

N-Channel Enhancement Mode Power MOSFET

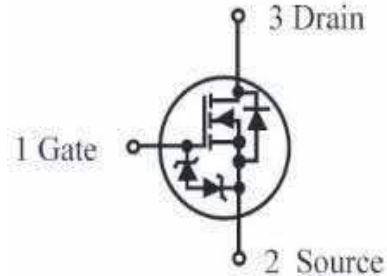
General Features

- $V_{DS} = 60V, I_D = 0.32A$
 $R_{DS(ON)} < 4.0\Omega @ V_{GS}=5V, I_D = 500 \text{ mA}$
 $R_{DS(ON)} < 3.0\Omega @ V_{GS}=10V, I_D = 50\text{mA}$
- ESD Rating: HBM 1000V

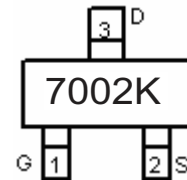
- High power and current handing capability
- Lead free product is acquired
- Surface mount package

Application

- Direct logic-level interface: TTL/CMOS
- Drivers: relays, solenoids, lamps, hammers, display, memories, transistors, etc.
- Battery operated systems
- Solid-state relays
- Halogen-free



Schematic diagram



Marking and pin assignment



SOT-23 top view

Package Marking And Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
7002K	2N7002KA	SOT-23	Ø180mm	8 mm	3000 units

Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	I_D	$T_A = 25^\circ\text{C}$	0.32
		$T_A = 100^\circ\text{C}$	0.18
Drain Current-Pulsed (Note 1)	I_{DM}	0.8	A
Maximum Power Dissipation	P_D	0.3	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	556	$^\circ\text{C/W}$
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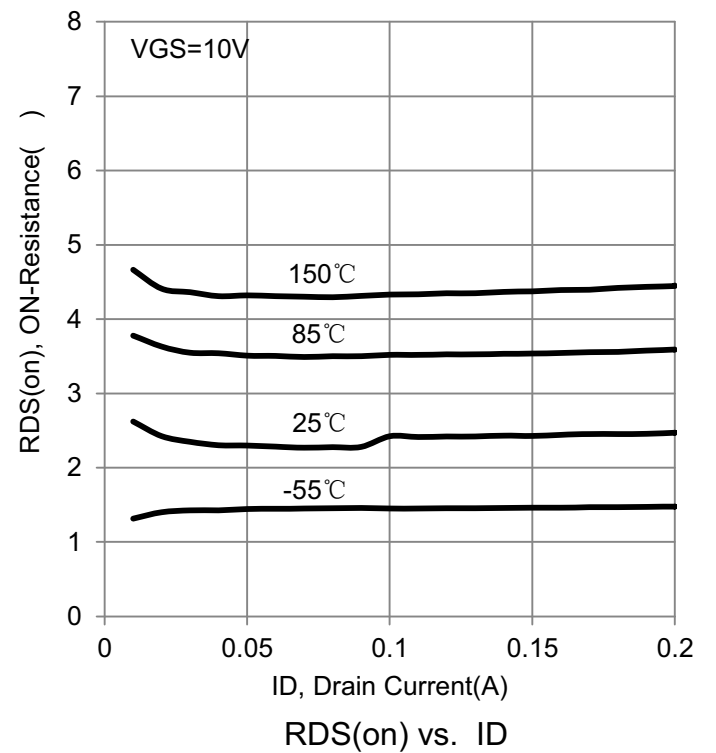
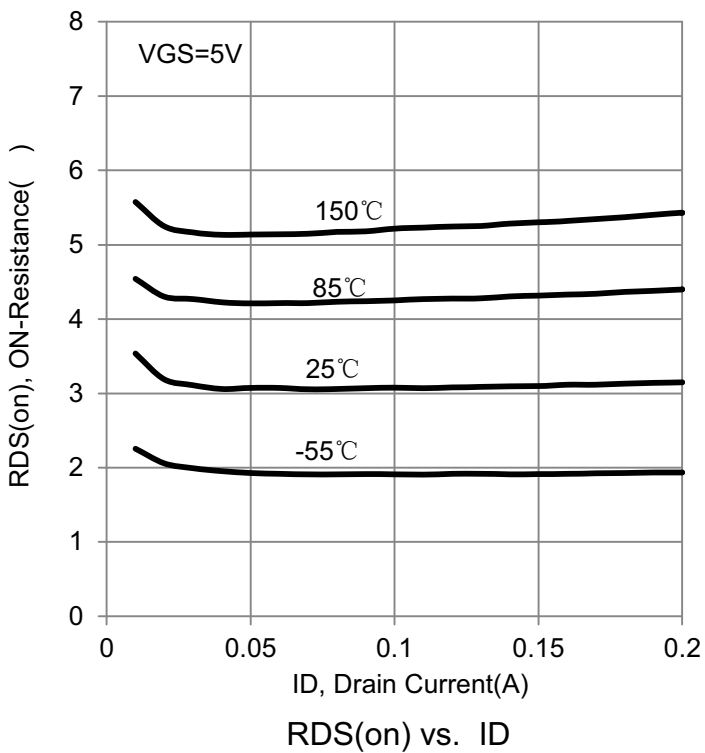
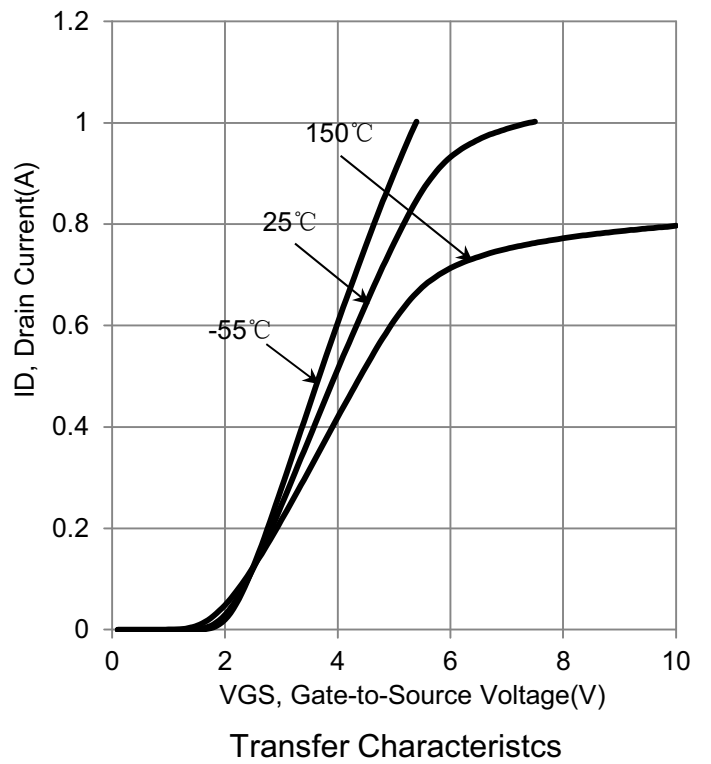
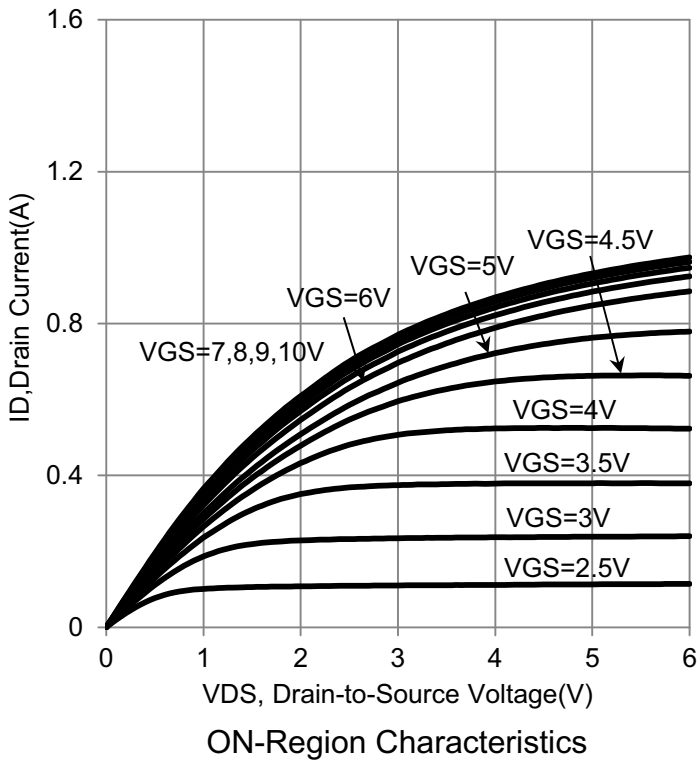
Electrical Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±1.0	μA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.0	1.6	2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =5V, I _D =0.05A	-	1.4	4.0	Ω
		V _{GS} =10V, I _D =0.5A	-	1.8	3.0	Ω
Forward Transconductance	g _{FS}	V _{DS} ≥2.0V, I _D =0.2A	80	-	-	mS
Dynamic Characteristics ^(Note 4)						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, F=1.0MHz	-	17	50	PF
Output Capacitance	C _{oss}		-	10	25	PF
Reverse Transfer Capacitance	C _{rss}		-	2.5	5.0	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =25V, I _D =0.5A V _{GS} =10V, R _{GEN} =10Ω	-	7	20	nS
Turn-on Rise Time	t _r		-	-	-	nS
Turn-Off Delay Time	t _{d(off)}		-	11	40	nS
Turn-Off Fall Time	t _f		-	-	-	nS
Total Gate Charge	Q _g	V _{DS} =10V, I _D =0.3A, V _{GS} =4.5V	-	-	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V, I _S =0.115A	-	-	1.5	V
Diode Forward Current ^(Note 2)	I _S		-	-	0.32	A

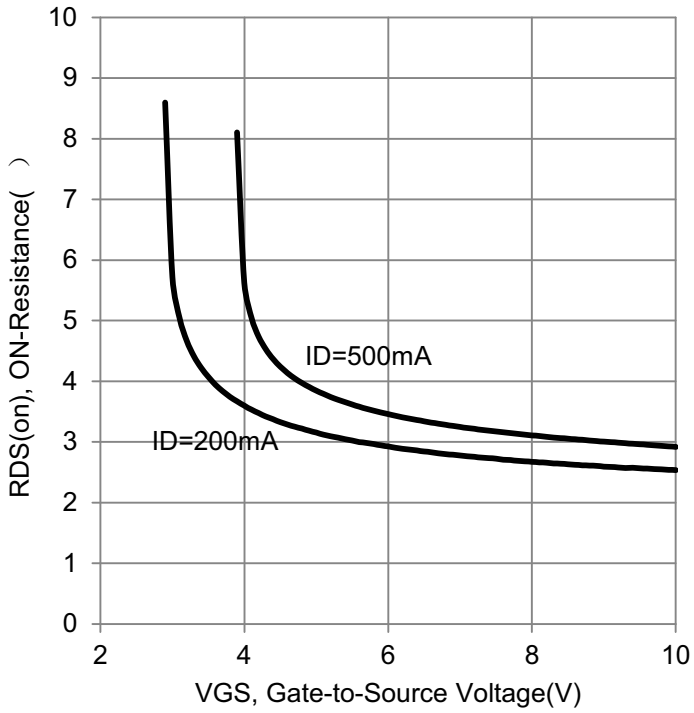
Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

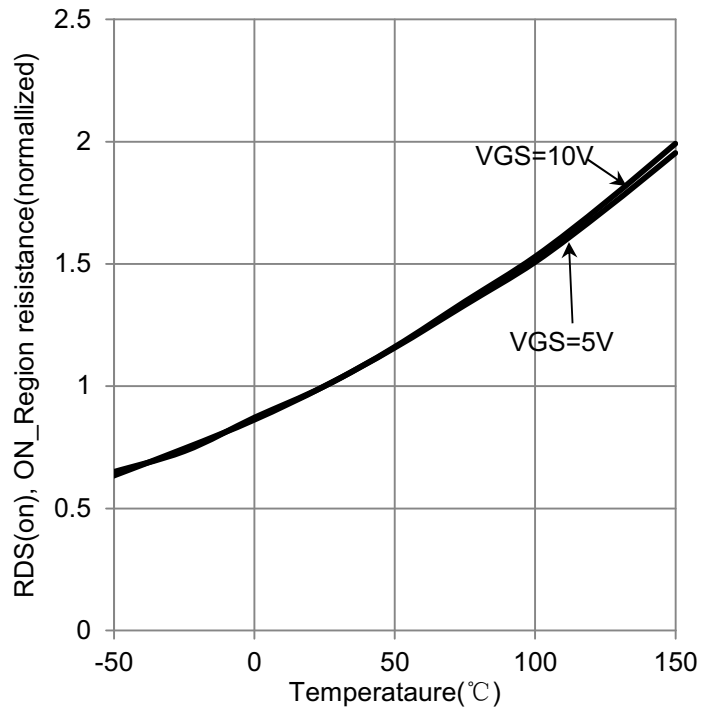
RATING AND CHARACTERISTICS CURVES (2N7002KA)



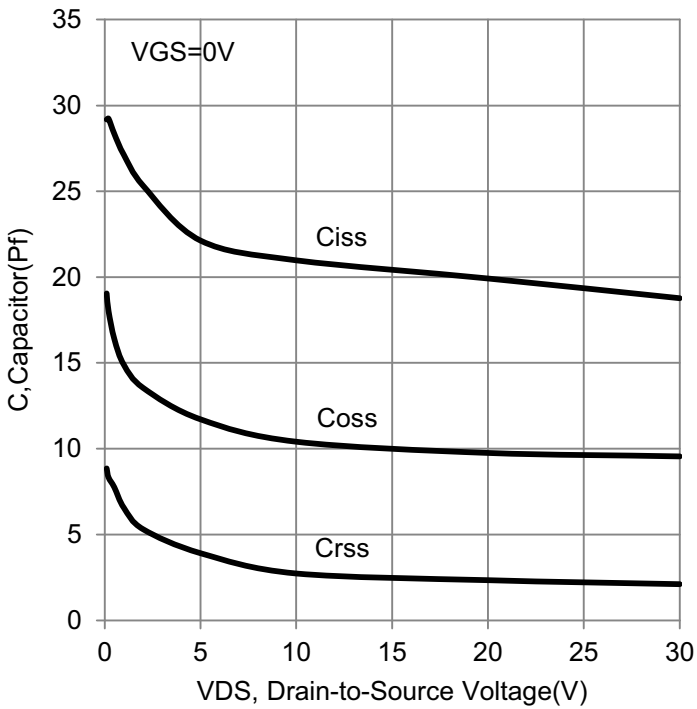
RATING AND CHARACTERISTICS CURVES (2N7002KA)



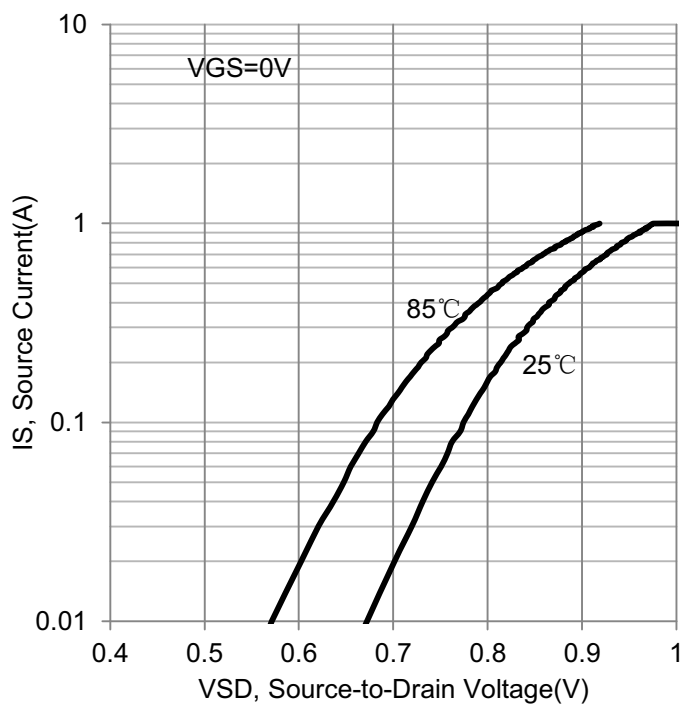
RDS(on) vs. VGS



RDS(on) vs. Temperature

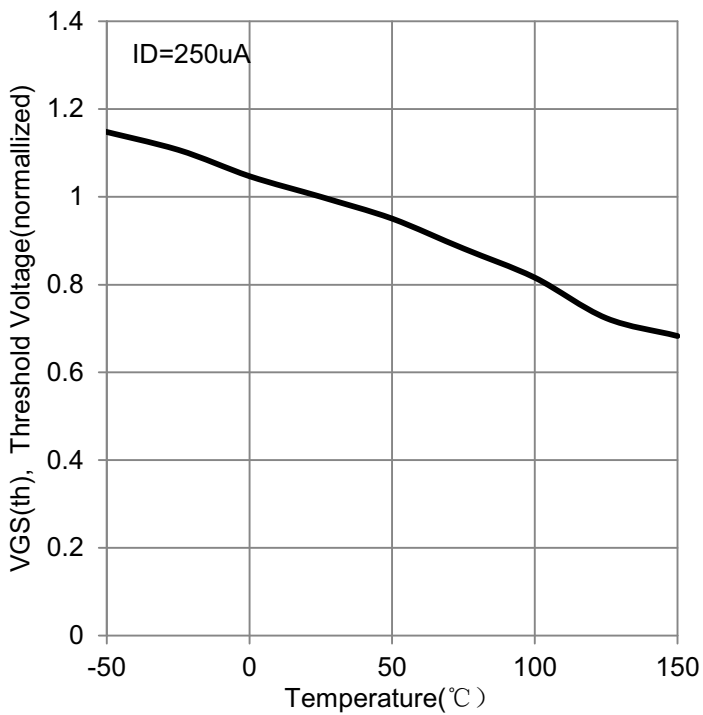


Capacitor vs. VDS

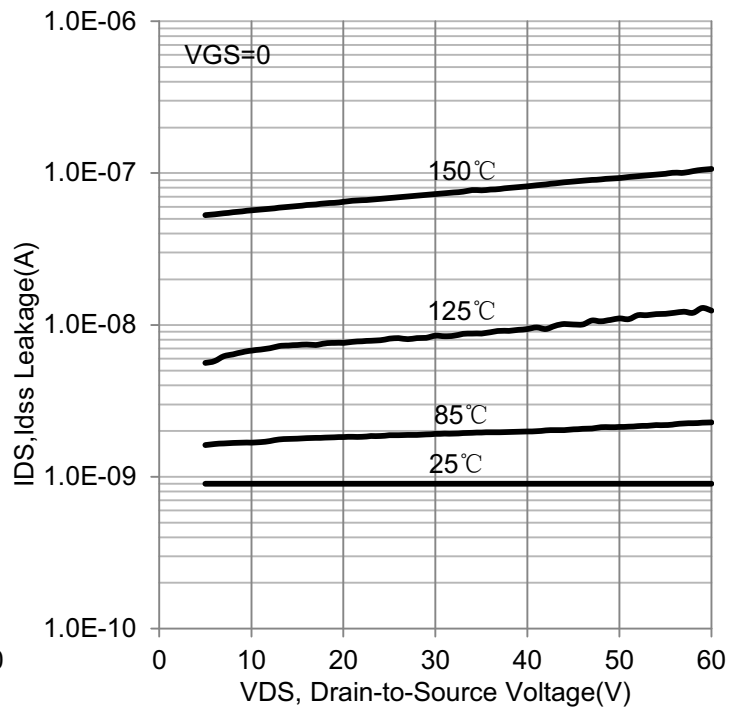


IS vs. VSD

RATING AND CHARACTERISTICS CURVES (2N7002KA)

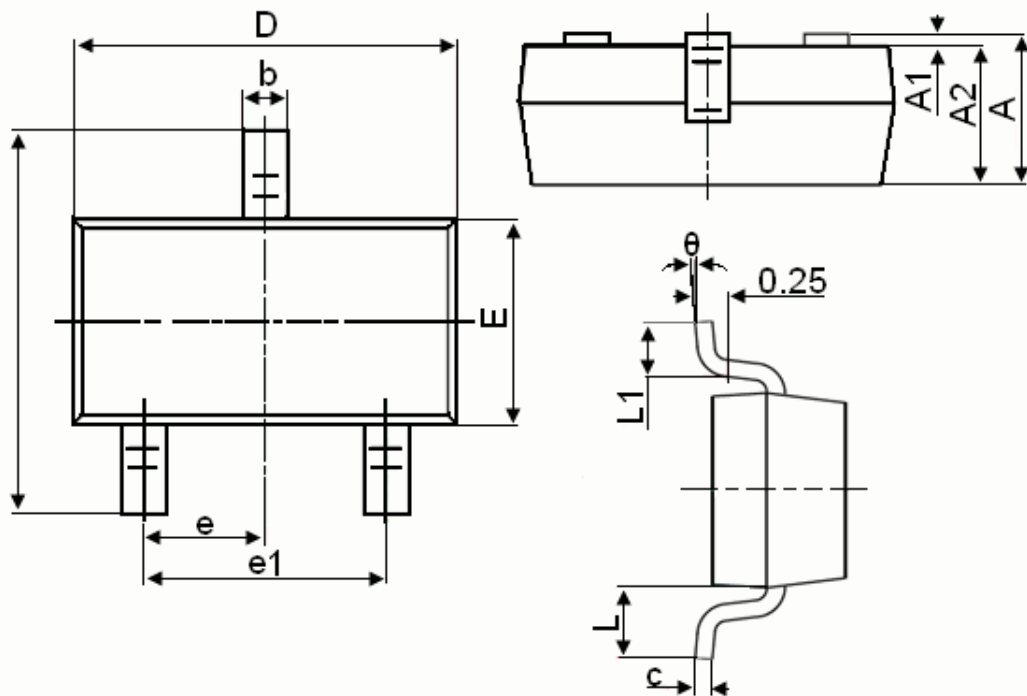


VGS(th) vs. Temperature



IDS vs. VDS

SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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