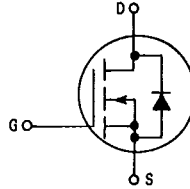


**MOTOROLA**  
**SEMICONDUCTOR**  
TECHNICAL DATA

**Power Field Effect Transistors**  
**N-Channel Enhancement-Mode**  
**Silicon Gate TMOS**

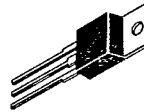
These TMOS Power FETs are designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

- Silicon Gate for Fast Switching Speeds
- Low  $r_{DS(on)}$  to Minimize On-Losses
- Rugged — SOA is Power Dissipation Limited
- Source-to-Drain Diode Characterized for Use With Inductive Loads



**IRFZ40**  
**IRFZ42**

TMOS POWER FETs  
46 and 51 AMPERES  
 $r_{DS(on)} = 0.028 \text{ OHM}$   
50 VOLTS  
 $r_{DS(on)} = 0.035 \text{ OHM}$



CASE 221A-04  
TO-220AB

**MAXIMUM RATINGS**

Rating	Symbol	Device		Unit
		IRFZ40	IRFZ42	
Drain-Source Voltage	$V_{DSS}$	50		Vdc
Drain-Gate Voltage ( $R_{GS} = 1 \text{ M}\Omega$ )	$V_{DGR}$	50		Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 20$		Vdc
Drain Current — Continuous @ $T_C = 25^\circ\text{C}$	$I_D$	51	46	Adc
— Continuous @ $T_C = 100^\circ\text{C}$		32	29	
— Pulsed @ $T_C = 25^\circ\text{C}$	$I_{DM}$	160	145	
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	$P_D$	125		Watts
Derate above $25^\circ\text{C}$		1		$\text{W}/^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-65 to 150		$^\circ\text{C}$

**THERMAL CHARACTERISTICS**

Thermal Resistance — Junction to Case	$R_{\theta JC}$	1	$^\circ\text{C}/\text{W}$
— Junction to Ambient	$R_{\theta JA}$	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 5 Seconds	$T_L$	300	$^\circ\text{C}$

See the MTP50N05E Designer's Data Sheet for a complete set of design curves for these devices.

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Drain-Source Breakdown Voltage (V <sub>GS</sub> = 0, I <sub>D</sub> = 0.25 mA)	V <sub>(BR)DSS</sub>	50	—	Vdc
Zero Gate Voltage Drain Current (V <sub>DS</sub> = Rated V <sub>DSS</sub> , V <sub>GS</sub> = 0) (V <sub>DS</sub> = 0.8 Rated V <sub>DSS</sub> , V <sub>GS</sub> = 0, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	—	0.2 1	mAdc
Gate-Body Leakage Current, Forward (V <sub>GSS</sub> = 20 Vdc, V <sub>DS</sub> = 0)	I <sub>GSSF</sub>	—	100	nAdc
Gate-Body Leakage Current, Reverse (V <sub>GSR</sub> = 20 Vdc, 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> = 0.25 mA)	V <sub>GS(th)</sub>	2	4	Vdc
Static Drain-Source On-Resistance (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 29 Adc)	r <sub>DS(on)</sub> IRFZ40 IRFZ42	—	0.028 0.035	Ohm
On-State Drain Current (V <sub>GS</sub> = 10 V) (V <sub>DS</sub> ≥ 1.4 Vdc) (V <sub>DS</sub> ≥ 1.6 Vdc)	I <sub>D(on)</sub> IRFZ40 IRFZ42	51 45	—	Adc
Forward Transconductance (V <sub>DS</sub> ≥ 1.4 V, I <sub>D</sub> = 29 A) (V <sub>DS</sub> ≥ 1.6 V, I <sub>D</sub> = 29 A)	g <sub>FS</sub> IRFZ40 IRFZ42	17 17	—	mhos

**DYNAMIC CHARACTERISTICS**

Input Capacitance	C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	—	3000 1200 400	pF
Output Capacitance				
Reverse Transfer Capacitance				

(V<sub>DS</sub> = 25 V, V<sub>GS</sub> = 0, f = 1 MHz)

**SWITCHING CHARACTERISTICS\***

Turn-On Delay Time	t <sub>d(on)</sub> t <sub>r</sub> t <sub>d(off)</sub> t <sub>f</sub>	—	25 60 70 25	ns
Rise Time				
Turn-Off Delay Time				
Fall Time				
Total Gate Charge	Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	40 (Typ)	60	nC
Gate-Source Charge				
Gate-Drain Charge				

(V<sub>DD</sub> = 25 V, I<sub>D</sub> = 29 Apk, R<sub>gen</sub> = Ohms)  
(V<sub>DS</sub> = 0.8 Rated V<sub>DSS</sub>, V<sub>GS</sub> = 10 Vdc, I<sub>D</sub> = Rated I<sub>D</sub>)

**SOURCE-DRAIN DIODE CHARACTERISTICS\***

Forward On-Voltage	V <sub>SD</sub>	1.3 (Typ)	2.2 <sup>(1)</sup>	Vdc
Forward Turn-On Time				
Reverse Recovery Time				

(I<sub>S</sub> = Rated I<sub>D</sub>, V<sub>GS</sub> = 0)

\*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.  
(1) Add 0.3 V for IRFZ40.

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

STYLE 6:  
1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1987.  
2. CONTROLLING DIMENSION IS INCH.  
3. DIM Z DIMINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.48	15.75	0.570	0.620
B	8.65	10.78	0.340	0.425
C	4.07	4.82	0.160	0.190
D	0.64	0.98	0.025	0.039
E	3.01	3.77	0.118	0.148
F	2.42	2.98	0.095	0.118
G	2.80	3.83	0.110	0.151
H	0.98	0.65	0.039	0.026
I	12.50	12.17	0.500	0.482
J	1.15	1.28	0.045	0.051
K	6.83	6.31	0.269	0.249
L	2.54	2.04	0.100	0.080
M	2.04	1.73	0.080	0.068
N	1.15	1.28	0.045	0.051
O	5.97	6.47	0.235	0.255
P	0.20	0.27	0.008	0.011
Q	1.15	—	0.045	—
R	—	1.204	—	0.048