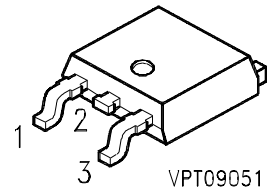
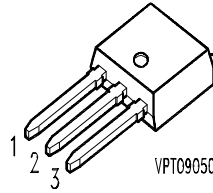


## SIPMOS<sup>®</sup> Power Transistor

- N channel
- Enhancement mode
- Logic Level
- Avalanche-rated
- dv/dt rated
- 175°C operating temperature



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
SPD28N05L	55 V	28 A	0.05 Ω	P-TO252	Q67040 - S4122 - A2
SPU28N05L	55 V	28 A	0.05 Ω	P-TO251	Q67040 - S4114 - A2

### Maximum Ratings

Parameter	Symbol	Values	Unit
Continuous drain current <i>T<sub>C</sub></i> = 25 °C <i>T<sub>C</sub></i> = 100 °C	<i>I<sub>D</sub></i>	28 20	A
Pulsed drain current <i>T<sub>C</sub></i> = 25 °C	<i>I<sub>Dpuls</sub></i>	112	
Avalanche energy, single pulse <i>I<sub>D</sub></i> = 28 A, <i>V<sub>DD</sub></i> = 25 V, <i>R<sub>GS</sub></i> = 25 Ω <i>L</i> = 357 μH, <i>T<sub>j</sub></i> = 25 °C	<i>E<sub>AS</sub></i>	140	mJ
Avalanche current, limited by <i>T<sub>jmax</sub></i>	<i>I<sub>AR</sub></i>	28	A
Avalanche energy, periodic limited by <i>T<sub>jmax</sub></i>	<i>E<sub>AR</sub></i>	7.5	mJ
Reverse diode dv/dt <i>I<sub>S</sub></i> = 30 A, <i>V<sub>DS</sub></i> = 40 V, <i>di<sub>F</sub>/dt</i> = 200 A/μs <i>T<sub>jmax</sub></i> = 175 °C	dv/dt	6	kV/μs
Gate source voltage	<i>V<sub>GS</sub></i>	± 14	V
Power dissipation <i>T<sub>C</sub></i> = 25 °C	<i>P<sub>tot</sub></i>	75	W

## Maximum Ratings

Parameter	Symbol	Values	Unit
Operating temperature	$T_j$	-55 ... + 175	°C
Storage temperature	$T_{stg}$	-55 ... + 175	
Thermal resistance, junction - case	$R_{thJC}$	≤ 2	K/W
Thermal resistance, junction - ambient (PCB mount)**	$R_{thJA}$	≤ 50	
Thermal resistance, junction - ambient	$R_{thJA}$	≤ 100	
IEC climatic category, DIN IEC 68-1		55 / 175 / 56	

\*\* when mounted on 1 " square PCB ( FR4 );for recommended footprint

## 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 $V_{GS} = 0 \text{ V}, I_D = 0.25 \text{ mA}, T_j = 25^\circ\text{C}$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage $V_{GS}=V_{DS}, I_D = 50 \mu\text{A}$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, T_j = -40^\circ\text{C}$ $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 25^\circ\text{C}$ $V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, T_j = 150^\circ\text{C}$	$I_{DSS}$	-	-	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 $V_{GS} = 4.5 \text{ V}, I_D = 20 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 20 \text{ A}$	$R_{DS(on)}$	-	0.04 0.025	0.05 0.03	

