

## OptiMOS® Power-Transistor

### Feature

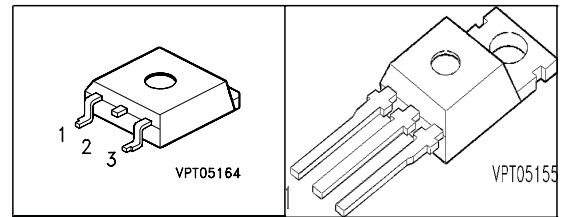
- N-Channel
- Enhancement mode
- 175°C operating temperature
- Avalanche rated
- dv/dt rated

### Product Summary

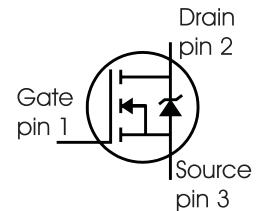
$V_{DS}$	55	V
$R_{DS(on)}$	12	mΩ
$I_D$	77	A

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	$I_D$		A
$T_C=25\text{ °C}$		77	
$T_C=100\text{ °C}$		53	
Pulsed drain current	$I_D \text{ puls}$	308	
$T_C=25\text{ °C}$			
Avalanche energy, single pulse	$E_{AS}$	280	mJ
$I_D=77\text{ A}$ , $V_{DD}=25\text{ V}$ , $R_{GS}=25\text{ Ω}$			
Reverse diode dv/dt	dv/dt	6	kV/μs
$I_S=77\text{ A}$ , $V_{DS}=44\text{ V}$ , $di/dt=200\text{ A/μs}$ , $T_{jmax}=175\text{ °C}$			
Gate source voltage	$V_{GS}$	±20	V
Power dissipation	$P_{tot}$	140	W
$T_C=25\text{ °C}$			
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.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	-	1	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$	-	-	62	
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	62	
@ 6 cm <sup>2</sup> cooling area <sup>1)</sup>		-	-	40	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain-source breakdown voltage $V_{GS}=0\text{V}, I_D=1\text{mA}$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=93\mu\text{A}$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS}=55\text{V}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$ $V_{DS}=55\text{V}, V_{GS}=0\text{V}, T_j=125^\circ\text{C}$	$I_{DSS}$	-	0.01	1	$\mu\text{A}$
		-	1	100	
Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0\text{V}$	$I_{GSS}$	-	1	100	nA
Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=38\text{A}$	$R_{DS(on)}$	-	9.2	12	m $\Omega$

<sup>1</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  $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

### Dynamic Characteristics

Transconductance	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 53\text{A}$	27	54	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	-	1800	2250	pF
Output capacitance	$C_{oss}$		-	465	580	
Reverse transfer capacitance	$C_{rss}$		-	125	190	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{V}$ , $V_{GS} = 10\text{V}$ , $I_D = 77\text{A}$ , $R_G = 6.2\Omega$	-	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

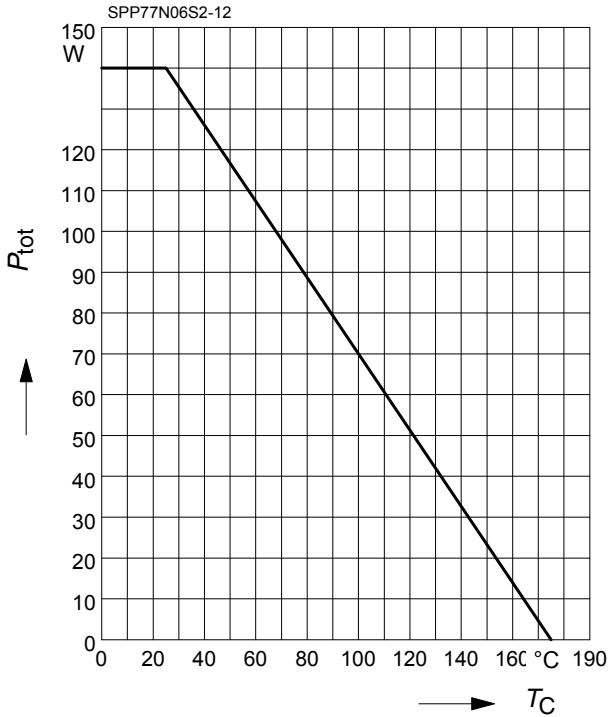
Gate to source charge	$Q_{gs}$	$V_{DD} = 44\text{V}$ , $I_D = 77\text{A}$	-	10.4	13	nC
Gate to drain charge	$Q_{gd}$		-	21	32	
Gate charge total	$Q_g$	$V_{DD} = 44\text{V}$ , $I_D = 77\text{A}$ , $V_{GS} = 0$ to $10\text{V}$	-	49	60	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 44\text{V}$ , $I_D = 77\text{A}$	-	5.9	-	V

