

# IRL3705NPbF

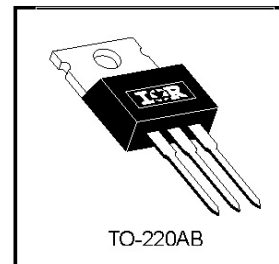
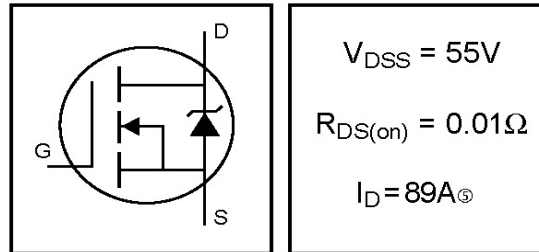
- Lead-Free
- Logic-Level Gate Drive
- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

## 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 TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.

## HEXFET® Power MOSFET



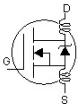
## Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	89 <sup>⑤</sup>	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	63	
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	310	
$P_D @ T_C = 25^\circ C$	Power Dissipation	170	W
	Linear Derating Factor	1.1	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 16	V
$E_{AS}$	Single Pulse Avalanche Energy <sup>②</sup>	340	mJ
$I_{AR}$	Avalanche Current <sup>①</sup>	46	A
$E_{AR}$	Repetitive Avalanche Energy <sup>①</sup>	17	mJ
dv/dt	Peak Diode Recovery dv/dt <sup>③</sup>	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 )	
	Mounting torque, 6-32 or M3 screw	10 lbf·in (1.1N·m)	

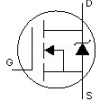
## Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	---	0.90	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	---	
$R_{\theta JA}$	Junction-to-Ambient	---	62	

## 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 $25^\circ\text{C}$ , $I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.010	$\Omega$	$V_{GS} = 10V, I_D = 46A$ ④
		—	—	0.012		$V_{GS} = 5.0V, I_D = 46A$ ④
		—	—	0.018		$V_{GS} = 4.0V, I_D = 39A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$g_s$	Forward Transconductance	50	—	—	S	$V_{DS} = 25V, I_D = 46A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS} = 55V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 44V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 16V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -16V$
$Q_g$	Total Gate Charge	—	—	98	nC	$I_D = 46A$
$Q_{gs}$	Gate-to-Source Charge	—	—	19		$V_{DS} = 44V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	49		$V_{GS} = 5.0V$ , See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	12	—		ns
$t_r$	Rise Time	—	140	—	$I_D = 46A$	
$t_{d(off)}$	Turn-Off Delay Time	—	37	—	$R_G = 1.8\Omega, V_{GS} = 5.0V$	
$t_f$	Fall Time	—	78	—	$R_D = 0.59\Omega$ , See Fig. 10 ④	
$L_D$	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
$L_S$	Internal Source Inductance	—	7.5	—		
$C_{iss}$	Input Capacitance	—	3600	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	870	—		$V_{DS} = 25V$
$C_{rss}$	Reverse Transfer Capacitance	—	320	—		$f = 1.0MHz$ , See Fig. 5

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	89	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	310		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 46A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	94	140	ns	$T_J = 25^\circ\text{C}, I_F = 46A$
$Q_{rr}$	Reverse Recovery Charge	—	290	440	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  $V_{DD} = 25V$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 320\mu H$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 46A$ . (See Figure 12)

- ③  $I_{SD} \leq 46A$ ,  $di/dt \leq 250A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 175^\circ\text{C}$

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

- ⑤ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4

