

Advance Information

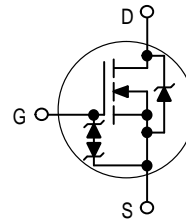
TMOS E-FET™

**High Energy Power FET
D2PAK for Surface Mount**

N-Channel Enhancement-Mode Silicon Gate

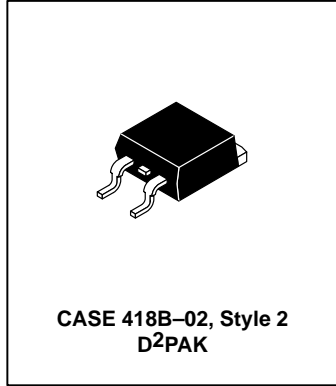
This advanced high voltage TMOS E-FET is designed to withstand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain-to-source diode with fast recovery time. Designed for high voltage, high speed switching applications in power supplies, PWM motor controls 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.



MTB55N06Z

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



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
Total Power Dissipation @ T _A = 25°C (1)		2.5	
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)	EAS	454	mJ
Thermal Resistance — Junction to Case	R _{θJC}	1.1	°C/W
— Junction to Ambient	R _{θJC}	62.5	
— Junction to Ambient (1)	R _{θJA}	50	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T _L	260	°C

(1) When surface mounted to an FR4 board using the minimum recommended pad size.

This document contains information on a new product. Specifications and information herein are subject to change without notice.

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

MTB55N06Z

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

Characteristic	Symbol	Min	Typ	Max	Unit
Drain-to-Source Breakdown Voltage (V _{GS} = 0 Vdc, I _D = 250 μAdc) Temperature Coefficient (Positive)	V _{(BR)DSS}	60	—	—	Vdc
		—	53	—	mV/°C
Zero Gate Voltage Drain Current (V _{DS} = 60 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 60 Vdc, V _{GS} = 0 Vdc, T _J = 125°C)	I _{DSS}	—	—	1.0	μAdc
		—	—	10	
Gate-Body Leakage Current (V _{GS} = ±20 Vdc, V _{DS} = 0 Vdc)	I _{GSS}	—	—	100	nAdc

ON CHARACTERISTICS (1)

Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = 250 μAdc) Threshold Temperature Coefficient (Negative)	V _{GS(th)}	2.0	3.0	4.0	Vdc
		—	6.0	—	mV/°C
Static Drain-to-Source On-Resistance (V _{GS} = 10 Vdc, I _D = 27.5 Adc)	R _{DS(on)}	—	14	18	mΩ
Drain-to-Source On-Voltage (V _{GS} = 10 Vdc) (I _D = 55 Adc) (I _D = 27.5 Adc, T _J = 125°C)	V _{DS(on)}	—	0.825	1.2	Vdc
		—	0.74	1.0	
Forward Transconductance (V _{DS} = 4.0 Vdc, I _D = 27.5 Adc)	g _{FS}	12	15	—	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 25 Vdc, V _{GS} = 0 Vdc, f = 1.0 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 Vdc, I _D = 55 Adc, V _{GS(on)} = 10 Vdc, R _G = 9.1 Ω)	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 Vdc, I _D = 55 Adc, V _{GS} = 10 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	1.1	Vdc
			—	0.82	—	
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	—	nH
		—	4.5	—	
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 ≤ 300 μs, Duty Cycle ≤ 2%.
- (2) Switching characteristics are independent of operating junction temperature.

