

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC240AP,TC74HC240AF,TC74HC240AFW TC74HC241AP,TC74HC241AF TC74HC244AP,TC74HC244AF,TC74HC244AFW

Octal Bus Buffer

TC74HC240AP/AF/AFW	Inverted, 3-State Outputs
TC74HC241AP/AF	Non-Inverted, 3-State Outputs
TC74HC244AP/AF/AFW	Non-Inverted, 3-State Outputs

The TC74HC240A, 241A and 244A are high speed CMOS OCTAL BUS BUFFERS fabricated with silicon gate C2MOS technology.

They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

The 74HC240A is an inverting 3-state buffer having two active-low output enables. The TC74HC241A and TC74HC244A are non-inverting 3-state buffers that differ only in that the 241A has one active-high and one active-low output enable, and the 244A has two active-low output enables.

These devices are designed to be used with 3-state memory address drivers, etc.

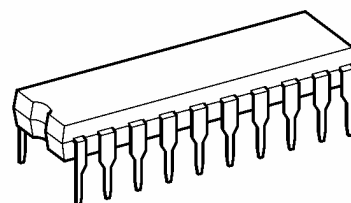
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

Features

- High speed: $t_{pd} = 10 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \text{ } \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Output drive capability: 15 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 6 \text{ mA (min)}$
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2\sim 6 \text{ V}$
- Pin and function compatible with 74LS240/241/244

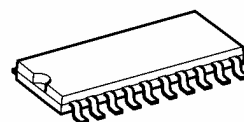
Note: xxxFW (JEDEC SOP) is not available in Japan.

TC74HC240AP, TC74HC241AP,
TC74HC244AP

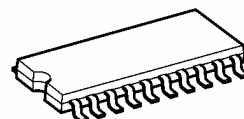


DIP20-P-300-2.54A

TC74HC240AF, TC74HC241AF, TC74HC244AF

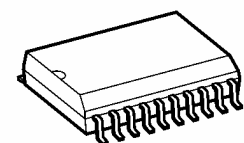


SOP20-P-300-1.27A



SOP20-P-300-1.27

TC74HC240AFW, TC74HC244AFW



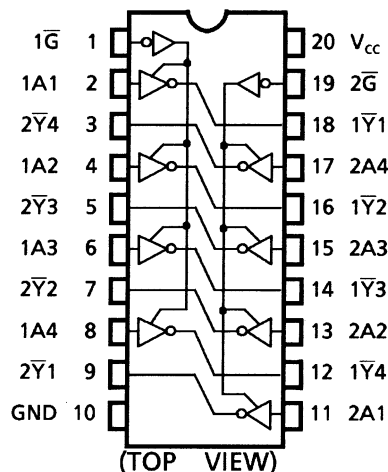
SOL20-P-300-1.27

Weight

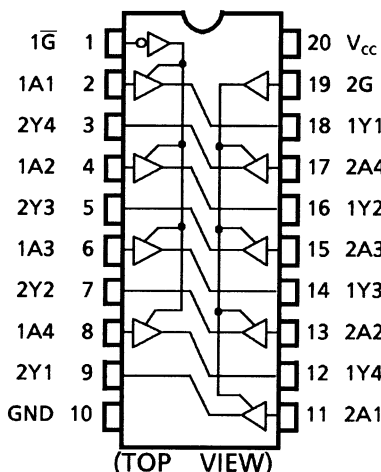
DIP20-P-300-2.54A	: 1.30 g (typ.)
SOP20-P-300-1.27A	: 0.22 g (typ.)
SOP20-P-300-1.27	: 0.22 g (typ.)
SOL20-P-300-1.27	: 0.46 g (typ.)

