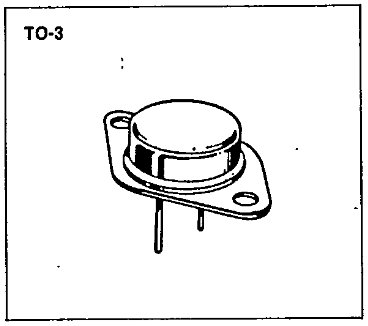
IRF430/431/432/433

N-CHANNEL POWER MOSFETS

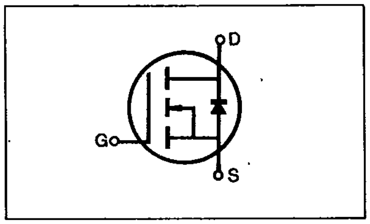
FEATURES

- 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-3 package (High voltage)



PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF330	500V	1.5Ω	4.5A
IRF331	450V	1.5Ω	4.5A
IRF332	500V	2.0Ω	4.0A
IRF333	450V	2.0Ω	4.0A



MAXIMUM RATINGS

Characteristic	Symbol	IRF430	IRF431	IRF432	IRF433	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	4.5	4.5	4.0	4.0	Adc
Continuous Drain Current T_C=100°C	I_D	3.0	3.0	2.5	2.5	Adc
Drain Current—Pulsed (3)	I_{DM}	18	18	16	16	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
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 width limited by max. junction temperature

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

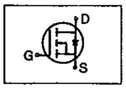
Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Drain-Source Breakdown Voltage	BV_{DSS}	IRF430 IRF432	500	—	—	V	V_{GS}=0V
		IRF431 IRF433	450	—	—	V	I_D=250μA
Gate Threshold Voltage	$V_{GS(th)}$	ALL	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D=250μA
Gate-Source Leakage Forward	I_{GSS}	ALL	—	—	100	nA	V_{GS}=20V
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)	$I_{D(on)}$	IRF430 IRF431	4.5	—	—	A	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, V_{GS}=10V
		IRF432 IRF433	4.0	—	—	A	
Static Drain-Source On-State Resistance (2)	$R_{DS(on)}$	IRF430 IRF431	—	0.95	1.5	Ω	V_{GS}=10V, I_D=2.5A
		IRF432 IRF433	—	1.4	2.0	Ω	
Forward Transconductance (2)	g_{fs}	ALL	2.5	3.2	—	℧	V_{DS}>$I_{D(on)}$×$R_{DS(on)\ max.}$, I_D=2.5A
Input Capacitance	C_{iss}	ALL	—	720	800	pF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
Output Capacitance	C_{oss}	ALL	—	110	200	pF	
Reverse Transfer Capacitance	C_{rss}	ALL	—	50	60	pF	
Turn-On Delay Time	$t_{d(on)}$	ALL	—	—	30	ns	V_{DD}=0.5BV_{DSS}, I_D=2.5A, Z_O=15 Ω (MOSFET switching times are essentially independent of operating temperature.)
Rise Time	t_r	ALL	—	—	30	ns	
Turn-Off Delay Time	$t_{d(off)}$	ALL	—	—	55	ns	
Fall Time	t_f	ALL	—	—	30	ns	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	ALL	—	22	30	nC	V_{GS}=10V, I_D=6.0A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Gate-Source Charge	Q_{gs}	ALL	—	4.2	—	nC	
Gate-Drain ("Miller") Charge	Q_{gd}	ALL	—	17.8	—	nC	

THERMAL RESISTANCE

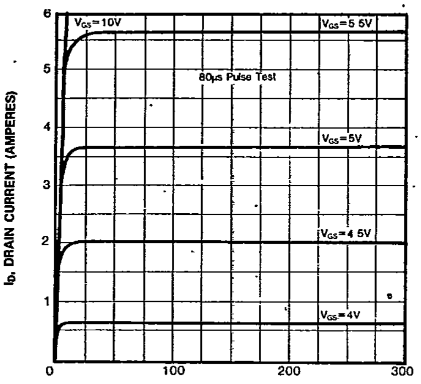
Junction-to-Case	R_{thJC}	ALL	—	—	1.67	K/W	
Case-to-Sink	R_{thCS}	ALL	—	0.1	—	K/W	Mounting surface flat, smooth, and greased
Junction-to-Ambient	R_{thJA}	ALL	—	—	30	K/W	Free Air Operation

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

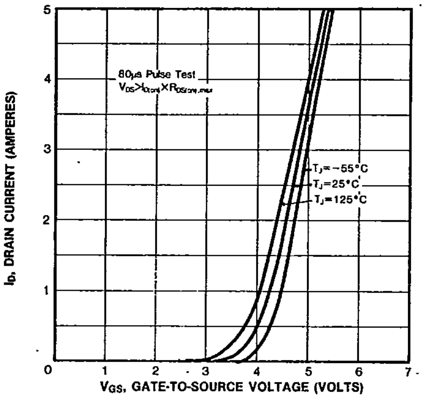
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristic	Symbol	Type	Min	Typ	Max	Units	Test Conditions
Continuous Source Current (Body Diode)	I_S	IRF430 IRF431	—	—	4.5	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
		IRF432 IRF433	—	—	4.0	A	
Pulse Source Current (Body Diode) (3)	I_{SM}	IRF430 IRF431	—	—	18	A	
		IRF432 IRF433	—	—	16	A	
Diode Forward Voltage (2)	V_{SD}	IRF430 IRF431	—	—	1.4	V	T_C=25°C, I_S=4.5A, V_{GS}=0V
		IRF432 IRF433	—	—	1.3	V	T_C=25°C, I_S=4.0A, V_{GS}=0V
Reverse Recovery Time	t_{rr}	ALL	—	800	—	ns	T_J=150°C, I_F= 4.5A, dI_F/dt=100A/μs

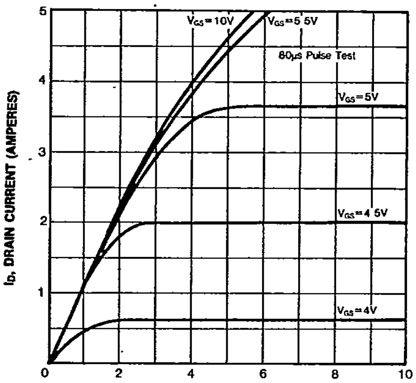
Notes: (1) T_J=25°C to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature



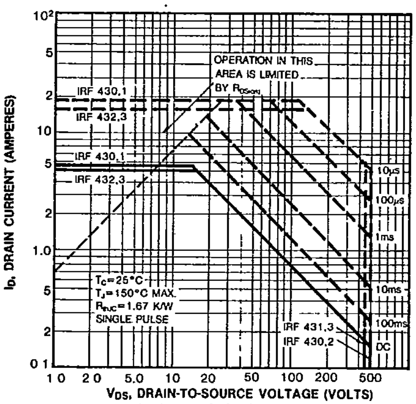
Typical Output Characteristics



Typical Transfer Characteristics



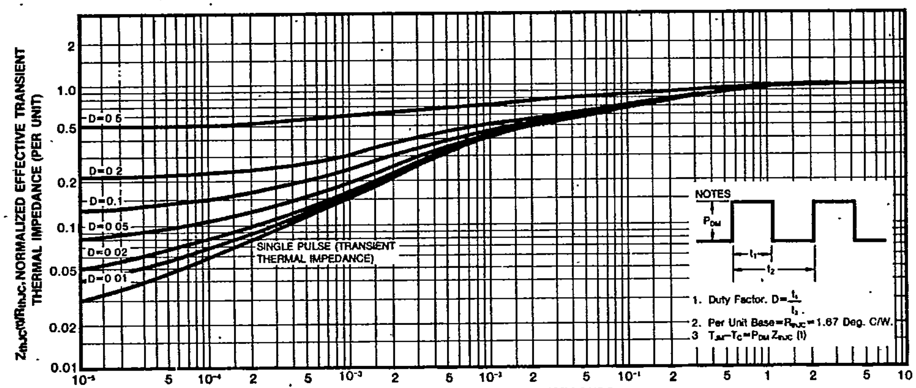
Typical Saturation Characteristics



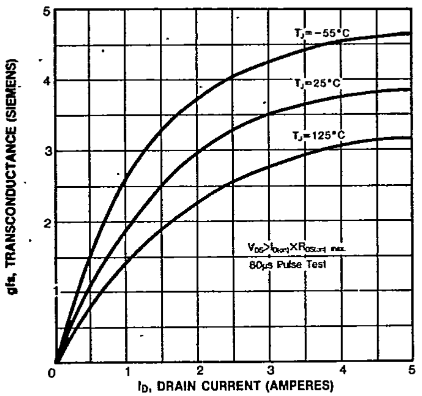
Maximum Safe Operating Area

IRF430/431/432/433

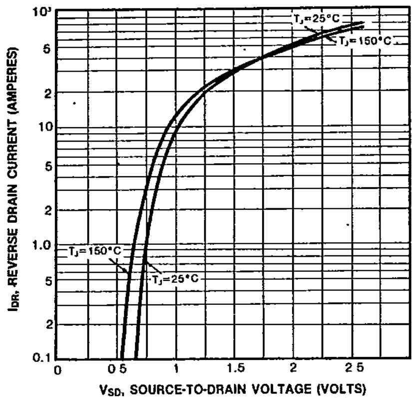
N-CHANNEL POWER MOSFETS



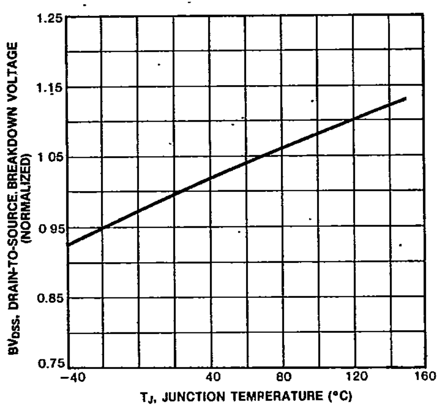
Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration



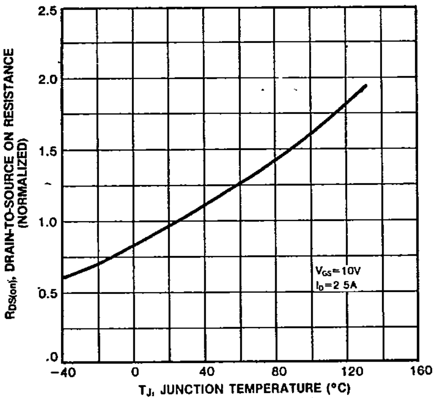
Typical Transcounductance Vs. Drain Current



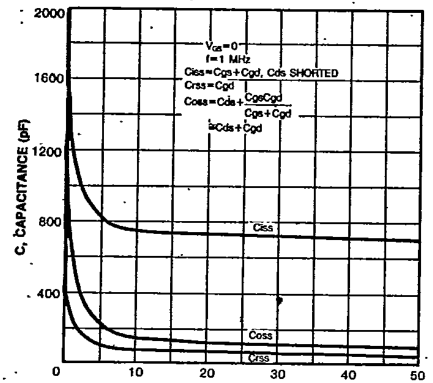
Typical Source—Drain Diode Forward Voltage



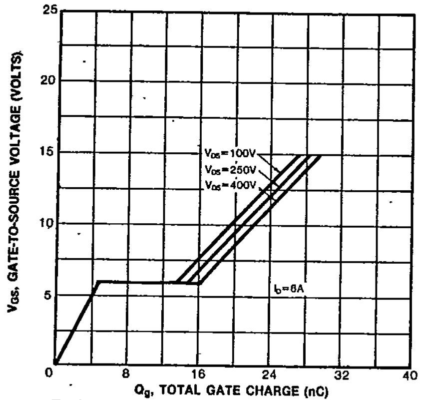
Breakdown Voltage Vs. Temperature



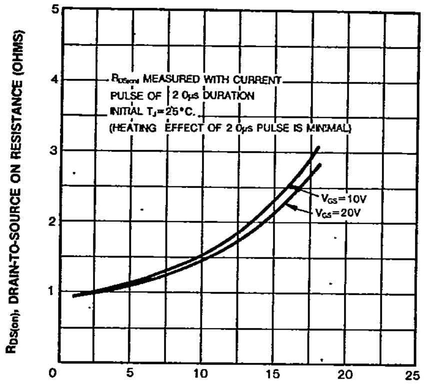
Normalized On-Resistance Vs. Temperature



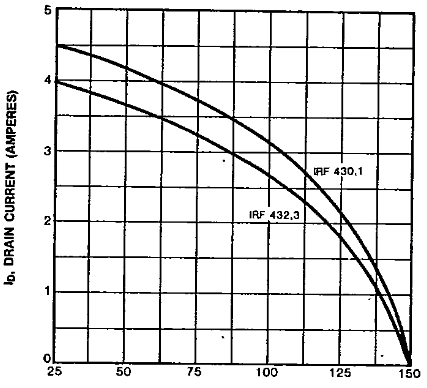
Typical Capacitance Vs. Drain to Source Voltage



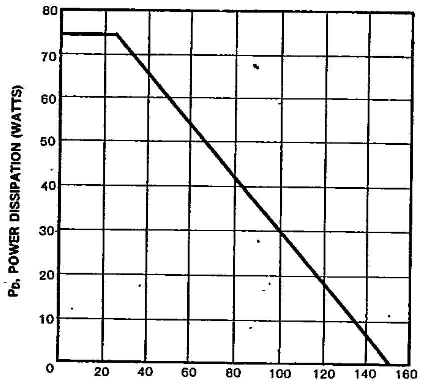
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve