Gate voltage 0 V / 15V versus +/- 15V

power electronics in motion

eupec

Turn-on losses and times:

- Values unchanged as compared to datasheet

Turn-off losses:

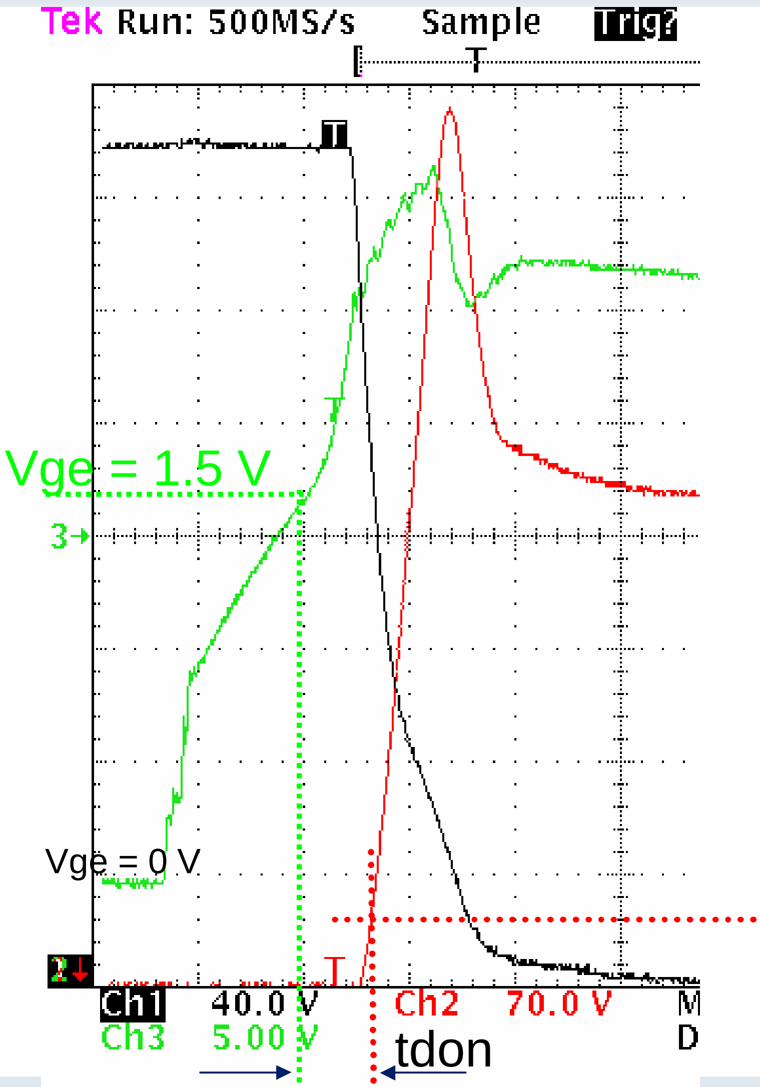
- Switching to 0V corresponds roughly to switching to -15V with 3 x R_g
  - with nominal Rg roughly Eoff + 10% vs. datasheet

Gate charge:

- reduced by 40% vs. datasheet (V_{cc} = 300V)

