

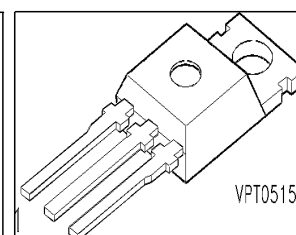
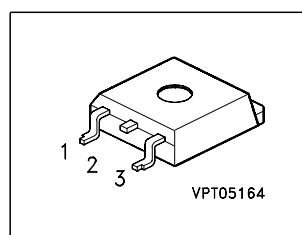
### SIPMOS® Power Transistor

#### Features

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

#### Product Summary

Drain source voltage	$V_{DS}$	30	V
Drain-Source on-state resistance	$R_{DS(on)}$	0.015	$\Omega$
Continuous drain current	$I_D$	46	A



Type	Package	Ordering Code	Packaging
SPP46N03	P-TO220-3-1	Q67040-S4742-A2	Tube
SPB46N03	P-TO263-3-2	Q67040-S4145-A3	Tape and Reel

Pin 1	Pin 2	Pin 3
G	D	S

#### Maximum Ratings, at $T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25\text{ °C}$ , <sup>1)</sup> $T_C = 100\text{ °C}$	$I_D$	46 46	A
Pulsed drain current $T_C = 25\text{ °C}$	$I_{Dpulse}$	184	
Avalanche energy, single pulse $I_D = 46\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$	$E_{AS}$	250	mJ
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	12	
Reverse diode $dv/dt$ $I_S = 46\text{ A}$ , $V_{DS} = 24\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ , $T_{jmax} = 175\text{ °C}$	$dv/dt$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C = 25\text{ °C}$	$P_{tot}$	120	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	°C
IEC climatic category; DIN IEC 68-1		55/175/56	

### Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	$R_{thJC}$	-		1.25	K/W
Thermal resistance, junction - ambient, leded	$R_{thJA}$	-	-	62	
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	62	
@ 6 cm <sup>2</sup> cooling area <sup>2)</sup>		-	-	40	

### Electrical Characteristics, at $T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain- source breakdown voltage $V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 80\text{ }\mu\text{A}$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS} = 30\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ }^{\circ}\text{C}$ $V_{DS} = 30\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150\text{ }^{\circ}\text{C}$	$I_{DSS}$		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	nA
Drain-Source on-state resistance $V_{GS} = 10\text{ V}$ , $I_D = 46\text{ A}$	$R_{DS(on)}$	-	0.009	0.015	$\Omega$

<sup>1</sup> current limited by bond wire

<sup>2</sup> Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 46$ A	$g_{fs}$	20	39	-	S
Input capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	$C_{iss}$	-	1400	1750	pF
Output capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	$C_{oss}$	-	645	810	
Reverse transfer capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	$C_{rss}$	-	260	325	
Turn-on delay time $V_{DD} = 15$ V, $V_{GS} = 10$ V, $I_D = 46$ A, $R_G = 6.8 \Omega$	$t_{d(on)}$	-	13	20	ns
Rise time $V_{DD} = 15$ V, $V_{GS} = 10$ V, $I_D = 46$ A, $R_G = 6.8 \Omega$	$t_r$	-	24	36	
Turn-off delay time $V_{DD} = 15$ V, $V_{GS} = 10$ V, $I_D = 46$ A, $R_G = 6.8 \Omega$	$t_{d(off)}$	-	27	42	
Fall time $V_{DD} = 15$ V, $V_{GS} = 10$ V, $I_D = 46$ A, $R_G = 6.8 \Omega$	$t_f$	-	24	36	

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

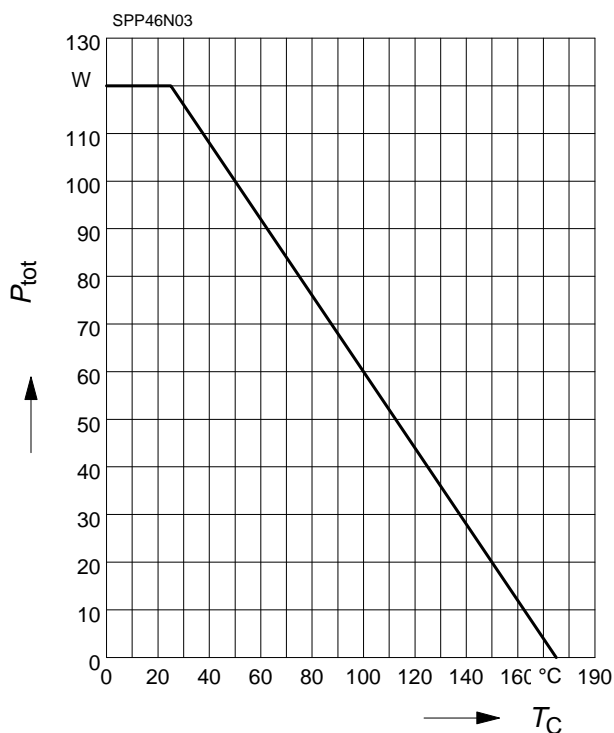
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Gate to source charge $V_{DD} = 24\text{ V}$ , $I_D = 46\text{ A}$	$Q_{gs}$	-	7	11	nC
Gate to drain charge $V_{DD} = 24\text{ V}$ , $I_D = 46\text{ A}$	$Q_{gd}$	-	19	28.5	
Gate charge total $V_{DD} = 24\text{ V}$ , $I_D = 46\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$	$Q_g$	-	39	60	
Gate plateau voltage $V_{DD} = 24\text{ V}$ , $I_D = 46\text{ A}$	$V_{(plateau)}$	-	5.5	-	V

### Reverse Diode

Inverse diode continuous forward current $T_C = 25\text{ °C}$	$I_S$	-	-	46	A
Inverse diode direct current,pulsed $T_C = 25\text{ °C}$	$I_{SM}$	-	-	184	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$ , $I_F = 92\text{ A}$	$V_{SD}$	-	1.06	1.7	V
Reverse recovery time $V_R = 15\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	40	60	ns
Reverse recovery charge $V_R = 15\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	0.04	0.06	$\mu\text{C}$

### Power Dissipation

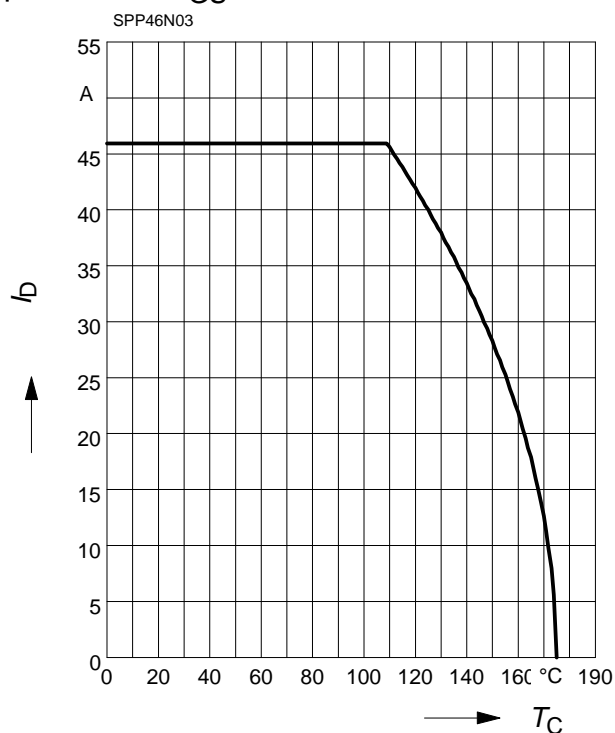
$$P_{\text{tot}} = f(T_C)$$



### Drain current

$$I_D = f(T_C)$$

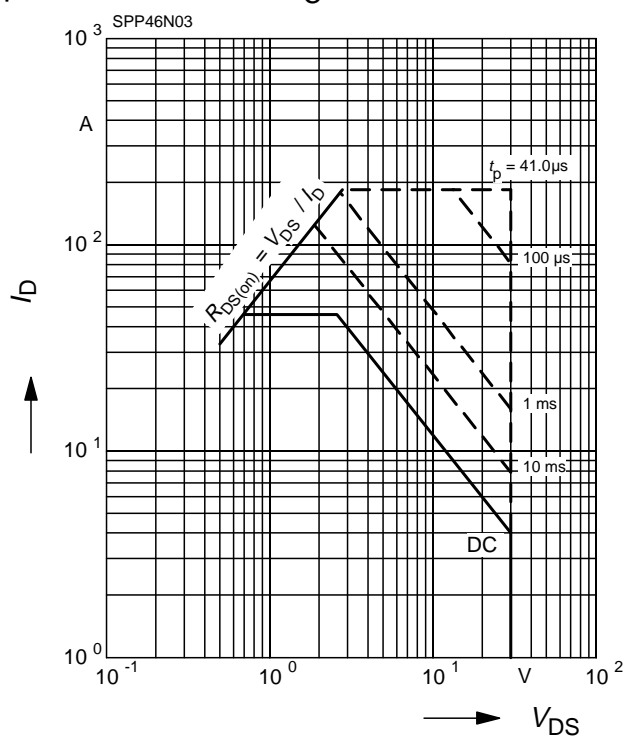
parameter:  $V_{\text{GS}} \geq 10 \text{ V}$



### Safe operating area

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

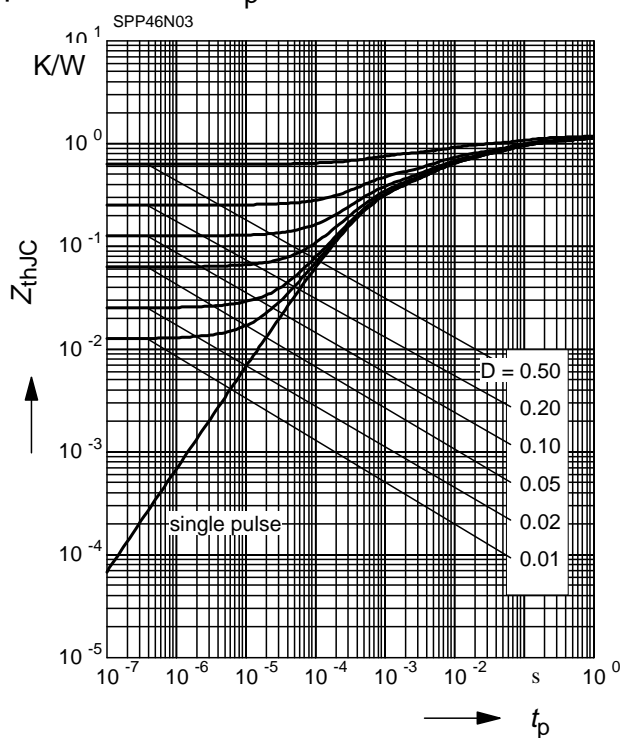
parameter:  $D = 0$ ,  $T_C = 25^{\circ}\text{C}$



