

**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

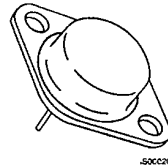
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**Description**

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.

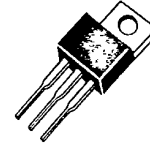
- $V_{GS}$  Rated at  $\pm 20$  V
- Silicon Gate for Fast Switching Speeds
- $I_{DSS}$ ,  $V_{DS(on)}$ , SOA and  $V_{GS(th)}$  Specified at Elevated Temperature
- Rugged

TO-204AA



500020F

TO-220AB



1500016F

IRF430  
IRF431  
IRF432  
IRF433  
MTM4N45  
MTM4N50

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	$\pm 20$	$\pm 20$	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 MTP4N45	
$R_{DS(on)}$	Static Drain-to-Source On Resistance	1.5	2.0	1.5	$\Omega$
$I_D$	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.

## IRF430-433/IRF830-833

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

Symbol	Characteristic	Min	Max	Unit	Test Conditions
<b>Off Characteristics</b>					
$V_{(BR)DSS}$	Drain Source Breakdown Voltage <sup>1</sup> IRF430/432/830/832 IRF431/433/831/833			V	$V_{GS} = 0\text{ V}$ , $I_D = 250\ \mu\text{A}$
		500			
		450			
$I_{DSS}$	Zero Gate Voltage Drain Current		250	$\mu\text{A}$	$V_{DS} = \text{Rated } V_{DSS}$ , $V_{GS} = 0\text{ V}$
			1000	$\mu\text{A}$	$V_{DS} = 0.8 \times \text{Rated } V_{DSS}$ , $V_{GS} = 0\text{ V}$ , $T_C = 125^\circ\text{C}$
$I_{GSS}$	Gate-Body Leakage Current IRF430-433 IRF830-833			nA	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$
			$\pm 100$		
			$\pm 500$		
<b>On Characteristics</b>					
$V_{GS(th)}$	Gate Threshold Voltage	2.0	4.0	V	$I_D = 250\ \mu\text{A}$ , $V_{DS} = V_{GS}$
$R_{DS(on)}$	Static Drain-Source On-Resistance <sup>2</sup> IRF430/431/830/831 IRF432/433/832/833			$\Omega$	$V_{GS} = 10\text{ V}$ , $I_D = 2.5\text{ A}$
			1.5		
			2.0		
$g_{fs}$	Forward Transconductance	2.5		S ( $\Omega$ )	$V_{DS} = 10\text{ V}$ , $I_D = 2.5\text{ A}$
<b>Dynamic Characteristics</b>					
$C_{iss}$	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	
<b>Switching Characteristics (<math>T_C = 25^\circ\text{C}</math>, Figures 12, 13)</b>					
$t_{d(on)}$	Turn-On Delay Time		30	ns	$V_{DD} = 225\text{ V}$ , $I_D = 2.5\text{ A}$ $V_{GS} = 10\text{ V}$ , $R_{GEN} = 15\ \Omega$ $R_{GS} = 15\ \Omega$
$t_r$	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	$V_{GS} = 10\text{ V}$ , $I_D = 7.0\text{ A}$ $V_{DS} = 180\text{ V}$
<b>Symbol Characteristic Typ Max Unit Test Conditions</b>					
<b>Source-Drain Diode Characteristics</b>					
$V_{SD}$	Diode Forward Voltage IRF430/431/830/831 IRF432/433/832/833		1.4	V	$I_S = 4.5\text{ A}$ ; $V_{GS} = 0\text{ V}$
			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

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

## MTM/MTP4N45/4N50

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

Symbol	Characteristic	Min	Max	Unit	Test Conditions
<b>Off Characteristics</b>					
$V_{(BR)DSS}$	Drain Source Breakdown Voltage <sup>1</sup> MTM/MTP4N50 MTM/MTP4N45			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		$\pm 500$	nA	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$
<b>On Characteristics</b>					
$V_{GS(th)}$	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 <sup>2</sup>		1.5	$\Omega$	$V_{GS} = 10\text{ V}$ , $I_D = 2.0\text{ A}$
$V_{DS(on)}$	Drain-Source On-Voltage <sup>2</sup>		3.0	V	$V_{GS} = 10\text{ V}$ , $I_D = 2.0\text{ V}$
			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 ( $\Omega$ )	$V_{DS} = 10\text{ V}$ , $I_D = 2.0\text{ A}$
<b>Dynamic Characteristics</b>					
$C_{iss}$	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	
<b>Switching Characteristics (<math>T_C = 25^\circ\text{C}</math>, Figures 12, 13)<sup>3</sup></b>					
$t_{d(on)}$	Turn-On Delay Time		50	ns	$V_{DD} = 25\text{ V}$ , $I_D = 2.0\text{ A}$ $V_{GS} = 10\text{ V}$ , $R_{GEN} = 50\ \Omega$ $R_{GS} = 50\ \Omega$
$t_r$	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  $\leq 80\ \mu\text{s}$ , Duty cycle  $\leq 1\%$
- Switching time measurements performed on LEM TR-58 test equipment.

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MTM/MTP4N45/4N50

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Typical Performance Curves Figures 4-6 for IRF 432/433/832/833 only.

Figure 1 Output Characteristics

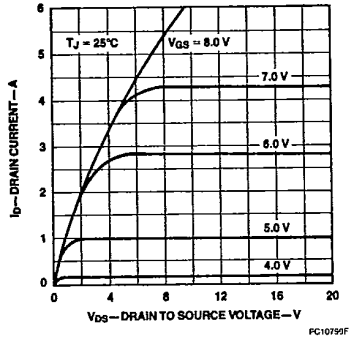


Figure 2 Static Drain to Source Resistance vs Drain Current

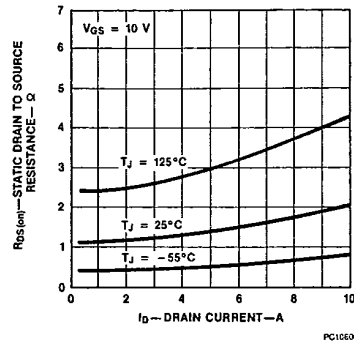


Figure 3 Transfer Characteristics

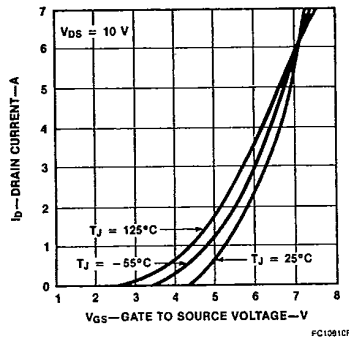


Figure 4 Output Characteristics

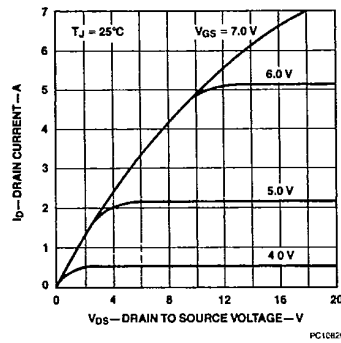


Figure 5 Static Drain to Source On Resistance vs Drain Current

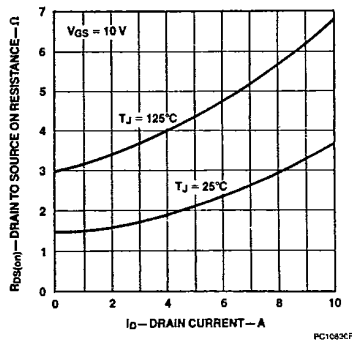
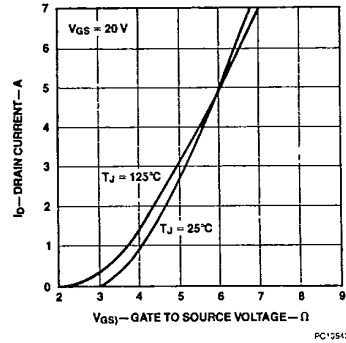


Figure 6 Transfer Characteristics





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Typical Electrical Characteristics

Figure 12 Switching Test Circuit

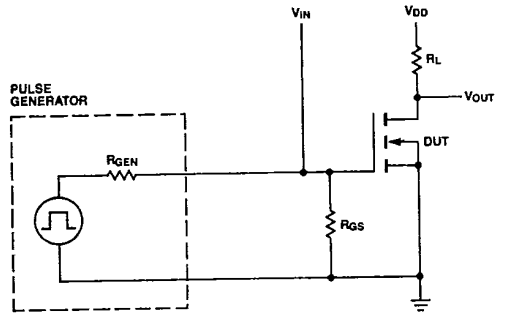


Figure 13 Switching Waveforms

