

SIPMOS[®] Power-Transistor

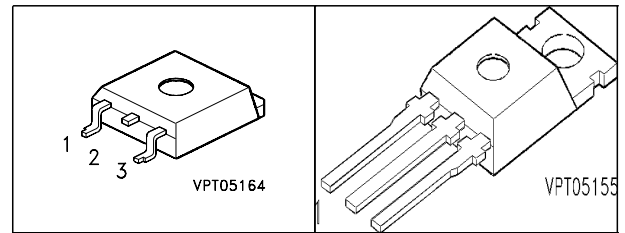
Features

- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated
- 175°C operating temperature
- Pb-free lead plating; RoHS compliant (TO263-3)



Product Summary

Drain source voltage	V_{DS}	-60	V
Drain-source on-state resistance	$R_{DS(on)}$	0.023	Ω
Continuous drain current	I_D	-80	A



Pin 1	PIN 2/4	PIN 3
G	D	S

Type	Package	Lead free
SPP80P06P	P-TO220-3	No
SPB80P06P G	PG-TO263-3	Yes

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25\text{ °C}$, 1) $T_C = 100\text{ °C}$	I_D	-80 -64	A
Pulsed drain current $T_C = 25\text{ °C}$	$I_D \text{ puls}$	-320	
Avalanche energy, single pulse $I_D = -80\text{ A}$, $V_{DD} = -25\text{ V}$, $R_{GS} = 25\ \Omega$	E_{AS}	823	mJ
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	34	
Reverse diode dv/dt $I_S = -80\text{ A}$, $V_{DS} = -48$, $di/dt = 200\text{ A}/\mu\text{s}$, $T_{jmax} = 175\text{ °C}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
Power dissipation $T_C = 25\text{ °C}$	P_{tot}	340	W
Operating and storage temperature	T_j, T_{stg}	-55...+175	$^{\circ}\text{C}$
IEC climatic category; DIN IEC 68-1		55/175/56	

¹Current limited by bondwire; with an $R_{thJC} = 0.4\text{ K/W}$ the chip is able to carry $I_D = -91\text{ A}$

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	0.4	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	62	
@ 6 cm ² cooling area ¹⁾		-	-	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 $V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	$V_{(BR)DSS}$	-60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = -5.5\text{ mA}$	$V_{GS(th)}$	-2.1	-3	-4	
Zero gate voltage drain current $V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25\text{ °C}$ $V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 150\text{ °C}$	I_{DSS}	-	-0.1	-1	μA
Gate-source leakage current $V_{GS} = -20\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	-	-10	-100	
Drain-source on-state resistance $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$	$R_{DS(on)}$	-	0.021	0.023	Ω

¹Device 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 $T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = -64\text{ A}$	g_{fs}	18	36	-	S
Input capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$	C_{iss}	-	4026	5033	pF
Output capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$	C_{oss}	-	1252	1565	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$	C_{rss}	-	437	546	
Turn-on delay time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$, $R_G = 1\ \Omega$	$t_{d(on)}$	-	24	36	ns
Rise time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$, $R_G = 1\ \Omega$	t_r	-	18	27	
Turn-off delay time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$, $R_G = 1\ \Omega$	$t_{d(off)}$	-	56	84	
Fall time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$, $R_G = 1\ \Omega$	t_f	-	30	45	

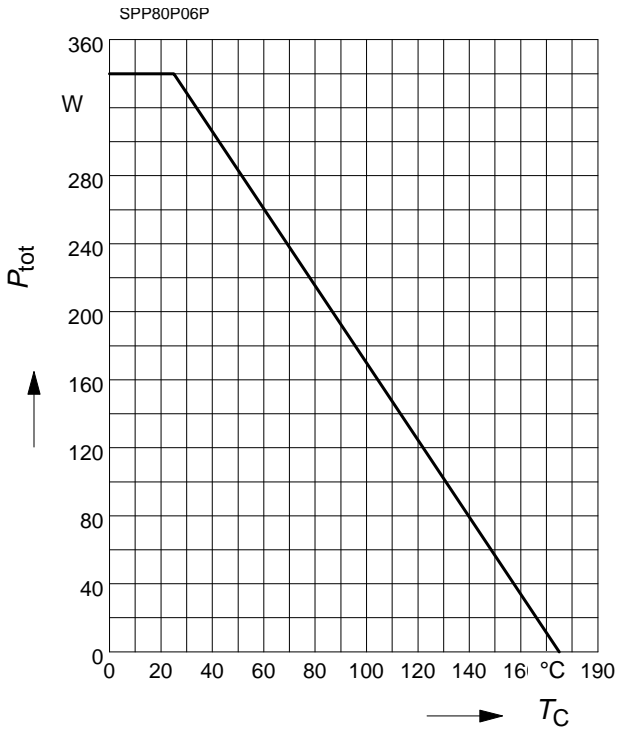
Electrical Characteristics, at $T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Gate to source charge $V_{DD} = -48\text{ V}, I_D = -80\text{ A}$	Q_{gs}	-	27.4	41	nC
Gate to drain charge $V_{DD} = -48\text{ V}, I_D = -80\text{ A}$	Q_{gd}	-	50	75	
Gate charge total $V_{DD} = -48\text{ V}, I_D = -80\text{ A}, V_{GS} = 0\text{ to }-10\text{ V}$	Q_g	-	115	173	
Gate plateau voltage $V_{DD} = -48\text{ V}, I_D = -80\text{ A}$	$V_{(plateau)}$	-	-6.2	-	V

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current $T_C = 25\text{ °C}$	I_S	-	-	-80	A
Inverse diode direct current, pulsed $T_C = 25\text{ °C}$	I_{SM}	-	-	-320	
Inverse diode forward voltage $V_{GS} = 0\text{ V}, I_F = -80\text{ A}$	V_{SD}	-	-1.2	-1.6	V
Reverse recovery time $V_R = -30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	t_{rr}	-	117	175	ns
Reverse recovery charge $V_R = -30\text{ V}, I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	Q_{rr}	-	420	630	nC

Power dissipation

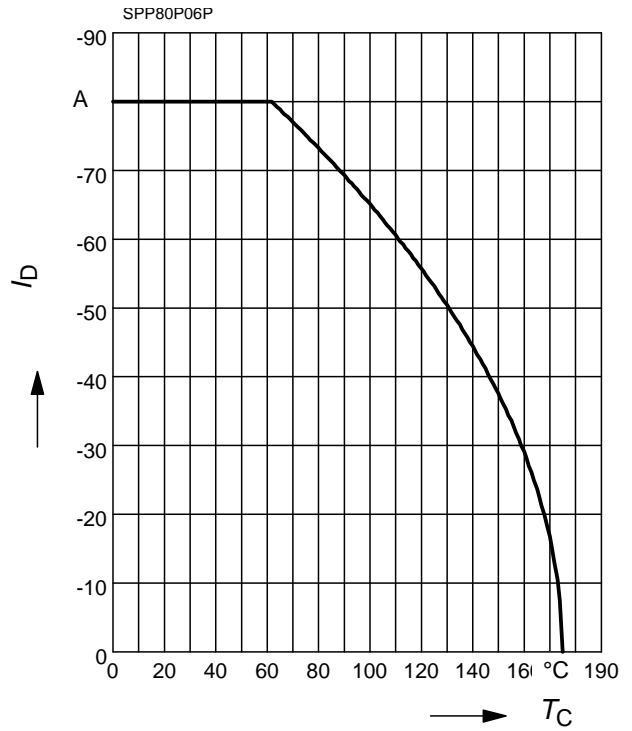
$$P_{\text{tot}} = f(T_C)$$



Drain current

$$I_D = f(T_C)$$

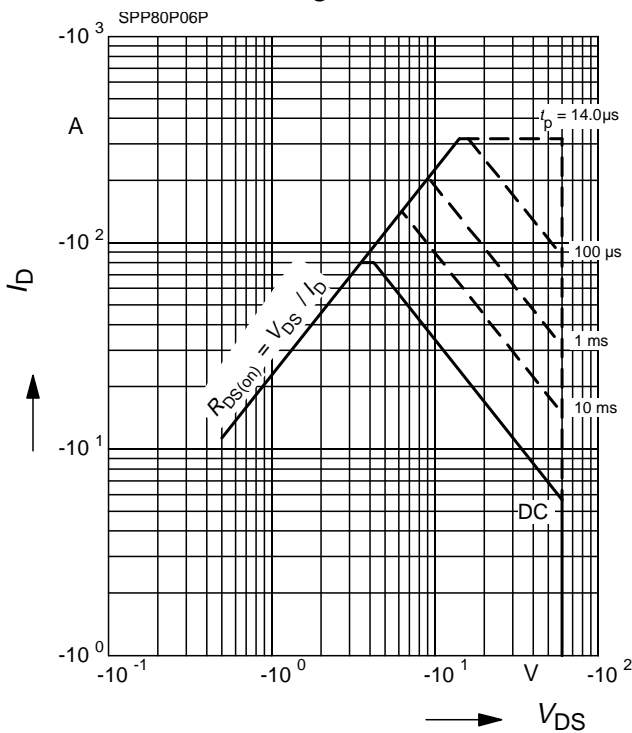
parameter: $V_{GS} \geq 10 \text{ V}$



Safe operating area

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

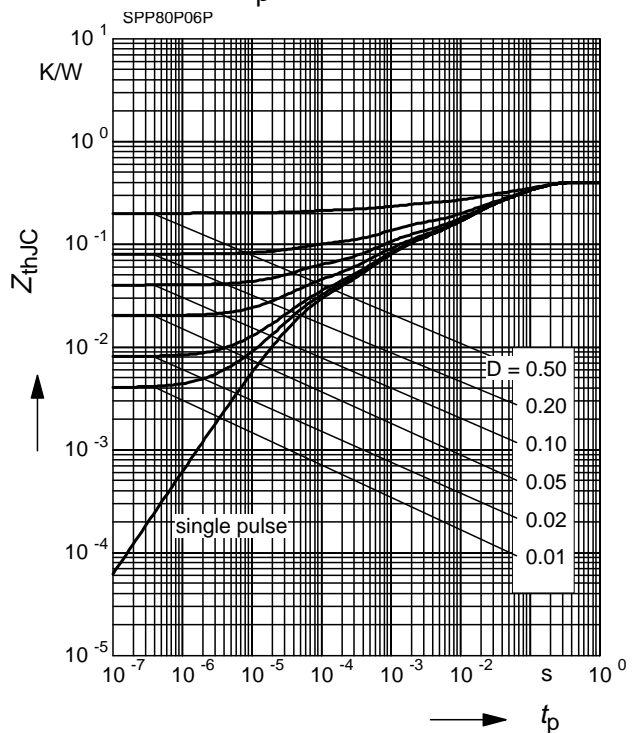
parameter: $D = 0$, $T_C = 25 \text{ °C}$



Transient thermal impedance

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

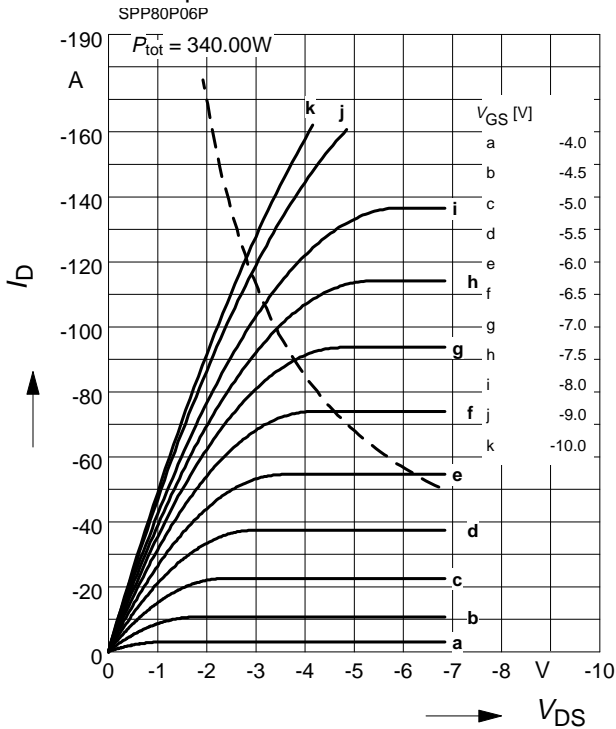
parameter: $D = t_p/T$



Typ. output characteristic

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

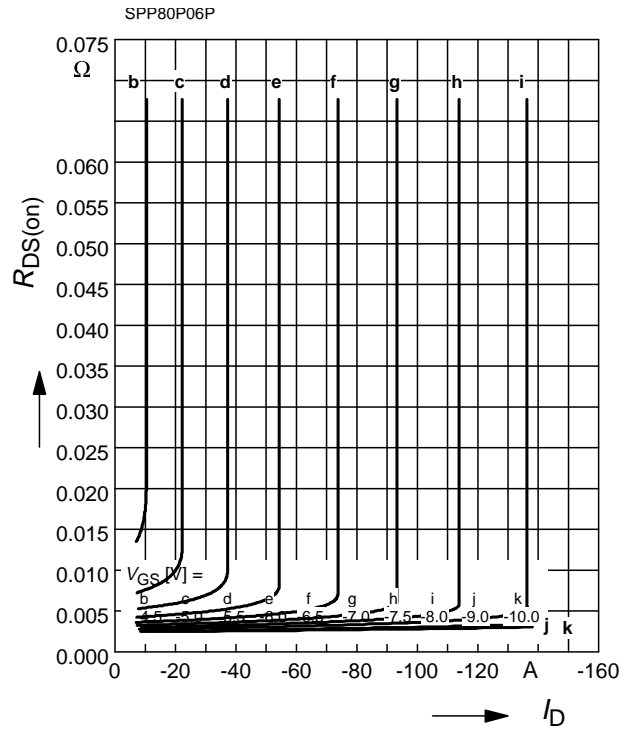
parameter: $t_p = 80 \mu\text{s}$



Typ. drain-source-on-resistance

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

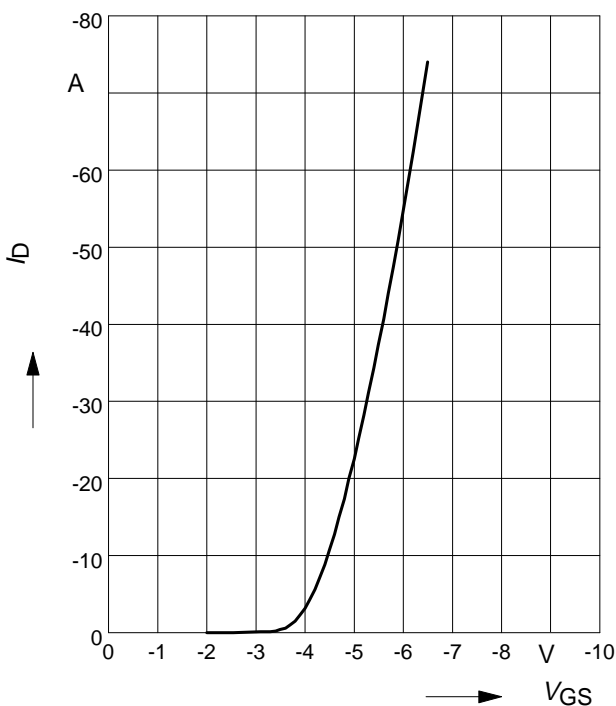
parameter: V_{GS}



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

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

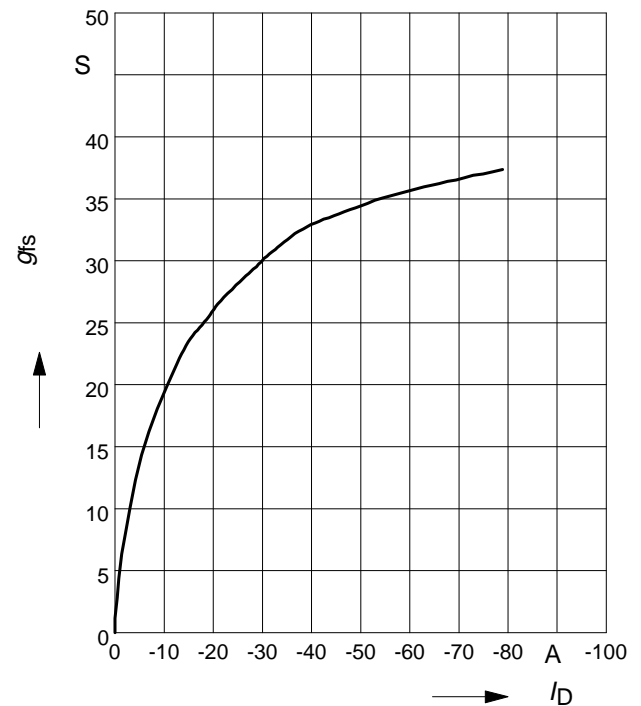
parameter: $t_p = 80 \mu\text{s}$



Typ. forward transconductance

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

parameter: g_{fs}

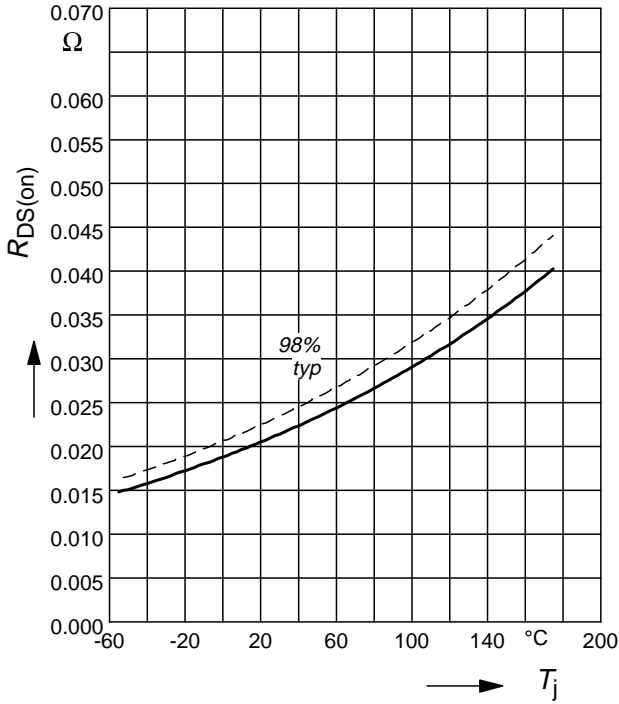


Drain-source on-state resistance

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

