SIPMOS® Power-Transistor

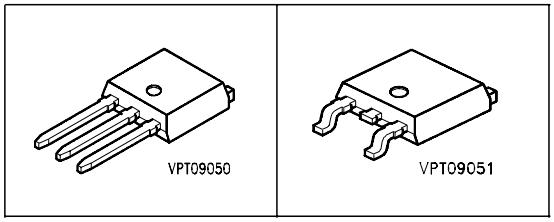
Feature

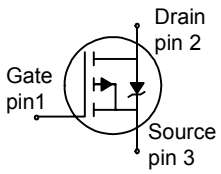
- P-Channel
- Enhancement mode
- Logic Level
- 175°C operating temperature
- Avalanche rated
- d*v*/d*t* rated

Product Summary

V_{DS}	-60	V
$R_{DS(on)}$	0.25	Ω
I_D	-9.7	A

P-TO251-3-1 P-TO252





Type	Package	Ordering Code
SPD09P06PL	P-TO252	Q67042-S4007
SPU09P06PL	P-TO251-3-1	Q67042-S4020

Maximum Ratings,at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current	I_D		A
T_C=25°C		-9.7	
T_C=100°C		-6.8	
Pulsed drain current	$I_{D\ puls}$	-38.8	
T_C=25°C			
Avalanche energy, single pulse	E_{AS}	70	mJ
I_D=-9.7 A , V_{DD}=-25V, R_{GS}=25Ω			
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	4.2	
Reverse diode d*v*/d*t*	d*v*/d*t*	6	kV/µs
I_S=-9.7A, V_{DS}=-48, d*i*/d*t*=200A/µs, T_{jmax}=175°C			
Gate source voltage	V_{GS}	±20	V
Power dissipation	P_{tot}	42	W
T_C=25°C			
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}	-	-	3.6	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 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS}=0V, I_D=-250µA	$V_{(BR)DSS}$	-60	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D=-250µA	$V_{GS(th)}$	-1	-1.5	-2	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS}=-60V, V_{GS}=0V, T_j=25°C		-	-0.1	-1	
V_{DS}=-60V, V_{GS}=0V, T_j=150°C		-	-10	-100	
Gate-source leakage current V_{GS}=-20V, V_{DS}=0V	I_{GSS}	-	-10	-100	nA
Drain-source on-state resistance V_{GS}=-4.5V, I_D=-5.4A	$R_{DS(on)}$	-	0.3	0.4	Ω
Drain-source on-state resistance V_{GS}=-10V, I_D=-6.8A	$R_{DS(on)}$	-	0.2	0.25	

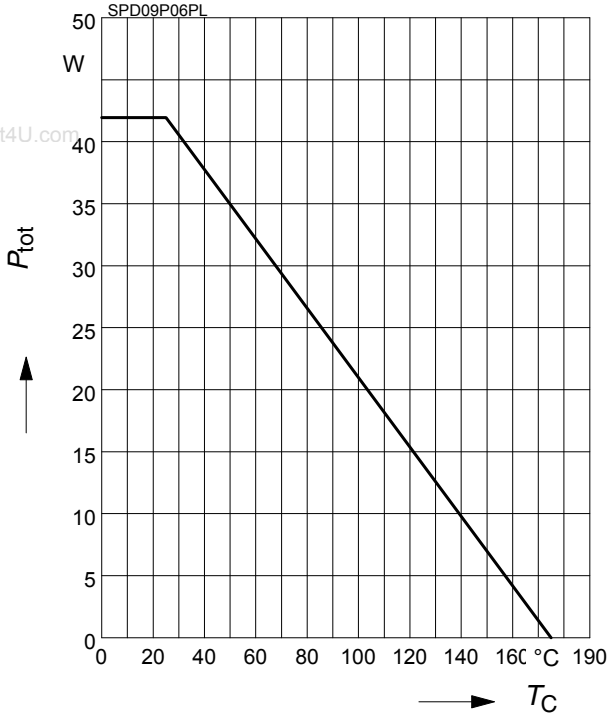
[1]Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Transconductance	g_{fs}	$V_{DS}\geq 2*I_D*R_{DS(on)max}$, I_D=-5.4	1.8	3.5	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=-25V, f=1MHz	-	360	450	pF
Output capacitance	C_{oss}		-	103	130	
Reverse transfer capacitance	C_{rss}		-	40	50	
Turn-on delay time	$t_{d(on)}$	V_{DD}=-30V, V_{GS}=-4.5V, I_D=-5.4, R_G=6Ω	-	11	17	ns
Rise time	t_r	V_{DD}=-30V, V_{GS}=-4.5V, I_D=-5.4A, R_G=6Ω	-	168	252	
Turn-off delay time	$t_{d(off)}$		-	49	74	
Fall time	t_f		-	89	134	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=-48V, I_D=-9.7A	-	1.3	2	nC
Gate to drain charge	Q_{gd}		-	5.1	7.5	
Gate charge total	Q_g	V_{DD}=-48V, I_D=-9.7A, V_{GS}=0 to -10V	-	14	21	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=-48V, I_D=-9.7A	-	-4.1	-	V
Reverse Diode						
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	-9.7	A
Inverse diode direct current, pulsed	I_{SM}		-	-	-38.8	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=-9.7A	-	-1.1	-1.4	V
Reverse recovery time	t_{rr}	V_R=-30V, I_F=I_S, di_F/dt=100A/µs	-	52	76	ns
Reverse recovery charge	Q_{rr}		-	64	96	nC

