

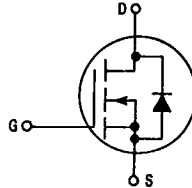
T-39-11

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

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

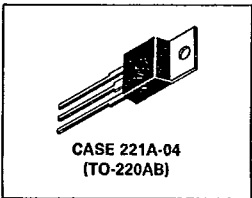
These TMOS Power FETs are designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

- 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



IRFZ30
IRFZ32

TMOS POWER FETs
25 and 30 AMPERES
 $r_{DS(on)} = 0.05 \text{ OHM}$
50 VOLTS
 $r_{DS(on)} = 0.07 \text{ OHM}$



MAXIMUM RATINGS

Rating	Symbol	Device		Unit
		IRFZ30	IRFZ32	
Drain-Source Voltage	V_{DS}	50		Vdc
Drain-Gate Voltage ($R_{GS} = 1 \text{ M}\Omega$)	V_{DGR}	50		Vdc
Gate-Source Voltage	V_{GS}	± 20		Vdc
Drain Current — Continuous @ $T_C = 25^\circ\text{C}$ — Continuous @ $T_C = 100^\circ\text{C}$ — Pulsed @ $T_C = 25^\circ\text{C}$	I_D	30	25	Adc
		19	16	
	I_{DM}	80	60	
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	75 0.6		Watts W/°C
Operating and Storage Temperature Range	T_J, T_{stg}	-65 to 150		°C

THERMAL CHARACTERISTICS

Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$	1.67	°C/W
		62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 5 Seconds	T_L	300	°C

See the MTP30N05E Designer's Data Sheet for a complete set of design curves for the product on this data sheet.

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Drain-Source Breakdown Voltage ($V_{GS} = 0, I_D = 0.25 \text{ mA}$)	$V_{(BR)DSS}$	50	—	Vdc
Zero Gate Voltage Drain Current ($V_{DS} = \text{Rated } V_{DSS}, V_{GS} = 0$) ($V_{DS} = 0.8 \text{ Rated } V_{DSS}, V_{GS} = 0, T_J = 125^\circ\text{C}$)	I_{DSS}	—	0.2 1	mAdc
Gate-Body Leakage Current, Forward ($V_{GSF} = 20 \text{ Vdc}, V_{DS} = 0$)	I_{GSSF}	—	100	nAdc
Gate-Body Leakage Current, Reverse ($V_{GSR} = 20 \text{ Vdc}, V_{DS} = 0$)	I_{GSSR}	—	100	nAdc

ON CHARACTERISTICS*

Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 0.25 \text{ mA}$)	$V_{GS(th)}$	2	4	Vdc
Static Drain-Source On-Resistance ($V_{GS} = 10 \text{ Vdc}, I_D = 16 \text{ Adc}$)	$r_{DS(on)}$	—	0.05 0.07	Ohm
On-State Drain Current ($V_{GS} = 10 \text{ V}$) ($V_{DS} \geq 1.5 \text{ Vdc}$) ($V_{DS} \geq 1.75 \text{ Vdc}$)	$I_D(on)$	30 25	—	Adc
Forward Transconductance ($V_{DS} \geq 1.5 \text{ V}, I_D = 16 \text{ A}$) ($V_{DS} \geq 1.75 \text{ V}, I_D = 16 \text{ A}$)	gFS	9 9	—	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 25 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz})$	C_{iss}	—	1600	pF
Output Capacitance		C_{oss}	—	800	
Reverse Transfer Capacitance		C_{rss}	—	200	

SWITCHING CHARACTERISTICS*

Turn-On Delay Time	$(V_{DD} = 25 \text{ V}, I_D = 16 \text{ Apk}, R_{gen} = 50 \text{ Ohms})$	$t_{d(on)}$	—	25	ns
Rise Time		t_r	—	35	
Turn-Off Delay Time		$t_{d(off)}$	—	45	
Fall Time		t_f	—	35	
Total Gate Charge	$(V_{DS} = 0.8 \text{ Rated } V_{DSS}, V_{GS} = 10 \text{ Vdc}, I_D = \text{Rated } I_D)$	Q_g	26 (Typ)	30	nC
Gate-Source Charge		Q_{gs}	14 (Typ)	—	
Gate-Drain Charge		Q_{gd}	12 (Typ)	—	

SOURCE-DRAIN DIODE CHARACTERISTICS*

Forward On-Voltage	$(I_S = \text{Rated } I_D, V_{GS} = 0)$	V_{SD}	1.2 (Typ)	1.5(1)	Vdc
Forward Turn-On Time		t_{on}	Limited by stray inductance		
Reverse Recovery Time		t_{rr}	150 (Typ)	—	ns

*Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.
(1) Add 0.1 V for IRFZ30.

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

STYLE S, GATE
PIN 1, GATE
2, DRAIN
3, SOURCE
4, DRAIN

MILLIMETERS		INCHES	
DIM	MIN - MAX	MIN	MAX
A	14.48 - 15.25	0.570 - 0.600	
B	8.64 - 10.28	0.340 - 0.405	
C	4.67 - 4.82	0.185 - 0.190	
D	0.64 - 0.98	0.025 - 0.039	
F	3.81 - 3.73	0.150 - 0.147	
G	2.42 - 2.68	0.095 - 0.105	
H	2.80 - 3.83	0.110 - 0.150	
J	4.36 - 4.68	0.172 - 0.184	
K	12.20 - 14.27	0.520 - 0.562	
L	1.15 - 1.39	0.045 - 0.055	
M	4.83 - 5.33	0.190 - 0.212	
N	2.54 - 3.04	0.100 - 0.120	
R	2.04 - 2.78	0.080 - 0.110	
S	1.15 - 1.29	0.045 - 0.050	
T	0.97 - 0.62	0.038 - 0.025	
U	0.00 - 1.27	0.000 - 0.050	
V	2.19 - —	0.085 - —	
Z	— - 2.04	— - 0.080	

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

IRFZ20,22

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
Drain-Source Breakdown Voltage (V _{GS} = 0, I _D = 0.25 mA)	V(BR)DSS	50	—	Vdc
Zero Gate Voltage Drain Current (V _{DS} = Rated V _{DSS} , V _{GS} = 0) (V _{DS} = 0.8 Rated V _{DSS} , V _{GS} = 0, T _J = 125°C)	I _{DSS}	—	0.2 1	mAdc
Gate-Body Leakage Current, Forward (V _{GSF} = 20 Vdc, V _{DS} = 0)	I _{GSSF}	—	100	nAdc
Gate-Body Leakage Current, Reverse (V _{GSR} = 20 Vdc, V _{DS} = 0)	I _{GSSR}	—	100	nAdc

ON CHARACTERISTICS*

Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = 0.25 mA)	V _{GS(th)}	2	4	Vdc
Static Drain-Source On-Resistance (V _{GS} = 10 Vdc, I _D = 9 Adc)	r _{DS(on)}	—	0.1 0.12	Ohm
On-State Drain Current (V _{GS} = 10 V) (V _{DS} ≥ 1.5 Vdc) (V _{DS} ≥ 1.7 Vdc)	I _{D(on)}	15 14	—	Adc
Forward Transconductance (V _{DS} ≥ 1.5 V, I _D = 9 A) (V _{DS} ≥ 1.7 V, I _D = 9 A)	g _{FS}	5 5	—	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	V _{DS} = 25 V, V _{GS} = 0, f = 1 MHz	C _{iss}	—	850	pF
Output Capacitance		C _{oss}	—	350	
Reverse Transfer Capacitance		C _{rss}	—	100	

SWITCHING CHARACTERISTICS*

Turn-On Delay Time	V _{DD} = 25 V, I _D = 9 Apk, R _{gen} = 50 Ohms	t _{d(on)}	—	30	ns
Rise Time		t _r	—	90	
Turn-Off Delay Time		t _{d(off)}	—	40	
Fall Time		t _f	—	30	
Total Gate Charge	V _{DS} = 0.8 Rated V _{DSS} , V _{GS} = 10 Vdc, I _D = Rated I _D	Q _g	12 (Typ)	17	nC
Gate-Source Charge		Q _{gs}	9 (Typ)	—	
Gate-Drain Charge		Q _{gd}	3 (Typ)	—	

SOURCE-DRAIN DIODE CHARACTERISTICS*

Forward On-Voltage	I _S = Rated I _D , V _{GS} = 0	V _{SD}	0.8 (Typ)	1.1(1)	Vdc
Forward Turn-On Time		t _{on}	Limited by stray inductance		
Reverse Recovery Time		t _{rr}	100 (Typ)	—	ns

*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
(1) Add 0.15 V for IRFZ20.

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

STYLE E.
PIN 1, GATE
2, DRAIN
3, SOURCE
4, DRAIN

NOTES:
1. DIMENSIONS AND TOLERANCING PER ASSI
Y14.5M, 1982
2. CONTROLLING DIMENSION: DIM.
3. DIM Z DEFINES A ZONE WHERE ALL BODY AND
LEAD IRREGULARITIES ARE ALLOWED.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.48	15.15	0.570	0.600
B	9.65	10.18	0.380	0.405
C	4.07	4.81	0.160	0.190
D	2.64	2.98	0.105	0.118
F	3.81	3.73	0.150	0.147
G	2.42	2.68	0.095	0.106
H	2.92	3.33	0.115	0.131
J	0.38	0.55	0.015	0.022
K	17.70	14.72	0.700	0.580
L	1.15	1.20	0.045	0.048
M	4.83	5.33	0.190	0.210
O	2.54	3.04	0.100	0.120
R	2.04	2.75	0.080	0.108
S	1.15	1.20	0.045	0.048
T	5.97	6.42	0.235	0.253
U	0.20	0.12	0.008	0.005
V	1.15	—	0.045	—
Z	—	2.04	—	0.080