Pin Assignment

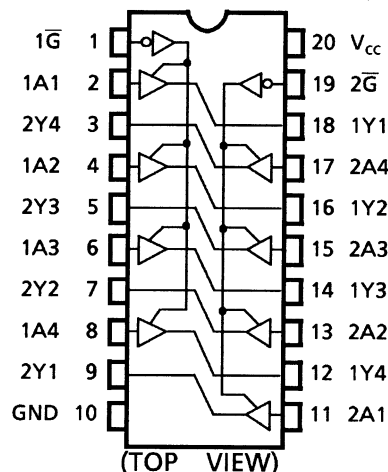
TC74HC240A



TC74HC241A

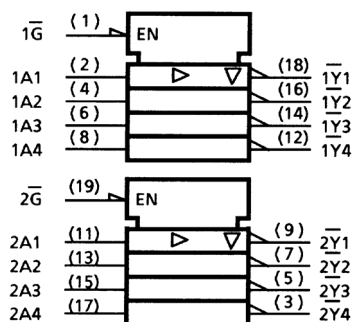


TC74HC244A

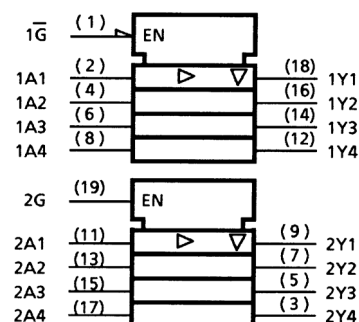


IEC Logic Symbol

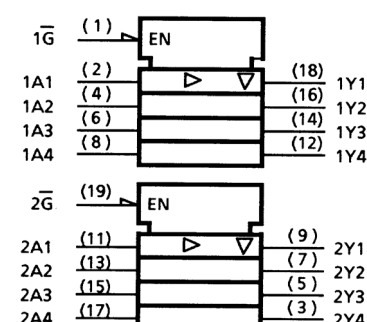
TC74HC240A



TC74HC241A



TC74HC244A



Truth Table

Inputs			Outputs	
\overline{G}	G^{Δ}	A_n	Y_n	$\overline{Y}_n^{\Delta\Delta}$
L	H	L	L	H
L	H	H	H	L
H	L	X	Z	Z

Δ : For TC74HC241A only

$\Delta\Delta$: For TC74HC240A only

X: Don't care

Z: High impedance

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	$-0.5 \sim 7$	V
DC input voltage	V_{IN}	$-0.5 \sim V_{CC} + 0.5$	V
DC output voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	V
Input diode current	I_{IK}	± 20	mA
Output diode current	I_{OK}	± 20	mA
DC output current	I_{OUT}	± 35	mA
DC V_{CC} /ground current	I_{CC}	± 75	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	$-65 \sim 150$	$^{\circ}\text{C}$

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note 2: 500 mW in the range of $T_a = -40$ to 65°C . From $T_a = 65$ to 85°C a derating factor of $-10 \text{ mW}/^{\circ}\text{C}$ shall be applied until 300 mW.

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	$2 \sim 6$	V
Input voltage	V_{IN}	$0 \sim V_{CC}$	V
Output voltage	V_{OUT}	$0 \sim V_{CC}$	V
Operating temperature	T_{opr}	$-40 \sim 85$	$^{\circ}\text{C}$
Input rise and fall time	t_r, t_f	$0 \sim 1000$ ($V_{CC} = 2.0 \text{ V}$) $0 \sim 500$ ($V_{CC} = 4.5 \text{ V}$) $0 \sim 400$ ($V_{CC} = 6.0 \text{ V}$)	ns

Note: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

Electrical Characteristics
DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C				Ta = -40~85°C		Unit
				VCC (V)	Min	Typ.	Max	Min	Max	
High-level input voltage	V _{IH}	—		2.0 4.5 6.0	1.50 3.15 4.20	— — —	— — —	1.50 3.15 4.20	— — —	V
Low-level input voltage	V _{IL}	—		2.0 4.5 6.0	— — —	— — —	0.50 1.35 1.80	— — —	0.50 1.35 1.80	V
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -20 μA	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
				6.0	5.9	6.0	—	5.9	—	
			I _{OH} = -6 mA I _{OH} = -7.8 mA	4.5	4.18	4.31	—	4.13	—	
6.0	5.68	5.80		—	5.63	—				
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20 μA	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
			I _{OL} = 6 mA I _{OL} = 7.8 mA	4.5	—	0.17	0.26	—	0.33	
6.0	—	0.18		0.26	—	0.33				
3-state output off-state current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND		6.0	—	—	±0.5	—	±5.0	μA
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		6.0	—	—	4.0	—	40.0	μA

AC Characteristics (input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = -40~85°C		Unit
			CL (pF)	VCC (V)	Min	Typ.	Max	Min	Max	
Output transition time	tTLH tTHL	—	50	2.0	—	25	60	—	75	ns
				4.5	—	7	12	—	15	
				6.0	—	6	10	—	13	
Propagation delay time	tPLH tPHL	—	50	2.0	—	36	90	—	115	ns
				4.5	—	12	18	—	23	
				6.0	—	10	15	—	20	
			150	2.0	—	51	130	—	165	
				4.5	—	17	26	—	33	
				6.0	—	14	22	—	28	
Output enable time	tPZL tPZH	RL = 1 kΩ	50	2.0	—	48	125	—	155	ns
				4.5	—	16	25	—	31	
				6.0	—	14	21	—	26	
			150	2.0	—	63	165	—	205	
				4.5	—	21	33	—	41	
				6.0	—	18	28	—	35	
Output disable time	tPLZ tPHZ	RL = 1 kΩ	50	2.0	—	32	125	—	155	ns
				4.5	—	15	25	—	31	
				6.0	—	14	21	—	26	
Input capacitance	CIN	—			—	5	10	—	10	pF
Output capacitance	COUT	—			—	10	—	—	—	pF
Power dissipation capacitance	CPD (Note)	TC74HC240A			—	31	—	—	—	pF
		TC74HC241A/244A			—	33	—	—	—	

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

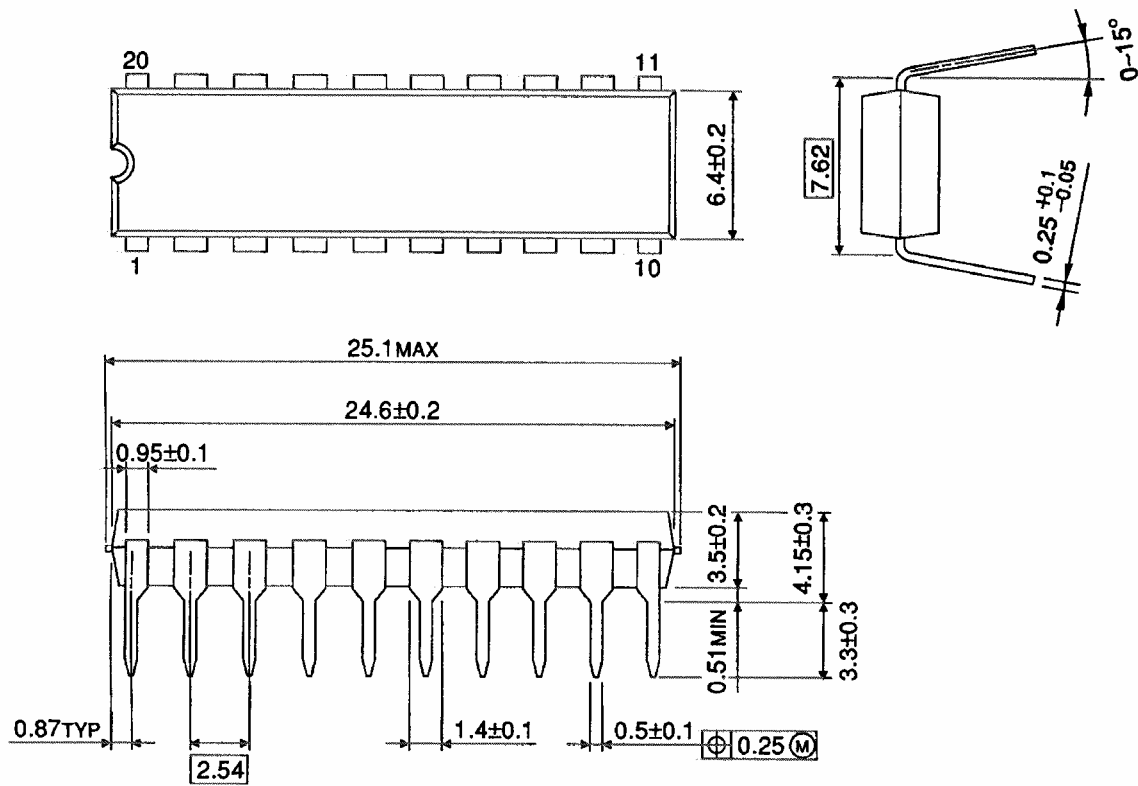
Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per bit)}$$

Package Dimensions

DIP20-P-300-2.54A

Unit : mm

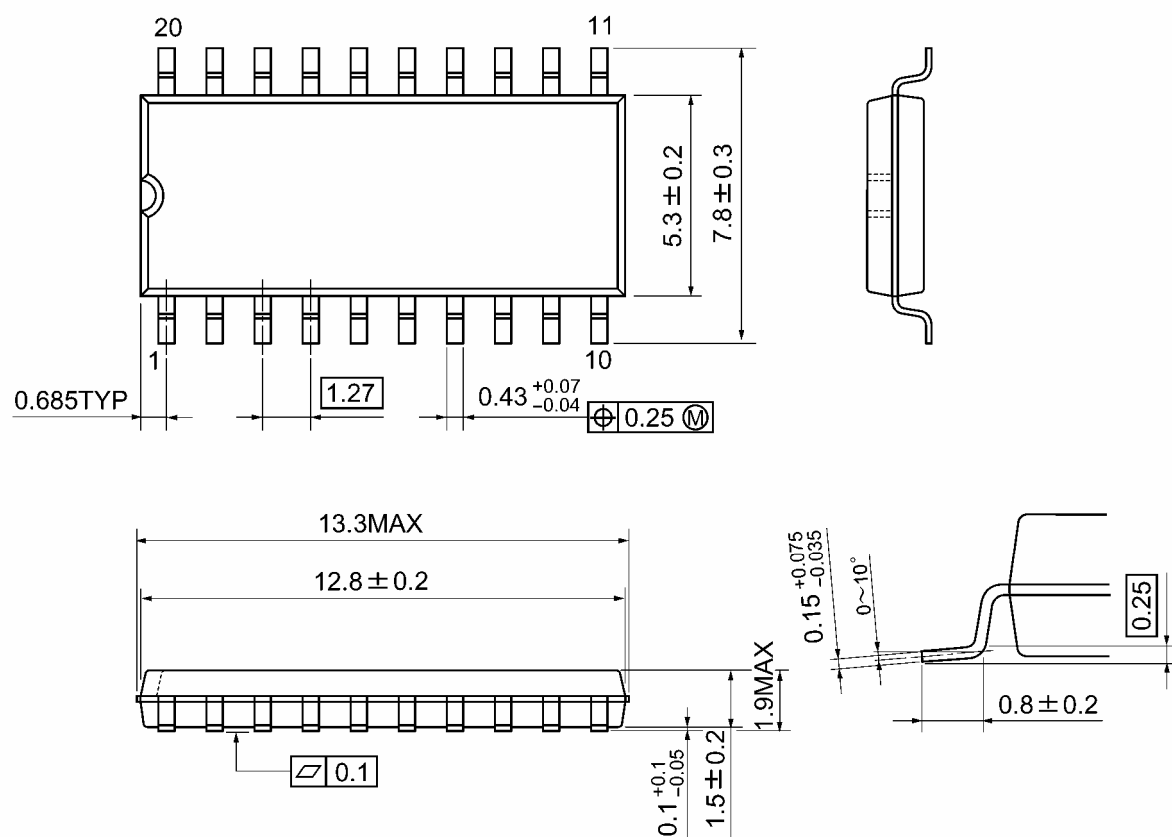


Weight: 1.30 g (typ.)

Package Dimensions

SOP20-P-300-1.27A

Unit: mm

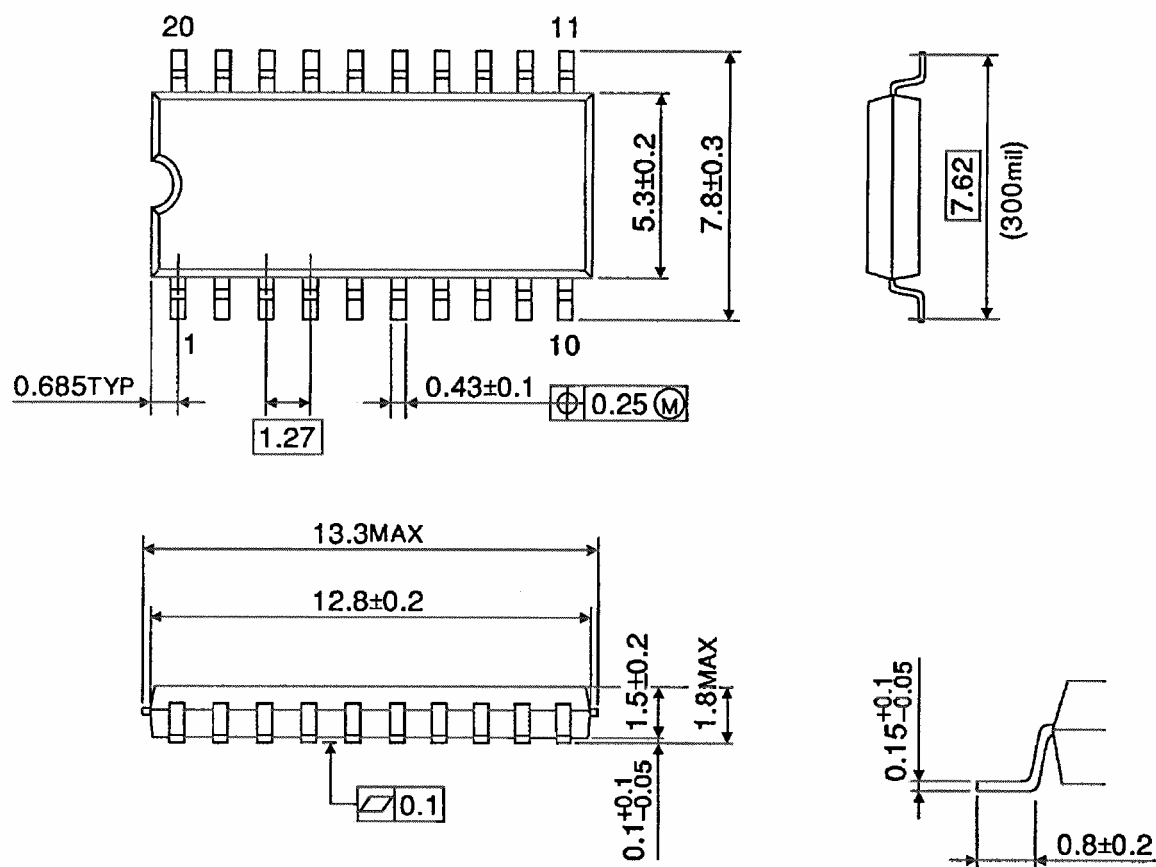


Weight: 0.22 g (typ.)

Package Dimensions

SOP20-P-300-1.27

Unit : mm

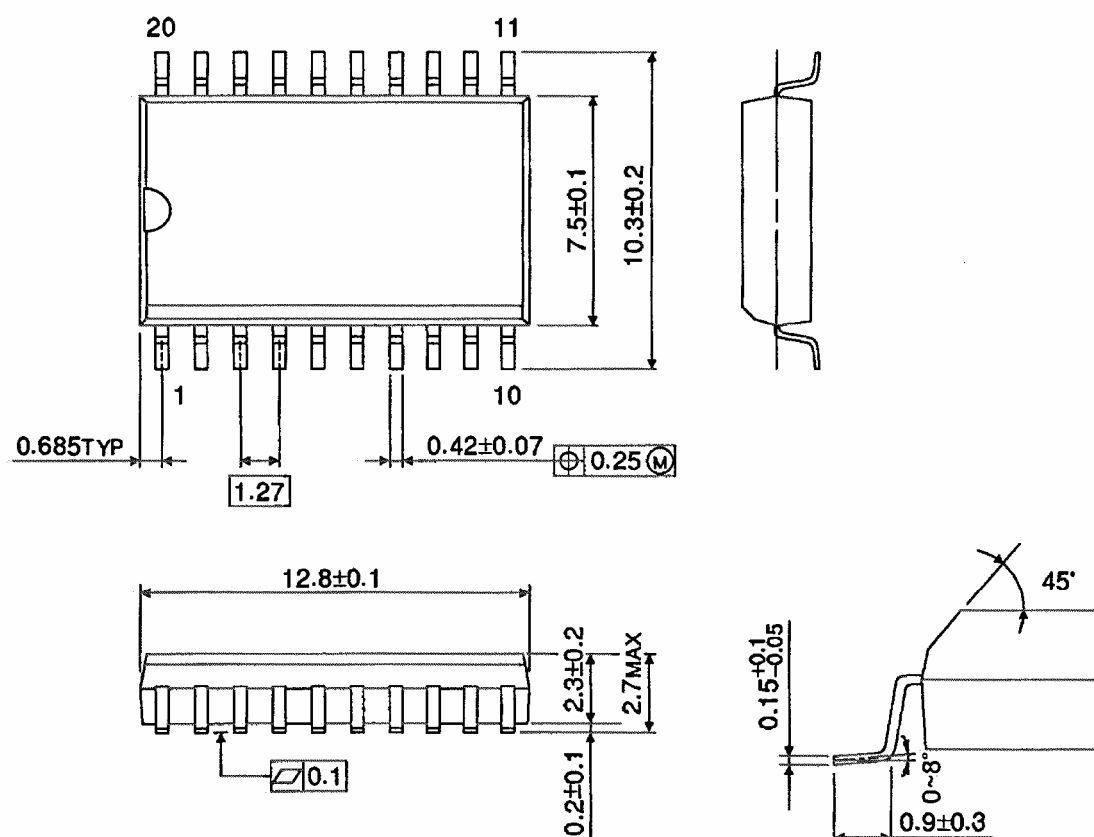


Weight: 0.22 g (typ.)

Package Dimensions (Note)

SOL20-P-300-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.46 g (typ.)

Note: Lead (Pb)-Free Packages

DIP20-P-300-2.54A SOP20-P-300-1.27A

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