### Reverse Diode

Inverse diode continuous forward current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	77	A
Inverse diode direct current, pulsed	$I_{SM}$		-	-	308	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0\text{V}$ , $I_F = 77\text{A}$	-	1	1.3	V
Reverse recovery time	$t_{rr}$	$V_R = 30\text{V}$ , $f = 5$ , $di_F/dt = 100\text{A}/\mu\text{s}$	-	59	74	ns
Reverse recovery charge	$Q_{rr}$		-	105	130	

### 1 Power dissipation

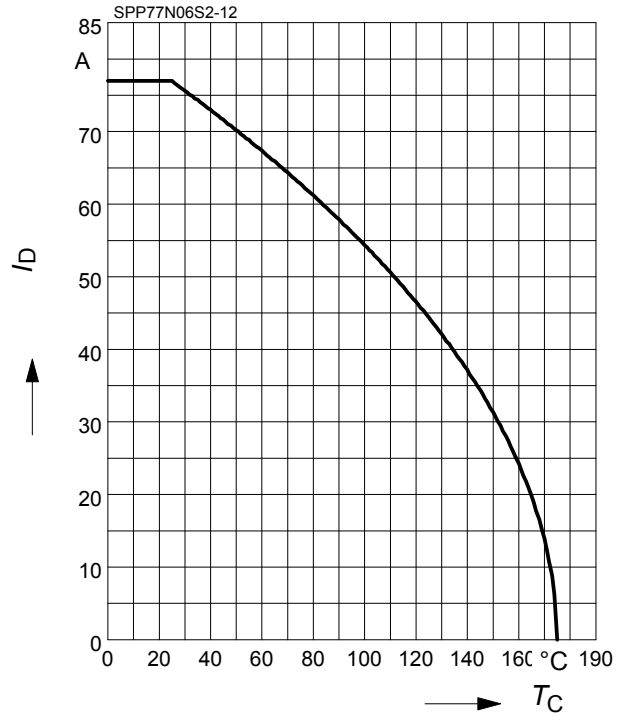
$$P_{tot} = f(T_C)$$



### 2 Drain current

$$I_D = f(T_C)$$

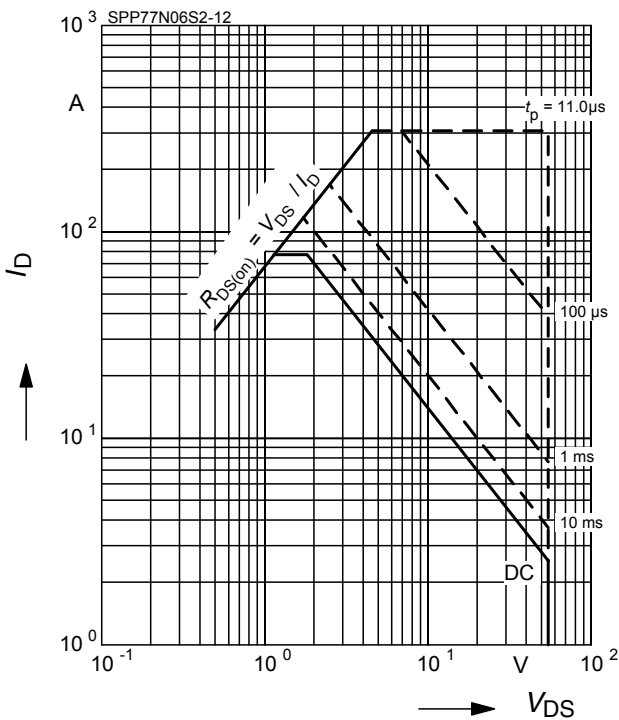
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

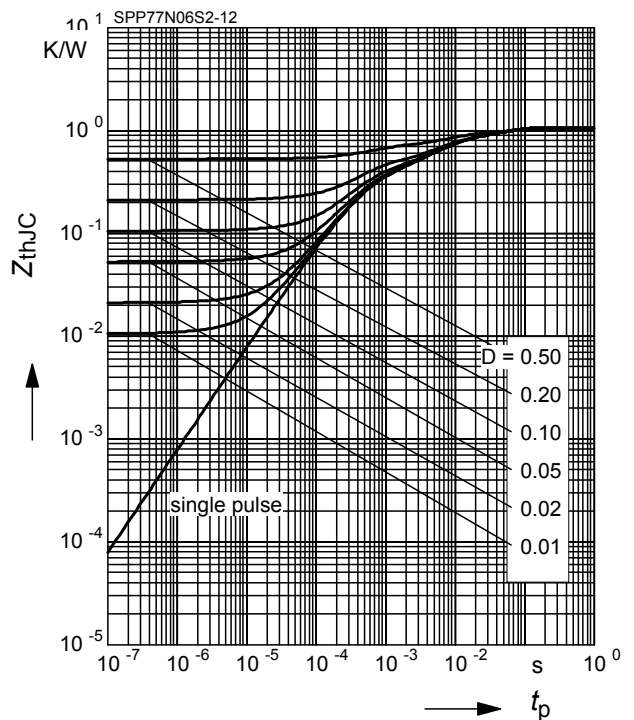
parameter:  $D = 0$ ,  $T_C = 25 \text{ °C}$



### 4 Transient thermal impedance

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

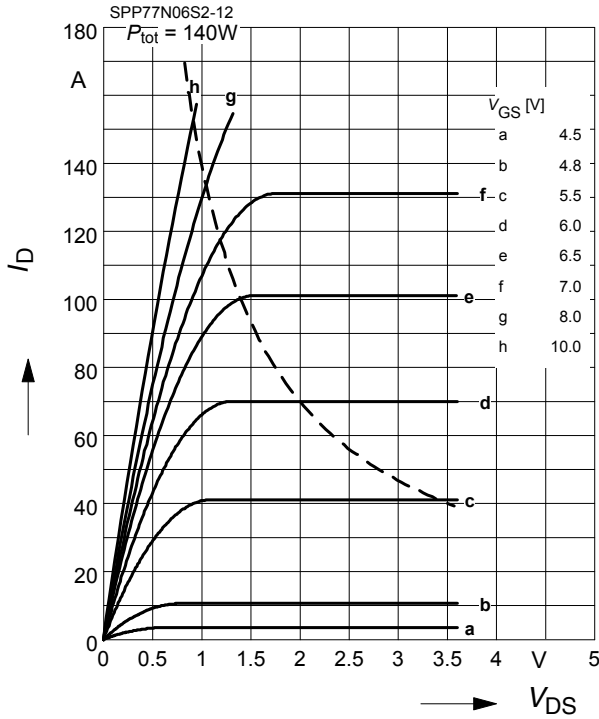
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

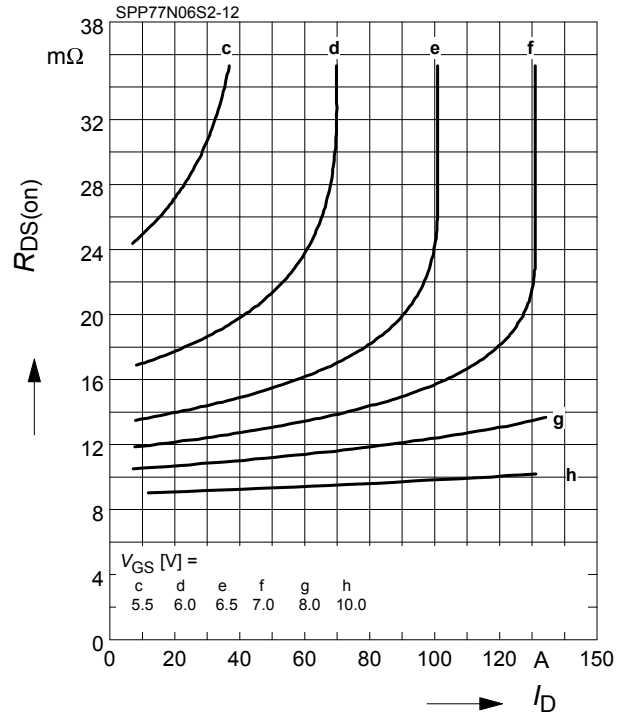
parameter:  $t_p = 80 \mu\text{s}$



**6 Typ. drain-source on resistance**

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

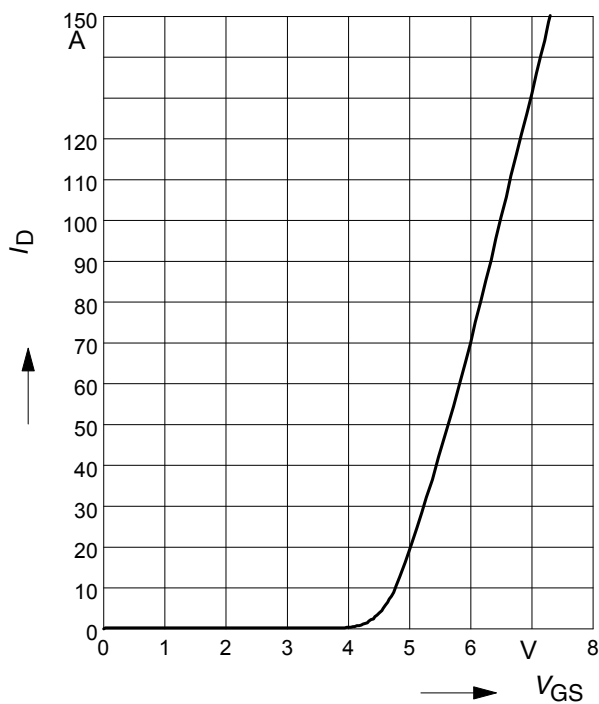
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

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

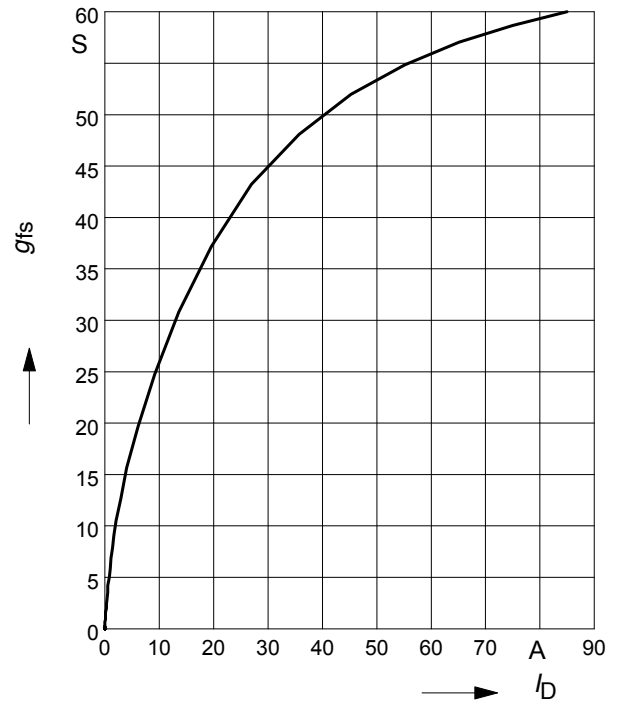
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

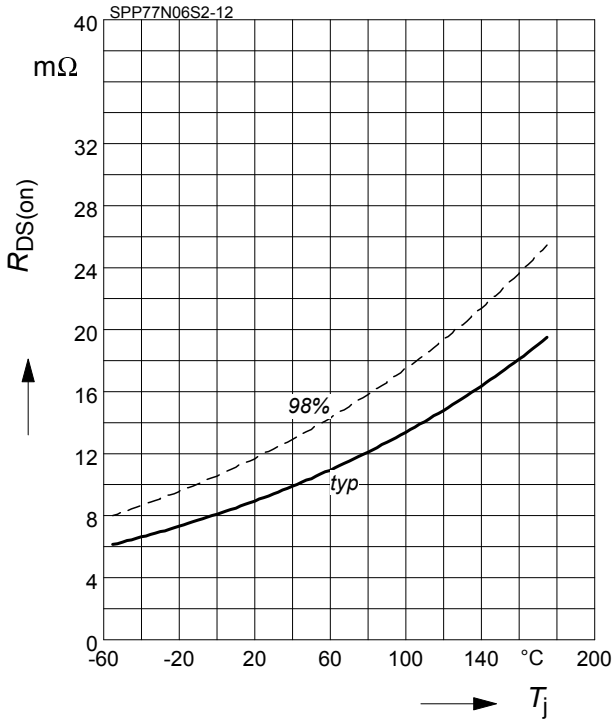
parameter:  $g_{fs}$



**9 Drain-source on-state resistance**

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

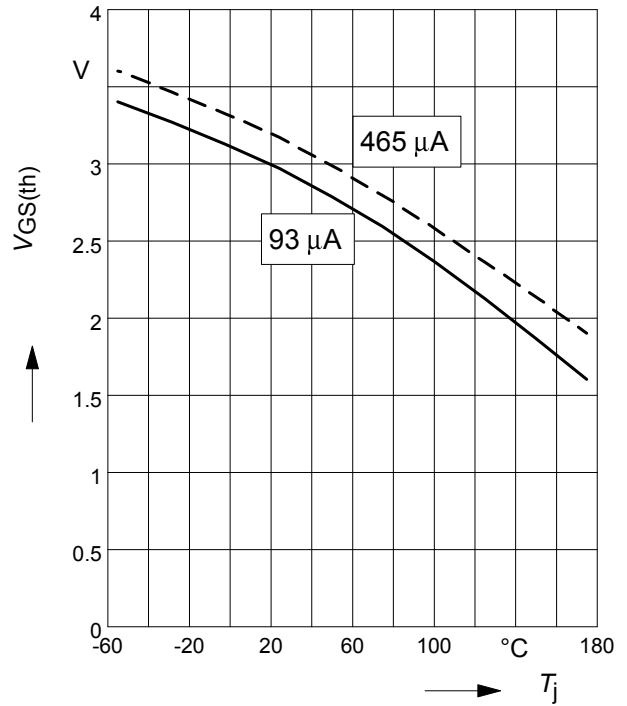
parameter:  $I_D = 38\text{ A}$ ,  $V_{GS} = 10\text{ V}$



**10 Typ. gate threshold voltage**

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

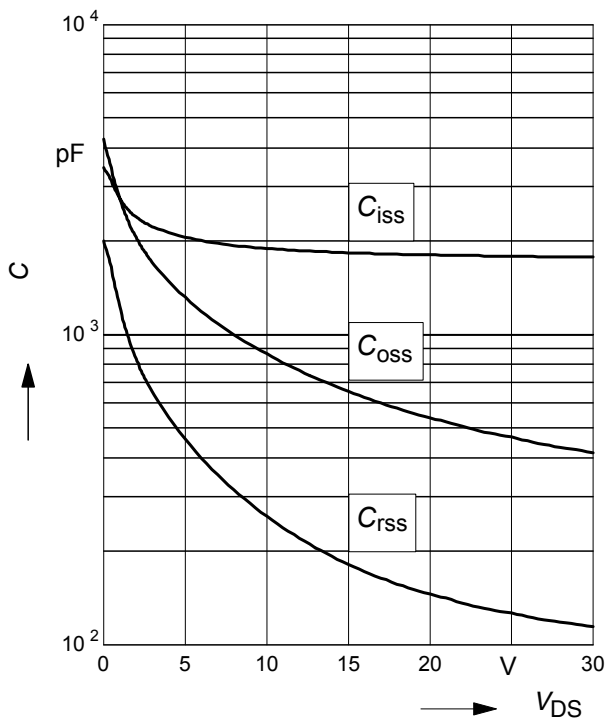
parameter:  $V_{GS} = V_{DS}$



**11 Typ. capacitances**

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

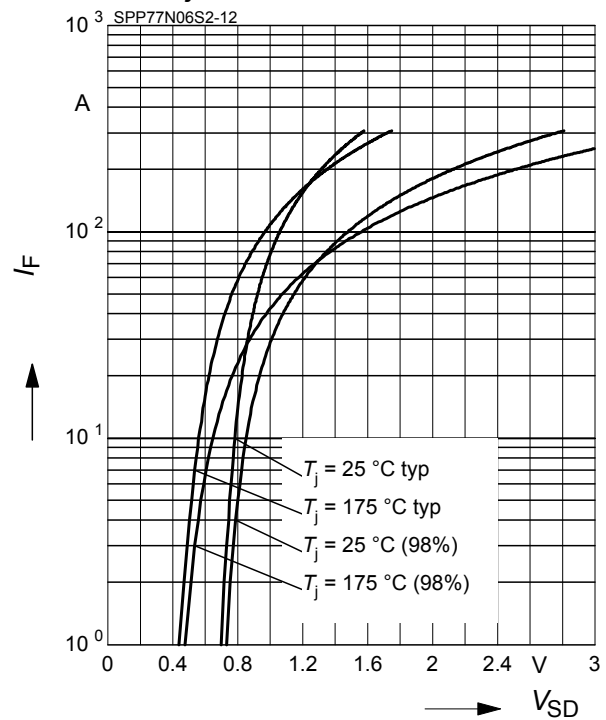
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



**12 Forward character. of reverse diode**

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

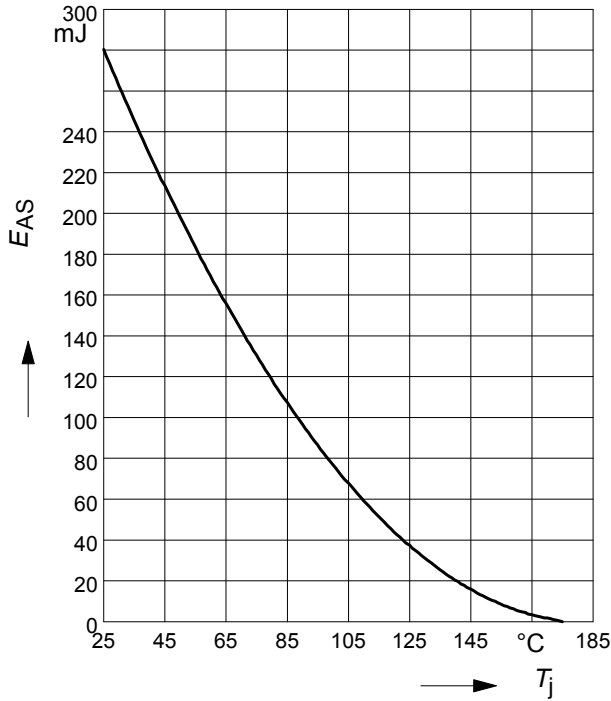
parameter:  $T_j$ ,  $t_p = 80\text{ μs}$



**13 Typ. avalanche energy**

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

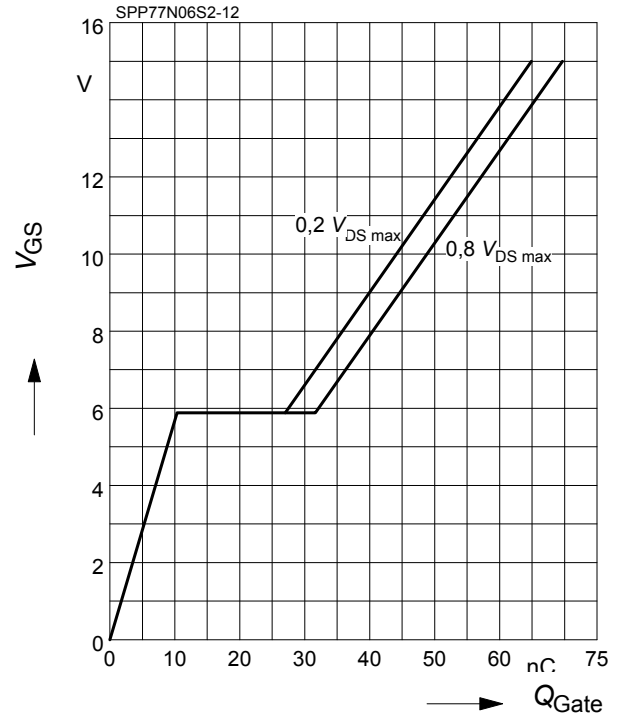
par.:  $I_D = 77 \text{ A}$  ,  $V_{DD} = 25 \text{ V}$ ,  $R_{GS} = 25 \Omega$



**14 Typ. gate charge**

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

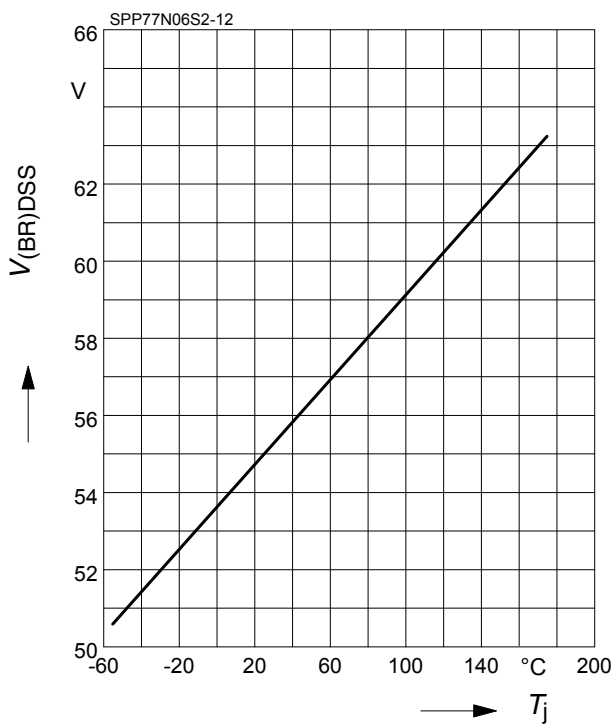
parameter:  $I_D = 77 \text{ A}$  pulsed



**15 Drain-source breakdown voltage**

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

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



**Published by**  
**Infineon Technologies AG,**  
**Bereichs Kommunikation**  
**St.-Martin-Strasse 53,**  
**D-81541 München**  
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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.