IRFP4310ZPbF

V_{DSS}	100V
$R_{DS(on)}$ typ.	4.8mΩ
max.	6.0mΩ
$I_{D\ (Silicon\ Limited)}$	134A①
$I_{D\ (Package\ Limited)}$	120A

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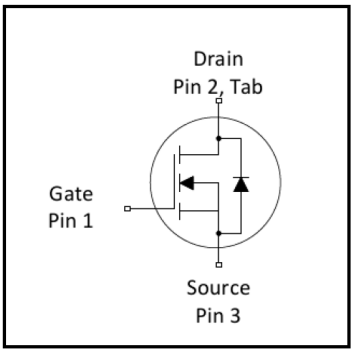
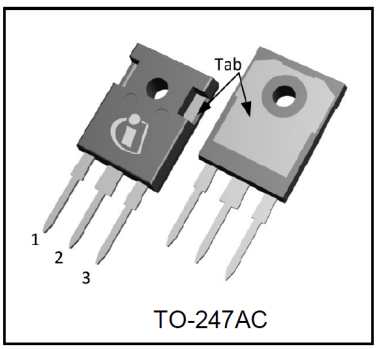




应用

- SMPS 中的高效同步整流
- 不间断电源
- 高速功率开关
- 硬开关和高频电路

优点

- 改进的栅极、雪崩和动态 dV/dt 性能
- 全面表征的电容和雪崩 SOA
- 增强型体二极管 dV/dt 和 dI/dt 能力
- 无铅

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFP4310ZPbF	TO-247	Tube	25	IRFP4310ZPbF

绝对最大额定值

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	134①	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V(Silicon Limited)	95	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Wire Bond Limited)	120	
I_{DM}	Pulsed Drain Current ②	560	
P_D @T_C = 25°C	Maximum Power Dissipation	280	W
	Linear Derating Factor	1.9	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ④	18	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting torque, 6-32 or M3 screw	10lbf·in (1.1N·m)	

雪崩特性

$E_{AS\ (Thermally\ limited)}$	Single Pulse Avalanche Energy ③	130	mJ
I_{AR}	Avalanche Current ②	See Fig. 14, 15, 22a, 22b	A
E_{AR}	Repetitive Avalanche Energy ⑤		mJ

热阻

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑧	---	0.54	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat Greased Surface	0.24	---	
$R_{\theta JA}$	Junction-to-Ambient⑧	---	40	

本数据手册的原文使用英文撰写。为方便起见，英飞凌提供了译文；由于翻译过程中可能使用了自动化工具，英飞凌不保证译文的准确性。为确认准确性，请务必访问 infineon.com 参考最新的英文版本（控制文档）。

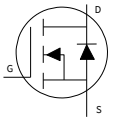
静态参数特性在 T_J = 25°C 时测得（除非另有规定）

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	---	---	V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	---	0.11	---	V/°C	Reference to 25°C, I_D = 5mA②
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	---	4.8	6.0	mΩ	V_{GS} = 10V, I_D = 75A ⑤
$V_{GS(th)}$	Gate Threshold Voltage	2.0	---	4.0	V	V_{DS} = V_{GS}, I_D = 150μA
I_{DSS}	Drain-to-Source Leakage Current	---	---	20	μA	V_{DS} = 100V, V_{GS} = 0V
		---	---	250		V_{DS} = 80V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	---	---	100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	---	---	-100		V_{GS} = -20V
R_G	Gate Resistance	---	0.7	---	Ω	

动态 @ T_J = 25°C（除非另有说明）

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
gfs	Forward Transconductance	150	---	---	S	V_{DS} = 50V, I_D = 75A
Q_g	Total Gate Charge	---	120	170	nC	I_D = 75A
Q_{gs}	Gate-to-Source Charge	---	29	---		V_{DS} =50V
Q_{gd}	Gate-to-Drain ("Miller") Charge	---	35	---		V_{GS} = 10V ⑤
Q_{gsync}	Total Gate Charge Sync. (Q_g-Q_{gd})	---	85	---		I_D = 75A, V_{DS} =50V, V_{GS} = 10V
$t_{d(on)}$	Turn-On Delay Time	---	20	---	ns	V_{DD} = 65V
t_r	Rise Time	---	60	---		I_D = 75A
$t_{d(off)}$	Turn-Off Delay Time	---	55	---		R_G = 2.7Ω
t_f	Fall Time	---	57	---		V_{GS} = 10V ⑤
C_{iss}	Input Capacitance	---	6860	---	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	---	490	---		V_{DS} = 50V
C_{rss}	Reverse Transfer Capacitance	---	220	---		f = 1.0 MHz, See Fig. 5
C_{oss} eff. (ER)	Effective Output Capacitance (Energy Related) ⑦	---	570	---		V_{GS} = 0V, V_{DS} = 0V to 80V, See Fig.11⑦
C_{oss} eff. (TR)	Effective Output Capacitance (Time Related) ⑥	---	920	---		V_{GS} = 0V, V_{DS} = 0V to 80V ⑥