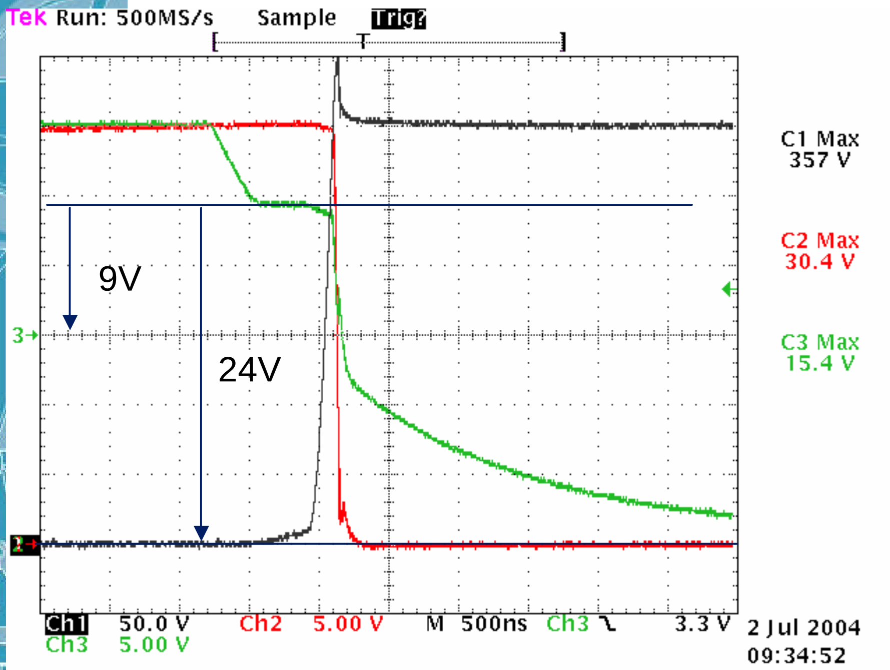
Turn-on

power electronics in motion
eupec



- turn-on delay time is defined form Vge = 1.5 V to Ic = 10% -> no difference between 0/15 V and +/- 15 V switching!
- Energy is determined by switching trajectory for Vge > Vgeth.
- Then I_{gate} = 15 V – Vge -> no difference between 0/15 V and +/- 15 V switching!

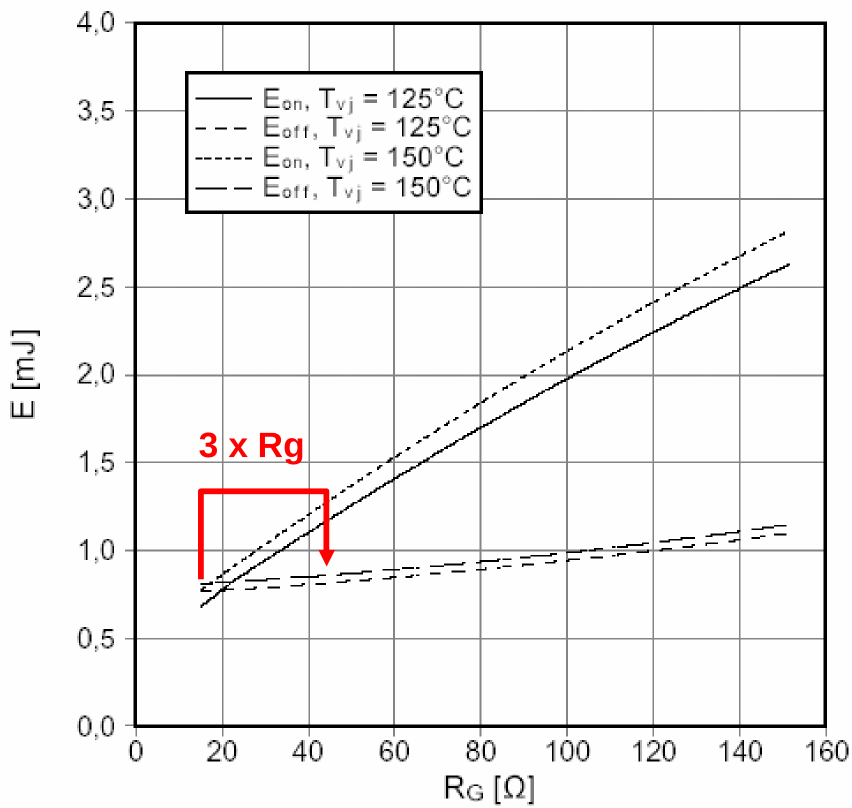
Turn-off



- for 0V switching turn-off delay time is increased by a factor of 2-3 vs. datasheet.
  Reason: decreased gate current due to decreased voltage on gate resistor (8-15 V instead of 23-30 V!)
- Energy corresponds to E_{off} at R_g = approx. 3 x Rg given in the datasheet:
  Reason: Voltage ratio (9 V / 24 V leads to the same decrease in gate current as a 3-times higher Rg value!

