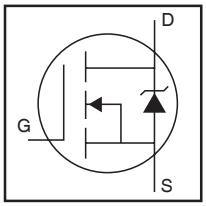
International
IOR Rectifier

PD - 95707E

IRFB4410PbF
IRFS4410PbF
IRFSL4410PbF

HEXFET® Power MOSFET

Applications
- High Efficiency Synchronous Rectification in SMPS
- Uninterruptible Power Supply
- High Speed Power Switching
- Hard Switched and High Frequency Circuits



V_{DSS}		100V
$R_{DS(on)}$	typ.	8.0mΩ
	max.	10mΩ
I_D		88A

Benefits
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche SOA
- Enhanced body diode dV/dt and dI/dt Capability
- Lead-Free

TO-220AB
IRFB4410PbF

D^2Pak
IRFS4410PbF

TO-262
IRFSL4410PbF

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	88①⑩	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	63①⑩	
I_{DM}	Pulsed Drain Current ②	380	
P_D @T_C = 25°C	Maximum Power Dissipation	200⑩	W
	Linear Derating Factor	1.3⑩	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ④	19	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting torque, 6-32 or M3 screw	10lb·in (1.1N·m)	

Avalanche Characteristics

$E_{AS\ (Thermally\ limited)}$	Single Pulse Avalanche Energy ③	220	mJ
I_{AR}	Avalanche Current ①	See Fig. 14, 15, 16a, 16b	A
E_{AR}	Repetitive Avalanche Energy ⑤		mJ

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑨	—	0.61⑩	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat Greased Surface , TO-220	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient, TO-220 ⑨	—	62	
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) , D^2Pak ⑧⑨	—	40	

Static @ T_J = 25°C (unless otherwise specified)

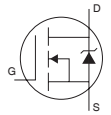
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	——	——	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.094	——	V/°C	Reference to 25°C, I_D = 1mA②
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	8.0	10	mΩ	V_{GS} = 10V, I_D = 58A ⑤
$V_{GS(th)}$	Gate Threshold Voltage	2.0	——	4.0	V	V_{DS} = V_{GS}, I_D = 150µA
I_{DSS}	Drain-to-Source Leakage Current	——	——	20	µA	V_{DS} = 100V, V_{GS} = 0V
		——	——	250		V_{DS} = 100V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	200	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	——	——	-200		V_{GS} = -20V
R_G	Gate Input Resistance	——	1.5	——	Ω	f = 1MHz, open drain

Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
gfs	Forward Transconductance	120	——	——	S	V_{DS} = 50V, I_D = 58A
Q_g	Total Gate Charge	——	120	180	nC	I_D = 58A
Q_{gs}	Gate-to-Source Charge	——	31	——		V_{DS} = 80V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	44	——		V_{GS} = 10V ⑤
$t_{d(on)}$	Turn-On Delay Time	——	24	——	ns	V_{DD} = 65V
t_r	Rise Time	——	80	——		I_D = 58A
$t_{d(off)}$	Turn-Off Delay Time	——	55	——		R_G = 4.1Ω
t_f	Fall Time	——	50	——		V_{GS} = 10V ⑤
C_{iss}	Input Capacitance	——	5150	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	360	——		V_{DS} = 50V
C_{rss}	Reverse Transfer Capacitance	——	190	——		f = 1.0MHz
C_{oss} eff. (ER)	Effective Output Capacitance (Energy Related)	——	420	——		V_{GS} = 0V, V_{DS} = 0V to 80V ⑦, See Fig.11
C_{oss} eff. (TR)	Effective Output Capacitance (Time Related)⑥	——	500	——		V_{GS} = 0V, V_{DS} = 0V to 80V ⑥, See Fig. 5

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	88①	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ②	——	——	380	A	
V_{SD}	Diode Forward Voltage	——	——	1.3	V	T_J = 25°C, I_S = 58A, V_{GS} = 0V ⑤
t_{rr}	Reverse Recovery Time	——	38	56	ns	T_J = 25°C V_R = 85V,
		——	51	77		T_J = 125°C I_F = 58A
Q_{rr}	Reverse Recovery Charge	——	61	92	nC	T_J = 25°C di/dt = 100A/µs ⑤
		——	110	170		T_J = 125°C
I_{RRM}	Reverse Recovery Current	——	2.8	——	A	T_J = 25°C
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				



Notes:

① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.

② Repetitive rating; pulse width limited by max. junction temperature.

③ Limited by T_{Jmax}, starting T_J = 25°C, L = 0.14mH R_G = 25Ω, I_{AS} = 58A, V_{GS} =10V. Part not recommended for use above this value.

④ I_{SD} ≤ 58A, di/dt ≤ 650A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

⑤ Pulse width ≤ 400µs; duty cycle ≤ 2%.

⑥ C_{oss} eff. (TR) is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑦ C_{oss} eff. (ER) is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

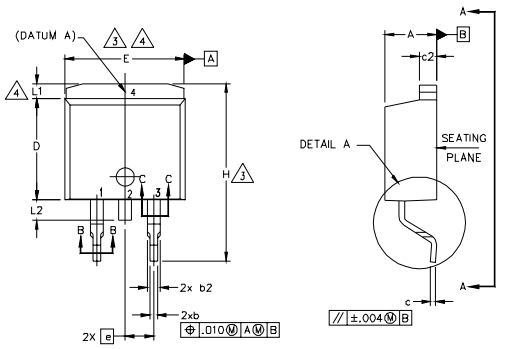
⑧ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.

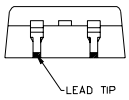
⑨ R_θ is measured at T_J approximately 90°C.

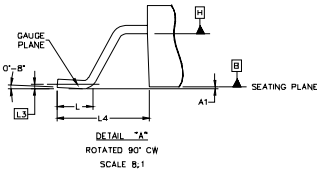
⑩ $R_{\theta JC}$ (end of life) for D^2Pak and TO-262 = 0.75°C/W. Note: This is the maximum measured value after 1000 temperature cycles from -55 to 150°C and is accounted for by the physical wearout of the die attach medium.

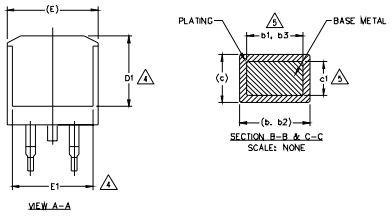
D²Pak (TO-263AB) Package Outline

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	4
L2	1.27	1.78	–	.070	
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

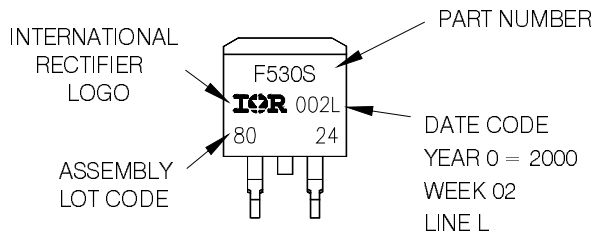
1.– ANODE *
2, 4.– CATHODE
3.– ANODE

* PART DEPENDENT.

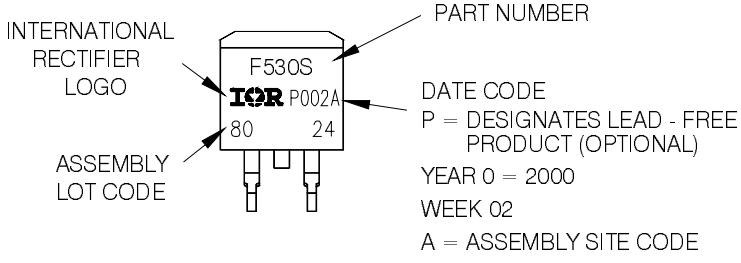
D²Pak (TO-263AB) Part Marking Information

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

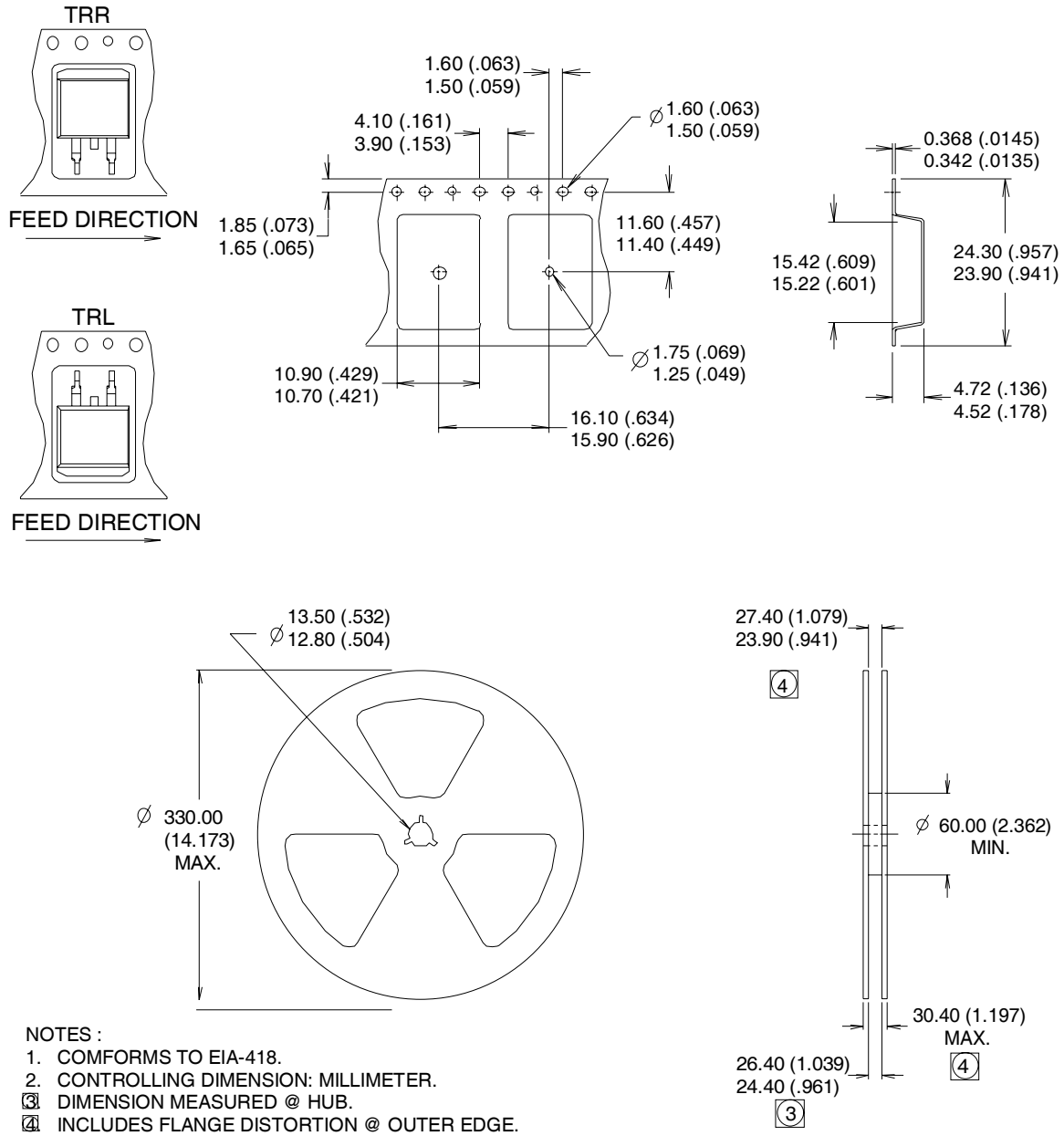
Note: "P" in assembly line position
indicates "Lead – Free"



OR



D²Pak (TO-263AB) Tape & Reel Information



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.
This product has been designed and qualified for the Industrial market.

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