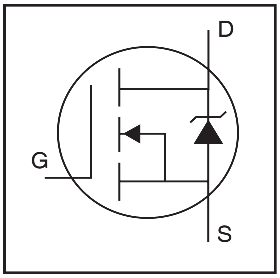
International
IOR Rectifier

PD - 95130

IRF540NSPbF
IRF540NLPbF

HEXFET® Power MOSFET

- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free



$V_{DSS} = 100V$

$R_{DS(on)} = 44m\Omega$

$I_D = 33A$

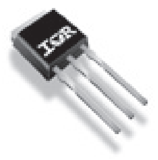
Description

Advanced HEXFET® Power MOSFETs 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^{2}Pak is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D^{2}Pak is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application.

The through-hole version (IRF540NL) is available for low-profile applications.


D^{2}Pak
IRF540NSPbF


TO-262
IRF540NLPbF

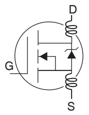
Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V ⑦	33	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V ⑦	23	
I_{DM}	Pulsed Drain Current ①⑦	110	
P_D @T_C = 25°C	Power Dissipation	130	W
	Linear Derating Factor	0.87	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
I_{AR}	Avalanche Current①	16	A
E_{AR}	Repetitive Avalanche Energy①	13	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑦	7.0	V/ns
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 srew	10 lbf•in (1.1N•m)	

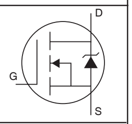
Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	–––	1.15	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)**	–––	40	

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	–––	0.12	–––	V/°C	Reference to 25°C, I_D = 1mA ⑦
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	–––	44	mΩ	V_{GS} = 10V, I_D = 16A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	–––	4.0	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	21	–––	–––	S	V_{DS} = 50V, I_D = 16A④⑦
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	–––	–––	71	nC	I_D = 16A
Q_{gs}	Gate-to-Source Charge	–––	–––	14		V_{DS} = 80V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	–––	21		V_{GS} = 10V, See Fig. 6 and 13 ④⑦
$t_{d(on)}$	Turn-On Delay Time	–––	11	–––	ns	V_{DD} = 50V
t_r	Rise Time	–––	35	–––		I_D = 16A
$t_{d(off)}$	Turn-Off Delay Time	–––	39	–––		R_G = 5.1Ω
t_f	Fall Time	–––	35	–––		V_{GS} = 10V, See Fig. 10 ④⑦
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	–––	1960	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	250	–––		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	–––	40	–––		ƒ = 1.0MHz, See Fig. 5 ⑦
E_{AS}	Single Pulse Avalanche Energy②⑦	–––	700⑤	185⑥	mJ	I_{AS} = 16A, L = 1.5mH

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	33	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)①	–––	–––	110		
V_{SD}	Diode Forward Voltage	–––	–––	1.2	V	T_J = 25°C, I_S = 16A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	–––	115	170	ns	T_J = 25°C, I_F = 16A
Q_{rr}	Reverse Recovery Charge	–––	505	760	nC	di/dt = 100A/µs ④⑦
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 =1.5mH R_G = 25Ω, I_{AS} = 16A. (See Figure 12)

③ $I_{SD} \leq$ 16A, di/dt ≤ 340A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 175°C

④ Pulse width ≤ 400µs; duty cycle ≤ 2%.

⑤ This is a typical value at device destruction and represents operation outside rated limits.

⑥ This is a calculated value limited to T_J = 175°C .

⑦ Uses IRF540N 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