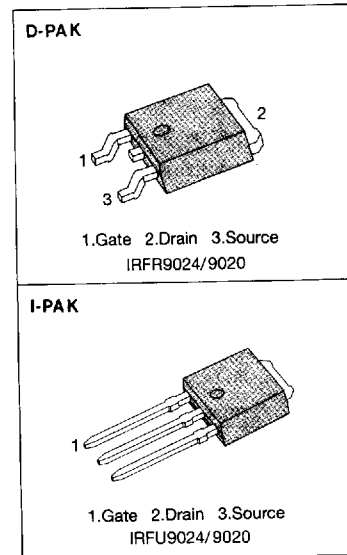


FEATURES

- 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
IRFR9024/U9024	-60V	0.28 Ω	-9.9A
IRFR9020/U9020	-50V	0.28 Ω	-9.9A



ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	IRFR9024/U9024	IRFR9020/U9020	Unit
Drain-Source Voltage (1)	V _{DSS}	-60	-50V	Vdc
Drain-Gate Voltage (R _{GS} =1.0MΩ)(1)	V _{DGR}	-60	-50	Vdc
Gate-Source Voltage	V _{GS}	±20		Vdc
Continuous Drain Current T _c =25 °C	I _D	-9.9		Adc
Continuous Drain Current T _c =100 °C	I _D	-6.3		Adc
Drain Current - Pulsed (3)	I _{DM}	-35		Adc
Gate Current - Pulsed	I _{GM}	±1.5		Adc
Single Pulsed Avalanche Energy (4)	E _{AS}	440		mJ
Avalanche Current	I _{AS}	-9.9		A
Total Power Dissipation at T _c =25 °C	P _D	42		Watts
Derate above 25 °C		0.30		W/ °C
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-55 to +150		°C
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T _L	300		°C

Notes : (1) T_J=25°C to 150°C

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

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

(4) L=5.1mH, V_{dd}=-25V, R_G=25Ω, Starting T_J=25°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					
	IRFR9024/IRFU9024	-60	-	-	V	V _{GS} =0V, I _D =-250 μ A
	IRFR9020/IRFU9020	-50	-	-	V	
V _{GS(th)}	Gate Threshold Voltage	-2.0	-	-4.0	V	V _{DS} =V _{GS} , I _D =-250 μ 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	μ A	V _{DS} =-Max. Rating, V _{GS} =0V
		-	-	1000	μ A	V _{DS} =-0.8 Max. Rating, V _{GS} =0V, T _C =125 $^\circ$ C
R _{DS(on)}	Static Drain-Source On Resistance(2)	-	-	0.28	Ω	V _{GS} =-10V, I _D =-5.0A
g _{fs}	Forward Transconductance (2)	2.3	-	-	S	V _{DS} \geq -50V, I _D =-5.0A
C _{iss}	Input Capacitance	-	650	-	pF	V _{DS} =0V
C _{oss}	Output Capacitance	-	220	-	pF	V _{DS} =-25V
C _{rss}	Reverse Transfer Capacitance	-	110	-	pF	f=1.0MHz
t _{d(on)}	Turn-On Delay Time	-	15.4	-	ns	V _{DD} =-0.5 BV _{DSS} , I _D =-9.9A, Z _O =18 Ω (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)	-	-	29	nC	V _{GS} =-10V, I _D =-9.9A, V _{DS} =-0.8 Max. Rating, (Gate charge is essentially independent of operating temperature)
Q _{gs}	Gate-Source Charge	-	7.5	-	nC	
Q _{gd}	Gate-Drain ("Miller") Charge	-	9.5	-	nC	

THERMAL RESISTANCE

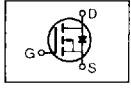
Symbol	Characteristics		All	Units	Remark
R _{thJC}	Junction-to-Case	MAX	3.0	K/W	
R _{thCS}	Case-to-Sink	TYP	1.7	K/W	Mounting surface flat, smooth and greased
R _{thJA}	Junction-to-Ambient	MAX	110	K/W	Free Air Operation

Notes : (1) T_J=25 $^\circ$ C to 150 $^\circ$ C

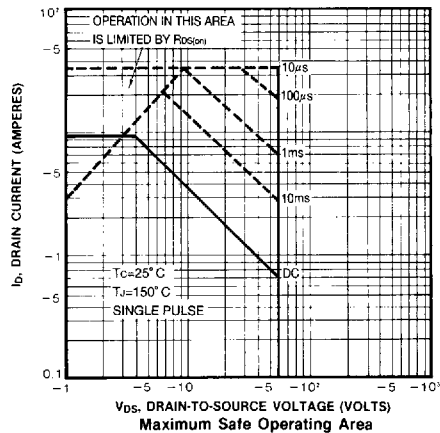
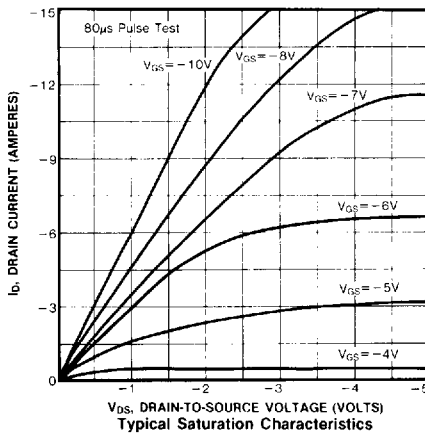
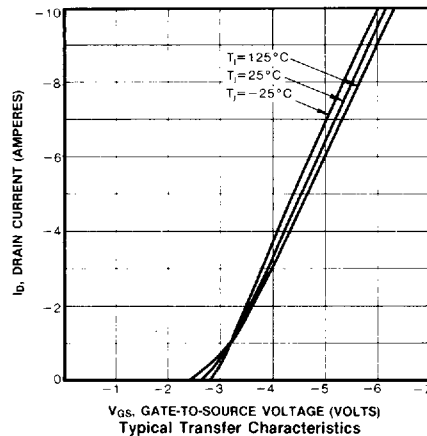
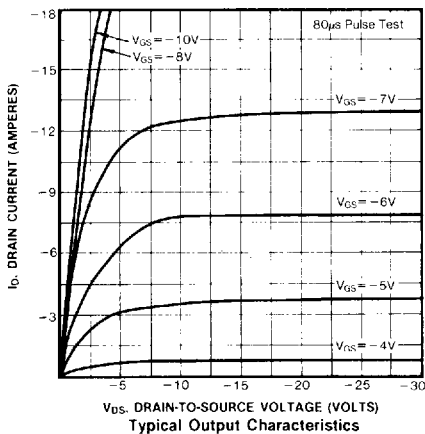
(2) Pulse test : Pulse width \leq 300 μ s, Duty Cycle \leq 2%

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

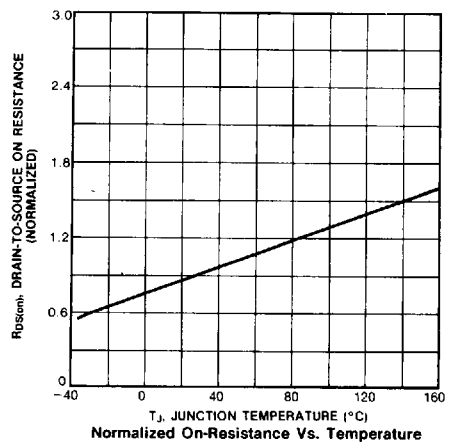
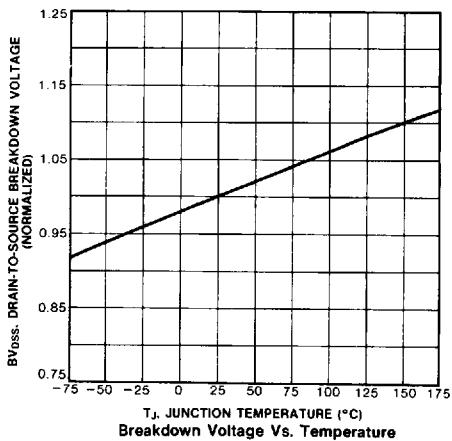
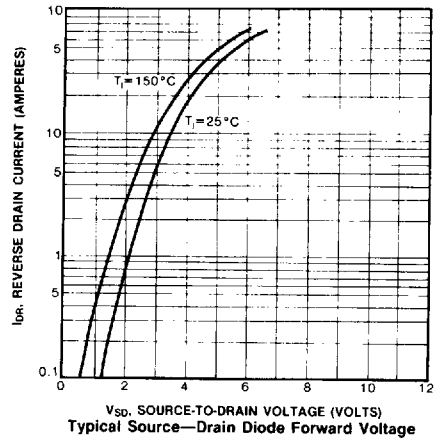
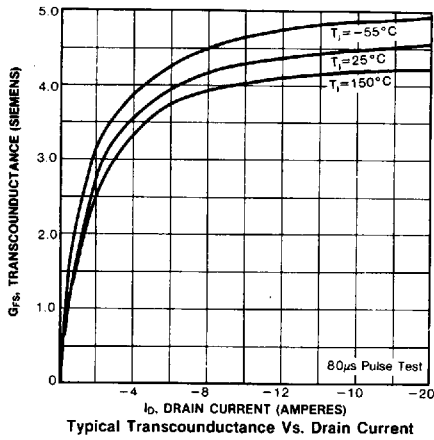
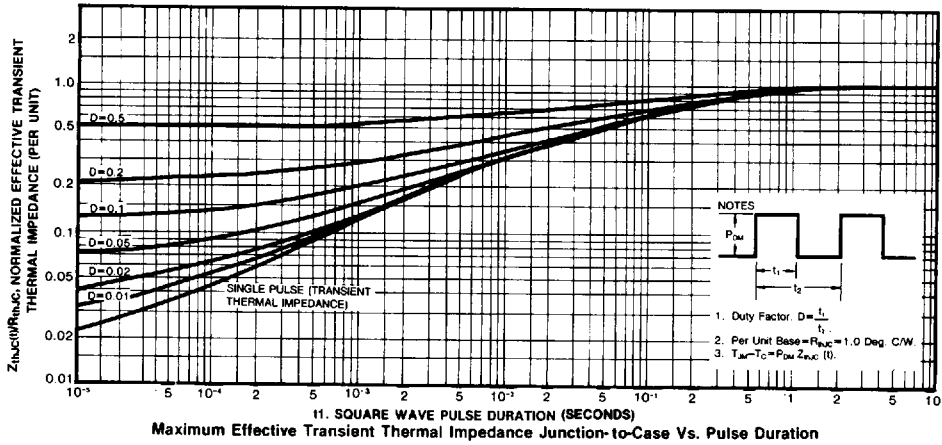
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

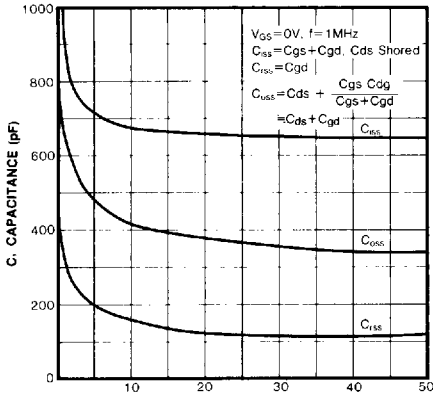
Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	-	-	-9.9	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
I_{SM}	Pulse Source Current (Body Diode) (3)	-	-	-35	A	
V_{SD}	Diode Forward Voltage	-	-	-6.3	V	$T_J=25^\circ\text{C}$, $I_S=-9.9\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse Recovery Time	-	-	280	ns	$T_J=25^\circ\text{C}$, $I_F=-9.9\text{A}$, $dI_F/dt=100\text{A}/\mu\text{S}$

- 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 width limited by max. junction temperature

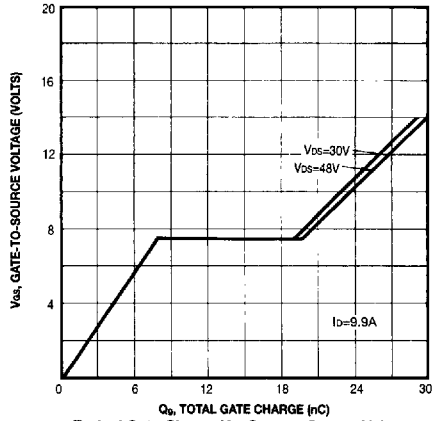


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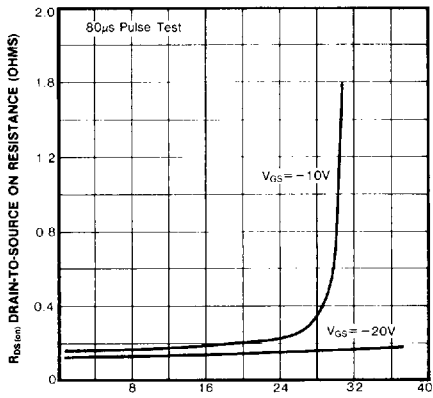




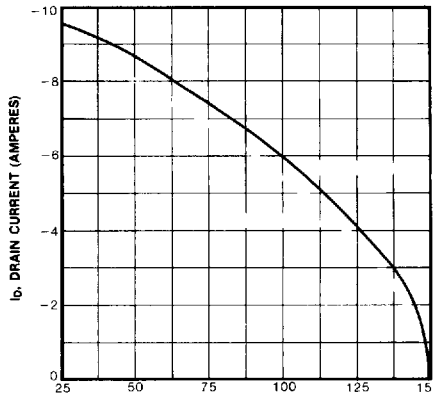
Typical Capacitance Vs. Drain to Source Voltage



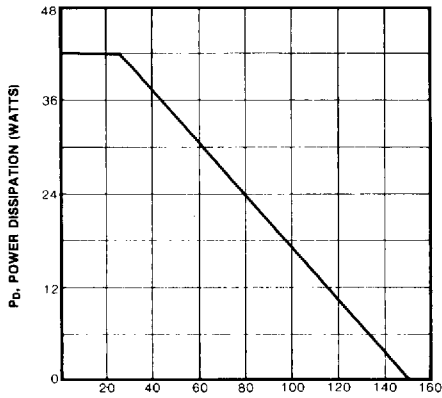
Typical Gate Charge Vs. Gate-to-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve

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