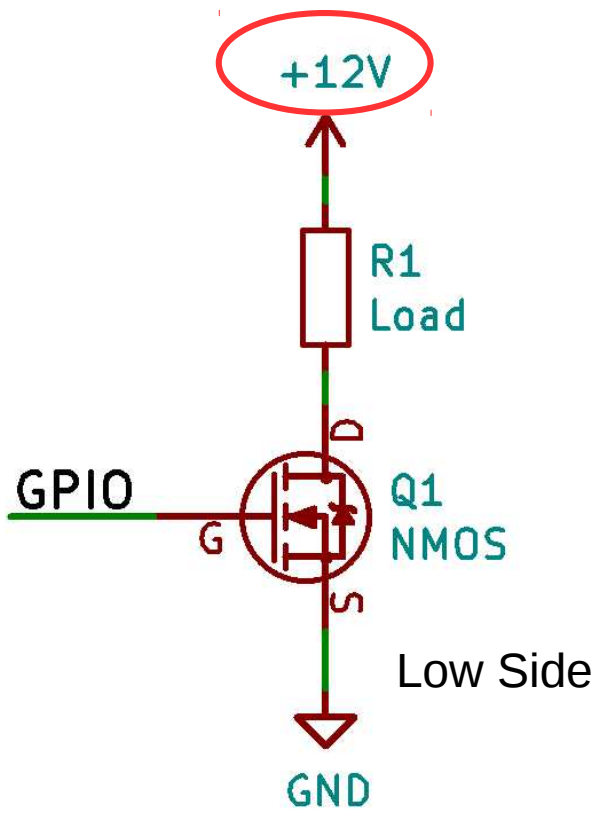


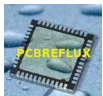
MOSFET



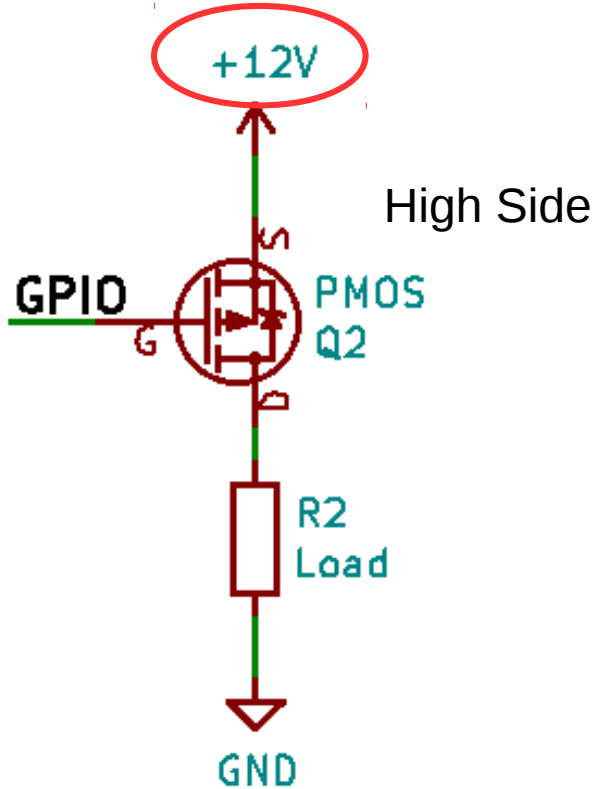
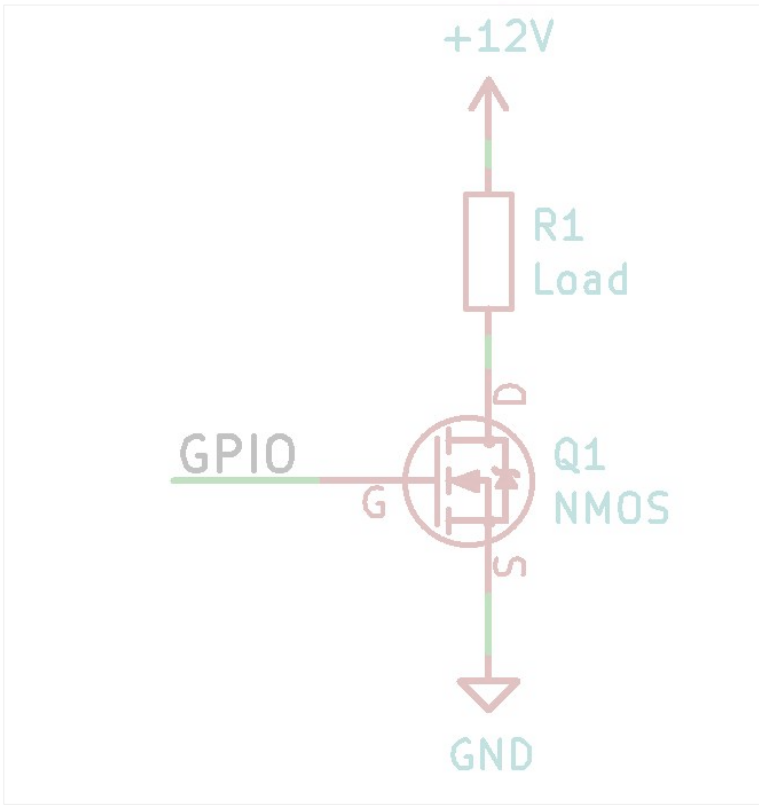


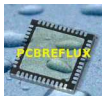
MOSFET



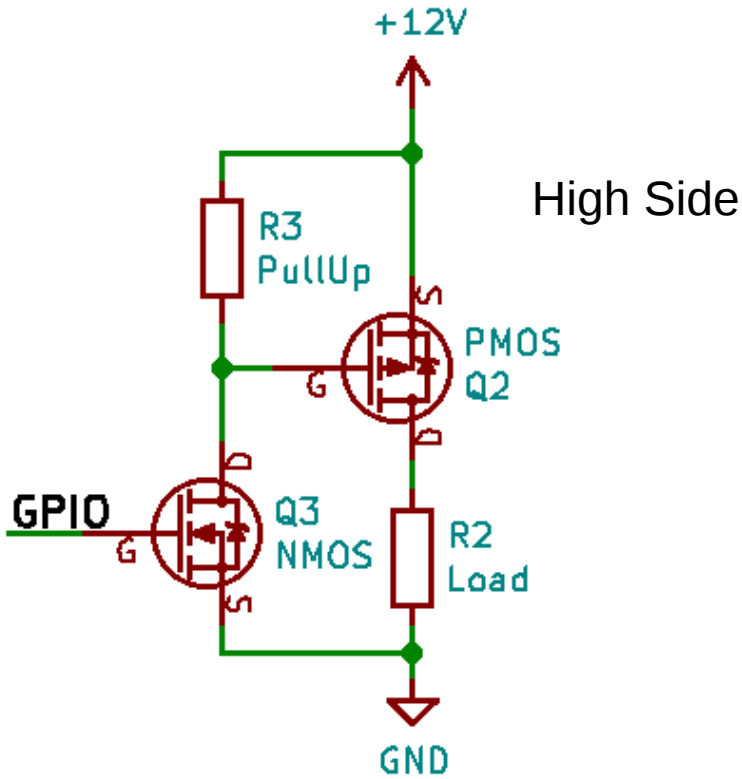
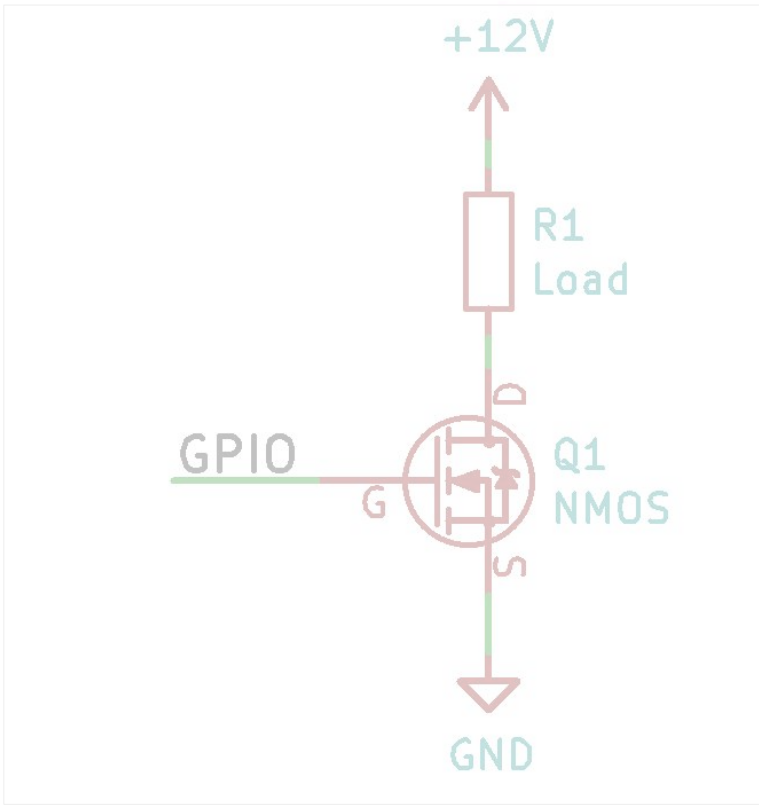


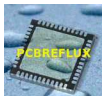
MOSFET





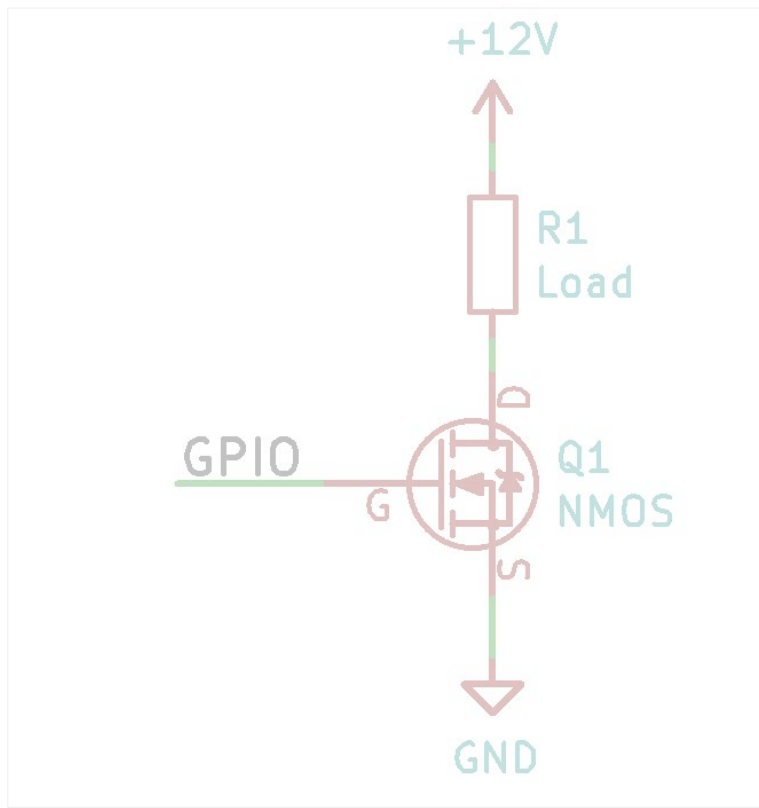
MOSFET



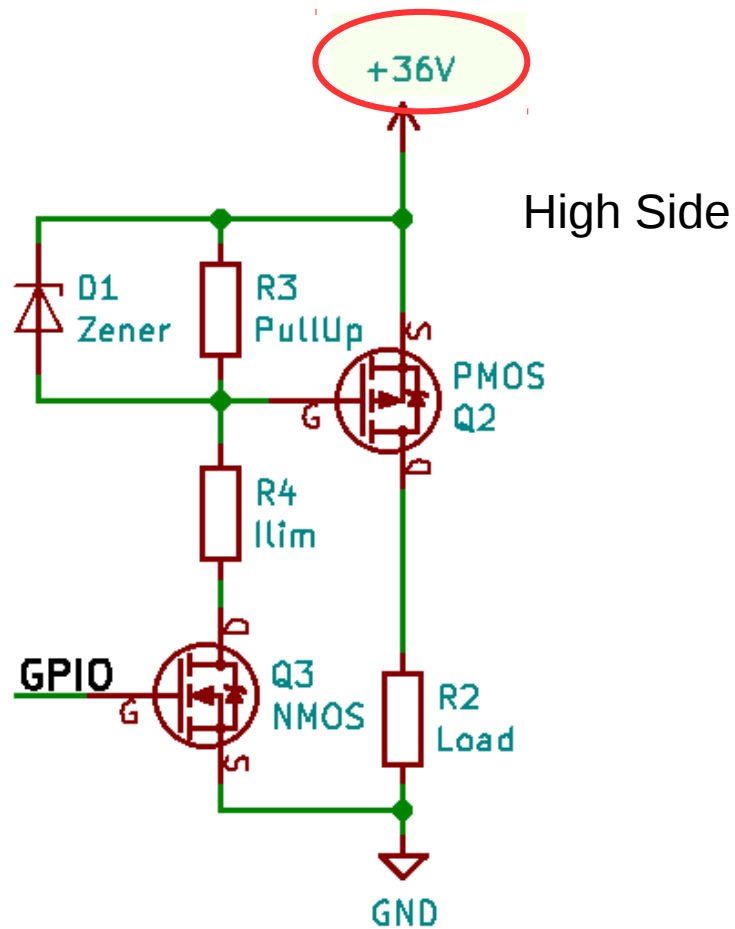


ESP32

MOSFET



pcbreflux





MOSFET

Thermal Example IRFU9024 (IPAK)

Example Drain Current : 2A

$R_{DS(ON)}$ Drain-Source On-Resistance Max 0.28Ω

P_D Power Dissipation $I_D^2 * R_{DS(ON)} = (2A)^2 * 0.28\Omega = 1.12 \text{ W}$

$R_{\theta JA}$ Junction-to-Ambient 110°C/W in Air and 50°C/W on PCB

$P_{JMAX} = (T_{JMAX} - T_A) / R_{\theta JA}$ (150°C-25°C) / 110°C/W ~ 1.136 W in Air
(150°C-25°C) / 50°C/W ~ 2.5 W on PCB

→ in Air (1.12W ~ 1.136W) nearly needs heatsink
on PCB (1.12W < 2.5W) no heatsink needed



MOSFET

Thermal Example DMG2301L (SOT23)

Example Drain Current : 2A

$R_{DS(ON)}$ Drain-Source On-Resistance Max 0.12Ω

P_D Power Dissipation $I_D^2 * R_{DS(ON)} = (2A)^2 * 0.12\Omega = 0.48W$

$R_{\theta JA}$ Junction-to-Ambient $83^\circ C/W$

$P_{JMAX} = (T_{JMAX} - T_A) / R_{\theta JA} = (150^\circ C - 25^\circ C) / 83^\circ C/W \sim 1.5 W$

$0.48W < 1.5W \rightarrow$ no heatsink needed