International
IOR Rectifier

SMPS MOSFET

PD - 95536

IRFB23N20DPbF
IRFS23N20DPbF
IRFSL23N20DPbF

HEXFET® Power MOSFET

V_{DSS}	$R_{DS(on)}$ max	I_D
200V	0.10Ω	24A

Applications
- High frequency DC-DC converters
- 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


TO-220AB
IRFB23N20D


D^2Pak
IRFS23N20D


TO-262
IRFSL23N20D

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	24	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	17	
I_{DM}	Pulsed Drain Current ①	96	
P_D @T_A = 25°C	Power Dissipation ⑦	3.8	W
P_D @T_C = 25°C	Power Dissipation	170	
	Linear Derating Factor	1.1	W/°C
V_{GS}	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	3.3	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)	

Typical SMPS Topologies

- Telecom 48V input Forward Converter

Notes ① through ⑤ 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	—	0.26	—	V/°C	Reference to 25°C, I_D = 1mA ⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.10	Ω	V_{GS} = 10V, I_D = 14A ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	5.5	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	13	—	—	S	V_{DS} = 50V, I_D = 14A
Q_g	Total Gate Charge	—	57	86	nC	I_D = 14A
Q_{gs}	Gate-to-Source Charge	—	14	21		V_{DS} = 160V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	27	40		V_{GS} = 10V, ④⑥
$t_{d(on)}$	Turn-On Delay Time	—	14	—	ns	V_{DD} = 100V
t_r	Rise Time	—	32	—		I_D = 14A
$t_{d(off)}$	Turn-Off Delay Time	—	26	—		R_G = 4.6Ω
t_f	Fall Time	—	16	—		V_{GS} = 10V ④
C_{iss}	Input Capacitance	—	1960	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	300	—		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	—	65	—		f = 1.0MHz⑥
C_{oss}	Output Capacitance	—	2200	—		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance	—	120	—		V_{GS} = 0V, V_{DS} = 160V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	—	220	—		V_{GS} = 0V, V_{DS} = 0V to 160V ⑤

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②⑥	—	250	mJ
I_{AR}	Avalanche Current①	—	14	A
E_{AR}	Repetitive Avalanche Energy①	—	17	mJ

Thermal Resistance

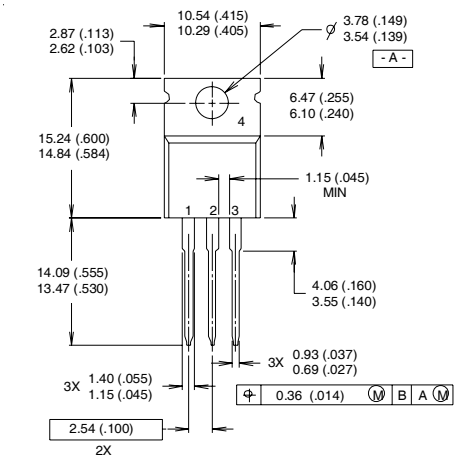
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.90	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface ⑥	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient⑥	—	62	
$R_{\theta JA}$	Junction-to-Ambient⑦	—	40	

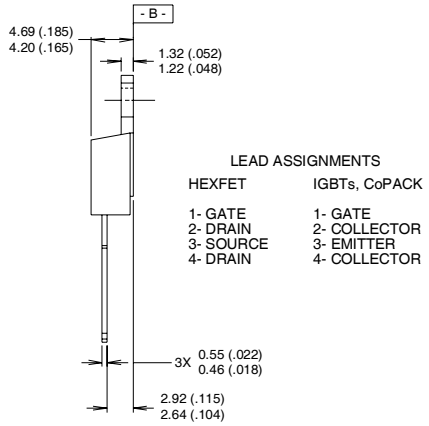
Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	24	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①⑥	—	—	96		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 14A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	200	300	ns	T_J = 25°C, I_F = 14A
Q_{rr}	Reverse RecoveryCharge	—	1300	1940	nC	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)				

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)





LEAD ASSIGNMENTS

HEXFET	IGBTs, CoPACK
1- GATE	1- GATE
2- DRAIN	2- COLLECTOR
3- SOURCE	3- EMITTER
4- DRAIN	4- COLLECTOR

NOTES:

1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.

2 CONTROLLING DIMENSION : INCH

3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220AB.

4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

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" in assembly line position indicates "Lead-Free"