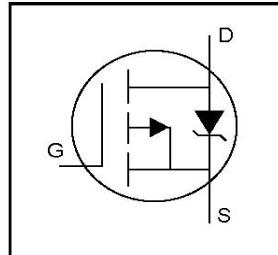


International **IR** Rectifier

PD - 96182

IRFR5505GPbF IRFU5505GPbF

- Ultra Low On-Resistance
- P-Channel
- Surface Mount (IRFR5505)
- Straight Lead (IRFU5505)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated
- Lead-Free
- Halogen-Free

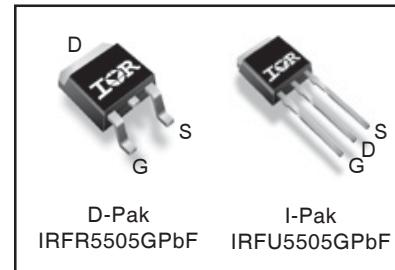


$V_{DSS} = -55V$
 $R_{DS(on)} = 0.11\Omega$
 $I_D = -18A$

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The D-Pak is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version (IRFU series) is for through-hole mounting applications. Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.



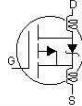
Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$	-18	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$	-11	
I_{DM}	Pulsed Drain Current ①	-64	
$P_D @ T_C = 25^\circ C$	Power Dissipation	57	W
	Linear Derating Factor	0.45	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy ②	150	mJ
I_{AR}	Avalanche Current ①	-9.6	A
E_{AR}	Repetitive Avalanche Energy ①	5.7	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.0	V/ns
T_J	Operating Junction and	-55 to + 150	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

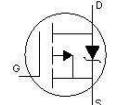
Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	2.2	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)**	—	50	
$R_{\theta JA}$	Junction-to-Ambient	—	110	

Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-55	---	---	V	$V_{GS} = 0V, I_D = -250\mu\text{A}$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	---	-0.049	---	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = -1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	---	---	0.11	Ω	$V_{GS} = -10V, I_D = -9.6\text{A}$ ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	---	-4.0	V	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$
g_{fs}	Forward Transconductance	4.2	---	---	S	$V_{DS} = -25V, I_D = -9.6\text{A}$
I_{DSS}	Drain-to-Source Leakage Current	---	---	-25	μA	$V_{DS} = -55V, V_{GS} = 0V$
		---	---	-250	μA	$V_{DS} = -44V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	---	---	-100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	---	---	100	nA	$V_{GS} = -20V$
Q_g	Total Gate Charge	---	---	32	nC	$I_D = -9.6\text{A}$
Q_{gs}	Gate-to-Source Charge	---	---	7.1	nC	$V_{DS} = -44V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	---	---	15	nC	$V_{GS} = -10V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	---	12	---	ns	$V_{DD} = -28V$
t_r	Rise Time	---	28	---		$I_D = -9.6\text{A}$
$t_{d(off)}$	Turn-Off Delay Time	---	20	---		$R_G = 2.6\Omega$
t_f	Fall Time	---	16	---		$R_D = 2.8\Omega$, See Fig. 10 ④
L_D	Internal Drain Inductance	---	4.5	---	nH	Between lead, 6mm (0.25in.) from package and center of die contact ⑤
L_S	Internal Source Inductance	---	7.5	---		
C_{iss}	Input Capacitance	---	650	---	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	---	270	---		$V_{DS} = -25V$
C_{rss}	Reverse Transfer Capacitance	---	120	---		$f = 1.0\text{MHz}$, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	---	---	-18	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	---	---	-64		
V_{SD}	Diode Forward Voltage	---	---	-1.6	V	$T_J = 25^\circ\text{C}, I_S = -9.6\text{A}, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	---	51	77	ns	$T_J = 25^\circ\text{C}, I_F = -9.6\text{A}$
Q_{rr}	Reverse Recovery Charge	---	110	160	nC	$di/dt = 100\text{A}/\mu\text{s}$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② Starting $T_J = 25^\circ\text{C}$, $L = 3.2\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = -9.6\text{A}$. (See Figure 12)
- ③ $I_{SD} \leq -9.6\text{A}$, $di/dt \leq 290\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$

④ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.

