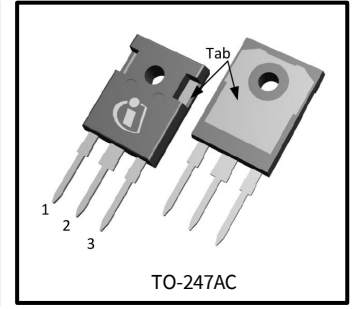
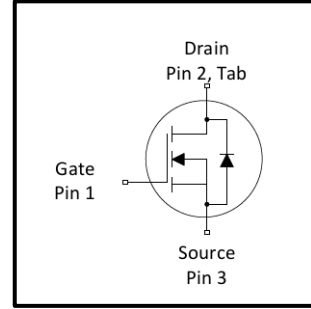


V_{DS}	60V
$R_{DS(on)}$ typ.	2.4m Ω
max.	3.0m Ω
I_D (Silicon Limited)	200A ^①
I_D (Package Limited)	120A



应用

- SMPS 中的高效同步整流
- 不间断电源
- 高速电源转换开关
- 硬开关和射频电路

优点

- TO-247封装中全球最佳RDS(on)
- 完全的特性化电容和雪崩 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	
IRFP3206PbF	TO-247	Tube	25	IRFP3206PbF

绝对最大额定值

Symbol	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Silicon Limited)	200 ^①	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Silicon Limited)	140 ^①	
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Wire Bond Limited)	120	
I_{DM}	Pulsed Drain Current ^②	840	
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	280	W
	Linear Derating Factor	1.9	W/ $^\circ\text{C}$
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ^④	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	$^\circ\text{C}$
	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	170	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 ^⑥	---	0.54	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Case-to-Sink, Flat Greased Surface	0.24	---	
$R_{\theta JA}$	Junction-to-Ambient ^{⑦⑧}	---	40	

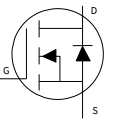
静态参数特性在 $T_J = 25^\circ\text{C}$ 时测得（除非另有规定）

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	60	---	---	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	---	0.07	---	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 5mA$ ②
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	---	2.4	3.0	m Ω	$V_{GS} = 10V, I_D = 75A$ ⑤
$V_{GS(th)}$	Gate Threshold Voltage	2.0	---	4.0	V	$V_{DS} = V_{GS}, I_D = 150\mu A$
I_{DSS}	Drain-to-Source Leakage Current	---	---	20	μA	$V_{DS} = 60V, V_{GS} = 0V$
		---	---	250		$V_{DS} = 48V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	---	---	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	---	---	-100		$V_{GS} = -20V$
R_G	Internal Gate Resistance	---	0.7	---	Ω	

动态 @ $T_J = 25^\circ\text{C}$ （除非另有说明）

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	210	---	---	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	---		$V_{DS} = 30V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	---	35	---		$V_{GS} = 10V$ ⑤
Q_g	Total Gate Charge Sync. ($Q_g - Q_{gd}$)	---	85	---		$I_D = 75A, V_{DS} = 0V, V_{GS} = 10V$
$t_{d(on)}$	Turn-On Delay Time	---	19	---	ns	$V_{DD} = 30V$
t_r	Rise Time	---	82	---		$I_D = 75A$
$t_{d(off)}$	Turn-Off Delay Time	---	55	---		$R_G = 2.7\Omega$
t_f	Fall Time	---	83	---		$V_{GS} = 10V$ ⑤
C_{iss}	Input Capacitance	---	6540	---	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	---	720	---		$V_{DS} = 50V$
C_{rss}	Reverse Transfer Capacitance	---	360	---		$f = 1.0\text{ MHz}$, See Fig. 5
$C_{oss\text{ eff. (ER)}}$	Effective Output Capacitance (Energy Related) ⑦	---	1040	---		$V_{GS} = 0V, V_{DS} = 0V$ to $48V$ ⑦ See Fig. 11
$C_{oss\text{ eff. (TR)}}$	Effective Output Capacitance (Time Related) ⑧	---	1230	---		$V_{GS} = 0V, V_{DS} = 0V$ to $48V$ ⑧ See Fig. 5

二极管特性

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	---	---	200①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ②	---	---	840		
V_{SD}	Diode Forward Voltage	---	---	1.3	V	$T_J = 25^\circ\text{C}, I_S = 75A, V_{GS} = 0V$ ⑤
t_{rr}	Reverse Recovery Time	---	33	50	ns	$T_J = 25^\circ\text{C}$
		---	37	56		$T_J = 125^\circ\text{C}$
Q_{rr}	Reverse Recovery Charge	---	41	62	nC	$T_J = 25^\circ\text{C}$ $V_R = 51V, I_F = 75A$
		---	53	80		$T_J = 125^\circ\text{C}$ $di/dt = 100A/\mu s$ ⑤
I_{RRM}	Reverse Recovery Current	---	2.1	---	A	$T_J = 25^\circ\text{C}$
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

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 $T_J = 25^\circ\text{C}$ 、 $L = 0.023\text{mH}$ 、 $R_G = 25\Omega$ 、 $I_{AS} = 120A$ 、 $V_{GS} = 10V$ 。不建议在高于此值的情况运行器件。
- ④ $ISD \leq 75A$, $di/dt \leq 400A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 175^\circ\text{C}$ 。
- ⑤ 脉冲宽度 $\leq 400\mu s$ ；占空比 $\leq 2\%$ 。
- ⑥ $C_{oss\text{ eff. (TR)}}$ 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 C_{oss} 相同。
- ⑦ $C_{oss\text{ eff. (ER)}}$ 是一个固定电容值，当 V_{DS} 从 0 上升至 $80\% V_{DSS}$ 时，其产生的热量与 C_{oss} 相同。
- ⑧ R_θ 在 T_J 约 90°C 时测得。
- ⑨ 安装在 1 英寸方形 PCB（FR-4 或 G-10 材料）上时。关于推荐的封装和焊接技术，请参阅应用笔记 #AN-0994。

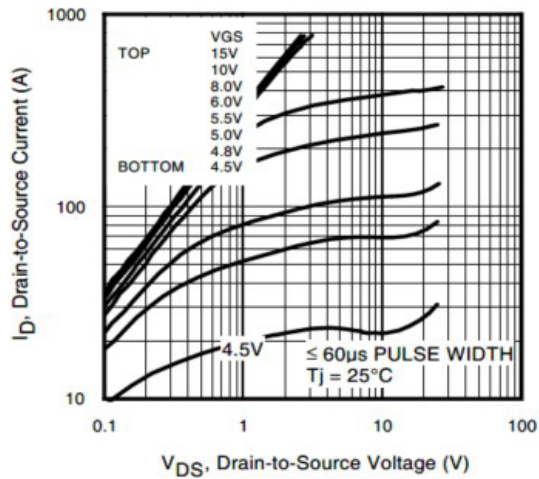


图 1. 典型输出特性

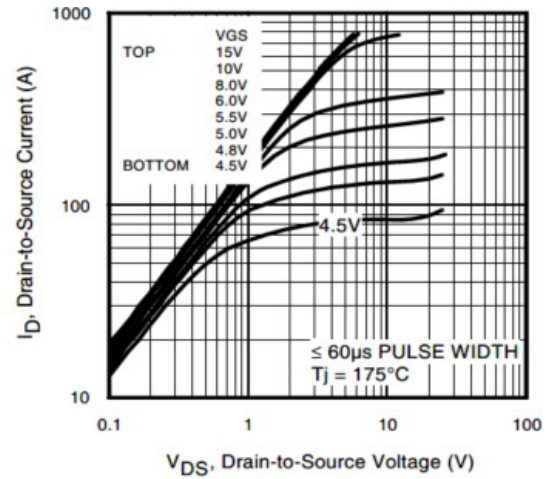


图 2. 典型输出特性

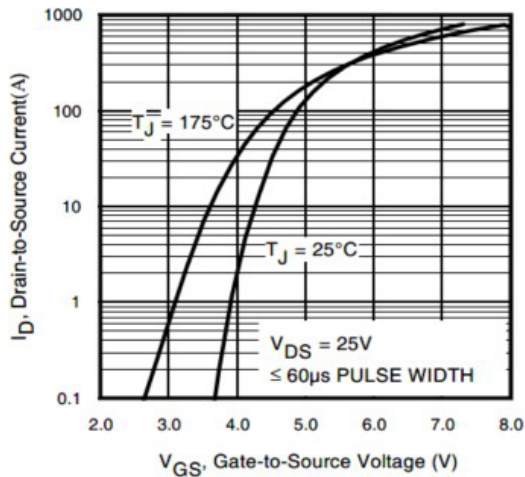


图 3. 典型转移特性

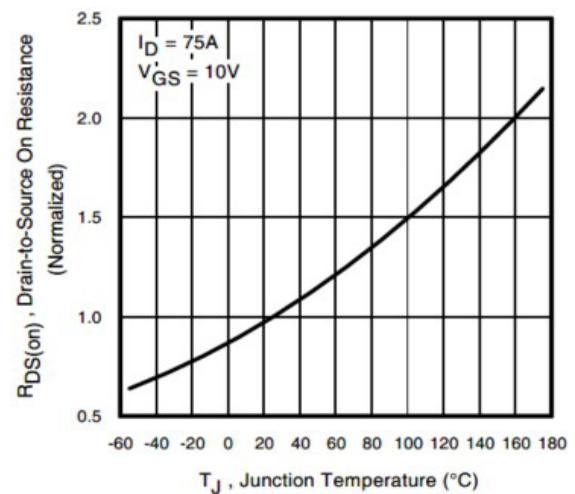


图 4. 归一化导通电阻与温度的关系

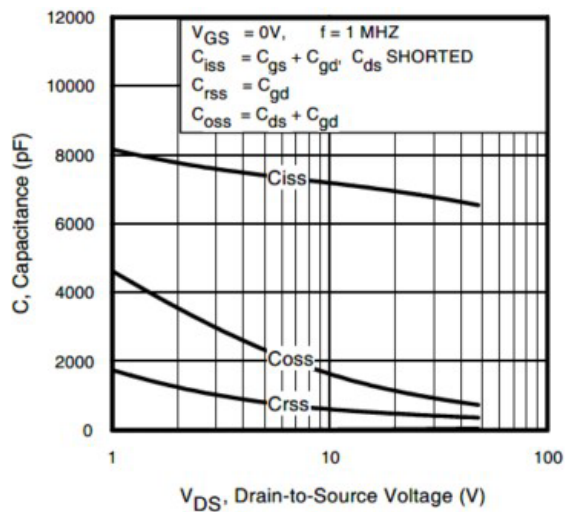


图 5. 典型电容与漏源电压关系曲线

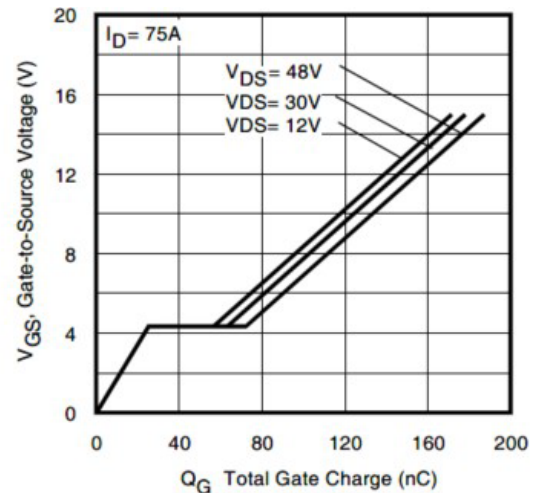


图 6. 典型栅极电荷与栅源电压关系曲线

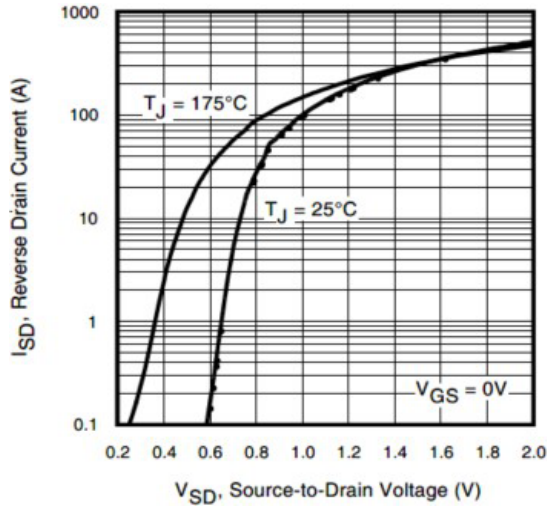


Fig 7. 典型源漏二极管正向电压

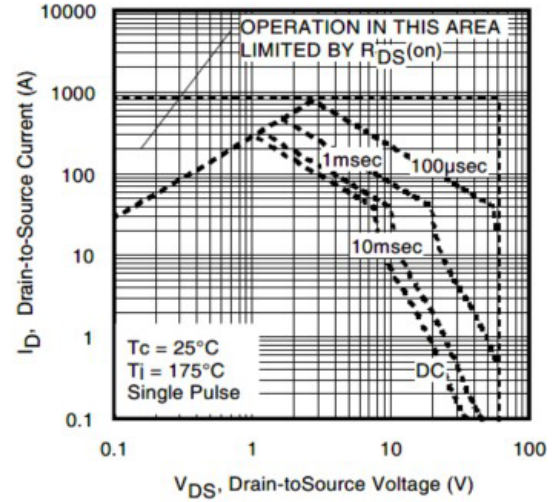


图 8. 最大安全工作区

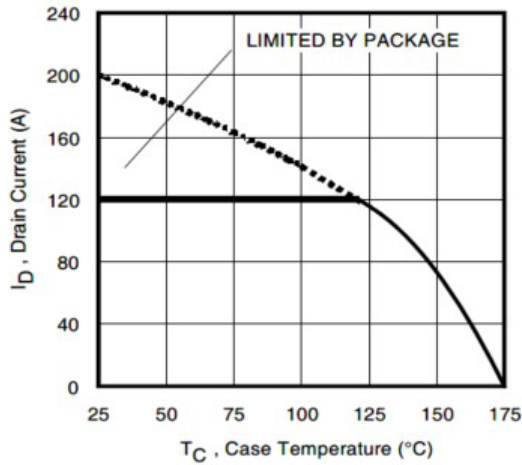


图 9. 最大漏极电流与壳温的关系

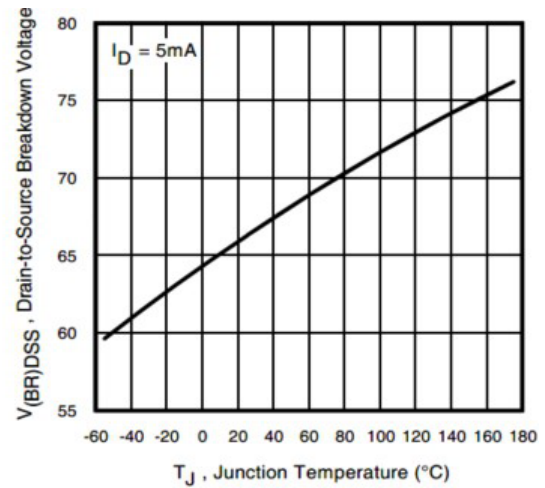


图 10. 漏源击穿电压

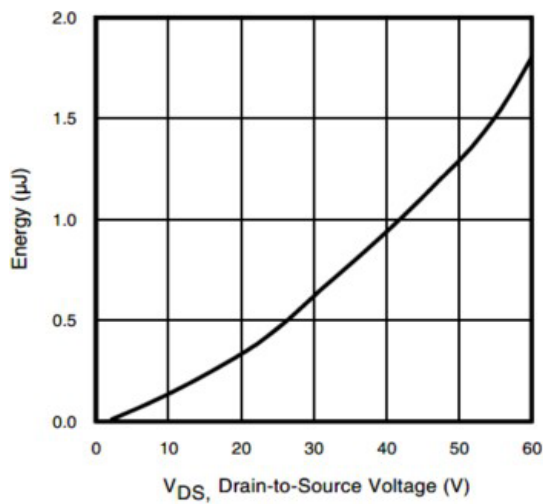
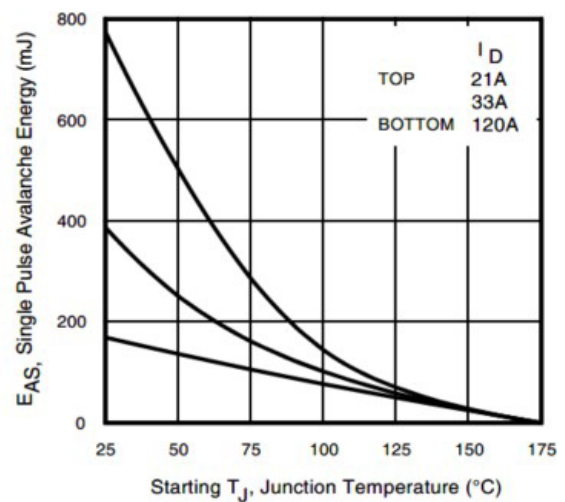
图 11. 典型 C_{oss} 存储能量

图 12c. 最大雪崩能量与漏极电流

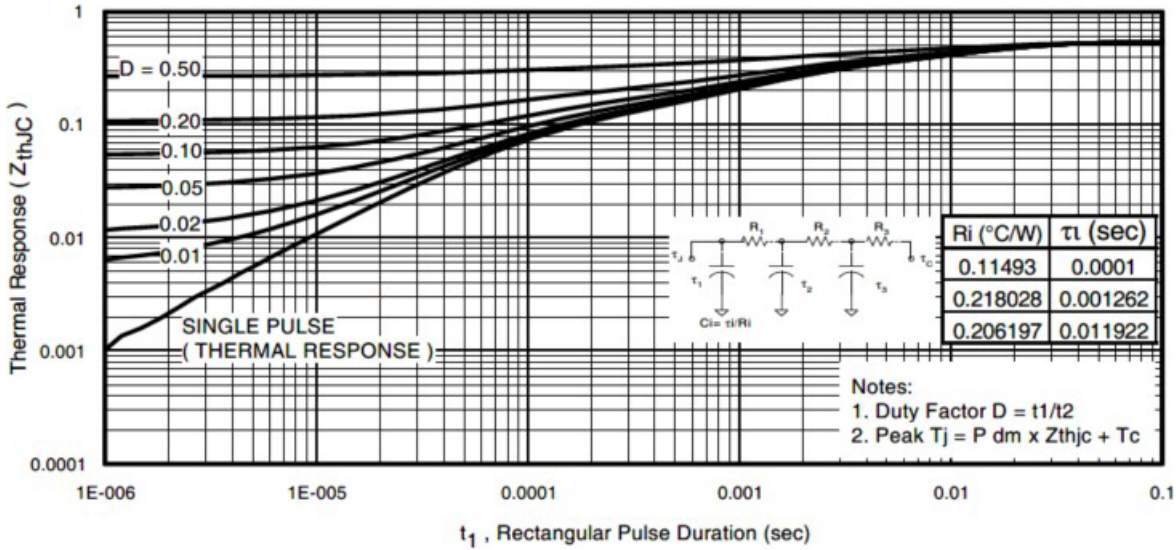


图 13. 最大有效瞬态热阻，结到壳

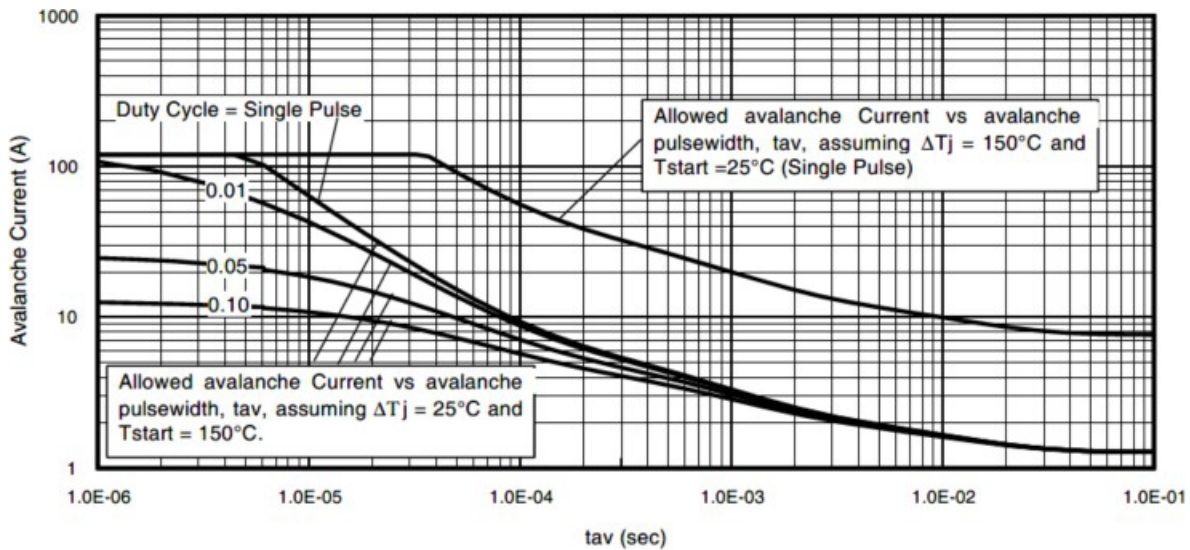


图 14. 典型雪崩电流与脉冲宽度

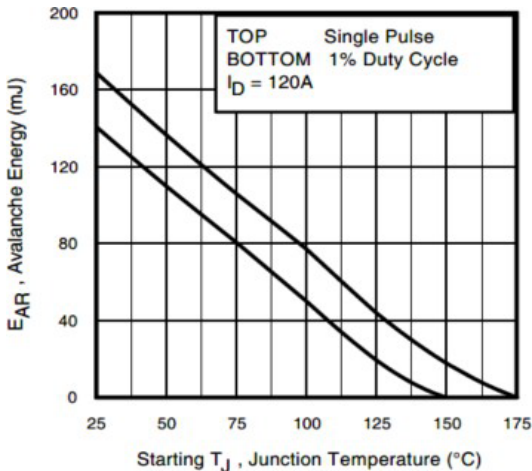


图 15. 最大雪崩能量与温度的关系曲线

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.infineon.cn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 T_{jmax} 的时候。这对每种零件类型都是有效的。

2. 只要不超过 T_{jmax} ，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 = 可允许的结温上升，不得超过 T_{jmax} （图 14、15 中假设为 25°C ）。

t_{av} = 雪崩的平均时间。

D = 雪崩占空比 = $t_{av} \cdot f$

$Z_{thJC}(D, t_{av})$ = 瞬态热阻，见图 13)

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

$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$

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

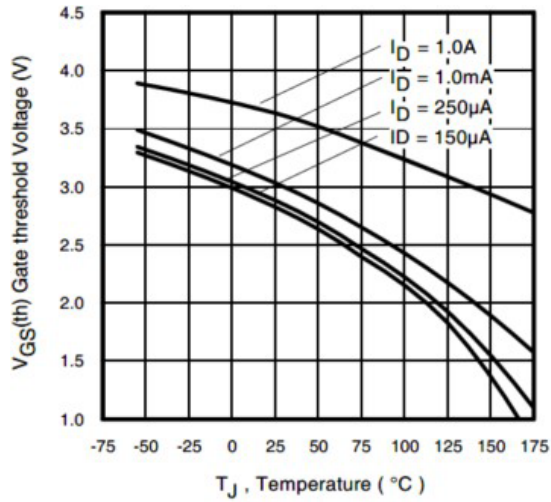
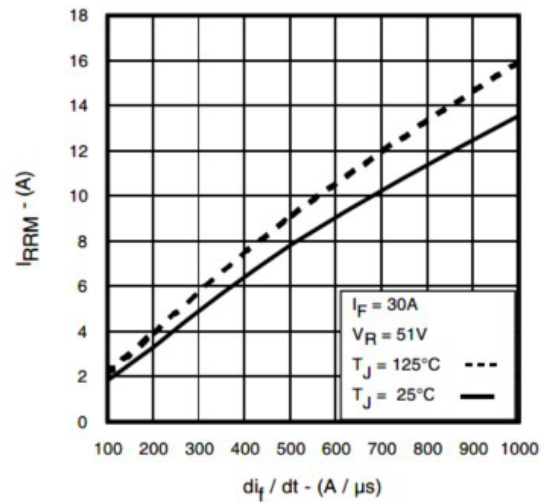
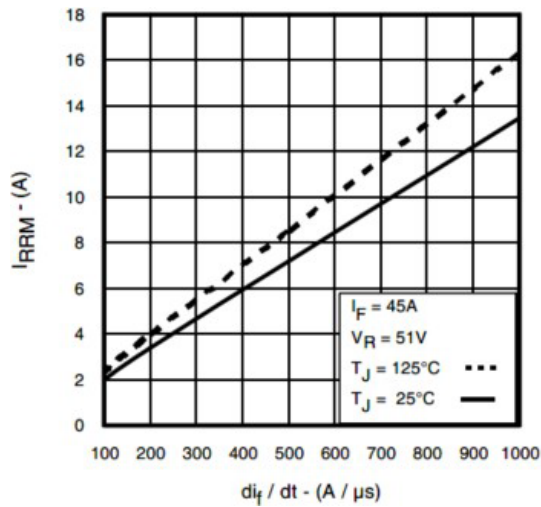
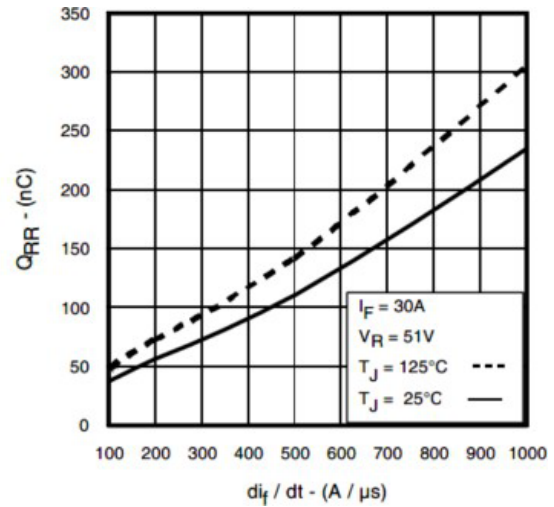
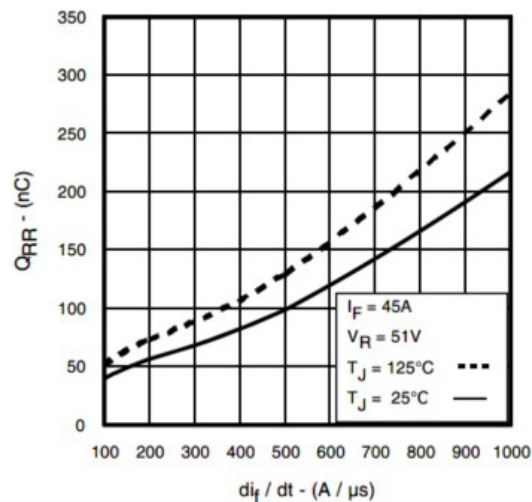


图 16 阈值电压与温度的关系曲线

图 17 典型恢复电流与 di_t/dt 图 18. 典型恢复电流与 di_t/dt 图 19. 典型存储电荷与 di_t/dt 图 20. 典型存储电荷与 di_t/dt

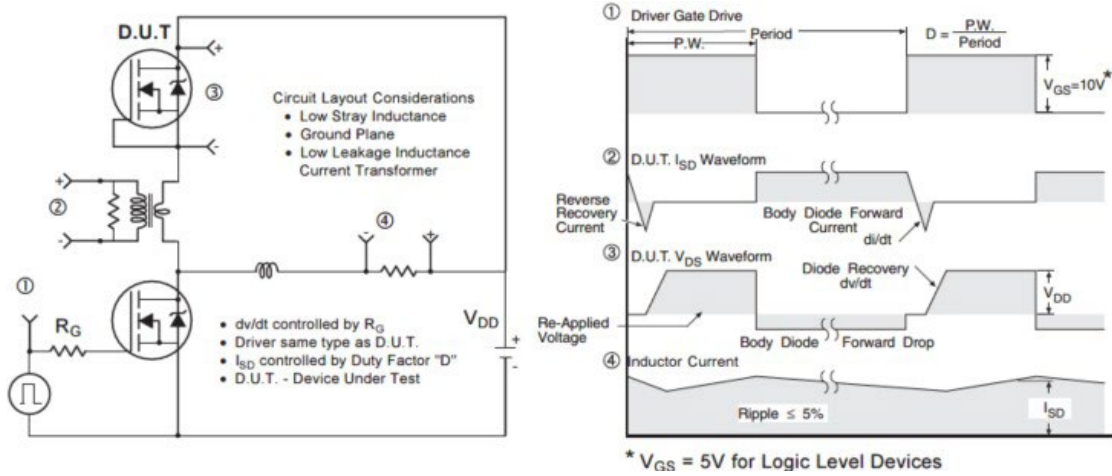


图 21. N 沟道 HEXFET® 功率 MOSFET 二极管峰值恢复 dv/dt 测试电路

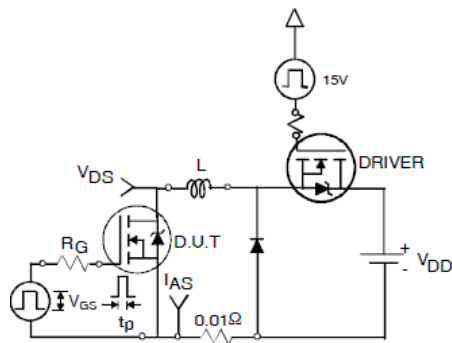


图 22a. 未钳位电感性测试电路

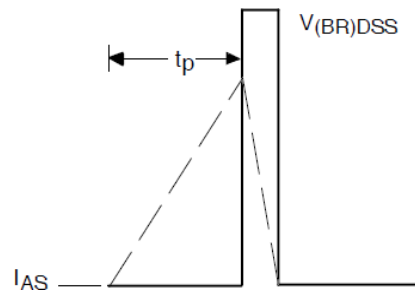


图 22b. 未钳位电感性电路测试波形

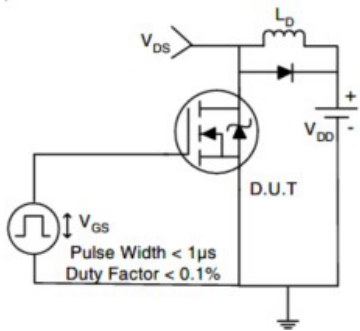


图 23a. 开关时间测试电路

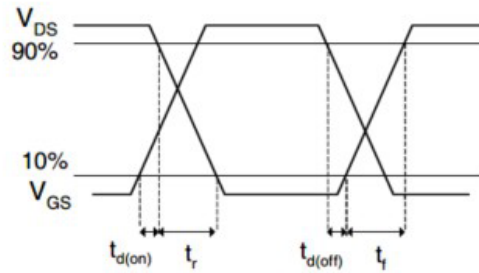


图 23b. 开关时间波形

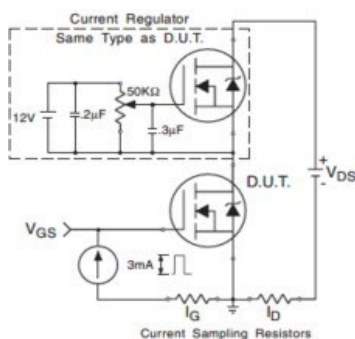


图 24a. 栅极电荷测试电路

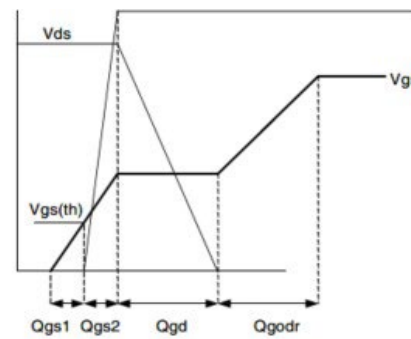
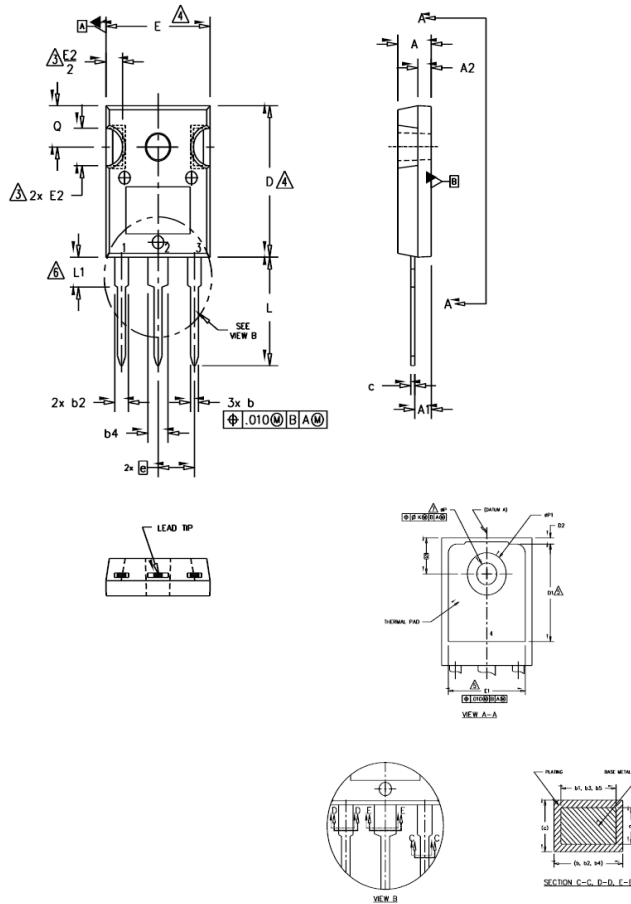


图 24b. 栅极电荷波形

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. #P 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	4
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	5
D	.776	.815	19.71	20.70	
D1	.515	-	13.08	-	
D2	.020	.053	0.51	1.35	
E	.602	.625	15.29	15.87	
E1	.530	-	13.46	-	4
E2	.178	.216	4.52	5.49	
e	.215 BSC		5.46 BSC		
ek	.010		0.25		
L	.559	.634	14.20	16.10	
L1	.146	.169	3.71	4.29	
#P	.140	.144	3.56	3.66	
#P1	-	.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

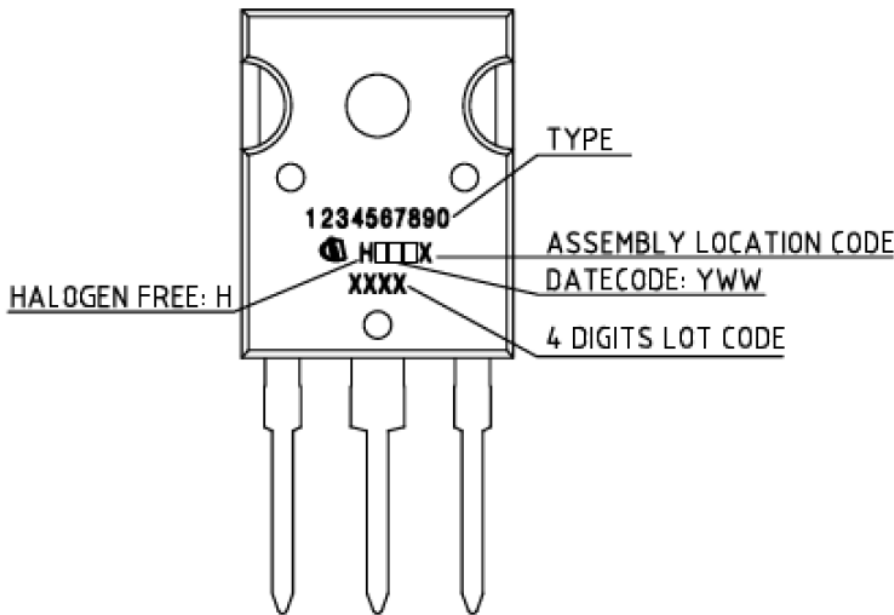
IGBTs, CoPACK

- 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
2024-12-04	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 2026-09-22

Infineon Technologies AG 出版，
德国 Neubiberg 85579

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