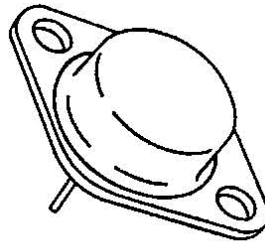


Description

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

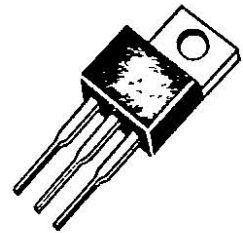
TO-204AA



1500020F

IRF320
IRF321
IRF322
IRF323

TO-220AB



1500010F

IRF720
IRF721
IRF722
IRF723
MTP3N35
MTP3N40

Product Summary

Part Number	V_{DSS}	$R_{DS(on)}$	I_D at $T_c=25$	I_D at $T_c=100$	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	
T _L	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5s	275	275	

Maximum Thermal Characteristics

		IRF320-323/ IRF720-723	MTP3N35/3N40	
R _{θJC}	Thermal Resistance, Junction to Case	3.12	1.67	/W
R _{θJA}	Thermal Resistance, Junction to Ambient	30/80	80	/W
P _D	Total Power Dissipation at T _c =25	40	75	W
I _{DM}	Pulsed Drain Current ²	12	12	A

Electrical Characteristics (T_c=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 MTP3N40 IRF321/323/721/723/ MTP3N35			V	V _{GS} =0V, I _D =250μA
		400			
		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, T _c =125
I _{GSS}	Gate-Body Leakage Current IRF320-323 IRF720-723/MTP3N35/3N40		±100 ±500	nA	V _{GS} =±20V, V _{DS} =0V



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

Symbol	Characteristic	Min	Max	Unit	Test Conditions
On Characteristics					
V _{GS(th)}	Gate Threshold Voltage IRF320-323/IRF720-723 MTP3N35/40	2.0	4.0	V	I _D =250μA, V _{DS} =V _{GS} I _D =1mA, V _{DS} =V _{GS}
		2.0	4.5		
R _{DS(on)}	Static Drain-Source On-Resistance ² IRF320/321/720/721 IRF322/323/722/723 MTP3N35/40		1.8	Ω	V _{GS} =10V, I _D =1.5A
			2.5		
			3.3		
V _{DS(on)}	Drain-Source On-Voltage ² MTP3N35/40		12	V	V _{GS} =10V; I _D =3.0A;
			10	V	V _{GS} =10V; I _D =1.5A; Tc=100
g _{fs}	Forward Transconductance	1.0		S(Ω)	V _{DS} =10V, I _D =1.5A

Dynamic Characteristics

C _{iss}	Input Capacitance		500	pF	V _{DS} =25V, V _{GS} =0V f=1.0MHz
C _{oss}	Output Capacitance		100	pF	
C _{rss}	Reverse Transfer Capacitance		40	pF	

Switching Characteristics (Tc=200, Figures 1,2)³

td(on)	Turn-On Delay Time		40	ns	V _{DD} =200V, I _D =1.5A V _{GS} =10V, R _{GEN} =50 Ω R _{GS} =50 Ω
tr	Rise Time		50	ns	
td(off)	Turn-Off Delay Time		100	ns	
tf	Fall Time		50	ns	
Qg	Total Gate Charge		15	nC	V _{GS} =10V, I _D =4.0A V _{DD} =200V

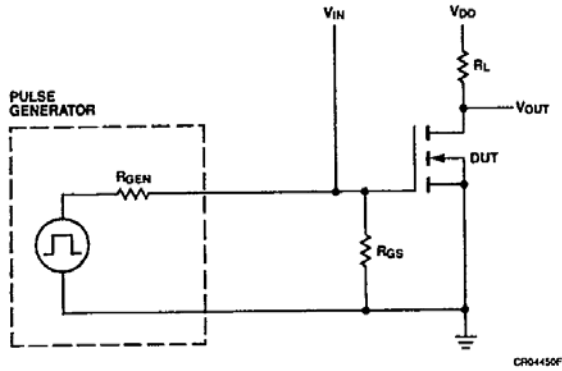
Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V _{SD}	Diode Forward Voltage IRF320/321/720/721 IRF322/323/722/723		1.6	V	I _S =3.0A; V _{GS} =0V
			1.5	V	I _S =2.5A; V _{GS} =0V
trr	Reverse Recovery Time	450		ns	I _F =3.0A; dI _S /dt=100A/μS

Notes

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

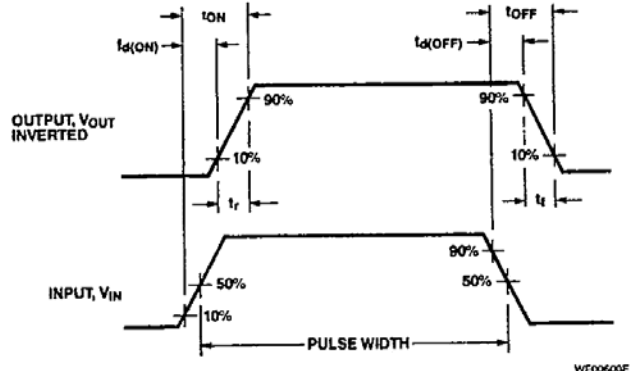
Typical Electrical Characteristics

Figure 1 Switching Test Circuit



CR64450F

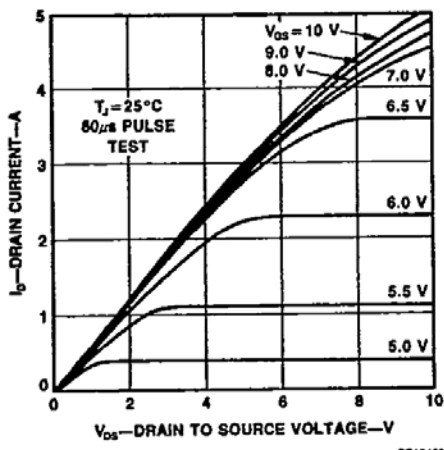
Figure 2 Switching Waveforms



WF00600F

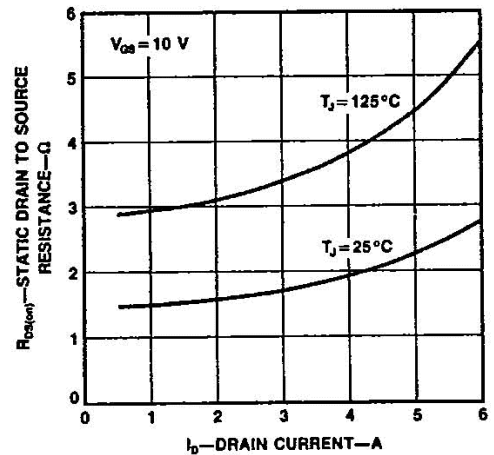
Typical Performance Curves

Figure 3 Output Characteristics



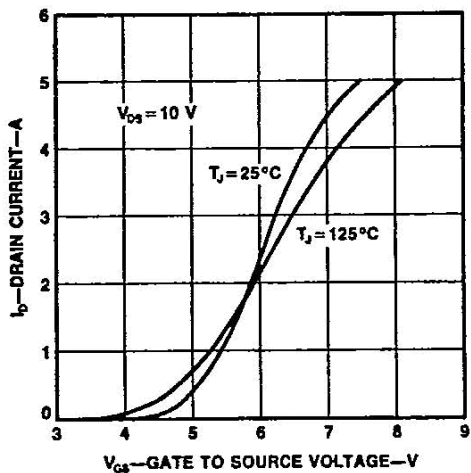
PC10450F

Figure 4 Static Drain to Source Resistance VS Drain Current



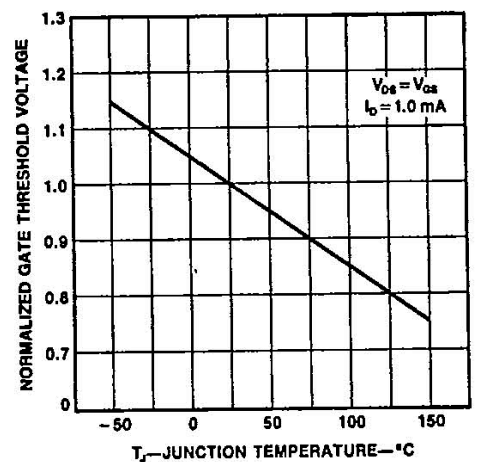
PC10460F

Figure 5 Transfer Characteristics



PC10470F

Figure 6 Temperature Variation of Gate to Source Threshold Voltage



PC09841F

Typical Performance Curves (Cont.)

Figure 7 Capacitance vs Drain to Source Voltage

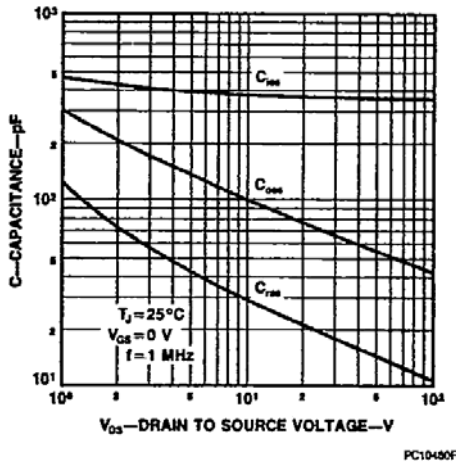


Figure 8 Gate to Source Voltage vs Total Gate Charge

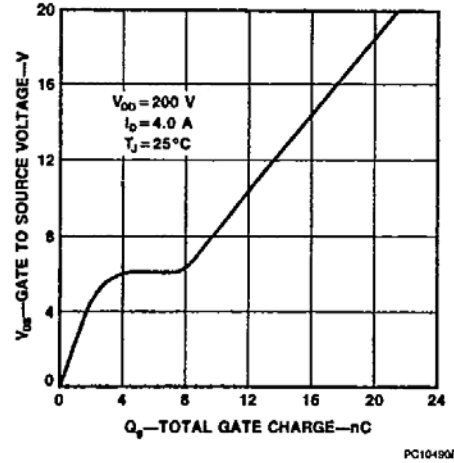


Figure 9 Forward Biased Safe Operating Area For IRF320-323 and IRF720-723

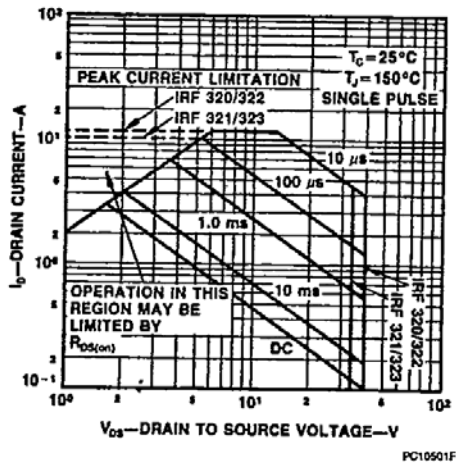


Figure 10 Transient Thermal Resistance vs Time for IRF320-323 and IRF720-723

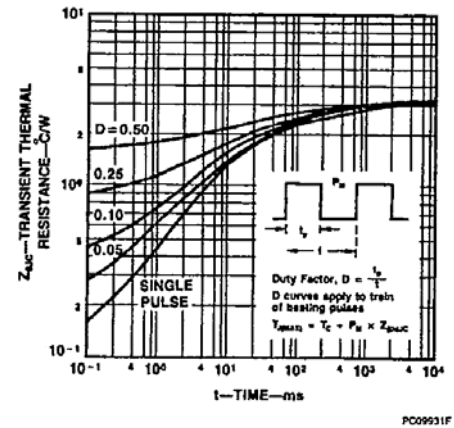


Figure 11 Forward Biased Safe Operating Area for MTP3N35/3N40

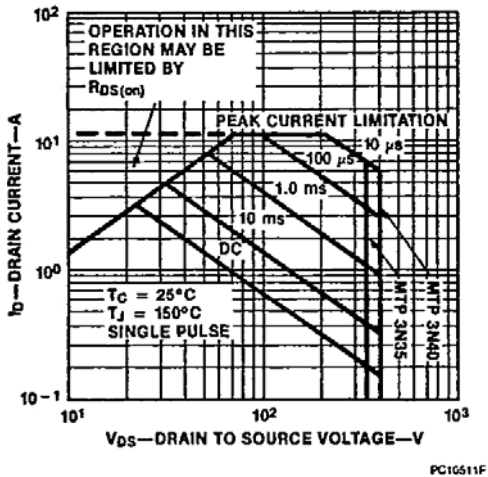
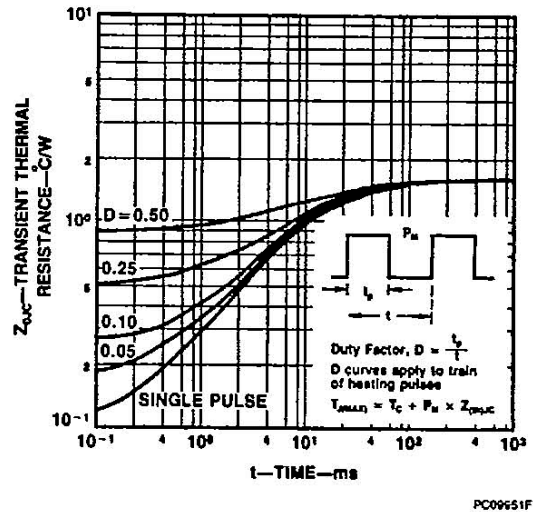


Figure 12 Transient Thermal Resistance vs Time for MTP3N35/3N40





IRF320-323/IRF720-723/MTP3N35/3N40 T-39-11
N-Channel Power MOSFETs, 3.0A, 350-400V
