International
IOR Rectifier

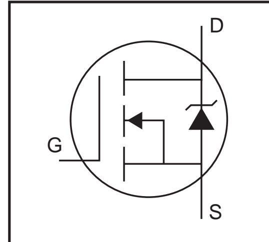
PD - 95379

AUTOMOTIVE MOSFET

IRFZ44ZPbF
IRFZ44ZSPbF
IRFZ44ZLPbF

HEXFET® Power MOSFET

Features
- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free

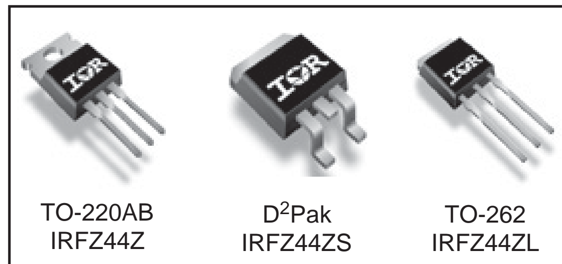


V_{DSS} = 55V

$R_{DS(on)}$ = 13.9mΩ

I_D = 51A

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.



TO-220AB	D²Pak	TO-262
IRFZ44Z	IRFZ44ZS	IRFZ44ZL

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	51	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V (See Fig. 9)	36	
I_{DM}	Pulsed Drain Current ①	200	
P_D @T_C = 25°C	Maximum Power Dissipation	80	W
	Linear Derating Factor	0.53	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy (Thermally Limited) ②	86	mJ
E_{AS} (tested)	Single Pulse Avalanche Energy Tested Value ⑦	105	
I_{AR}	Avalanche Current ①	See Fig.12a,12b,15,16	A
E_{AR}	Repetitive Avalanche Energy ⑥		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
$R_{θJC}$	Junction-to-Case	—–	1.87	°C/W
$R_{θCS}$	Case-to-Sink, Flat, Greased Surface	0.50	—–	
$R_{θJA}$	Junction-to-Ambient	—–	62	
$R_{θJA}$	Junction-to-Ambient (PCB Mount, steady state)⑧	—–	40	

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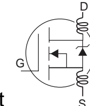
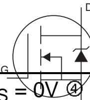
Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	55	–––	–––	V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.054	–––	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	11.1	13.9	mΩ	V_{GS} = 10V, I_D = 31A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	–––	4.0	V	V_{DS} = V_{GS}, I_D = 250μA
gfs	Forward Transconductance	22	–––	–––	S	V_{DS} = 25V, I_D = 31A
I_{DSS}	Drain-to-Source Leakage Current	–––	–––	20	μA	V_{DS} = 55V, V_{GS} = 0V
		–––	–––	250		V_{DS} = 55V, 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	–––	29	43	nC	I_D = 31A
Q_{gs}	Gate-to-Source Charge	–––	7.2	11		V_{DS} = 44V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	12	18		V_{GS} = 10V ④
$t_{d(on)}$	Turn-On Delay Time	–––	14	–––	ns	V_{DD} = 28V
t_r	Rise Time	–––	68	–––		I_D = 31A
$t_{d(off)}$	Turn-Off Delay Time	–––	33	–––		R_G = 15Ω
t_f	Fall Time	–––	41	–––		V_{GS} = 10V ④
L_D	Internal Drain Inductance	–––	4.5	–––	nH	Between lead, 6mm (0.25in.)
L_S	Internal Source Inductance	–––	7.5	–––		from package and center of die contact 
C_{iss}	Input Capacitance	–––	1420	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	240	–––		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	–––	130	–––		f = 1.0MHz, See Fig. 5
C_{oss}	Output Capacitance	–––	830	–––		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance	–––	190	–––		V_{GS} = 0V, V_{DS} = 44V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	–––	300	–––		V_{GS} = 0V, V_{DS} = 0V to 44V

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	51	A	MOSFET symbol showing the
I_{SM}	Pulsed Source Current (Body Diode) ①	–––	–––	200		integral reverse p-n junction diode. 
V_{SD}	Diode Forward Voltage	–––	–––	1.2	V	T_J = 25°C, I_S = 31A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	–––	23	35	ns	T_J = 25°C, I_F = 31A, V_{DD} = 28V
Q_{rr}	Reverse Recovery Charge	–––	17	26	nC	di/dt = 100A/μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

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 =0.18mH, R_G = 25Ω, I_{AS} = 31A, V_{GS} =10V. Part not recommended for use above this value.

③ $I_{SD} \leq$ 31A, di/dt ≤ 840A/μs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 175°C.

④ Pulse width ≤ 1.0ms; duty cycle ≤ 2%.

⑤ 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} .

⑥ Limited by T_{Jmax} , see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.

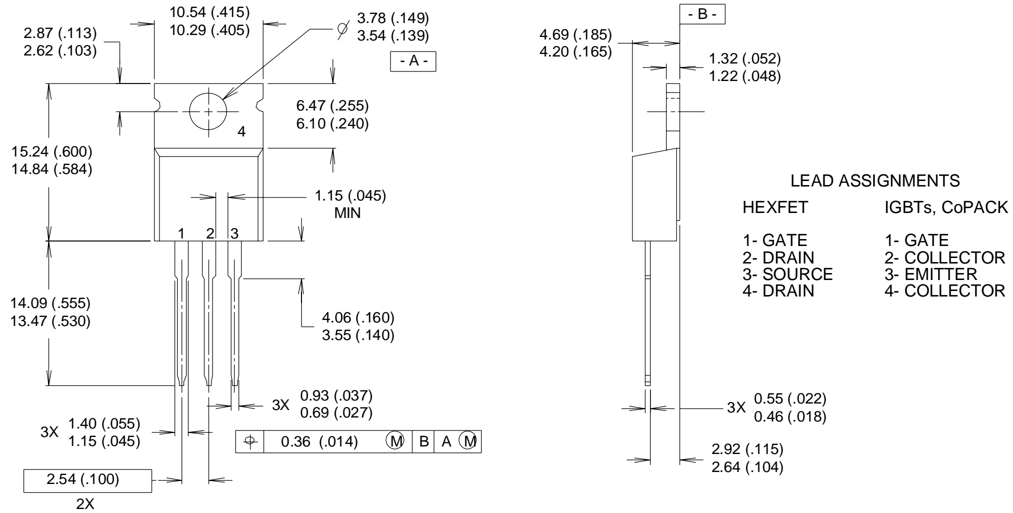
⑦ This value determined from sample failure population. 100% tested to this value in production.

⑧ This is applied to D^2Pak, when mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.

⑨ R_θ is rated at T_J of approximately 90°C.

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH
3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.
4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

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