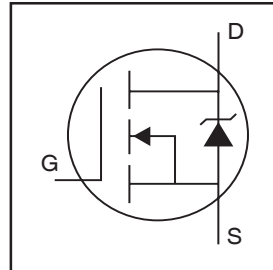


# IRLR/U014NPbF

HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Surface Mount (IRLR024N)
- Straight Lead (IRLU024N)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated
- Lead-Free

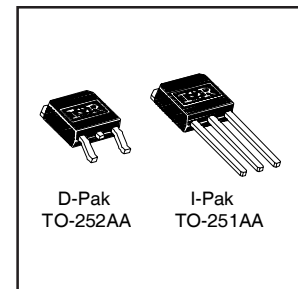


$V_{DSS} = 55V$
$R_{DS(on)} = 0.14\Omega$
$I_D = 10A$

## Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible 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 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

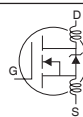
	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	10	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	7.1	
$I_{DM}$	Pulsed Drain Current ①	40	
$P_D @ T_C = 25^\circ C$	Power Dissipation	28	W
	Linear Derating Factor	0.2	W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 16$	V
$E_{AS}$	Single Pulse Avalanche Energy②	35	mJ
$I_{AR}$	Avalanche Current①	6.0	A
$E_{AR}$	Repetitive Avalanche Energy①	2.8	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
$T_J$	Operating Junction and	-55 to + 175	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case )	

## Thermal Resistance

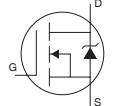
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	5.3	°C/W
$R_{\theta JA}$	Case-to-Ambient (PCB mount)**	—	50	
$R_{\theta JA}$	Junction-to-Ambient	—	110	

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

## 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	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.056	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.14	$\Omega$	$V_{GS} = 10V, I_D = 6A$ ④
		—	—	0.21		$V_{GS} = 4.5V, I_D = 5A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$g_{fs}$	Forward Transconductance	3.1	—	—	S	$V_{DS} = 25V, I_D = 6A$ ⑦
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS} = 55V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 55V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 16V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -16V$
$Q_g$	Total Gate Charge	—	—	7.9	nC	$I_D = 6A$
$Q_{gs}$	Gate-to-Source Charge	—	—	1.4		$V_{DS} = 44V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	4.4		$V_{GS} = 5.0V$ , See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	6.5	—		$V_{DD} = 28V$
$t_r$	Rise Time	—	47	—	ns	$I_D = 6A$
$t_{d(off)}$	Turn-Off Delay Time	—	12	—		$R_G = 6.2\Omega, V_{GS} = 5.0V$
$t_f$	Fall Time	—	23	—		$R_D = 4.5\Omega$ , See Fig. 10 ④
$L_D$	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact ⑥
$L_S$	Internal Source Inductance	—	7.5	—		
$C_{iss}$	Input Capacitance	—	265	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	80	—		$V_{DS} = 25V$
$C_{rss}$	Reverse Transfer Capacitance	—	38	—		$f = 1.0\text{MHz}$ , See Fig. 5

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	10	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	40		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 6A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	37	56	nS	$T_J = 25^\circ\text{C}, I_F = 6A$
$Q_{rr}$	Reverse Recovery Charge	—	48	71	nC	$di/dt = 100A/\mu s$ 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  $T_J = 25^\circ\text{C}$ ,  $L = 1.96\text{mH}$   
 $R_G = 25\Omega, I_{AS} = 6A$ . (See Figure 12)

③  $I_{SD} \leq 6.0A, di/dt \leq 210A/\mu s, V_{DD} \leq$

$V_{(BR)DSS},$   
 $T_J \leq 175^\circ\text{C}$   
2

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

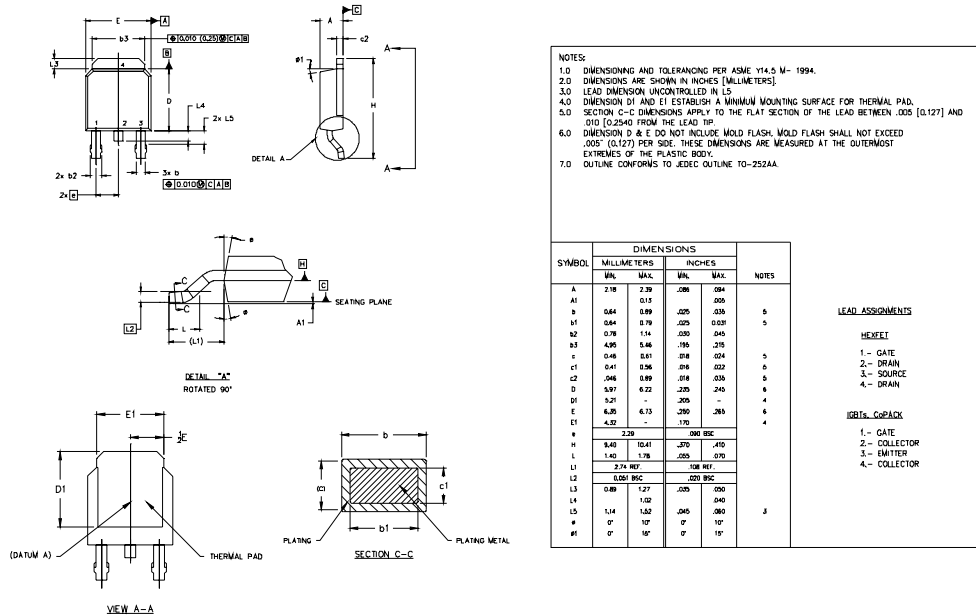
⑤ This is applied for I-PAK,  $L_S$  of D-PAK is measured between lead and center of die contact

# IRLR/U014NPbF

International  
**IR** Rectifier

## D-Pak (TO-252AA) Package Outline

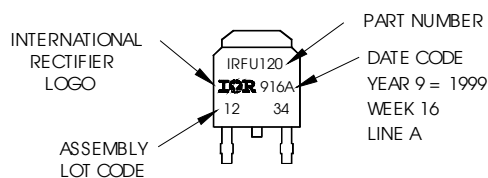
Dimensions are shown in millimeters (inches)



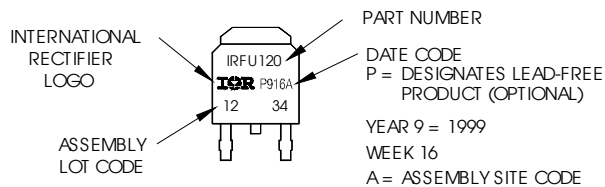
## D-Pak (TO-252AA) Part Marking Information

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"

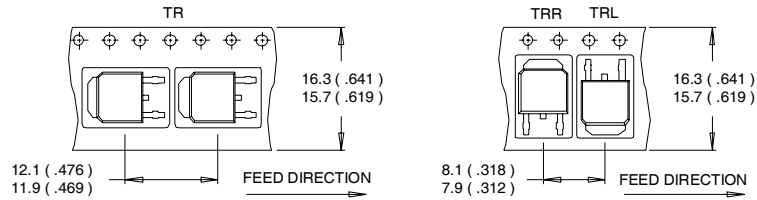


OR

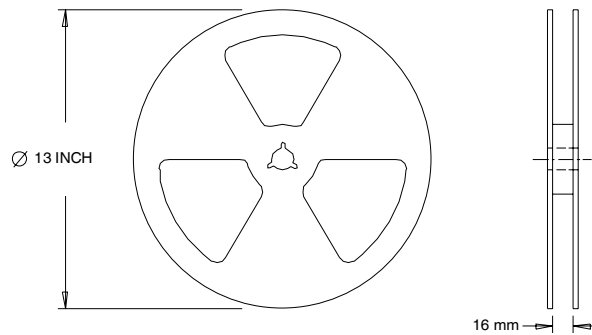


## D-Pak (TO-252AA) Tape & Reel Information

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.

Data and specifications subject to change without notice.  
This product has been designed and qualified for the Automotive[Q101] market.  
Qualification Standards can be found on IR's Web site.