

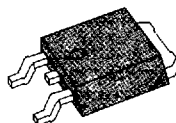
IRFR9210/9212
IRFU9210/9212
P-CHANNEL
POWER MOSFETS
FEATURES

- 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

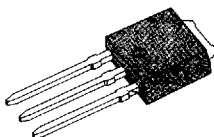
Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFR9210/U9210	-200V	3.0 Ω	-2.0A
IRFR9212/U9212	-200V	4.5 Ω	-1.6A

D-PACK



IRFR9210/9212

I-PACK



IRFU9210/9212

MAXIMUM RATINGS

Characteristic	Symbol	IRFR9210/U9120	IRFR9212/U9212	Unit
Drain-Source Voltage (1)	V_{DS}	-200		Vdc
Drain-Gate Voltage ($R_{GS}=1.0M\Omega$)(1)	V_{DGR}	-200		Vdc
Gate-Source Voltage	V_{GS}	± 20		Vdc
Continuous Drain Current $T_C=25^\circ C$	I_D	-2.0	-1.6	Adc
Continuous Drain Current $T_C=100^\circ C$	I_D	-1.2	-1.0	Adc
Drain Current—Pulsed (3)	I_{DM}	-8.0	-6.4	Adc
Gate Current—Pulsed	I_{GM}	± 1.5		Adc
Single Pulsed Avalanche Energy (4)	E_{AS}	150		mJ
Avalanche Current	I_{AS}	-2.0		A
Total Power Dissipation @ $T_C=25^\circ C$ Derate above $25^\circ C$	P_D	25 0.20		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) $L=59mH$, $V_{dd}=-50V$, $R_G=25\Omega$, Starting $T_J=25^\circ C$

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**P-CHANNEL
POWER MOSFETS****ELECTRICAL CHARACTERISTICS** ($T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DS}	Drain-Source Breakdown Voltage	-200	—	—		$V_{GS}=0V$ $I_D = -250\mu A$
$V_{GS(th)}$	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	$V_{DS} = \text{Max. Rating}$, $V_{GS} = 0V$
		—	—	1000	μA	$V_{DS} = \text{Max. Rating} \times 0.8$, $V_{GS} = 0V$, $T_C = 125^\circ\text{C}$
$I_{D(on)}$	On-State Drain-Source Current (2) IRFR9210/U9210	-2.0	—	—	A	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, $V_{GS} = -10V$
	IRFR9212/U9212	-1.6	—	—	A	
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRFR9210/U9210	—	—	3.0	Ω	$V_{GS} = -10V$, $I_D = -1.0A$
	IRFR9212/U9212	—	—	4.5	Ω	
g_{fs}	Forward Transconductance (2)	0.61	—	—	S	$V_{DS} \leq -50V$, $I_D = -1.0A$
C_{iss}	Input Capacitance	—	180	—	pF	$V_{GS} = 0V$, $V_{DS} = -25V$, $f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	53	—	pF	
C_{rss}	Reverse Transfer Capacitance	—	17	—	pF	
$t_{d(on)}$	Turn-On Delay Time	—	8.0	12	ns	$V_{DD} = 0.5BV_{DS}$, $I_D = -2.3A$, $Z_\theta = 24.1$ (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	—	12	18	ns	
$t_{d(off)}$	Turn-Off Delay Time	—	11	17	ns	
t_f	Fall Time	—	13	20	ns	$V_{GS} = -10V$, $I_D = -2.3A$, $V_{DS} = 0.8 \text{ Max. Rating}$ (Gate charge is essentially independent of operating temperature.)
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	—	6.5	9.7	nC	
Q_{gs}	Gate-Source Charge	—	1.4	2.2	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	—	3.3	5.7	nC	

THERMAL RESISTANCE

R_{thJC}	Junction-to-Case	MAX	5.0	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) $T_J = 25^\circ\text{C}$ to 150°C (2) Pulse test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

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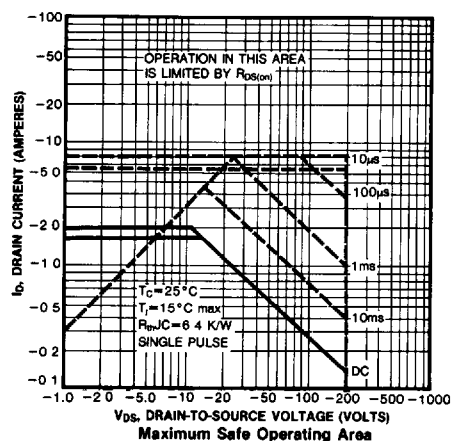
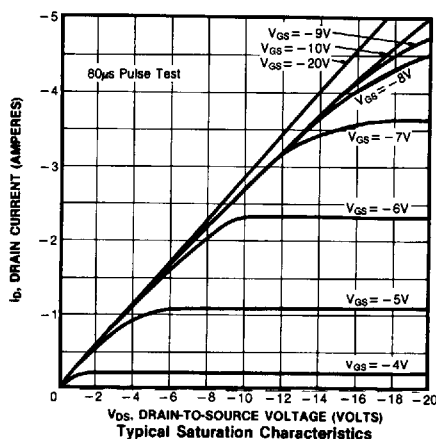
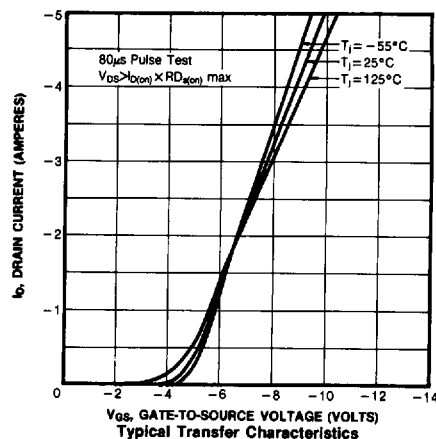
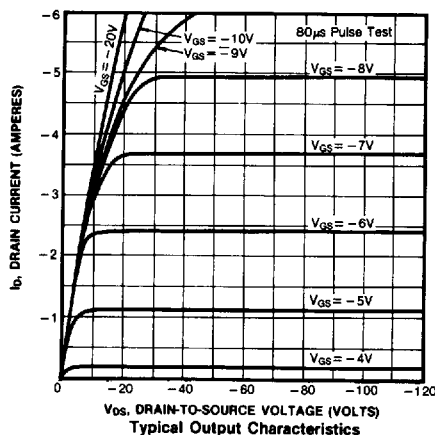
P-CHANNEL
POWER MOSFETS

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-2.0	A	Modified MOSFET showing the integral reverse P-N junction rectifier 
I_{SM}	Pulse Source Current (Body Diode) (3)	—	—	-8.0	A	
V_{SD}	Diode Forward Voltage (2)	—	—	-5.8	V	$T_C = 25^\circ\text{C}$, $I_S = -2.0\text{A}$, $V_{GS} = 0\text{V}$
t_{rr}	Reverse Recovery Time	—	99	214	ns	$T_J = 150^\circ\text{C}$, $I_F = -2.3\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{S}$

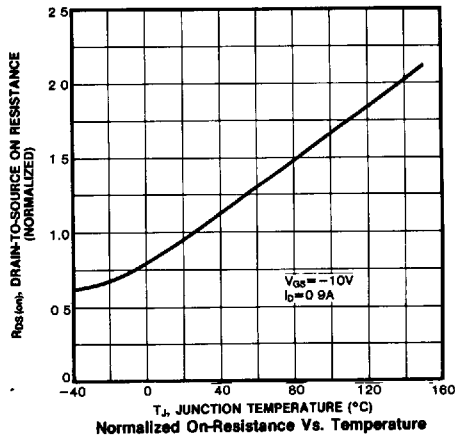
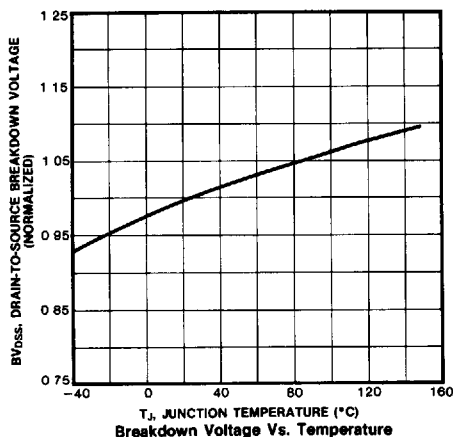
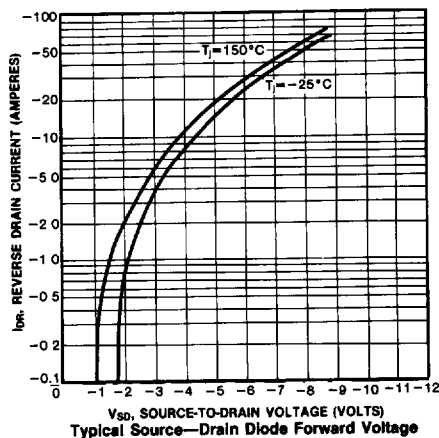
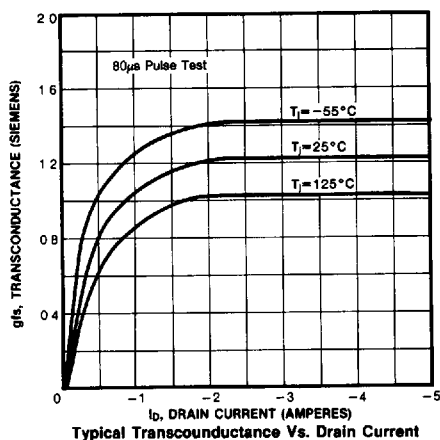
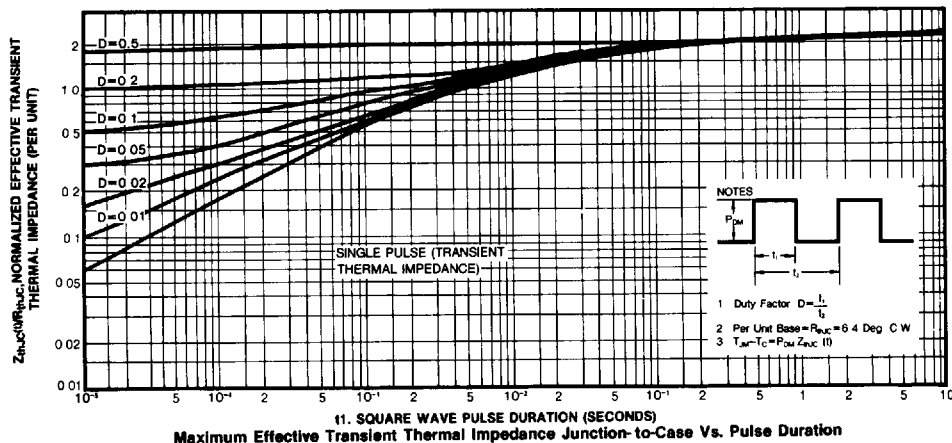
Notes: (1) $T_J = 25^\circ\text{C}$ to 150°C (2) Pulse test: Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$

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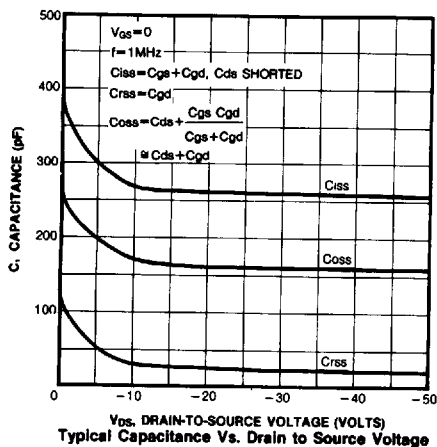
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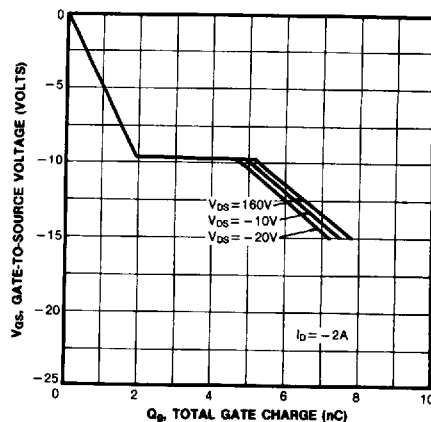
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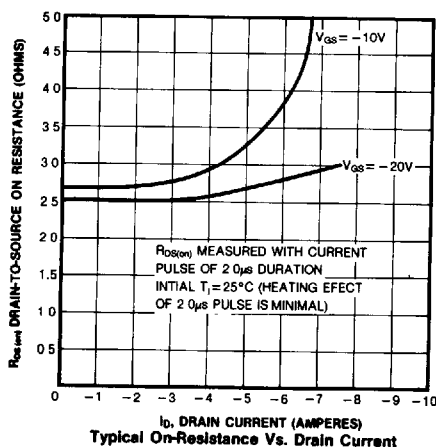
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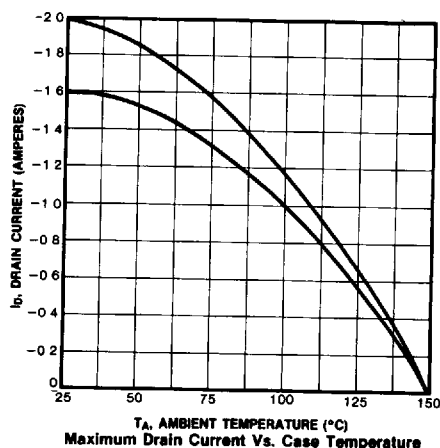
Typical Capacitance Vs. Drain to Source Voltage



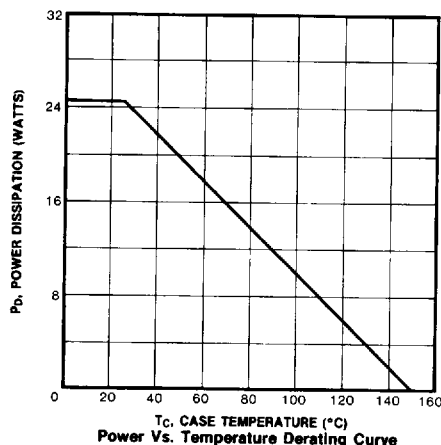
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve