

OptiMOS®-P Small-Signal-Transistor

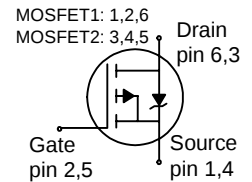
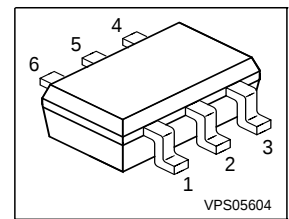
Feature

- Dual P-Channel
- Enhancement mode
- Super Logic Level (2.5 V rated)
- 150°C operating temperature
- Avalanche rated
- dv/dt rated

Product Summary

V_{DS}	-20	V
$R_{DS(on)}$	1.2	Ω
I_D	-0.39	A

SOT-363



Type	Package	Ordering Code	Marking
BSD 223P	SOT-363	Q67042-S4059	X1s

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25^\circ\text{C}$ $T_A=70^\circ\text{C}$	I_D	-0.39 -0.31	A
Pulsed drain current $T_A=25^\circ\text{C}$	$I_{D \text{ puls}}$	-1.56	
Avalanche energy, single pulse $I_D=-0.39 \text{ A}$, $V_{DD}=-10\text{V}$, $R_{GS}=25\Omega$	E_{AS}	1.4	mJ
Reverse diode dv/dt $I_S=-0.39\text{A}$, $V_{DS}=-16\text{V}$, $di/dt=200\text{A}/\mu\text{s}$, $T_{j\text{max}}=150^\circ\text{C}$	dv/dt	-6	kV/ μs
Gate source voltage	V_{GS}	± 12	V
Power dissipation $T_A=25^\circ\text{C}$	P_{tot}	0.25	W
Operating and storage temperature	T_j, T_{stg}	-55... +150	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/150/56	

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - soldering point	R_{thJS}	-	-	180	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	500	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage $V_{GS}=0, I_D=-250\mu A$	$V_{(BR)DSS}$	-20	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-1.5\mu A$	$V_{GS(th)}$	-0.6	-0.9	-1.2	
Zero gate voltage drain current $V_{DS}=-20V, V_{GS}=0, T_j=25^{\circ}C$ $V_{DS}=-20V, V_{GS}=0, T_j=150^{\circ}C$	I_{DSS}	- -	-0.1 -10	-1 -100	μA
Gate-source leakage current $V_{GS}=-12V, V_{DS}=0$	I_{GSS}	-	-10	-100	
Drain-source on-state resistance $V_{GS}=-2.5V, I_D=-0.29A$	$R_{DS(on)}$	-	1.27	2.1	Ω
Drain-source on-state resistance $V_{GS}=-4.5, I_D=-0.39A$	$R_{DS(on)}$	-	0.7	1.2	

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}$ $I_D = -0.31\text{A}$	0.35	0.7	-	S
Input capacitance	C_{iss}	$V_{GS}=0, V_{DS}=-15\text{V},$ $f=1\text{MHz}$	-	45	56	pF
Output capacitance	C_{oss}		-	21	26	
Reverse transfer capacitance	C_{rss}		-	17	22	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=-10\text{V}, V_{GS}=-4.5\text{V},$ $I_D=-0.39\text{A}, R_G=6\Omega$	-	3.8	5.7	ns
Rise time	t_r		-	5	7.5	
Turn-off delay time	$t_{d(off)}$		-	5.1	7.6	
Fall time	t_f		-	3.2	4.8	

