

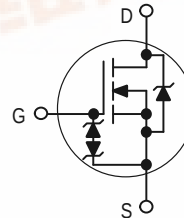
Advance Information

TMOS E-FET™

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

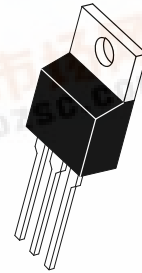
This advanced high voltage TMOS E-FET is designed to withstand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain-to-source diode with fast recovery time. Designed for high voltage, high speed switching applications in power supplies, PWM motor controls and other inductive loads, the avalanche energy capability is specified to eliminate the guesswork in designs where inductive loads are switched and offer additional safety margin against unexpected voltage transients.

- Avalanche Energy Capability Specified at Elevated Temperature
- Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- Low Stored Gate Charge for Efficient Switching
- Internal Source-to-Drain Diode Designed to Replace External Zener Transient Suppressor-Absorbs High Energy in the Avalanche Mode
- ESD Protected. Designed to Typically Withstand 400 V Machine Model and 4000 V Human Body Model.



MTP55N06Z

TMOS POWER FET
55 AMPERES
60 VOLTS
RDS(on) = 18 mΩ



CASE 221A-06, Style 5
TO-220AB

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	60	Vdc
Drain-to-Gate Voltage (R _{GS} = 1.0 MΩ)	V _{DGR}	60	Vdc
Gate-to-Source Voltage — Continuous	V _{GS}	± 20	Vdc
— Non-Repetitive (t _p ≤ 10 ms)	V _{GSM}	± 40	Vpk
Drain Current — Continuous @ T _C = 25°C	I _D	55	Adc
— Continuous @ T _C = 100°C	I _D	35.5	
— Single Pulse (t _p ≤ 10 μs)	I _{DM}	165	Apk
Total Power Dissipation @ T _C = 25°C	P _D	113	Watts
Derate above 25°C		0.91	W/°C
Operating and Storage Temperature Range	T _J , T _{stg}	–55 to 150	°C
Single Pulse Drain-to-Source Avalanche Energy — Starting T _J = 25°C (V _{DD} = 25 Vdc, V _{DS} = 60 Vdc, V _{GS} = 10 Vdc, Peak I _L = 55 Apk, L = 0.3 mH, R _G = 25 Ω)	E _{AS}	454	mJ
Thermal Resistance — Junction-to-Case	R _{θJC}	1.1	°C/W
— Junction-to-Ambient	R _{θJA}	62.5	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T _L	260	°C

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E-FET is a trademark of Motorola, Inc. TMOS is a registered trademark of Motorola, Inc.

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	60 —	— 53	— —	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ($V_{DS} = 60\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 60\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	I_{DSS}	— —	— —	1.0 10	μAdc
Gate-Body Leakage Current ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	—	—	100	nAdc

ON CHARACTERISTICS (1)

Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	2.0 —	3.0 6.0	4.0 —	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance ($V_{GS} = 10\text{ Vdc}$, $I_D = 27.5\text{ Adc}$)	$R_{DS(on)}$	—	14	16	m Ω
Drain-to-Source On-Voltage ($V_{GS} = 10\text{ Vdc}$) ($I_D = 55\text{ Adc}$) ($I_D = 27.5\text{ Adc}$, $T_J = 125^\circ\text{C}$)	$V_{DS(on)}$	— —	0.825 0.74	1.2 1.0	Vdc
Forward Transconductance ($V_{DS} = 4.0\text{ Vdc}$, $I_D = 27.5\text{ Adc}$)	g_{FS}	12	15	—	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 25\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{iss}	—	1390	1950	pF
Output Capacitance		C_{oss}	—	520	730	
Transfer Capacitance		C_{rss}	—	119	238	

SWITCHING CHARACTERISTICS (2)

Turn-On Delay Time	$(V_{DD} = 30\text{ Vdc}$, $I_D = 55\text{ Adc}$, $V_{GS(on)} = 10\text{ Vdc}$, $R_G = 9.1\text{ }\Omega$)	$t_{d(on)}$	—	27	54	ns
Rise Time		t_r	—	157	314	
Turn-Off Delay Time		$t_{d(off)}$	—	116	232	
Fall Time		t_f	—	126	252	
Gate Charge (See Figure 8)	$(V_{DS} = 48\text{ Vdc}$, $I_D = 55\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$)	Q_T	—	40	56	nC
		Q_1	—	7.0	—	
		Q_2	—	18	—	
		Q_3	—	15	—	

SOURCE-DrAIN DIODE CHARACTERISTICS

Forward On–Voltage	(I _S = 55 Adc, V _{GS} = 0 Vdc) (I _S = 55 Adc, V _{GS} = 0 Vdc, T _J = 125°C)	V _{SD}	— —	0.93 0.82	1.1 —	Vdc
Reverse Recovery Time	(I _S = 55 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs)	t _{rr}	—	57	—	ns
		t _a	—	32	—	
		t _b	—	25	—	
Reverse Recovery Stored Charge		Q _{RR}	—	0.11	—	μC

INTERNAL PACKAGE INDUCTANCE

Internal Drain Inductance (Measured from contact screw on tab to center of die) (Measured from drain lead 0.25" from package to center of die)	L_D	— —	3.5 4.5	— —	nH
Internal Source Inductance (Measured from the source lead 0.25" from package to source bond pad)	L_S	—	7.5	—	

(1) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

(2) Switching characteristics are independent of operating junction temperature.

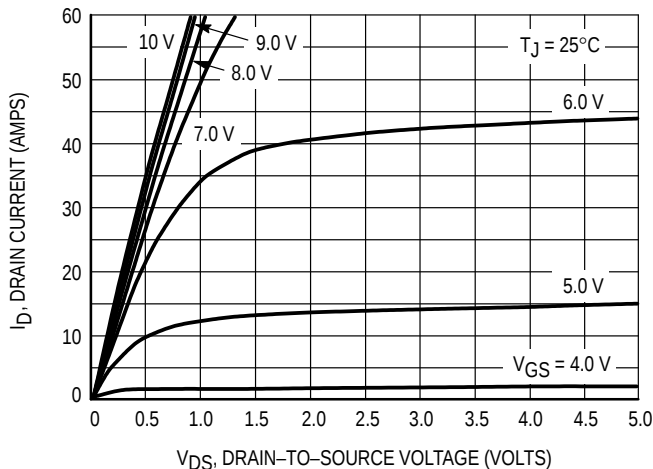


Figure 1. On-Region Characteristics

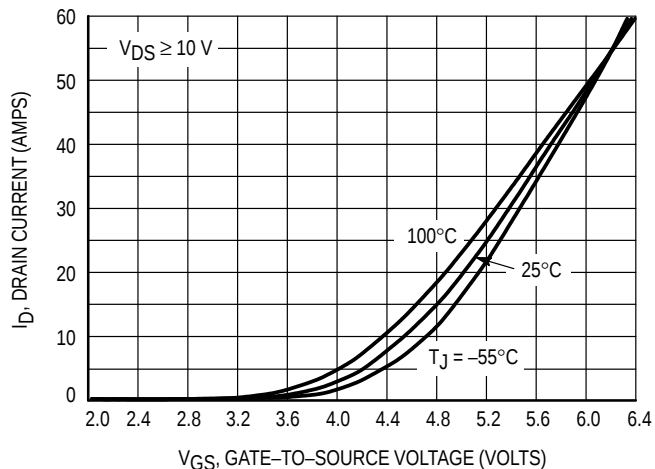


Figure 2. Transfer Characteristics

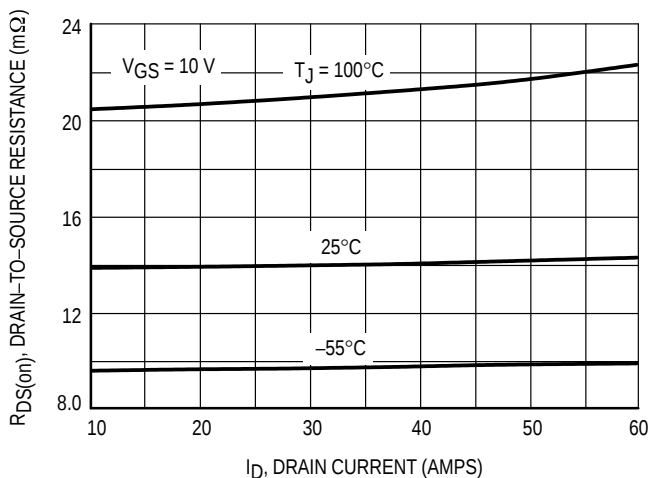


Figure 3. On-Resistance versus Drain Current and Temperature

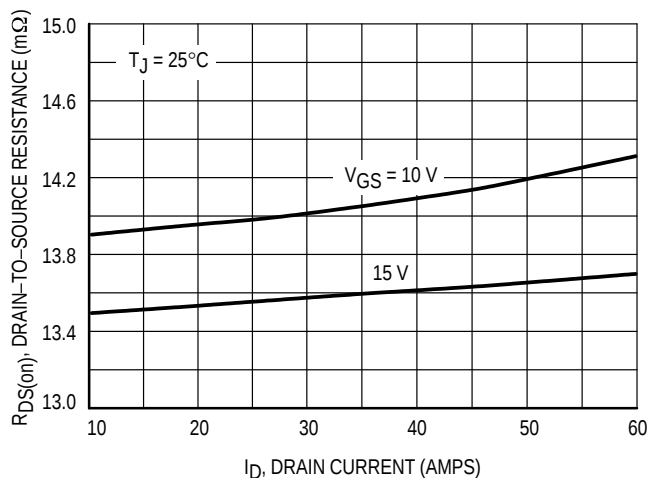


Figure 4. On-Resistance versus Drain Current and Gate Voltage

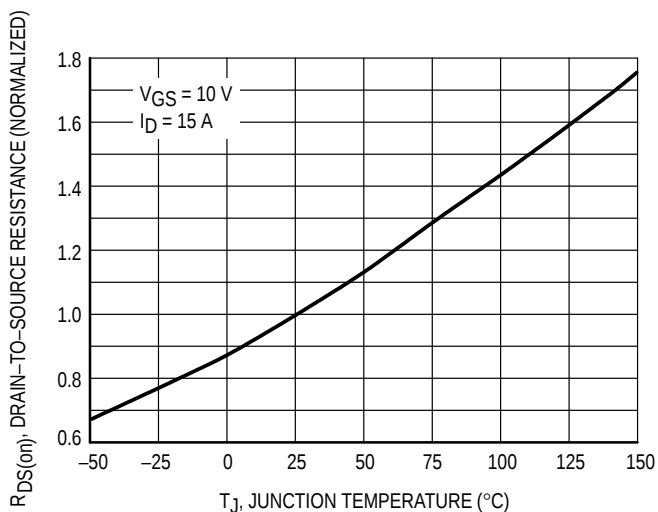


Figure 5. On-Resistance Variation with Temperature

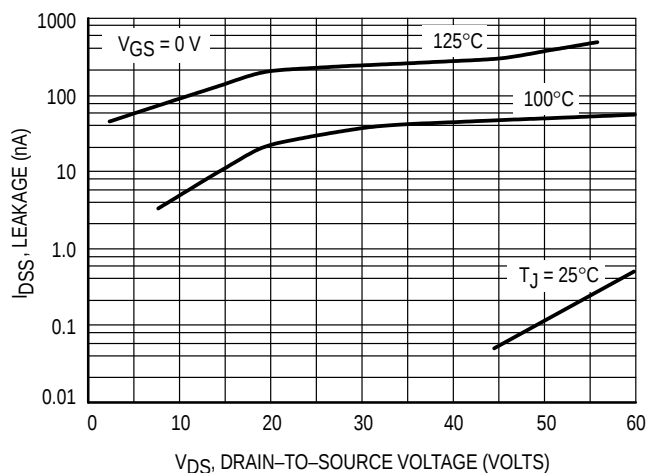
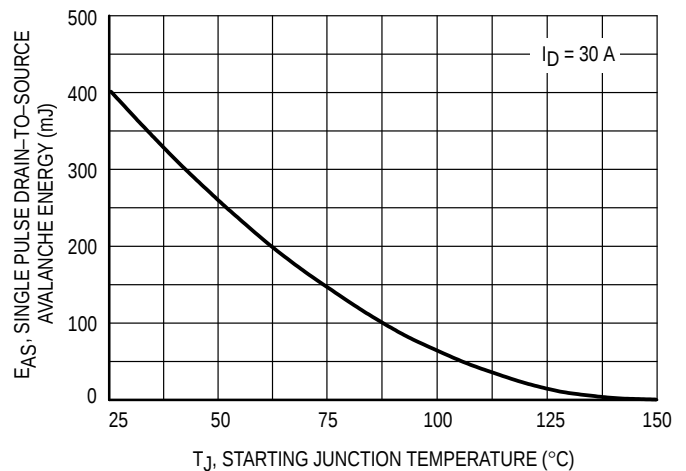
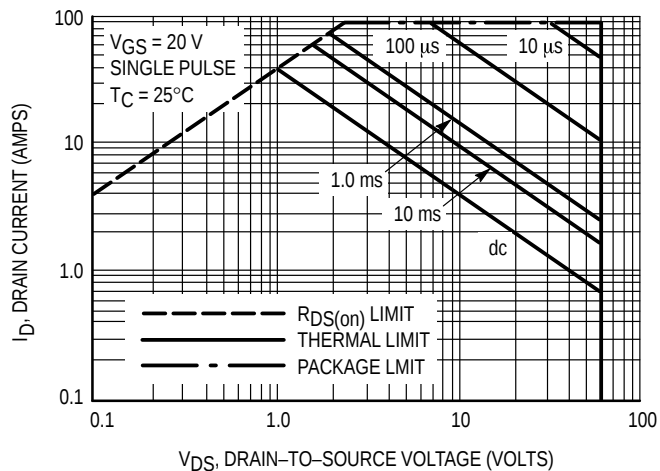
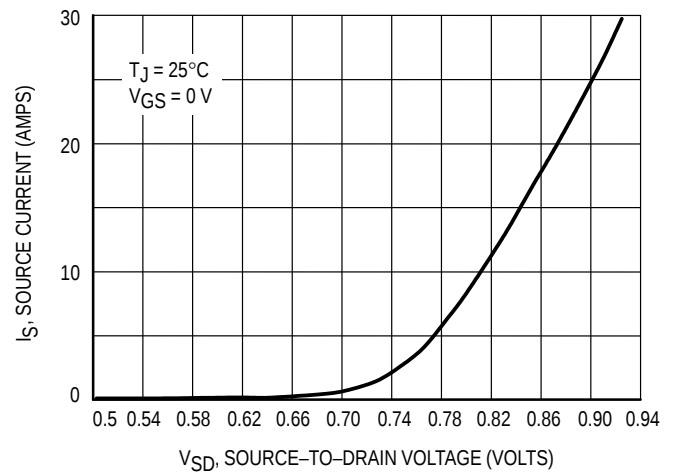
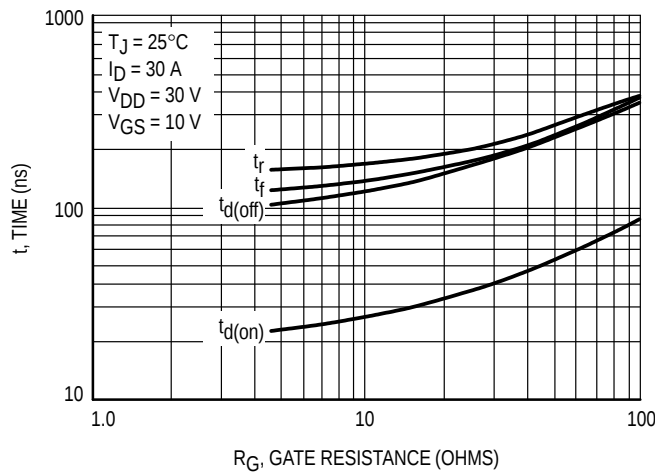
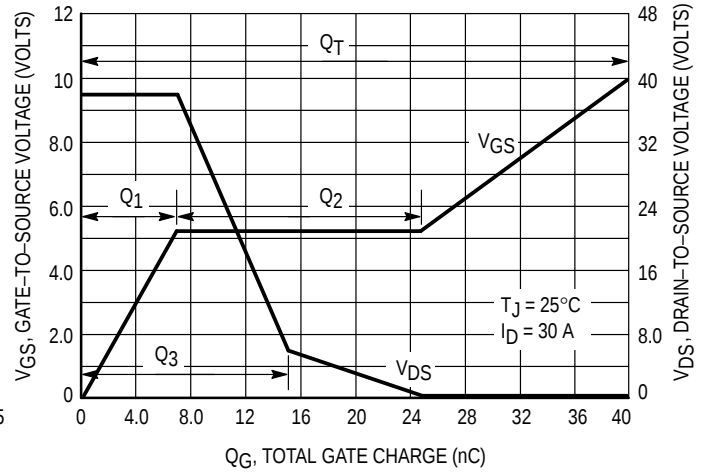
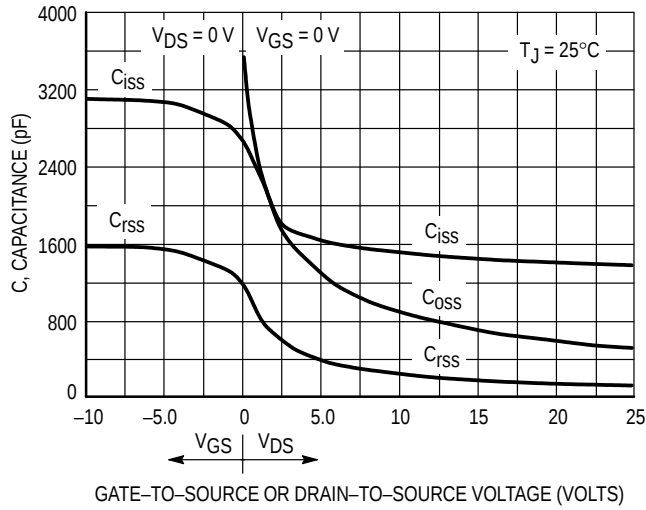


Figure 6. Drain-to-Source Leakage Current versus Voltage

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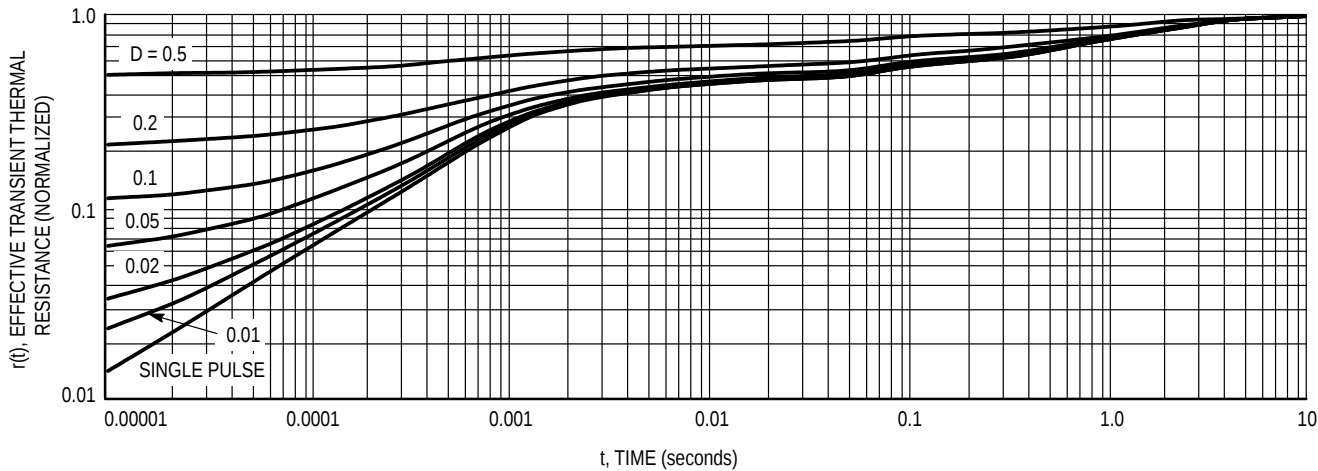
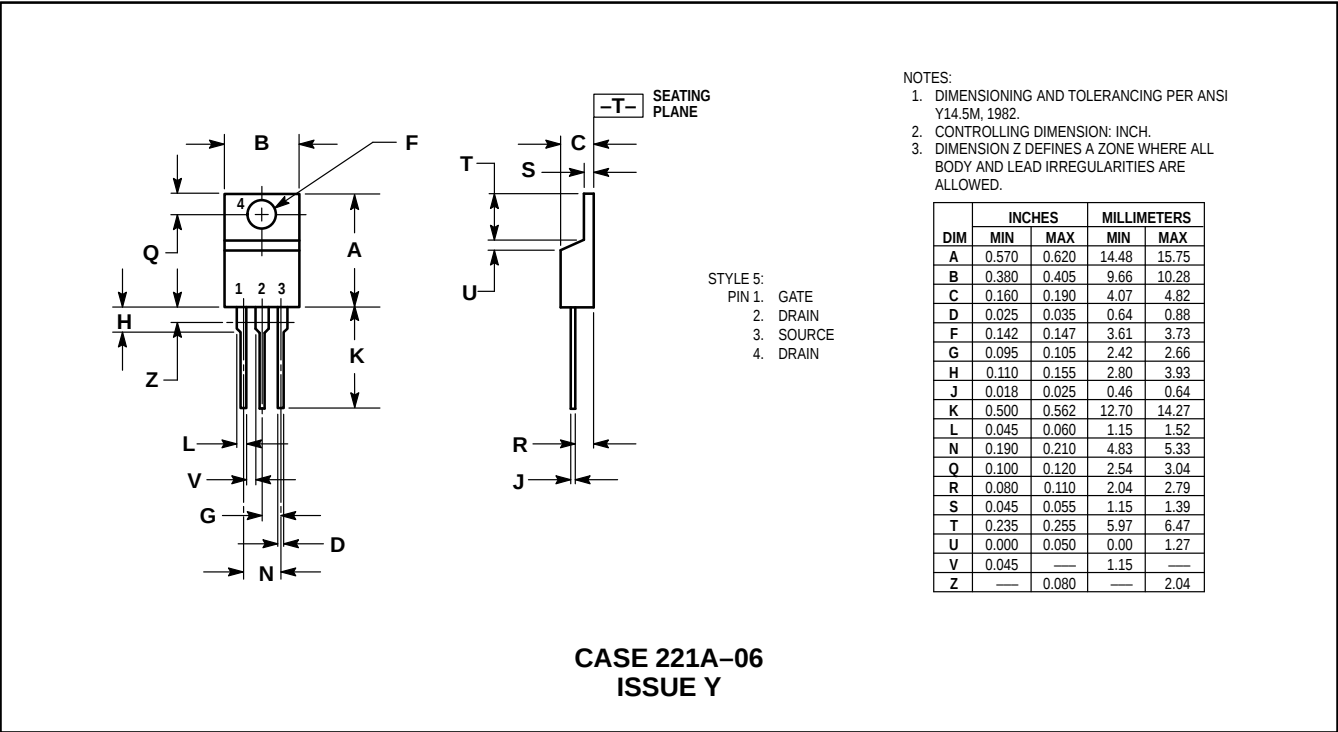


Figure 13. Thermal Response

PACKAGE DIMENSIONS



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USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 303-675-2140 or 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center,
3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 81-3-3521-8315

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 602-244-6609
– US & Canada ONLY 1-800-774-1848

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

INTERNET: <http://www.mot.com/SPS/>



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