

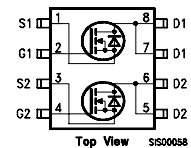
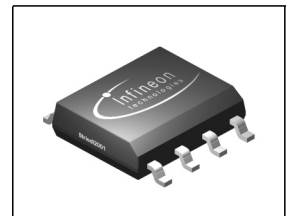
## OptiMOS® Power-Transistor

### Feature

- Dual N-Channel
- Enhancement mode
- Logic Level
- 150 °C operating temperature
- Avalanche rated
- dv/dt rated
- Green Product (RoHS compliant)
- AEC Qualified

### Product Summary

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



Type	Package	Ordering Code	Marking
BSO604NS2	PG-DSO-8 -25	On Request	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 $I_S=5\text{ A}$ , $V_{DS}=44\text{ V}$ , $di/dt=200\text{ A/μs}$ , $T_{j\text{ max}}=150\text{ °C}$	dv/dt	6	kV/μs
Gate source voltage	$V_{GS}$	±20	V
Power dissipation, one channel active $T_A=25\text{ °C}$	$P_{\text{tot}}$	2	W
Operating and storage temperature	$T_j$ , $T_{\text{stg}}$	-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:	$R_{thJA}$	-	-	100	
@ min. footprint ; $t \leq 10$ s @ 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 $V_{GS}=0\text{V}, I_D=1\text{mA}$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=30\mu\text{A}$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS}=55\text{V}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$ $V_{DS}=55\text{V}, V_{GS}=0\text{V}, T_j=150^\circ\text{C}$	$I_{DSS}$	-	0.01	1	$\mu\text{A}$
Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0\text{V}$	$I_{GSS}$	-	1	100	
Drain-source on-state resistance $V_{GS}=4.5\text{V}, I_D=2.5\text{A}$	$R_{DS(on)}$	-	38	44	m $\Omega$
Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=2.5\text{A}$	$R_{DS(on)}$	-	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	$Q_g$	$V_{DD} = 44V, I_D = 5A,$ $V_{GS} = 0 \text{ to } 10V$	-	19.7	26	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 44V, I_D = 5A$	-	2.9	-	V

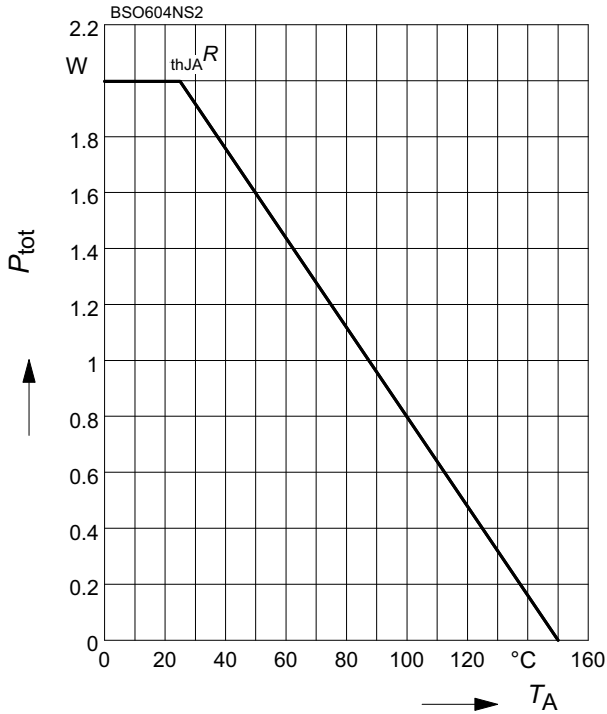
**Reverse Diode**

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	

### 1 Power dissipation

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

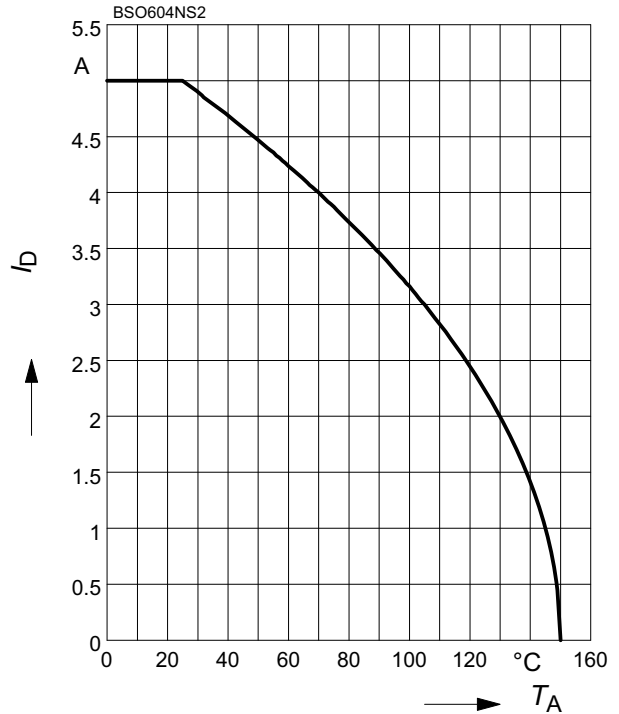
parameter:  $V_{\text{GS}} \geq 6 \text{ V}$



### 2 Drain current

$$I_D = f(T_A)$$

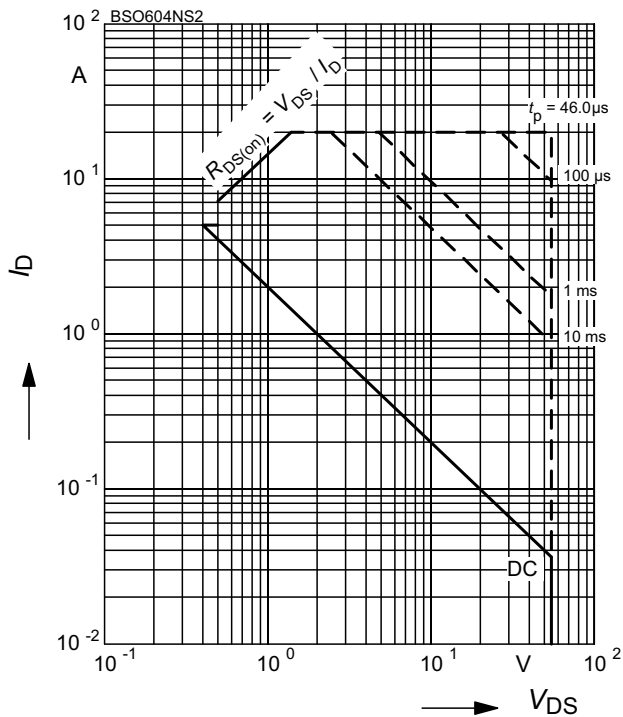
parameter:  $V_{\text{GS}} \geq 10 \text{ V}$



### 3 Safe operating area

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

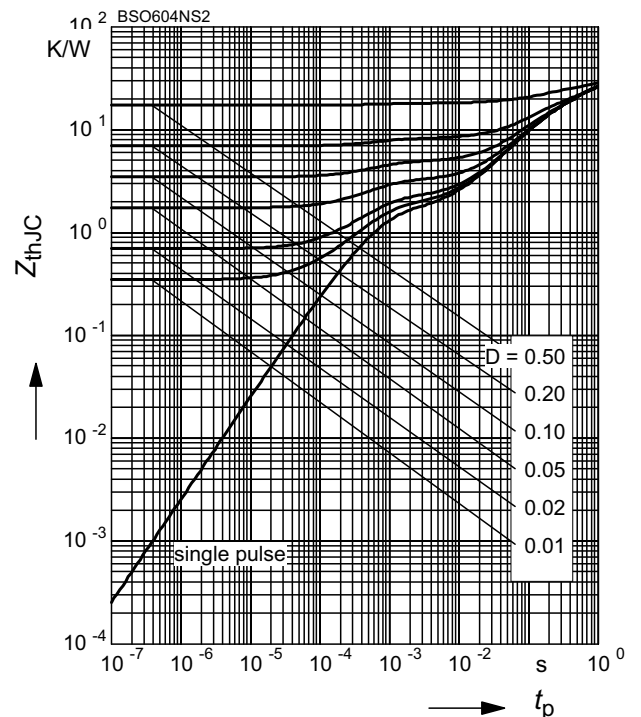
parameter:  $D = 0$ ,  $T_A = 25 \text{ °C}$



### 4 Max. transient thermal impedance

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

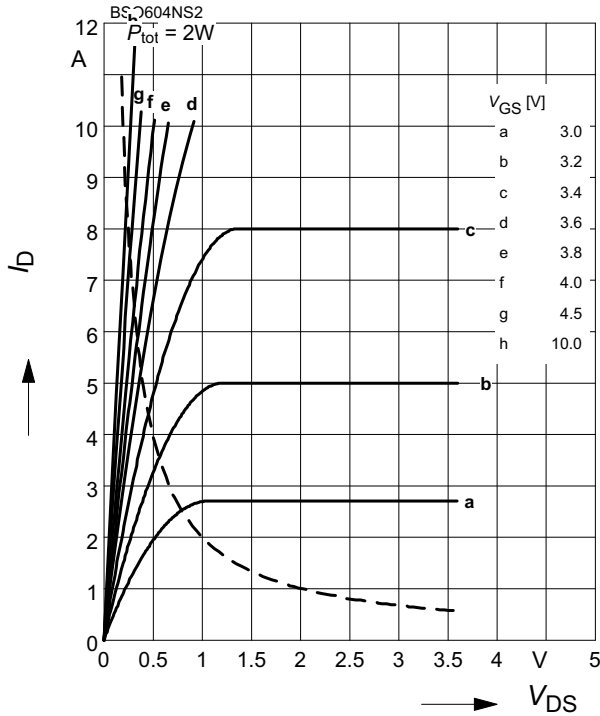
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

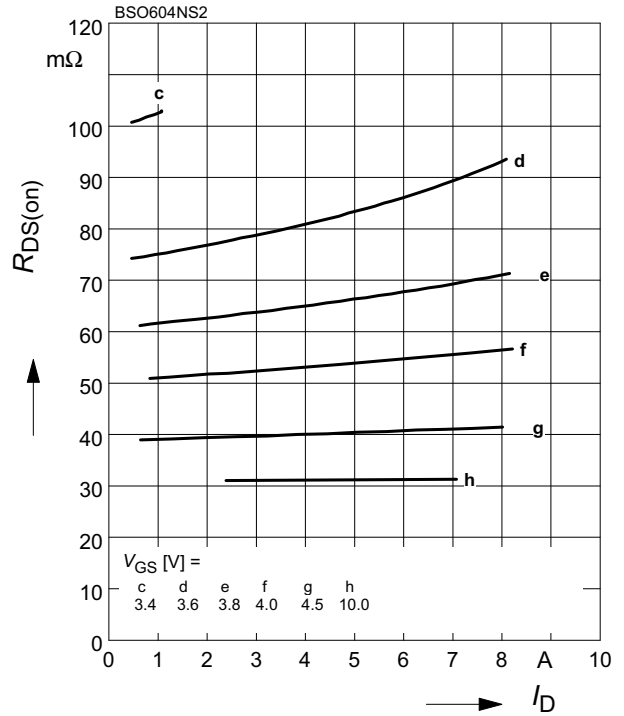
parameter:  $t_p = 80 \mu\text{s}$



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

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

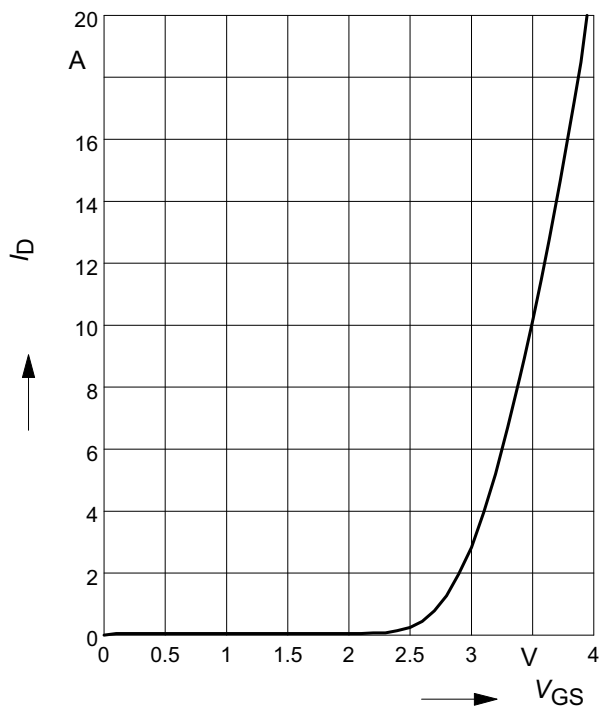
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

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

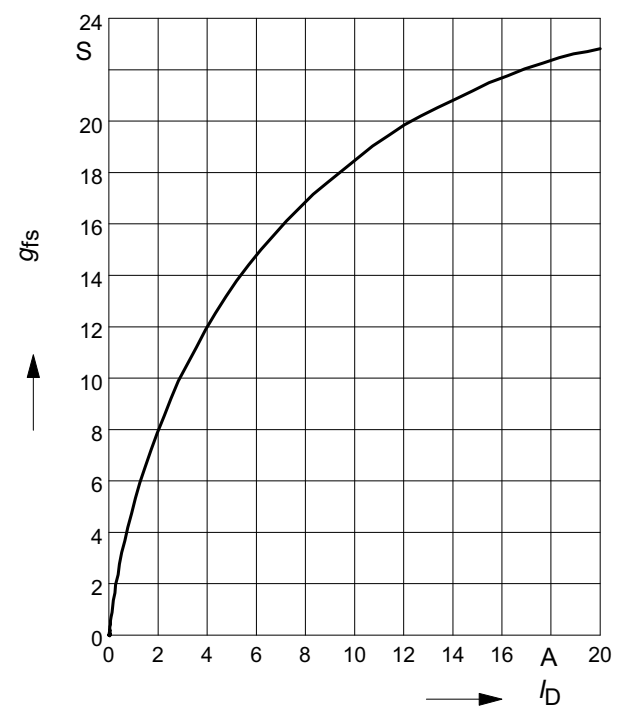
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

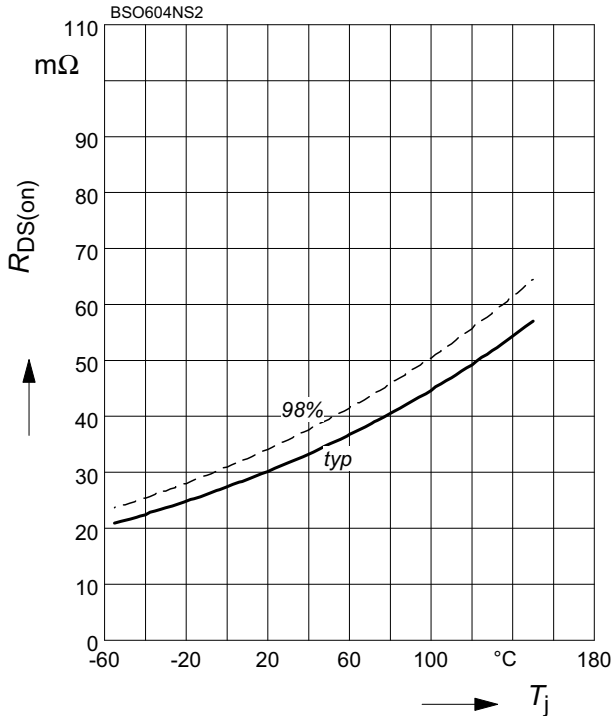
parameter:  $g_{fs}$



### 9 Drain-source on-state resistance

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

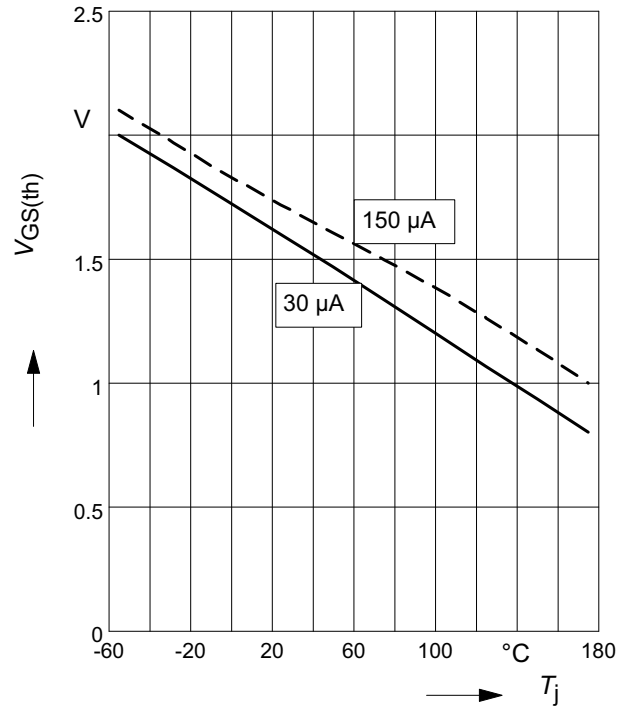
parameter:  $I_D = 2.5 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



