



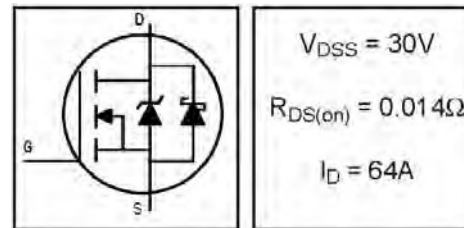
**THE DATASHEET OF  
IRL3103D1SPBF**



# IRL3103D1SPbF

- Co-packaged HEXFET<sup>®</sup> Power MOSFET and Schottky Diode
- Generation 5 Technology
- Logic Level Gate Drive
- Minimize Circuit Inductance
- Ideal For Synchronous Regulator Application
- Lead-Free

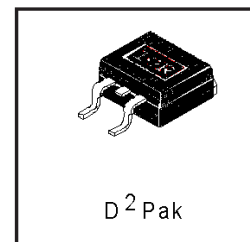
## FETKY<sup>™</sup> MOSFET & SCHOTTKY RECTIFIER



### Description

The FETKY family of co-packaged HEXFET power MOSFETs and Schottky Diodes offer the designer an innovative board space saving solution for switching regulator applications. A low on-resistance Gen5 MOSFET with a low forward voltage drop Schottky diode and minimized component interconnect inductance and resistance result in maximized converter efficiencies.

The D<sup>2</sup>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<sup>2</sup>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.



### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}^{\text{③}}$	64	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}^{\text{③}}$	45	
$I_{DM}$	Pulsed Drain Current ① ③	220	
$P_D @ T_A = 25^\circ\text{C}$	Power Dissipation	3.1	W
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation	89	W
	Linear Derating Factor	0.56	W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 16$	V
$T_J$	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	---	1.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient ( PCB Mounted, steady-state)**	---	40	

## MOSFET Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.037	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA <sup>③</sup>
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.014	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 34A <sup>②</sup>
		—	—	0.019		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 28A <sup>②</sup>
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0	—	—	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	23	—	—	S	V <sub>DS</sub> = 25V, I <sub>D</sub> = 34A <sup>③</sup>
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	0.10	mA	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V
		—	—	22		V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 16V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -16V
Q <sub>g</sub>	Total Gate Charge	—	—	43	nC	I <sub>D</sub> = 32A
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	14		V <sub>DS</sub> = 24V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	—	23		V <sub>GS</sub> = 4.5V, See Fig. 6 <sup>②</sup>
t <sub>d(on)</sub>	Turn-On Delay Time	—	9.0	—	ns	V <sub>DD</sub> = 15V
t <sub>r</sub>	Rise Time	—	210	—		I <sub>D</sub> = 32A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	20	—		R <sub>G</sub> = 3.4Ω, V <sub>GS</sub> = 4.5V
t <sub>f</sub>	Fall Time	—	54	—		R <sub>D</sub> = 0.43 Ω, <sup>②③</sup>
L <sub>S</sub>	Internal Source Inductance	—	7.5	—	nH	Between lead, and center of die contact
C <sub>iss</sub>	Input Capacitance	—	1900	—		V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	810	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	240	—		f = 1.0MHz, See Fig. 5
C <sub>iss</sub>	Input Capacitance	—	3500	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V

## Body Diode & Schottky Diode Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>F</sub> (AV)	( Schottky)	—	—	2.0	A	MOSFET symbol showing the integral reverse p-n junction and Schottky diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) <sup>①</sup>	—	—	220		
V <sub>SD1</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 32A, V <sub>GS</sub> = 0V <sup>②</sup>
V <sub>SD2</sub>	Diode Forward Voltage	—	—	0.50	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 1.0A, V <sub>GS</sub> = 0V <sup>②</sup>
t <sub>rr</sub>	Reverse Recovery Time	—	51	77	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 32A
Q <sub>rr</sub>	Reverse Recovery Charge	—	49	73	nC	di/dt = 100A/μs <sup>②</sup>
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

### Notes:

① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 10 )

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

③ Uses IRL3103D1 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.

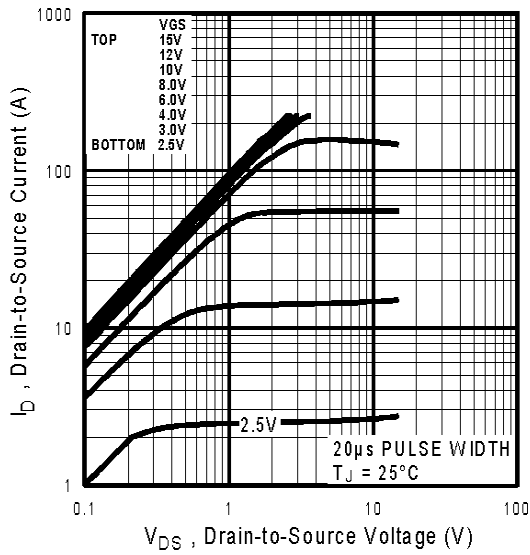


Fig 1. Typical Output Characteristics

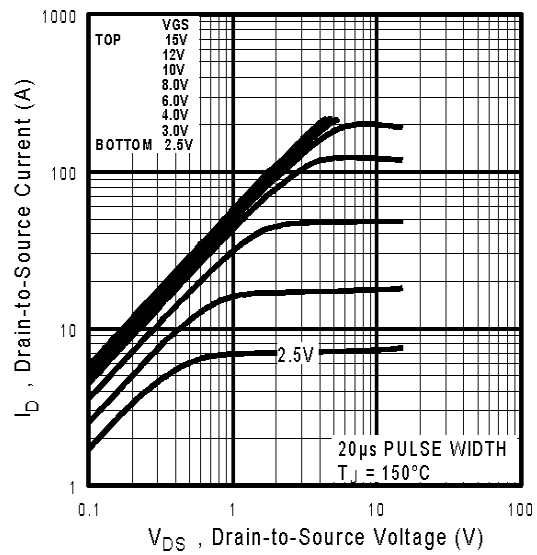


Fig 2. Typical Output Characteristics

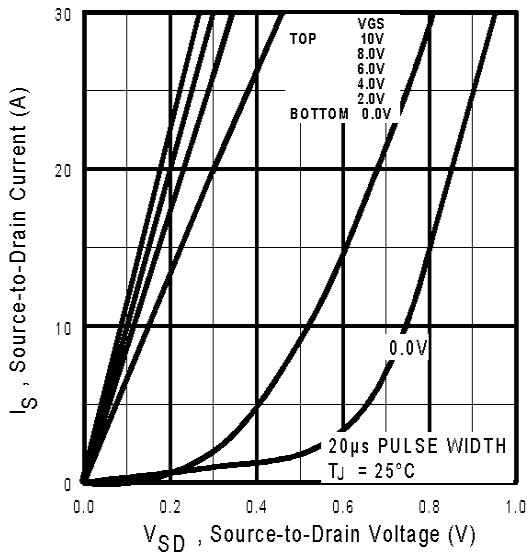


Fig 3. Typical Reverse Output Characteristics

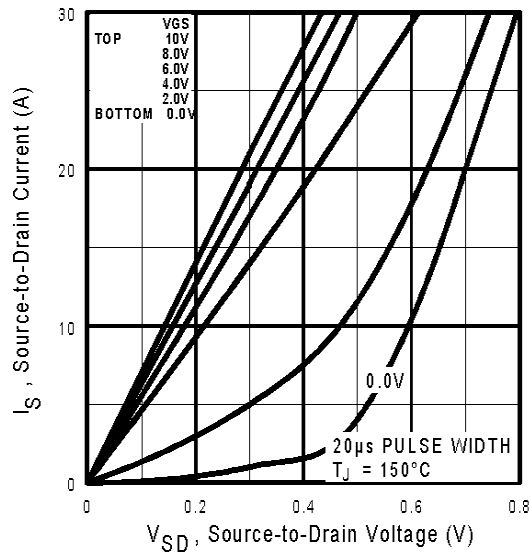
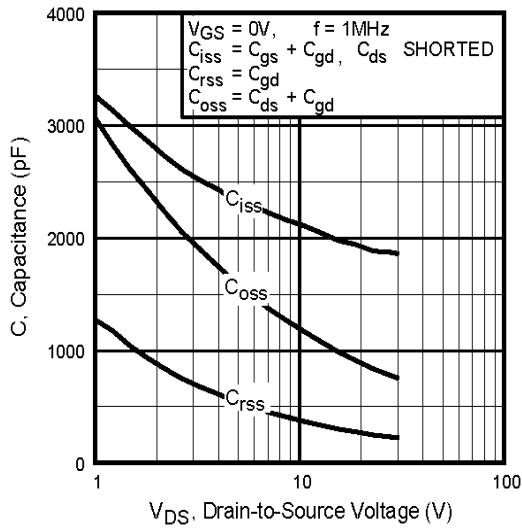
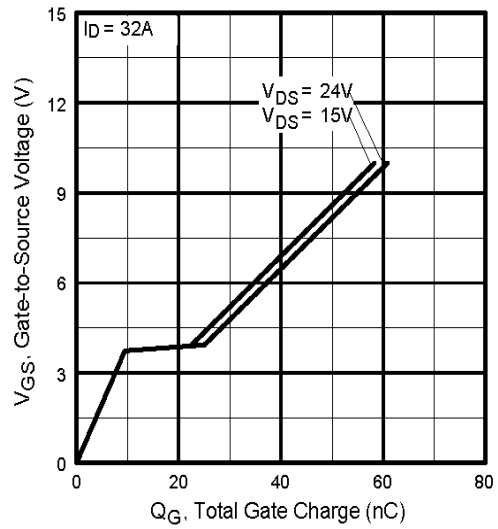


Fig 4. Typical Reverse Output Characteristics

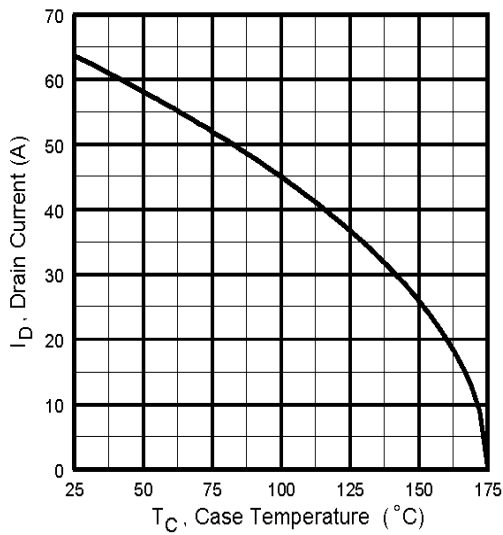
# IRL3103D1SPbF



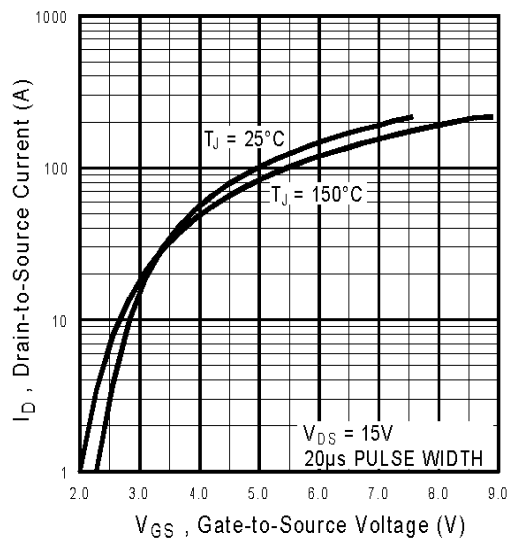
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



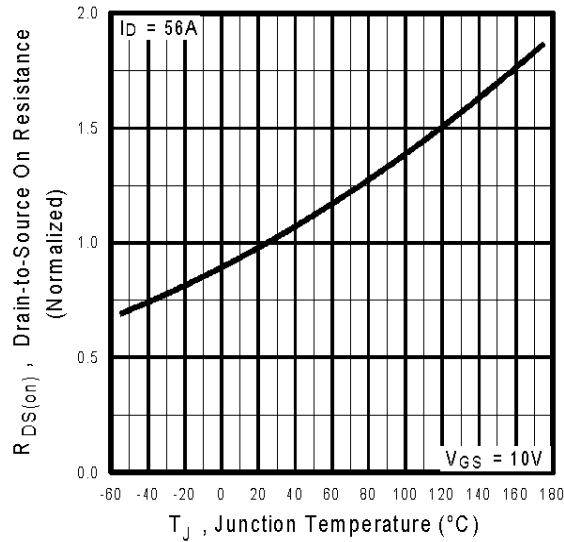
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



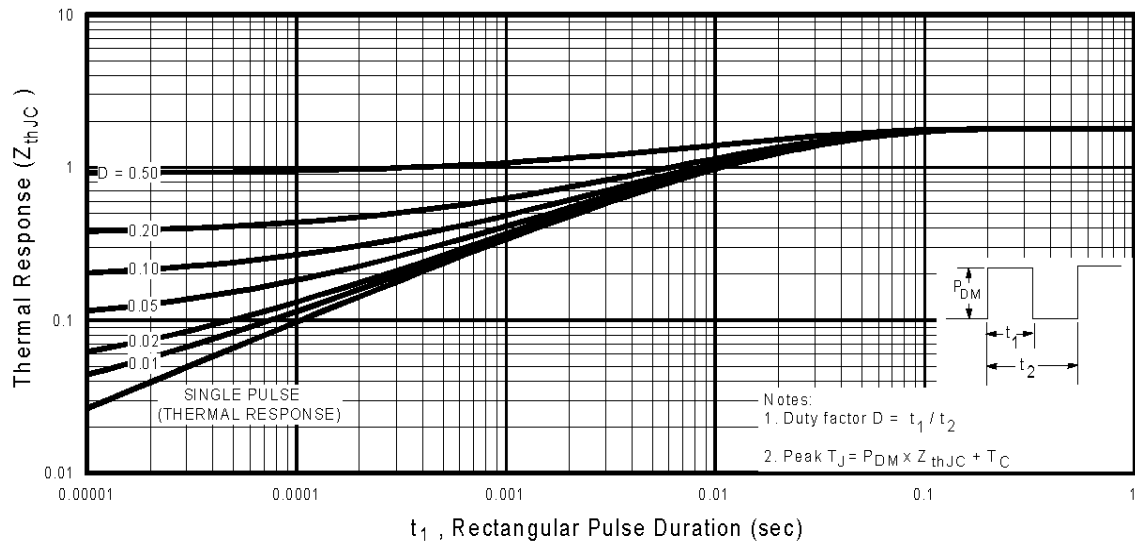
**Fig 7.** Maximum Drain Current Vs. Case Temperature



**Fig 8.** Typical Transfer Characteristics



**Fig 9.** Normalized On-Resistance Vs. Temperature



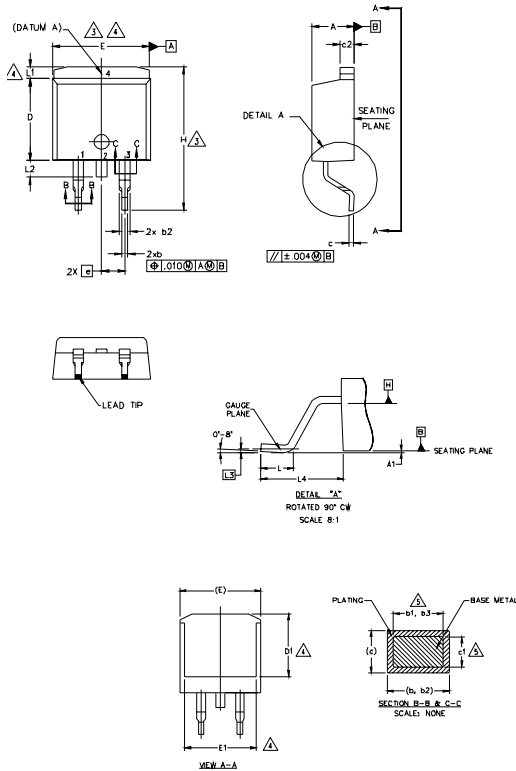
**Fig 10.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

# IRL3103D1SPbF

International  
**IR** Rectifier

## D<sup>2</sup>Pak Package Outline

Dimensions are shown in millimeters (inches)



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 AT DATUM H.
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
7. CONTROLLING DIMENSION: INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	-	.270	-	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	-	.245	-	4
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	-	1.65	-	.066	
L2	1.27	1.78	-	.070	4
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	

LEAD ASSIGNMENTS

HEXFET

- 1.- GATE
- 2, 4.- DRAIN
- 3.- SOURCE

IGBTs, CoPACK

- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

DIODES

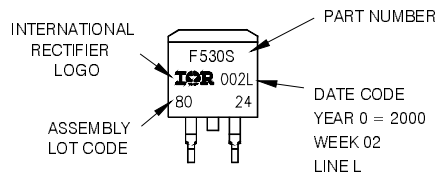
- 1.- ANODE \*
- 2, 4.- CATHODE
- 3.- ANODE

\* PART DEPENDENT.

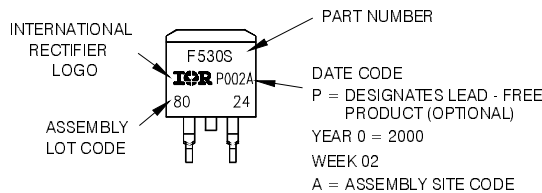
## D<sup>2</sup>Pak Part Marking Information

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"

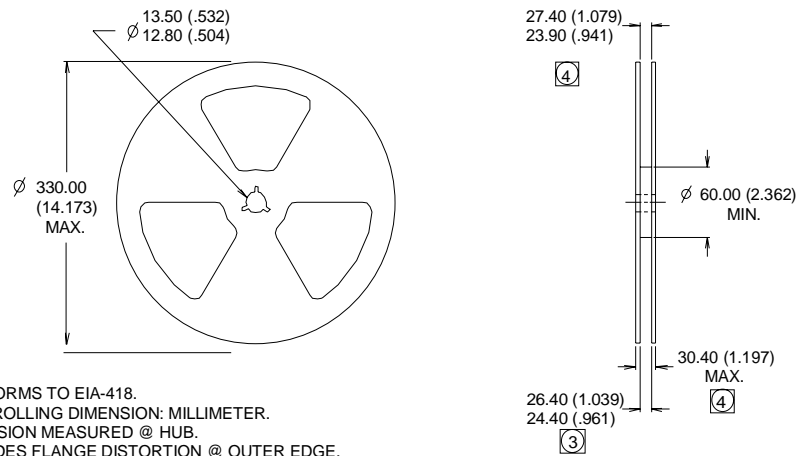
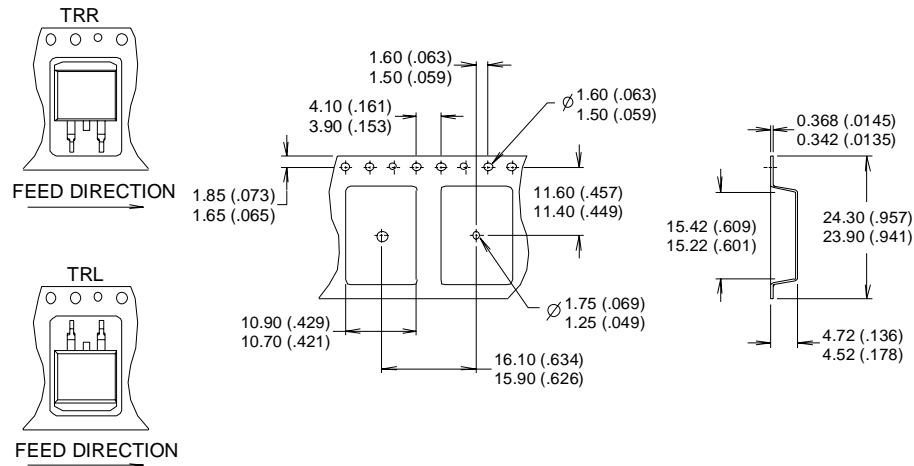


OR



## D<sup>2</sup>Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



- NOTES:
1. CONFORMS 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.

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

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