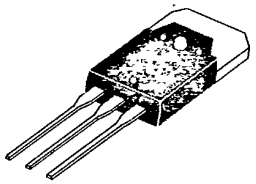
IRFP450/451/452/453

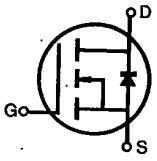
N-CHANNEL POWER MOSFETS

FEATURES

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

TO-3P





PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFP250	500V	0.4Ω	13A
IRFP251	450V	0.4Ω	13A
IRFP252	500V	0.5Ω	12A
IRFP253	450V	0.5Ω	12A

MAXIMUM RATINGS

Characteristic	Symbol	IRFP450	IRFP451	IRFP452	IRFP453	Unit
Drain-Source Voltage (1)	V_{DSS}	500	450	500	450	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ) (1)	V_{DGR}	500	450	500	450	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	13	13	12	12	Adc
Continuous Drain Current T_C=100°C	I_D	8.0	8.0	7.0	7.0	Adc
Drain Current—Pulsed (3)	I_{DM}	52	52	48	48	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	150 1.2				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 width limited by max. junction temperature

IRFP450/451/452/453

N-CHANNEL POWER MOSFETS

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

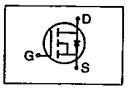
Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV_{DSS}	IRFP450 IRFP452	500	—	—	V	V_{GS}=0V
		IRFP451 IRFP453	450	—	—	V	I_D=250μA
Gate Threshold Voltage	$V_{GS(th)}$	ALL	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D=250μA
Gate-Source Leakage Forward	I_{GSS}	ALL	—	—	100	nA	V_{GS}=20V
Gate-Source Leakage Reverse	I_{GSS}	ALL	—	—	−100	nA	V_{GS}=−20V
Zero Gate Voltage Drain Current	I_{DSS}	ALL	—	—	250	μA	V_{DS}=Max. Rating, V_{GS}=0V
			—	—	1000	μA	V_{DS}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
On-State Drain-Source Current (2)	$I_{D(on)}$	IRFP450 IRFP451	13	—	—	A	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, V_{GS}=10V
		IRFP452 IRFP453	12	—	—	A	
Static Drain-Source On-State Resistance (2)	$R_{DS(on)}$	IRFP450 IRFP451	—	0.38	0.4	Ω	V_{GS}=10V, I_D=7.0A
		IRFP452 IRFP453	—	0.4	0.5	Ω	
Forward Transconductance (2)	g_{fs}	ALL	6.0	10.8	—	℧	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, I_D=7.0A
Input Capacitance	C_{iss}	ALL	—	2850	3000	pF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
Output Capacitance	C_{oss}	ALL	—	350	600	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	150	200	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	35	ns	V_{DD}=0.5BV_{DSS}, I_D=7.0A, Z_O=4.7Ω (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	t_r	ALL	—	—	50	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	—	150	ns	
Fall Time	t_f	ALL	—	—	70	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	77	120	nC	V_{GS}=10V, I_D=16A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	11	—	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	66	—	nC	

THERMAL RESISTANCE

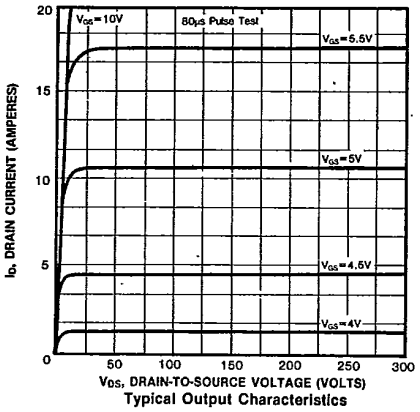
Junction-to-Case	R_{thJC}	ALL	—	—	0.83	K/W	
Case-to-Sink	R_{thCS}	ALL	—	0.1	—	K/W	Mounting surface flat, smooth, and greased
Junction-to-Ambient	R_{thJA}	ALL	—	—	80	K/W	Free Air Operation

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

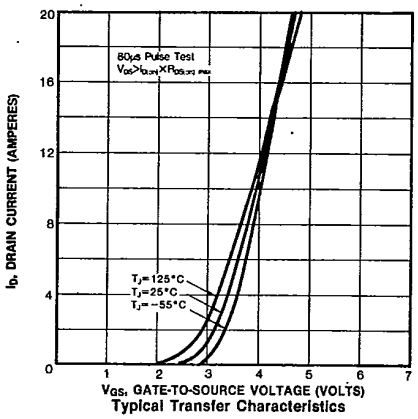
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	I_S	IRFP450 IRFP451	—	—	13	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRFP452 IRFP453	—	—	12	A	
Pulse Source Current (Body Diode) (3)	I_{SM}	IRFP450 IRFP451	—	—	52	A	
		IRFP452 IRFP453	—	—	48	A	
Diode Forward Voltage (2)	V_{SD}	IRFP450 IRFP451	—	—	1.4	V	T_C=25°C, I_S=13A, V_{GS}=0V
		IRFP452 IRFP453	—	—	1.3	V	T_C=25°C, I_S=12A, V_{GS}=0V
Reverse Recovery Time	t_{rr}	ALL	—	1300	—	ns	T_J=150°C, I_F=13A, dI_F/dt=100A/μs

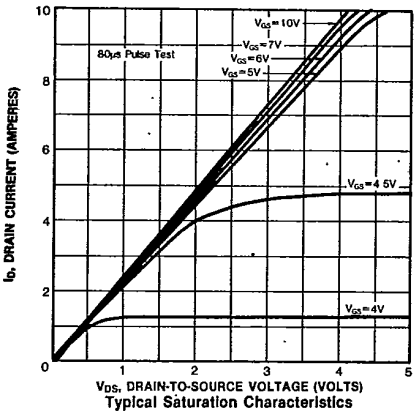
Notes: (1) T_J=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature



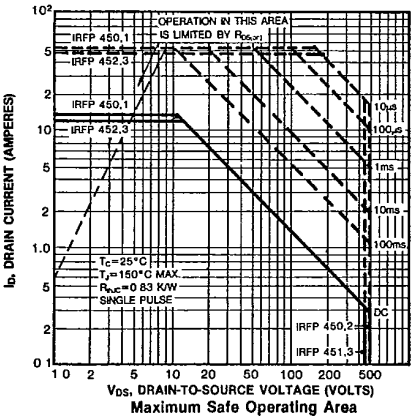
Typical Output Characteristics



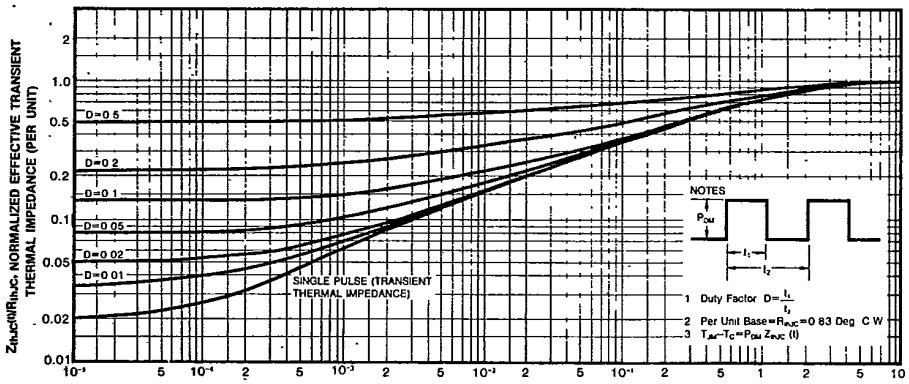
Typical Transfer Characteristics



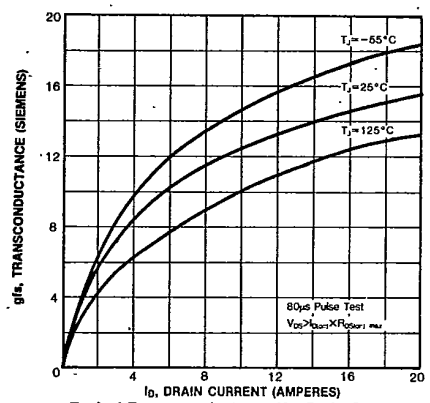
Typical Saturation Characteristics



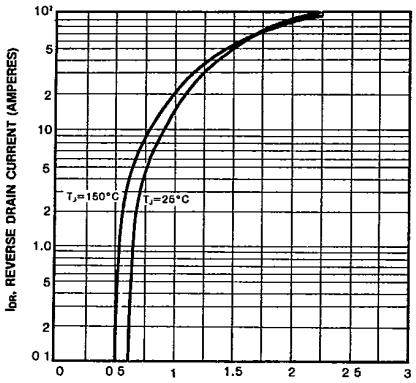
Maximum Safe Operating Area



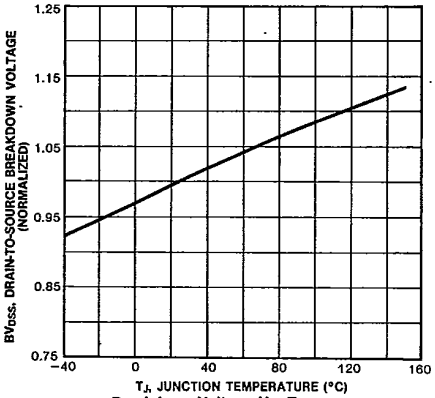
Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration



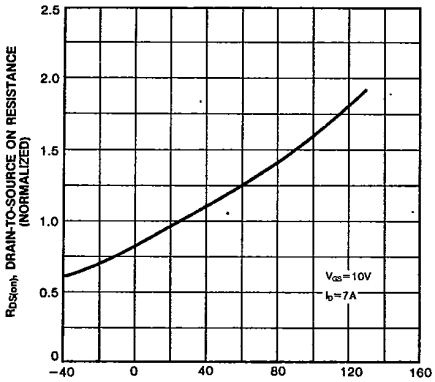
Typical Transcounductance Vs. Drain Current



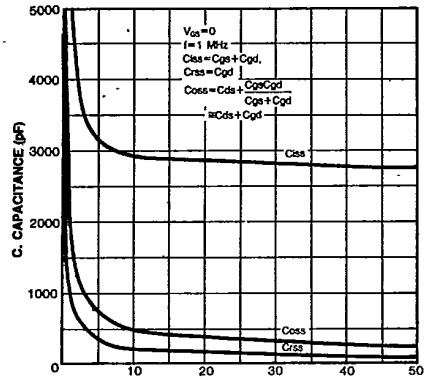
Typical Source—Drain Diode Forward Voltage



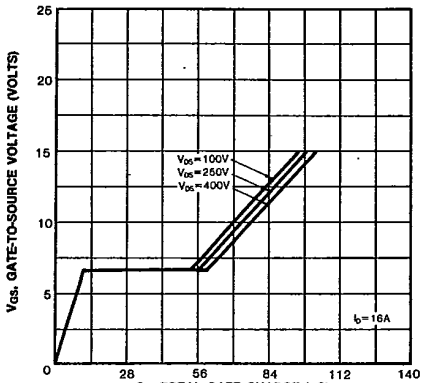
Breakdown Voltage Vs. Temperature



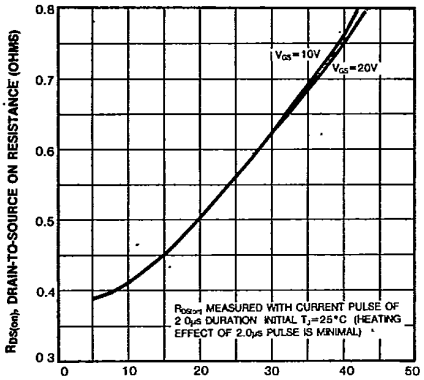
Normalized On-Resistance Vs. Temperature



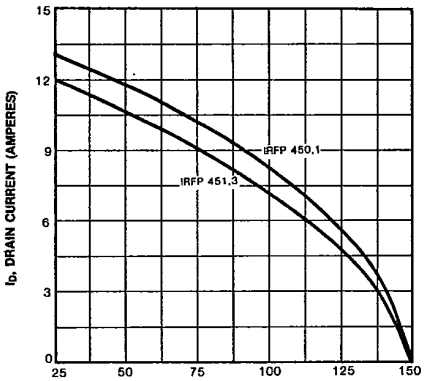
Typical Capacitance Vs. Drain to Source Voltage



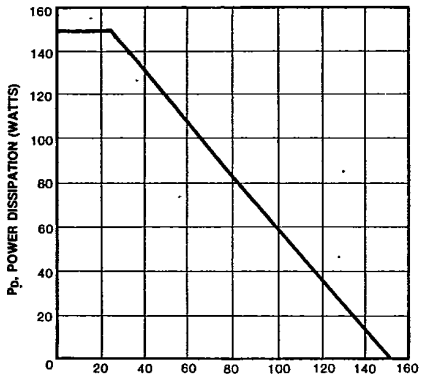
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve