FAIRCHILD
A Schlumberger Company

IRF420-423/IRF820-823 T-39-11
MTP2N45/2N50
N-Channel Power MOSFETs, 3.0 A, 450 V/500 V

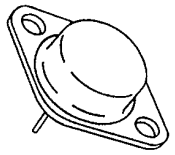
Power And Discrete Division

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**

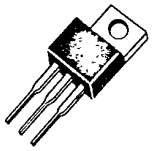
TO-204AA



IS00020F

IRF420
IRF421
IRF422
IRF423

TO-220AB



IS00010F

IRF820
IRF821
IRF822
IRF823
MTP2N45
MTP2N50

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
IRF420	500 V	3.0 Ω	2.5 A	1.5 A	TO-204AA
IRF421	450 V	3.0 Ω	2.5 A	1.5 A	
IRF422	500 V	4.0 Ω	2.0 A	1.0 A	
IRF423	450 V	4.0 Ω	2.0 A	1.0 A	
IRF820	500 V	3.0 Ω	2.5 A	1.5 A	TO-220AB
IRF821	450 V	3.0 Ω	2.5 A	1.5 A	
IRF822	500 V	4.0 Ω	2.0 A	1.0 A	
IRF823	450 V	4.0 Ω	2.0 A	1.0 A	
MTP2N45	450 V	4.0 Ω	3.0 A	2.0 A	
MTP2N50	500 V	4.0 Ω	3.0 A	2.0 A	

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

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IRF420-423/IRF820-823
MTP2N45/2N50

T-39-11

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} = 20 kΩ	500	450	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 5 s	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 T_C = 25°C	40	75	W
I_{DM}	Pulsed Drain Current[2]	10	10	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]			V	V_{GS} = 0 V, I_D = 250 μA
	IRF420/422/820/822/ MTP2N50	500			
	IRF421/423/821/823/ MTP2N45	450			
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
	IRF420-423		±100		
	IRF820-823/MTP2N45/50		±500		

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IRF420-423/IRF820-823
MTP2N45/2N50

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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	
	IRF420-423/IRF820-823	2.0	4.0		I_D = 250 μA, V_{DS} = V_{GS}
	MTP2N45/MTP2N50	2.0	4.5		I_D = 1.0 mA, V_{DS} = V_{GS}
$R_{DS(on)}$	Static Drain-Source On-Resistance[2]			Ω	V_{GS} = 10 V, I_D = 1.0 A
	IRF420/421/820/821		3.0		
	IRF422/423/822/823		4.0		
	MTP2N45/50		4.0		
$V_{DS(on)}$	Drain-Source On-Voltage[2]				
	MTP2N45/50		10	V	V_{GS} = 10 V; I_D = 2.0 A
			8	V	V_{GS} = 10 V; I_D = 1.0 A, T_C = 100°C
g_{fs}	Forward Transconductance	1.0		S (℧)	V_{DS} = 10 V, I_D = 1.0 A
Dynamic Characteristics					
C_{iss}	Input Capacitance		400	pF	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz
C_{oss}	Output Capacitance		100	pF	
C_{rss}	Reverse Transfer Capacitance		40	pF	
Switching Characteristics (T_C = 25°C, *Figures 1, 2*)[3]					
$t_{d(on)}$	Turn-On Delay Time		40	ns	V_{DD} = 250 V, I_D = 1.0 A, V_{GS} = 10 V, R_{GEN} = 50 Ω, R_{GS} = 50 Ω
t_r	Rise Time		50	ns	
$t_{d(off)}$	Turn-Off Delay Time		60	ns	
t_f	Fall Time		60	ns	
Q_g	Total Gate Charge		15	nC	V_{GS} = 10 V, I_D = 3.0 A, V_{DD} = 200 V

Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage		1.4	V	I_S = 2.5 A; V_{GS} = 0 V
			1.3	V	I_S = 2.0 A; V_{GS} = 0 V
t_{rr}	Reverse Recovery Time	600		ns	I_S = 2.5 A; dI_S/dt = 100 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.

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Typical Electrical Characteristics

Figure 1 Switching Test Circuit

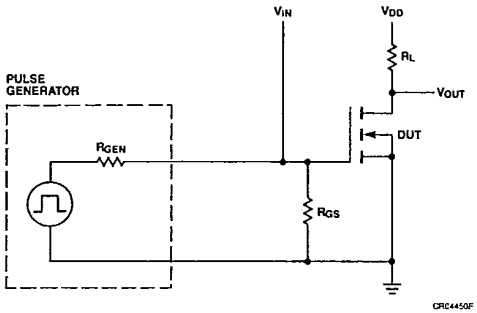
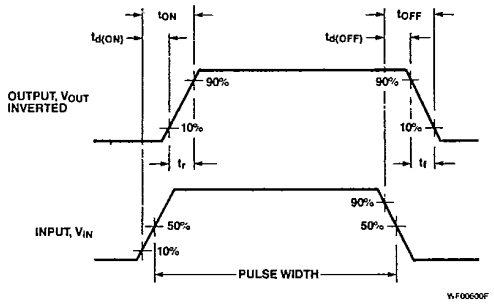


Figure 2 Switching Waveforms



Typical Performance Curves

Figure 3 Output Characteristics

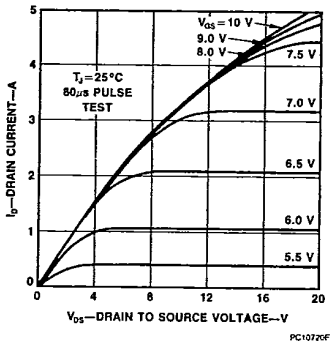


Figure 4 Static Drain to Source Resistance vs Drain Current

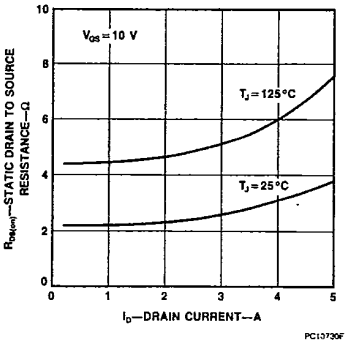


Figure 5 Transfer Characteristics

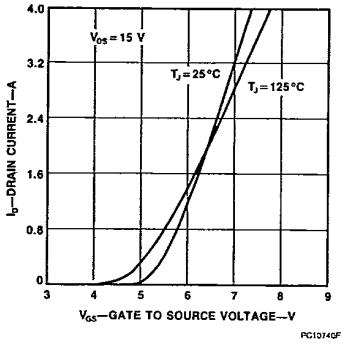
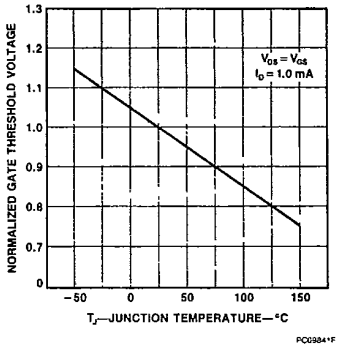


Figure 6 Temperature Variation of Gate to Source Threshold Voltage



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Typical Performance Curves (Cont.)

Figure 7 Capacitance vs Drain to Source Voltage

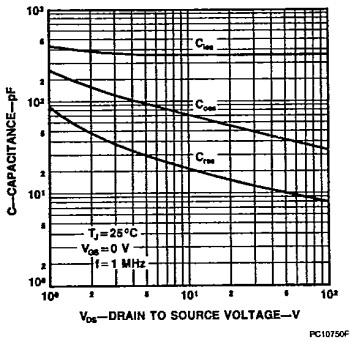


Figure 8 Gate to Source Voltage vs Total Gate Charge

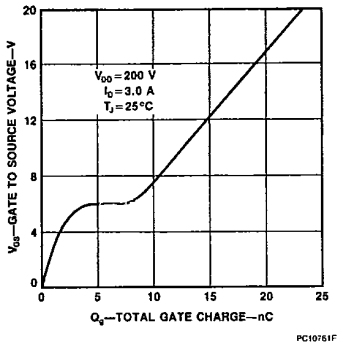


Figure 9 Forward Biased Safe Operating Area for IRF420-423 and IRF820-823

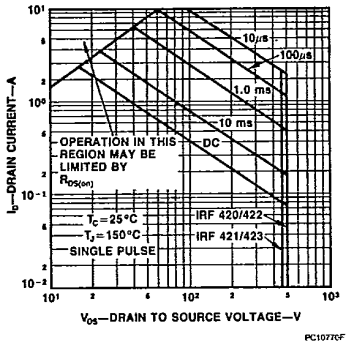


Figure 10 Transient Thermal Resistance vs Time for IRF420-423 and IRF820-823

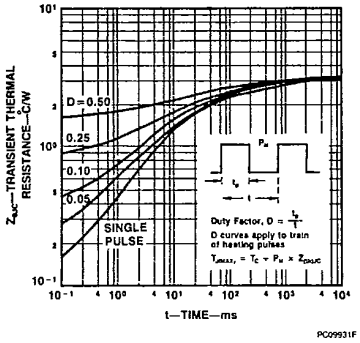


Figure 11 Forward Biased Safe Operating Area for MTP2N45/2N50

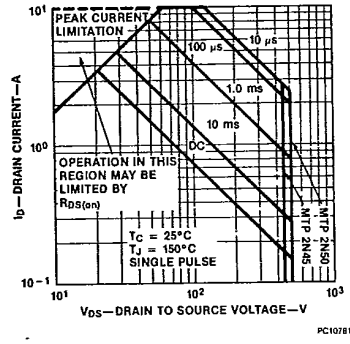
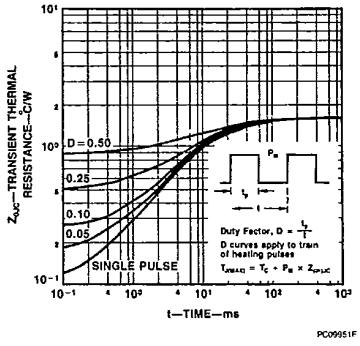


Figure 12 Transient Thermal Resistance vs Time for MTP2N45/2N50



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