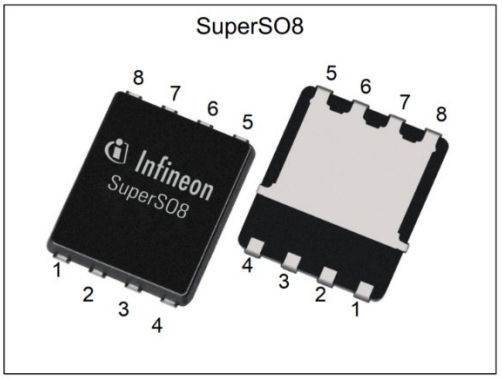
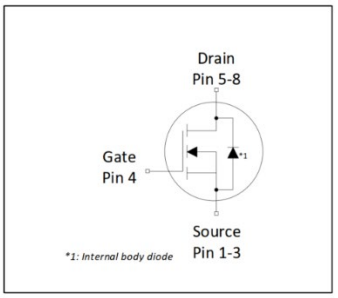
英飞凌MOSFET功率晶体管

英飞凌ISC046N13NM6 OptiMOS™ 6功率晶体管, 135 V





特性

- N沟道，标准电平
- 极低的导通电阻 $R_{DS(on)}$
- 出色的栅极电荷 x $R_{DS(on)}$乘积 (FOM)
- 极低的反向恢复电荷 (Q_{rr})
- 100% 雪崩测试
- 工作温度 175°C
- 针对电机驱动和电池供电应用进行了优化
- 无铅镀层；符合RoHS标准
- 符合 IEC61249-2-21 标准的无卤素
- 基于 J-STD-020的 MSL 1 分类

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}	135	V
$R_{DS(on),max}$	4.6	mΩ
I_D	142	A
Q_{oss}	112	nC
Q_G (0V...10V)	65	nC
Q_{rr} (500A/µs)	85	nC

Type / Ordering Code	Package	Marking	Related Links
ISC046N13NM6	PG-TDSON-8	046N13N6	-

目录

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[1]	I_D	- - - -	- - - -	142 100 92 17	A	V_{GS}=10 V, T_C=25 °C V_{GS}=10 V, T_C=100 °C V_{GS}=8 V, T_C=100 °C V_{GS}=10 V, T_A=25 °C, R_{THJA}=50 °C/W[2]
Pulsed drain current[3]	$I_{D,pulse}$	-	-	568	A	T_C=25 °C
Avalanche current, single pulse[4]	I_{AS}	-	-	50	A	T_C=25 °C
Avalanche energy, single pulse[4]	E_{AS}	-	-	616	mJ	I_D=15 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	- -	- -	211 3	W	T_C=25 °C T_A=25 °C, R_{THJA}=50 °C/W[2]
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}	-	-	0.7	°C/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	20	°C/W	-
Device on PCB, 6 cm² cooling area[2]	R_{thJA}	-	-	50	°C/W	-

[1]额定值指产品仅具有数据手册指定的绝对最大值，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] 器件置于 40 mm x 40 mm x 1.5 mm 环氧树脂印刷电路板 FR4 上，配有 6 cm² （单层，70 µm厚）铜层面积用于漏极连接。印刷电路板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

3 电气特性

除非另有规定，T_j=25 °C

表 4 静态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	135	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2.5	3.0	3.5	V	V_{DS}=V_{GS}, I_D=110 µA
Zero gate voltage drain current	I_{DSS}	- -	1 10	10 100	µA	V_{DS}=108 V, V_{GS}=0 V, T_j=25 °C V_{DS}=108 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	10	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- - -	3.7 3.9 4.2	4.3 4.6 5.4	mΩ	V_{GS}=15 V, I_D=50 A V_{GS}=10 V, I_D=50 A V_{GS}=8 V, I_D=25 A
Gate resistance[1)]	R_G	-	0.7	1.1	Ω	-
Transconductance[1)]	g_{fs}	55	110	-	S	$\|V_{DS}\|\geq 2\|I_D\|R_{DS(on)max}$, I_D=50 A

表 5 动态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance[1)]	C_{iss}	-	4400	5700	pF	V_{GS}=0 V, V_{DS}=68 V, f=1 MHz
Output capacitance[1)]	C_{oss}	-	880	1100	pF	V_{GS}=0 V, V_{DS}=68 V, f=1 MHz
Reverse transfer capacitance[1)]	C_{rss}	-	14	24	pF	V_{GS}=0 V, V_{DS}=68 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	15	-	ns	V_{DD}=68 V, V_{GS}=10 V, I_D=25 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	7.3	-	ns	V_{DD}=68 V, V_{GS}=10 V, I_D=25 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	24	-	ns	V_{DD}=68 V, V_{GS}=10 V, I_D=25 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	7.2	-	ns	V_{DD}=68 V, V_{GS}=10 V, I_D=25 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[1)]	Q_{gs}	-	19	25	nC	V_{DD}=68 V, I_D=25 A, V_{GS}=0 to 10 V
Gate charge at threshold	$Q_{g(th)}$	-	13	-	nC	V_{DD}=68 V, I_D=25 A, V_{GS}=0 to 10 V
Gate to drain charge[1)]	Q_{gd}	-	13	19	nC	V_{DD}=68 V, I_D=25 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	-	19	-	nC	V_{DD}=68 V, I_D=25 A, V_{GS}=0 to 10 V
Gate charge total[1)]	Q_g	-	65	85	nC	V_{DD}=68 V, I_D=25 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	4.4	-	V	V_{DD}=68 V, I_D=25 A, V_{GS}=0 to 10 V
Gate charge total, sync. FET	$Q_{g(sync)}$	-	58	-	nC	V_{DS}=0.1 V, V_{GS}=0 to 10 V
Output charge[1)]	Q_{oss}	-	112	146	nC	V_{DS}=68 V, V_{GS}=0 V

[1)]由设计指定，未经过生产测试。

[2)]参数定义请参见"栅极充电波形"。

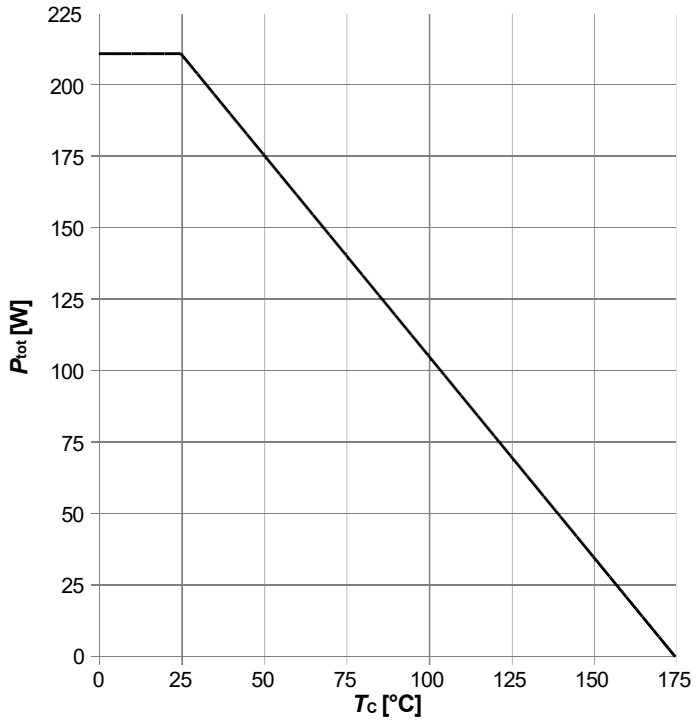
表 7　　反向二极管

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	142	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	568	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.84	1	V	V_{GS}=0 V, I_F=50 A, T_j=25 °C
Reverse recovery time[1)]	t_{rr}	-	26	52	ns	V_R=68 V, I_F=25 A, di_F/dt=500 A/µs
Reverse recovery charge[1)]	Q_{rr}	-	85	170	nC	V_R=68 V, I_F=25 A, di_F/dt=500 A/µs

[1)] 由设计指定，未经过生产测试。

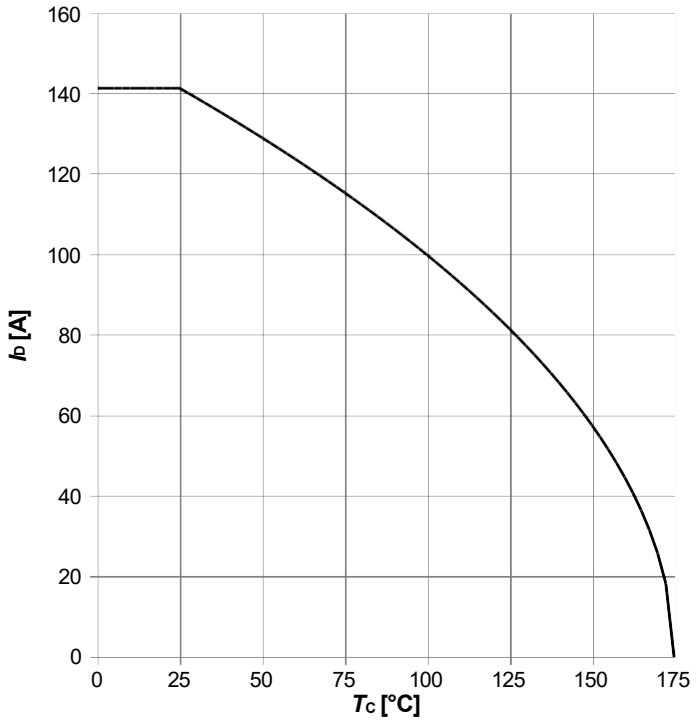
4 电气特性图

图 1：功率耗散



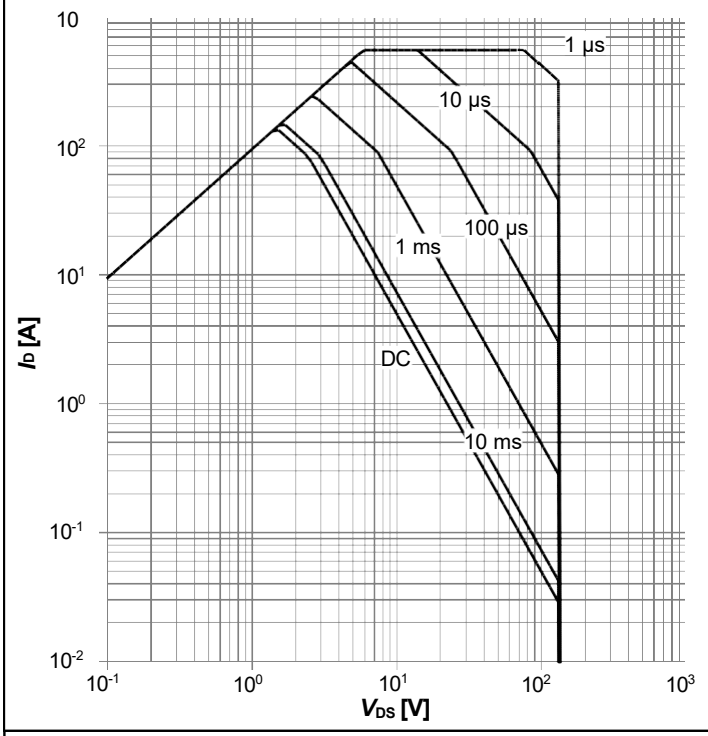
$P_{tot}=f(T_C)$

图 2：漏极电流



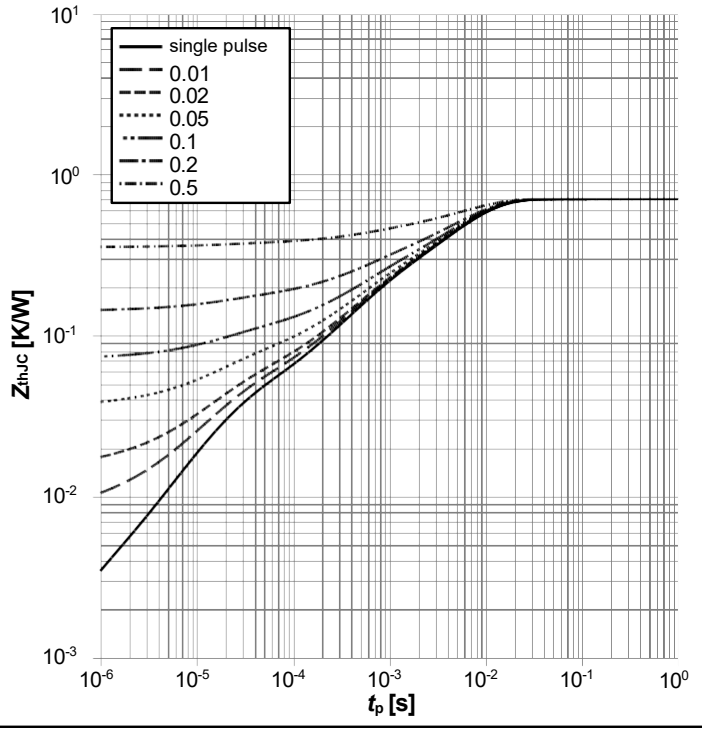
$I_D=f(T_C)$; $V_{GS}\geq 10$ V

图 3：安全操作区



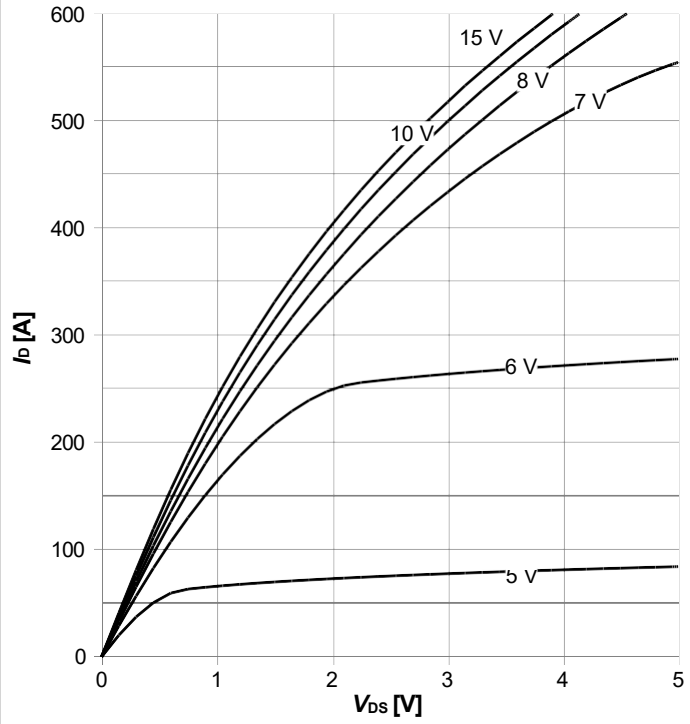
$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$; parameter: t_p

图 4：最大瞬态热阻抗



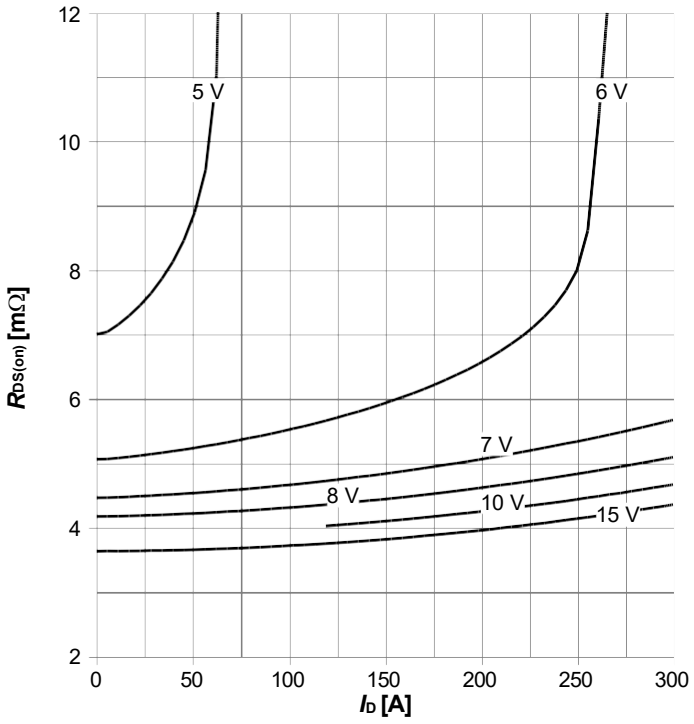
$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

图 5：典型输出特性



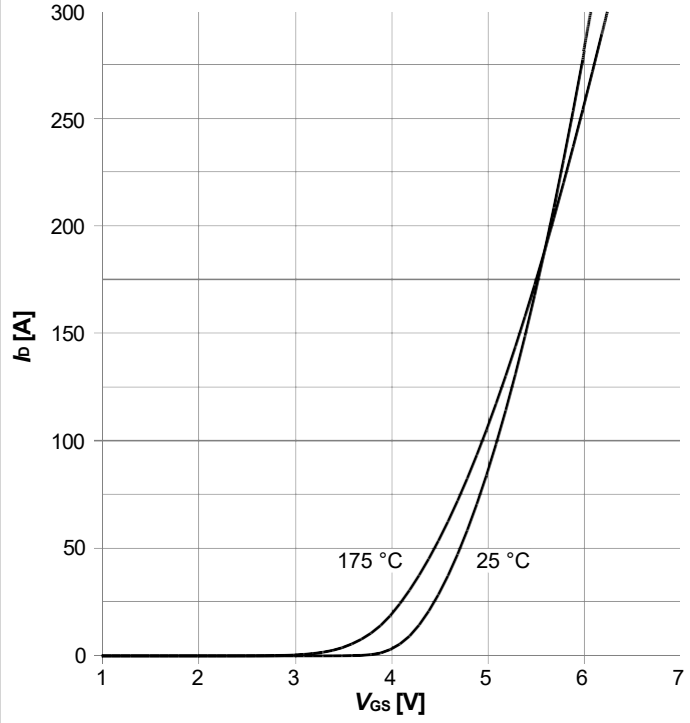
$I_D=f(V_{DS})$, $T_j=25$ °C; parameter: V_{GS}

