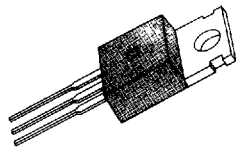
IRF9530/9531/9532/9533
IRFP9130/9131/9132/9133

P-CHANNEL POWER MOSFETS

FEATURES

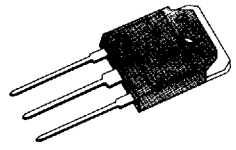
- Lower $R_{DS\ (ON)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

TO-220



IRF9530/9531/9532/9533

TO-3P



IRFP9130/9131/9132/9133

2

PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF9530/IRFP9130	−100V	0.30Ω	−12A
IRF9531/IRFP9131	−60V	0 30Ω	−12A
IRF9532/IRFP9132	−100V	0 40Ω	−10A
IRF9533/IRFP9133	−60V	0 40Ω	−10A

MAXIMUM RATINGS

Characteristic	Symbol	IRF9530 IRF9130	IRF9531 IRF9131	IRF9532 IRFP9132	IRF9533 IRFP9133	Unit
Drain-Source Voltage (1)	V_{DSS}	−100	−60	−100	−60	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ)(1)	V_{DGR}	−100	−60	−100	−60	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	−12	−12	−10	−10	Adc
Continuous Drain Current T_C=100°C	I_D	−7.5	−7.5	−6.5	−6.5	Adc
Drain Current—Pulsed (3)	I_{DM}	−48	−48	−40	−40	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Single Pulsed Avalanche Energy (4)	E_{AS}	550				mJ
Avalanche Current	I_{AS}	−12				A
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	75 0.6				Watts W/°C
Operating and Storage Junction Temperature Range	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=8.5mH, V_{dd}=−25V, R_G=25Ω, Starting T_J=25°C

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

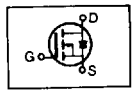
Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage IRF9530/IRFP9130 IRF9532/IRFP9132	-100	—	—	V	V_{GS}=0V I_D=−250μA
	IRF9531/IRFP9131 IRF9533/IRF9133	−60	—	—	V	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D=−250μA
I_{GSS}	Gate-Source 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}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
$I_{D(on)}$	On-State Drain-Source Current (2) IRF9530/IRFP9130 IRF9531/IRFP9131	-12	—	—	A	V_{DS}≤−4.8V, V_{GS}=−10V
	IRF9532/IRFP9132 IRF9533/IRFP9133	-10	—	—	A	
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRF9530/IRFP9130 IRF9531/IRFP9131	—	—	0.3	Ω	V_{GS}=−10V, I_D=−6.5A
	IRF9532/IRFP9132 IRF9533/IRFP9133	—	—	0.4	Ω	
g_{fs}	Forward Transconductance (2)	2.0	—	—	℧	V_{DS}≤−50V, I_D=−6.5A
C_{iss}	Input Capacitance	—	835	—	pF	V_{GS}=0V, V_{DS}=−25V, f=1.0MHz
C_{oss}	Output Capacitance	—	357	—	pF	
C_{rss}	Reverse Transfer Capacitance	—	94	—	pF	
$t_{d(on)}$	Turn-On Delay Time	—	—	60	ns	V_{DD}=0.5BV_{DSS}, I_D=−6.5A, Z_O=50Ω (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	—	—	140	ns	
$t_{d(off)}$	Turn-Off Delay Time	—	—	140	ns	
t_f	Fall Time	—	—	140	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	—	—	45	nC	V_{GS}=−15V, I_D=−15A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Q_{gs}	Gate-Source Charge	—	—	20	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	—	—	25	nC	

THERMAL RESISTANCE

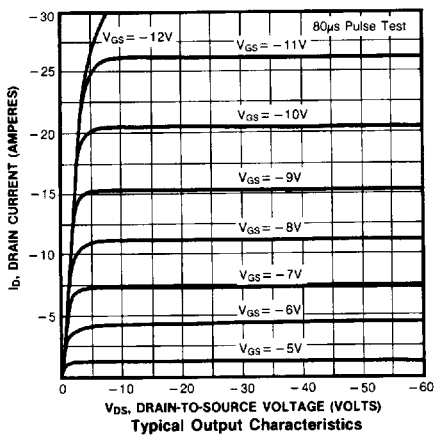
Symbol	Characteristic		IRF9530-3	IRFP9130-3	Unit	
R_{thJC}	Junction-to-Case	MAX	1.67	1.67	K/W	
R_{thCS}	Case-to-Sink	TYP	1.0	0.24	K/W	Mounting surface flat, smooth, and greased
R_{thJA}	Junction-to-Ambient	MAX	80	40	K/W	Free Air Operation

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

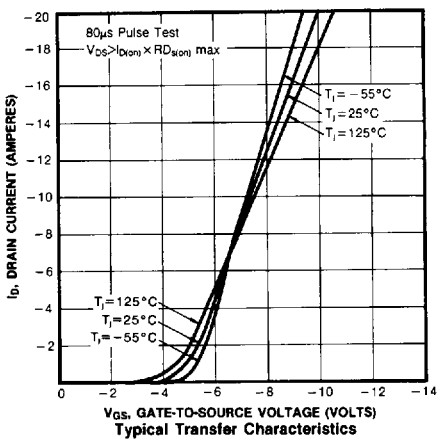
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode) IRF9530/IRFP9130 IRF9531/IRFP9131	—	—	−12	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
	IRF9532/IRFP9132 IRF9533/IRFP9133	—	—	−10	A	
I_{SM}	Pulse Source Current (Body Diode) (3) IRF9530/IRFP9130 IRF9531/IRFP9131	—	—	−48	A	
	IRF9532/IRFP9132 IRF9533/IRFP9133	—	—	−40	A	
V_{SD}	Diode Forward Voltage (2) IRF9530/IRFP9130 IRF9531/IRFP9131	—	—	−6.3	A	T_C=25°C, I_S=−12A, V_{GS}=0V
	IRF9532/IRFP9132 IRF9533/IRFP9133	—	—	−6.0	A	T_C=25°C, I_S=−10A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	—	300	—	ns	T_J=150°C, I_F=−6.0A, 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



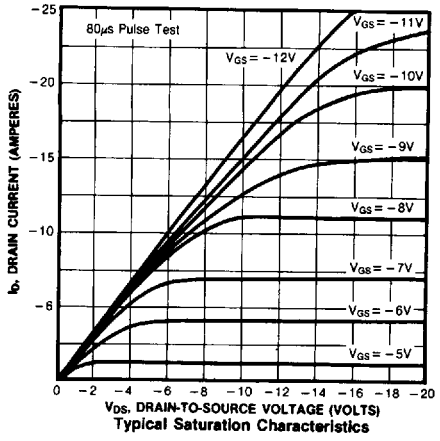
Typical Output Characteristics



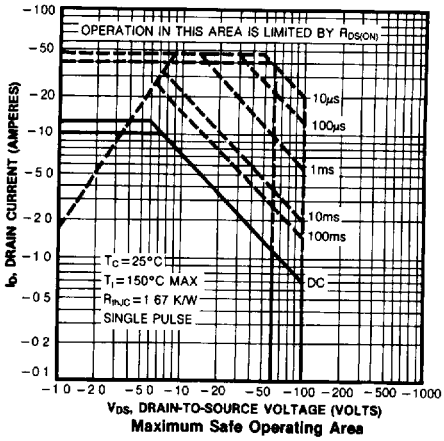
Typical Transfer Characteristics

IRF9530/9531/9532/9533
IRFP9130/9131/9132/9133

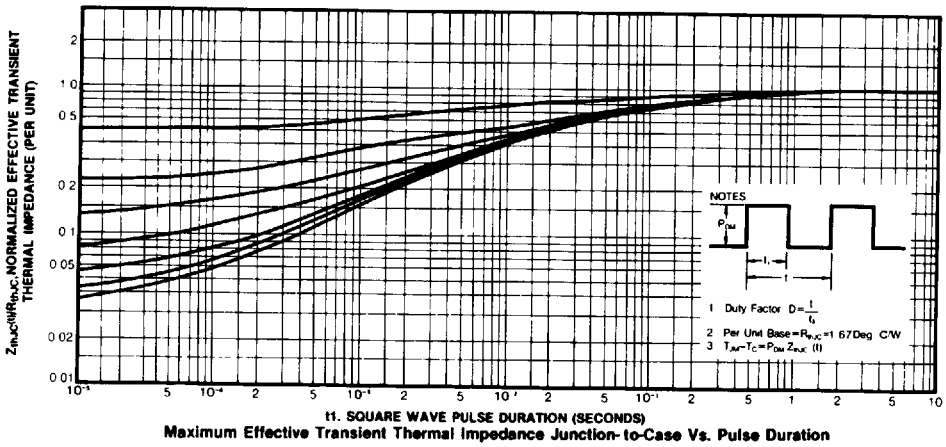
P-CHANNEL POWER MOSFETS



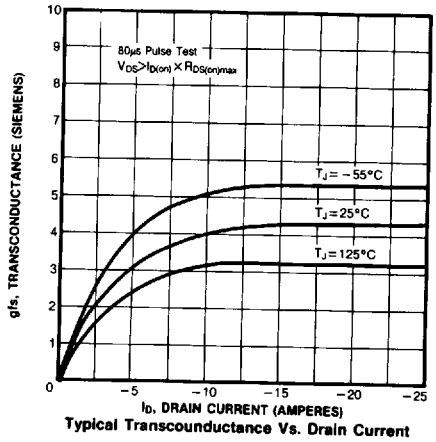
Typical Saturation Characteristics



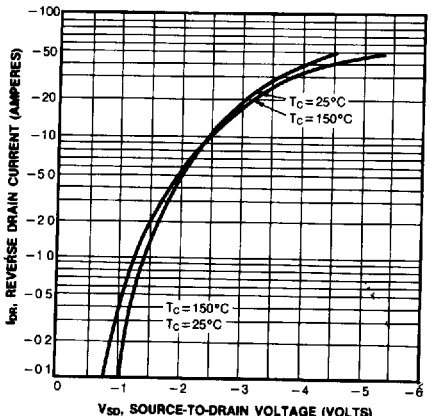
Maximum Safe Operating Area



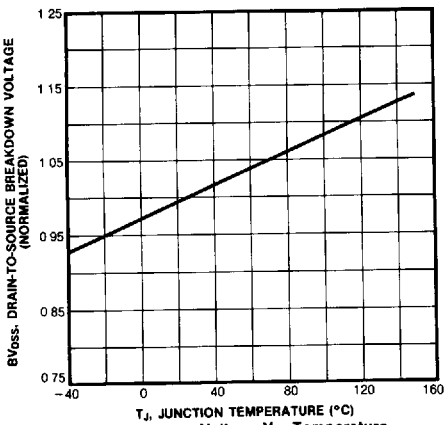
Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration



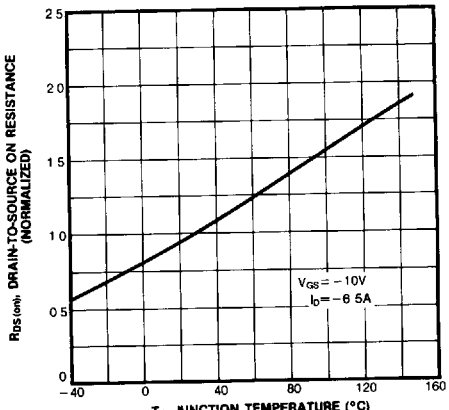
Typical Transcounductance Vs. Drain Current



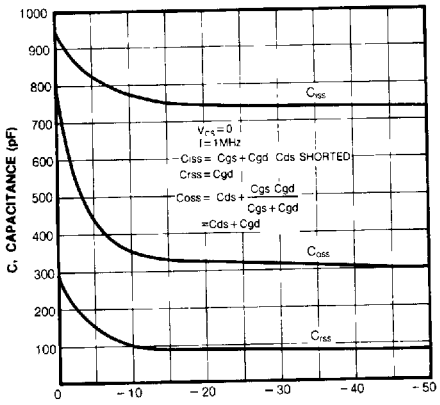
Typical Source—Drain Diode Forward Voltage



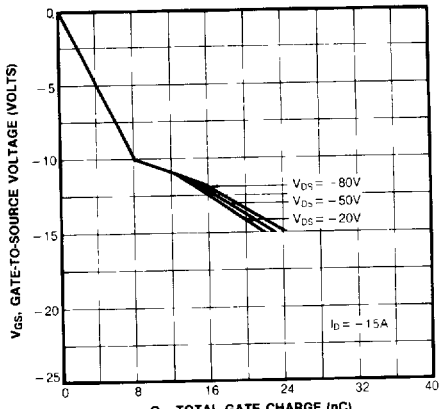
Breakdown Voltage Vs. Temperature



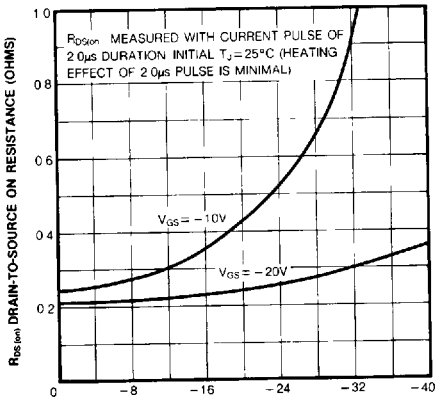
Normalized On-Resistance Vs. Temperature



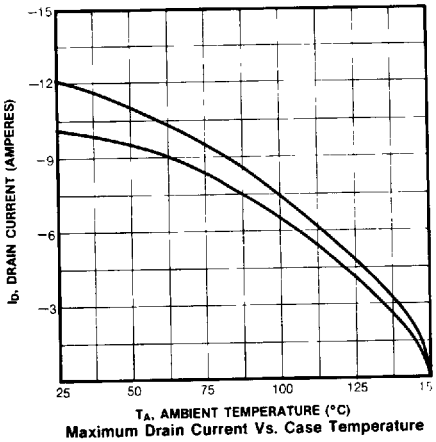
Typical Capacitance Vs. Drain to Source Voltage



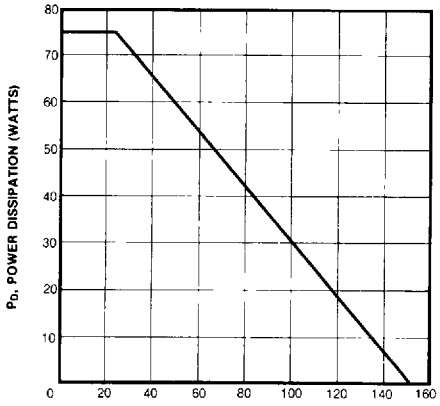
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve