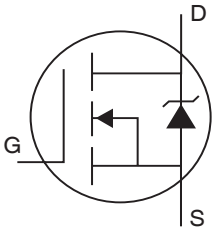
International
IOR Rectifier

PD - 95126

IRL3502SPbF

HEXFET® Power MOSFET

- Advanced Process Technology
- Surface Mount
- Optimized for 4.5V-7.0V Gate Drive
- Ideal for CPU Core DC-DC Converters
- Fast Switching
- Lead-Free



V_{DSS} = 20V

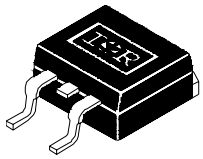
$R_{DS(on)}$ = 0.007Ω

I_D = 110A⑥

Description

These HEXFET Power MOSFETs were designed specifically to meet the demands of CPU core DC-DC converters in the PC environment. Advanced processing techniques combined with an optimized gate oxide design results in a die sized specifically to offer maximum efficiency at minimum cost.

The D^2Pak 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^2Pak 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.



D^2Pak

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 4.5V⑤	110⑥	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 4.5V⑤	67	
I_{DM}	Pulsed Drain Current ①⑤	420	
P_D @T_C = 25°C	Power Dissipation	140	W
	Linear Derating Factor	1.1	W/°C
V_{GS}	Gate-to-Source Voltage	± 10	V
V_{GSM}	Gate-to-Source Voltage (Start Up Transient, tp = 100µs)	14	V
E_{AS}	Single Pulse Avalanche Energy②⑤	390	mJ
I_{AR}	Avalanche Current①	64	A
E_{AR}	Repetitive Avalanche Energy①	14	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑤	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	–––	0.89	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mounted,steady-state)**	–––	40	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	20	–––	–––	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.019	–––	V/°C	Reference to 25°C, I_D = 1.0mA⑤
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	–––	0.008	Ω	V_{GS} = 4.5V, I_D = 64A ④
		–––	–––	0.007		V_{GS} = 7.0V, I_D = 64A ④
$V_{GS(th)}$	Gate Threshold Voltage	0.70	–––	–––	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	77	–––	–––	S	V_{DS} = 10V, I_D = 64A⑤
I_{DSS}	Drain-to-Source Leakage Current	–––	–––	25	µA	V_{DS} = 20V, V_{GS} = 0V
		–––	–––	250		V_{DS} = 10V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	–––	–––	100	nA	V_{GS} = 10V
	Gate-to-Source Reverse Leakage	–––	–––	-100		V_{GS} = -10V
Q_g	Total Gate Charge	–––	–––	110	nC	I_D = 64A
Q_{gs}	Gate-to-Source Charge	–––	–––	27		V_{DS} = 16V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	–––	39		V_{GS} = 4.5V, See Fig. 6 ④⑤
$t_{d(on)}$	Turn-On Delay Time	–––	10	–––	ns	V_{DD} = 10V
t_r	Rise Time	–––	140	–––		I_D = 64A
$t_{d(off)}$	Turn-Off Delay Time	–––	96	–––		R_G = 3.8Ω, V_{GS} = 4.5V
t_f	Fall Time	–––	130	–––		R_D = 0.15Ω, ④⑤
L_S	Internal Source Inductance	–––	7.5	–––	nH	Between lead, and center of die contact
C_{iss}	Input Capacitance	–––	4700	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	1900	–––		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	–––	640	–––		f = 1.0MHz, See Fig. 5⑤

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	110⑥	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①⑤	–––	–––	420		
V_{SD}	Diode Forward Voltage	–––	–––	1.3	V	T_J = 25°C, I_S = 64A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	–––	87	130	ns	T_J = 25°C, I_F = 64A
Q_{rr}	Reverse Recovery Charge	–––	200	310	nC	di/dt = 100A/µs ④⑤
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.

② Starting T_J = 25°C, L = 190µH R_G = 25Ω, I_{AS} = 64A.

③ I_{SD} ≤ 64A, di/dt ≤ 86A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.

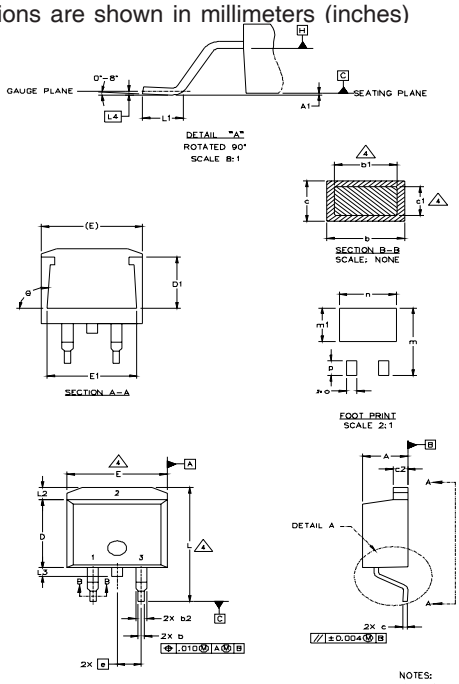
⑤ Uses IRL3502 data and test conditions

⑥ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4

** When mounted on FR-4 board using minimum recommended footprint.
For recommended footprint and soldering techniques refer to application note #AN-994.

D²Pak Package Outline

Dimensions are shown in millimeters (inches)



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1		0.127		.005	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	4
b2	1.14	1.40	.045	.055	
c	0.43	0.63	.017	.025	
c1	0.38	0.74	.015	.029	4
c2	1.14	1.40	.045	.055	
D	8.51	9.65	.335	.380	3
D1	5.33		.210		
E	9.65	10.67	.380	.420	3
E1	6.22		.245		
e	2.54 BSC		.100 BSC		
L	14.61	15.88	.575	.625	
L1	1.78	2.79	.070	.110	
L2		1.65		.065	
L3	1.27	1.78	.050	.070	
L4	0.25 BSC		.010 BSC		
m	17.78		.700		
m1	8.89		.350		
n	11.43		.450		
o	2.08		.082		
p	3.81		.150		
θ	90°	93°	90°	93°	

LEAD ASSIGNMENTS

HEXFET	IGBTs, CoPACK	DIODES
1.– GATE	1.– GATE	1.– ANODE *
2.– DRAIN	2.– COLLECTOR	2.– CATHODE
3.– SOURCE	3.– EMITTER	3.– ANODE

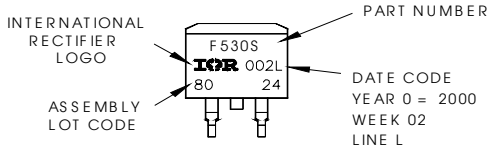
* PART DEPENDENT.

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSION: INCH.

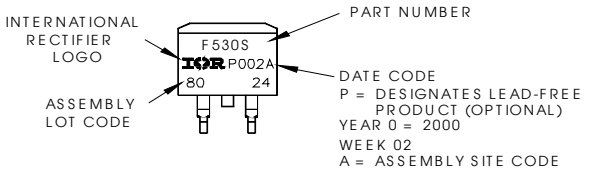
D²Pak Part Marking Information (Lead-Free)

EXAMPLE: THIS IS AN IRF530S WITH
LOT CODE 8024
ASSEMBLED ON WW 02, 2000
IN THE ASSEMBLY LINE "L"

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

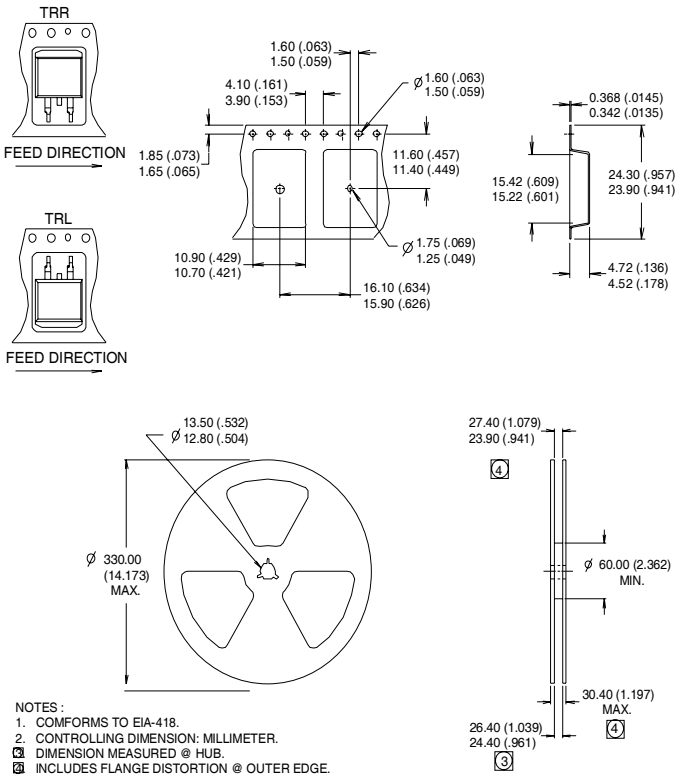


OR



D^{2}Pak Tape & Reel Infomation

Dimensions are shown in millimeters (inches)



NOTES :
1. COMFORMS TO EIA-418.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION MEASURED @ HUB.
4. INCLUDES FLANGE DISTORTION @ OUTER EDGE.

Data and specifications subject to change without notice.