

Preliminary Data

SIPMOS® Small-Signal-Transistor

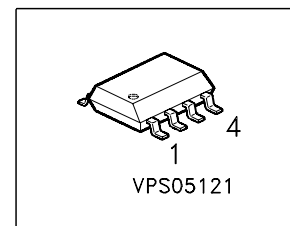
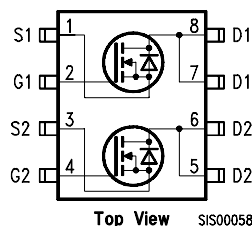
BSO 220N

Features

- Dual N Channel
- Enhancement mode
- Avalanche rated
- Logic Level
- dv/dt rated

Product Summary

Drain source voltage	V_{DS}	20	V
Drain-Source on-state resistance	$R_{DS(on)}$	0.13	Ω
Continuous drain current	I_D	3.2	A



Type	Package	Ordering Code
BSO220N	SO 8	Q67000-S4010

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

Parameter	Symbol	Value	Unit
Continuous drain current, <i>one channel active</i> $T_A = 25^\circ\text{C}$	I_D	3.2	A
Pulsed drain current, <i>one channel active</i> $T_A = 25^\circ\text{C}$	I_{Dpulse}	12.8	
Avalanche energy, single pulse $I_D = 3.2\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\ \Omega$	E_{AS}	15	mJ
Avalanche current, periodic limited by T_{jmax}	I_{AR}	3.2	A
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	0.2	mJ
Reverse diode dv/dt $I_S = 3.2\text{ A}$, $V_{DS} = 24\text{ V}$, $di/dt = 200\text{ A}/\mu\text{s}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
Power dissipation, <i>one channel active</i> $T_A = 25^\circ\text{C}$	P_{tot}	2	W
Operating temperature	T_j	-55 ... +150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 ... +150	
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}	-	-	45	K/W
Thermal resistance @ 10 sec., min. footprint	$R_{th(JA)}$	-	-	100	
Thermal resistance @ 10 sec., 6 cm ² cooling area ¹⁾	$R_{th(JA)}$	-	-	62.5	

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 $V_{GS} = 0\text{ V}$, $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	20	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 10\text{ }\mu\text{A}$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25\text{ }^{\circ}\text{C}$ $V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 150\text{ }^{\circ}\text{C}$	I_{DSS}	- -	0.1 -	1 100	μA
Gate-source leakage current $V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	-	10	100	
Drain-Source on-state resistance $V_{GS} = 4.5\text{ V}$, $I_D = 2.6\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 3.2\text{ A}$	$R_{DS(on)}$	- -	0.13 0.08	0.2 0.13	Ω

¹ Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Transconductance $V_{DS} \leq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 2.6$ A	g_{fs}	1.9	3.8	-	S
Input capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	C_{iss}	-	130	165	pF
Output capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	C_{oss}	-	80	100	
Reverse transfer capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	C_{rss}	-	40	50	
Turn-on delay time $V_{DD} = 15$ V, $V_{GS} = 4.5$ V, $I_D = 2.6$ A, $R_G = 15 \Omega$	$t_{d(on)}$	-	15	23	ns
Rise time $V_{DD} = 15$ V, $V_{GS} = 4.5$ V, $I_D = 2.6$ A, $R_G = 15 \Omega$	t_r	-	33	50	ns
Turn-off delay time $V_{DD} = 15$ V, $V_{GS} = 4.5$ V, $I_D = 2.6$ A, $R_G = 15 \Omega$	$t_{d(off)}$	-	14	21	ns
Fall time $V_{DD} = 15$ V, $V_{GS} = 4.5$ V, $I_D = 2.6$ A, $R_G = 15 \Omega$	t_f	-	15	23	ns

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

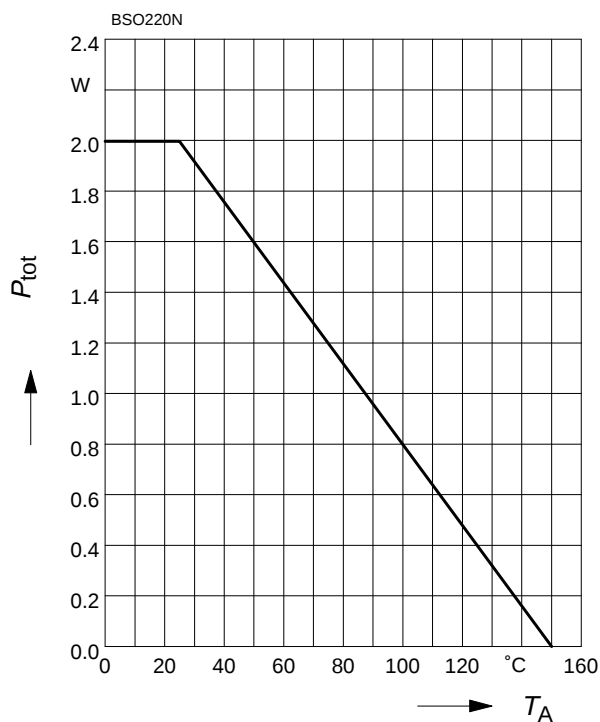
Parameter at $T_j = 25\text{ }^{\circ}\text{C}$, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Gate charge at threshold $V_{DD} = 15\text{ V}$, $I_D \geq 0,1\text{ A}$, $V_{GS} = 0\text{ to }1\text{ V}$	$Q_{G(th)}$	-	0.6	0.9	nC
Gate charge at $V_{gs}=5V$ $V_{DD} = 15\text{ V}$, $I_D = 2.6\text{ A}$, $V_{GS} = 0\text{ to }5\text{ V}$	$Q_{g(5)}$	-	9.2	13.8	
Gate charge total $V_{DD} = 15\text{ V}$, $I_D = 2.6\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$	Q_g	-	14.5	22	nC
Gate plateau voltage $V_{DD} = 15\text{ V}$, $I_D = 2.6\text{ A}$	$V_{(plateau)}$	-	3.13	-	V

Reverse Diode

Inverse diode continuous forward current $T_A = 25^\circ\text{C}$	I_S	-	-	3.2	A
Inverse diode direct current,pulsed $T_A = 25^\circ\text{C}$	I_{SM}	-	-	12.8	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$, $I_F = 5.2\text{ A}$	V_{SD}	-	0.95	1.4	V
Reverse recovery time $V_R = 15\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$	t_{rr}	-	37	55	ns
Reverse recovery charge $V_R = 15\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$	Q_{rr}	-	19	30	μC

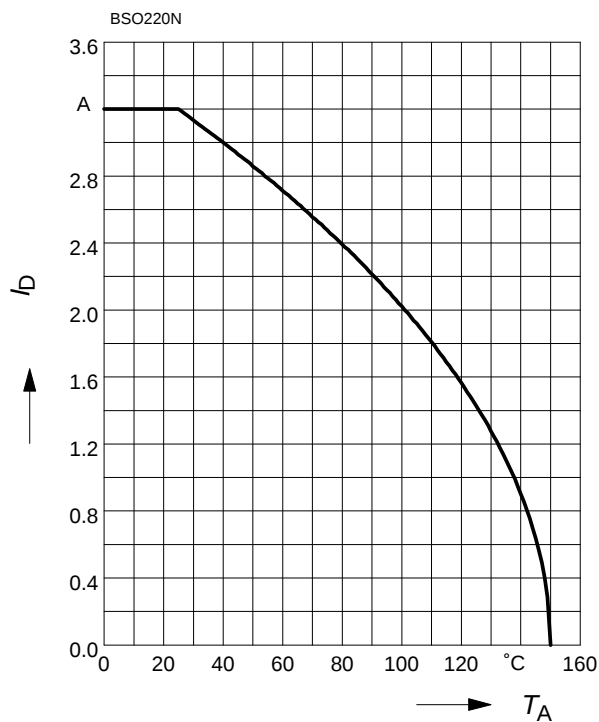
Power dissipation

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



Drain current

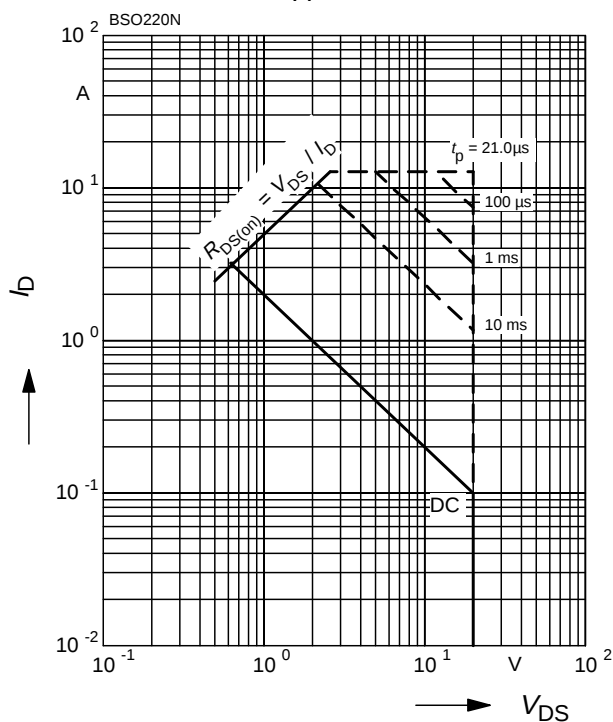
$$I_D = f(T_A)$$



Safe operating area

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

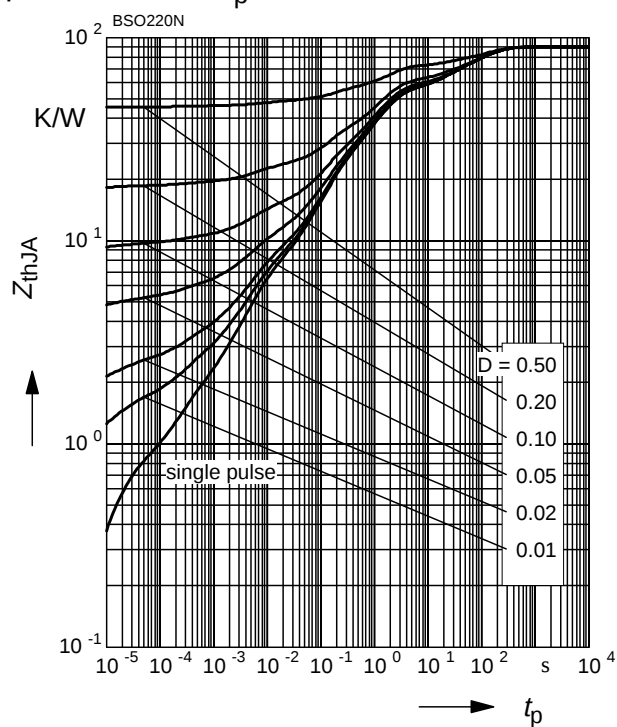
parameter : $D = 0$, $T_A = 25^{\circ}\text{C}$



Transient thermal impedance

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

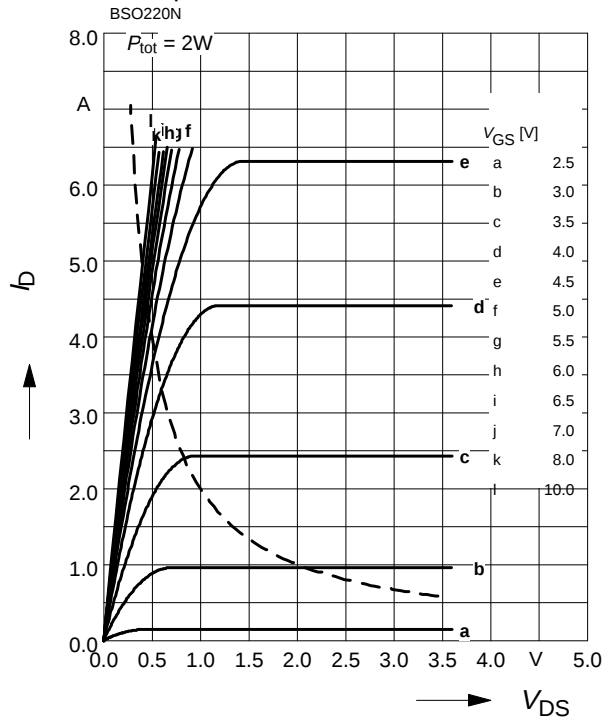
parameter : $D = t_p / T$



Typ. output characteristics

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

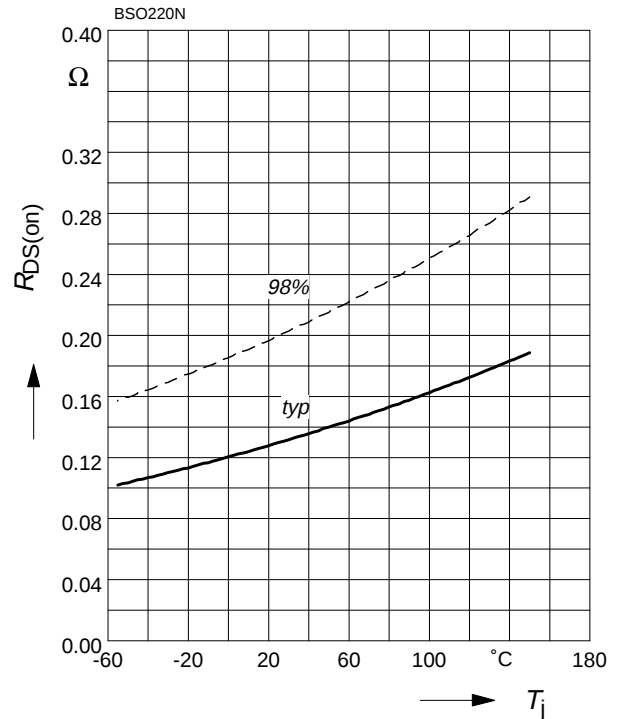
parameter: $t_p = 80 \mu s$



Drain-source on-resistance

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

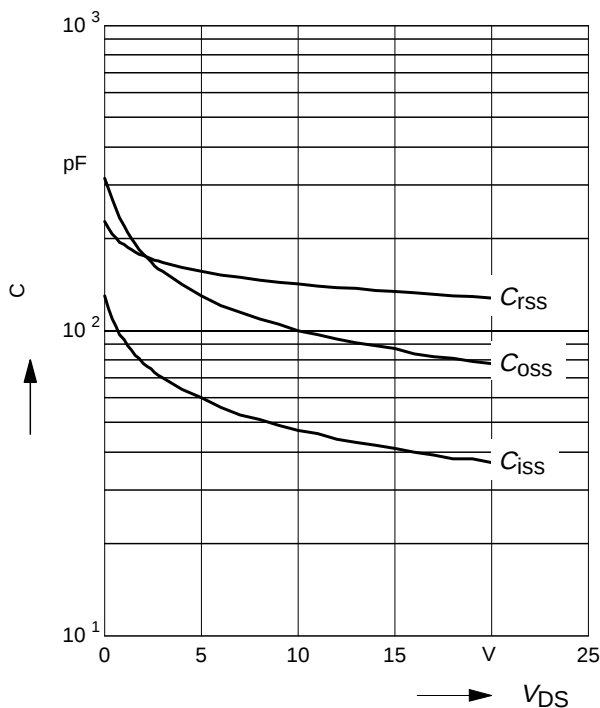
parameter: $I_D = 2.6 A$, $V_{GS} = 4.5 V$



Typ. capacitances

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

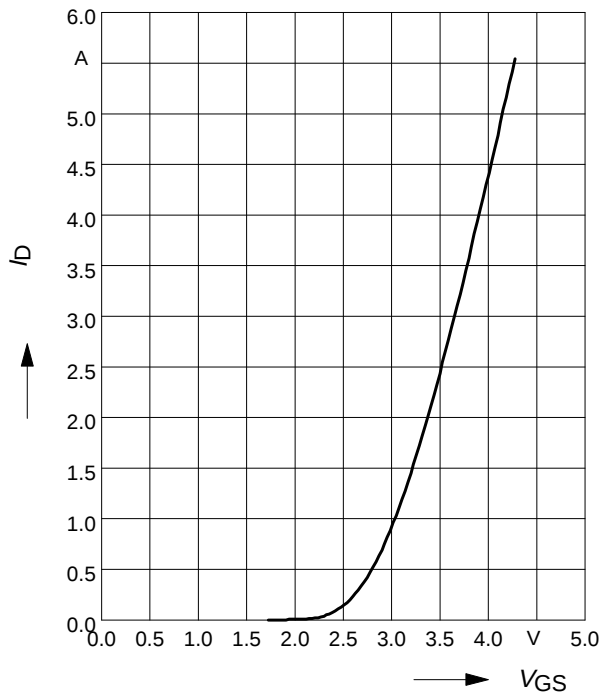
parameter: $V_{GS} = 0 V$, $f = 1 MHz$



Typ. transfer characteristics $I_D = f(V_{GS})$

parameter: $t_p = 80 \mu s$

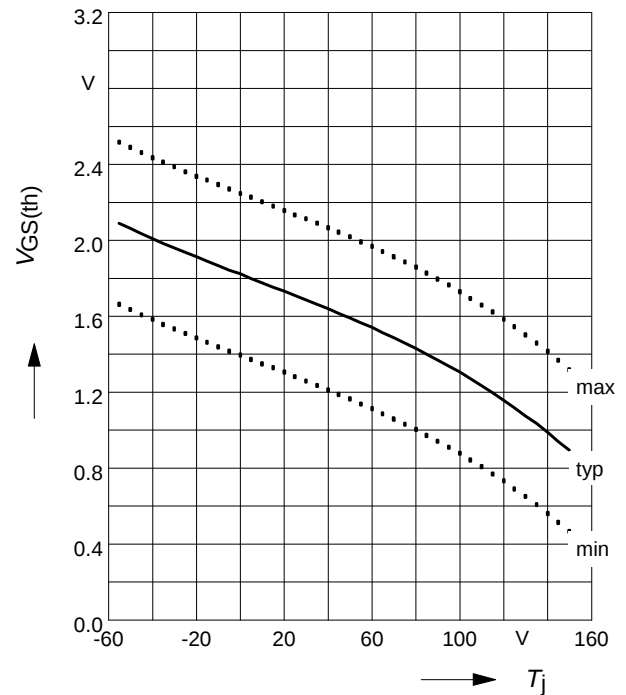
$V_{DS} \geq 2 \times I_D \times R_{DS(on) \max}$



Gate threshold voltage

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

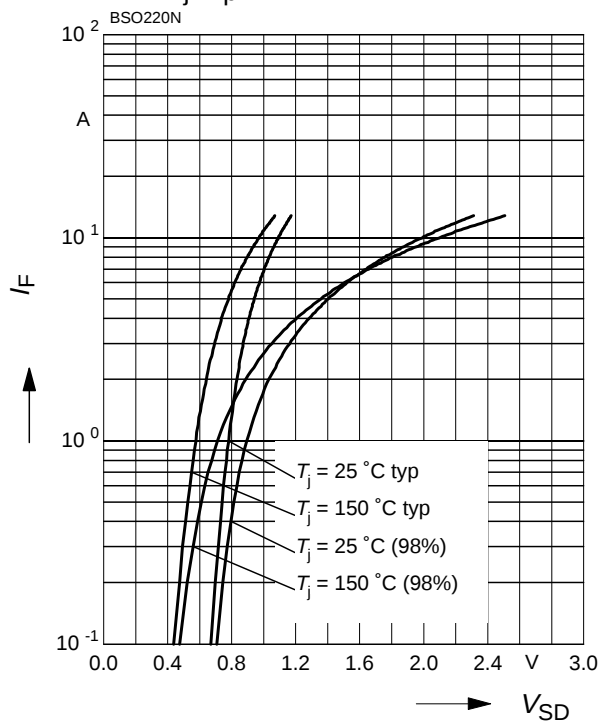
parameter: $V_{GS} = V_{DS}$, $I_D = 10 \mu A$



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

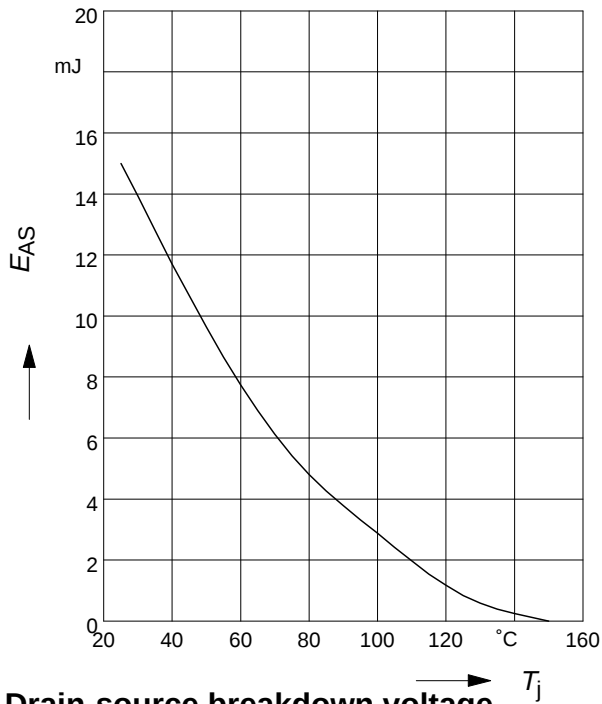
parameter: T_j , $t_p = 80 \mu s$



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

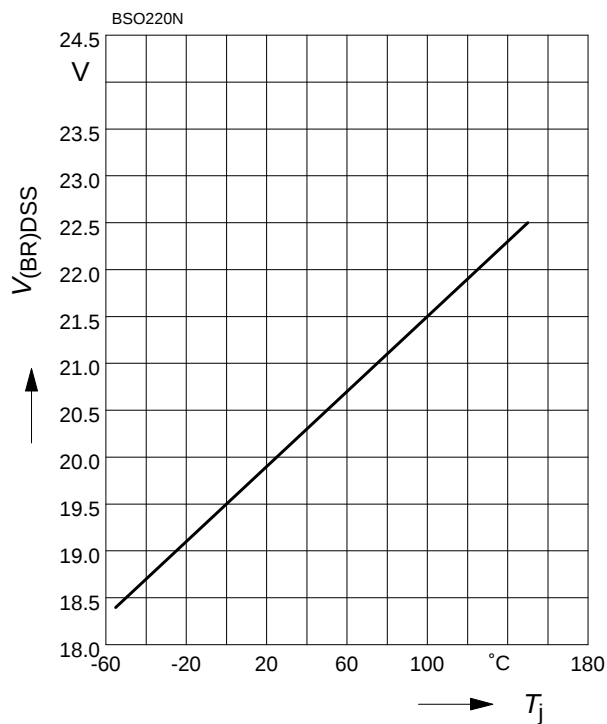
parameter: $I_D = 3.2 \text{ A}$, $V_{DD} = 25 \text{ V}$

$R_{GS} = 25 \Omega$



Drain-source breakdown voltage

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



Typ. gate charge

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

parameter: $I_{D \text{ puls}} = 2.6 \text{ A}$

