TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74LCX00F, TC74LCX00FN, TC74LCX00FT

LOW-VOLTAGE QUAD 2-INPUT NAND GATE WITH 5V TOLERANT INPUTS AND OUTPUTS

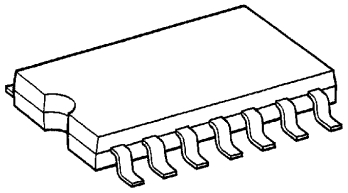
The TC74LCX00 is a high performance CMOS 2-INPUT NAND GATE. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.
The device is designed for low-voltage (3.3V) V_{CC} applications, but it could be used to interface to 5V supply environment for inputs.
All inputs are equipped with protection circuits against static discharge.

FEATURES

- Low voltage operation : $V_{CC} = 2.0 \sim 3.6V$
- High speed operation : $t_{pd} = 5.2ns$ (Max.) at $V_{CC} = 3.0 \sim 3.6V$
- Output current : $|I_{OH}| / I_{OL} = 24mA$ (Min.) at $V_{CC} = 3.0V$
- Latch-up performance : $\pm 500mA$
- Available in JEDEC SOP, EIAJ SOP and TSSOP
- Power down protection is provided on all inputs and outputs.
- Pin and function compatible with the 74 series (74AC / VHC / HC / F / ALS / LS etc.) 00 type.

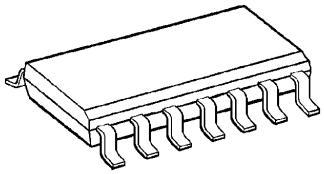
(Note) The JEDEC SOP (FN) is not available in Japan.

TC74LCX00F



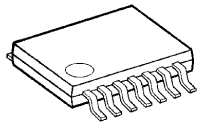
SOP14-P-300-1.27

TC74LCX00FN



SOL14-P-150-1.27

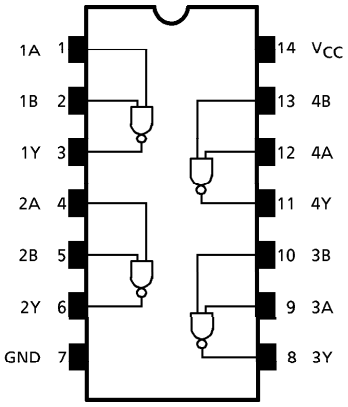
TC74LCX00FT



TSSOP14-P-0044-0.65

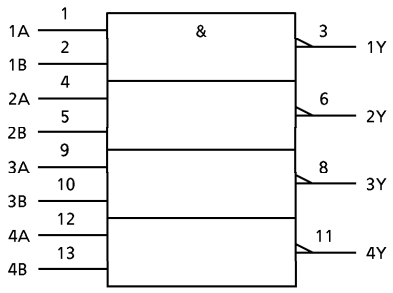
Weight
SOP14-P-300-1.27 : 0.18g (Typ.)
SOL14-P-150-1.27 : 0.12g (Typ.)
TSSOP14-P-0044-0.65 : 0.06g (Typ.)

PIN CONNECTION



(TOP VIEW)

IEC LOGIC SYMBOL



TRUTH TABLE

INPUTS		OUTPUTS
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Power Supply Voltage	V_{CC}	−0.5~7.0	V
DC Input Voltage	V_{IN}	−0.5~7.0	V
DC Output Voltage	V_{OUT}	−0.5~7.0 (Note 1)	V
		−0.5~V_{CC}+0.5 (Note 2)	
Input Diode Current	I_{IK}	−50	mA
Output Diode Current	I_{OK}	±50 (Note 3)	mA
DC Output Current	I_{OUT}	±50	mA
Power Dissipation	P_D	180	mW
DC V_{CC} / Ground Current	I_{CC} / I_{GND}	±100	mA
Storage Temperature	T_{stg}	−65~150	°C

(Note 1) V_{CC} = 0V

(Note 2) High or Low State. I_{OUT} absolute maximum rating must be observed.

(Note 3) V_{OUT} < GND, V_{OUT} > V_{CC}

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	2.0~3.6	V
		1.5~3.6 (Note 4)	
Input Voltage	V_{IN}	0~5.5	V
Output Voltage	V_{OUT}	0~5.5 (Note 5)	V
		0~ V_{CC} (Note 6)	
Output Current	I_{OH} / I_{OL}	±24 (Note 7)	mA
		±12 (Note 8)	
Operating Temperature	T_{opr}	−40~85	°C
Input Rise And Fall Time	dt / dv	0~10 (Note 9)	ns / V

(Note 4) Data Retention Only
(Note 5) V_{CC} = 0V
(Note 6) High or Low State
(Note 7) V_{CC} = 3.0~3.6V
(Note 8) V_{CC} = 2.7~3.0V
(Note 9) V_{IN} = 0.8~2.0V, V_{CC} = 3.0V

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS (Ta = −40~85°C)

PARAMETER		SYMBOL	TEST CONDITION		V_{CC} (V)	MIN.	MAX.	UNIT
Input Voltage	"H" Level	V_{IH}			2.7~3.6	2.0	—	V
	"L" Level	V_{IL}			2.7~3.6	—	0.8	V
Output Voltage	"H" Level	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −100μA	2.7~3.6	V_{CC} −0.2	—	V
				I_{OH} = −12mA	2.7	2.2	—	
				I_{OH} = −18mA	3.0	2.4	—	
				I_{OH} = −24mA	3.0	2.2	—	
	"L" Level	V_{OL}	V_{IN} = V_{IH}	I_{OL} = 100μA	2.7~3.6	—	0.2	V
				I_{OL} = 12mA	2.7	—	0.4	
				I_{OL} = 16mA	3.0	—	0.4	
				I_{OL} = 24mA	3.0	—	0.55	
Input Leakage Current		I_{IN}	V_{IN} = 0~5.5V		2.7~3.6	—	±5.0	μA
Power Off Leakage Current		I_{OFF}	V_{IN} / V_{OUT} = 5.5V		0	—	10.0	μA
Quiescent Supply Current		I_{CC}	V_{IN} = V_{CC} or GND		2.7~3.6	—	10.0	μA
			V_{IN} / V_{OUT} = 3.6~5.5V		2.7~3.6	—	±10.0	
Increase In I_{CC} Per Input		ΔI_{CC}	V_{IH} = V_{CC} − 0.6V		2.7~3.6	—	500	μA

AC CHARACTERISTICS (Ta = −40~85°C)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	MIN.	MAX.	UNIT
Propagation Delay Time	t_{pLH} t_{pHL}	(Fig.1, 2)	2.7	—	6.0	ns
			3.3 ± 0.3	1.5	5.2	
Output To Output Skew	t_{osLH} t_{osHL}	(Note 10)	2.7	—	—	ns
			3.3 ± 0.3	—	1.0	

(Note 10) Parameter guaranteed by design.
($t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$)

DYNAMIC SWITCHING CHARACTERISTICS (Ta = 25°C, Input $t_r = t_f = 2.5$ns, $C_L = 50$pF, $R_L = 500\Omega$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP	UNIT
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	V_{IH} = 3.3V, V_{IL} = 0V	3.3	0.8	V
Quiet Output Minimum Dynamic V_{OL}	$\|V_{OLV}\|$	V_{IH} = 3.3V, V_{IL} = 0V	3.3	0.8	V

CAPACITIVE CHARACTERISTICS (Ta = 25°C)

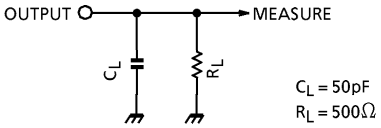
PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	UNIT
Input Capacitance	C_{IN}	—	3.3	7	pF
Output Capacitance	C_{OUT}		0	8	pF
Power Dissipation Capacitance	C_{PD}	f_{IN} = 10MHz (Note 11)	3.3	25	pF

(Note 11) 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)

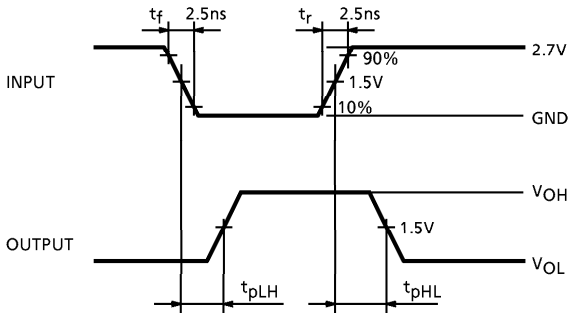
TEST CIRCUIT

Fig.1



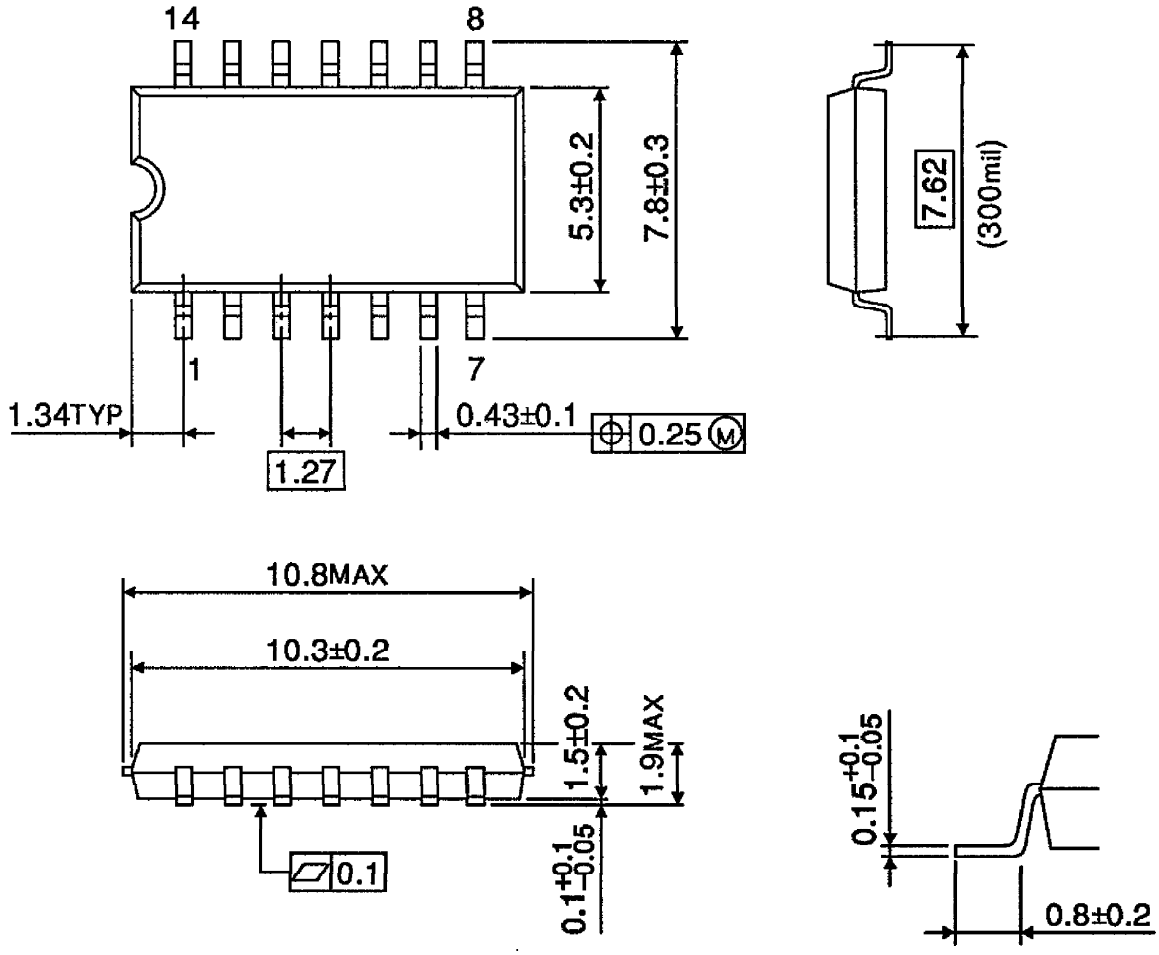
AC WAVEFORM

Fig.2 t_{pLH}, t_{pHL}



OUTLINE DRAWING

SOP14-P-300-1.27 Unit : mm

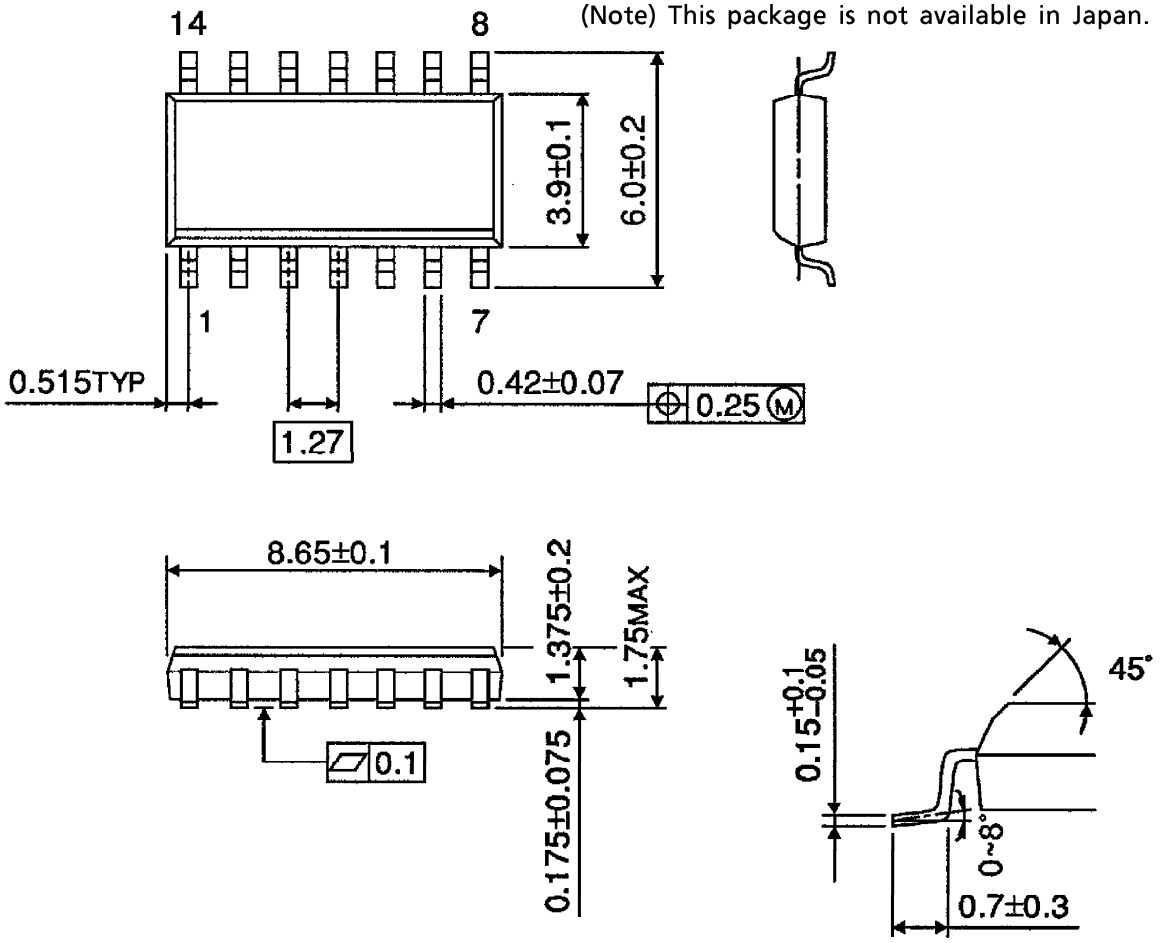


Weight : 0.18g (Typ.)

OUTLINE DRAWING

SOL14-P-150-1.27 Unit : mm

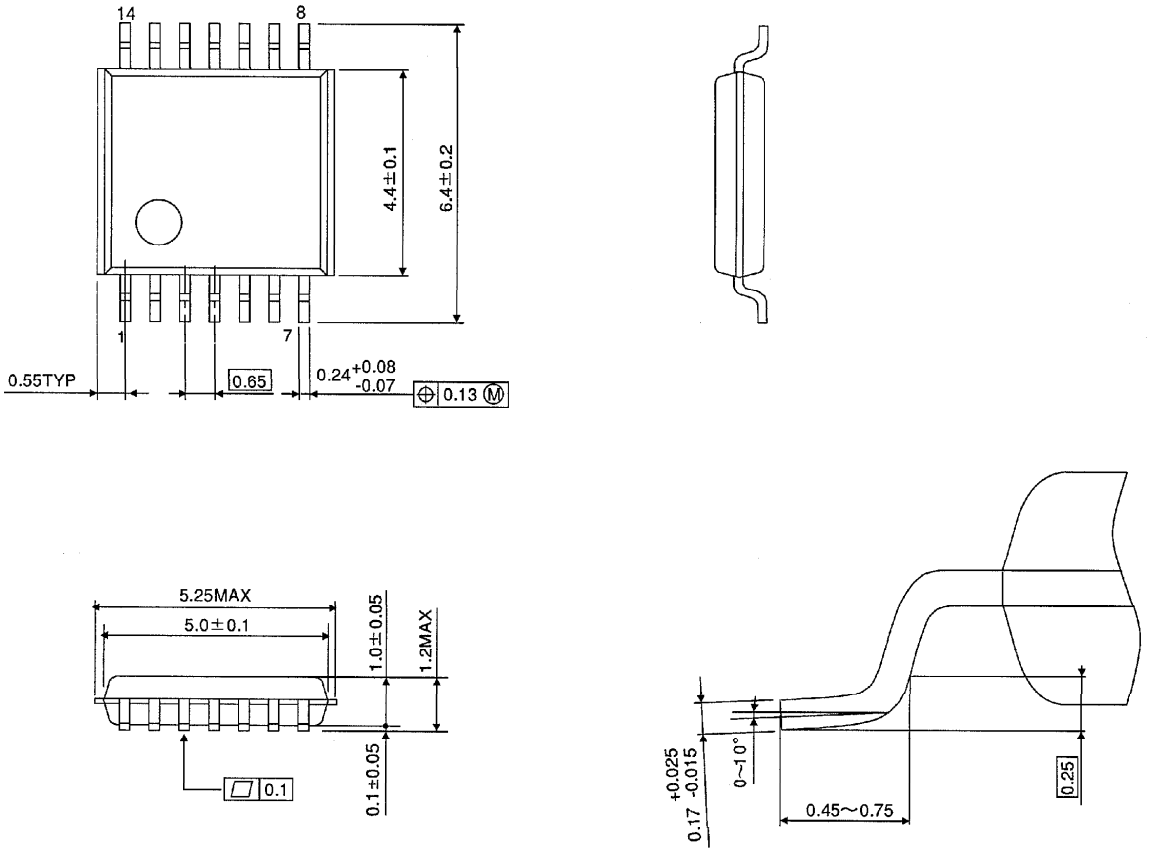
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

OUTLINE DRAWING

TSSOP14-P-0044-0.65 Unit : mm



Weight : 0.06g (Typ.)