

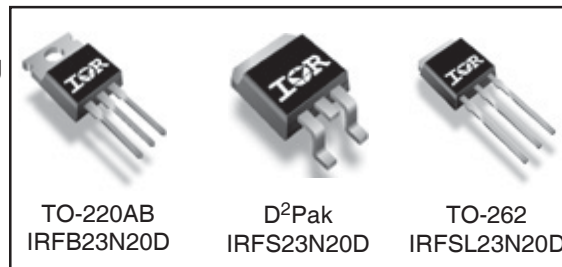
Applications

- High frequency DC-DC converters
- Lead-Free

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

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



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 ②	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 torque, 6-32 or M3 screw④	10 lbf•in (1.1N•m)	

Typical SMPS Topologies

- Telecom 48V input Forward Converter

Notes ① through ④ are on page 11

IRFB/IRFS/IRFSL23N20DPbF

International
IR Rectifier

Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	200	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.26	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ 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	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 200V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 160V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 30V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -30V$

Dynamic @ $T_J = 25^\circ\text{C}$ (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		$V_{GS} = 10V, \text{④⑥}$
$t_{d(on)}$	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	—		$R_G = 4.6\Omega$
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	—		$f = 1.0\text{MHz}$ ⑥
C_{oss}	Output Capacitance	—	2200	—		$V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	120	—		$V_{GS} = 0V, V_{DS} = 160V, f = 1.0\text{MHz}$
$C_{oss\ eff.}$	Effective Output Capacitance	—	220	—		$V_{GS} = 0V, V_{DS} = 0V \text{ to } 160V$ ⑤

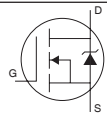
Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②⑥	—	250	mJ
I_{AR}	Avalanche Current ①	—	14	A
E_{AR}	Repetitive Avalanche Energy ①	—	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-Ambient ⑥	—	62	
$R_{\theta JA}$	Junction-to-Ambient ⑦	—	40	

Diode Characteristics

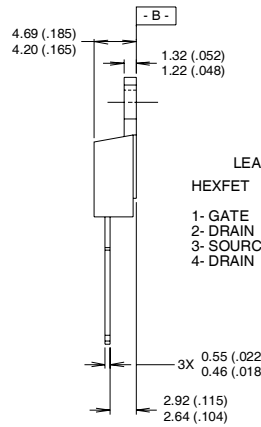
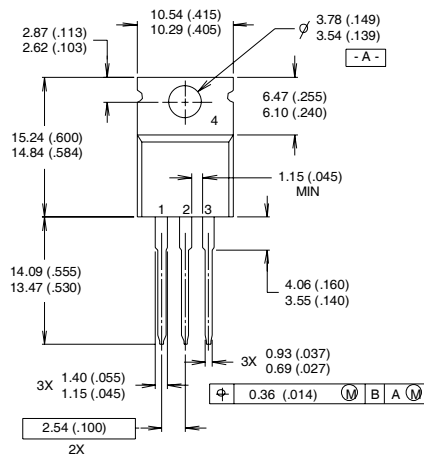
	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	24	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①⑥	—	—	96		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 14A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	200	300	ns	$T_J = 25^\circ\text{C}, I_F = 14A$
Q_{rr}	Reverse Recovery Charge	—	1300	1940	nC	$di/dt = 100A/\mu s$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

IRFB/IRFS/IRFSL23N20DPbF



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"

