

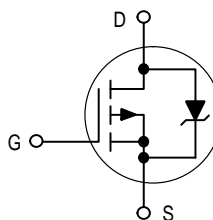
Product Preview

TMOS E-FET TM

High Energy Power FET
P-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 such as 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
- 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
- Source-to-Drain Diode Recovery Time Comparable to Discrete Fast Recovery Diode



MTD1P50E

Motorola Preferred Device

TMOS POWER FET
1.0 AMPERES
500 VOLTS
15 Ω



CASE 369A-13, Style 2
DPAK Surface Mount

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	500	Vdc
Drain-to-Gate Voltage ($R_{GS} = 1.0 \text{ M}\Omega$)	V_{DGR}	500	Vdc
Gate-to-Source Voltage — Continuous	V_{GS}	± 20	Vdc
— Single Pulse ($t_p \leq 50 \mu\text{s}$)	V_{GSM}	± 40	
Drain Current — Continuous @ $T_C = 25^\circ\text{C}$	I_D	1.0	Adc
— Continuous @ $T_C = 100^\circ\text{C}$	I_D	0.8	
— Single Pulse ($t_p \leq 10 \mu\text{s}$)	I_{DM}	4.0	Apk
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	50	Watts
Derate above 25°C		0.4	W/ $^\circ\text{C}$
Total Power Dissipation @ $T_C = 25^\circ\text{C}$, when mounted to minimum recommended pad size		1.75	Watts
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$

UNCLAMPED DRAIN-TO-SOURCE AVALANCHE CHARACTERISTICS ($T_J < 150^\circ\text{C}$)

Single Pulse Drain-to-Source Avalanche Energy — Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 100 \text{ Vdc}$, $V_{GS} = 10 \text{ Vdc}$, Peak $I_L = 3.0 \text{ Apk}$, $L = 10 \text{ mH}$, $R_G = 25 \Omega$)	E_{AS}	45	mJ
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THERMAL CHARACTERISTICS

Thermal Resistance — Junction to Case	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
— Junction to Ambient	$R_{\theta JA}$	100	
— Junction to Ambient (1)	$R_{\theta JA}$	71.4	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	T_L	260	$^\circ\text{C}$

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

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Preferred devices are Motorola recommended choices for future use and best overall value.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain-to-Source Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 0.25\text{ mAdc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	500 —	— TBD	— —	Vdc V/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ($V_{DS} = 500\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 500\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	I_{DSS}	— —	— —	10 100	μAdc
Gate-Body Leakage Current ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0$)	I_{GSS}	—	—	100	nAdc

ON CHARACTERISTICS*

Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 0.25\text{ mAdc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	2.0 —	3.1 TBD	4.0 —	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance ($V_{GS} = 10\text{ Vdc}$, $I_D = 0.5\text{ Adc}$)	$R_{DS(on)}$	—	12	15	Ohms
Drain-to-Source On-Voltage ($V_{GS} = 10\text{ Vdc}$) ($I_D = 1.0\text{ Adc}$) ($I_D = 0.5\text{ Adc}$, $T_J = 125^\circ\text{C}$)	$V_{DS(on)}$	— —	— —	18 15.8	Vdc
Forward Transconductance ($V_{DS} = 15\text{ Vdc}$, $I_D = 0.5\text{ Adc}$)	g_{FS}	0.4	0.6	—	mhos

DYNAMIC CHARACTERISTICS

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

SWITCHING CHARACTERISTICS*

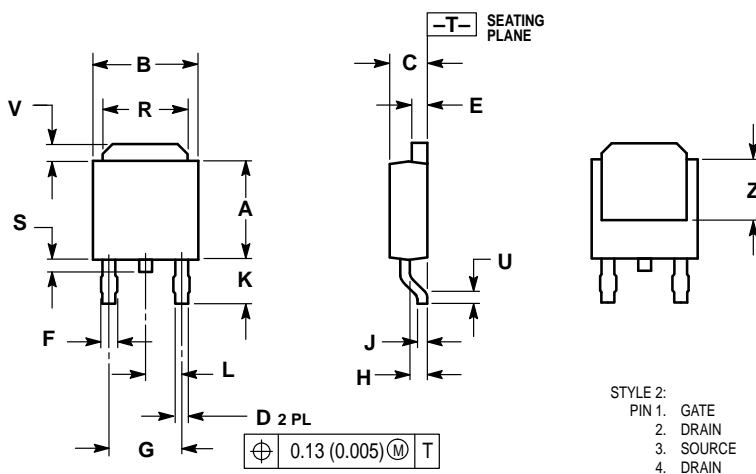
Turn-On Delay Time	$(V_{DS} = 250\text{ Vdc}$, $I_D = 1.0\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$, $R_G = 9.1\ \Omega$)	$t_{d(on)}$	—	TBD	TBD	ns
Rise Time		t_r	—	TBD	TBD	
Turn-Off Delay Time		$t_{d(off)}$	—	TBD	TBD	
Fall Time		t_f	—	TBD	TBD	
Gate Charge	$(V_{DS} = 400\text{ Vdc}$, $I_D = 1.0\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$)	Q_T	—	TBD	TBD	nC
		Q_1	—	TBD	—	
		Q_2	—	TBD	—	
		Q_3	—	TBD	—	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage ($I_S = 1.0\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) ($I_S = 1.0\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	V_{SD}	— —	2.0 TBD	3.5 —	Vdc
Reverse Recovery Time ($I_S = 1.0\text{ Adc}$, $dI_S/dt = 100\text{ A}/\mu\text{s}$)	t_{rr}	—	TBD	—	ns
	t_a	—	TBD	—	
	t_b	—	TBD	—	
Reverse Recovery Stored Charge	Q_{RR}	—	TBD	—	μC

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

PACKAGE DIMENSIONS




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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.175	0.215	4.45	5.46
S	0.020	0.050	0.51	1.27
U	0.020		0.51	
V	0.030	0.050	0.77	1.27
Z	0.138		3.51	

CASE 369A-13
ISSUE W

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