

SIPMOS® Small-Signal-Transistor

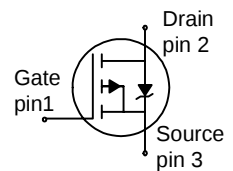
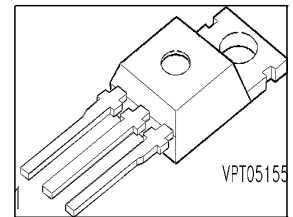
Feature

- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated

Product Summary

V_{DS}	-100	V
$R_{DS(on)}$	0.24	Ω
I_D	-15	A

P-TO220-3-1



Type	Package	Ordering Code
SPP15P10P	P-TO220-3-1	Q67042-S4166

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C=25^\circ\text{C}$ $T_C=100^\circ\text{C}$	I_D	-15 -10.6	A
Pulsed drain current $T_C=25^\circ\text{C}$	$I_{D \text{ puls}}$	-60	
Avalanche energy, single pulse $I_D=-15 \text{ A}$, $V_{DD}=-25\text{V}$, $R_{GS}=25\Omega$	E_{AS}	230	mJ
Reverse diode dv/dt $I_S=-15\text{A}$, $V_{DS}=-48\text{V}$, $di/dt=-200\text{A}/\mu\text{s}$, $T_{j\text{max}}=150^\circ\text{C}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
Power dissipation $T_C=25^\circ\text{C}$	P_{tot}	128	W
Operating and storage temperature	T_j, T_{stg}	-55... +175	$^\circ\text{C}$
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}	-	-	1.17	K/W
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	75	
@ 6 cm ² cooling area ¹⁾		-	-	45	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage $V_{GS}=0, I_D=-250\mu A$	$V_{(BR)DSS}$	-100	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-1.54mA$	$V_{GS(th)}$	-4	-3	-2.1	
Zero gate voltage drain current $V_{DS}=-100V, V_{GS}=0, T_j=25^{\circ}C$ $V_{DS}=-100V, V_{GS}=0, T_j=150^{\circ}C$	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 $V_{GS}=-10V, I_D=-10.6A$	$R_{DS(on)}$	-	0.18	0.24	Ω

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 $T_j = 25^\circ\text{C}$, 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}$ $I_D = -10.7\text{A}$	4.7	9.3	-	S
Input capacitance	C_{iss}	$V_{GS} = 0, V_{DS} = -25\text{V},$ $f = 1\text{MHz}$	-	944	1180	pF
Output capacitance	C_{oss}		-	226	283	
Reverse transfer capacitance	C_{rss}		-	91	114	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -50\text{V}, V_{GS} = -10\text{V},$ $I_D = -15\text{A}, R_G = 6\Omega$	-	8.9	13.4	ns
Rise time	t_r		-	30	45	
Turn-off delay time	$t_{d(off)}$		-	35	53	
Fall time	t_f		-	22	33	

Gate Charge Characteristics

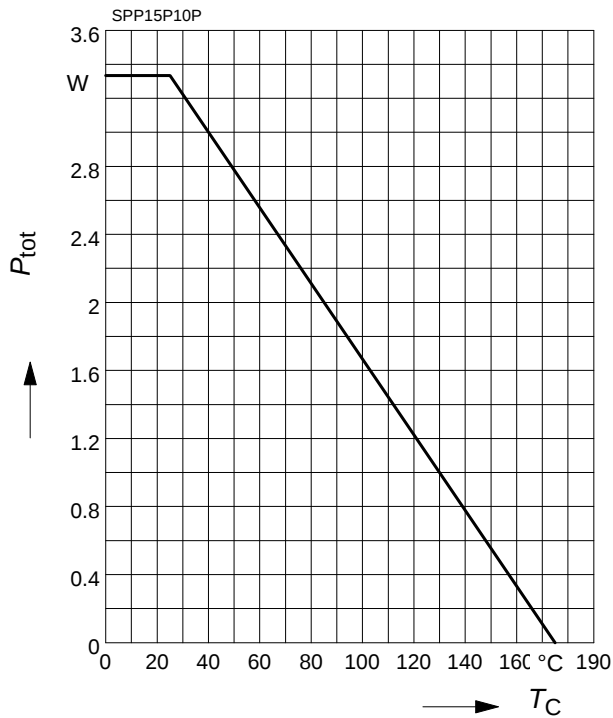
Gate to source charge	Q_{gs}	$V_{DD} = -80\text{V}, I_D = -15\text{A}$	-	-4.5	-6.7	nC
Gate to drain charge	Q_{gd}		-	-15.3	-23	
Gate charge total	Q_g	$V_{DD} = -80\text{V}, I_D = -15\text{A},$ $V_{GS} = 0 \text{ to } -10\text{V}$	-	-33.4	-50	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -80\text{V}, I_D = -15\text{A}$	-	-5.7	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_A = 25^\circ\text{C}$	-	-	-15	A
Inv. diode direct current, pulsed	I_{SM}		-	-	-60	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0, I_F = I_S $	-	-0.94	-1.35	V
Reverse recovery time	t_{rr}	$V_R = -50\text{V}, I_F = I_S ,$ $di_F/dt = 100\text{A}/\mu\text{s}$	-	100	150	ns
Reverse recovery charge	Q_{rr}		-	419	628	nC

1 Power dissipation

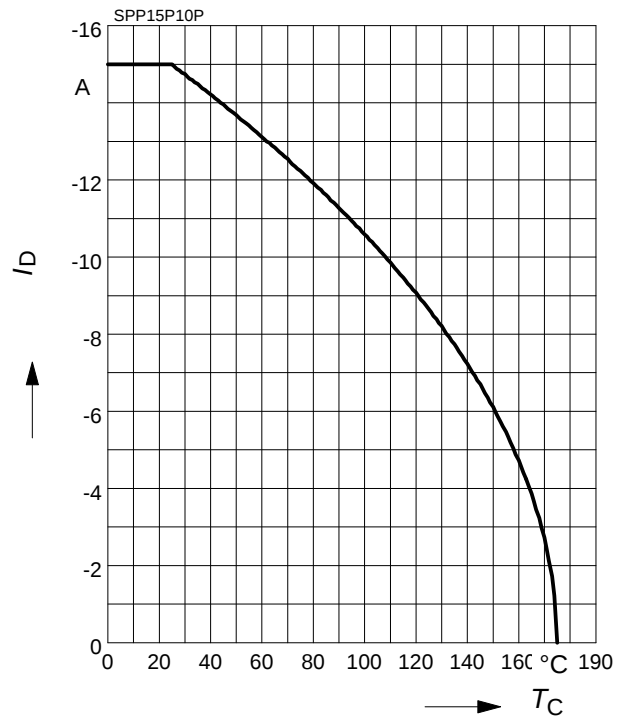
$$P_{\text{tot}} = f(T_C)$$



2 Drain current

$$I_D = f(T_C)$$

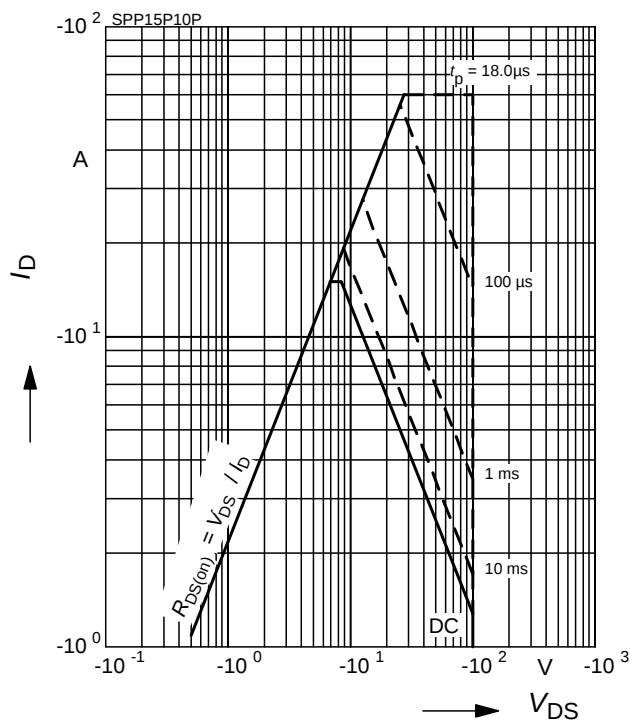
parameter: $|V_{GS}| \geq 10V$



3 Safe operating area

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

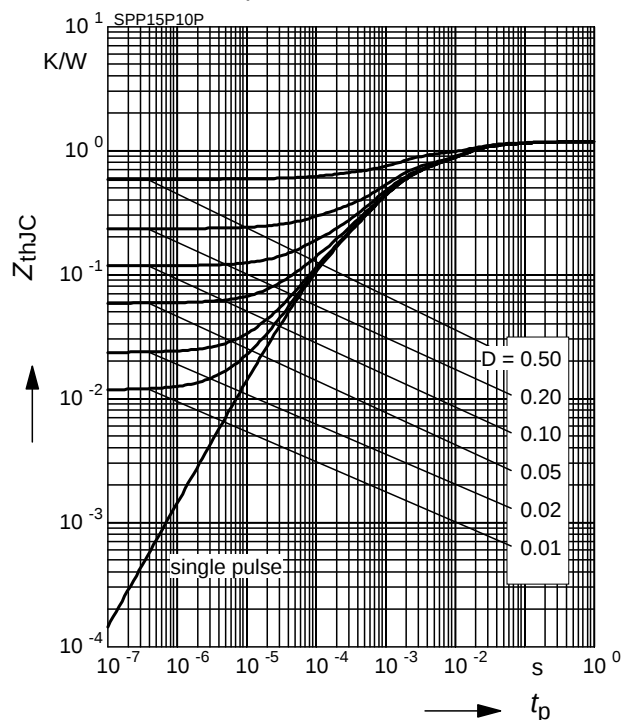
parameter: $D = 0$, $T_C = 25^\circ\text{C}$



4 Max. transient thermal impedance

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

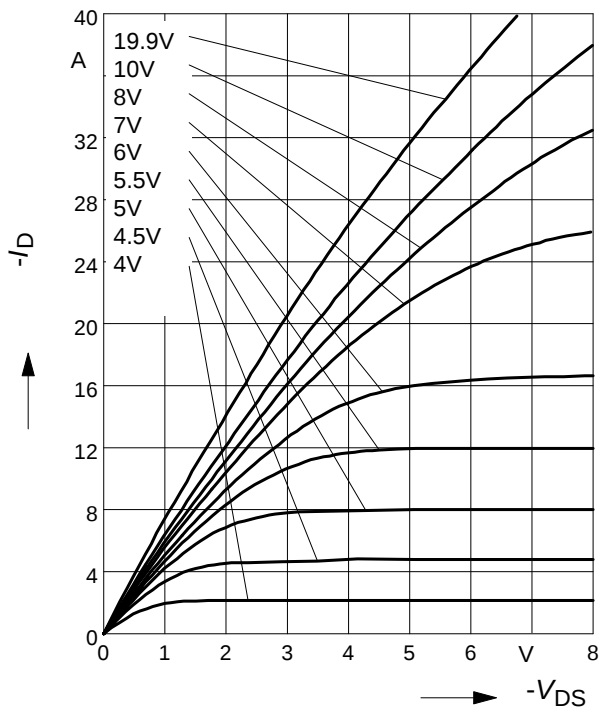
parameter: $D = t_p/T$



5 Typ. output characteristic

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

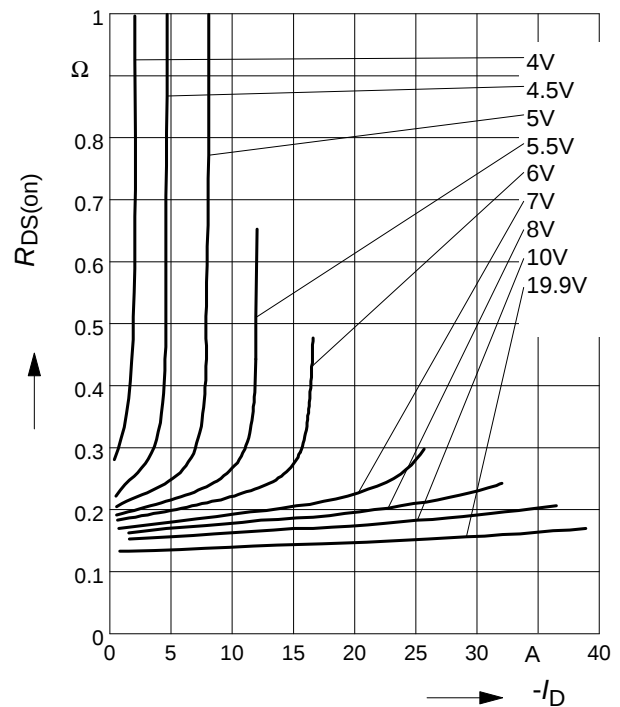
parameter: $T_j = 25^\circ\text{C}$, $-V_{GS}$



6 Typ. drain-source on resistance

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

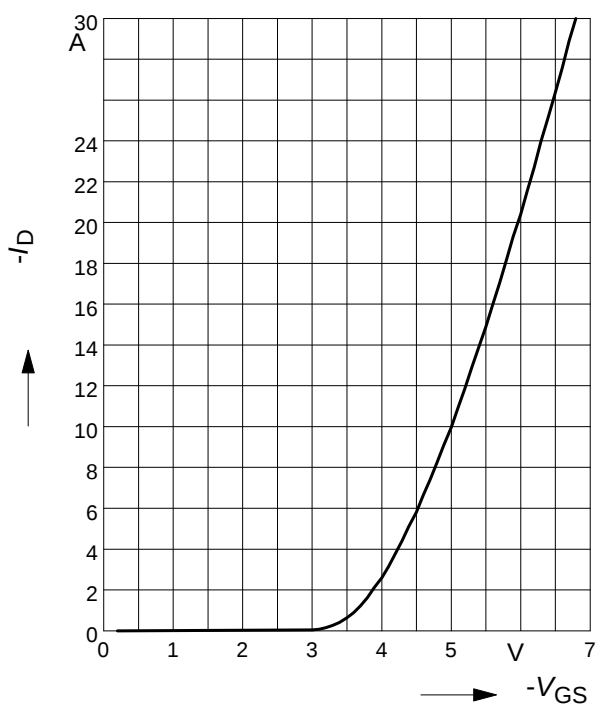
parameter: V_{GS} ; $T_j = 25^\circ\text{C}$, $-V_{GS}$



