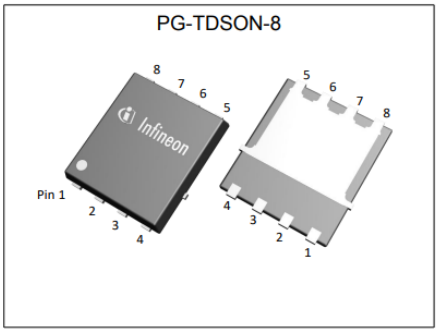
英飞凌MOSFET功率晶体管

英飞凌BSC13DN30NSFD OptiMOS™3 300 V 175°C功率晶体管



特性

- N沟道，正常电平
- 额定温度为 175°C
- 出色的栅极电荷 x $R_{DS(on)}$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 [1] 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

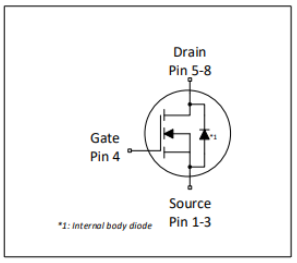


表 1　　主要性能参数

Parameter	Value	Unit
V_{DS}	300	V
$R_{DS(on),max}$	130	mΩ
I_D	16	A

Type / Ordering Code	Package	Marking	Related Links
BSC13DN30NSFD	PG-TDSON-8	13DN30NF	-

[1] J-STD20 和 JESD22

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1 最大额定值

除非另有规定， T_A = 25 °C

表 2 最大额定值

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	- -	- -	16 14	A	T_C=25 °C T_C=100 °C
Pulsed drain current[1]	$I_{D,pulse}$	-	-	64	A	T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	56	mJ	I_D=14.4 A, R_{GS}=25 Ω
Reverse diode peak dv/dt	dv/dt	-	-	60	kV/µs	I_D=36 A, V_{DS}=150 V, di/dt=1000 A/µs, $T_{j,max}$=175 °C
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	150	W	T_C=25 °C
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°C	-

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}	-	0.6	1	K/W	-
Thermal resistance, junction - ambient, minimal footprint	R_{thJA}	-	-	75	K/W	-
Thermal resistance, junction - ambient, 6 cm² cooling area[2]	R_{thJA}	-	-	50	K/W	-

3 电气特性

表4 静态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	300	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	V_{DS}=V_{GS}, I_D=90 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	1 100	µA	V_{DS}=240 V, V_{GS}=0 V, T_j=25 °C V_{DS}=240 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	1	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	114	130	mΩ	V_{GS}=10 V, I_D=16 A
Gate resistance	R_G	-	3.3	5	Ω	-
Transconductance	g_{fs}	19	38	-	S	$\|V_{DS}\|$>2$\|I_D\|R_{DS(on)max}$, I_D=16 A

[1] 参见图3

[2] 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 cm²（一层，70 µm厚）。印刷电路板垂直放置在静止空气中。

表 5 动态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	1840	2450	pF	V_{GS}=0 V, V_{DS}=150 V, f=1 MHz
Output capacitance[1)]	C_{oss}	-	76	102	pF	V_{GS}=0 V, V_{DS}=150 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	5.4	-	pF	V_{GS}=0 V, V_{DS}=150 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	8.0	-	ns	V_{DD}=150 V, V_{GS}=10 V, I_D=8 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	4.0	-	ns	V_{DD}=150 V, V_{GS}=10 V, I_D=8 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	19	-	ns	V_{DD}=150 V, V_{GS}=10 V, I_D=8 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	4.0	-	ns	V_{DD}=150 V, V_{GS}=10 V, I_D=8 A, $R_{G,ext}$=1.6 Ω

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}	-	8.0	-	nC	V_{DD}=150 V, I_D=16 A, V_{GS}=0 to 10 V
Gate to drain charge	Q_{gd}	-	2.9	-	nC	V_{DD}=150 V, I_D=16 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	-	5.4	-	nC	V_{DD}=150 V, I_D=16 A, V_{GS}=0 to 10 V
Gate charge total[1)]	Q_g	-	23	30	nC	V_{DD}=150 V, I_D=16 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	4.4	-	V	V_{DD}=150 V, I_D=16 A, V_{GS}=0 to 10 V
Output charge	Q_{oss}	-	48	-	nC	V_{DD}=150 V, V_{GS}=0 V

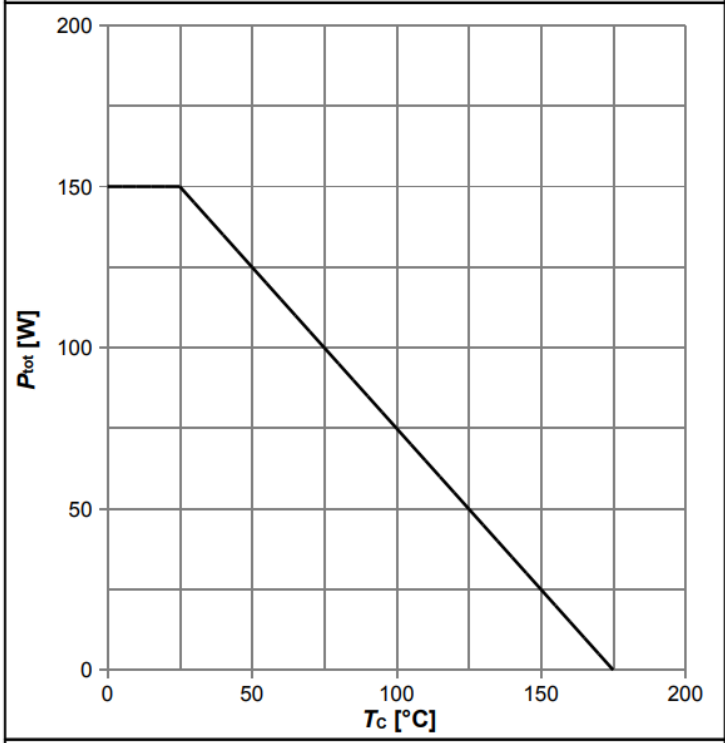
表 7 反向二极管

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continous forward current	I_S	-	-	16	A	T_C=25 °C
Diode pulse current[3)]	$I_{S,pulse}$	-	-	64	A	T_C=25 °C
Diode hard commutation current[4)]	$I_{S,hard}$	-	-	16	A	T_C=25 °C, di_F/dt=1000 A/µs
Diode forward voltage	V_{SD}	-	0.9	1.2	V	V_{GS}=0 V, I_F=16 A, T_j=25 °C
Reverse recovery time[1)]	t_{rr}	-	111	222	ns	V_R=150 V, I_F=12.6A, di_F/dt=100 A/µs
Reverse recovery charge[1)]	Q_{rr}	-	249	498	nC	V_R=150 V, I_F=12.6A, di_F/dt=100 A/µs

[1)]由设计标定，不受制于生产测试。
[2)] 参数定义请参见□栅极电荷波形”
[3)]二极管脉冲电流由热和/或封装限制定义
[4)] di/dt=1000 A/µs 时允许通过二极管的最大硬换向电流

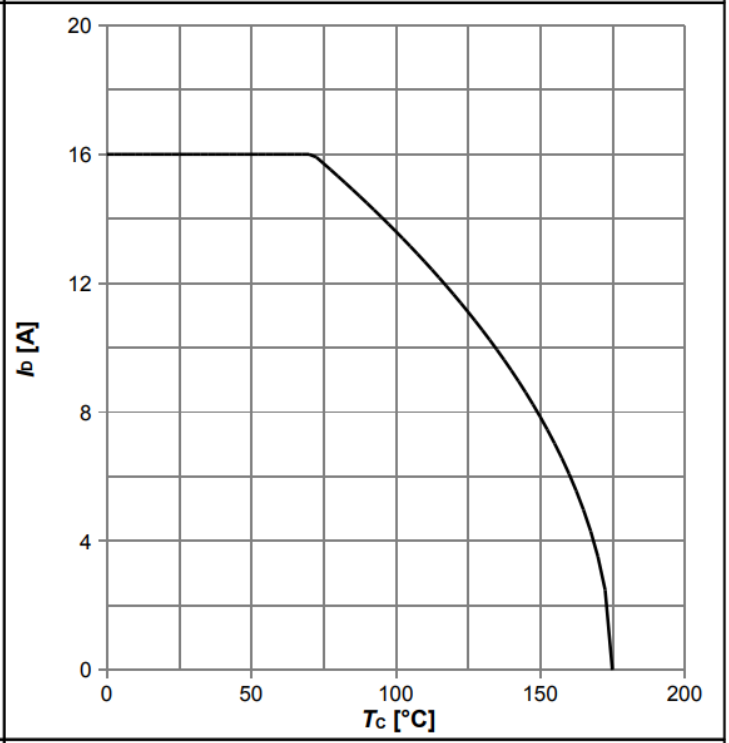
4 电气特性图

Diagram 1: Power dissipation



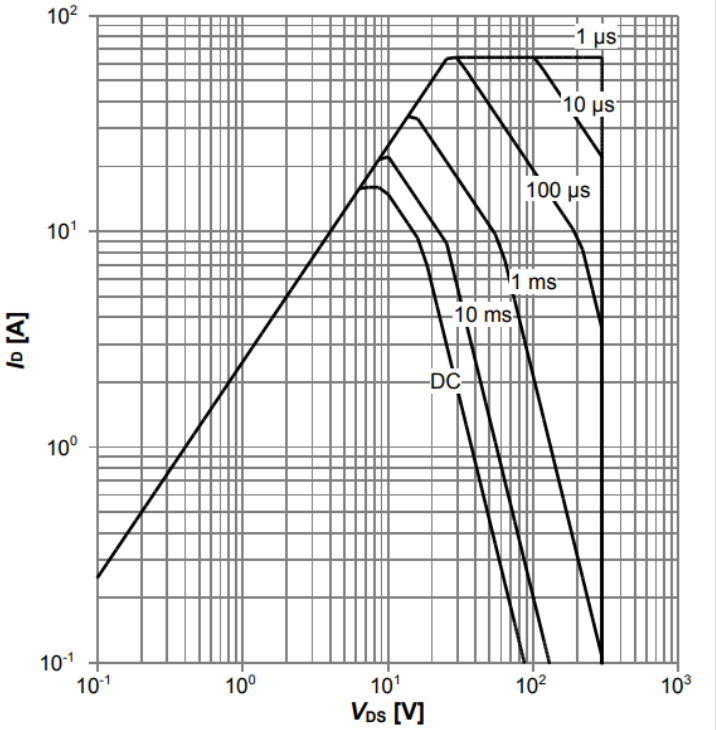
P_{tot}=f(T_C)

Diagram 2: Drain current



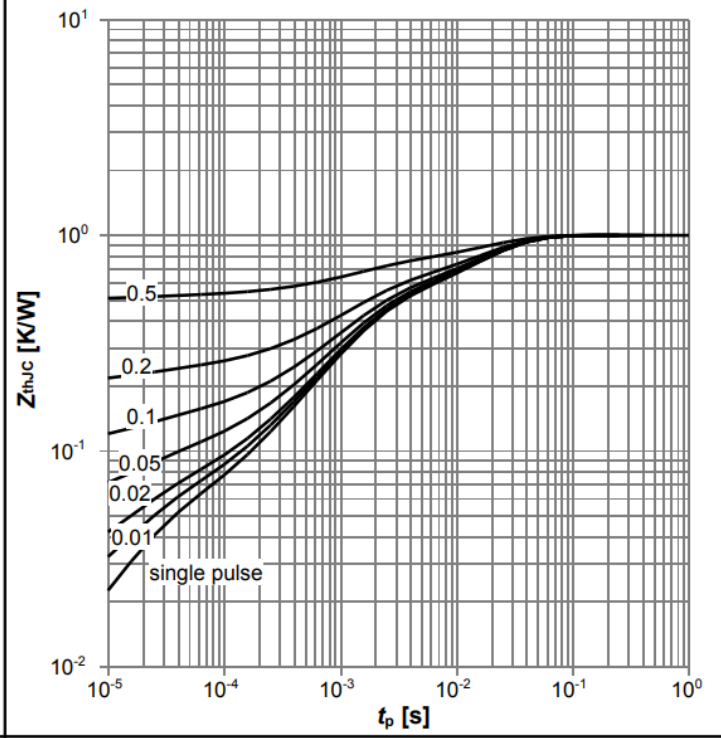
I_D=f(T_C); V_{GS}≥10 V

Diagram 3: Safe operating area



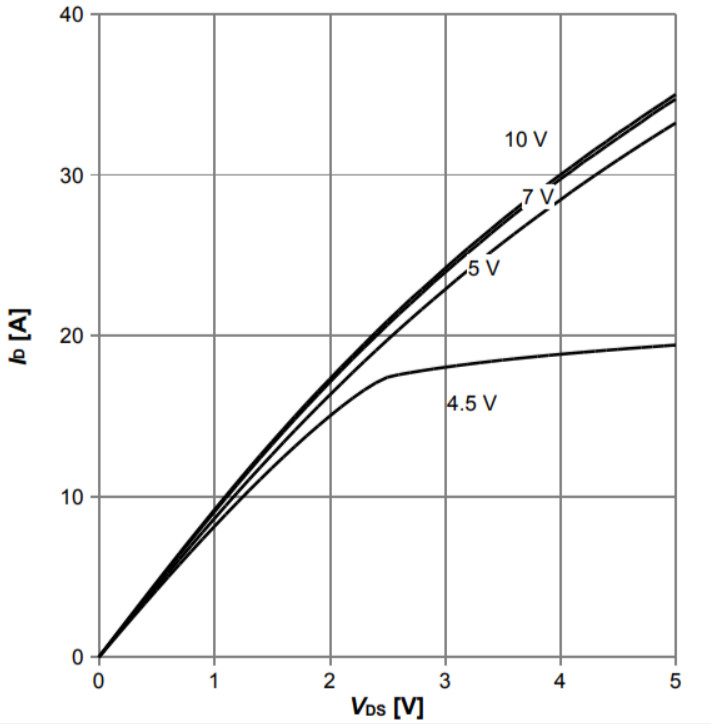
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



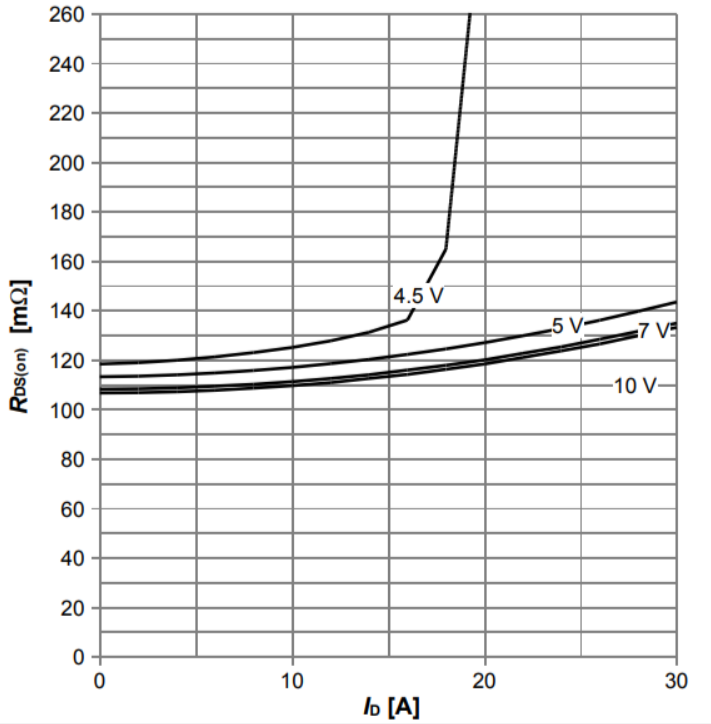
Z_{thJC}=f(t_p); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



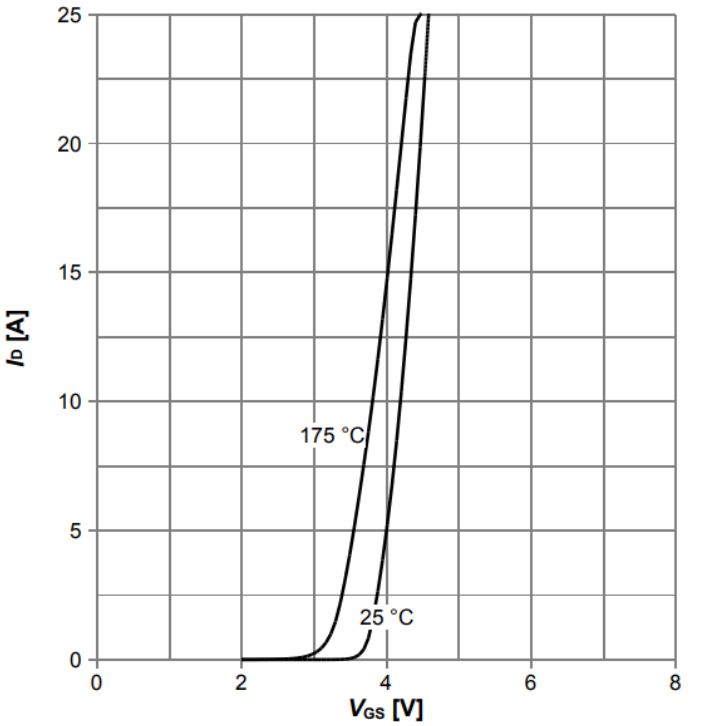
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



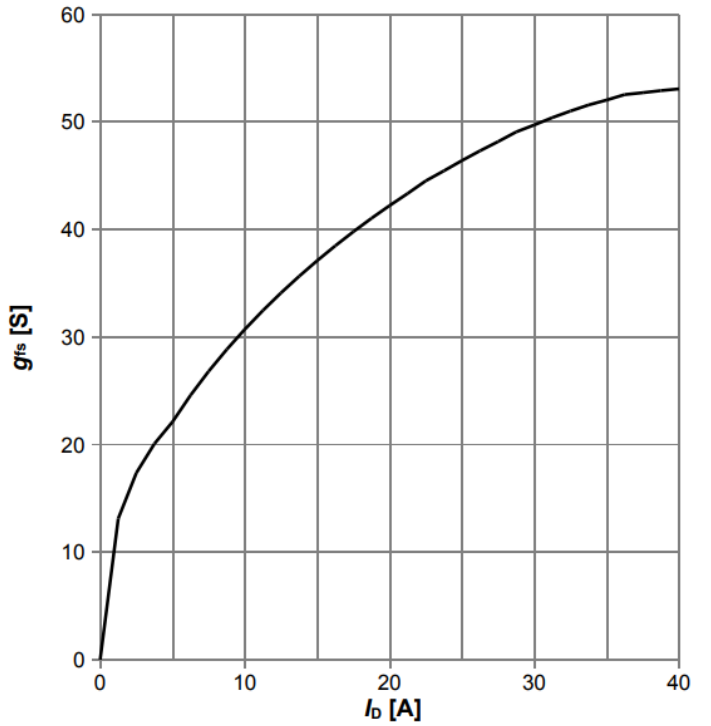
$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



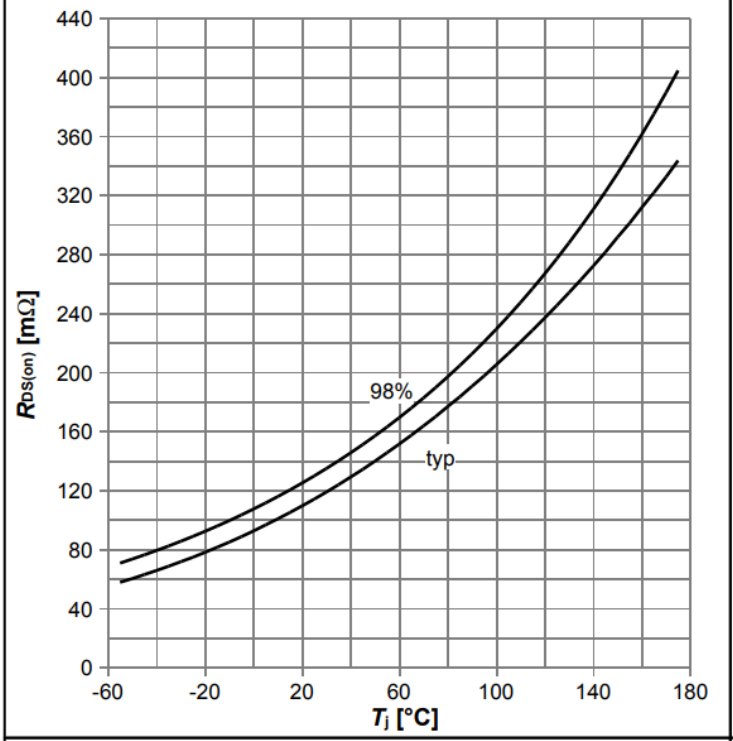
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



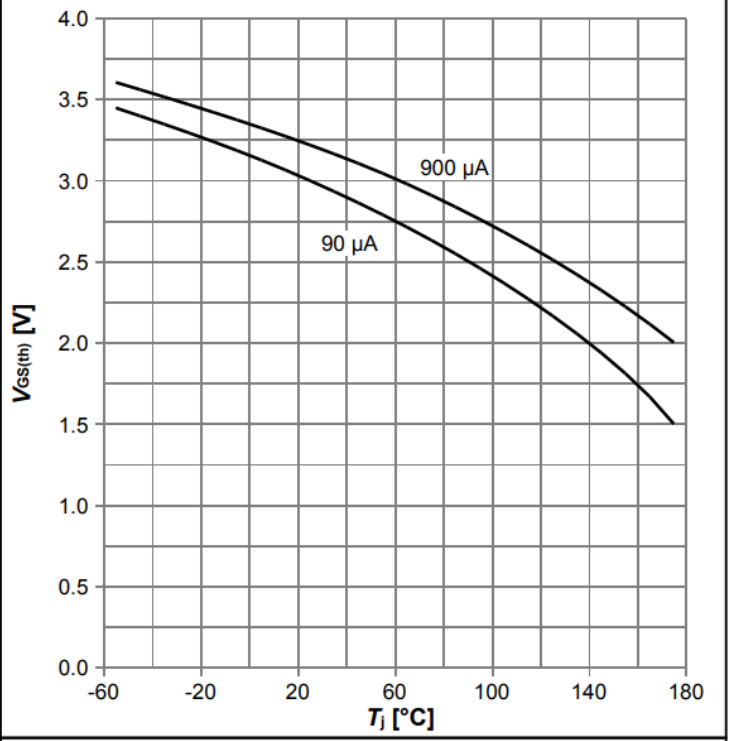
g_{fs}=f(I_D); T_j=25 °C

Diagram 9: Drain-source on-state resistance



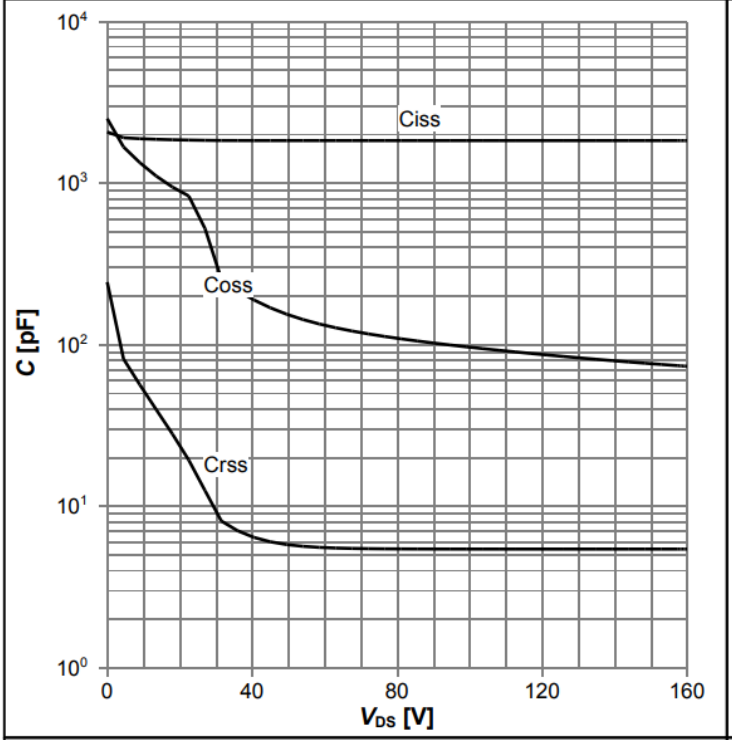
$R_{DS(on)}$=f(T_j); I_D=16 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



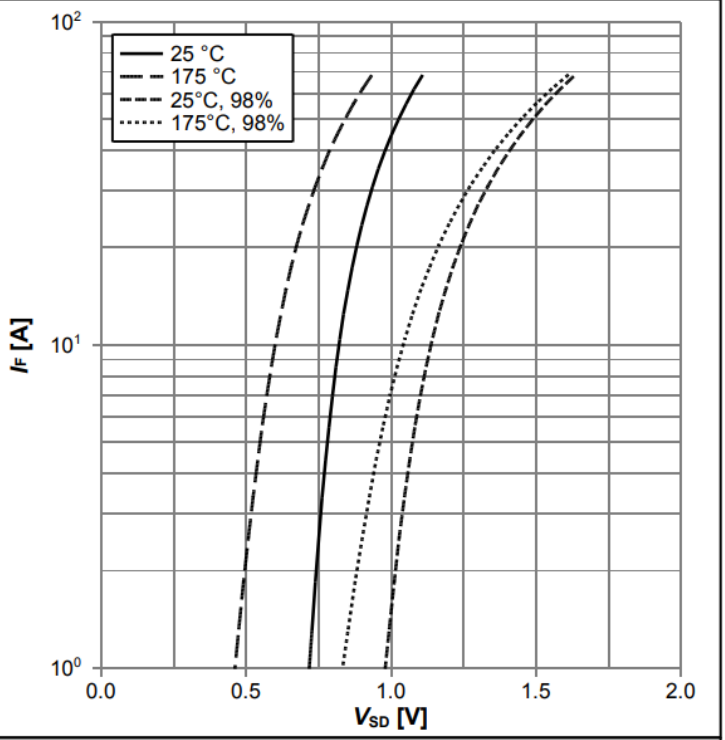
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



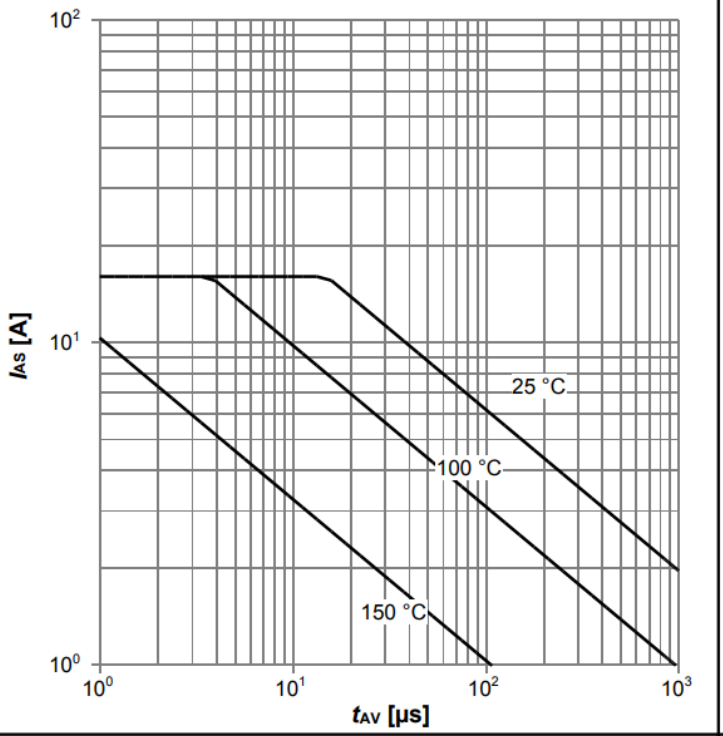
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



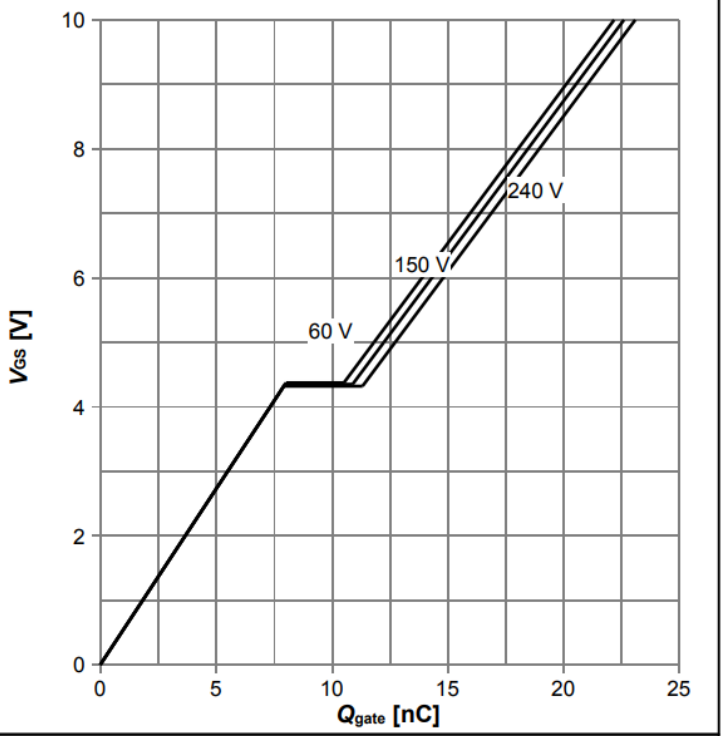
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



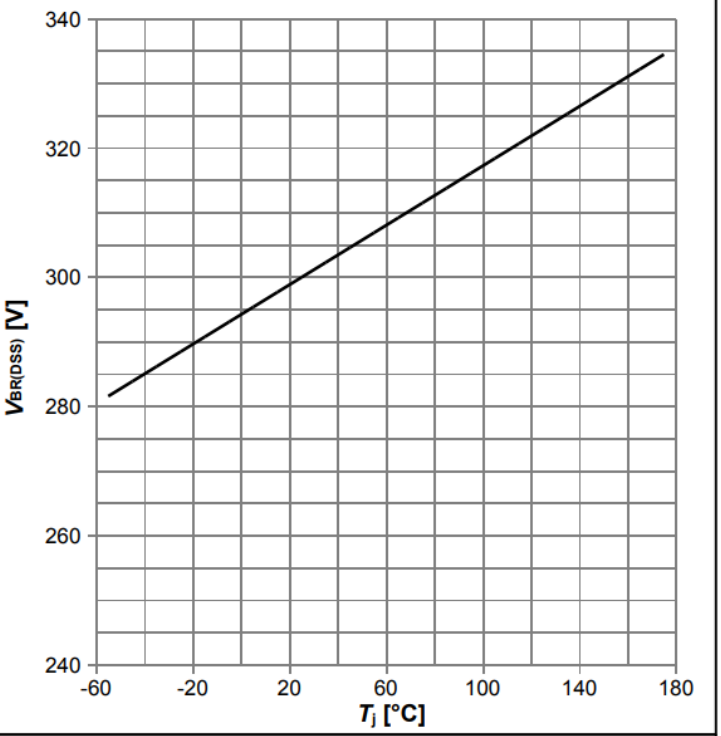
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



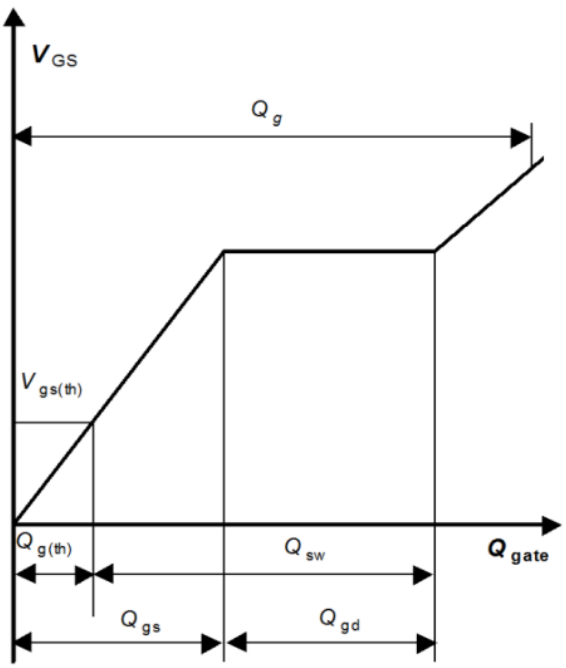
V_{GS}=f(Q_{gate}); I_D=16 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

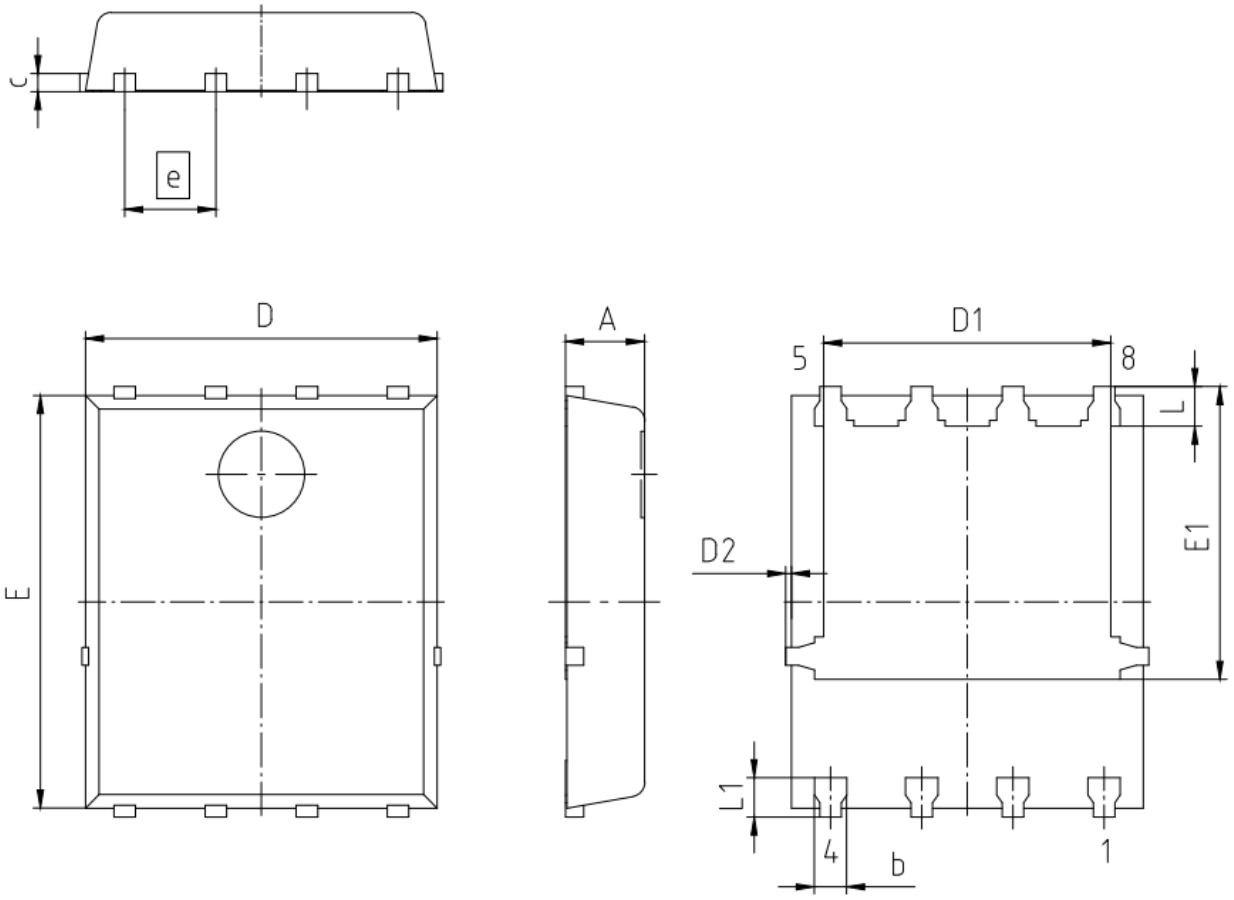


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram Gate charge waveforms



5 封装外形



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

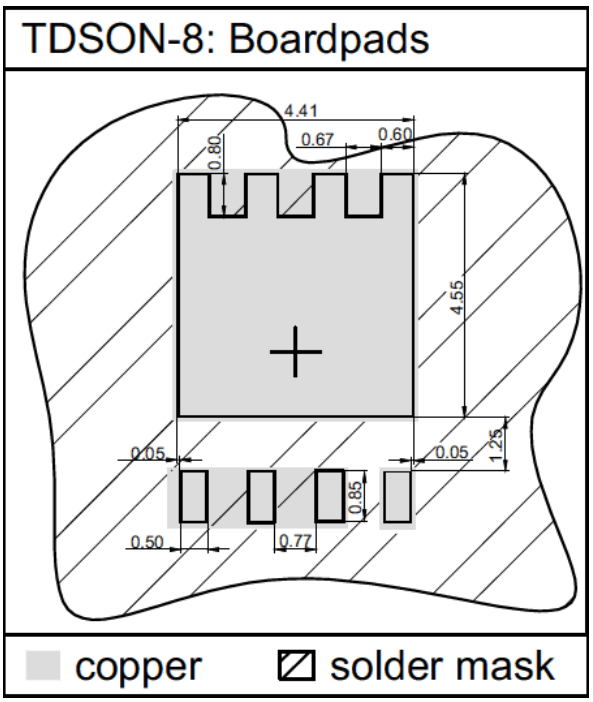


图 2　　外形封装（TDSON-8）

修订记录

BSC13DN30NSFD

Revision: 2022-11-09, Rev. 2.2

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.0	2016-10-21	Release of final version
2.1	2016-12-05	Update Eas
2.2	2022-11-09	Update package outline drawing and footnotes

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