

SIPMOS® Power-Transistor

Feature

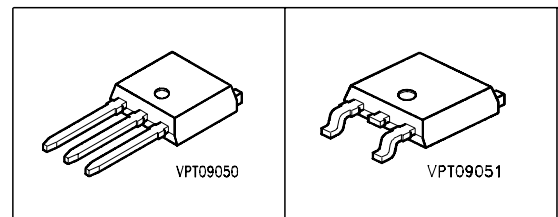
- P-Channel
- Enhancement mode
- 175°C operating temperature
- Avalanche rated
- dv/dt rated

Product Summary

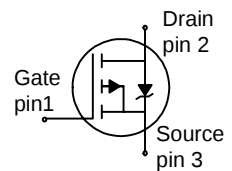
V_{DS}	-60	V
$R_{DS(on)}$	0.075	Ω
I_D	-30	A

P-TO251

P-TO252



Type	Package	Ordering Code
SPD30P06P	P-TO252	Q67042-S4018
SPU30P06P	P-TO251	Q67042-S4019



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

Parameter	Symbol	Value	Unit
Continuous drain current	I_D	-30	A
$T_C = 25^\circ\text{C}$		-21.5	
$T_C = 100^\circ\text{C}$			
Pulsed drain current	$I_{D \text{ puls}}$	-120	
$T_C = 25^\circ\text{C}$			
Avalanche energy, single pulse	E_{AS}	250	mJ
$I_D = -30 \text{ A}$, $V_{DD} = -25 \text{ V}$, $R_{GS} = 25 \Omega$			
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	12.5	
Reverse diode dv/dt	dv/dt	-6	kV/ μs
$I_S = -30 \text{ A}$, $V_{DS} = -48 \text{ V}$, $di/dt = -200 \text{ A}/\mu\text{s}$, $T_{jmax} = 175^\circ\text{C}$			
Gate source voltage	V_{GS}	± 20	V
Power dissipation	P_{tot}	125	W
$T_C = 25^\circ\text{C}$			
Operating and storage temperature	T_j , T_{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}	-	-	1.2	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	100	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	75	
@ 6 cm ² cooling area ¹⁾		-	-	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 $V_{GS}=0, I_D=-250\mu A$	$V_{(BR)DSS}$	-60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-1.7mA$	$V_{GS(th)}$	-2.1	-3	-4	
Zero gate voltage drain current $V_{DS}=-60V, V_{GS}=0, T_j=25^{\circ}C$ $V_{DS}=-60V, V_{GS}=0, T_j=150^{\circ}C$	I_{DSS}	- -	-0.1 -10	-1 -100	μA
Gate-source leakage current $V_{GS}=-20V, V_{DS}=0$	I_{GSS}	-	-10	-100	
Drain-source on-state resistance $V_{GS}=-10V, I_D=-21.5A$	$R_{DS(on)}$	-	0.066	0.075	Ω

¹⁾Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics, at $T_j = 25\text{ }^{\circ}\text{C}$, 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}$, $I_D = -21.5\text{A}$	5.2	10.4	-	S
Input capacitance	C_{iss}	$V_{GS} = 0$, $V_{DS} = -25\text{V}$, $f = 1\text{MHz}$	-	1228	1535	pF
Output capacitance	C_{oss}		-	387	484	
Reverse transfer capacitance	C_{rss}		-	142	177	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -30\text{V}$, $V_{GS} = -10\text{V}$, $I_D = -21.5\text{A}$, $R_G = 3.3\Omega$	-	8.7	13	ns
Rise time	t_r		-	25.2	37.8	
Turn-off delay time	$t_{d(off)}$		-	27.4	41.1	
Fall time	t_f		-	14.6	21.9	

Gate Charge Characteristics

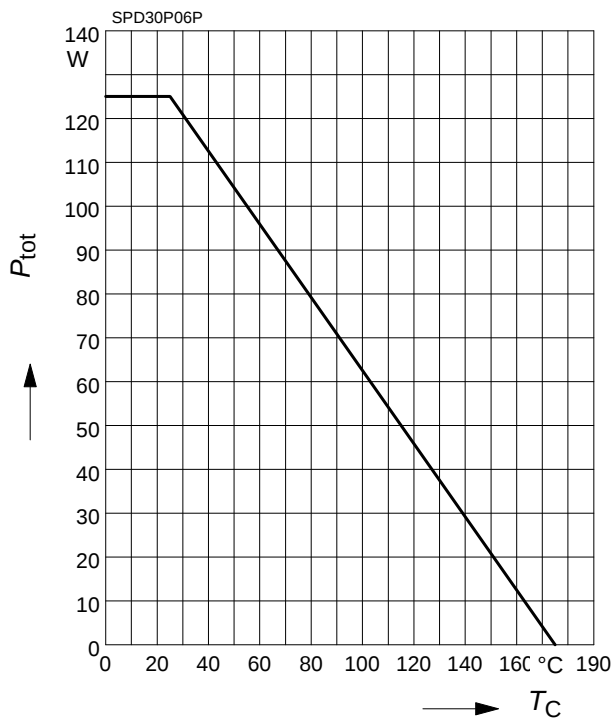
Gate to source charge	Q_{gs}	$V_{DD} = -48\text{V}$, $I_D = -30\text{A}$	-	-3.7	-5.6	nC
Gate to drain charge	Q_{gd}		-	-13.8	-20.7	
Gate charge total	Q_g	$V_{DD} = -48\text{V}$, $I_D = -30\text{A}$, $V_{GS} = 0$ to -10V	-	-32	-48	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -48\text{V}$, $I_D = -30\text{A}$	-	-5.2	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_C = 25^{\circ}\text{C}$	-	-	-30	A
Inv. diode direct current, pulsed	I_{SM}		-	-	-120	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0$, $ I_F = I_S $	-	-1.3	-1.7	V
Reverse recovery time	t_{rr}	$V_R = -30\text{V}$, $ I_F = I_S $, $di_F/dt = 100\text{A}/\mu\text{s}$	-	64.6	97	ns
Reverse recovery charge	Q_{rr}		-	153	230	nC

1 Power dissipation

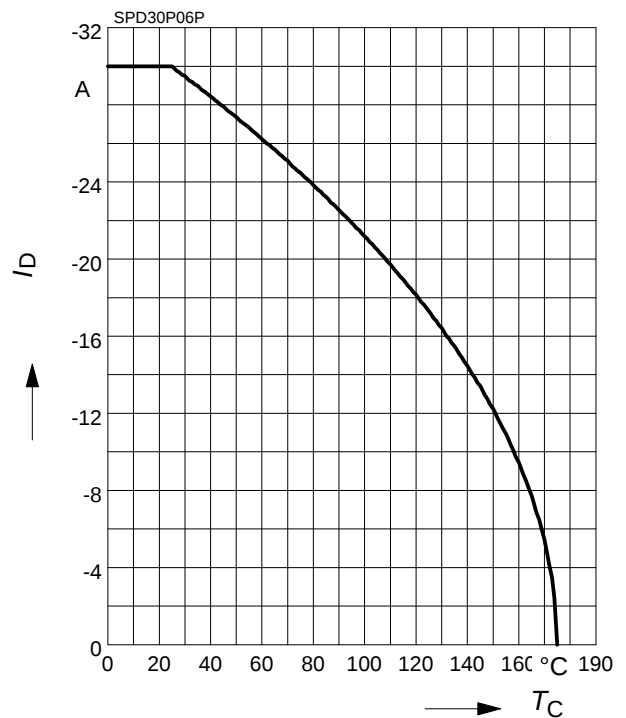
$$P_{\text{tot}} = f(T_C)$$



2 Drain current

$$I_D = f(T_C)$$

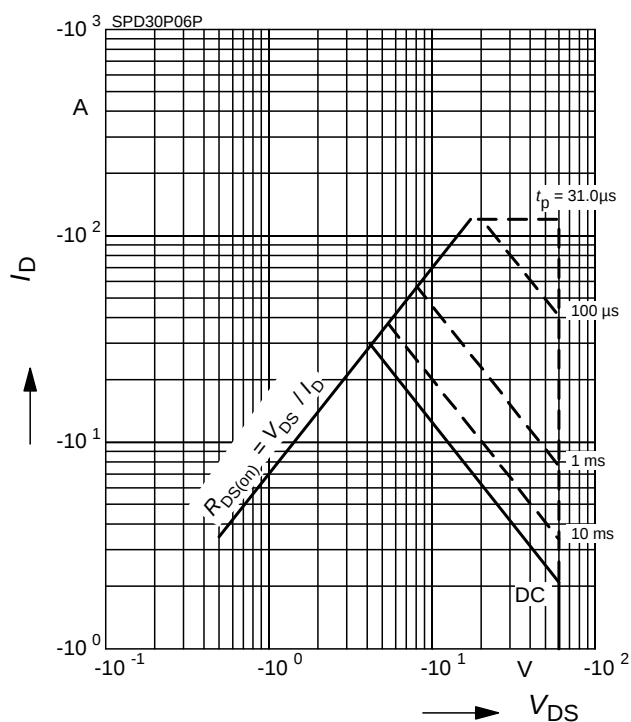
parameter: $|V_{GS}| \geq 10 \text{ V}$



3 Safe operating area

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

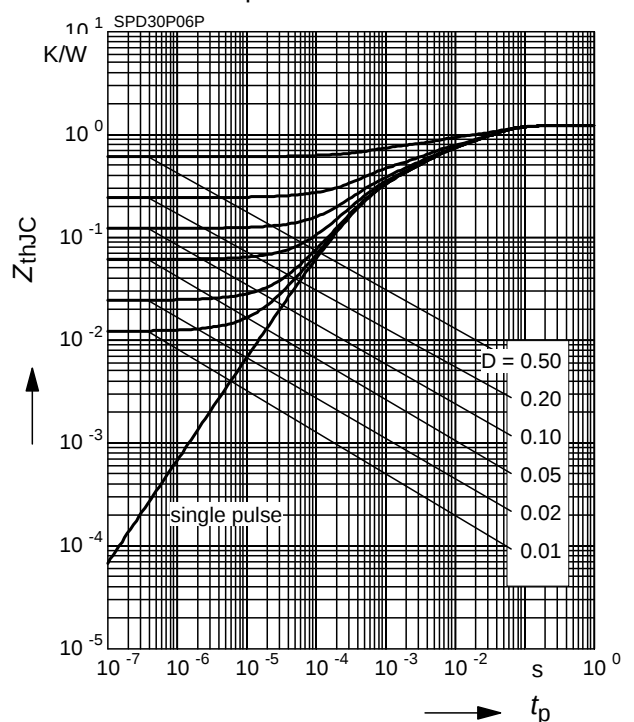
parameter: $D = 0$, $T_C = 25^\circ\text{C}$



4 Max. transient thermal impedance

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

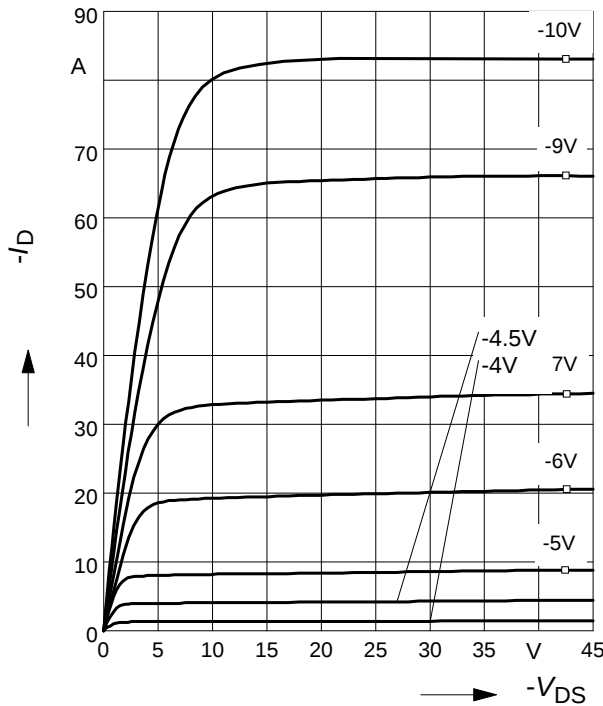
parameter: $D = t_p/T$



5 Typ. output characteristic

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

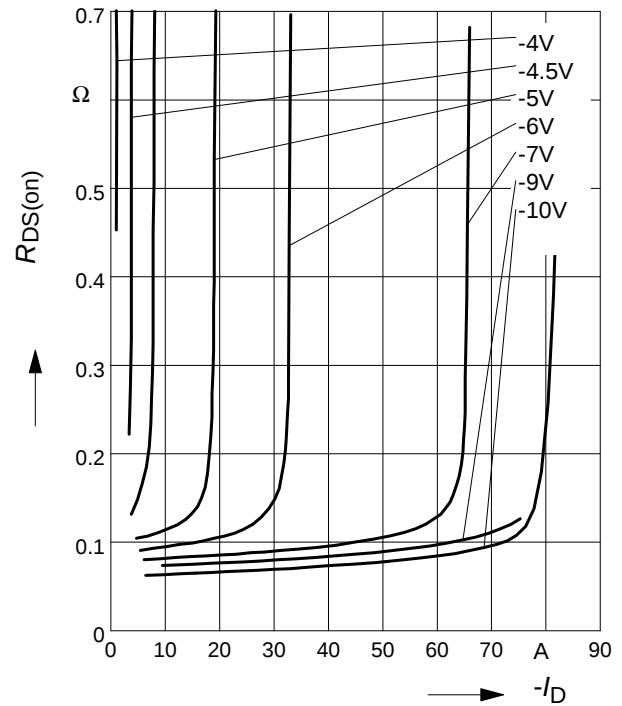
parameter: $T_j = 25^\circ\text{C}$



6 Typ. drain-source on resistance

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

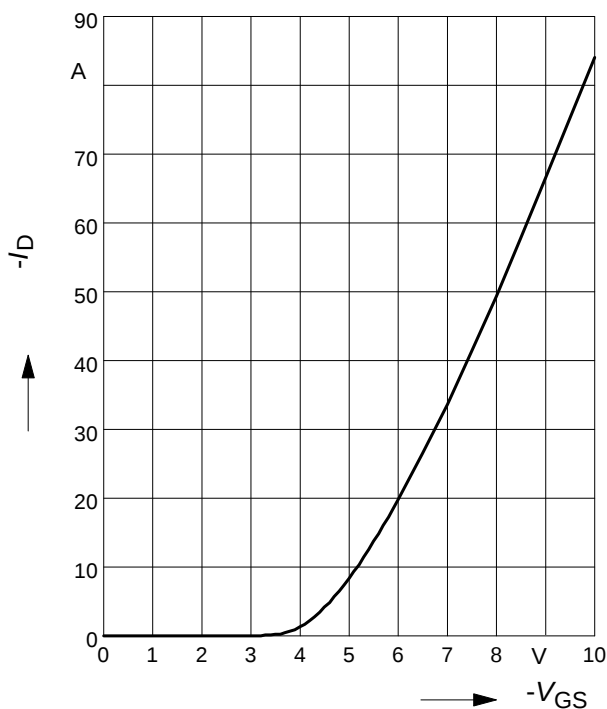
parameter: V_{GS} ; $T_j = 25^\circ\text{C}$



7 Typ. transfer characteristics

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

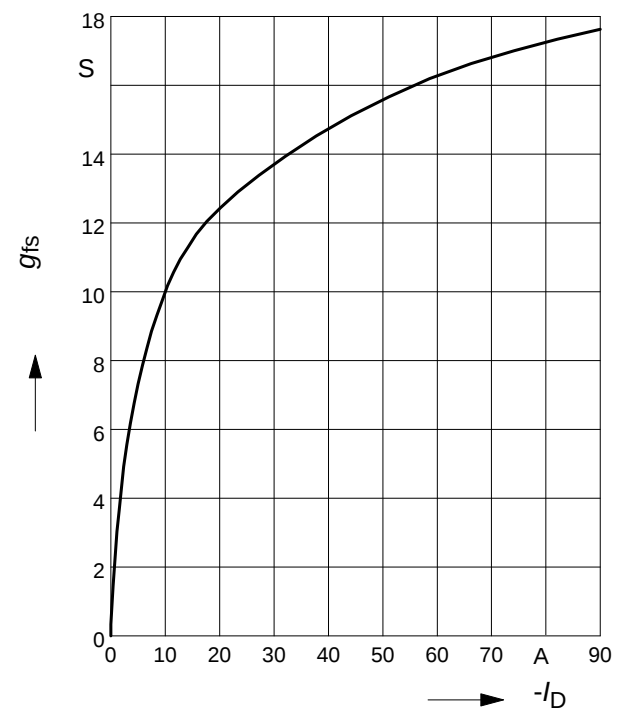
parameter: $T_j = 25^\circ\text{C}$



8 Typ. forward transconductance

$$g_{fs} = f(I_D)$$

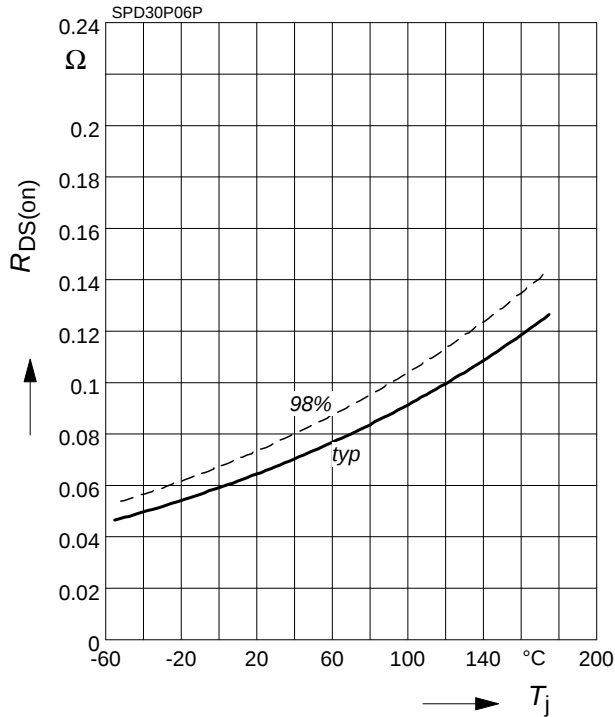
parameter: $T_j = 25^\circ\text{C}$



9 Drain-source on-state resistance

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

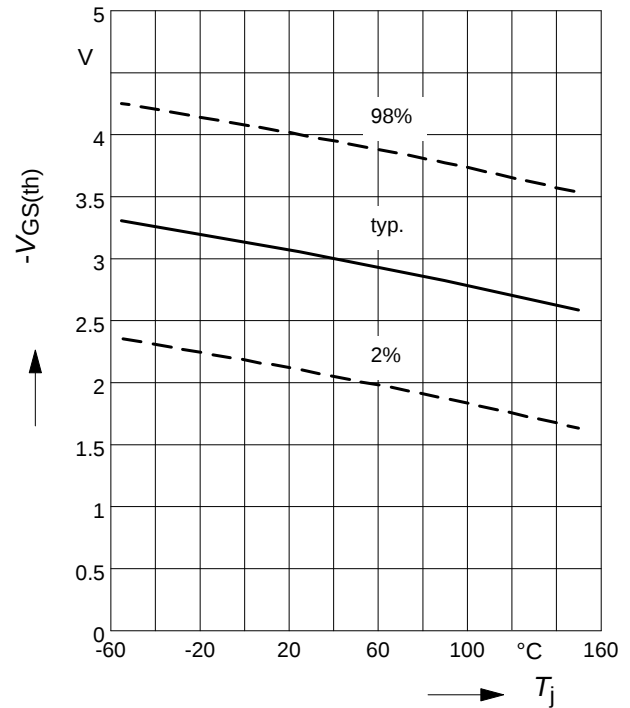
parameter: $I_D = -21.5 \text{ A}$, $V_{GS} = -10 \text{ V}$



10 Typ. gate threshold voltage

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

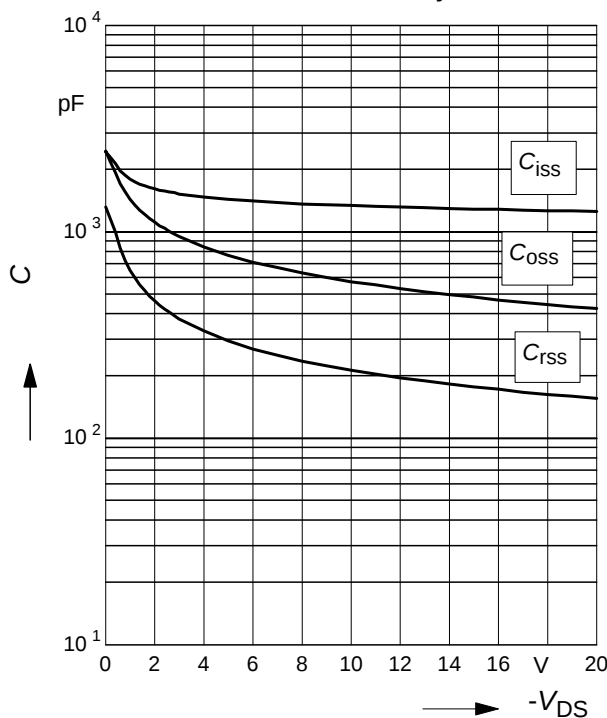
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

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

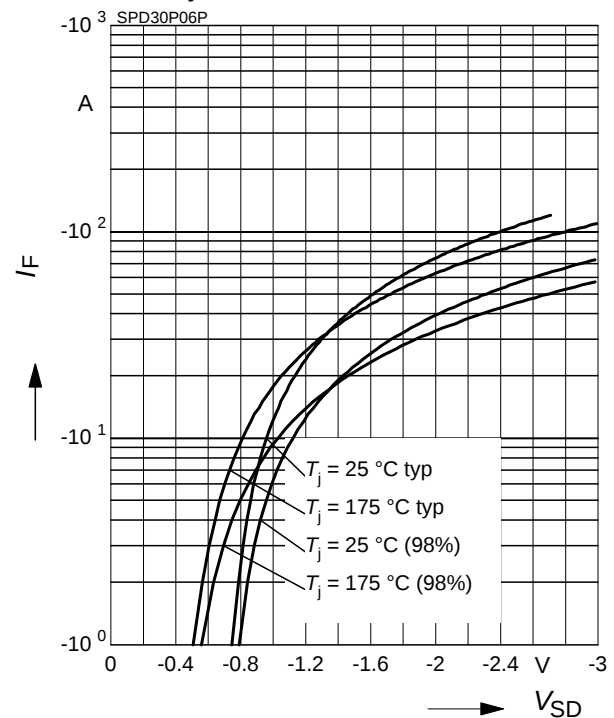
parameter: $V_{GS}=0$, $f=1 \text{ MHz}$; $T_j = 25^{\circ}\text{C}$



