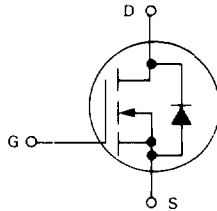


**IRF510**  
**IRF511**  
**IRF512**  
**IRF513**

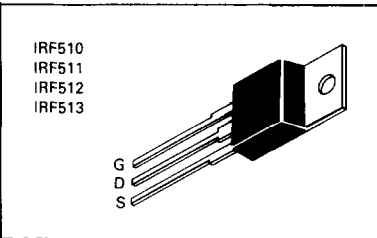
**N-CHANNEL ENHANCEMENT-MODE SILICON GATE  
 TMOS POWER FIELD EFFECT TRANSISTOR**

These TMOS Power FETs are designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

- Silicon Gate for Fast Switching Speeds
- Rugged — SOA is Power Dissipation Limited
- Source-to-Drain Diode Characterized for Use With Inductive Loads



Part Number	V <sub>DS</sub>	r <sub>DS(on)</sub>	I <sub>D</sub>
IRF510	100 V	0.6 Ω	4.0 A
IRF511	60 V	0.6 Ω	4.0 A
IRF512	100 V	0.8 Ω	3.5 A
IRF513	60 V	0.8 Ω	3.5 A



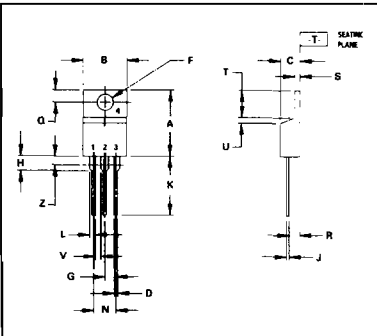
**MAXIMUM RATINGS**

Rating	Symbol	IRF				Unit
		510	511	512	513	
Drain-Source Voltage	V <sub>DSS</sub>	100	60	100	60	Vdc
Drain-Gate Voltage (R <sub>GS</sub> = 1.0 MΩ)	V <sub>DGR</sub>	100	60	100	60	Vdc
Gate-Source Voltage	V <sub>GS</sub>	= 20				Vdc
Continuous Drain Current T <sub>C</sub> = 25°C	I <sub>D</sub>	4.0	4.0	3.5	3.5	Adc
Continuous Drain Current T <sub>C</sub> = 100°C	I <sub>D</sub>	2.5	2.5	2.0	2.0	Adc
Drain Current Pulsed	I <sub>DM</sub>	16	16	14	14	Adc
Total Power Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	20 0.16				Watts W/°C
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150				°C

**THERMAL CHARACTERISTICS**

Thermal Resistance Junction to Case Junction to Ambient	R <sub>θJC</sub> R <sub>θJA</sub>	6.4 62.5	°C/W
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T <sub>L</sub>	300	°C

See the MTP6N10 Designer's Data Sheet for a complete set of design curves for this product.



- NOTES  
 1 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M 1982  
 2 CONTROLLING DIMENSION: INCH  
 3 DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED  
 STYLE 5  
 PIN 1 GATE  
 2 DRAIN  
 3 SOURCE  
 4 DRAIN

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.48	15.75	0.573	0.620
B	9.56	10.28	0.380	0.405
C	4.07	4.52	0.160	0.180
D	0.64	0.98	0.025	0.039
F	3.61	3.73	0.142	0.147
G	2.42	2.56	0.095	0.101
H	2.90	3.03	0.113	0.120
J	0.38	0.55	0.014	0.022
K	12.70	14.27	0.500	0.561
L	1.15	1.39	0.045	0.055
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.15	1.39	0.045	0.055
T	5.97	6.47	0.235	0.255
U	0.38	1.17	0.014	0.046
V	1.15	—	0.045	—
Z	—	3.04	—	0.120

**CASE 221A-04**  
**TO-220AB**

# IRF510-513

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-Source Breakdown Voltage (V <sub>GS</sub> = 0, I <sub>D</sub> = 250 μA)	V <sub>(BR)DSS</sub>	100 60	—	—	Vdc
Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0 V, V <sub>DS</sub> = Rated V <sub>DSS</sub> ) (V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 0.8 Rated V <sub>DSS</sub> , T <sub>C</sub> = 125°C)	I <sub>DSS</sub>	—	—	0.25 1.0	mAdc
Forward Gate-Body Leakage Current (V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0)	I <sub>GSSF</sub>	—	—	100	nAdc
Reverse Gate-Body Leakage Current (V <sub>GS</sub> = -20 V, V <sub>DS</sub> = 0)	I <sub>GSSR</sub>	—	—	-100	nAdc

### ON CHARACTERISTICS\*

Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA)	V <sub>GS(th)</sub>	2.0	—	4.0	Vdc
On-State Drain Current (V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 10 V)	I <sub>D(on)</sub>	4.0 3.5	—	—	Adc
Static Drain-Source On-Resistance (V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.0 A)	r <sub>DS(on)</sub>	—	—	0.6 0.8	Ohms
Forward Transconductance (V <sub>DS</sub> = 15 V, I <sub>D</sub> = 2.0 A)	g <sub>FS</sub>	1.0	—	—	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0, f = 1.0 MHz)	C <sub>iss</sub>	—	—	150	pF
Output Capacitance		C <sub>oss</sub>	—	—	100	
Reverse Transfer Capacitance		C <sub>rss</sub>	—	—	25	

### SWITCHING CHARACTERISTICS\* (T<sub>J</sub> = 100°C)

Turn-On Delay Time	V <sub>DD</sub> = 0.5 V <sub>DSS</sub> , I <sub>D</sub> = 2.0 A Z <sub>o</sub> = 50 Ω	t <sub>d(on)</sub>	—	—	20	ns
Rise Time		t <sub>r</sub>	—	—	25	
Turn-Off Delay Time		t <sub>d(off)</sub>	—	—	25	
Fall Time		t <sub>f</sub>	—	—	20	

### SOURCE DRAIN DIODE CHARACTERISTICS\*

Characteristic	Symbol	Typ	Unit
Forward On-Voltage	V <sub>SD</sub>	2.0	Vdc
Forward Turn-On Time	t <sub>on</sub>	Limited by stray inductance	
Reverse Recovery Time	t <sub>rr</sub>	230	ns

### INTERNAL PACKAGE INDUCTANCE (TO-220)

Characteristic	Symbol	Min	Typ	Max	Unit
Internal Drain Inductance (Measured from the contact screw on tab to center of die) (Measured from the drain lead 0.25" from package to center of die)	L <sub>d</sub>	—	3.5 4.5	—	nH
Internal Source Inductance (Measured from the source lead 0.25" from package to source bond pad.)	L <sub>s</sub>	—	7.5	—	

\*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0 %.

## RESISTIVE SWITCHING

FIGURE 1 — SWITCHING TEST CIRCUIT

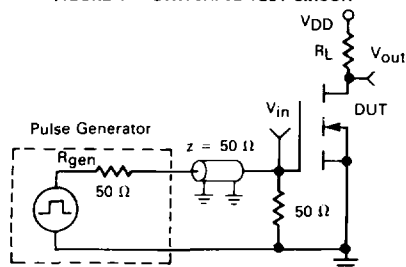


FIGURE 2 — SWITCHING WAVEFORMS

