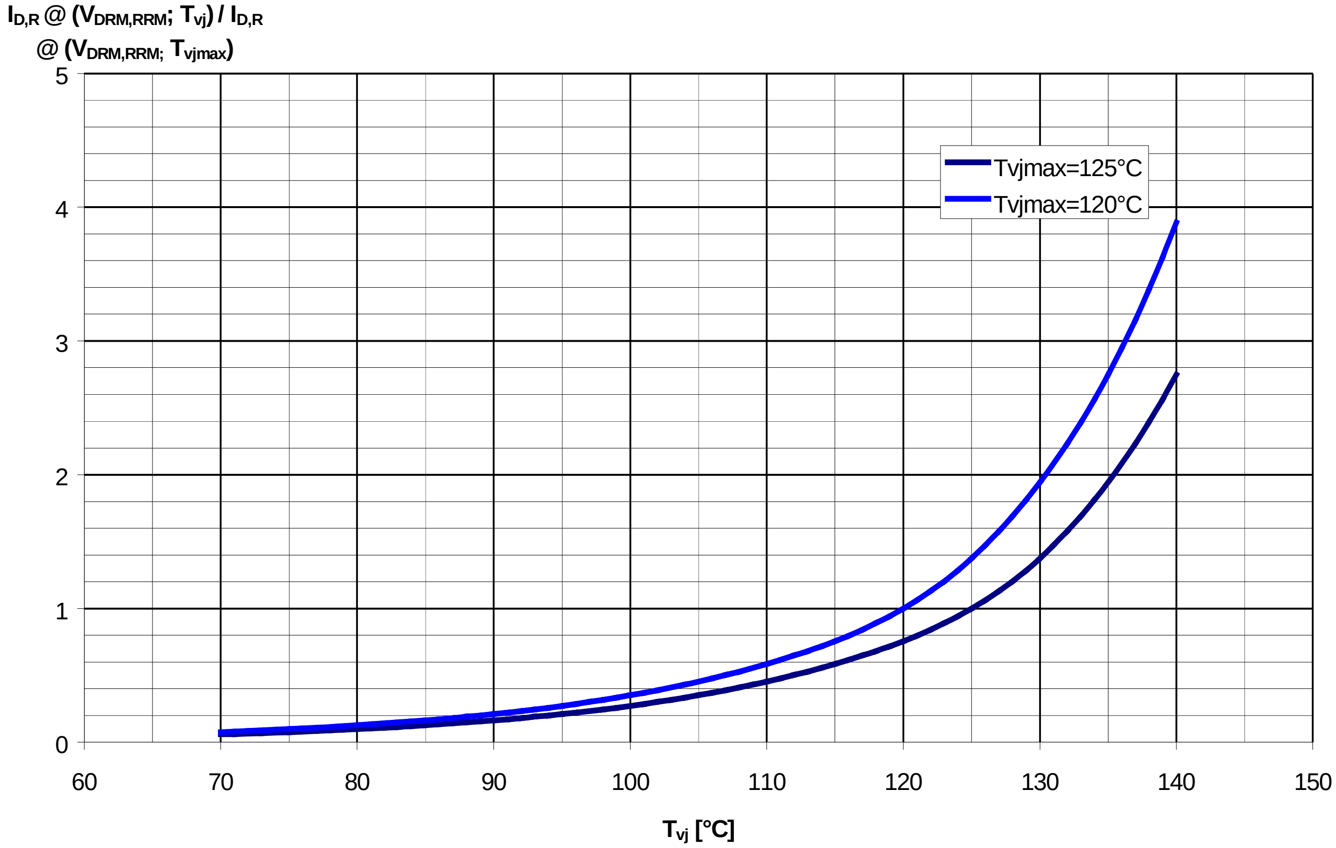
Additional Technical Information for High Power Phase Control Thyristors

These Application Notes show diagrams of typical behaviours and give approximation formulas. The Application Notes help to find semiconductor characteristics for application conditions but promises no characteristics.

1) Dependence of off state and reverse current on junction temperature

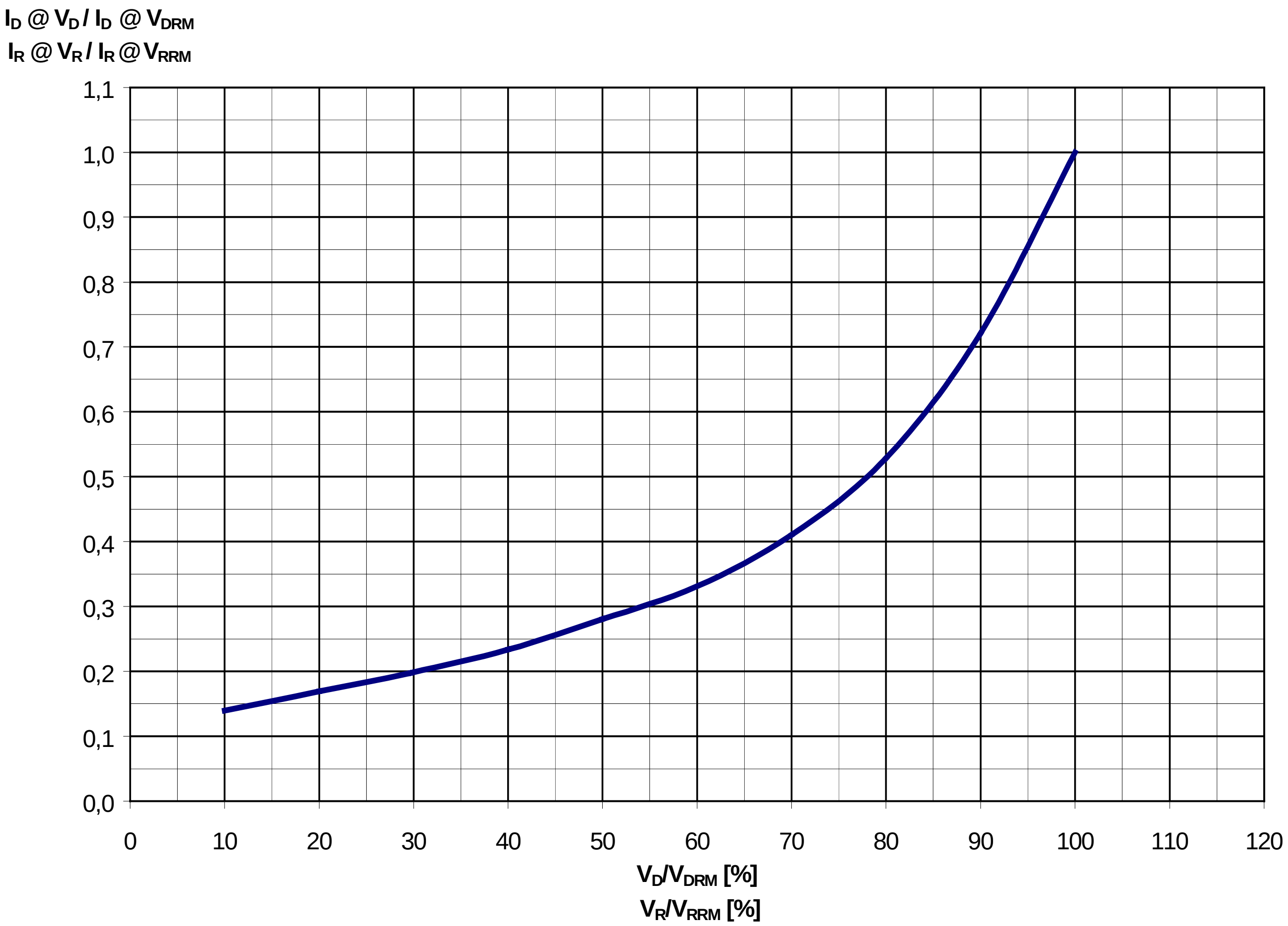
I_D, I_R = $f(T_{vj})$



2) Dependence of off state and reverse current