

**SIPMOS® Power Transistor**

- N channel
- Enhancement mode
- Avalanche-rated
- dv/dt rated
- 175°C operating temperature
- also in SMD available



Pin 1	Pin 2	Pin 3
G	D	S

Type	V <sub>DS</sub>	I <sub>D</sub>	R <sub>DS(on)</sub>	Package	Ordering Code
BUZ 102 S	55 V	52 A	0.023 Ω	TO-220 AB	Q67040-S4011-A2

**Maximum Ratings**

Parameter	Symbol	Values	Unit
Continuous drain current $T_C = 25\text{ °C}$ $T_C = 100\text{ °C}$	$I_D$	52 37	A
Pulsed drain current $T_C = 25\text{ °C}$	$I_{Dpuls}$	208	
Avalanche energy, single pulse $I_D = 52\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\text{ Ω}$ $L = 181\text{ μH}$ , $T_j = 25\text{ °C}$	$E_{AS}$	245	mJ
Avalanche current, limited by $T_{jmax}$	$I_{AR}$	52	A
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	12	mJ
Reverse diode dv/dt $I_S = 52\text{ A}$ , $V_{DS} = 40\text{ V}$ , $di_F/dt = 200\text{ A/μs}$ $T_{jmax} = 175\text{ °C}$	dv/dt	6	kV/μs
Gate source voltage	$V_{GS}$	± 20	V
Power dissipation $T_C = 25\text{ °C}$	$P_{tot}$	120	W

**Maximum Ratings**

Parameter	Symbol	Values	Unit
Operating temperature	$T_j$	-55 ... + 175	°C
Storage temperature	$T_{stg}$	-55 ... + 175	
Thermal resistance, junction - case	$R_{thJC}$	≤ 1.25	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	≤ 62	
IEC climatic category, DIN IEC 68-1		55 / 175 / 56	

**Electrical Characteristics, at  $T_j = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**Static Characteristics**

Drain- source breakdown voltage $V_{GS} = 0 \text{ V}, I_D = 0.25 \text{ mA}, T_j = 25 \text{ }^\circ\text{C}$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage $V_{GS}=V_{DS}, I_D = 90 \text{ }\mu\text{A}$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, T_j = -40 \text{ }^\circ\text{C}$ $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 25 \text{ }^\circ\text{C}$ $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$	$I_{DSS}$	-	-	0.1 1 100	$\mu\text{A}$
Gate-source leakage current $V_{GS} = 20 \text{ V}, V_{DS} = 0 \text{ V}$	$I_{GSS}$	-	10	100	
Drain-Source on-resistance $V_{GS} = 10 \text{ V}, I_D = 37 \text{ A}$	$R_{DS(on)}$	-	0.016	0.023	

