FAIRCHILD
A Schlumberger Company

IRF230-233/IRF630-633 T-39-11
MTP12N18/12N20 T-39-13
N-Channel Power MOSFETs, 12 A, 150-200 V

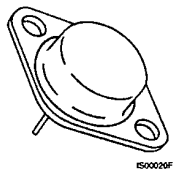
Power And Discrete Division

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

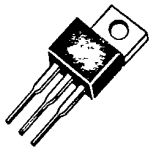
TO-204AA



IS00020F

IRF230
IRF231
IRF232
IRF233

TO-220AB



IS00010F

IRF630
IRF631
IRF632
IRF633
MTP12N18
MTP12N20

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
IRF230	200 V	0.40 Ω	9.0 A	6.0 A	TO-204AA
IRF231	150 V	0.40 Ω	9.0 A	6.0 A	
IRF232	200 V	0.50 Ω	8.0 A	5.0 A	
IRF233	150 V	0.50 Ω	8.0 A	5.0 A	
IRF630	200 V	0.40 Ω	9.0 A	6.0 A	TO-220AB
IRF631	150 V	0.40 Ω	9.0 A	6.0 A	
IRF632	200 V	0.50 Ω	8.0 A	5.0 A	
IRF633	150 V	0.50 Ω	8.0 A	5.0 A	
MTP12N18	180 V	0.35 Ω	12 A	8.5 A	
MTP12N20	200 V	0.35 Ω	12 A	8.5 A	

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

IRF230-233/IRF630-633
MTP12N18/12N20

T-39-11
T-39-13

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 – 233 IRF630 – 633	MTP12N18/20	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.67	1.25	°C/W
P_D	Total Power Dissipation at T_C = 25°C	75	100	W
I_{DM}	Pulsed Drain Current[2]	40	40	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			V	V_{GS} = 0 V, I_D = 250 μA
	IRF230/232/630/632/ MTP12N20	200			
	MTP12N18	180			
	IRF231/233/631/633	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			nA	V_{GS} = ±20 V, V_{DS} = 0 V
	IRF230-233		±100		
	IRF630-633/ MTP12N18/12N20		±500		

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	
	IRF230/233/630/633	2.0	4.0		I_D = 250 μA, V_{DS} = V_{GS}
	MTP12N18/12N20	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 = 5.0 A
	IRF230/231/630/631		0.40		
	IRF232/233/632/633		0.50		
	MTP12N18/12N20		0.35		I_D = 6.0 A
$V_{DS(on)}$	Drain-Source On-Voltage[2]		2.1	V	V_{GS} = 10 V; I_D = 6.0 A
	MTP12N18/12N20		5.0	V	V_{GS} = 10 V; I_D = 12.0 A;
			4.2	V	V_{GS} = 10 V; I_D = 6.0 A T_C = 100°C
g_{fs}	Forward Transconductance	3.0		S (℧)	V_{DS} = 10 V, I_D = 5.0 A
Dynamic Characteristics					
C_{iss}	Input Capacitance		800	pF	V_{DS} = 25 V, V_{GS} = 0 V f = 1.0 MHz
C_{oss}	Output Capacitance		450	pF	
C_{rss}	Reverse Transfer Capacitance		150	pF	
Switching Characteristics (T_C = 25°C, *Figures 1, 2*)[1]					
$t_{d(on)}$	Turn-On Delay Time		30	ns	V_{DD} = 90 V, I_D = 5.0 A V_{GS} = 10 V, R_{GEN} = 15 Ω R_{GS} = 15 Ω
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 V, I_D = 6.0 A V_{GS} = 10 V, R_{GEN} = 50 Ω R_{GS} = 50 Ω
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 V, I_D = 12 A V_{DD} = 120 V

T-39-11

T-39-13

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

Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage IRF230/231/630/631	1.25	2.0	V	I_S = 9.0 A; V_{GS} = 0 V
	IRF232/233/632/633	1.25	1.8	V	I_S = 8.0 A; V_{GS} = 0 V
t_{rr}	Reverse Recovery Time	450		ns	I_S = 4.0 A; I_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.

Typical Electrical Characteristics

Figure 1 Switching Test Circuit

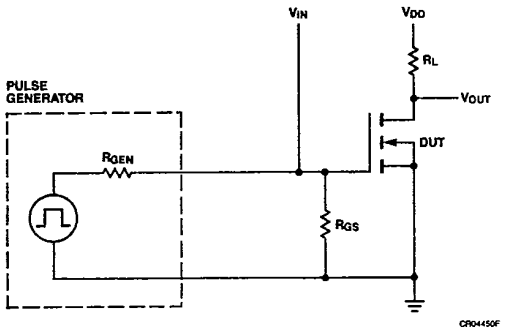
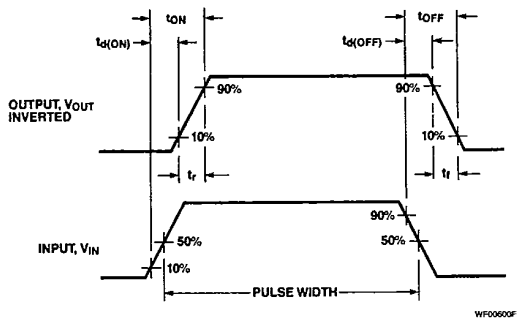


Figure 2 Switching Waveforms



Typical Performance Curves

Figure 3 Output Characteristics

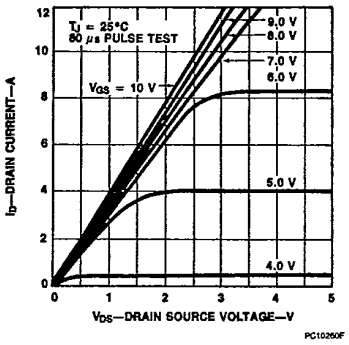
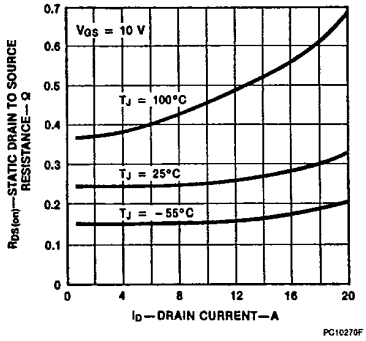


Figure 4 Static Drain to Source Resistance vs Drain Current



Typical Performance Curves (Cont.)

Figure 5 Transfer Characteristics

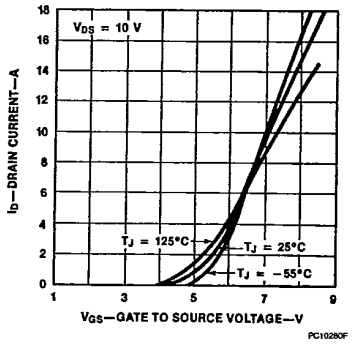


Figure 6 Temperature Variation of Gate to Source Threshold Voltage

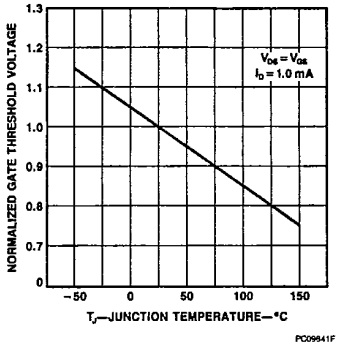


Figure 7 Capacitance vs Drain to Source Voltage

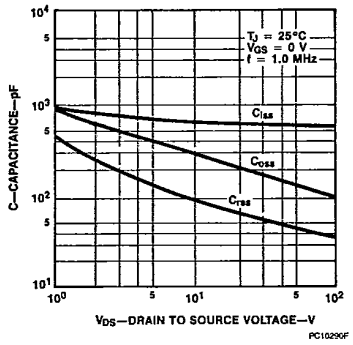


Figure 8 Gate to Source Voltage vs Total Gate Charge

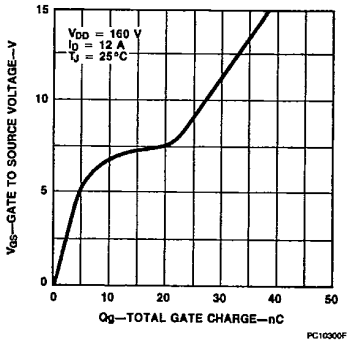


Figure 9 Forward Biased Safe Operating Area for IRF230-233 and IRF630-633

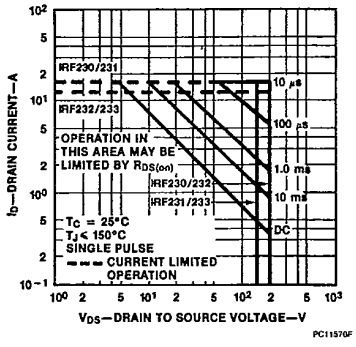
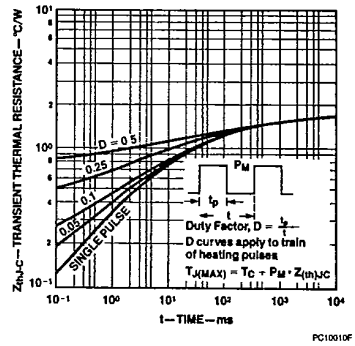


Figure 10 Transient Thermal Resistance vs Time for IRF230-233 and IRF630-633



Typical Performance Curves (Cont.)

Figure 11 Forward Biased Safe Operating Area for MTP12N18/12N20

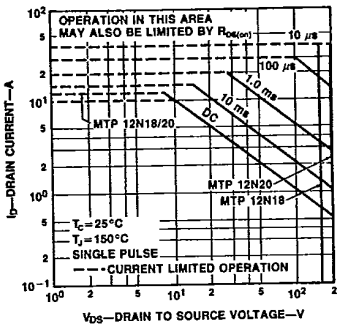


Figure 12 Transient Thermal Resistance vs Time for MTP12N18/12N20