1 Power dissipation

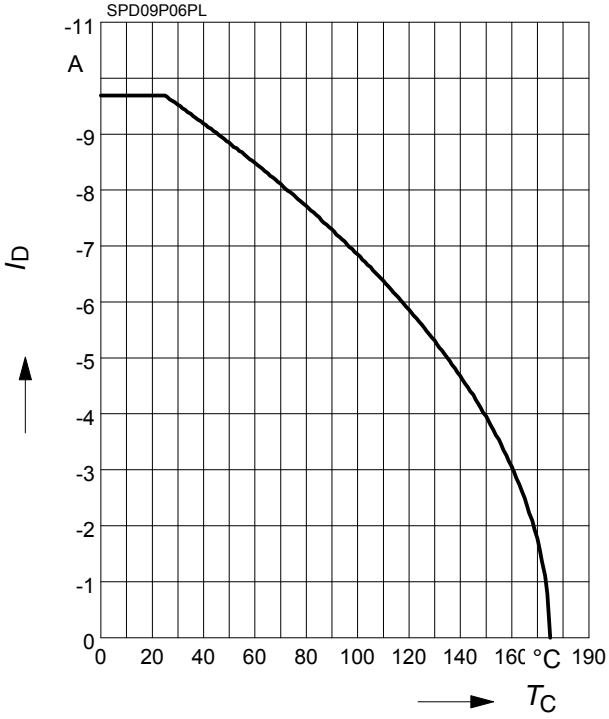
$P_{tot} = f(T_C)$



2 Drain current

$I_D = f(T_C)$

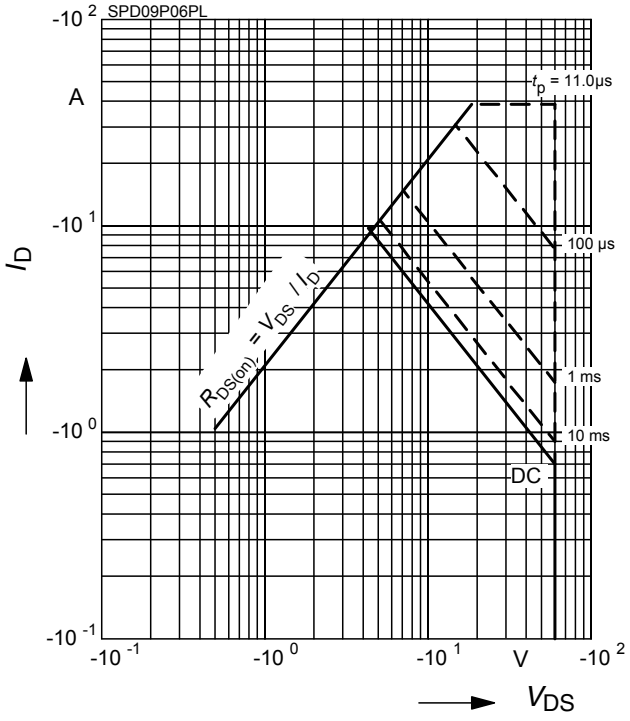
parameter: $V_{GS} \geq 10$ V



3 Safe operating area

$I_D = f(V_{DS})$

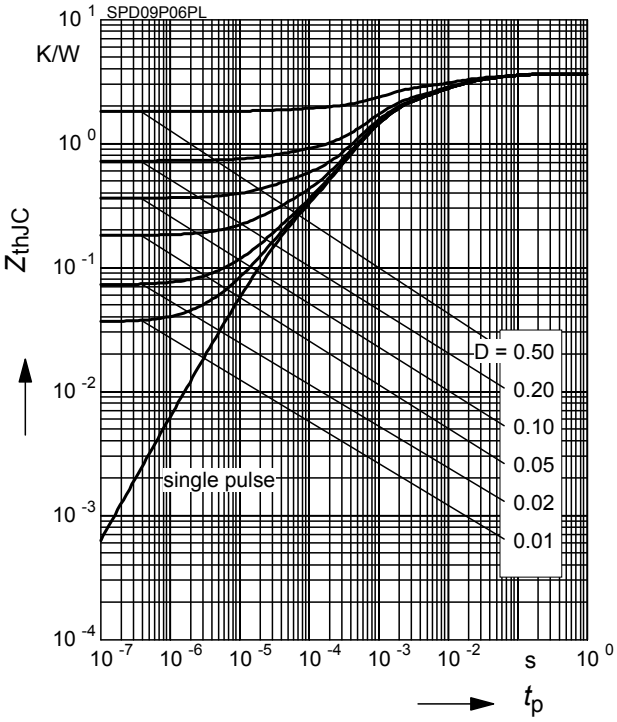
parameter : $D = 0$, $T_C = 25$ °C



4 Transient thermal impedance

$Z_{thJC} = f(t_p)$

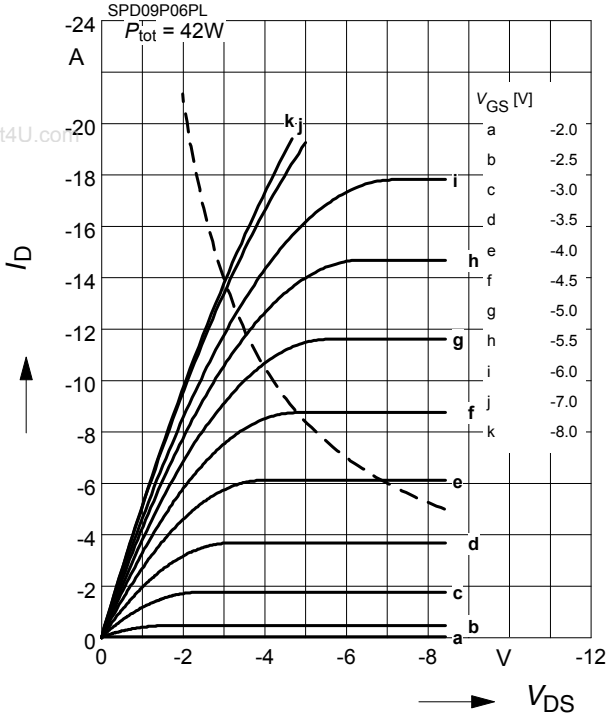
parameter : $D = t_p/T$



5 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

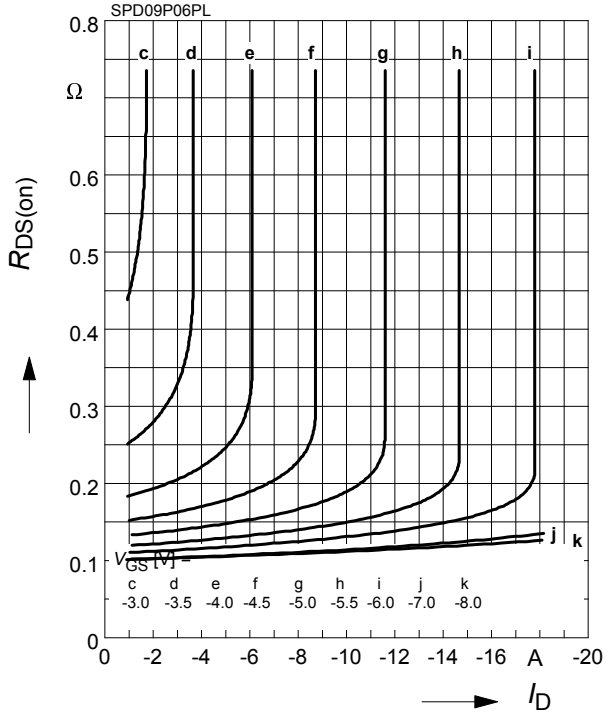
parameter: t_p = 80 µs



6 Typ. drain-source on resistance

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

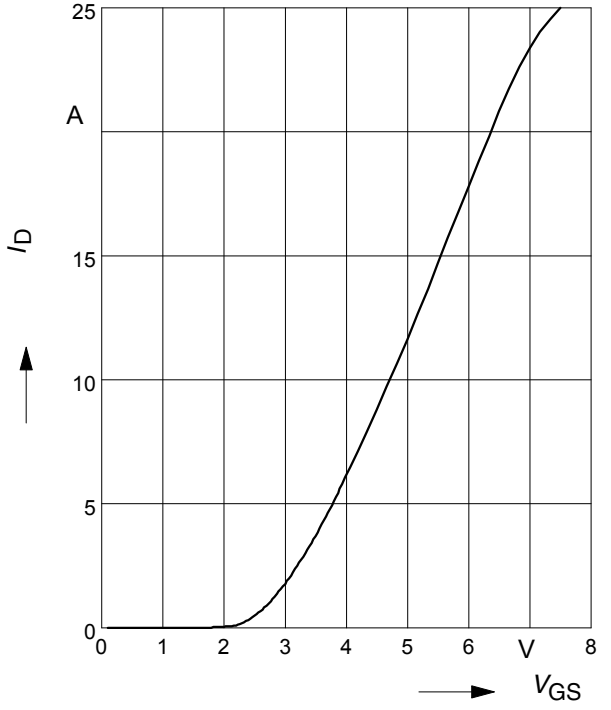
parameter: V_{GS}



7 Typ. transfer characteristics

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

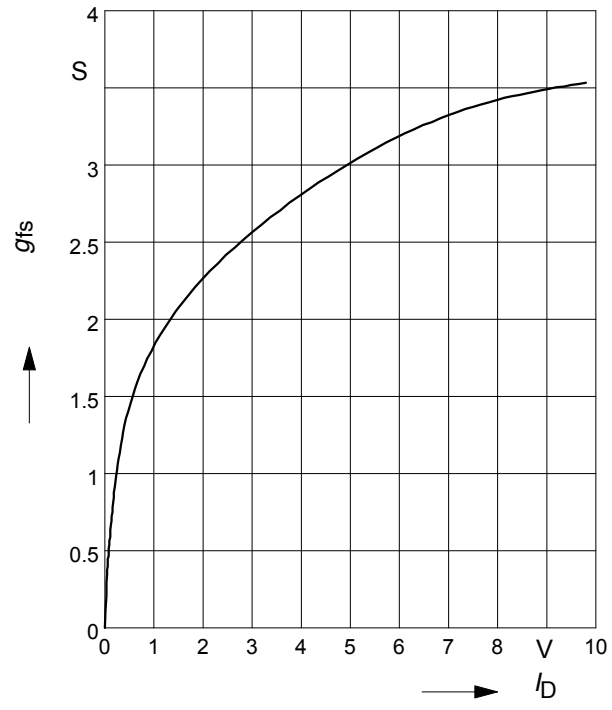
parameter: t_p = 80 µs



8 Typ. forward transconductance

g_{fs} = f(I_D); T_j=25°C

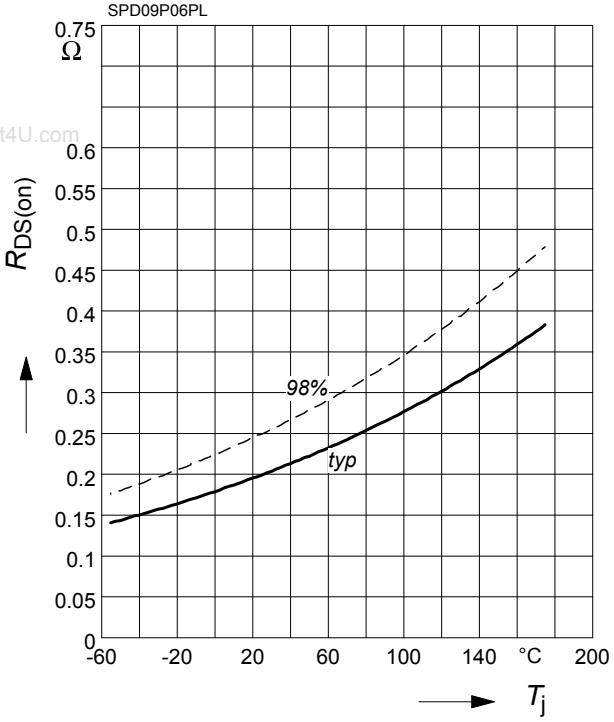
parameter: g_{fs}



9 Drain-source on-state resistance

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

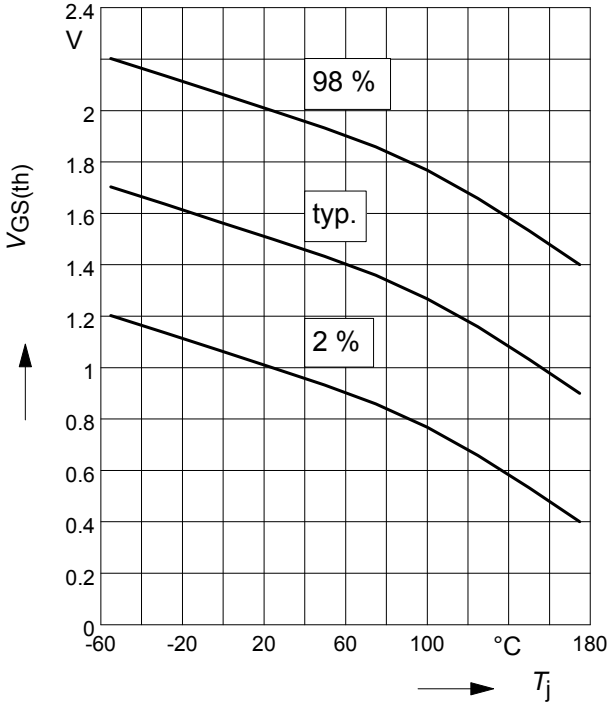
parameter : I_D = -6.8 A, V_{GS} = -10 V



10 Gate threshold voltage

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

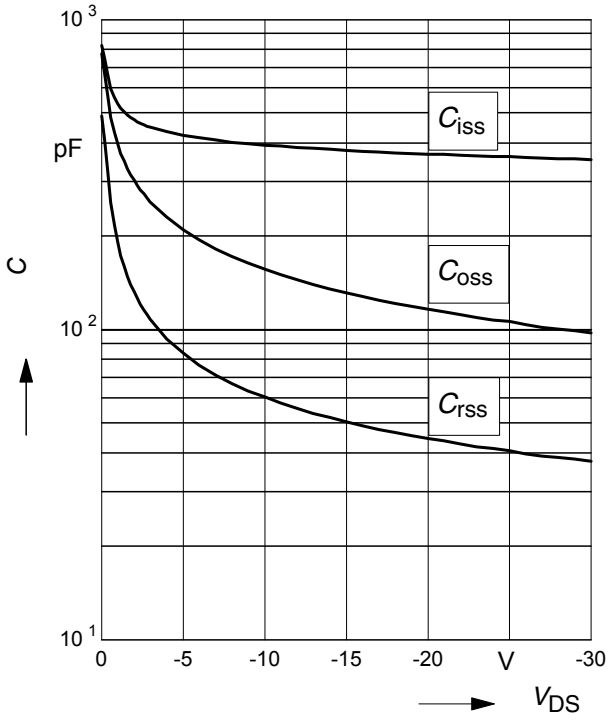
parameter: $V_{GS} = V_{DS}$, I_D = -250 µA



11 Typ. capacitances

$C = f(V_{DS})$

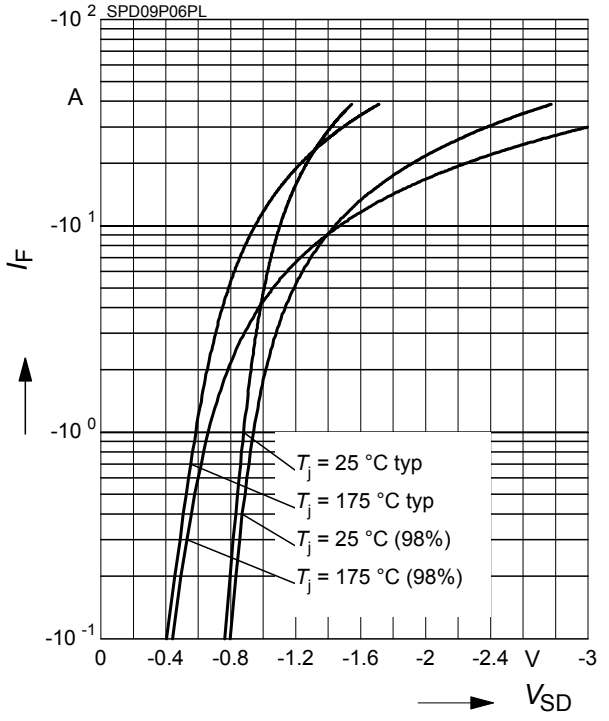
parameter: V_{GS}=0V, f=1 MHz



12 Forward character. of reverse diode

$I_F = f(V_{SD})$

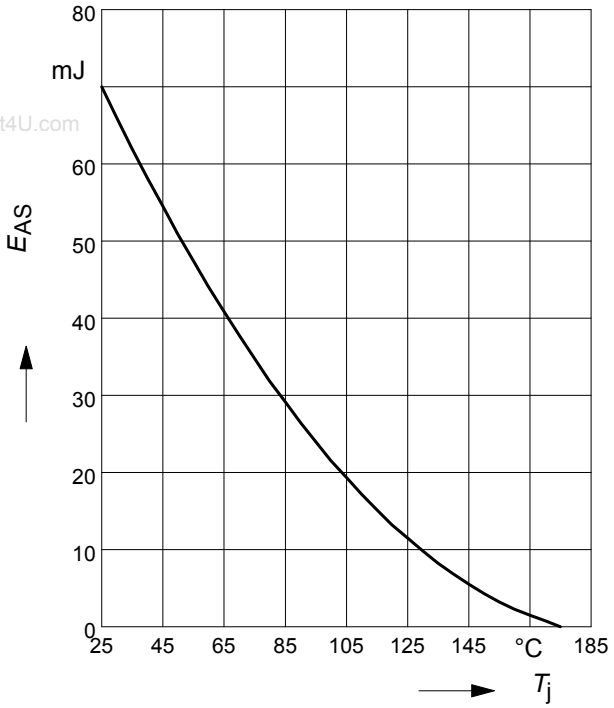
parameter: T_j , tp = 80 µs



13 Typ. avalanche energy

$E_{AS} = f(T_j)$

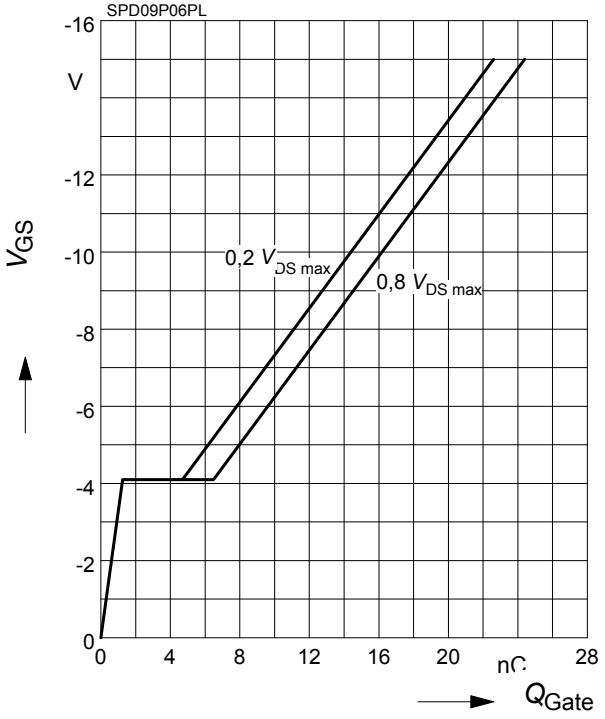
par.: I_D = -9.7 A , V_{DD} = -25 V, R_{GS} = 25 Ω



14 Typ. gate charge

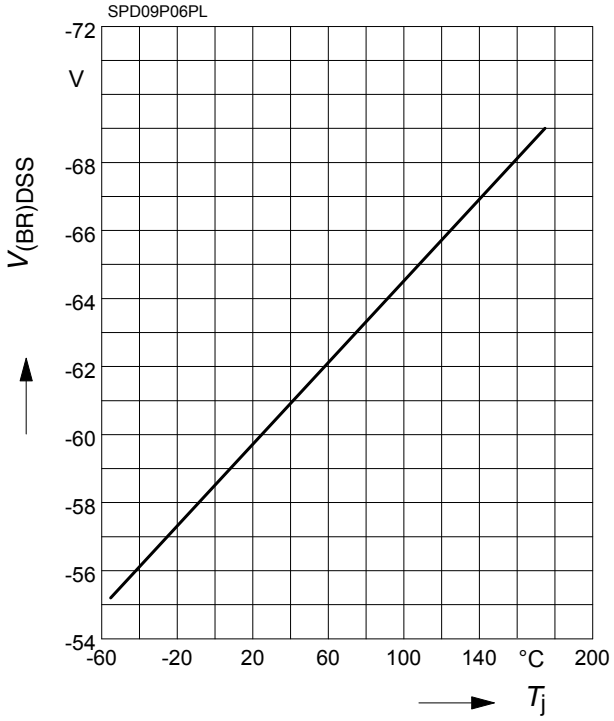
$V_{GS} = f(Q_{Gate})$

parameter: I_D = -9.7 A pulsed



15 Drain-source breakdown voltage

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



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