

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74LVX04F, TC74LVX04FN, TC74LVX04FT**HEX INVERTER**

The TC74LVX04 is a high speed CMOS HEX INVERTER fabricated with silicon gate C²MOS 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.

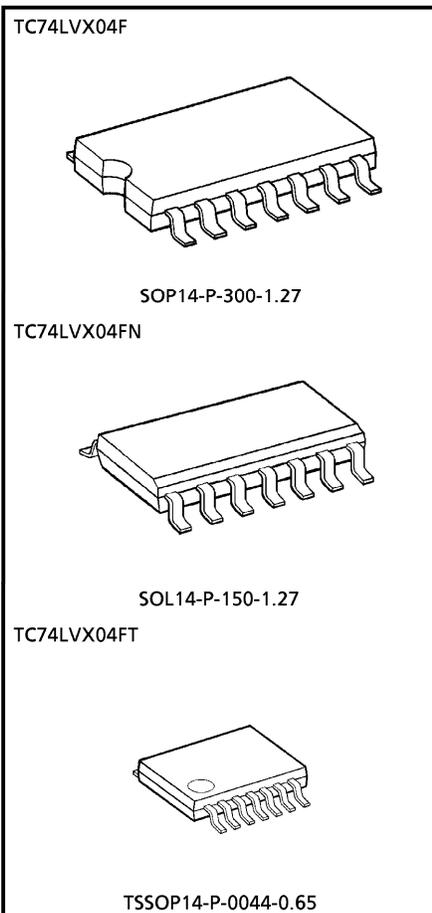
An input protection circuit ensures that 0 to 7V can be applied to the input pins without regard to the supply voltage.

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 : $t_{pd} = 4.1\text{ns}$ (Typ.) ($V_{CC} = 3.3\text{V}$)
- Low power dissipation : $I_{CC} = 2\mu\text{A}$ (Max.) ($T_a = 25^\circ\text{C}$)
- Input voltage level : $V_{IL} = 0.8\text{V}$ (Max.) ($V_{CC} = 3\text{V}$)
 $V_{IH} = 2.0\text{V}$ (Min.) ($V_{CC} = 3\text{V}$)
- 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 74HC04

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

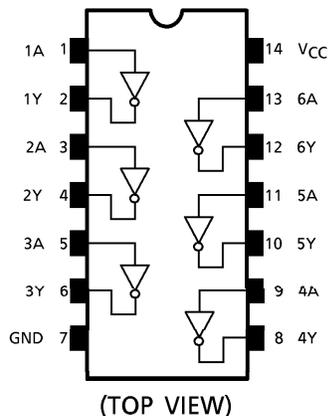


Weight
 SOP14-P-300-1.27 : 0.18g (Typ.)
 SOL14-P-150-1.27 : 0.12g (Typ.)
 TSSOP14-P-0044-0.65 : 0.06g (Typ.)

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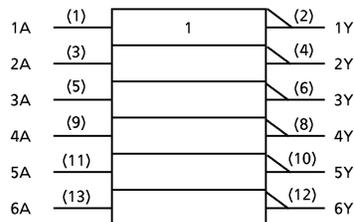
PIN ASSIGNMENT



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

AC characteristics (Input t_r = t_f = 3ns)

PARAMETER	SYM-BOL	TEST CONDITION	V _{CC} (V)	C _L (pF)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time	t _{pLH}	(Note 1)	2.7	15	—	5.4	10.1	1.0	12.5	ns
				50	—	7.9	13.6	1.0	16.0	
	t _{pHL}		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 _{osLH}	(Note 1)	2.7	50	—	—	1.5	—	1.5	ns
	t _{osHL}				3.3 ± 0.3	50	—	—	1.5	
Input Capacitance	C _{IN}	(Note 2)	—	—	—	4	10	—	10	pF
Power Dissipation Capacitance	C _{PD}	(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_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.

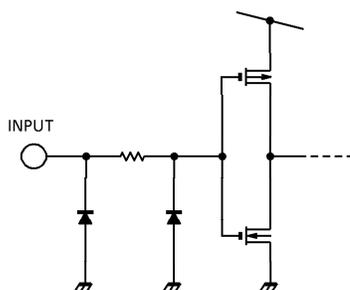
Average operating current can be obtained by the equation :

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

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

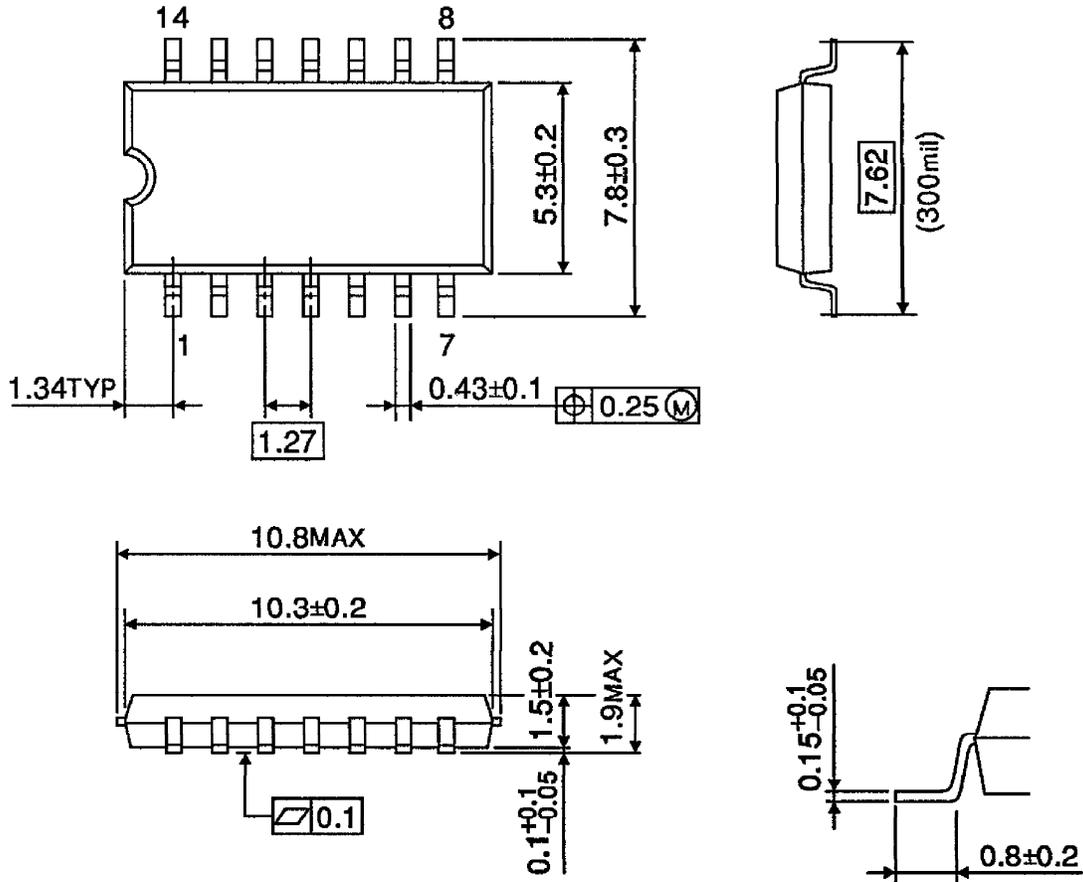
PARAMETER	SYMBOL	TEST CONDITION	VCC (V)	TYP.	LIMIT	UNIT
Quiet Output Maximum Dynamic VOL	VOLP		3.3	0.3	0.5	V
Quiet Output Minimum Dynamic VOL	VOLV		3.3	-0.3	-0.5	V
Minimum High Level Dynamic Input Voltage	VIHD		3.3	—	2.0	V
Maximum Low Level Dynamic Input Voltage	VI LD		3.3	—	0.8	V

INPUT EQUIVALENT CIRCUIT



OUTLINE DRAWING
SOP14-P-300-1.27

Unit : mm

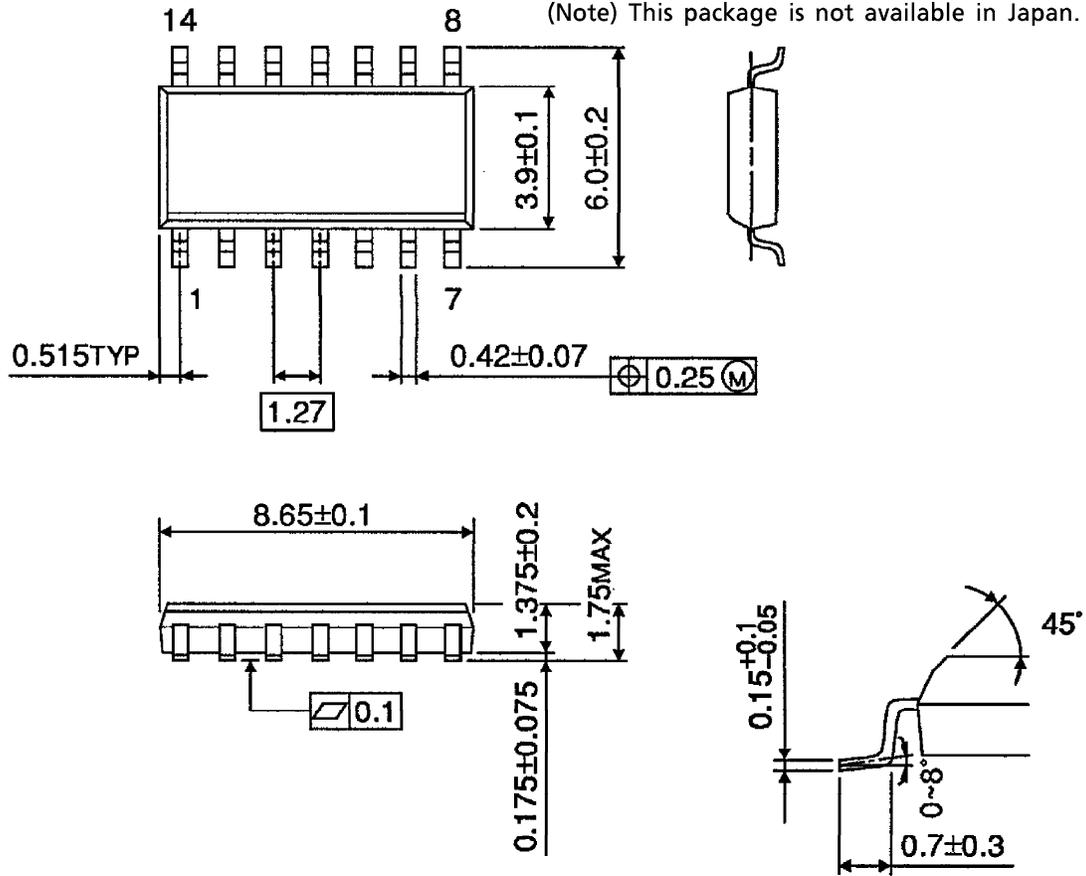


Weight : 0.18g (Typ.)

OUTLINE DRAWING
SOL14-P-150-1.27

Unit : mm

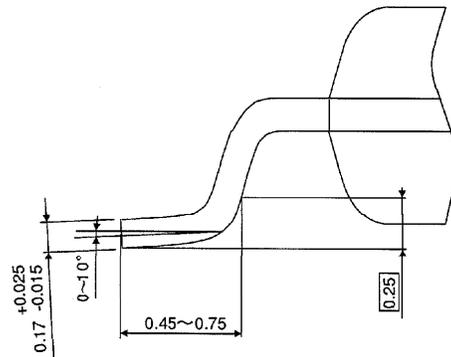
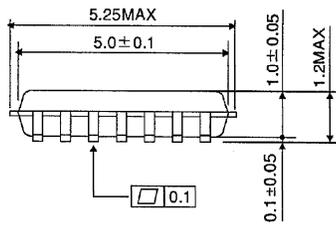
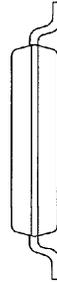
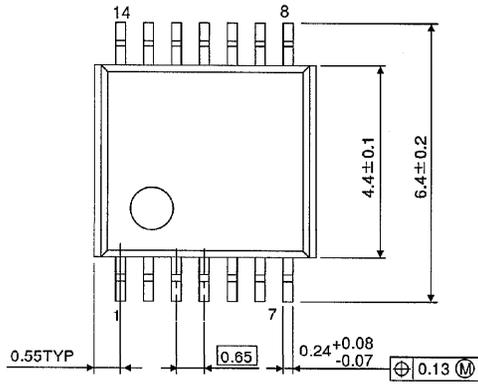
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

OUTLINE DRAWING
TSSOP14-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)