

**TC74LVX04F, TC74LVX04FN, TC74LVX04FT**

**HEX INVERTER**

The TC74LVX04 is a high speed CMOS HEX INVERTER fabricated with silicon gate C<sup>2</sup>MOS technology. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

This device is suitable for low voltage and battery operated systems.

The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output.

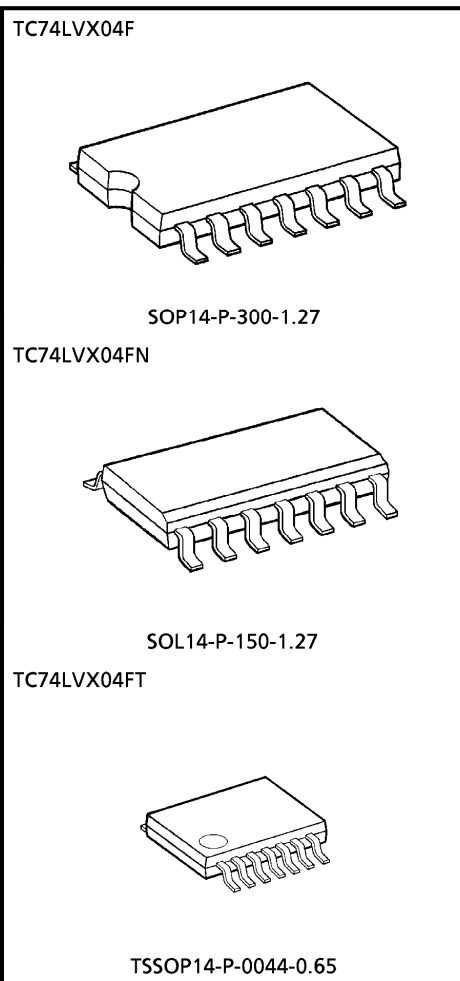
An input protection circuit ensures that 0 to 7V can be applied to the input pins without regard to the supply voltage.

This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

**FEATURES**

- High speed :  $t_{pd} = 4.1ns$  (Typ.) ( $V_{CC} = 3.3V$ )
- Low power dissipation :  $I_{CC} = 2\mu A$  (Max.) ( $T_a = 25^\circ C$ )
- Input voltage level :  $V_{IL} = 0.8V$  (Max.) ( $V_{CC} = 3V$ )  
 $V_{IH} = 2.0V$  (Min.) ( $V_{CC} = 3V$ )
- Power down protection is provided on all inputs.
- Balanced propagation delays :  $t_{pLH} \approx t_{pHL}$
- Low noise :  $V_{OLP} = 0.5V$  (Max.)
- Pin and function compatible with 74HC04

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

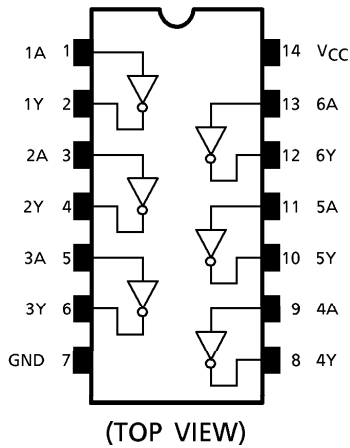


Weight  
 SOP14-P-300-1.27 : 0.18g (Typ.)  
 SOL14-P-150-1.27 : 0.12g (Typ.)  
 TSSOP14-P-0044-0.65 : 0.06g (Typ.)

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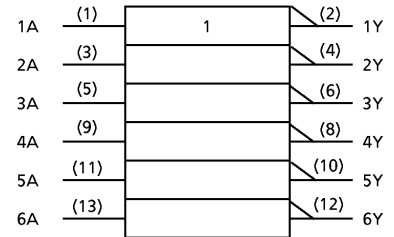
**PIN ASSIGNMENT**



**TRUTH TABLE**

INPUTS	OUTPUTS
A	Y
L	H
H	L

**IEC LOGIC SYMBOL**



**MAXIMUM RATINGS**

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	V
DC Input Voltage	$V_{IN}$	-0.5~7.0	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	$P_D$	180	mW
Storage Temperature	$T_{stg}$	-65~150	°C

**RECOMMENDED OPERATING CONDITIONS**

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	$V_{CC}$	2.0~3.6	V
Input Voltage	$V_{IN}$	0~5.5	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	°C
Input Rise And Fall Time	$dt/dv$	0~100	ns/V

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- The information contained herein is subject to change without notice.

**ELECTRICAL CHARACTERISTICS**

DC characteristics

PARAMETER	SYM-BOL	TEST CONDITION	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT					
				MIN.	TYP.	MAX.	MIN.	MAX.						
Input Voltage	"H" Level	V <sub>IH</sub>	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V				
				3.0	2.0	—	—	2.0	—					
				3.6	2.4	—	—	2.4	—					
	"L" Level			V <sub>IL</sub>	2.0	—	—	0.5	—		0.5	V		
					3.0	—	—	0.8	—		0.8			
					3.6	—	—	0.8	—		0.8			
Output Voltage	"H" Level	V <sub>OH</sub>	V <sub>IH</sub> = V <sub>IL</sub>		I <sub>OH</sub> = -50 μA	2.0	1.9	2.0	—	1.9	—		V	
					I <sub>OH</sub> = -50 μA	3.0	2.9	3.0	—	2.9	—			
					I <sub>OH</sub> = -4mA	3.0	2.58	—	—	2.48	—			
	"L" Level			V <sub>OL</sub>	V <sub>IH</sub> = V <sub>IH</sub>	I <sub>OL</sub> = 50 μA	2.0	—	0.0	0.1	—	0.1		V
						I <sub>OL</sub> = 50 μA	3.0	—	0.0	0.1	—	0.1		
						I <sub>OL</sub> = 4mA	3.0	—	—	0.36	—	0.44		
Input Leakage Current	I <sub>IN</sub>	V <sub>IH</sub> = 5.5V or GND	3.6			—	—	±0.1	—	±1.0	μA			
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IH</sub> = V <sub>CC</sub> or GND	3.6			—	—	2.0	—	20.0	μA			

AC characteristics (Input t<sub>r</sub> = t<sub>f</sub> = 3ns)

PARAMETER	SYM-BOL	TEST CONDITION	V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	Ta = 25°C			Ta = -40~85°C		UNIT	
					MIN.	TYP.	MAX.	MIN.	MAX.		
Propagation Delay Time	t <sub>pLH</sub>	(Note 1)	2.7	15	—	5.4	10.1	1.0	12.5	ns	
					50	—	7.9	13.6	1.0		16.0
	t <sub>pHL</sub>			3.3 ± 0.3	15	—	4.1	6.2	1.0		7.5
					50	—	6.6	9.7	1.0		11.0
Output To Output Skew	t <sub>osLH</sub>	(Note 1)	2.7	50	—	—	1.5	—	1.5	ns	
	t <sub>osHL</sub>				3.3 ± 0.3	50	—	—	1.5		—
Input Capacitance	C <sub>IN</sub>	(Note 2)	—	—	—	4	10	—	10	pF	
Power Dissipation Capacitance	C <sub>PD</sub>	(Note 3)	—	—	—	18	—	—	—	pF	

(Note 1) Parameter guaranteed by design.

$$(t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|)$$

(Note 2) Parameter guaranteed by design.

(Note 3) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.

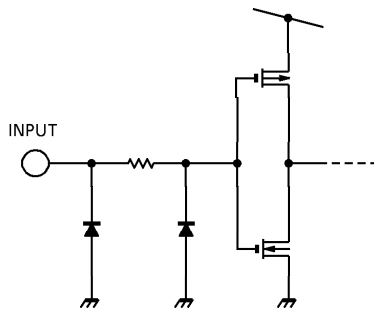
Average operating current can be obtained by the equation :

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

Noise characteristics (Ta = 25°C, Input tr = tf = 3ns, CL = 50pF)

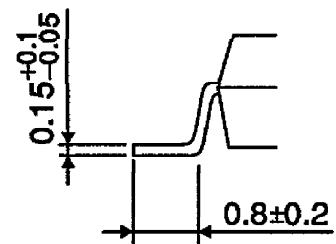
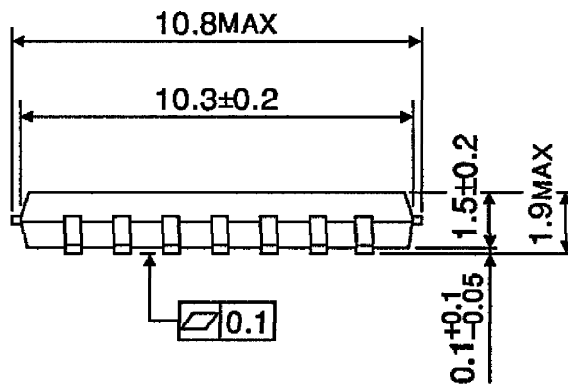
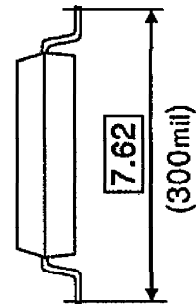
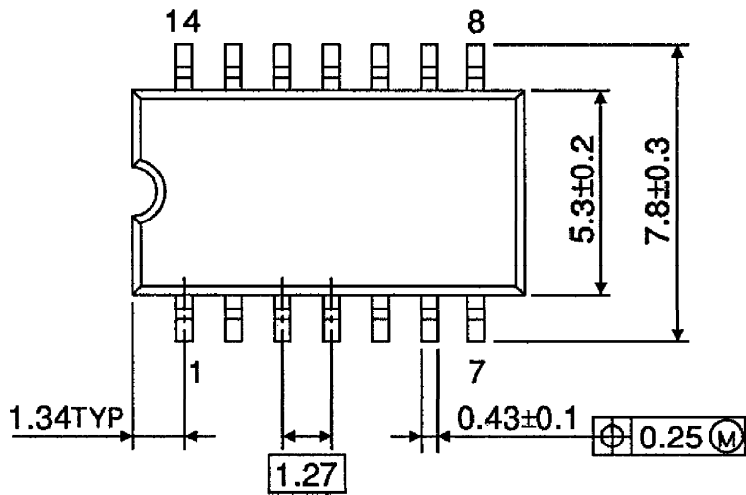
PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	TYP.	LIMIT	UNIT
Quiet Output Maximum Dynamic $V_{OL}$	$V_{OLP}$		3.3	0.3	0.5	V
Quiet Output Minimum Dynamic $V_{OL}$	$V_{OLV}$		3.3	-0.3	-0.5	V
Minimum High Level Dynamic Input Voltage	$V_{IHD}$		3.3	—	2.0	V
Maximum Low Level Dynamic Input Voltage	$V_{ILD}$		3.3	—	0.8	V

**INPUT EQUIVALENT CIRCUIT**



**OUTLINE DRAWING**  
SOP14-P-300-1.27

Unit : mm

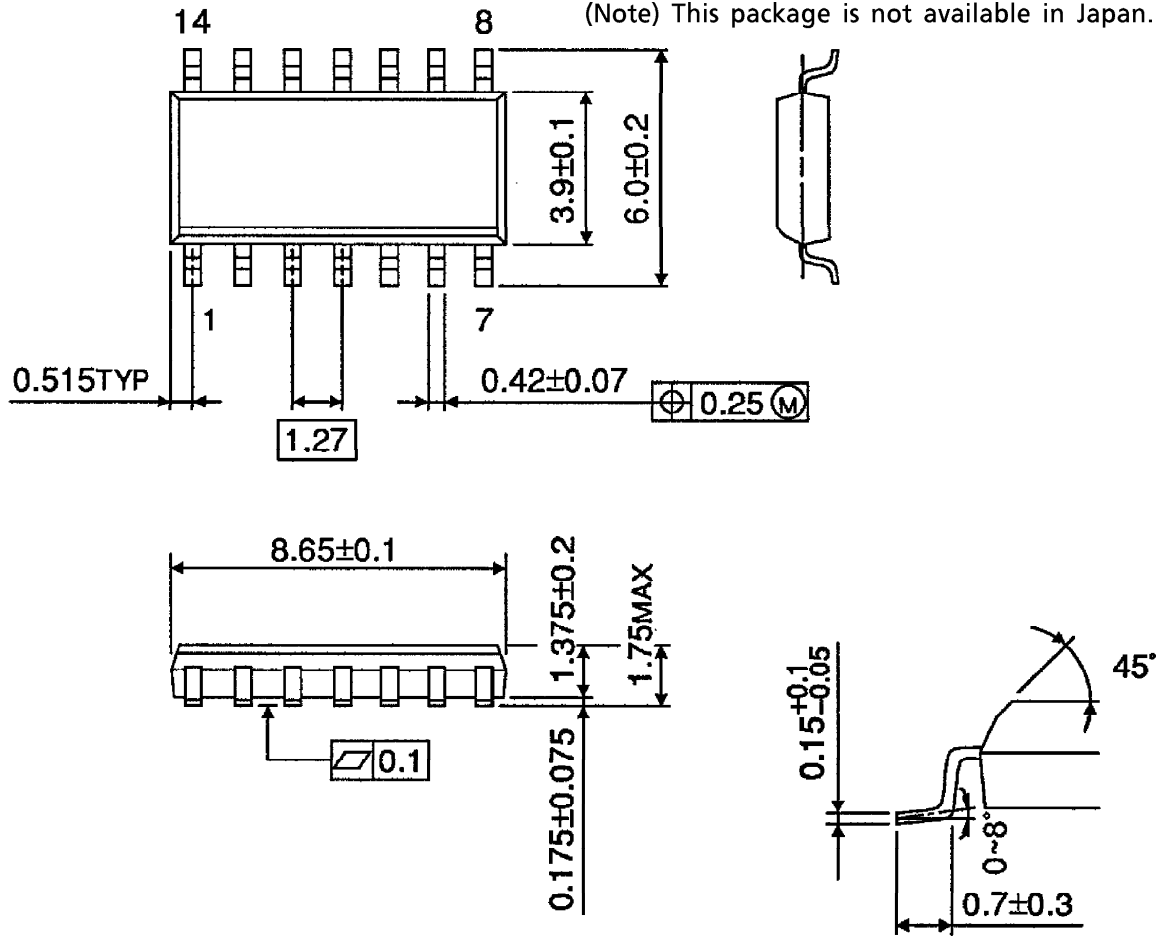


Weight : 0.18g (Typ.)

**OUTLINE DRAWING**  
SOL14-P-150-1.27

Unit : mm

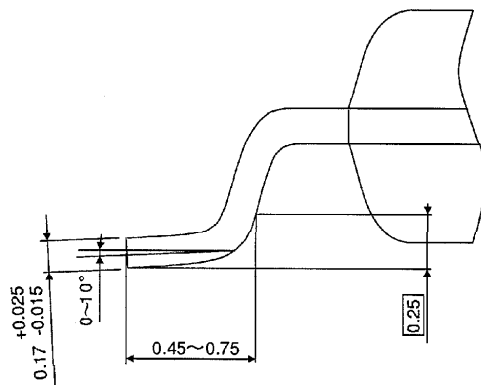
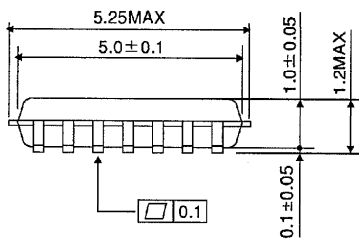
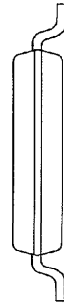
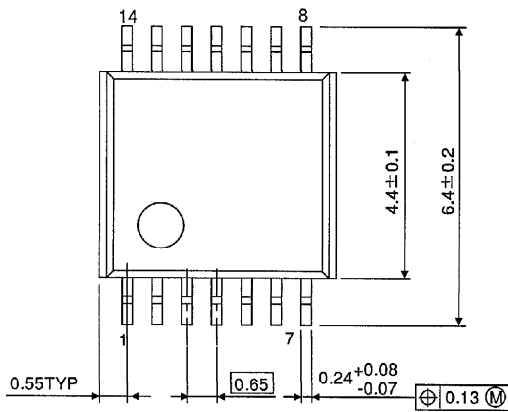
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

**OUTLINE DRAWING**  
TSSOP14-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)