

# TC74LVX14F, TC74LVX14FN, TC74LVX14FT

## HEX SCHMITT INVERTER

The TC74LVX14 is a high speed CMOS HEX SCHMITT 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.

Pin configuration and function are the same as the TC74LVX04 but the inputs have hysteresis and with its schmitt trigger function, the TC74LVX14 can be used as a line receivers which will receive slow input signals. An input protection circuit ensures that 0 to 7V can be applied to the input pins without regard to the supply voltage.

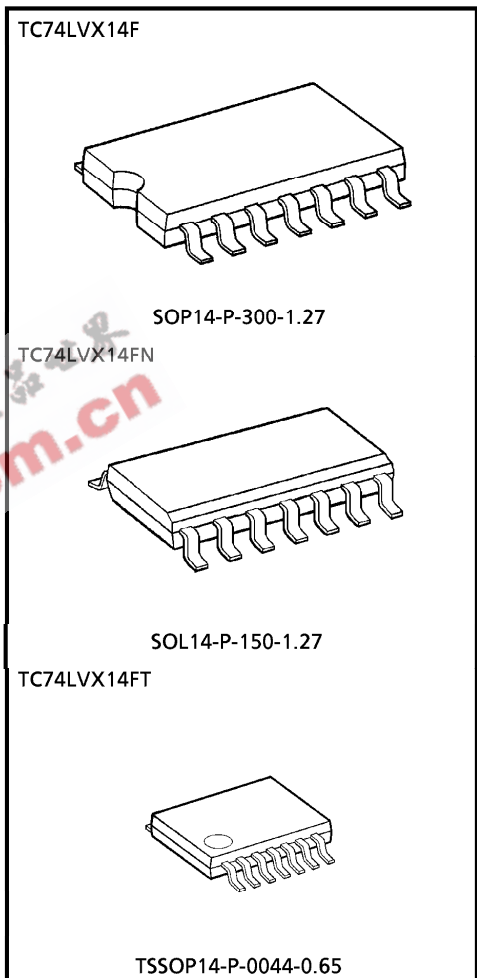
This device can be used to interface 5V to 3V systems and two supply systems such as battery back up.

This circuit prevents device destruction due to mismatched supply and input voltages.

### FEATURES

- High speed :  $t_{pd} = 6.8\text{ns}$  (Typ.) ( $V_{CC} = 3.3\text{V}$ )
- Low power dissipation :  $I_{CC} = 2\mu\text{A}$  (Max.) ( $T_a = 25^\circ\text{C}$ )
- Power down protection is provided on all inputs.
- Balanced propagation delays :  $t_{pLH} \approx t_{pHL}$
- Low noise :  $V_{OLP} = 0.5\text{V}$  (Max.)
- Pin and function compatible with 74HC14

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



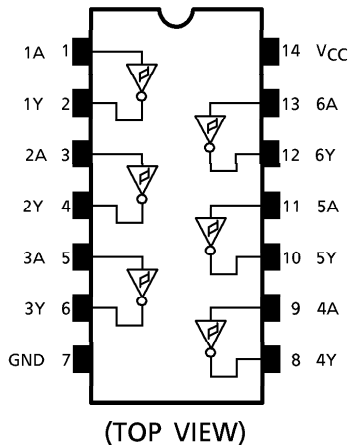
### Weight

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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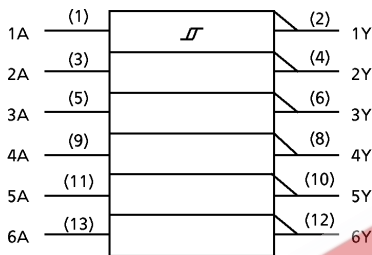
**PIN ASSIGNMENT**



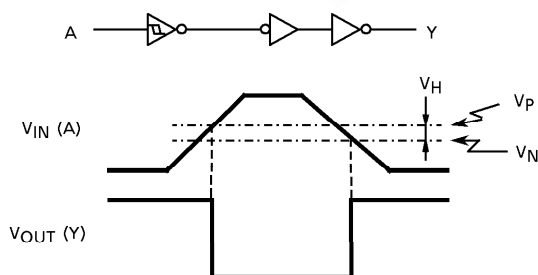
**TRUTH TABLE**

INPUTS	OUTPUTS
A	Y
L	H
H	L

**IEC LOGIC SYMBOL**



**SYSTEM DIAGRAM, WAVEFORM**



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## 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