### 10 Typ. gate threshold voltage

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

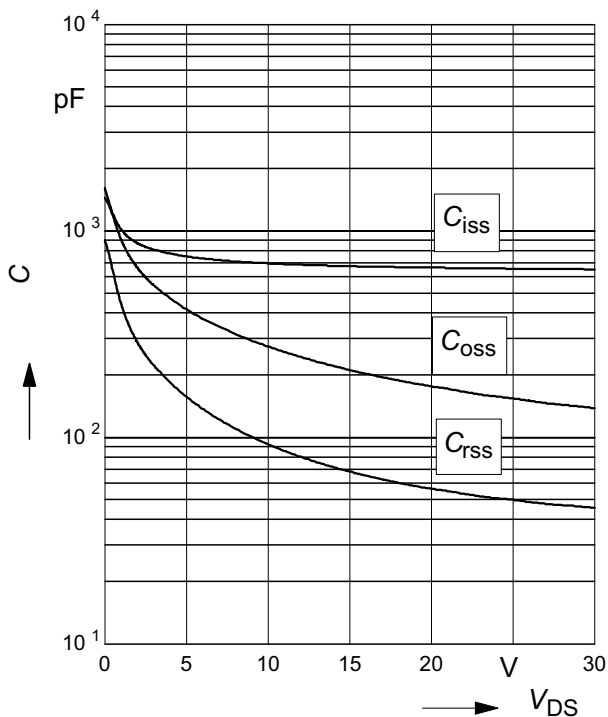
parameter:  $V_{GS} = V_{DS}$



### 11 Typ. capacitances

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

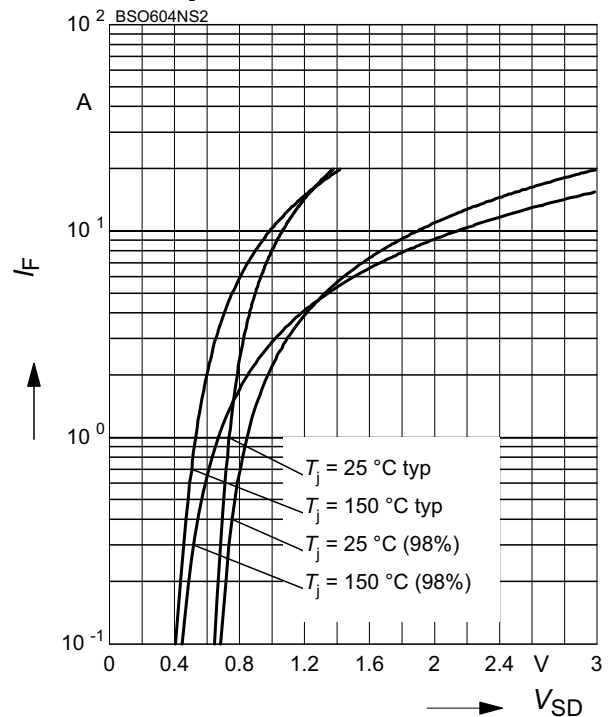
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



### 12 Forward character. of reverse diode

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

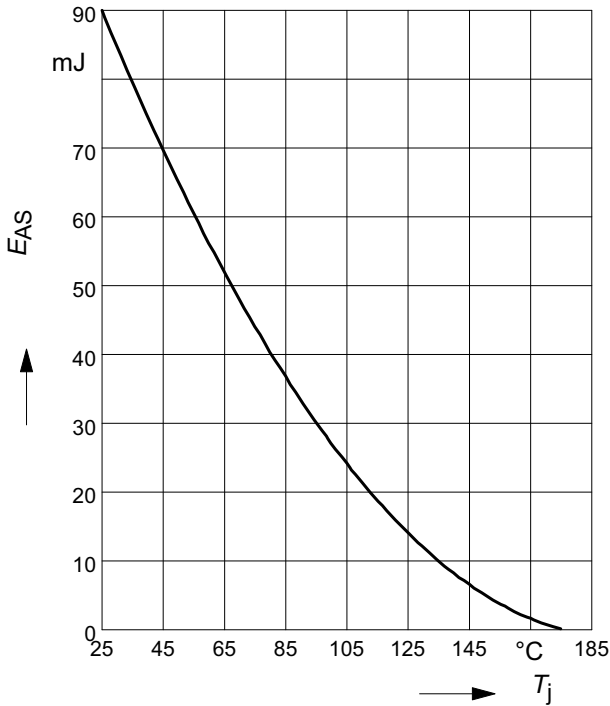
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**13 Typ. avalanche energy**

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

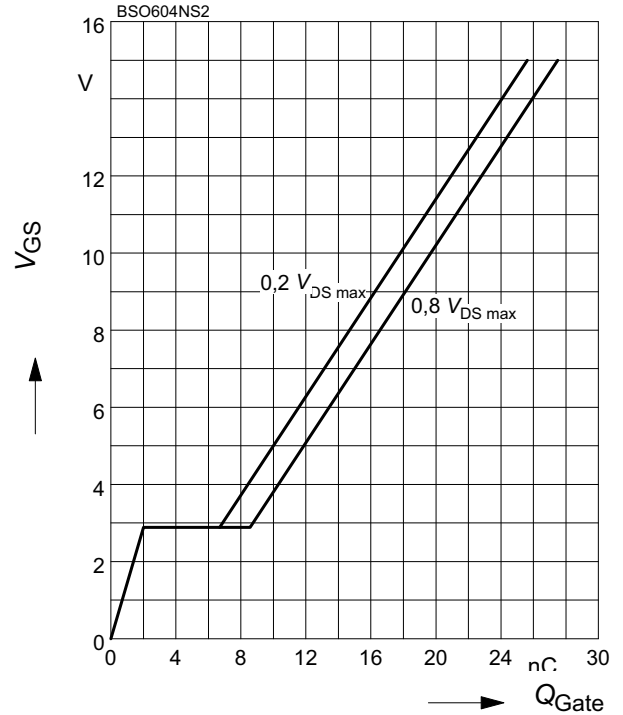
par.:  $I_D = 5\text{ A}$  ,  $V_{DD} = 25\text{ V}$  ,  $R_{GS} = 25\ \Omega$



**14 Typ. gate charge**

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

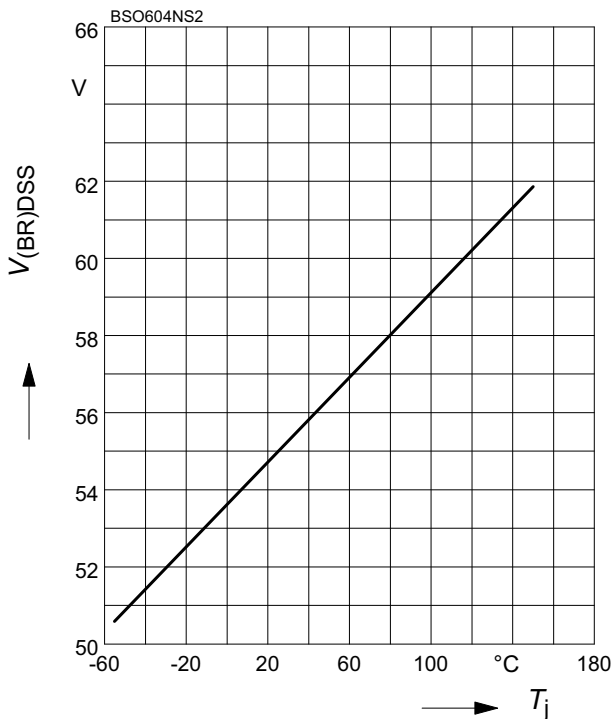
parameter:  $I_D = 5\text{ A}$  pulsed



**15 Drain-source breakdown voltage**

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

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



# 1 Package Outlines

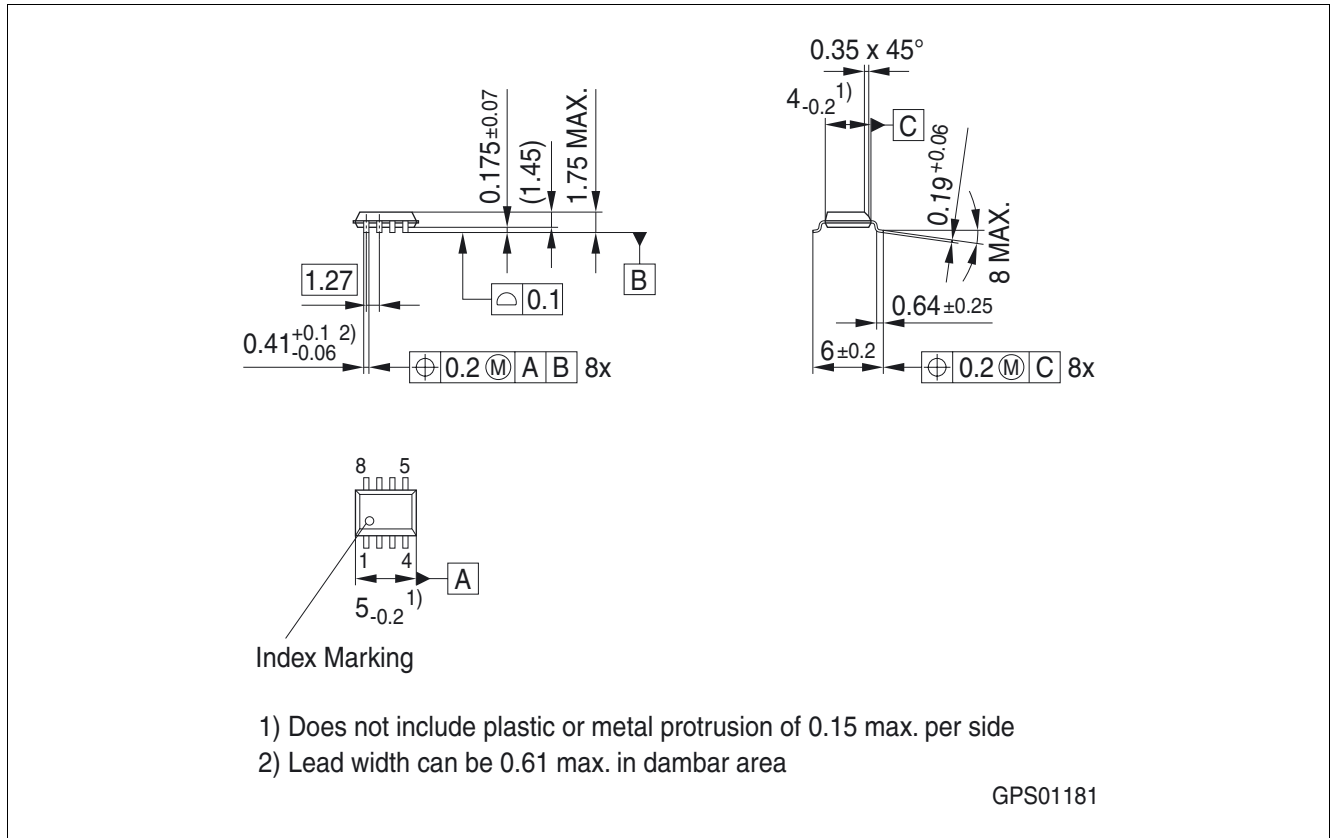


Figure 1 PG-DSO-8-25

### Green Product (RoHS compliant)

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a green product. Green products are RoHS-Compliant (i.e. Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).



## 2 Revision History

Revision	Date	Changes
1.1	2008-03-20	Initial version of RoHS-compliant derivate of BSO604NS2 Page 1: AEC certified statement added Page 1 and 8: added RoHS compliance statement and Green product feature Page 1 and 8: Package changed to RoHS compliant version Page 9-10: added Revision History, updated Legal Disclaimer

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