

英飞凌MOSFET功率晶体管

英飞凌BSC040N10NS5SC OptiMOS™ 5 100 V 175°C 功率晶体管

特性

- 双面冷却封装，具有最低的结顶热阻抗
- 额定温度为 175°C
- 针对高性能 SMPS（例如同步整流）进行优化
- 100% 雪崩测试
- 卓越的耐热性
- N沟道
- 无铅镀层；符合RoHS标准
- 符合 IEC61249-2-21 标准的无卤素

产品验证

完全符合 JEDEC 工业应用标准

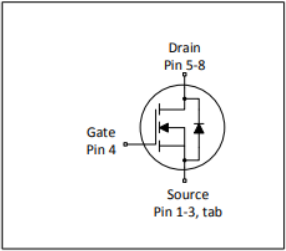


表 1 主要性能参数

Parameter	Value	Unit
V_{DS}	100	V
$R_{DS(on),max}$	4.0	mΩ
I_D	140	A
Q_{oss}	75	nC
$Q_G(0V..10V)$	58	nC



Type / Ordering Code	Package	Marking	Related Links
BSC040N10NS5SC	PG-WSON-8	040N10SC	-

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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	-	-	140 99 18	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ ¹⁾ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$, $R_{thJA}=50\text{ K/W}$ ²⁾
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	560	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse ⁴⁾	E_{AS}	-	-	268	mJ	$I_D=50\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	167 3.0	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=50\text{ K/W}$ ³⁾
Operating and storage temperature	T_j , T_{stg}	-55	-	175	°C	IEC climatic category; DIN IEC 68-1: 55/175/56

2 热特性

表 3 热特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	0.5	0.9	K/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	0.4	0.86	K/W	-
Device on PCB, 6 cm ² cooling area ²⁾	R_{thJA}	-	-	50	K/W	-

¹⁾额定值指产品仅具有数据表指定的绝对最大值，保持外壳温度符合规定要求。其他外壳温度请参见图 2。需要根据实际环境条件降低额定值。

²⁾器件位于 40 mm x 40 mm x 1.5 mm 环氧 PCB FR4 上，具有 6 cm²（一层，70 μm 厚）铜面积用于漏极连接。PCB 在静止空气中垂直放置。

³⁾详细信息请参见图 3

⁴⁾详细信息请参见图 13

OptiMOS™ 5 Power-Transistor, 100 V

BSC040N10NS5SC

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	$V_{(BR)DSS}$	100	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2.2	3.0	3.8	V	$V_{DS}=V_{GS}$, $I_D=95\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	1 100	μA	$V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=100\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	3.4 4.0	4.0 5.6	$\text{m}\Omega$	$V_{GS}=10\text{ V}$, $I_D=50\text{ A}$ $V_{GS}=6\text{ V}$, $I_D=25\text{ A}$
Gate resistance	R_G	-	1.3	2.0	Ω	-
Transconductance	g_{fs}	60	120	-	S	$ V_{DS} > 2 I_D R_{DS(on)max}$, $I_D=50\text{ A}$

表5 动态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance ¹⁾	C_{iss}	-	4100	5300	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Output capacitance ¹⁾	C_{oss}	-	630	820	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance ¹⁾	C_{rss}	-	28	49	pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	13	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=3\text{ }\Omega$
Rise time	t_r	-	9	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=3\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	32	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=3\text{ }\Omega$
Fall time	t_f	-	10	-	ns	$V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=3\text{ }\Omega$

表6 栅极电荷特性²⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	19	-	nC	$V_{DD}=50\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	12	-	nC	$V_{DD}=50\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge ¹⁾	Q_{gd}	-	12	18	nC	$V_{DD}=50\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	18	-	nC	$V_{DD}=50\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total ¹⁾	Q_g	-	58	72	nC	$V_{DD}=50\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	4.6	-	V	$V_{DD}=50\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total, sync. FET	$Q_{g(sync)}$	-	50	-	nC	$V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge ¹⁾	Q_{oss}	-	75	100	nC	$V_{DD}=50\text{ V}$, $V_{GS}=0\text{ V}$

¹⁾由设计标定, 不受限于生产测试。

²⁾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	-	-	152	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	560	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.9	1.1	V	$V_{GS}=0\text{ V}$, $I_F=50\text{ A}$, $T_J=25\text{ °C}$
Reverse recovery time ¹⁾	t_{rr}	-	54	108	ns	$V_R=50\text{ V}$, $I_F=I_S$, $di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁾	Q_{rr}	-	90	180	nC	$V_R=50\text{ V}$, $I_F=I_S$, $di_F/dt=100\text{ A}/\mu\text{s}$

¹⁾由设计标定，不受制于生产测试。

4 电气特性图

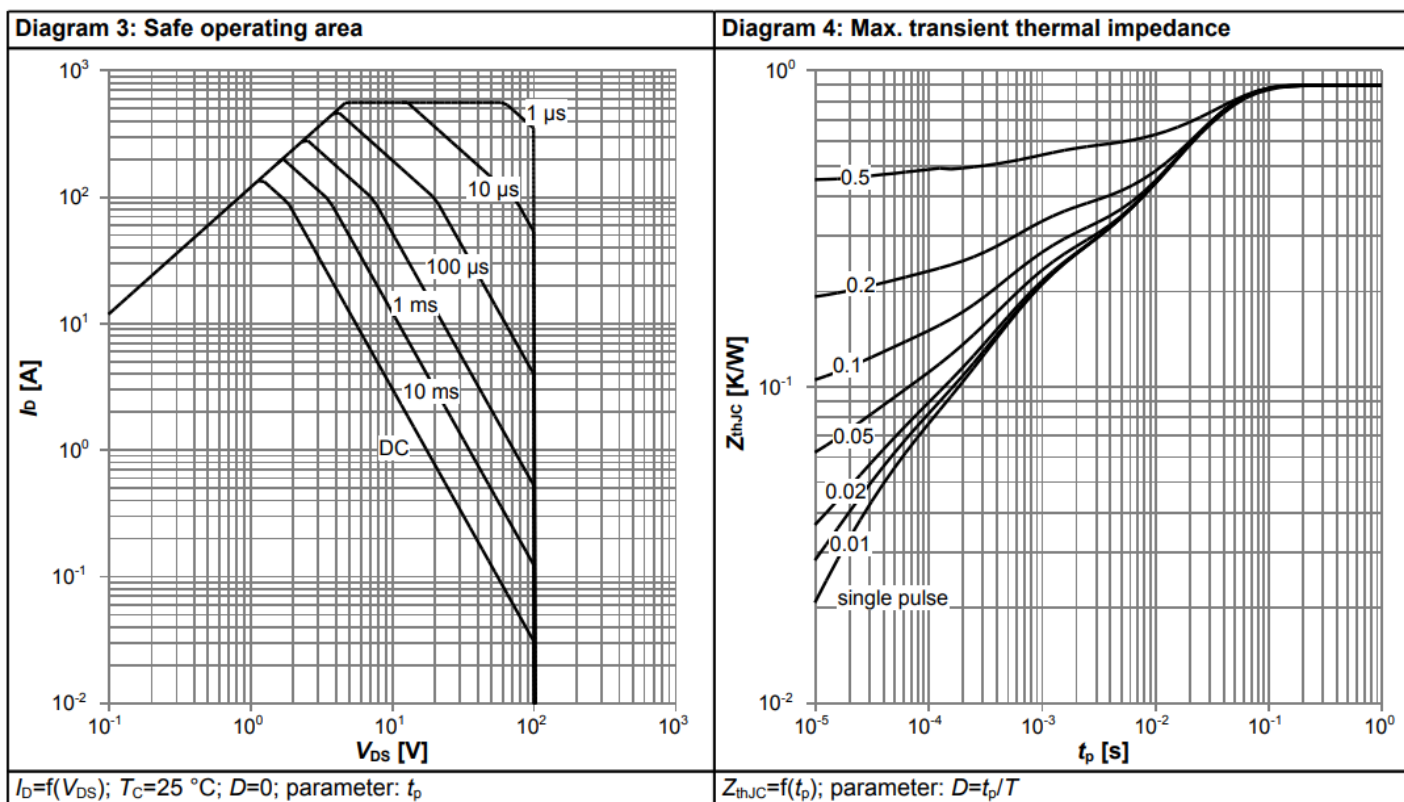
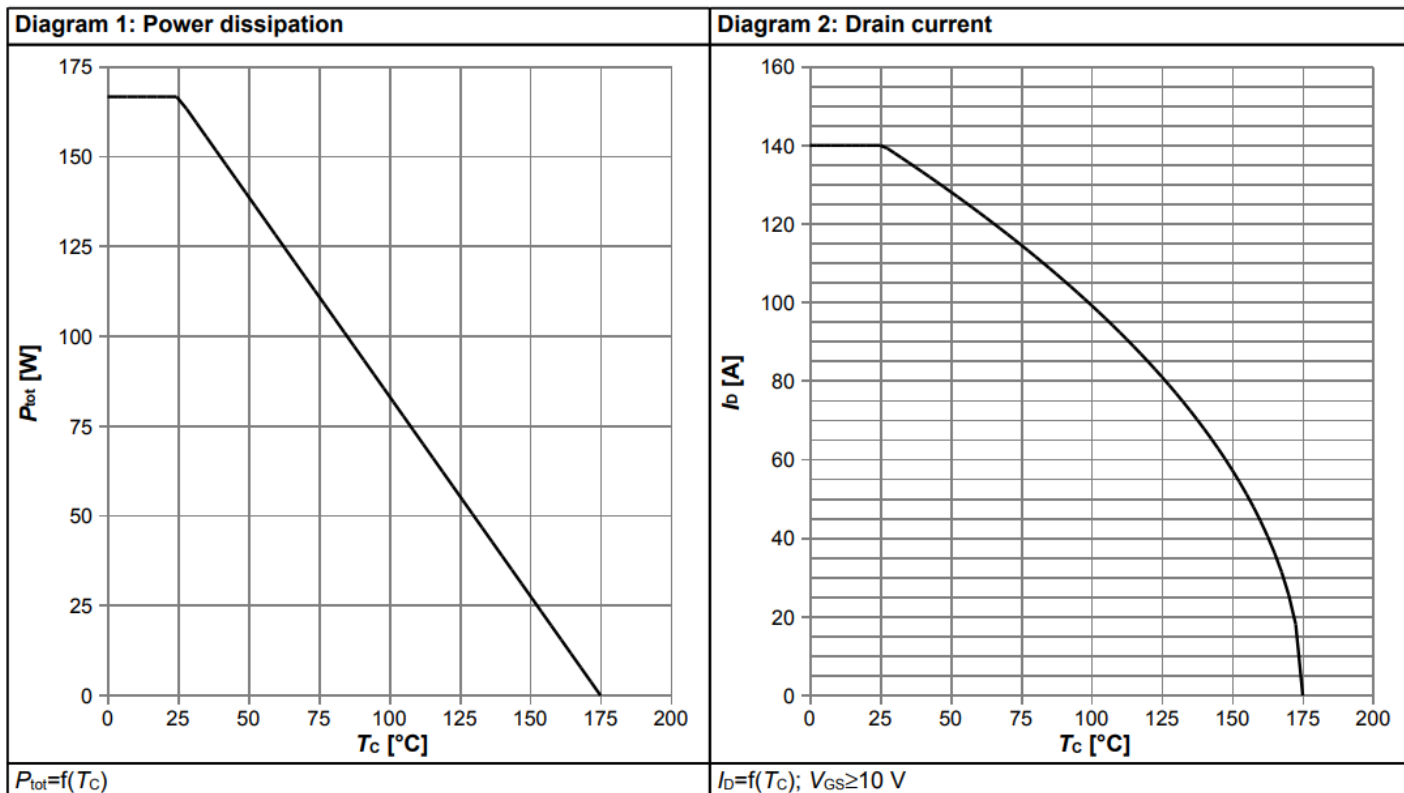
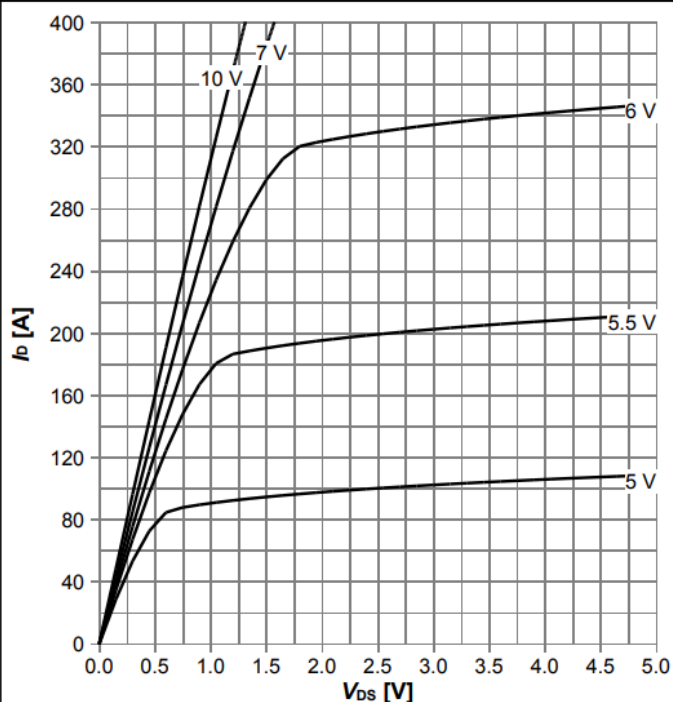
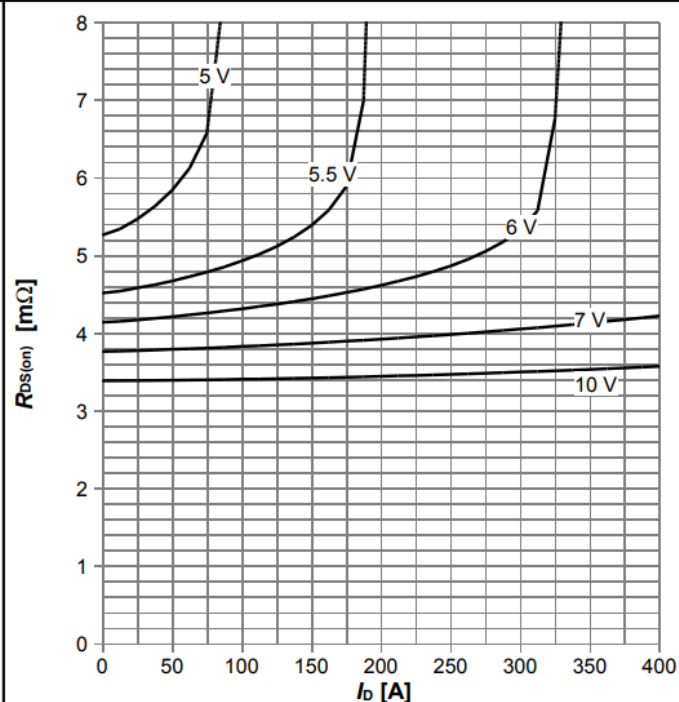


Diagram 5: Typ. output characteristics



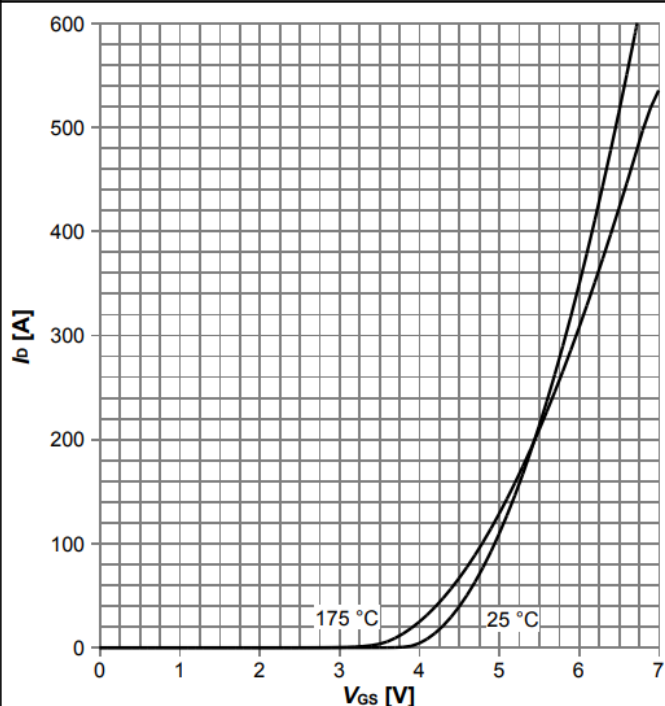
$I_D = f(V_{DS})$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



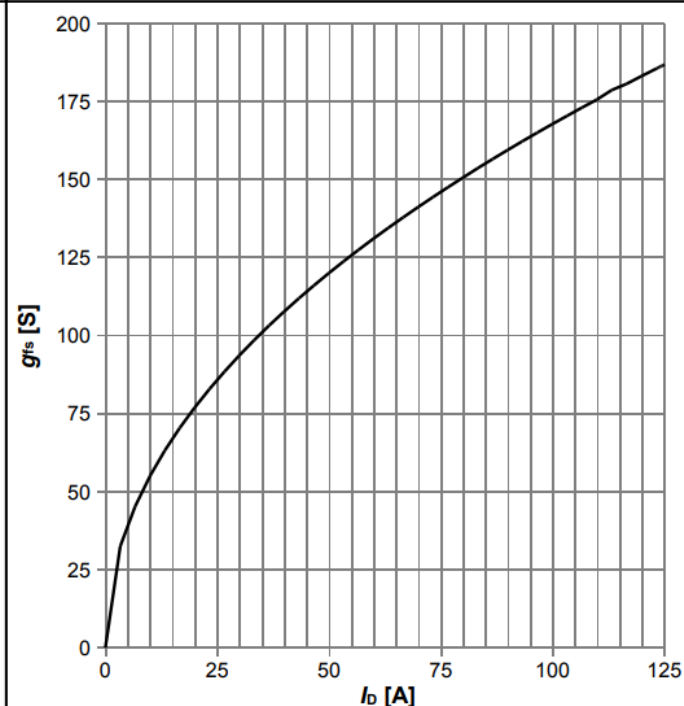
$R_{DS(on)} = f(I_D)$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



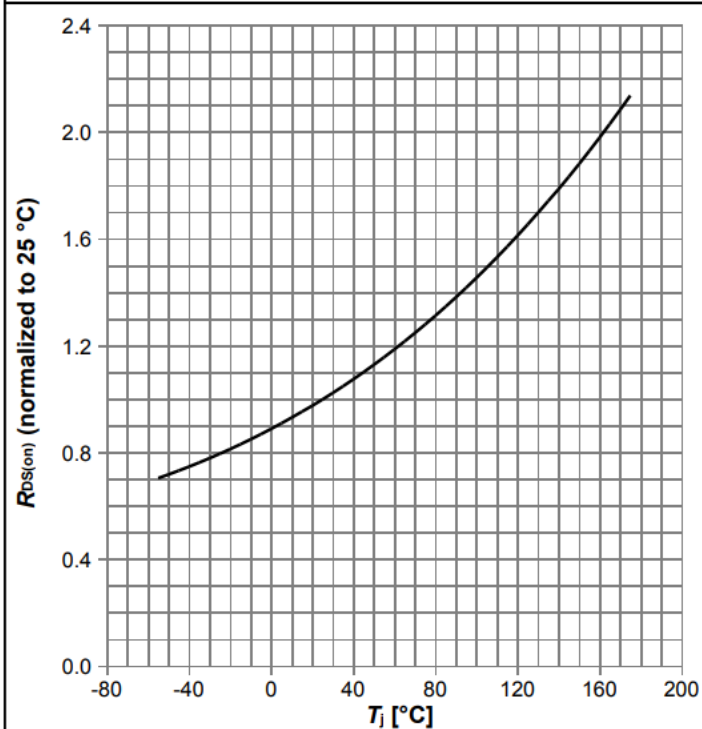
$I_D = f(V_{GS})$, $|V_{DS}| > 2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



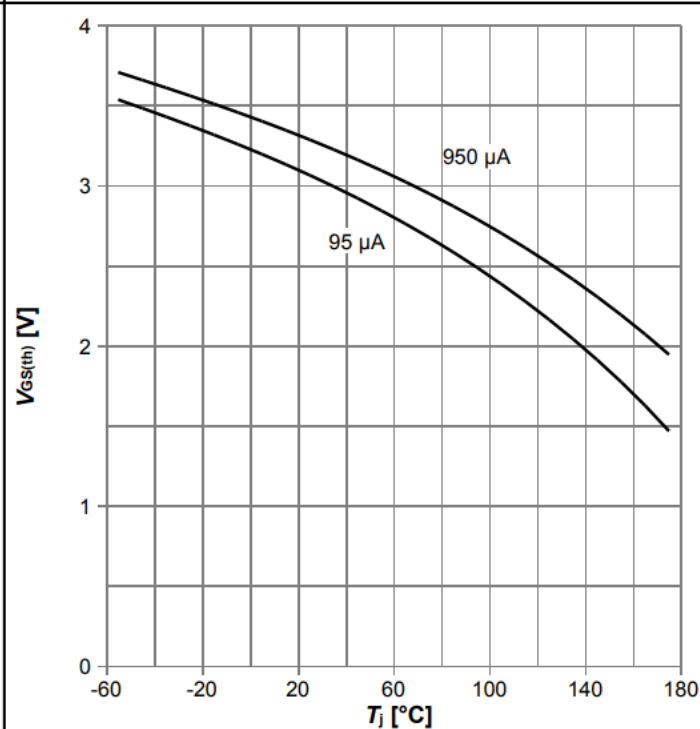
$g_{fs} = f(I_D)$, $V_{DS} = 5\text{ V}$, $T_j = 25^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



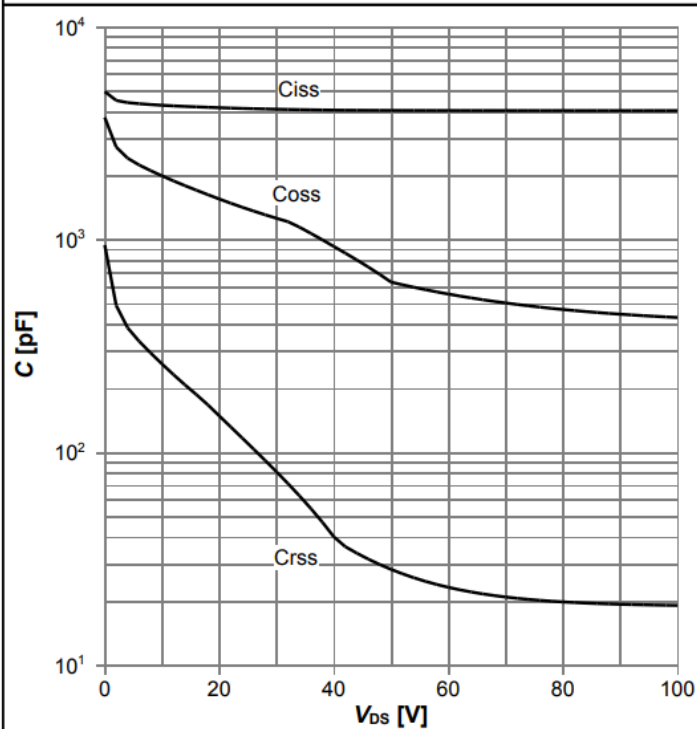
$$R_{DS(on)} = f(T_j), I_D = 50 \text{ A}, V_{GS} = 10 \text{ V}$$

Diagram 10: Typ. gate threshold voltage



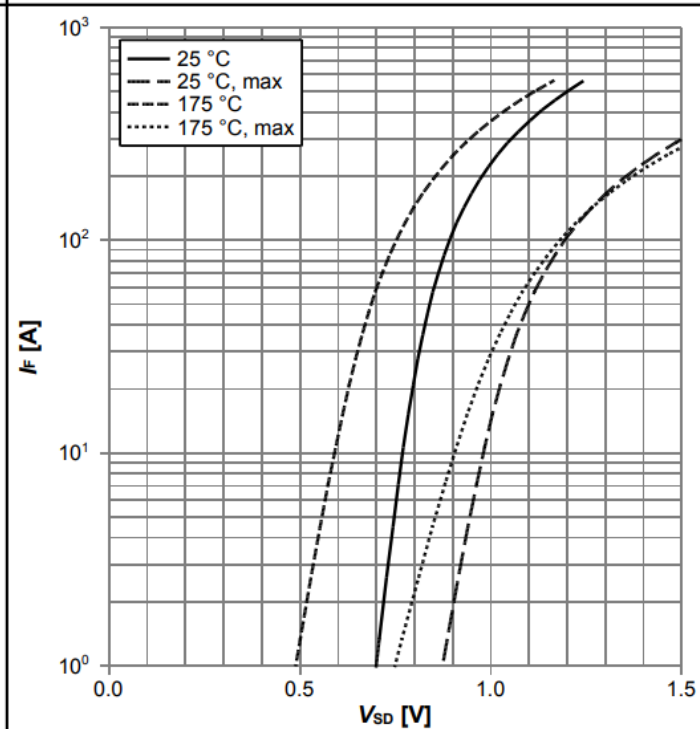
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

Diagram 11: Typ. capacitances



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

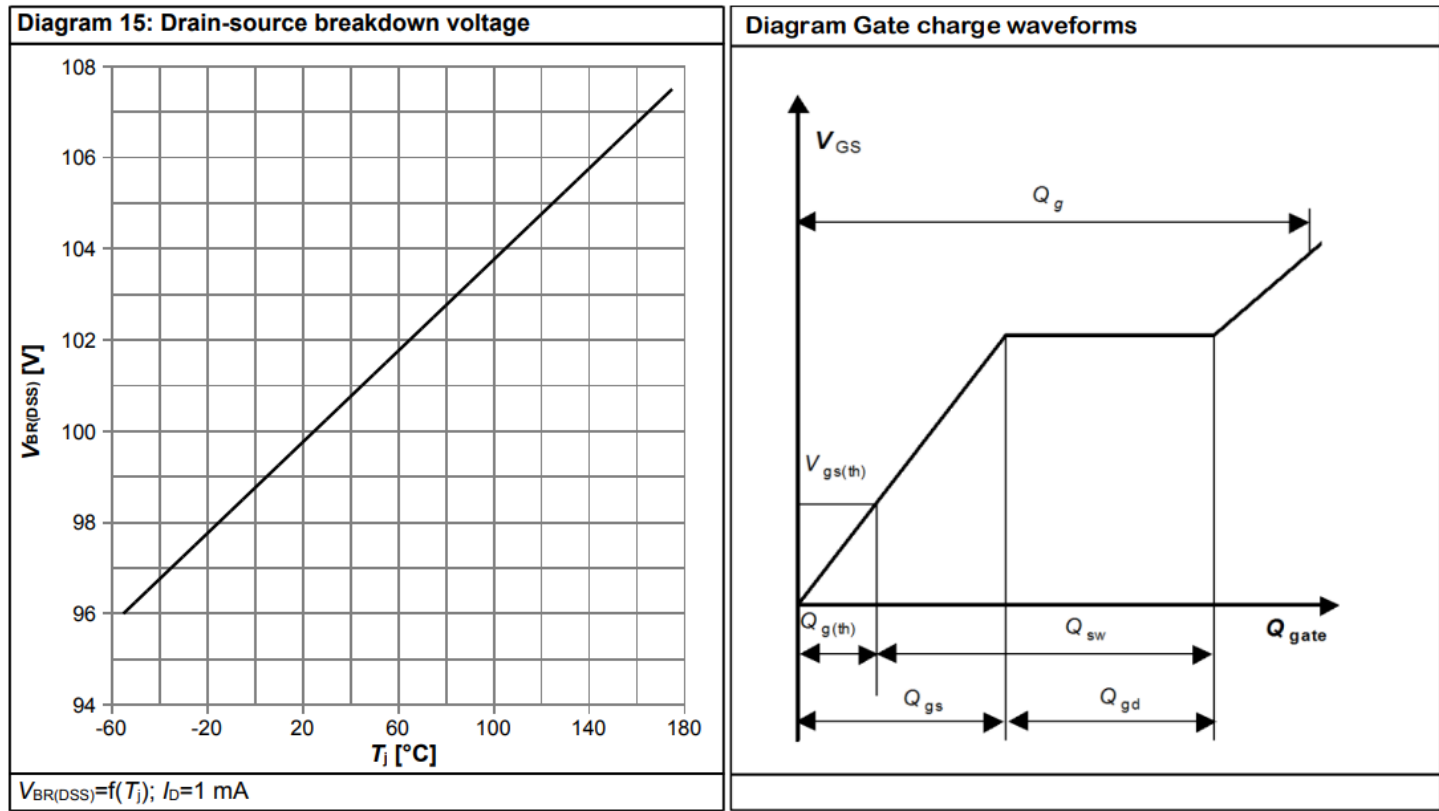
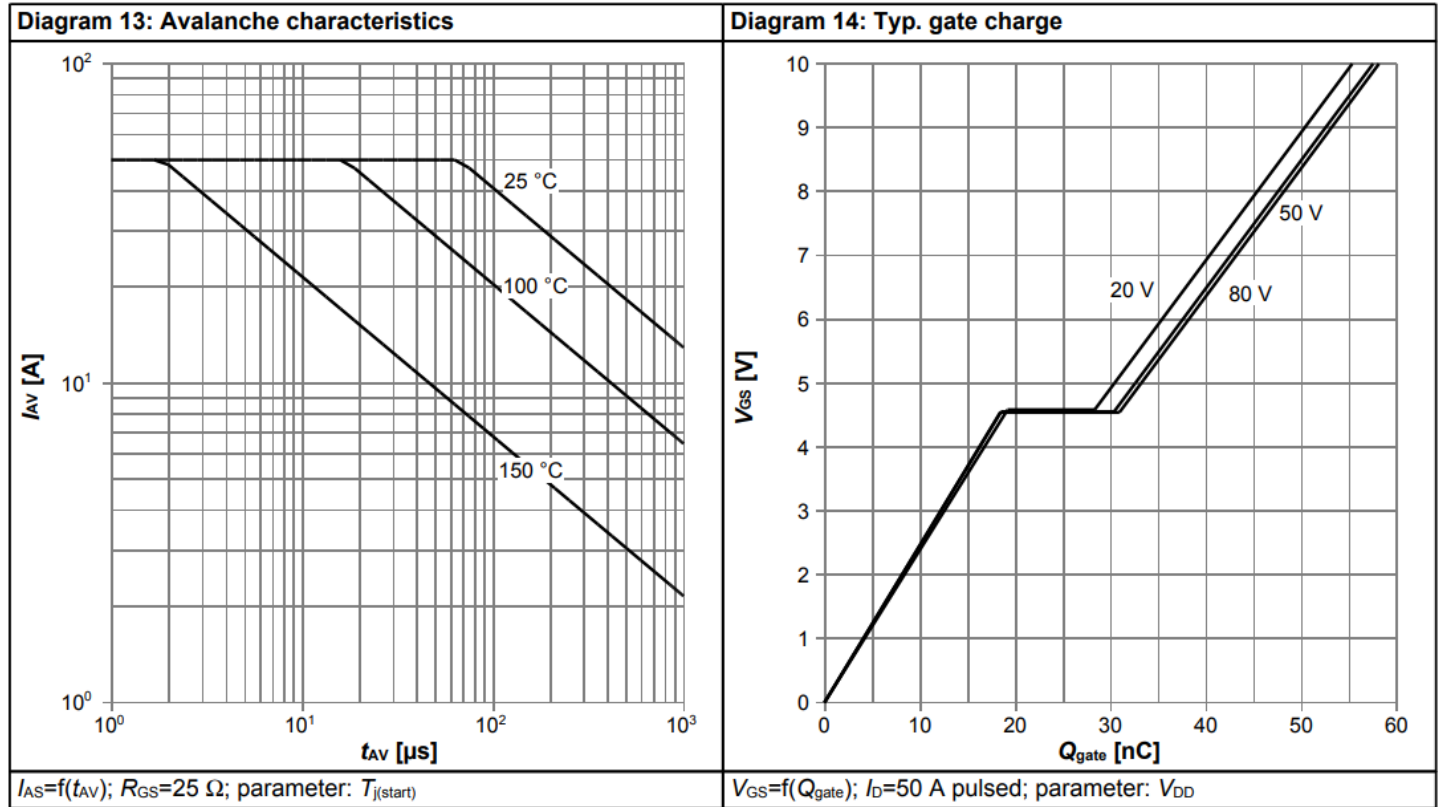
Diagram 12: Forward characteristics of reverse diode



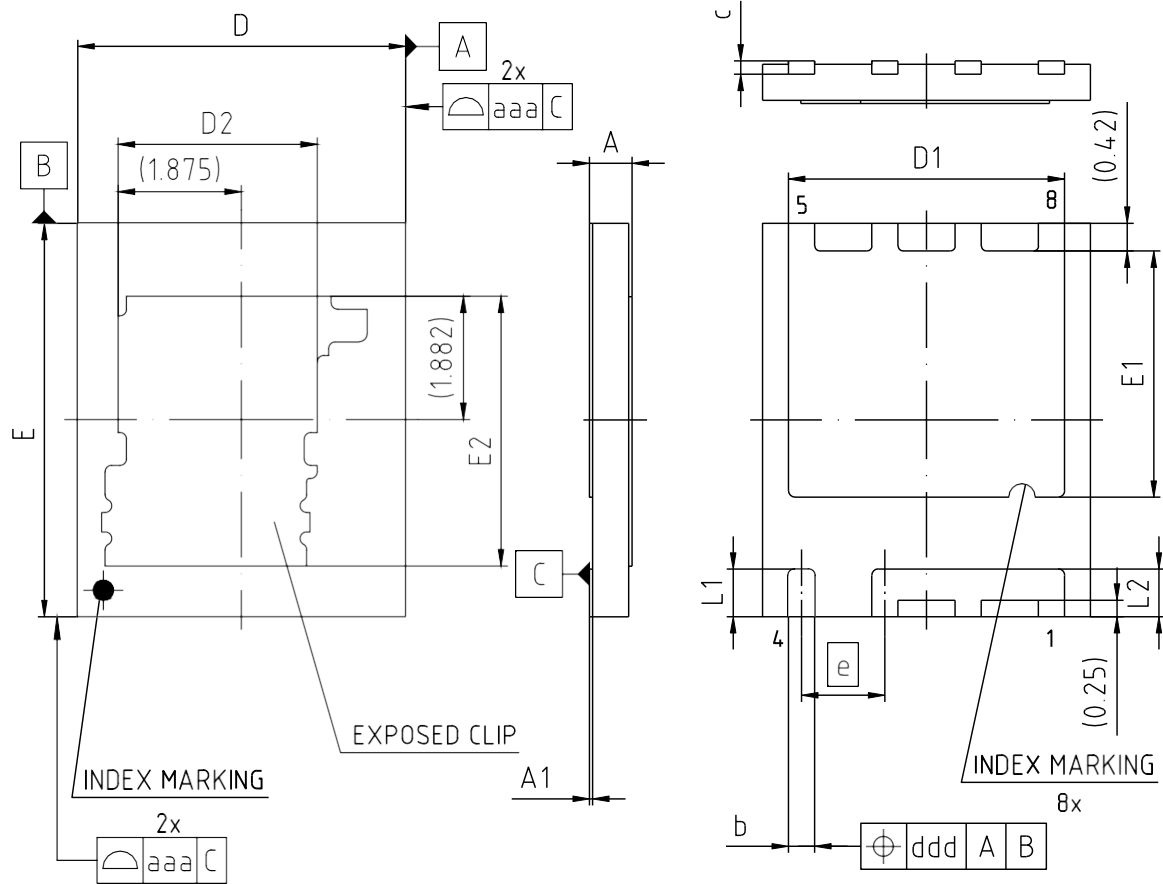
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

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5 封装外形



DIMENSIONS DOES NOT INCLUDE MOLD FLASH OR MOLD PROTRUSIONS.

DIMENSION	MILLIMETERS	
	MIN.	MAX.
A	-	0.75
A1	-	0.05
b	0.35	0.45
c	0.203	
D	4.95	5.05
D1	4.11	4.31
D2	3.03	
E	5.95	6.05
E1	3.66	3.86
E2	4.11	
e	1.27	
L1	0.675	0.775
L2	0.625	0.825
aaa	0.05	
ddd	0.10	

DOCUMENT NO. Z8B00184589
REVISION 03
SCALE 10:1 0 1 2mm
EUROPEAN PROJECTION
ISSUE DATE 03.06.2019

图 1 PG-WSON-8 外形图，尺寸单位为毫米

修订记录

BSC040N10NS5SC

Revision: 2022-10-13, Rev. 2.1

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.0	2019-11-19	Release of final version
2.1	2022-10-13	Update "Features"

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Edition 2025-07-28

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81726 Munich, Germany

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