

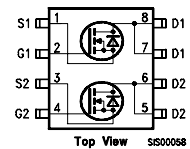
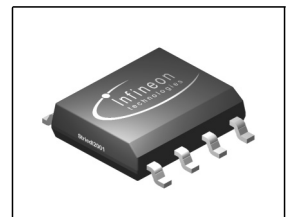
**OptiMOS® Power-Transistor**
**Feature**

- Dual N-Channel
- Enhancement mode
- Logic Level
- 150 °C operating temperature
- Avalanche rated
- dv/dt rated

**Product Summary**

$V_{DS}$	55	V
$R_{DS(on)}$	35	mΩ
$I_D$	5	A

P-DSO-8 -7



Type	Package	Ordering Code	Marking
BSO604NS2	P-DSO-8 -7	Q67060-S7309	2N604L

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25\text{ °C}$ , one channel active $T_A=70\text{ °C}$ , one channel active	$I_D$	5 4	A
Pulsed drain current, one channel active $T_A=25\text{ °C}$	$I_{D\text{ puls}}$	20	
Avalanche energy, single pulse $I_D=5\text{ A}$ , $V_{DD}=25\text{ V}$ , $R_{GS}=25\text{ Ω}$	$E_{AS}$	90	mJ
Reverse diode dv/dt $I_S=5\text{ A}$ , $V_{DS}=44\text{ V}$ , $di/dt=200\text{ A/μs}$ , $T_{jmax}=150\text{ °C}$	dv/dt	6	kV/μs
Gate source voltage	$V_{GS}$	±20	V
Power dissipation, one channel active $T_A=25\text{ °C}$	$P_{tot}$	2	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +150	°C
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	$R_{thJS}$	-	34	50	K/W
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint ; $t \leq 10$ s		-	-	100	
@ 6 cm <sup>2</sup> cooling area <sup>1)</sup> ; $t \leq 10$ s		-	-	62.5	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain-source breakdown voltage $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=30\mu A$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS}=55V, V_{GS}=0V, T_j=25^\circ\text{C}$ $V_{DS}=55V, V_{GS}=0V, T_j=150^\circ\text{C}$	$I_{DSS}$	-	0.01	1	$\mu A$
		-	1	100	
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	$I_{GSS}$	-	1	100	nA
Drain-source on-state resistance $V_{GS}=4.5V, I_D=2.5A$	$R_{DS(on)}$	-	38	44	m $\Omega$
Drain-source on-state resistance $V_{GS}=10V, I_D=2.5A$	$R_{DS(on)}$	-	31	35	

<sup>1</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<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	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic Characteristics**

Transconductance	$g_{fs}$	$V_{DS} \geq 2 * I_D *$ $R_{DS(on)max}=0.4V, I_D=5A$	6.7	13.4	-	S
Input capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=25V,$ $f=1MHz$	-	656	870	pF
Output capacitance	$C_{oss}$		-	154	205	
Reverse transfer capacitance	$C_{rss}$		-	49	75	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=27.5V, V_{GS}=4.5V,$ $I_D=5A,$ $R_G=75\Omega$	-	9	14	ns
Rise time	$t_r$		-	8	13	
Turn-off delay time	$t_{d(off)}$		-	52	78	
Fall time	$t_f$		-	8	12	

**Gate Charge Characteristics**

Gate to source charge	$Q_{gs}$	$V_{DD}=44V, I_D=5A$	-	2	3	nC
Gate to drain charge	$Q_{gd}$		-	6.6	10	
Gate charge total	$Q_g$	$V_{DD}=44V, I_D=5A,$ $V_{GS}=0$ to 10V	-	19.7	26	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD}=44V, I_D=5A$	-	2.9	-	V

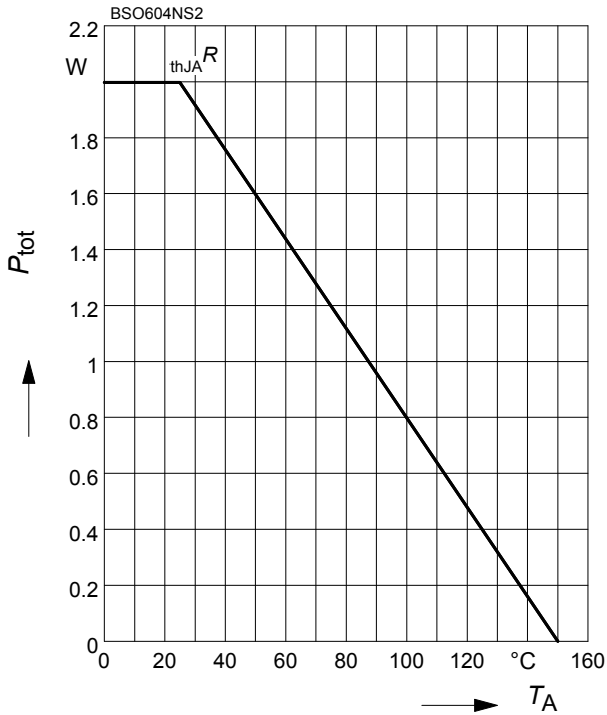
**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_A=25^\circ C$	-	-	5	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	20	
Inverse diode forward voltage	$V_{SD}$	$V_{GS}=0V, I_F=5A$	-	0.9	1.3	V
Reverse recovery time	$t_{rr}$	$V_R=27.5V, I_F=I_S,$ $di_F/dt=100A/\mu s$	-	32	40	ns
Reverse recovery charge	$Q_{rr}$		-	34	43	nC

**1 Power dissipation**

$P_{tot} = f(T_A)$

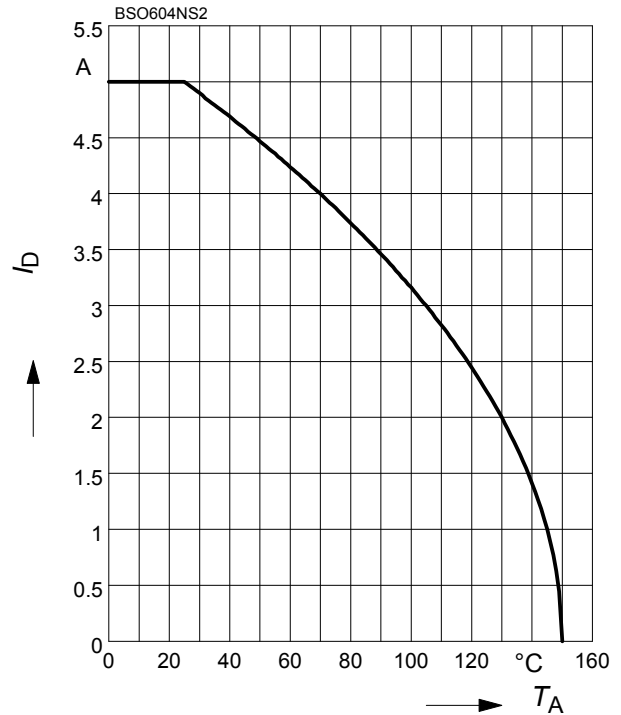
parameter:  $V_{GS} \geq 6\text{ V}$



**2 Drain current**

$I_D = f(T_A)$

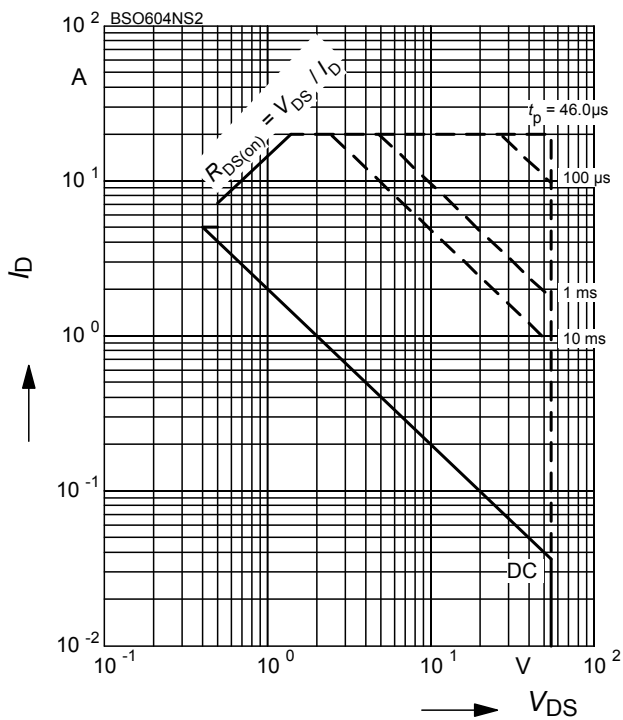
parameter:  $V_{GS} \geq 10\text{ V}$



**3 Safe operating area**

$I_D = f(V_{DS})$

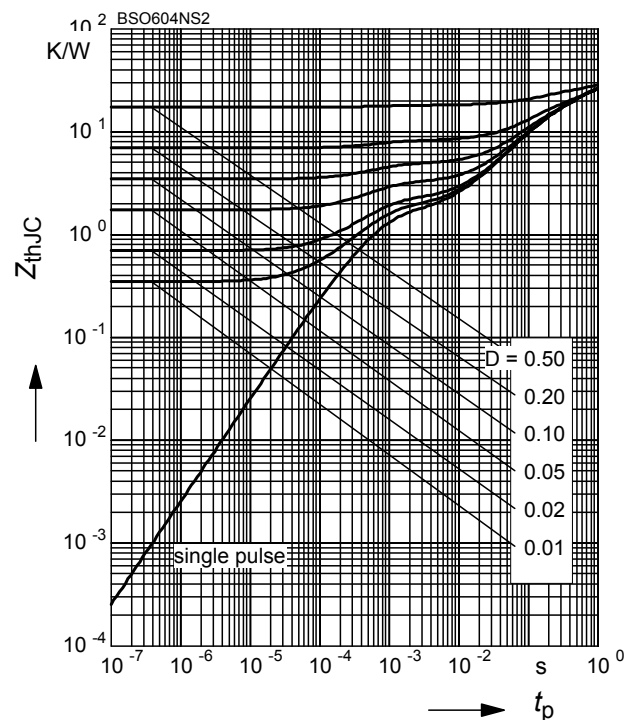
parameter:  $D = 0, T_A = 25\text{ °C}$



**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

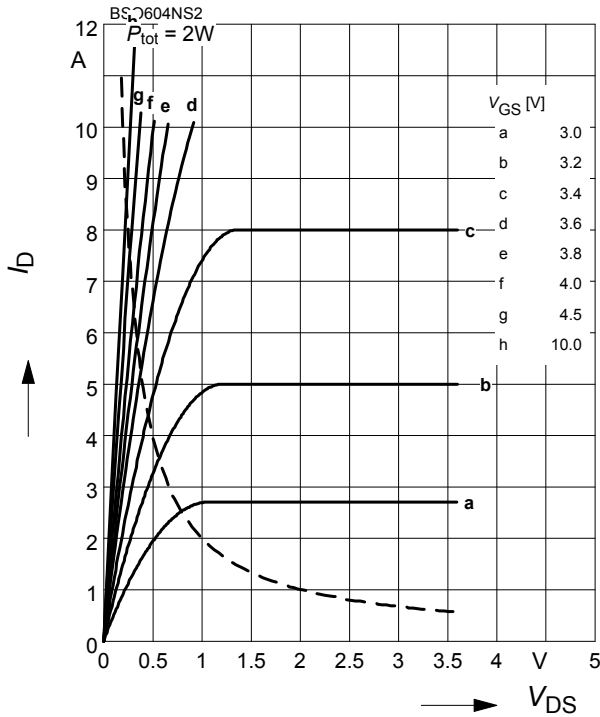
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

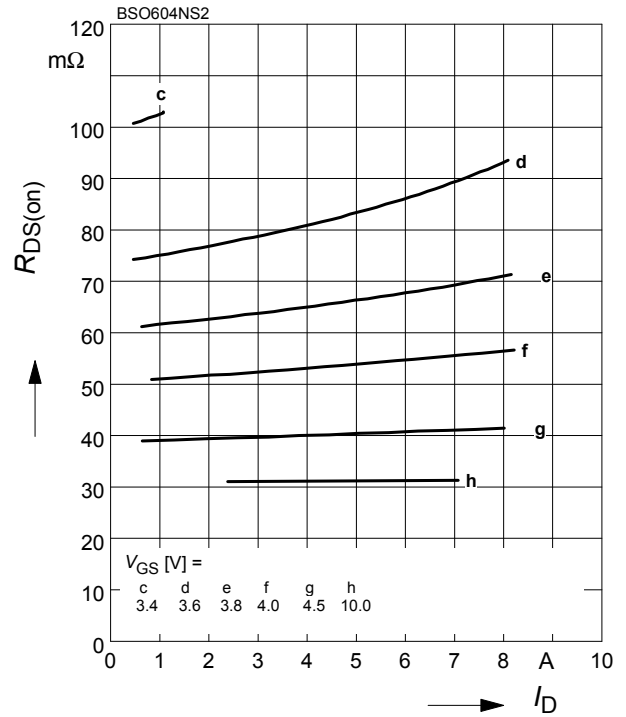
parameter:  $t_p = 80 \mu\text{s}$



**6 Typ. drain-source on resistance**

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

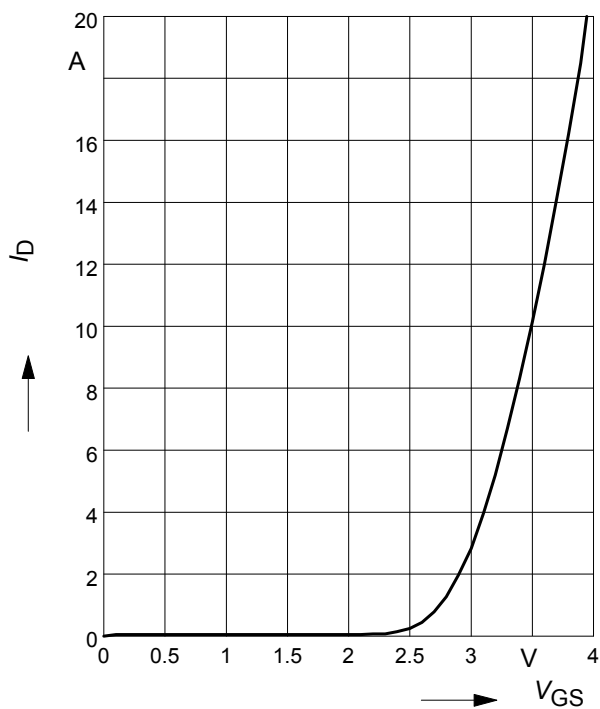
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

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

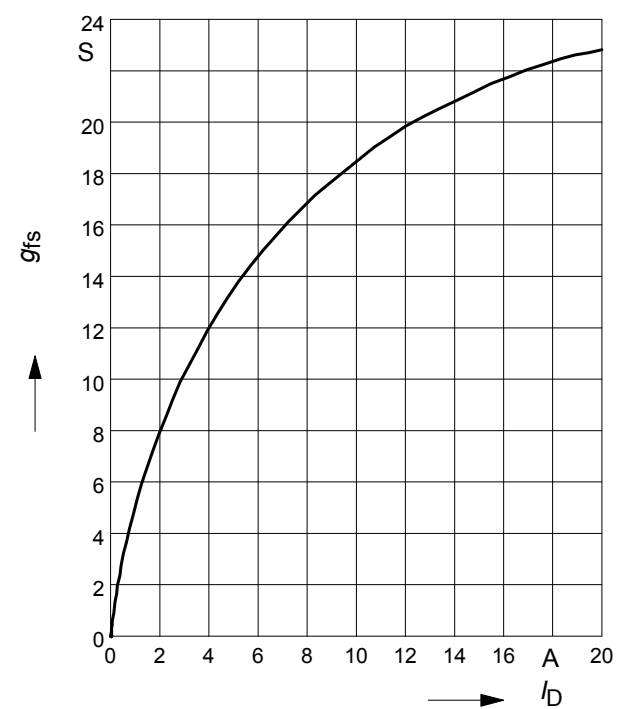
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

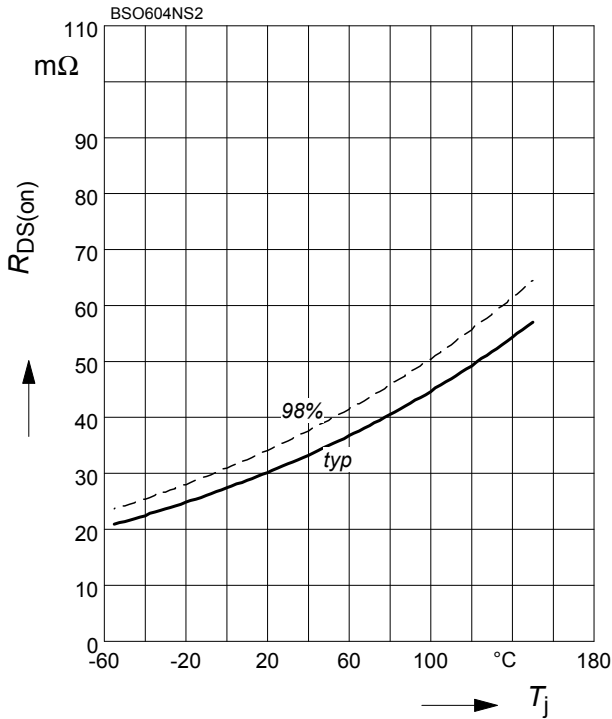
parameter:  $g_{fs}$



**9 Drain-source on-state resistance**

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

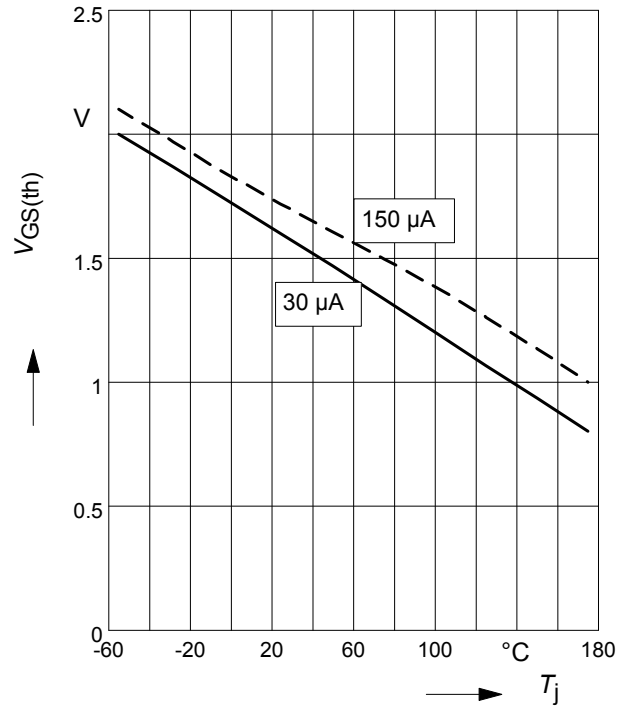
parameter :  $I_D = 2.5 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

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

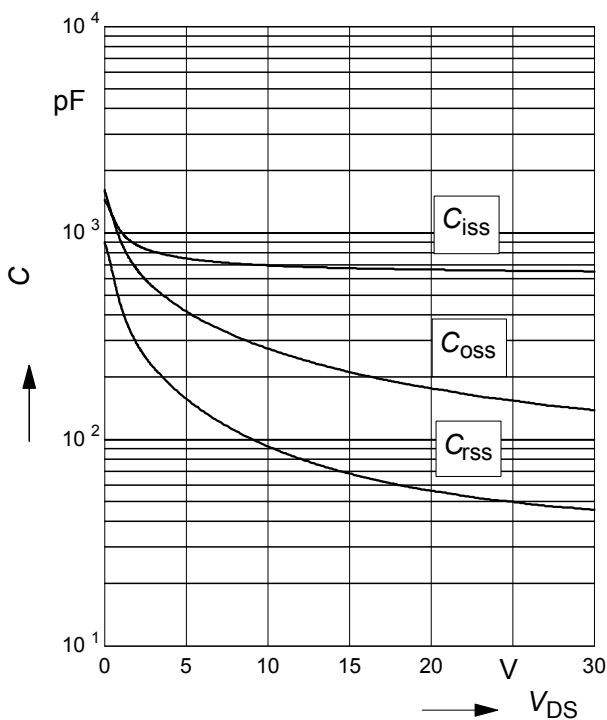
parameter:  $V_{GS} = V_{DS}$



**11 Typ. capacitances**

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

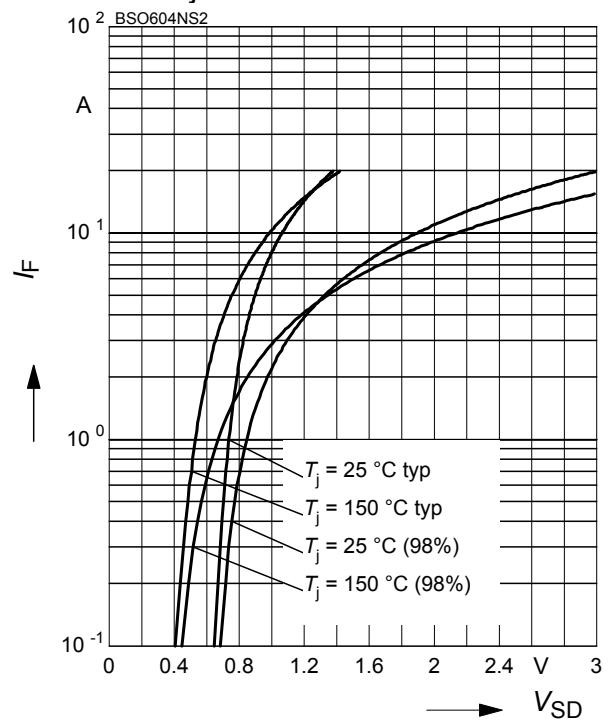
parameter:  $V_{GS}=0\text{V}$ ,  $f=1 \text{ MHz}$



**12 Forward character. of reverse diode**

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

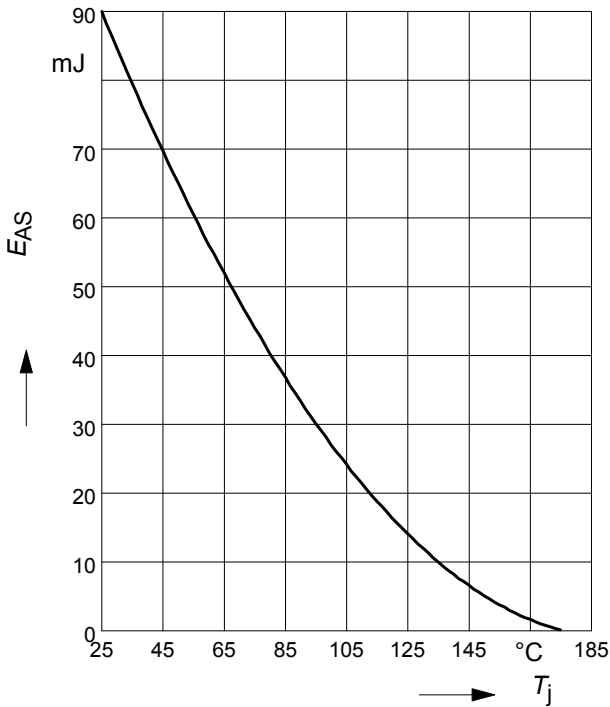
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**13 Typ. avalanche energy**

$E_{AS} = f(T_j)$

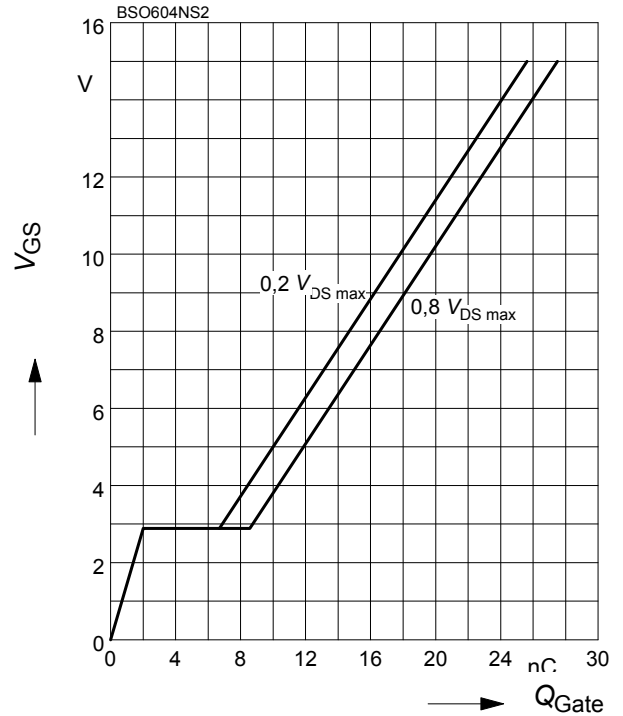
par.:  $I_D = 5\text{ A}$  ,  $V_{DD} = 25\text{ V}$  ,  $R_{GS} = 25\ \Omega$



**14 Typ. gate charge**

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

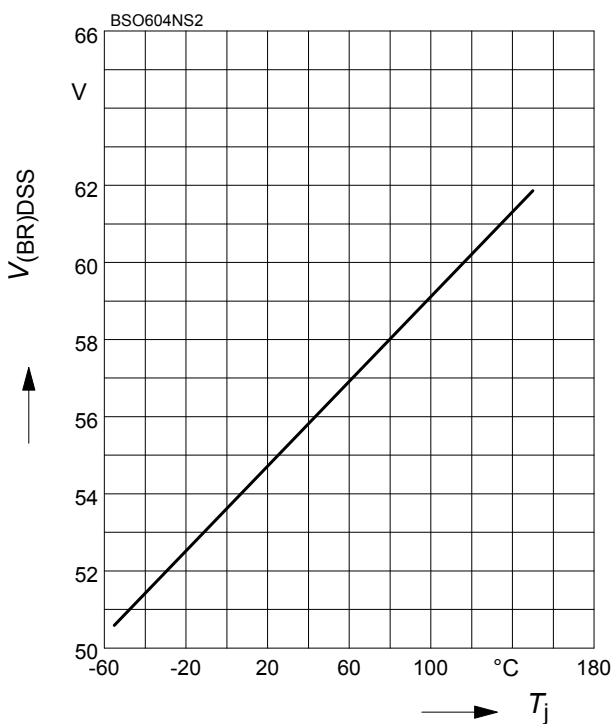
parameter:  $I_D = 5\text{ A}$  pulsed



**15 Drain-source breakdown voltage**

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

parameter:  $I_D = 10\text{ mA}$



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**Further information**

Please notice that the part number is BBSO604NS2, for simplicity the device is referred to by the term BSO604NS2 throughout this documentation.