

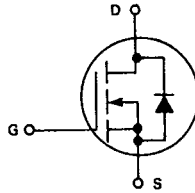
T-39-11

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

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

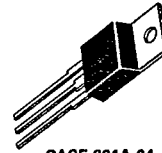
These TMOS Power FETs are designed for high voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

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



IRF820
IRF821
IRF823

TMOS POWER FETs
2 and 2.5 AMPERES
 $r_{DS(on)} = 3 \text{ OHM}$
450 and 500 VOLTS
 $r_{DS(on)} = 4 \text{ OHM}$
450 VOLTS



CASE 221A-04
TO-220AB

MAXIMUM RATINGS

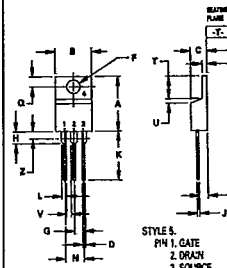
Rating	Symbol	IRF			Unit
		820	821	823	
Drain-Source Voltage	V_{DSS}	500	450	450	Vdc
Drain-Gate Voltage ($R_{GS} = 1 \text{ M}\Omega$)	V_{DGR}	500	450	450	Vdc
Gate-Source Voltage	V_{GS}	± 20			Vdc
Drain Current	I_D	2.5	2	8	Adc
	I_{DM}				
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	40			Adc
		0.32			
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150			$^\circ\text{C}$

THERMAL CHARACTERISTICS

Thermal Resistance Junction to Case	$R_{\theta JC}$	3.12	$^\circ\text{C/W}$
Junction to Ambient	$R_{\theta JA}$	62.5	
Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 5 Seconds	T_L	300	$^\circ\text{C}$

See the MTP3N45 Designer's Data Sheet for a complete set of design curves for the product on this data sheet.

OUTLINE DIMENSIONS



- NOTES:
1. DIMENSIONS 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.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.48	15.75	0.570	0.620
B	8.68	10.20	0.340	0.405
C	4.07	4.83	0.160	0.190
D	0.64	0.98	0.025	0.039
F	3.61	3.73	0.142	0.147
G	2.47	2.66	0.097	0.105
H	2.80	2.93	0.110	0.115
J	0.36	0.55	0.014	0.022
K	12.20	14.27	0.500	0.562
L	1.15	1.38	0.045	0.055
M	4.83	5.30	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.78	0.080	0.110
S	1.15	1.38	0.045	0.055
T	5.97	6.47	0.235	0.255
U	0.50	1.27	0.020	0.050
V	1.15	—	0.045	—
Z	—	2.04	—	0.080

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Drain-Source Breakdown Voltage (V _{GS} = 0, I _D = 0.25 mA)	IRF821, IRF823 IRF820	V(BR)DSS 450 500	— —	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}	— 0.25 1	mAdc
Gate-Body Leakage Current, Forward (V _{GSF} = 20 Vdc, V _{DS} = 0)		I _{GSSF}	— 500	nAdc
Gate-Body Leakage Current, Reverse (V _{GSR} = 20 Vdc, V _{DS} = 0)		I _{GSSR}	— 500	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 = 1 Adc)	IRF820, IRF821 IRF823	r _{DS(on)}	— 3 4	Ohm
On-State Drain Current (V _{GS} = 10 V) (V _{DS} ≥ 7.5 Vdc) (V _{DS} ≥ 8 Vdc)	IRF820, IRF821 IRF823	I _{D(on)}	2.5 2	Adc
Forward Transconductance (V _{DS} ≥ 7.5 V, I _D = 1 A) (V _{DS} ≥ 8 V, I _D = 1 A)	IRF820, IRF821 IRF823	g _{FS}	1 1	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 25 V, V _{GS} = 0, f = 1 MHz)	C _{iss}	— 400	pF
Output Capacitance		C _{oss}	— 150	
Reverse Transfer Capacitance		C _{rss}	— 40	

SWITCHING CHARACTERISTICS*

Turn-On Delay Time	V _{DD} ≈ 200 V, I _D = 1 Apk, R _{gen} = 50 Ohms)	t _{d(on)}	— 60	ns
Rise Time		t _r	— 50	
Turn-Off Delay Time		t _{d(off)}	— 60	
Fall Time		t _f	— 30	
Total Gate Charge	(V _{GS} = 10 V, V _{DS} = 0.8 x Rated V _{DSS} , I _D = Rated I _D)	Q _g	12 (Typ) 15	nC
Gate-Source Charge		Q _{gs}	6 (Typ)	
Gate-Drain Charge		Q _{gd}	6 (Typ)	

SOURCE-DRAIN DIODE CHARACTERISTICS*

Forward On-Voltage	I _S = Rated I _D , V _{GS} = 0)	V _{SD}	— 1.5(1)	Vdc
Forward Turn-On Time		t _{on}	Limited by stray inductance	
Reverse Recovery Time		t _{rr}	500 (Typ)	—

INTERNAL PACKAGE INDUCTANCE

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 _d	3.5 (Typ) 4.5 (Typ)	—	nH
Internal Source Inductance (Measured from the source lead 0.25" from package to source bond pad)	L _s	7.5 (Typ)	—	

*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
 (1) Add 0.1 V for IRF820 and IRF821.