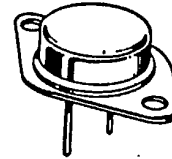


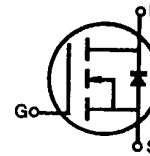
**IRF220/221/222/223****N-CHANNEL  
POWER MOSFETS****FEATURES**

- Low  $R_{DS(on)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Low input capacitance
- Extended safe operating area
- Improved high temperature reliability
- TO-3 package (Standard)

TO-3

**PRODUCT SUMMARY**

Part Number	V <sub>DS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
IRF220	200V	0.80Ω	5.0A
IRF221	150V	0.80Ω	5.0A
IRF222	200V	1.2Ω	4.0A
IRF223	150V	1.2Ω	4.0A

**MAXIMUM RATINGS**

Characteristic	Symbol	IRF220	IRF221	IRF222	IRF223	Unit
Drain-Source Voltage (1)	V <sub>DSS</sub>	200	150	200	150	V <sub>dc</sub>
Drain-Gate Voltage (R <sub>GS</sub> =1.0MΩ) (1)	V <sub>DGR</sub>	200	150	200	150	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>	5.0	5.0	4.0	4.0	A <sub>dc</sub>
Continuous Drain Current T <sub>C</sub> =100°C	I <sub>D</sub>	3.0	3.0	2.0	2.0	A <sub>dc</sub>
Drain Current—Pulsed (3)	I <sub>DM</sub>	20	20	16	16	A <sub>dc</sub>
Gate Current—Pulsed	I <sub>GM</sub>	±1.5				A <sub>dc</sub>
Total Power Dissipation @ T <sub>C</sub> =25°C Derate above 25°C	P <sub>D</sub>	40 0.32				Watts W/°C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150				°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 150°C  
 (2) Pulse test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%  
 (3) Repetitive rating: Pulse width limited by max. junction temperature

## IRF220/221/222/223

N-CHANNEL  
POWER MOSFETSELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C unless otherwise specified)

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	IRF220	200	—	—	V	V <sub>GS</sub> =0V
		IRF222					
		IRF221 IRF223	150	—	—	V	I <sub>D</sub> =250μA
Gate Threshold Voltage	V <sub>GS(th)</sub>	ALL	2.0	—	4.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
Gate-Source Leakage Forward	I <sub>GSS</sub>	ALL	—	—	100	nA	V <sub>GS</sub> =20V
Gate-Source Leakage Reverse	I <sub>GSS</sub>	ALL	—	—	-100	nA	V <sub>GS</sub> =-20V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	ALL	—	—	250	μA	V <sub>DS</sub> =Max. Rating, V <sub>GS</sub> =0V
			—	—	1000	μA	V <sub>DS</sub> =Max. Rating×0.8, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C
On-State Drain-Source Current (2)	I <sub>D(on)</sub>	IRF220	5.0	—	—	A	V <sub>DS</sub> >I <sub>D(on)</sub> ×R <sub>DS(on) max.</sub> , V <sub>GS</sub> =10V
		IRF221					
		IRF222 IRF223	4.0	—	—	A	
Static Drain-Source On-State Resistance (2)	R <sub>DS(on)</sub>	IRF220	—	0.4	0.8	Ω	V <sub>GS</sub> =10V, I <sub>D</sub> =2.5A
		IRF221					
		IRF222	—	0.8	1.2	Ω	
		IRF223					
Forward Transconductance (2)	g <sub>fs</sub>	ALL	1.3	2.8	—	Ω	V <sub>DS</sub> >I <sub>D(on)</sub> ×R <sub>DS(on) max.</sub> , I <sub>D</sub> =2.5A
Input Capacitance	C <sub>iss</sub>	ALL	—	450	600	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz
Output Capacitance	C <sub>oss</sub>	ALL	—	150	300	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	ALL	—	50	80	pF	
Turn-On Delay Time	t <sub>d(on)</sub>	ALL	—	—	40	ns	
Rise Time	t <sub>r</sub>	ALL	—	—	60	ns	V <sub>DD</sub> =0.5BV <sub>DSS</sub> , I <sub>D</sub> =2.5A, Z <sub>O</sub> =50Ω (MOSFET switching times are essentially independent of operating temperature.)
Turn-Off Delay Time	t <sub>d(off)</sub>	ALL	—	—	100	ns	
Fall Time	t <sub>f</sub>	ALL	—	—	60	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q <sub>g</sub>	ALL	—	12.5	15	nC	V <sub>GS</sub> =10V, I <sub>D</sub> =6.0A, V <sub>DS</sub> =0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q <sub>gs</sub>	ALL	—	4.0	—	nC	
Gate-Drain ("Miller") Charge	Q <sub>gd</sub>	ALL	—	8.5	—	nC	

## THERMAL RESISTANCE

Junction-to-Case	R <sub>thJC</sub>	ALL	—	—	3.12	K/W	
Case-to-Sink	R <sub>thCS</sub>	ALL	—	0.1	—	K/W	Mounting surface flat, smooth, and greased
Junction-to-Ambient	R <sub>thJA</sub>	ALL	—	—	30	K/W	Free Air Operation

Notes: (1) T<sub>J</sub>=25°C to 150°C

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

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



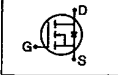
SAMSUNG SEMICONDUCTOR

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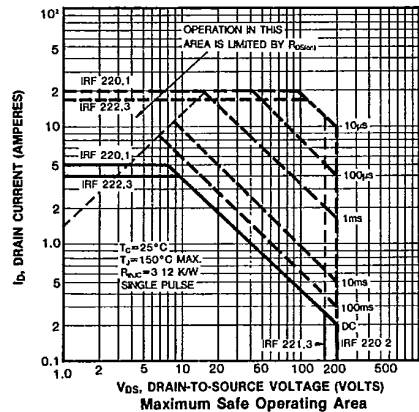
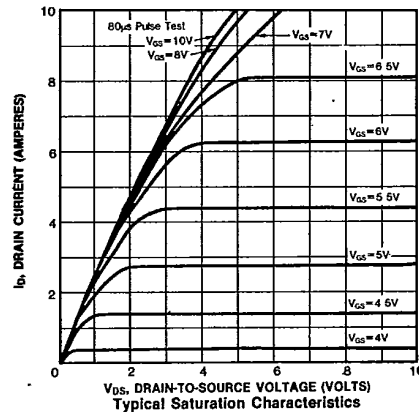
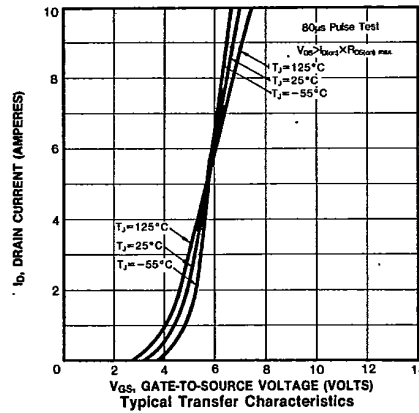
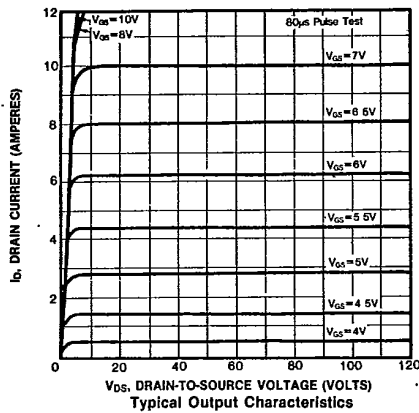
**N-CHANNEL  
POWER MOSFETS**

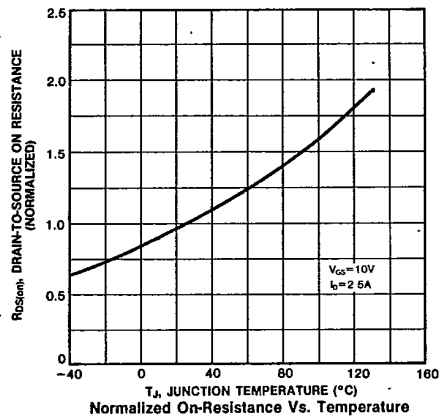
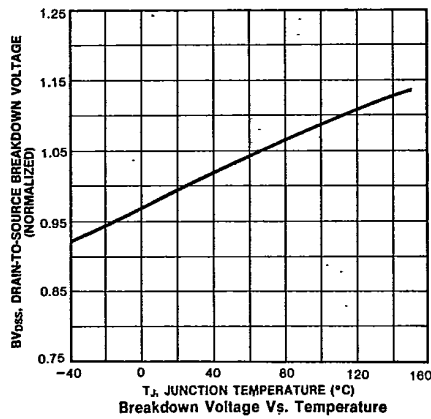
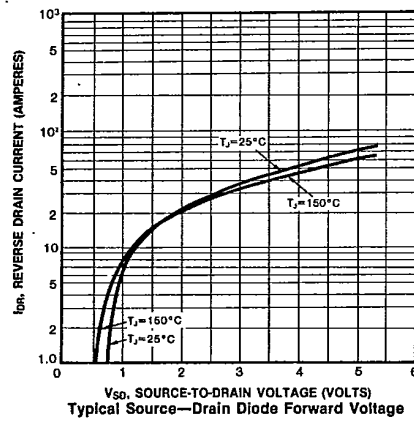
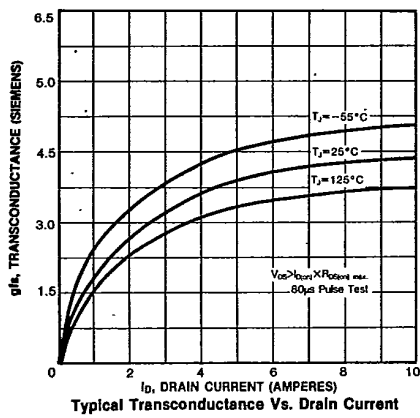
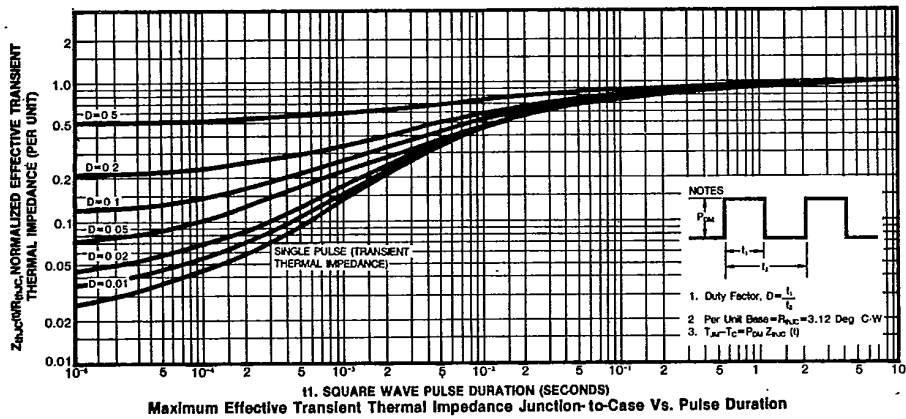
**IRF220/221/222/223**

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	$I_S$	IRF220 IRF221	—	—	5.0	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRF222 IRF223	—	—	4.0	A	
Pulse Source Current (Body Diode) (3)	$I_{SM}$	IRF220 IRF221	—	—	20	A	
		IRF222 IRF223	—	—	16	A	
Diode Forward Voltage (2)	$V_{SD}$	IRF220 IRF221	—	—	2.0	V	$T_C=25^\circ\text{C}$ , $I_S=5.0\text{A}$ , $V_{GS}=0\text{V}$
		IRF222 IRF223	—	—	1.8	V	$T_C=25^\circ\text{C}$ , $I_S=4.0\text{A}$ , $V_{GS}=0\text{V}$
Reverse Recovery Time	$t_{rr}$	ALL	—	350	—	ns	$T_J=150^\circ\text{C}$ , $I_F=5.0\text{A}$ , $dI_F/dt=100\text{A}/\mu\text{s}$

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





**IRF220/221/222/223**

**N-CHANNEL  
POWER MOSFETS**

