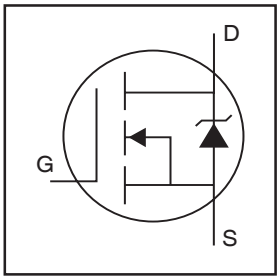
International
IOR Rectifier

AUTOMOTIVE MOSFET

PD - 96191

IRFR2307ZPbF
IRFU2307ZPbF

HEXFET® Power MOSFET



V_{DSS} = 75V

$R_{DS(on)}$ = 16mΩ

I_D = 42A

D-Pak IRFR2307ZPbF

I-Pak IRFU2307ZPbF

Features

- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free

Description

Specifically designed for Automotive applications, this HEXFET® Power MOSFET utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this design are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating . These features combine to make this design an extremely efficient and reliable device for use in Automotive applications and a wide variety of other applications.

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	53	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	38	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Package Limited)	42	
I_{DM}	Pulsed Drain Current ①	210	
P_D @T_C = 25°C	Power Dissipation	110	W
	Linear Derating Factor	0.70	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
$E_{AS\ (Thermally\ limited)}$	Single Pulse Avalanche Energy②	100	mJ
E_{AS} (Tested)	Single Pulse Avalanche Energy Tested Value ⑥	140	
I_{AR}	Avalanche Current ①	See Fig.12a, 12b, 15, 16	A
E_{AR}	Repetitive Avalanche Energy ⑤		mJ
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑧	–––	1.42	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount) ⑦⑧	–––	40	
$R_{\theta JA}$	Junction-to-Ambient ⑧	–––	110	

HEXFET® is a registered trademark of International Rectifier.

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

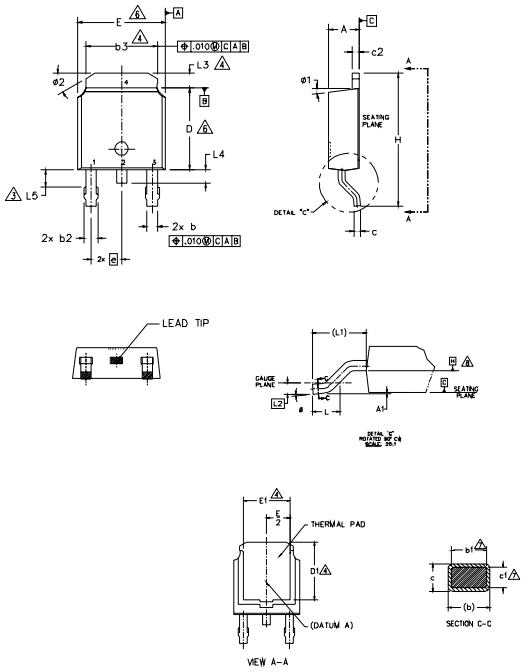
	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	75	—	—	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.072	—	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	12.8	16	mΩ	V_{GS} = 10V, I_D = 32A ③
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS} = V_{GS}, I_D = 100µA
gfs	Forward Transconductance	30	—	—	S	V_{DS} = 25V, I_D = 32A
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	µA	V_{DS} = 75V, V_{GS} = 0V
		—	—	250		V_{DS} = 75V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	—	—	-200		V_{GS} = -20V
Q_g	Total Gate Charge	—	50	75		I_D = 32A
Q_{gs}	Gate-to-Source Charge	—	14	—	nC	V_{DS} = 60V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	19	—		V_{GS} = 10V ③
$t_{d(on)}$	Turn-On Delay Time	—	16	—		V_{DD} = 38V
t_r	Rise Time	—	65	—		I_D = 32A
$t_{d(off)}$	Turn-Off Delay Time	—	44	—	ns	R_G = 10 Ω
t_f	Fall Time	—	29	—		V_{GS} = 10V ③
L_D	Internal Drain Inductance	—	4.5	—		Between lead,
					nH	6mm (0.25in.)
L_S	Internal Source Inductance	—	7.5	—		from package
						and center of die contact
C_{iss}	Input Capacitance	—	2190	—		V_{GS} = 0V
C_{oss}	Output Capacitance	—	280	—		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	—	150	—	pF	f = 1.0MHz
C_{oss}	Output Capacitance	—	1070	—		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance	—	190	—		V_{GS} = 0V, V_{DS} = 60V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	—	400	—		V_{GS} = 0V, V_{DS} = 0V to 60V ④

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current	—	—	42		MOSFET symbol
	(Body Diode)				A	showing the
I_{SM}	Pulsed Source Current	—	—	210		integral reverse
	(Body Diode) ①					p-n junction diode.
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 32A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	—	31	47	ns	T_J = 25°C, I_F = 32A, V_{DD} = 38V
Q_{rr}	Reverse Recovery Charge	—	31	47	nC	di/dt = 100A/µs ③
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

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.

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	
b1	0.65	0.79	.025	.031	7
b2	0.76	1.14	.030	.045	
b3	4.95	5.46	.195	.215	4
c	0.46	0.61	.018	.024	
c1	0.41	0.56	.016	.022	7
c2	0.46	0.89	.018	.035	
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 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	4
L4	–	1.02	–	.040	
L5	1.14	1.52	.045	.060	3
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

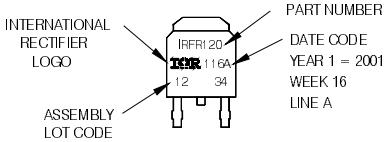
IGBT & CoPAK

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

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

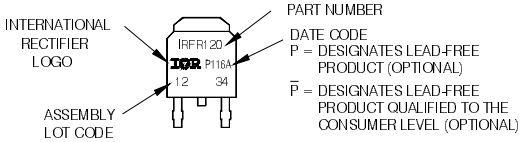
EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 2001
IN THE ASSEMBLY LINE 'A'

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



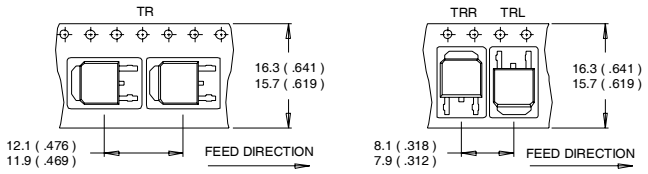
'P' in assembly line position indicates
'Lead-Free' qualification to the consumer-level

OR

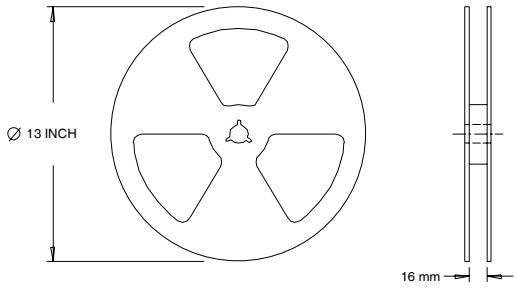


D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters



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/

Notes:

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

② Limited by T_{Jmax}, starting T_J = 25°C, L = 0.197mH R_G = 25Ω, I_{AS} = 32A, V_{GS} =10V. Part not recommended for use above this value.

③ Pulse width ≤ 1.0ms; duty cycle ≤ 2%.

④ C_{oss} eff. is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

⑤ Limited by T_{Jmax} , see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.

⑥ This value determined from sample failure population. 100% tested to this value in production.

⑦ When mounted on 1" square PCB (FR-4 or G-10 Material) . For recommended footprint and soldering techniques refer to application note #AN-994

⑧ R_θ is measured at T_J approximately 90°C

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

International
IOR Rectifier