

## OptiMOS® Power-Transistor

### Feature

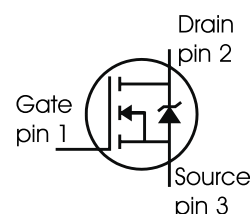
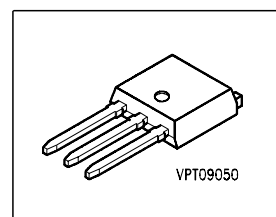
- N-Channel
- Logic Level
- Low on-resistance  $R_{DS(on)}$
- Excellent Gate Charge x  $R_{DS(on)}$  product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- dv/dt rated
- Ideal for fast switching applications

Type	Package	Ordering Code	Marking
SPU30N03S2L-10	P-TO251	Q67042-S4042	2N03L10

### Product Summary

$V_{DS}$	30	V
$R_{DS(on)}$	10	mΩ
$I_D$	30	A

P-TO251



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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C=25^\circ\text{C}, ^{1)}$ $T_C=100^\circ\text{C}$	$I_D$	30 30	A
Pulsed drain current $T_C=25^\circ\text{C}$	$I_{D \text{ puls}}$	120	
Avalanche energy, single pulse $I_D=30 \text{ A}$ , $V_{DD}=25\text{V}$ , $R_{GS}=25\Omega$	$E_{AS}$	150	mJ
Reverse diode dv/dt $I_S=30\text{A}$ , $V_{DS}=24\text{V}$ , $di/dt=200\text{A}/\mu\text{s}$ , $T_{j\text{max}}=175^\circ\text{C}$	dv/dt	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C=25^\circ\text{C}$	$P_{\text{tot}}$	82	W
Operating and storage temperature	$T_j$ , $T_{\text{stg}}$	-55... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/175/56	

## Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	$R_{thJC}$	-	-	1.8	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$	-	-	100	
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	75	
@ 6 cm <sup>2</sup> cooling area <sup>2)</sup>		-	-	50	

## 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 $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=50\mu A$	$V_{GS(th)}$	1.2	1,6	2	
Zero gate voltage drain current $V_{DS}=30V, V_{GS}=0V, T_j=25^{\circ}C$ $V_{DS}=30V, V_{GS}=0V, T_j=125^{\circ}C$	$I_{DSS}$	- -	0.01 10	1 100	$\mu A$
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	$I_{GSS}$	-	1	100	
Drain-source on-state resistance $V_{GS}=4.5V, I_D=30A$	$R_{DS(on)}$	-	11.6	14.6	m $\Omega$
Drain-source on-state resistance $V_{GS}=10V, I_D=30A$	$R_{DS(on)}$	-	8.1	10	

<sup>1</sup>Current limited by bondwire; with a  $R_{thJC} = 1.8 \text{ K/W}$  the chip is able to carry  $I_D = 64\text{A}$  and calculated with max. source pin temperature of  $85^\circ\text{C}$ .

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

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

### Dynamic Characteristics

Transconductance	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 30\text{A}$	23.8	47.5	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	-	1170	1460	pF
Output capacitance	$C_{oss}$		-	490	610	
Reverse transfer capacitance	$C_{rss}$		-	125	155	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15\text{V}$ , $V_{GS} = 10\text{V}$ , $I_D = 30\text{A}$ , $R_G = 5.4\Omega$	-	6.1	9.2	ns
Rise time	$t_r$		-	63	94	
Turn-off delay time	$t_{d(off)}$		-	27	41	
Fall time	$t_f$		-	17	26	

### Gate Charge Characteristics

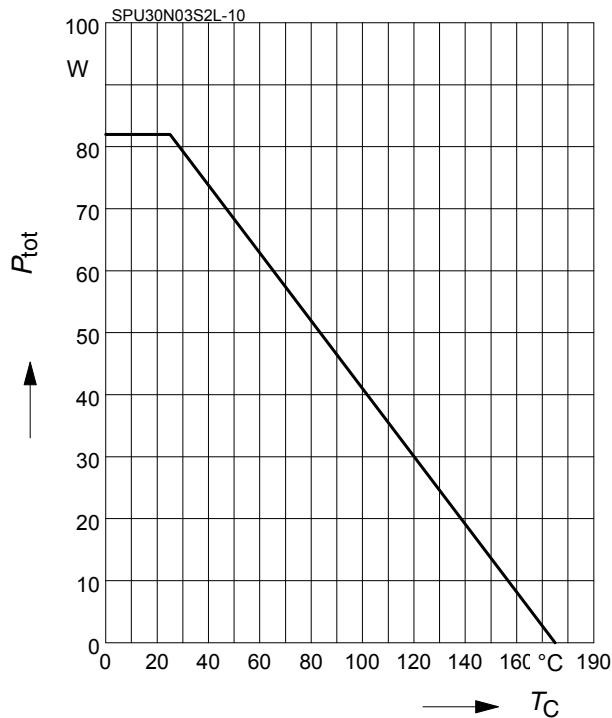
Gate to source charge	$Q_{gs}$	$V_{DD} = 24\text{V}$ , $I_D = 30\text{A}$	-	3.8	4.3	nC
Gate to drain charge	$Q_{gd}$		-	10.8	16.2	
Gate charge total	$Q_g$	$V_{DD} = 24\text{V}$ , $I_D = 30\text{A}$ , $V_{GS} = 0 \text{ to } 10\text{V}$	-	31.5	39.4	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 24\text{V}$ , $I_D = 30\text{A}$	-	3.4	-	V

### Reverse Diode

Inverse diode continuous forward current	$I_S$	$T_C = 25^\circ\text{C}$	-	-	30	A
Inverse diode direct current, pulsed	$I_{SM}$		-	-	120	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0\text{V}$ , $I_F = 30\text{A}$	-	0.9	1.2	V
Reverse recovery time	$t_{rr}$	$V_R = -V$ , $I_F = I_S$ , $di_F/dt = 100\text{A}/\mu\text{s}$	-	25.5	38	ns
Reverse recovery charge	$Q_{rr}$		-	26.5	40	nC

### 1 Power dissipation

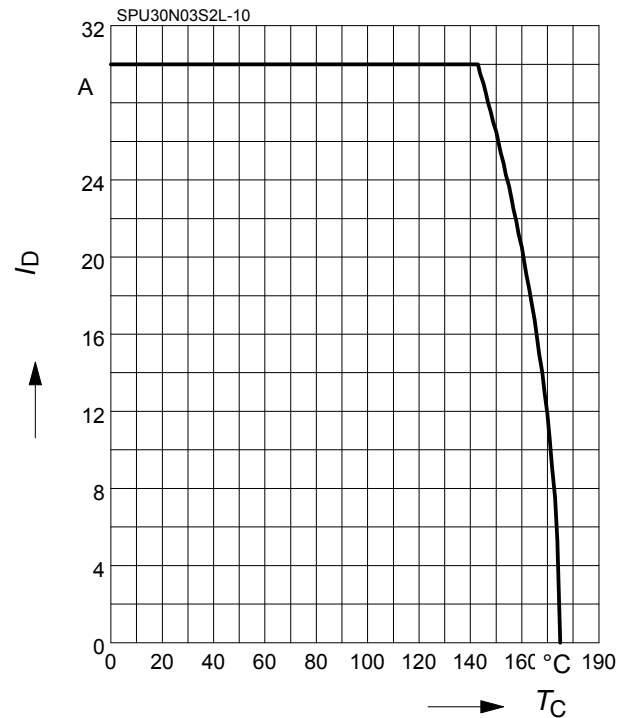
$$P_{\text{tot}} = f(T_C)$$



### 2 Drain current

$$I_D = f(T_C)$$

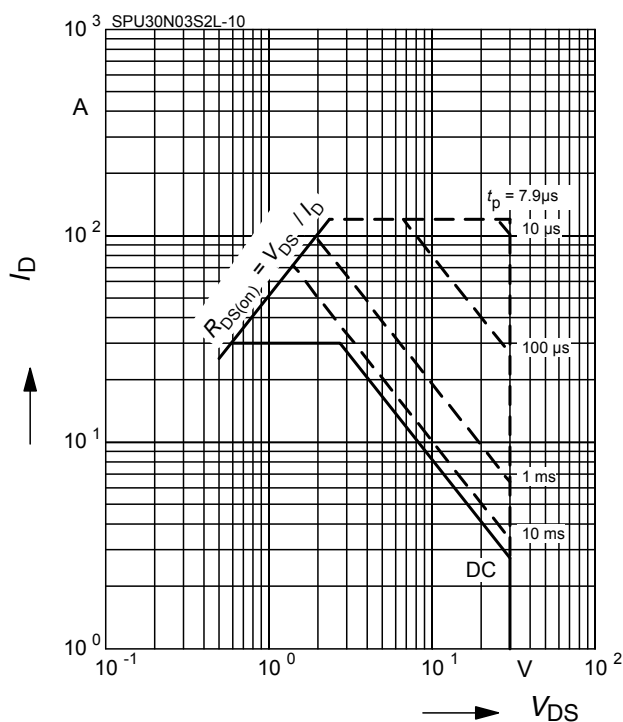
parameter:  $V_{GS} \geq 10$  V



### 3 Safe operating area

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

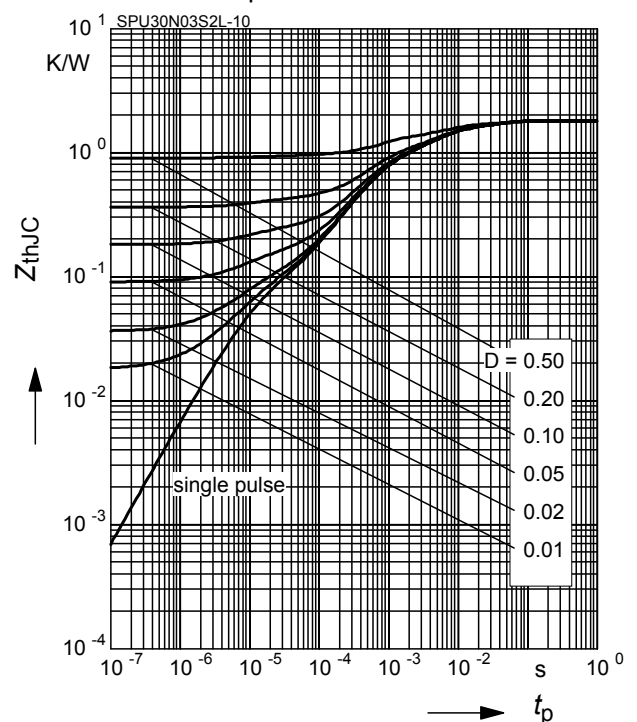
parameter:  $D = 0$ ,  $T_C = 25$  °C



### 4 Transient thermal impedance

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

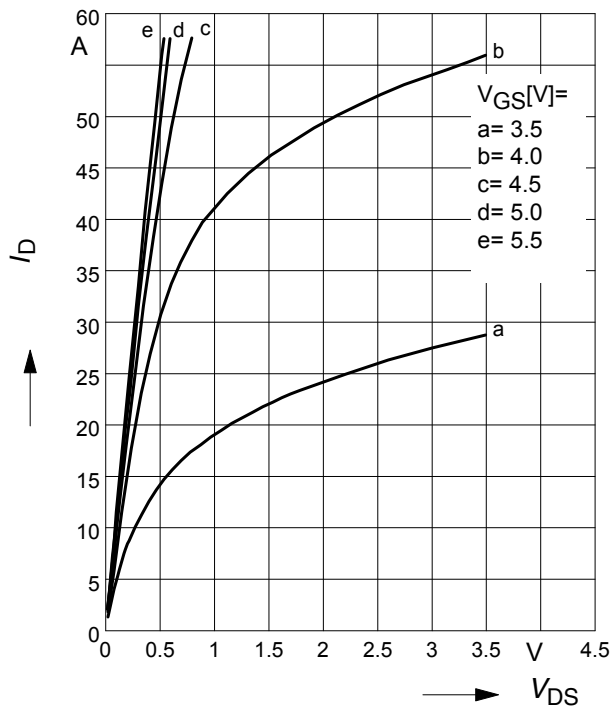
parameter:  $D = t_p / T$



### 5 Typ. output characteristic

$$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$$

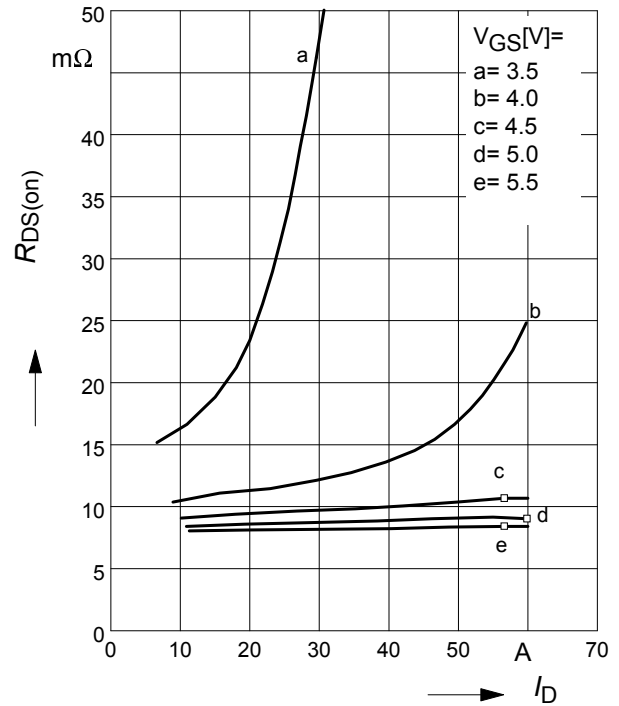
parameter:  $t_p = 80 \mu\text{s}$



### 6 Typ. drain-source on resistance

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

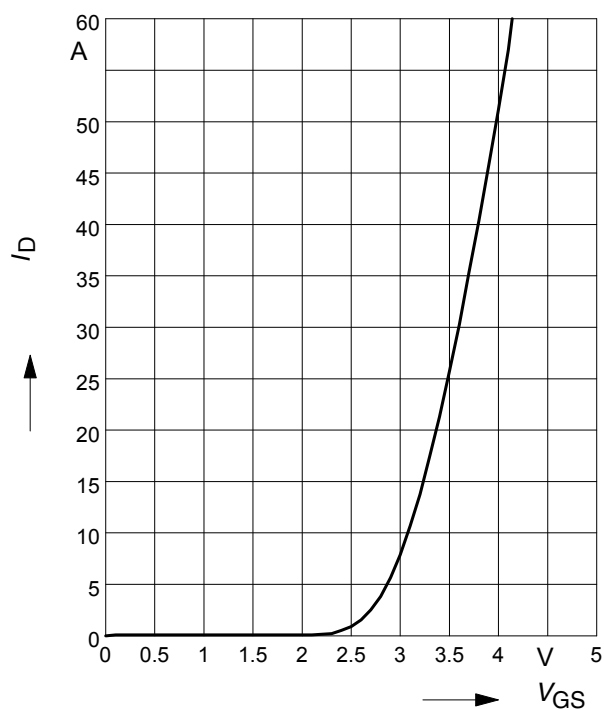
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

$$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$

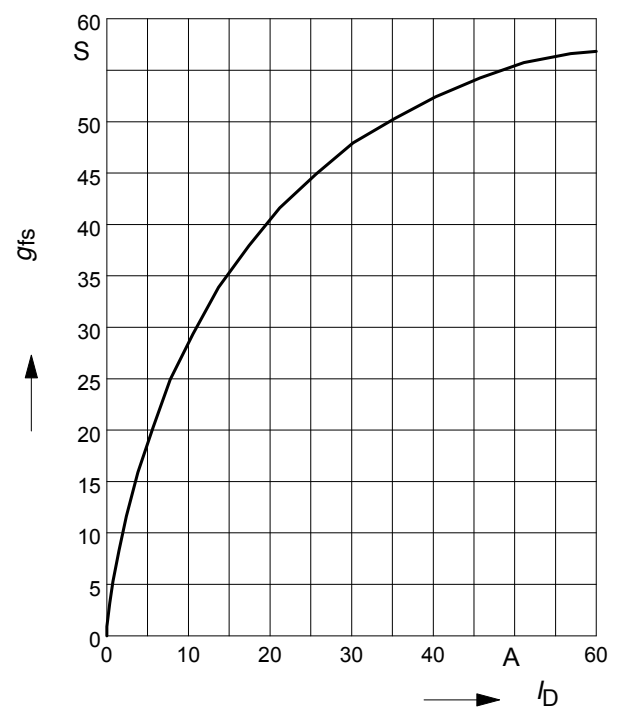
parameter:  $t_p = 80 \mu\text{s}$



### 8 Typ. forward transconductance

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

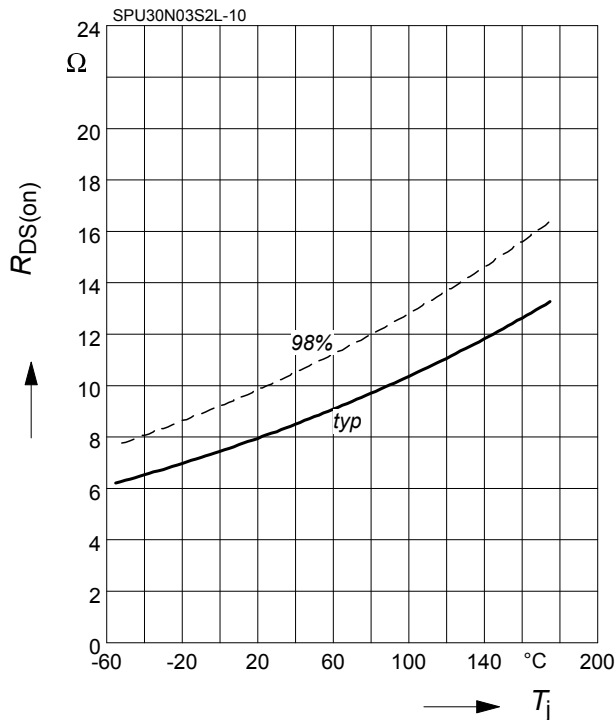
parameter:  $g_{fs}$



## 9 Drain-source on-state resistance

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

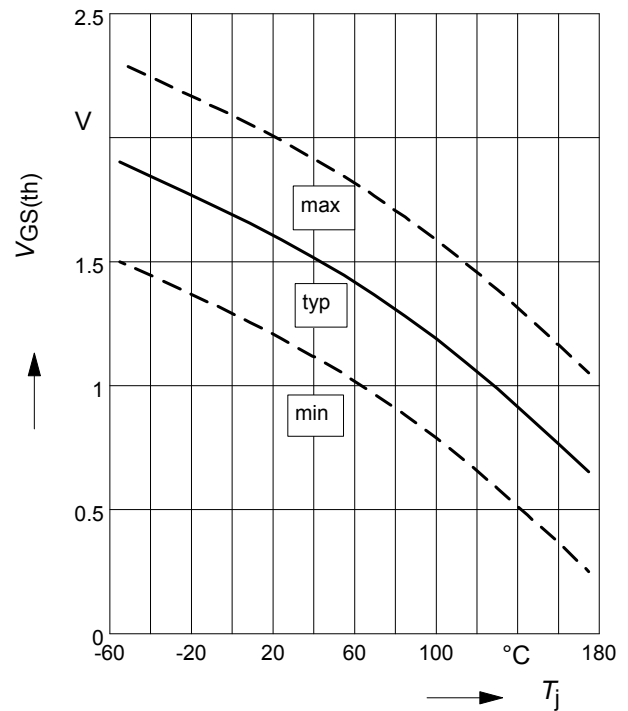
parameter:  $I_D = 30\text{ A}$ ,  $V_{GS} = 10\text{ V}$



## 10 Typ. gate threshold voltage

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

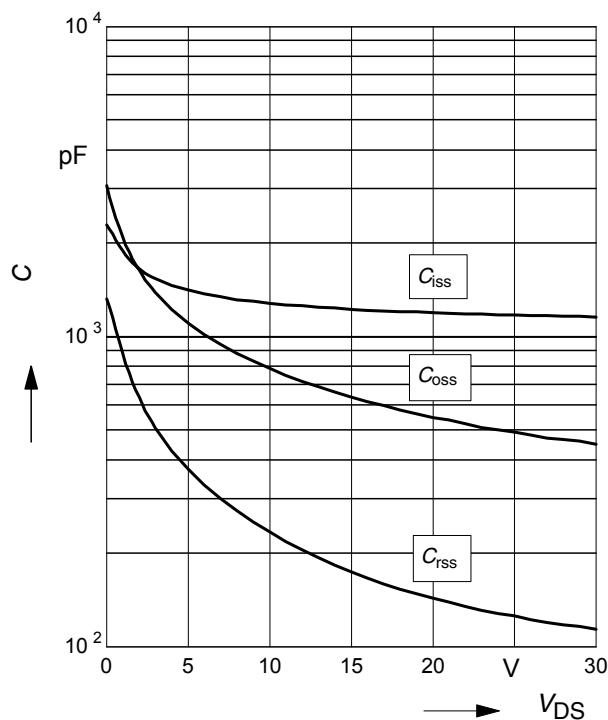
parameter:  $V_{GS} = V_{DS}$



## 11 Typ. capacitances

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

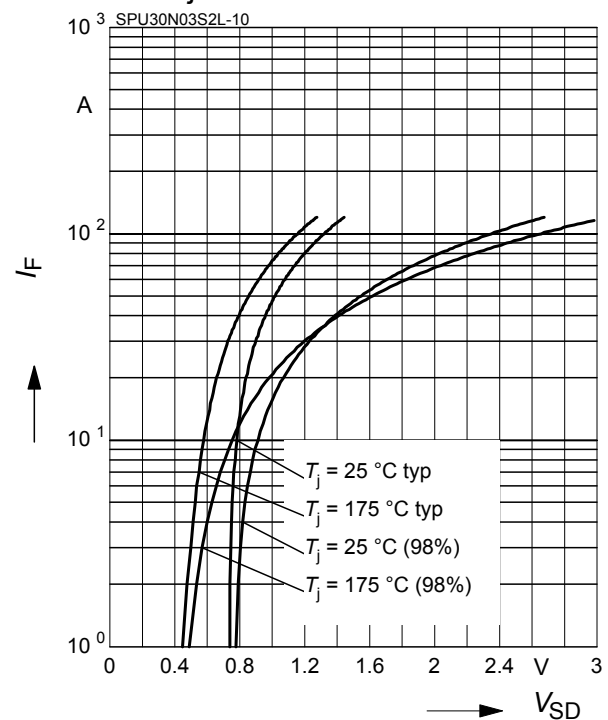
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



## 12 Forward character. of reverse diode

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

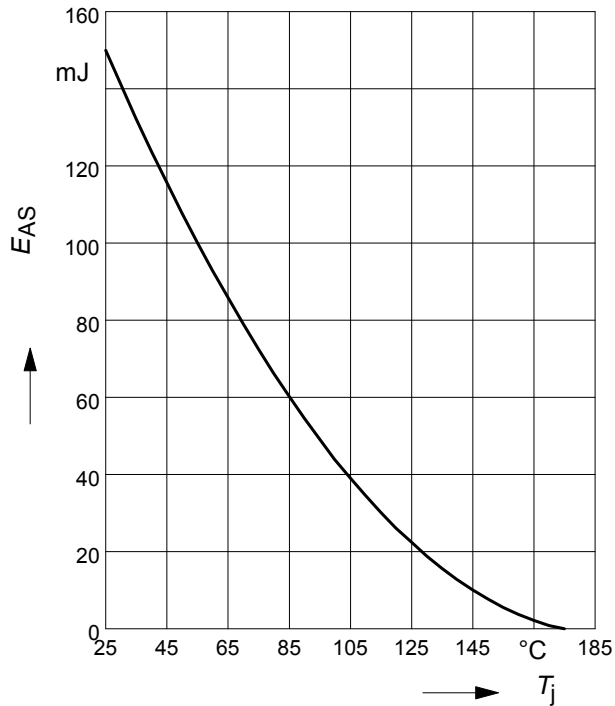
parameter:  $T_j$ ,  $t_p = 80\text{ }\mu\text{s}$



### 13 Typ. avalanche energy

$$E_{AS} = f(T_j)$$

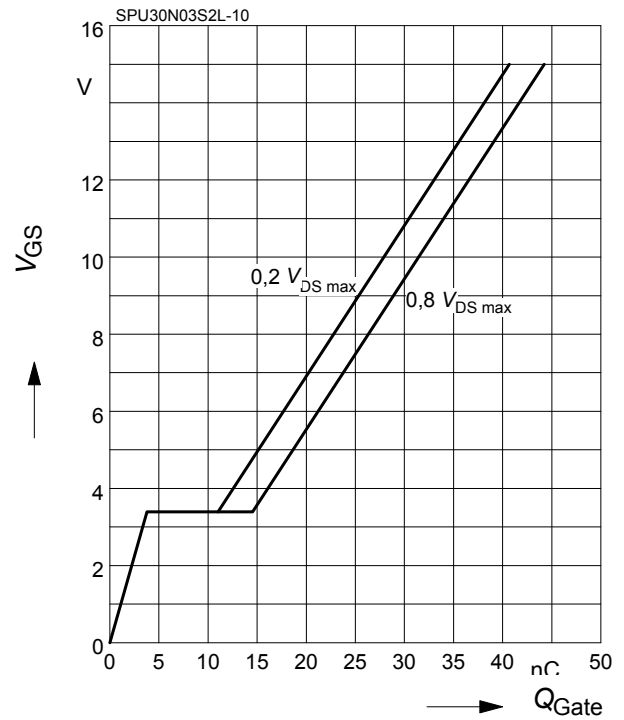
par.:  $I_D = 30\text{ A}$  ,  $V_{DD} = 25\text{ V}$  ,  $R_{GS} = 25\ \Omega$



### 14 Typ. gate charge

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

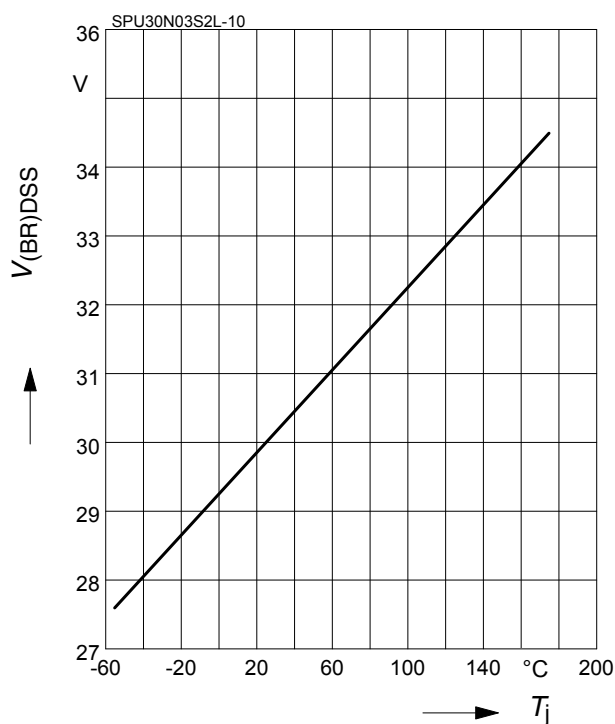
parameter:  $I_D = 30\text{ A}$  pulsed



### 15 Drain-source breakdown voltage

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

parameter:  $I_D = 10\text{ mA}$



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**Further information**

Please notice that the part number is BSPU30N03S2L-10, for simplicity the device is referred to by the term SPU30N03S2L-10 throughout this documentation.