parameter: $I_D = -64 \text{ A}$, $V_{GS} = -10 \text{ V}$

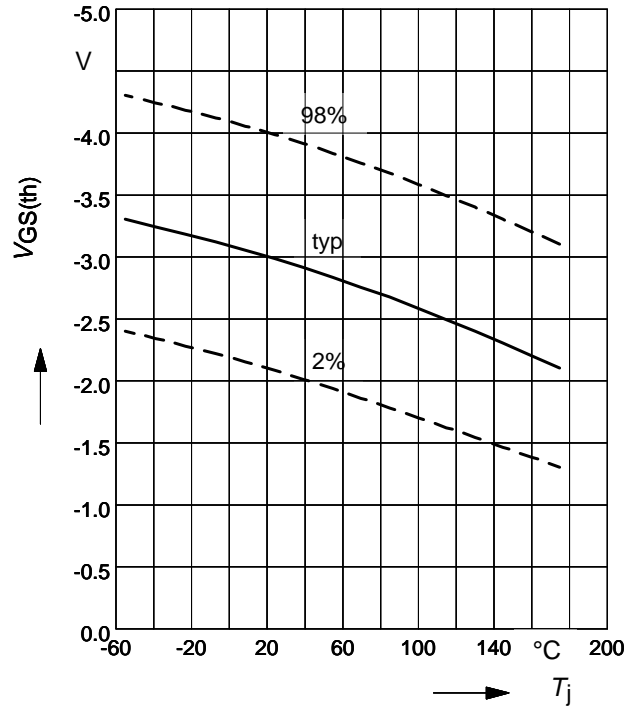
SPP80P06P



Gate threshold voltage

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

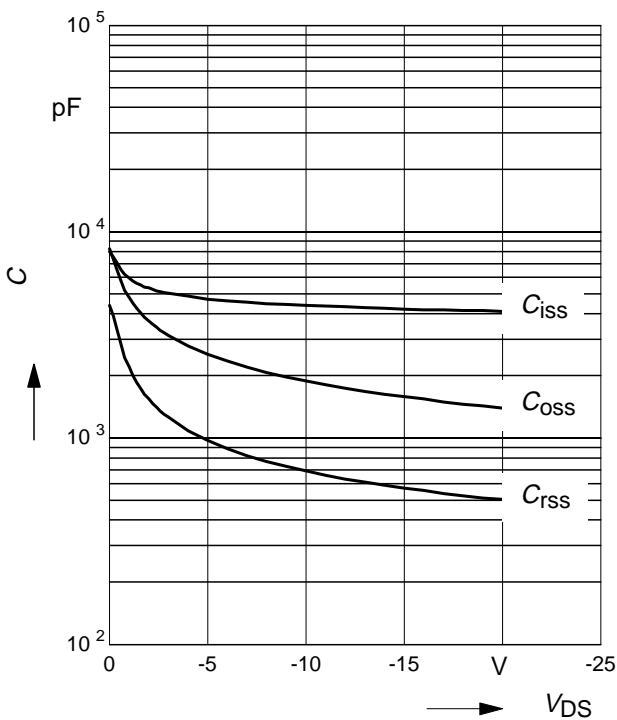
parameter: $V_{GS} = V_{DS}$, $I_D = -5.5 \text{ mA}$



Typ. capacitances

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

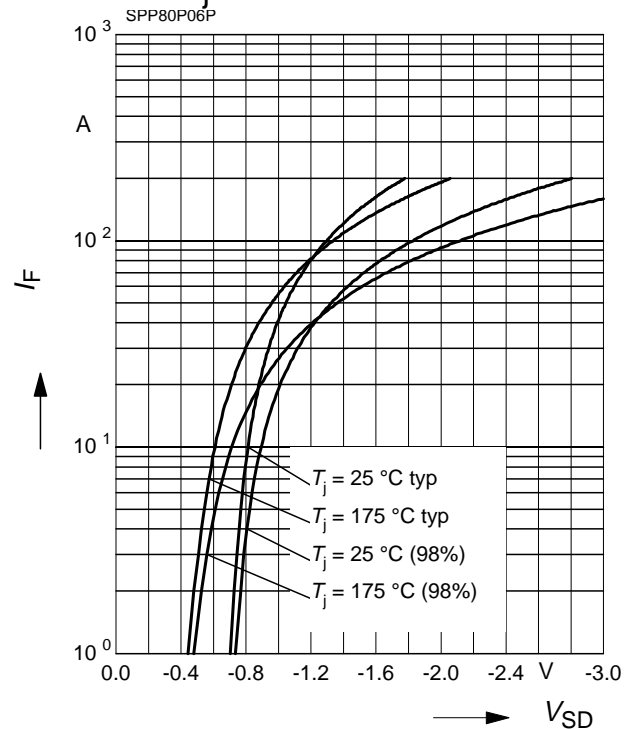
parameter: $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$



Forward characteristics of reverse diode

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

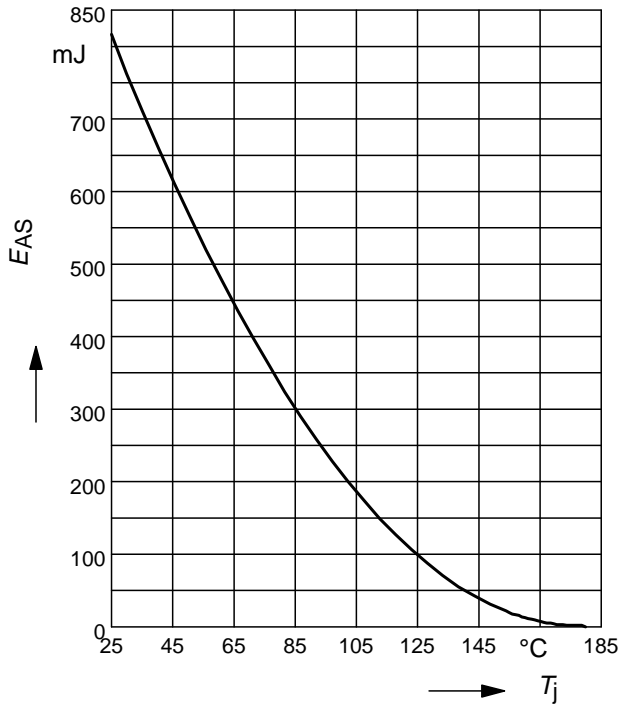
parameter: T_j , $t_p = 80 \mu\text{s}$



Avalanche energy

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

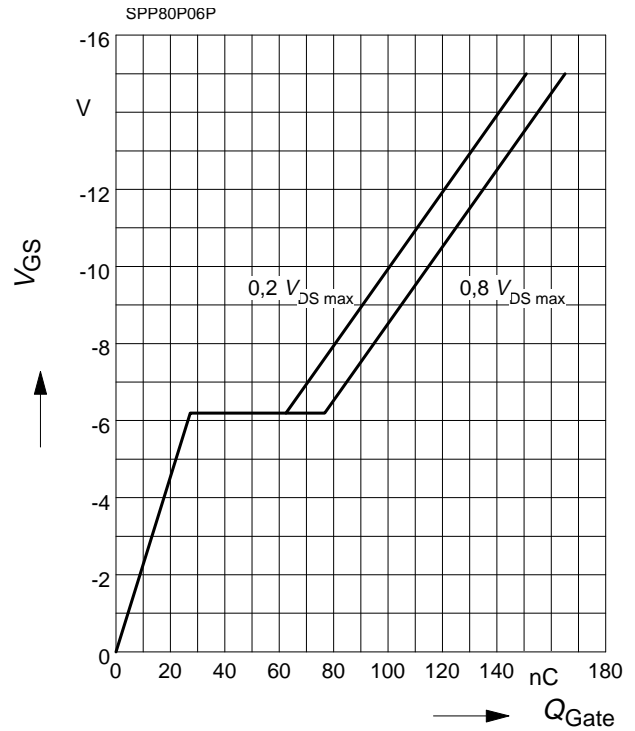
para.: $I_D = -80\text{ A}$, $V_{DD} = -25\text{ V}$, $R_{GS} = 25\ \Omega$



Typ. gate charge

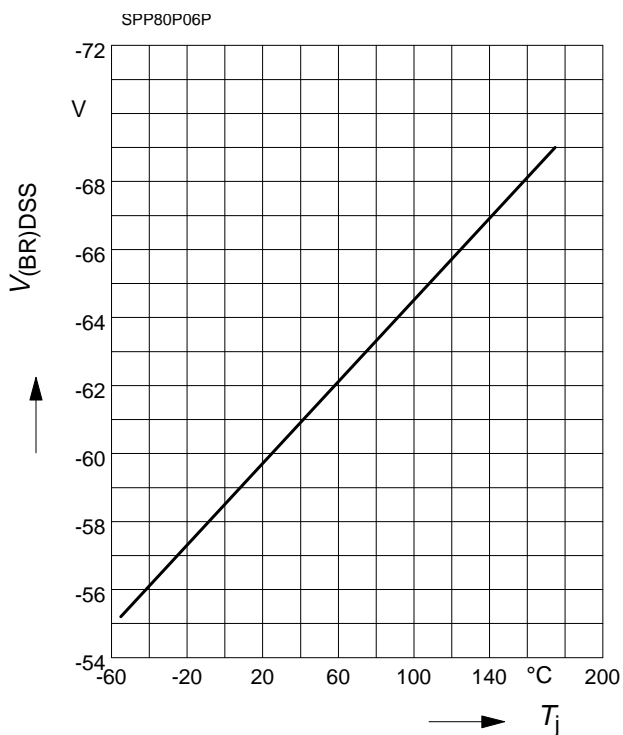
$$V_{GS} = f(Q_{Gate})$$

parameter: $I_D = -80\text{ A}$ pulsed



Drain-source breakdown voltage

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



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