

TC74LCX05F, TC74LCX05FN, TC74LCX05FT

LOW VOLTAGE HEX INVERTER

WITH 5 V TOLERANT INPUTS AND OUTPUTS (OPEN DRAIN)

The TC74LCX05 is a high performance CMOS INVERTER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

Pin configuration and function are the same as the TC74LCX04, but the TC74LCX05 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.

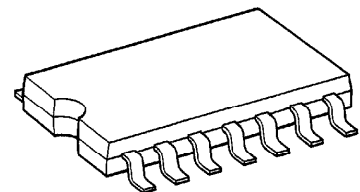
All inputs are equipped with protection circuits against static discharge.

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

FEATURES

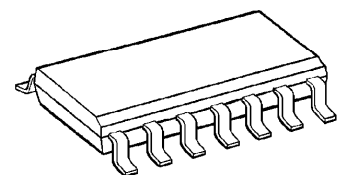
- Low voltage operation : $V_{CC} = 2.0 \sim 3.6 \text{ V}$
- High speed operation : $t_{pZ} = 5.0 \text{ ns (max)}$
($V_{CC} = 3.0 \sim 3.6 \text{ V}$)
- Output current : $I_{OL} = 24 \text{ mA (min)}$
($V_{CC} = 3.0 \text{ V}$)
- Latch-up performance : -500 mA
- Available in JEDEC SOP, EIAJ SOP and 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.) 05 type.

TC74LCX05F



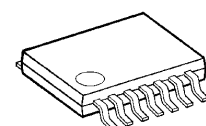
SOP14-P-300-1.27

TC74LCX05FN



SOL14-P-150-1.27

TC74LCX05FT



TSSOP14-P-0044-0.65

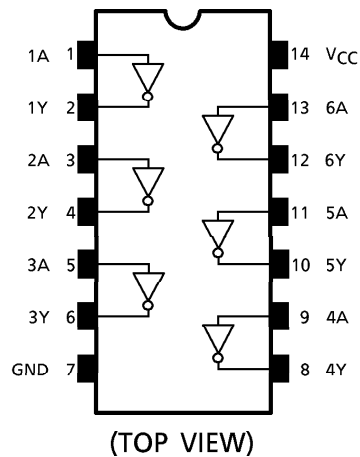
Weight

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.)

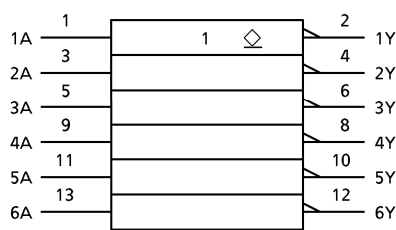
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PIN ASSIGNMENT



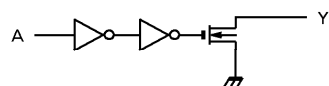
IEC LOGIC SYMBOL



TRUTH TABLE

INPUTS	OUTPUTS
A	Y
L	Z
H	L

SYSTEM DIAGRAM (per gate)



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) - 0.5~ $V_{CC} + 0.5$ (Note 2)	V
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	$^{\circ}C$

- (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) : $V_{CC} = 3.0\sim 3.6\text{ V}$ (Note 8) : $V_{CC} = 2.7\sim 3.0\text{ V}$ (Note 9) : $V_{IN} = 0.8\sim 2.0\text{ V}$, $V_{CC} = 3.0\text{ V}$

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS ($T_a = -40\sim 85^\circ\text{C}$)

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 _{IH}	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 _{IL} , 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	6.0	ns
			3.3 ± 0.3	0.8	5.0	
Output Disable Time	t _{pLZ}	(Fig.1, 2)	2.7	1.0	6.0	ns
			3.3 ± 0.3	0.8	5.0	
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)

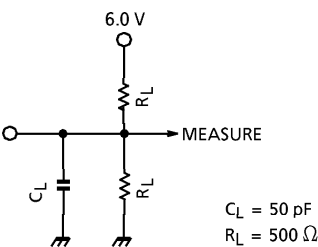
PARAMETER	SYMBOL	TEST CONDITION	V _{CC} (V)	TYP.	UNIT
Input Capacitance	C _{IN}	—	3.3	7	pF
Output Capacitance	C _{OUT}		3.3	8	pF
Power Dissipation Capacitance	C _{PD}	f _{IN} = 10 MHz (Note 11)	3.3	5	pF

(Note 11) : C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

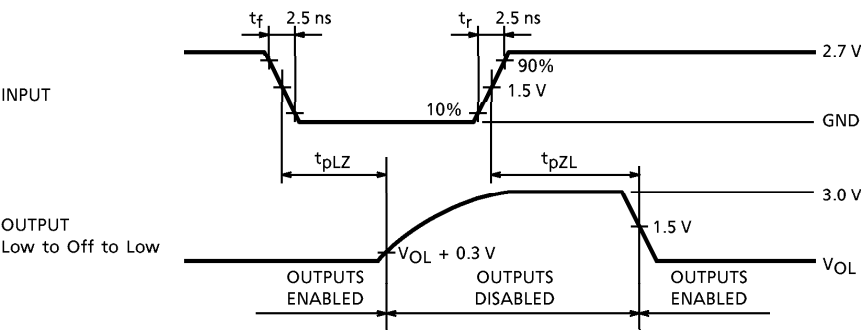
Average operating current can be obtained by the equation :

$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/6 \text{ (Per gate)}$$

TEST CIRCUIT
Fig.1

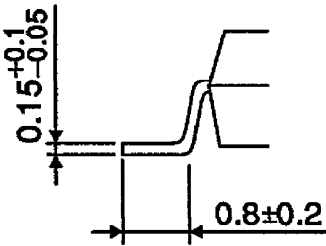
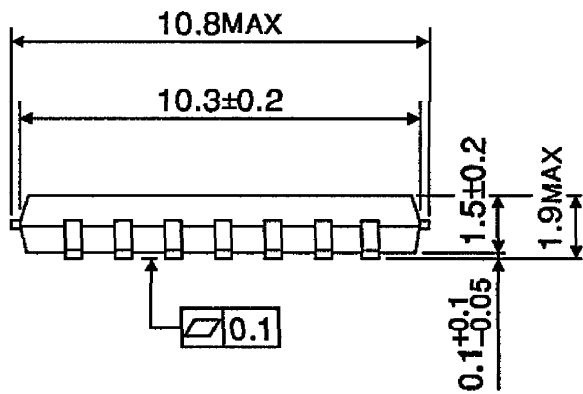
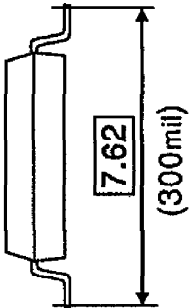
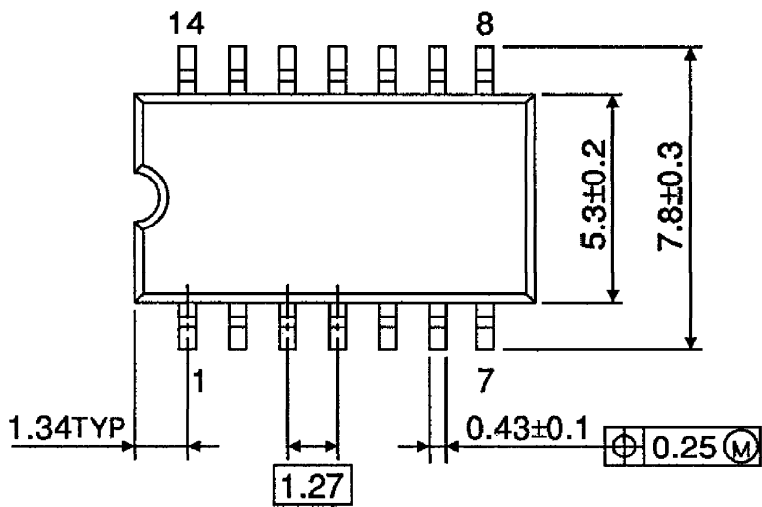


AC WAVEFORM
Fig.2 t_{pLZ} , t_{pZL}



PACKAGE DIMENSIONS
SOP14-P-300-1.27

Unit : mm

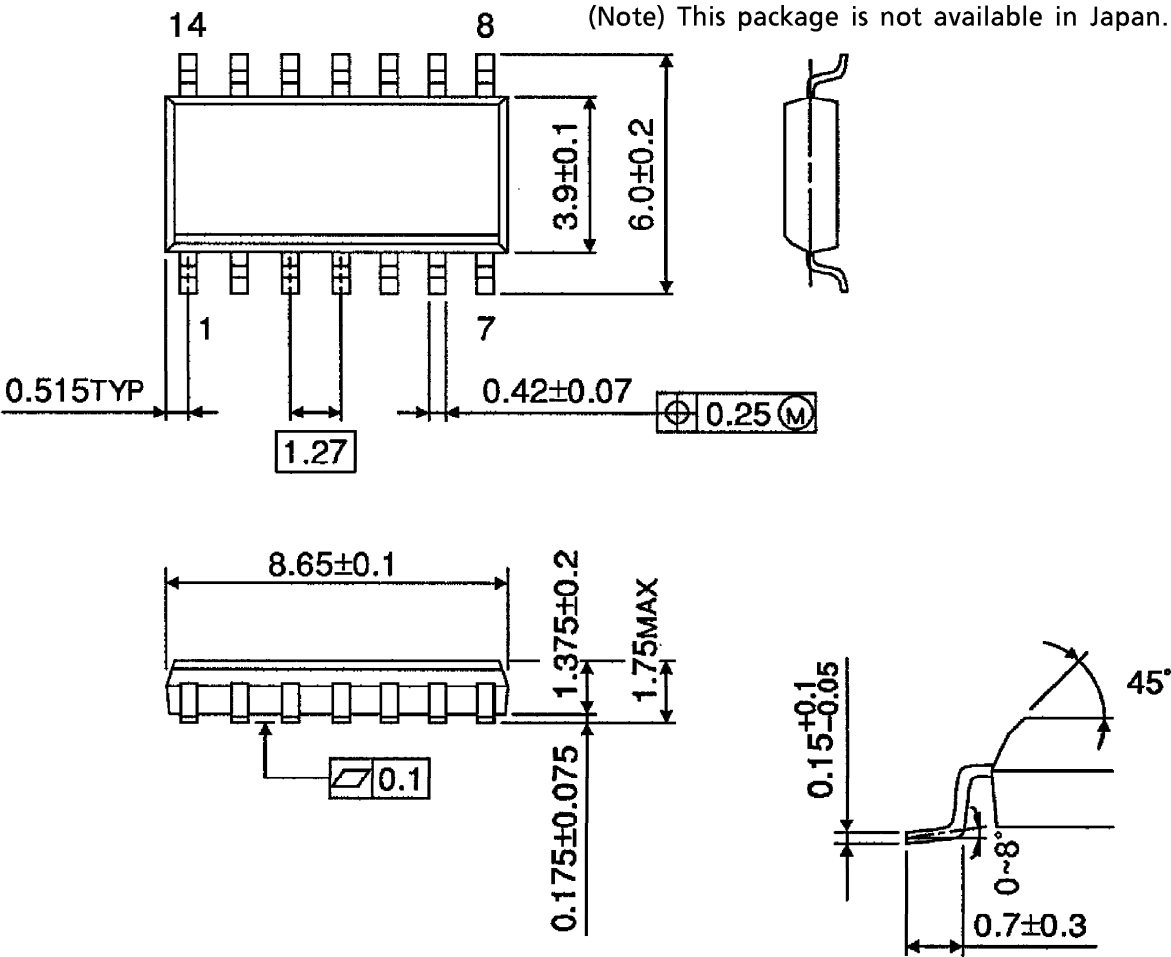


Weight : 0.18 g (Typ.)

PACKAGE DIMENSIONS
SOL14-P-150-1.27

Unit : mm

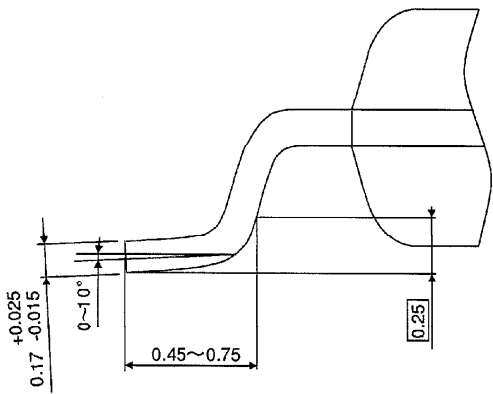
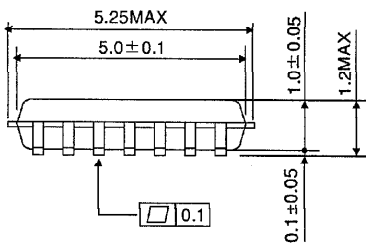
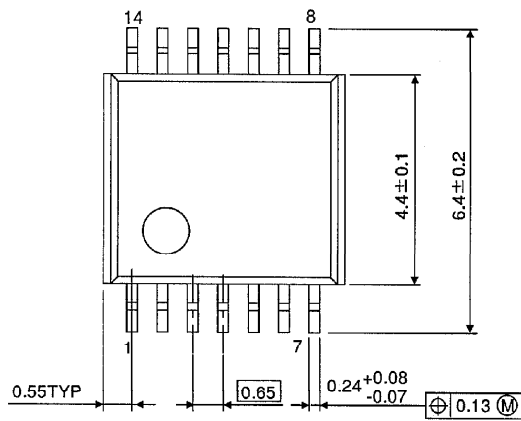
(Note) This package is not available in Japan.



Weight : 0.12 g (Typ.)

PACKAGE DIMENSIONS
TSSOP14-P-0044-0.65

Unit : mm



Weight : 0.06 g (Typ.)