Gate Charge Characteristics

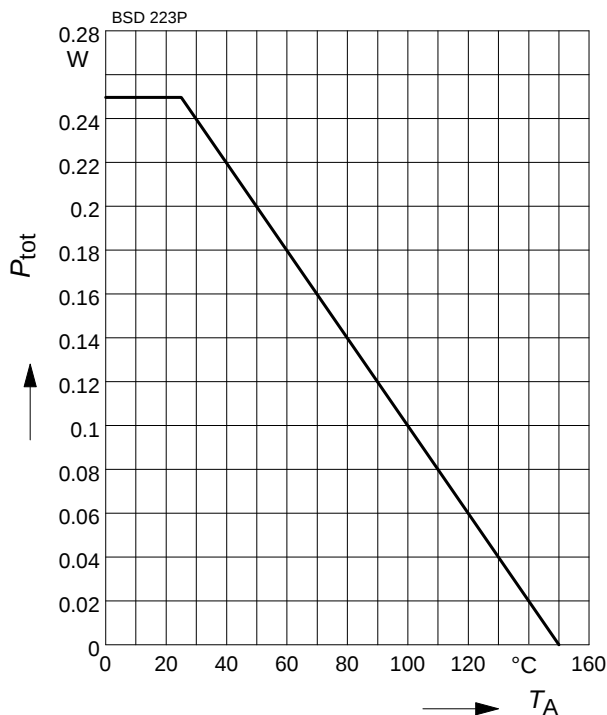
Gate to source charge	Q_{gs}	$V_{DD}=-10\text{V}, I_D=-0.39\text{A}$	-	-0.04	-0.05	nC
Gate to drain charge	Q_{gd}		-	-0.4	-0.5	
Gate charge total	Q_g	$V_{DD}=-10\text{V}, I_D=-0.39\text{A},$ $V_{GS}=0 \text{ to } -4.5\text{V}$	-	-0.5	-0.62	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD}=-10\text{V}, I_D=-0.39\text{A}$	-	-2.2	-2.7	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_A=25^\circ\text{C}$	-	-	-0.39	A
Inv. diode direct current, pulsed	I_{SM}		-	-	-1.56	
Inverse diode forward voltage	V_{SD}	$V_{GS}=0, I_F=-0.39$	-	-1	-1.33	V
Reverse recovery time	t_{rr}	$V_R=-10\text{V}, I_F = I_D ,$ $di_F/dt=100\text{A}/\mu\text{s}$	-	7.6	9.5	ns
Reverse recovery charge	Q_{rr}		-	1.1	1.4	nC

1 Power dissipation

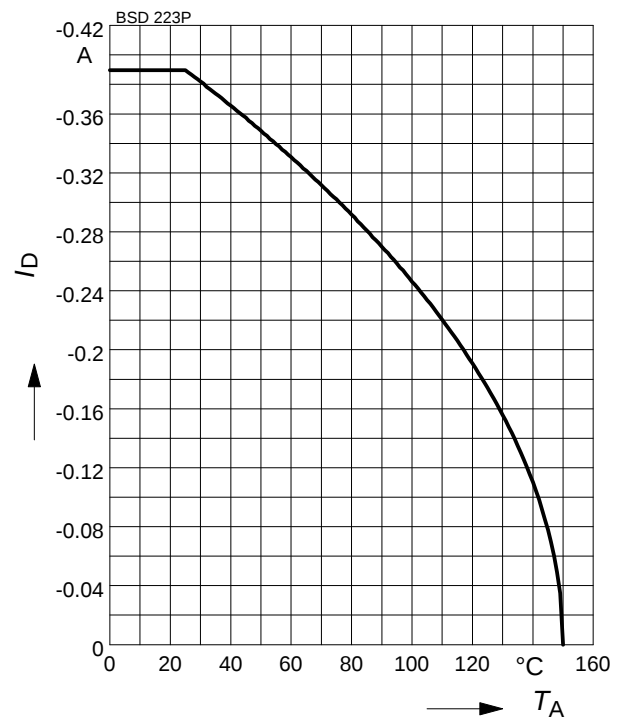
$$P_{\text{tot}} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

