

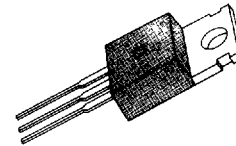
**IRF9530/9531/9532/9533**  
**IRFP9130/9131/9132/9133**
**P-CHANNEL**  
**POWER MOSFETS**
**FEATURES**

- 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

**PRODUCT SUMMARY**

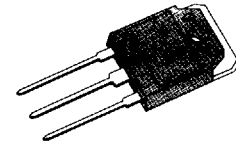
Part Number	$V_{DS}$	$R_{DS(on)}$	$I_D$
IRF9530/IRFP9130	-100V	0.30 $\Omega$	-12A
IRF9531/IRFP9131	-60V	0.30 $\Omega$	-12A
IRF9532/IRFP9132	-100V	0.40 $\Omega$	-10A
IRF9533/IRFP9133	-60V	0.40 $\Omega$	-10A

TO-220



IRF9530/9531/9532/9533

TO-3P



IRFP9130/9131/9132/9133

**MAXIMUM RATINGS**

Characteristic	Symbol	IRF9530 IRFP9130	IRF9531 IRFP9131	IRF9532 IRFP9132	IRF9533 IRFP9133	Unit
Drain-Source Voltage (1)	$V_{DSS}$	-100	-60	-100	-60	Vdc
Drain-Gate Voltage ( $R_{GS}=1.0M\Omega$ )(1)	$V_{DGR}$	-100	-60	-100	-60	Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 20$				Vdc
Continuous Drain Current $T_C=25^\circ C$	$I_D$	-12	-12	-10	-10	Adc
Continuous Drain Current $T_C=100^\circ C$	$I_D$	-7.5	-7.5	-6.5	-6.5	Adc
Drain Current—Pulsed (3)	$I_{DM}$	-48	-48	-40	-40	Adc
Gate Current—Pulsed	$I_{GM}$	$\pm 1.5$				Adc
Single Pulsed Avalanche Energy (4)	$E_{AS}$	550				mJ
Avalanche Current	$I_{AS}$	-12				A
Total Power Dissipation @ $T_C=25^\circ C$ Derate above $25^\circ C$	$P_D$	75 0.6				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)  $L=8.5mH$ ,  $V_{dd}=-25V$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ C$

**ELECTRICAL CHARACTERISTICS** ( $T_C=25^\circ\text{C}$  unless otherwise specified)


Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
$BV_{DSS}$	Drain-Source Breakdown Voltage IRF9530/IRFP9130 IRF9532/IRFP9132	-100	—	—	V	$V_{GS}=0V$ $I_D=-250\mu A$
	IRF9531/IRFP9131 IRF9533/IRFP9133	-60	—	—	V	
$V_{GS(th)}$	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	$\mu A$	$V_{DS}=\text{Max. Rating}$ , $V_{GS}=0V$
		—	—	1000	$\mu A$	$V_{DS}=\text{Max. Rating} \times 0.8$ , $V_{GS}=0V$ , $T_C=125^\circ\text{C}$
$I_{D(on)}$	On-State Drain-Source Current (2) IRF9530/IRFP9130 IRF9531/IRFP9131	-12	—	—	A	$V_{DS} \leq -4.8V$ , $V_{GS}=-10V$
	IRF9532/IRFP9132 IRF9533/IRFP9133	-10	—	—	A	
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRF9530/IRFP9130 IRF9531/IRFP9131	—	—	0.3	$\Omega$	$V_{GS}=-10V$ , $I_D=-6.5A$
	IRF9532/IRFP9132 IRF9533/IRFP9133	—	—	0.4	$\Omega$	
$g_{fs}$	Forward Transconductance (2)	2.0	—	—	$\Omega$	$V_{DS} \leq -50V$ , $I_D=-6.5A$
$C_{iss}$	Input Capacitance	—	835	—	pF	$V_{GS}=0V$ , $V_{DS}=-25V$ , $f=1.0\text{MHz}$
$C_{oss}$	Output Capacitance	—	357	—	pF	
$C_{rss}$	Reverse Transfer Capacitance	—	94	—	pF	
$t_{d(on)}$	Turn-On Delay Time	—	—	60	ns	$V_{DD}=0.5BV_{DSS}$ , $I_D=-6.5A$ , $Z_\theta=50\Omega$ (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	$V_{GS}=-15V$ , $I_D=-15A$ , $V_{DS}=0.8 \text{ Max. Rating}$ (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**