二极管特性

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	---	---	134①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ②	---	---	560		
V_{SD}	Diode Forward Voltage	---	---	1.3	V	T_J = 25°C, I_S = 75A, V_{GS} = 0V ⑤
t_{rr}	Reverse Recovery Time	---	40	---	ns	T_J = 25°C
		---	49	---		T_J = 125°C
Q_{rr}	Reverse Recovery Charge	---	58	---	nC	T_J = 25°C
		---	89	---		T_J = 125°C
I_{RRM}	Reverse Recovery Current	---	2.5	---	A	T_J = 25°C
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

V_R = 85V, I_F = 75A di/dt = 100A/μs ⑤

注：

①根据最大允许结温计算连续电流。键合线电流限制为 120A。请注意，某些引脚安装排布可能会因器件引脚发热而产生电流限制。（参见 AN-1140）

② 重复额定值；脉冲宽度受最高结温限制。

③ 受 T_{Jmax}限制，初始 T_J = 25°C、L = 0.047mH、R_G = 25Ω、I_{AS} = 75A、V_{GS}=10V。不建议在高于此值的情况运行器件。

④ I_{SD} ≤ 75A, di/dt ≤ 600A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

⑤ 脉冲宽度 ≤ 400μs; 占空比 ≤ 2%。

⑥Coss eff.(TR) 是一个固定电容值， 当 V_{DS} 从 0 上升至 80% V_{DSS}时，其充电时间与 Coss 相同。

⑦ C oss eff. (ER) 是一个固定电容值， 当 V_{DS} 从 0 上升至 80% V_{DSS}时，其产生与 C oss 相同的热量。

⑧R_θ 在 T_J 约 90°C 时测得。

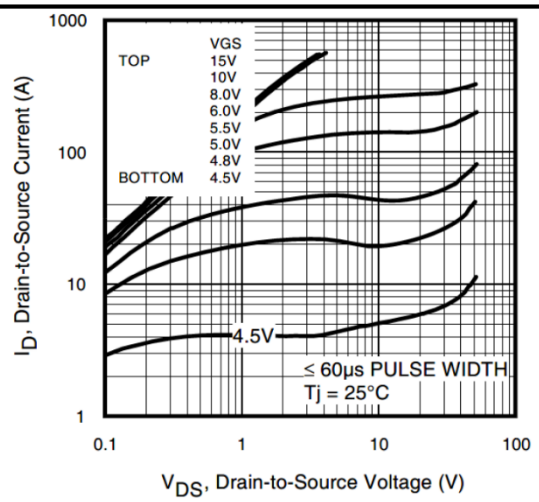


图 1.典型输出特性

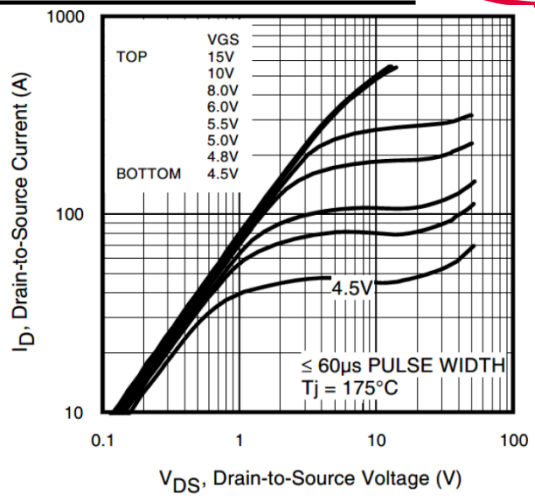


图 2.典型输出特性

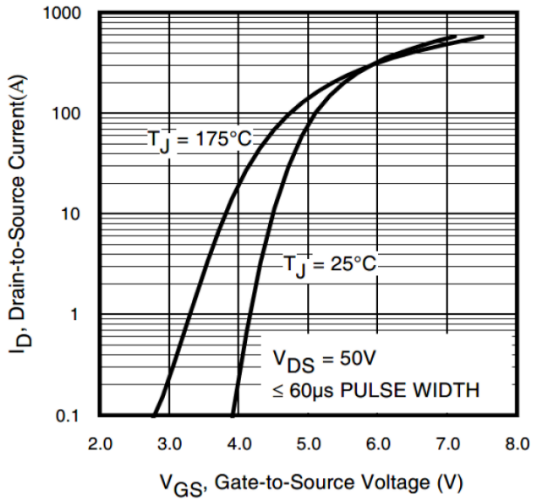


图 3.典型转移特性

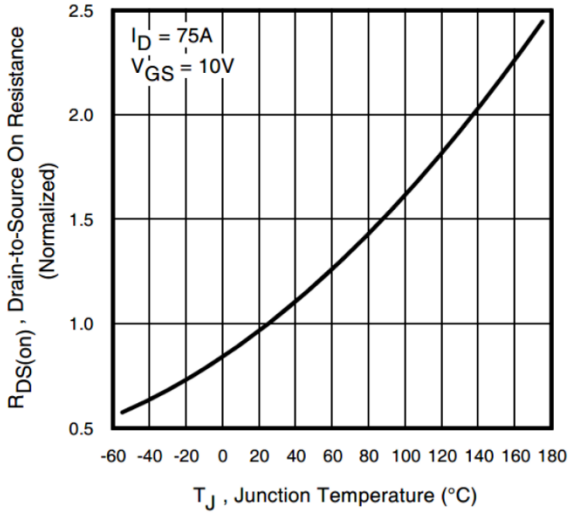


图 4.归一化导通电阻与温度的关系

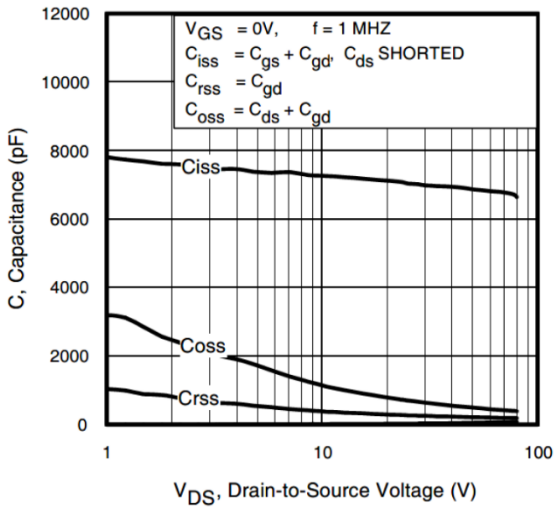


图 5.典型电容与漏源电压关系曲线

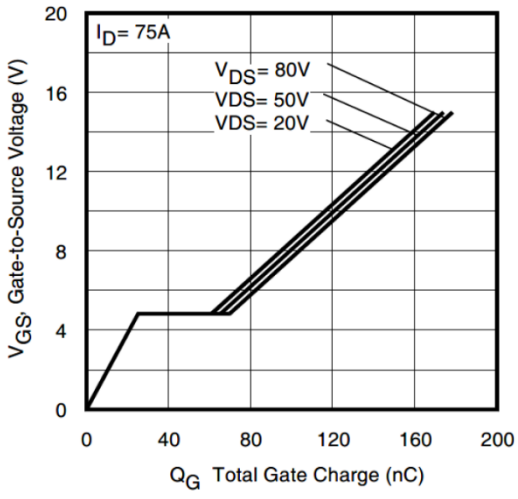


图 6.典型栅极电荷与栅源电压关系曲线

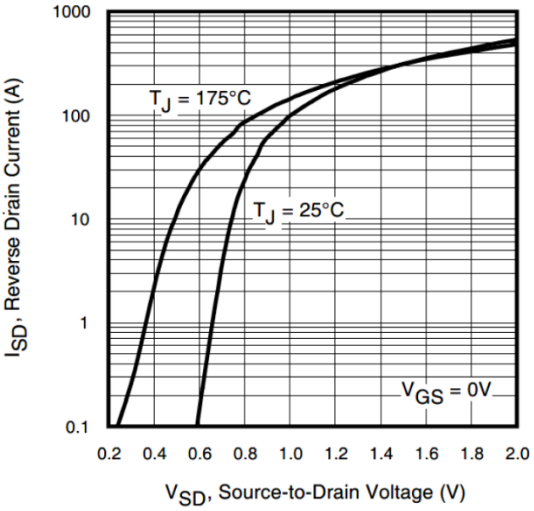


图 7. 典型的源极-漏极二极管 正向电压

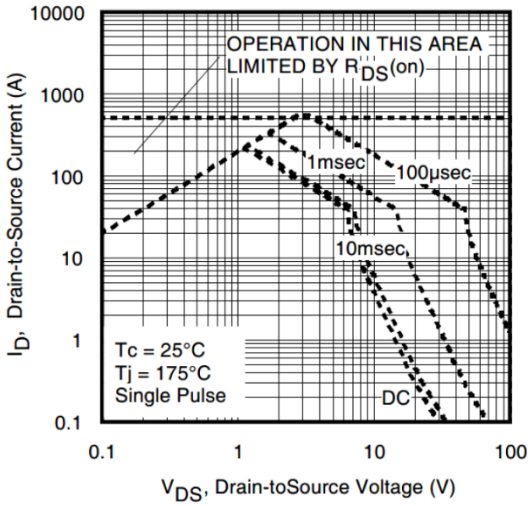


图 8.最大安全工作区

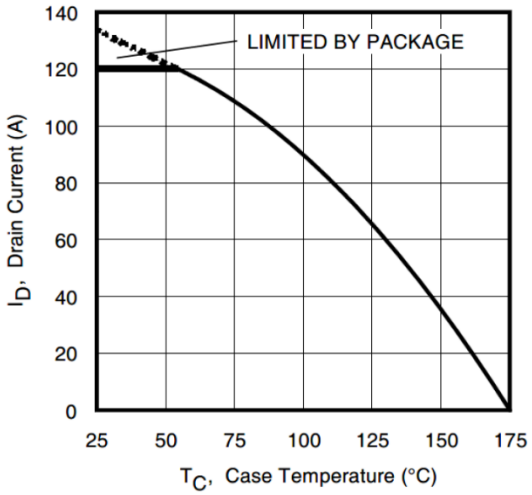


图 9.最大漏极电流与壳温的关系

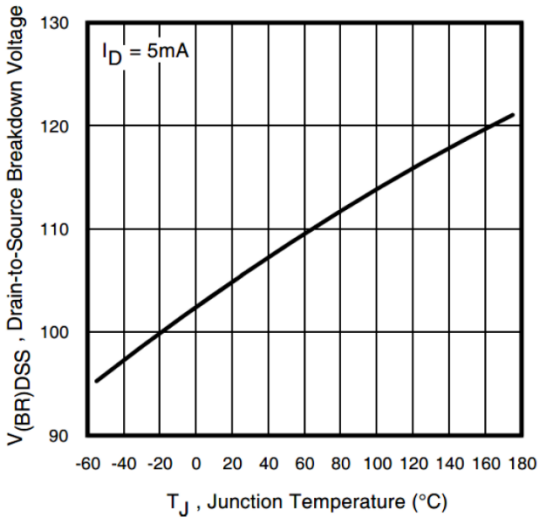


图 10.漏源击穿电压

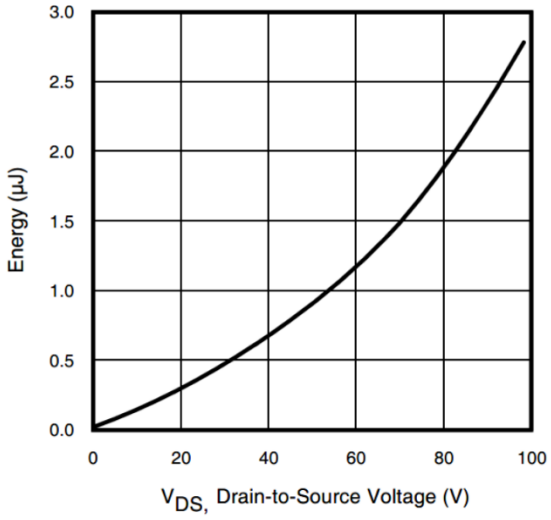


图 11典型 Coss 存储能量

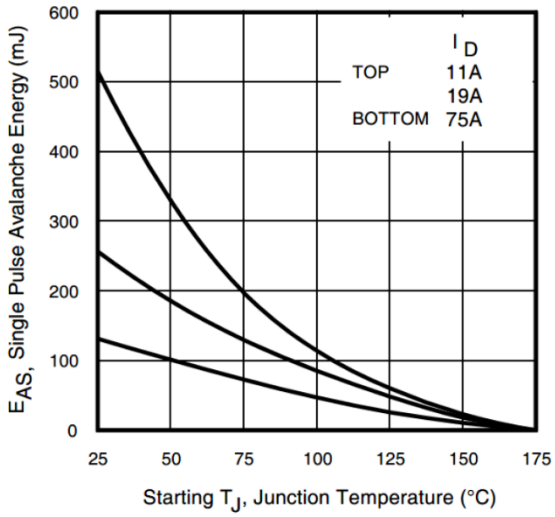


图 12c.最大雪崩能量与漏极电流

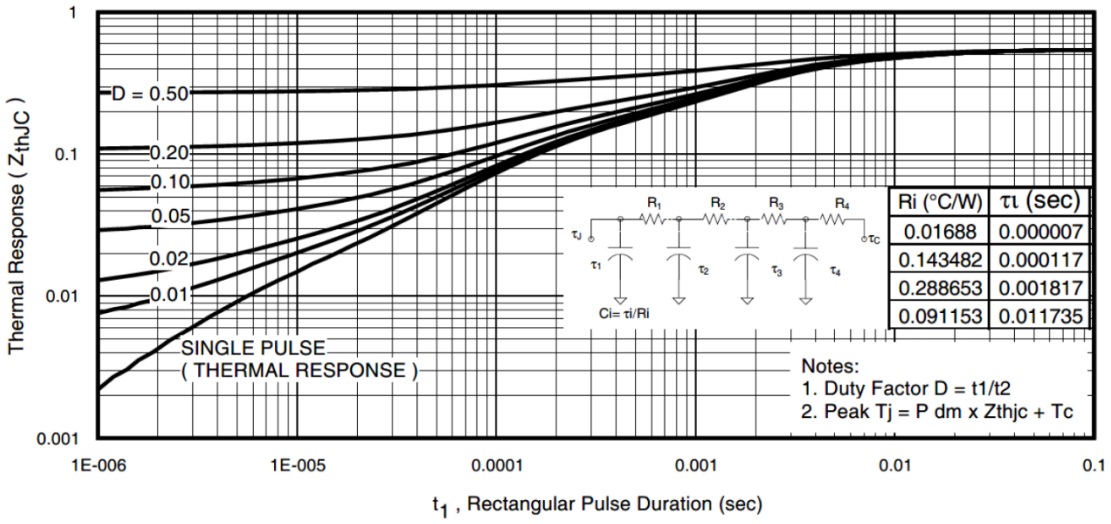


图 13.最大有效瞬态热阻，结到壳

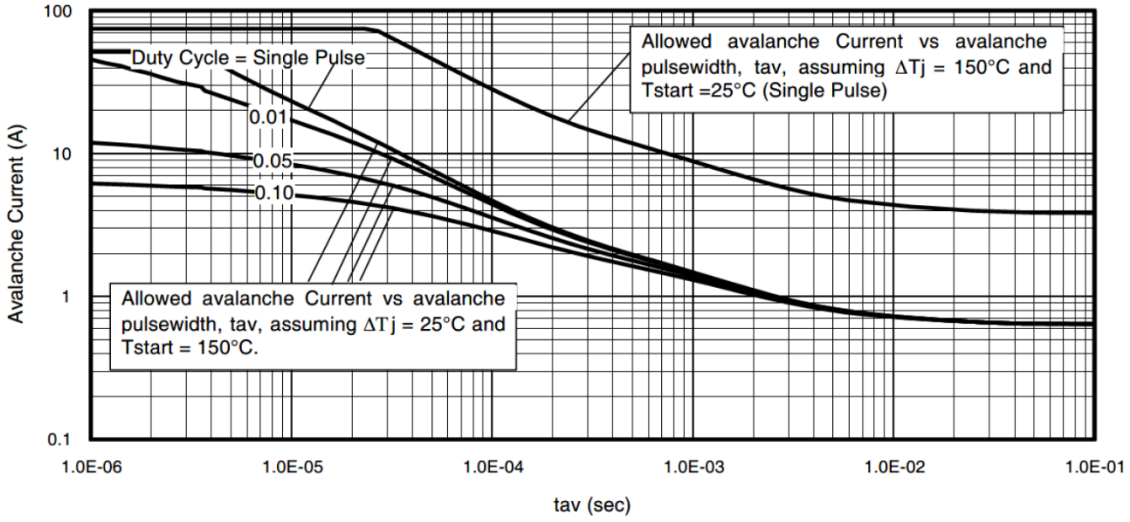


图 14.典型雪崩电流与脉冲宽度

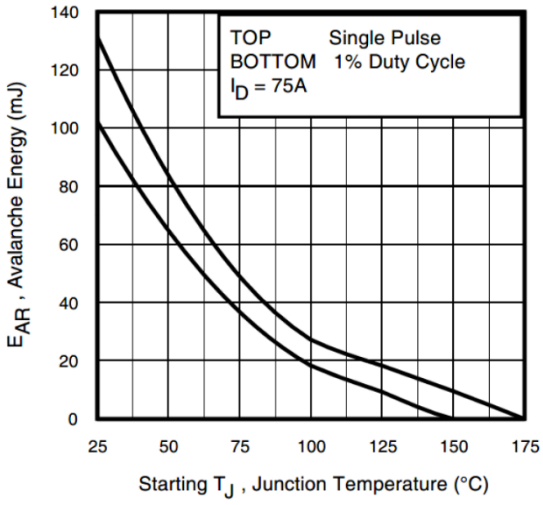


图 15.最大雪崩能量与温度的关系曲线

关于重复的雪崩曲线的注释，图 14、15：（有关详细信息，请参阅www.irf.com 上的 AN-1005）

1. 雪崩失效假设：
   纯粹的热现象和故障发生在温度远远超过Tjmax的时候。这对每种零件类型都是有效的。
2. 只要不超过Tjmax，就可以在雪崩中安全运行。
3. 如下公式基于图 16a、16b 所示的电路和波形。
4. $P_{D\,(ave)}$ = 每个雪崩脉冲的平均功率耗散。
5. BV = 额定击穿电压（1.3 倍系数，考虑雪崩期间的电压增加）。
6. I_{av} = 可允许的雪崩电流。
7. ΔT = Allowable rise in junction temperature, not to exceed Tjmax (assumed as 25°C in Figure 14, 15).
   t_{av} = 雪崩的平均时间。
   D = 雪崩占空比 = tav ·f
   $Z_{thJC}(D, t_{av})$ = 瞬态热阻抗，见图 13)

$$P_{D\,(ave)} = 1/2\,(1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}\, I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$

$$E_{AS\,(AR)} = P_{D\,(ave)} \cdot t_{av}$$

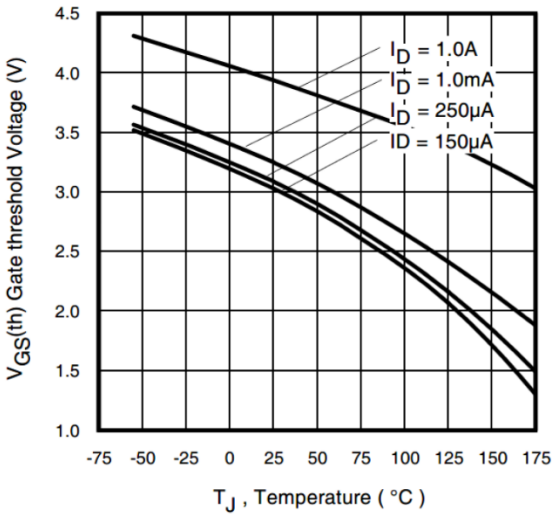


图 16 阈值电压与温度

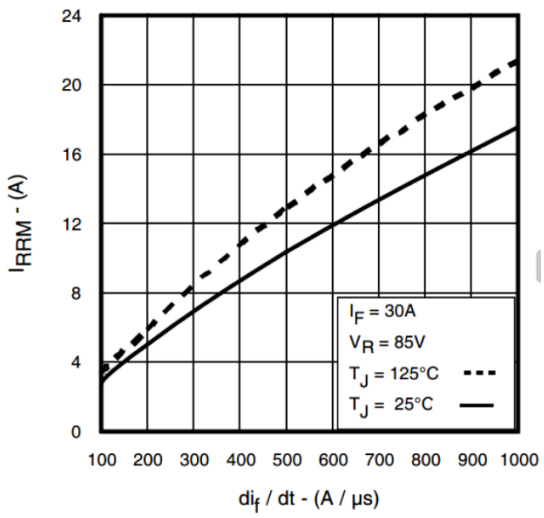


图17 典型恢复电流与 dif/dt 的关系

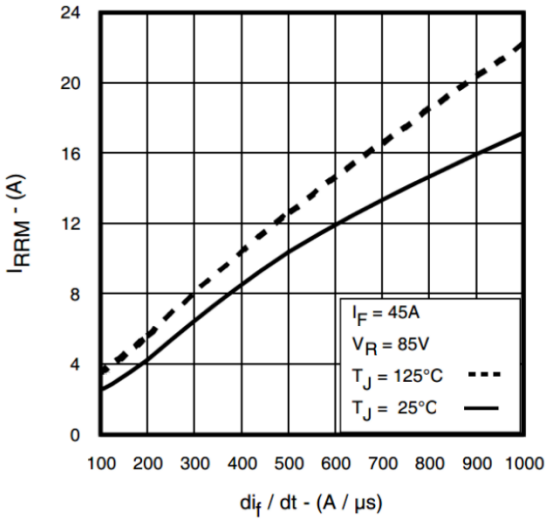


图 18. 典型恢复电流与di_f/dt的关系

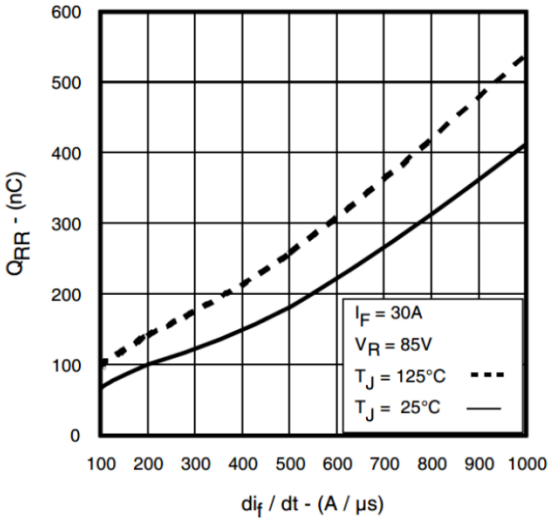


图19. 典型储电量与di_f/dt的关系

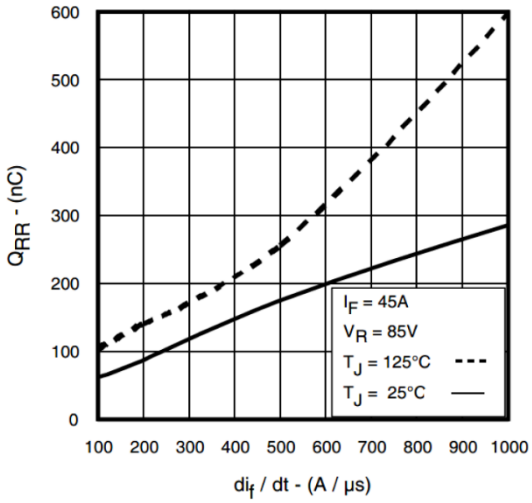


图 20. 典型储电量与 di_f/dt的关系

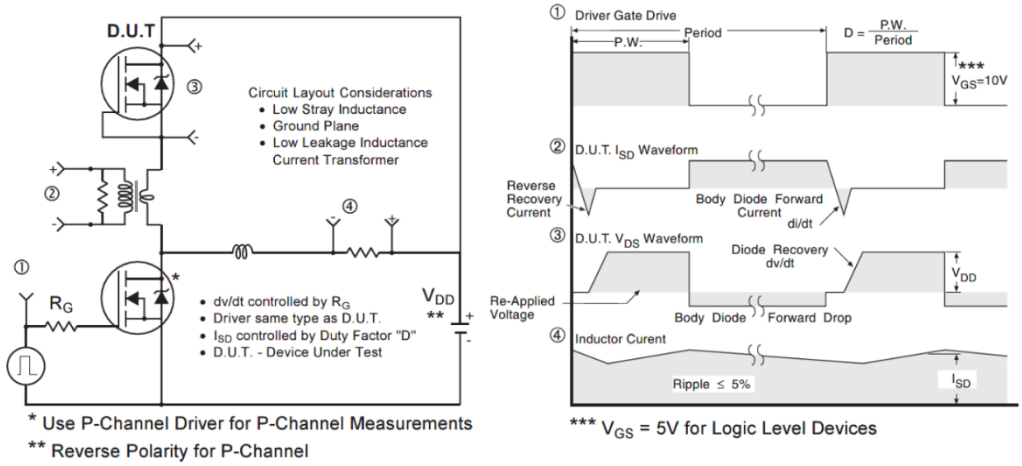


图 21. N 沟道 HEXFET® 功率 MOSFET 二极管峰值恢复 dv/dt 测试电路

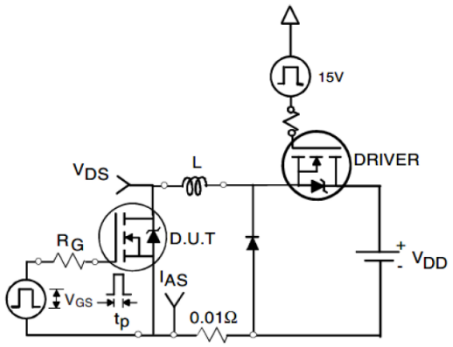


图 22a.未钳位电感性测试电路

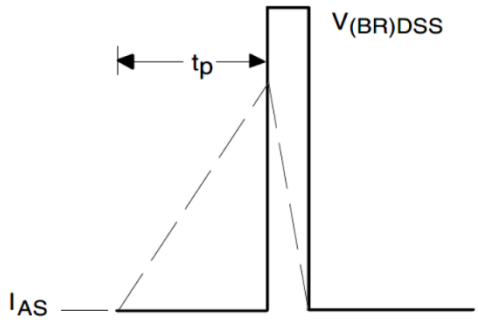


图 22b.未钳位电感性电路测试波形

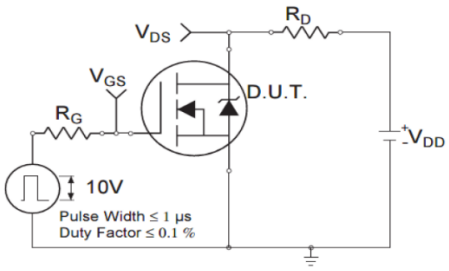


图 23a.开关时间测试电路

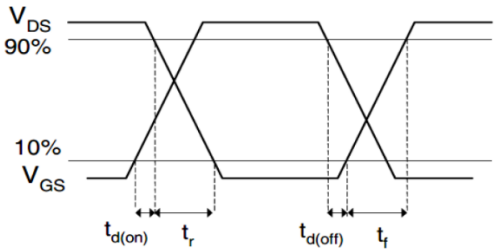


图 23b.开关时间波形

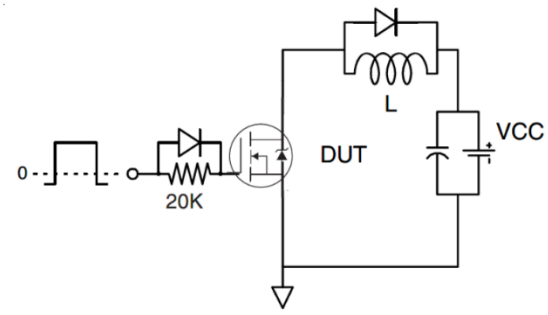


图 24a.栅极电荷测试电路

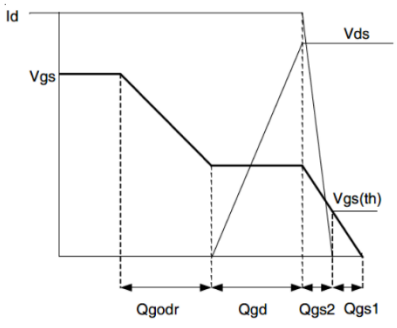
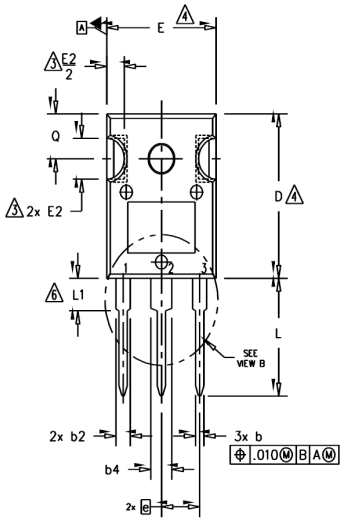
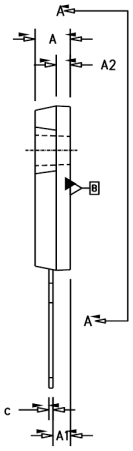
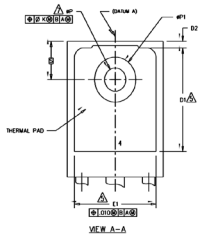


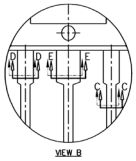
图 24b.栅极电荷波形

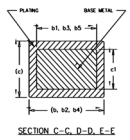
TO-247AC 封装外形（尺寸以毫米（英寸）为单位）











NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN INCHES.
3. CONTOUR OF SLOT OPTIONAL.
4. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS D1 & E1.
6. LEAD FINISH UNCONTROLLED IN L1.
7. øP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5 ° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154 INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-247AC .

SYMBOL	DIMENSIONS				NOTES
	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	.183	.209	4.65	5.31	
A1	.087	.102	2.21	2.59	
A2	.059	.098	1.50	2.49	
b	.039	.055	0.99	1.40	
b1	.039	.053	0.99	1.35	
b2	.065	.094	1.65	2.39	
b3	.065	.092	1.65	2.34	
b4	.102	.135	2.59	3.43	
b5	.102	.133	2.59	3.38	
c	.015	.035	0.38	0.89	
c1	.015	.033	0.38	0.84	
D	.776	.815	19.71	20.70	4
D1	.515	–	13.08	–	5
D2	.020	.053	0.51	1.35	
E	.602	.625	15.29	15.87	4
E1	.530	–	13.46	–	
E2	.178	.216	4.52	5.49	
e	.215 BSC		5.46 BSC		
øk	.010		0.25		
L	.559	.634	14.20	16.10	
L1	.146	.169	3.71	4.29	
øP	.140	.144	3.56	3.66	
øP1	–	.291	–	7.39	
Q	.209	.224	5.31	5.69	
S	.217 BSC		5.51 BSC		

LEAD ASSIGNMENTS

HEXFET

1.– GATE
2.– DRAIN
3.– SOURCE
4.– DRAIN

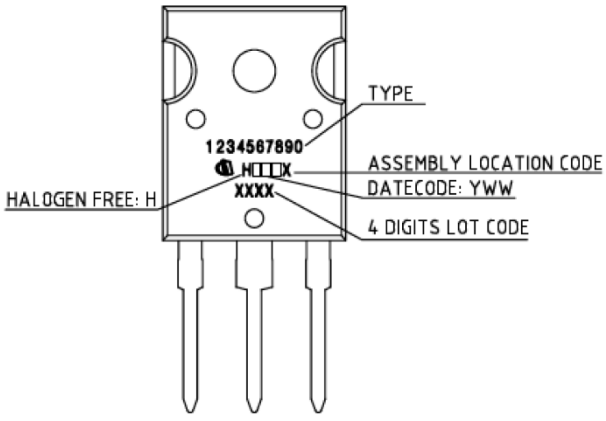
IGBTs, CoPACK

1.– GATE
2.– COLLECTOR
3.– EMITTER
4.– COLLECTOR

DIODES

1.– ANODE/OPEN
2.– CATHODE
3.– ANODE

TO-247AC 零件标识信息



TO-247AC 封装不建议用于表面贴装应用。

修订记录

Date	Rev.	Comments
2013-09-06	2.0	• Final data sheet
2024-12-05	2.1	• Update datasheet to Infineon format • Updated Part marking –page 8 • Added disclaimer on last page.

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Published by

Infineon Technologies AG

81726 München, Germany

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版本 **2026-11-04**

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德国 **Neubiberg 85579**

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