International
IOR Rectifier

PROVISIONAL

PD - 97001B

SMPS MOSFET

IRFB38N20DPbF
IRFS38N20DPbF
IRFSL38N20DPbF

HEXFET® Power MOSFET

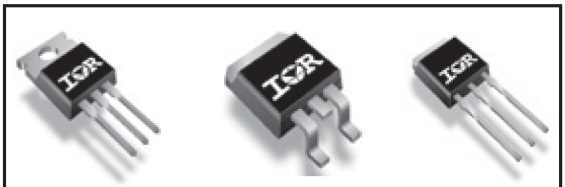
Applications

- High frequency DC-DC converters
- Plasma Display Panel
- Lead-Free

Benefits

- Low Gate-to-Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective C_{OSS} to Simplify Design, (See App. Note AN1001)
- Fully Characterized Avalanche Voltage and Current

Key Parameters		
V_{DS}	200	V
$V_{DS\ (Avalanche)}$ min.	260	V
$R_{DS(ON)}$ max @ 10V	54	mΩ
T_J max	175	°C



TO-220AB IRFB38N20DPbF | D^2Pak IRFS38N20DPbF | TO-262 IRFSL38N20DPbF

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V ⑦	43*	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V ⑦	30*	
I_{DM}	Pulsed Drain Current ①	180	
P_D @T_A = 25°C	Power Dissipation ⑦	3.8	W
P_D @T_C = 25°C	Power Dissipation ⑦	300*	
	Linear Derating Factor ⑦	2.0*	W/°C
V_{GS}	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	9.5	V/ns
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torqe, 6-32 or M3 screw⑥	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.47*	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface ⑥	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient⑥	—	62	
$R_{\theta JA}$	Junction-to-Ambient⑦	—	40	

* $R_{\theta JC}$ (end of life) for D^2Pak and TO-262 = 0.50°C/W. 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.

Notes ① through ⑦ are on page 11

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	200	—	—	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.22	—	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.054	Ω	V_{GS} = 10V, I_D = 26A ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	5.0	V	V_{DS} = V_{GS}, I_D = 250µA
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	µA	V_{DS} = 200V, V_{GS} = 0V
		—	—	250		V_{DS} = 160V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V_{GS} = 30V
	Gate-to-Source Reverse Leakage	—	—	-100		V_{GS} = -30V

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	17	—	—	S	V_{DS} = 50V, I_D = 26A
Q_g	Total Gate Charge	—	60	91	nC	I_D = 26A
Q_{gs}	Gate-to-Source Charge	—	17	25		V_{DS} = 100V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	28	42		V_{GS} = 10V, ④
$t_{d(on)}$	Turn-On Delay Time	—	16	—	ns	V_{DD} = 100V
t_r	Rise Time	—	95	—		I_D = 26A
$t_{d(off)}$	Turn-Off Delay Time	—	29	—		R_G = 2.5Ω
t_f	Fall Time	—	47	—		V_{GS} = 10V ④
C_{iss}	Input Capacitance	—	2900	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	450	—		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	—	73	—		f = 1.0MHz
C_{oss}	Output Capacitance	—	3550	—		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance	—	180	—		V_{GS} = 0V, V_{DS} = 160V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	—	380	—		V_{GS} = 0V, V_{DS} = 0V to 160V ⑤

Avalanche Characteristics

	Parameter	Min.	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②⑥	—	—	460	mJ
I_{AR}	Avalanche Current ①	—	—	26	A
E_{AR}	Repetitive Avalanche Energy ①	—	390	—	mJ
$V_{DS\ (Avalanche)}$	Repetitive Avalanche Voltage ①	260	—	—	V

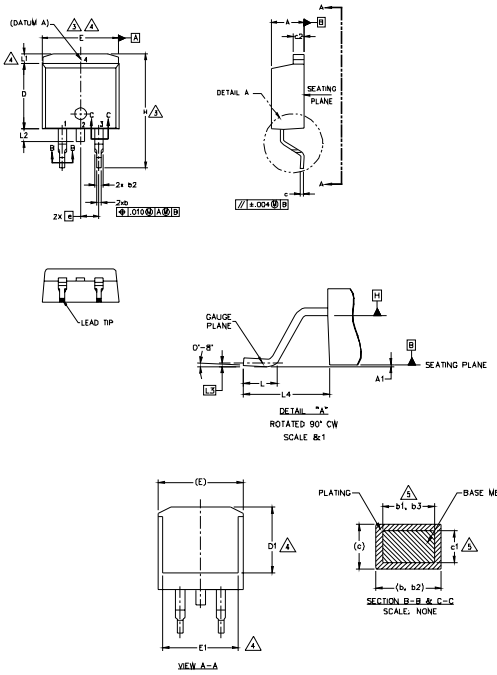
Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	44	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①⑥	—	—	180		
V_{SD}	Diode Forward Voltage	—	—	1.5	V	T_J = 25°C, I_S = 26A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	160	240	nS	T_J = 25°C, I_F = 26A
Q_{rr}	Reverse RecoveryCharge	—	1.3	2.0	µC	di/dt = 100A/µs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

International
IOR Rectifier

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	0.00	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	–	1.78	–	.070	
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	

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.

LEAD ASSIGNMENTS

DIODES

1.- ANODE (TWO DIE) / OPEN (ONE DIE)
2, 4.- CATHODE
3.- ANODE

HEXFET

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

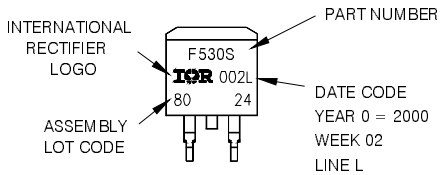
IGBTs, CoPACK

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

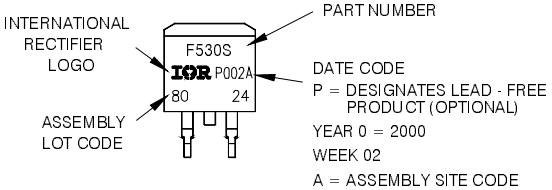
D²Pak Part Marking Information

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

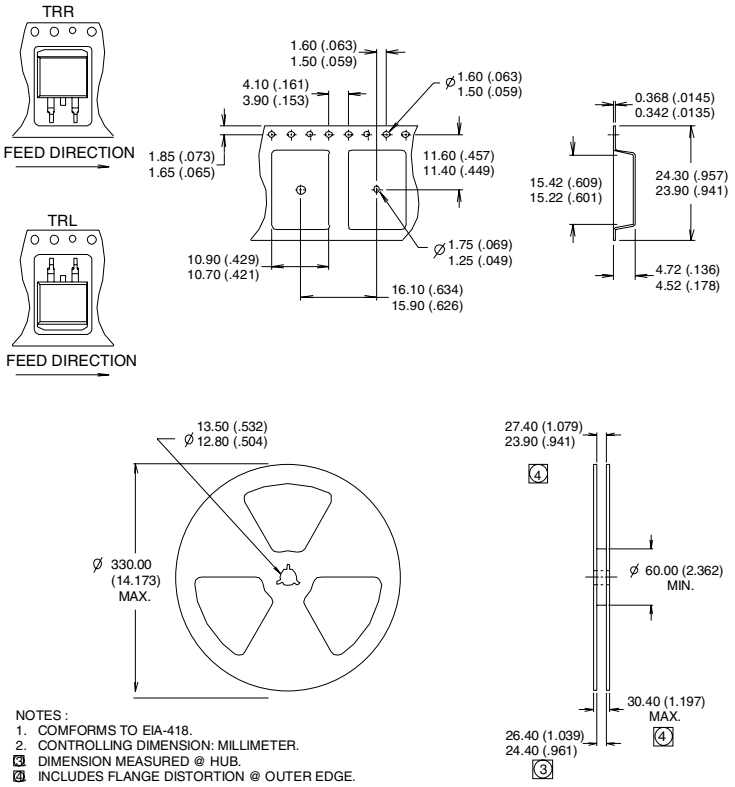
Note: "P" in assembly line position
indicates "Lead – Free"



OR



D²Pak Tape & Reel Information



Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J = 25°C, L = 1.3mH R_G = 25Ω, I_{AS} = 26A.

③ $I_{SD} \leq$ 26A, di/dt ≤ 390A/μs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 175°C.

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

⑤ C_{oss} eff. is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑥ This is only applied to TO-220AB package.

⑦ This is applied to D²Pak, when mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Automotive [Q101] (IRFB38N20DPbF), & Industrial (IRFS38N20DPbF/IRFSL38N20D) market.

International
IOR Rectifier