

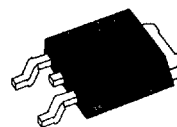
IRFR9020/22/24/25
IRFU9020/22/24/25
P-CHANNEL
POWER MOSFETS
FEATURES

- 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

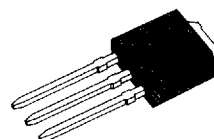
PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFR9020/U9020	-50V	0.29 Ω	-9.9A
IRFR9022/U9022	-50V	0.33 Ω	-9.0A
IRFR9024/U9024	-60V	0.29 Ω	-9.9A
IRFR9025/U9025	-60V	0.33 Ω	-9.0A

D-PACK


 IRFR9020/9022
 IRFR9024/9025

I-PACK


 IRFU9020/9022
 IRFU9024/9025

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	IRFR9020 IRFU9020	IRFR9022 IRFU9022	IRFR9024 IRFU9024	IRFR9025 IRFU9025	Unit
Drain-Source Voltage (1)	V_{DSS}	-50		-60V		Vdc
Drain-Gate Voltage ($R_{GS}=1.0M\Omega$)(1)	V_{DGR}	-50		-60		Vdc
Gate-Source Voltage	V_{GS}	± 20				Vdc
Continuous Drain Current $T_C=25^\circ C$	I_D	-9.9	-9.0	-9.9	-9.0	Adc
Continuous Drain Current $T_C=100^\circ C$	I_D	-6.3	-5.7	-6.3	-5.7	Adc
Drain Current—Pulsed (3)	I_{DM}	-40	-36	-40	-36	Adc
Gate Current—Pulsed	I_{GM}	± 1.5				Adc
Single Pulsed Aulanche Energy (4)	E_{AS}	440				mj
Avalanche Current	I_{AS}	-9.9				A
Total Power Dissipation at $T_C=25^\circ C$ Derate above $25^\circ C$	P_D	42 0.32				Watts W/ $^\circ C$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-55 to 150				$^\circ C$
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T_L	300				$^\circ C$

- Notes: (1) $T_J=25^\circ C$ to $150^\circ C$
 (2) Pulse test. Pulse width $\leq 300\mu s$, Duty Cycle $\leq 2\%$
 (3) Repetitive rating: Pulse with limited by max. junction temperature
 (4) $L=5$ mH, $V_{dd}=-25V$, $R_G=25\Omega$, Starting $T_J=25^\circ C$

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ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV _{DSS}	Drain-Source Breakdown Voltage					$V_{GS}=0V, I_D=-250\mu A$
	IRFR9024/9025, IRFU9024/9025	-60	-	-	V	
	IRFR9020/9022, IRFU9020/9022	-50	-	-	V	
V _{GS(th)}	Gate Threshold Voltage	-2.0	-	-4.0	V	$V_{DS}=V_{GS}, I_D=-250\mu A$
I _{GSS}	Gate-Source Leakage Forward	-	-	-100	nA	$V_{GS}=-20V$
I _{GSS}	Gate-Source Leakage Reverse	-	-	100	nA	$V_{GS}=20V$
I _{DSS}	Zero Gate Voltage Drain Current	-	-	250	μA	$V_{DS}=\text{Max. Rating}, V_{GS}=0V$ $V_{DS}=0.8 \text{ Max. Rating}, V_{GS}=0V, T_J=125^\circ\text{C}$
I _{D(on)}	On-State Drain-Source Current (2)					$V_{DS}\leq-3.2V, V_{GS}=-10V$
	IRFR9020/9024, IRFU9020/9024	-9.9	-	-	A	
	IRFR9022/9025, IRFU9022/9025	-9.0	-	-		
R _{DS(on)}	Static Drain-Source					$V_{GS}=-10V, I_D=-5.7A$
	IRFR9020/9024, IRFU9020/9024	-	0.20	0.28	Ω	
	IRFR9022/9025, IRFU9022/9025	-	-	0.33		
g _{fs}	Forward Transconductance (2)	2.3	-	-	U	$V_{DS}\leq-50V, I_D=-5.7A$
C _{iss}	Input Capacitance	-	650	-	pF	$V_{GS}=0V$
C _{oss}	Output Capacitance	-	220	-	pF	$V_{DS}=-25V$
C _{rss}	Reverse Transfer Capacitance	-	110	-	pF	$f=1 \text{ MHz}$
t _{d(on)}	Turn-On Delay Time	-	15.4	-	ns	$V_{DD}=-25V, I_D=-9.7A, Z_\theta=18\Omega$ (MOSFET switching times are essentially independent of operating temperature)
t _r	Rise Time	-	25.4	-	ns	
t _{d(off)}	Turn-Off Delay Time	-	20.5	-	ns	
t _f	Fall Time	-	48.1	-	ns	
Q _g	Total Gate Charge (Gate-Source Plus Gate-Drain)	-	23.7	-	nC	
Q _{gs}	Gate-Source Charge	-	8.8	-	nC	$V_{GS}=-10V, I_D=-9.7A, V_{DS}=0.8 \text{ Max. Rating}$ (Gate charge is essentially independent of operating temperature)
Q _{gd}	Gate-Drain ("Miller") Charge	-	10.8	-	nC	

THERMAL RESISTANCE

R _{thJC}	Junction-to-Case	MAX	3.0	K/W	
R _{thCS}	Case-to-Sink	TYP	1.7	K/W	Mounting surface flat smooth, and grased
R _{thJA}	Junction-to-Ambient	MAX	110	K/W	Free Air Operation

Notes: (1) $T_J=25^\circ\text{C}$ to 150°C

(2) Pulse test Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$

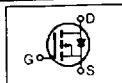
(3) Repetitive rating. Pulse width limited by max. junction temperature

IRFR9020/22/24/25
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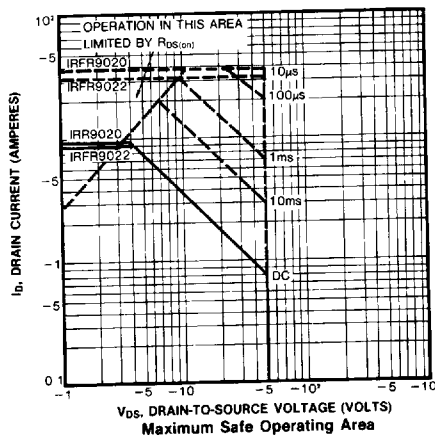
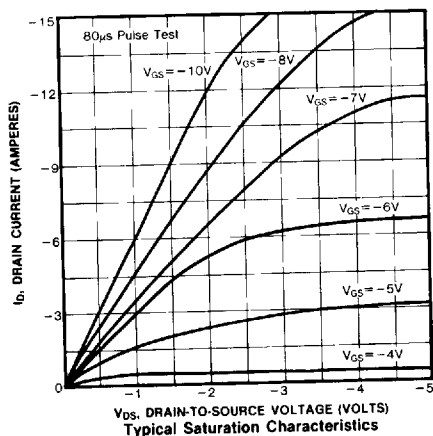
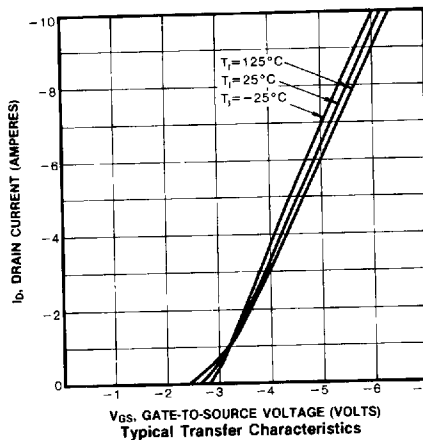
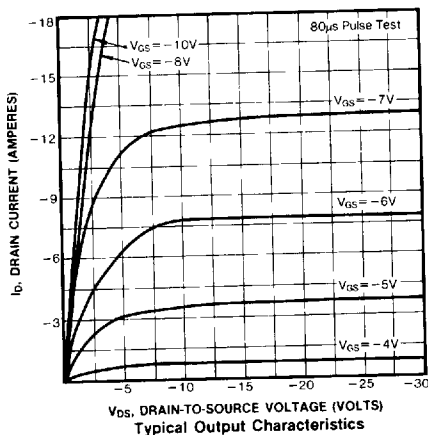
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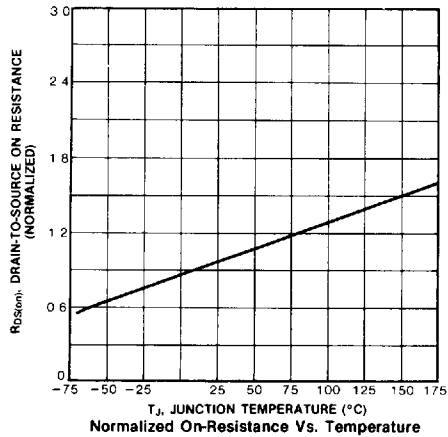
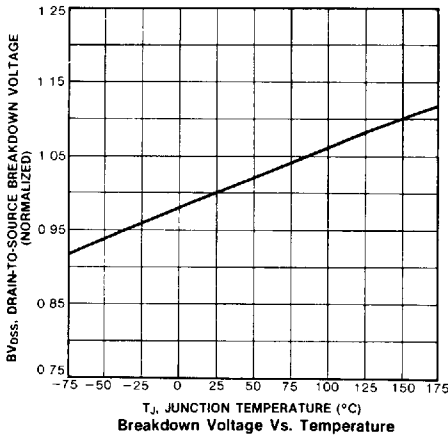
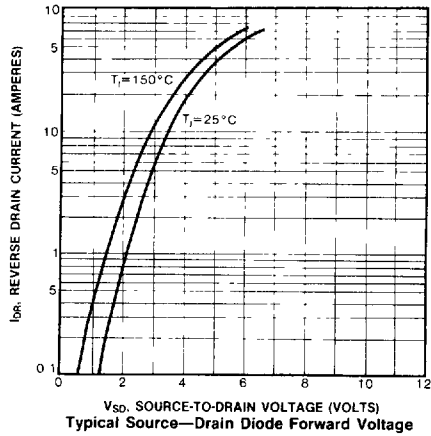
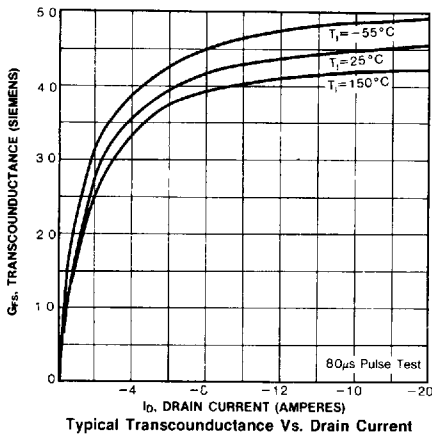
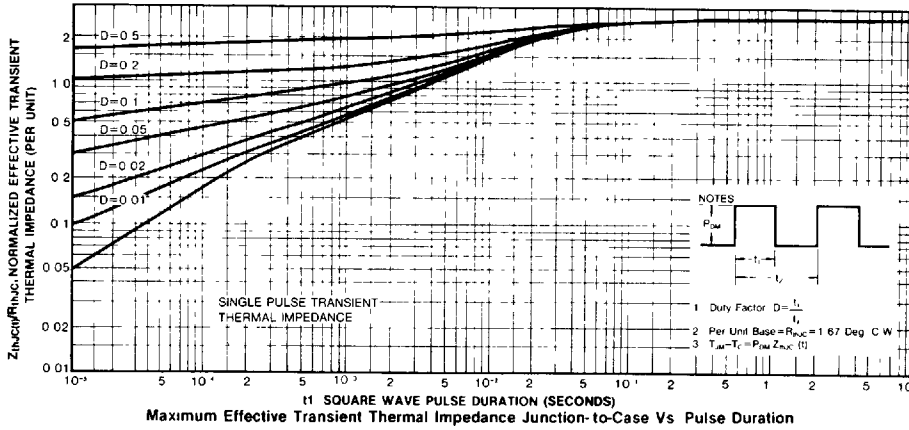
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-9.9	A	Modified MOSFET integral reverse P-N junction rectifier
I_{SM}	Pulse Source Current (3)	—	—	-40	A	
V_{SD}	Diode Forward Voltage	—	—	-6.3	V	$T_C=25^\circ\text{C}$, $I_S=-5.3\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse Recovery Time	—	—	280	ns	$T_J=25^\circ\text{C}$, $I_F=-4.7\text{A}$, $dI_F/dt=100\text{A}/\mu\text{S}$



- Notes:** (1) $T_J=25^\circ\text{C}$ to 150°C
 (2) Pulse test. Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
 (3) Repetitive rating: Pulse with limited by max junction temperature





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