图 6：典型漏源导通电阻抗



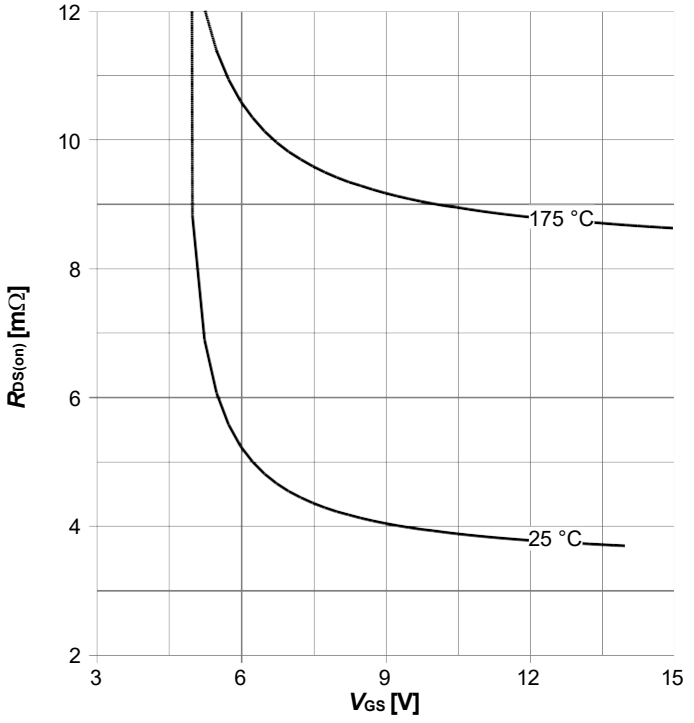
$R_{DS(on)}=f(I_D)$, $T_j=25$ °C; parameter: V_{GS}

图 7：典型转移特性



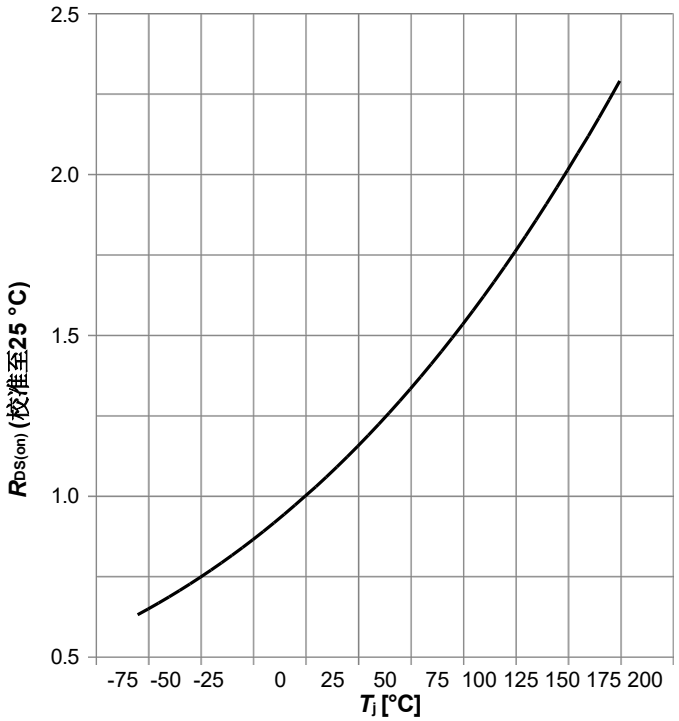
$I_D=f(V_{GS})$, $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

图 8：典型漏源导通电阻抗



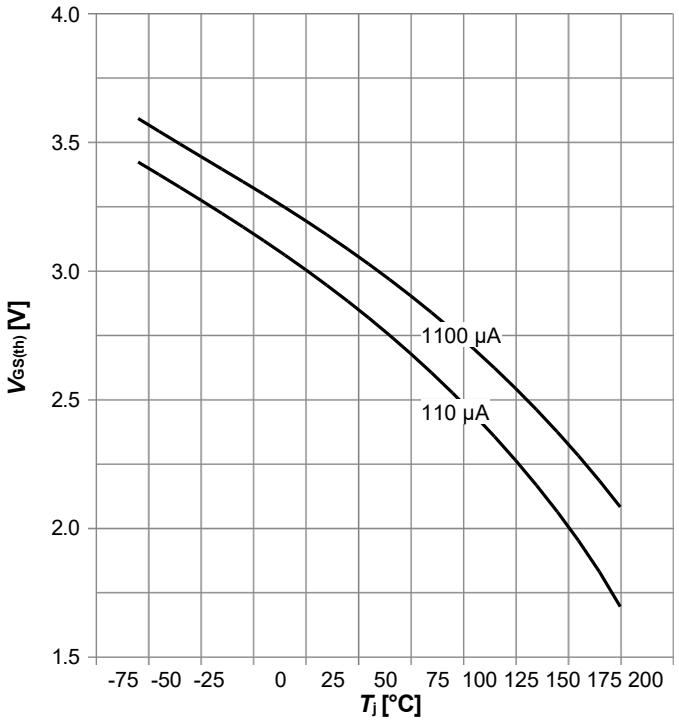
$R_{DS(on)}=f(V_{GS})$, $I_D=50$ A; parameter: T_j

图 9：归一化漏源导通电阻



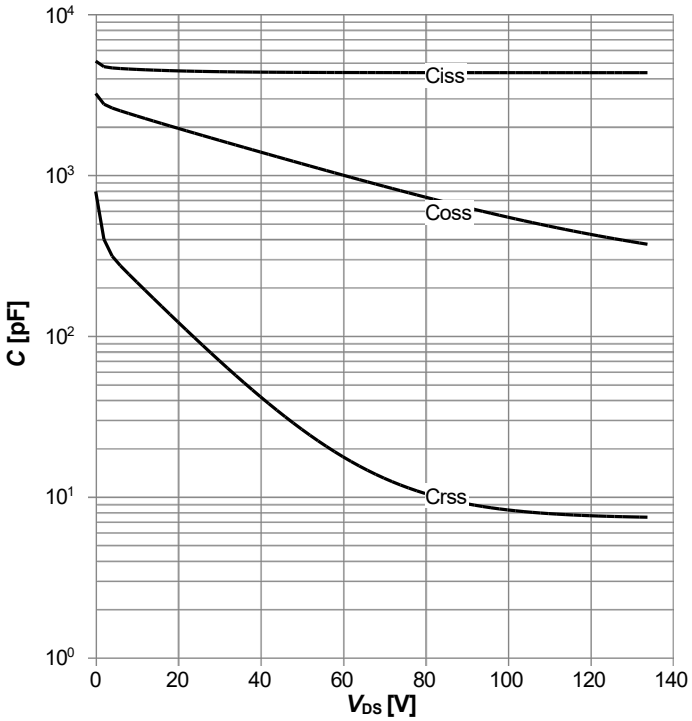
$R_{DS(on)}$=f(T_j), I_D=50 A, V_{GS}=10 V

图 10：典型栅极阈值电压



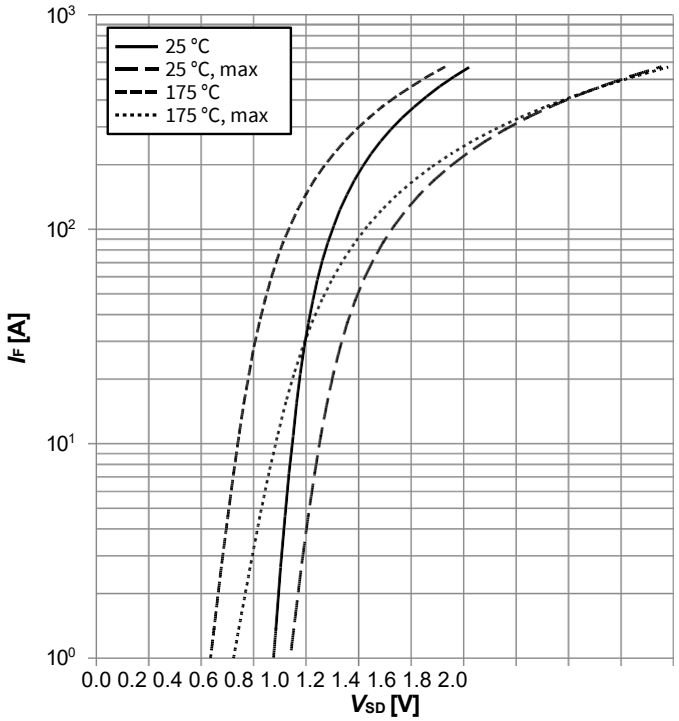
$V_{GS(th}$=f(T_j), V_{GS}=V_{DS}; parameter: I_D

图 11：典型电容值



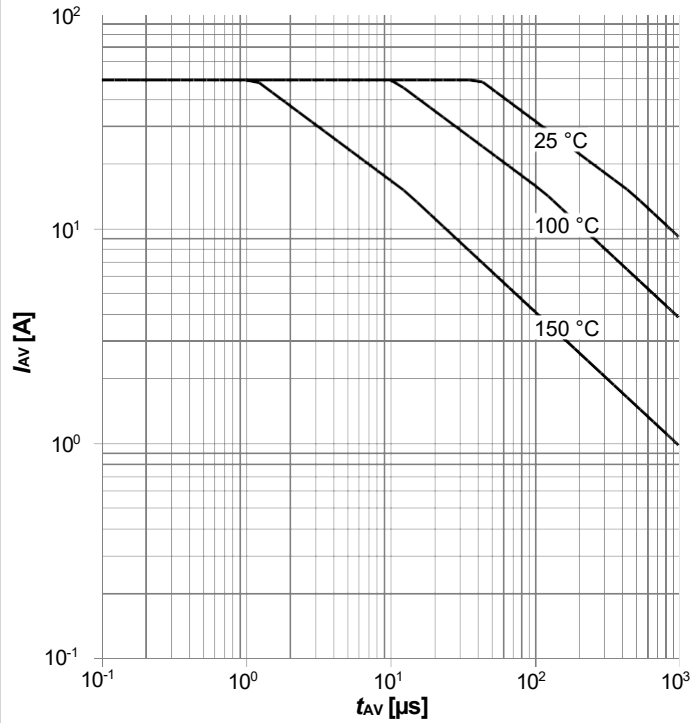
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

图 12：反向二极管的正向特性



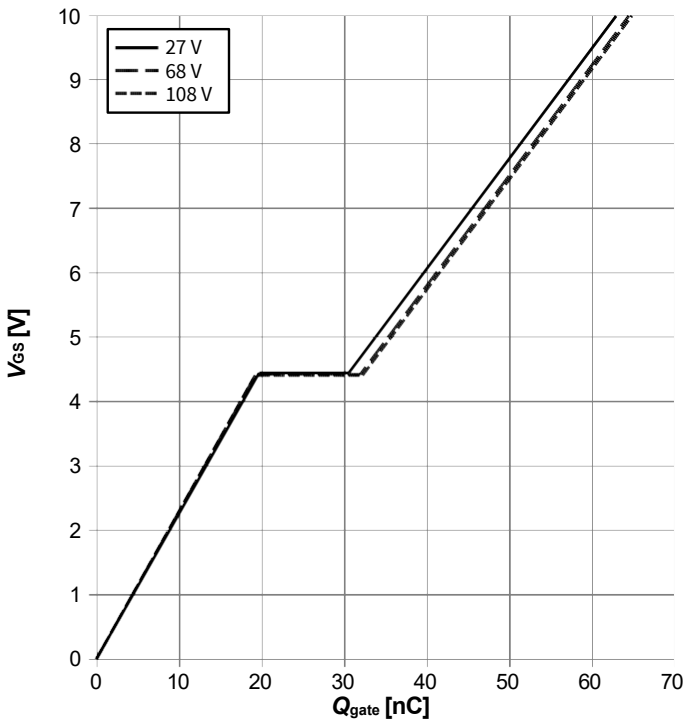
I_F=f(V_{SD}); parameter: T_j

图 13：雪崩特性



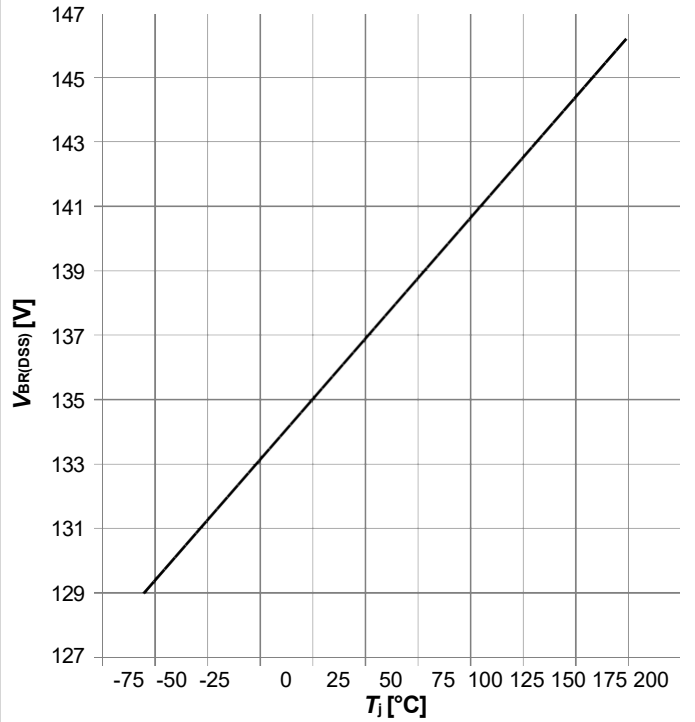
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j,start}$

图 14：典型栅极电荷



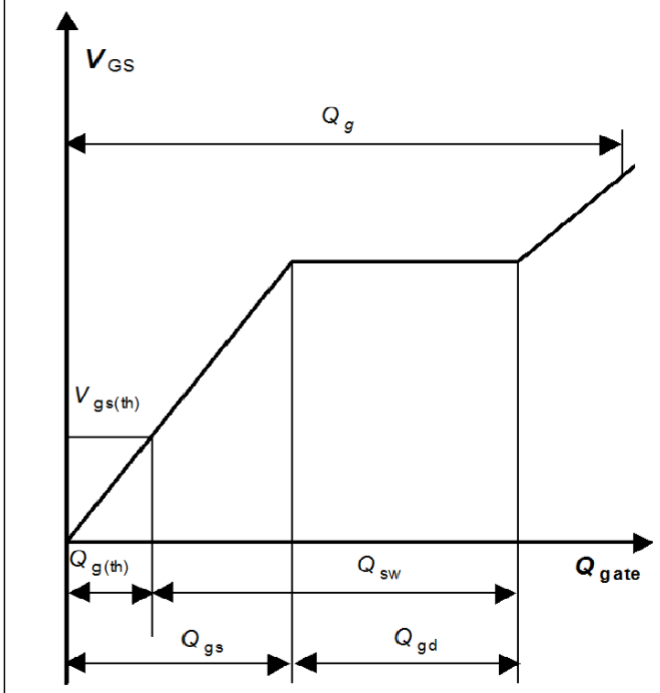
V_{GS}=f(Q_{gate}), I_D=25 A pulsed, T_j=25 °C; parameter: V_{DD}

图 15：漏源击穿电压

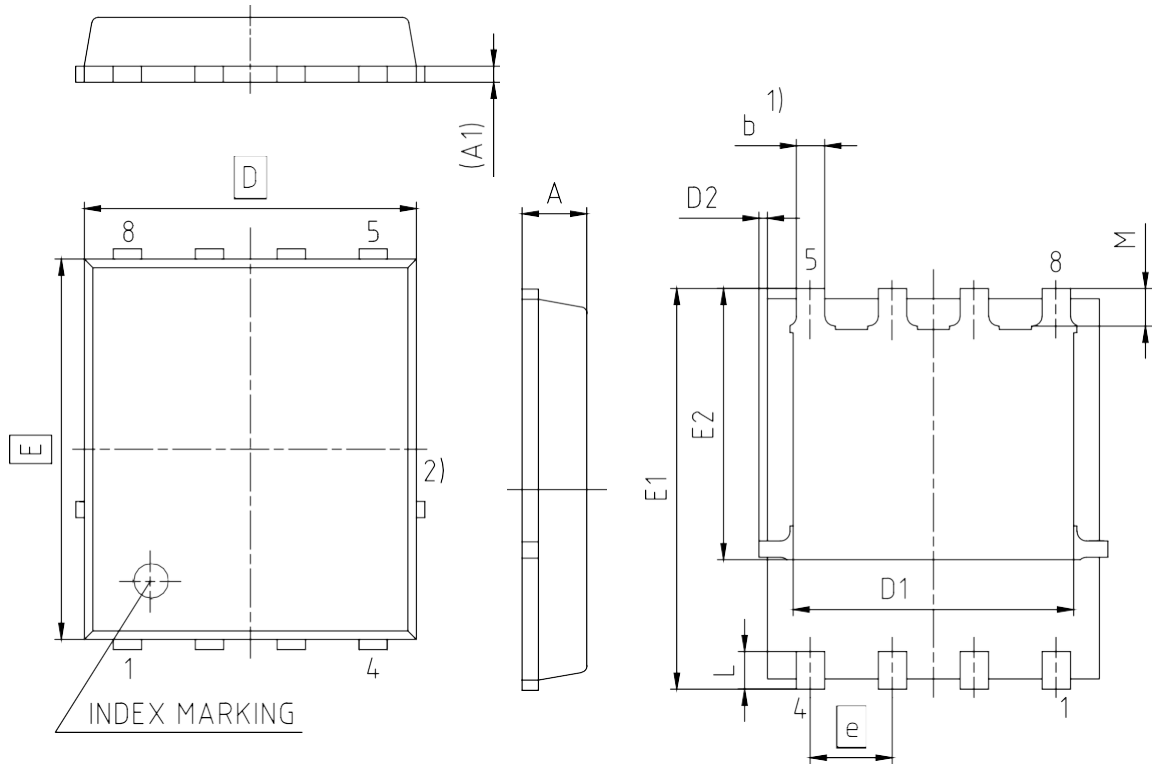


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

图栅极充电波形



5 封装外形



1) EXCLUDING MOLD FLASH
2) REMOVAL ON MOLD GATE
INTRUSION 0.1 MM
PROTRUSION 0.1 MM
LEAD LENGTH UP TO ANTI FLASH LINE
ALL METAL SURFACES ARE PLATED, EXCEPT AREA OF CUT

DIMENSION	MILLIMETERS	
	MIN.	MAX.
A	0.90	1.20
A1	0.15	0.35
b	0.34	0.54
D	4.80	5.35
D1	3.90	4.40
D2	0.00	0.22
E	5.70	6.10
E1	5.90	6.42
E2	3.88	4.31
e	1.27	
L	0.45	0.71
M	0.45	0.69

DOCUMENT NO. Z8B00003332
REVISION 08
SCALE 10:1 0 1 2 3mm
EUROPEAN PROJECTION
ISSUE DATE 05.11.2019

图 1 PG-TDSON-8 外形图，尺寸单位为毫米

修订记录

ISC046N13NM6

Revision: 2023-10-16, Rev. 2.0

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.0	2023-10-16	Release of final version

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Published by
Infineon Technologies AG
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