

MC74AC14, MC74ACT14

Hex Inverter Schmitt Trigger

The MC74AC14/74ACT14 contains six logic inverters which accept standard CMOS Input signals (TTL levels for MC74ACT14) and provide standard CMOS output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have a greater noise margin than conventional inverters.

The MC74AC14/74ACT14 has hysteresis between the positive-going and negative-going input thresholds (typically 1.0 V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

- Schmitt Trigger Inputs
- Outputs Source/Sink 24 mA
- 'ACT14 Has TTL Compatible Inputs

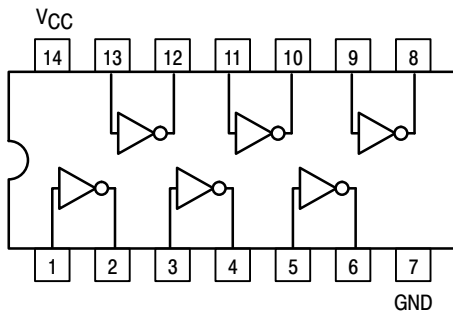


Figure 1. Pinout; 14-Lead Packages Conductors (Top View)

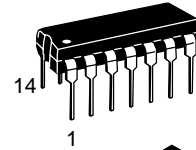
FUNCTION TABLE

Input	Output
A	O
L	H
H	L

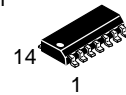


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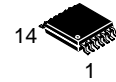
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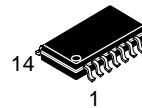
PDIP-14
N SUFFIX
CASE 646



SO-14
D SUFFIX
CASE 751A



TSSOP-14
DT SUFFIX
CASE 948G



EIAJ-14
M SUFFIX
CASE 965

ORDERING INFORMATION

Device	Package	Shipping
MC74AC14N	PDIP-14	25 Units/Rail
MC74ACT14N	PDIP-14	25 Units/Rail
MC74AC14D	SOIC-14	55 Units/Rail
MC74AC14DR2	SOIC-14	2500 Tape & Reel
MC74ACT14D	SOIC-14	55 Units/Rail
MC74ACT14DR2	SOIC-14	2500 Tape & Reel
MC74AC14DT	TSSOP-14	96 Units/Rail
MC74AC14DTR2	TSSOP-14	2500 Tape & Reel
MC74ACT14DT	TSSOP-14	96 Units/Rail
MC74ACT14DTR2	TSSOP-14	2500 Tape & Reel
MC74AC14M	EIAJ-14	50 Units/Rail
MC74AC14MEL	EIAJ-14	2000 Tape & Reel
MC74ACT14M	EIAJ-14	50 Units/Rail
MC74ACT14MEL	EIAJ-14	2000 Tape & Reel

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 5 of this data sheet.

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MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
V_{out}	DC Output Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
I_{in}	DC Input Current, per Pin	± 20	mA
I_{out}	DC Output Sink/Source Current, per Pin	± 50	mA
I_{CC}	DC V_{CC} or GND Current per Output Pin	± 50	mA
T_{stg}	Storage Temperature	-65 to +150	$^{\circ}\text{C}$

*Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
V_{CC}	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Ref. to GND)	0	-	V_{CC}	V	
t_r, t_f	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	$V_{CC} @ 3.0\text{ V}$	-	150	-	ns/V
		$V_{CC} @ 4.5\text{ V}$	-	40	-	
		$V_{CC} @ 5.5\text{ V}$	-	25	-	
t_r, t_f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	$V_{CC} @ 4.5\text{ V}$	-	10	-	ns/V
		$V_{CC} @ 5.5\text{ V}$	-	8.0	-	
T_J	Junction Temperature (PDIP)	-	-	140	$^{\circ}\text{C}$	
T_A	Operating Ambient Temperature Range	-40	25	85	$^{\circ}\text{C}$	
I_{OH}	Output Current - High	-	-	-24	mA	
I_{OL}	Output Current - Low	-	-	24	mA	

1. V_{in} from 30% to 70% V_{CC} ; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V_{in} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

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DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	74AC		74AC		Unit	Conditions
			T _A = +25°C		T _A = -40°C to +85°C			
			Typ	Guaranteed Limits				
V _{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	I _{OUT} = -50 μA	
		4.5	4.49	4.4	4.4			
		5.5	5.49	5.4	5.4	V	*V _{IN} = V _{IL} or V _{IH} -12 mA I _{OH} -24 mA -24 mA	
		3.0	-	2.56	2.46			
		4.5	-	3.86	3.76	V	I _{OH} -24 mA -24 mA	
		5.5	-	4.86	4.76			
V _{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	I _{OUT} = 50 μA	
		4.5	0.001	0.1	0.1			
		5.5	0.001	0.1	0.1	V	*V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA	
		3.0	-	0.36	0.44			
		4.5	-	0.36	0.44	V	I _{OL} 24 mA 24 mA	
		5.5	-	0.36	0.44			
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μA	V _I = V _{CC} , GND	
I _{OLD}	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V _{OLD} = 1.65 V Max	
I _{OHD}		5.5	-	-	-75	mA	V _{OHD} = 3.85 V Min	
I _{CC}	Maximum Quiescent Supply Current	5.5	-	4.0	40	μA	V _{IN} = V _{CC} or GND	

*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

NOTE: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

AC CHARACTERISTICS (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

Symbol	Parameter	V _{CC} * (V)	74AC			74AC		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
t _{PLH}	Propagation Delay	3.3	1.5	9.5	13.5	1.5	15.0	ns	3-5
		5.0	1.5	7.0	10.0	1.5	11.0		
t _{PHL}	Propagation Delay	3.3	1.5	7.5	11.5	1.5	13.0	ns	3-5
		5.0	1.5	6.0	8.5	1.5	9.5		

*Voltage Range 3.3 V is 3.3 V ±0.3 V.

Voltage Range 5.0 V is 5.0 V ±0.5 V.

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INPUT CHARACTERISTICS (unless otherwise specified)

Symbol	Parameter	V _{CC} (V)	74AC		74ACT		Test Conditions
V _{t+}	Maximum Positive Threshold	3.0	2.2	2.0	V	T _A = Worst Case	
		4.5	3.2				
		5.5	3.9				
V _{t-}	Minimum Negative Threshold	3.0	0.5	0.8	V	T _A = Worst Case	
		4.5	0.9				
		5.5	1.1				
V _{h(max)}	Maximum Hysteresis	3.0	1.2	1.2	V	T _A = Worst Case	
		4.5	1.4				
		5.5	1.6				
V _{h(min)}	Minimum Hysteresis	3.0	0.3	0.4	V	T _A = Worst Case	
		4.5	0.4				
		5.5	0.5				

DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	74ACT		74ACT		Unit	Conditions
			T _A = +25°C		T _A = -40°C to +85°C			
			Typ	Guaranteed Limits				
V _{OH}	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	V	I _{OUT} = -50 μA	
		5.5	5.49	5.4	5.4			
		4.5	-	3.86	3.76	V	*V _{IN} = V _{IL} or V _{IH} -24 mA	
		5.5	-	4.86	4.76			
V _{OL}	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	V	I _{OUT} = 50 μA	
		5.5	0.001	0.1	0.1			
		4.5	-	0.36	0.44	V	*V _{IN} = V _{IL} or V _{IH} 24 mA	
		5.5	-	0.36	0.44			
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μA	V _I = V _{CC} , GND	
ΔI _{CCCT}	Additional Max. I _{CC} /Input	5.5	0.6	-	1.5	mA	V _I = V _{CC} - 2.1 V	
I _{OLD}	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V _{OLD} = 1.65 V Max	
I _{OHD}		5.5	-	-	-75	mA	V _{OHD} = 3.85 V Min	
I _{CC}	Maximum Quiescent Supply Current	5.5	-	4.0	40	μA	V _{IN} = V _{CC} or GND	

*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

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AC CHARACTERISTICS (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

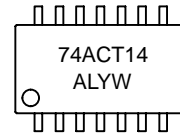
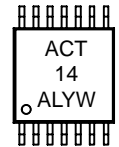
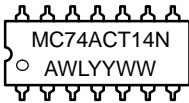
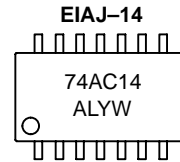
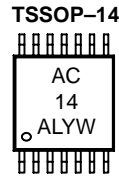
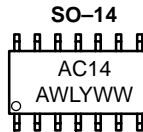
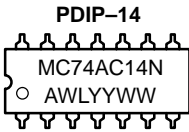
Symbol	Parameter	V _{CC} * (V)	74ACT			74ACT		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
t _{PLH}	Propagation Delay	5.0	1.5	–	11.5	1.0	12.5	ns	3–5
t _{PHL}	Propagation Delay	5.0	1.5	–	10.0	1.0	11.0	ns	3–5

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
C _{PD}	Power Dissipation Capacitance	25	pF	V _{CC} = 5.0 V

MARKING DIAGRAMS

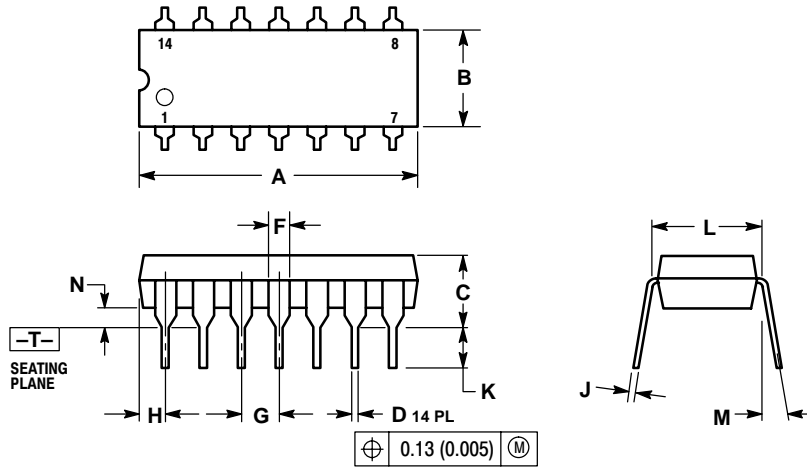


A = Assembly Location
 WL, L = Wafer Lot
 YY, Y = Year
 WW, W = Work Week

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PACKAGE DIMENSIONS

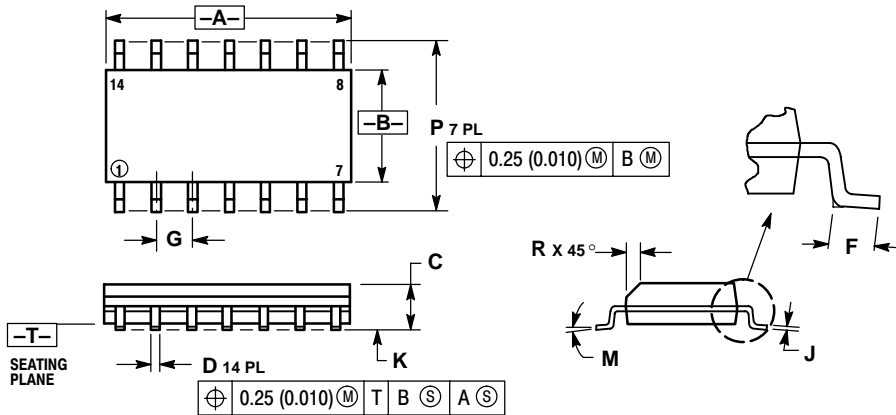
PDIP-14
N SUFFIX
 14 PIN PLASTIC DIP PACKAGE
 CASE 646-06
 ISSUE M



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	18.80
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	---	10°	---	10°
N	0.015	0.039	0.38	1.01

SO-14
D SUFFIX
 14 PIN PLASTIC SOIC PACKAGE
 CASE 751A-03
 ISSUE F



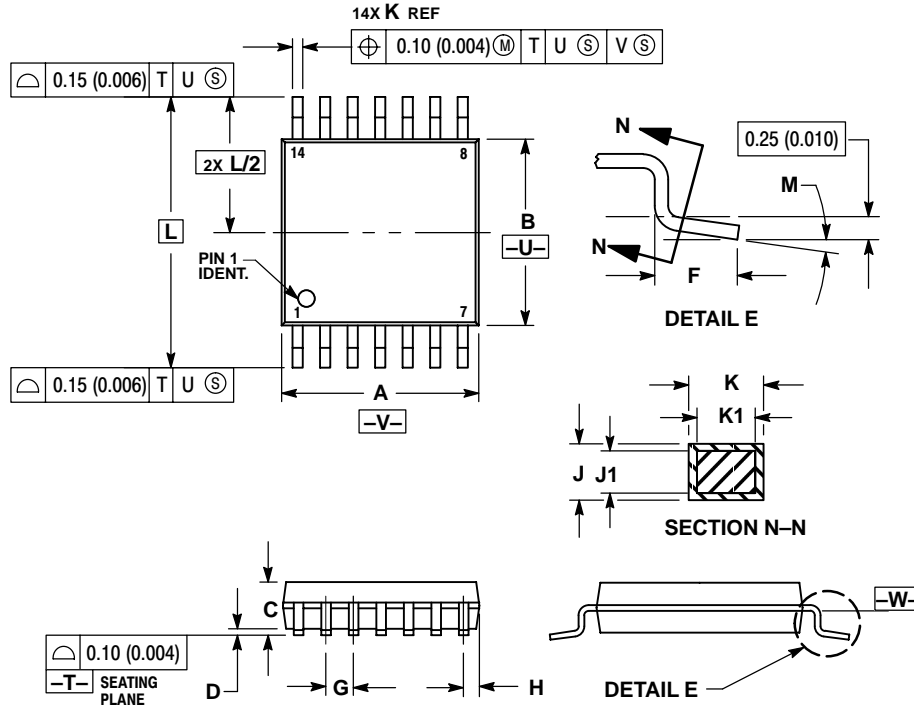
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

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PACKAGE DIMENSIONS

TSSOP-14
DT SUFFIX
 14 PIN PLASTIC TSSOP PACKAGE
 CASE 948G-01
 ISSUE O

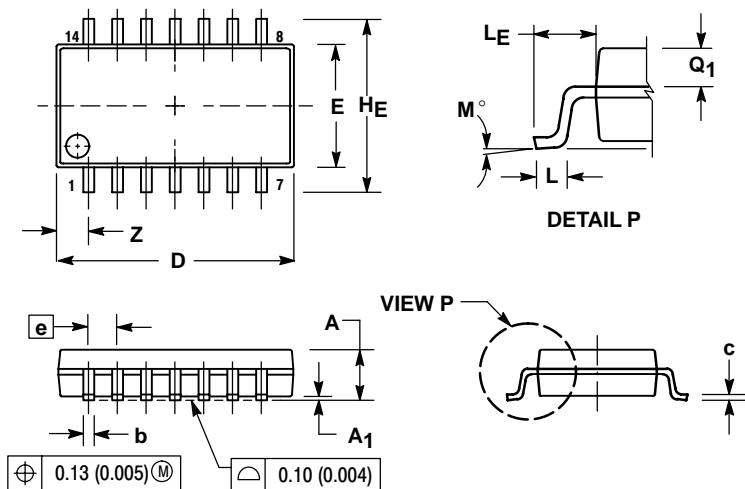


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

EIAJ-14
M SUFFIX
 14 PIN PLASTIC EIAJ PACKAGE
 CASE 965-01
 ISSUE O



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A1	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
HE	7.40	8.20	0.291	0.323
0.50	0.50	0.85	0.020	0.033
LE	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q1	0.70	0.90	0.028	0.035
Z	---	1.42	---	0.056

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