

FAIRCHILD

A Schlumberger Company

IRF220-223/IRF620-623

MTP7N18/7N20

N-Channel Power MOSFETs,

7 A, 150-200 V

Power And Discrete Division

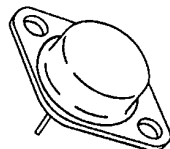
T-39-11

Description

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

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

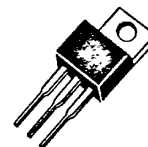
TO-204AA



IS00020F

IRF220
IRF221
IRF222
IRF223

TO-220AB



IS00019F

IRF620
IRF621
IRF622
IRF623
MTP7N18
MTP7N20

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Product Summary

Part Number	V_{DS}	$R_{DS(on)}$	I_D at $T_C = 25^\circ\text{C}$	I_D at $T_C = 100^\circ\text{C}$	Case Style
IRF220	200 V	0.8 Ω	5.0 A	3.0 A	TO-204AA
IRF221	150 V	0.8 Ω	5.0 A	3.0 A	
IRF222	200 V	1.2 Ω	4.0 A	2.5 A	
IRF223	150 V	1.2 Ω	4.0 A	2.5 A	
IRF620	200 V	0.8 Ω	5.0 A	3.0 A	TO-220AB
IRF621	150 V	0.8 Ω	5.0 A	3.0 A	
IRF622	200 V	1.2 Ω	4.0 A	2.5 A	
IRF623	150 V	1.2 Ω	4.0 A	2.5 A	
MTP7N18	180 V	0.7 Ω	7.0 A	4.5 A	
MTP7N20	200 V	0.7 Ω	7.0 A	4.5 A	

Notes

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

IRF220-223/IRF620-623
MTP7N18/7N20

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Maximum Ratings

Symbol	Characteristic	Rating IRF220/222 IRF620/622 MTP7N20	Rating MTP7N18	Rating IRF222/223 IRF622/623	Unit
V_{DSS}	Drain to Source Voltage ¹	200	180	150	V
V_{DGR}	Drain to Gate Voltage ¹ $R_{GS} = 20 \text{ k}\Omega$	200	180	150	V
V_{GS}	Gate to Source Voltage	± 20	± 20	± 20	V
T_J, T_{slg}	Operating Junction and Storage Temperatures	-55 to +150	-55 to +150	-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5 s	275	275	275	°C

Maximum Thermal Characteristics

		IRF220 - 223/IRF620 - 623	MTP7N18/20	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.12	1.67	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	30/80	80	°C/W
P_D	Total Power Dissipation at $T_C = 25^\circ\text{C}$	40	75	W
I_{DM}	Pulsed Drain Current ²	20	20	A

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	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$
	IRF220/222/620/622/ MTP7N20	200			
	MTP7N18	180			
	IRF221/223/621/623	150			
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		± 100	nA	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$
	IRF220-223 IRF620-623/MTP7N18/20		± 500		

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MTP7N18/7N20

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

Symbol	Characteristic	Min	Max	Unit	Test Conditions
On Characteristics					
$V_{GS(th)}$	Gate Threshold Voltage			V	
	IRF220-223/IRF620-623	2.0	4.0		$I_D = 250\ \mu\text{A}$, $V_{DS} = V_{GS}$
	MTP7N18/20	2.0	4.5		$I_D = 1\ \text{mA}$, $V_{DS} = V_{GS}$
$R_{DS(on)}$	Static Drain-Source On-Resistance ²			Ω	$V_{GS} = 10\ \text{V}$, $I_D = 2.5\ \text{A}$
	IRF220/221/620/621		0.8		
	IRF222/223/622/623		1.2		
	MTP7N18/7N20		0.7		$I_D = 3.5\ \text{A}$
$V_{DS(on)}$	Drain-Source On-Voltage ² MTP7N18/7N20		2.45	V	$V_{GS} = 10\ \text{V}$; $I_D = 3.5\ \text{A}$
			5.9	V	$V_{GS} = 10\ \text{V}$; $I_D = 7.0\ \text{A}$
			5.0	V	$V_{GS} = 10\ \text{V}$, $I_D = 3.5\ \text{A}$ $T_C = 100^\circ\text{C}$
g_{fs}	Forward Transconductance	1.3		S (Ω)	$V_{DS} = 10\ \text{V}$, $I_D = 2.5\ \text{A}$

Dynamic Characteristics

C_{iss}	Input Capacitance		600	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 1, 2)³

$t_{d(on)}$	Turn-On Delay Time		40	ns	$V_{DD} = 100\ \text{V}$, $I_D = 2.5\ \text{A}$ $V_{GS} = 10\ \text{V}$, $R_{GEN} = 50\ \Omega$ $R_{GS} = 50\ \Omega$
t_r	Rise Time		60	ns	
$t_{d(off)}$	Turn-Off Delay Time		100	ns	
t_f	Fall Time		60	ns	
Q_g	Total Gate Charge		15	nC	$V_{GS} = 10\ \text{V}$, $I_D = 6.0\ \text{A}$ $V_{DD} = 45\ \text{V}$

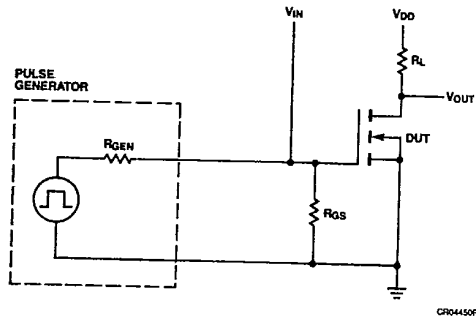
Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage		1.8	V	$I_S = 5.0\ \text{A}$; $V_{GS} = 0\ \text{V}$
			1.4	V	$I_S = 4.0\ \text{A}$; $V_{GS} = 0\ \text{V}$
t_{rr}	Reverse Recovery Time	350		ns	$I_S = 5.0\ \text{A}$; $dI_S/dt = 25\ \text{A}/\mu\text{S}$

Notes

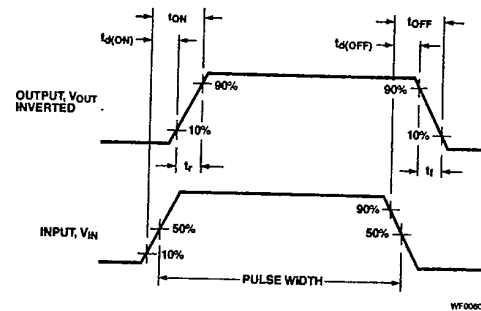
- $T_J = +25^\circ\text{C}$ to $+150^\circ\text{C}$
- Pulse width limited by T_J
- Switching time measurements performed on LEM TR-58 test equipment.

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MTP7N18/7N20

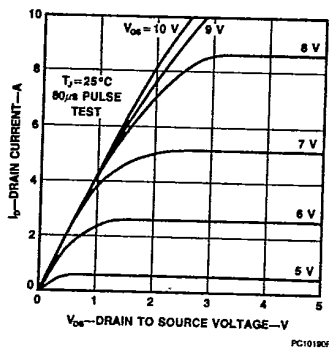
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Typical Electrical Characteristics**Figure 1 Switching Test Circuit**

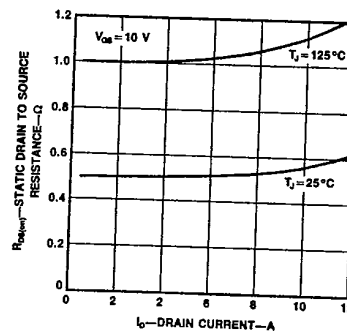
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Figure 2 Switching Waveforms

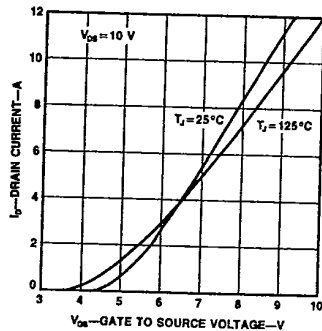
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Typical Performance Curves**Figure 3 Output Characteristics**

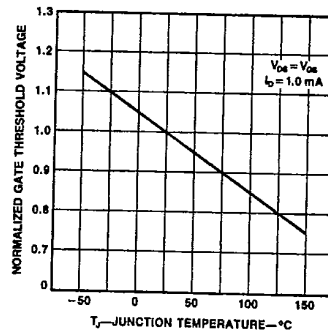
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Figure 4 Static Drain to Source Resistance vs Drain Current

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Figure 5 Transfer Characteristics

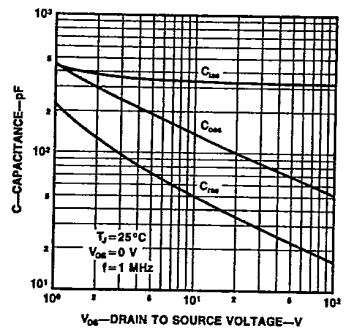
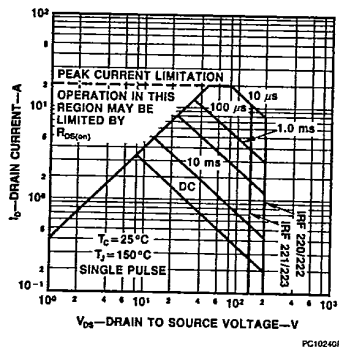
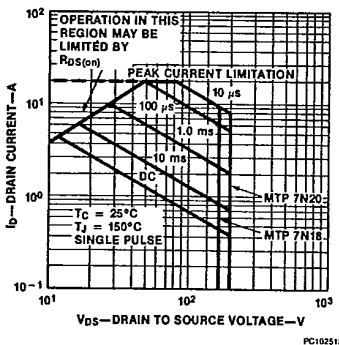
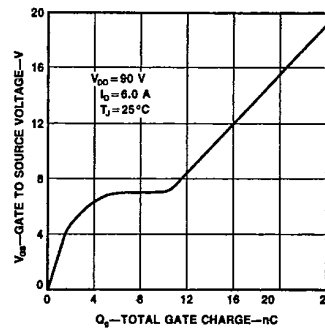
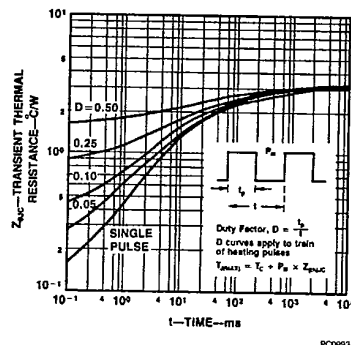
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Figure 6 Temperature Variation of Gate to Source Threshold Voltage

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Typical Performance Curves (Cont)**Figure 7 Capacitance vs Drain to Source Voltage****Figure 9 Forward Biased Safe Operating Area for IRF220-223 and IRF620-623****Figure 11 Forward Biased Safe Operating Area for MTP7N18/7N20****Figure 8 Gate to Source Voltage vs Total Gate Charge****Figure 10 Transient Thermal Resistance vs Time for IRF220-223 and IRF620-623****Figure 12 Transient Thermal Resistance vs Time for MTP7N18/7N20**