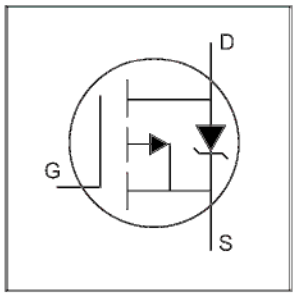
IRFR9120NPbF

Power MOSFET

- Ultra Low On-Resistance
- P-Channel
- Surface Mount (IRFR9120N)
- Straight Lead (IRFU9120N)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated
- Lead-Free



V_{DSS} = -100V

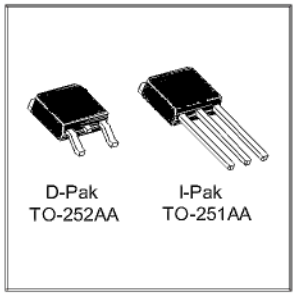
$R_{DS(on)}$ = 0.48Ω

I_D = -6.6A

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

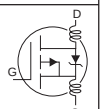
	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ -10V	-6.6	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ -10V	-4.2	
I_{DM}	Pulsed Drain Current ①	-26	
P_D @T_C = 25°C	Power Dissipation	40	W
	Linear Derating Factor	0.32	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②	100	mJ
I_{AR}	Avalanche Current①	-6.6	A
E_{AR}	Repetitive Avalanche Energy①	4.0	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)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	——	3.1	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)**	——	50	
$R_{\theta JA}$	Junction-to-Ambient	——	110	

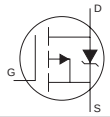
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	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 = -1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	–––	0.48	Ω	V_{GS} = -10V, I_D = -3.9A ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	–––	-4.0	V	V_{DS} = V_{GS}, I_D = -250µA
g_{fs}	Forward Transconductance	1.4	–––	–––	S	V_{DS} = -50V, I_D = -4.0A⑥
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	–––	–––	27	nC	I_D = -4.0A
Q_{gs}	Gate-to-Source Charge	–––	–––	5.0		V_{DS} = -80V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	–––	15		V_{GS} = -10V, See Fig. 6 and 13 ④⑥
$t_{d(on)}$	Turn-On Delay Time	–––	14	–––	ns	V_{DD} = -50V
t_r	Rise Time	–––	47	–––		I_D = -4.0A
$t_{d(off)}$	Turn-Off Delay Time	–––	28	–––		R_G = 12 Ω
t_f	Fall Time	–––	31	–––		R_D =12 Ω, 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	–––	350	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	110	–––		V_{DS} = -25V
C_{rss}	Reverse Transfer Capacitance	–––	70	–––		f = 1.0MHz, See Fig. 5⑥



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	-6.6	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	–––	–––	-26		
V_{SD}	Diode Forward Voltage	–––	–––	-1.6	V	T_J = 25°C, I_S = -3.9A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	–––	100	150	ns	T_J = 25°C, I_F = -4.0A
Q_{rr}	Reverse Recovery Charge	–––	420	630	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)				



Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

② Starting T_J = 25°C, L = 13mH R_G = 25Ω, I_{AS} = -3.9A. (See Figure 12)

③ I_{SD} ≤ -4.0A, di/dt ≤ 300A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.

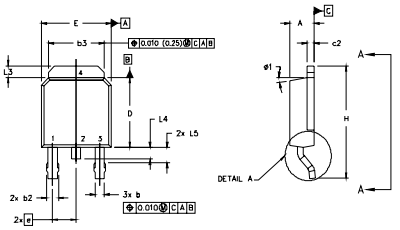
⑤This is applied for I-PAK, L_S of D-PAK is measured between lead and center of die contact

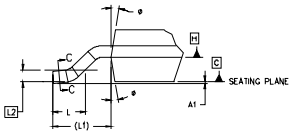
⑥ Uses IRF9520N data and test conditions.

** When mounted on 1" square PCB (FR-4 or G-10 Material) .
For recommended footprint and soldering techniques refer to application note #AN-994

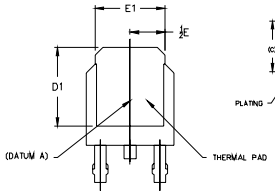
D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)

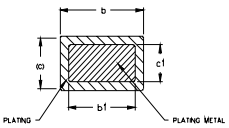




DETAIL "A"
ROTATED 90°



VIEW A-A



SECTION C-C

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
φ	0°	10°	0°	10°	
e1	0°	15°	0°	15°	

LEAD ASSIGNMENTS

HEXFET

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

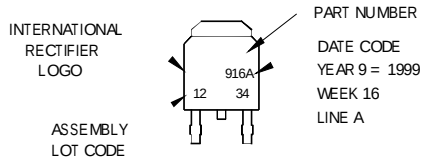
IGBTs, CoPACK

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

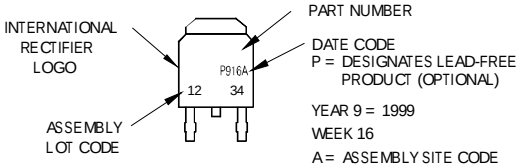
D-Pak (TO-252AA) Part Marking Information

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"

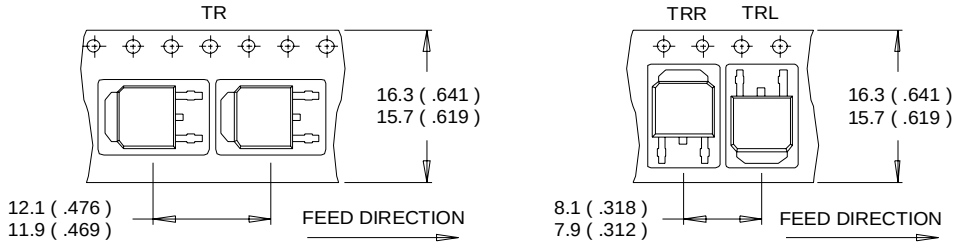


OR

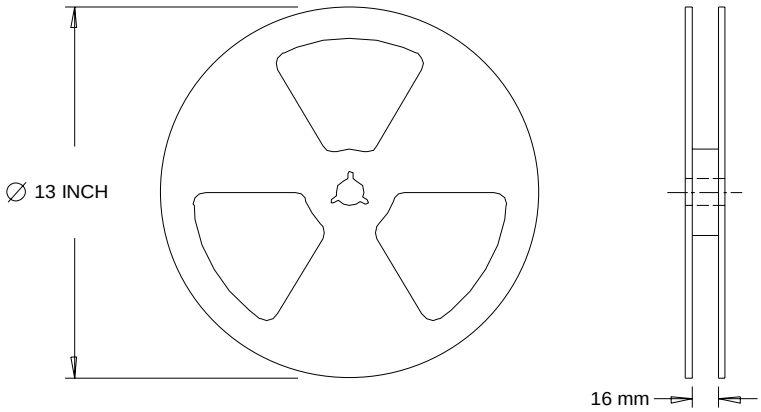


D-Pak (TO-252AA) Tape & Reel Information

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.