

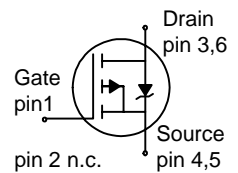
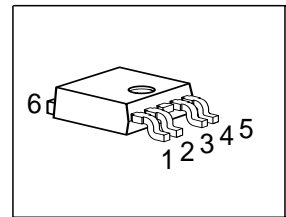
**OptiMOS<sup>®</sup>-P Power - Transistor  
Feature**

- P-Channel
- Enhancement mode
- Logic Level
- High current rating
- 175°C operating temperature
- Avalanche rated
- dv/dt rated

**Product Summary**

$V_{DS}$	-30	V
$R_{DS(on)}$	7	mΩ
$I_D$	-50	A

P-TO252-5-3



Type	Package	Ordering Code
SPD50P03L	P-TO252-5-3	Q67042-S4076

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C=25\text{ °C}$ $T_C=100\text{ °C}$	$I_D$	-50 -50	A
Pulsed drain current $T_C=25\text{ °C}$	$I_D \text{ puls}$	-200	
Avalanche energy, single pulse $I_D=-50\text{ A}$ , $V_{DD}=-25\text{ V}$ , $R_{GS}=25\text{ Ω}$	$E_{AS}$	256	mJ
Reverse diode dv/dt $I_S=-50\text{ A}$ , $V_{DS}=-24\text{ V}$ , $dI/dt=200\text{ A}/\mu\text{s}$ , $T_{jmax}=175\text{ °C}$	dv/dt	-6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C=25\text{ °C}$	$P_{tot}$	150	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.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	-	1	K/W
SMD version, device on PCB:	$R_{thJA}$	-	-	75	
@ min. footprint, $t < 10s$ @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>		-	-	50	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain-source breakdown voltage $V_{GS}=0V, I_D=-250\mu A$	$V_{(BR)DSS}$	-30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-250\mu A$	$V_{GS(th)}$	-1	-1.5	-2	
Zero gate voltage drain current $V_{DS}=-30V, V_{GS}=0, T_j=25^\circ C$ $V_{DS}=-30V, V_{GS}=0, T_j=150^\circ C$	$I_{DSS}$	-	-0.1 -10	-1 -100	$\mu A$
Gate-source leakage current $V_{GS}=-20V, V_{DS}=0$	$I_{GSS}$	-	-10	-100	
Drain-source on-state resistance $V_{GS}=-4.5V, I_D=-30A$	$R_{DS(on)}$	-	8.5	12.5	m $\Omega$
Drain-source on-state resistance $V_{GS}=-10V, I_D=-50A$	$R_{DS(on)}$	-	5.7	7	

<sup>1</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu m$  thick) copper area for drain connection. PCB is vertical without blown air;  $t \leq 10$  sec.

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}$ $I_D = -50\text{A}$	47	94	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0, V_{DS} = -25\text{V},$ $f = 1\text{MHz}$	-	4560	-	pF
Output capacitance	$C_{oss}$		-	1178	-	
Reverse transfer capacitance	$C_{rss}$		-	965	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -15\text{V}, V_{GS} = -10\text{V},$ $I_D = -1\text{A}, R_G = 6\Omega$	-	14.8	22	ns
Rise time	$t_r$		-	21.7	32	
Turn-off delay time	$t_{d(off)}$		-	139	208	
Fall time	$t_f$		-	104	156	

**Gate Charge Characteristics**

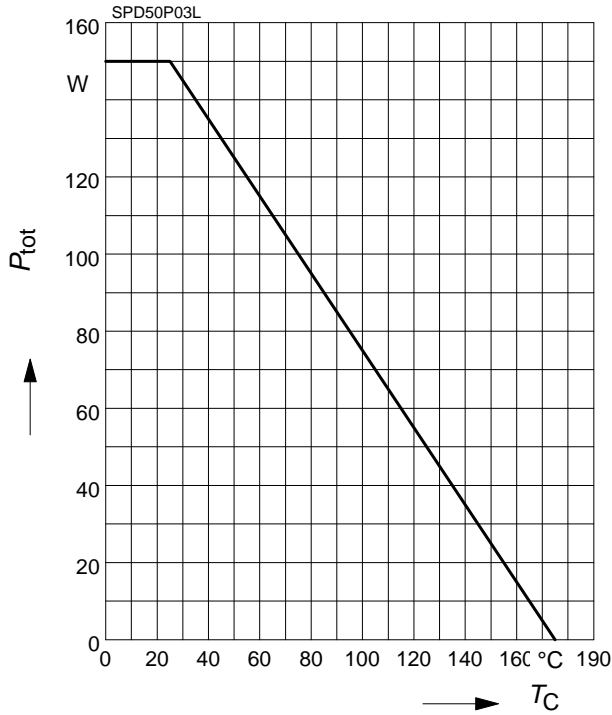
Gate to source charge	$Q_{gs}$	$V_{DD} = -24\text{V}, I_D = -50\text{A}$	-	-12.7	-17	nC
Gate to drain charge	$Q_{gd}$		-	-40	-60	
Gate charge total	$Q_g$	$V_{DD} = -24\text{V}, I_D = -50\text{A},$ $V_{GS} = 0 \text{ to } -10\text{V}$	-	-119	-178	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -24\text{V}, I_D = -50\text{A}$	-	-2.7	-	V

**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	-50	A
Inverse diode direct current, pulsed	$I_{SM}$		-	-	-200	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0,  I_F  =  I_D $	-	-1.1	-1.65	V
Reverse recovery time	$t_{rr}$	$V_R = -15\text{V},  I_F  =  I_D ,$ $di_F/dt = 100\text{A}/\mu\text{s}$	-	38	47	ns
Reverse recovery charge	$Q_{rr}$		-	46	57	nC