**Electrical Characteristics**, at  $T_j = 25^\circ\text{C}$ , unless otherwise specified

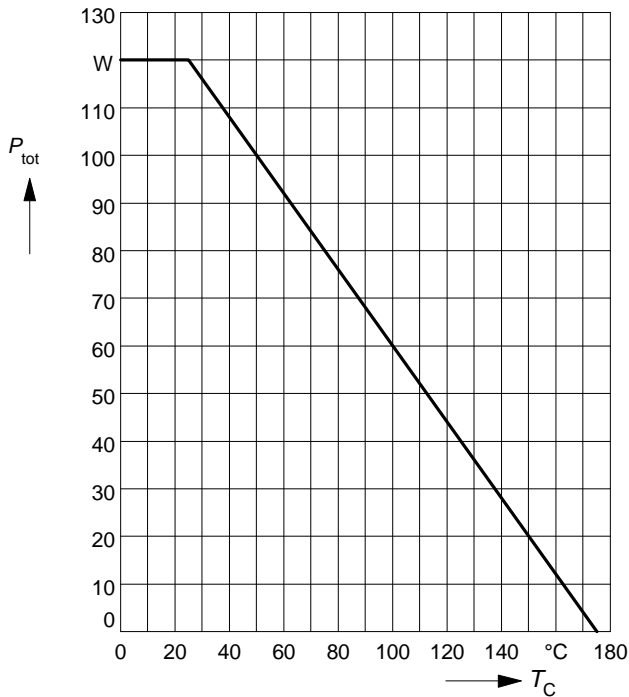
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 37\text{ A}$	$g_{fs}$	10	-	-	S
Input capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{iss}$	-	1220	1525	pF
Output capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{oss}$	-	410	515	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{rss}$	-	210	265	
Turn-on delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 52\text{ A}$ $R_G = 6.8\ \Omega$	$t_{d(on)}$	-	12	18	ns
Rise time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 52\text{ A}$ $R_G = 6.8\ \Omega$	$t_r$	-	22	33	
Turn-off delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 52\text{ A}$ $R_G = 6.8\ \Omega$	$t_{d(off)}$	-	30	45	
Fall time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 52\text{ A}$ $R_G = 6.8\ \Omega$	$t_f$	-	25	40	
Gate charge at threshold $V_{DD} = 40\text{ V}$ , $I_D = 0.1\text{ A}$ , $V_{GS} = 0\text{ to }1\text{ V}$	$Q_{g(th)}$	-	1.5	2.8	nC
Gate charge at 7.0 V $V_{DD} = 40\text{ V}$ , $I_D = 52\text{ A}$ , $V_{GS} = 0\text{ to }7\text{ V}$	$Q_{g(7)}$	-	35	55	
Gate charge total $V_{DD} = 40\text{ V}$ , $I_D = 52\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$	$Q_{g(total)}$	-	45	70	
Gate plateau voltage $V_{DD} = 40\text{ V}$ , $I_D = 52\text{ A}$	$V_{(plateau)}$	-	5.9	-	V

**Electrical Characteristics, at  $T_j = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Reverse Diode</b>					
Inverse diode continuous forward current $T_C = 25^\circ\text{C}$	$I_S$	-	-	52	A
Inverse diode direct current, pulsed $T_C = 25^\circ\text{C}$	$I_{SM}$	-	-	208	
Inverse diode forward voltage $V_{GS} = 0\text{ V}, I_F = 104\text{ A}$	$V_{SD}$	-	1.2	1.7	V
Reverse recovery time $V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	70	105	ns
Reverse recovery charge $V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	0.15	0.25	$\mu\text{C}$