7 Typ. transfer characteristics

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

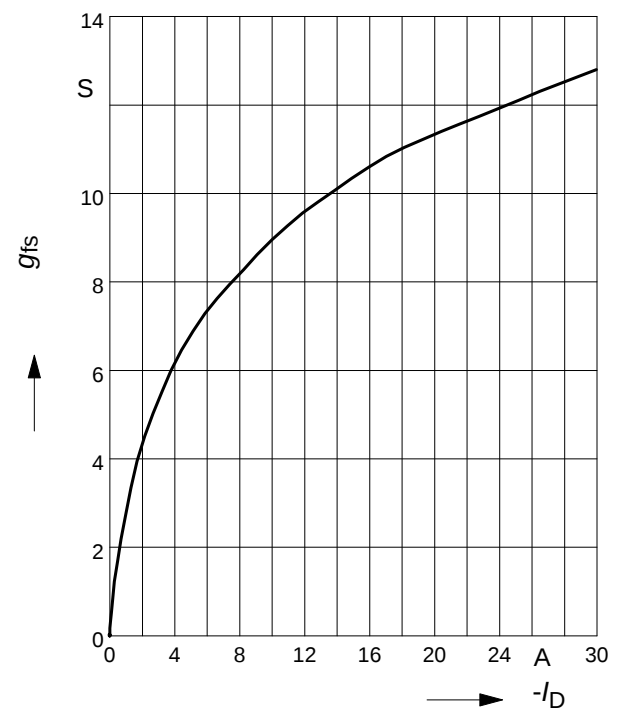
parameter: $T_j = 25^\circ\text{C}$



8 Typ. forward transconductance

$$g_{fs} = f(I_D)$$

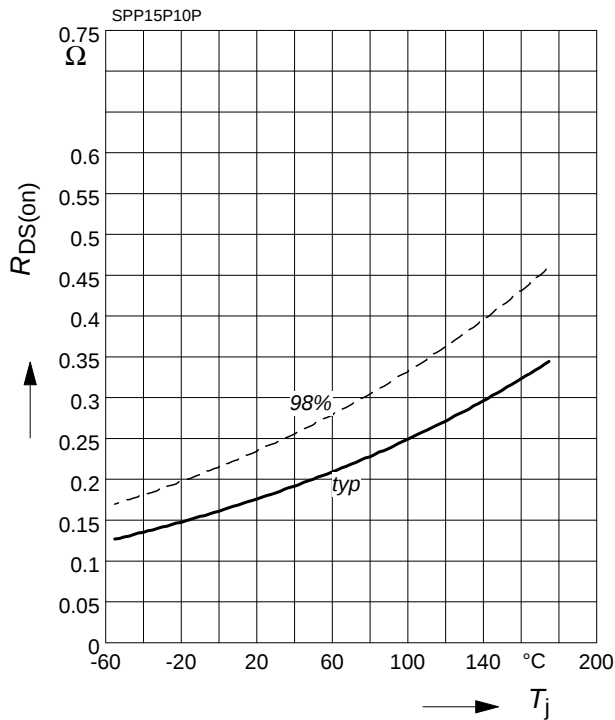
parameter: $T_j = 25^\circ\text{C}$



9 Drain-source on-state resistance

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

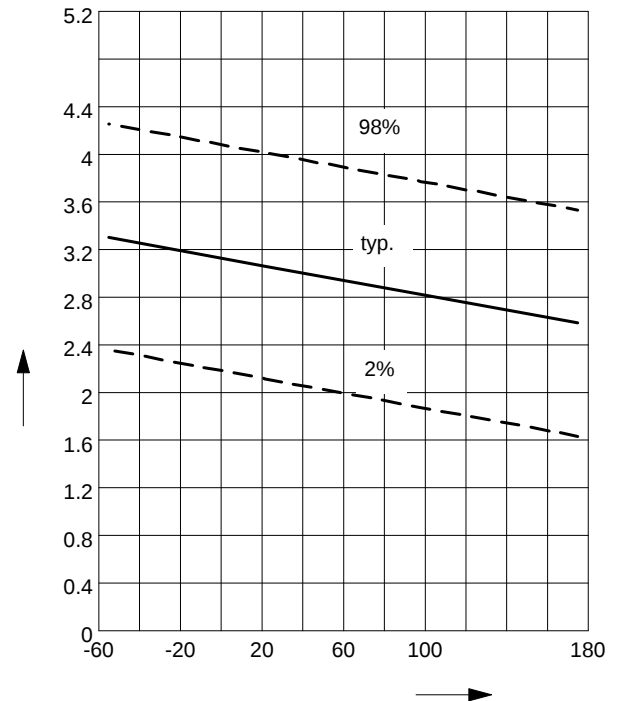
parameter: $I_D = -10.6 \text{ A}$, $V_{GS} = -10 \text{ V}$



