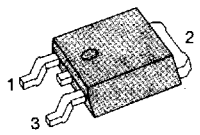
FEATURES

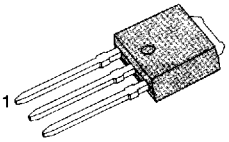
- Lower $R_{DS(ON)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

D-PAK



1.Gate 2.Drain 3.Source
IRFR9024/9020

I-PAK



1.Gate 2.Drain 3.Source
IRFU9024/9020

PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFR9024/U9024	-60V	0.28Ω	-9.9A
IRFR9020/U9020	-50V	0.28Ω	-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

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

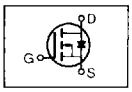
Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage					
	IRFR9024/IRFU9024	-60	-	-	V	V_{GS}=0V, I_D=-250μA
	IRFR9020/IRFU9020	-50	-	-	V	
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	-	-4.0	V	V_{DS}=V_{GS}, I_D=-250μA
I_{GSS}	Gate-Source Leakage Forward	-	-	-100	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}=-Max. Rating, V_{GS}=0V
		-	-	1000	μA	V_{DS}=-0.8 Max. Rating, V_{GS}=0V, Tc=125°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	-	-	℧	V_{DS}≥-50V, I_D=-5.0A
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=1.0MHz
$t_{d(on)}$	Turn-On Delay Time	-	15.4	-	ns	V_{DD}=-0.5 BV_{DSS}, I_D=-9.9A, Z_O=18Ω
t_r	Rise Time	-	25.4	-	ns	(MOSFET switching times are essentially
$t_{d(off)}$	Turn-Off Delay Time	-	20.5	-	ns	independent of operating temperature)
t_f	Fall Time	-	48.1	-	ns	
Q_g	Total Gate Charge (Gate-Source Pluse 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

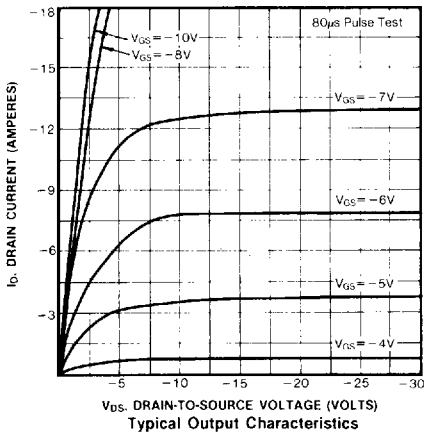
Symbol	Characteristics		All	Units	Remark
R_{thJC}	Junction-to-Case	MAX	3.0	K/W	
R_{thCS}	Case-to-Sink	TYP	1.7	K/W	Mounting surface flat, smooth and greased
R_{thJA}	Junction-to-Ambient	MAX	110	K/W	Free Air Operation

Notes : (1) T_J=25°C to 150°C
(2) Pulse test : Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating : Pulse width limited by max. junction temperature

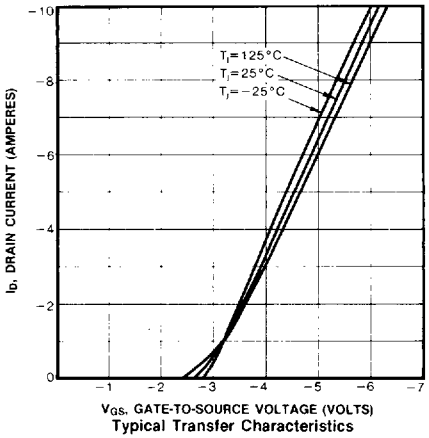
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	-	-	-9.9	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°C, I_S=-9.9A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	-	-	280	ns	T_J=25°C, I_F=-9.9A, dI_F/dt=100A/μS

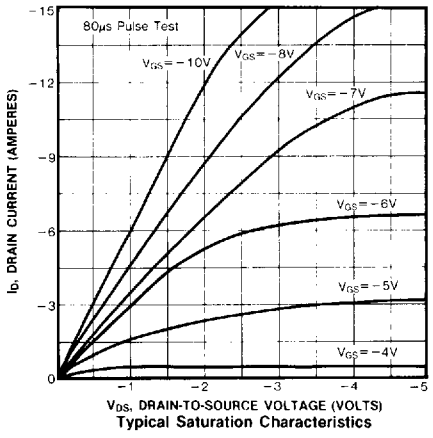
Notes : (1) T_J=25°C to 150°C
(2) Pulse test : Pulse width ≤ 300μs, Duty Cycle ≤ 2%
(3) Repetitive rating : Pulse width limited by max. junction temperature



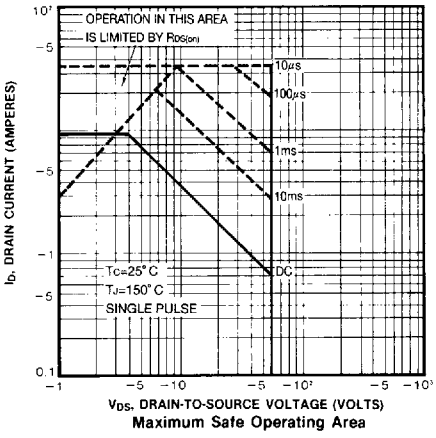
Typical Output Characteristics



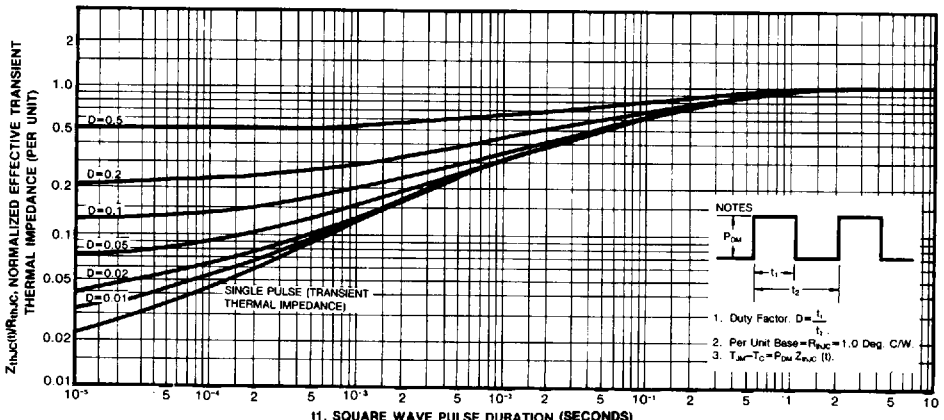
Typical Transfer Characteristics



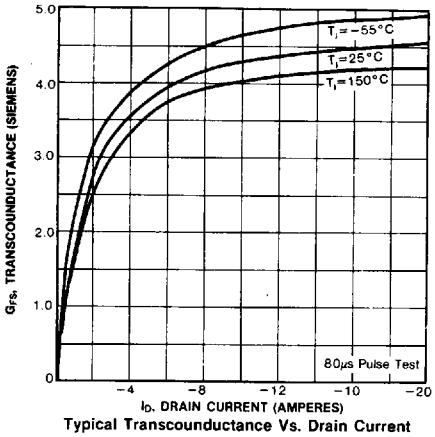
Typical Saturation Characteristics



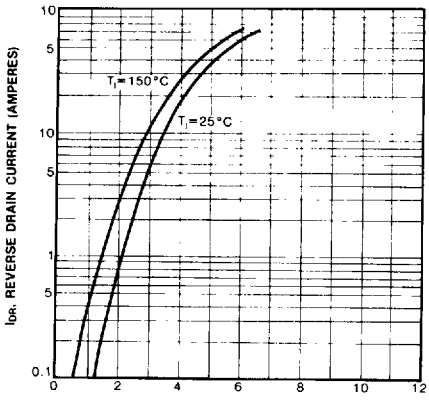
Maximum Safe Operating Area



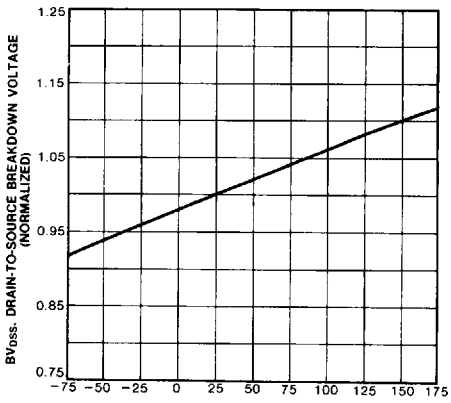
Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration



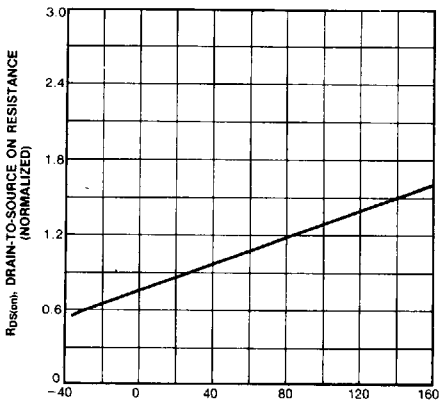
Typical Transconductance Vs. Drain Current



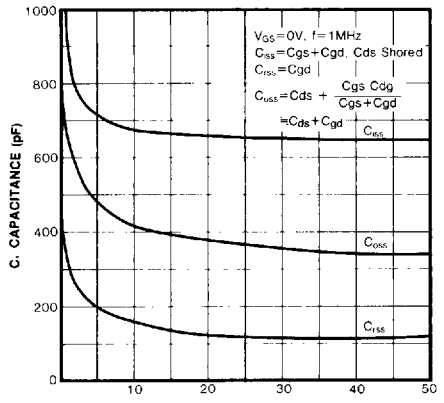
Typical Source—Drain Diode Forward Voltage



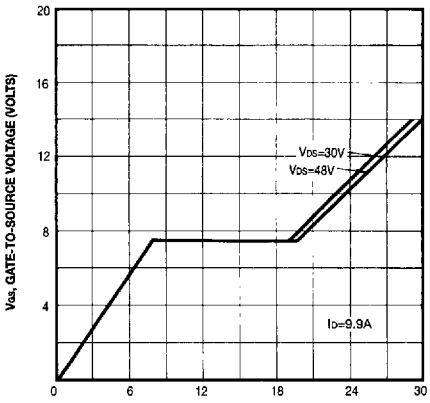
Breakdown Voltage Vs. Temperature



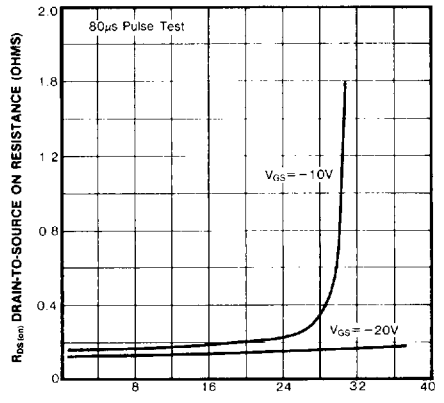
Normalized On-Resistance Vs. Temperature



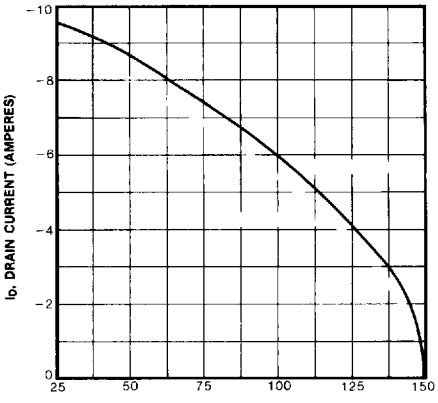
Typical Capacitance Vs. Drain to Source Voltage



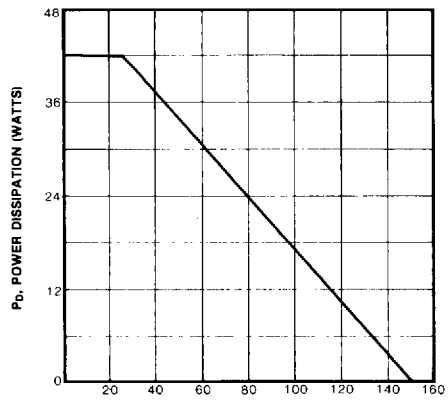
Typical Gate Charge Vs. Gate-to-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve