

MC14007UB

Dual Complementary Pair Plus Inverter

The MC14007UB multipurpose device consists of three N-Channel and three P-Channel enhancement mode devices packaged to provide access to each device. These versatile parts are useful in inverter circuits, pulse-shapers, linear amplifiers, high input impedance amplifiers, threshold detectors, transmission gating, and functional gating.

Features

- Diode Protection on All Inputs
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-power TTL Loads or One Low-power Schottky TTL Load Over the Rated Temperature Range
- Pin-for-Pin Replacement for CD4007A or CD4007UB
- This device has 2 outputs without ESD Protection. Antistatic precautions must be taken.
- Pb-Free Packages are Available*

MAXIMUM RATINGS (Voltages Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V _{DD}	DC Supply Voltage Range	-0.5 to +18.0	V
V _{in} , V _{out}	Input or Output Voltage Range (DC or Transient)	-0.5 to V _{DD} +0.5	V
I _{in} , I _{out}	Input or Output Current (DC or Transient) per Pin	±10	mA
P _D	Power Dissipation, per Package (Note 1)	500	mW
T _A	Ambient Temperature Range	-55 to +125	°C
T _{stg}	Storage Temperature Range	-65 to +150	°C
T _L	Lead Temperature (8 second Soldering)	260	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Temperature Derating:

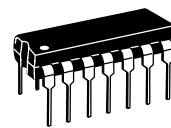
Plastic "P and D/DW" Packages: - 7.0 mW/°C from 65°C to 125°C.



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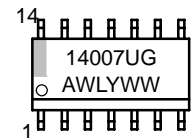
MARKING DIAGRAMS



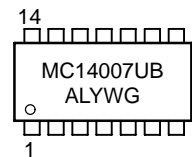
PDIP-14
P SUFFIX
CASE 646



SOIC-14
D SUFFIX
CASE 751A

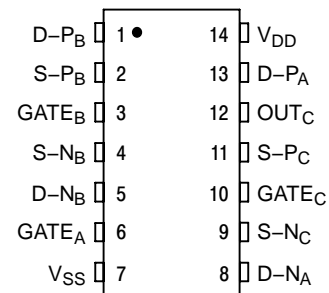


SOEIAJ-14
F SUFFIX
CASE 965



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G = Pb-Free Indicator

PIN ASSIGNMENT



D = DRAIN
S = SOURCE

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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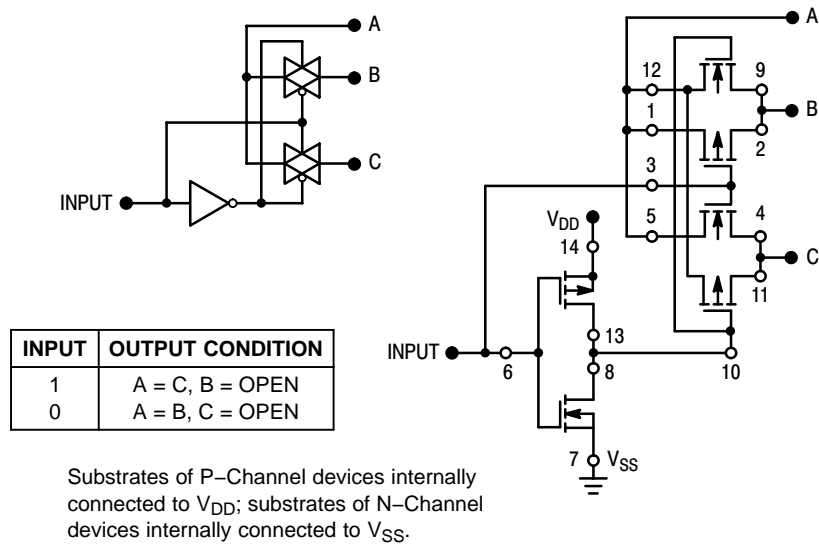


Figure 1. Typical Application: 2-Input Analog Multiplexer

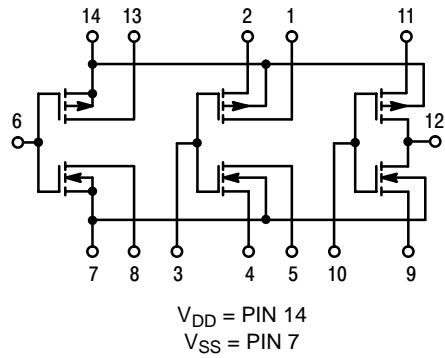


Figure 2. Schematic

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ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Symbol	Characteristic	V _{DD} Vdc	-55°C		25°C			125°C		Unit
			Min	Max	Min	Typ (Note 2)	Max	Min	Max	
V _{OL}	Output Voltage V _{in} = V _{DD} or 0 "0" Level	5.0	–	0.05	–	0	0.05	–	0.05	Vdc
		10	–	0.05	–	0	0.05	–	0.05	
		15	–	0.05	–	0	0.05	–	0.05	
V _{OH}	V _{in} = 0 or V _{DD} "1" Level	5.0	4.95	–	4.95	5.0	–	4.95	–	Vdc
		10	9.95	–	9.95	10	–	9.95	–	
		15	14.95	–	14.95	15	–	14.95	–	
V _{IL}	Input Voltage (V _O = 4.5 Vdc) (V _O = 9.0 Vdc) (V _O = 13.5 Vdc) "0" Level	5.0	–	1.0	–	2.25	1.0	–	1.0	Vdc
		10	–	2.0	–	4.50	2.0	–	2.0	
		15	–	2.5	–	6.75	2.5	–	2.5	
V _{IH}	(V _O = 0.5 Vdc) (V _O = 1.0 Vdc) (V _O = 1.5 Vdc) "1" Level	5.0	4.0	–	4.0	2.75	–	4.0	–	Vdc
		10	8.0	–	8.0	5.50	–	8.0	–	
		15	12.5	–	12.5	8.25	–	12.5	–	
I _{OH}	Output Drive Current (V _{OH} = 2.5 Vdc) (V _{OH} = 4.6 Vdc) (V _{OH} = 9.5 Vdc) (V _{OH} = 13.5 Vdc) Source	5.0	–3.0	–	–2.4	–5.0	–	–1.7	–	mAdc
		5.0	–0.64	–	–0.51	–1.0	–	–0.36	–	
		10	–1.6	–	–1.3	–2.5	–	–0.9	–	
		15	–4.2	–	–3.4	–10	–	–2.4	–	
I _{OL}	(V _{OL} = 0.4 Vdc) (V _{OL} = 0.5 Vdc) (V _{OL} = 1.5 Vdc) Sink	5.0	0.64	–	0.51	1.0	–	0.36	–	mAdc
		10	1.6	–	1.3	2.5	–	0.9	–	
		15	4.2	–	3.4	10	–	2.4	–	
I _{in}	Input Current	15	–	±0.1	–	±0.00001	±0.1	–	±1.0	μAdc
C _{in}	Input Capacitance (V _{in} = 0)	–	–	–	–	5.0	7.5	–	–	pF
I _{DD}	Quiescent Current (Per Package)	5.0	–	0.25	–	0.0005	0.25	–	7.5	μAdc
		10	–	0.5	–	0.0010	0.5	–	15	
		15	–	1.0	–	0.0015	1.0	–	30	
I _T	Total Supply Current (Notes 3 and 4) (Dynamic plus Quiescent, Per Gate) (C _L = 50 pF)	5.0	I _T = (0.7 μA/kHz) f + I _{DD} /6							μAdc
10	I _T = (1.4 μA/kHz) f + I _{DD} /6									
15	I _T = (2.2 μA/kHz) f + I _{DD} /6									

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

3. The formulas given are for the typical characteristics only at 25°C.

4. To calculate total supply current at loads other than 50 pF: I_T(C_L) = I_T(50 pF) + (C_L – 50) Vfk

where: I_T is in μA (per package), C_L in pF, V = (V_{DD} – V_{SS}) in volts, f in kHz is input frequency, and k = 0.003.

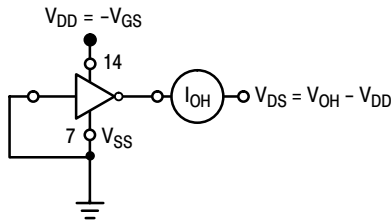
MC14007UB

SWITCHING CHARACTERISTICS (Note 5) ($C_L = 50 \text{ pF}$, $T_A = 25^\circ\text{C}$)

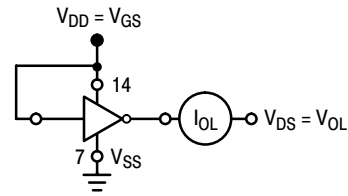
Symbol	Characteristic	V_{DD} Vdc	Min	Typ (Note 6)	Max	Unit
t_{TLH}	Output Rise Time $t_{TLH} = (1.2 \text{ ns/pF}) C_L + 30 \text{ ns}$ $t_{TLH} = (0.5 \text{ ns/pF}) C_L + 20 \text{ ns}$ $t_{TLH} = (0.4 \text{ ns/pF}) C_L + 15 \text{ ns}$	5.0	–	90	180	ns
		10	–	45	90	
		15	–	35	70	
t_{THL}	Output Fall Time $t_{THL} = (1.2 \text{ ns/pF}) C_L + 15 \text{ ns}$ $t_{THL} = (0.5 \text{ ns/pF}) C_L + 15 \text{ ns}$ $t_{THL} = (0.4 \text{ ns/pF}) C_L + 10 \text{ ns}$	5.0	–	75	150	ns
		10	–	40	80	
		15	–	30	60	
t_{PLH}	Turn-Off Delay Time $t_{PLH} = (1.5 \text{ ns/pF}) C_L + 35 \text{ ns}$ $t_{PLH} = (0.2 \text{ ns/pF}) C_L + 20 \text{ ns}$ $t_{PLH} = (0.15 \text{ ns/pF}) C_L + 17.5 \text{ ns}$	5.0	–	60	125	ns
		10	–	30	75	
		15	–	25	55	
t_{PHL}	Turn-On Delay Time $t_{PHL} = (1.0 \text{ ns/pF}) C_L + 10 \text{ ns}$ $t_{PHL} = (0.3 \text{ ns/pF}) C_L + 15 \text{ ns}$ $t_{PHL} = (0.2 \text{ ns/pF}) C_L + 15 \text{ ns}$	5.0	–	60	125	ns
		10	–	30	75	
		15	–	25	55	

5. The formulas given are for the typical characteristics only. Switching specifications are for device connected as an inverter.

6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.



All unused inputs connected to ground.



All unused inputs connected to ground.

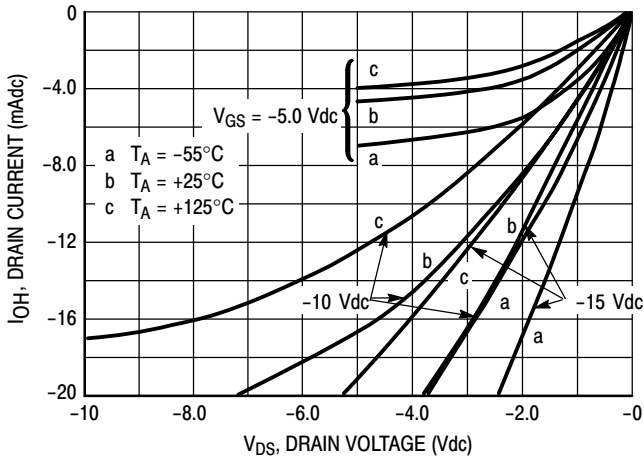


Figure 3. Typical Output Source Characteristics

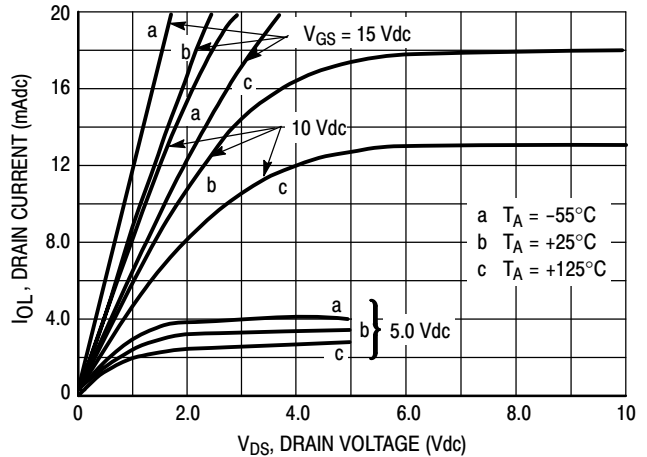


Figure 4. Typical Output Sink Characteristics

These typical curves are not guarantees, but are design aids.
Caution: The maximum current rating is 10 mA per pin.

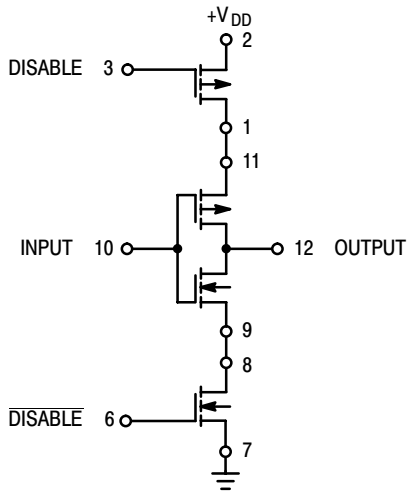
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Figure 5. Switching Time and Power Dissipation Test Circuit and Waveforms

APPLICATIONS

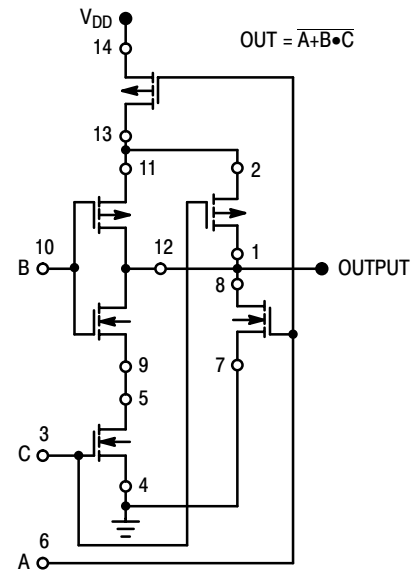
The MC14007UB dual pair plus inverter, which has access to all its elements offers a number of unique circuit applications. Figures 1, 6, and 7 are a few examples of the device flexibility.



INPUT	DISABLE	OUTPUT
1	0	0
0	0	1
X	1	OPEN

X = Don't Care

Figure 6. 3-State Buffer



Substrates of P-Channel devices internally connected to V_{DD} ;
Substrates of N-Channel devices internally connected to V_{SS} .

Figure 7. AOI Functions Using Tree Logic

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ORDERING INFORMATION

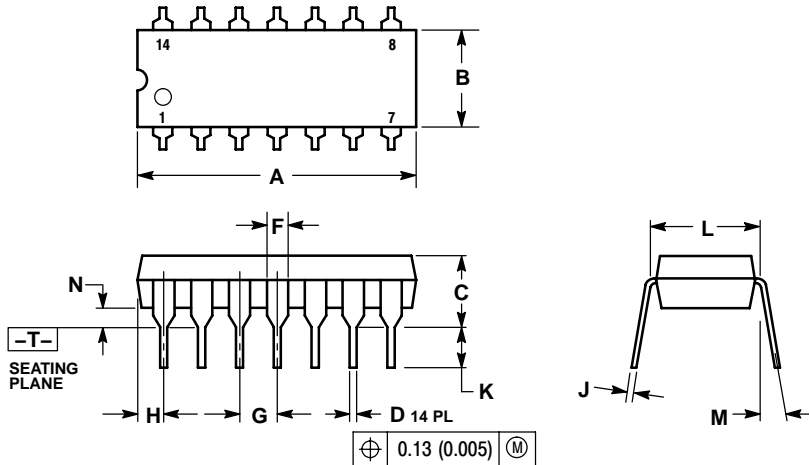
Device	Package	Shipping†
MC14007UBCP	PDIP-14	500 Units / Rail
MC14007UBCPG	PDIP-14 (Pb-Free)	500 Units / Rail
MC14007UBD	SOIC-14	55 Units / Rail
MC14007UBDR2	SOIC-14	2500 / Tape & Reel
MC14007UBDR2G	SOIC-14 (Pb-Free)	2500 / Tape & Reel
MC14007UBFEL	SOEIAJ-14	2000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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PACKAGE DIMENSIONS

P SUFFIX PLASTIC DIP PACKAGE CASE 646-06 ISSUE N

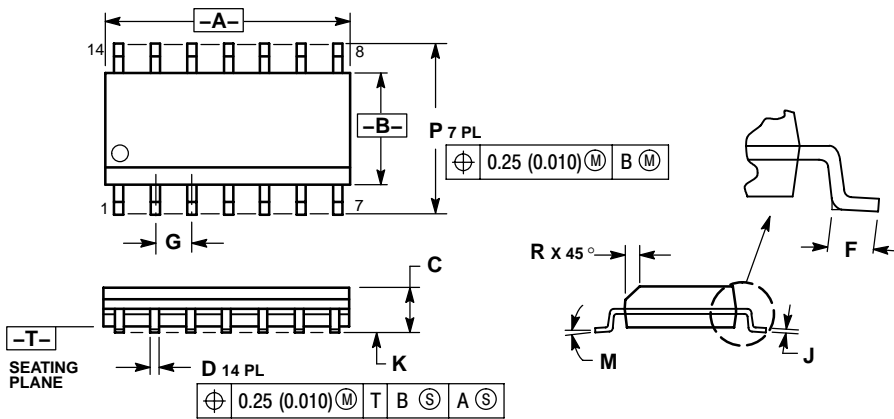


NOTES:

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

D SUFFIX PLASTIC SOIC PACKAGE CASE 751A-03 ISSUE G



NOTES:

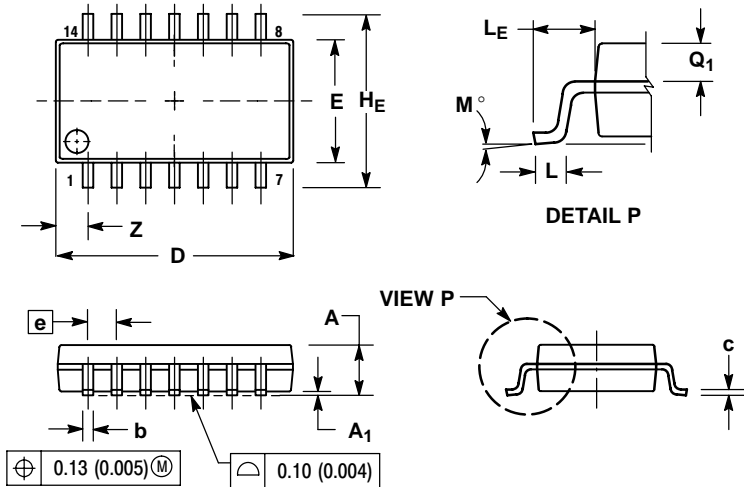
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL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

F SUFFIX PLASTIC EIAJ SOIC 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
A ₁	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	
H _E	7.40	8.20	0.291	0.323
0.50	0.50	0.85	0.020	0.033
L _E	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q ₁	0.70	0.90	0.028	0.035
Z	---	1.42	---	0.056

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