

Applications

- Telecom and Data-Com off-Line SMPS
- Motor Control
- Uninterruptible Power Supply

Benefits

- Low On-Resistance
- High Speed Switching
- Low Gate Drive Current Due to Improved Gate Charge Characteristics
- Built in Fast Recovery Diode
- Improved Avalanche Ruggedness and Dynamic dv/dt, Fully Characterized Avalanche Voltage and Current

V_{DS}	$R_{DS(on)}$	I_D
500V	0.152 Ω	31A



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	31	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	19	
I_{DM}	Pulsed Drain Current ①	124	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	360	W
	Linear Derating Factor	2.9	W/ $^\circ\text{C}$
V_{GS}	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	$^\circ\text{C}$
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Recommended clip force	20	

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	31	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	124		
V_{SD}	Diode Forward Voltage	—	—	1.5	V	$T_J = 25^\circ\text{C}$, $I_S = 31\text{A}$, $V_{GS} = 0\text{V}$ ④
t_{rr}	Reverse Recovery Time	—	180	—	ns	$T_J = 125^\circ\text{C}$, $I_F = 31\text{A}$
Q_{rr}	Reverse Recovery Charge	—	800	—	nC	di/dt = 100A/ μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

Typical SMPS Topologies

- Zero Voltage Switching Full and Half Bridge Circuits

IRFBA31N50L

PROVISIONAL

International
IR Rectifier

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.55	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1mA$ ⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.152	Ω	$V_{GS} = 10V, I_D = 19A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	3.5	—	5.5	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	50	μA	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	2.0	mA	$V_{DS} = 400V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
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)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	12	—	—	S	$V_{DS} = 50V, I_D = 19A$
Q_g	Total Gate Charge	—	—	195	nC	$I_D = 31A$ $V_{DS} = 400V$ $V_{GS} = 10V$, ④
Q_{gs}	Gate-to-Source Charge	—	—	75		
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	90		
$t_{d(on)}$	Turn-On Delay Time	—	20	—	ns	$V_{DD} = 250V$ $I_D = 31A$ $R_G = 4.3\Omega$ $V_{GS} = 10V$, ④
t_r	Rise Time	—	60	—		
$t_{d(off)}$	Turn-Off Delay Time	—	45	—		
t_f	Fall Time	—	40	—		
C_{iss}	Input Capacitance	—	5300	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0MHz$
C_{oss}	Output Capacitance	—	540	—		
C_{rss}	Reverse Transfer Capacitance	—	33	—		

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	—	760	mJ
I_{AR}	Avalanche Current①	—	31	A
E_{AR}	Repetitive Avalanche Energy①	—	36	mJ

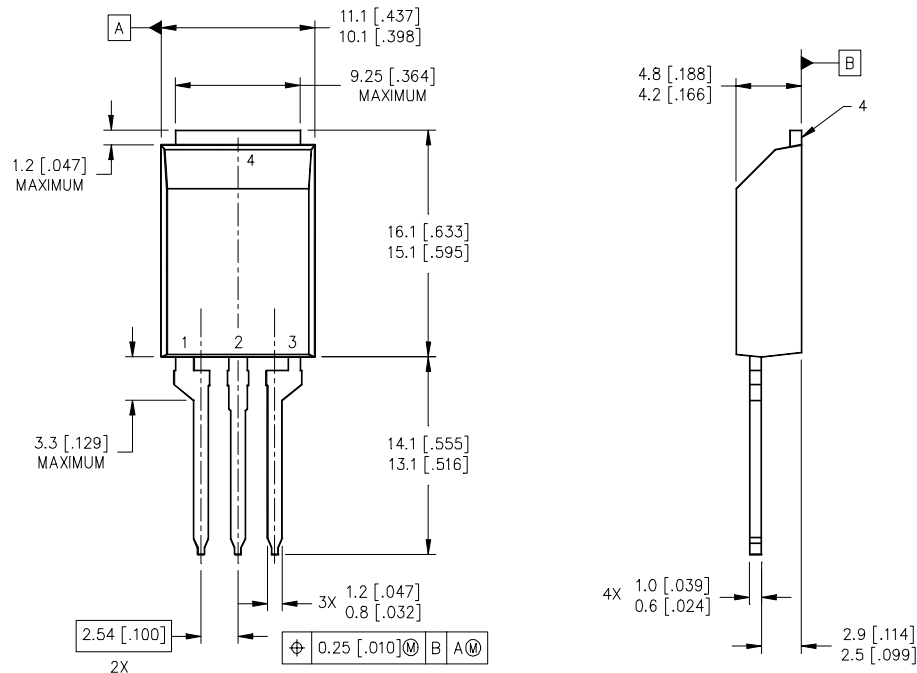
Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.35	$^\circ\text{C/W}$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient	—	58	

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. ④ Pulse width $\leq 400\mu s$; duty cycle $\leq 2\%$.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 4.3mH$, $R_G = 25\Omega$, $I_{AS} = 31A$,
- ③ $I_{SD} \leq 31A$, $di/dt \leq TBDA/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ\text{C}$

Super-220™ Package Outline



NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO-273AA.

LEAD ASSIGNMENTS

MOSFET	IGBT
1 – GATE	1 – GATE
2 – DRAIN	2 – COLLECTOR
3 – SOURCE	3 – EMITTER
4 – DRAIN	4 – COLLECTOR