### Transient thermal impedance

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

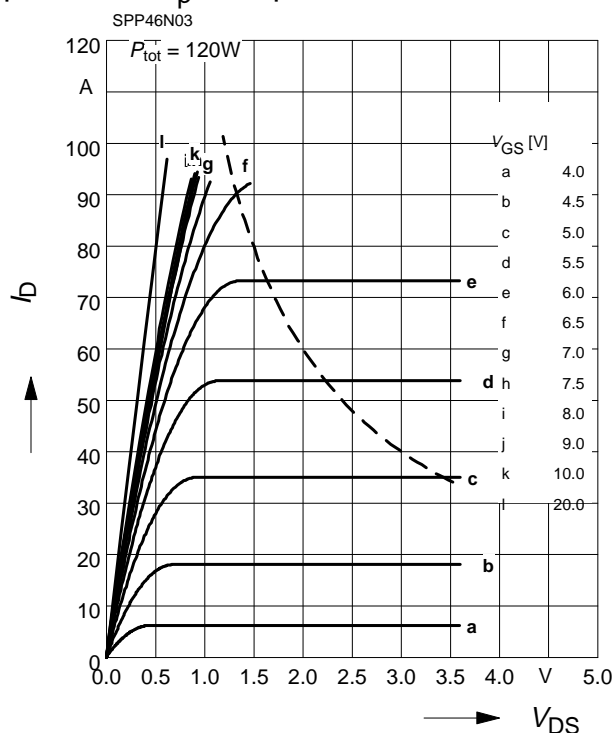
parameter:  $D = t_p / T$



### Typ. output characteristics

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

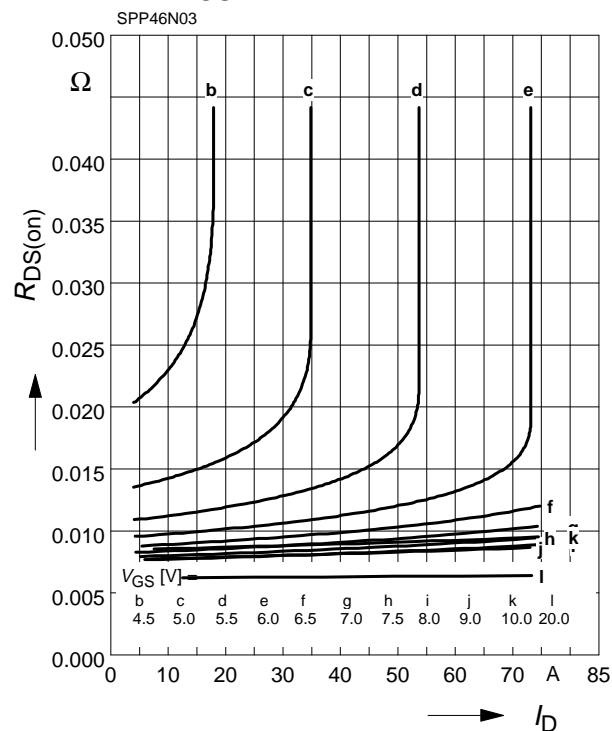
parameter:  $t_p = 80 \mu s$



### Typ. drain-source-on-resistance

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

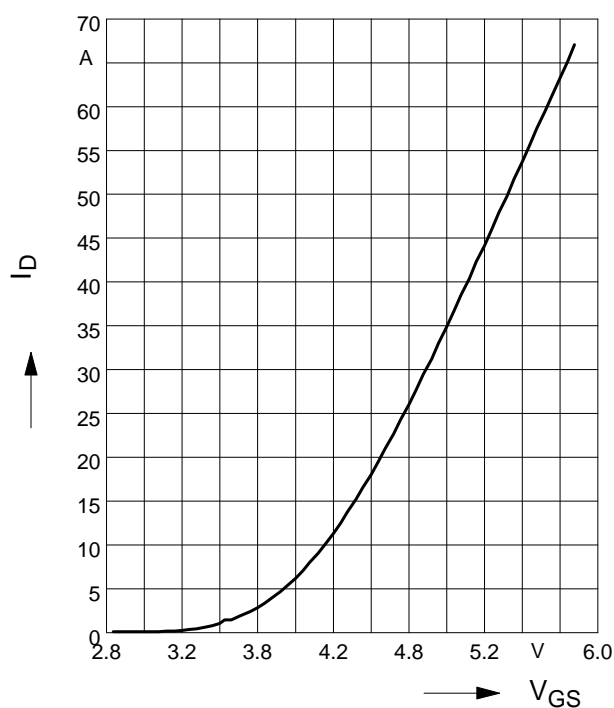
parameter:  $V_{GS}$



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

parameter:  $t_p = 80 \mu s$

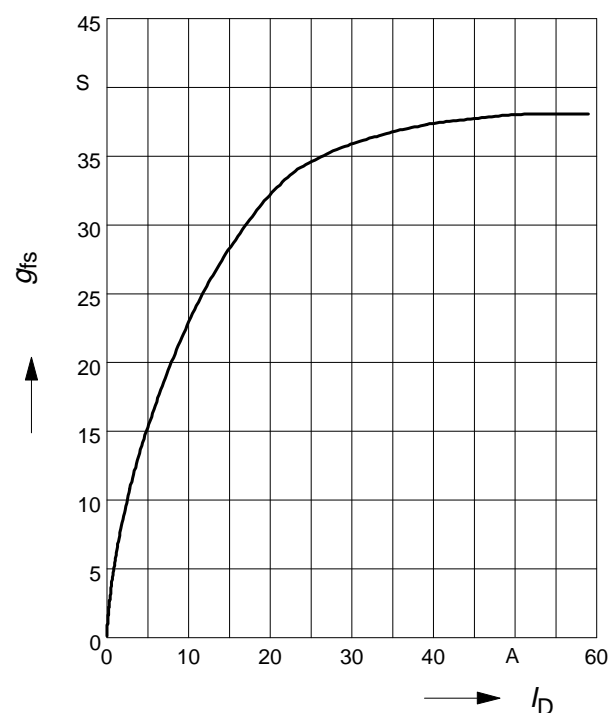
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



### Typ. forward transconductance

$$g_{fs} = f(I_D); T_j = 25^\circ C$$

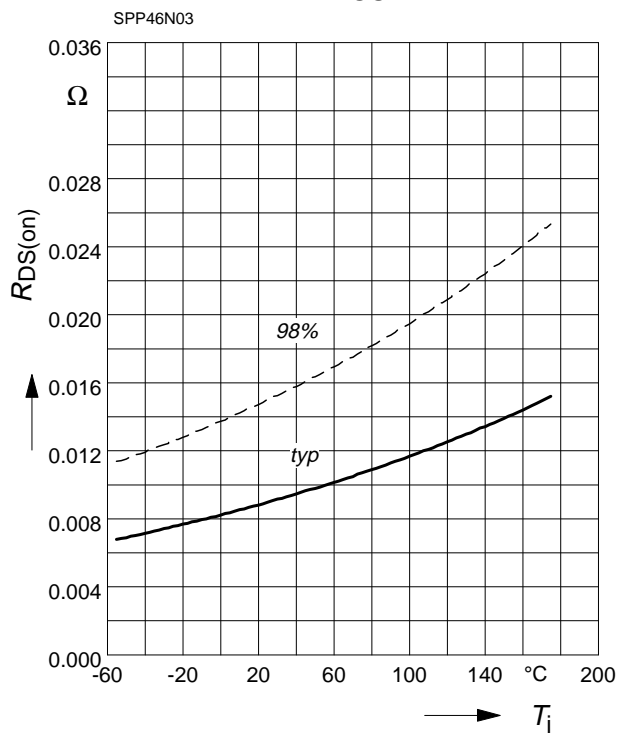
parameter:  $g_{fs}$



### Drain-source on-resistance

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

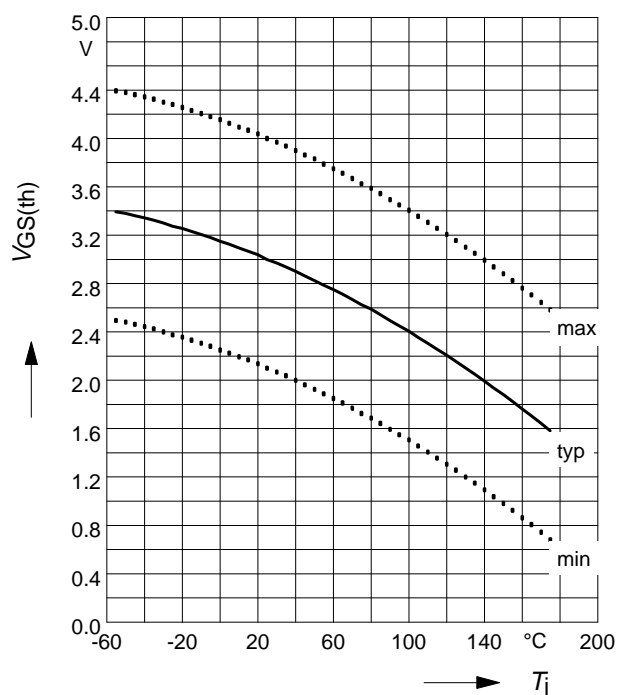
parameter :  $I_D = 46 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