## ELECTRICAL CHARACTERISTICS

DC characteristics

PARAMETER		SYM-BOL	TEST CONDITION	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \sim 85^\circ\text{C}$		UNIT	
					MIN.	TYP.	MAX.	MIN.	MAX.		
Threshold Voltage	"H" Level	$V_P$		3.0	—	—	2.2	—	2.2	V	
	"L" Level	$V_N$		3.0	0.9	—	—	0.9	—		
Hysteresis Voltage		$V_H$		3.0	0.3	—	1.2	0.3	1.2	V	
Output Voltage	"H" Level	$V_{OL}$	$V_{IN} = V_{IL}$	$I_{OH} = -50\mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
				$I_{OH} = -50\mu\text{A}$	3.0	2.9	3.0	—	2.9	—	
				$I_{OH} = -4\text{mA}$	3.0	2.58	—	—	2.48	—	
	"L" Level	$V_{OL}$	$V_{IN} = V_{IH}$	$I_{OL} = 50\mu\text{A}$	2.0	—	0.0	0.1	—	0.1	
				$I_{OL} = 50\mu\text{A}$	3.0	—	0.0	0.1	—	0.1	
				$I_{OL} = 4\text{mA}$	3.0	—	—	0.36	—	0.44	
Input Leakage Current		$I_{IN}$	$V_{IN} = 5.5\text{V}$ or GND	3.6	—	—	±0.1	—	±1.0	$\mu\text{A}$	
Quiescent Supply Current		$I_{CC}$	$V_{IN} = V_{CC}$ or GND	3.6	—	—	2.0	—	20.0	$\mu\text{A}$	

AC characteristics (Input  $t_r = t_f = 3\text{ns}$ )

PARAMETER	SYM-BOL	TEST CONDITION			Ta = 25°C			Ta = -40~85°C		UNIT
			VCC (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time	t <sub>pLH</sub>		2.7	15	—	8.7	16.3	1.0	19.5	ns
				50	—	11.2	19.8	1.0	23.0	
	3.3 ± 0.3		15	—	6.8	10.6	1.0	12.5		
			50	—	9.3	14.1	1.0	16.0		
Output To Output Skew	t <sub>osLH</sub>	(Note 1)	2.7	50	—	—	1.5	—	1.5	ns
	t <sub>osHL</sub>			50	—	—	1.5	—	1.5	
Input Capacitance	C <sub>IN</sub>	(Note 2)			—	4	10	—	10	pF
Power Dissipation Capacitance	C <sub>PD</sub>	(Note 3)			—	21	—	—	—	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.

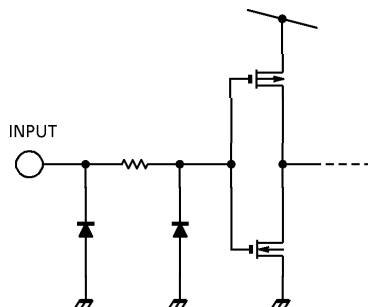
Average operating current can be obtained by the equation :

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

Noise characteristics (Ta = 25°C, Input  $t_r = t_f = 3\text{ns}$ , C<sub>L</sub> = 50pF)