### 1 Power dissipation

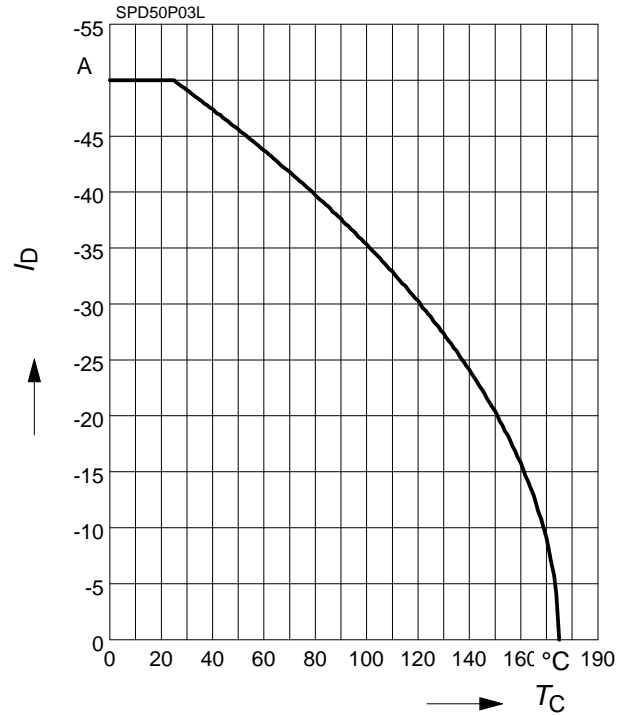
$$P_{tot} = f(T_C)$$



### 2 Drain current

$$I_D = f(T_C)$$

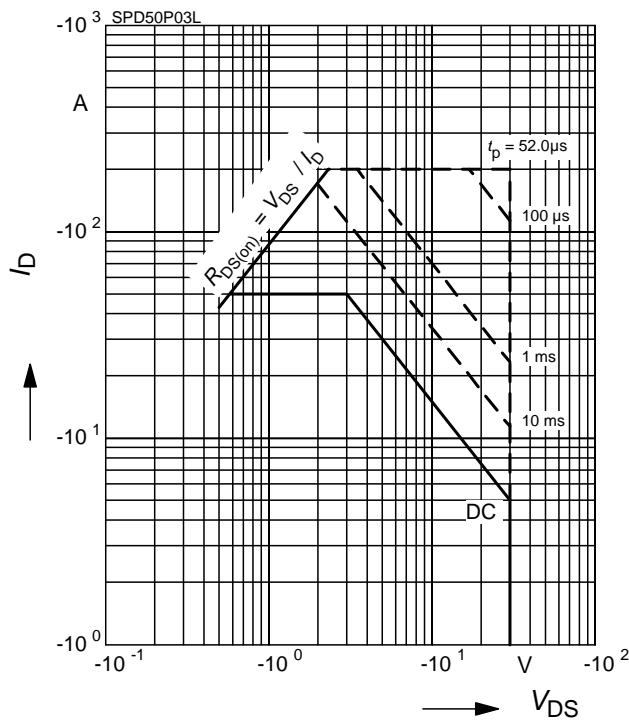
parameter:  $|V_{GS}| \geq 10 \text{ V}$



### 3 Safe operating area

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

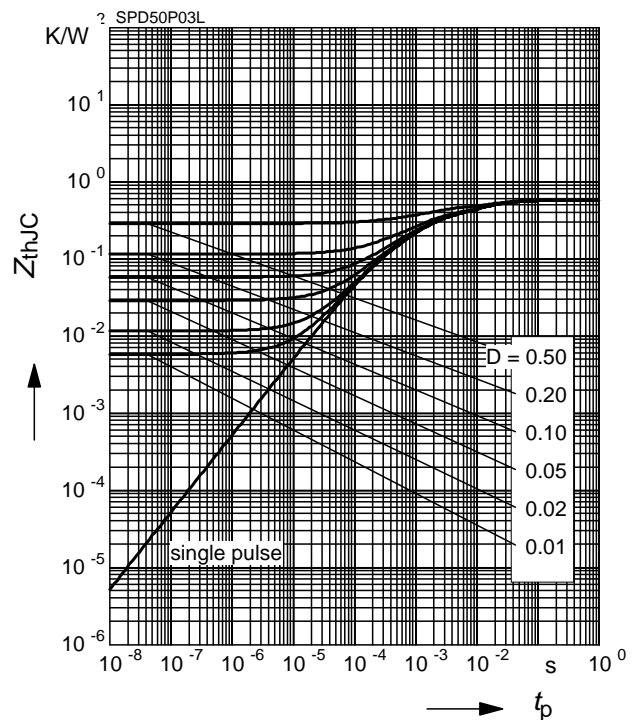
parameter:  $D = 0, T_C = 25 \text{ °C}$



### 4 Transient thermal impedance

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

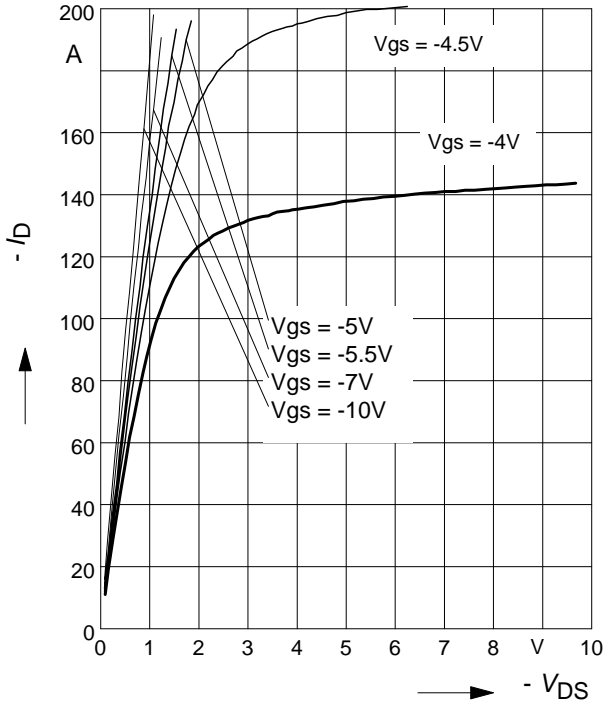
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

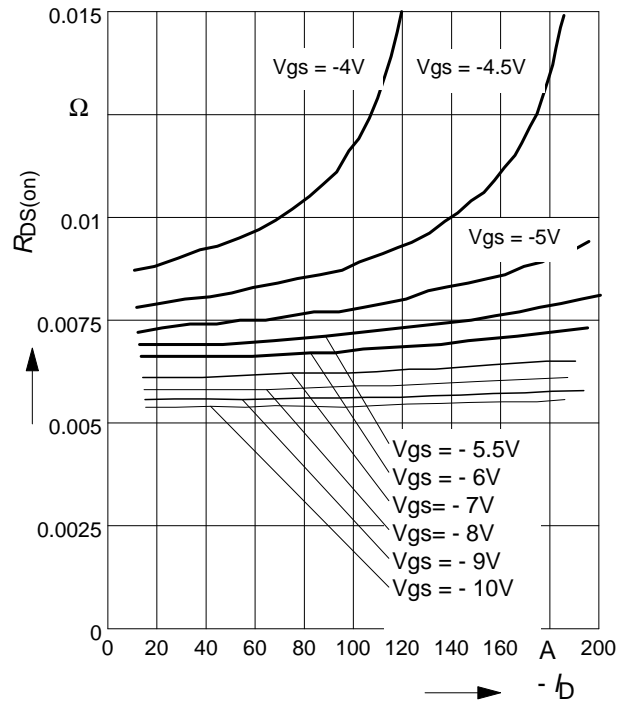
parameter:  $t_p = 80 \mu\text{s}$



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

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

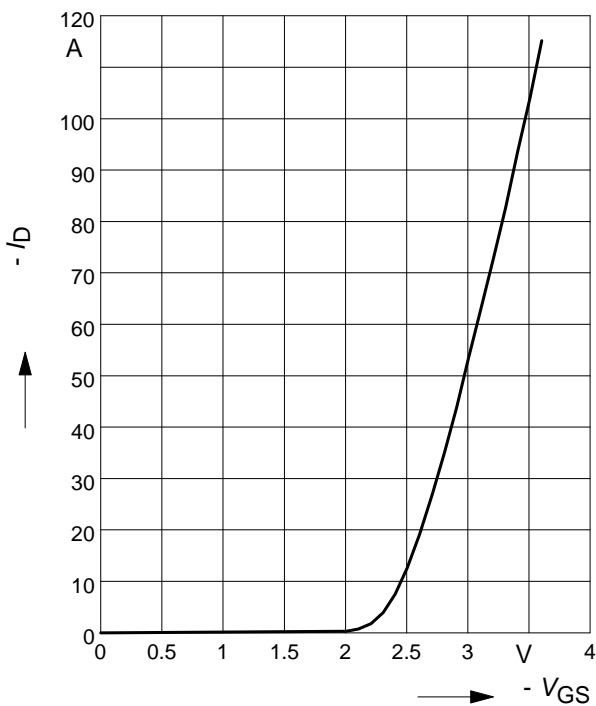
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

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

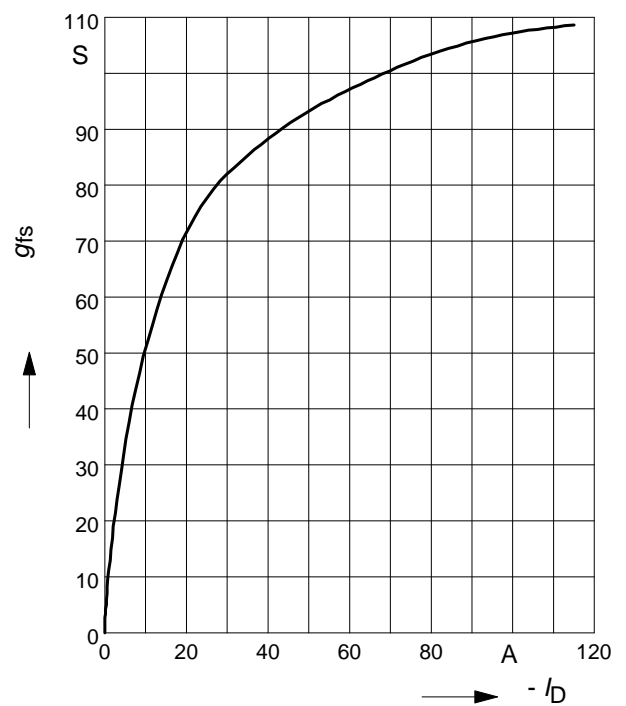
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

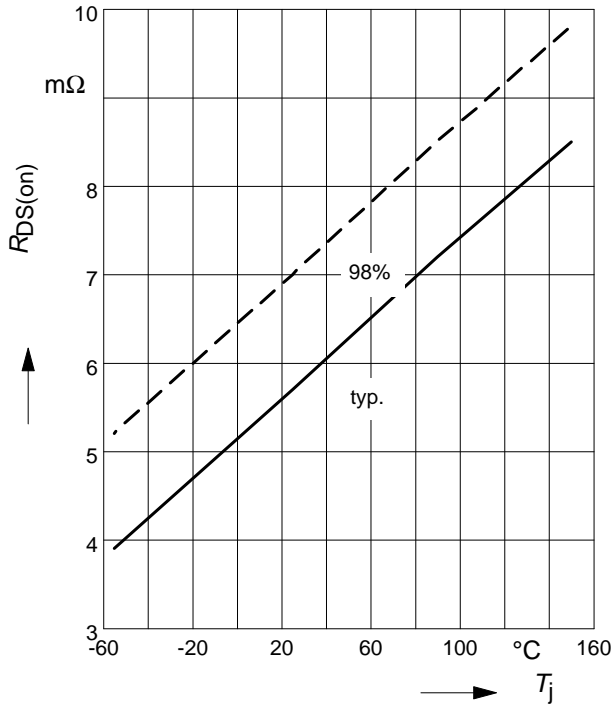
parameter:  $t_p = 80 \mu\text{s}$



### 9 Drain-source on-resistance

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

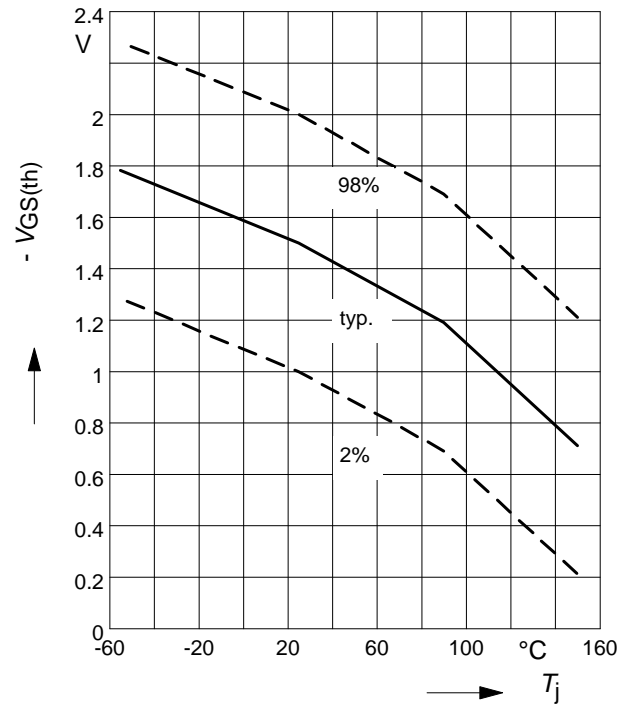
parameter:  $I_D = -50\text{ A}$ ,  $V_{GS} = -10\text{ V}$



### 10 Gate threshold voltage

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

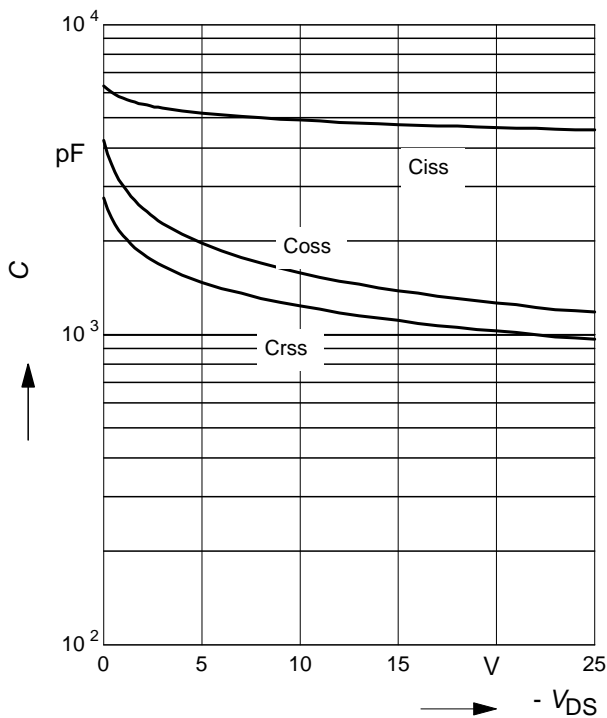
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -250\text{ }\mu\text{A}$



### 11 Typ. capacitances

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

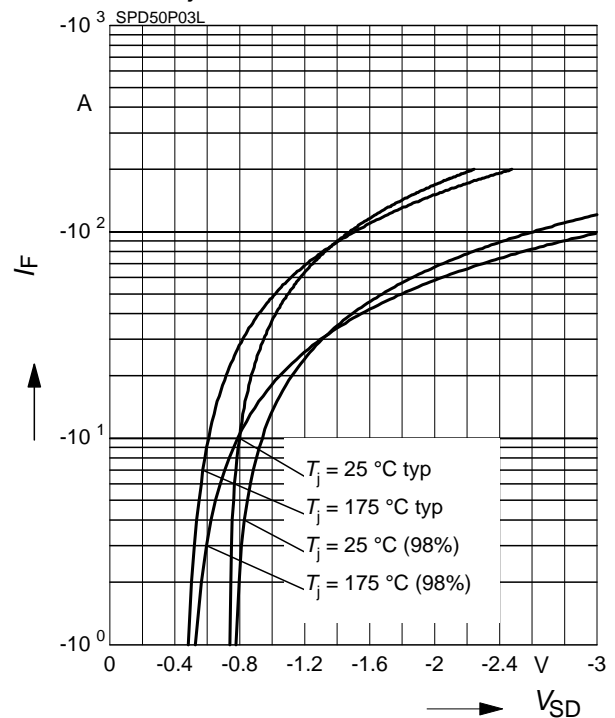
parameter:  $V_{GS} = 0$ ,  $f = 1\text{ MHz}$



### 12 Forward character. of reverse diode

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

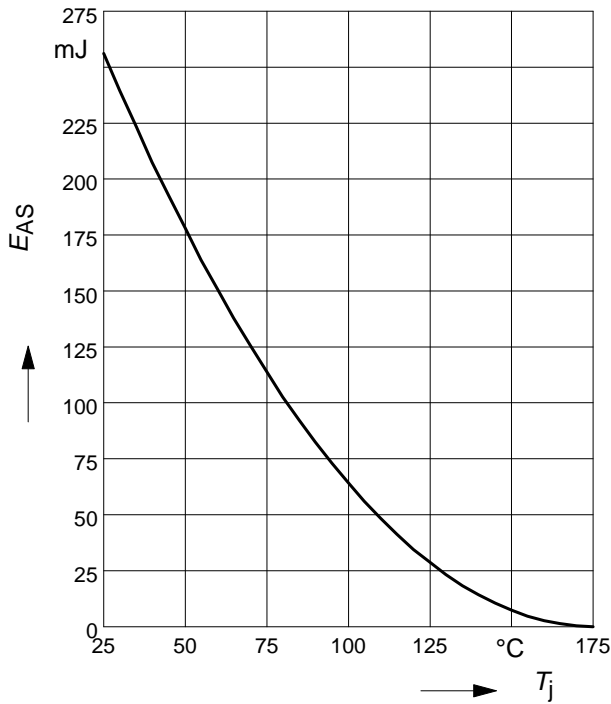
parameter:  $T_j$ ,  $t_p = 80\text{ }\mu\text{s}$