on forward and reverse voltage

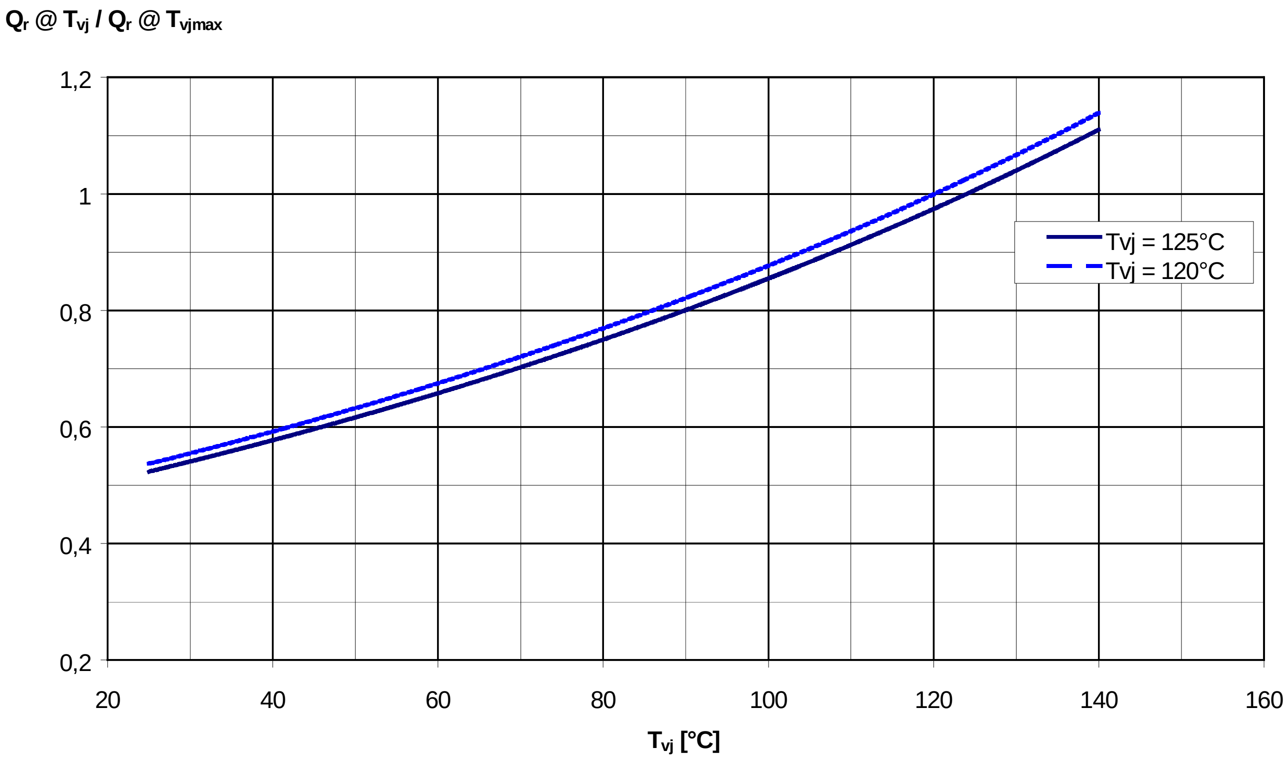
$$I_D, I_R = f(V_D, V_R)$$

$T_{vj} \geq 90°C$



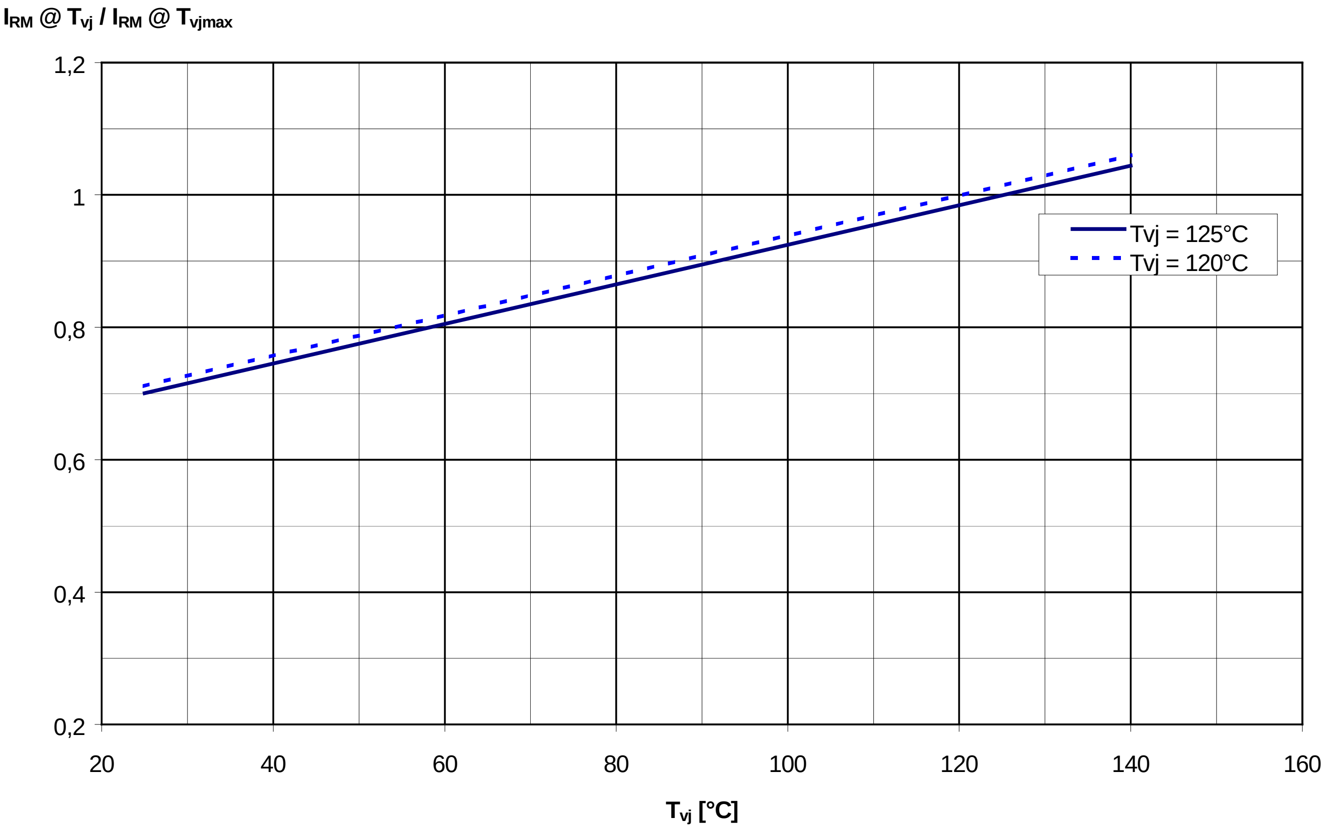
3) Dependence of reverse recovery charge on junction temperature

$Q_r = f(T_{vj})$



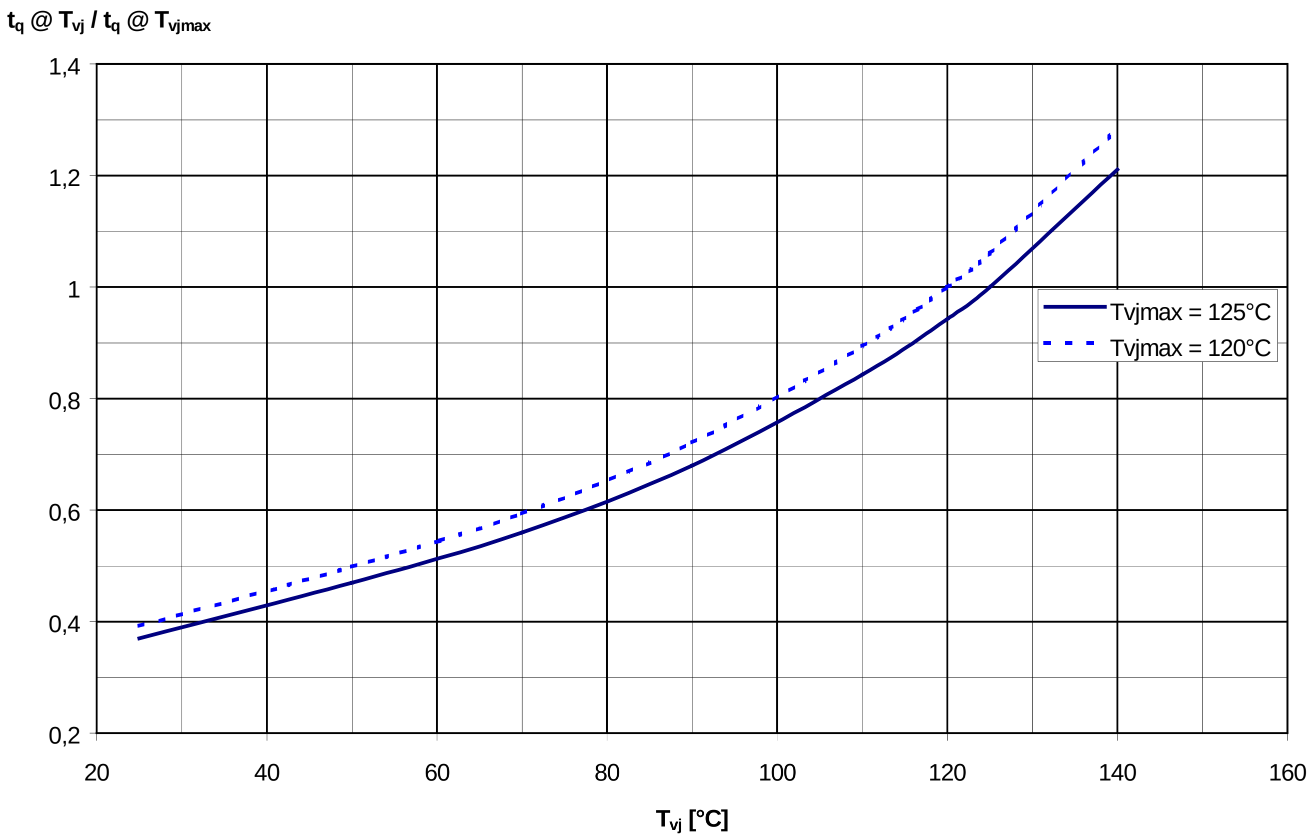
4) Dependence of peak reverse recovery current on junction temperature