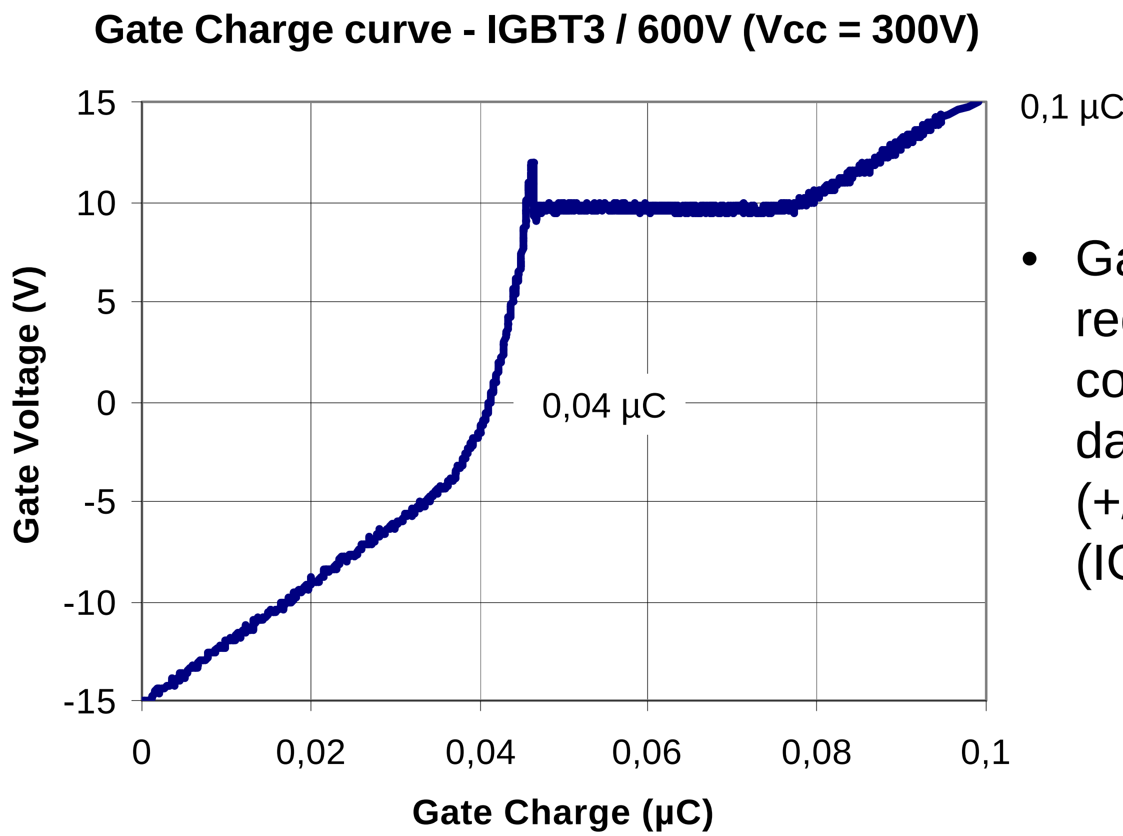
Turn-off

Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm 15$ V, $I_C = 30$ A, $V_{CE} = 300$ V



- Typically, E_{off} is increased by less than 10 % with switching to 0V instead of -15V
- Note: E_{on} is unchanged!

Gate Charge



- Gate charge is reduced by 40 % as compared to datasheet value (+/-15 V switching) (IGBT3 / 600V)