

## Preliminary Data

### SIPMOS® Small-Signal-Transistor

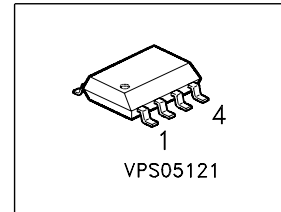
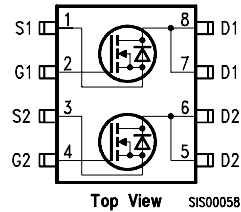
### BSO 220N

#### 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	$\Omega$
Continuous drain current	$I_D$	3.2	A



Type	Package	Ordering Code
BSO220N	SO 8	Q67000-S4010

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

Parameter	Symbol	Value	Unit
Continuous drain current, <i>one channel active</i> $T_A = 25\text{ }^\circ\text{C}$	$I_D$	3.2	A
Pulsed drain current, <i>one channel active</i> $T_A = 25\text{ }^\circ\text{C}$	$I_{Dpulse}$	12.8	
Avalanche energy, single pulse $I_D = 3.2\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$	$E_{AS}$	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/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation, <i>one channel active</i> $T_A = 25\text{ }^\circ\text{C}$	$P_{tot}$	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.	
<b>Characteristics</b>					
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 <sup>2</sup> cooling area <sup>1)</sup>	$R_{th(JA)}$	-	-	62.5	

**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 $V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	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	$\mu\text{A}$
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	0.2	$\Omega$
		-	0.08	0.13	

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

**Electrical Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
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  $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

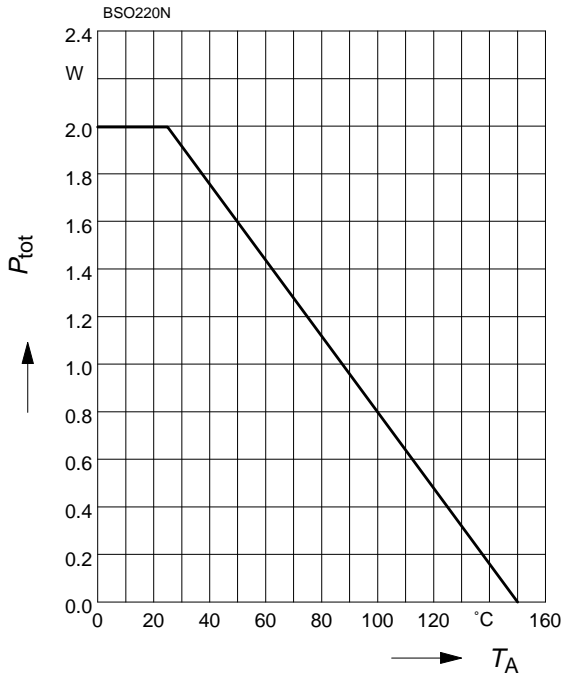
Parameter at $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Gate charge at threshold $V_{DD} = 15\text{ V}$ , $I_D \geq 0,1\text{ A}$ , $V_{GS} = 0\text{ to }1\text{ V}$	$Q_{G(th)}$	-	0.6	0.9	nC
Gate charge at $V_{gs}=5\text{V}$ $V_{DD} = 15\text{ V}$ , $I_D = 2.6\text{ A}$ , $V_{GS} = 0\text{ to }5\text{ V}$	$Q_{g(5)}$	-	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 $T_A = 25\text{ }^\circ\text{C}$	$I_S$	-	-	3.2	A
Inverse diode direct current, pulsed $T_A = 25\text{ }^\circ\text{C}$	$I_{SM}$	-	-	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	$\mu\text{C}$

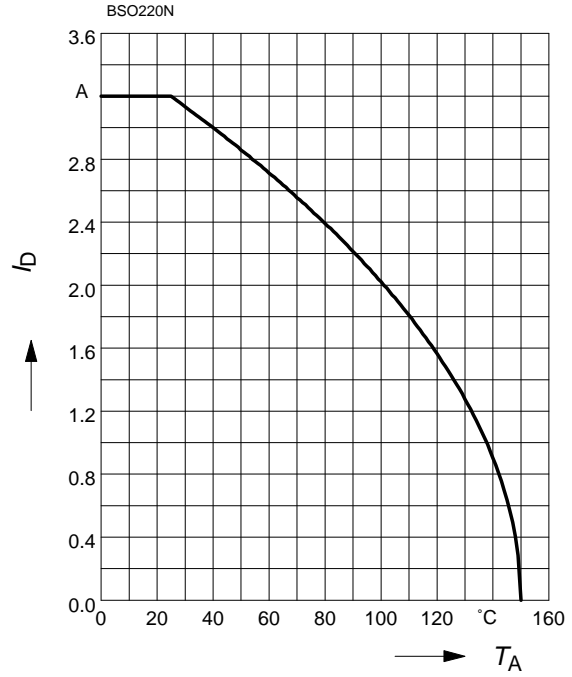
**Power dissipation**

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



**Drain current**

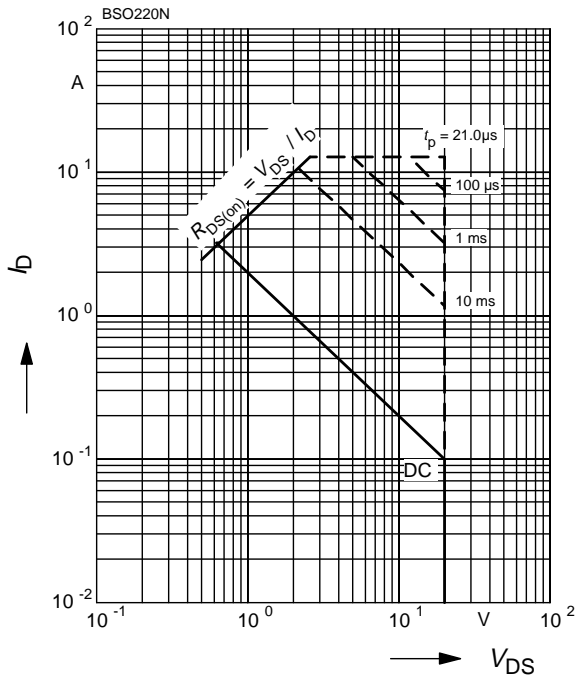
$$I_D = f(T_A)$$



**Safe operating area**

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

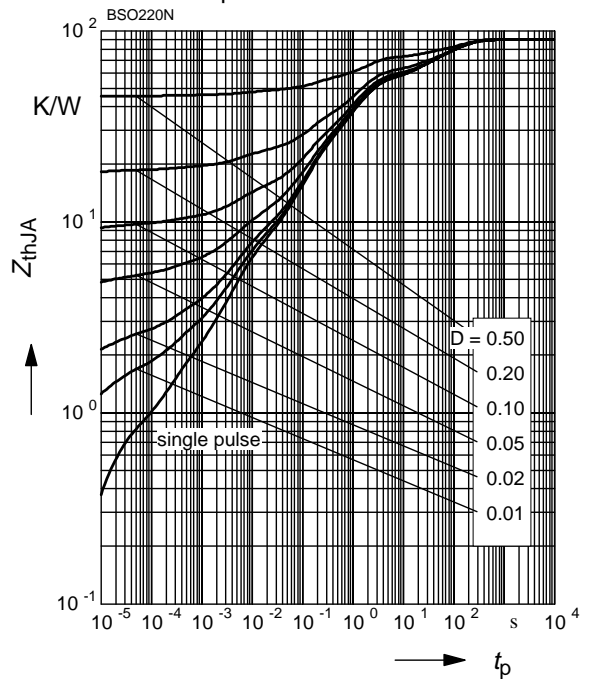
parameter :  $D = 0$  ,  $T_A = 25\text{ °C}$



**Transient thermal impedance**

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

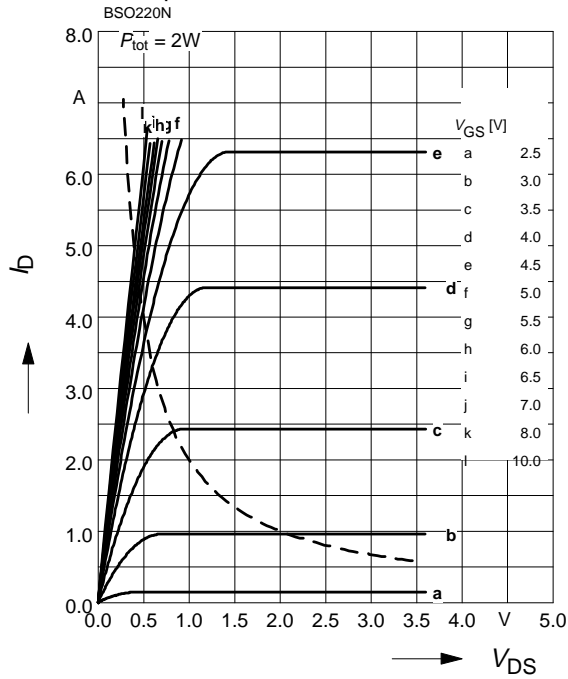
parameter :  $D = t_p/T$



**Typ. output characteristics**

$I_D = f(V_{DS})$

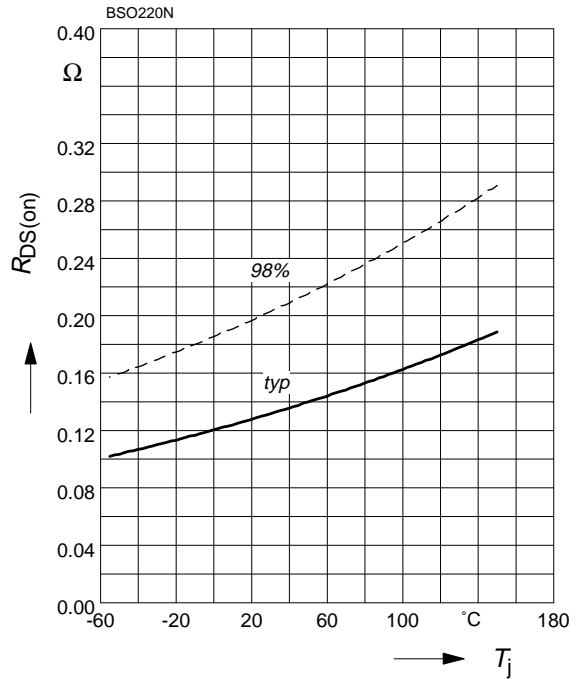
parameter:  $t_p = 80 \mu s$



**Drain-source on-resistance**

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

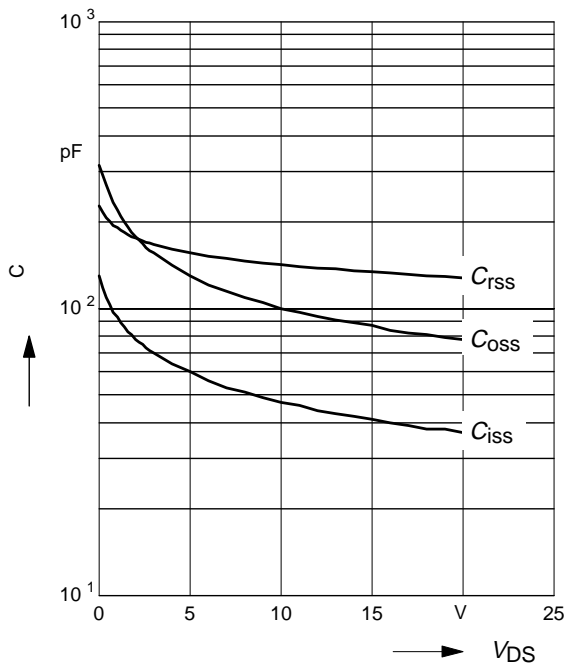
parameter :  $I_D = 2.6 A, V_{GS} = 4.5 V$



**Typ. capacitances**

$C = f(V_{DS})$

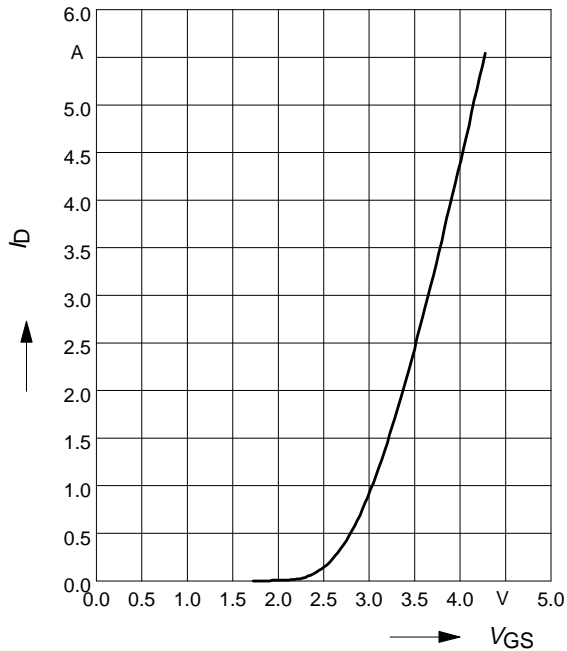
parameter:  $V_{GS} = 0 V, f = 1 MHz$



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

parameter:  $t_p = 80 \mu s$

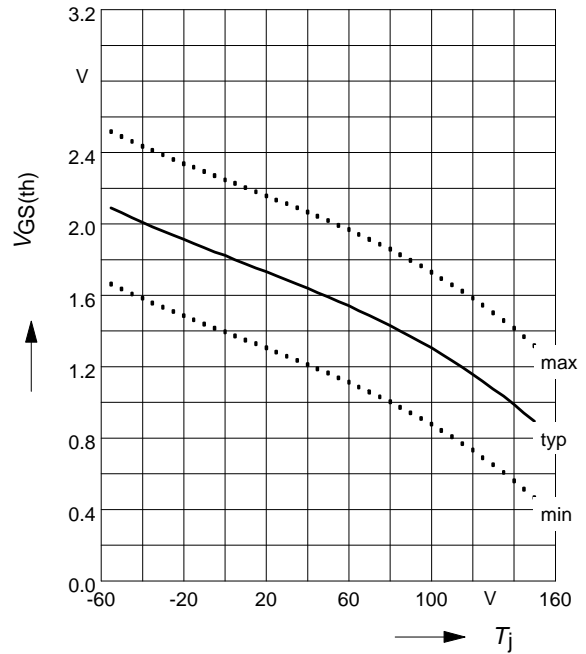
$V_{DS} \geq 2 \times I_D \times R_{DS(on) \max}$



**Gate threshold voltage  $V_{GS(th)} = f(T_j)$**

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

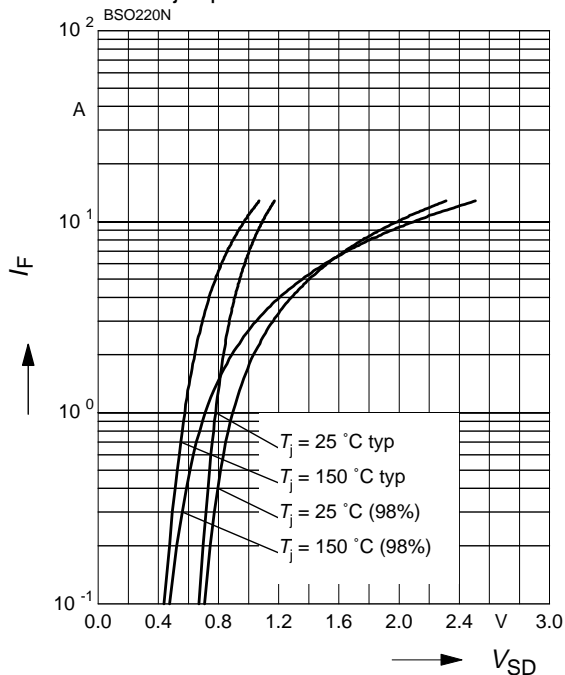
parameter:  $V_{GS} = V_{DS}, I_D = 10 \mu A$



**Forward characteristics of reverse diode  $I_F = f(V_{SD})$**

$I_F = f(V_{SD})$

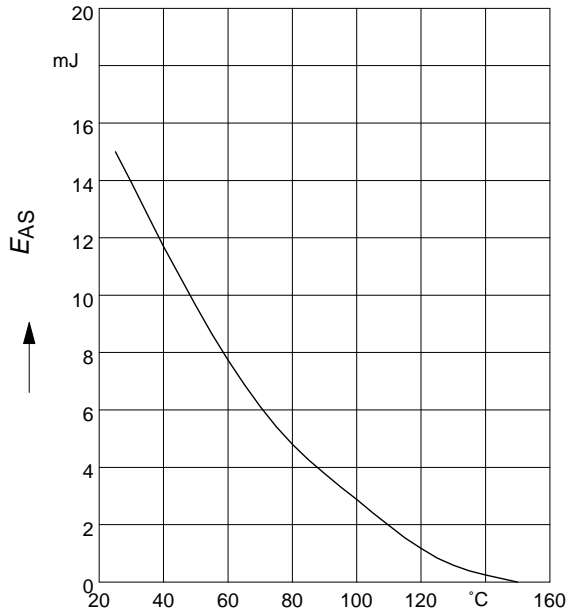
parameter:  $T_j, t_p = 80 \mu s$



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

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

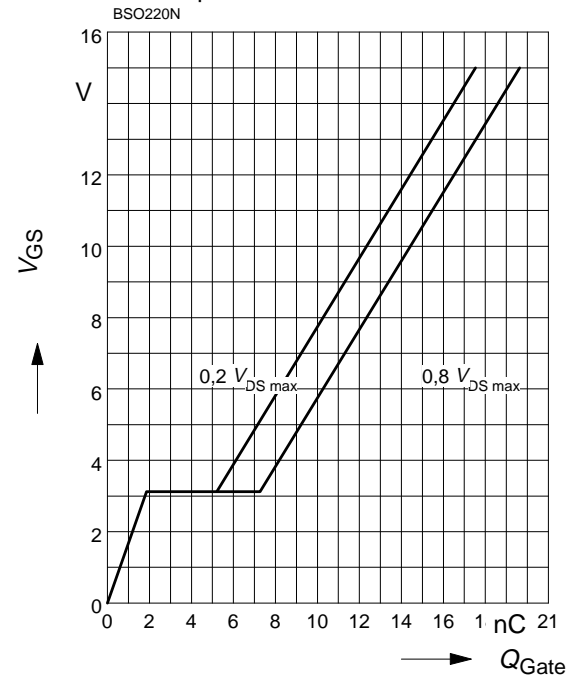
$R_{GS} = 25 \text{ } \Omega$



**Typ. gate charge**

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

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



**Drain-source breakdown voltage  $V_{(BR)DSS} = f(T_j)$**

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