### Gate threshold voltage

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

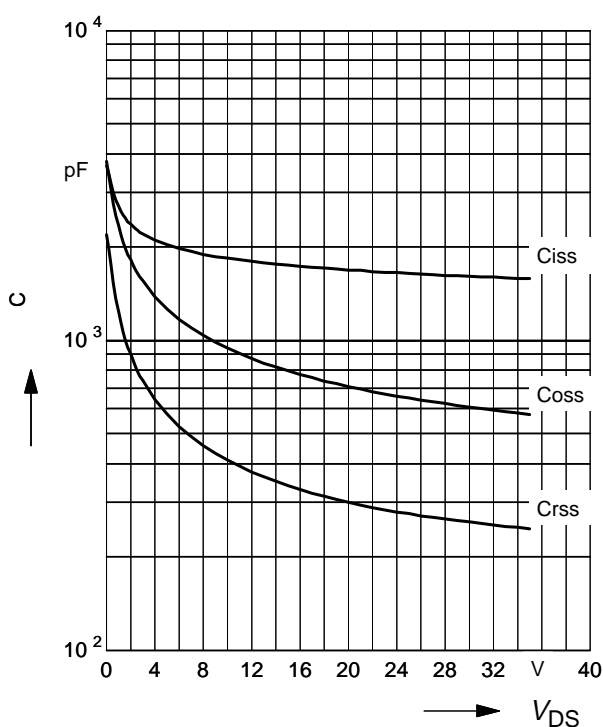
parameter :  $V_{GS} = V_{DS}$ ,  $I_D = 80 \mu\text{A}$



### Typ. capacitances

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

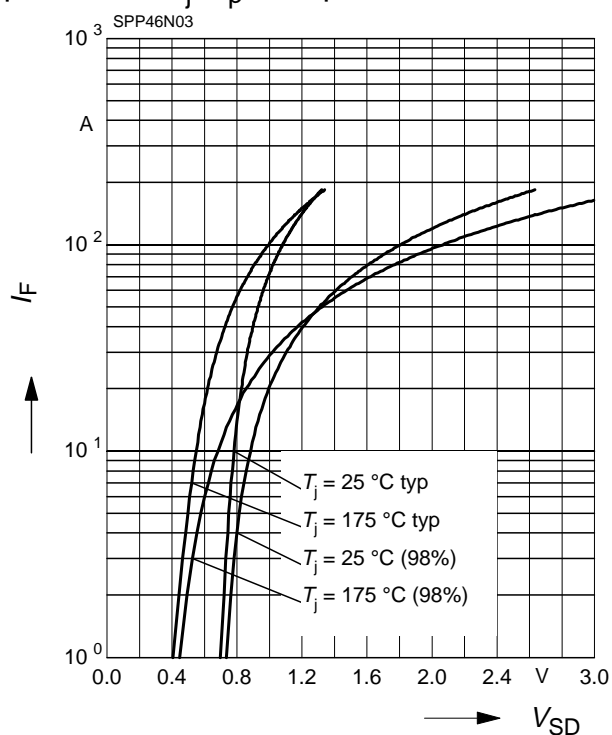
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



### Forward characteristics of reverse diode

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

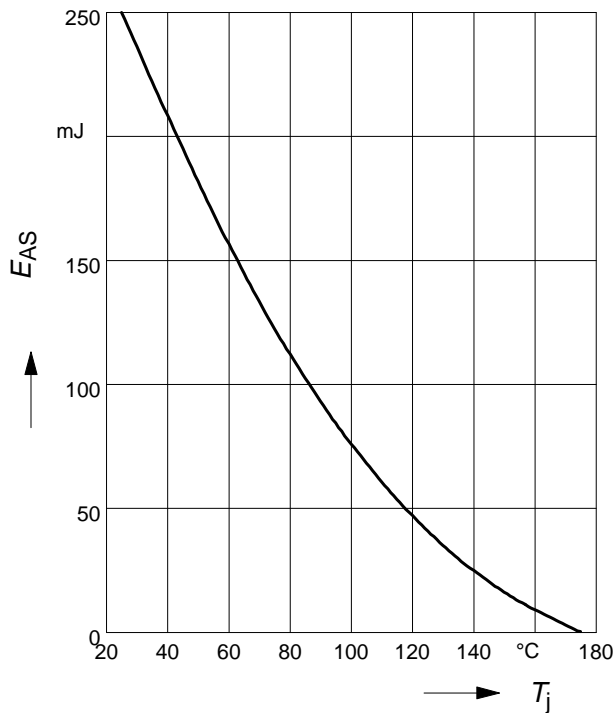
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**Avalanche Energy**  $E_{AS} = f(T_j)$

