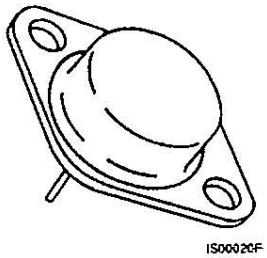
IRF420-423/IRF820-823
MTP2N45/2N50
N-Channel Power MOSFETs
3.0A, 450V/500V

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.

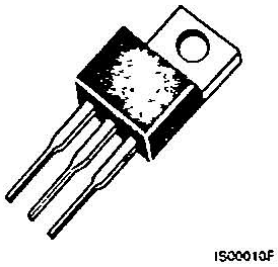
- Low $R_{DS(on)}$
- V_{GS} Rated at ±20V
- Silicon Gate for Fast Switching Speeds
- I_{DSS}, $V_{DS(on)}$, Specified at Elevated Temperature
- Rugged
- Low Drive Requirements
- Ease of Paralleling

TO-204AA



IRF420
IRF421
IRF422
IRF423

TO-220AB



IRF820
IRF821
IRF822
IRF823
MTP2N45
MTP2N50

Product Summary

Part Number	V_{DSS}	$R_{DS(on)}$	I_D at Tc=25℃	I_D at Tc=100℃	Case Style
IRF420	500V	3.0 Ω	2.5A	1.5A	TO-204AA
IRF421	450V	3.0 Ω	2.5A	1.5A	
IRF422	500V	4.0 Ω	2.0A	1.0A	
IRF423	450V	4.0 Ω	2.0A	1.0A	
IRF820	500V	3.0 Ω	2.5A	1.5A	TO-220AB
IRF821	450V	3.0 Ω	2.5A	1.5A	
IRF822	500V	4.0 Ω	2.0A	1.0A	
IRF823	450V	4.0 Ω	2.0A	1.0A	
MTP2N45	450V	4.0 Ω	3.0A	2.0A	
MTP2N50	500V	4.0 Ω	3.0A	2.0A	

Notes

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

Maximum Ratings

Symbol	Characteristic	Rating IRF420/422 IRF820/822 MTP2N50	Rating IRF421/423 IRF821/823 MTP2N45	Unit
V_{DSS}	Drain to Source Voltage 1	500	450	V
V_{DGR}	Drain to Gate Voltage 1 R_{GS}=20kΩ	500	450	V
V_{GS}	Gate to Source Voltage	±20	±20	V
TJ, Tstg	Operating Junction and Storage Temperatures	-55 to +150	-55 to +150	°C
TL	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5s	275	275	°C

Maximum Thermal Characteristics

		IRF420-423/ IRF820-823	MTP2N45/2N50	
$R_{\Theta JC}$	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 Current [2]	10	10	A

Electrical Characteristics (Tc=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}=0V, I_D=250μA
	IRF420/422/820/822	500			
	MTP2N50	450			
	IRF421/423/821/823/ MTP2N45				
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			nA	V_{GS}=±20V, V_{DS}=0V
	IRF420-423		±100		
	IRF820-823/MTP2N45/50		±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	2.0	4.0	V	
	IRF420-423/IRF820-823	2.0	4.5		I_D=250μA, V_{DS}=V_{GS}
	MTP2N45/MTP2N50				I_D=1.0mA, V_{DS}=V_{GS}
$R_{DS(on)}$	Static Drain-Source On-Resistance 2			Ω	V_{GS}=10V, I_D=1.0A
	IRF420/421/820/821		3.0		
	IRF422/423/822/823		4.0		
	MTP2N45/50		4.0		
$V_{DS(on)}$	Drain-Source On-Voltage2				
	MTP2N45/50		10	V	V_{GS}=10V; I_D=2.0A
			8	V	V_{GS}=10V; I_D=1.0A
					Tc=100°C
gfs	Forward Transconductance	1.0		S(℧)	V_{DS}=10V, I_D=1.0A
Dynamic Characteristics					
Ciss	Input Capacitance		400	pF	V_{DS}=25V, V_{GS}=0V
Coss	Output Capacitance		100	pF	f=1.0MHz
Crss	Reverse Transfer Capacitance		40	pF	
Switching Characteristics (Tc=25°C, Figure 1,2)[3]					
td(on)	Turn-On Delay Time		40	ns	V_{DD}=250V, I_D=1.0A
tr	Rise Time		50	ns	V_{GS}=10V, R_{GEN}=50 Ω
td(off)	Turn-Off Delay Time		60	ns	R_{GS}=50 Ω
tf	Fall Time		60	ns	
Qg	Total Gate Charge		15	nC	V_{GS}=10V, I_D=3.0A
					V_{DD}=200V
Symbol	**Characteristic**	**Typ**	**Max**	**Unit**	**Test Conditions**
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage		1.4	V	Is=2.5A; V_{GS}=0V
			1.3	V	Is=2.0A; V_{GS}=0V
trr	Reverse Recovery Time	600		ns	Is=2.5A; dIs/dt=100A/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 equrpment.

Typical Electrical Characteristics

Figure 1 Switching Test Circuit

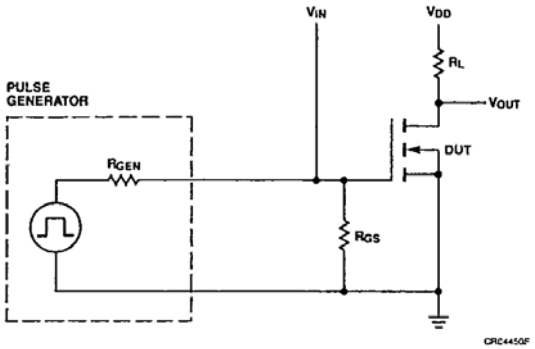
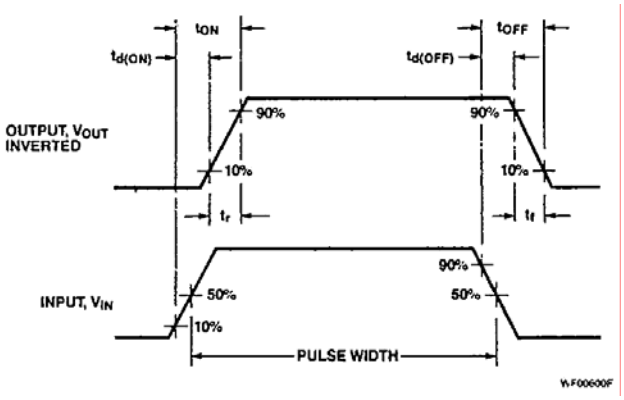


Figure 2 Switching Waveforms



Typical Performance Curves

Figure 3 Output Characteristics

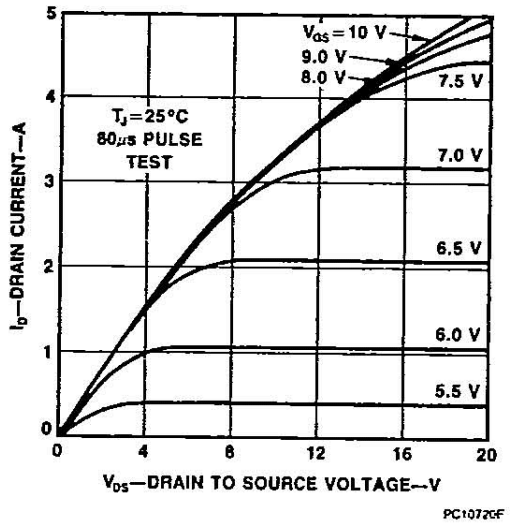


Figure 4 Static Drain to Source Resistance Vs Drain Current

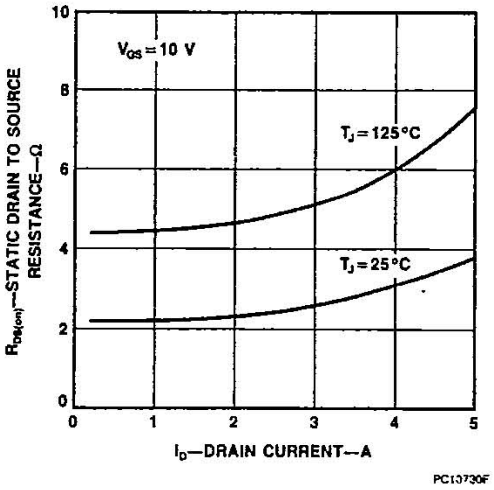


Figure 5 Transfer Characteristics

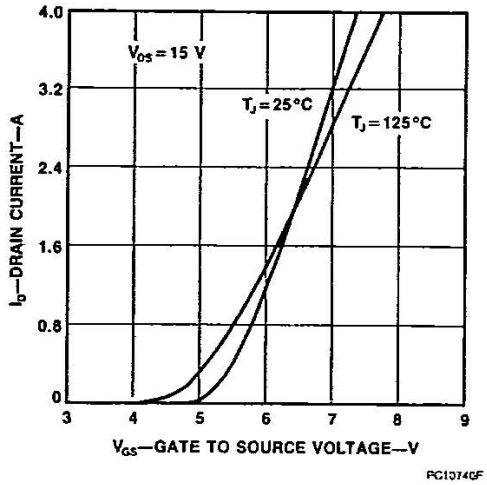
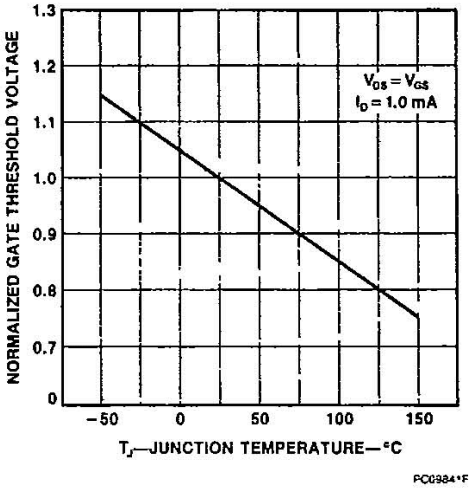


Figure 6 Temperature Variation of Gate to Source Threshold Voltage



Typical Performance Curves (Cont.)

Figure 7 Capacitance vs Drain to Source Voltage

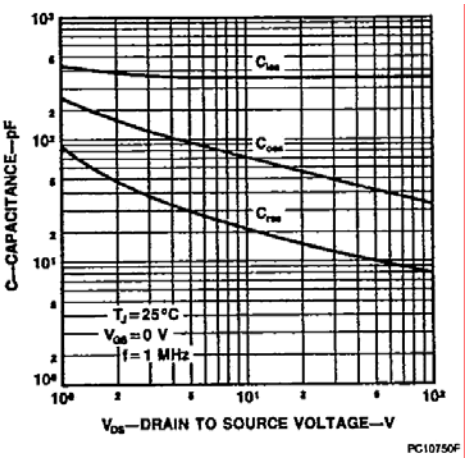


Figure 8 Gate to Source Voltage VS Total Gate Charge

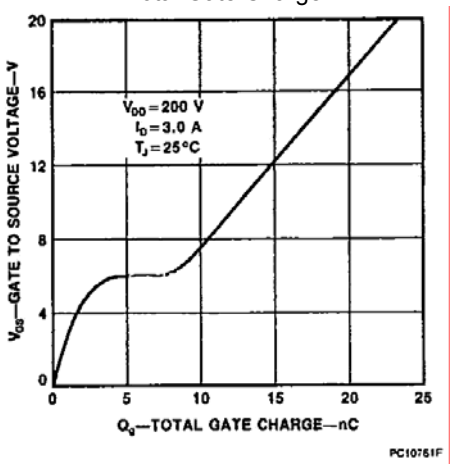


Figure 9 Forward Biased Safe Operating Area for IRF420-423 and IRF820-823

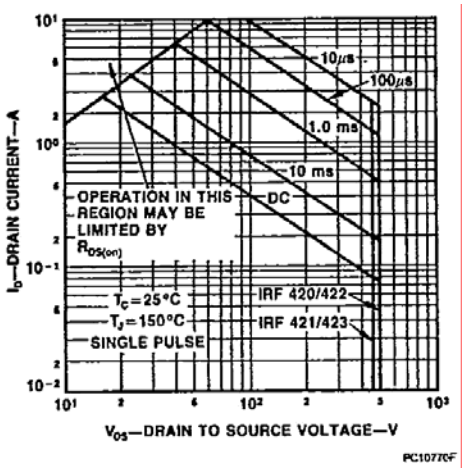


Figure 10 Transient Thermal Resistance vs Time for IRF420-423 and IRF820-823

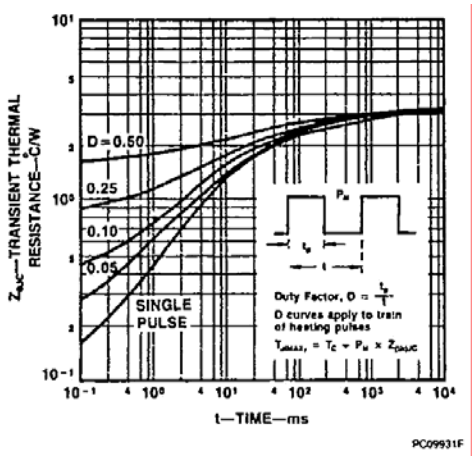


Figure 11 Forward Biased Safe Operating Area for MTP2N45/2N50

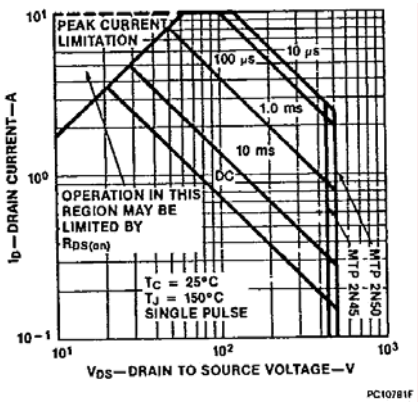


Figure 12 Transient Thermal Resistance vs time for MTP2N45/2N50

