FAIRCHILD
A Schlumberger Company

IRF220-223/IRF620-623 MTP7N18/7N20

T-39-11

N-Channel Power MOSFETs, 7 A, 150-200 V

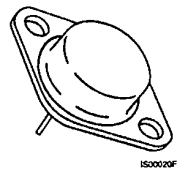
Power And Discrete Division

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.

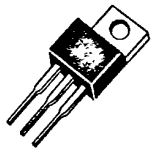
- **Low $R_{DS(on)}$**
- **V_{GS} Rated at ±20 V**
- **Silicon Gate for Fast Switching Speeds**
- **I_{DSS}, $V_{DS(on)}$, Specified at Elevated Temperature**
- **Rugged**
- **Low Drive Requirements**
- **Ease of Paralleling**

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°C	I_D at T_C = 100°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	
$R_{\theta JC}$	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°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]			V	V_{GS} = 0 V, I_D = 250 μA
	IRF220/222/620/622/ MTP7N20	200			
	MTP7N18	180			
	IRF221/223/621/623	150			
I_{DSS}	Zero Gate Voltage Drain Current		250	μA	V_{DS} = Rated V_{DSS}, V_{GS} = 0 V
			1000	μA	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

Electrical Characteristics (Cont.) (T_C = 25°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 μA, V_{DS} = V_{GS}
	MTP7N18/20	2.0	4.5		I_D = 1 mA, V_{DS} = V_{GS}
$R_{DS(on)}$	Static Drain-Source On-Resistance[2]			Ω	V_{GS} = 10 V, I_D = 2.5 A
	IRF220/221/620/621		0.8		
	IRF222/223/622/623		1.2		
	MTP7N18/7N20		0.7		I_D = 3.5 A
$V_{DS(on)}$	Drain-Source On-Voltage[2]		2.45	V	V_{GS} = 10 V; I_D = 3.5 A
	MTP7N18/7N20		5.9	V	V_{GS} = 10 V; I_D = 7.0 A
			5.0	V	V_{GS} = 10 V, I_D = 3.5 A T_C = 100°C
g_{fs}	Forward Transconductance	1.3		S (℧)	V_{DS} = 10 V, I_D = 2.5 A
Dynamic Characteristics					
C_{iss}	Input Capacitance		600	pF	V_{DS} = 25 V, V_{GS} = 0 V f = 1.0 MHz
C_{oss}	Output Capacitance		300	pF	
C_{rss}	Reverse Transfer Capacitance		80	pF	
Switching Characteristics (T_C = 25°C, *Figures 1, 2*)[3]					
$t_{d(on)}$	Turn-On Delay Time		40	ns	V_{DD} = 100 V, I_D = 2.5 A V_{GS} = 10 V, R_{GEN} = 50 Ω R_{GS} = 50 Ω
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 V, I_D = 6.0 A V_{DD} = 45 V

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

Notes
1. T_J = +25°C to +150°C
2. Pulse width limited by T_J
3. Switching time measurements performed on LEM TR-58 test equipment.

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Typical Electrical Characteristics

Figure 1 Switching Test Circuit

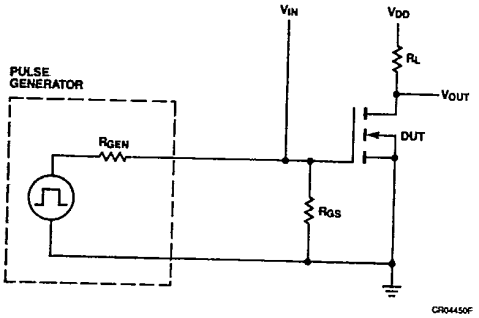
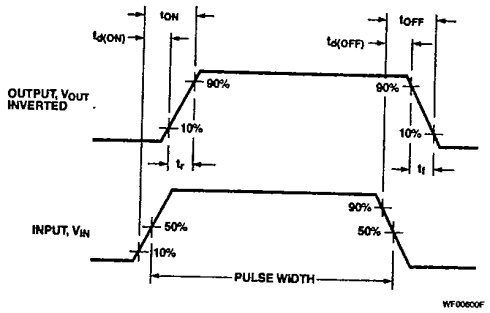


Figure 2 Switching Waveforms



Typical Performance Curves

Figure 3 Output Characteristics

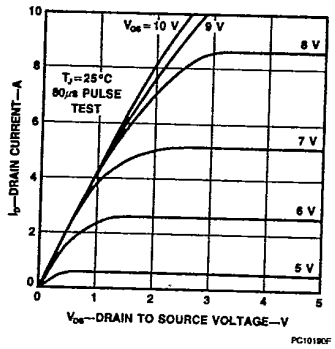


Figure 4 Static Drain to Source Resistance vs Drain Current

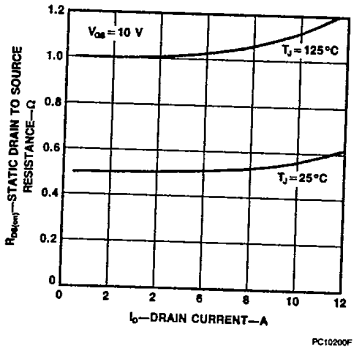


Figure 5 Transfer Characteristics

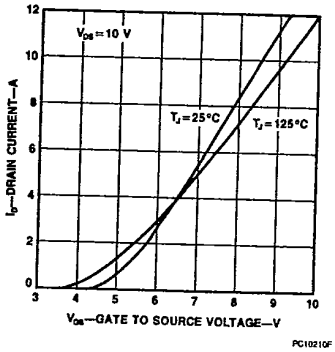
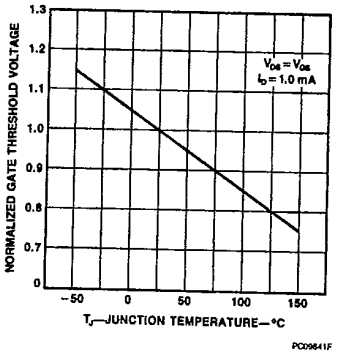


Figure 6 Temperature Variation of Gate to Source Threshold Voltage



Typical Performance Curves (Cont)

Figure 7 Capacitance vs Drain to Source Voltage

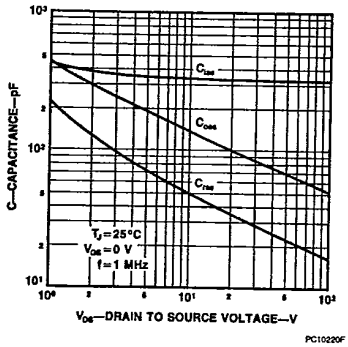


Figure 8 Gate to Source Voltage vs Total Gate Charge

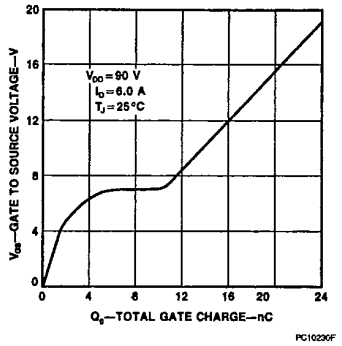


Figure 9 Forward Biased Safe Operating Area for IRF220-223 and IRF620-623

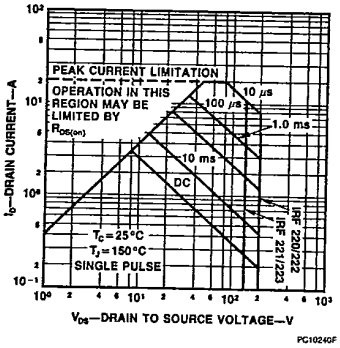


Figure 10 Transient Thermal Resistance vs Time for IRF220-223 and IRF620-623

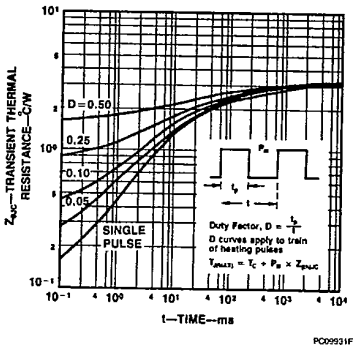


Figure 11 Forward Biased Safe Operating Area for MTP7N18/7N20

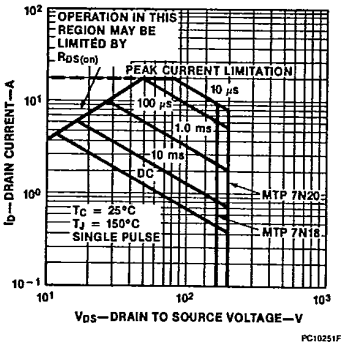


Figure 12 Transient Thermal Resistance vs Time for MTP7N18/7N20