

OptiMOS® Power-Transistor

Feature

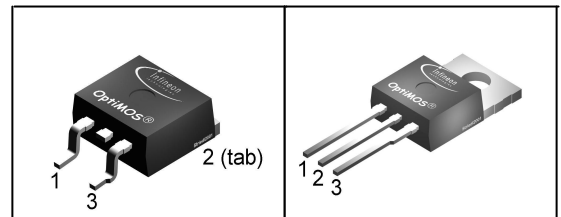
- N-Channel
- Enhancement mode
- 175°C operating temperature
- Avalanche rated
- dv/dt rated

Product Summary

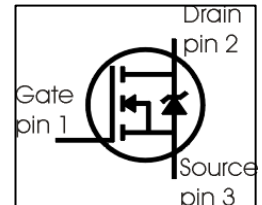
V_{DS}	55	V
$R_{DS(on)}$	12	mΩ
I_D	80	A

P- TO263 -3-2

P- TO220 -3-1



Type	Package	Ordering Code	Marking
SPP77N06S2-12	P- TO220 -3-1	Q67060-S6029	2N0612
SPB77N06S2-12	P- TO263 -3-2	Q67060-S6030	2N0612



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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C=25\text{ °C}$	I_D	80 56	A
Pulsed drain current $T_C=25\text{ °C}$	$I_{D\text{ puls}}$	320	
Avalanche energy, single pulse $I_D=77\text{ A}$, $V_{DD}=25\text{ V}$, $R_{GS}=25\text{ Ω}$	E_{AS}	280	mJ
Repetitive avalanche energy, limited by $T_{jmax}^{1)}$	E_{AR}	16	
Reverse diode dv/dt $I_S=77\text{ A}$, $V_{DS}=44\text{ V}$, $di/dt=200\text{ A/μs}$, $T_{jmax}=175\text{ °C}$	dv/dt	6	kV/μs
Gate source voltage	V_{GS}	±20	V
Power dissipation $T_C=25\text{ °C}$	P_{tot}	158	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}	-	0.63	0.95	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
SMD version, device on PCB: @ min. footprint @ 6 cm ² cooling area ²⁾	R_{thJA}	-	-	62 40	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=93\mu A$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS}=55V, V_{GS}=0V, T_j=25^\circ C$ $V_{DS}=55V, V_{GS}=0V, T_j=125^\circ C$	I_{DSS}	-	0.01 1	1 100	μA
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	I_{GSS}	-	1	100	
Drain-source on-state resistance $V_{GS}=10V, I_D=38A$	$R_{DS(on)}$	-	9.8	12	$m\Omega$

¹Defined by design. Not subject to production test.

²Device 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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic Characteristics

Transconductance	g_{fs}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 56A$	27	54	-	S
Input capacitance	C_{iss}	$V_{GS} = 0V$, $V_{DS} = 25V$, $f = 1MHz$	-	1770	2350	pF
Output capacitance	C_{oss}		-	460	610	
Reverse transfer capacitance	C_{rss}		-	120	180	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30V$, $V_{GS} = 10V$, $I_D = 77A$, $R_G = 6.2\Omega$	-	14	20	ns
Rise time	t_r		-	27	40	
Turn-off delay time	$t_{d(off)}$		-	34	50	
Fall time	t_f		-	26	39	

Gate Charge Characteristics

Gate to source charge	Q_{gs}	$V_{DD} = 44V$, $I_D = 77A$	-	9	12	nC
Gate to drain charge	Q_{gd}		-	18	28	
Gate charge total	Q_g	$V_{DD} = 44V$, $I_D = 77A$, $V_{GS} = 0$ to $10V$	-	45	60	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 44V$, $I_D = 77A$	-	5.9	-	V

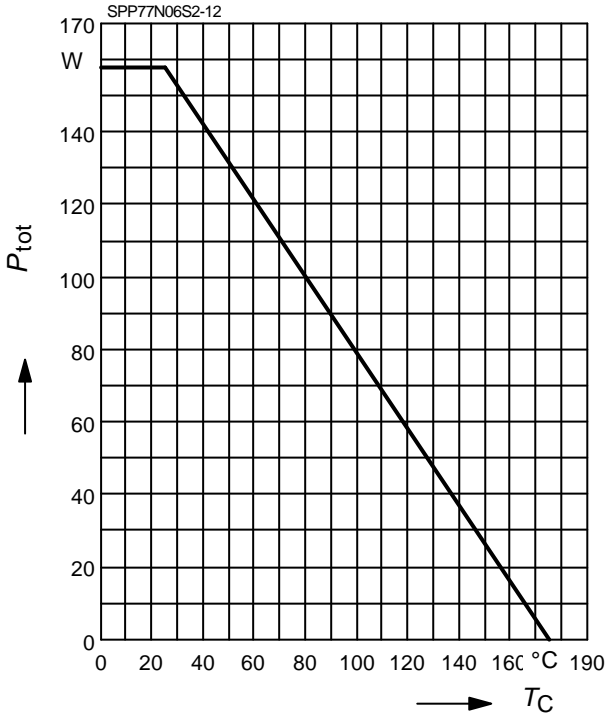
Reverse Diode

Inverse diode continuous forward current	I_S	$T_C = 25^\circ C$	-	-	80	A
Inv. diode direct current, pulsed	I_{SM}		-	-	320	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0V$, $I_F = 77A$	-	1	1.3	V
Reverse recovery time	t_{rr}	$V_R = 30V$, $I_F = I_S$, $di_F/dt = 100A/\mu s$	-	45	60	ns
Reverse recovery charge	Q_{rr}		-	64	80	

1 Power dissipation

$P_{tot} = f(T_C)$

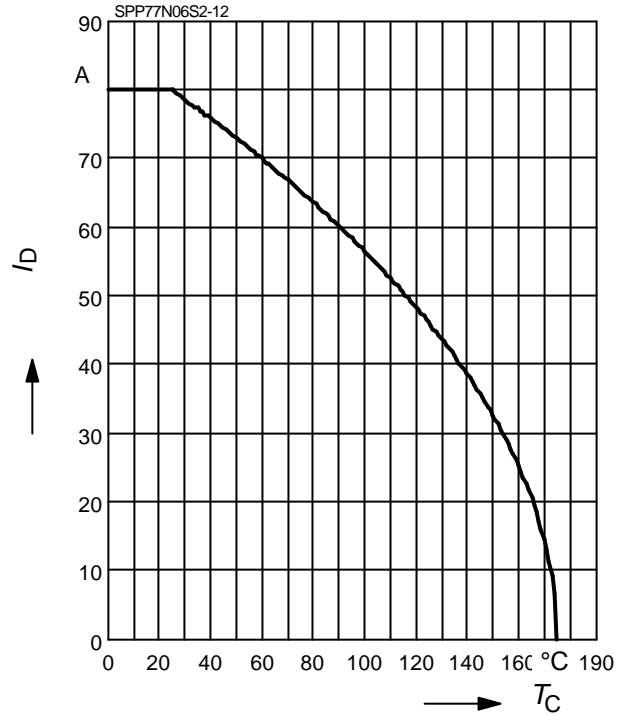
parameter: $V_{GS} \geq 6\text{ V}$



2 Drain current

$I_D = f(T_C)$

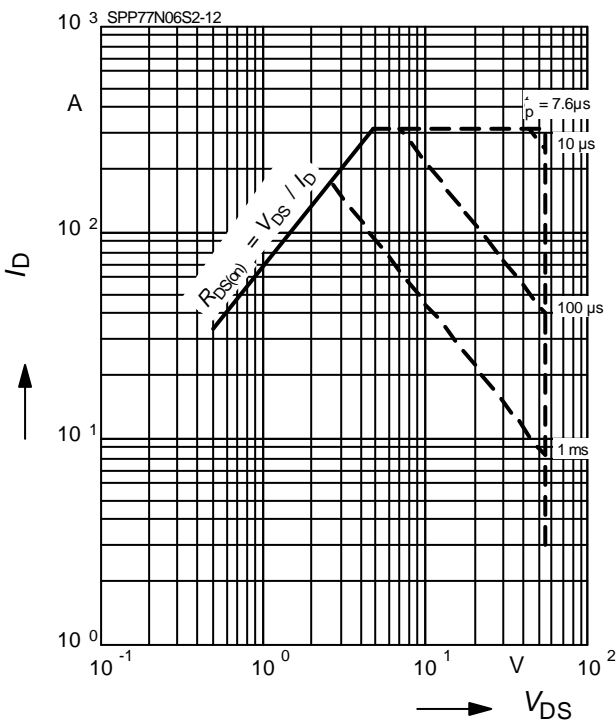
parameter: $V_{GS} \geq 10\text{ V}$



3 Safe operating area

$I_D = f(V_{DS})$

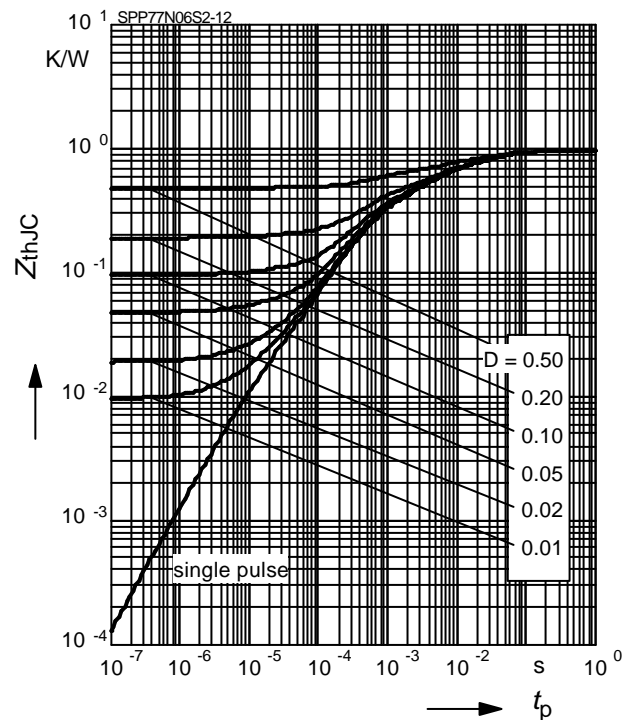
parameter: $D = 0, T_C = 25\text{ °C}$



4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

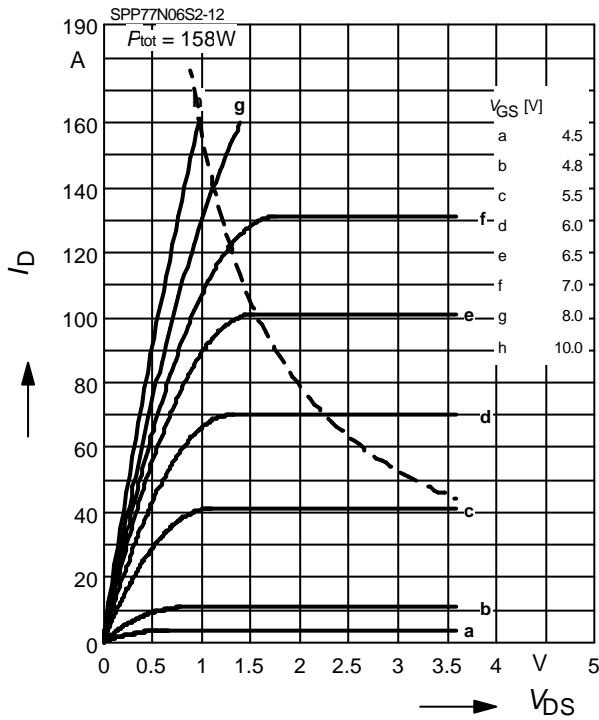
parameter: $D = t_p/T$



5 Typ. output characteristic

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

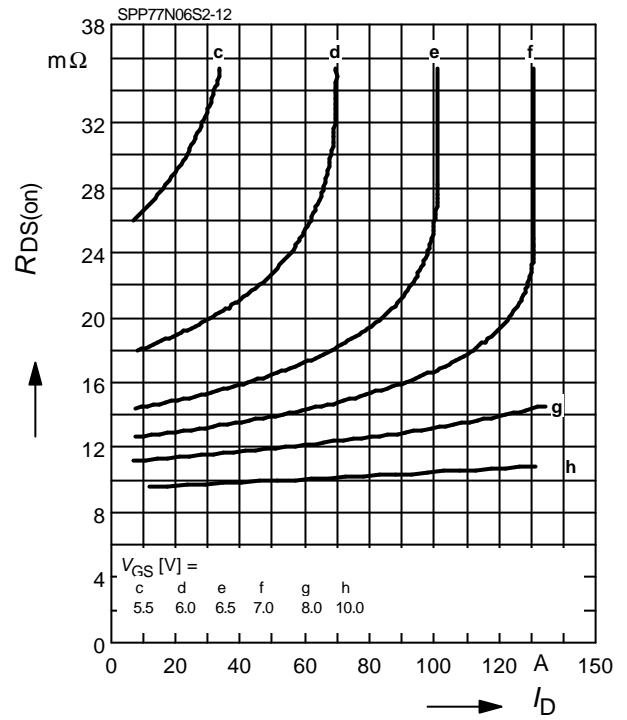
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

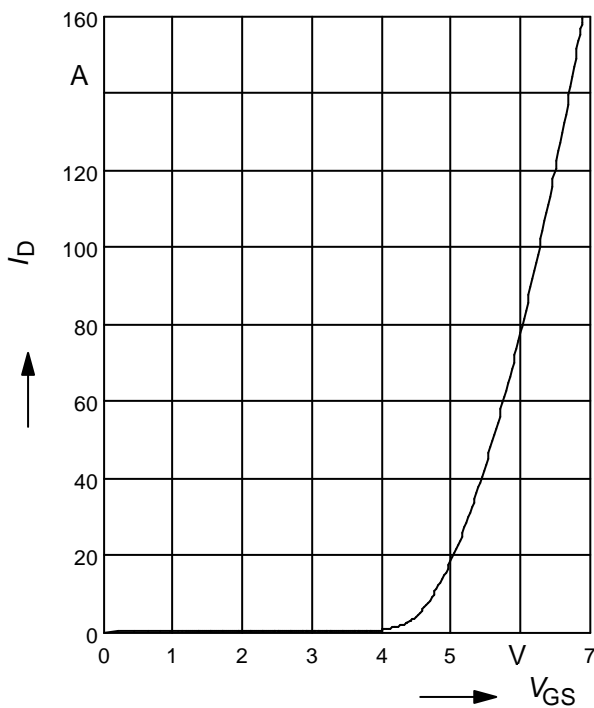
parameter: V_{GS}



7 Typ. transfer characteristics

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

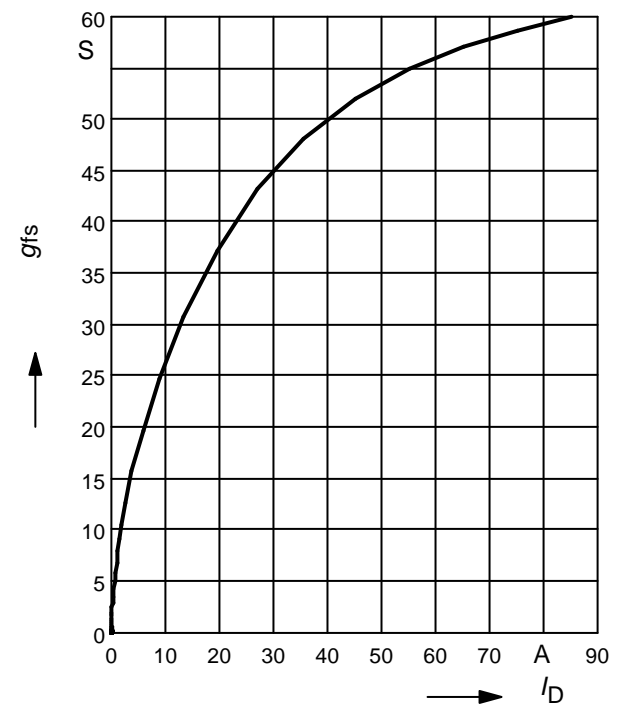
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

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

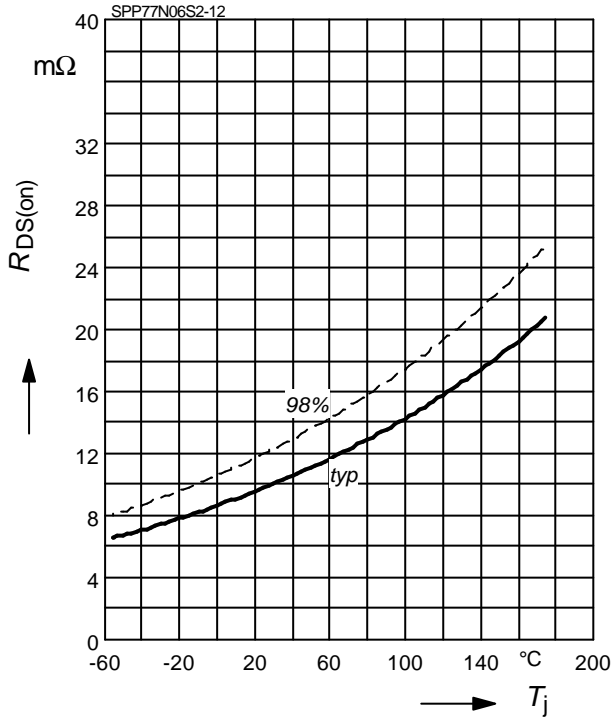
parameter: g_{fs}



9 Drain-source on-state resistance

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

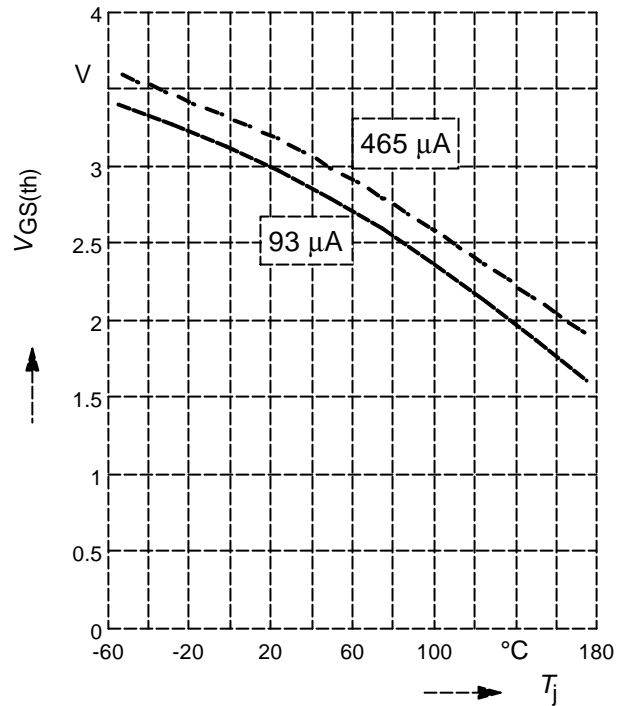
parameter: $I_D = 38\text{ A}$, $V_{GS} = 10\text{ V}$



10 Typ. gate threshold voltage

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

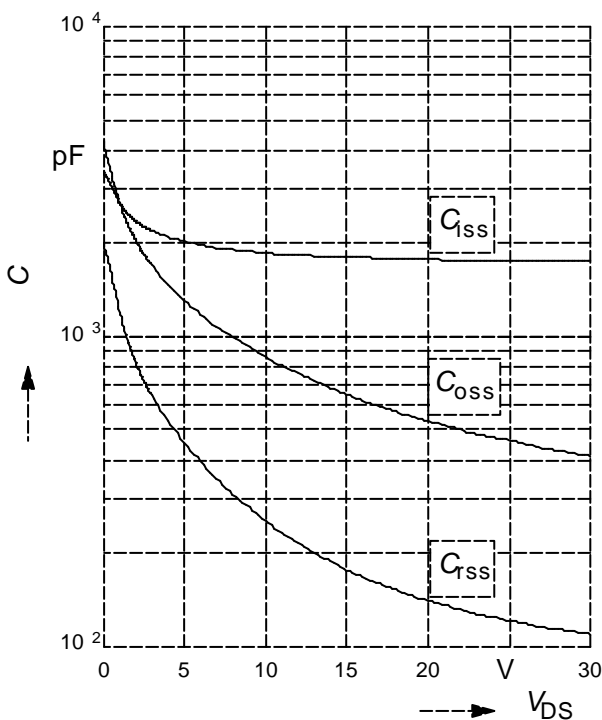
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

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

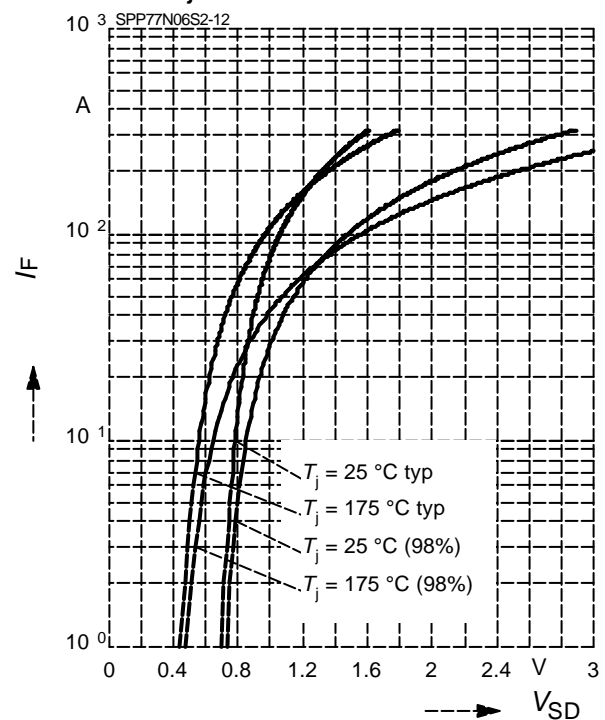
parameter: $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$



12 Forward character. of reverse diode

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

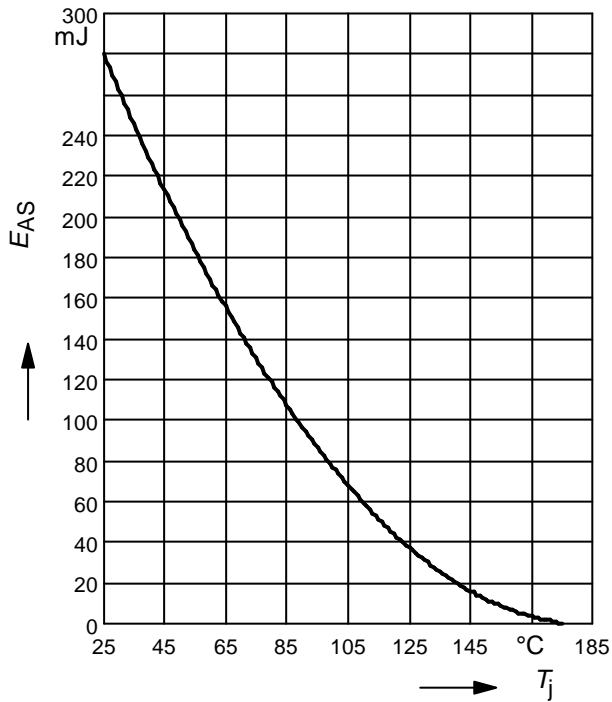
parameter: T_j , $t_p = 80\text{ μs}$



13 Typ. avalanche energy

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

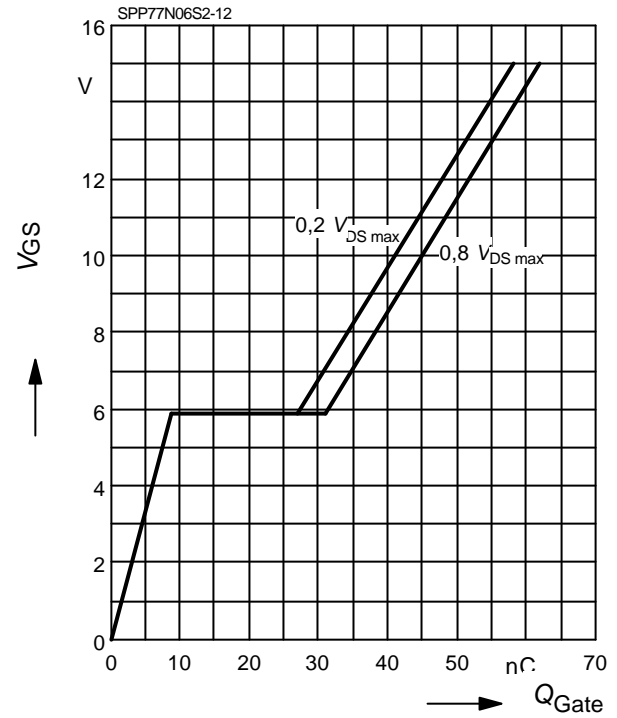
par.: $I_D=77A$, $V_{DD} = 25 V$, $R_{GS} = 25 \Omega$



14 Typ. gate charge

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

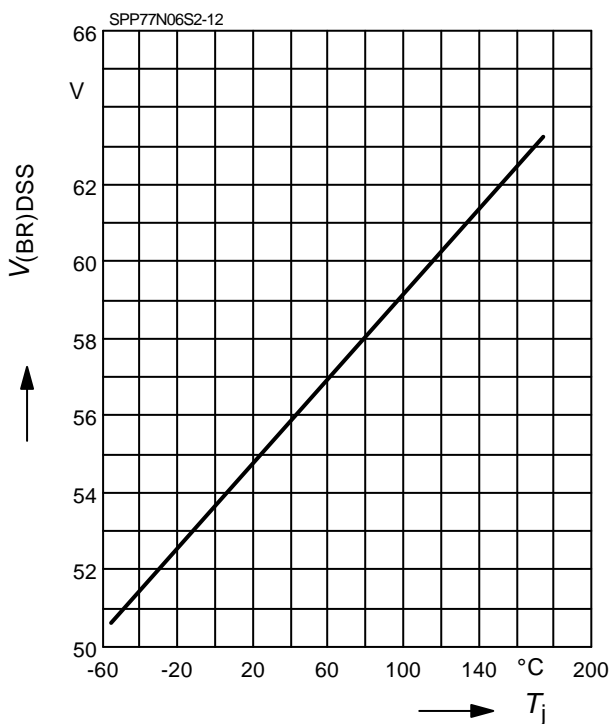
parameter: $I_D = 80 A$ pulsed



15 Drain-source breakdown voltage

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

parameter: $I_D=10 mA$



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Further information

Please notice that the part number is **BSPP77N06S2-12** and **BSPB77N06S2-12**, for simplicity the device is referred to by the term **SPP77N06S2-12** and **SPB77N06S2-12** throughout this documentation.