INTEGRATED CIRCUIT

TOSHIBA

TECHNICAL DATA

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT

TC74HCT02AP/AF/AFN

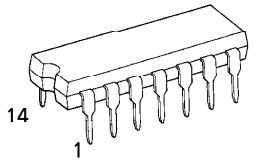
SILICON MONOLITHIC

QUAD 2-INPUT NOR GATE

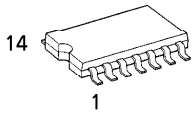
The TC74HCT02A is a high speed CMOS 2-INPUT NOR GATE fabricated with silicon gate C²MOS technology.
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.
This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.
The internal circuit is composed of 3 stages, including buffer output, which provide high noise immunity and stable output.
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES:

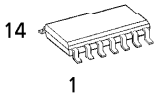
- High Speed ····· t_{pd} = 9ns(typ.) at V_{CC} = 5V
- Low Power Dissipation ····· I_{CC} = 1μA(Max.) at Ta = 25°C
- Compatible with TTL outputs ··· V_{IH} = 2V (Min.)
  V_{IL} = 0.8V (Max.)
- Wide Interfacing ability ····· LSTTL, NMOS, CMOS
- Output Drive Capability ····· 10 LSTTL Loads
- Symmetrical Output Impedance ··· $|I_{OH}| = I_{OL}$ = 4mA(Min.)
- Balanced Propagation Delays ····· $t_{pLH} \simeq t_{pHL}$
- Pin and Function Compatible with 74LS02



P (DIP14-P-300-2.54)
Weight : 0.96g (TYP.)

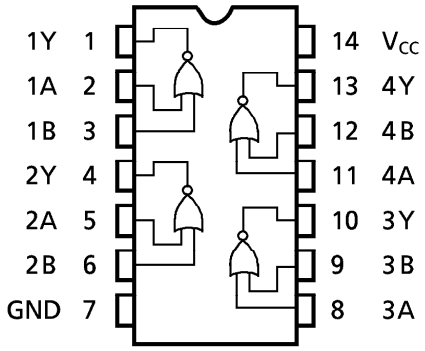


F (SOP14-P-300-1.27)
Weight : 0.18g (TYP.)



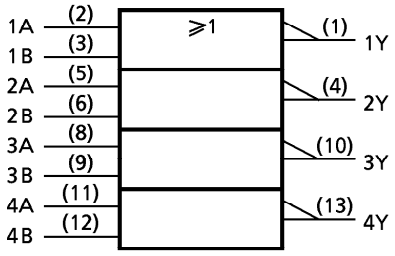
FN (SOL14-P-150-1.27)
Weight : 0.12g (TYP.)

PIN ASSIGNMENT



(TOP VIEW)

IEC LOGIC SYMBOL



TRUTH TABLE

A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	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	I_{OK}	±20	mA
DC Output Current	I_{OUT}	±25	mA
DC V_{CC} / Ground Current	I_{CC}	±50	mA
Power Dissipation	P_D	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	T_{stg}	−65~150	°C

*500mW in the range of Ta = −40°C~65°C. From Ta = 65°C to 85 °C a derating factor of −10mW/ °C shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	4.5~5.5	V
Input Voltage	V_{IN}	0~V_{CC}	V
Output Voltage	V_{OUT}	0~V_{CC}	V
Operating Temperature	T_{opr}	−40~85	°C
Input Rise and Fall Time	t_r, t_f	0~500	ns

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V_{IH}			4.5 ~ 5.5	2.0	—	—	2.0	—	V
Low - Level Input Voltage	V_{IL}			4.5 ~ 5.5	—	—	0.8	—	0.8	V
High - Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −20 μA	4.5	4.4	4.5	—	4.4	—	V
			I_{OH} = −4 mA	4.5	4.18	4.31	—	4.13	—	
Low - Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	4.5	—	0.0	0.1	—	0.1	V
			I_{OL} = 4 mA	4.5	—	0.17	0.26	—	0.33	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	1.0	—	10.0	μA
	I_C	PER INPUT: V_{IN} = 0.5V or 2.4V OTHER INPUT: V_{CC} or GND		5.5	—	—	2.0	—	2.9	mA

AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, V_{CC} = 5V, Ta = 25°C, Input $t_r = t_f$ = 6ns)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		—	6	12	ns
Propagation Delay Time	t_{pLH} t_{pHL}		—	9	15	

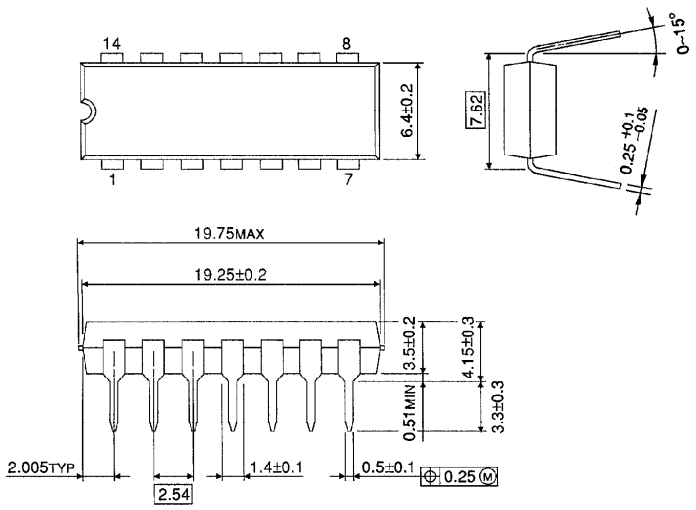
AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input $t_r = t_f$ = 6ns)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC} (V)	MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t_{TLH} t_{THL}		4.5 5.5	— —	8 7	15 13	— —	19 16	ns
Propagation Delay Time	t_{pLH} t_{pHL}		4.5 5.5	— —	12 11	18 16	— —	23 20	
Input Capacitance	C_{IN}			—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD} (1)			—	18	—	—	—	

Note (1) 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:

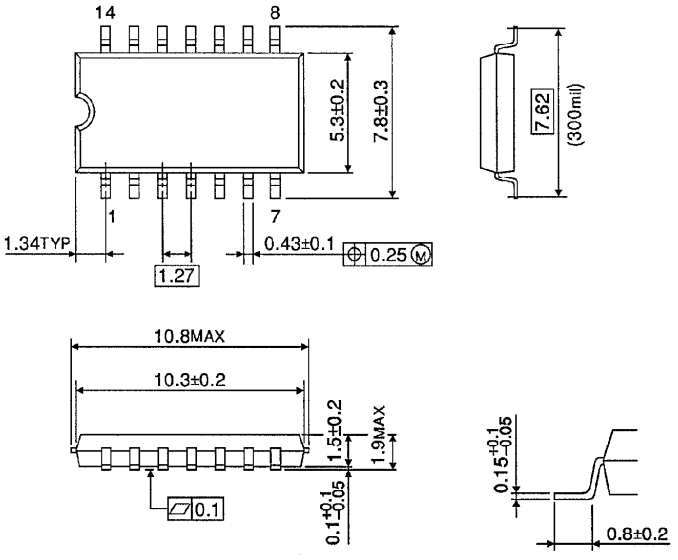
$$I_{CC}(opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 4 \text{ (per Gate)}$$

DIP 14PIN OUTLINE DRAWING (DIP14-P-300-2.54) Unit in mm



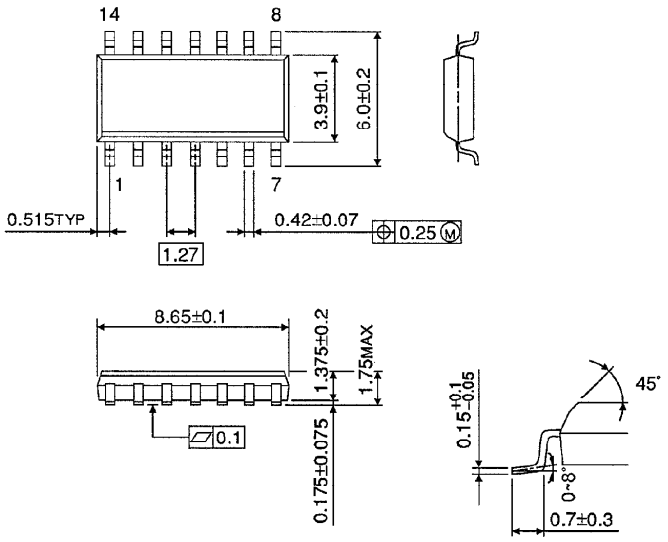
Weight : 0.96g (TYP.)

SOP 14PIN (200mil BODY) OUTLINE DRAWING (SOP14-P-300-1.27) Unit in mm



Weight : 0.18g (TYP.)

SOP 14PIN (150mil BODY) OUTLINE DRAWING (SOL14-P-150-1.27) Unit in mm



Weight : 0.12g (TYP.)