### Power dissipation

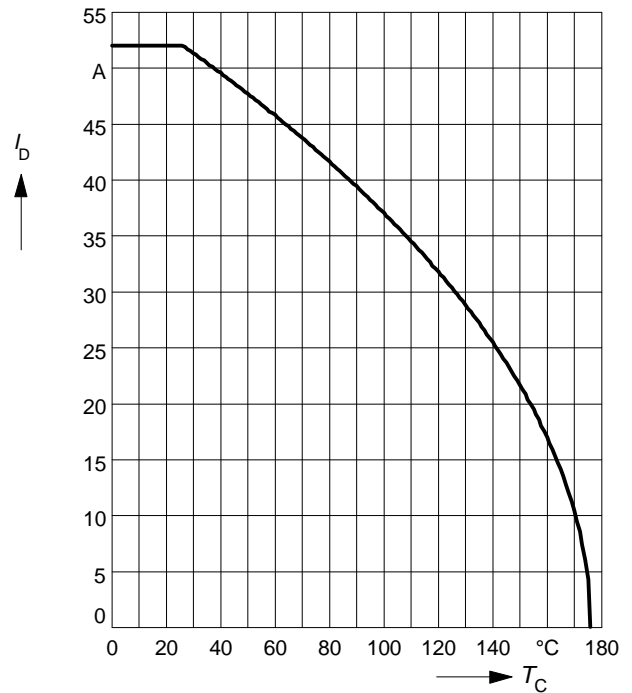
$$P_{\text{tot}} = f(T_C)$$



### Drain current

$$I_D = f(T_C)$$

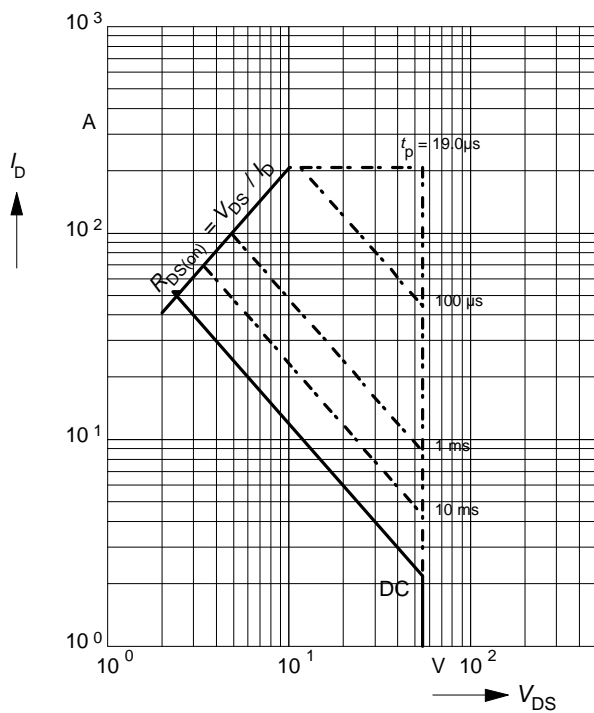
parameter:  $V_{GS} \geq 10 \text{ V}$



### Safe operating area

$$I_D = f(V_{DS})$$

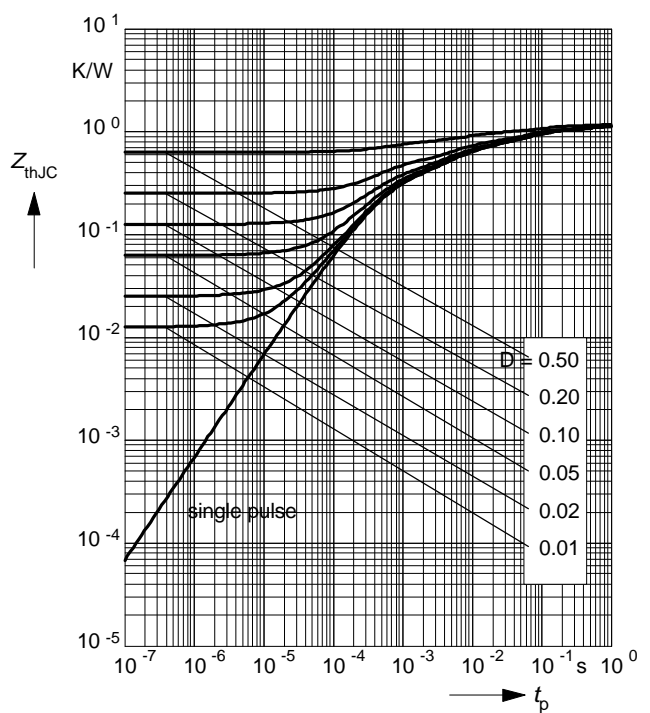
parameter:  $D = 0, T_C = 25^\circ\text{C}$



