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FAIRCHILD

A Schlumberger Company

IRF430-433/IRF830-833

MTM/MTP4N45/4N50

N-Channel Power MOSFETs,

4.5 A, 450 V/500 V

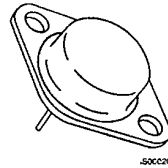
Power And Discrete Division

T-39-11

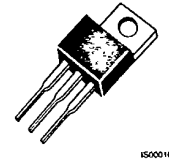
Description

These devices are n-channel, enhancement mode, power MOSFETs designed especially for high voltage, high speed applications, such as off-line switching power supplies, UPS, AC and DC motor controls, relay and solenoid drivers.

- V_{GS} Rated at ± 20 V
- Silicon Gate for Fast Switching Speeds
- I_{DSS} , $V_{DS(on)}$, SOA and $V_{GS(th)}$ Specified at Elevated Temperature
- Rugged

TO-204AA

IRF430
IRF431
IRF432
IRF433
MTM4N45
MTM4N50

TO-220AB

IRF830
IRF831
IRF832
IRF833
MTP4N45
MTP4N50

Maximum Ratings

Symbol	Characteristic	Rating IRF430/432 IRF830/832 MTM/MTP4N50	Rating IRF431/433 IRF831/833 MTM/MTP4N45	Unit
V_{DSS}	Drain to Source Voltage	500	450	V
V_{DGR}	Drain to Gate Voltage $R_{GS} = 20 \text{ k}\Omega$	500	450	V
V_{GS}	Gate to Source Voltage	± 20	± 20	V
T_J, T_{stg}	Operating Junction and Storage Temperature	-55 to $+150$	-55 to $+150$	$^{\circ}\text{C}$
T_L	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5 s	275	275	$^{\circ}\text{C}$

Maximum On-State Characteristics

		IRF430/431 IRF830/831	IRF432/433 IRF832/833	MTM/MTP4N45 MTM/MTP4N45	
$R_{DS(on)}$	Static Drain-to-Source On Resistance	1.5	2.0	1.5	Ω
I_D	Drain Current Continuous Pulsed	4.5 18	4.0 16	4.0 10	A

Maximum Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.67	1.67	1.67	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	60	60	60	$^{\circ}\text{C}/\text{W}$
P_D	Total Power Dissipation at $T_C = 25^{\circ}\text{C}$	75	75	75	W

Notes

For information concerning connection diagram and package outline, refer to Section 7.

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Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
Off Characteristics					
$V_{(BR)DSS}$	Drain Source Breakdown Voltage ¹			V	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$
	IRF430/432/830/832	500			
	IRF431/433/831/833	450			
I_{DSS}	Zero Gate Voltage Drain Current		250	μA	$V_{DS} = \text{Rated } V_{DSS}$, $V_{GS} = 0\text{ V}$
			1000	μA	$V_{DS} = 0.8 \times \text{Rated } V_{DSS}$, $V_{GS} = 0\text{ V}$, $T_C = 125^\circ\text{C}$
I_{GSS}	Gate-Body Leakage Current			nA	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$
	IRF430-433		± 100		
	IRF830-833		± 500		

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	2.0	4.0	V	$I_D = 250\text{ }\mu\text{A}$, $V_{DS} = V_{GS}$
$R_{DS(on)}$	Static Drain-Source On-Resistance ²			Ω	$V_{GS} = 10\text{ V}$, $I_D = 2.5\text{ A}$
	IRF430/431/830/831		1.5		
	IRF432/433/832/833		2.0		
g_{fs}	Forward Transconductance	2.5		S (Ω)	$V_{DS} = 10\text{ V}$, $I_D = 2.5\text{ A}$

Dynamic Characteristics

C_{iss}	Input Capacitance		800	pF	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$ $f = 1.0\text{ MHz}$
C_{oss}	Output Capacitance		200	pF	
C_{rss}	Reverse Transfer Capacitance		60	pF	

Switching Characteristics ($T_C = 25^\circ\text{C}$, Figures 12, 13)

$t_{d(on)}$	Turn-On Delay Time		30	ns	$V_{DD} = 225\text{ V}$, $I_D = 2.5\text{ A}$ $V_{GS} = 10\text{ V}$, $R_{GEN} = 15\text{ }\Omega$ $R_{GS} = 15\text{ }\Omega$
t_r	Rise Time		30	ns	
$t_{d(off)}$	Turn-Off Delay Time		55	ns	
t_f	Fall Time		30	ns	
Q_g	Total Gate Charge		30	nC	$V_{GS} = 10\text{ V}$, $I_D = 7.0\text{ A}$ $V_{DS} = 180\text{ V}$

Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage			V	$I_S = 4.5\text{ A}$, $V_{GS} = 0\text{ V}$
	IRF430/431/830/831		1.4		
	IRF432/433/832/833		1.3	V	$I_S = 4.0\text{ A}$, $V_{GS} = 0\text{ V}$
t_{rr}	Reverse Recovery Time	600		ns	$I_S = 4.5\text{ A}$, $di_S/dt = 100\text{ A}/\mu\text{S}$

Notes

1. $T_J = +25^\circ\text{C}$ to $+150^\circ\text{C}$ 2. Pulse test: Pulse width $\leq 80\text{ }\mu\text{s}$, Duty cycle $\leq 1\%$

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Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
Off Characteristics					
$V_{(BR)DSS}$	Drain Source Breakdown Voltage ¹			V	$V_{GS} = 0\text{ V}$, $I_D = 5.0\text{ mA}$
		500			
		450			
I_{DSS}	Zero Gate Voltage Drain Current		0.25	mA	$V_{DS} = 0.85 \times \text{Rated } V_{DSS}$, $V_{GS} = 0\text{ V}$
			2.5	mA	$V_{DS} = 0.85 \times \text{Rated } V_{DSS}$, $V_{GS} = 0\text{ V}$, $T_C = 100^\circ\text{C}$
I_{GSS}	Gate-Body Leakage Current		± 500	nA	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	2.0	4.5	V	$I_D = 1.0\text{ mA}$, $V_{DS} = V_{GS}$
		1.5	4.0	V	$I_D = 1.0\text{ mA}$, $V_{DS} = V_{GS}$, $T_C = 100^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance ²		1.5	Ω	$V_{GS} = 10\text{ V}$, $I_D = 2.0\text{ A}$
$V_{DS(on)}$	Drain-Source On-Voltage ²		3.0	V	$V_{GS} = 10\text{ V}$, $I_D = 2.0\text{ A}$
			7.0	V	$V_{GS} = 10\text{ V}$, $I_D = 4.0\text{ A}$
			6.0	V	$V_{GS} = 10\text{ V}$, $I_D = 4.0\text{ A}$, $T_C = 100^\circ\text{C}$
g_{fs}	Forward Transconductance	2.0		S (Ω)	$V_{DS} = 10\text{ V}$, $I_D = 2.0\text{ A}$

Dynamic Characteristics

C_{iss}	Input Capacitance		1200	pF	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$ $f = 1.0\text{ MHz}$
C_{oss}	Output Capacitance		300	pF	
C_{rss}	Reverse Transfer Capacitance		80	pF	

Switching Characteristics ($T_C = 25^\circ\text{C}$, Figures 12, 13)³

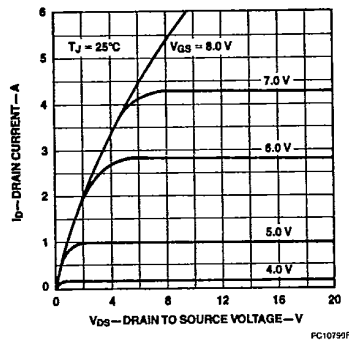
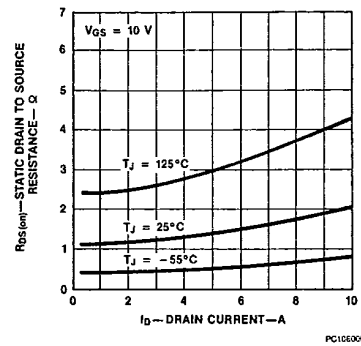
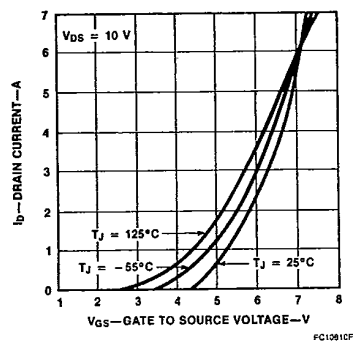
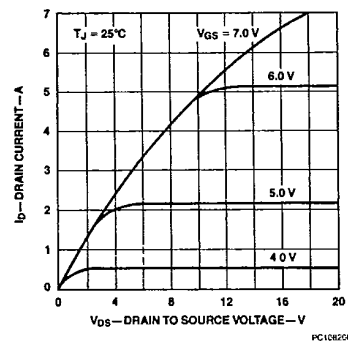
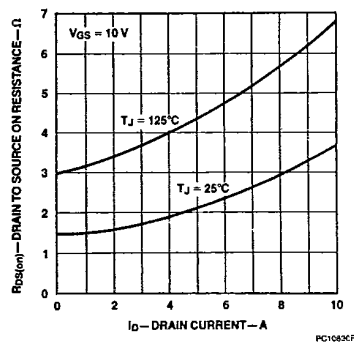
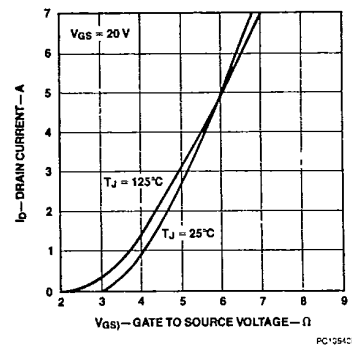
$t_{d(on)}$	Turn-On Delay Time		50	ns	$V_{DD} = 25\text{ V}$, $I_D = 2.0\text{ A}$ $V_{GS} = 10\text{ V}$, $R_{GEN} = 50\text{ }\Omega$ $R_{GS} = 50\text{ }\Omega$
t_r	Rise Time		100	ns	
$t_{d(off)}$	Turn-Off Delay Time		200	ns	
t_f	Fall Time		100	ns	
Q_g	Total Gate Charge		60	nC	$V_{GS} = 10\text{ V}$, $I_D = 7.0\text{ A}$ $V_{DD} = 180\text{ V}$

Notes

- $T_J = +25^\circ\text{C}$ to $+150^\circ\text{C}$
- Pulse test: Pulse width $\leq 80\text{ }\mu\text{s}$, Duty cycle $\leq 1\%$
- Switching time measurements performed on LEM TR-58 test equipment.

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Typical Performance Curves Figures 4-6 for IRF 432/433/832/833 only.**Figure 1 Output Characteristics****Figure 2 Static Drain to Source Resistance vs Drain Current****Figure 3 Transfer Characteristics****Figure 4 Output Characteristics****Figure 5 Static Drain to Source On Resistance vs Drain Current****Figure 6 Transfer Characteristics**

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Typical Electrical Characteristics

Figure 12 Switching Test Circuit

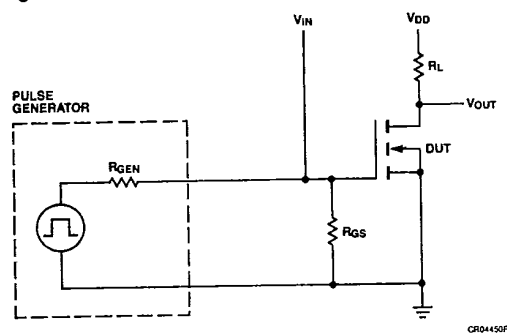


Figure 13 Switching Waveforms

