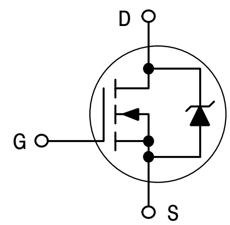
TMOS E-FET ™
Power Field Effect Transistor
N–Channel Enhancement–Mode Silicon Gate

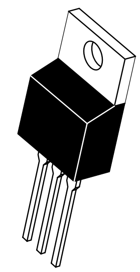
MTP8N50E

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





CASE 221A–09, Style 5
TO-220AB

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 MΩ)	V_{DGR}	500	Vdc
Gate–to–Source Voltage – Continuous – Non–repetitive (tp ≤ 10 ms)	V_{GS} V_{GSM}	±20 ±40	Vdc Vpk
Drain Current — Continuous @ T_C = 25°C — Continuous @ T_C = 100°C — Single Pulse (tp ≤ 10 µs)	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_J = 25°C (V_{DD} = 25 Vdc, V_{GS} = 10 Vdc, PEAK I_L = 8.0 Apk, L = 16 mH, R_G = 25 Ω)	E_{AS}	510	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 5 sec.	T_L	260	°C

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain–to–Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = 250 μAdc)		$V_{(BR)DSS}$	500	—	—	Vdc
Temperature Coefficient (Positive)			—	500	—	mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 500 Vdc, V_{GS} = 0 Vdc)		I_{DSS}	—	—	250	μAdc
(V_{DS} = 400 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)			—	—	1000	
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)		$V_{GS(th)}$	2.0	2.8	4.0	Vdc
Threshold Temperature Coefficient (Negative)			—	6.3	—	mV/°C
Static Drain–to–Source On–Resistance (V_{GS} = 10 Vdc, I_D = 4.0 Adc)		$R_{DS(on)}$	—	0.6	0.8	Ohms
Drain–to–Source On–Voltage (V_{GS} = 10 Vdc) (I_D = 8.0 Adc)		$V_{DS(on)}$	—	5.0	7.2	Vdc
(I_D = 4.0 Adc, T_J = 125°C)			—	—	6.4	
Forward Transconductance (V_{DS} = 15 Vdc, I_D = 4.0 Adc)		g_{FS}	4.0	—	—	mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = 25 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}	—	1450	1680	pF
Output Capacitance		C_{oss}	—	190	246	
Transfer Capacitance		C_{rss}	—	45.4	144	
SWITCHING CHARACTERISTICS (2)						
Turn–On Delay Time	(R_{go} + C17n = 9.1 Ω)	$t_{d(on)}$	—	15	50	ns
Rise Time		t_r	—	33	72	
Turn–Off Delay Time		$t_{d(off)}$	—	40	150	
Fall Time		t_f	—	32	60	
Gate Charge (see Figure 8)	(V_{DS} = 400 Vdc, I_D = 8.0 Adc, V_{GS} = 10 Vdc)	Q_T	—	40	64	nC
		Q_1	—	8.0	—	
		Q_2	—	17	—	
		Q_3	—	17.3	—	
SOURCE–DRAIN DIODE CHARACTERISTICS						
Forward On–Voltage (I_S = 8.0 Adc, V_{GS} = 0 Vdc)		V_{SD}	—	1.2	2.0	Vdc
(I_S = 8.0 Adc, V_{GS} = 0 Vdc, T_J = 125°C)			—	1.1	—	
Reverse Recovery Time	(I_S = 8.0 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs)	t_{rr}	—	320	—	ns
		t_a	—	179	—	
		t_b	—	141	—	
Reverse Recovery Stored Charge		Q_{RR}	—	3.0	—	μC
INTERNAL PACKAGE INDUCTANCE						
Internal Drain Inductance (Measured from the drain lead 0.25″ from package to center of die)		L_D	—	4.5	—	nH
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 ≤ 2.0%.
(2) Switching characteristics are independent of operating junction temperature.