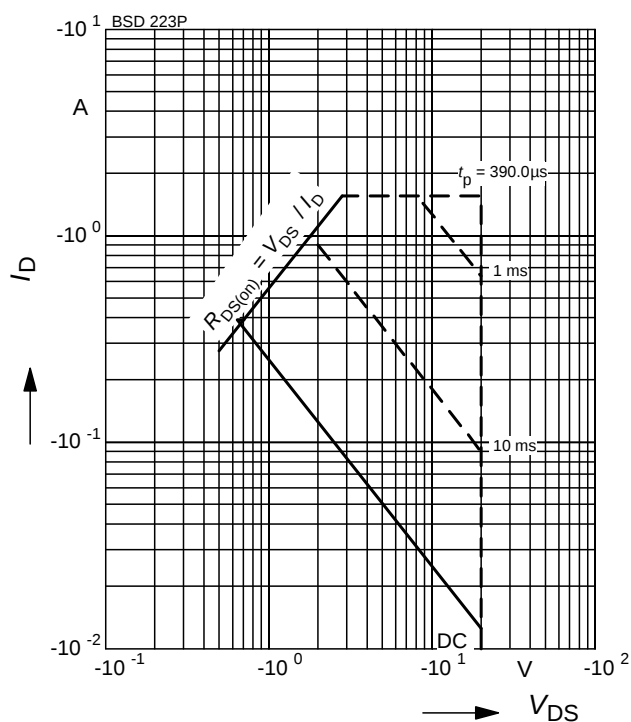
parameter: $|V_{GS}| \geq 4.5 \text{ V}$



3 Safe operating area

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

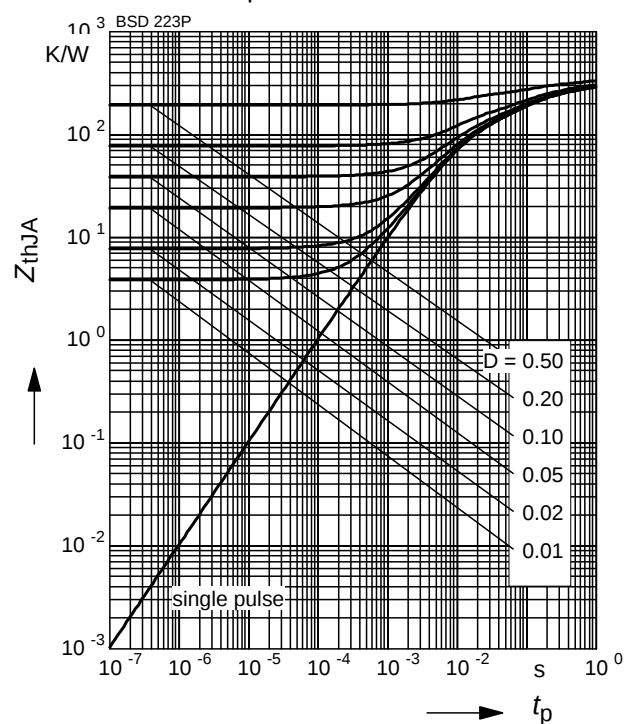
parameter: $D = 0$, $T_A = 25^\circ\text{C}$



4 Transient thermal impedance

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

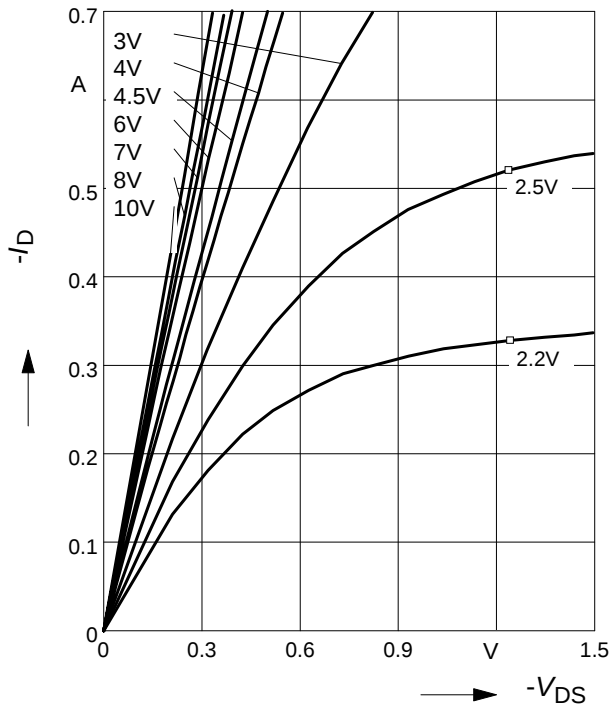
parameter: $D = t_p/T$



5 Typ. output characteristic

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

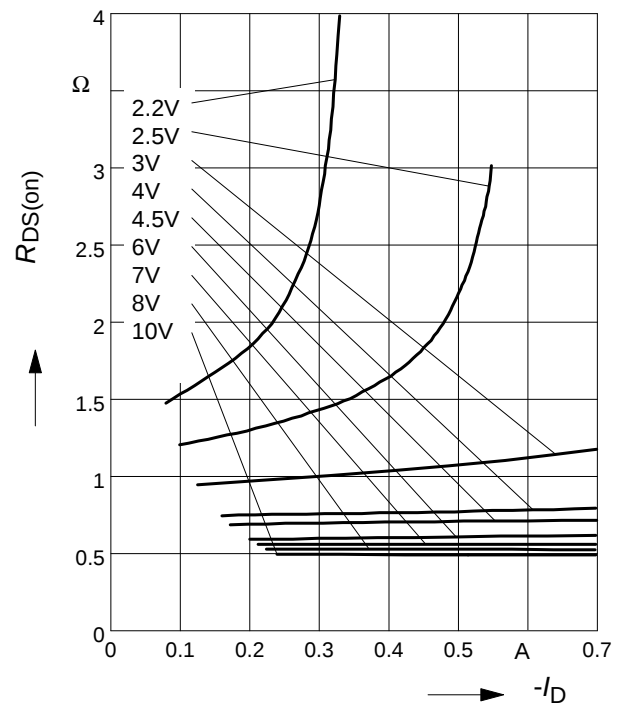
parameter: $T_j = 25^\circ\text{C}$



6 Typ. drain-source on resistance

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

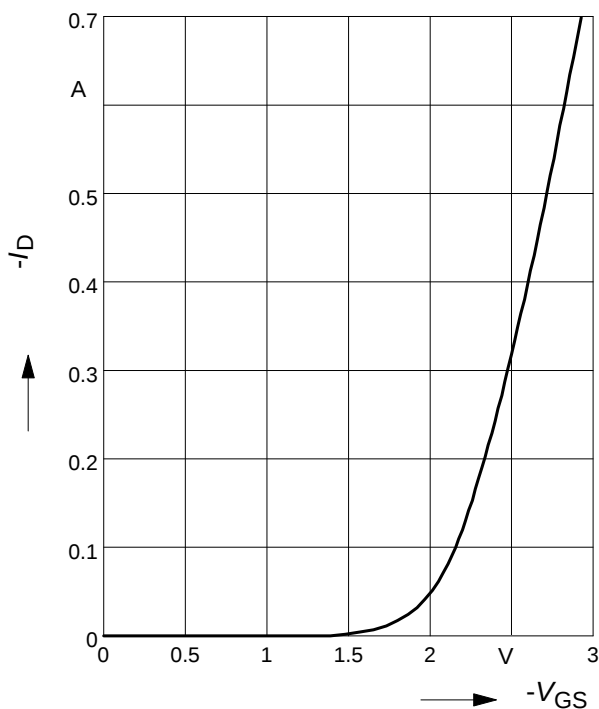
parameter: V_{GS}



7 Typ. transfer characteristics

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

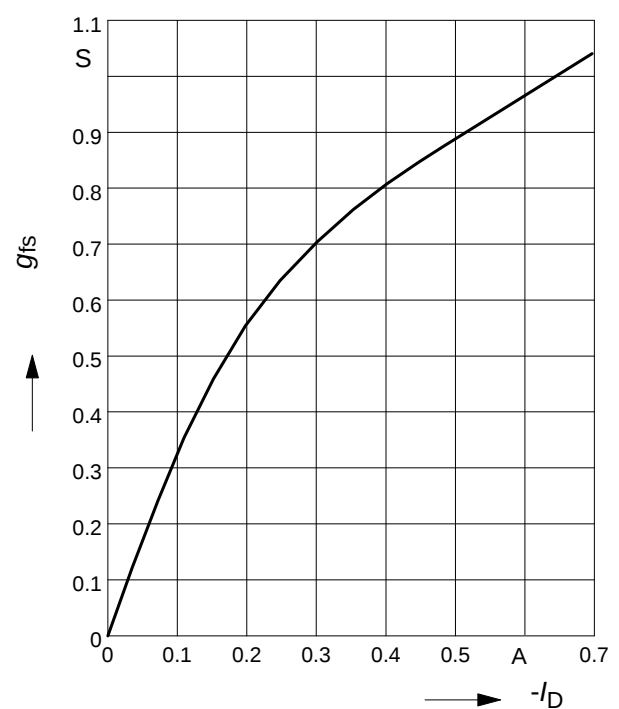
parameter: $T_j = 25^\circ\text{C}$



8 Typ. forward transconductance

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

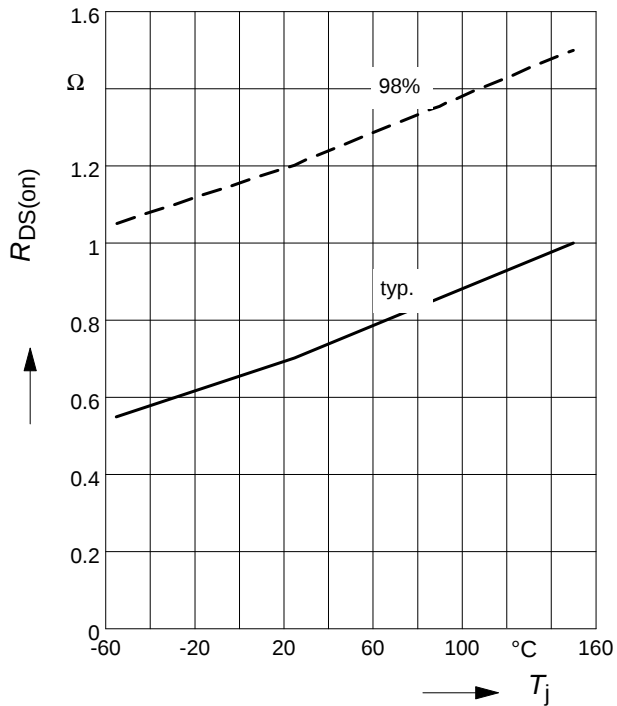
parameter: $T_j = 25^\circ\text{C}$



9 Drain-source on-resistance

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

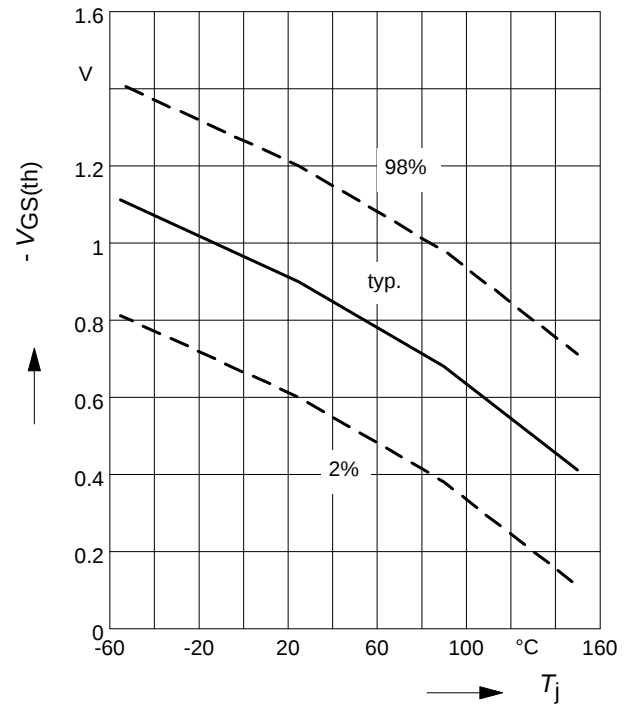
parameter: $I_D = -0.39$ A, $V_{GS} = -4.5$ V



10 Typ. gate threshold voltage

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

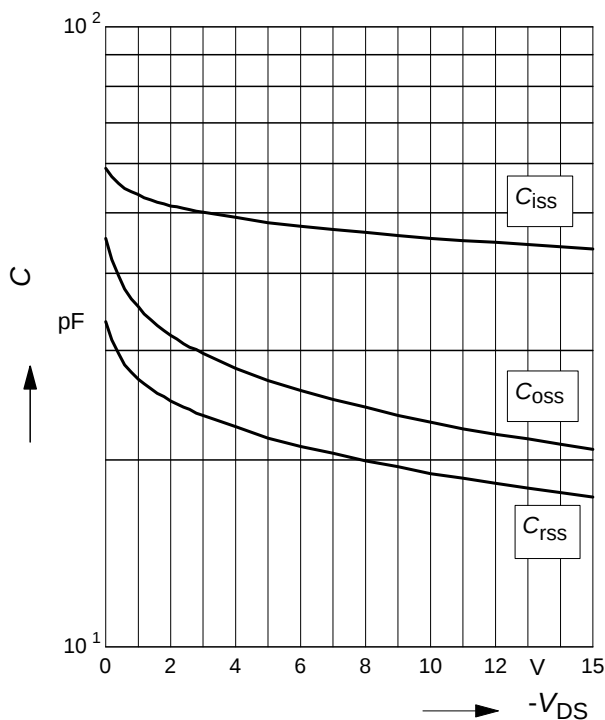
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

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

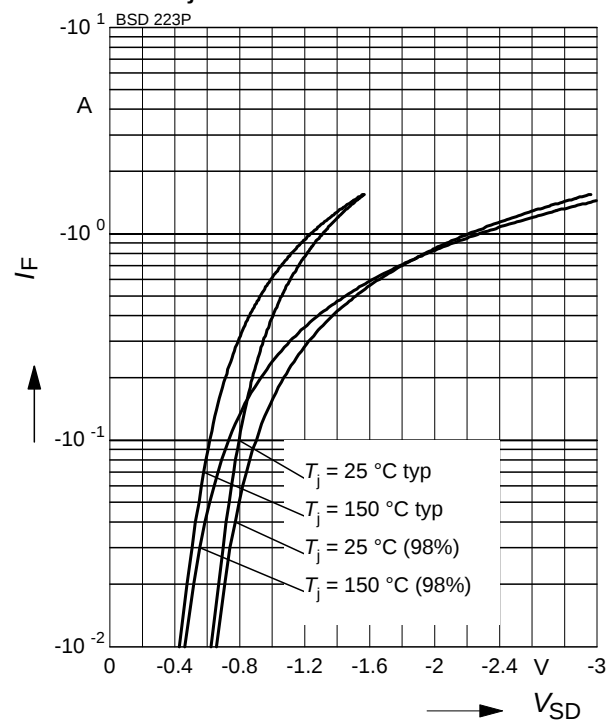
parameter: $V_{GS}=0$, $f=1$ MHz



12 Forward character. of reverse diode

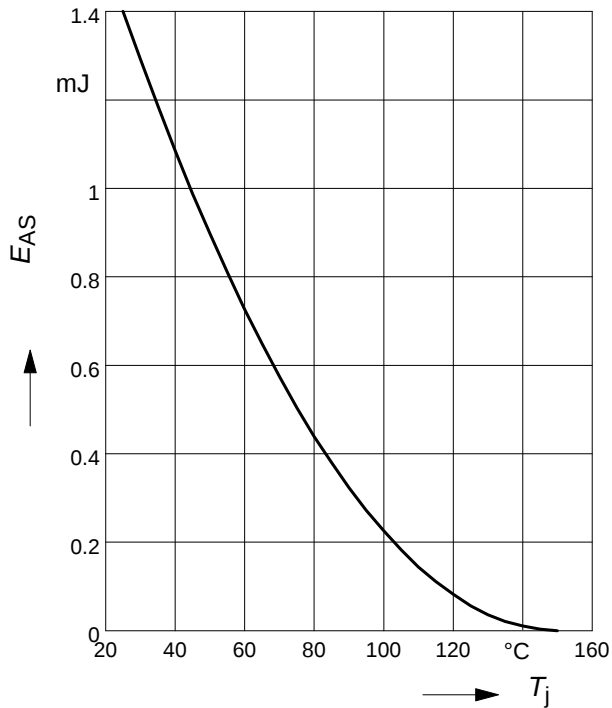
$$I_F = f(V_{SD})$$

parameter: T_j



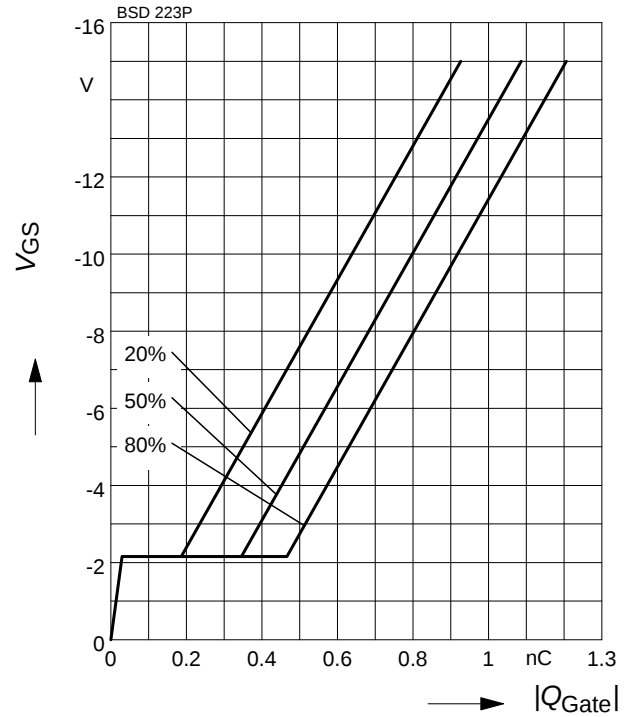
13 Typ. avalanche energy

 $E_{AS} = f(T_j)$, par.: $I_D = -0.39$ A

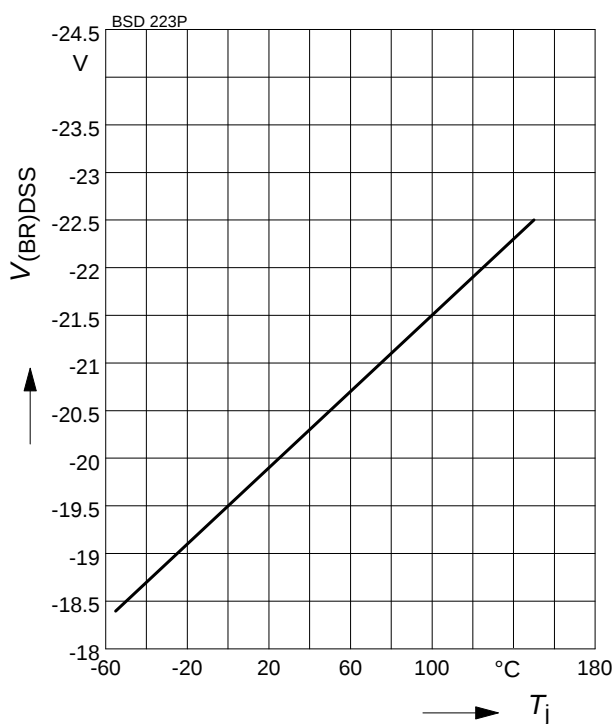
 $V_{DD} = -10$ V, $R_{GS} = 25$ Ω


14 Typ. gate charge

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

parameter: $I_D = -0.39$ A pulsed; $T_j = 25$ °C


15 Drain-source breakdown voltage

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


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