### Transient thermal impedance

$$Z_{\text{th JC}} = f(t_p)$$

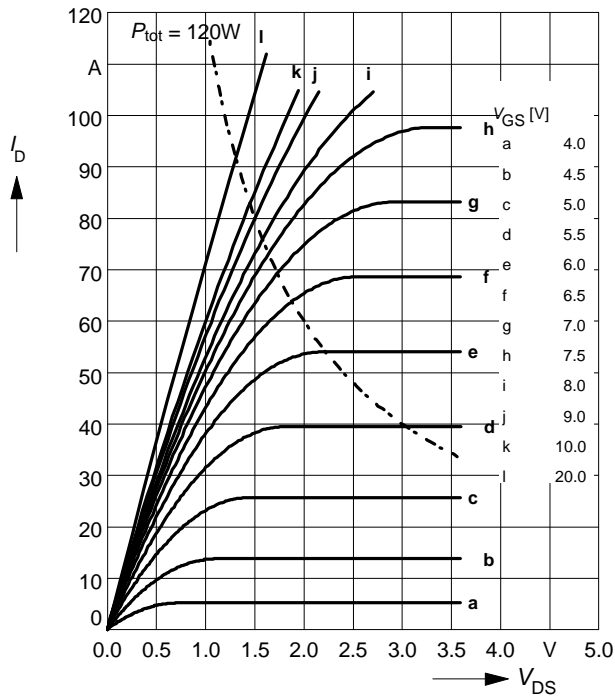
parameter:  $D = t_p / T$



### Typ. output characteristics

$$I_D = f(V_{DS})$$

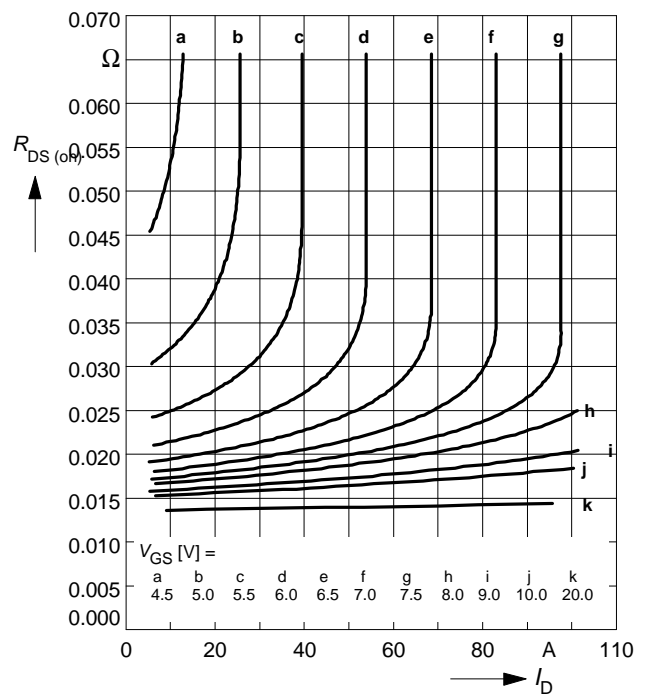
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



### Typ. drain-source on-resistance

$$R_{DS(on)} = f(I_D)$$

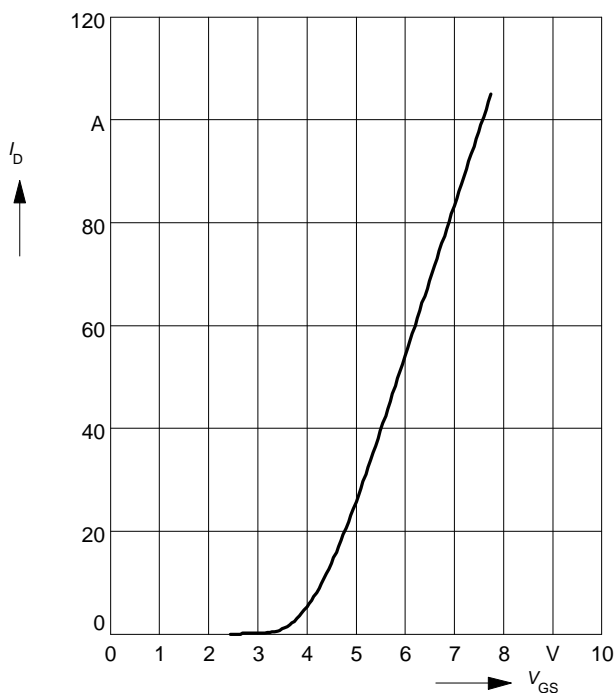
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



### Typ. transfer characteristics $I_D = f(V_{GS})$

parameter:  $t_p = 80 \mu s$

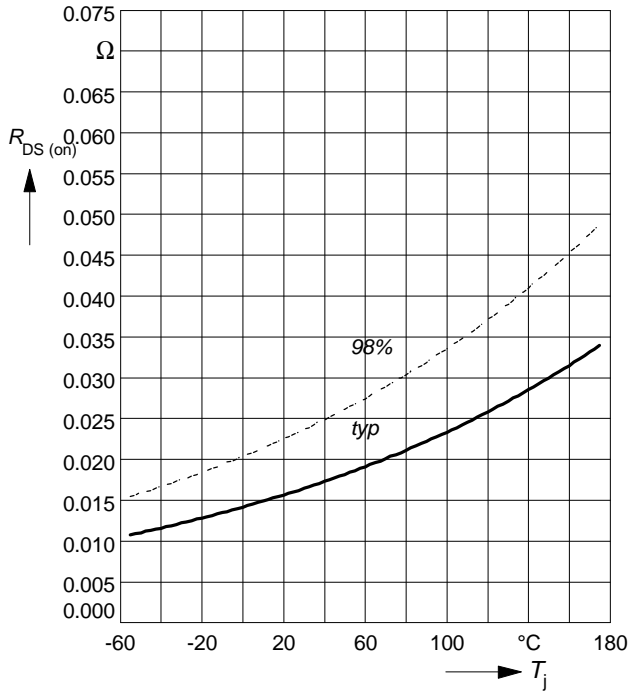
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



### Drain-source on-resistance

$$R_{DS(on)} = f(T_j)$$

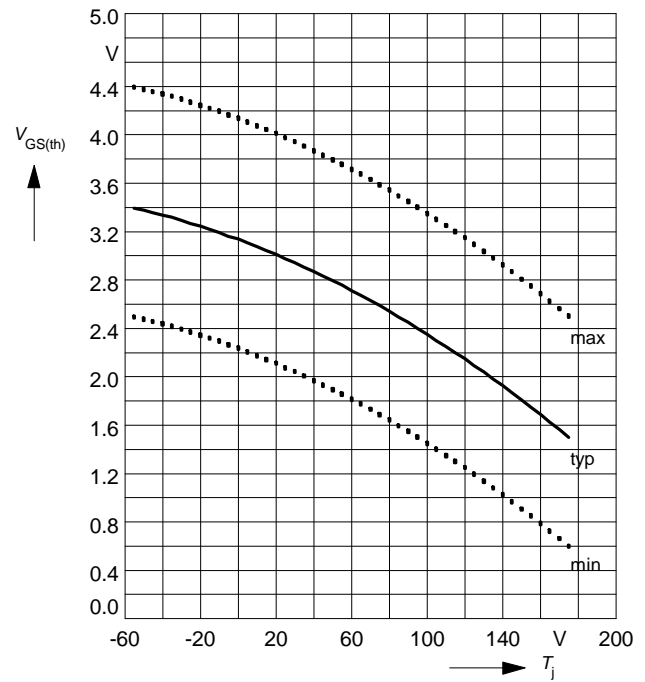
parameter:  $I_D = 37\text{ A}$ ,  $V_{GS} = 10\text{ V}$



### Gate threshold voltage

$$V_{GS(th)} = f(T_j)$$

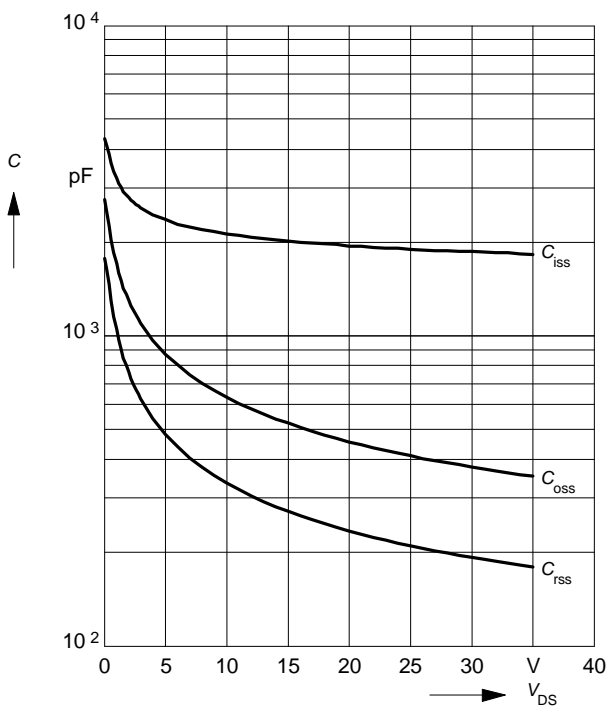
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 90\mu\text{A}$



### Typ. capacitances

$$C = f(V_{DS})$$

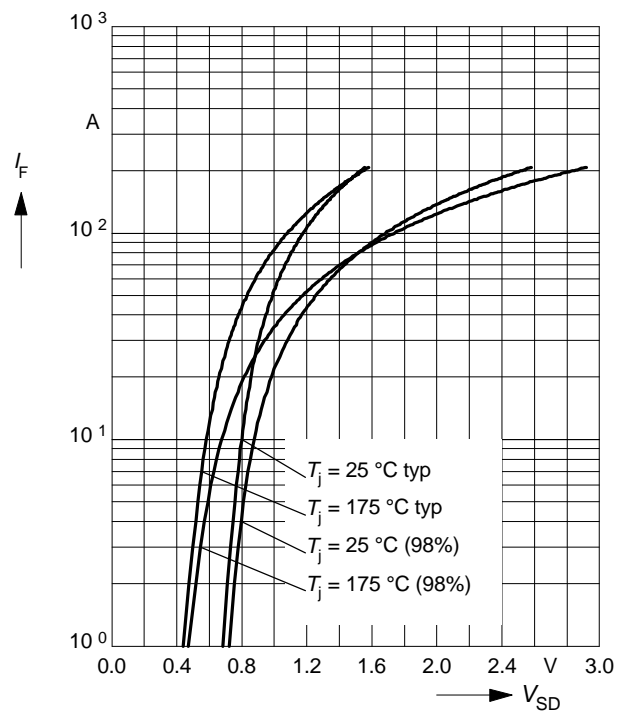
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



