

FAIRCHILD

A Schlumberger Company

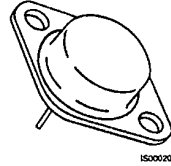
IRF220-223/IRF620-623
MTP7N18/7N20 T-39-11
N-Channel Power MOSFETs,
7 A, 150-200 V
 Power And Discrete Division

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.

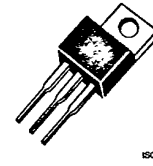
- Low $R_{DS(on)}$
- V_{GS} Rated at ± 20 V
- Silicon Gate for Fast Switching Speeds
- I_{DSS} , $V_{DS(on)}$ Specified at Elevated Temperature
- Rugged
- Low Drive Requirements
- Ease of Paralleling

TO-204AA



IRF220
 IRF221
 IRF222
 IRF223

TO-220AB



IRF620
 IRF621
 IRF622
 IRF623
 MTP7N18
 MTP7N20

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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
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 kΩ	200	180	150	V
V _{GS}	Gate to Source Voltage	± 20	± 20	± 20	V
T _J , T _{stg}	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 _{θJC}	Thermal Resistance, Junction to Case	3.12	1.67	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	30/80	80	°C/W
P _D	Total Power Dissipation at T _C = 25°C	40	75	W
I _{DM}	Pulsed Drain Current ²	20	20	A

Electrical Characteristics (T_C = 25°C unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
Off Characteristics					
V _{(BR)DSS}	Drain Source Breakdown Voltage ¹ IRF220/222/620/622/ MTP7N20 MTP7N18 IRF221/223/621/623	200 180 150		V	V _{GS} = 0 V, I _D = 250 μA
I _{DSS}	Zero Gate Voltage Drain Current		250 1000	μA	V _{DS} = Rated V _{DSS} , V _{GS} = 0 V V _{DS} = 0.8 x Rated V _{DSS} , V _{GS} = 0 V, T _C = 125°C
I _{GSS}	Gate-Body Leakage Current IRF220-223 IRF620-623/MTP7N18/20		± 100 ± 500	nA	V _{GS} = ± 20 V, V _{DS} = 0 V

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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	$I_D = 250 \mu\text{A}, V_{DS} = V_{GS}$ $I_D = 1 \text{ mA}, V_{DS} = V_{GS}$	
	IRF220-223/IRF620-623	2.0	4.0			
	MTP7N18/20	2.0	4.5			
$R_{DS(on)}$	Static Drain-Source On-Resistance ²			Ω	$V_{GS} = 10 \text{ V}, I_D = 2.5 \text{ A}$ $I_D = 3.5 \text{ A}$	
	IRF220/221/620/621		0.8			
	IRF222/223/622/623		1.2			
	MTP7N18/7N20		0.7			
$V_{DS(on)}$	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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Typical Electrical Characteristics
Figure 1 Switching Test Circuit

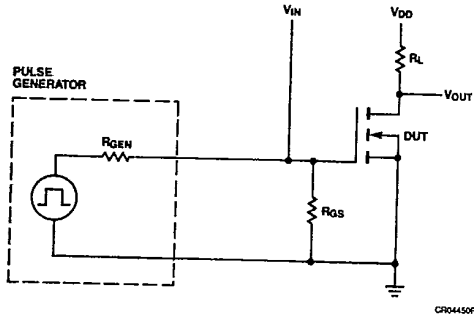
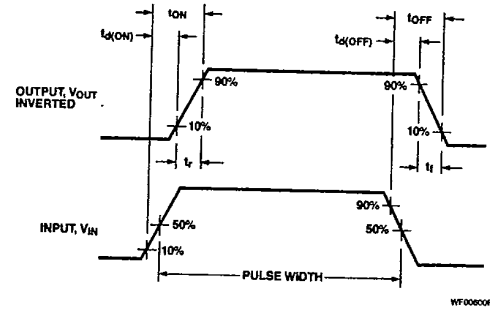


Figure 2 Switching Waveforms



Typical Performance Curves

Figure 3 Output Characteristics

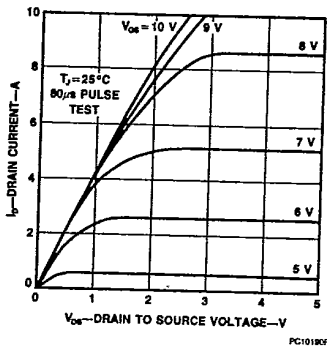


Figure 4 Static Drain to Source Resistance vs Drain Current

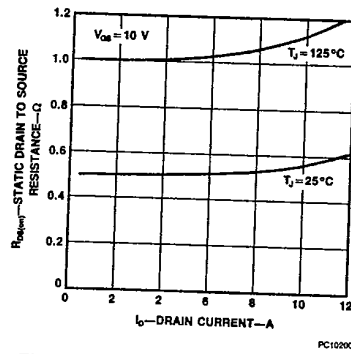


Figure 5 Transfer Characteristics

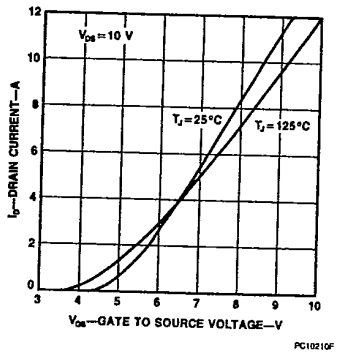
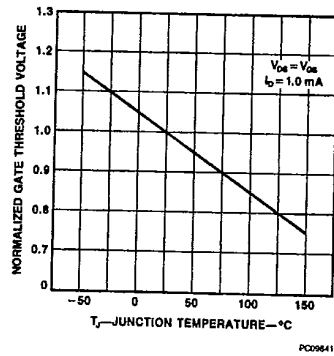


Figure 6 Temperature Variation of Gate to Source Threshold Voltage



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Typical Performance Curves (Cont)

Figure 7 Capacitance vs Drain to Source Voltage

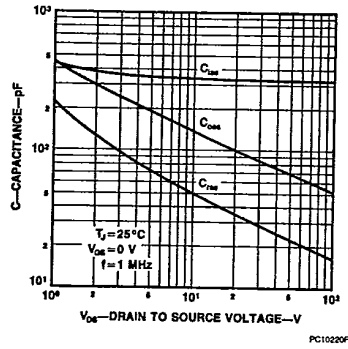


Figure 8 Gate to Source Voltage vs Total Gate Charge

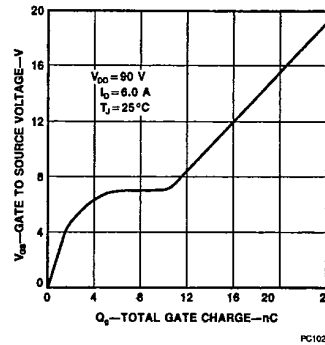


Figure 9 Forward Biased Safe Operating Area for IRF220-223 and IRF620-623

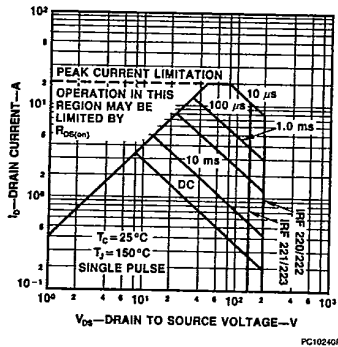


Figure 10 Transient Thermal Resistance vs Time for IRF220-223 and IRF620-623

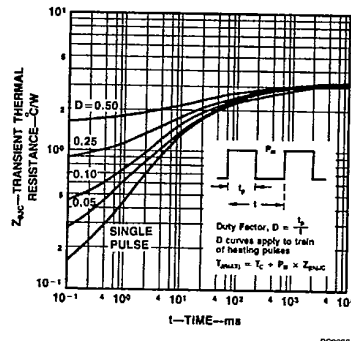


Figure 11 Forward Biased Safe Operating Area for MTP7N18/7N20

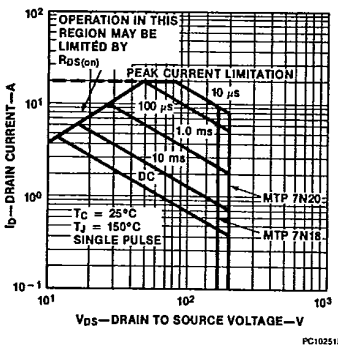


Figure 12 Transient Thermal Resistance vs Time for MTP7N18/7N20

