TMOS E-FET TM

Power Field Effect Transistor

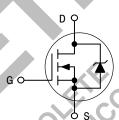
N-Channel Enhancement-Mode Silicon Gate

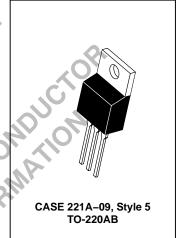
This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage—blocking capability without degrading performance over time. In addition, this advanced TMOS E—FET is designed to withstand high energy in the avalanche and commutation modes. This new energy efficient design also offers a drain—to—source diode with a fast recovery time. Designed for low voltage, high speed switching applications in power supplies, converters, PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional safety margin against unexpected voltage transients.

- Robust High Voltage Termination
- Avalanche Energy Specified
- Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- Diode is Characterized for Use in Bridge Circuits
- I_{DSS} and V_{DS(on)} Specified at Elevated Temperature

MTP8N50E

TMOS POWER FET 8.0 AMPERES 500 VOLTS R_{DS(on)} = 0.8 OHM





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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	500	Vdc
Drain-to-Gate Voltage (R_{GS} = 1.0 M Ω)	V_{DGR}	500	Vdc
Gate–to–Source Voltage – Continuous Vol. – Non–repetitive (tp ≤ 10 ms)	V _{GS} V _{GSM}	±20 ±40	Vdc Vpk
Drain Current — Continuous @ $T_C = 25^{\circ}C$ — Continuous @ $T_C = 100^{\circ}C$ — Single Pulse (tp $\leq 10 \mu s$)	I _D I _D I _{DM}	8.0 5.0 32	Adc Apk
Total Power Dissipation @ T _C = 25°C Derate above 25°C	P _D	125 1.0	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 $_{\rm J}$ = 25°C (V $_{\rm DD}$ = 25 Vdc, V $_{\rm GS}$ = 10 Vdc, PEAK I $_{\rm L}$ = 8.0 Apk, L = 16 mH, R $_{\rm G}$ = 25 Ω)	E _{AS}	510	mJ
Thermal Resistance – Junction–to–Case – Junction–to–Ambient	R _θ JC R _θ JA	1.0 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 5 sec.	T _L	260	°C

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

Cha	Symbol	Min	Тур	Max	Unit	
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltaç ($V_{GS} = 0$ Vdc, $I_D = 250 \mu Adc$) Temperature Coefficient (Positive	V _{(BR)DSS}	500 —	<u> </u>	_ _	Vdc mV/°C	
Zero Gate Voltage Drain Current $(V_{DS} = 500 \text{ Vdc}, V_{GS} = 0 \text{ Vdc})$ $(V_{DS} = 400 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, T_{J})$	I _{DSS}	_	_	250 1000	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 $(V_{DS} = V_{GS}, I_{D} = 250 \mu Adc)$ Threshold Temperature Coefficie	V _{GS(th)}	2.0 —	2.8 6.3	4.0 —	Vdc mV/°C	
Static Drain-to-Source On-Resista $(V_{GS} = 10 \text{ Vdc}, I_D = 4.0 \text{ Adc})$	R _{DS(on)}	_	0.6	0.8	Ohms	
$\begin{split} & \text{Drain-to-Source On-Voltage (V}_{GS} \\ & \text{(I}_{D} = 8.0 \text{ Adc)} \\ & \text{(I}_{D} = 4.0 \text{ Adc, T}_{J} = 125^{\circ}\text{C)} \end{split}$	V _{DS(on)}	_	5.0 —	7.2 6.4	Vdc	
Forward Transconductance (V _{DS} = 15 Vdc, I _D = 4.0 Adc)		9FS	4.0	_	_	mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	// OF \/ \	C _{iss}	_	1450	1680	pF
Output Capacitance	$(V_{DS} = 25 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}, f = 1.0 \text{ MHz})$	C _{oss}	_	190	246	
Transfer Capacitance	,	C _{rss}	_	45.4	144	
SWITCHING CHARACTERISTICS (2	2)	T	T	T	T	1
Turn-On Delay Time		t _{d(on)}	_	15	50	ns
Rise Time	$(R_{qo} + C17n = 9.1 \Omega)$	t _r	_	33	72	
Turn-Off Delay Time	(Ngo + C1711 = 9.1 52)	t _{d(off)}	_	40	150	
Fall Time		t _f	_	32	60	
Gate Charge	$(V_{DS} = 400 \text{ Vdc}, I_{D} = 8.0 \text{ Adc}, V_{GS} = 10 \text{ Vdc})$	Q _T	_	40	64	nC
(see Figure 8)		Q ₁	_	8.0	_	
		Q_2	_	17	_	
		Q_3	_	17.3	_	
SOURCE-DRAIN DIODE CHARACT	TERISTICS					
Forward On-Voltage (I _S = 8.0 Adc, V _{GS} = 0 Vdc)	40500)	V _{SD}	_	1.2	2.0	Vdc
$(I_S = 8.0 \text{ Adc}, V_{GS} = 0 \text{ Vdc}, T_J = 0)$	125°C)		_	1.1	_	
Reverse Recovery Time	$(I_S = 8.0 \text{ Adc}, V_{GS} = 0 \text{ Vdc}, \\ dI_S/dt = 100 \text{ A}/\mu\text{s})$	t _{rr}	_	320	_	ns
		t _a	_	179	_	1
		t _b	_	141	_	1
Reverse Recovery Stored Charge		Q _{RR}	_	3.0	_	μС
INTERNAL PACKAGE INDUCTANC	E	1	I	I	l	1
Internal Drain Inductance (Measured from the drain lead 0.	L _D	_	4.5	_	nH	
Internal Source Inductance (Measured from the source lead	L _S	_	7.5	_		

⁽¹⁾ Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
(2) Switching characteristics are independent of operating junction temperature.

TYPICAL ELECTRICAL CHARACTERISTICS

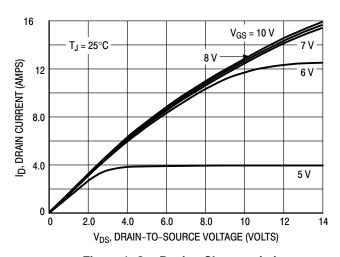


Figure 1. On-Region Characteristics

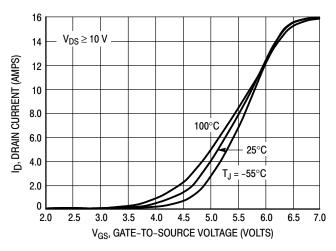


Figure 2. Transfer Characteristics

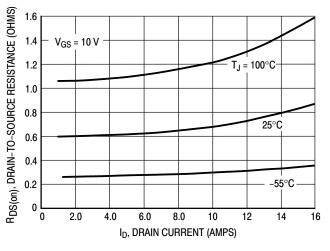


Figure 3. On-Resistance versus Drain Current and Temperature

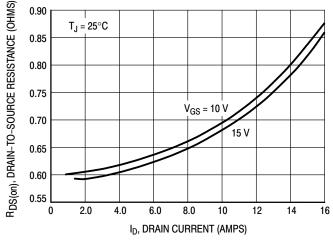


Figure 4. On-Resistance versus Drain Current and Gate Voltage

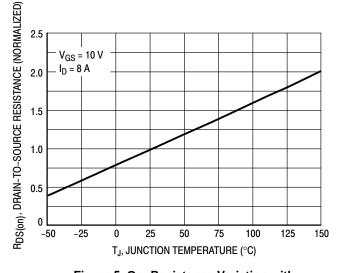


Figure 5. On–Resistance Variation with Temperature

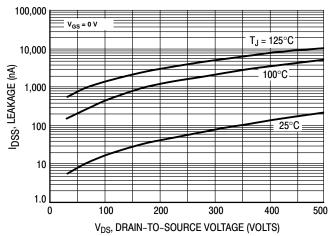
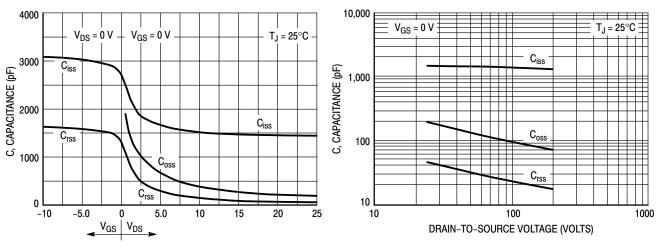


Figure 6. Drain-to-Source Leakage Current versus Voltage

TYPICAL ELECTRICAL CHARACTERISTICS



GATE-TO-SOURCE OR DRAIN-TO-SOURCE VOLTAGE (VOLTS)

Figure 7. Capacitance Variation

) Figure

Figure 8. High Voltage Capacitance Variation

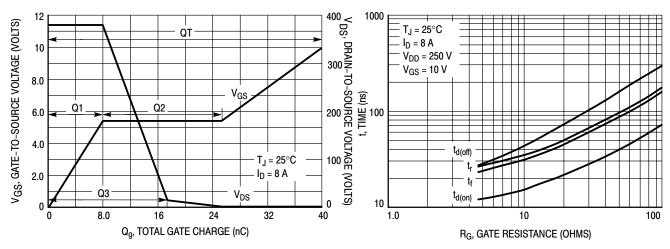


Figure 9. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

Figure 10. Resistive Switching Time Variation versus Gate Resistance

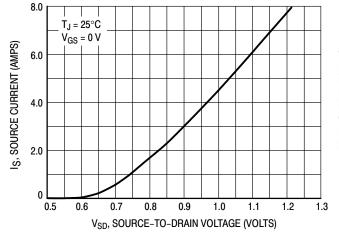


Figure 11. Diode Forward Voltage versus Current

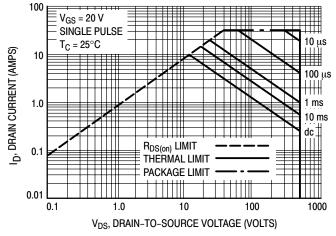


Figure 12. Maximum Rated Forward Biased Safe Operating Area

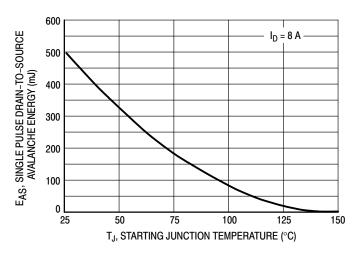


Figure 13. Maximum Avalanche Energy versus Starting Junction Temperature

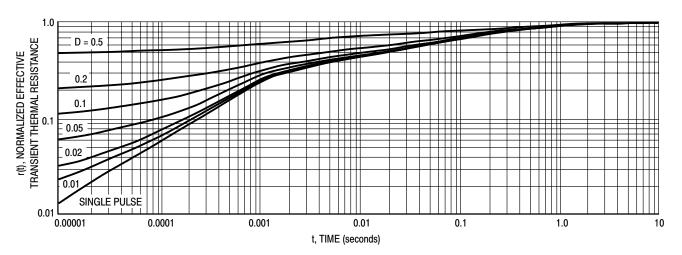
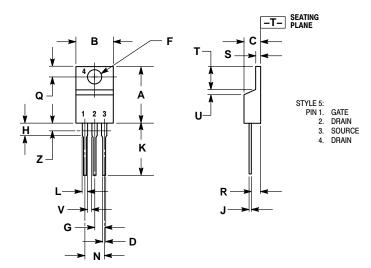


Figure 14. Thermal Response

PACKAGE DIMENSIONS CASE 221A-09 ISSUE AA



- 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.

	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.570	0.620	14.48	15.75
В	0.380	0.405	9.66	10.28
С	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
Н	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	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
Т	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
٧	0.045		1.15	
z		0.080		2.04

Notes

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