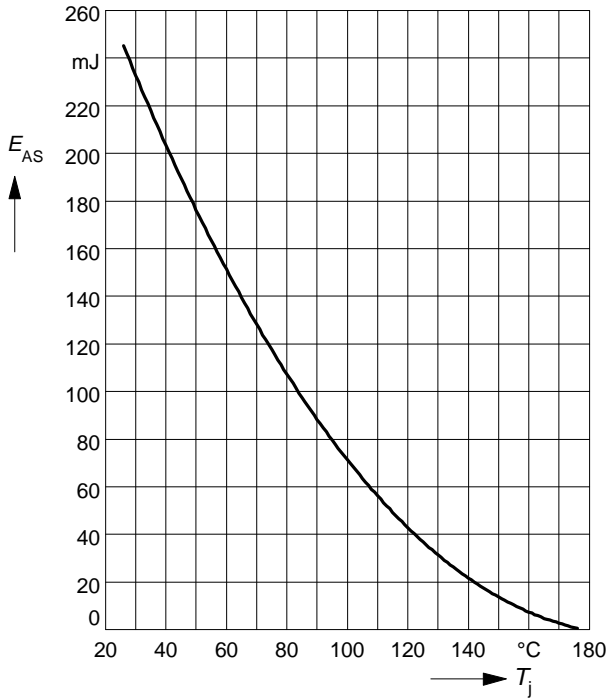
### Forward characteristics of reverse diode

$$I_F = f(V_{SD})$$

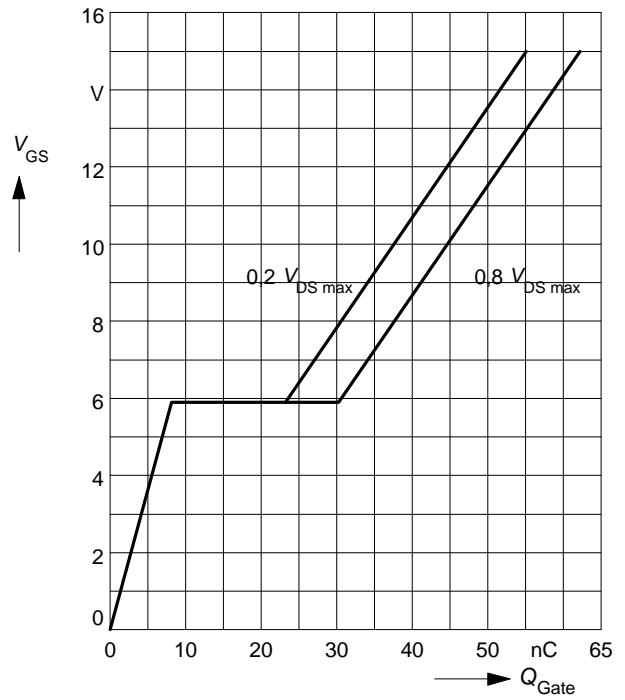
parameter:  $T_j$ ,  $t_p = 80\mu\text{ s}$



**Avalanche energy**  $E_{AS} = f(T_j)$   
 parameter:  $I_D = 52 \text{ A}$ ,  $V_{DD} = 25 \text{ V}$   
 $R_{GS} = 25 \Omega$ ,  $L = 181 \mu\text{H}$



**Typ. gate charge**  
 $V_{GS} = f(Q_{Gate})$   
 parameter:  $I_{D \text{ puls}} = 52 \text{ A}$



**Drain-source breakdown voltage**

$V_{(BR)DSS} = f(T_j)$