**13 Typ. avalanche energy**

$E_{AS} = f(T_j)$ , par.:  $I_D = -50\text{ A}$

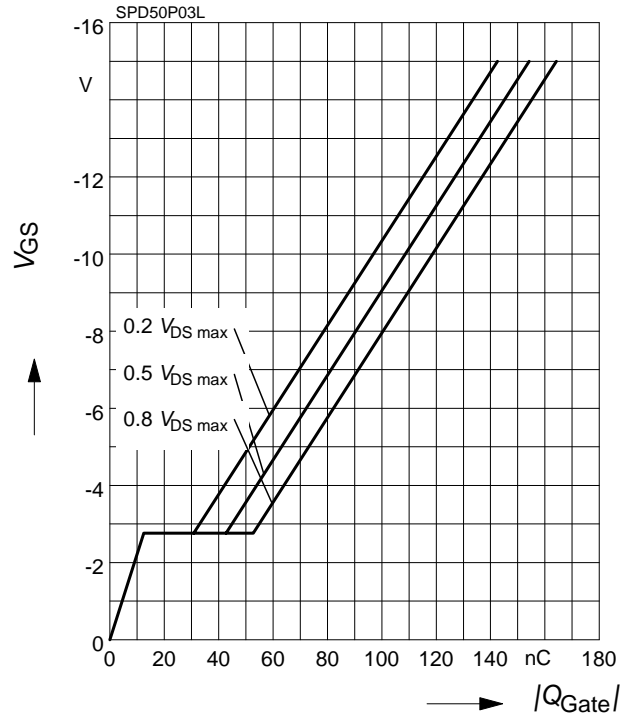
$V_{DD} = -25\text{ V}$ ,  $R_{GS} = 25\ \Omega$



**14 Typ. gate charge**

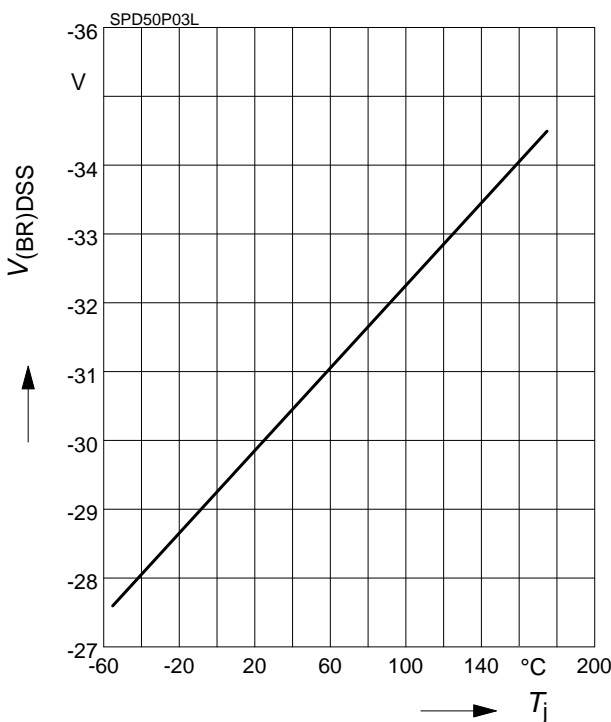
$V_{GS} = f(Q_{Gate})$

parameter:  $I_D = -50\text{ A}$  pulsed



**15 Drain-source breakdown voltage**

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



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