TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT   SILICON MONOLITHIC

TC74LCX32F, TC74LCX32FN, TC74LCX32FT

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

The TC74LCX32 is a high performance CMOS 2-INPUT OR 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   : $t_{pd} = 5.5ns$ (Max.)
  $(V_{CC} = 3.0 \sim 3.6V)$

● Output current   : $|I_{OH}| / I_{OL} = 24mA$ (Min.)
  $(V_{CC} = 3.0V)$

● Latch-up performance : $\pm 500mA$

● Available in JEDEC SOP, JEITA SOP and TSSOP

● Power down protection is provided on all inputs and outputs.

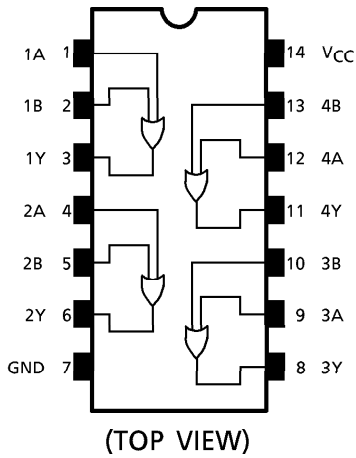● Pin and function compatible with the 74 series (74AC / VHC / HC / F / ALS / LS etc.) 32 type.
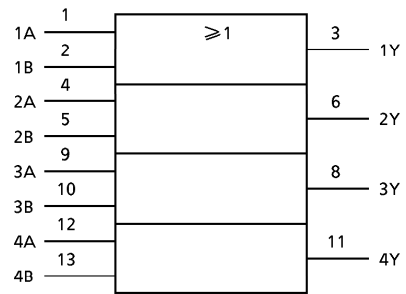
(Note) The JEDEC SOP (FN) is not available in Japan.

TC74LCX32F

SOP14-P-300-1.27

TC74LCX32FN

SOL14-P-150-1.27

TC74LCX32FT
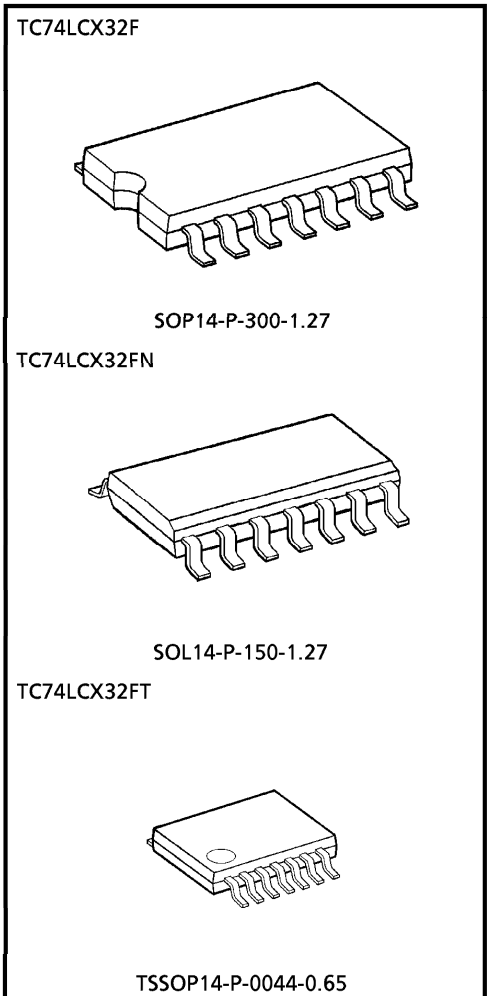
TSSOP14-P-0044-0.65

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 ASSIGNMENT

(TOP VIEW)

IEC LOGIC SYMBOL

TRUTH TABLE

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

MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7.0$	V
DC Input Voltage	V_{IN}	$-0.5 \sim 7.0$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim 7.0$ (Note 1)	V
		$-0.5 \sim V_{CC} + 0.5$ (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}	$-65 \sim 150$	°C

(Note 1)   VCC = 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)   VCC = 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	
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}	$V_{IN} = V_{IL}$	I_{OL} = 100μA	2.7~3.6	—	0.2	
				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 Cuurent		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	
Quiescent 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}	(Fig.1, 2)	2.7	—	6.2	ns
	t_{pHL}		3.3 ± 0.3	1.5	5.5	
Output To Output Skew	t_{osLH}	(Note 10)	2.7	—	—	ns
	t_{osHL}		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}	$f_{IN} = 10$MHz (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 :
$$I_{CC\,(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 4 \text{ (per gate)}$$

TEST CIRCUIT

Fig.1

OUTPUT o——•———•——→ MEASURE

C_L R_L

$C_L = 50pF$
$R_L = 500\Omega$
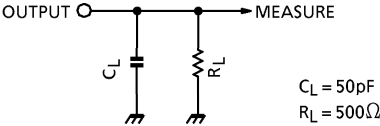
AC WAVEFORM

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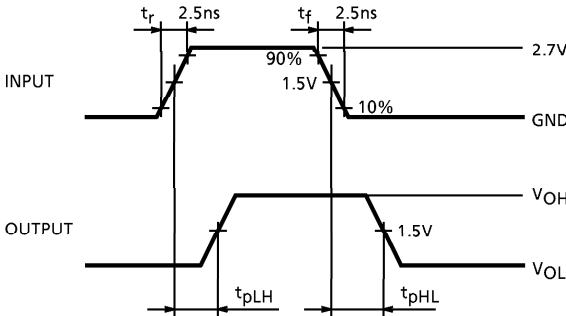
PACKAGE DIMENSIONS

SOP14-P-300-1.27

Unit : mm
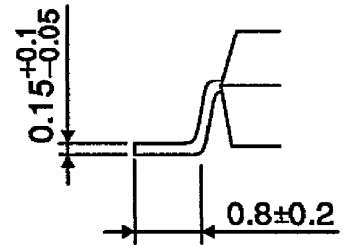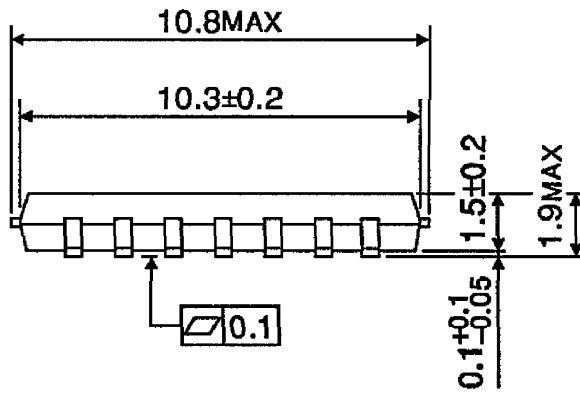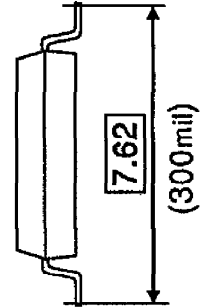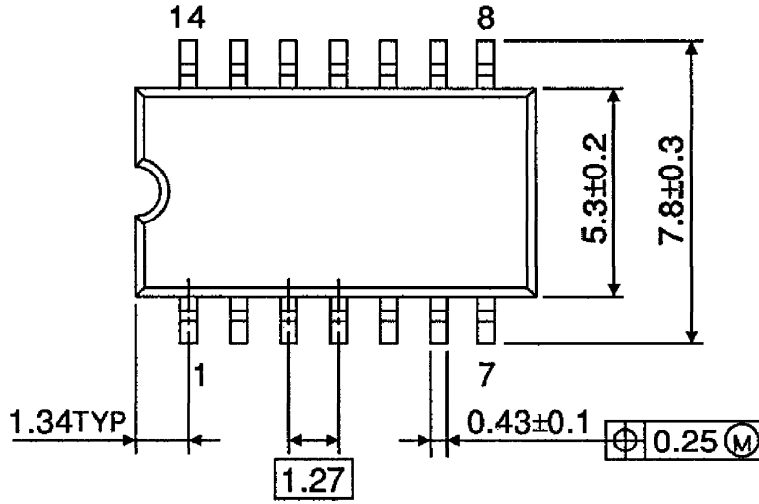
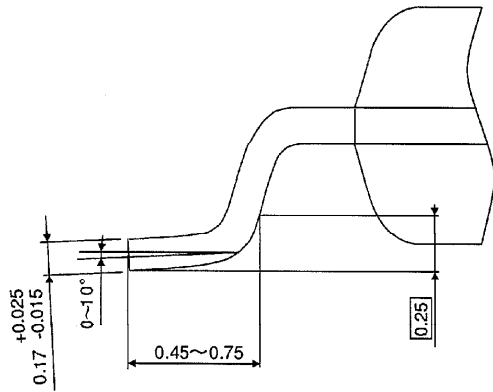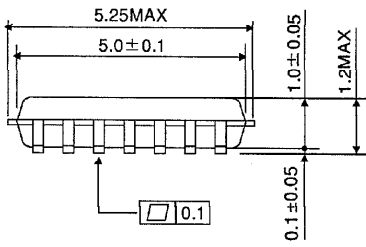Weight : 0.18g (Typ.)
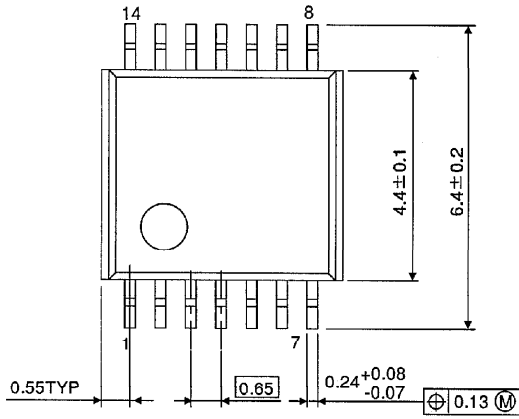
PACKAGE DIMENSIONS

SOL14-P-150-1.27

Unit : mm

(Note) This package is not available in Japan.

14   8

1   7

3.9±0.1

6.0±0.2

0.515TYP

1.27

0.42±0.07

0.25 (M)

8.65±0.1

1.375±0.2

1.75MAX

0.175±0.075

0.1

0.15 +0.1 −0.05

45°

0~8°

0.7±0.3
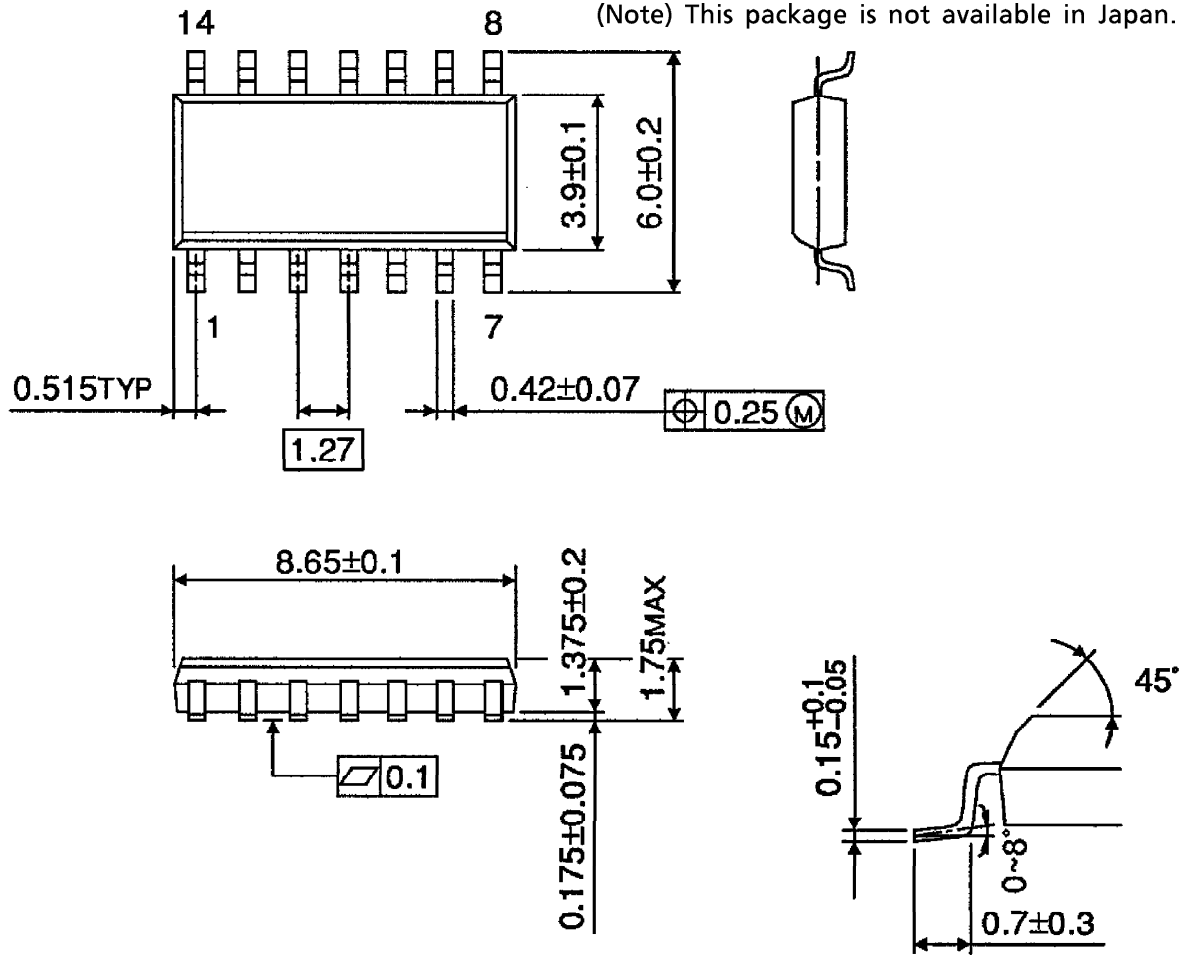
Weight : 0.12g (Typ.)

PACKAGE DIMENSIONS
TSSOP14-P-0044-0.65

Unit : mm

Weight : 0.06g (Typ.)

RESTRICTIONS ON PRODUCT USE

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