TYPICAL ELECTRICAL CHARACTERISTICS

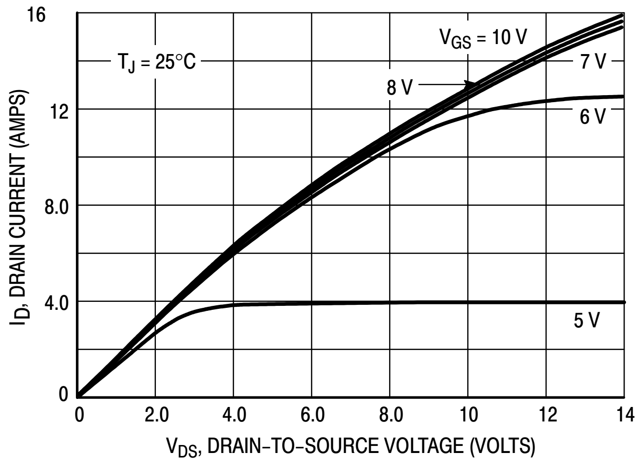


Figure 1. On–Region Characteristics

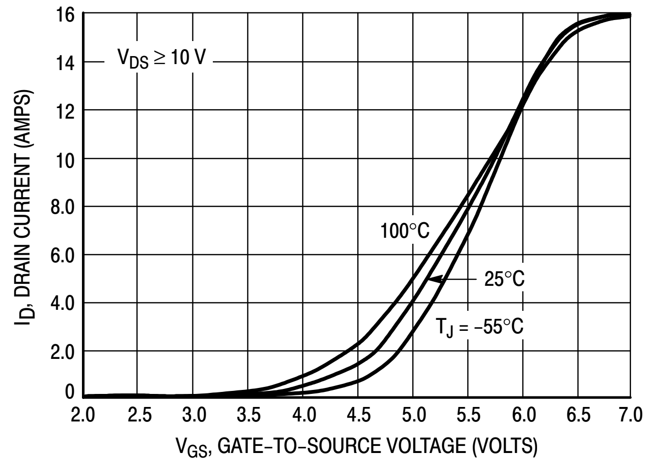


Figure 2. Transfer Characteristics

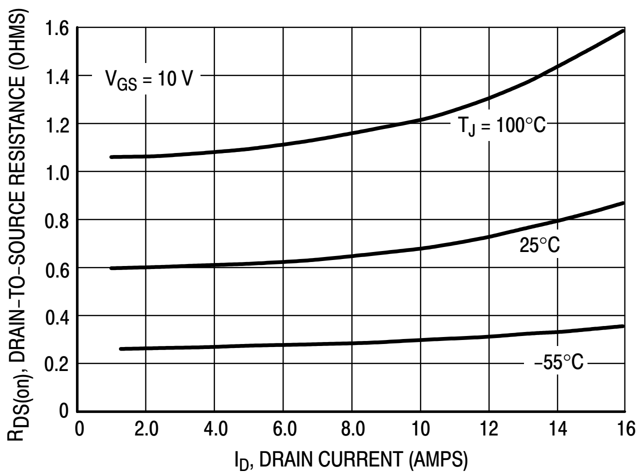


Figure 3. On–Resistance versus Drain Current and Temperature

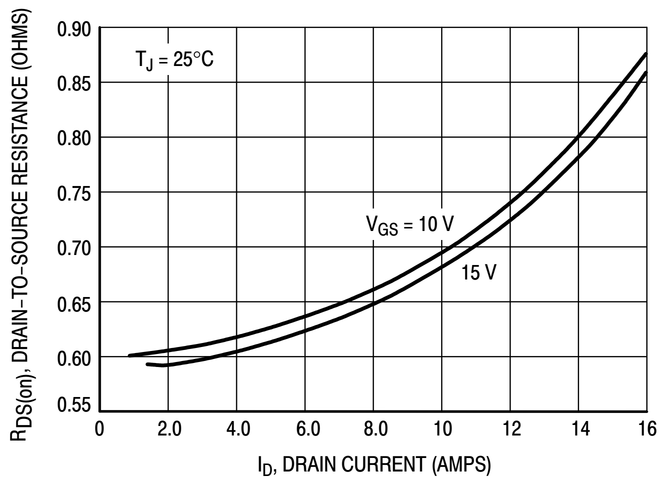


Figure 4. On–Resistance versus Drain Current and Gate Voltage

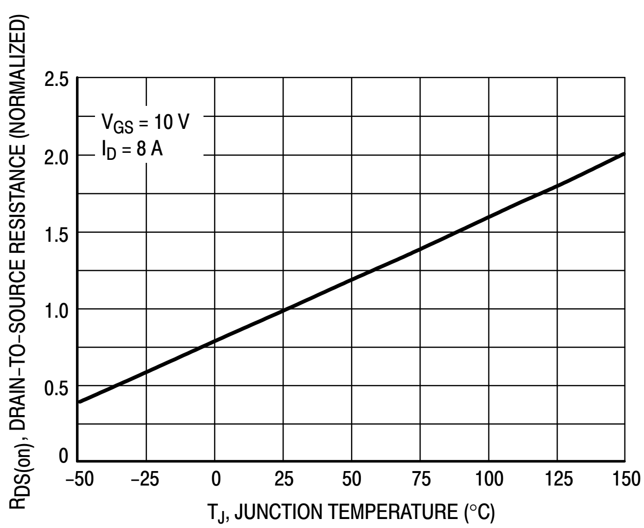


Figure 5. On–Resistance Variation with Temperature

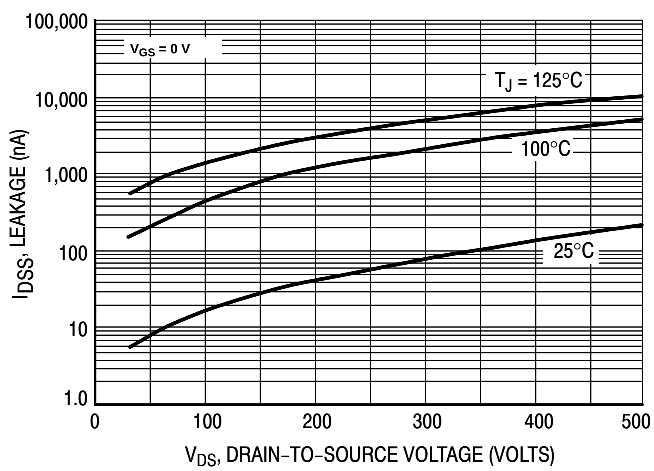


Figure 6. Drain–to–Source Leakage Current versus Voltage

TYPICAL ELECTRICAL CHARACTERISTICS

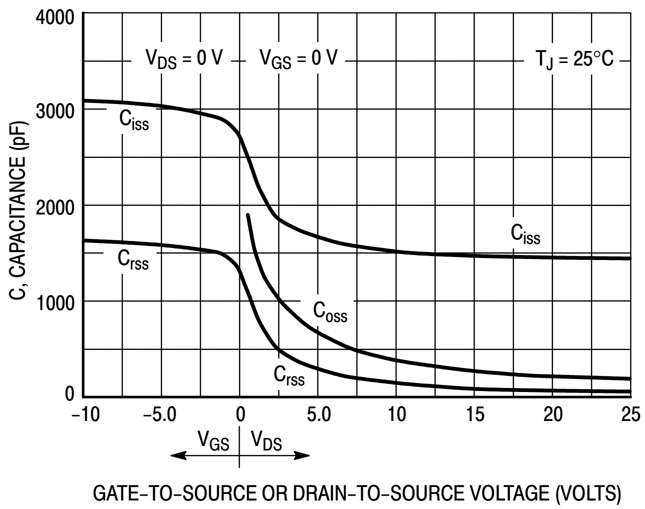


Figure 7. Capacitance Variation

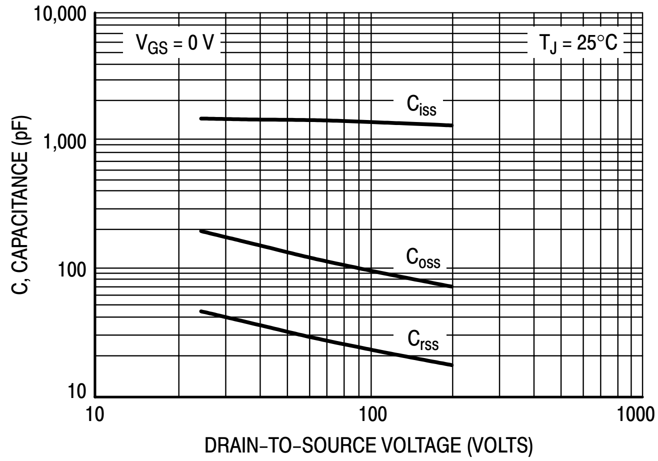


Figure 8. High Voltage Capacitance Variation

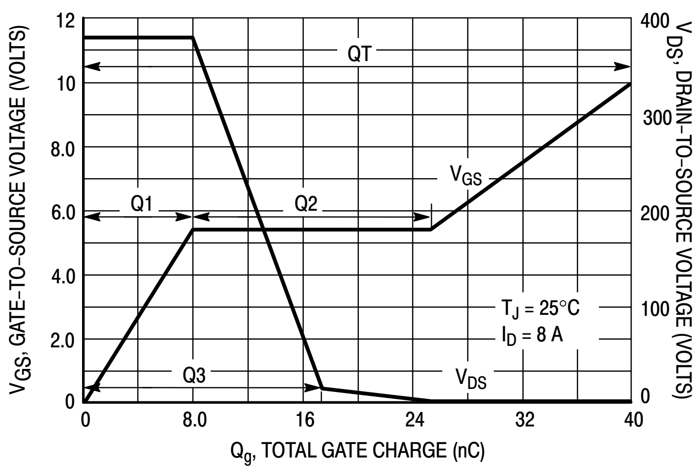


Figure 9. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

