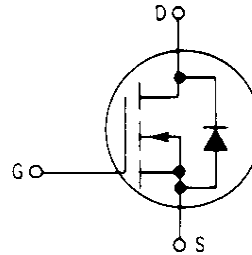


Power Field Effect Transistor

N-Channel Enhancement-Mode Silicon Gate

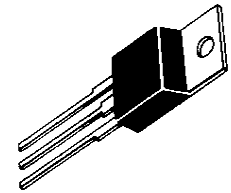
This TMOS Power FET is designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

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



IRF640

TMOS POWER FET
18 AMPERES
 $R_{DS(on)} = 0.18 \text{ OHM}$
200 VOLTS



CASE 221A-06
(TO-220AB)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	200	Vdc
Drain-Gate Voltage ($R_{GS} = 20 \text{ k}\Omega$)	V_{DGR}	200	Vdc
Gate-Source Voltage	V_{GS}	± 20	Vdc
Drain Current	I_D		Adc
Continuous, $T_C = 25^\circ\text{C}$		18	
Peak, $T_C = 25^\circ\text{C}$		72	
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	125 1	Watts W/ $^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	1 62.5	$^\circ\text{C/W}$
Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 10 Seconds	T_L	260	$^\circ\text{C}$

See the MTP20N20E 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 ($V_{GS} = 0, I_D = 0.25 \text{ mA}$)	$V_{(BR)DSS}$	200	—	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 ($V_{GS} = 10 \text{ Vdc}, I_D = 10 \text{ Adc}$)	$R_{DS(on)}$	—	0.18	Ohm
On-State Drain Current ($V_{GS} = 10 \text{ V}$) ($V_{DS} \geq 3.2 \text{ Vdc}$)	$I_{D(on)}$	18	—	Adc
Forward Transconductance ($V_{DS} \geq 3.2 \text{ V}, I_D = 10 \text{ A}$)	g_{FS}	6	—	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}	—	750	
Reverse Transfer Capacitance		C_{rss}	—	300	

SWITCHING CHARACTERISTICS*

Turn-On Delay Time	$(V_{DD} \approx 30 \text{ V}, I_D = 15 \text{ Apk}, R_{gen} = 4.7 \text{ Ohms})$	$t_{d(on)}$	—	30	ns
Rise Time		t_r	—	60	
Turn-Off Delay Time		$t_{d(off)}$	—	80	
Fall Time		t_f	—	60	
Total Gate Charge	$(V_{DS} = 0.8 \text{ Rated } V_{DSS}, V_{GS} = 10 \text{ Vdc}, I_D = \text{Rated } I_D)$	Q_g	36 (Typ)	60	nC
Gate-Source Charge		Q_{gs}	16 (Typ)	—	
Gate-Drain Charge		Q_{gd}	22 (Typ)	—	

SOURCE DRAIN DIODE CHARACTERISTICS*

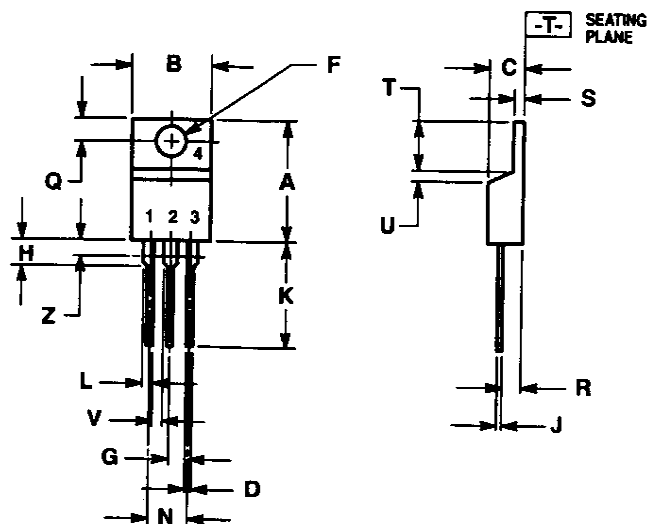
Forward On-Voltage	$(I_S = \text{Rated } I_D, V_{GS} = 0)$	V_{SD}	1.8 (Typ)	2.0	Vdc
Forward Turn-On Time		t_{on}	Limited by stray inductance		
Reverse Recovery Time		t_{rr}	450 (Typ)	—	ns

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 $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.

PACKAGE OUTLINE DIMENSIONS AND FOOTPRINTS (continued)

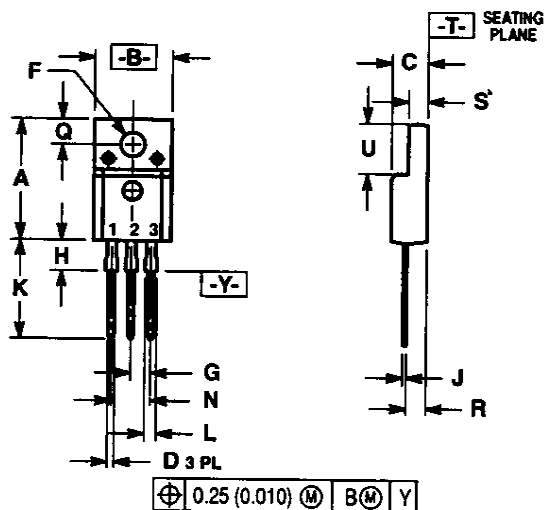


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.060	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.060	0.050	0.00	1.27
V	0.045	—	1.15	—
Z	—	0.080	—	2.04

- STYLE 5:
 PIN 1. GATE
 2. DRAIN
 3. SOURCE
 4. DRAIN

CASE 221A-06
 (TO-220AB)
 ISSUE Y



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.621	0.629	15.78	15.97
B	0.394	0.402	10.01	10.21
C	0.181	0.189	4.60	4.80
D	0.026	0.034	0.67	0.86
F	0.121	0.129	3.08	3.27
G	0.100 BSC		2.54 BSC	
H	0.123	0.129	3.13	3.27
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.14	1.52
N	0.200 BSC		5.08 BSC	
Q	0.126	0.134	3.21	3.40
R	0.107	0.111	2.72	2.81
S	0.096	0.104	2.44	2.64
U	0.259	0.267	6.58	6.78

- STYLE 1:
 PIN 1. GATE
 2. DRAIN
 3. SOURCE

CASE 221D-02
 (ISOLATE TO-220 TYPE)
 ISSUE D