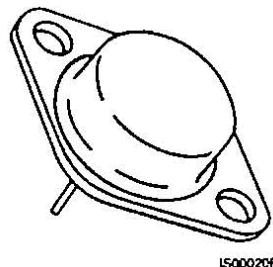


Description

These devices are n-channel, enhancement mode, power MOSFETs designed especially for high voltage, high speed applications, such as off-line switching power supplies, UPS, AC and DC motor controls, relay and solenoid drivers.

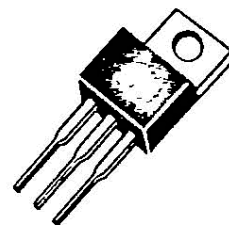
- V_{GS} Rated at $\pm 20V$
- Silicon Gate for Fast Switching Speeds
- I_{DSS} , $V_{DS(on)}$, SOA and $V_{GS(th)}$ Specified at Elevated Temperature
- Rugged

TO-204AA



IRF440
 IRF441
 IRF442
 IRF443
 MTM7N45
 MTM7N50

TO-220AB



IRF840
 IRF841
 IRF842
 IRF843

Maximum Ratings

Symbol	Characteristic	Rating IRF440/442 IRF840/842 MTM7N50	Rating IRF441/443 IRF841/843 MTM7n45	Unit
V_{DSS}	Drain to Source Voltage	500	450	V
V_{DGR}	Drain to Gate Voltage $R_{GS}=20k\ \Omega$	500	450	V
V_{GS}	Gate to Source Voltage	± 20	± 20	V
T_J, T_{stg}	Operating Junction and Storage Temperature	-50 to +150	-50 to +150	
TL	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5S	275	275	

Maximum On-State Characteristics

		IRF440/441 IRF840/841	IRF442/443 IRF842/843	MTM7N45 MTM7N50	
$R_{DS(on)}$	Static Drain-to-Source On Resistance	0.85	1.1	0.8	Ω
I_D	Drain Current Continuous Pulsed	8 32	7 28	7 40	A

Maximum Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.0	1.0	0.83	/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	60	60	60	/W
P_D	Total Power Dissipation at $T_c=25$	125	125	150	W

Notes

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



IRF440-443/IRF840-843
MTM7N45/7N50
N-Channel Power MOSFETs
8A, 450V/500V

Electrical Characteristics (Tc=25 unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
Off Characteristics					
V _{(BR)DSS}	Drain Source Breakdown Voltage1			V	V _{GS} =0V, I _D =250μA
	IRF440/442/840/842	500			
	IRF441/443/842/843	450			
I _{DSS}	Zero Gate Voltage Drain Current		250	μA	V _{DS} =Rated V _{DSS} , V _{GS} =0V
			100	μA	V _{DS} =0.8 x Rated V _{DSS} , V _{GS} =0V, Tc=125
I _{GSS}	Gate-Body Leakage Current			nA	V _{GS} =±20V, V _{DS} =0V
	IRF440-443		±100		
	IRF840-843		±500		
On Characteristics					
V _{GS(th)}	Gate Threshold Voltage	2.0	4.0	V	I _D =250μA, V _{DS} =V _{GS}
R _{DS(on)}	Static Drain-Source On-Resistance 2			Ω	V _{GS} =10V, I _D =4.0A
	IRF440/441/840/841		0.85		
	IRF442/443/842/843		1.10		
g _{fs}	Forward Transconductance	4.0		S(Ω)	V _{DS} =10V, I _D =4.0A
Dynamic Characteristics					
C _{iss}	Input Capacitance		1600	pF	V _{DS} =25V, V _{GS} =0V f=1.0MHz
C _{oss}	Output Capacitance		350	pF	
Cr _{ss}	Reverse Transfer Capacitance		150	pF	
Switching Characteristics (Tc=25 , Figure 9, 10)					
t _{d(on)}	Turn-On Delay Time		35	ns	V _{DD} =220V, I _D =4.0A V _{GS} =10V, R _{GEN} =4.7 Ω R _{GS} =4.7 Ω
t _r	Rise Time		15	ns	
t _{d(off)}	Turn-Off Delay Time		90	ns	
t _f	Fall Time		30	ns	
Q _g	Total Gate Charge		60	nC	V _{GS} =10V, I _D =12A V _{DD} =400V
Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V _{SD}	Diode Forward Voltage		2.0	V	I _S =8.0A; V _{GS} =0V
	IRF440/441/840/841		1.9	V	I _S =7.0A; V _{GSA} =0V
	IRF442/443/842/843				
t _{rr}	Reverse Recovery Time	700		ns	I _S =8.0A; dI _S /dt=100A/μs

Notes

1. T_J=+25 to +150
2. Pulse test: Pulse width ≤80μs, Duty cycle ≤ 1%



IRF440-443/IRF840-843
MTM7N45/7N50
N-Channel Power MOSFETs
8A, 450V/500V

Electrical Characteristics (Tc=25 unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit	Test Conditions
Off Characteristics					
V _{(BR)DSS}	Drain Source Breakdown Voltage1 MTM7N50 MTM7N45			V	V _{GS} =0V, I _D =5.0mA
		500			
		450			
I _{DSS}	Zero Gate Voltage Drain Current		0.25	mA	V _{DS} =0.85 x Rated V _{DSS} , V _{GS} =0V
			2.5	mA	V _{DS} =0.85 x Rated V _{DSS} , V _{GS} =0V, T _c =100
I _{GSS}	Gate-Body Leakage Current		±500	nA	V _{GS} =±20V, V _{DS} =0V
On Characteristics					
V _{GS(th)}	Gate Threshold Voltage	2.0	4.5	V	I _D =1.0mA, V _{DS} =V _{GS}
		1.5	4.0	V	I _D =1.0mA, V _{DS} =V _{GS} T _C =100
R _{DS(on)}	Static Drain-Source On-Resistance2		0.8	Ω	V _{GS} =10V, I _D =3.5A
V _{DS(on)}	Drain-Source On-Voltage2		2.8	V	V _{GS} =10V, I _D =3.5A
			7.0	V	V _{GS} =10V, I _D =7.0A
			5.6	V	V _{GS} =10V, I _D =3.5A T _c =100
g _{fs}	Forward Transconductance	4.0		S(Ω)	V _{DS} =10V, I _D ≈4.0A
Dynamic Characteristics					
C _{iss}	Input Capacitance		1800	pF	V _{DS} =25V, V _{GS} =0V f=1.0MHz
C _{oss}	Output Capacitance		350	pF	
C _{rss}	Reverse Transfer Capacitance		150	pF	
Switching Characteristics (T _c =25℃, Figure 9,10) ³					
t _{d(on)}	Turn-On Delay Time		60	ns	V _{DD} =25V, I _D =3.5A V _{GS} =10V, R _{GEN} =50 Ω R _{GS} =50 Ω
t _r	Rise Time		150	ns	
t _{d(off)}	Turn-Off Delay Time		200	ns	
t _f	Fall Time		120	ns	
Q _g	Total Gate Charge		60	nC	V _{GS} =10V, I _D =12A V _{DD} =400V

Notes

1. T_J=+25 to +150
2. Pulse test: Pulse width ≤ 80μs, Duty cycle ≤ 1%
3. Switching time measurements performed on LEM TR-58 test equipment

Typical Performance Curves

Figure 1 Output Characteristics

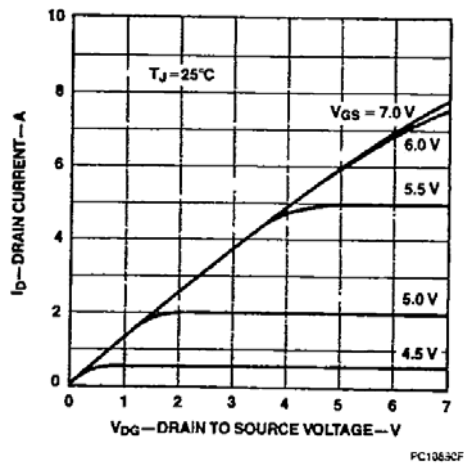


Figure 2 Static Drain to Source Resistance vs Drain Current

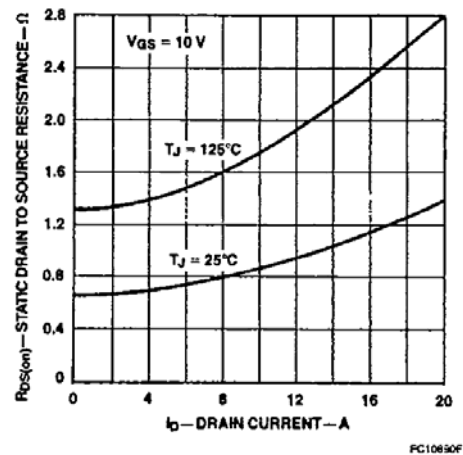


Figure 3 Transfer Characteristics

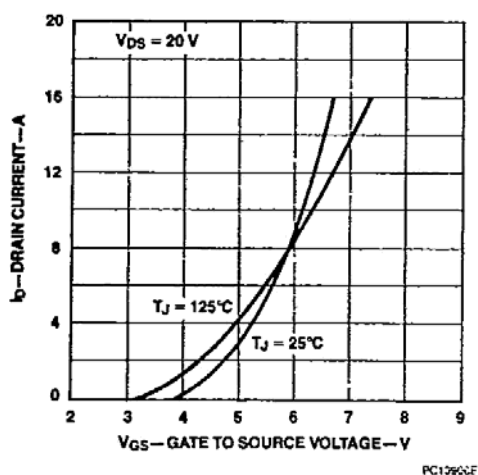


Figure 4 Temperature Variation of Gate to Source Threshold Voltage

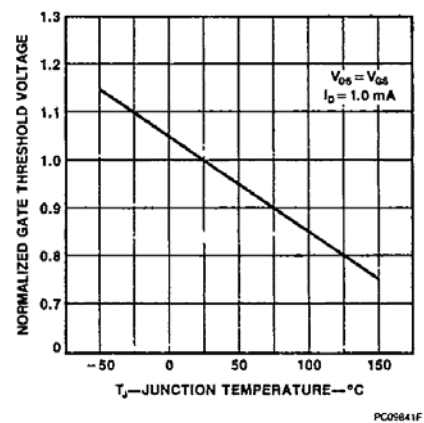


Figure 5 Capacitance vs Drain to Source Voltage

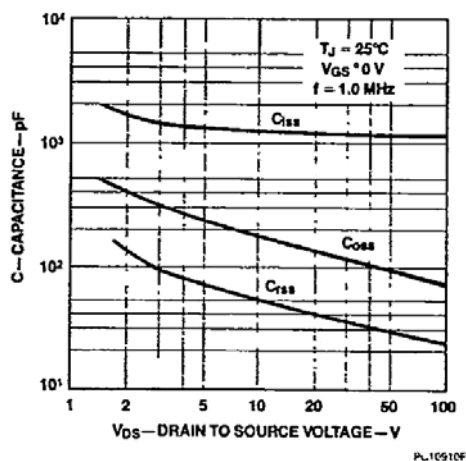
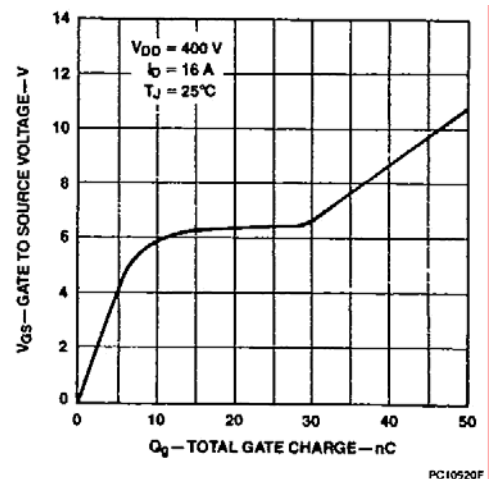


Figure 6 Gate to Source Voltage vs Total Gate Charge



Typical Performance Curves (Cont.)

Figure 7 Forward Biased Safe Operating Area Curves

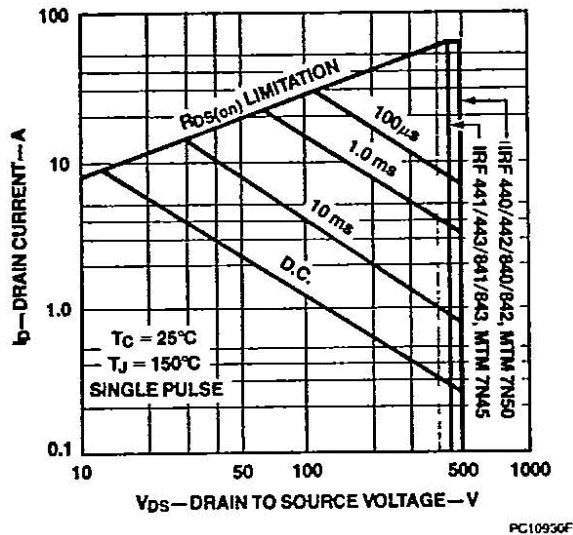
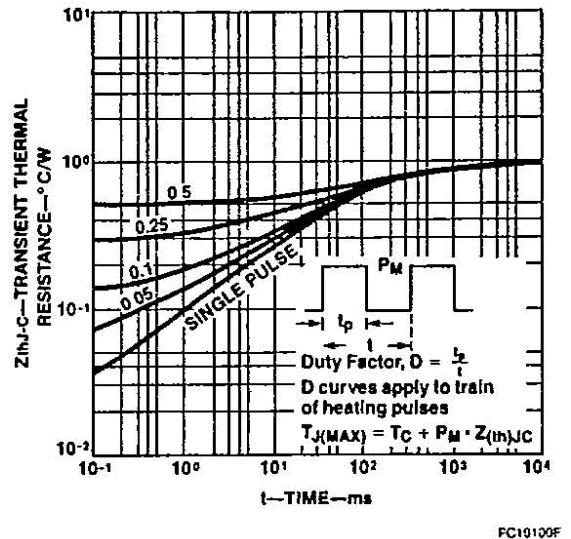


Figure 8 Transient Thermal Resistance vs Time



Typical Electrical Characteristics

Figure 9 Switching Test Circuit

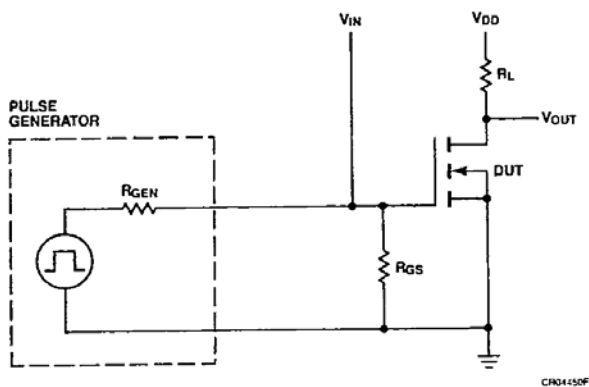


Figure 10 Switching Waveforms

