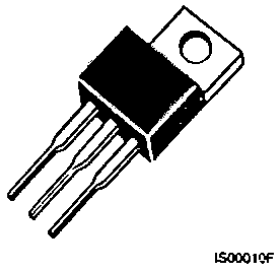
IRL510-513
N-Channel Power Mosfets

Description

The 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
- Sillcon Gate for Fast Switching Speeds
- I_{DSS}, $V_{DS(on)}$, Specified at Elevated Temperature
- Rugged
- Low Drive Requirements
- Ease of Parallelling

TO-220AB



IRF510
IRF511
IRF512
IRF513
MTP4N08
MTP4N10

Maximum Ratings

Symbol	Characteristic	Rating IRF510/512 MTP4N10	Rating MTP4N08	Rating IRF511/513	Unit
V_{DSS}	Drain to Source Voltage 1	100	80	60	V
V_{DGR}	Drain to Gate Voltage 1 R_{GS}=20k Ω	100	80	60	V
V_{GS}	Gate to Source Voltage	±20	±20	±20	V
TJ, Tstg	Operating Junction and Storage Temperatures	-55 to +150	-55 to +150	-55 to +150	°C
TL	Maximum Lead Temperature for Soldering Purposes, 1/8" From Case for 5s	275	275	275	°C
Maximum On-State Characteristics					
		IRF510/511	**IRF512/513**	**MTP4N08/10**	
$R_{DS(on)}$	Static Drain-to-Source On Resistance	0.60	0.80	0.80	Ω
I_D	Drain Current Continuous at Tc=25°C Continuous at Tc=100°C Pulsed	 4.0 2.5 16	 3.5 2.0 14	 5.0 3.5 14	A
Maximum Thermal Characteristics					
$R_{\theta JC}$	Thermal Resistance Junction to Case	6.4	6.4	2.5	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	80	80	80	°C/W
P_D	Total Power Dissipation at Tc=25°C	20	20	50	W

Notes

For information concerning connection dregram 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
	IRF510/512/MTP4N10	100			
	MTP4N08	80			
	IRF511/513	60			
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		±500	nA	V_{GS}=±20V, V_{DS}=0V
On Characteristics					
$V_{GS(th)}$	Gate Threshold Voltage			V	
	IRF510-513	2.0	4.0		I_D=250μA,V_{DS}=V_{GS}
	MTP4N08/10	2.0	4.5		I_D=1mA, V_{DS}=V_{GS}
$R_{DS(on)}$	Static Drain-Source On-Resistance[2]			Ω	V_{GS}=10V, I_D=2.0A
	IRF510/511		0.60		
	IRF512/513/MTP4N08/4N10		0.80		
$V_{DS(on)}$	Drain-Source On-Voltage [2]		4.8	V	V_{GS}=10V; I_D=4.0A
	MTP4N08/4N10		3.2	V	V_{GS}=10V; I_D=2.0A; T_C=100°C
g_{fs}	Forward Transconductance	1.0		S(℧)	V_{DS}=10V, I_D=2.0A
Dynamic Characteristics					
C_{iss}	Input Capacitance		200	pF	V_{DS}=25V, V_{GS}=0V F=1.0MHz
C_{oss}	Output Capacitance		100	pF	
C_{rss}	Reverse Transfer Capacitance		30	pF	
Switching Characteristics (Tc=25°C, Figure 11,12)[3]					
td(on)	Turn-On Delay Time		20	ns	V_{DD}=50V, I_D=2.0A
tr	Rise Time		25	ns	V_{GS}=10V, R_{GEN}=50 Ω
td(off)	Turn-Off Delay Time		25	ns	R_{GS}=50 Ω
tf	Fall Time		20	ns	
Qg	Total Gate Charge		7.5	nC	V_{GS}=10V, I_D=8.0A V_{DD}=40V

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

Symbol	Characteristic	Typ	Max	Unit	Test Conditions
Source-Drain Diode Characteristics					
V_{SD}	Diode Forward Voltage			V	
	IRF510/511		2.5		I_S=4.0A; V_{GS}=0V
	IRF512/513		2.0		I_S=3.5A; V_{GS}=0V
trr	Reverse Recovery Time	230		ns	I_S=4.0A; DI_S/dt=25A/μS

Notes

1. T_J=+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

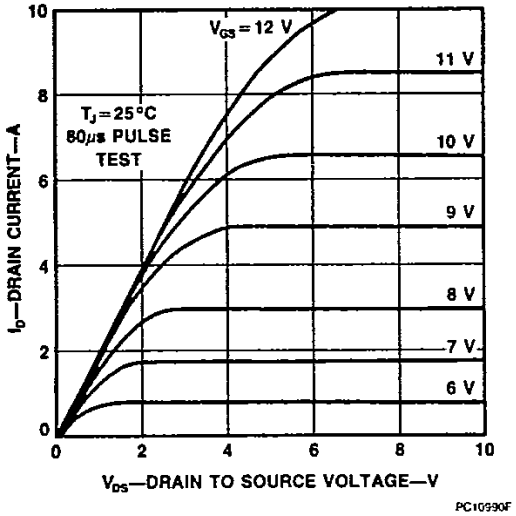


Figure 2 Static Drain to Source Resistance vs Drain Current

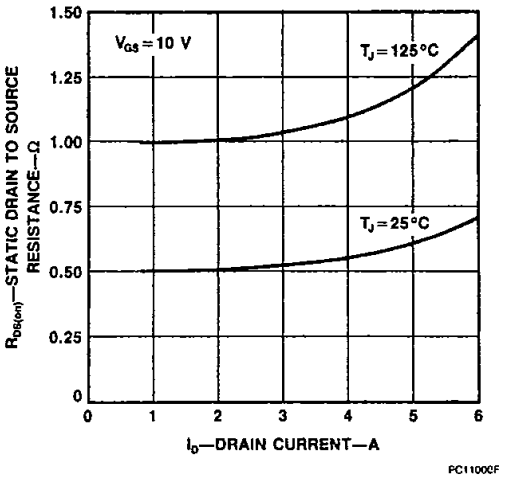


Figure 3 Transfer Characteristics

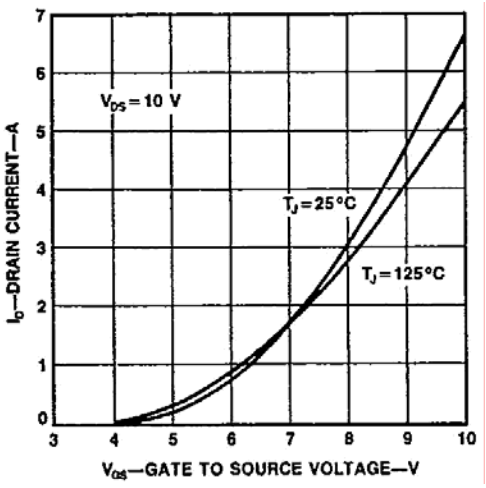
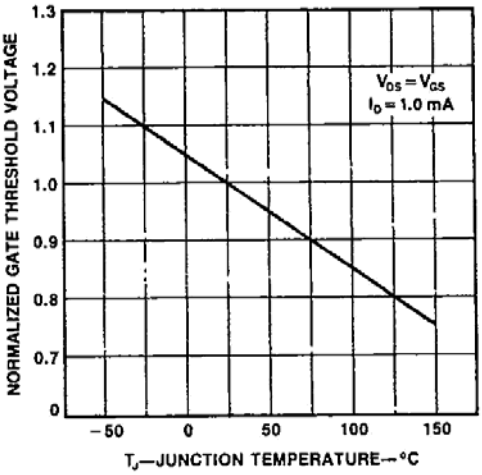


Figure 4 Temperature Variation of Gate to Source Threshold Voltage



Typical Performance Curves (Cont.)

Figure 5 Capacitance vs Drain to Source Voltage

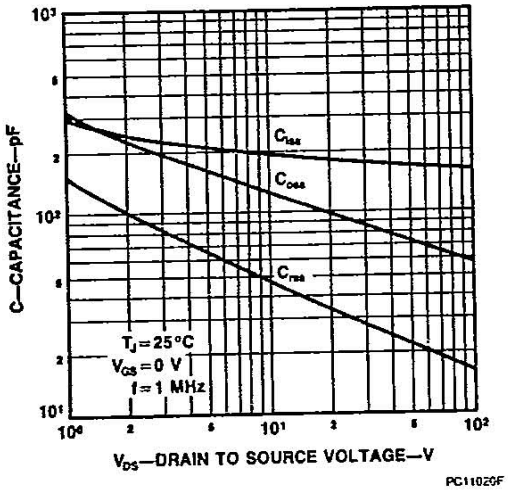


Figure 6 Gate to Source Voltage vs Total Gate Charge

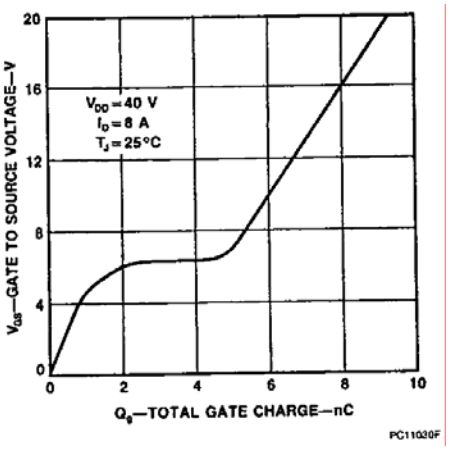


Figure 7 Forward Biased Operating Area for MTP4N08/4N10

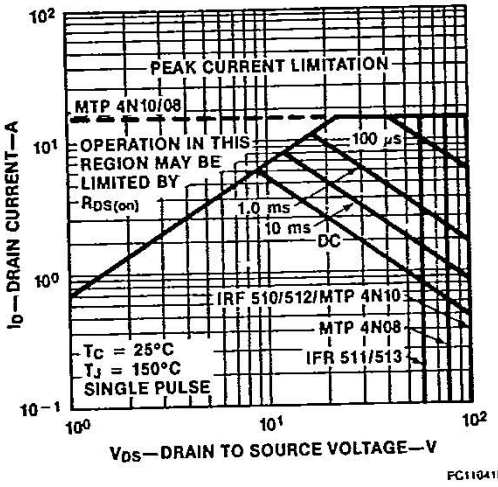


Figure 8 Transient Thermal Resistance vs Time for MTP4N08/4N10

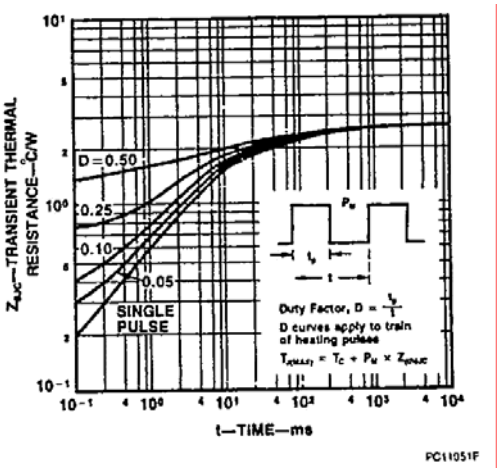


Figure 9 Forward Blased Safe Operating Area For IRF510-513

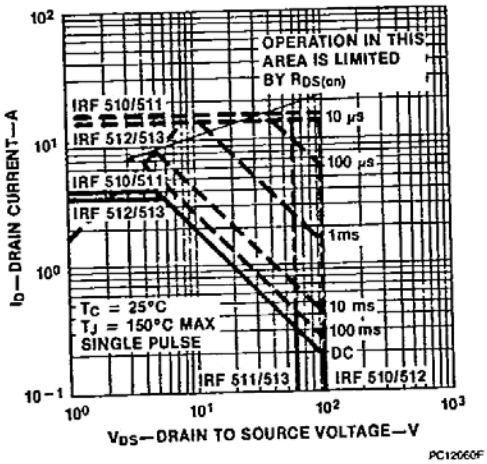
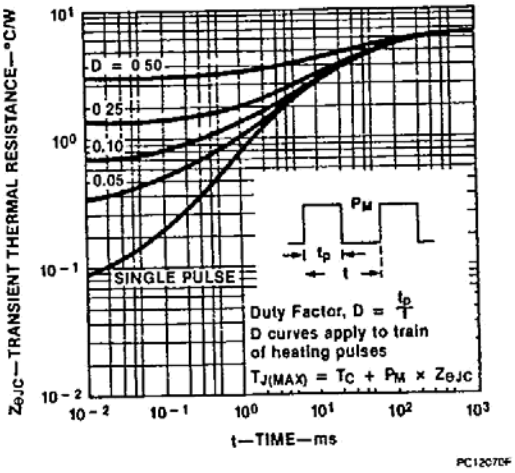


Figure 10 Transiant Thermal Resistance vs Time For IRF510-513



Typical Electrical Characteristics

Figure 11 Switching Test Circuit

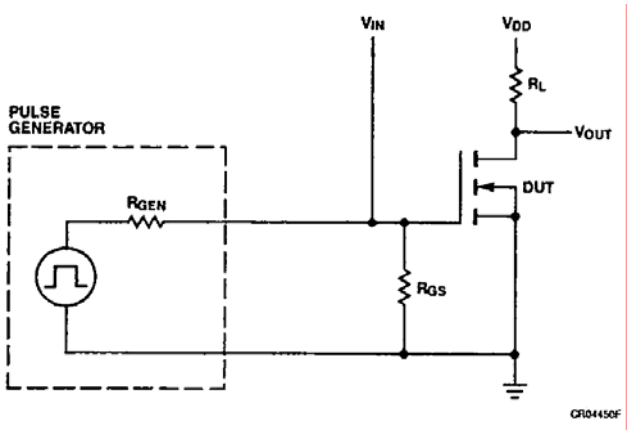


Figure 12 Switching Waveforms