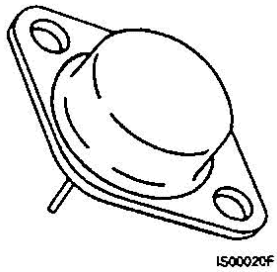
IRF440-443/IRF840-843
MTM7N45/7N50
N-Channel Power MOSFETs
8A, 450V/500V

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.

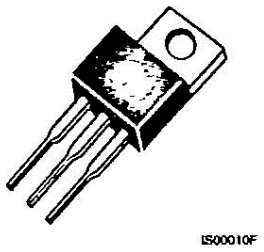
- V_{GS} Rated at ±20V
- Silicon Gate for Fast Switching Speeds
- I_{DSS}, $V_{DS(on)}$, S_{OA} and $V_{GS(th)}$ Specified at Elevated Temperature
- Rugged

TO-204AA



IRF440
IRF441
IRF442
IRF443
MTM7N45
MTTM7N50

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 Ω	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	°C
TL	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5S	275	275	°C

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	°C/W
$R_{\Theta JA}$	Thermal Resistance, Junction to Ambient	60	60	60	°C/W
P_D	Total Power Dissipation at Tc=25°C	125	125	150	W

Notes

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

Electrical Characteristics (Tc=25°C 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°C
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		
gfs	Forward Transconductance	4.0		S(℧)	V_{DS}=10V, I_D=4.0A
Dynamic Characteristics					
Ciss	Input Capacitance		1600	pF	V_{DS}=25V, V_{GS}=0V f=1.0MHz
Coss	Output Capacitance		350	pF	
Crss	Reverse Transfer Capacitance		150	pF	
Switching Characteristics (Tc=25°C, Figure 9, 10)					
td(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
tr	Rise Time		15	ns	
td(off)	Turn-Off Delay Time		90	ns	
tf	Fall Time		30	ns	
Qg	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				
trr	Reverse Recovery Time	700		ns	Is=8.0A; dI_S/dt=100A/μs

Notes

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

Electrical Characteristics (Tc=25°C 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=5.0mA
	MTM7N50	500			
	MTM7N45	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, Tc=100°C
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°C
$R_{DS(on)}$	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 Tc=100°C
gfs	Forward Transconductance	4.0		S(℧)	V_{DS}=10V, I_D≈4.0A
Dynamic Characteristics					
Ciss	Input Capacitance		1800	pF	V_{DS}=25V, V_{GS}=0V f=1.0MHz
Coss	Output Capacitance		350	pF	
Crss	Reverse Transfer Capacitance		150	pF	
Switching Characteristics (Tc=25°C, Figure 9,10)[3]					
td(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
tr	Rise Time		150	ns	
td(off)	Turn-On Delay Time		200	ns	
tf	Fall Time		120	ns	
Qg	Total Gate Charge		60	nC	V_{GS}=10V, I_D=12A V_{DD}=400V

Notes

1. TJ=+25°C to +150°C
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

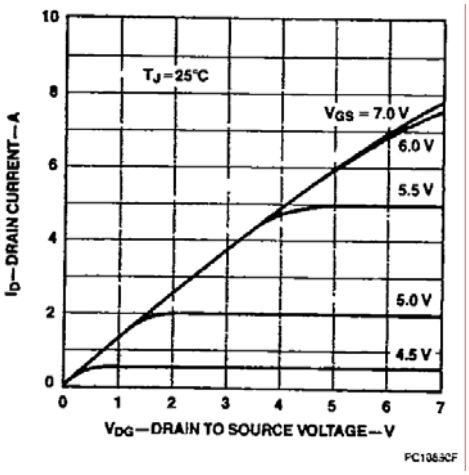


Figure 2 Static Drain to Source Resistance vs Drain Current

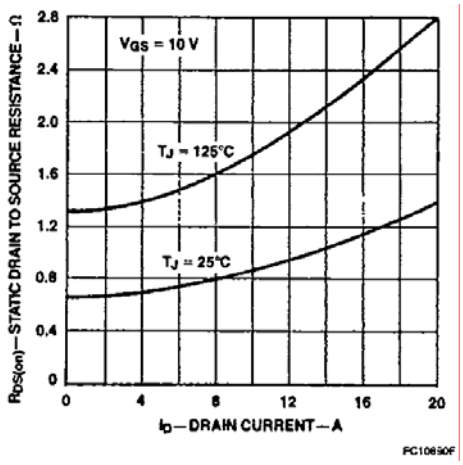


Figure 3 Transfer Characteristics

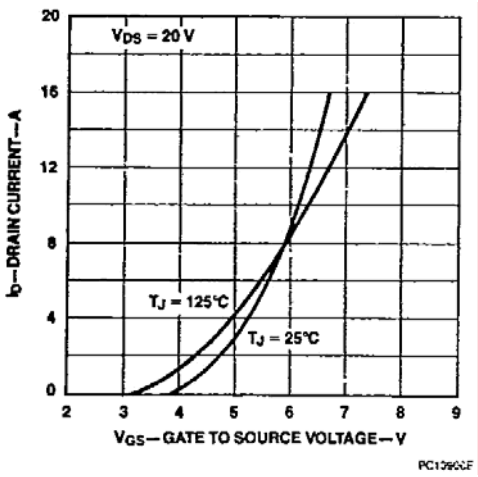


Figure 4 Temperature Variation of Gate to Source Threshold Voltage

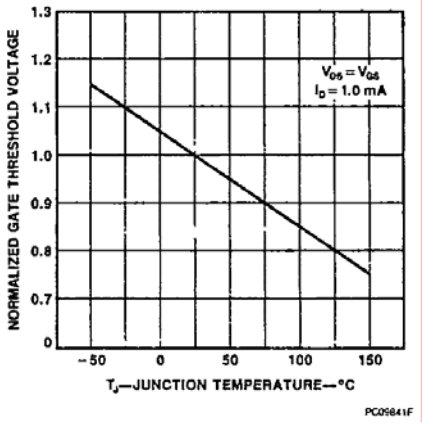


Figure 5 Capacitance vs Drain to Source Voltage

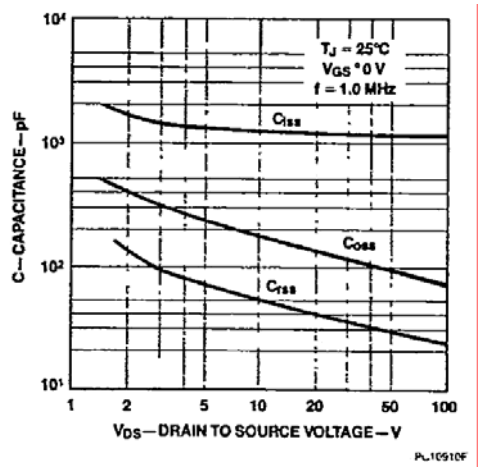
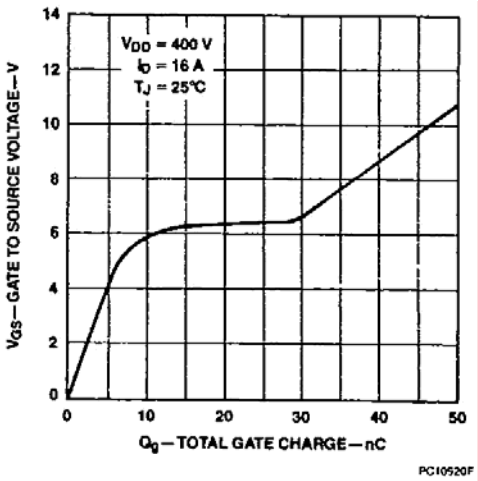


Figure 6 Gate to Source Voltage vs Total Gate Charge



Typical Performance Curves (Cont.)

Figure 7 Forward Biased Safe Operating Area Curves

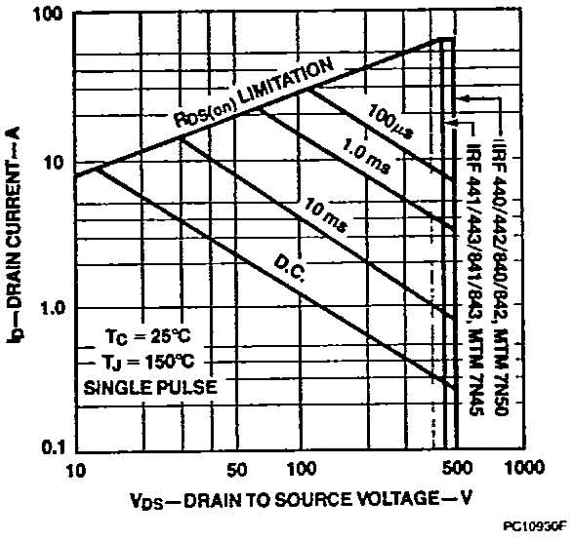
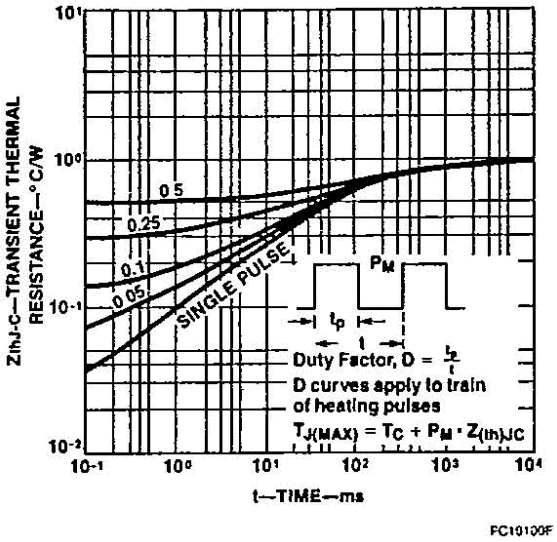


Figure 8 Transient Thermal Resistance vs Time



Typical Electrical Characteristics

Figure 9 Switching Test Circuit

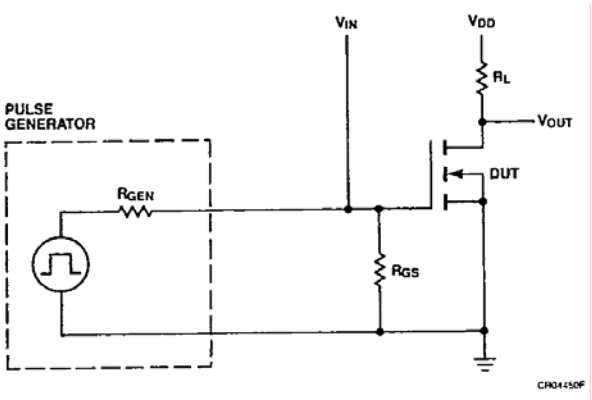


Figure 10 Switching Waveforms