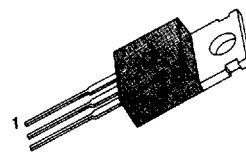


## FEATURES

- Lower  $R_{DS(on)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

TO-220



1. Gate 2. Drain 3. Source

## PRODUCT SUMMARY

Part Number	V <sub>DS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
IRF9Z24	-60V	0.28Ω	-9.7A
IRF9Z20	-50V	0.28Ω	-9.7A

## ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	IRF9Z24	IRF9Z20	Unit
Drain-Source Voltage (1)	V <sub>DSS</sub>	-60V	-50V	V <sub>dc</sub>
Drain-Gate Voltage (R <sub>GS</sub> =1.0MΩ)(1)	V <sub>DGR</sub>	-60V	-50V	V <sub>dc</sub>
Gate-Source Voltage	V <sub>GS</sub>	±20		V <sub>dc</sub>
Continuous Drain Current T <sub>c</sub> =25 °C	I <sub>D</sub>	-9.7		A <sub>dc</sub>
Continuous Drain Current T <sub>c</sub> =100 °C	I <sub>D</sub>	-6.8		A <sub>dc</sub>
Drain Current - Pulsed (3)	I <sub>DM</sub>	-39		A <sub>dc</sub>
Gate Current - Pulsed	I <sub>GM</sub>	± 1.5		A <sub>dc</sub>
Single Pulsed Avalanche Energy (4)	E <sub>AS</sub>	4.2		mJ
Avalanche Current	I <sub>AS</sub>	-9.7		A
Total Power Dissipation at T <sub>c</sub> =25 °C	P <sub>D</sub>	48		Watts
Derate above 25 °C		0.32		W/ °C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175		°C
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T <sub>L</sub>	300		°C

Notes : (1) T<sub>J</sub>=25°C to 175°C

(2) Pulse test : Pulse width ≤ 300μs, Duty Cycle ≤ 2%

(3) Repetitive rating : Pulse width limited by max. junction temperature

(4) L=100μH, V<sub>DD</sub>=-25V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C

**ELECTRICAL CHARACTERISTICS** (Tc=25°C unless otherwise specified)

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage					
	IRF9Z24	-60	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA
	IRF9Z20	-50	-	-	V	
V <sub>GS(th)</sub>	Gate Threshold Voltage	-2.0	-	-4.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA
I <sub>GSS</sub>	Gate-Source Leakage Forward	-	-	-100	nA	V <sub>GS</sub> =-20V
I <sub>GSS</sub>	Gate-Source Leakage Reverse	-	-	100	nA	V <sub>GS</sub> =20V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	-	-	-250	μA	V <sub>DS</sub> =-Max. Rating, V <sub>GS</sub> =0V
		-	-	-1000	μA	V <sub>DS</sub> =-0.8 Max. Rating, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C
R <sub>DS(on)</sub>	Static Drain-Source On Resistance(2)	-	0.18	0.28	Ω	V <sub>GS</sub> =-10V, I <sub>D</sub> =-4.9A
g <sub>fs</sub>	Forward Transconductance (2)	2.3	4.1	-	Ω	V <sub>DS</sub> =2xV <sub>GS</sub> , I <sub>D</sub> =-4.9A
C <sub>iss</sub>	Input Capacitance	-	635	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =-25V, f=1.0MHz
C <sub>oss</sub>	Output Capacitance	-	218	-	pF	
C <sub>rss</sub>	Reverse Transfer Capacitance	-	105	-	pF	
t <sub>d(on)</sub>	Turn-On Delay Time	-	8.2	12	ns	V <sub>DD</sub> =-25V, I <sub>D</sub> =-9.7A, R <sub>G</sub> =18 Ω R <sub>D</sub> =2.4 Ω (MOSFET switching times are essentially independent of operating temperature)
t <sub>r</sub>	Rise Time	-	57	86	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time	-	12	18	ns	
t <sub>f</sub>	Fall Time	-	25	38	ns	
Q <sub>g</sub>	Total Gate Charge (Gate-Source Plus Gate-Drain)	-	-	29	nC	
Q <sub>gs</sub>	Gate-Source Charge	-	7.5	-	nC	V <sub>GS</sub> =-10V, I <sub>D</sub> =-9.7A, V <sub>DS</sub> =-0.8 Max. Rating (Gate charge is essentially independent of operating temperature)
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	-	9.5	-	nC	

**THERMAL RESISTANCE**

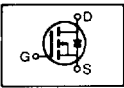
Symbol	Characteristics		All	Units	Remark
R <sub>thJC</sub>	Junction-to-Case	MAX	3.1	K/W	
R <sub>thCS</sub>	Case-to-Sink	TYP	0.5	K/W	Mounting surface flat smooth, and greased
R <sub>thJA</sub>	Junction-to-Ambient	MAX	62.5	K/W	Free Air Operation

Notes : (1) T<sub>J</sub>=25°C to 175°C

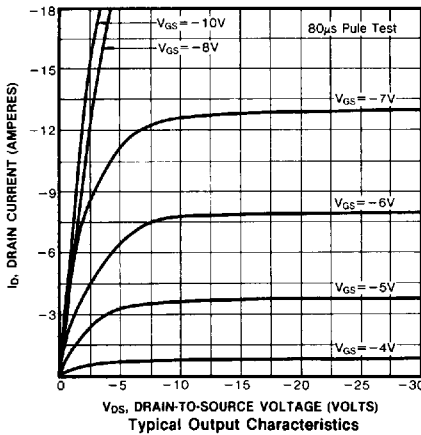
(2) Pulse test : Pulse width ≤ 300μs, Duty Cycle ≤ 2%

(3) Repetitive rating : Pulse width limited by max. junction temperature

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode)	-	-	-9.7	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
$I_{SM}$	Pulse Source Current (Body Diode) (3)	-	-	-39	A	
$V_{SD}$	Diode Forward Voltage (2)	-	-	-6.3	V	$T_J=25^\circ\text{C}$ , $I_S=-9.7\text{A}$ , $V_{GS}=0\text{V}$
$t_{rr}$	Reverse Recovery Time	-	-	280	ns	$T_J=25^\circ\text{C}$ , $I_F=-9.7\text{A}$ , $dI_F/dt=100\text{A}/\mu\text{S}$

- Notes : (1)  $T_J=25^\circ\text{C}$  to  $175^\circ\text{C}$   
 (2) Pulse test : Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$   
 (3) Repetitive rating : Pulse width limited by max. junction temperature



IRF9Z20

