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MTP4N80E

Designer's™ Data Sheet

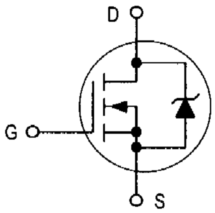
TMOS E-FET ™ Power Field Effect Transistor

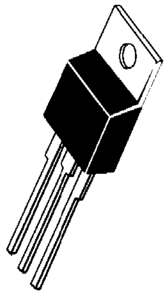
N–Channel Enhancement–Mode Silicon Gate

TMOS POWER FET
4.0 AMPERES
800 VOLTS
$R_{DS(on)}$ = 3.0 OHM

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. The new energy efficient design also offers a drain–to–source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, converters and 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





TO–220AB

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

Rating	Symbol	Value	Unit
Drain–Source Voltage	V_{DSS}	800	Vdc
Drain–Gate Voltage (R_{GS} = 1.0 MΩ)	V_{DGR}	800	Vdc
Gate–Source Voltage — Continuous — Non–Repetitive ($t_p \le$ 10 ms)	V_{GS} V_{GSM}	± 20 ± 40	Vdc Vpk
Drain Current — Continuous — Continuous @ 100°C — Single Pulse ($t_p \le$ 10 μs)	I_D I_D I_{DM}	4.0 2.9 12	Adc Apk
Total Power Dissipation 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_J = 25°C (V_{DD} = 100 Vdc, V_{GS} = 10 Vdc, I_L = 8.0 Apk, L = 10 mH, R_G = 25 Ω)	E_{AS}	320	mJ
Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	1.0 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	T_L	260	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain–Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = 250 μAdc)	$V_{(BR)DSS}$	800	—	—	Vdc
Temperature Coefficient (Positive)		—	1.02	—	mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 800 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	10	μAdc
(V_{DS} = 800 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)		—	—	100	
Gate–Body Leakage Current (V_{GS} = ± 20 Vdc, V_{DS} = 0)	I_{GSS}	—	—	100	nAdc
ON CHARACTERISTICS (1)					
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 250 μAdc)	$V_{GS(th)}$	2.0	3.0	4.0	Vdc
Temperature Coefficient (Negative)		—	7.0	—	mV/°C
Static Drain–Source On–Resistance (V_{GS} = 10 Vdc, I_D = 2.0 Adc)	$R_{DS(on)}$	—	1.95	3.0	Ohm
Drain–Source On–Voltage (V_{GS} = 10 Vdc) (I_D = 4.0 Adc)	$V_{DS(on)}$	—	8.24	12	Vdc
(I_D = 2.0 Adc, T_J = 125°C)		—	—	10	
Forward Transconductance (V_{DS} = 15 Vdc, I_D = 2.0 Adc)	g_{FS}	2.0	4.3	—	mhos

DYNAMIC CHARACTERISTICS

Characteristic		Symbol	Min	Typ	Max	Unit
Input Capacitance	(V_{DS} = 25 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}	—	1320	2030	pF
Output Capacitance		C_{oss}	—	187	400	
Reverse Transfer Capacitance		C_{rss}	—	72	160	

SWITCHING CHARACTERISTICS (2)

Characteristic		Symbol	Min	Typ	Max	Unit
Turn–On Delay Time	(V_{DD} = 400 Vdc, I_D = 4.0 Adc, V_{GS} = 10 Vdc, R_G = 9.1 Ω)	$t_{d(on)}$	—	13	30	ns
Rise Time		t_r	—	36	90	
Turn–Off Delay Time		$t_{d(off)}$	—	40	80	
Fall Time		t_f	—	30	75	
Gate Charge (See Figure 8)	(V_{DS} = 400 Vdc, I_D = 4.0 Adc, V_{GS} = 10 Vdc)	Q_T	—	36	80	nC
		Q_1	—	7.0	—	
		Q_2	—	16.5	—	
		Q_3	—	12	—	

SOURCE–DRAIN DIODE CHARACTERISTICS

Characteristic		Symbol	Min	Typ	Max	Unit
Forward On–Voltage (1)	(I_S = 4.0 Adc, V_{GS} = 0 Vdc)	V_{SD}	—	0.812	1.5	Vdc
	(I_S = 4.0 Adc, V_{GS} = 0 Vdc, T_J = 125°C)		—	0.7	—	
Reverse Recovery Time (See Figure 14)	(I_S = 4.0 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs)	t_{rr}	—	557	—	ns
		t_a	—	100	—	
		t_b	—	457	—	
Reverse Recovery Stored Charge		Q_{RR}	—	2.33	—	μC

INTERNAL PACKAGE INDUCTANCE

Characteristic	Symbol	Min	Typ	Max	Unit
Internal Drain Inductance (Measured from contact screw on tab to center of die)	L_D	—	3.5	—	nH
(Measured from the 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	—	nH

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

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