TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT   SILICON MONOLITHIC

TC74LCX07F, TC74LCX07FN, TC74LCX07FT

LOW VOLTAGE HEX BUFFER
WITH 5 V TOLERANT INPUTS AND OUTPUTS (OPEN DRAIN)

The TC74LCX07 is a high performance CMOS BUFFER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

The TC74LCX07 has high performance MOS N-channel transistor. (Open-Drain outputs)

The device is designed for low-voltage (3.3 V) 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} = 2.0~3.6 V

- High speed operation : t_{pz} = 3.7 ns (max)
  (V_{CC} = 3.0~3.6 V)

- Output current : I_{OL} = 24 mA (min)
  (V_{CC} = 3.0 V)

- Latch-up performance : −500 mA

- Available in JEDEC SOP, JEITA SOP and TSSOP

- Open-Drain Outputs

- 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.) 07 type.
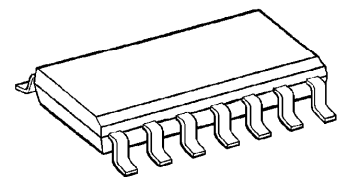
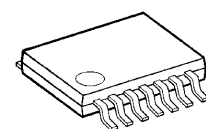(Note) : The JEDEC SOP (FN) is not available in Japan.

TC74LCX07F
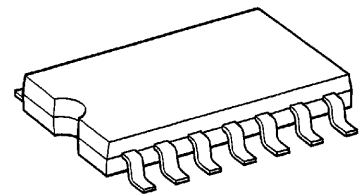
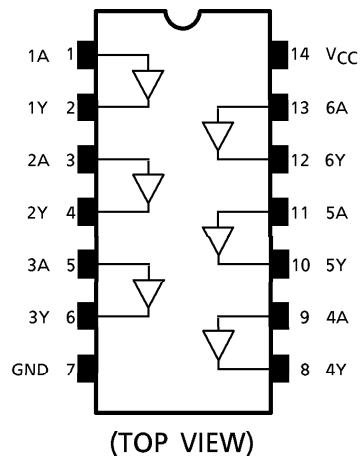SOP14-P-300-1.27

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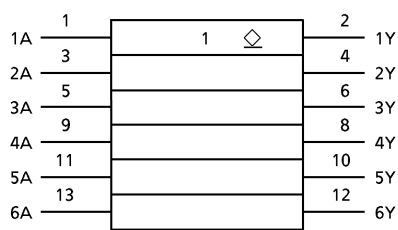

SOL14-P-150-1.27

TC74LCX07FT

TSSOP14-P-0044-0.65

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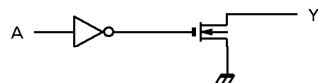TSSOP14-P-0044-0.65 : 0.06 g (Typ.)

PIN ASSIGNMENT

(TOP VIEW)

IEC LOGIC SYMBOL

TRUTH TABLE

INPUTS	OUTPUTS
A	Y
L	L
H	Z

SYSTEM DIAGRAM (per gate)

MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Power Supply Voltage	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) : Output in Off-State
(Note 2) : Low State. I_{OUT} absolute maximum rating must be observed.
(Note 3) : $V_{OUT} <$ GND

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) : Output in Off-State

(Note 6) : Low State

(Note 7) : V_{CC} = 3.0~3.6 V

(Note 8) : V_{CC} = 2.7~3.0 V

(Note 9) : V_{IN} = 0.8~2.0 V, V_{CC} = 3.0 V

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	"L" Level	V_{OL}	V_{IN} = V_{IL}	I_{OL} = 100 μA	2.7~3.6	—	0.2	V
				I_{OL} = 12 mA	2.7	—	0.4	
				I_{OL} = 16 mA	3.0	—	0.4	
				I_{OL} = 24 mA	3.0	—	0.55	
Input Leakage Current		I_{IN}	V_{IN} = 0~5.5V		2.7~3.6	—	±5.0	μA
Output Off-State Current		I_{OZ}	V_{IN} = V_{IH}, V_{OUT} = 0~5.5 V		2.7~3.6	—	±5.0	μA
Power Off Leakage Current		I_{OFF}	V_{IN} / V_{OUT} = 5.5 V		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} = 3.6~5.5 V		2.7~3.6	—	± 10.0	
Increase In I_{CC} Per Input		ΔI_{CC}	V_{IH} = V_{CC} − 0.6 V		2.7~3.6	—	500	μA

AC CHARACTERISTICS (Ta = −40~85°C)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	MIN	MAX	UNIT
Output Enable Time	t_{pZL}	(Fig.1, 2)	2.7	1.0	4.4	ns
			3.3 ± 0.3	0.8	3.7	
Output Disable Time	t_{pLZ}	(Fig.1, 2)	2.7	1.0	4.4	ns
			3.3 ± 0.3	0.8	3.7	
Output To Output Skew	t_{osZL}	(Note 10)	2.7	—	—	ns
			3.3 ± 0.3	—	1.0	

(Note 10) :   Parameter guaranteed by design.
$(t_{osZL} = |t_{pZLm} - t_{pZLn}|)$

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

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	UNIT
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	0.8	V
Quiet Output Minimum Dynamic V_{OL}	$|V_{OLV}|$	V_{IH} = 3.3 V, V_{IL} = 0 V	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}	—	3.3	8	pF
Power Dissipation Capacitance	C_{PD}	f_{IN} = 10 MHz (Note 11)	3.3	5	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.
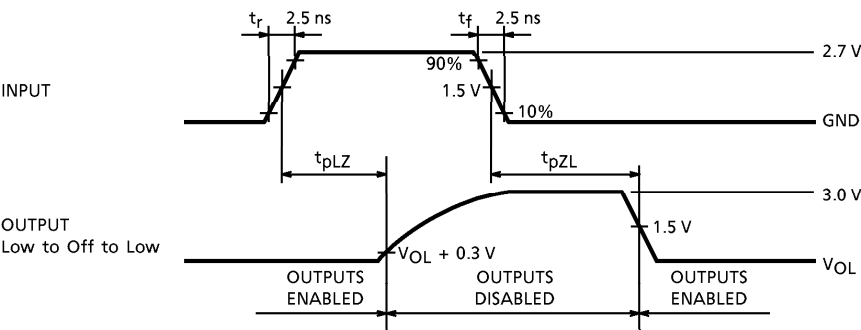Average operating current can be obtained by the equation :
$$I_{CC\,(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 6 \text{ (Per gate)}$$
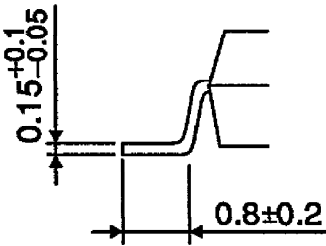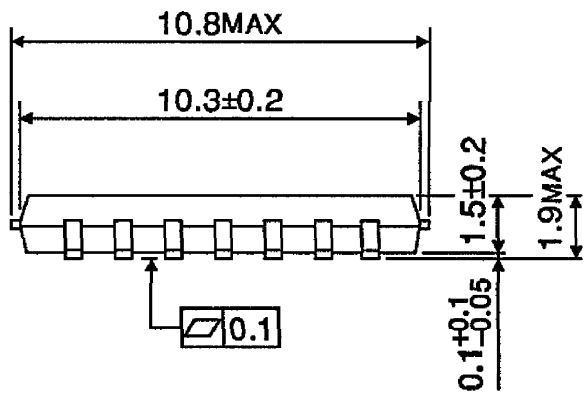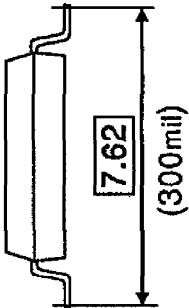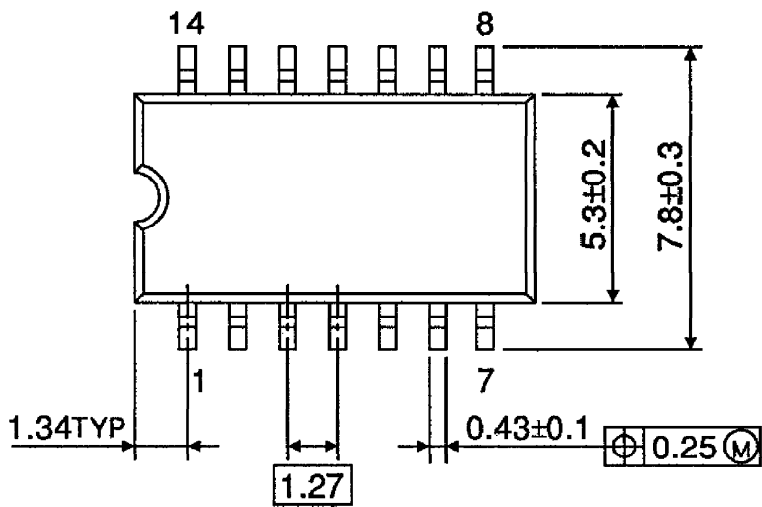
TEST CIRCUIT
Fig.1

6.0 V

R_L

C_L

R_L

MEASURE

C_L = 50 pF
R_L = 500 Ω
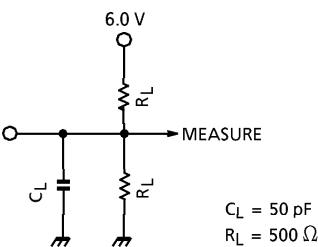
AC WAVEFORM
Fig.2 t_{pLZ}, t_{pZL}

INPUT

t_r 2.5 ns

t_f 2.5 ns

2.7 V

90%

1.5 V

10%

GND

t_{pLZ}

t_{pZL}

OUTPUT
Low to Off to Low

3.0 V

1.5 V

V_{OL} + 0.3 V

V_{OL}

OUTPUTS
ENABLED

OUTPUTS
DISABLED

OUTPUTS
ENABLED

PACKAGE DIMENSIONS
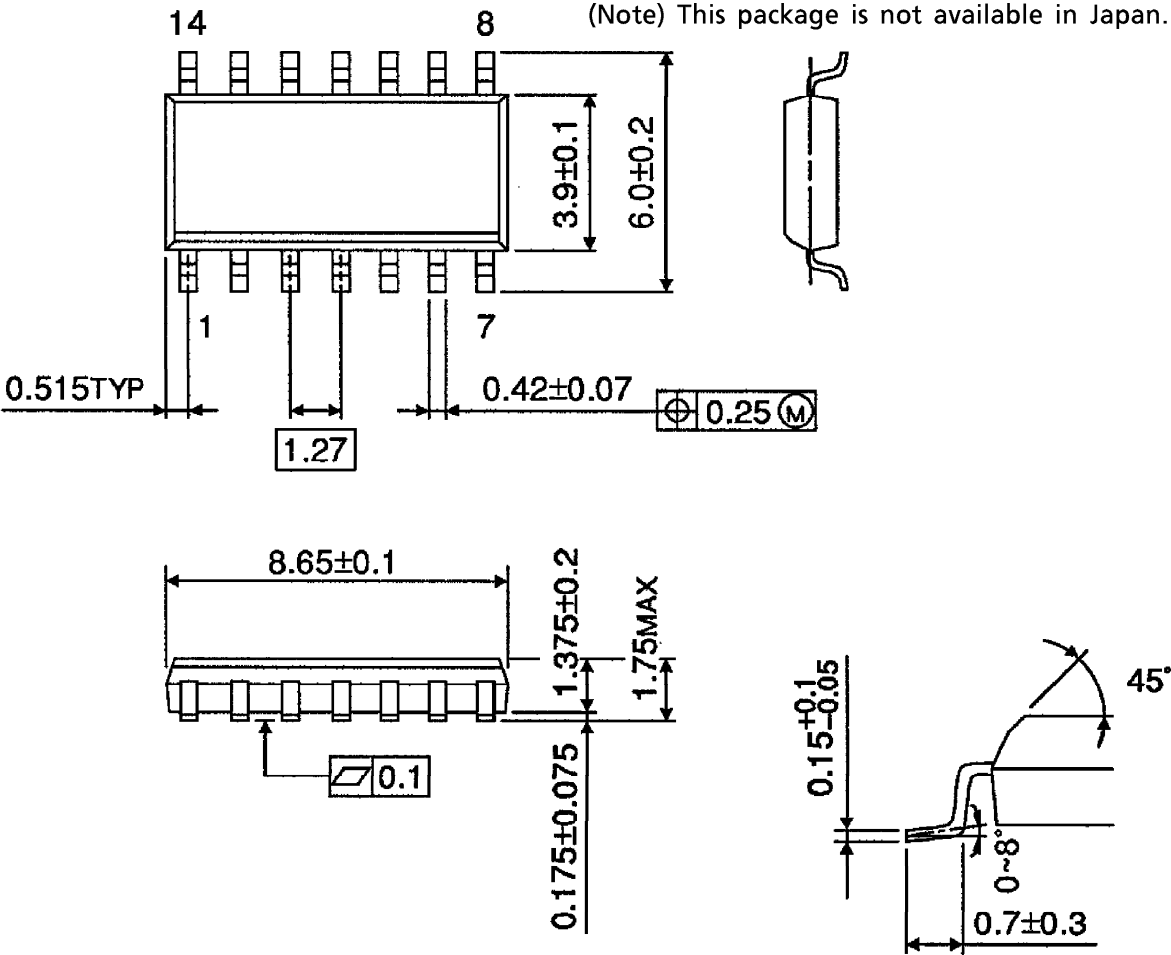
SOP14-P-300-1.27

Unit : mm

Weight : 0.18 g (Typ.)
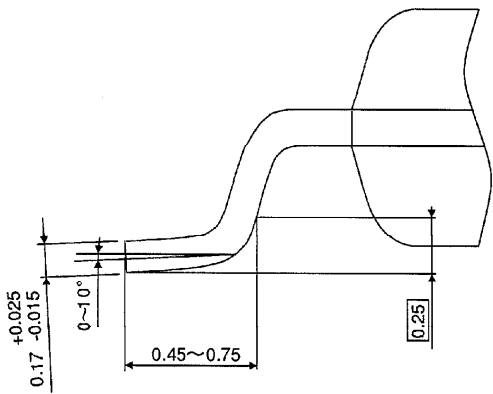
PACKAGE DIMENSIONS
SOL14-P-150-1.27

Unit : mm

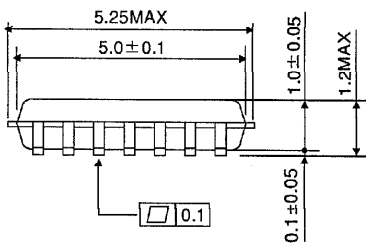(Note) This package is not available in Japan.

14　8

3.9 ± 0.1

6.0 ± 0.2

1　7

0.515TYP

0.42 ± 0.07

$\bigoplus$ 0.25 Ⓜ

1.27

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 : 0.12 g (Typ.)

PACKAGE DIMENSIONS

TSSOP14-P-0044-0.65

Unit : mm
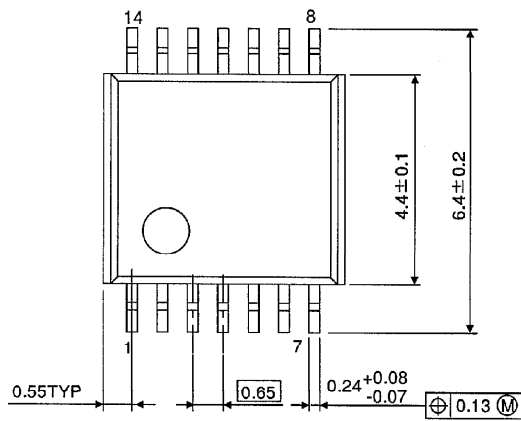
Weight : 0.06 g (Typ.)

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