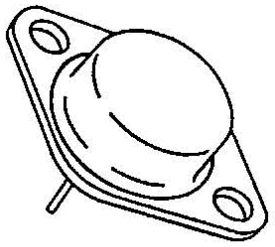
Description

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.

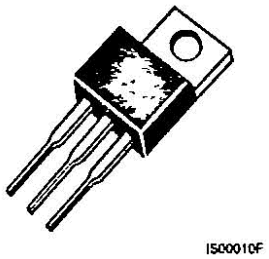
- Low $R_{DS(on)}$
- V_{GS} Rated at ±20V
- Silicon Gate for Fast Switching Speeds
- I_{DSS}, $V_{DS(on)}$, Specified at Elevated Temperature
- Rugged
- Low Drive Requirements
- Ease of Paralleling

TO-204AA



IRF320
IRF321
IRF322
IRF323

TO-220AB



IRF720
IRF721
IRF722
IRF723
MTP3N35
MTP3N40

Product Summary

Part Number	V_{DSS}	$R_{DS(on)}$	I_D at Tc=25℃	I_D at Tc=100℃	Case Style
IRF320	400V	1.8 Ω	3.0A	2.0A	TO-204AA
IRF321	350V	1.8 Ω	3.0A	2.0A	
IRF322	400V	2.5 Ω	2.5A	1.5A	
IRF323	350V	2.5 Ω	2.5A	1.5A	
IRF720	400V	1.8 Ω	3.0A	2.0A	TO-220AB
IRF721	350V	1.8 Ω	3.0A	2.0A	
IRF722	400V	2.5 Ω	2.5A	1.5A	
IRF723	350V	2.5 Ω	2.5A	1.5A	
MTP3N35	350V	1.8 Ω	3.0A	2.0A	
MTP3N40	400V	1.8 Ω	3.0A	2.0A	

Notes

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

Maximum Ratings

Symbol	Characteristic	Rating IRF320/322 IRF720/722 MTP3N40	Rating IRF321/323 IRF721/723 MTP3N35	Unit
V_{DSS}	Drain to Source Voltage [2]	400	350	V
V_{DGR}	Drain to Gate Voltage[2] R_{GS}=20k Ω	400	350	V
V_{GS}	Gate to Source Voltage	±20	±20	V
T_J, T_{stg}	Operating Junction and Storage Temperatures	-55 to +150	-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5s	275	275	°C

Maximum Thermal Characteristics

		IRF320-323/ IRF720-723	MTP3N35/3N40	
$R_{\theta JC}$	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 Tc=25°C	40	75	W
I_{DM}	Pulsed Drain Current2	12	12	A

Electrical Characteristics (Tc=25℃ unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
Off Characteristics					
$V_{(BR)DSS}$	Drain Source Breakdown Voltage 1 IRF320/322/720/722			V	V_{GS}=0V, I_D=250μA
	MTP3N40	400			
	IRF321/323/721/723/ MTP3N35	350			
I_{DSS}	Zero Gate Voltage Drain Current		250	μA	V_{DS}=Rated V_{DSS}, V_{GS}=0V
			1000	μA	V_{DS}=0.8 x Rated V_{DSS}, V_{GS}=0V, Tc=125°C
I_{GSS}	Gate-Body Leakage Current IRF320-323		±100	nA	V_{GS}=±20V, V_{DS}=0V
	IRF720-723/MTP3N35/3N40		±500		

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

Symbol	Characteristic	Min	Max	Unit	Test Conditions
On Characteristics					
$V_{GS(th)}$	Gate Threshold Voltage			V	I_D=250μA, V_{DS}=V_{GS}
	IRF320-323/IRF720-723	2.0	4.0		I_D=1mA, V_{DS}=V_{GS}
	MTP3N35/40	2.0	4.5		
$R_{DS(on)}$	Static Drain-Source On-Resistance[2]			Ω	V_{GS}=10V, I_D=1.5A
	IRF320/321/720/721		1.8		
	IRF322/323/722/723		2.5		
	MTP3N35/40		3.3		
$V_{DS(on)}$	Drain-Source On-Voltage [2]		12	V	V_{GS}=10V; I_D=3.0A;
	MTP3N35/40		10	V	V_{GS}=10V; I_D=1.5A; Tc=100°C
gfs	Forward Transconductance	1.0		S(℧)	V_{DS}=10V, I_D=1.5A
Dynamic Characteristics					
Ciss	Input Capacitance		500	pF	V_{DS}=25V, V_{GS}=0V
Coss	Output Capacitance		100	pF	f=1.0MHz
Crss	Reverse Transfer Capacitance		40	pF	
Switching Characteristics (Tc=200°C, Figures 1,2)[3]					
td(on)	Turn-On Delay Time		40	ns	V_{DD}=200V, I_D=1.5A
tr	Rise Time		50	ns	V_{GS}=10V, R_{GEN}=50 Ω
td(off)	Turn-Off Delay Time		100	ns	R_{GS}=50 Ω
tf	Fall Time		50	ns	
Qg	Total Gate Charge		15	nC	V_{GS}=10V, I_D=4.0A V_{DD}=200V

Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage		1.6	V	Is=3.0A; V_{GS}=0V
	IRF320/321/720/721		1.5	V	Is=2.5A; V_{GS}=0V
	IRF322/323/722/723				
trr	Reverse Recovery Time	450		ns	I_F=3.0A; dIs/dt=100A/μS

Notes

1. TJ=+25°C to +150°C
2. Pulse test: Pulse width ≤ 60μs, Duty cycle ≤ 1%
3. Switching time measurements performed on LEM TR-58 test equipment.

Typical Electrical Characteristics

Figure 1 Switching Test Circuit

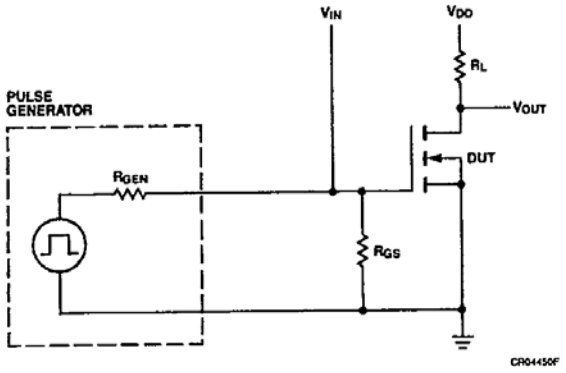
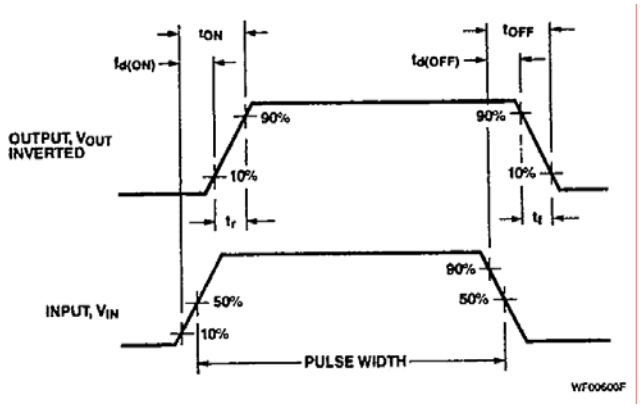


Figure 2 Switching Waveforms



Typical Performance Curves

Figure 3 Output Characteristics

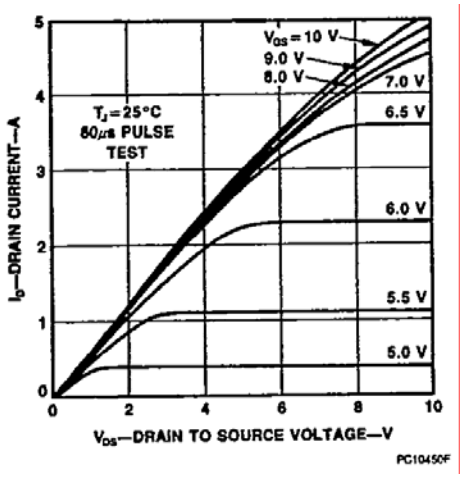


Figure 4 Static Drain to Source Resistance VS Drain Current

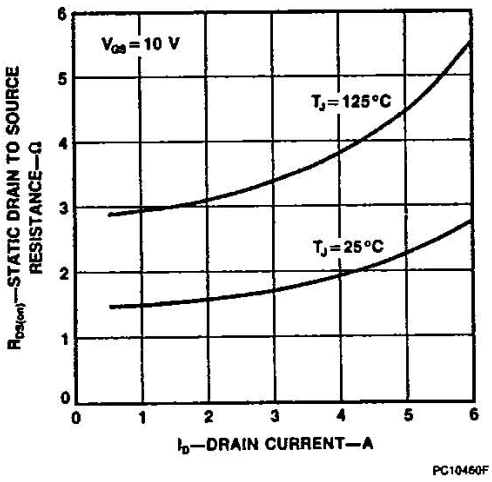


Figure 5 Transfer Characteristics

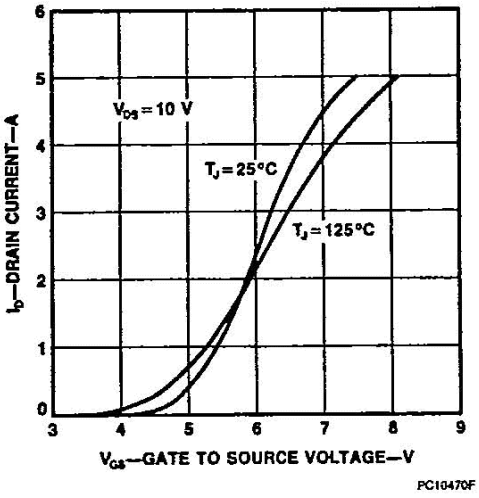
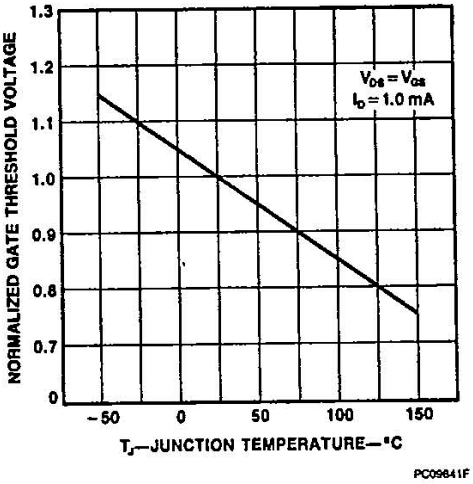


Figure 6 Temperature Variation of Gate to Source Threshold Voltage



Typical Performance Curves (Cont.)

Figure 7 Capacitance vs Drain to Source Voltage

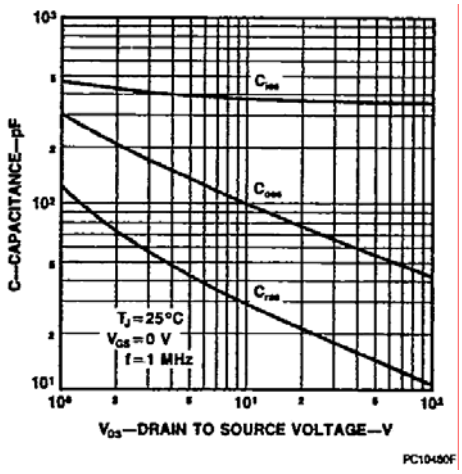


Figure 8 Gate to Source Voltage vs Total Gate Charge

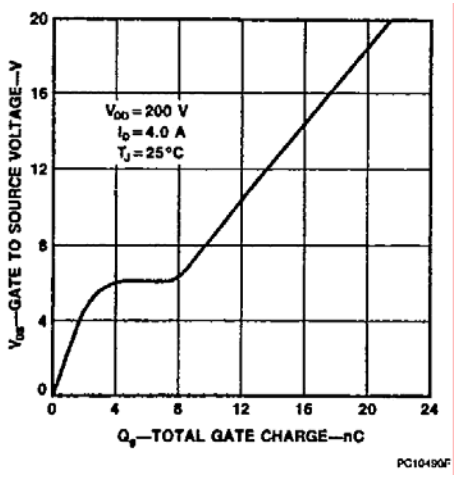


Figure 9 Forward Biased Safe Operating Area For IRF320-323 and IRF720-723

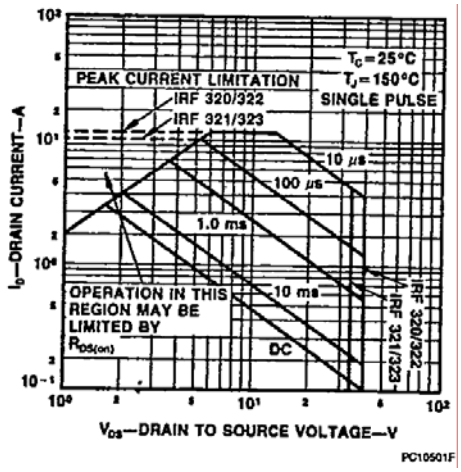


Figure 10 Transient Thermal Resistance vs Time for IRF320-323 and IRF720-723

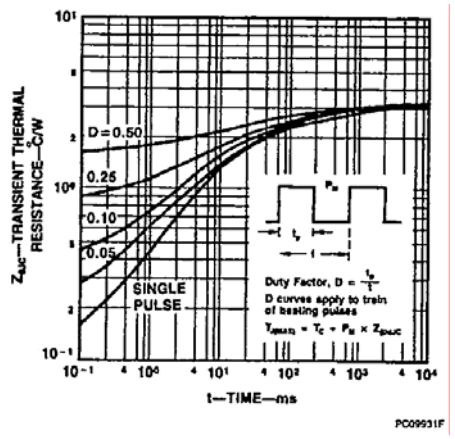


Figure 11 Forward Biased Safe Operating Area for MTP3N35/3N40

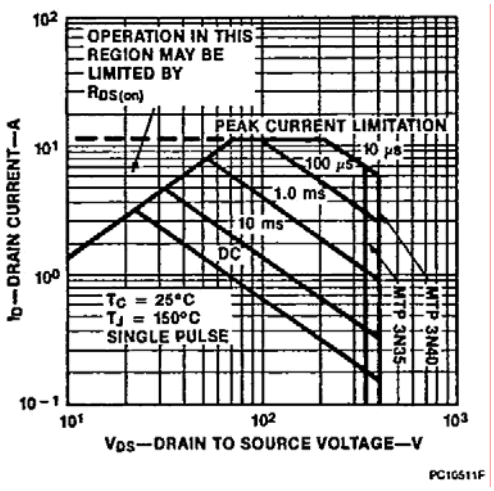


Figure 12 Transient Thermal Resistance vs Time for MTP3N35/3N40