parameter:  $I_D = 46 \text{ A}$ ,  $V_{DD} = 25 \text{ V}$

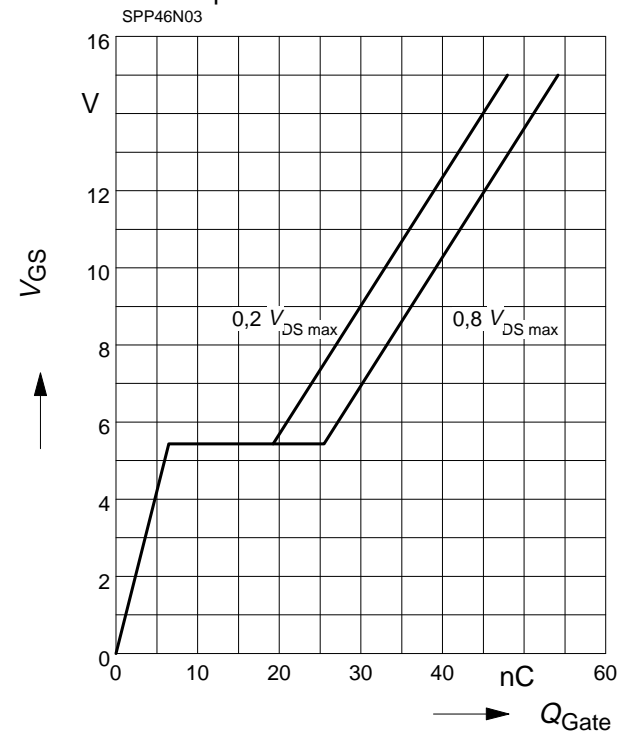
$R_{GS} = 25 \Omega$



**Typ. gate charge**

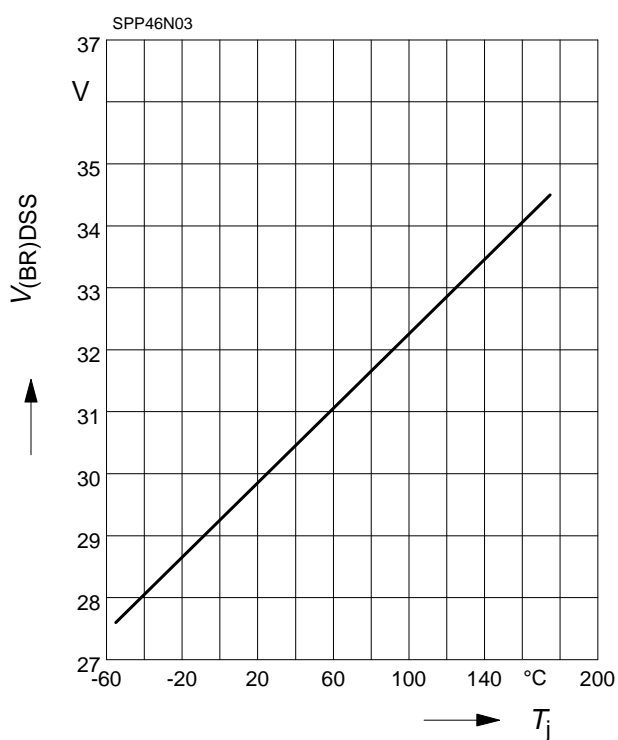
$V_{GS} = f(Q_{Gate})$

parameter:  $I_{D \text{ puls}} = 46 \text{ A}$



**Drain-source breakdown voltage**

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





**Edition 02 / 1999**

**Published by Siemens AG,  
Bereich Halbleiter Vertrieb,  
Werbung, Balanstraße 73,  
81541 München**

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