

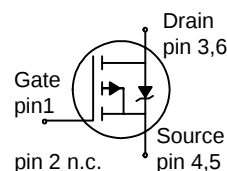
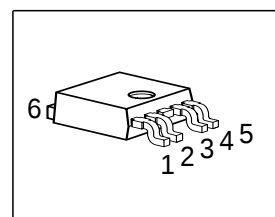
OptiMOS®-P Power - Transistor Feature

- 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 $T_j = 25^\circ\text{C}$, unless otherwise specified

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

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
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	μA
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 Ω
Drain-source on-state resistance $V_{GS}=-10V, I_D=-50A$	$R_{DS(on)}$	-	5.7	7	

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; $t \leq 10$ sec.

Electrical Characteristics, at $T_j = 25^\circ\text{C}$, 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}$ $I_D = -50\text{A}$	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

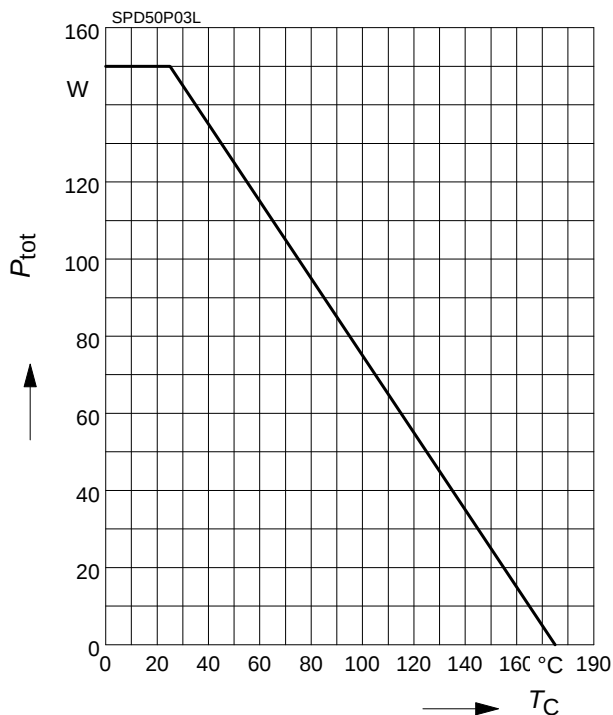
Gate to source charge	Q_{gs}	$V_{DD}=-24\text{V}, I_D=-50\text{A}$	-	-12.7	-17	nC
Gate to drain charge	Q_{gd}		-	-40	-60	
Gate charge total	Q_g	$V_{DD}=-24\text{V}, I_D=-50\text{A},$ $V_{GS}=0 \text{ to } -10\text{V}$	-	-119	-178	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD}=-24\text{V}, I_D=-50\text{A}$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

Reverse Diode

Inverse diode continuous forward current	I_S	$T_C=25^\circ\text{C}$	-	-	-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

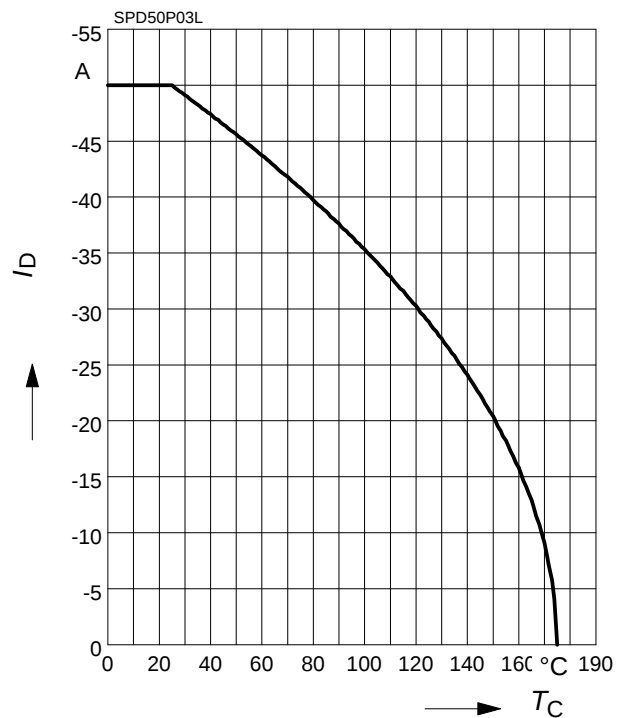
$$P_{\text{tot}} = f(T_C)$$



2 Drain current

$$I_D = f(T_C)$$

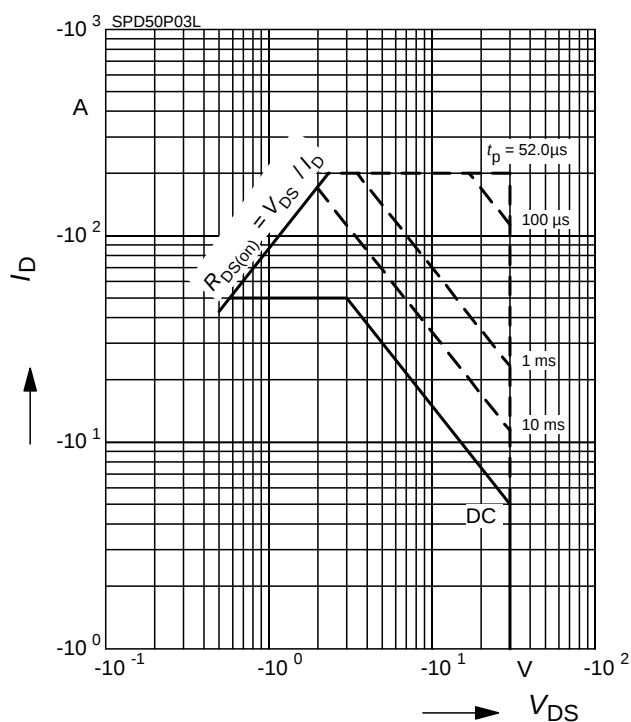
parameter: $|V_{GS}| \geq 10 \text{ V}$



3 Safe operating area

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

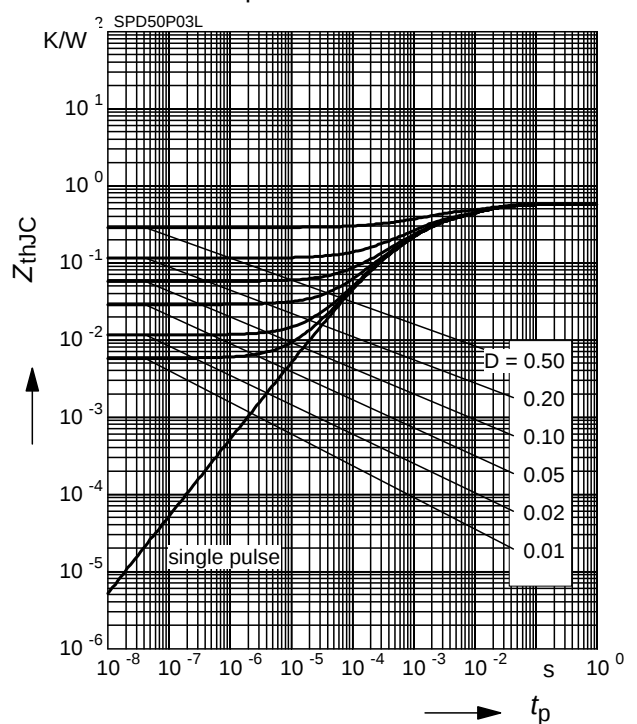
parameter: $D = 0$, $T_C = 25^\circ\text{C}$



4 Transient thermal impedance

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

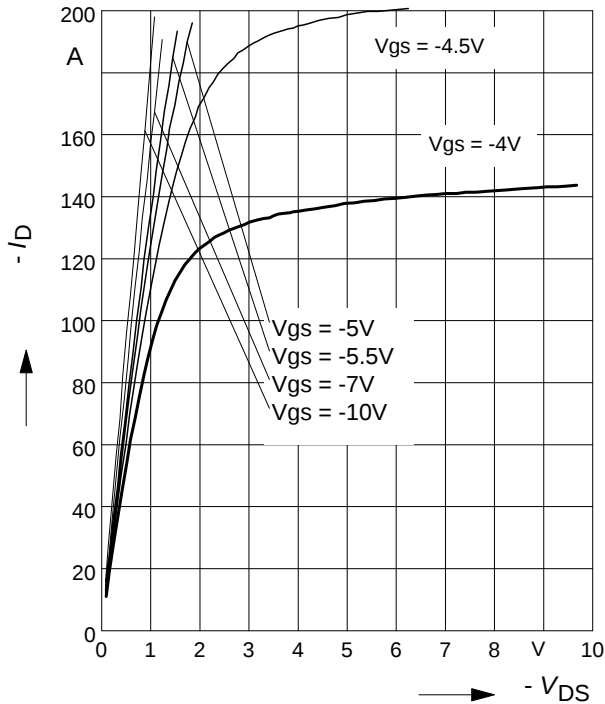
parameter: $D = t_p/T$



5 Typ. output characteristic

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

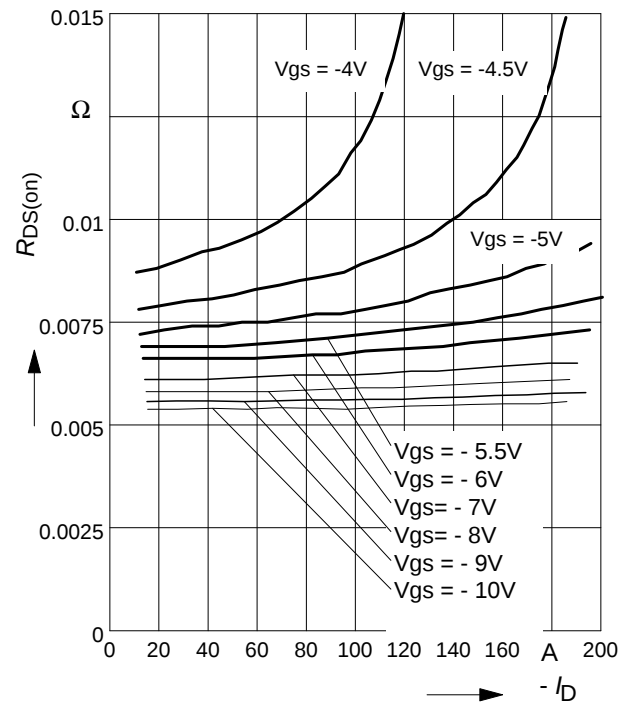
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

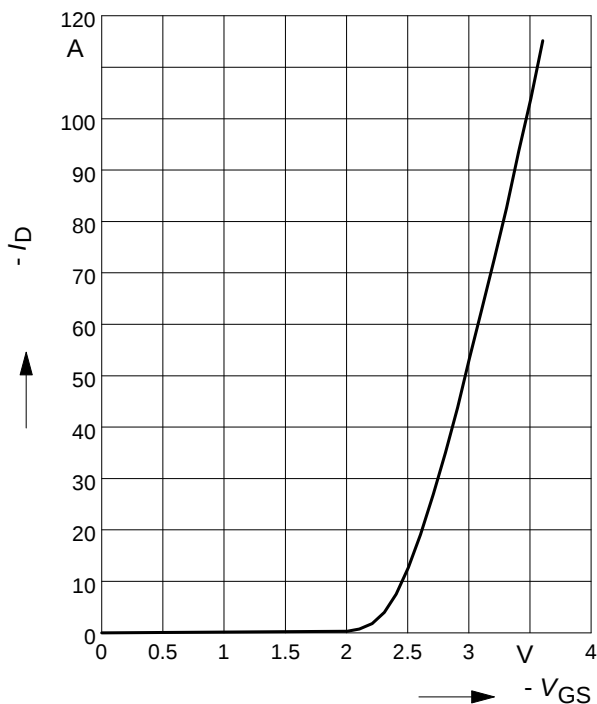
parameter: V_{GS}



7 Typ. transfer characteristics

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

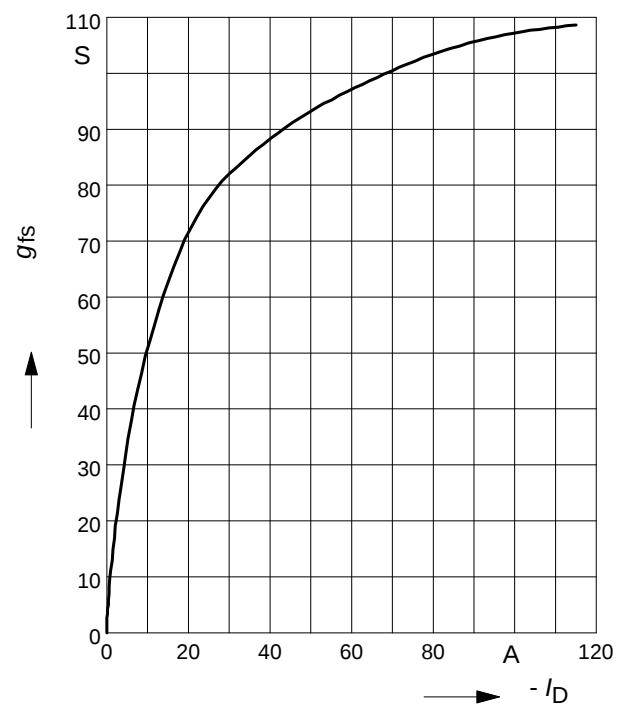
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

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

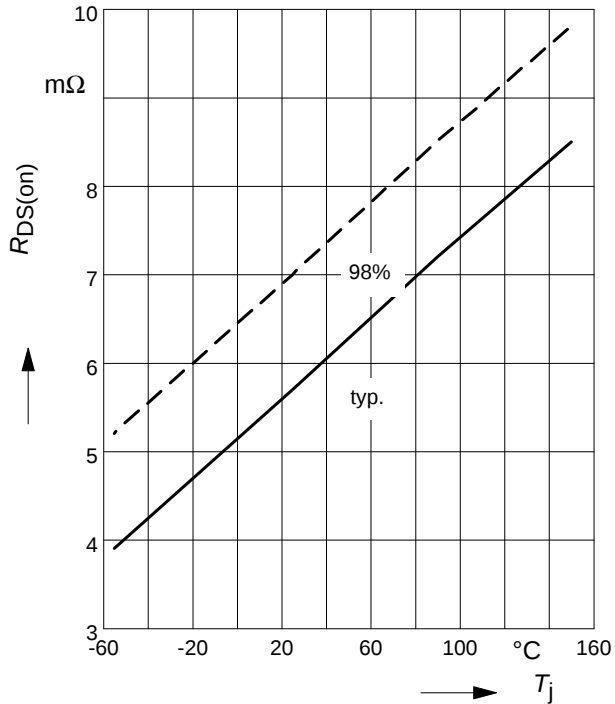
parameter: $t_p = 80 \mu\text{s}$



9 Drain-source on-resistance

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

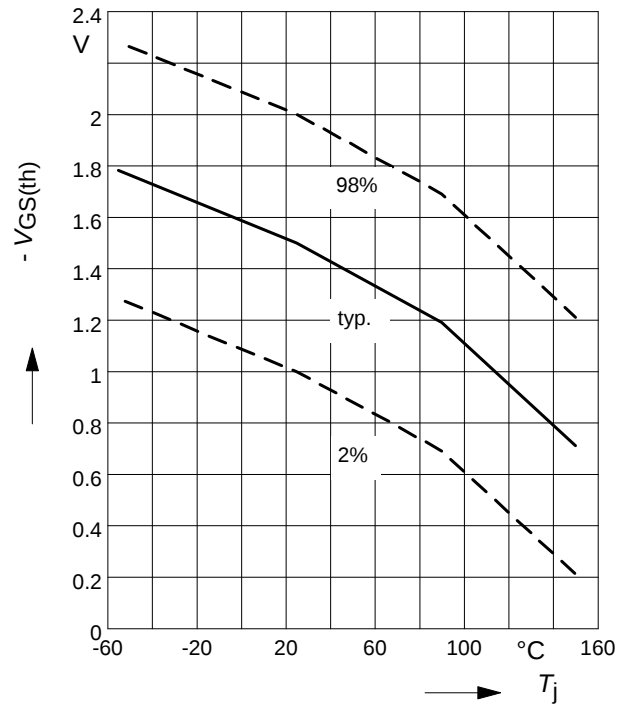
parameter: $I_D = -50$ A, $V_{GS} = -10$ V



10 Gate threshold voltage

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

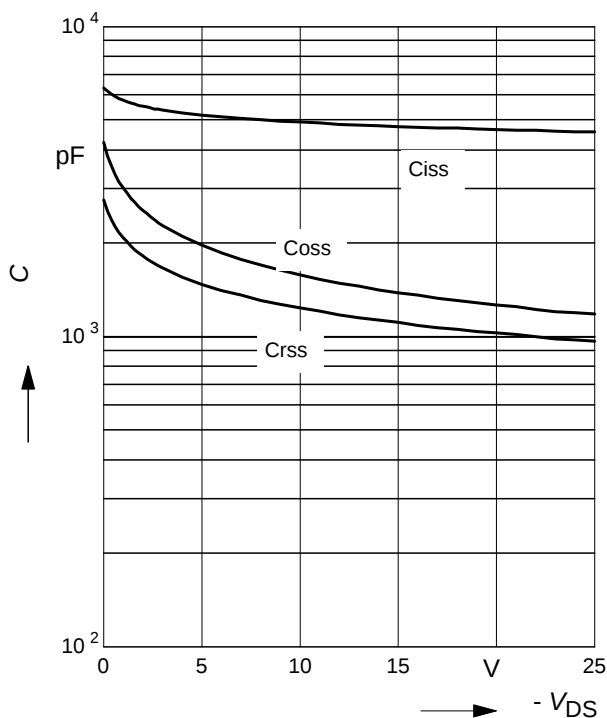
parameter: $V_{GS} = V_{DS}$, $I_D = -250$ μA



11 Typ. capacitances

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

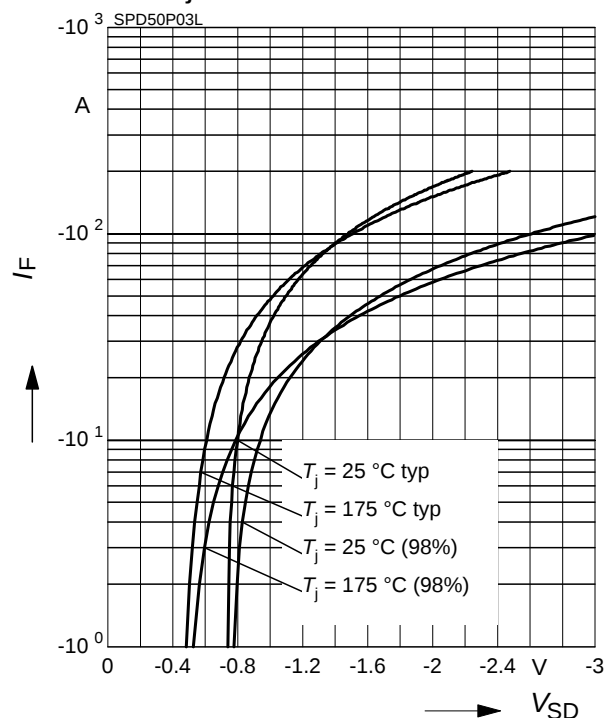
parameter: $V_{GS}=0$, $f=1$ MHz



12 Forward character. of reverse diode

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

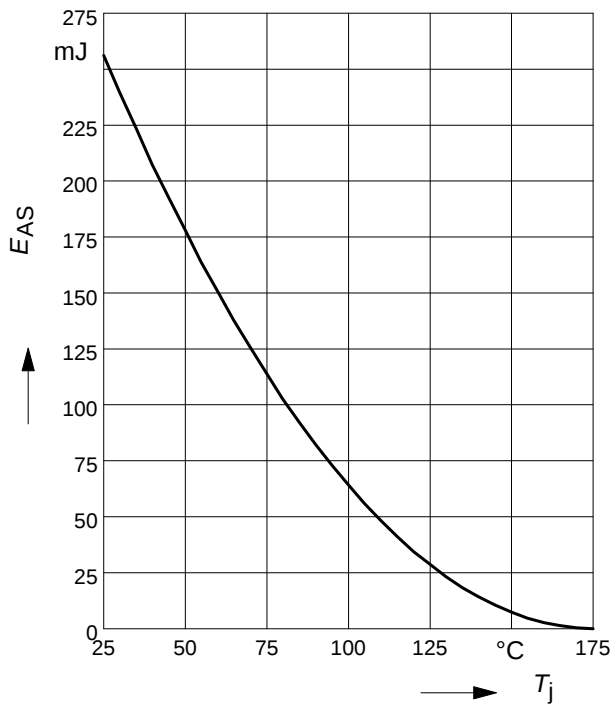
parameter: T_j , $t_p = 80$ μs



13 Typ. avalanche energy

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

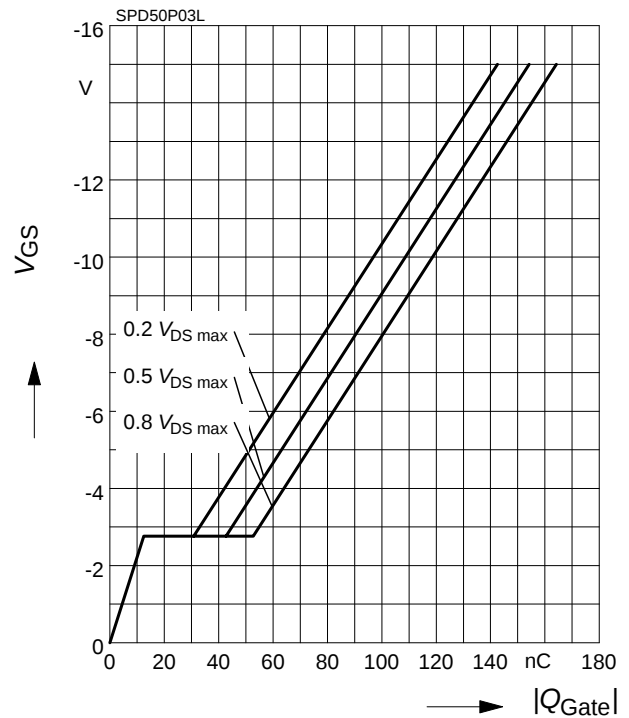
$V_{DD} = -25$ V, $R_{GS} = 25 \Omega$



14 Typ. gate charge

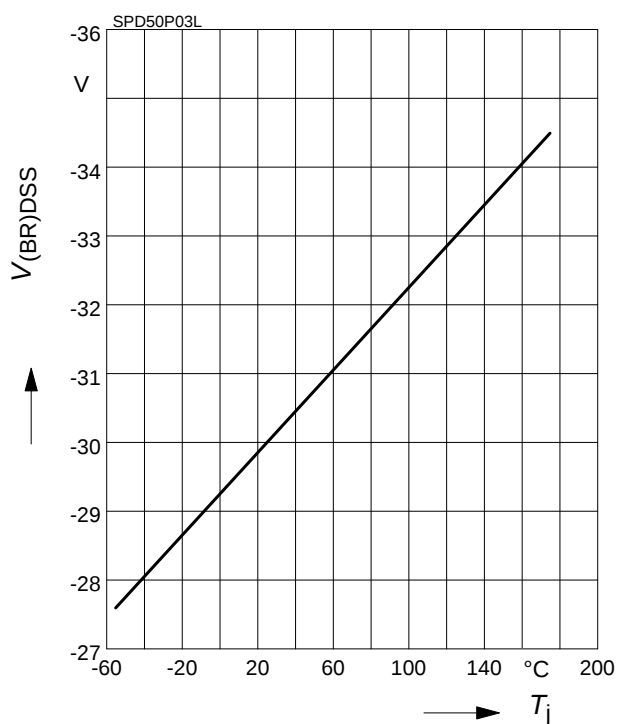
$V_{GS} = f(Q_{Gate})$

parameter: $I_D = -50$ A pulsed



15 Drain-source breakdown voltage

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



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