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)				

IRFB/S/SL38N20DPbF

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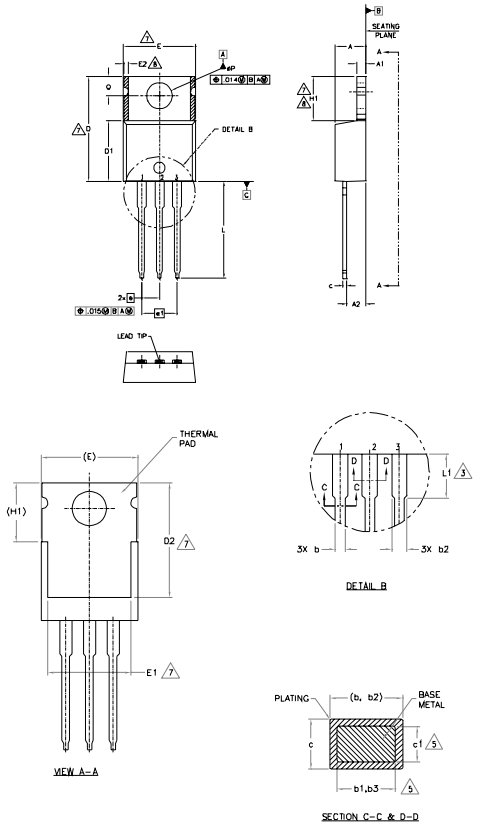
TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1.– DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M– 1994.
2.– DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3.– LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4.– DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5.– DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
6.– CONTROLLING DIMENSION : INCHES.
7.– THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
8.– DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.
9.– OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.83	.140	.190	
A1	0.51	1.40	.020	.055	
A2	2.03	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.97	.015	.038	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	11.68	12.88	.460	.507	7
E	9.65	10.67	.380	.420	4,7
E1	6.86	8.89	.270	.350	7
E2	–	0.76	–	.030	8
e	2.54 BSC		.100 BSC		
e1	5.08 BSC		.200 BSC		
H1	5.84	6.86	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	3.56	4.06	.140	.160	3
øP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	

LEAD ASSIGNMENTS

HEXFET
1.– GATE
2.– DRAIN
3.– SOURCE

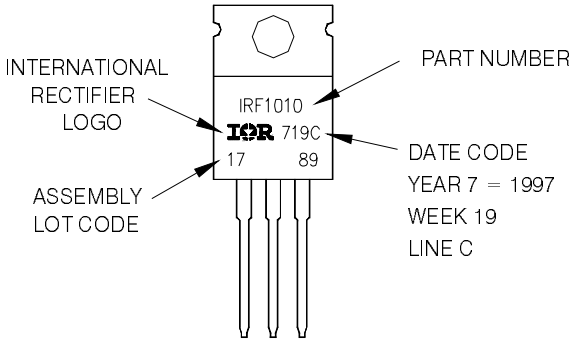
IGBTs, CoPACK
1.– GATE
2.– COLLECTOR
3.– EMITTER

DIODES
1.– ANODE
2.– CATHODE
3.– ANODE

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

Note: "P" inassembly line position indicates "Lead - Free"



TO-220AB packages are not recommended for Surface Mount Application.