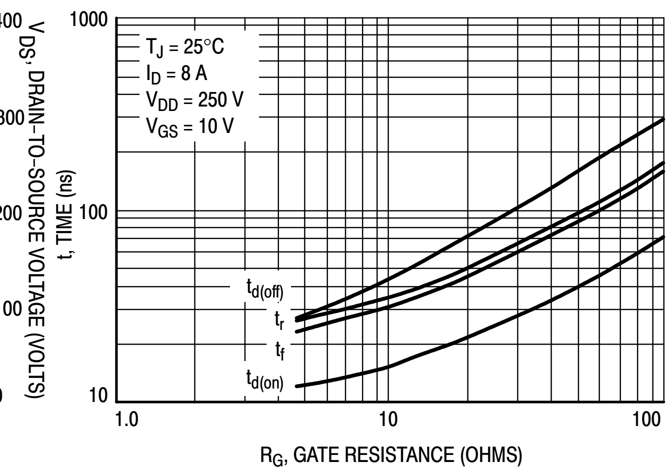


Figure 10. Resistive Switching Time Variation versus Gate Resistance

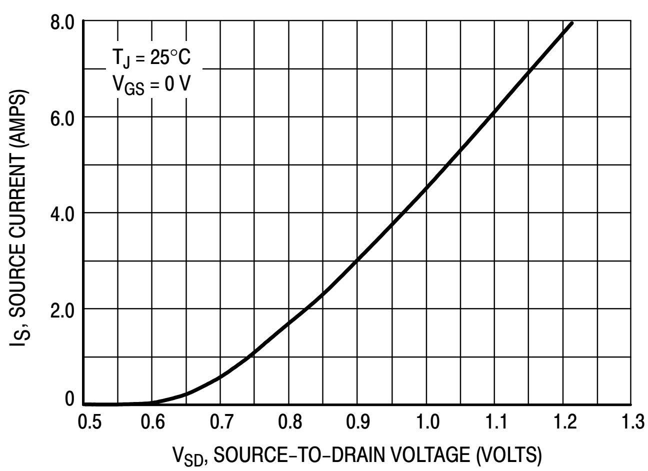


Figure 11. Diode Forward Voltage versus Current

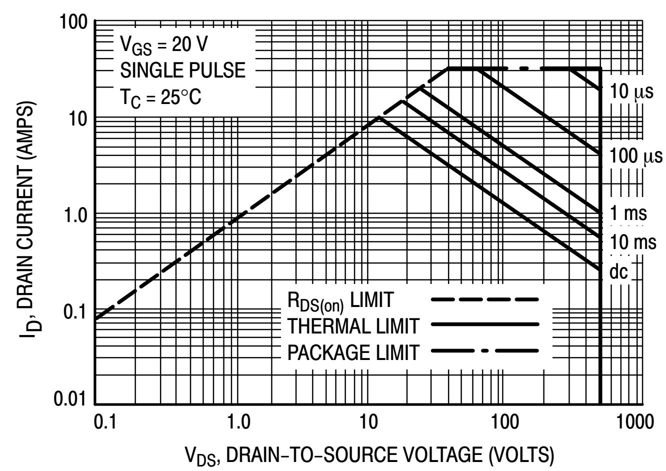


Figure 12. Maximum Rated Forward Biased Safe Operating Area

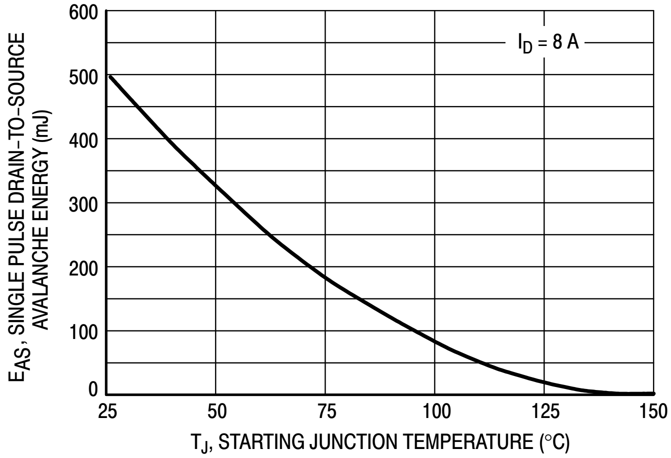


Figure 13. Maximum Avalanche Energy versus Starting Junction Temperature

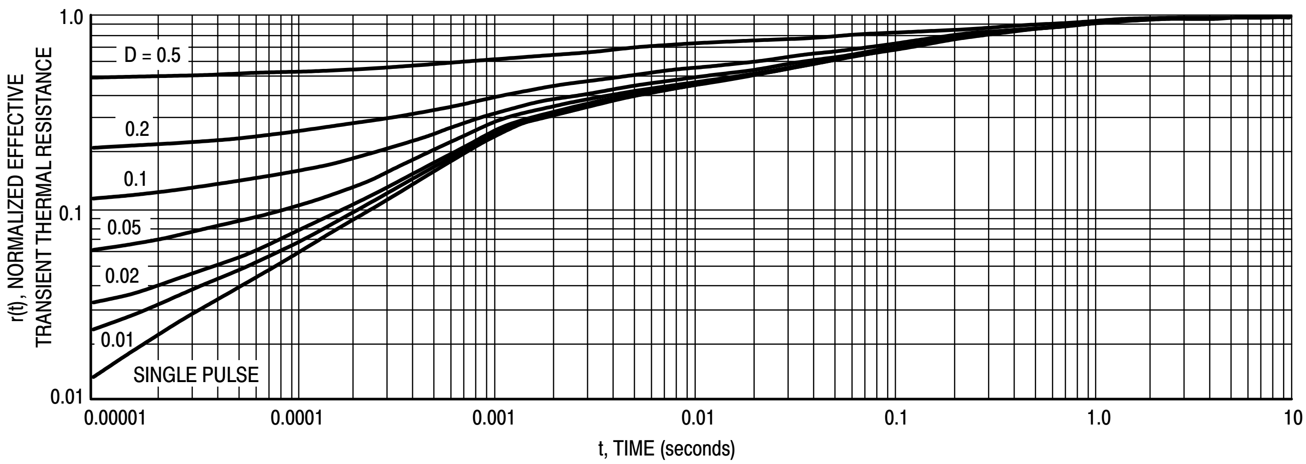
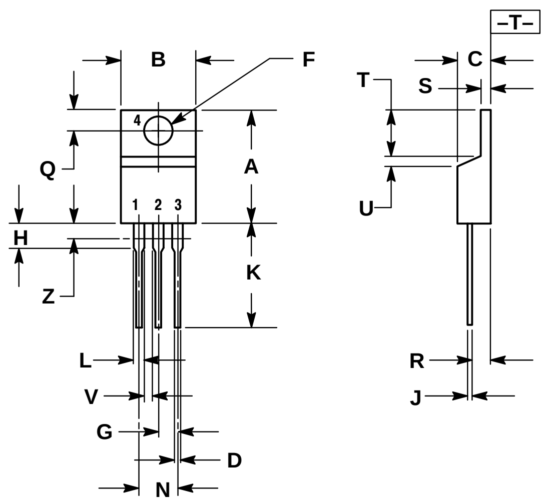


Figure 14. Thermal Response

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.

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	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
H	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
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

Notes

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