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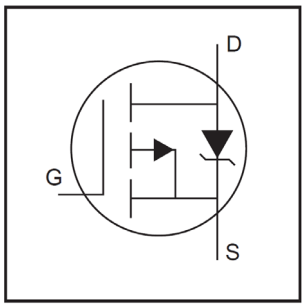
International
IOR Rectifier

PD -95314A

IRFR5410PbF
IRFU5410PbF

英飞凌HEXFET®功率MOSFET

- 超低导通电阻
- P沟道
- 表贴封装 (IRFR5410)
- 直插封装 (IRFU5410)
- 先进工艺技术
- 快速开关
- 雪崩完全额定
- 无铅



V_{DSS} = -100V

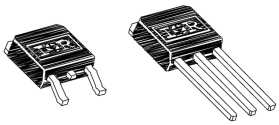
$R_{DS(on)}$ = 0.205Ω

I_D = -13A

描述

英飞凌国际整流器公司（International Rectifier）推出的第五代 HEXFET 采用先进的工艺技术，实现了单位硅面积极低的导通电阻。这一优点与 HEXFET 功率 MOSFET 众所周知的快速开关速度和坚固耐用的器件设计相结合，为设计人员提供了一种可用于各种应用的极为高效和可靠的器件。

D-PAK 封装专为表贴工艺设计，可兼容气相焊、红外焊或波峰焊工艺。直插封装（IRFU 系列）适用于通孔安装应用。在典型的表贴应用中，功耗最高可达 1.5 瓦。



D-Pak
TO-252AA

I-Pak
TO-251AA

绝对最大额定值

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ -10V	-13	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ -10V	-8.2	
I_{DM}	Pulsed Drain Current ①	-52	
P_D @T_C = 25°C	Power Dissipation	66	W
	Linear Derating Factor	0.53	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②	194	mJ
I_{AR}	Avalanche Current①	-8.4	A
E_{AR}	Repetitive Avalanche Energy①	6.3	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

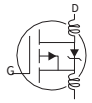
热阻

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	---	1.9	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)**	---	50	
$R_{\theta JA}$	Junction-to-Ambient	---	110	

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）。

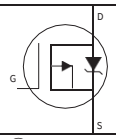
电气特性 @T_J = 25°C（除非另有说明）

	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	---	-0.12	---	V/°C	Reference to 25°C, I_D = -1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	---	---	0.205	Ω	V_{GS} = -10V, I_D = -7.8A ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	---	-4.0	V	V_{DS} = V_{GS}, I_D = -250μA
g_{fs}	Forward Transconductance	3.2	---	---	S	V_{DS} = -50V, I_D = -7.8A
I_{DSS}	Drain-to-Source Leakage Current	---	---	-25	μA	V_{DS} = -100V, V_{GS} = 0V
		---	---	-250		V_{DS} = -80V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	---	---	100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	---	---	-100		V_{GS} = -20V
Q_g	Total Gate Charge	---	---	58	nC	I_D = -8.4A V_{DS}
Q_{gs}	Gate-to-Source Charge	---	---	8.3		= -80V
Q_{gd}	Gate-to-Drain ("Miller") Charge	---	---	32		V_{GS} = -10V, See Fig. 6 and 13 ④⑥
$t_{d(on)}$	Turn-On Delay Time	---	15	---	ns	V_{DD} = 50V I_D
t_r	Rise Time	---	58	---		= -8.4A R_G =
$t_{d(off)}$	Turn-Off Delay Time	---	45	---		9.1Ω
t_f	Fall Time	---	46	---		R_D=6.2Ω, See Fig. 10 ④⑥
L_D	Internal Drain Inductance	---	4.5	---	nH	Between lead, 6mm (0.25in.) from package and center of die contact⑤
L_S	Internal Source Inductance	---	7.5	---		
C_{iss}	Input Capacitance	---	760	---	pF	V_{GS} = 0V V_{DS} = -25V
C_{oss}	Output Capacitance	---	260	---		f = 1.0MHz, See Fig. 5⑥
C_{rss}	Reverse Transfer Capacitance	---	170	---		



源极-漏极额定值与特性

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	---	---	-13	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	---	---	-52		
V_{SD}	Diode Forward Voltage	---	---	-1.6	V	T_J = 25°C, I_S = -7.8A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	---	130	190	ns	T_J = 25°C, I_F = -8.4A
Q_{rr}	Reverse Recovery Charge	---	650	970	nC	di/dt = 100A/μs ④⑥
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				