⑤ This is applied for I-PAK, L_S of D-PAK is measured between lead and center of die contact

** When mounted on 1" square PCB (FR-4 or G-10 Material) .

For recommended footprint and soldering techniques refer to application note #AN-994

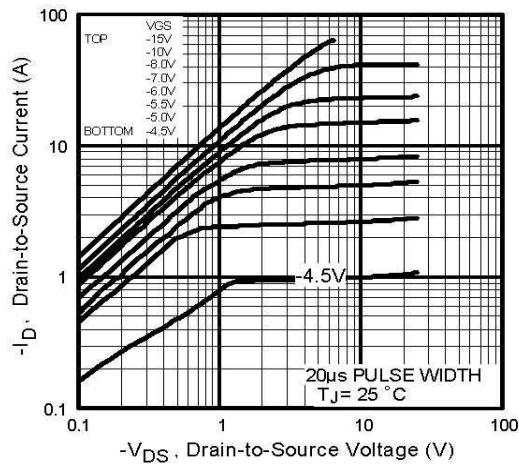


Fig 1. Typical Output Characteristics

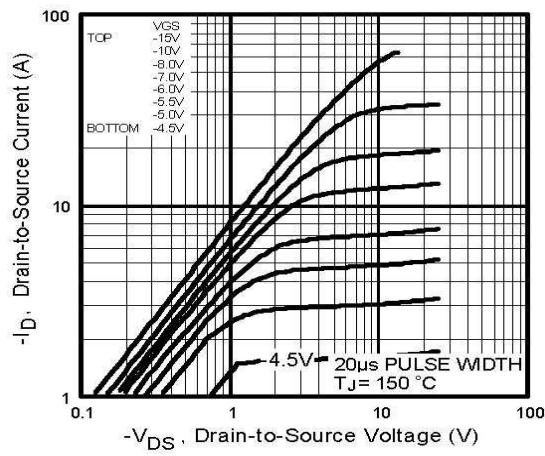


Fig 2. Typical Output Characteristics

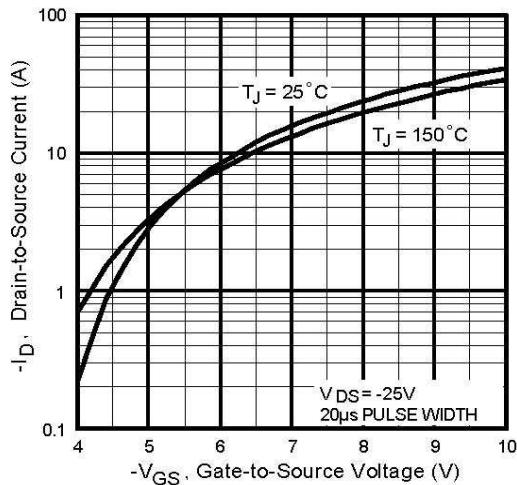


Fig 3. Typical Transfer Characteristics
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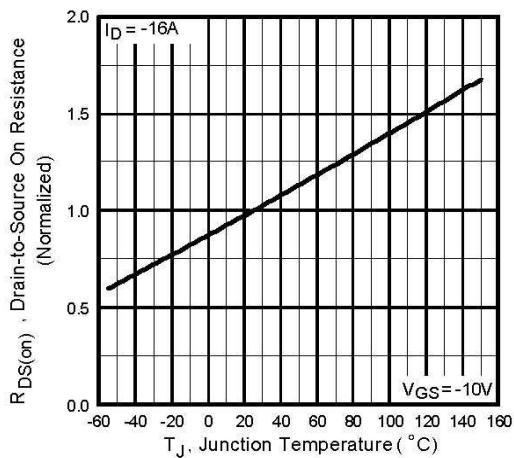


