FAIRCHILD
A Schlumberger Company

IRF120-123/IRF520-523 T-39-11
MTP10N08/10N10
N-Channel Power MOSFETs, 11 A, 60-100 V

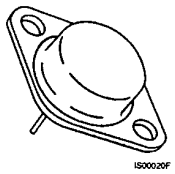
Power And Discrete Division

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.

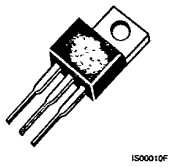
- **Low $R_{DS(on)}$**
- **V_{GS} Rated at ±20 V**
- **Silicon Gate for Fast Switching Speeds**
- **I_{DSS}, $V_{DS(on)}$, Specified at Elevated Temperature**
- **Rugged**
- **Low Drive Requirements**
- **Ease of Paralleling**

TO-204AA



IRF120
IRF121
IRF122
IRF123

TO-220AB



IRF520
IRF521
IRF522
IRF523
MTP10N08
MTP10N10

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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
IRF120	100 V	0.30 Ω	8.0 A	5.0 A	TO-204AA
IRF121	60 V	0.30 Ω	8.0 A	5.0 A	
IRF122	100 V	0.40 Ω	7.0 A	4.0 A	
IRF123	60 V	0.40 Ω	7.0 A	4.0 A	
IRF520	100 V	0.30 Ω	8.0 A	5.0 A	TO-220AB
IRF521	60 V	0.30 Ω	8.0 A	5.0 A	
IRF522	100 V	0.40 Ω	7.0 A	4.0 A	
IRF523	60 V	0.40 Ω	7.0 A	4.0 A	
MTP10N08	80 V	0.33 Ω	10 A	6.4 A	
MTP10N10	100 V	0.33 Ω	10 A	6.4 A	

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

IRF120-123/IRF520-523
MTP10N08/10N10

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Maximum Ratings

Symbol	Characteristic	Rating IRF120/122 IRF520/522 MTP10N10	Rating MTP10N08	Rating IRF122/123 IRF522/523	Unit
V_{DSS}	Drain to Source Voltage[1]	100	80	60	V
V_{DGR}	Drain to Gate Voltage[1] R_{GS} = 20 kΩ	100	80	60	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

		IRF120-123/IRF520-523	MTP10N08/10	
$R_{\theta JC}$	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	32	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] IRF120/122/520/522/ MTP10N10	100		V	V_{GS} = 0 V, I_D = 250 μA
	MTP10N08	80			
	IRF121/123/521/523	60			
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 IRF120-123 IRF520-523/MTP10N08/10		±100 ±500	nA	V_{GS} = ±20 V, V_{DS} = 0 V

IRF120-123/IRF520-523
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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	
	IRF120-123/IRF520-523	2.0	4.0		I_D = 250 μA, V_{DS} = V_{GS}
	MTP10N08/10N10	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
	IRF120/121/520/521		0.30		I_D = 4.0 A
	MTP10N08/10N10		0.33		I_D = 5.0 A
	IRF122/123/522/523		0.40		I_D = 4.0 A
$V_{DS(on)}$	Drain-Source On-Voltage[2] MTP 10N08/10N10		4.0	V	V_{GS} = 10 V; I_D = 10.0 A
			3.3	V	V_{GS} = 10 V, I_D = 5.0 A T_C = 100°C
g_{fs}	Forward Transconductance	1.5		S (℧)	V_{DS} = 10 V, I_D = 4.0 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		400	pF	
C_{rss}	Reverse Transfer Capacitance		100	pF	
Switching Characteristics (T_C = 25°C, *Figures 1, 2*)[3]					
$t_{d(on)}$	Turn-On Delay Time		40	ns	V_{DD} = 50 V, I_D = 4.0 A V_{GS} = 10 V, R_{GEN} = 50 Ω R_{GS} = 50 Ω
t_r	Rise Time		70	ns	
$t_{d(off)}$	Turn-Off Delay Time		100	ns	
t_f	Fall Time		70	ns	
Q_g	Total Gate Charge		15	nC	V_{GS} = 10 V, I_D = 10 A V_{DD} = 50 V

Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage IRF120/121/520/521		2.5	V	I_S = 8.0 A; V_{GS} = 0 V
	IRF122/123/522/523		2.3	V	I_S = 7.0 A; V_{GS} = 0 V
t_{rr}	Reverse Recovery Time	280		ns	I_S = 4.0 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.

Typical Electrical Characteristics

Figure 1 Switching Test Circuit

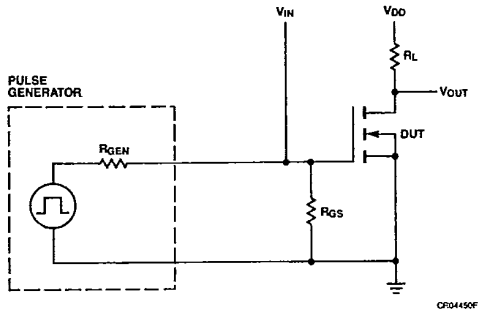
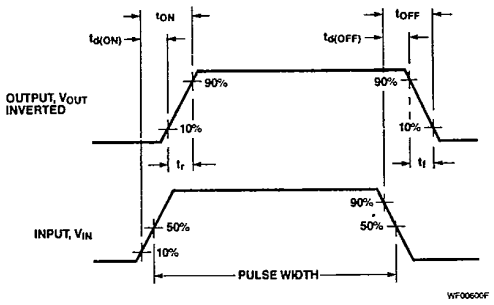


Figure 2 Switching Waveforms



Typical Performance Curves

Figure 3 Output Characteristics

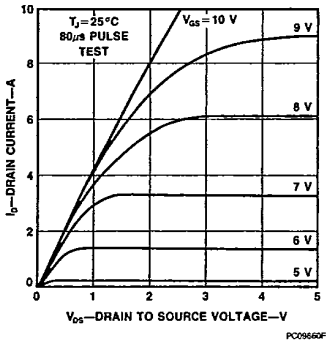


Figure 4 Static Drain to Source Resistance vs Drain Current

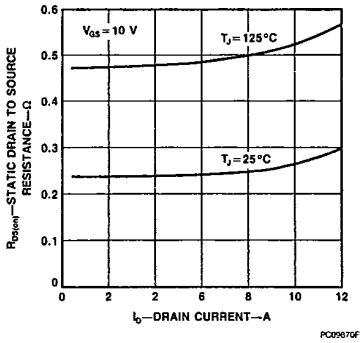


Figure 5 Transfer Characteristics

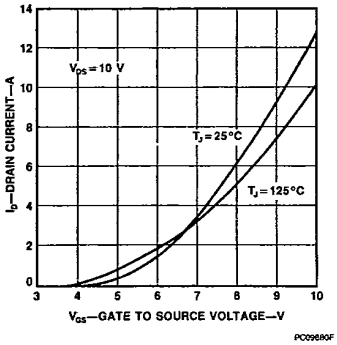
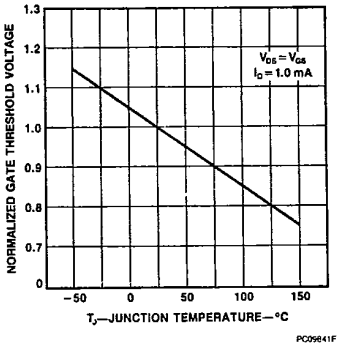


Figure 6 Temperature Variation of Gate to Source Threshold Voltage



Typical Performance Curves (Cont.)

Figure 7 Capacitance vs Drain to Source Voltage

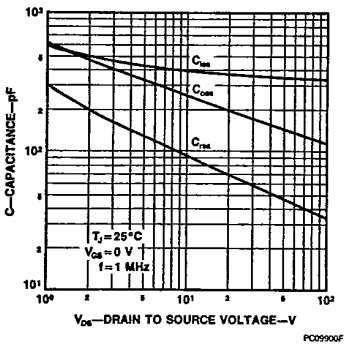


Figure 8 Gate to Source Voltage vs Total Gate Charge

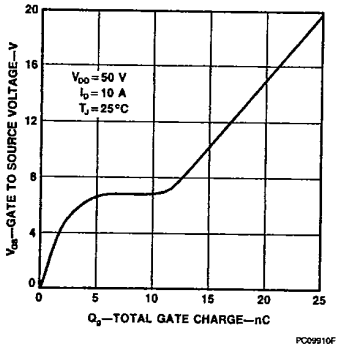


Figure 9 Forward Biased Safe Operating Area for IRF120-123 And IRF520-523

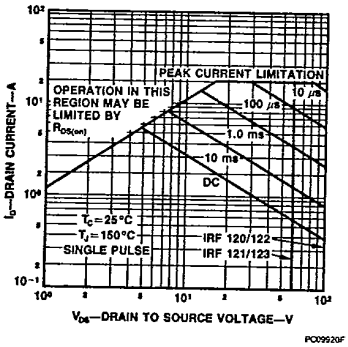


Figure 10 Transient Thermal Resistance vs Time for IRF120-123 And IRF520-523

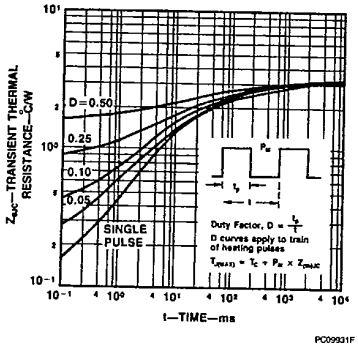


Figure 11 Forward Biased Safe Operating Area for MTP10N08/10N10

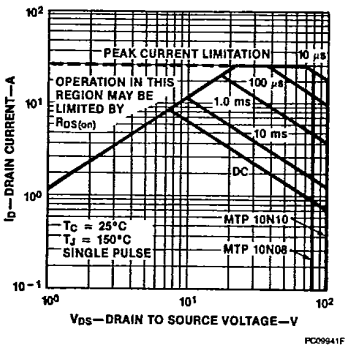


Figure 12 Transient Thermal Resistance vs Time for MTP10N08/10N10