注：

① 重复额定值；脉冲宽度受最高结温限制。（见图11）

② 初始TJ = 25°C，L = 6.4mH R_G = 25Ω，IAS = -7.8A。（见图12）

③ I_{SD} ≤ -7.8A, di/dt ≤ 200A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C

④ 脉冲宽度 ≤ 300μs; 占空比 ≤ 2%。

⑤ 这适用于 I-PAK，D-PAK 的 LS 在引线和模具接触中心之间测量。

⑥ 使用IRF9530N 数据和测试条件。

**安装在 1 英寸方形 PCB（FR-4 或 G-10 材料）上时。
有关推荐的占位面积和焊接技术，请参阅应用说明 #AN-994。

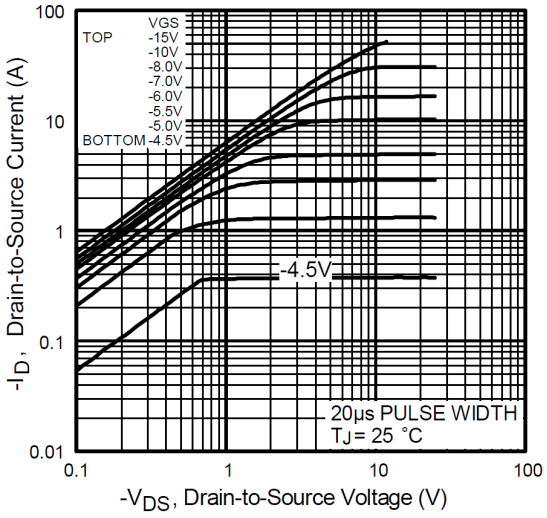


Fig 1. Typical Output Characteristics

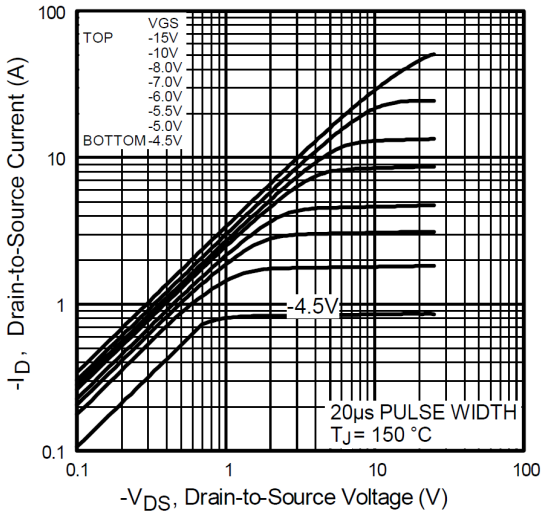


Fig 2. Typical Output Characteristics

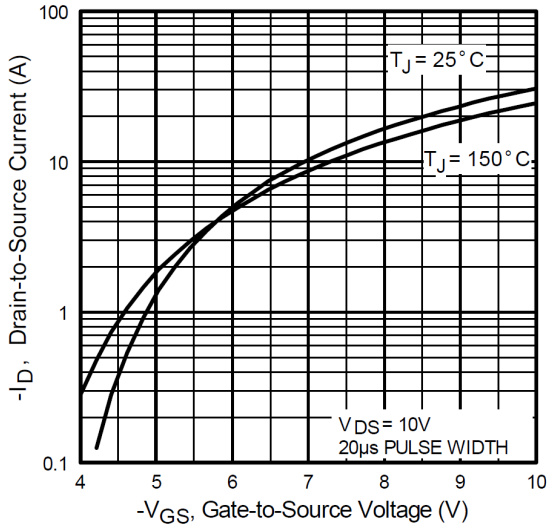


Fig 3. Typical Transfer Characteristics

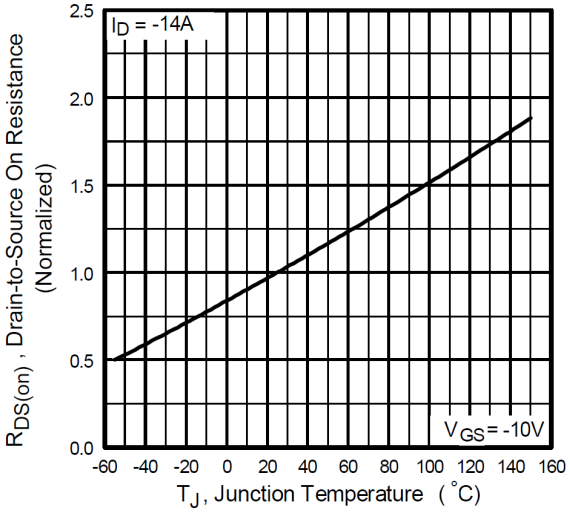


Fig 4. Normalized On-Resistance Vs. Temperature

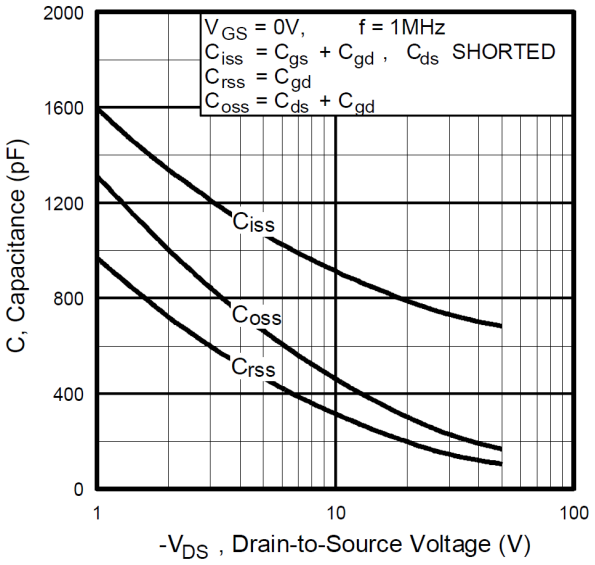


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

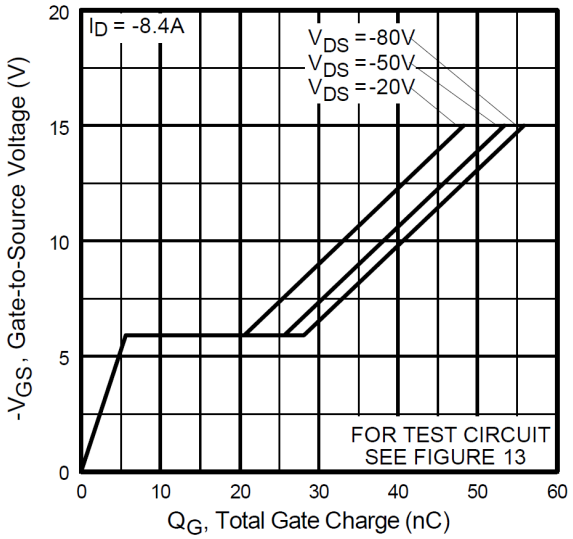


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

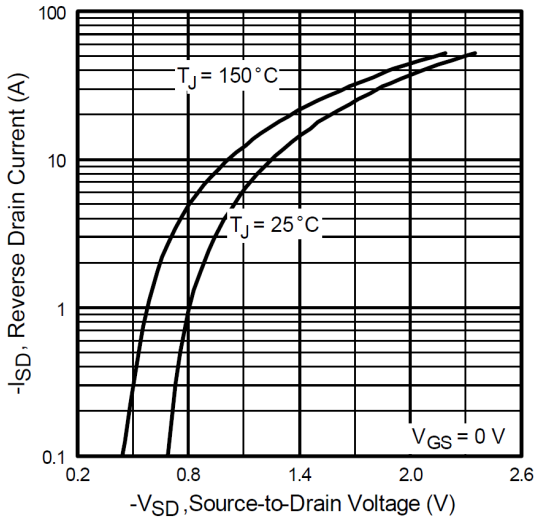


Fig 7. Typical Source-Drain Diode Forward Voltage

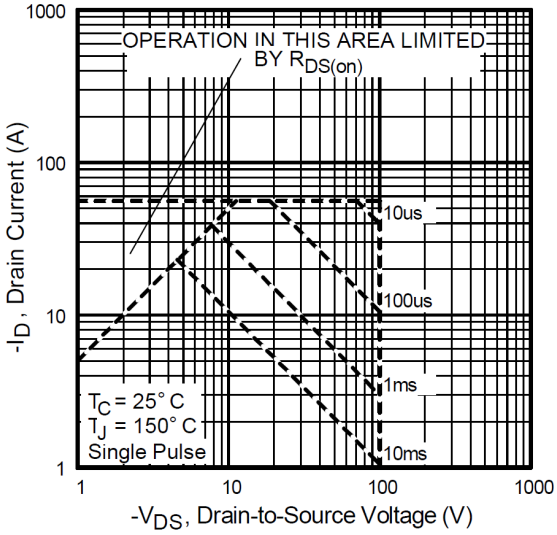


Fig 8. Maximum Safe Operating Area

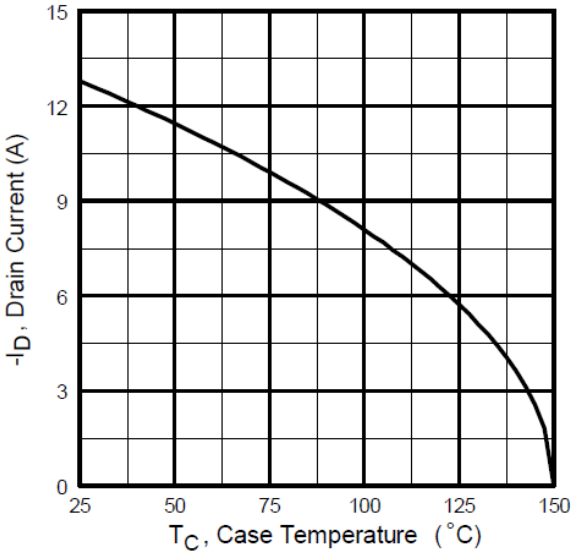


Fig 9. Maximum Drain Current Vs. Case Temperature

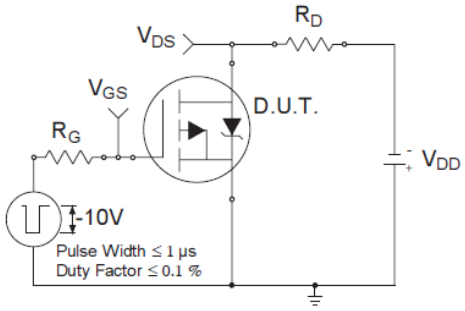


Fig 10a. Switching Time Test Circuit

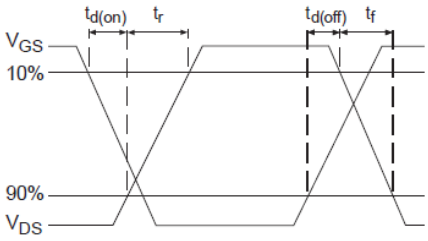
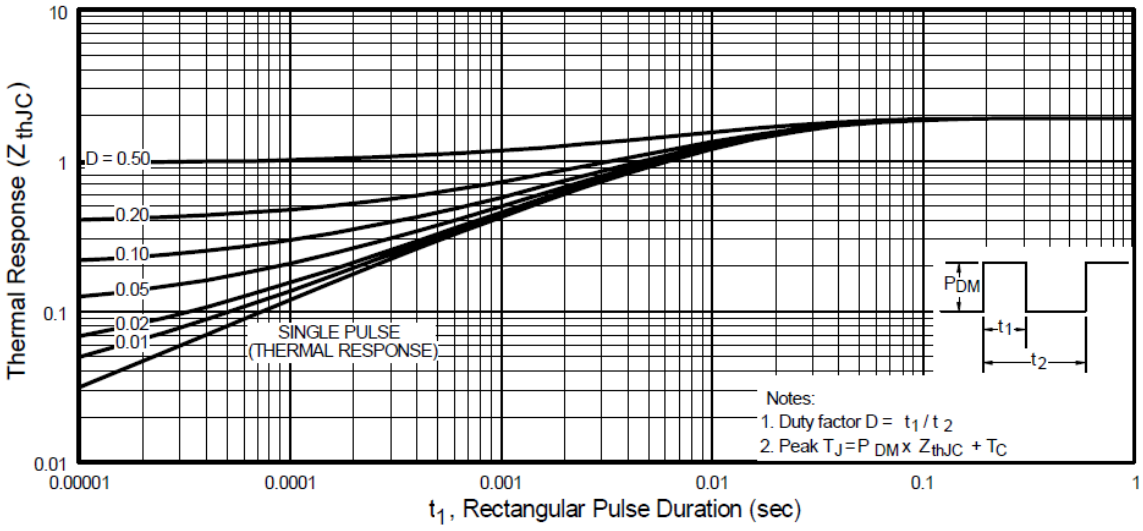


Fig 10b. Switching Time Waveforms



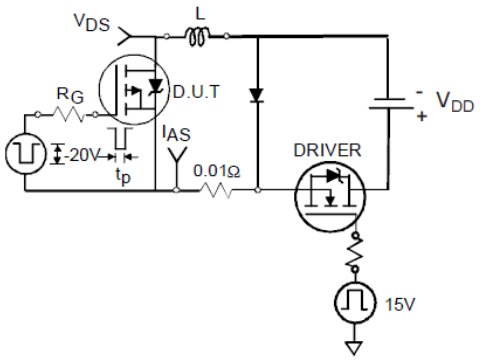


Fig 12a. Unclamped Inductive Test Circuit

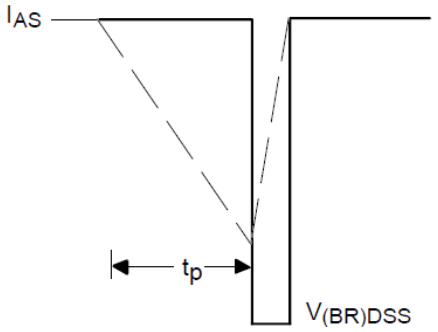


Fig 12b. Unclamped Inductive Waveforms

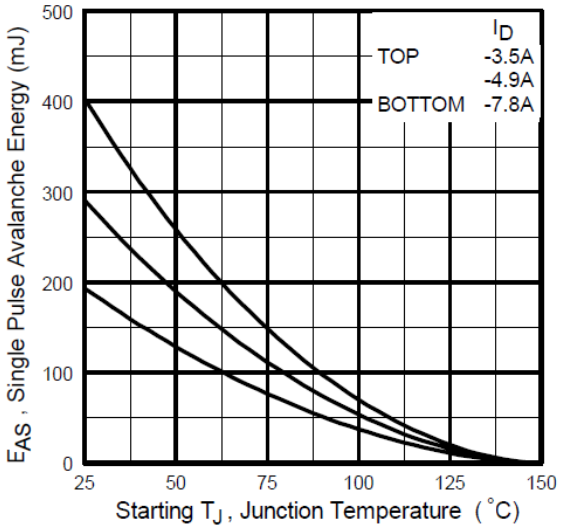


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

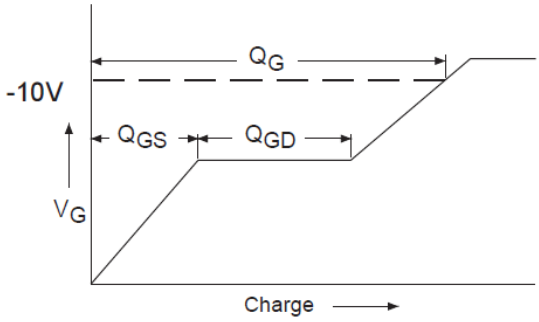


Fig 13a. Basic Gate Charge Waveform

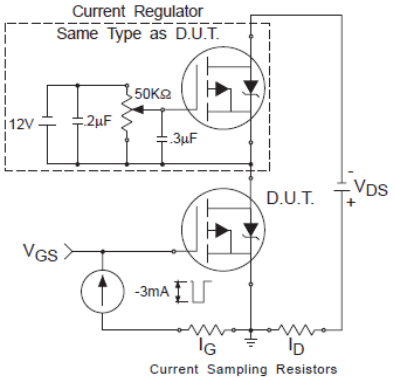
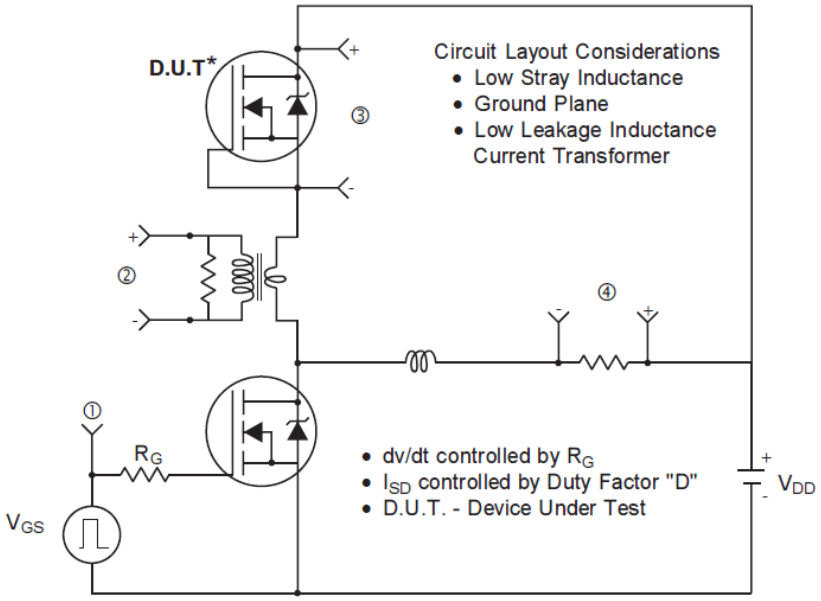
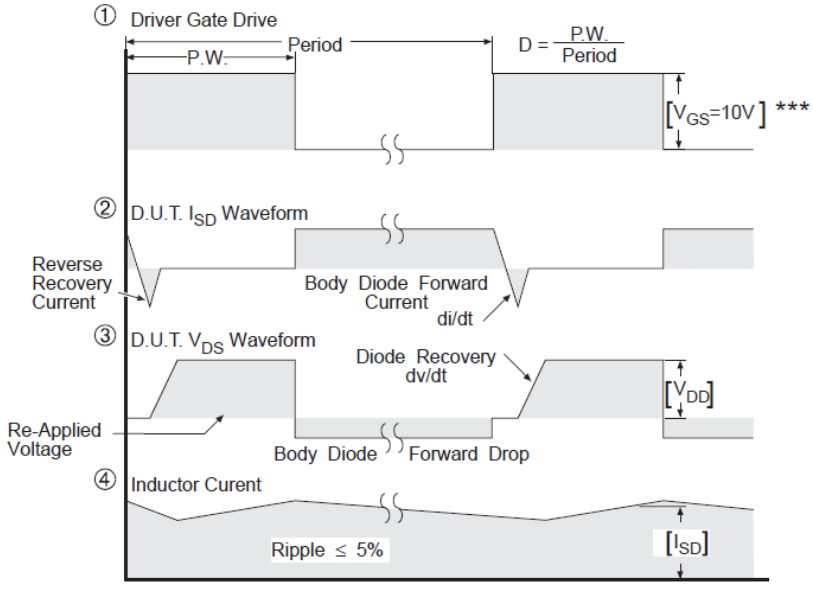


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity of D.U.T for P-Channel

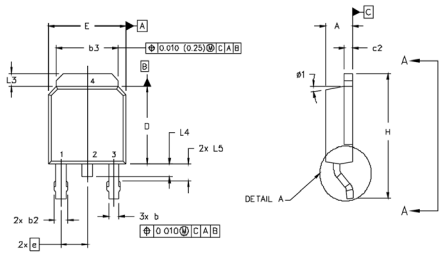


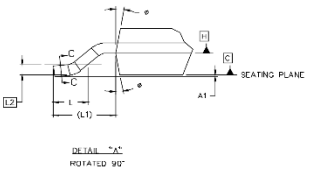
*** V_{GS} = 5.0V for Logic Level and 3V Drive Devices

Fig 14. For P-Channel HEXFETS

D-Pak (T0-252AA) 封装外形

尺寸以毫米（英寸）为单位





NOTES:

1.0 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
2.0 DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3.0 LEAD DIMENSION UNCONTROLLED IN L5
4.0 DIMENSION D1 AND E1 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
5.0 SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 [0.127] AND .010 [0.2540 FROM THE LEAD TIP.
6.0 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.
7.0 OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	.086	.094	
A1		0.13		.005	
b	0.64	0.89	.025	.035	5
b1	0.64	0.79	.025	0.031	5
b2	0.76	1.14	.030	.045	
b3	4.95	5.46	.195	.215	
c	0.46	0.61	.018	.024	5
c1	0.41	0.56	.016	.022	5
c2	.046	0.89	.018	.035	5
D	5.97	6.22	.235	.245	6
D1	5.21	-	.205	-	4
E	6.35	6.73	.250	.265	6
E1	4.32	-	.170		4
e	2.29		.090 BSC		
H	9.40	10.41	.370	.410	
L	1.40	1.78	.055	.070	
L1	2.74 REF.		.108 REF.		
L2	0.051 BSC		.020 BSC		
L3	0.89	1.27	.035	.050	
L4		1.02		.040	
L5	1.14	1.52	.045	.060	3
ø	0°	10°	0°	10°	
ø1	0°	15°	0°	15°	

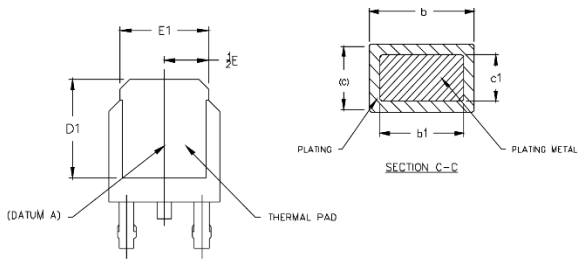
LEAD ASSIGNMENTS

HEXFET

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

IGBTs, CoPACK

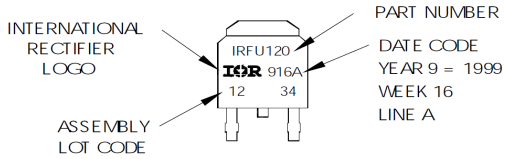
1.- GATE
2.- COLLECTOR
3.- EMITTER
4.- COLLECTOR



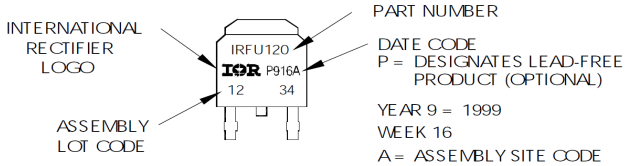
D-Pak (T0-252AA) 零件信息标识

EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 1999
IN THE ASSEMBLY LINE "A"

Note: "P" in assembly line position
indicates "Lead-Free"

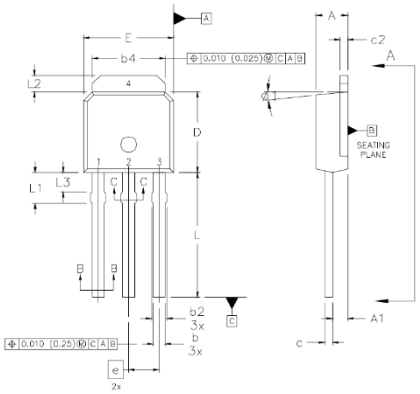


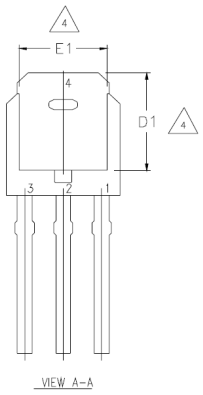
OR



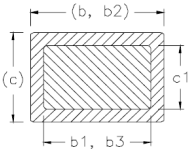
I-Pak (T0-251AA) Package 0utline

尺寸以毫米（英寸）为单位





VIEW A–A



SECTION A–A

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5 M– 1994.
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
4. THERMAL PAD CONTOUR OPTION WITHIN DIMENSION b4, L2, E1 & D1.
5. LEAD DIMENSION UNCONTROLLED IN L3.
6. DIMENSION b1, b3 APPLY TO BASE METAL ONLY.
7. OUTLINE CONFORMS TO JEDEC OUTLINE TO-251AA.
8. CONTROLLING DIMENSION : INCHES.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	0.086	.094	
A1	0.89	1.14	0.035	0.045	
b	0.64	0.89	0.025	0.035	
b1	0.64	0.79	0.025	0.031	4
b2	0.76	1.14	0.030	0.045	
b3	0.76	1.04	0.030	0.041	
b4	5.00	5.46	0.195	0.215	4
c	0.46	0.61	0.018	0.024	
c1	0.41	0.56	0.016	0.022	
c2	.046	0.86	0.018	0.035	
D	5.97	6.22	0.235	0.245	3, 4
D1	5.21	–	0.205	–	4
E	6.35	6.73	0.250	0.265	3, 4
E1	4.32	–	0.170	–	4
e	2.29		0.090 BSC		
L	8.89	9.60	0.350	0.380	
L1	1.91	2.29	0.075	0.090	
L2	0.89	1.27	0.035	0.050	4
L3	1.14	1.52	0.045	0.060	5
ø1	0°	15°	0°	15°	

LEAD ASSIGNMENTS

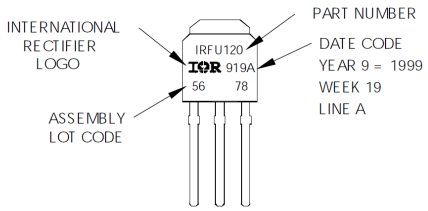
HEXFET

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

I-Pak (T0-251AA) 零件信息标识

EXAMPLE: THIS IS AN IRFU120
WITH ASSEMBLY
LOT CODE 5678
ASSEMBLED ON WW 19, 1999
IN THE ASSEMBLY LINE "A"

Note: "P" in assembly line position indicates "Lead-Free"

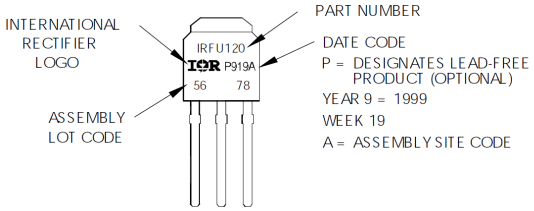


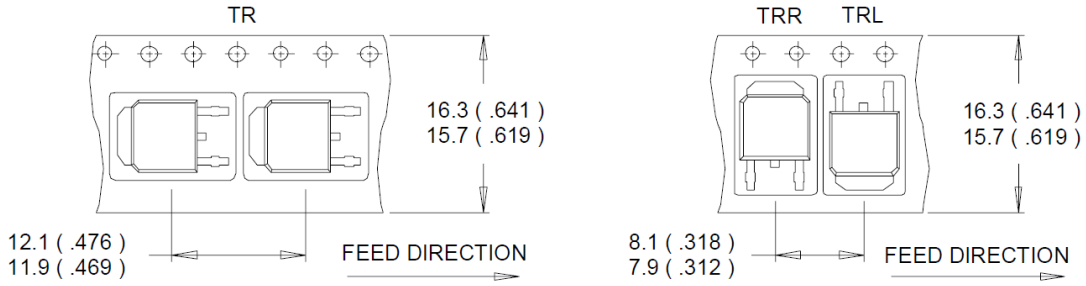
D-Pak (T0-252AA)

注:

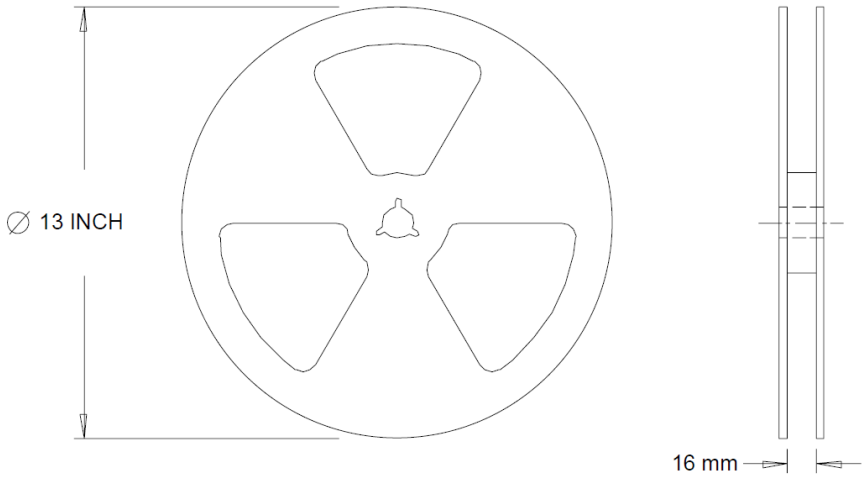
1. CONTROL
2. ALL DIMEN
3. OUTLINE (

OR





NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES :
1. OUTLINE CONFORMS TO EIA-481.

Data and specifications subject to change without notice.

International
IOR Rectifier

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