Fig 4. Normalized On-Resistance
Vs. Temperature

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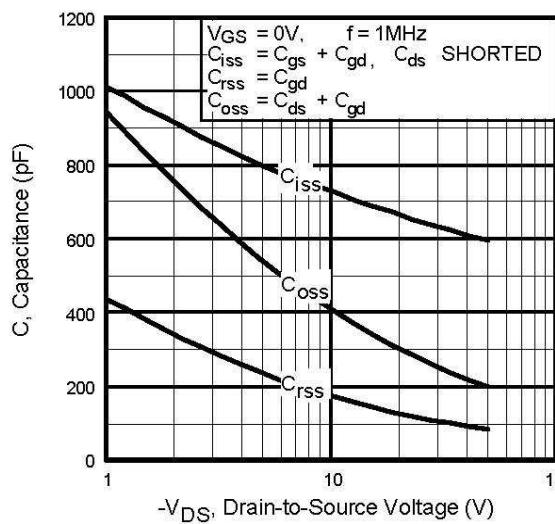


Fig 5. Typical Capacitance Vs.
Drain-to-Source Voltage

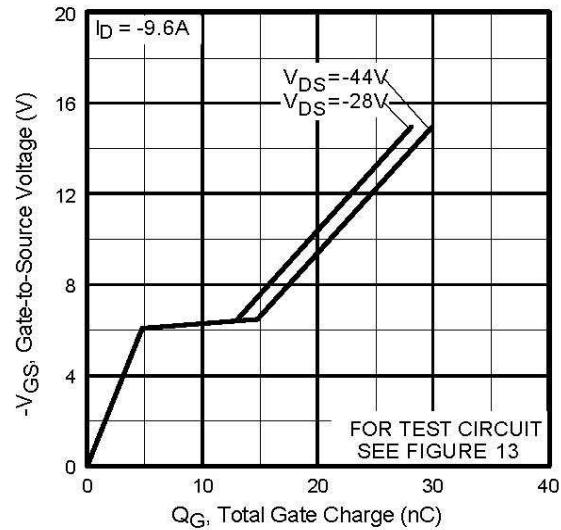


Fig 6. Typical Gate Charge Vs.
Gate-to-Source Voltage

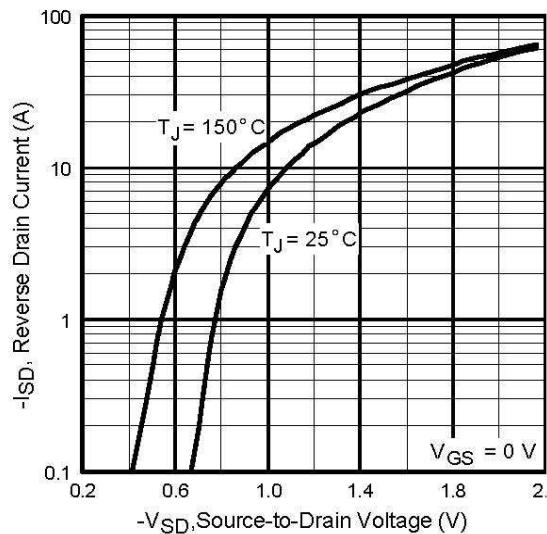


Fig 7. Typical Source-Drain Diode
Forward Voltage

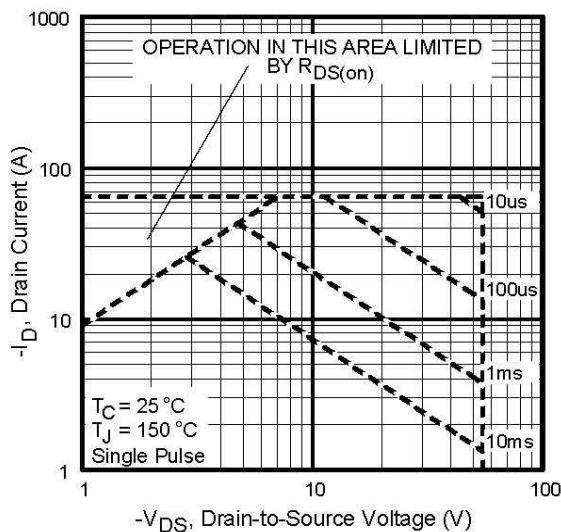


Fig 8. Maximum Safe Operating Area

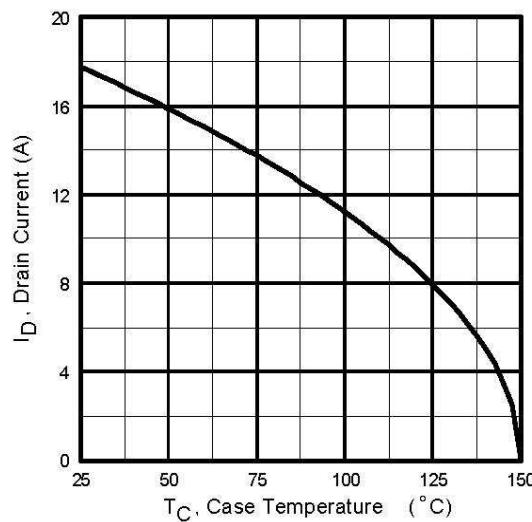


Fig 9. Maximum Drain Current Vs.
Case Temperature

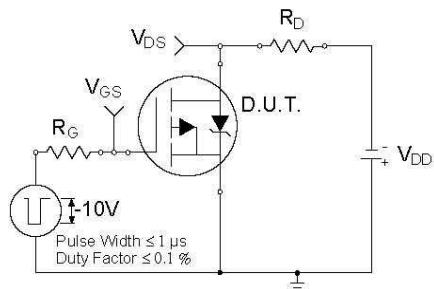


Fig 10a. Switching Time Test Circuit

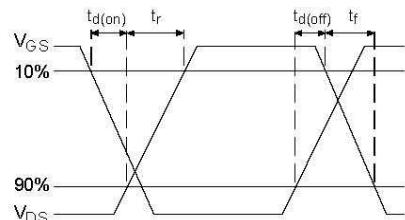


Fig 10b. Switching Time Waveforms

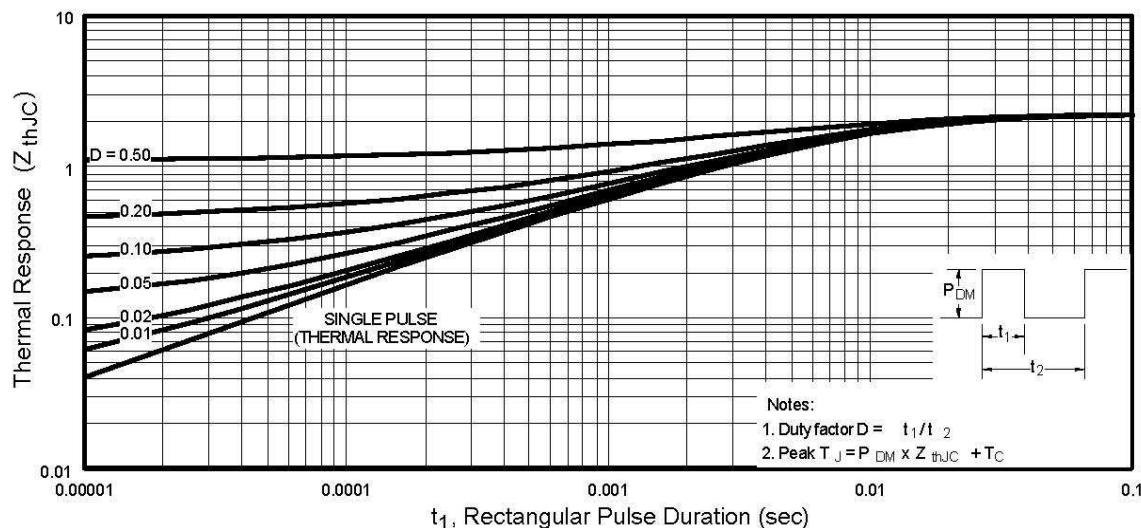


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case
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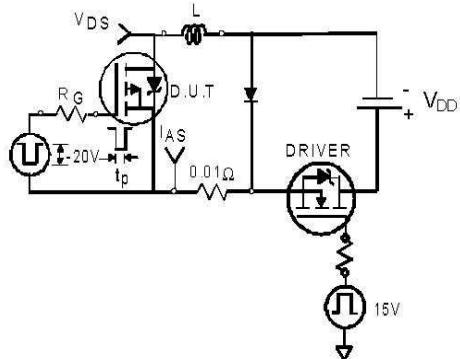


Fig 12a. Unclamped Inductive Test Circuit

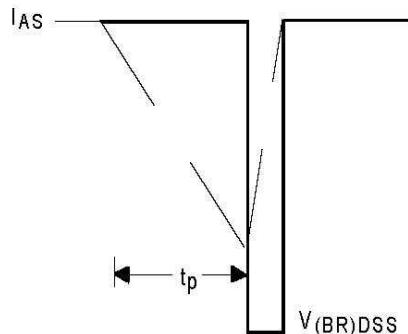


Fig 12b. Unclamped Inductive Waveforms

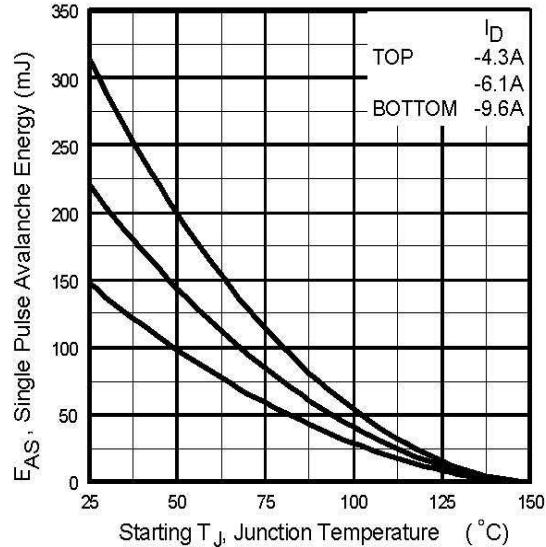


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

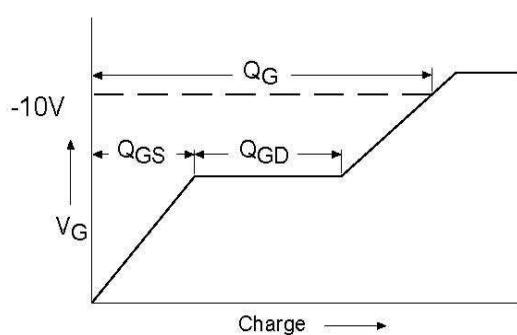


Fig 13a. Basic Gate Charge Waveform

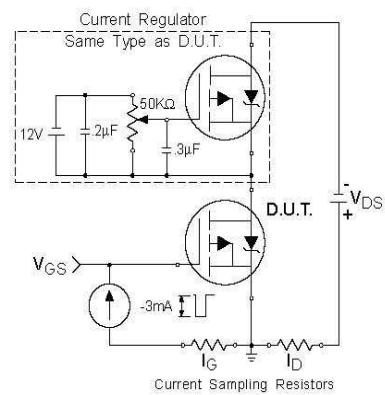
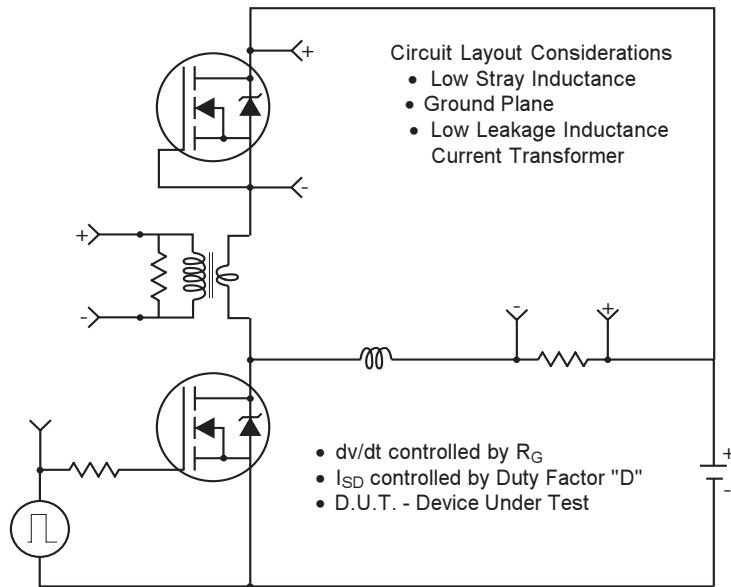


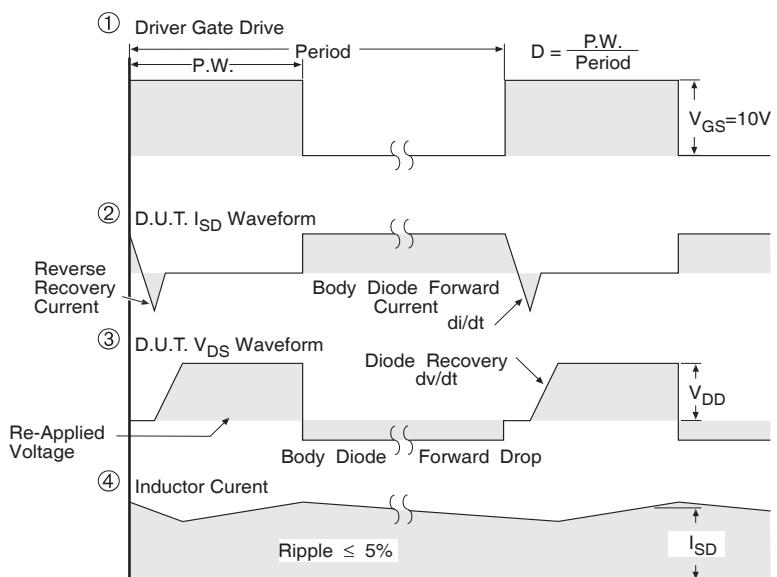
Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity for P-Channel

** Use P-Channel Driver for P-Channel Measurements



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

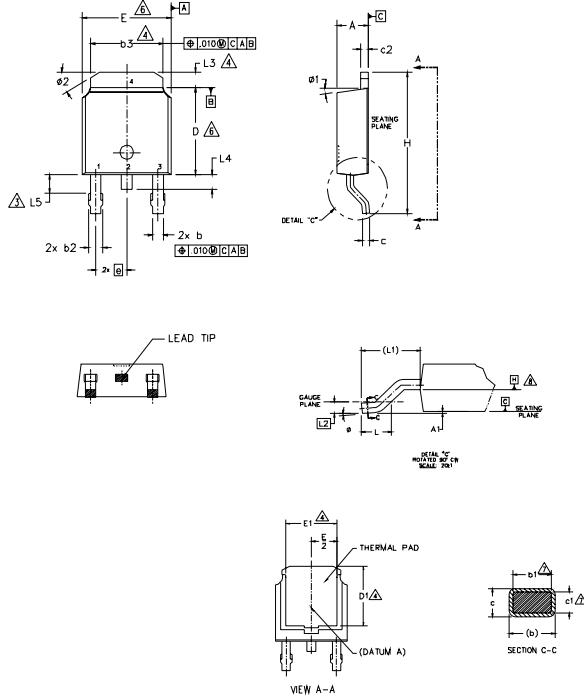
Fig 14 For P Channel HEXFETs

IRFR/U5505GPbF

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D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSION ARE SHOWN IN INCHES [MILLIMETERS].
3. LEAD DIMENSION UNCONTROLLED IN L5.
4. DIMENSION D1, E1, L3 & b3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
5. SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 AND 0.10 [0.13 AND 0.25] FROM THE LEAD TIP.
6. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005 [0.13] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
7. DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.
8. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
9. OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

S Y M B O O L	DIMENSIONS		N O T E S
	MILLIMETERS	INCHES	
	MIN.	MAX.	
A	2.18	2.39	.086 .094
A1	—	0.13	— .005
b	0.64	0.89	.025 .035
b1	0.65	0.79	.025 .031
b2	0.76	1.14	.030 .045
b3	4.95	5.46	.195 .215
c	0.46	0.61	.018 .024
c1	0.41	0.56	.016 .022
c2	0.46	0.89	.018 .035
D	5.97	6.22	.235 .245
D1	5.21	—	.205 —
E	6.35	6.73	.250 .265
E1	4.32	—	.170 —
e	2.29 BSC	.090 BSC	
H	9.40	10.41	.370 .410
L	1.40	1.78	.055 .070
L1	2.74 BSC	.108 REF.	
L2	0.51 BSC	.020 BSC	
L3	0.89	1.27	.035 .050
L4	—	1.02	— .040
L5	1.14	1.52	.045 .060
ø	0"	10"	0" 10"
ø1	0"	15"	0" 15"
ø2	25"	35"	25" 35"

LEAD ASSIGNMENTS

HEXFET

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

IGBT & CoPAK

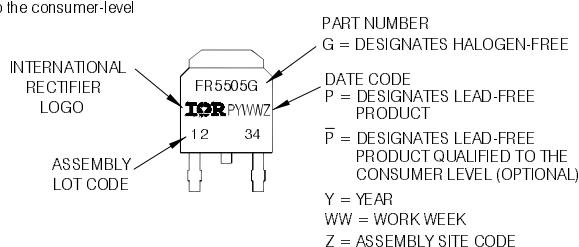
1. GATE
2. COLLECTOR
3. Emitter
4. COLLECTOR

D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR5505GPBF

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

\bar{P} in assembly line position indicates
'Lead-Free' qualification to the consumer-level

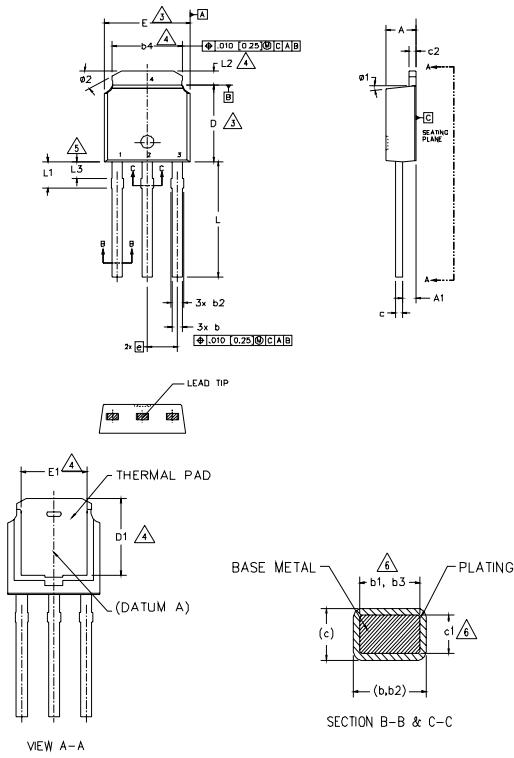


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

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IR Rectifier

I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)



IRFR/U5505GPbF

- 1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
- 2.- DIMENSION ARE SHOWN IN INCHES [MILLIMETERS].
- ⚠ DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005 [0.13] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
- ⚠ THERMAL PAD CONTOUR OPTION WITHIN DIMENSION B4, L2, E1 & D1.
- ⚠ LEAD DIMENSION UNCONTROLLED IN L3.
- ⚠ DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
- 7.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-251AA (Date 06/02).
- 8.- CONTROLLING DIMENSION : INCHES.

SYMBOL	DIMENSIONS				NOTES	
	MILLIMETERS		INCHES			
	MIN.	MAX.	MIN.	MAX.		
A	2.18	2.39	.086	.094		
A1	0.89	1.14	.035	.045		
b	0.64	0.89	.025	.035		
b1	0.65	0.79	.025	.031	6	
b2	0.76	1.14	.030	.045		
b3	0.76	1.04	.030	.041		
b4	4.95	5.46	.195	.215		
c	0.46	0.61	.018	.024		
c1	0.41	0.56	.016	.022		
c2	0.46	0.89	.018	.035		
D	5.97	6.22	.235	.245	3	
D1	5.21	—	.205	—		
E	6.35	6.73	.250	.265		
E1	4.32	—	.170	—		
e	2.29	BSC	.090	BSC		
L	8.89	9.65	.350	.380		
L1	1.91	2.29	.045	.090		
L2	0.89	1.27	.035	.050	4	
L3	1.14	1.52	.045	.060		
Ø1	0"	15"	0"	15"		
Ø2	25"	35"	25"	35"		

LEAD ASSIGNMENTS

HEXFET

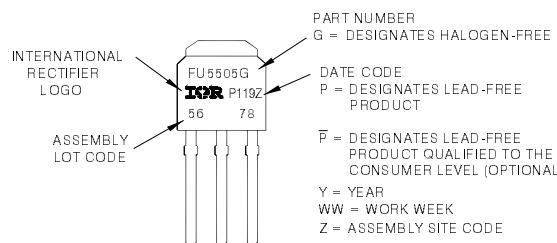
- 1. - GATE
- 2. - DRAIN
- 3. - SOURCE
- 4. - DRAIN

I-Pak (TO-251AA) Part Marking Information

EXAMPLE: THIS IS AN IBEU5505GPBE

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

'P' in assembly line position indicates
'Lead-Free' qualification to the consumer level



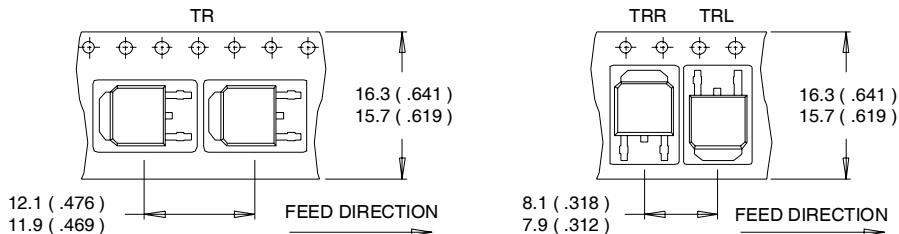
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/> www.irf.com

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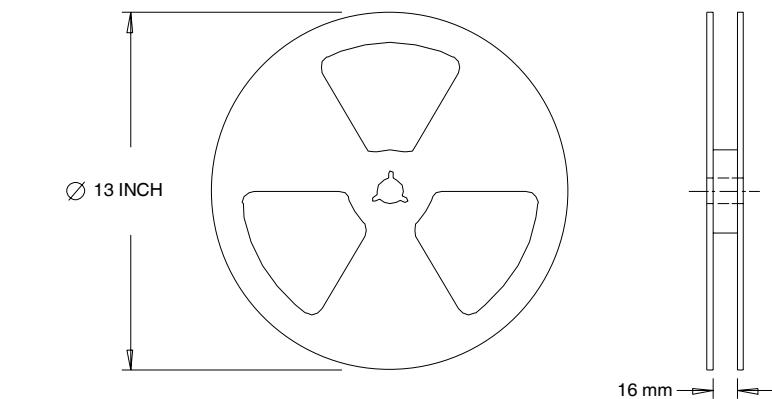
D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



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.

Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

Data and specifications subject to change without notice.

International
IR Rectifier

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TAC Fax: (310) 252-7903

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