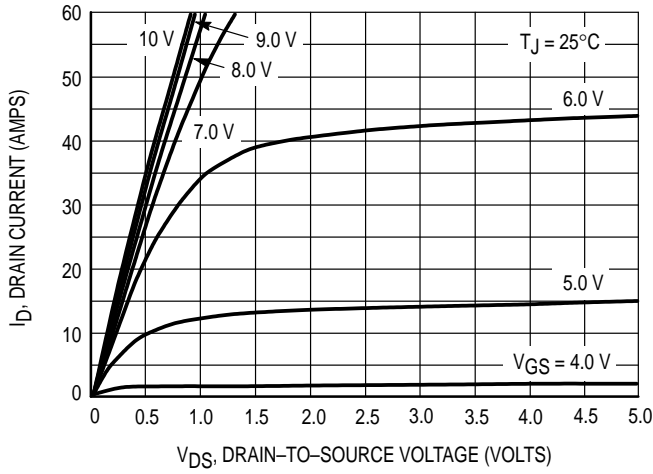


Figure 1. On-Region Characteristics

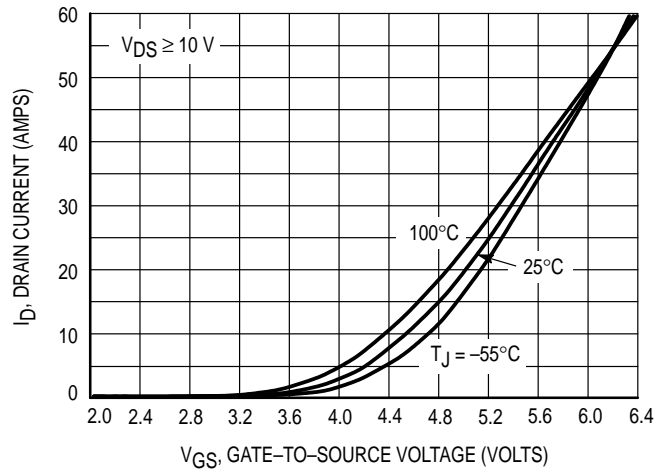


Figure 2. Transfer Characteristics

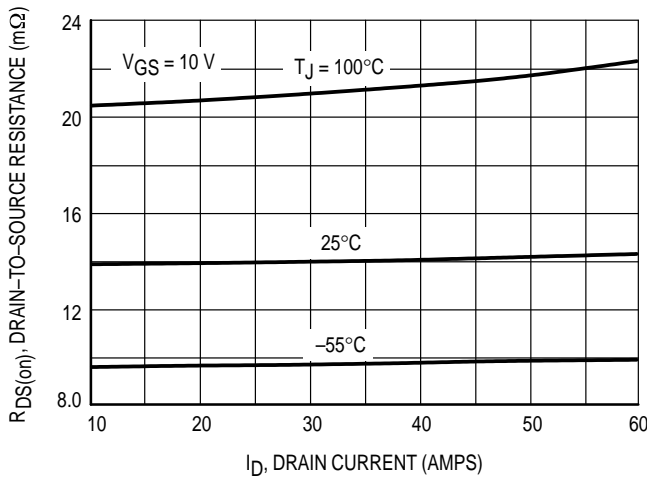


Figure 3. On-Resistance versus Drain Current and Temperature

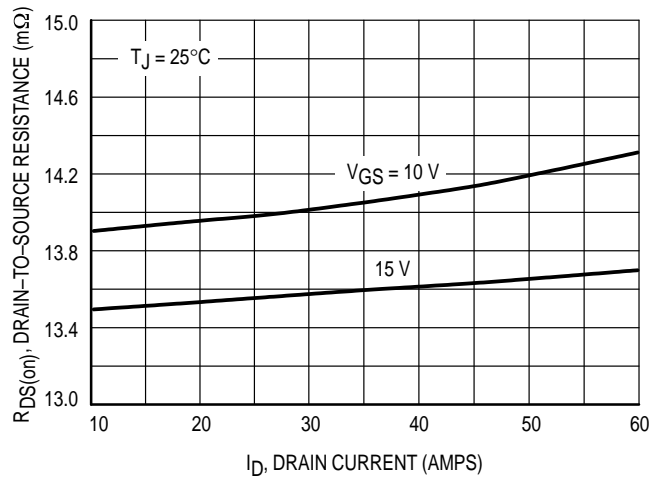


Figure 4. On-Resistance versus Drain Current and Gate Voltage