10 Typ. gate threshold voltage

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

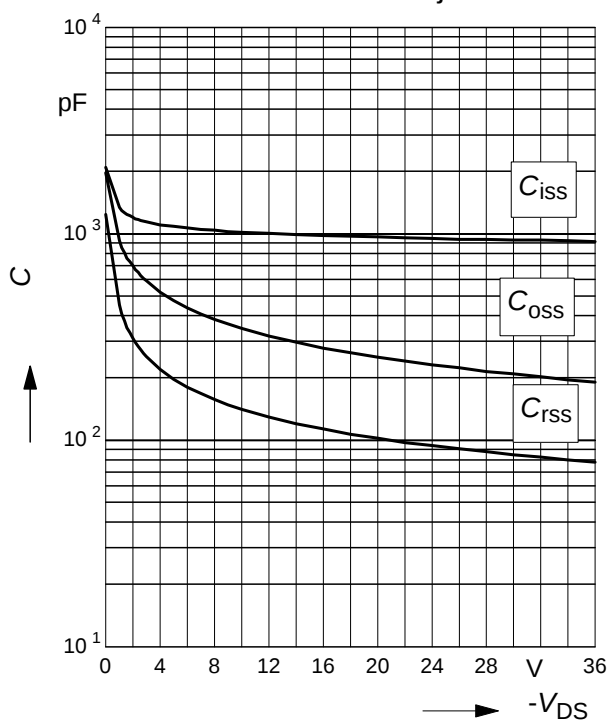
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

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

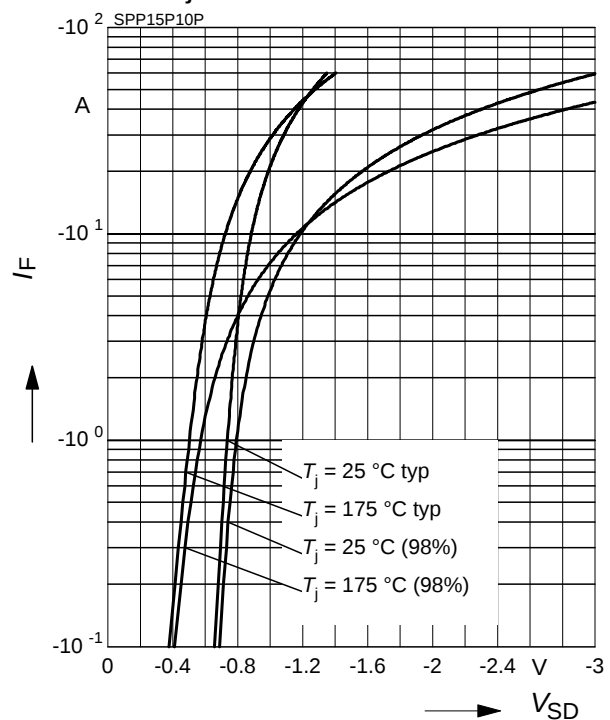
parameter: $V_{GS}=0$, $f=1 \text{ MHz}$, $T_j = 25 \text{ }^{\circ}\text{C}$



12 Forward character. of reverse diode

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

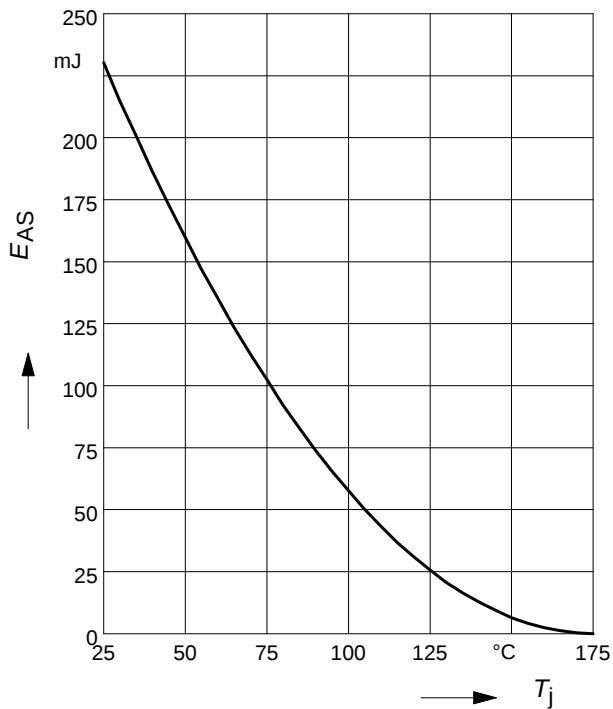
parameter: T_j



13 Typ. avalanche energy

$E_{AS} = f(T_j)$; par.: $I_D = -15\text{ A}$,

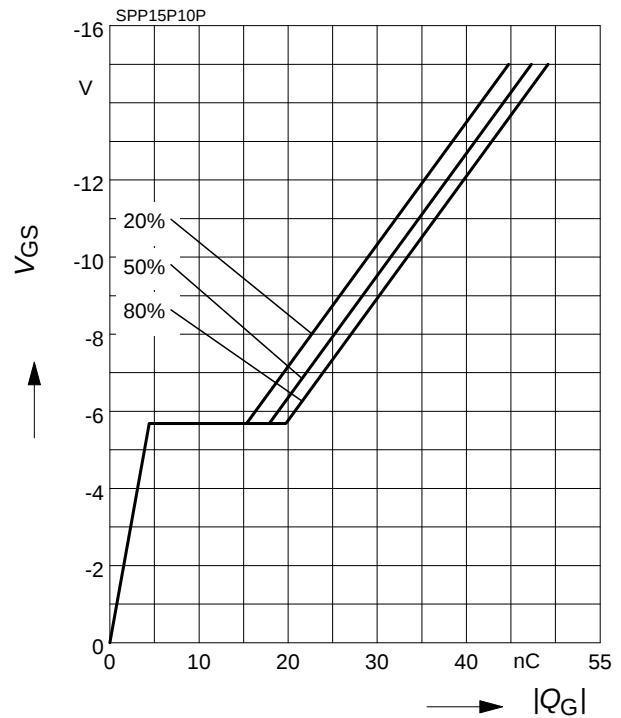
$V_{DD} = -25\text{ V}$, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

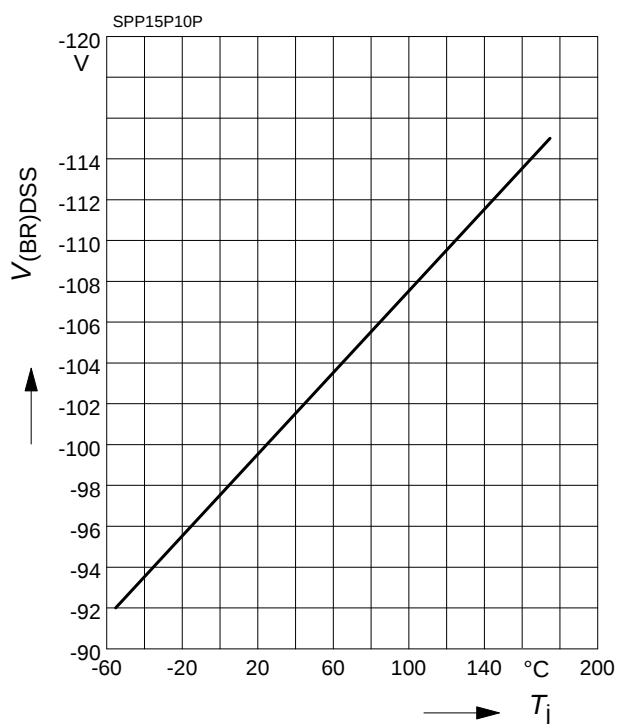
$V_{GS} = f(Q_{Gate})$

parameter: $I_D = -15\text{ A}$ pulsed, $T_j = 25^\circ\text{C}$



15 Drain-source breakdown voltage

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



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