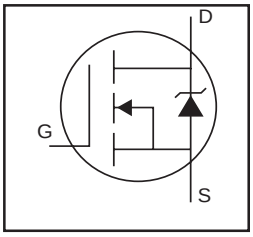
International
IOR Rectifier

IRL3302SPbF

HEXFET® Power MOSFET

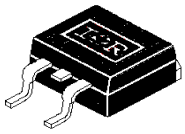
- Advanced Process Technology
- Surface Mount
- Optimized for 4.5V-7.0V Gate Drive
- Ideal for CPU Core DC-DC Converters
- Fast Switching
- Lead-Free



V_{DSS} = 20V

$R_{DS(on)}$ = 0.020Ω

I_D = 39A



D²Pak

Description

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

The D²Pak 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 D²Pak 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.

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 4.5V⑤	39	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 4.5V⑤	25	
I_{DM}	Pulsed Drain Current ①⑤	160	
P_D@T_C = 25°C	Power Dissipation	57	W
	Linear Derating Factor	0.45	W/°C
V_{GS}	Gate-to-Source Voltage	± 10	V
E_{AS}	Single Pulse Avalanche Energy②⑤	130	mJ
I_{AR}	Avalanche Current①	23	A
E_{AR}	Repetitive Avalanche Energy①	5.7	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑤	5.0	V/ns
T_J	Operating Junction and	-55 to + 150	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—–	2.2	°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	—	0.022	—	V/°C	Reference to 25°C, I_D = 1mA⑤
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.023	Ω	V_{GS} = 4.5V, I_D = 23A ④
		—	—	0.020		V_{GS} = 7.0V, I_D = 23A ④
$V_{GS(th)}$	Gate Threshold Voltage	0.70	—	—	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	21	—	—	S	V_{DS} = 10V, I_D = 23A⑤
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	—	—	31	nC	I_D = 23A
Q_{gs}	Gate-to-Source Charge	—	—	5.7		V_{DS} = 16V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	13		V_{GS} = 4.5V, See Fig. 6 ④⑤
$t_{d(on)}$	Turn-On Delay Time	—	7.2	—	ns	V_{DD} = 10V
t_r	Rise Time	—	110	—		I_D = 23A
$t_{d(off)}$	Turn-Off Delay Time	—	41	—		R_G = 9.5Ω, V_{GS} = 4.5V
t_f	Fall Time	—	89	—		R_D = 2.4Ω, ④⑤
L_S	Internal Source Inductance	—	7.5	—	nH	Between lead, and center of die contact
C_{iss}	Input Capacitance	—	1300	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	520	—		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	—	190	—		ƒ = 1.0MHz, See Fig. 5⑤

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	39	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①⑤	—	—	160		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 23A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	62	94	ns	T_J = 25°C, I_F = 23A
Q_{rr}	Reverse Recovery Charge	—	110	160	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 = 0.49mH R_G = 25Ω, I_{AS} = 23A.

③ I_{SD} £ 23A, di/dt £ 97A/µs, V_{DD} £ $V_{(BR)DSS}$, T_J £ 150°C

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

⑤ Uses IRL3302 data and test conditions

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

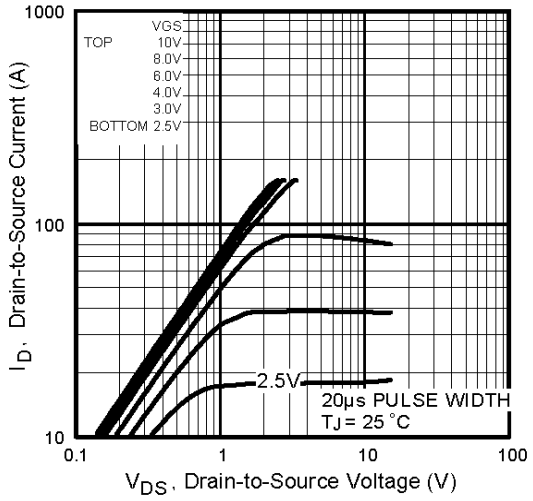


Fig 1. Typical Output Characteristics

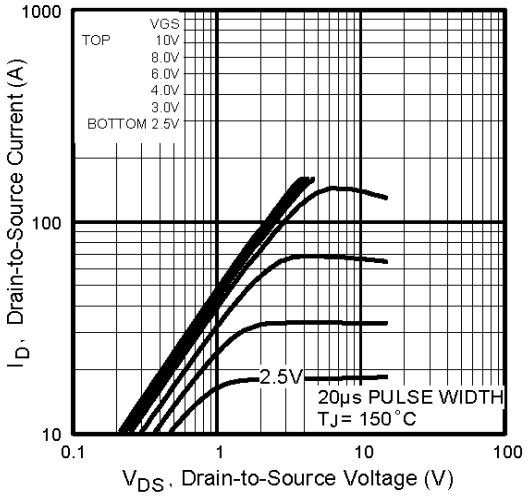


Fig 2. Typical Output Characteristics

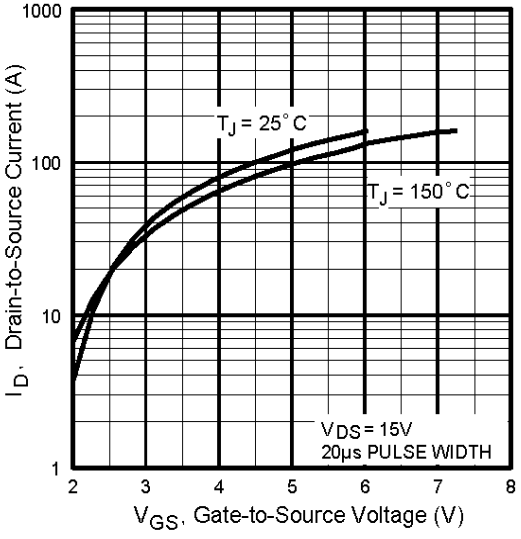


Fig 3. Typical Transfer Characteristics

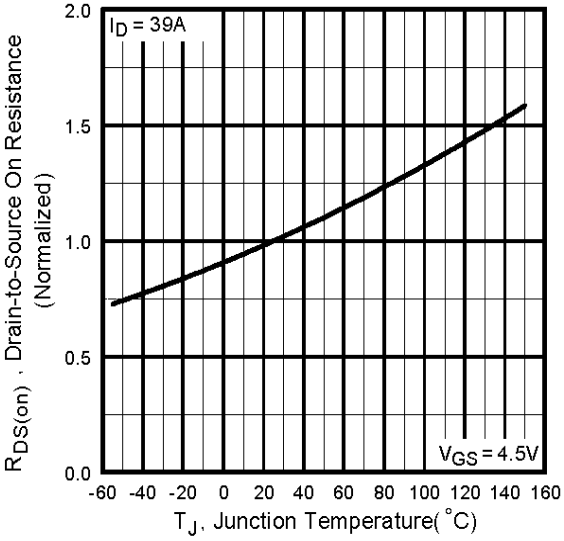


Fig 4. Normalized On-Resistance
Vs. Temperature

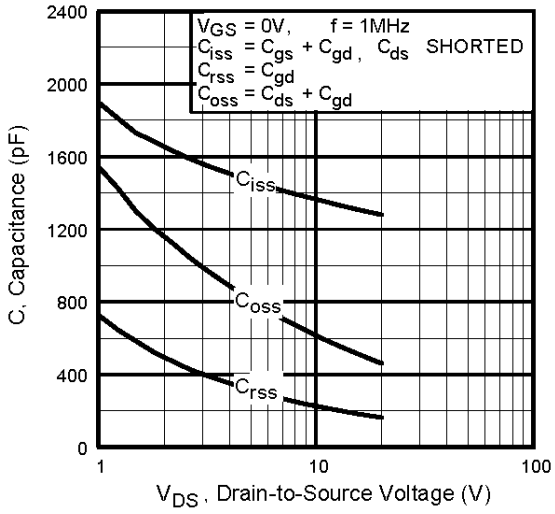


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

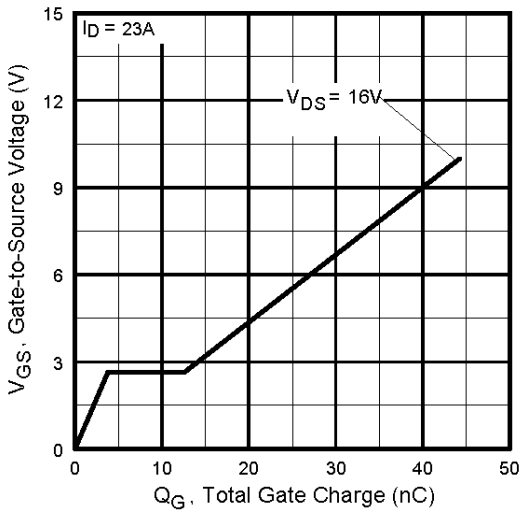


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

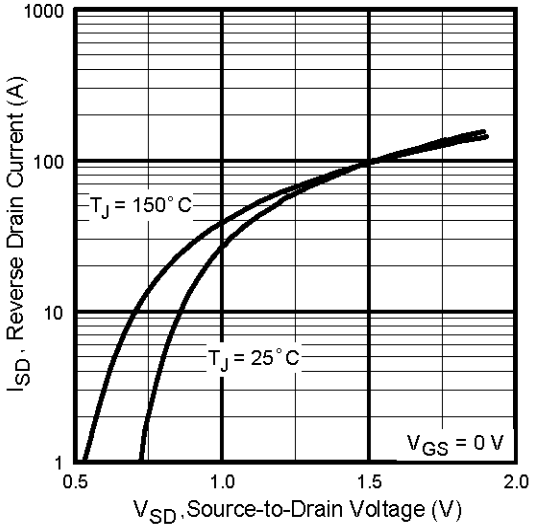


Fig 7. Typical Source-Drain Diode Forward Voltage

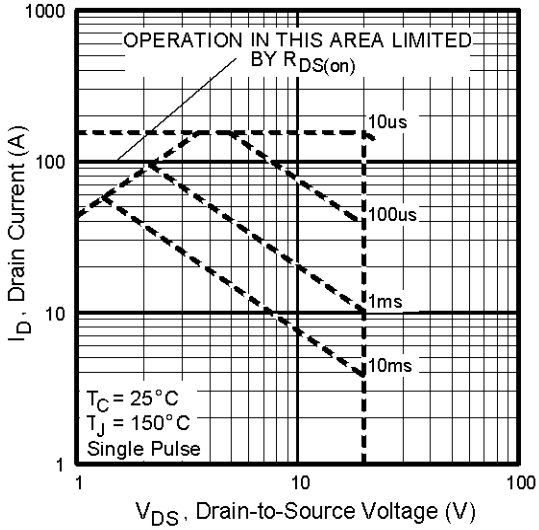


Fig 8. Maximum Safe Operating Area

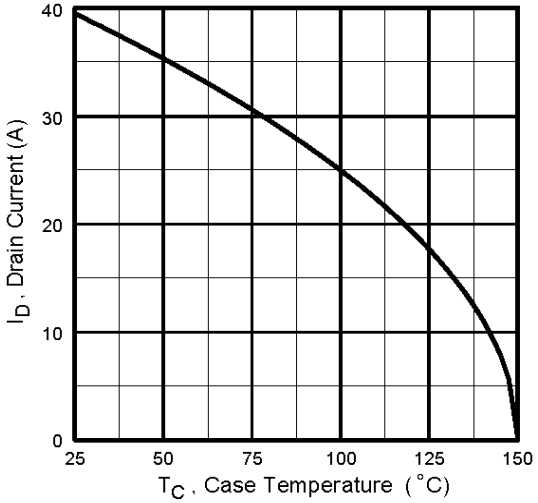


Fig 9. Maximum Drain Current Vs. Case Temperature

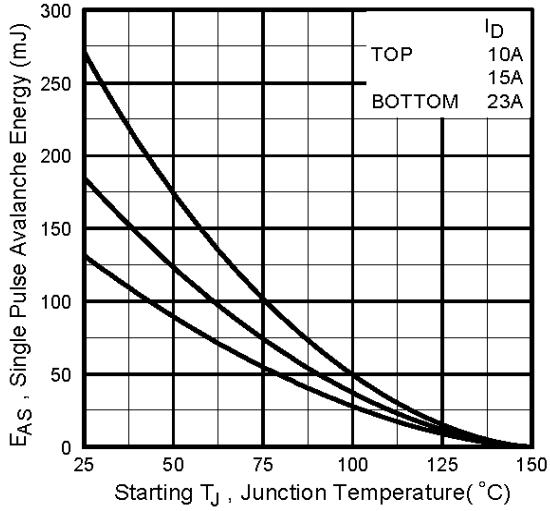


Fig 10. Maximum Avalanche Energy Vs. Drain Current

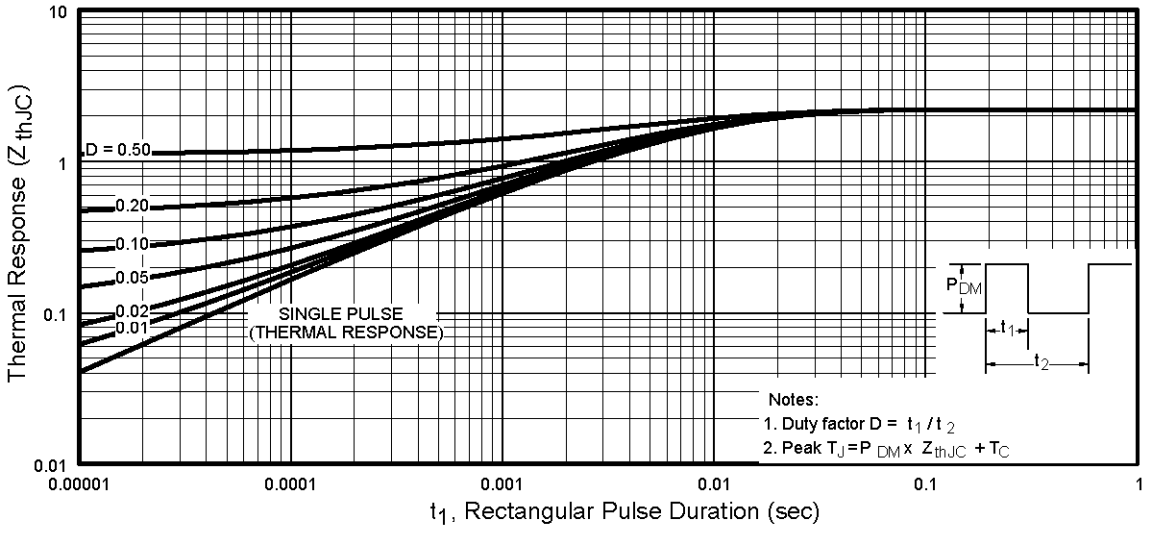


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

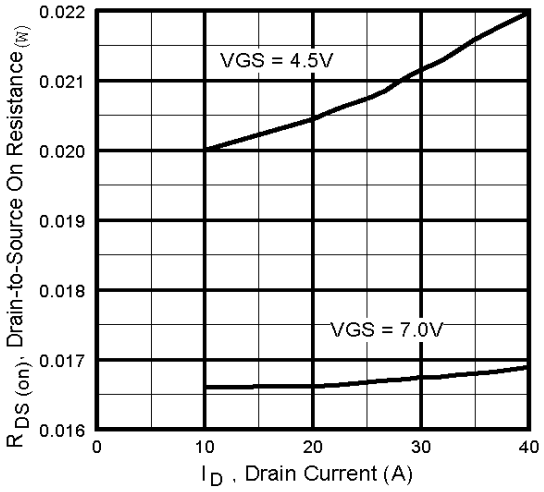


Fig 12. On-Resistance Vs. Drain Current

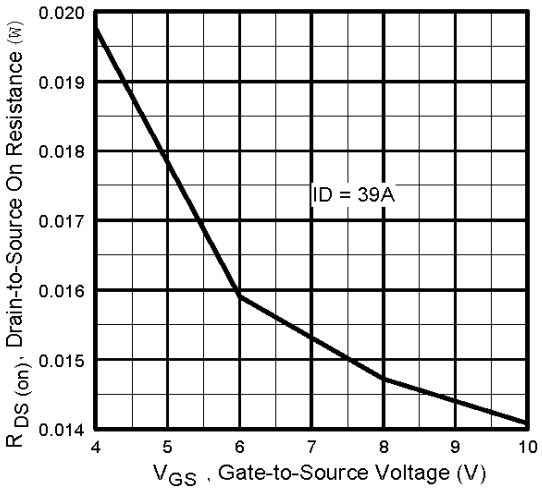
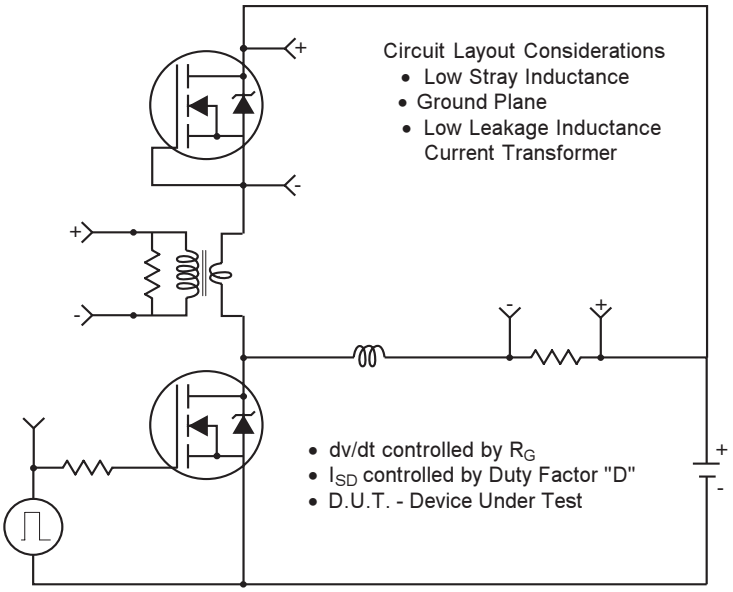
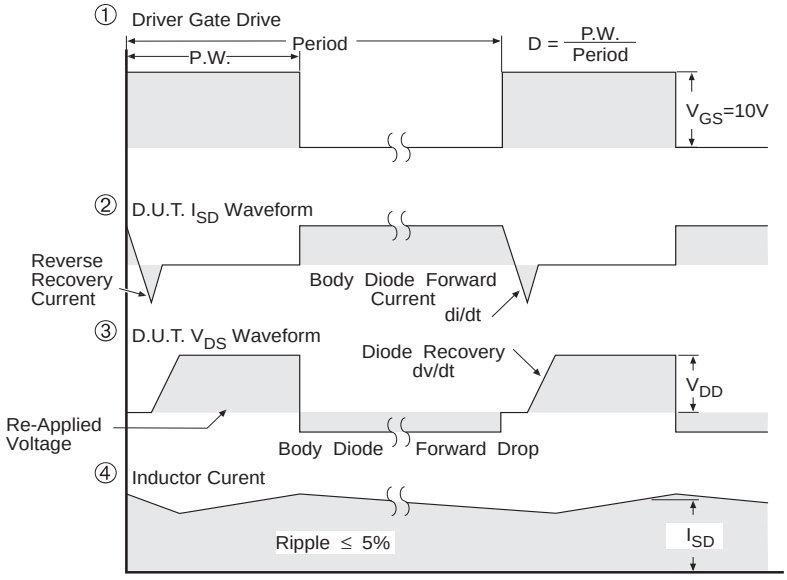


Fig 13. On-Resistance Vs. Gate Voltage

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity for P-Channel
** Use P-Channel Driver for P-Channel Measurements

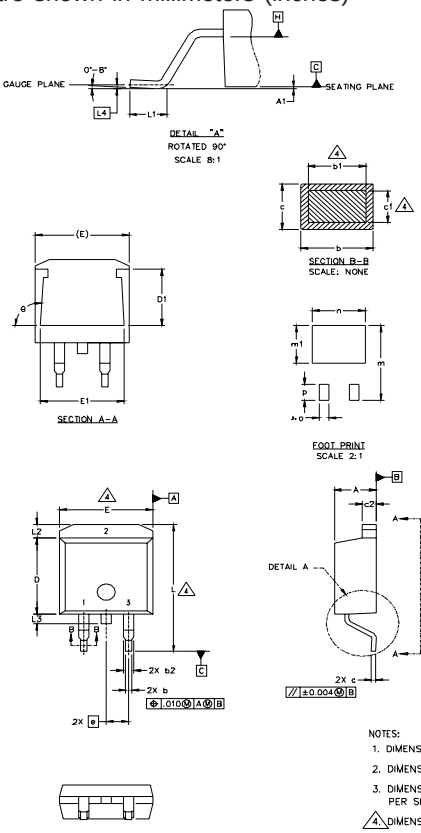


*** V_{GS} = 5.0V for Logic Level and 3V Drive Devices

Fig 14 For N Channel HEXFETS

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.

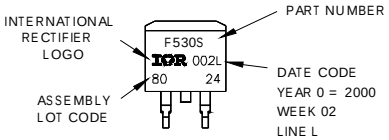
NOTES:

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.

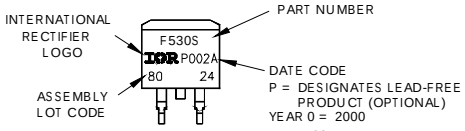
D²Pak Part Marking Information

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"

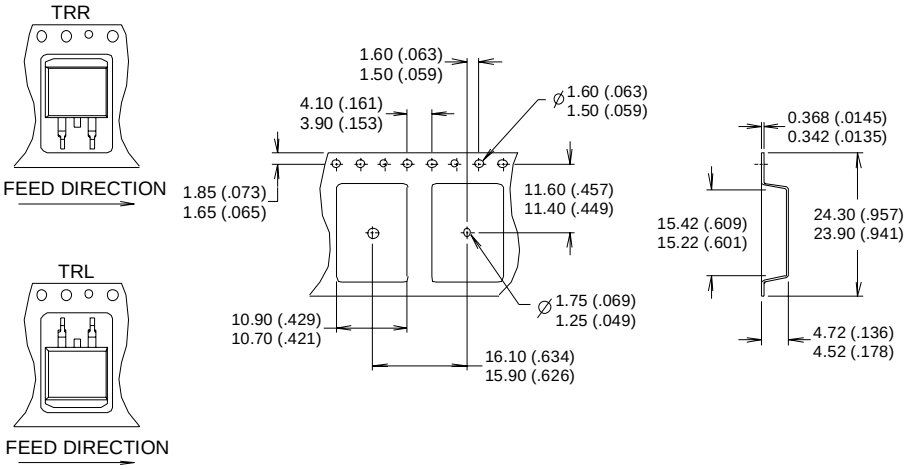


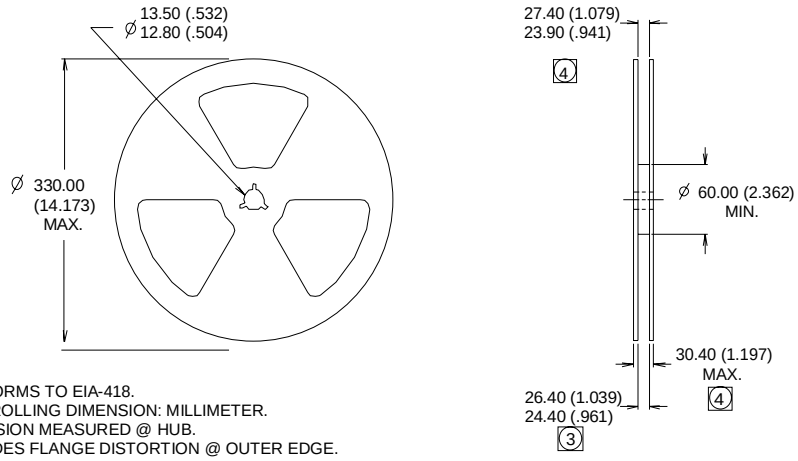
OR



D²Pak Tape & Reel Information

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.

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Note: For the most current drawings please refer to the IR website at:
http://www.irf.com/package/