TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC86AP,TC74HC86AF,TC74HC86AFN

Quad Exclusive OR Gate

The TC74HC86A is a high speed CMOS EXCLUSIVE OR GATE fabricated with silicon gate C^2 MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

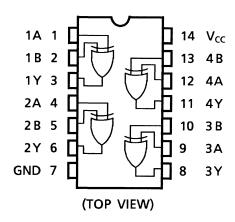
Input and output buffers are provided which offer high noise immunity and stable output.

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

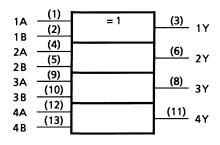
Features

- High speed: $t_{pd} = 10 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 1 \mu A \text{ (max)}$ at $T_{a} = 25 \text{°C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: | I_{OH} | = I_{OL} = 4 mA (min)
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2~6 V
- Pin and function compatible with 74LS86

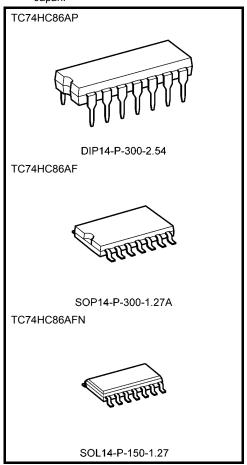
Pin Assignment



IEC Logic Symbol



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



Weight

DIP14-P-300-2.54 : 0.96 g (typ.) SOP14-P-300-1.27A : 0.18 g (typ.) SOL14-P-150-1.27 : 0.12 g (typ.)

Truth Table

Α	В	Υ
Н	Н	L
L	Н	Н
Н	L	Н
L	L	L

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5~7	V
DC input voltage	V _{IN}	-0.5~V _{CC} + 0.5	V
DC output voltage	V _{OUT}	-0.5~V _{CC} + 0.5	V
Input diode current	I _{IK}	±20	mA
Output diode current	lok	±20	mA
DC output current	lout	±25	mA
DC V _{CC} /ground current	Icc	±50	mA
Power dissipation	PD	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T _{stg}	-65~150	°C

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

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

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

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	2~6	V
Input voltage	V _{IN}	0~V _{CC}	V
Output voltage	V _{OUT}	0~V _{CC}	V
Operating temperature	T _{opr}	-40~85	°C
		0~1000 (V _{CC} = 2.0 V)	
Input rise and fall time	t _r , t _f	0~500 (V _{CC} = 4.5 V)	ns
		0~400 (V _{CC} = 6.0 V)	

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.



Electrical Characteristics

DC Characteristics

		Test Condition		-	Га = 25°C		Ta = -40~85°C			
Characteristics	Symbol			V _{CC} (V)	Min	Тур.	Max	Min	Max	Unit
		_		2.0	1.50	_	_	1.50	_	
High-level input voltage	V_{IH}			4.5	3.15	_	_	3.15	_	V
ŭ					4.20	_		4.20	_	
				2.0	_	_	0.50	_	0.50	
Low-level input voltage	V _{IL}		_	4.5	_	_	1.35	_	1.35	V
, and the second				6.0	_	_	1.80	_	1.80	
		V _{IN} = V _{IH} or V _{IL}		2.0	1.9	2.0	_	1.9	_	
			I _{OH} = -20 μA	4.5	4.4	4.5	_	4.4	_	
High-level output voltage	V _{OH}			6.0	5.9	6.0		5.9	_	V
			I _{OH} = -4 mA	4.5	4.18	4.31	_	4.13	_	
			I _{OH} = -5.2 mA	6.0	5.68	5.80	_	5.63	_	
		VIN		2.0	_	0.0	0.1	_	0.1	
			$I_{OL} = 20 \mu A$	4.5	_	0.0	0.1	_	0.1	
Low-level output voltage	V _{OL}	= V _{IH} or		6.0	_	0.0	0.1	_	0.1	V
		V_{IL}	I _{OL} = 4 mA	4.5	_	0.17	0.26	_	0.33	
			I _{OL} = 5.2 mA	6.0	_	0.18	0.26	_	0.33	
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		6.0	_	_	±0.1	_	±1.0	μА
Quiescent supply current	I _{CC}	V _{IN} = V _C	V _{IN} = V _{CC} or GND		_	_	1.0	_	10.0	μА

AC Characteristics ($C_L = 15 \text{ pF}$, $V_{CC} = 5 \text{ V}$, $Ta = 25^{\circ}\text{C}$, input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Output transition time	t _{TLH}	_	_	4	8	ns
	t _{THL}					
Propagation delay time	t _{pLH}	_	_	10	17	ns
	t_pHL			10	.,,	110



AC Characteristics ($C_L = 50 \text{ pF}$, input: $t_r = t_f = 6 \text{ ns}$)

Characteristics Symbo		Test Condition		Ta = 25°C			Ta = -40~85°C		
	Symbol		V _{CC} (V)	Min	Тур.	Max	Min	Max	Unit
	4		2.0	_	30	75	_	95	
Output transition time	t _{TLH}	_	4.5	_	8	15	_	19	ns
	t _{THL}		6.0	_	7	13	_	16	
timo	t _{pLH}		2.0	_	45	100	_	125	
		_	4.5	_	13	20	_	25	ns
	t _{pHL}		6.0	_	11	17	_	21	
Input capacitance	C _{IN}	_		_	5	10	_	10	pF
Power dissipation capacitance	C _{PD}				26				ηE
	(Note)				20				pF

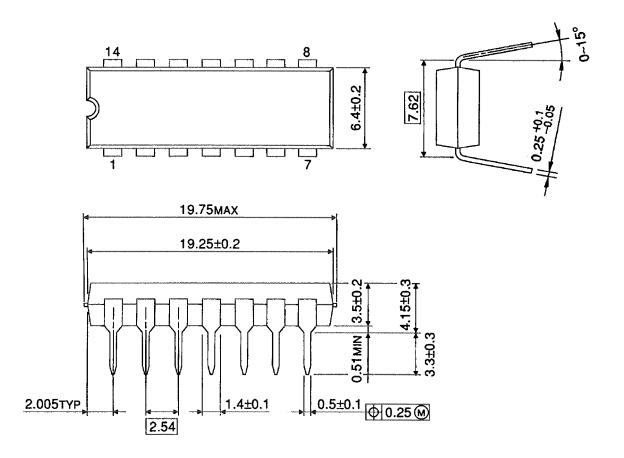
Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC}$$
 (opr) = $C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4$ (per gate)

Package Dimensions

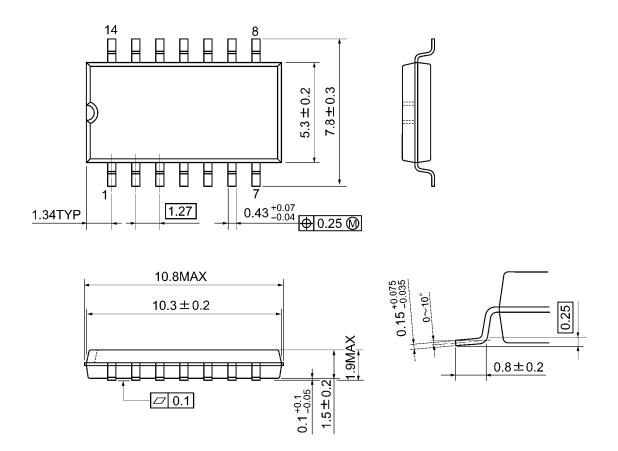
DIP14-P-300-2.54 Unit: mm



Weight: 0.96 g (typ.)

Package Dimensions

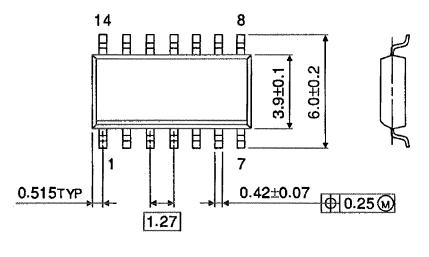
SOP14-P-300-1.27A Unit: mm

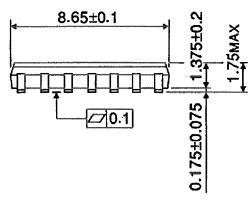


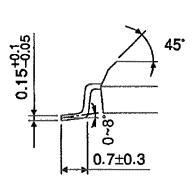
Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL14-P-150-1.27 Unit: mm







Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

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