

# 英飞凌MOSFET功率晶体管

## 英飞凌BSC500N20NS3 G OptiMOS™ 3 200 V功率晶体管

### 特性

- N沟道，正常电平
- 出色的栅极电荷  $\times R_{DS(on)}$  乘积 (FOM)
- 极低的导通电阻  $R_{DS(on)}$
- 无铅镀层；符合RoHS标准
- 符合 JEDEC <sup>1)</sup> 的目标应用要求
- 符合 IEC61249-2-21 标准的无卤素
- 非常适合高频开关和同步整流

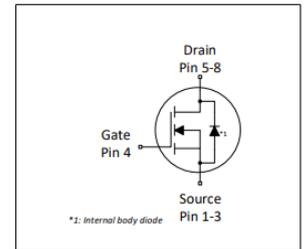
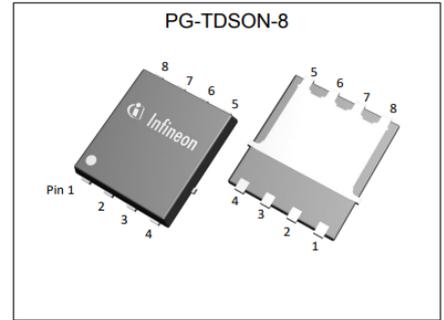


表 1 主要性能参数

Parameter	Value	Unit
$V_{DS}$	200	V
$R_{DS(on),max}$	50	m $\Omega$
$I_b$	24	A



Type / Ordering Code	Package	Marking	Related Links
BSC500N20NS3 G	PG-TDSON-8	500N20NS	-

<sup>1)</sup> J-STD20 和 JESD22

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## 目录

描述 .....	1
最大额定值 .....	3
热特性 .....	3
电气特性 .....	4
电气特性图 .....	6
封装外形 .....	10
修订记录 .....	11
商标 .....	11
免责声明 .....	11

## 1 最大额定值

除非另有规定， $T_A = 25\text{ °C}$

**表 2 最大额定值**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	$I_D$	-	-	24 17	A	$T_C = 25\text{ °C}$ $T_C = 100\text{ °C}$
Pulsed drain current <sup>1)</sup>	$I_{D,pulse}$	-	-	97	A	$T_C = 25\text{ °C}$
Avalanche energy, single pulse	$E_{AS}$	-	-	120	mJ	$I_D = 22\text{ A}$ , $R_{GS} = 25\text{ }\Omega$
Reverse diode dv/dt	dv/dt	-	-	50	kV/ $\mu$ s	-
Gate source voltage	$V_{GS}$	-20	-	20	V	-
Power dissipation	$P_{tot}$	-	-	96	W	$T_C = 25\text{ °C}$
Operating and storage temperature	$T_j, T_{stg}$	-55	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56

## 2 热特性

**表 3 热特性**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{thJC}$	-	-	1.3	K/W	-
Thermal resistance, junction - ambient, minimal footprint	$R_{thJA}$	-	-	75	K/W	-
Thermal resistance, junction - ambient, 6 cm <sup>2</sup> cooling area <sup>2)</sup>	$R_{thJA}$	-	-	50	K/W	-

<sup>1)</sup> 见图3

<sup>2)</sup> 器件安装在 40 mm x 40 mm x 1.5 mm 环氧树脂印刷电路板 FR4 上，漏极连接用铜面积为 6 cm<sup>2</sup>（一层，70  $\mu$ m 厚）。印刷电路板垂直放置在静止空气中。

# OptiMOS™ 3 Power-Transistor, 200 V

BSC500N20NS3 G

## 3 电气特性

除非另有规定， $T_j = 25\text{ °C}$

**表4 静态特性**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	200	-	-	V	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	$V_{DS}=V_{GS}, I_D=60\text{ }\mu\text{A}$
Zero gate voltage drain current	$I_{DSS}$	-	0.1 10	1 100	$\mu\text{A}$	$V_{DS}=160\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$ $V_{DS}=160\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$
Gate-source leakage current	$I_{GSS}$	-	1	100	nA	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	42	50	m $\Omega$	$V_{GS}=10\text{ V}, I_D=22\text{ A}$
Gate resistance	$R_G$	-	1.9	-	$\Omega$	-
Transconductance	$g_{fs}$	19	37	-	S	$ V_{DS}  > 2 I_D /R_{DS(on)max}, I_D=22\text{ A}$

**表5 动态特性**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance <sup>1)</sup>	$C_{iss}$	-	1190	1580	pF	$V_{GS}=0\text{ V}, V_{DS}=100\text{ V}, f=1\text{ MHz}$
Output capacitance <sup>1)</sup>	$C_{oss}$	-	90	120	pF	$V_{GS}=0\text{ V}, V_{DS}=100\text{ V}, f=1\text{ MHz}$
Reverse transfer capacitance	$C_{riss}$	-	5	-	pF	$V_{GS}=0\text{ V}, V_{DS}=100\text{ V}, f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	14	-	ns	$V_{DD}=100\text{ V}, V_{GS}=10\text{ V}, I_D=12\text{ A}, R_{G,ext}=6\text{ }\Omega$
Rise time	$t_r$	-	5	-	ns	$V_{DD}=100\text{ V}, V_{GS}=10\text{ V}, I_D=12\text{ A}, R_{G,ext}=6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	28	-	ns	$V_{DD}=100\text{ V}, V_{GS}=10\text{ V}, I_D=12\text{ A}, R_{G,ext}=6\text{ }\Omega$
Fall time	$t_f$	-	7	-	ns	$V_{DD}=100\text{ V}, V_{GS}=10\text{ V}, I_D=12\text{ A}, R_{G,ext}=6\text{ }\Omega$

**表6 栅极电荷特性<sup>2)</sup>**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	$Q_{gs}$	-	5	-	nC	$V_{DD}=100\text{ V}, I_D=12\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge	$Q_{gd}$	-	2	-	nC	$V_{DD}=100\text{ V}, I_D=12\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Switching charge	$Q_{sw}$	-	4	-	nC	$V_{DD}=100\text{ V}, I_D=12\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate charge total <sup>1)</sup>	$Q_g$	-	15	20	nC	$V_{DD}=100\text{ V}, I_D=12\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	4.4	-	V	$V_{DD}=100\text{ V}, I_D=12\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Output charge <sup>1)</sup>	$Q_{oss}$	-	35	47	nC	$V_{DD}=100\text{ V}, V_{GS}=0\text{ V}$

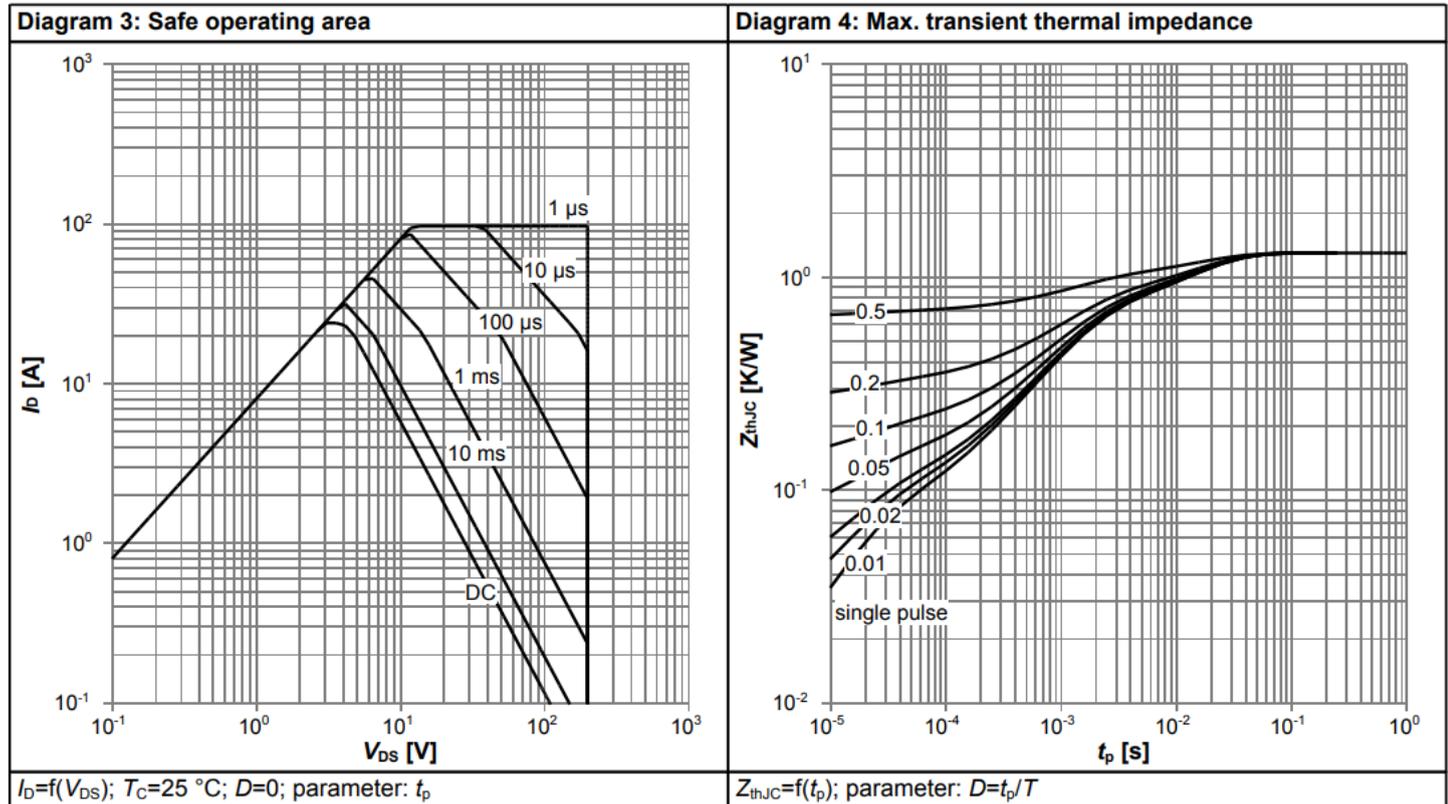
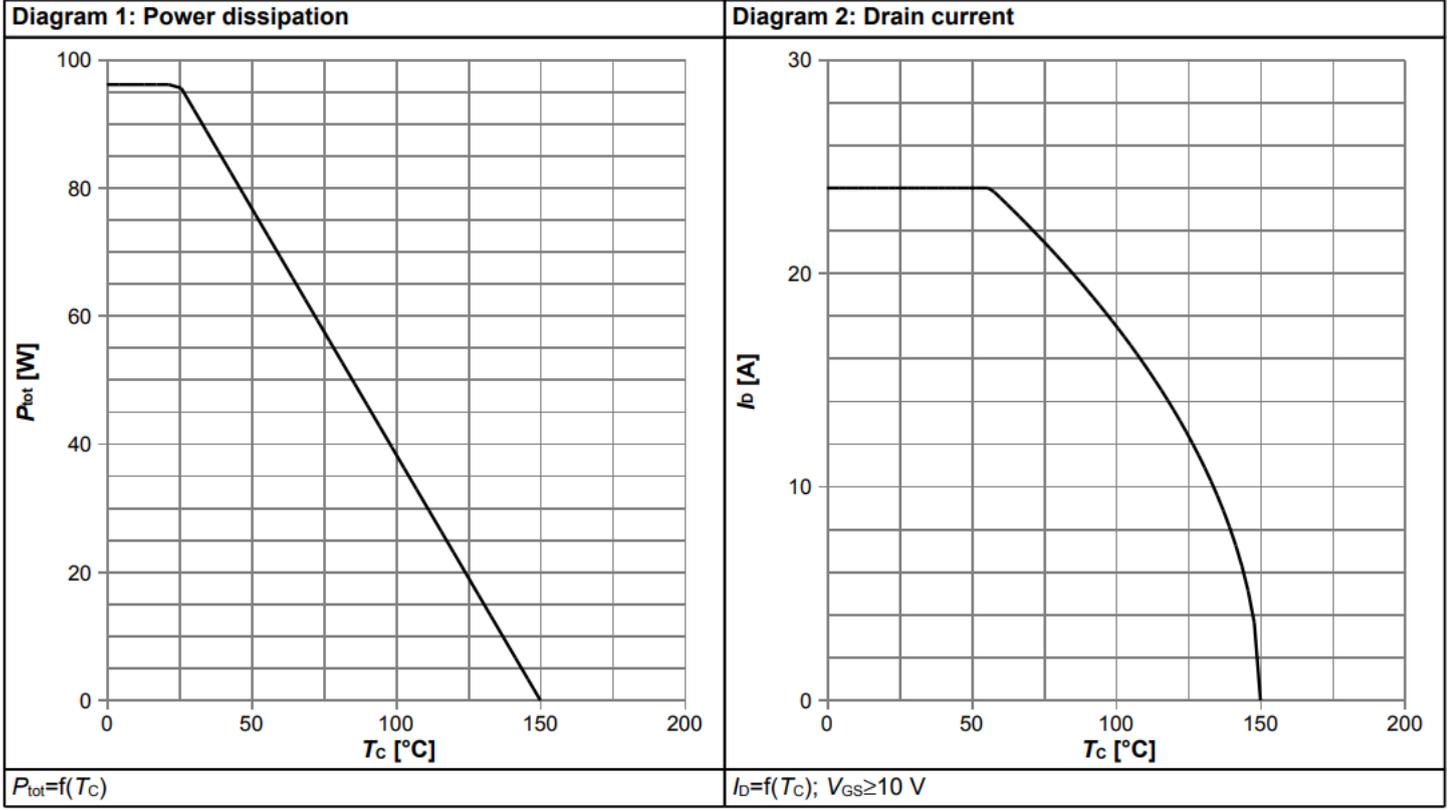
<sup>1)</sup>由设计标定，不受制于生产测试。

<sup>2)</sup>参数定义请参见“栅极电荷波形”

表 7 反向二极管

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	$I_S$	-	-	24	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	97	A	$T_C=25\text{ °C}$
Diode forward voltage	$V_{SD}$	-	0.9	1.2	V	$V_{GS}=0\text{ V}, I_F=22\text{ A}, T_J=25\text{ °C}$
Reverse recovery time	$t_{rr}$	-	110	-	ns	$V_R=100\text{ V}, I_F=12\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	$Q_{rr}$	-	399	-	nC	$V_R=100\text{ V}, I_F=12\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$

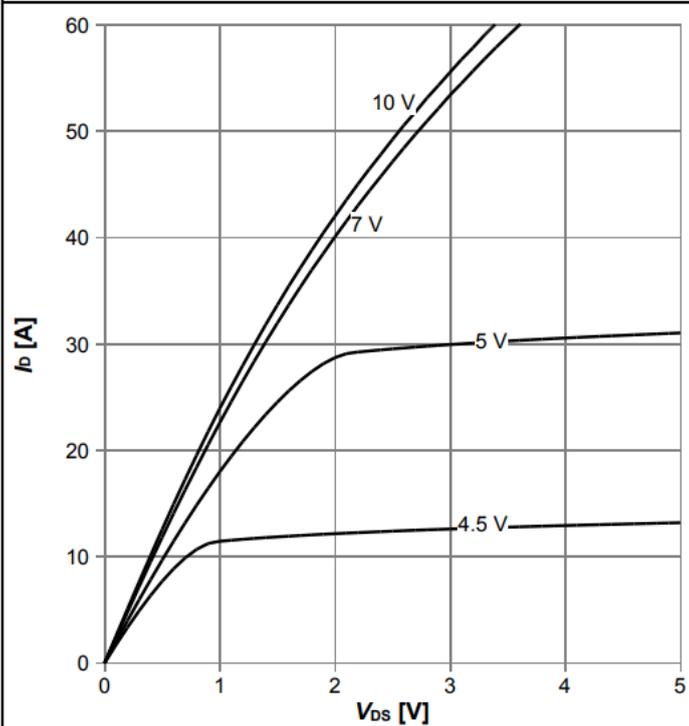
### 4 电气特性图



# OptiMOS™ 3 Power-Transistor, 200 V

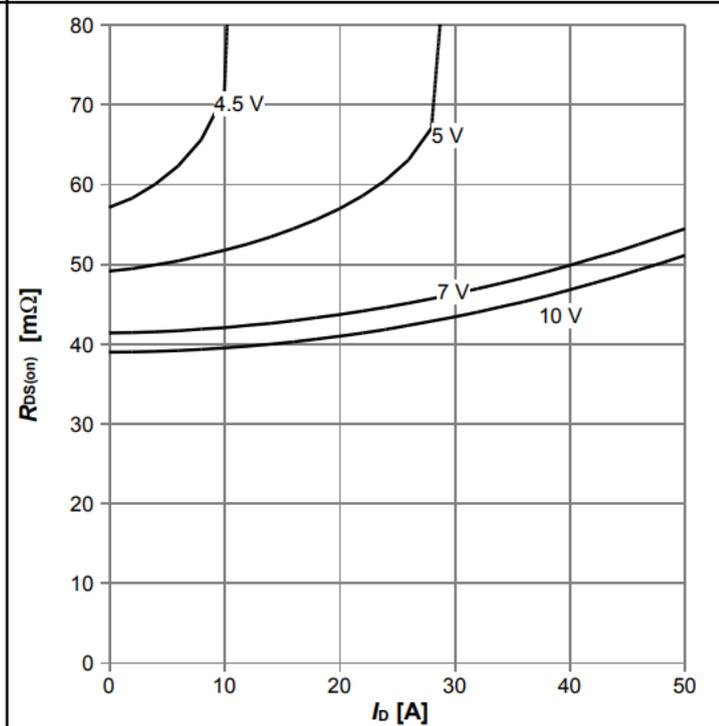
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Diagram 5: Typ. output characteristics



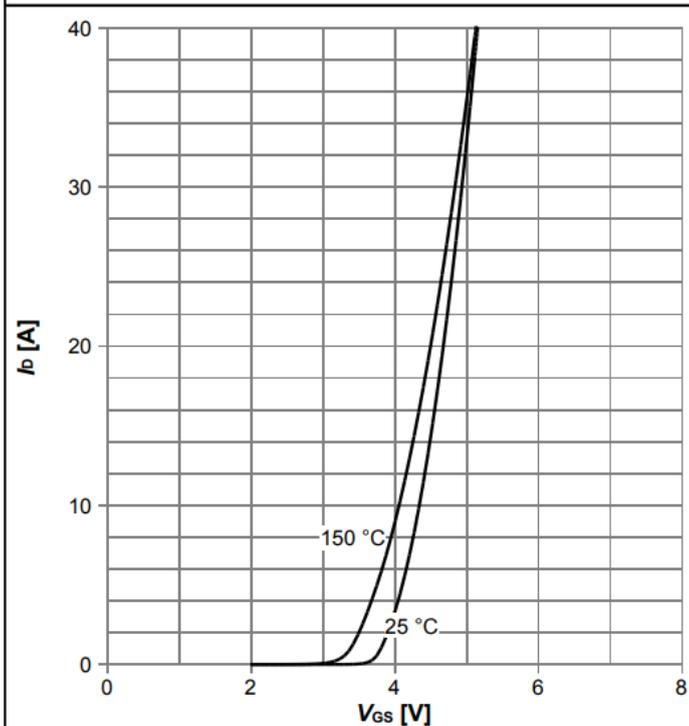
$I_D=f(V_{DS}); T_j=25\text{ }^\circ\text{C};$  parameter:  $V_{GS}$

Diagram 6: Typ. drain-source on resistance



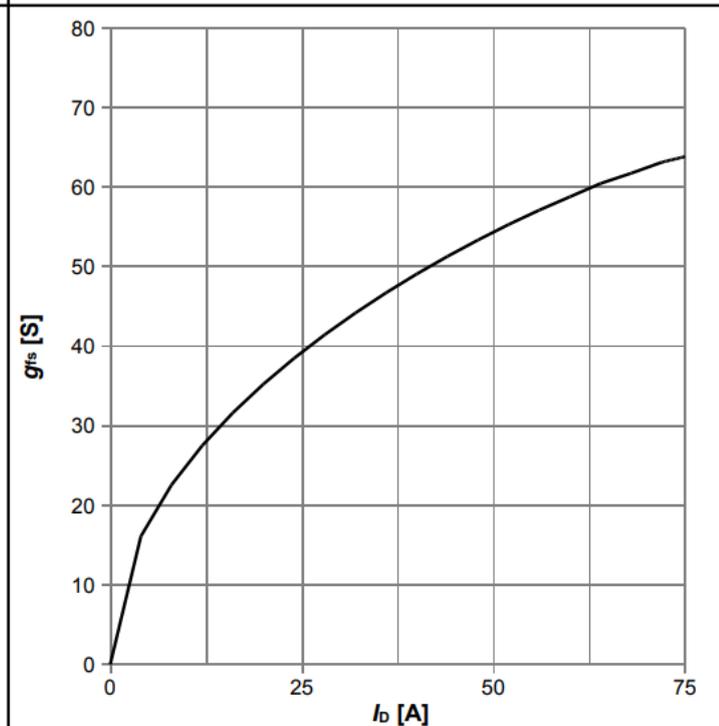
$R_{DS(on)}=f(I_D); T_j=25\text{ }^\circ\text{C};$  parameter:  $V_{GS}$

Diagram 7: Typ. transfer characteristics



$I_D=f(V_{GS}); |V_{DS}|>2I_D R_{DS(on)max};$  parameter:  $T_j$

Diagram 8: Typ. forward transconductance

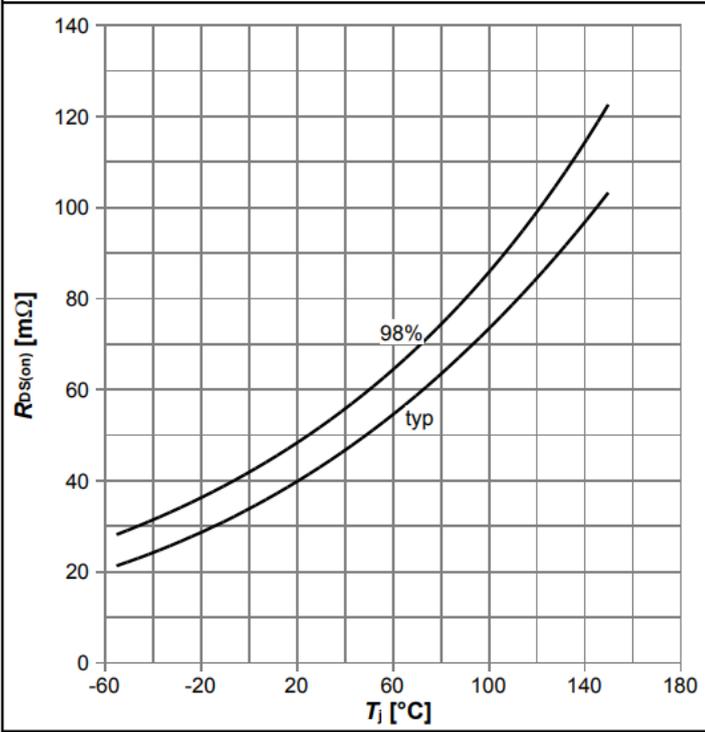


$g_{fs}=f(I_D); T_j=25\text{ }^\circ\text{C}$

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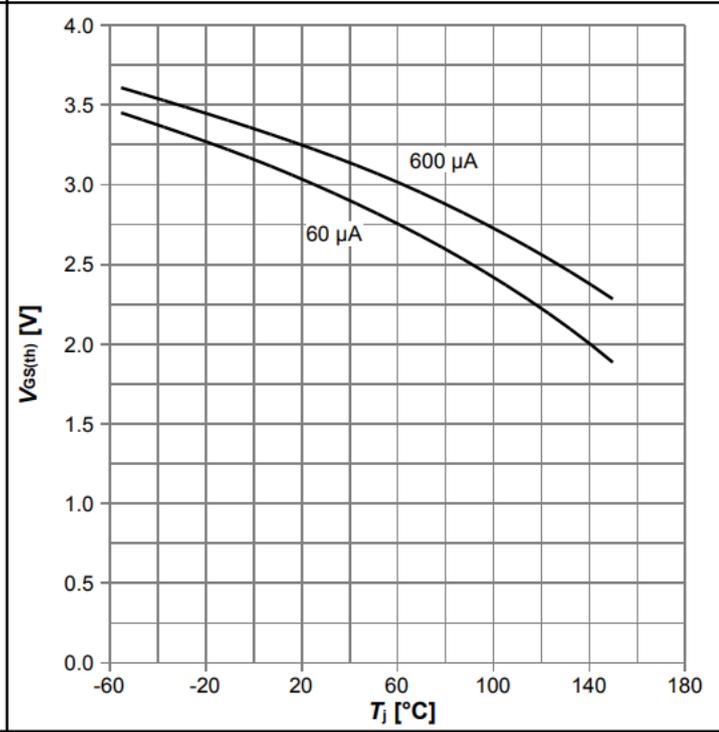
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Diagram 9: Drain-source on-state resistance



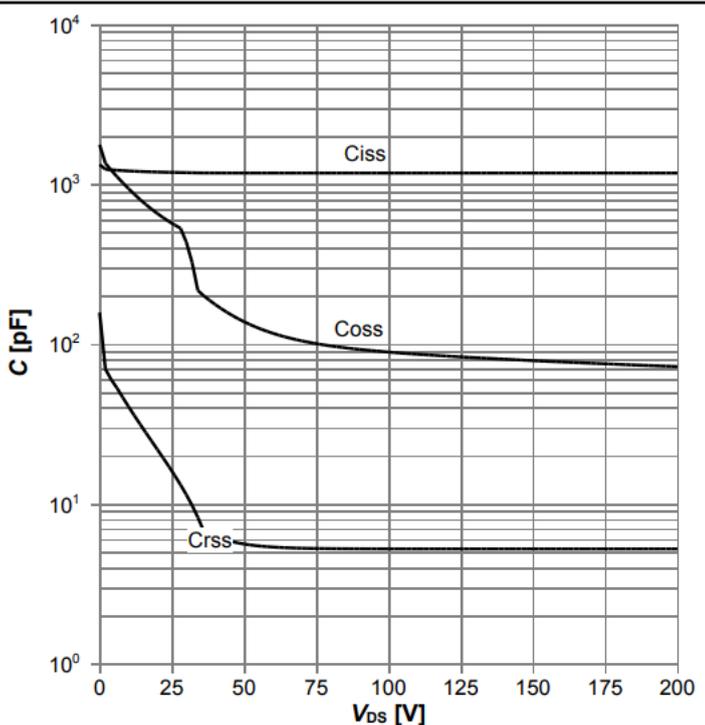
$R_{DS(on)}=f(T_j); I_D=22\text{ A}; V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



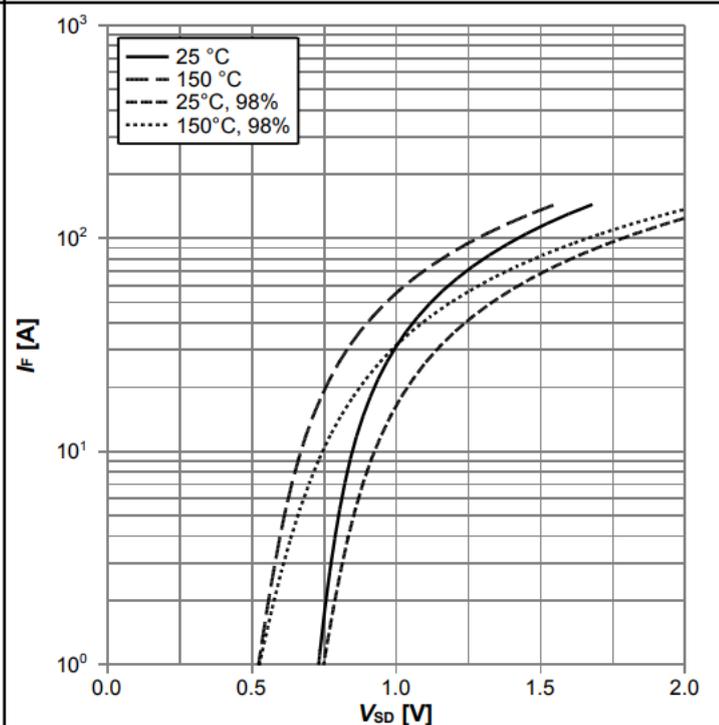
$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}; \text{parameter: } I_D$

Diagram 11: Typ. capacitances



$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode

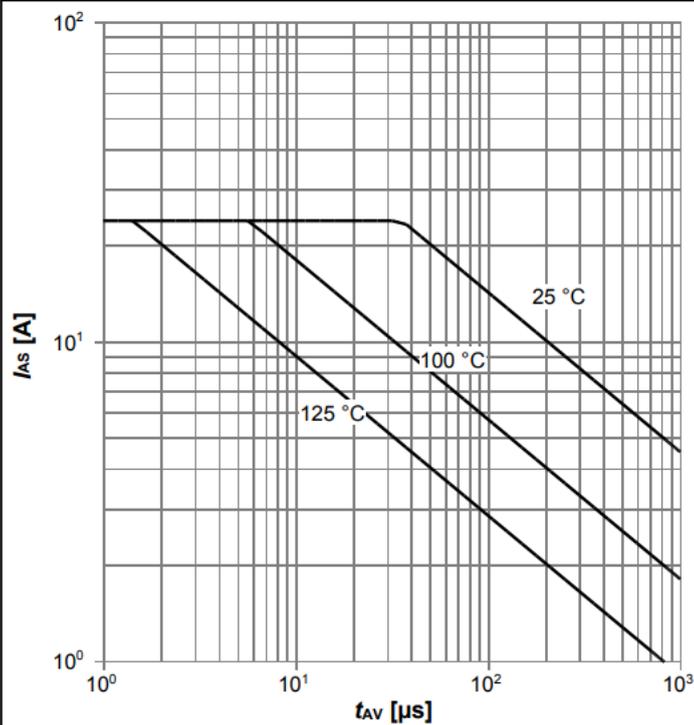


$I_F=f(V_{SD}); \text{parameter: } T_j$

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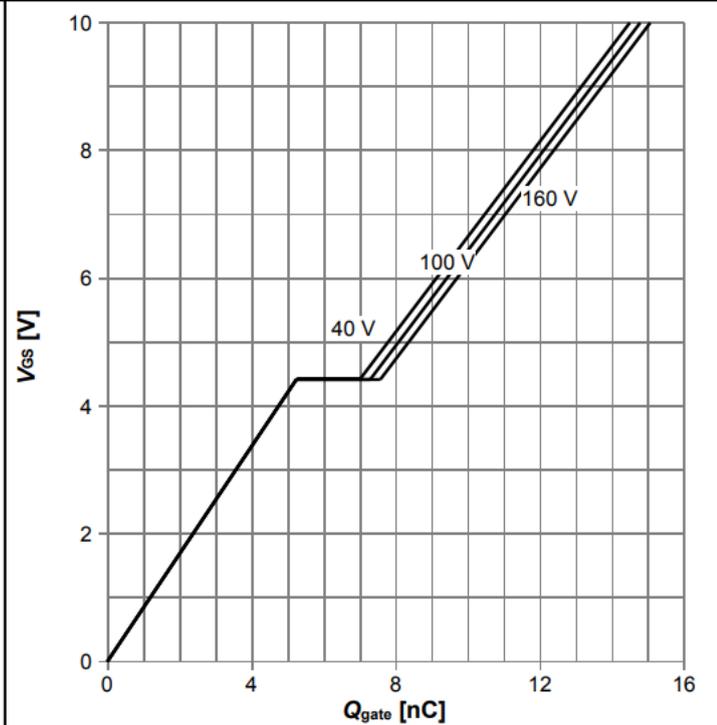
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Diagram 13: Avalanche characteristics



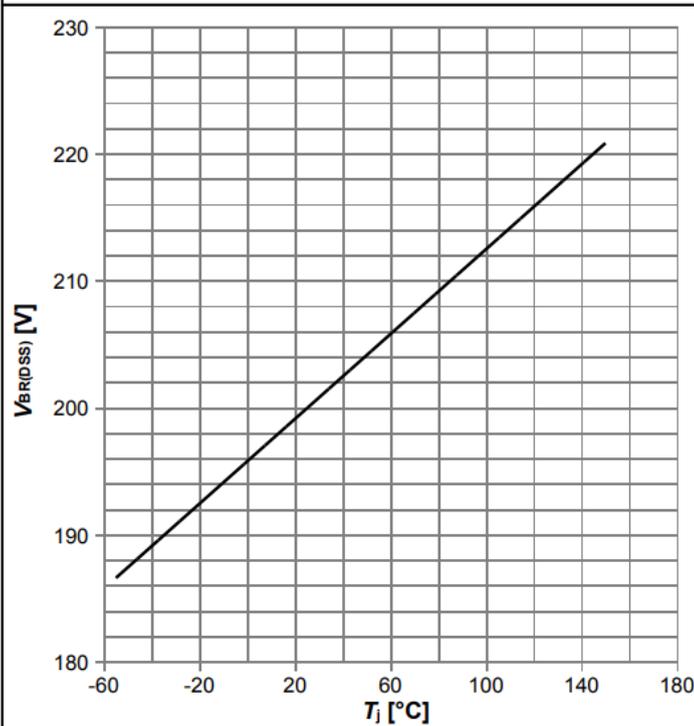
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$ ; parameter:  $T_{j(start)}$

Diagram 14: Typ. gate charge



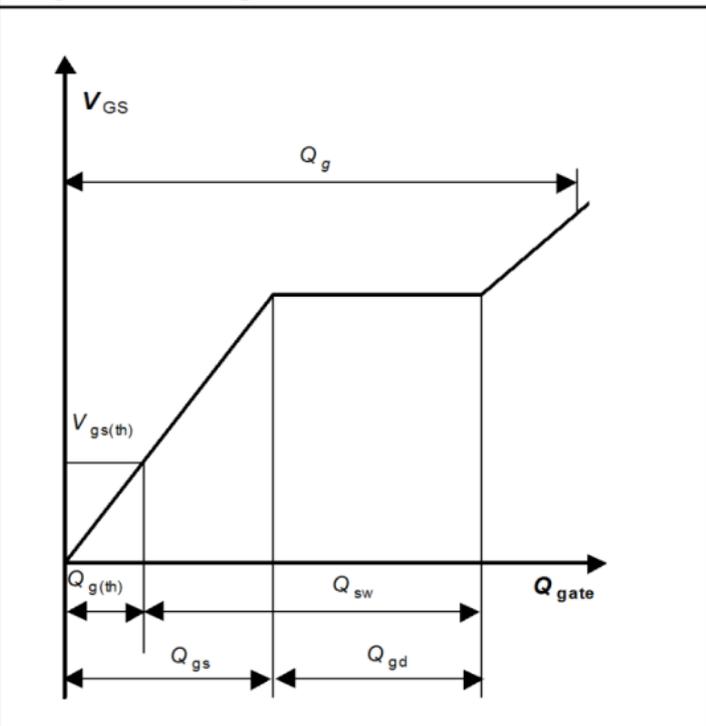
$V_{GS}=f(Q_{gate}); I_D=12 \text{ A pulsed}$ ; parameter:  $V_{DD}$

Diagram 15: Drain-source breakdown voltage

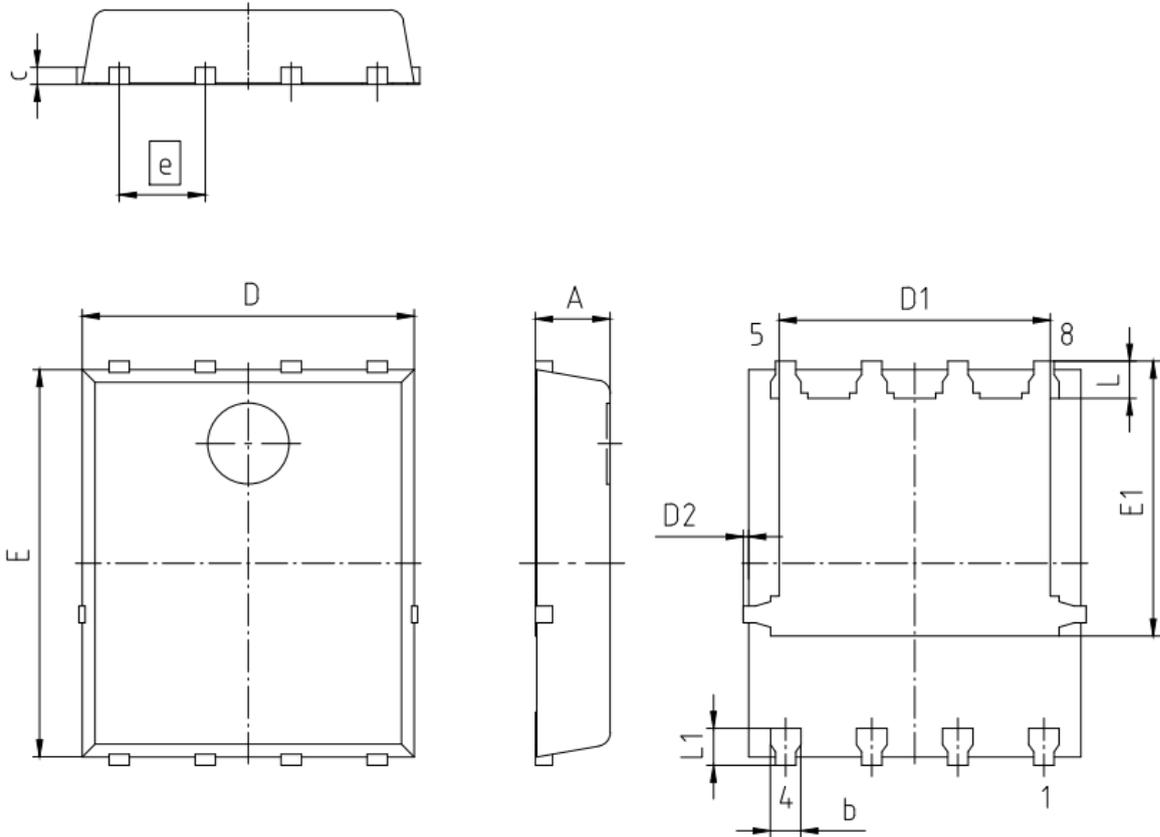


$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

Diagram Gate charge waveforms



## 5 封装外形



PACKAGE - GROUP NUMBER: <b>PG-TDSON-8-U08</b>		
DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
<b>A</b>	0.90	1.20
<b>b</b>	0.34	0.54
<b>c</b>	0.15	0.35
<b>D</b>	4.80	5.35
<b>D1</b>	3.90	4.40
<b>D2</b>	0.00	0.22
<b>E</b>	5.70	6.10
<b>E1</b>	4.05	4.25
<b>e</b>	1.27	
<b>L</b>	0.45	0.65
<b>L1</b>	0.45	0.65

- 1) EXCLUDING MOLD FLASH
- 2) REMOVAL ON MOLD GATE  
INTRUSION 0.1 MM  
PROTRUSION 0.1 MM
- 3) ALL METAL SURFACES ARE PLATED,  
EXCEPT AREA OF CUT

**图 1 PG-TDSON-8 外形图，尺寸单位为毫米**

## 修订记录

BSC500N20NS3 G

**Revision: 2023-05-31, Rev. 2.1**

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.1	2023-05-31	Update POD and footnotes

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