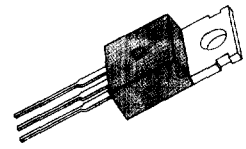
Jameco Part Number 209234

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

TO-220



IRF510/511/512/513

2

PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF510	100V	0.54Ω	5.6A
IRF511	80V	0.54Ω	5.6A
IRF512	100V	0.74Ω	4.9A
IRF513	80V	0.74Ω	4.9A

MAXIMUM RATINGS

Characteristic	Symbol	IRF510	IRF511	IRF512	IRF513	Unit
Drain-Source Voltage (1)	V_{DSS}	100	80	100	80	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ)(1)	V_{DGR}	100	80	100	80	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	5.6	5.6	4.9	4.9	Adc
Continuous Drain Current T_C=100°C	I_D	4.0	4.0	3.4	3.4	Adc
Drain Current—Pulsed (3)	I_{DM}	20	20	18	18	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Single Pulsed Avalanche Energy(4)	E_{AS}	19				mJ
Avalanche Current	I_{AS}	5.6				A
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	43 0.34				Watts W/°C
Operating and Storage Junction to Case	T_J, Tstg	−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 with limited by max. junction temperature
(4) L=0.19 mH, V_{dd}=25V, R_G=25Ω, Starting T_j=25°C

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

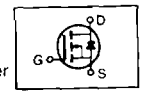
Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage IRF510/512	100	—	—	V	V_{GS}=0V
	IRF511/513	80	—	—	V	I_D=250μA
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D=250μA
I_{GSS}	Gate-Source Leakage Forward	—	—	100	nA	V_{GS}=20V
I_{GSS}	Gate-Source 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}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
$I_{D(on)}$	On-State Drain-Source Current (2) IRF510/511	5.6	—	—	A	V_{DS}≥4.1V, V_{GS}=10V
	IRF512/513	4.9	—	—	Ω	
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRF510/511	—	0.41	0.54	Ω	V_{GS}=10V, I_D=3.4A
	IRF512/513	—	0.54	0.74	Ω	
g_{fs}	Forward Transconductance (2)	1.3	2.0	—	℧	V_{DS}≥50V, I_D=3.4A
C_{iss}	Input Capacitance	—	180	—	pF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
C_{oss}	Output Capacitance	—	82	—	pF	
C_{rss}	Reverse Transfer Capacitance	—	20	—	pF	
$t_{d(on)}$	Turn-On Delay Time	—	7.6	11	ns	V_{DD}=0.5BV_{DSS}, I_D=3.4A, Z_O=24Ω (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	—	24	36	ns	
$t_{d(off)}$	Turn-Off Delay Time	—	14	21	ns	
t_f	Fall Time	—	14	21	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	—	5.2	7.7	nC	V_{GS}=10V, I_D=5.6A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Q_{gs}	Gate-Source Charge	—	1.5	2.3	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	—	2.2	3.2	nC	

THERMAL RESISTANCE

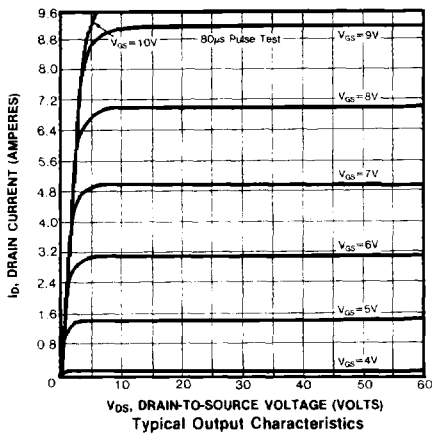
R_{thJC}	Junction-to-Case	—	—	2.9	K/W	
R_{thCS}	Case-to-Sink	—	0.5	—	K/W	Mounting surface flat, smooth, and greased
R_{thJA}	Junction-to-Ambient	—	—	80	K/W	Free Air Operation

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

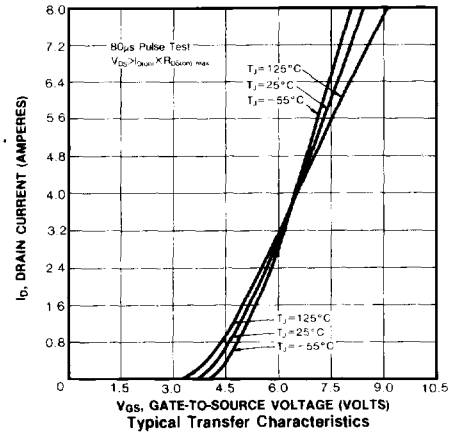
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Type	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	IRF510 IRF511	—	—	5.6	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRF512 IRF513	—	—	4.9	A	
I_{SM}	Pulse Source Current (Body Diode) 1	IRF510 IRF511	—	—	20	A	
		IRF512 IRF513	—	—	18	A	
V_{SD}	Diode Forward Voltage 2	IRF510 IRF511	—	—	2.5	V	T_C=25°C, I_S=5.6A, V_{GS}=0V
		IRF512 IRF513	—	—	2.0	V	T_C=25°C, I_S=4.9A, V_{GS}=0V
t_{rr}	Reverse Recovery Time		—	230	—	ns	T_J=25°C, I_F=5.6A, dI_F/dt=100A/μs

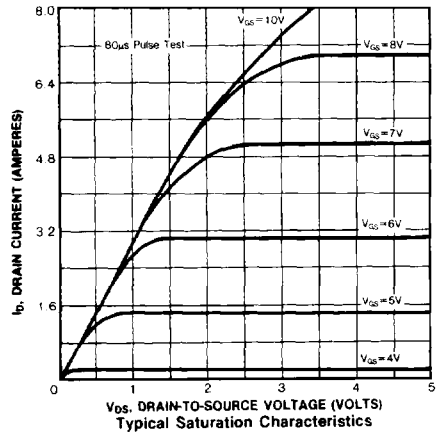
Notes: (1) T_J=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse with limited by max. junction temperature



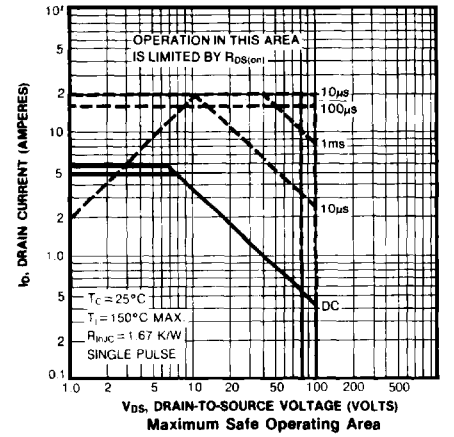
Typical Output Characteristics



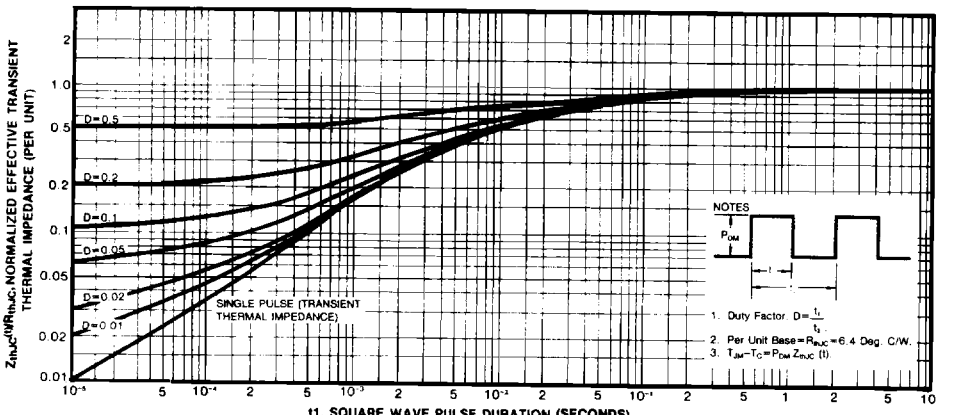
Typical Transfer Characteristics



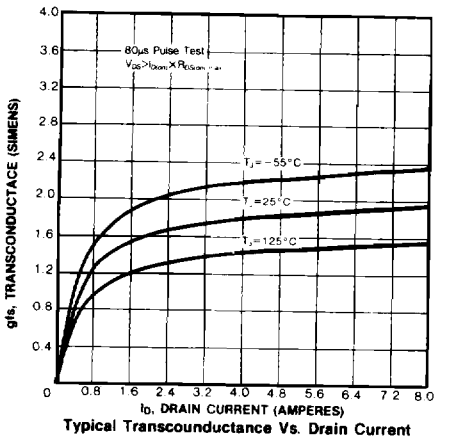
Typical Saturation Characteristics



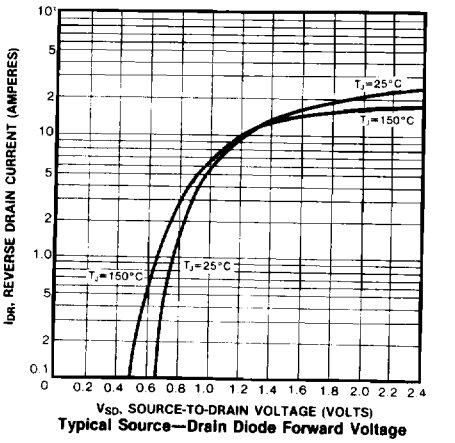
Maximum Safe Operating Area



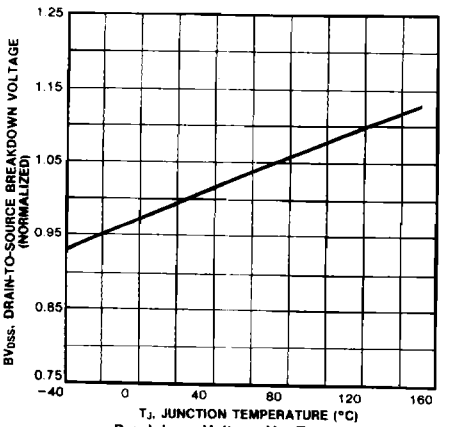
Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration



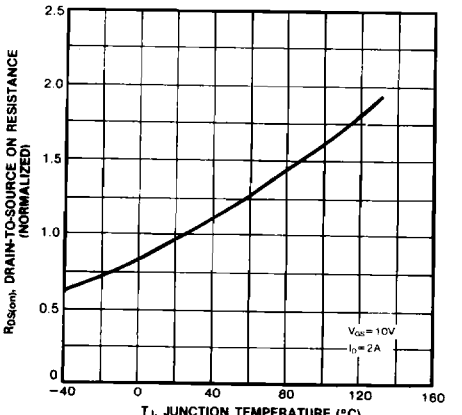
Typical Transcounductance Vs. Drain Current



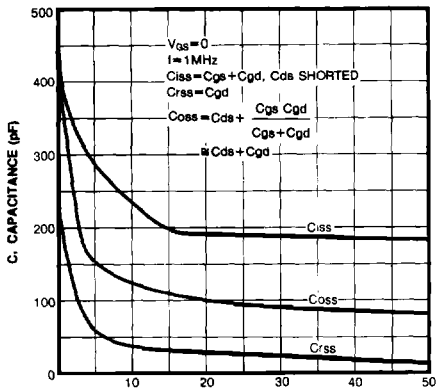
Typical Source—Drain Diode Forward Voltage



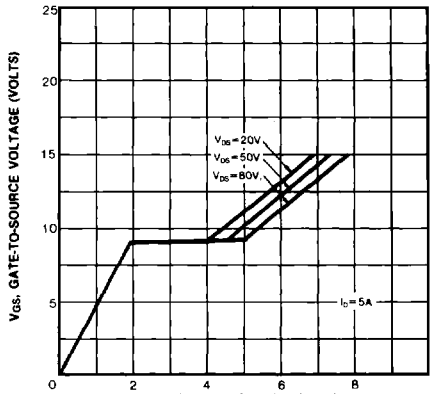
Breakdown Voltage Vs. Temperature



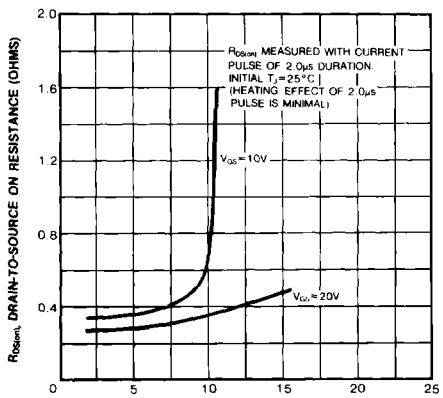
Normalized On-Resistance Vs. Temperature



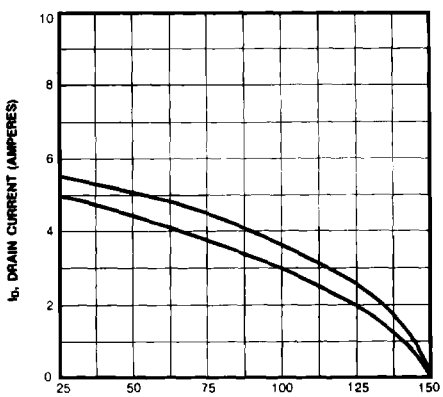
Typical Capacitance Vs. Drain to Source Voltage



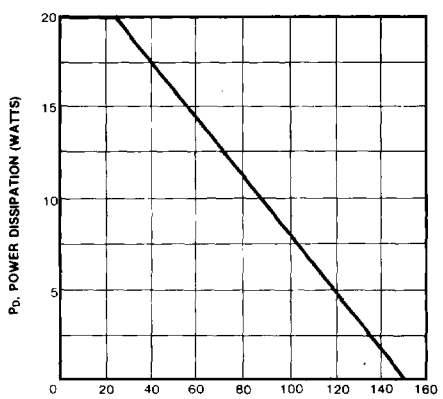
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve