

# New Jersey Semi-Conductor Products, Inc.

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## IRF230-233/IRF630-633 MTP12N18/12N20 N-Channel Power MOSFETs, 12 A, 150-200 V

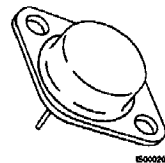
Power And Discrete Division

### Description

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

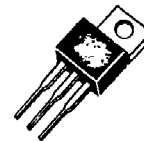
- Low  $R_{DS(on)}$
- $V_{GS}$  Rated at  $\pm 20$  V
- Silicon Gate for Fast Switching Speeds
- $I_{DSS}$ ,  $V_{DS(on)}$ , Specified at Elevated Temperature
- Rugged
- Low Drive Requirements
- Ease of Paralleling

TO-204AA



IRF230  
 IRF231  
 IRF232  
 IRF233

TO-220AB



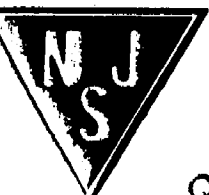
IRF630  
 IRF631  
 IRF632  
 IRF633  
 MTP12N18  
 MTP12N20

### Product Summary

Part Number	$V_{DSS}$	$R_{DS(on)}$	$I_D$ at $T_C = 25^\circ C$	$I_D$ at $T_C = 100^\circ C$	Case Style
IRF230	200 V	0.40 $\Omega$	9.0 A	6.0 A	TO-204AA
IRF231	150 V	0.40 $\Omega$	9.0 A	6.0 A	
IRF232	200 V	0.50 $\Omega$	8.0 A	5.0 A	
IRF233	150 V	0.50 $\Omega$	8.0 A	5.0 A	
IRF630	200 V	0.40 $\Omega$	9.0 A	6.0 A	TO-220AB
IRF631	150 V	0.40 $\Omega$	9.0 A	6.0 A	
IRF632	200 V	0.50 $\Omega$	8.0 A	5.0 A	
IRF633	150 V	0.50 $\Omega$	8.0 A	5.0 A	
MTP12N18	180 V	0.35 $\Omega$	12 A	8.5 A	
MTP12N20	200 V	0.35 $\Omega$	12 A	8.5 A	

### Notes

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



NJ Semi-Conductors reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by NJ Semi-Conductors is believed to be both accurate and reliable at the time of going to press. However, NJ Semi-Conductors assumes no responsibility for any errors or omissions discovered in its use. NJ Semi-Conductors encourages customers to verify that datasheets are current before placing orders.

Quality Semi-Conductors

**IRF230-233/IRF630-633  
MTP12N18/12N20**

**Maximum Ratings**

Symbol	Characteristic	Rating IRF220/222 IRF620/622 MTP7N20	Rating MTP7N18	Rating IRF222/223 IRF622/623	Unit
V <sub>DSS</sub>	Drain to Source Voltage <sup>1</sup>	200	180	150	V
V <sub>DGR</sub>	Drain to Gate Voltage <sup>1</sup> R <sub>GS</sub> = 20 k $\Omega$	200	180	150	V
V <sub>GS</sub>	Gate to Source Voltage	$\pm 20$	$\pm 20$	$\pm 20$	V
T <sub>J</sub> , T <sub>stg</sub>	Operating Junction and Storage Temperatures	-55 to +150	-55 to +150	-55 to +150	$^{\circ}\text{C}$
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5 s	275	275	275	$^{\circ}\text{C}$

**Maximum Thermal Characteristics**

		IRF220 - 233 IRF630 - 633	MTP12N18/20	
R <sub>thJC</sub>	Thermal Resistance, Junction to Case	1.67	1.25	$^{\circ}\text{C}/\text{W}$
P <sub>D</sub>	Total Power Dissipation at T <sub>C</sub> = 25 $^{\circ}\text{C}$	75	100	W
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	40	40	A

**Electrical Characteristics (T<sub>C</sub> = 25 $^{\circ}\text{C}$  unless otherwise noted)**

Symbol	Characteristic	Min	Max	Unit	Test Conditions
V <sub>(BR)DSS</sub>	Drain Source Breakdown Voltage IRF230/232/630/632/ MTP12N20 MTP12N18 IRF231/233/631/633	200		V	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 $\mu\text{A}$
		180			
		150			
I <sub>DSS</sub>	Zero Gate Voltage Drain Current		250	$\mu\text{A}$	V <sub>DS</sub> = Rated V <sub>DSS</sub> , V <sub>GS</sub> = 0 V
			1000	$\mu\text{A}$	V <sub>DS</sub> = 0.8 x Rated V <sub>DSS</sub> , V <sub>GS</sub> = 0 V, T <sub>C</sub> = 125 $^{\circ}\text{C}$
I <sub>GSS</sub>	Gate-Body Leakage Current IRF230-233 IRF630-633/ MTP12N18/12N20			nA	V <sub>GS</sub> = $\pm 20$ V, V <sub>DS</sub> = 0 V
			$\pm 100$		
			$\pm 500$		

**IRF230-233/IRF630-633**  
**MTP12N18/12N20**

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

Symbol	Characteristic	Min	Max	Unit	Test Conditions
<b>On Characteristics</b>					
$V_{GS(th)}$	Gate Threshold Voltage			V	$I_D = 250 \mu\text{A}$ , $V_{DS} = V_{GS}$ $I_D = 1 \text{ mA}$ , $V_{DS} = V_{GS}$
	IRF230/233/630/633	2.0	4.0		
	MTP12N18/12N20	2.0	4.5		
$R_{DS(on)}$	Static Drain-Source On-Resistance <sup>2</sup>			$\Omega$	$V_{GS} = 10 \text{ V}$ , $I_D = 5.0 \text{ A}$  $I_D = 6.0 \text{ A}$
	IRF230/231/630/631		0.40		
	IRF232/233/632/633		0.50		
	MTP12N18/12N20		0.35		
$V_{DS(on)}$	Drain-Source On-Voltage <sup>2</sup>		2.1	V	$V_{GS} = 10 \text{ V}$ ; $I_D = 6.0 \text{ A}$
	MTP12N18/12N20		5.0	V	$V_{GS} = 10 \text{ V}$ ; $I_D = 12.0 \text{ A}$ ;
			4.2	V	$V_{GS} = 10 \text{ V}$ ; $I_D = 6.0 \text{ A}$ $T_C = 100^\circ\text{C}$
$g_{fs}$	Forward Transconductance	3.0		S ( $\Omega$ )	$V_{DS} = 10 \text{ V}$ , $I_D = 5.0 \text{ A}$
<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		450	pF	
$C_{rss}$	Reverse Transfer Capacitance		150	pF	
<b>Switching Characteristics</b> ( $T_C = 25^\circ\text{C}$ , Figures 1, 2) <sup>1</sup>					
$t_{d(on)}$	Turn-On Delay Time		30	ns	$V_{DD} = 90 \text{ V}$ , $I_D = 5.0 \text{ A}$ $V_{GS} = 10 \text{ V}$ , $R_{GEN} = 15 \Omega$ $R_{GS} = 15 \Omega$
$t_r$	Rise Time		50	ns	
$t_{d(off)}$	Turn-Off Delay Time		50	ns	
$t_f$	Fall Time		40	ns	
$t_{d(on)}$	Turn-On Delay Time		50	ns	$V_{DD} = 25 \text{ V}$ , $I_D = 6.0 \text{ A}$ $V_{GS} = 10 \text{ V}$ , $R_{GEN} = 50 \Omega$ $R_{GS} = 50 \Omega$
$t_r$	Rise Time		250	ns	
$t_{d(off)}$	Turn-Off Delay Time		100	ns	
$t_f$	Fall Time		120	ns	
$Q_g$	Total Gate Charge		30	nC	$V_{GS} = 10 \text{ V}$ , $I_D = 12 \text{ A}$ $V_{DD} = 120 \text{ V}$