12 Forward character. of reverse diode

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

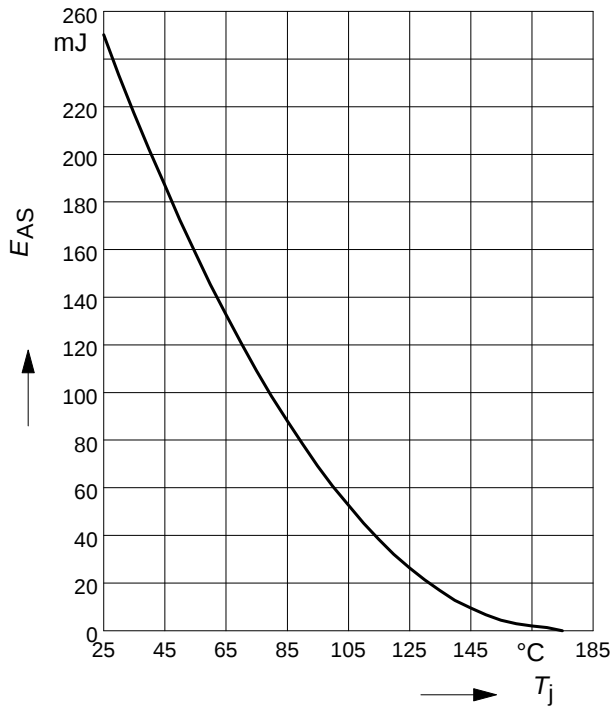
parameter: T_j , $t_p = 80 \mu\text{s}$



13 Typ. avalanche energy

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

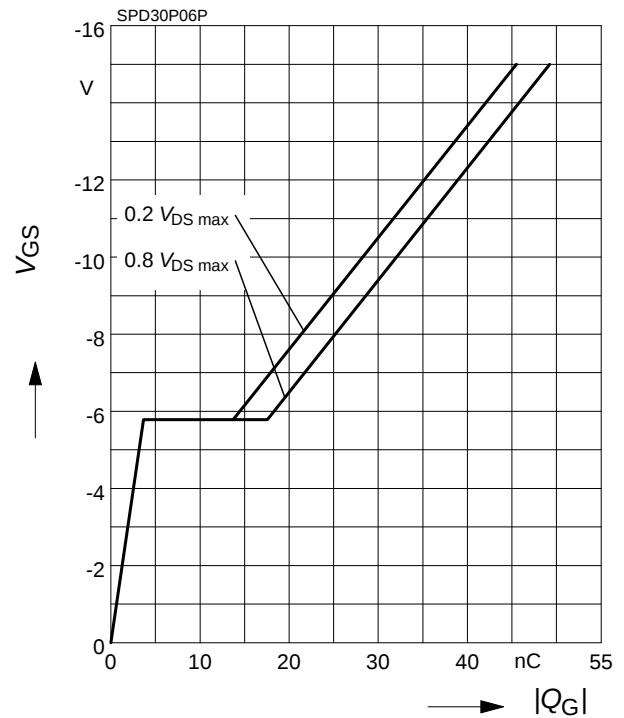
par.: $I_D = -30\text{ A}$, $V_{DD} = -25\text{ V}$, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

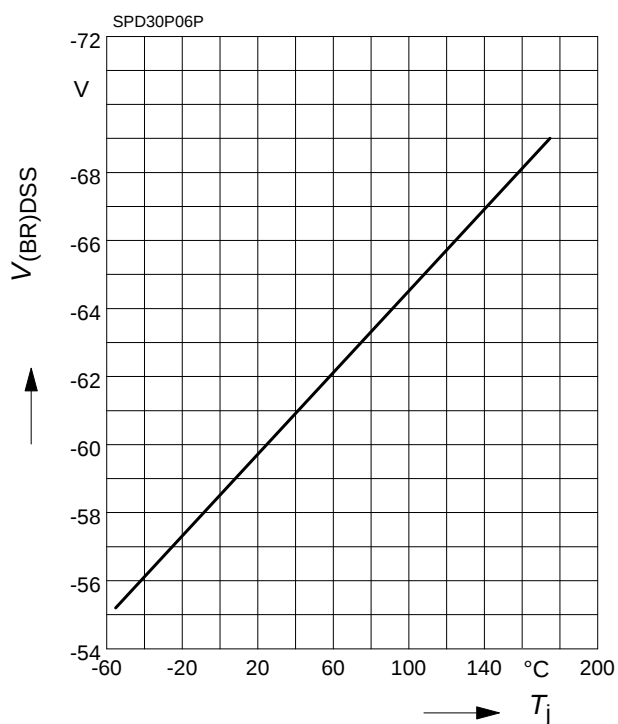
$$V_{GS} = f(Q_G), \text{ parameter: } V_{DS}; T_j = 25\text{ °C}$$

$I_D = -30\text{ A}$ pulsed;



15 Drain-source breakdown voltage

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



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