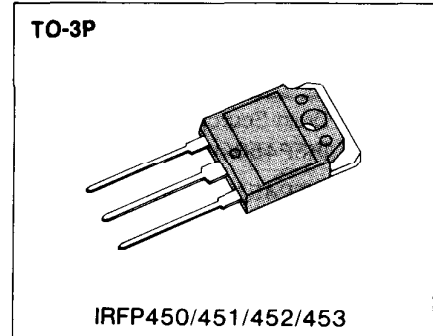


# IRFP450/451/452/453 IRF450/451/452/453

## N-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	$V_{DS}$	$R_{DS(on)}$	$I_D$
IRFP450/IRF450	500V	0.4 $\Omega$	14A
IRFP451/IRF451	450V	0.4 $\Omega$	14A
IRFP452/IRF452	500V	0.5 $\Omega$	12A
IRFP453/IRF453	450V	0.5 $\Omega$	12A

### MAXIMUM RATINGS

Characteristic	Symbol	IRFP450 IRF450	IRFP451 IRF451	IRFP452 IRF452	IRFP453 IRF453	Unit
Drain-Source Voltage (1)	$V_{DSS}$	500	450	500	450	Vdc
Drain-Gate Voltage ( $R_{GS}=1.0M\Omega$ )(1)	$V_{DGR}$	500	450	500	450	Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 20$				Vdc
Continuous Drain Current $T_C=25^\circ C$	$I_D$	14	14	12	12	Adc
Continuous Drain Current $T_C=100^\circ C$	$I_D$	8.8	8.8	7.9	7.9	Adc
Drain Current—Pulsed (3)	$I_{DM}$	56	56	48	48	Adc
Gate Current—Pulsed	$I_{GM}$	$\pm 1.5$				Adc
Single Pulsed Avalanche Energy	$E_{AS}$	760				mJ
Avalanche Current	$I_{AS}$	14				A
Total Power Dissipation @ $T_C=25^\circ C$ Derate above $25^\circ C$	$P_D$	180 1.4				Watts W/ $^\circ C$
Operating and Storage Junction to Case	$T_J, T_{stg}$	-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)  $L=7.0mH$ ,  $V_{dd}=50V$ ,  $R_G=25\Omega$ , 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 <sub>DSS</sub>	Drain-Source Breakdown Voltage IRFP450/452/IRF450/452	500	—	—	V	V <sub>GS</sub> =0V
	IRFP451/453/IRF451/453	450	—	—	V	I <sub>D</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	—	4.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
I <sub>GSS</sub>	Gate-Source Leakage Forward	—	—	100	nA	V <sub>GS</sub> =20V
I <sub>GSS</sub>	Gate-Source Leakage Reverse	—	—	-100	nA	V <sub>GS</sub> =-20V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	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
I <sub>D(on)</sub>	On-State Drain-Source Current (2) IRFP450/451/IRF450/451	14	—	—	A	V <sub>DS</sub> ≥7V, V <sub>GS</sub> =10V
	IRFP452/453/IRF452/453	12	—	—	A	
R <sub>DS(on)</sub>	Static Drain-Source On-State Resistance (2) IRF450/451/IRF450-451	—	0.35	0.4	Ω	V <sub>GS</sub> =10V, I <sub>D</sub> =7.9A
	IRFP452/453/IRF452/453	—	0.4	0.5	Ω	
g <sub>fs</sub>	Forward Transconductance (2)	9.3	10.8	—	Ω	V <sub>DS</sub> ≥50V, I <sub>D</sub> =7.9A
C <sub>iss</sub>	Input Capacitance	—	2950	—	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz
C <sub>oss</sub>	Output Capacitance	—	290	—	pF	
C <sub>rss</sub>	Reverse Transfer Capacitance	—	118	—	pF	
t <sub>d(on)</sub>	Turn-On Delay Time	—	—	35	ns	V <sub>DD</sub> =0.5 BV <sub>DSS</sub> , I <sub>D</sub> =13A, Z <sub>O</sub> =4.7Ω (MOSFET switching times are essentially independent of operating temperature)
t <sub>r</sub>	Rise Time	—	—	50	ns	
t <sub>d(off)</sub>	Turn-Off Delay Time	—	—	150	ns	
t <sub>f</sub>	Fall Time	—	—	70	ns	
Q <sub>g</sub>	Total Gate Charge (Gate-Source Plus Gate-Drain)	—	77	120	nC	V <sub>GS</sub> =10V, I <sub>D</sub> =13A, V <sub>DS</sub> =0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Q <sub>gs</sub>	Gate-Source Charge	—	11	—	nC	
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	—	60	—	nC	

**THERMAL RESISTANCE**

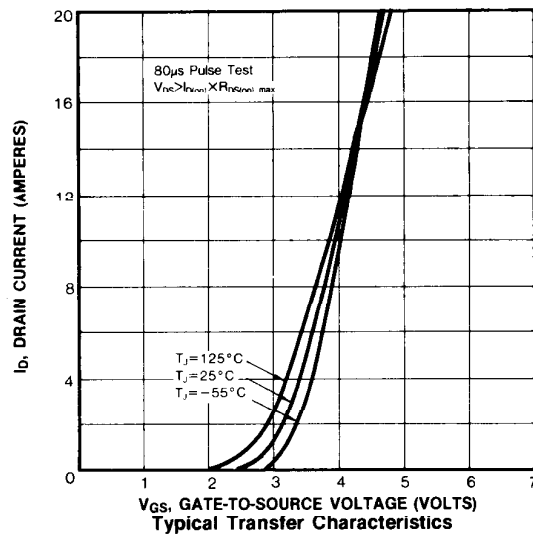
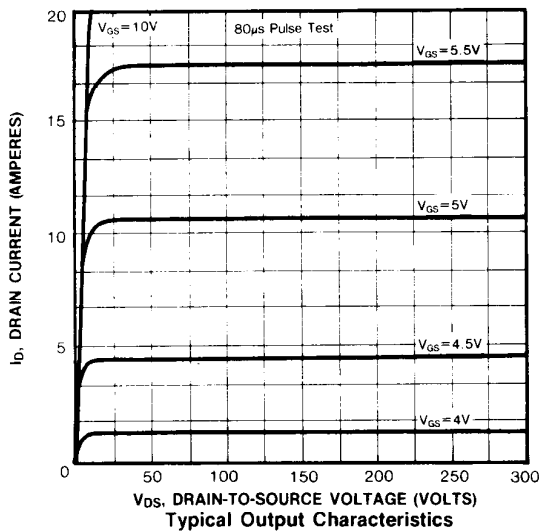
Symbol	Characteristic		IRFP450-3	IRF450-3	Unit	
R <sub>thJC</sub>	Junction-to-Case	MAX	0.70	0.70	K/W	
R <sub>thCS</sub>	Case-to-Sink	TYP	0.24	0.12	K/W	Mounting surface flat, smooth, and greased
R <sub>thJA</sub>	Junction-to-Ambient	MAX	40	30	K/W	Free Air Operation

- 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

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode) IRF450/451/IRFP450/451	—	—	14	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
	IRF452/453/IRFP450/451	—	—	12	A	
I <sub>SM</sub>	Pulse Source Current(Body Diode)(3) IRF450/451/IRFP450/451	—	—	56	A	
	IRF452/453/IRFP452/453	—	—	48	A	
V <sub>SD</sub>	Diode Forward Voltage (2) IRF450/451/IRFP450/451	—	—	1.4	V	T <sub>C</sub> =25°C, I <sub>S</sub> =14A, V <sub>GS</sub> =0V
	IRF452/453/IRFP452/453	—	—	1.3	V	T <sub>C</sub> =25°C, I <sub>S</sub> =12A, V <sub>GS</sub> =0V
t <sub>rr</sub>	Reverse Recovery Time	—	580	1200	ns	T <sub>J</sub> =25°C, I <sub>F</sub> =13A, dI <sub>F</sub> /dt=100A/μS

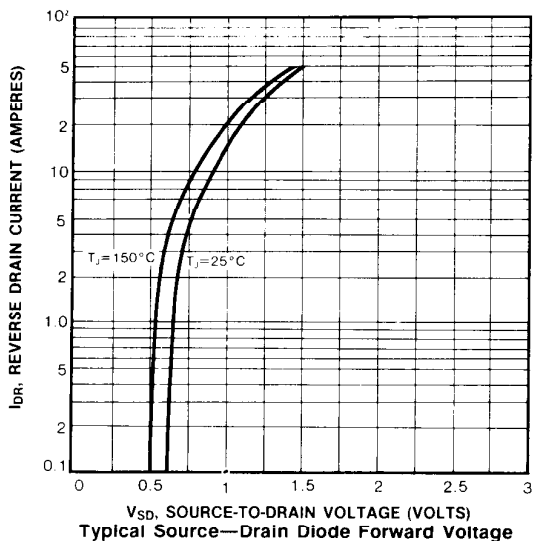
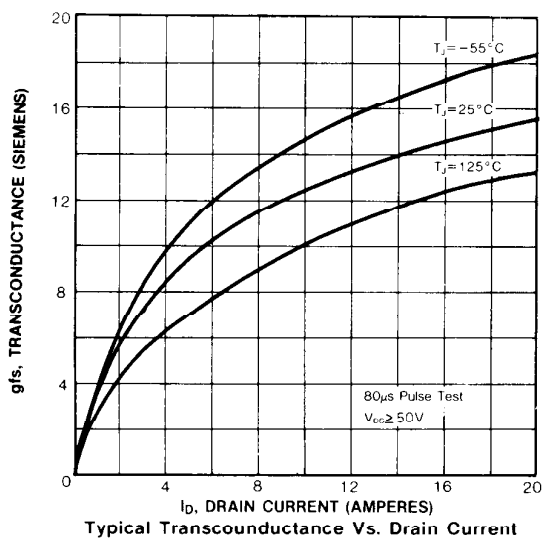
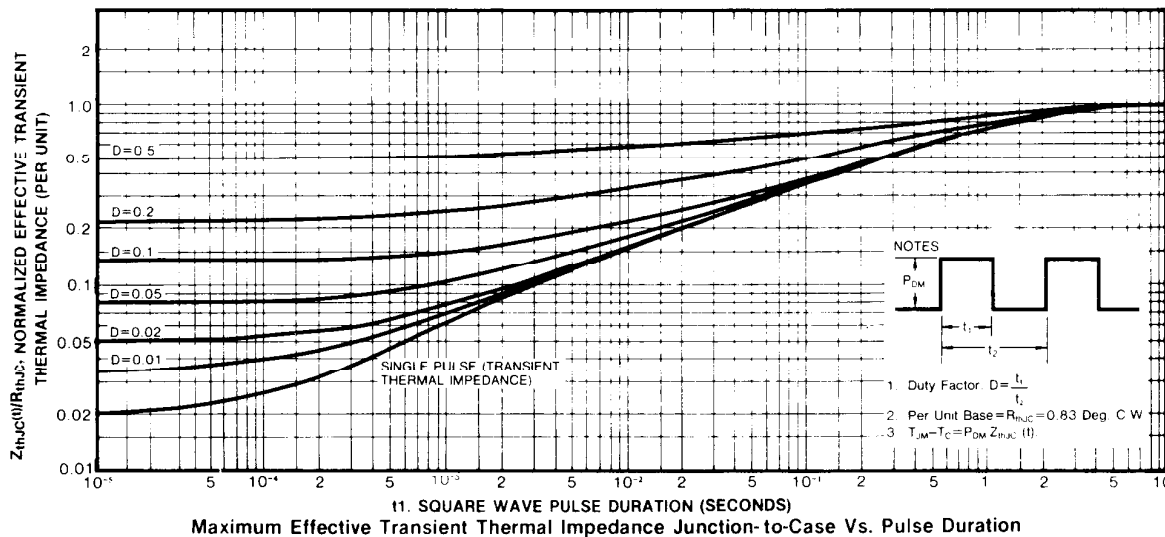
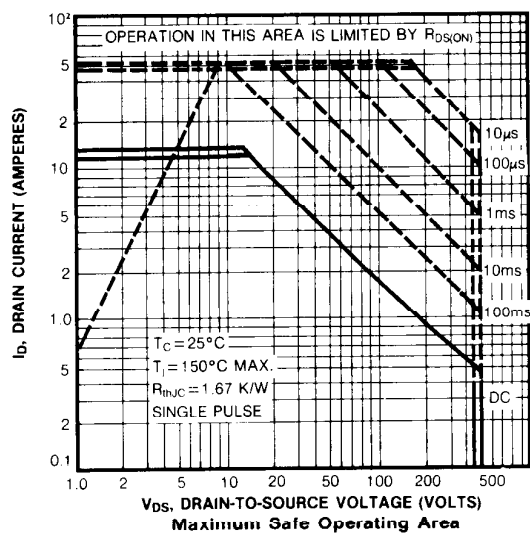
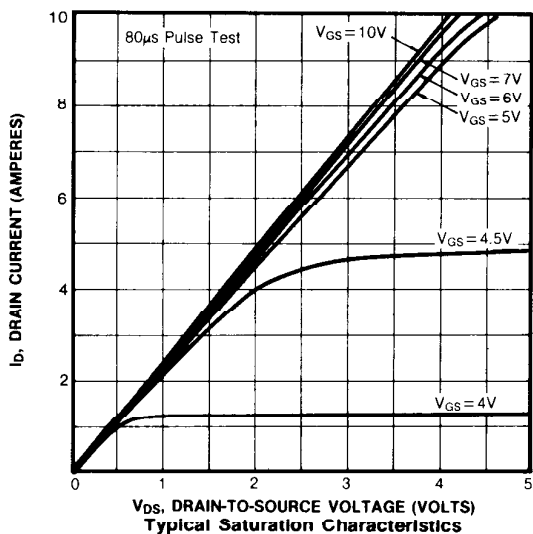
**Notes:** (1) T<sub>J</sub>=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%  
 (3) Repetitive rating: Pulse with limited by max. junction temperature

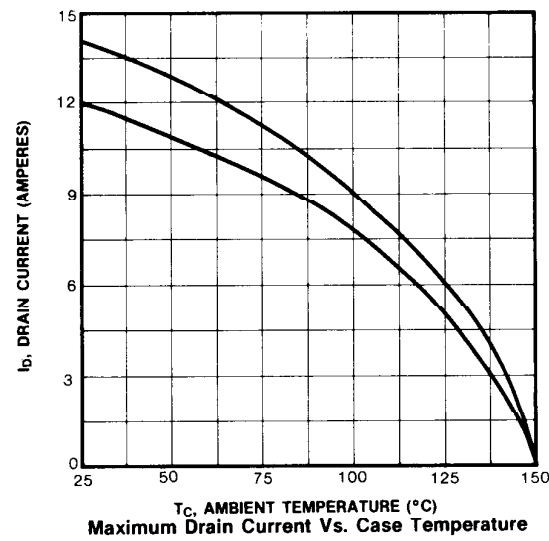
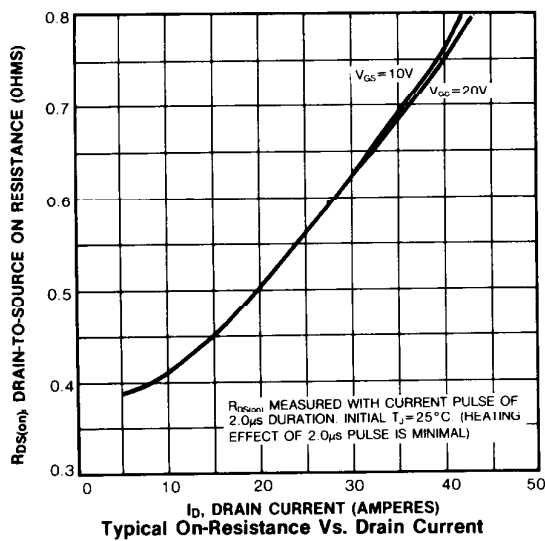
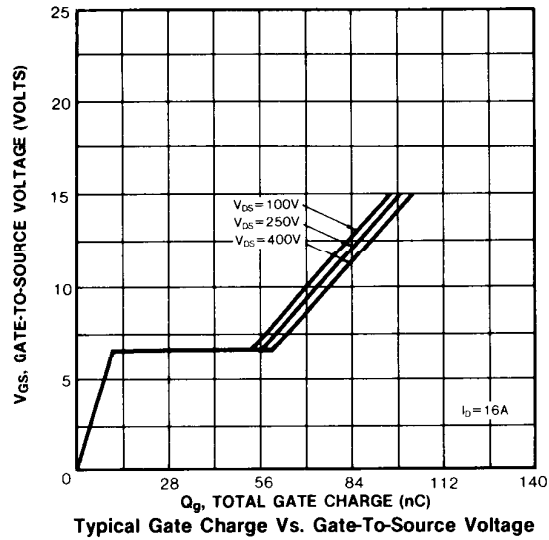
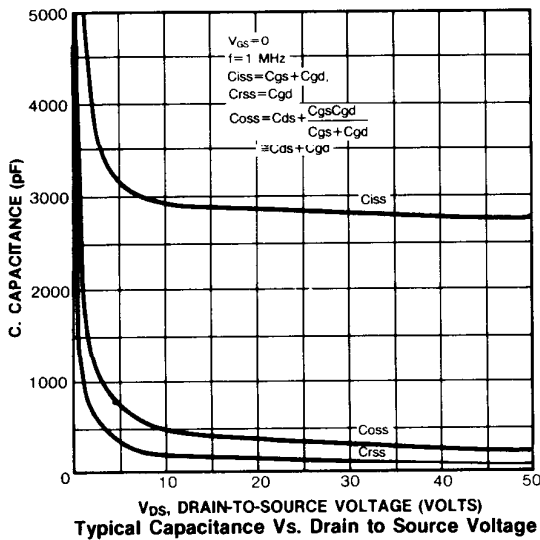
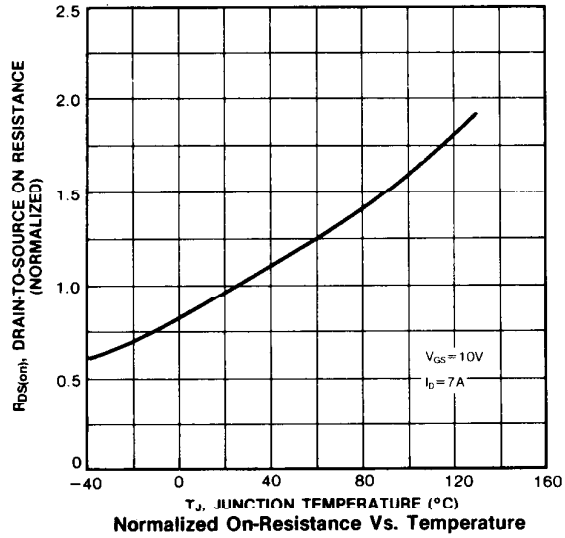
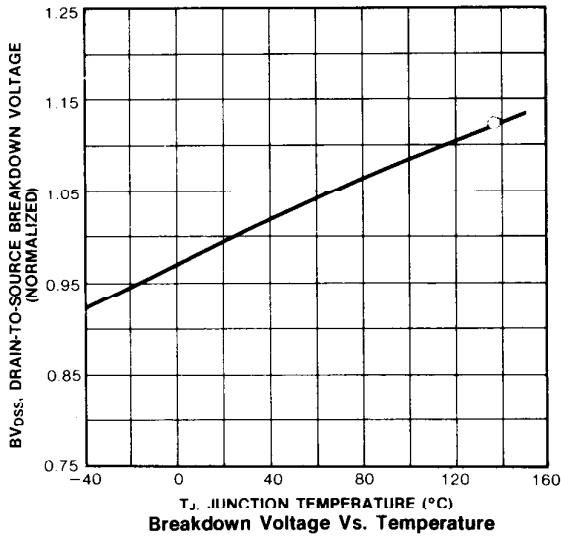


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