$I_{RM} = f(T_{vj})$



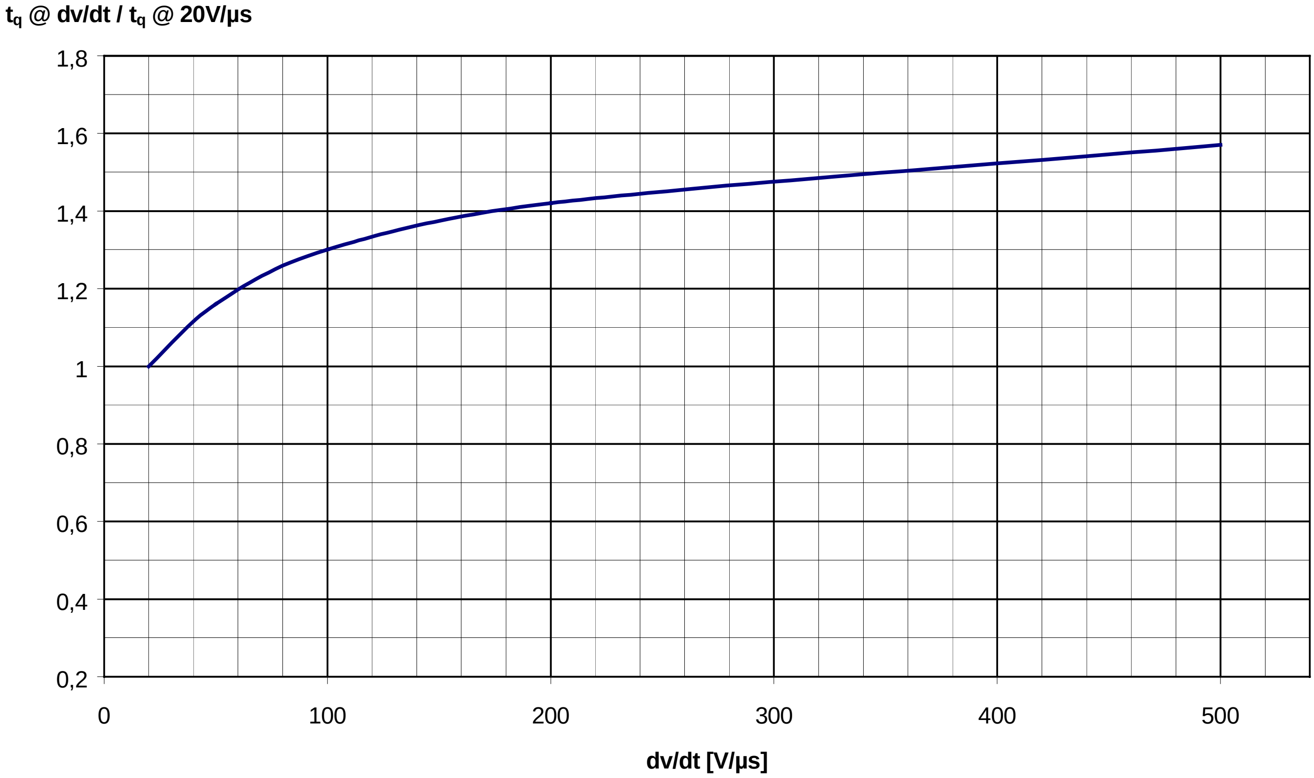
5) Dependence of turn off time on junction temperature

