Advance Information

TMOS E-FET™ High Energy Power FET D²PAK for Surface Mount

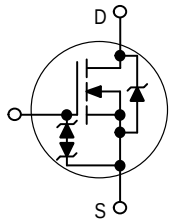
N–Channel Enhancement–Mode Silicon Gate

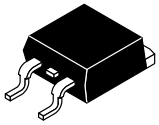
MTB55N06Z

TMOS POWER FET
55 AMPERES
60 VOLTS
$R_{DS(on)}$ = 18 mΩ

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.





CASE 418B–02, Style 2
D²PAK

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 — Non–Repetitive ($t_p \le 10$ ms)	V_{GS} V_{GSM}	±20 ±40	Vdc Vpk
Drain Current — Continuous @ T_C = 25°C — Continuous @ T_C = 100°C — Single Pulse ($t_p \le 10$ μs)	I_D I_D I_{DM}	55 35.5 165	Adc Apk
Total Power Dissipation @ T_C = 25°C Derate above 25°C Total Power Dissipation @ T_A = 25°C (1)	P_D	113 0.91 2.5	Watts 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 — Junction to Ambient — Junction to Ambient (1)	$R_{\theta JC}$ $R_{\theta JC}$ $R_{\theta JA}$	1.1 62.5 50	°C/W
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.

REV 1

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain–to–Source Breakdown Voltage (Cpk ≥ 2.0)		$V_{(BR)DSS}$				Vdc
(V_{GS} = 0 Vdc, I_D = 250 μAdc)			60	—	—	
Temperature Coefficient (Positive)			—	53	—	mV/°C
Zero Gate Voltage Drain Current		I_{DSS}				μAdc
(V_{DS} = 60 Vdc, V_{GS} = 0 Vdc)			—	—	1.0	
(V_{DS} = 60 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)			—	—	10	
Gate–Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)		I_{GSS}	—	—	100	nAdc
ON CHARACTERISTICS (1)						
Gate Threshold Voltage (Cpk ≥ 2.0)		$V_{GS(th)}$				Vdc
(V_{DS} = V_{GS}, I_D = 250 μAdc)			2.0	3.0	4.0	
Threshold Temperature Coefficient (Negative)			—	6.0	—	mV/°C
Static Drain–to–Source On–Resistance (Cpk ≥ 2.0)		$R_{DS(on)}$				mΩ
(V_{GS} = 10 Vdc, I_D = 27.5 Adc)			—	14	18	
Drain–to–Source On–Voltage (V_{GS} = 10 Vdc)		$V_{DS(on)}$				Vdc
(I_D = 55 Adc)			—	0.825	1.2	
(I_D = 27.5 Adc, T_J = 125°C)			—	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)	V_{SD}				Vdc
	(I_S = 55 Adc, V_{GS} = 0 Vdc, T_J = 125°C)		—	0.93	1.1	
			—	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		L_D				nH
(Measured from contact screw on tab to center of die)			—	3.5	—	
(Measured from drain lead 0.25″ from package to center of die)			—	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.

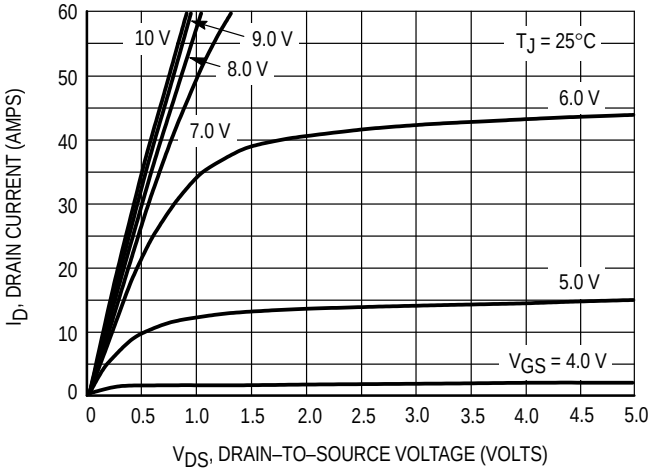


Figure 1. On–Region Characteristics

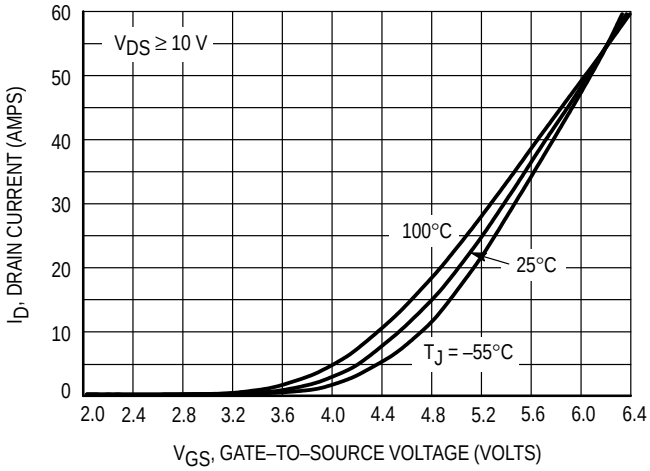


Figure 2. Transfer Characteristics

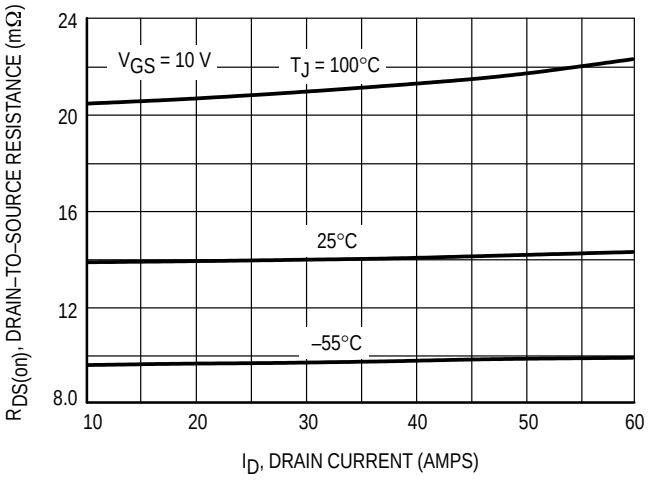


Figure 3. On–Resistance versus Drain Current and Temperature

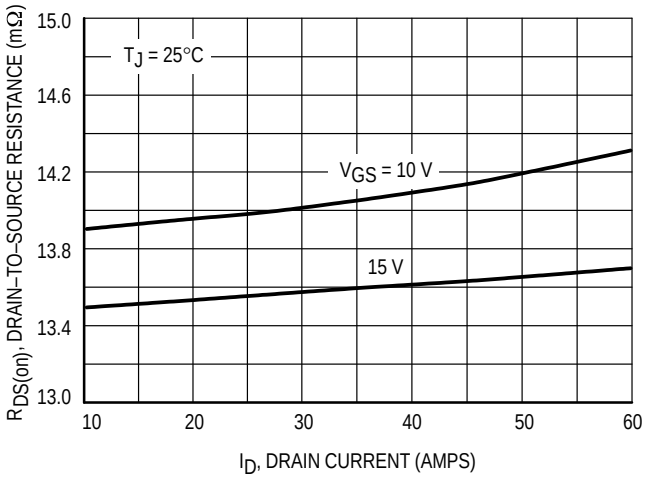


Figure 4. On–Resistance versus Drain Current and Gate Voltage

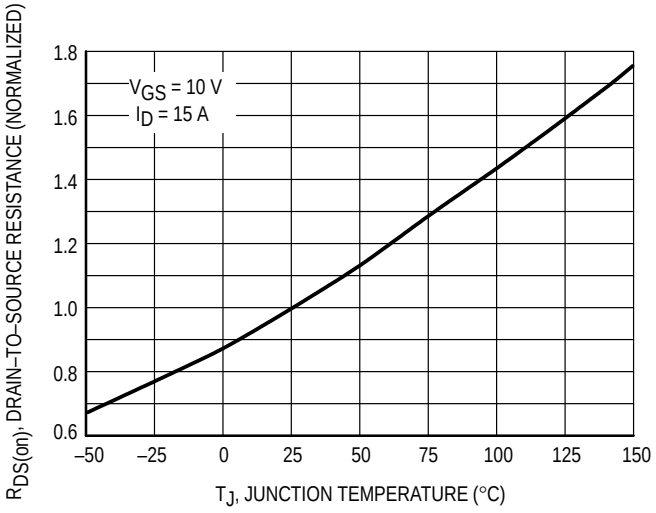


Figure 5. On–Resistance Variation with Temperature

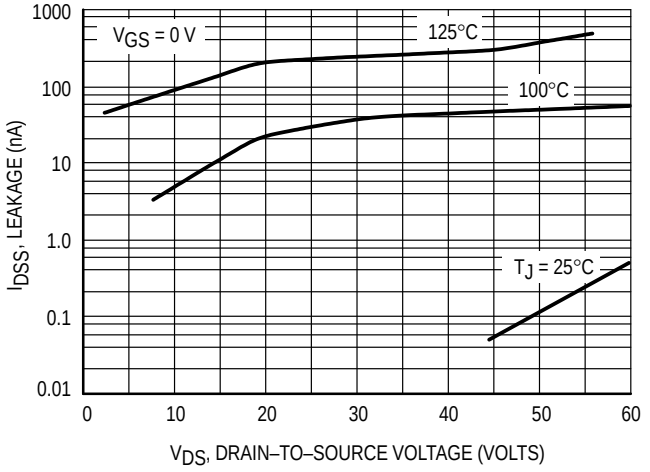


Figure 6. Drain–to–Source Leakage Current versus Voltage

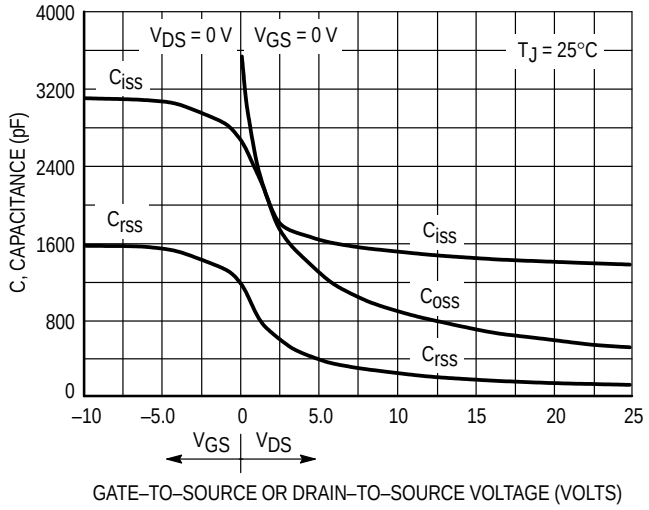


Figure 7. Capacitance Variation

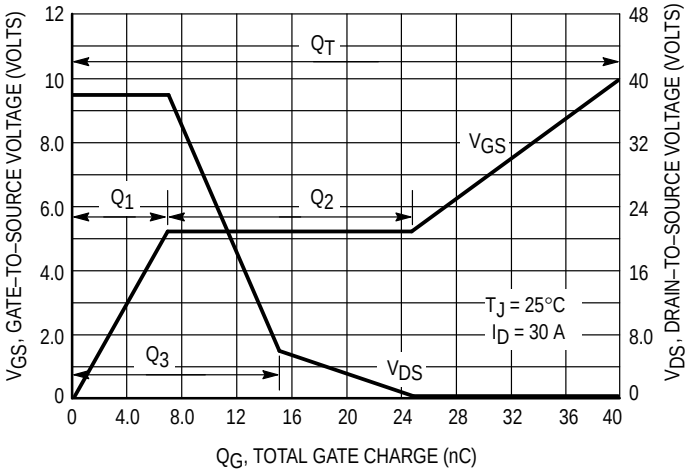


Figure 8. Gate–to–Source and Drain–to–Source Voltage versus Total Charge

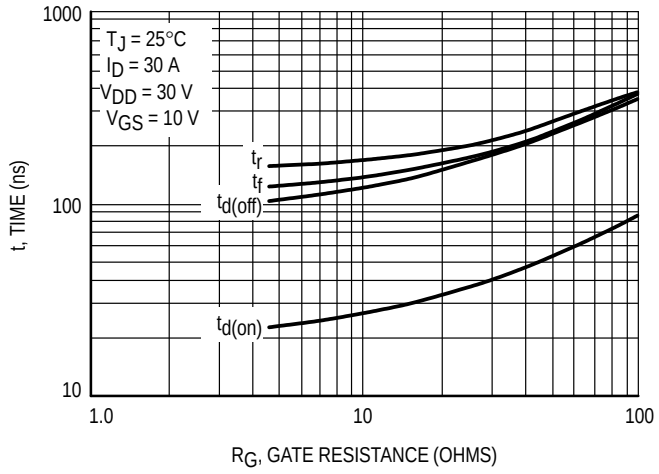


Figure 9. Resistive Switching Time Variation versus Gate Resistance

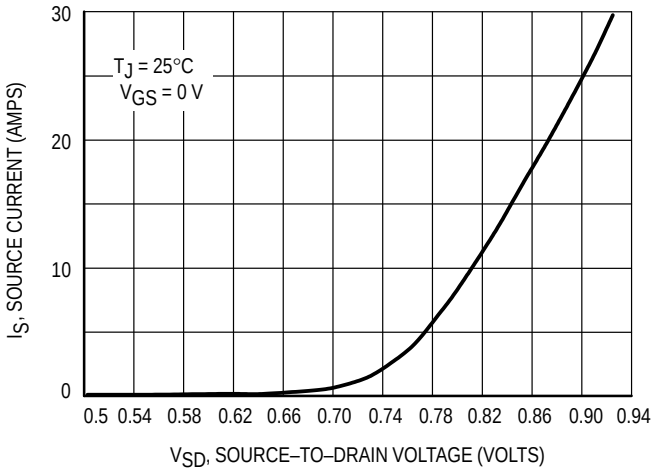


Figure 10. Diode Forward Voltage versus Current

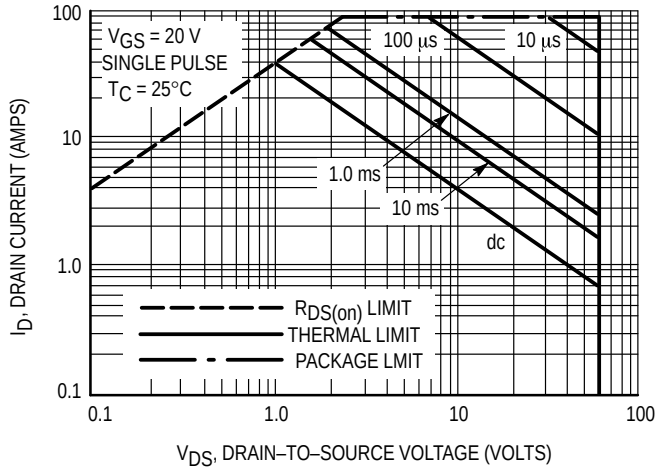


Figure 11. Maximum Rated Forward Biased Safe Operating Area

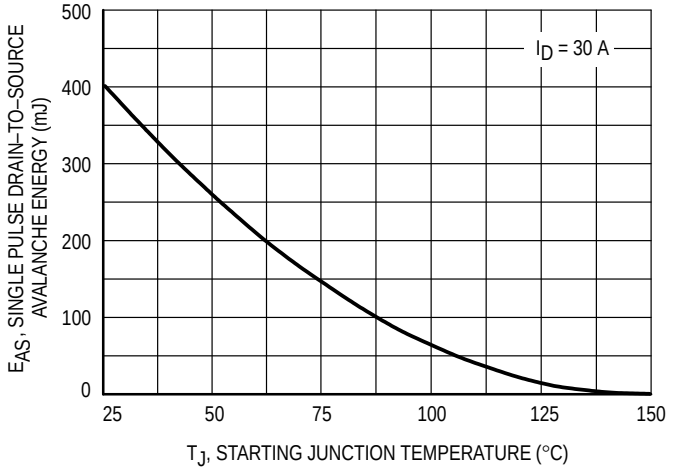


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

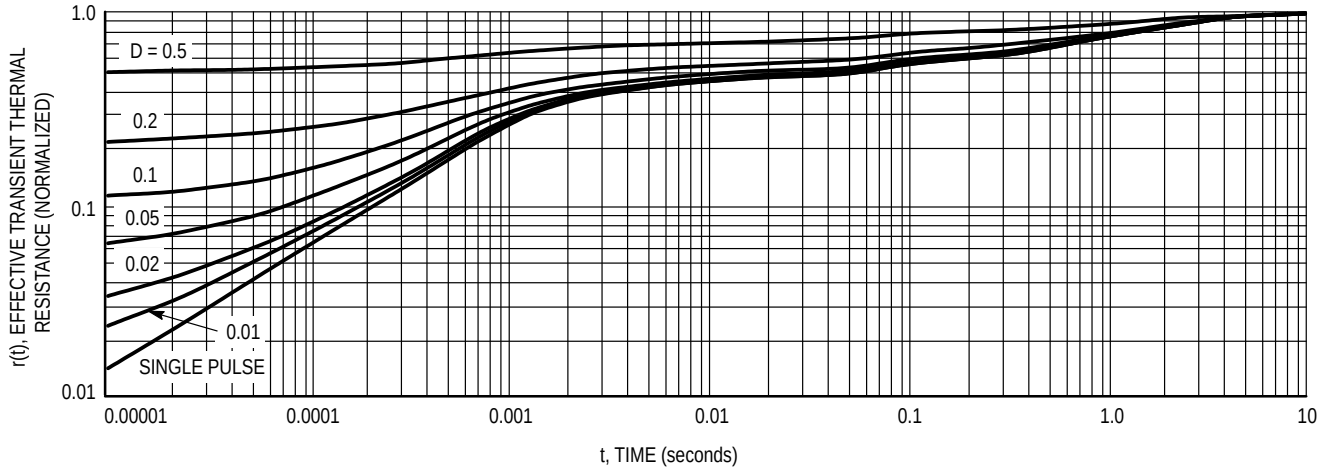
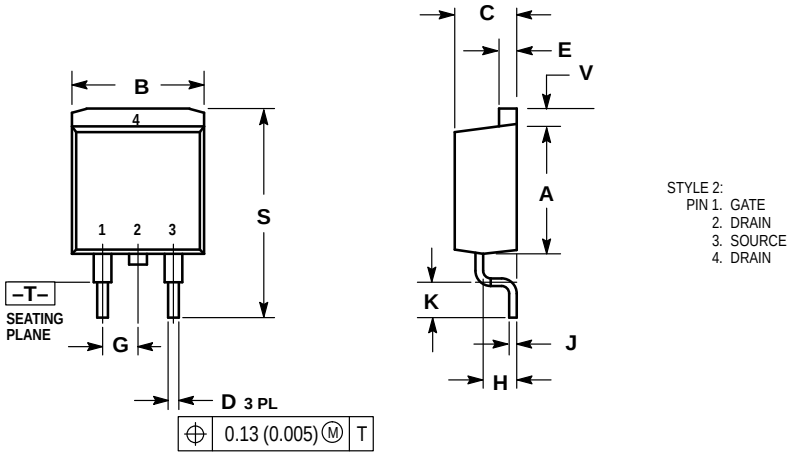


Figure 13. Thermal Response

PACKAGE DIMENSIONS



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

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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

CASE 418B–02
ISSUE B

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