

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

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.

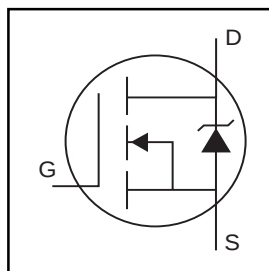
The D²Pak is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²Pak is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application.

Absolute Maximum Ratings

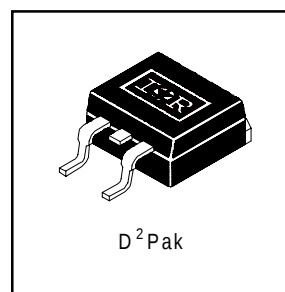
	Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 4.5V⑤	110⑥	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 4.5V⑤	67	
I_{DM}	Pulsed Drain Current ①⑤	420	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	140	W
	Linear Derating Factor	1.1	W/°C
V_{GS}	Gate-to-Source Voltage	± 10	V
V_{GSM}	Gate-to-Source Voltage (Start Up Transient, $t_p = 100\mu\text{s}$)	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	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_{qJC}	Junction-to-Case	—	0.89	°C/W
R_{qJA}	Junction-to-Ambient (PCB Mounted, steady-state)**	—	40	



$V_{DSS} = 20V$
$R_{DS(on)} = 0.007W$
$I_D = 110A$ ⑥



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	20	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$DV_{(BR)DSS}/DT_J$	Breakdown Voltage Temp. Coefficient	—	0.019	—	$V/^\circ\text{C}$	Reference to 25°C , $I_D = 1.0\text{mA}$ ⑤
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.008	W	$V_{GS} = 4.5V, I_D = 64A$ ④
		—	—	0.007		$V_{GS} = 7.0V, I_D = 64A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	0.70	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	77	—	—	S	$V_{DS} = 10V, I_D = 64A$ ⑤
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 20V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 10V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
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	—		$R_G = 3.8W, V_{GS} = 4.5V$
t_f	Fall Time	—	130	—		$R_D = 0.15W$ 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	—		$f = 1.0\text{MHz}$, See Fig. 5⑤

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	110	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	$T_J = 25^\circ\text{C}, I_S = 64A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	87	130	ns	$T_J = 25^\circ\text{C}, I_F = 64A$
Q_{rr}	Reverse Recovery Charge	—	200	310	nC	$di/dt = 100A/\mu s$ 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 $T_J = 25^\circ\text{C}$, $L = 190\mu H$
 $R_G = 25W, I_{AS} = 64A$.
- ③ $I_D \leq 64A$, $di/dt \leq 86A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$

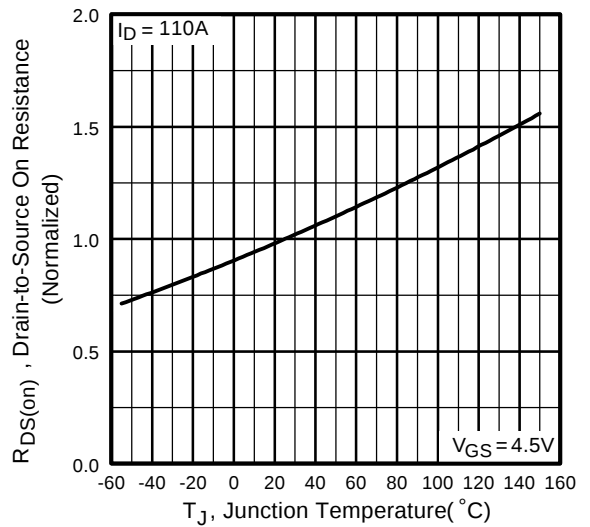
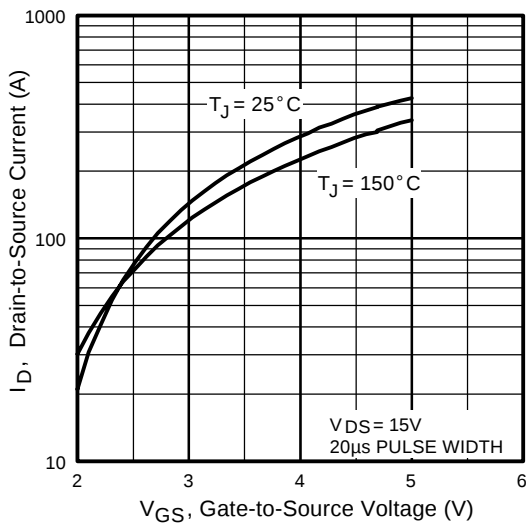
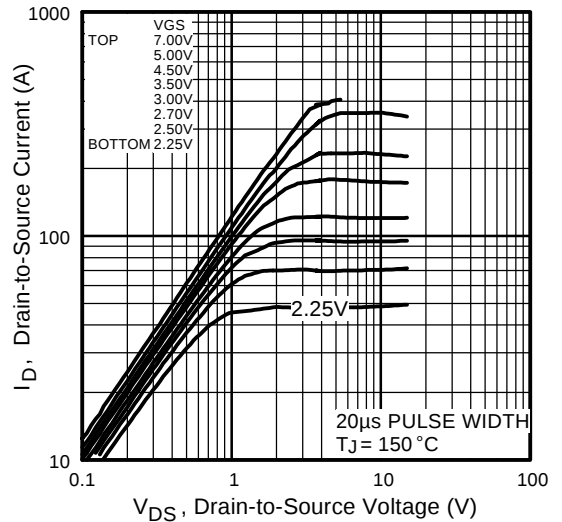
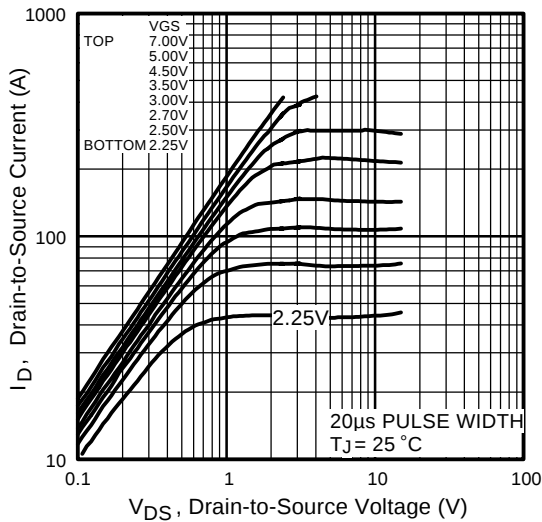
④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

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.



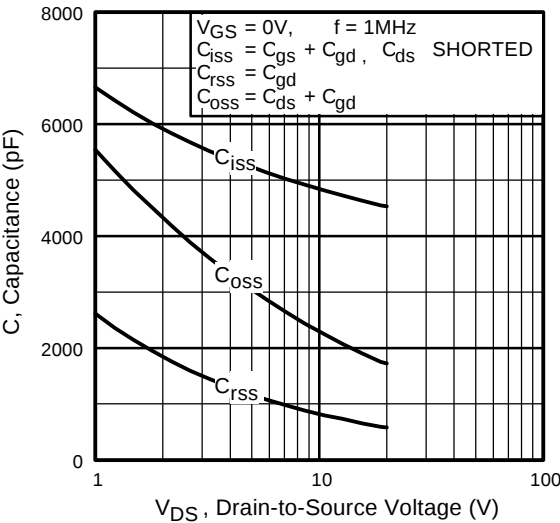


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

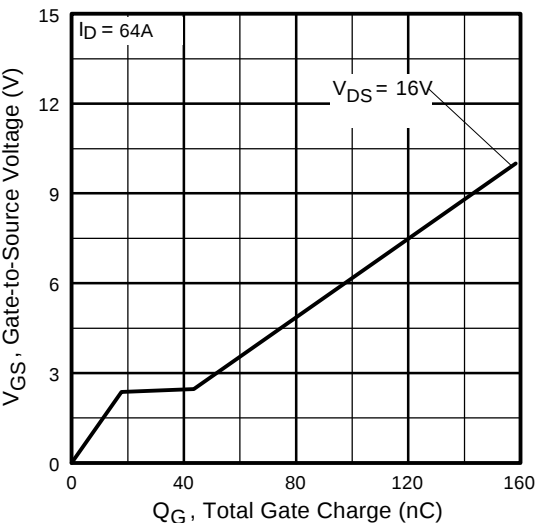


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

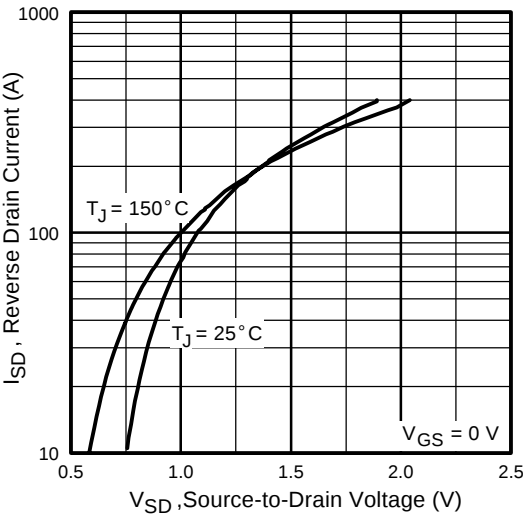


Fig 7. Typical Source-Drain Diode Forward Voltage

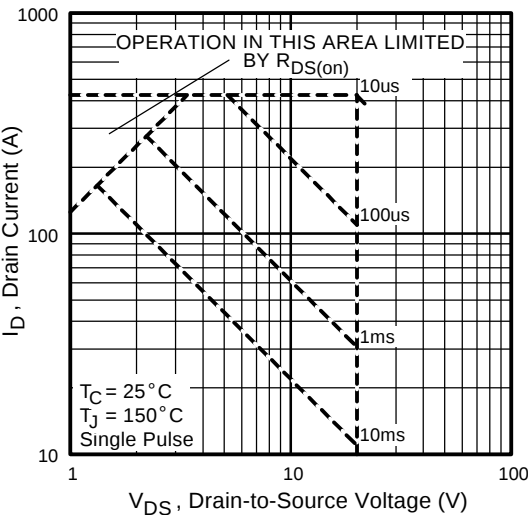


Fig 8. Maximum Safe Operating Area

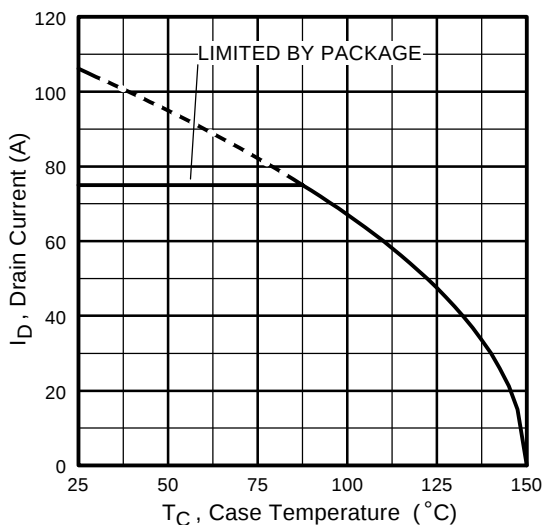


Fig 9. Maximum Drain Current Vs. Case Temperature

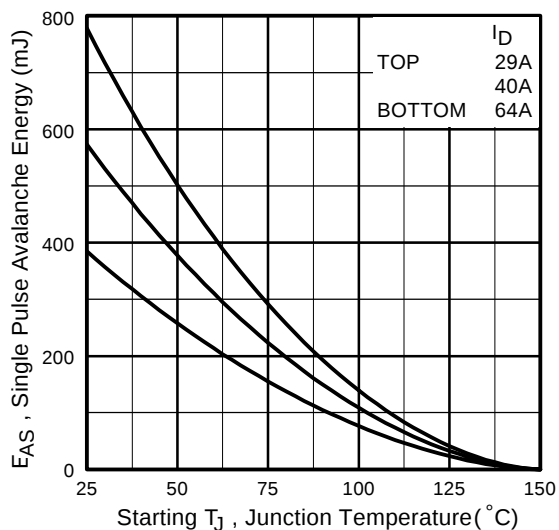


Fig 10. Maximum Avalanche Energy Vs. Drain Current

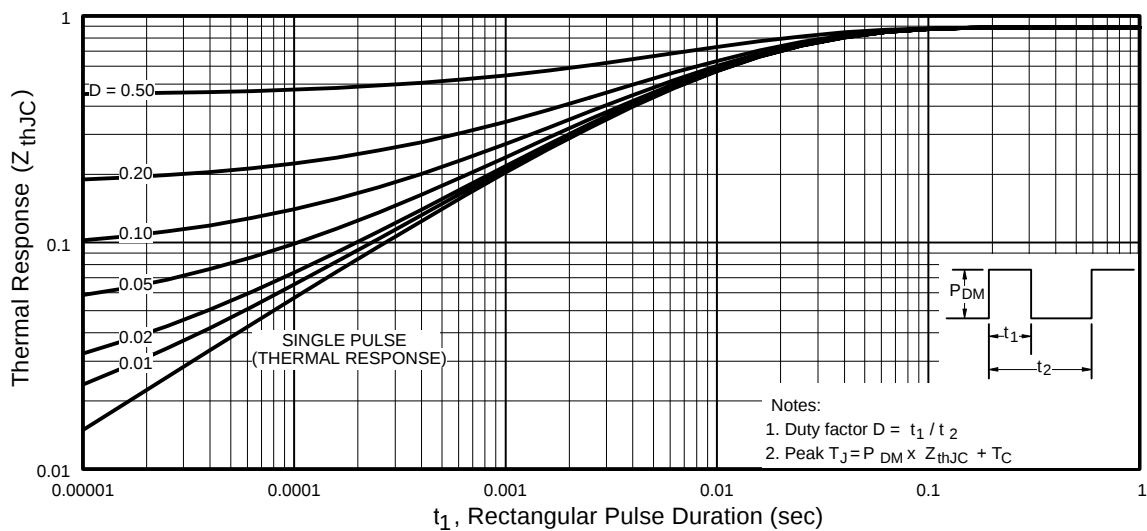


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

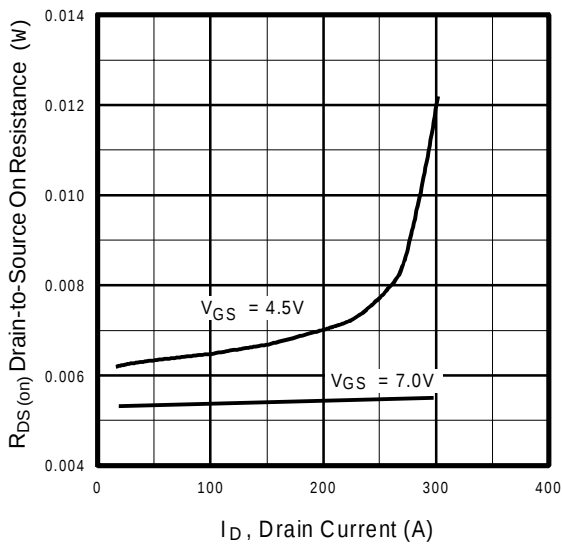


Fig 12. On-Resistance Vs. Drain Current

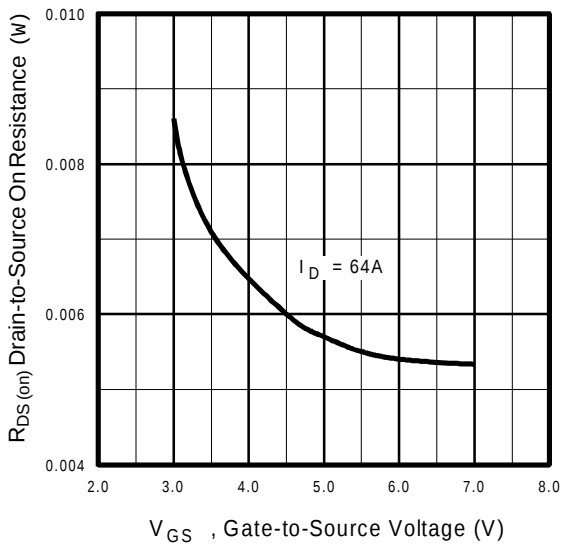


Fig 13. On-Resistance Vs. Gate Voltage

Technical drawing of a square flange with dimensions in inches and millimeters. The drawing shows a square flange with a central hole and four mounting holes. Dimensions include overall width (10.54 in / 415 mm), mounting hole diameter (1.40 in / 55 mm), central hole diameter (0.25 in / 10 mm), and flange thickness (0.14 in / 3.5 mm). A section line A-A is indicated.

Feature	Dimension (in)	Dimension (mm)
Overall Width	10.54	(415)
Mounting Hole Diameter	1.40	(55)
Central Hole Diameter	0.25	(10)
Flange Thickness	0.14	(3.5)
Mounting Hole Spacing (Center-to-Center)	1.40	(55)
Mounting Hole Diameter (3x)	1.40	(55)
Mounting Hole Diameter (1x)	1.14	(45)
Overall Width (3x)	5.08	(200)
Overall Width (1x)	5.08	(200)
Overall Width (3x)	0.93	(37)
Overall Width (1x)	0.69	(27)

1 DIMENSIONS AFTER SOLDER DIP.
2 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
3 CONTROLLING DIMENSION : INCH.
4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

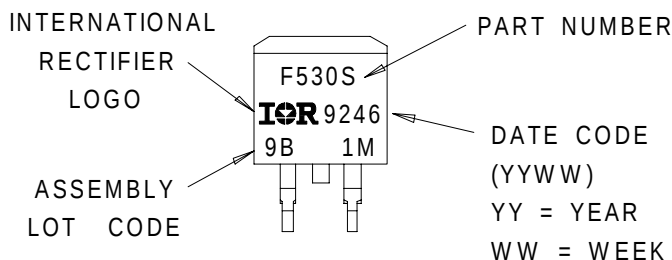
1 - GATE
2 - DRAIN
3 - SOURCE

Technical drawing of the bottom view of a component. The drawing shows a central rectangular area with four protruding pins. Dimensions are provided in inches and millimeters.

- Overall width: 10.16 (.400) REF.
- Overall height: 6.47 (.255)
- Height of the central rectangular area: 6.18 (.243)
- Height of the pins: 2.61 (.103)
- Width of the pins: 2.32 (.091)
- Overall width of the pins: 8.89 (.350) REF.

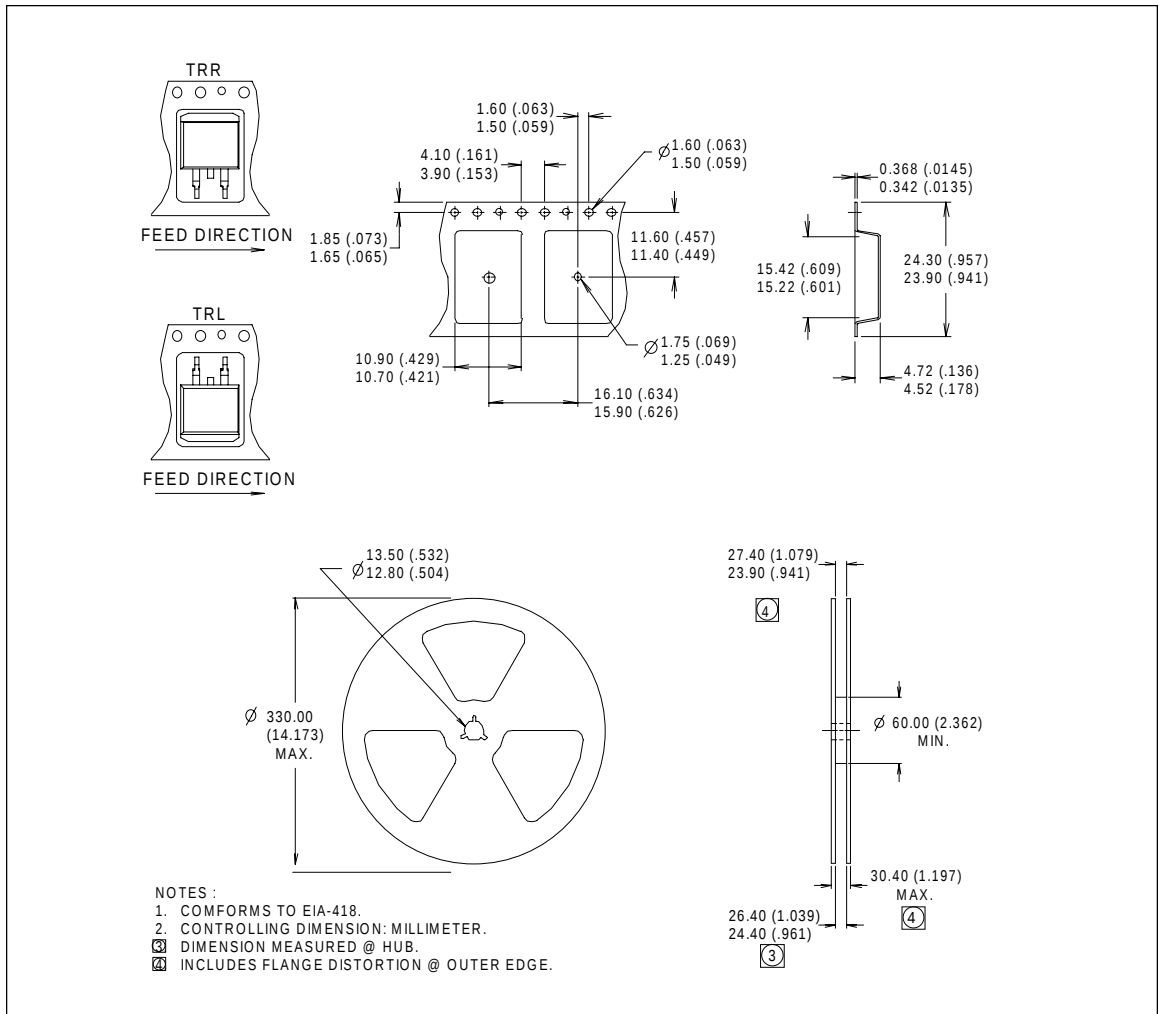
MINIMUM RECOMMENDED FOOTPRINT

D²Pak



Tape & Reel Information

D²Pak



International
IR Rectifier

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<http://www.irf.com/> Data and specifications subject to change without notice. 11/97

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