$t_q = f(T_{vj})$



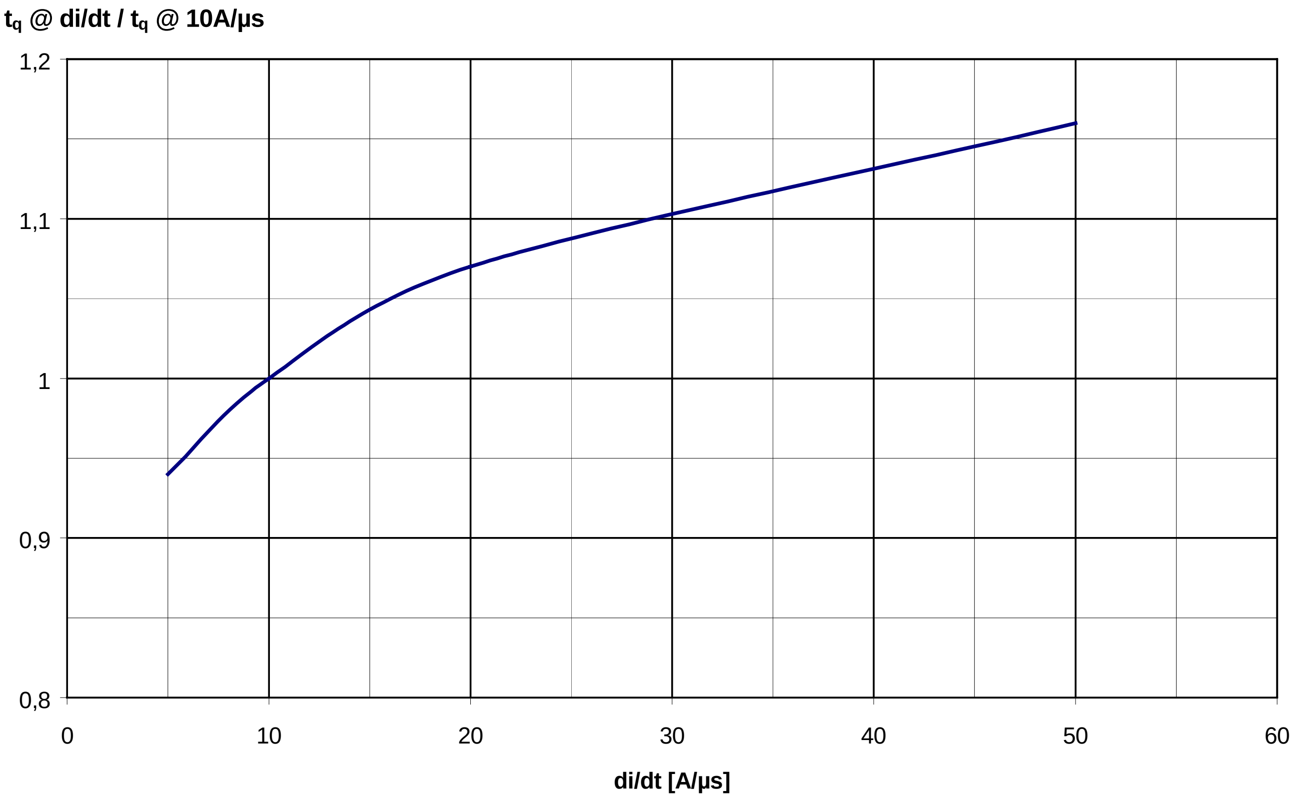
6) Dependence of turn off time on rise of forward voltage

$t_q = f(dv/dt)$



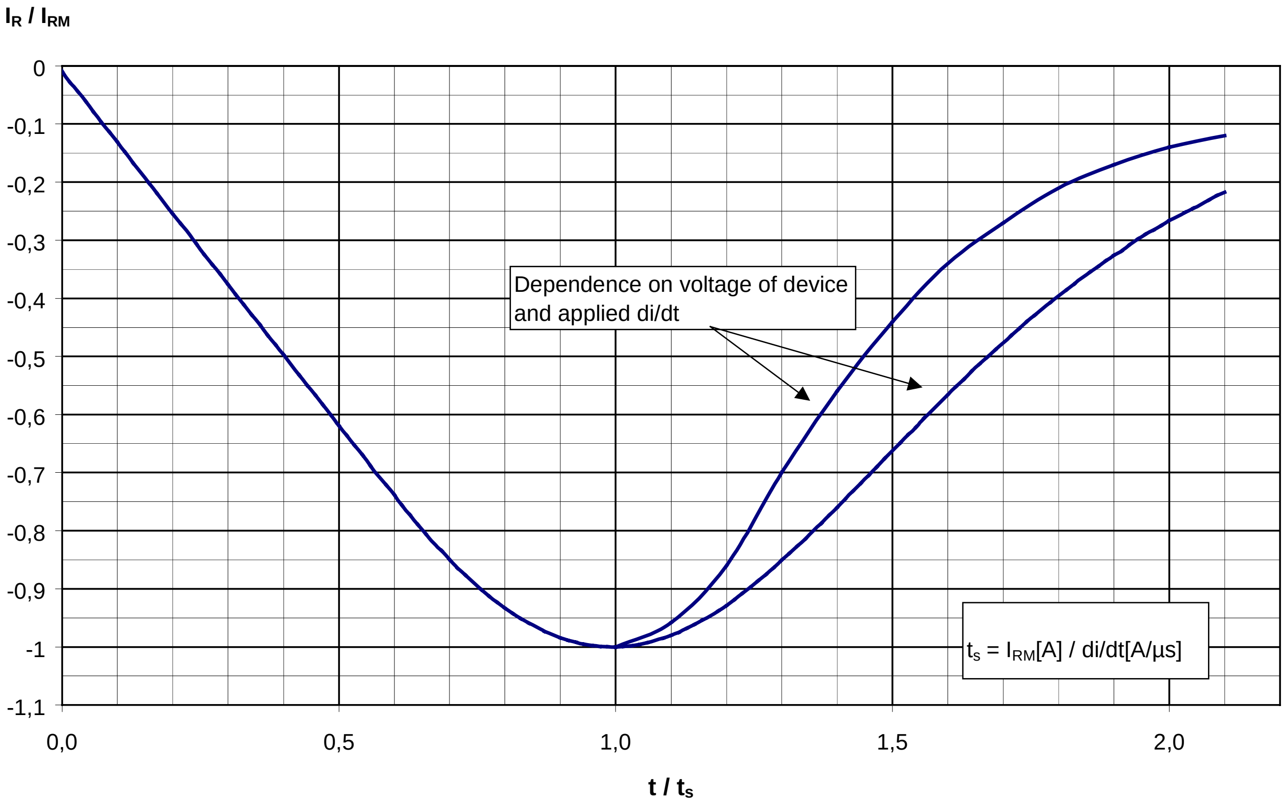
7) Dependence of turn off time on rate of current change

$t_q = f(di/dt)$



8) Reverse recovery current waveform

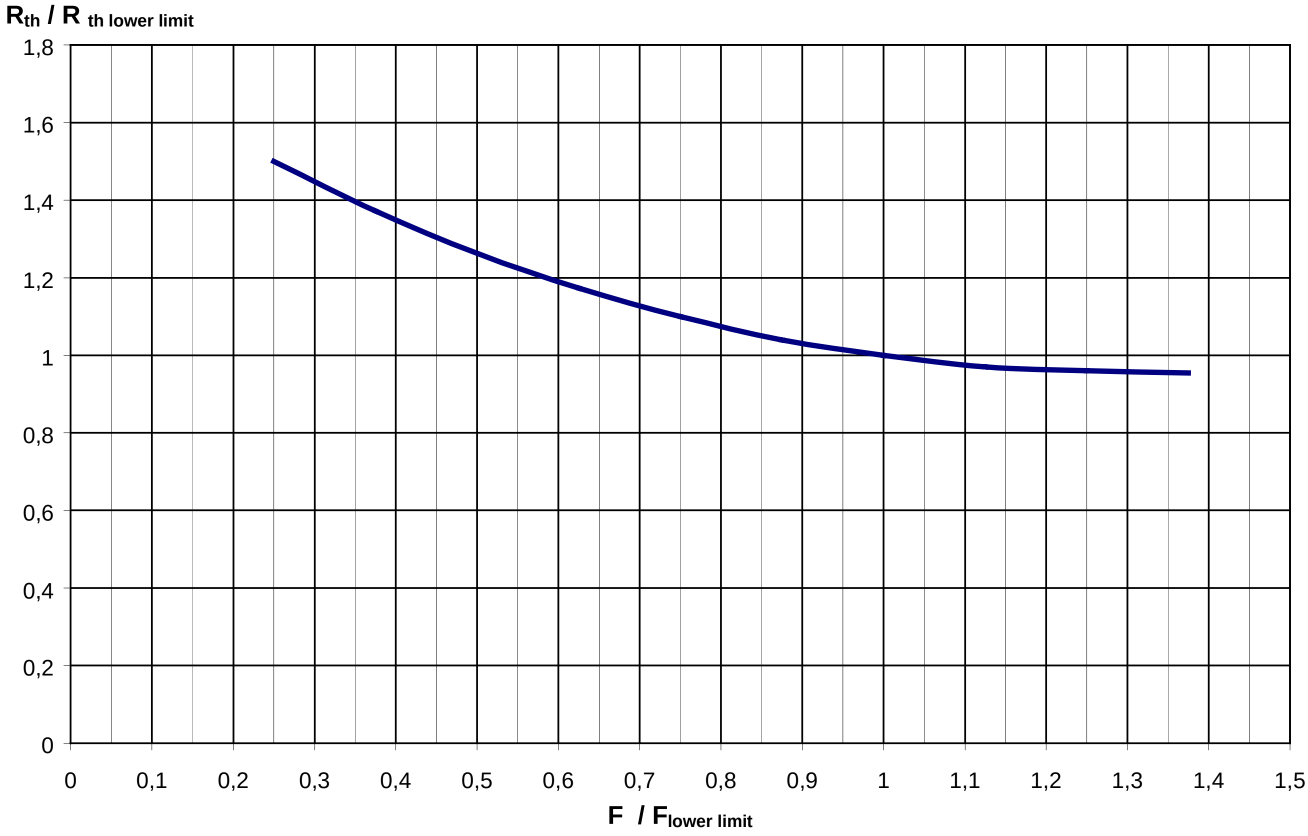
$I_{RM} = f(t)$



9) Dependence of thermal resistance on applied clamping force

$R_{th} = f(F)$

pellet diameter ≥ 75mm
Normalised on lower limit of recommended clamping force range



10) Turn-on losses

The turn on losses are low compared to the on-state losses. We recommend to use fixed percentages of the on state losses as approximation formulas to consider the turn on losses:

di/dt [A/µs]	pellet-∅: 75mm to 88mm	pellet-∅: 88mm to 119mm
1	0,5%	1,0%
2	1,0%	2,0%
5	2,0%	3,5%
10	3,5%	5,0%

11) Turn-off losses

The turn off losses can be calculated by using the following approximation formulas:

Devices with on-state voltages near the maximum valueof the data sheet:

$$E_{off} = Q_{r\,max} \cdot V_R \cdot 0{,}4$$

Devices with on- state voltages near the typical value of the data sheet:

$$E_{off} = Q_{r\,max} \cdot V_R \cdot 0{,}5$$

$Q_{r\,max}$: Maximum recovered charge from the data sheet
V_R: Applied reverse voltage at commutation

12) Conversion factor for surge current

I_{TSM} @ 60Hz ≈ $1{,}05 \cdot I_{TSM}$ @ 50Hz (according to data sheet)