

英飞凌MOSFET

OptiMOS™ 6 功率晶体管，150 V

特性

- N沟道，标准电平
- 极低的导通电阻 $R_{DS(on)}$
- 卓越的热阻抗
- 100% 雪崩测试
- 无铅镀层；符合RoHS标准
- 符合 IEC61249-2-21 标准的无卤素
- MSL 1 分类基于 J-STD-020

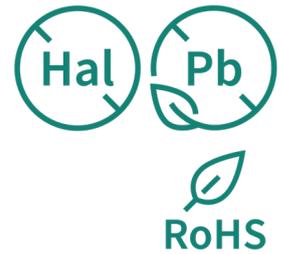
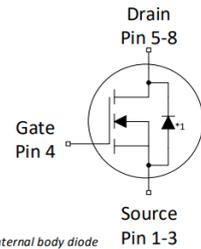
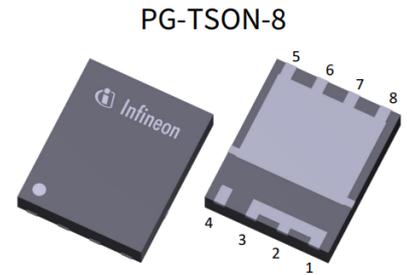
产品验证

完全符合 JEDEC 工业应用标准

表 1 主要性能参数

Parameter	Value	Unit
V_{DS}	150	V
$R_{DS(on),max}$	4.4	m Ω
I_b	156	A
Q_{oss}	163	nC
Q_G	55	nC
Q_{rr} (500 A/ μ s)	137	nC

Type/Ordering Code	Package	Marking	Related Links
ISC044N15NM6	PG-TSON-8	04415N6	-





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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 ¹⁾	I_D	-	-	156 111 103 17.1	A	$V_{GS}=10\text{ V}, T_C=25\text{ °C } V_{GS}=10\text{ V},$ $T_C=100\text{ °C } V_{GS}=8\text{ V}, T_C=100\text{ °C}$ $V_{GS}=10\text{ V}, T_A=25\text{ °C}, R_{thJA}=50\text{ °C/W}^2)$
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	624	A	$T_C=25\text{ °C}$
Avalanche current, single pulse ⁴⁾	I_{AS}	-	-	50	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse	E_{AS}	-	-	1050	mJ	$I_D=15\text{ A}, R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	250 3.0	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}, R_{thJA}=50\text{ °C/W}^2)$
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°C	-

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 × 40 mm × 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

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}	-	-	0.59	°C/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	20	°C/W	-
Thermal resistance, junction - ambient, 6 cm ² cooling area ⁵⁾	R_{thJA}	-	-	50	°C/W	-

5) 器件置于40 mm × 40 mm × 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。印刷电路板垂直放置在静止空气中。

3 电气特性

除非另有规定, $T_j=25\text{ }^\circ\text{C}$

表 4 静态特性

Parameter	Symbol	Values			Unit	Note/ Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	150	-	-	V	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	3.0	3.5	4.0	V	$V_{DS}=V_{GS}, I_D=140\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	1 100	μA	$V_{DS}=120\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$ $V_{DS}=120\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	3.5 3.8 4.3	4.2 4.4 5.1	m Ω	$V_{GS}=15\text{ V}, I_D=50\text{ A}$ $V_{GS}=10\text{ V}, I_D=50\text{ A}$ $V_{GS}=8\text{ V}, I_D=25\text{ A}$
Gate resistance	R_G	-	0.86	1.29	Ω	-
Transconductance	g_{fs}	48	97	-	S	$ V_{DS} \geq 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 ⁶⁾	C_{iss}	-	3900	5100	pF	$V_{GS}=0\text{ V}, V_{DS}=75\text{ V}, f=1\text{ MHz}$
Output capacitance ⁶⁾	C_{oss}	-	1200	1600	pF	$V_{GS}=0\text{ V}, V_{DS}=75\text{ V}, f=1\text{ MHz}$
Reverse transfer capacitance ⁶⁾	C_{rss}	-	16	24	pF	$V_{GS}=0\text{ V}, V_{DS}=75\text{ V}, f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	15	-	ns	$V_{DD}=75\text{ V}, V_{GS}=10\text{ V}, I_D=25\text{ A}, R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r	-	7	-	ns	$V_{DD}=75\text{ V}, V_{GS}=10\text{ V}, I_D=25\text{ A}, R_{G,ext}=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	20	-	ns	$V_{DD}=75\text{ V}, V_{GS}=10\text{ V}, I_D=25\text{ A}, R_{G,ext}=1.6\text{ }\Omega$
Fall time	t_f	-	10	-	ns	$V_{DD}=75\text{ V}, V_{GS}=10\text{ V}, I_D=25\text{ A}, R_{G,ext}=1.6\text{ }\Omega$

⁶⁾ 由设计指定, 未经过生产测试。

表 6 栅极电荷特性⁷⁾

Parameter	Symbol	Values			Unit	Note/ Test Condition
		Min.	Typ.	Max.		
Gate to source charge ⁸⁾	Q_{gs}	-	21	27	nC	$V_{DD}=75\text{ V}, I_D=25\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	13.6	-	nC	$V_{DD}=75\text{ V}, I_D=25\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge ⁸⁾	Q_{gd}	-	12.5	18.8	nC	$V_{DD}=75\text{ V}, I_D=25\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	19.5	-	nC	$V_{DD}=75\text{ V}, I_D=25\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate charge total ⁸⁾	Q_g	-	55	72	nC	$V_{DD}=75\text{ V}, I_D=25\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	5.3	-	V	$V_{DD}=75\text{ V}, I_D=25\text{ A}, V_{GS}=0\text{ to }10\text{ V}$
Gate charge total, sync. FET	$Q_{g(sync)}$	-	46	-	nC	$V_{DS}=0.1\text{ V}, V_{GS}=0\text{ to }10\text{ V}$
Output charge ⁸⁾	Q_{oss}	-	163	212	nC	$V_{DS}=75\text{ V}, V_{GS}=0\text{ V}$

7) 参数定义请参见“栅极充电波形”。

8) 由设计标定, 未经过生产测试。

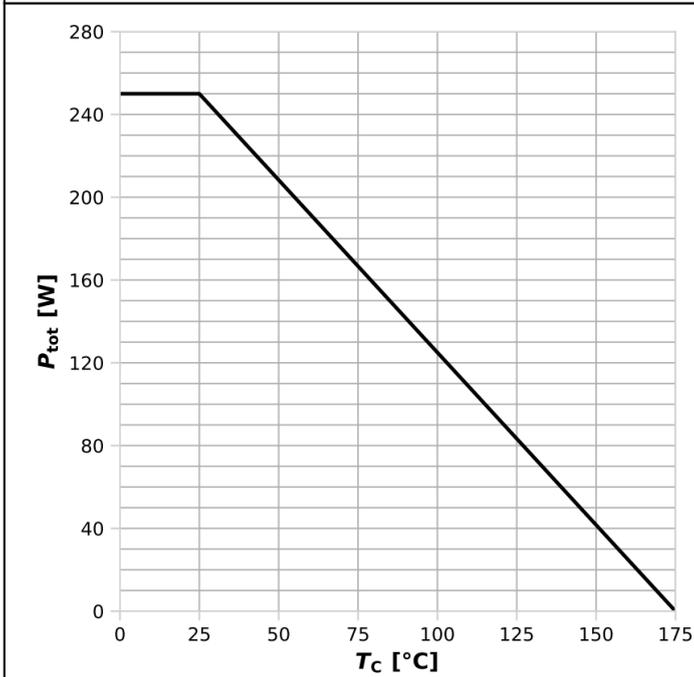
表 7 反向二极管

Parameter	Symbol	Values			Unit	Note/ Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	156	A	$T_C=25\text{ }^\circ\text{C}$
Diode pulse current	$I_{S,pulse}$	-	-	624	A	$T_C=25\text{ }^\circ\text{C}$
Diode forward voltage	V_{SD}	-	0.83	1.0	V	$V_{GS}=0\text{ V}, I_F=50\text{ A}, T_J=25\text{ }^\circ\text{C}$
Reverse recovery time ⁹⁾	t_{rr}	-	33	66	ns	$V_R=75\text{ V}, I_F=25\text{ A}, di_F/dt=500\text{ A}/\mu\text{s}$
Reverse recovery charge ⁹⁾	Q_{rr}	-	137	274	nC	$V_R=75\text{ V}, I_F=25\text{ A}, di_F/dt=500\text{ A}/\mu\text{s}$
Reverse recovery time ⁹⁾	t_{rr}	-	29	58	ns	$V_R=75\text{ V}, I_F=25\text{ A}, di_F/dt=1000\text{ A}/\mu\text{s}$
Reverse recovery charge ⁹⁾	Q_{rr}	-	274	548	nC	$V_R=75\text{ V}, I_F=25\text{ A}, di_F/dt=1000\text{ A}/\mu\text{s}$

9) 由设计标定, 未经过生产测试。

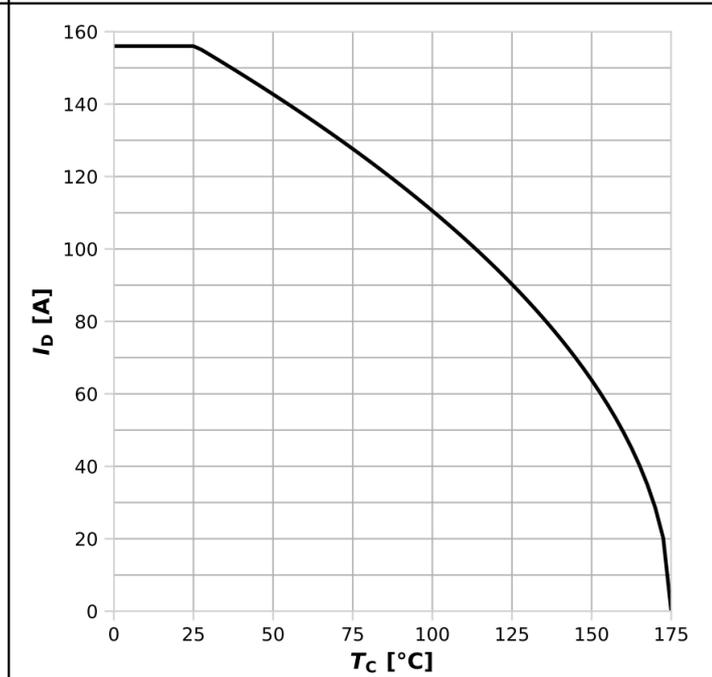
4 电气特性图

Diagram 1: Power dissipation



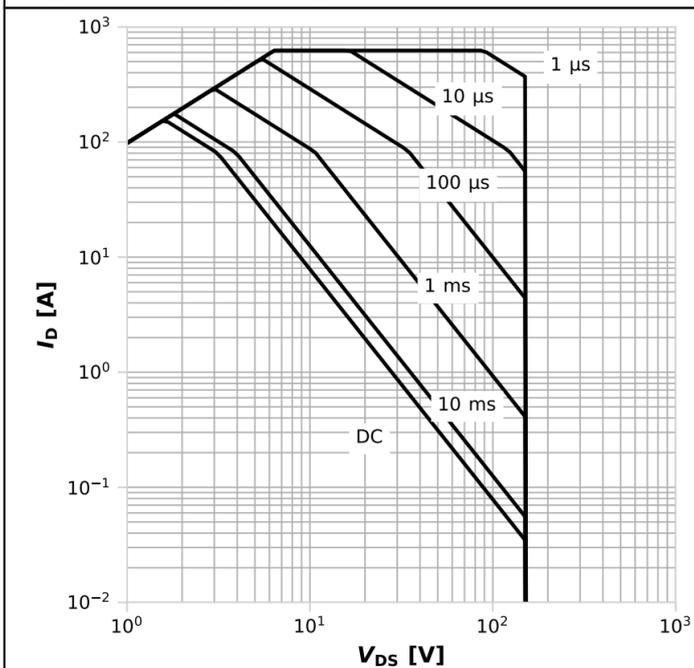
$$P_{tot}=f(T_C)$$

Diagram 2: Drain current



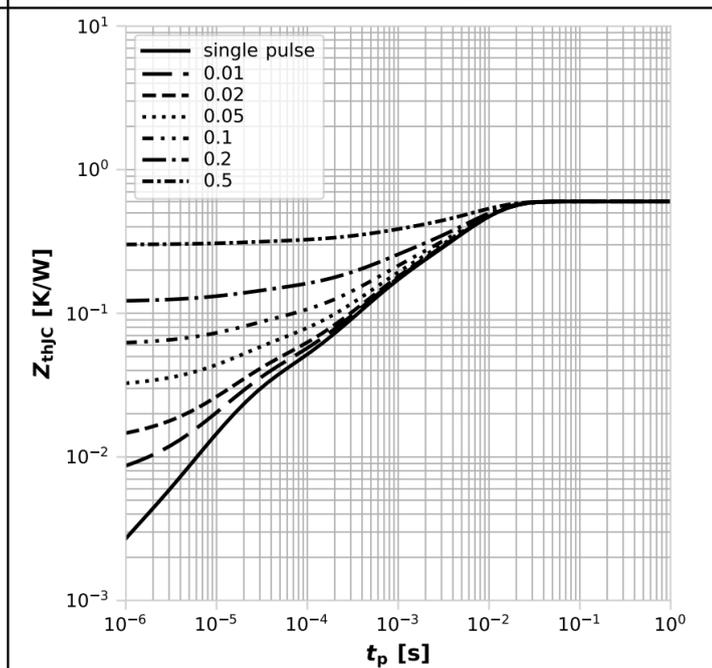
$$I_b=f(T_C); V_{GS} \geq 10 \text{ V}$$

Diagram 3: Safe operating area



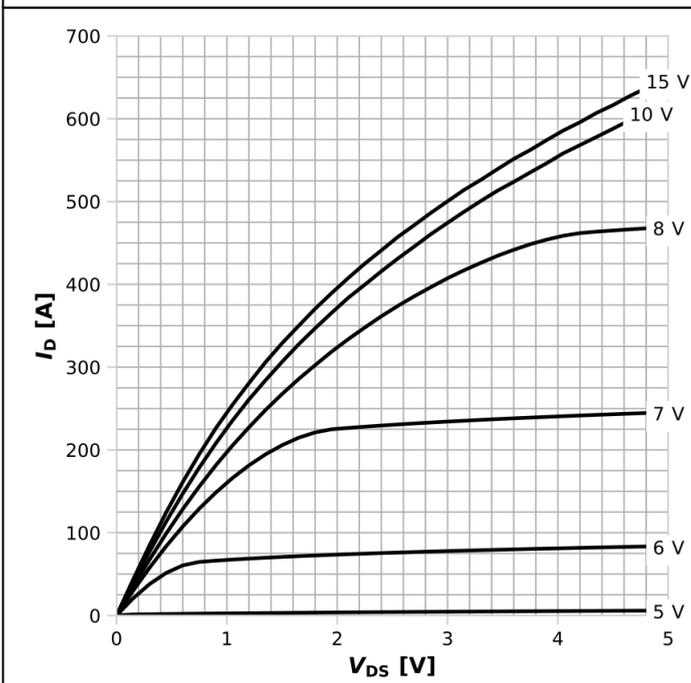
$$I_b=f(V_{DS}); T_C=25 \text{ °C}; D=0; \text{ parameter: } t_p$$

Diagram 4: Max. transient thermal impedance



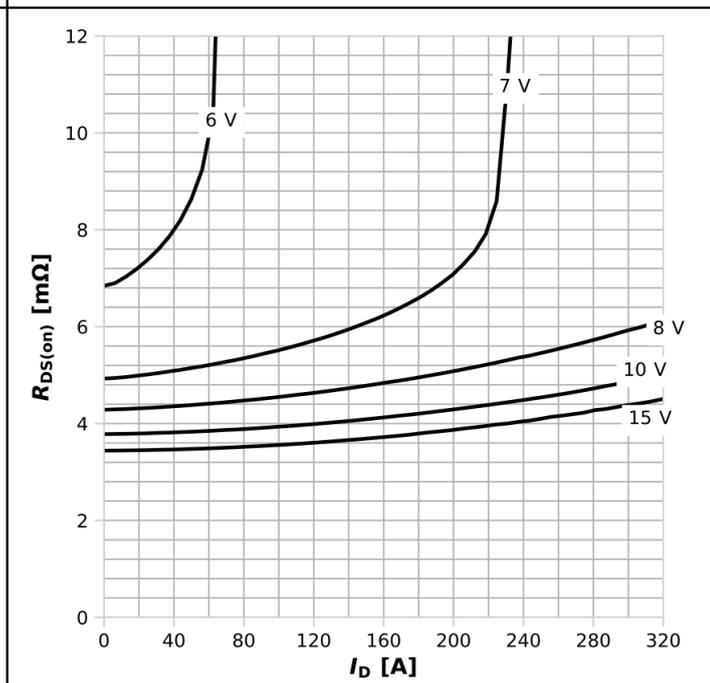
$$Z_{thjC}=f(t_p); \text{ parameter: } D=t_p/T$$

Diagram 5: Typ. output characteristics



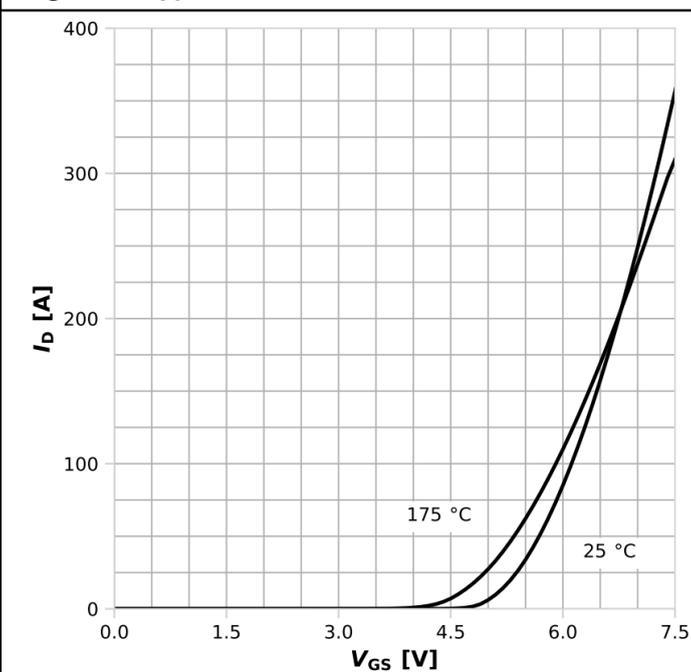
$$I_D = f(V_{DS}), T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$$

Diagram 6: Typ. drain-source on resistance



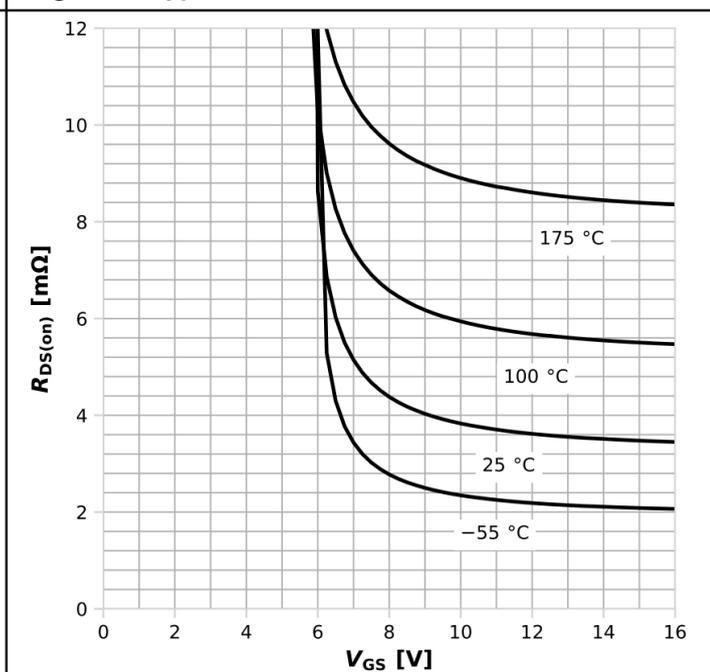
$$R_{DS(on)} = f(I_D), T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$$

Diagram 7: Typ. transfer characteristics



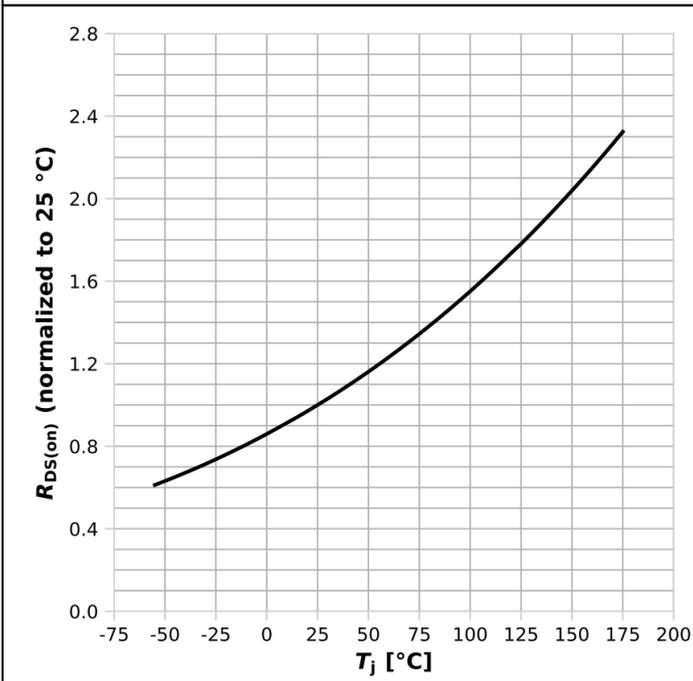
$$I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)max}; \text{parameter: } T_j$$

Diagram 8: Typ. drain-source on resistance



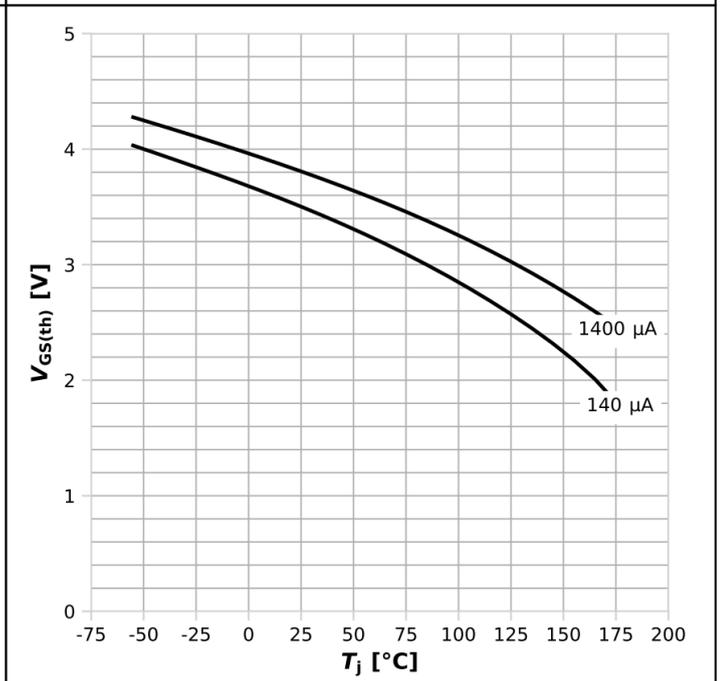
$$R_{DS(on)} = f(V_{GS}), I_D = 50 \text{ A}; \text{parameter: } T_j$$

Diagram 9: Normalized drain-source on resistance



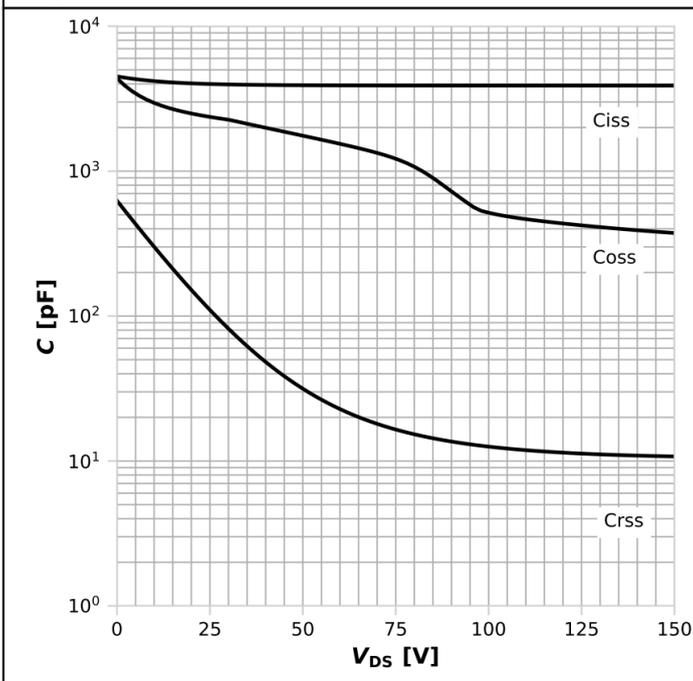
$R_{DS(on)}=f(T_j), I_D=50\text{ A}, V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



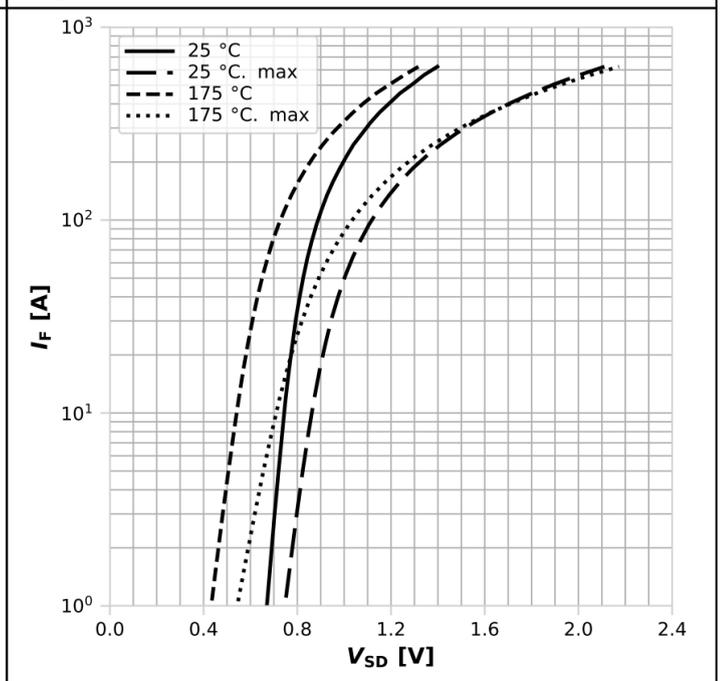
$V_{GS(th)}=f(T_j), V_{GS}=V_{DS}; \text{parameter: } I_D$

Diagram 11: Typ. capacitances



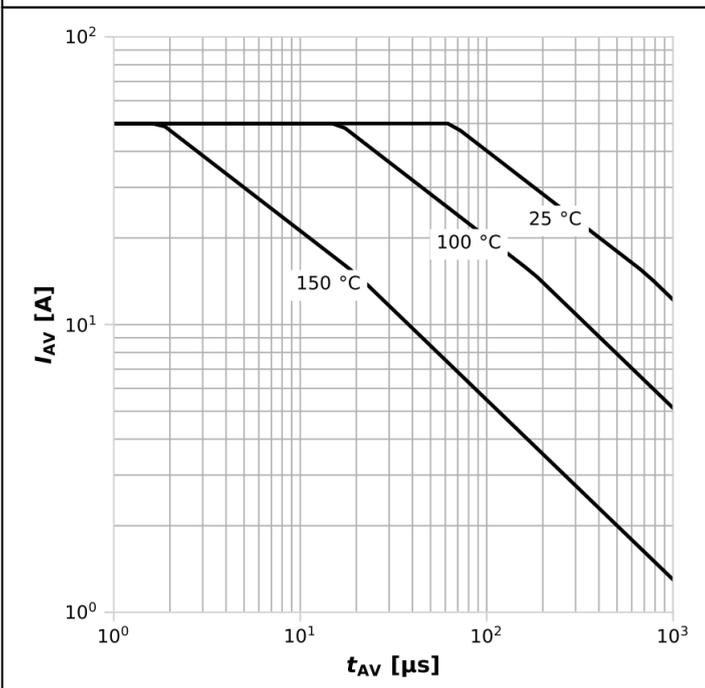
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



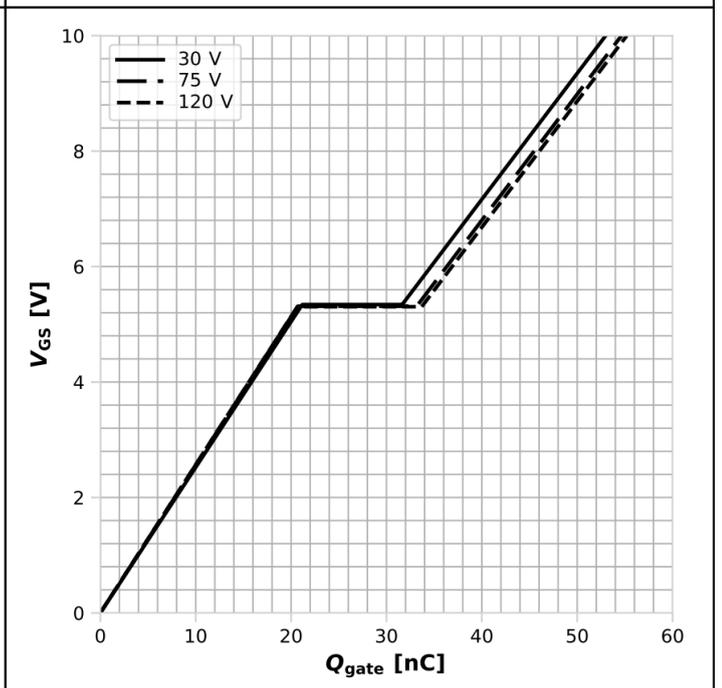
$I_F=f(V_{SD}); \text{parameter: } T_j$

Diagram 13: Avalanche characteristics



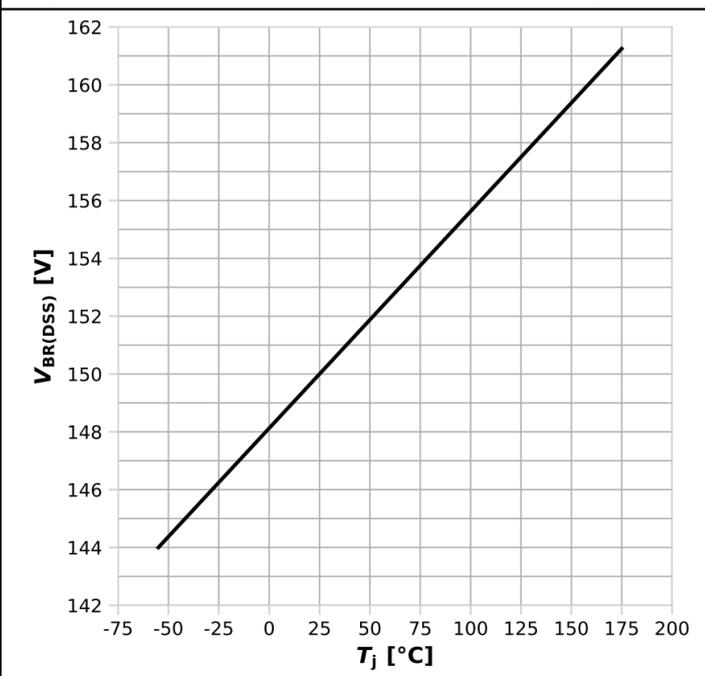
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega; \text{parameter: } T_{j,start}$

Diagram 14: Typ. gate charge



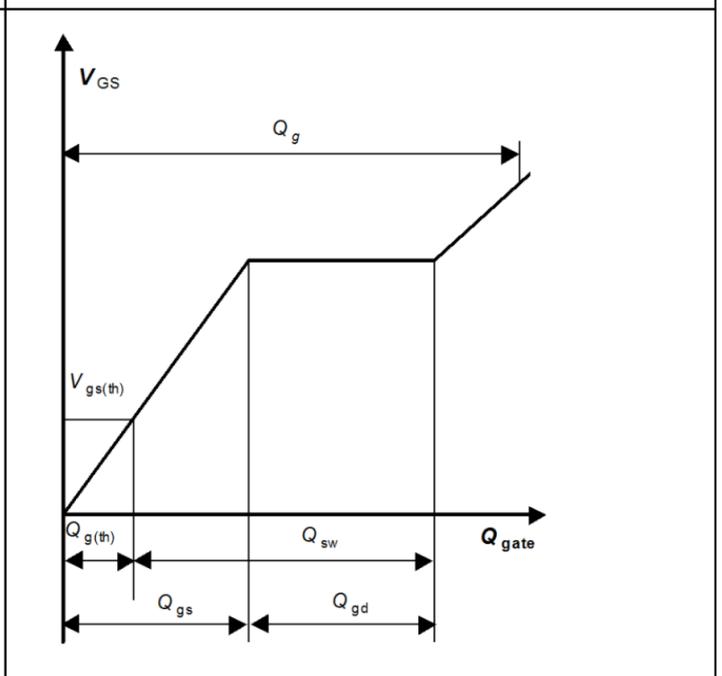
$V_{GS}=f(Q_{gate}), I_D=25 \text{ A pulsed}, T_j=25 \text{ °C}; \text{parameter: } V_{DD}$

Diagram 15: Min. drain-source breakdown voltage



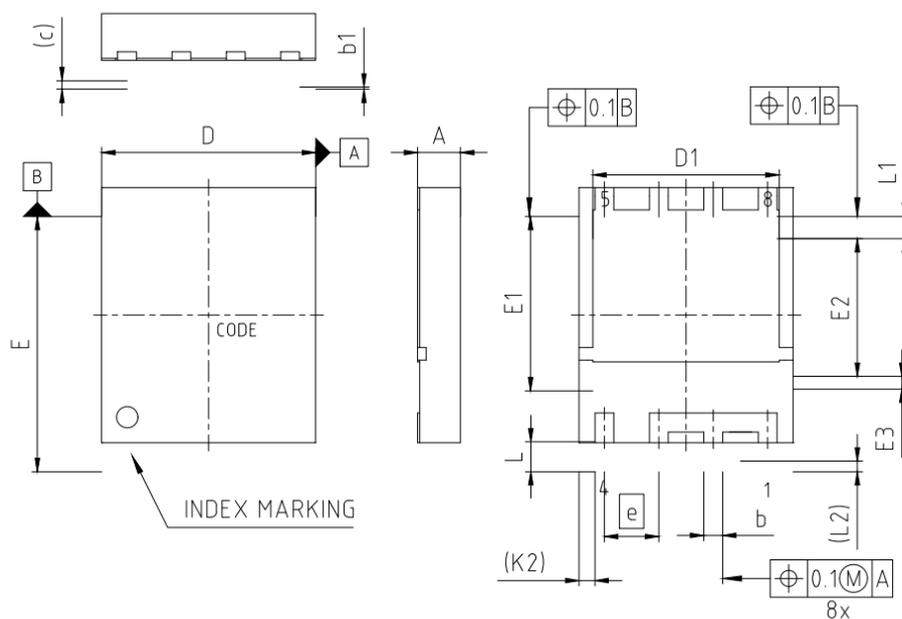
$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

Gate charge waveforms



-

5 封装外形



PACKAGE - GROUP NUMBER: PG-TSON-8-U05		
DIMENSION	MILLIMETERS	
	MIN.	MAX.
A	0.90	1.10
b	0.34	0.54
b1	0.00	0.05
c	0.20	
D	4.90	5.10
D1	4.25	4.45
E	5.90	6.10
E1	4.00	4.20
E2	3.14	3.34
E3	0.20	0.40
e	1.27	
K2	0.38	
L	0.60	0.80
L1	0.43	0.63
L2	0.25	

NOTE: DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS

图 1 PG-TSON-8 外形图，尺寸单位为毫米

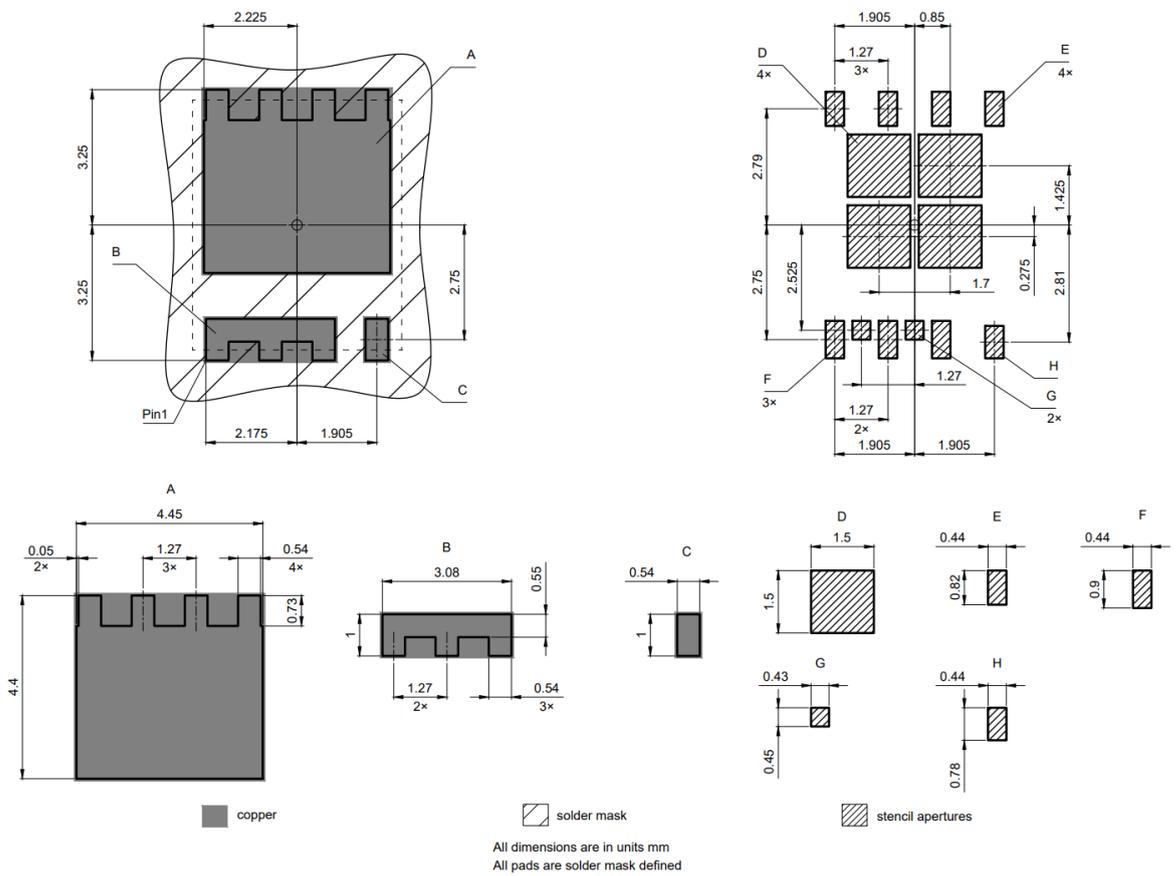
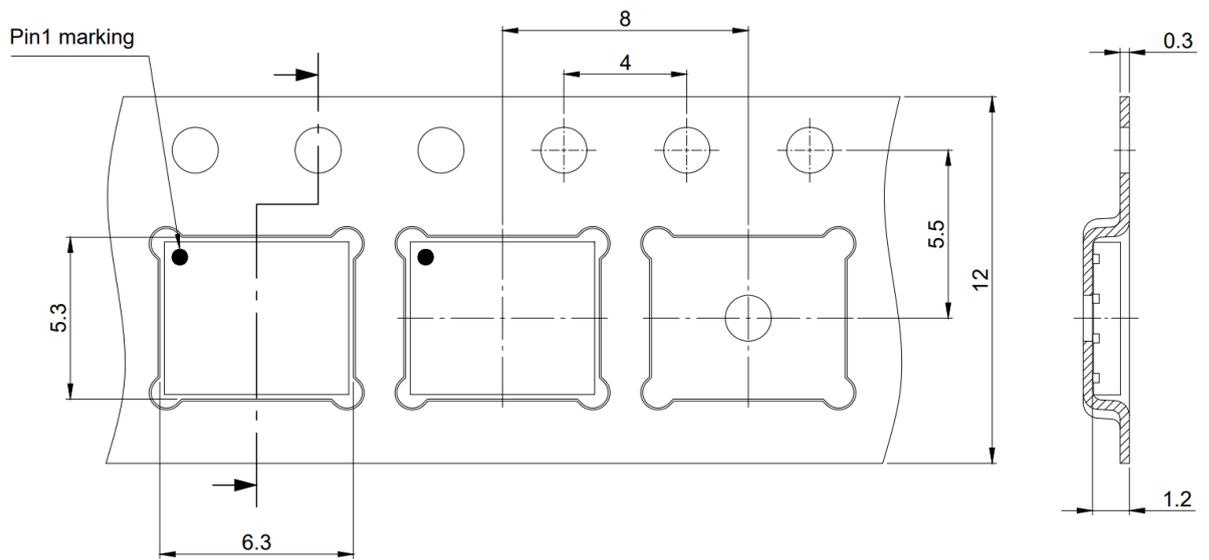


图 2 PG-TSON-8 外形图, 尺寸单位为毫米



All dimensions are in units mm
The drawing is in compliance with ISO 128-30, Projection Method 1 []

图 3 PG-TSON-8 外形图，尺寸单位为毫米

修订记录

ISC044N15NM6

Revision 2024 - 04 - 24 , Rev. 2 . 0

历史修订版本

Revision	Date	Subjects (major changes since last revision)
1.0	2024-03-15	Release of preliminary version
2.0	2024-04-24	Release of final

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