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

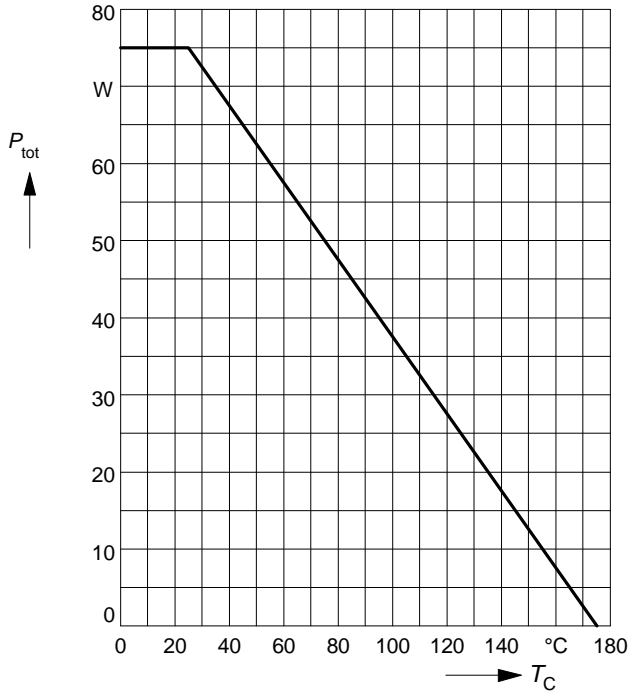
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Transconductance $V_{DS} \geq 2 * I_D * R_{DS(on)max}, I_D = 20 \text{ A}$	$g_{fs}$	10	20	-	S
Input capacitance $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$	$C_{iss}$	-	770	960	pF
Output capacitance $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$	$C_{oss}$	-	230	300	
Reverse transfer capacitance $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$	$C_{rss}$	-	130	165	
Turn-on delay time $V_{DD} = 30 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 28 \text{ A}$ $R_G = 6.8 \Omega$	$t_{d(on)}$	-	10	15	ns
Rise time $V_{DD} = 30 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 28 \text{ A}$ $R_G = 6.8 \Omega$	$t_r$	-	75	115	
Turn-off delay time $V_{DD} = 30 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 28 \text{ A}$ $R_G = 6.8 \Omega$	$t_{d(off)}$	-	30	45	
Fall time $V_{DD} = 30 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 28 \text{ A}$ $R_G = 6.8 \Omega$	$t_f$	-	20	30	
Gate charge at threshold $V_{DD} = 40 \text{ V}, I_D \geq 0.1 \text{ A}, V_{GS} = 0 \text{ to } 1 \text{ V}$	$Q_{g(th)}$	-	1	1.5	nC
Gate charge at 5.0 V $V_{DD} = 40 \text{ V}, I_D = 28 \text{ A}, V_{GS} = 0 \text{ to } 5 \text{ V}$	$Q_{g(5)}$	-	20	30	
Gate charge total $V_{DD} = 40 \text{ V}, I_D = 28 \text{ A}, V_{GS} = 0 \text{ to } 10 \text{ V}$	$Q_{g(total)}$	-	32	50	
Gate plateau voltage $V_{DD} = 40 \text{ V}, I_D = 28 \text{ A}$	$V_{(plateau)}$	-	4	-	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 $T_C = 25^\circ\text{C}$	$I_S$	-	-	28	A
Inverse diode direct current, pulsed $T_C = 25^\circ\text{C}$	$I_{SM}$	-	-	112	
Inverse diode forward voltage $V_{GS} = 0\text{ V}, I_F = 56\text{ A}$	$V_{SD}$	-	1.1	1.8	V
Reverse recovery time $V_R = 30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	60	90	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

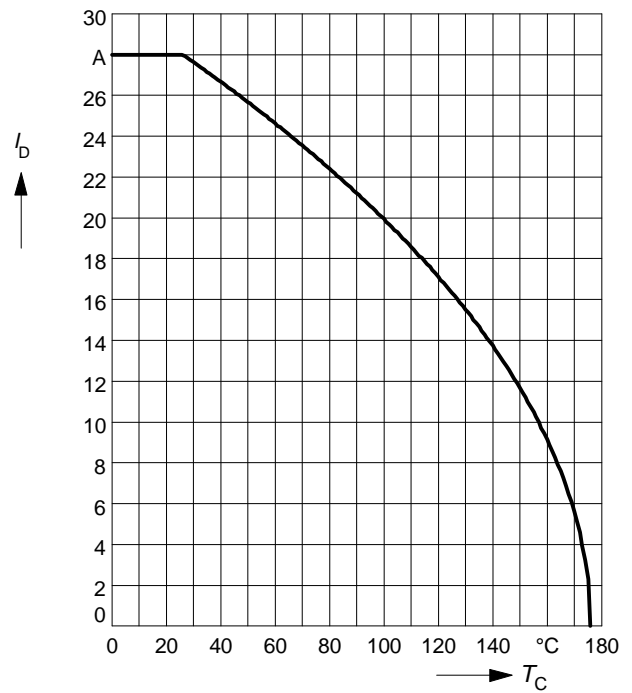
$$P_{\text{tot}} = f(T_C)$$



### Drain current

$$I_D = f(T_C)$$

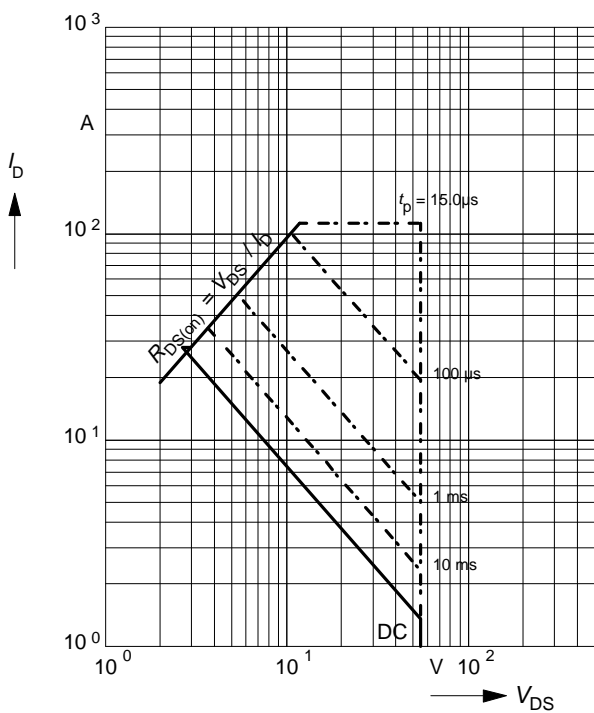
parameter:  $V_{GS} \geq 4 \text{ V}$



### Safe operating area

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

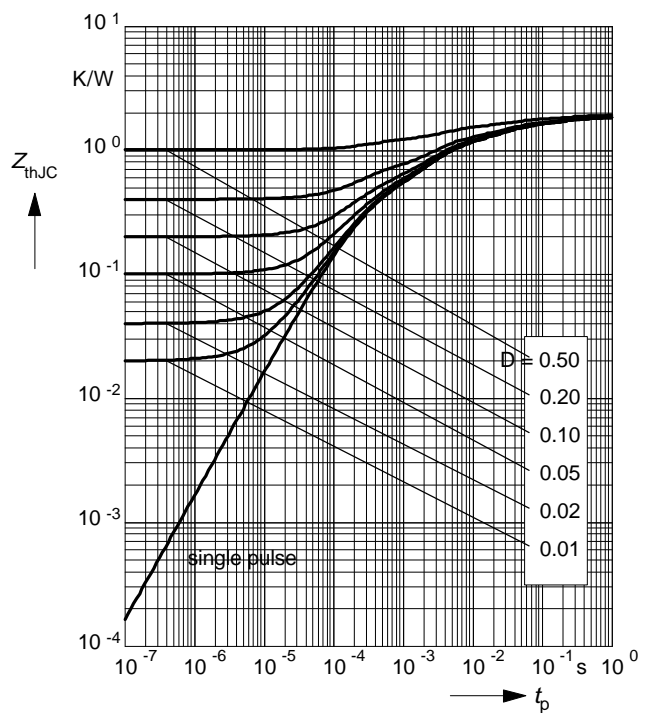
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



### Transient thermal impedance

$$Z_{\text{thJC}} = f(t_p)$$

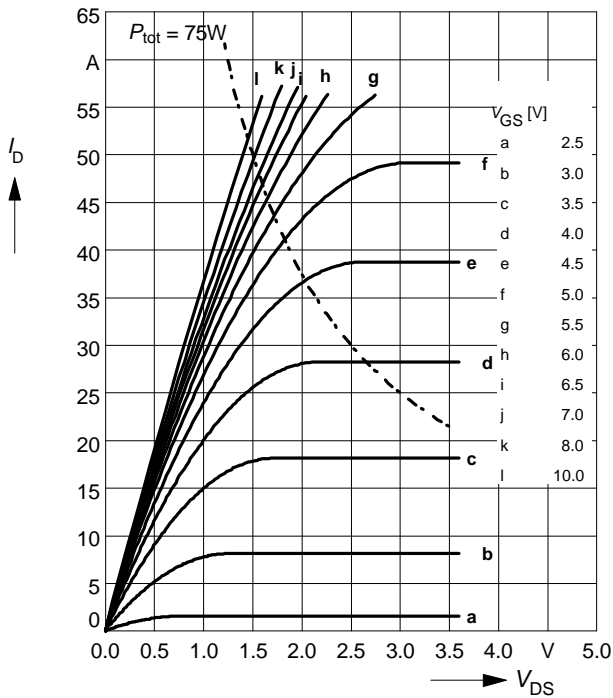
parameter:  $D = t_p / T$



### Typ. output characteristics

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

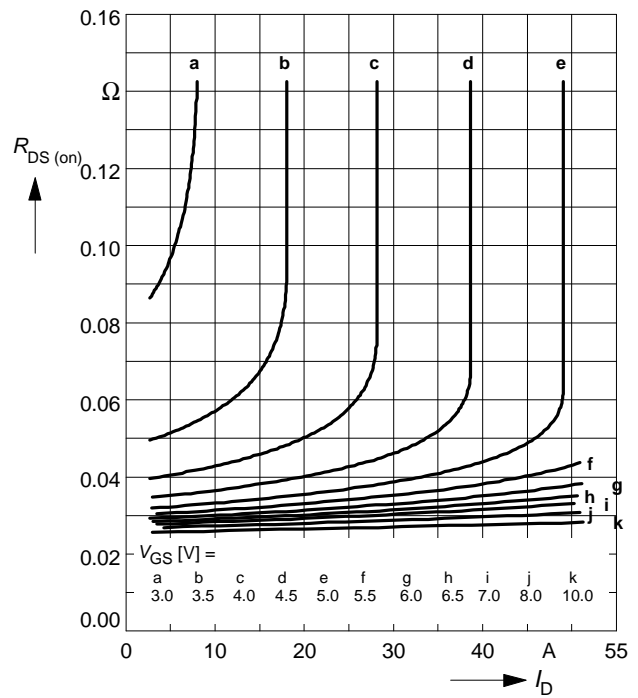
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



### Typ. drain-source on-resistance

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

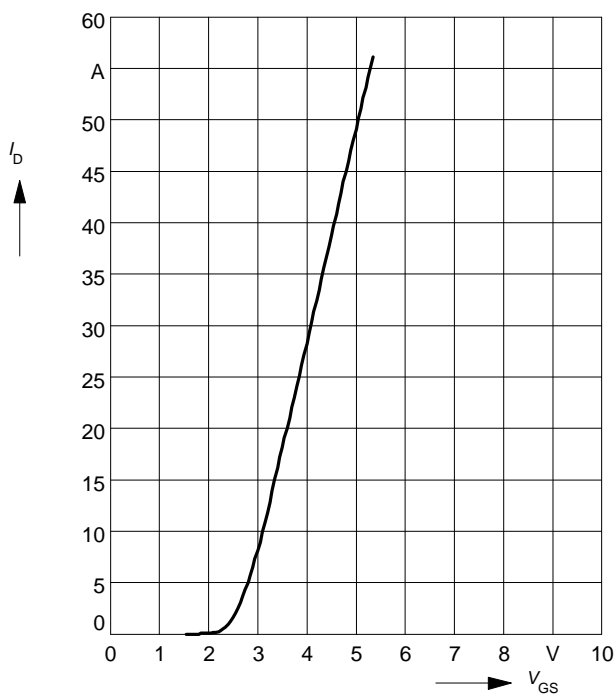
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



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

parameter:  $t_p = 80 \mu s$

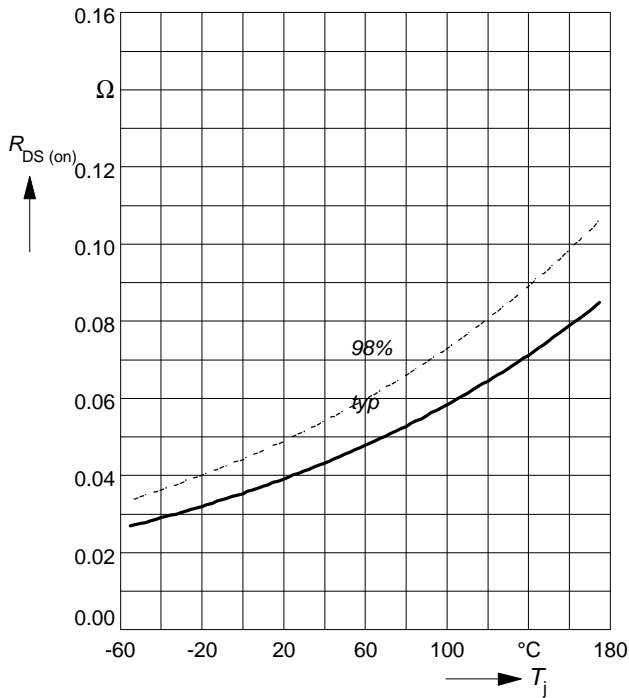
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



### Drain-source on-resistance

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

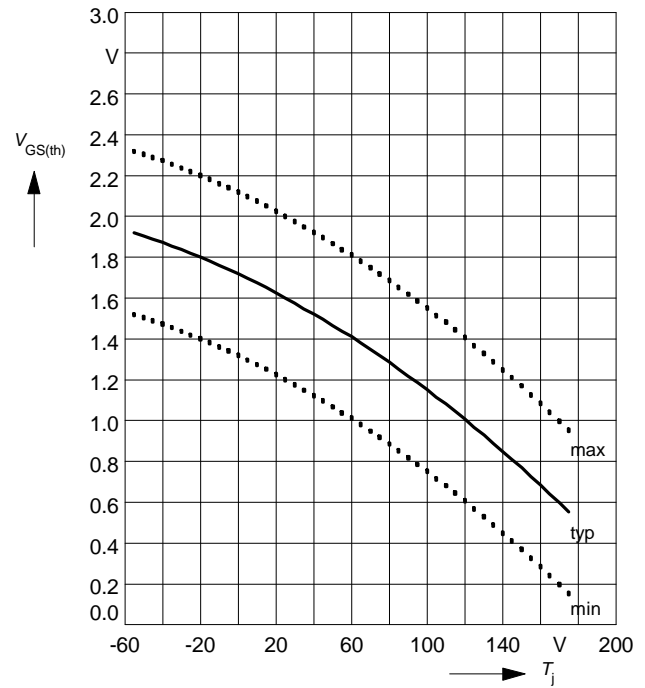
parameter:  $I_D = 20\text{ A}$ ,  $V_{GS} = 4.5\text{ V}$



### Gate threshold voltage

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

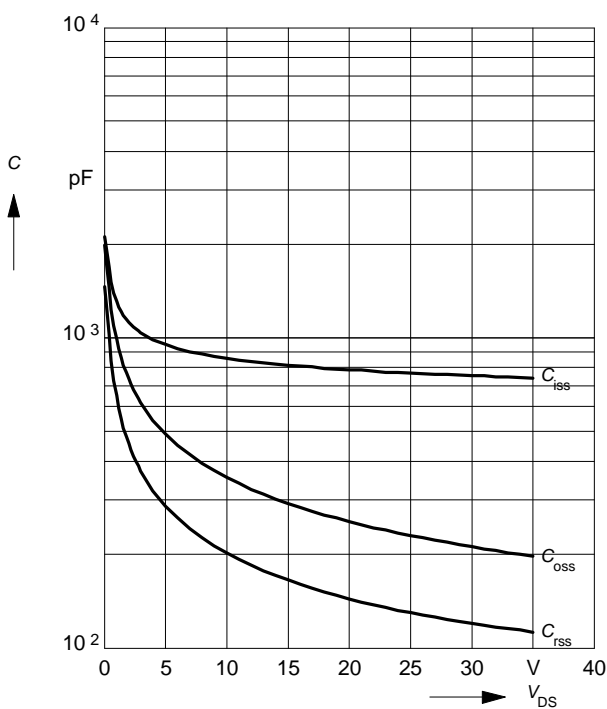
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = 50\mu\text{A}$



### Typ. capacitances

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

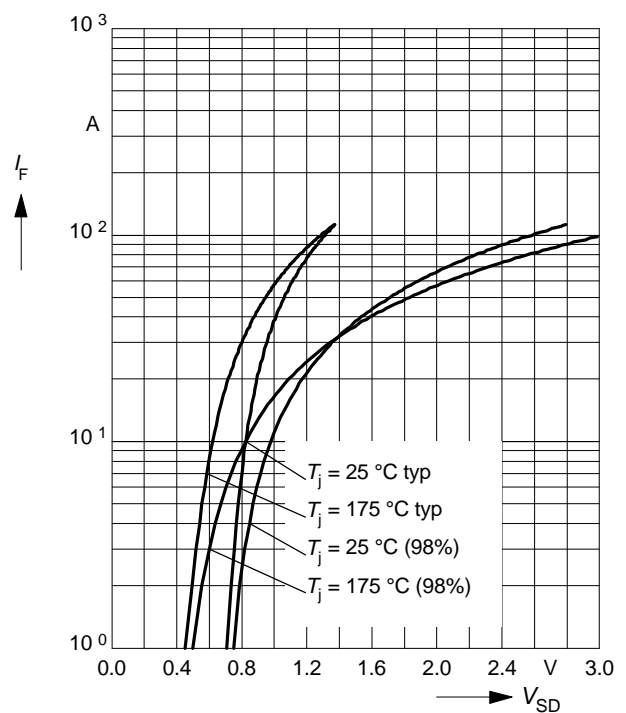
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



### Forward characteristics of reverse diode

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

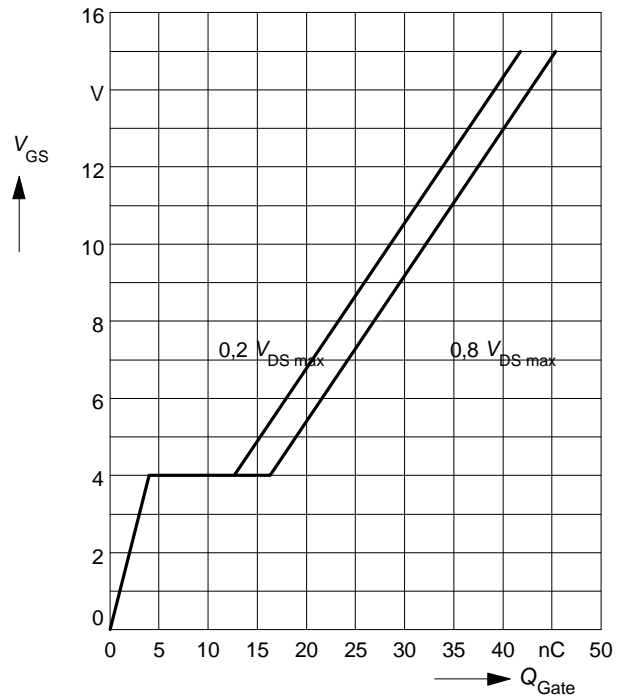
parameter:  $T_j$ ,  $t_p = 80\mu\text{ s}$



### Typ. gate charge

$$V_{GS} = f(Q_{Gate})$$

parameter:  $I_{D\ puls} = 28\ A$



### Drain-source breakdown voltage

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