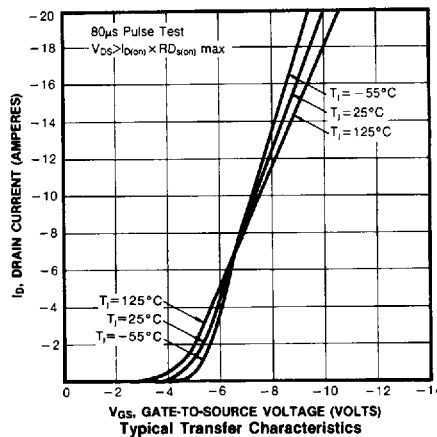
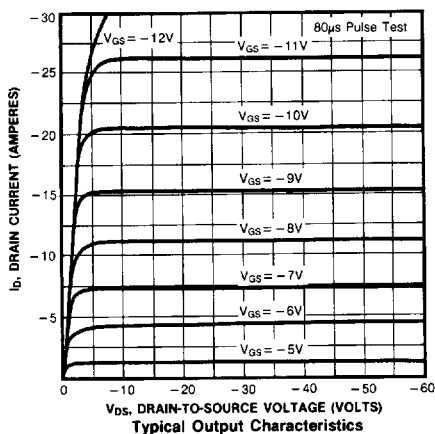
Symbol	Characteristic		IRF9530-3	IRFP9130-3	Unit	
$R_{thJC}$	Junction-to-Case	MAX	1.67	1.67	K/W	
$R_{thCS}$	Case-to-Sink	TYP	1.0	0.24	K/W	Mounting surface flat, smooth, and greased
$R_{thJA}$	Junction-to-Ambient	MAX	80	40	K/W	Free Air Operation

- Notes:** (1)  $T_J=25^\circ\text{C}$  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

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

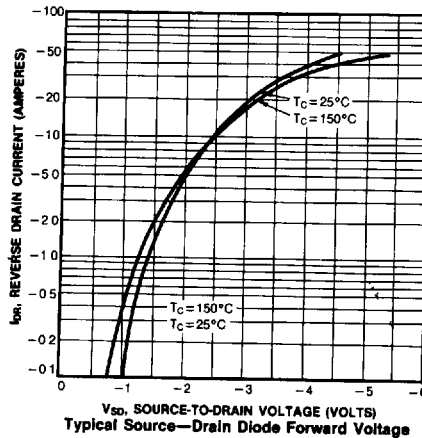
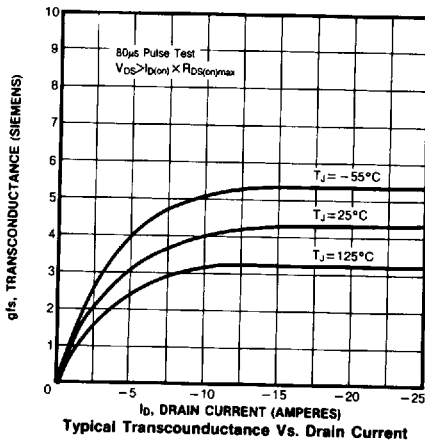
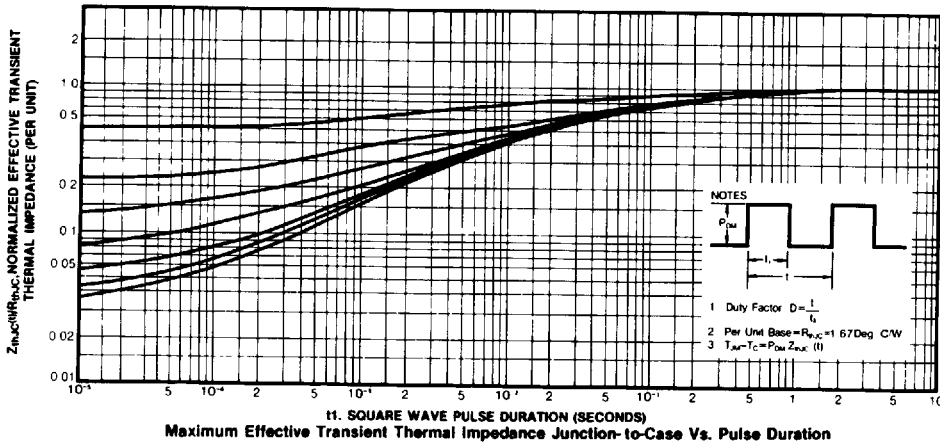
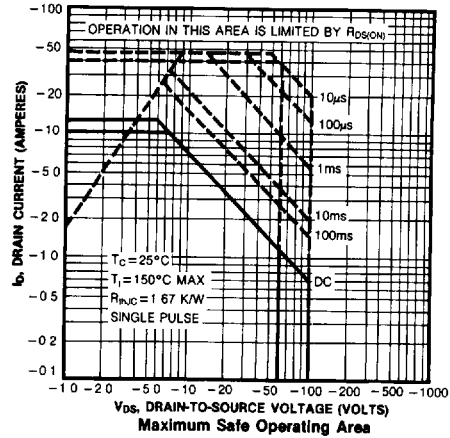
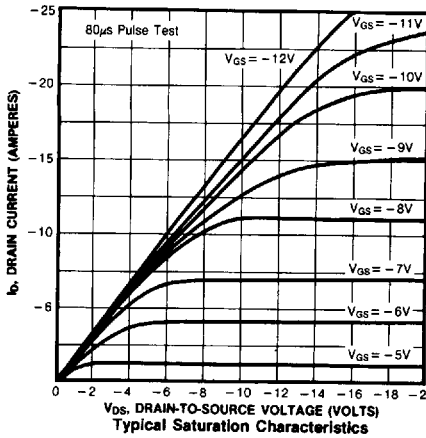
Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode) IRF9530/IRFP9130 IRF9531/IRFP9131	—	—	-12	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
	IRF9532/IRFP9132 IRF9533/IRFP9133	—	—	-10	A	
$I_{SM}$	Pulse Source Current (Body 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	$T_C=25^\circ\text{C}$ , $I_S=-12\text{A}$ , $V_{GS}=0\text{V}$
	IRF9532/IRFP9132 IRF9533/IRFP9133	—	—	-6.0	A	$T_C=25^\circ\text{C}$ , $I_S=-10\text{A}$ , $V_{GS}=0\text{V}$
$t_{rr}$	Reverse Recovery Time	—	300	—	ns	$T_J=150^\circ\text{C}$ , $I_F=-6.0\text{A}$ , $dI_F/dt=100\text{A}/\mu\text{S}$

**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 with limited by max. junction temperature



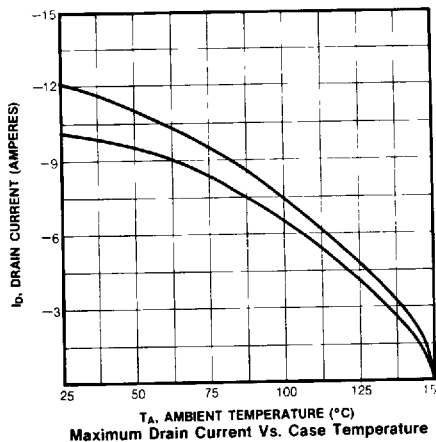
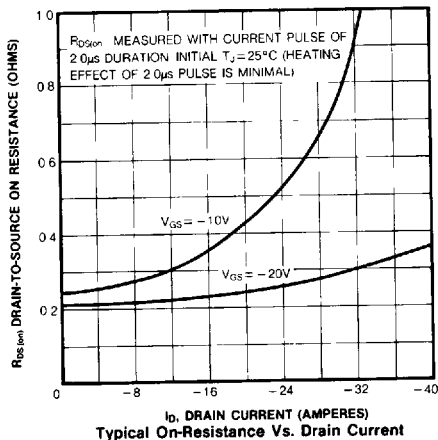
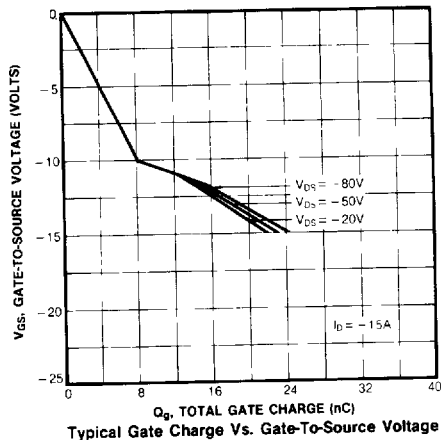
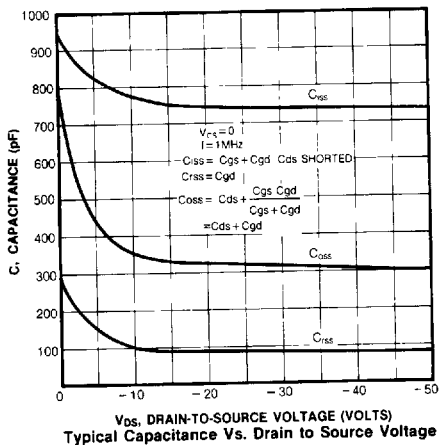
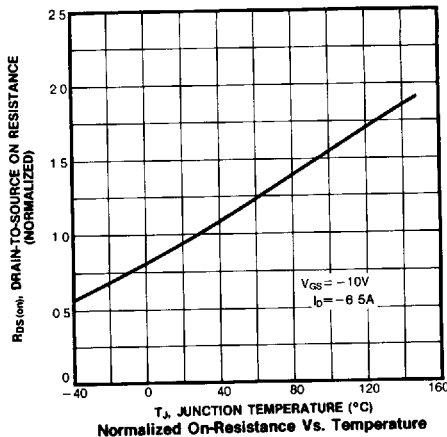
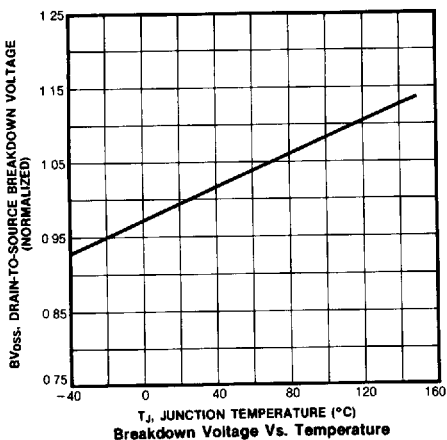
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