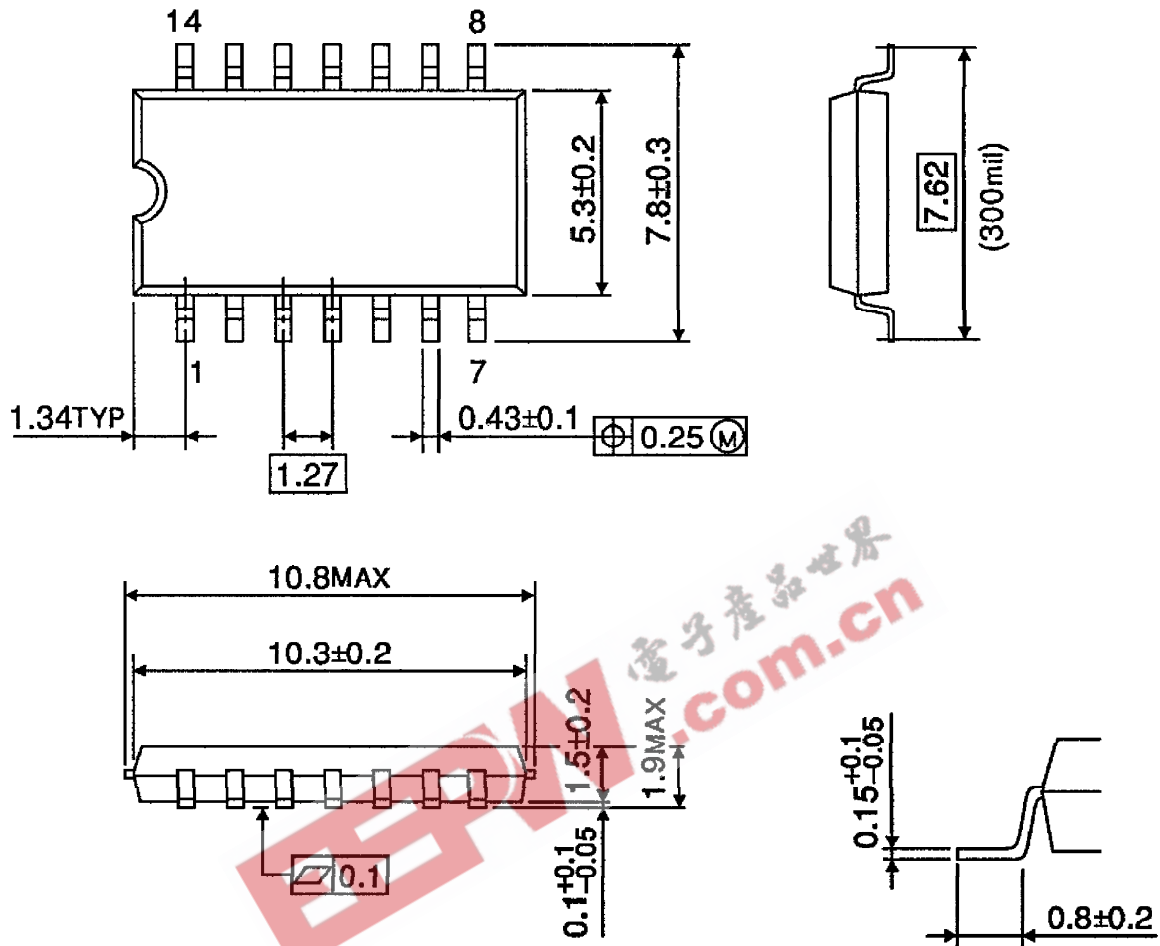
PARAMETER	SYMBOL	TEST CONDITION	VCC (V)	TYP.	LIMIT	UNIT
			3.3	0.3	0.5	
Quiet Output Maximum Dynamic	V <sub>OLP</sub>		3.3	0.3	0.5	V
Quiet Output Minimum Dynamic	V <sub>OLV</sub>		3.3	-0.3	-0.5	V
Minimum High Level Dynamic Input Voltage	V <sub>IHD</sub>		3.3	—	2.2	V
Maximum Low Level Dynamic Input Voltage	V <sub>I LD</sub>		3.3	—	0.9	V

**INPUT EQUIVALENT CIRCUIT**



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

Unit : mm

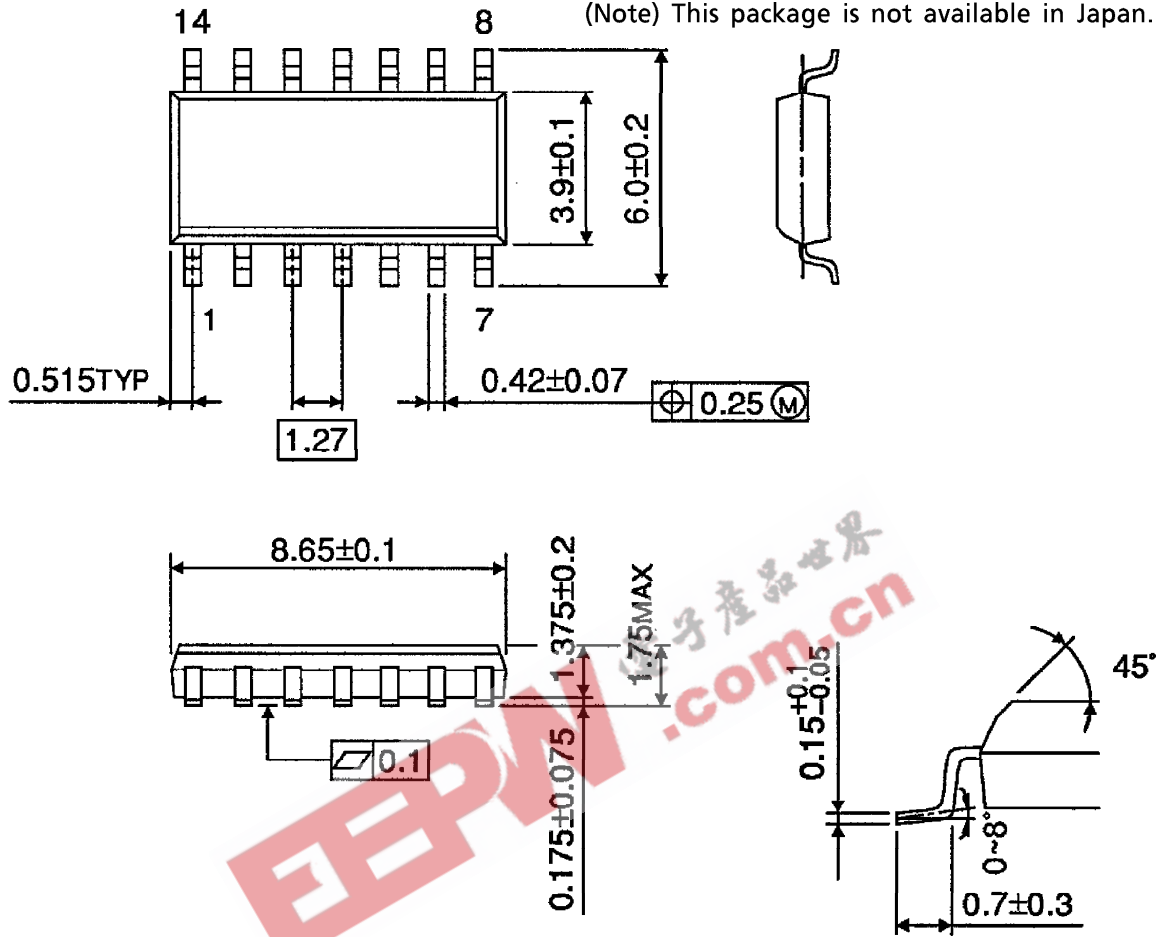


Weight : 0.18g (Typ.)

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

Unit : mm

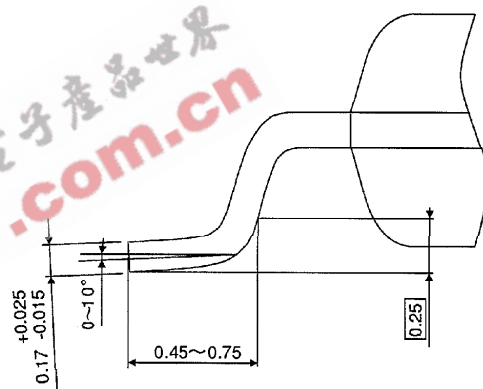
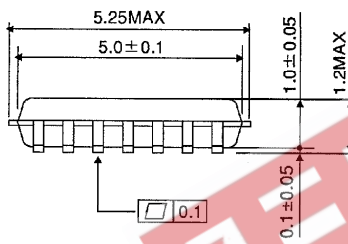
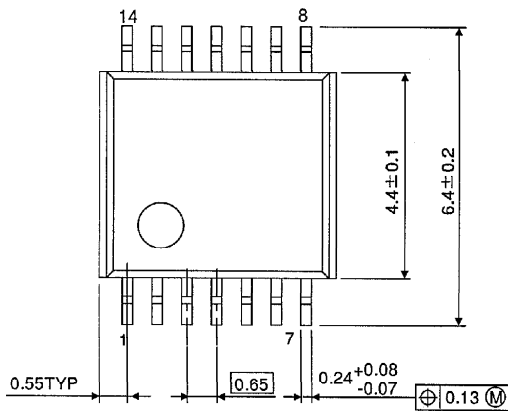
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

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

Unit : mm



Weight : 0.06g (Typ.)