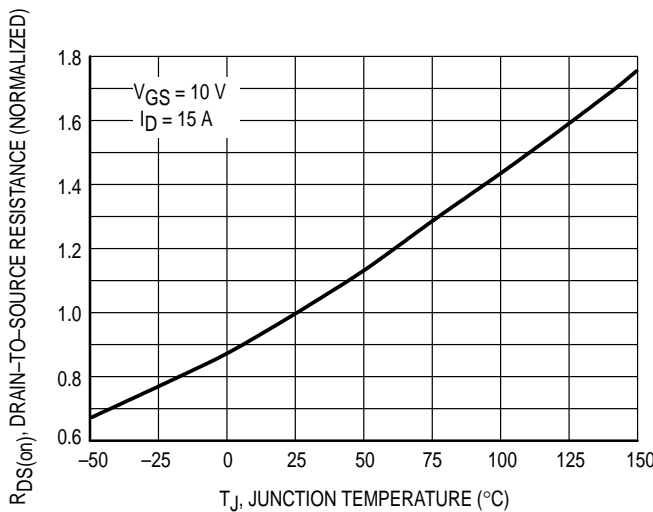


Figure 5. On-Resistance Variation with Temperature

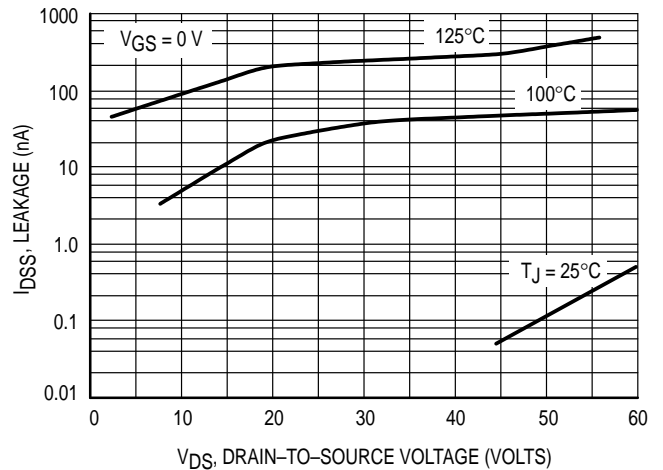


Figure 6. Drain-to-Source Leakage Current versus Voltage

MTB55N06Z

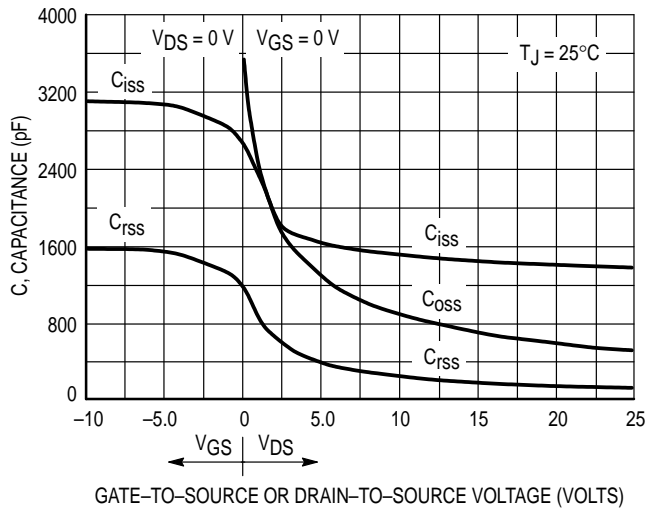


Figure 7. Capacitance Variation

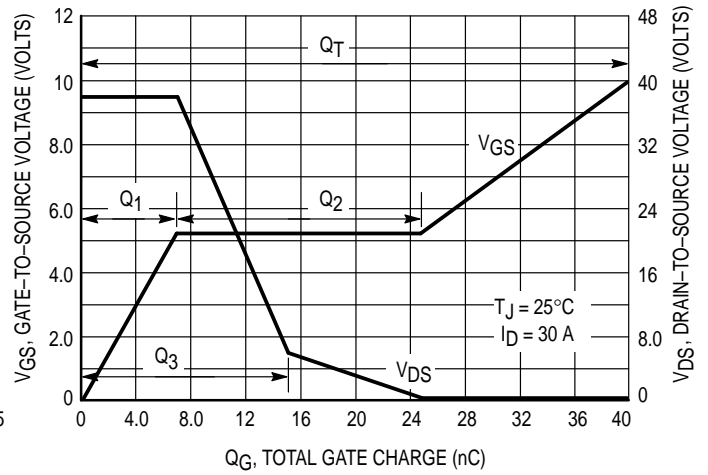


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

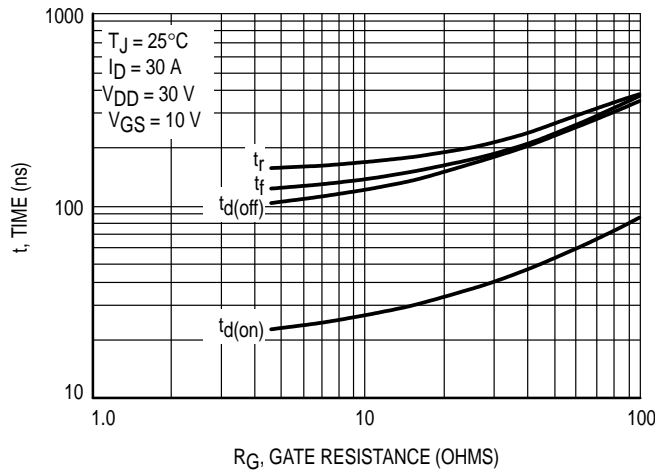


Figure 9. Resistive Switching Time Variation versus Gate Resistance

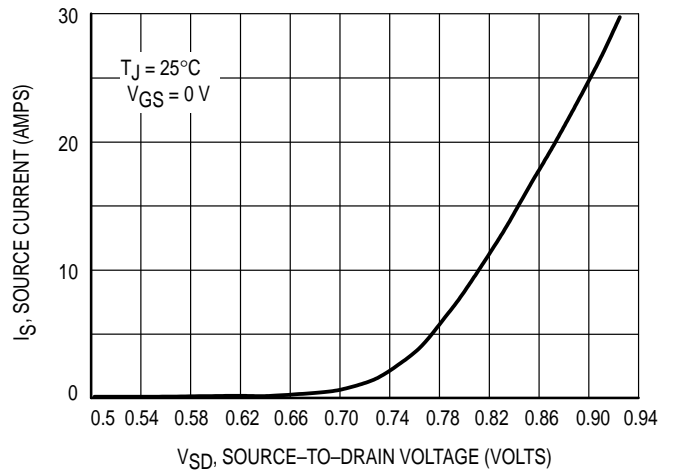


Figure 10. Diode Forward Voltage versus Current

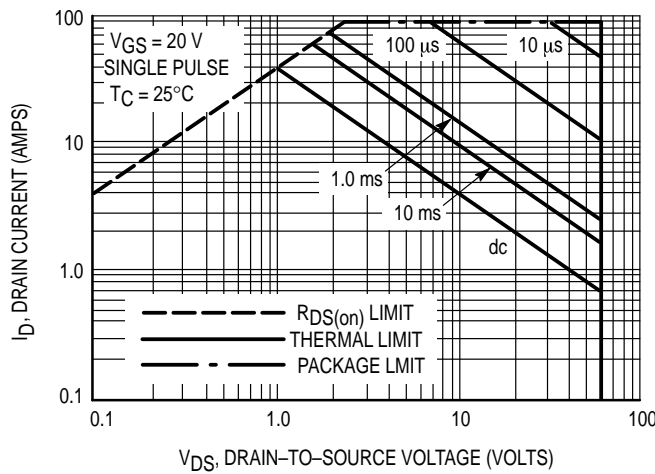


Figure 11. Maximum Rated Forward Biased Safe Operating Area

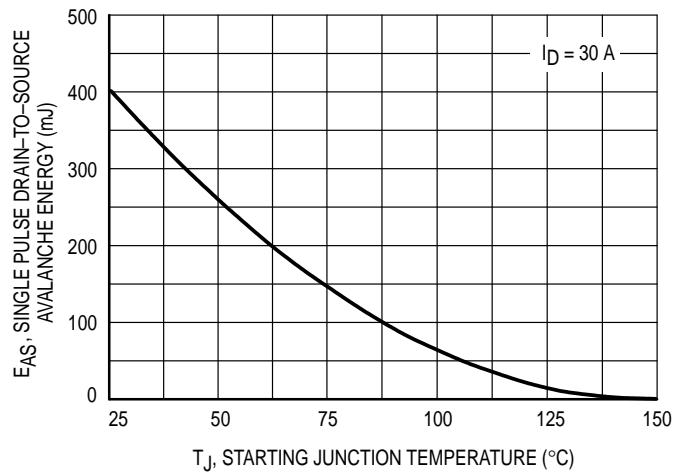


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

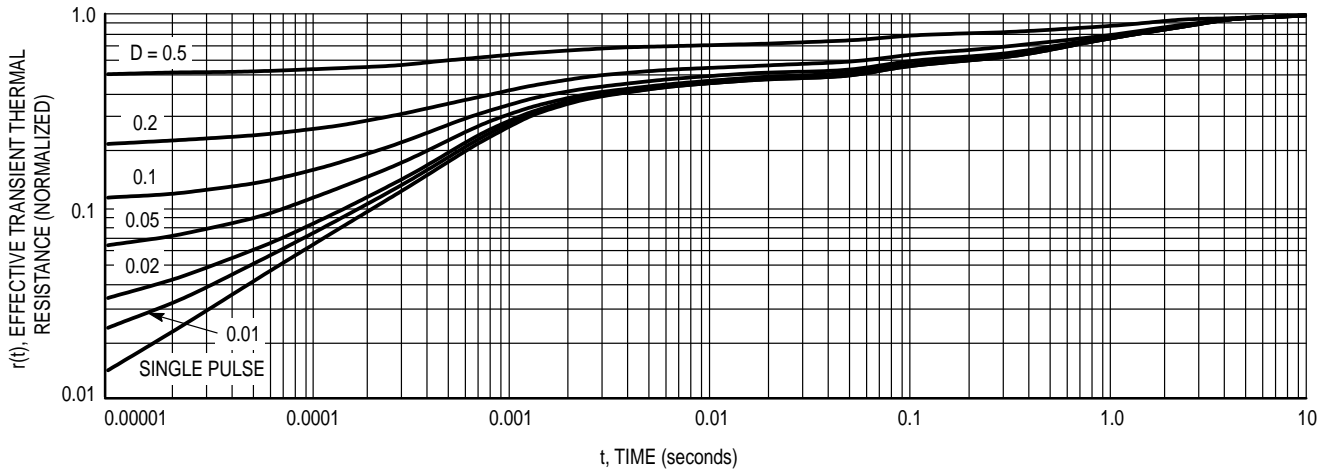
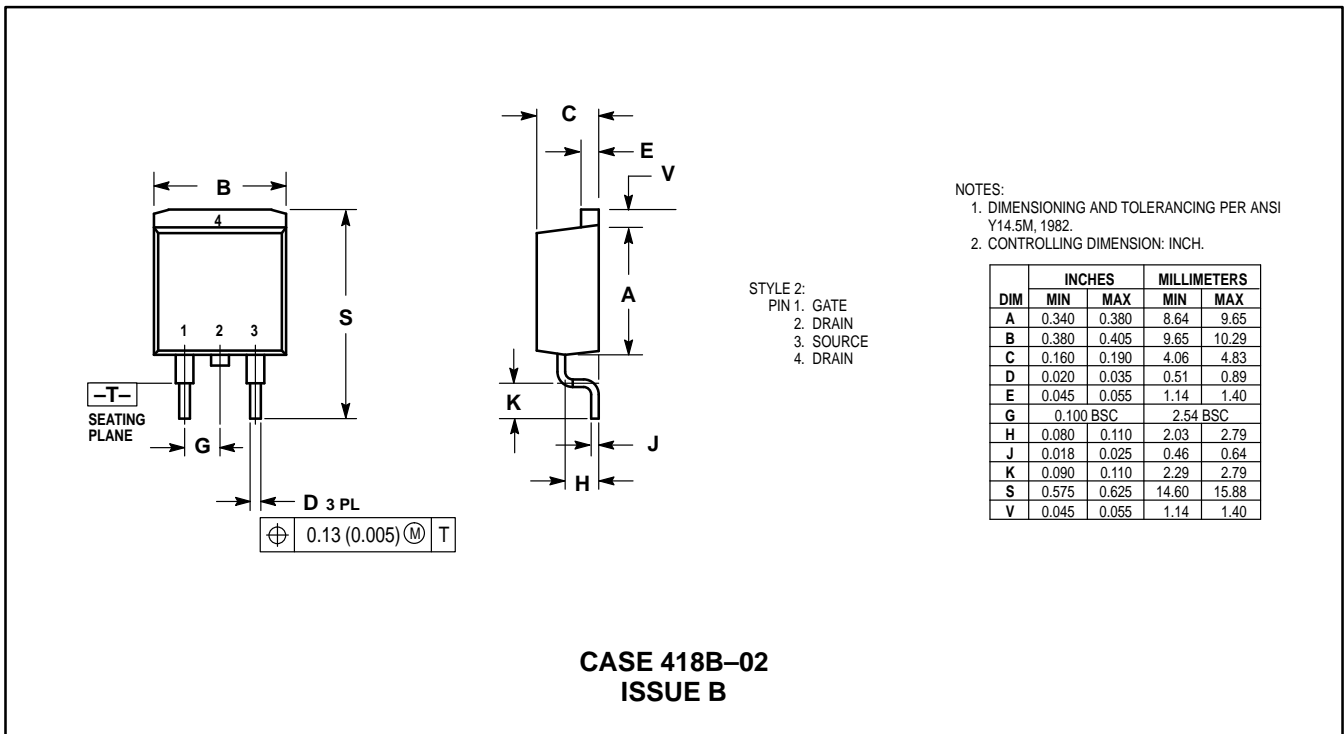


Figure 13. Thermal Response

PACKAGE DIMENSIONS



Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

How to reach us:

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/>

**MOTOROLA**