TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

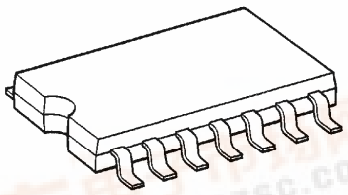
TC74LCX14F, TC74LCX14FN, TC74LCX14FT

LOW VOLTAGE HEX SCHMITT INVERTER WITH 5V TOLERANT INPUTS AND OUTPUTS

The TC74LCX14 is a high performance CMOS SCHMITT INVERTER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.
The device is designed for low-voltage (3.3V) V_{CC} applications, but it could be used to interface to 5V supply environment for inputs.
Pin configuration and function are the same as the TC74LCX04 but the inputs have hysteresis and with its schmitt trigger function, the TC74LCX14 can be used as a line receivers which will receive slow input signals.
All inputs are equipped with protection circuits against static discharge.

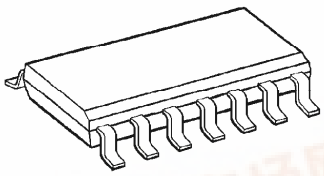
(Note) The JEDEC SOP (FN) is not available in Japan.

TC74LCX14F



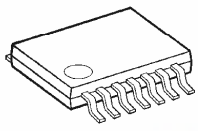
SOP14-P-300-1.27

TC74LCX14FN



SOL14-P-150-1.27

TC74LCX14FT



TSSOP14-P-0044-0.65

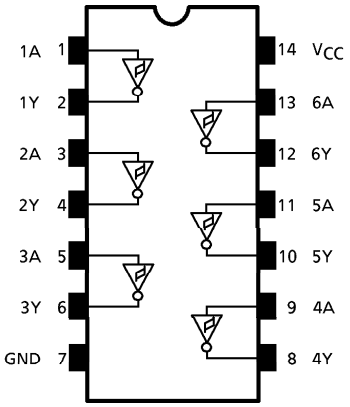
FEATURES

- Low voltage operation : $V_{CC} = 2.0 \sim 3.6V$
- High speed operation : $t_{pd} = 6.5ns$ (Max.) ($V_{CC} = 3.0 \sim 3.6V$)
- Output current : $|I_{OH}| / I_{OL} = 24mA$ (Min.) ($V_{CC} = 3.0V$)
- Latch-up performance : $\pm 500mA$
- Available in JEDEC SOP, EIAJ SOP and TSSOP
- 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.) 14 type.

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.)

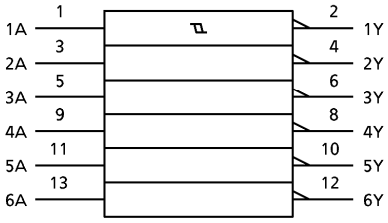
961001EBA2

PIN ASSIGNMENT



(TOP VIEW)

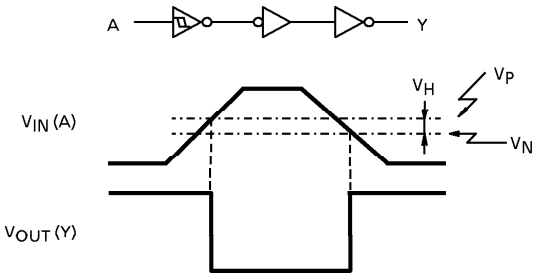
IEC LOGIC SYMBOL



TRUTH TABLE

INPUTS	OUTPUTS
A	Y
L	H
H	L

SYSTEM DIAGRAM, WAVEFORM



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)	V
		−0.5~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}	−65~150	°C

(Note 1) V_{CC} = 0V

(Note 2) High or Low State. I_{OUT} absolute maximum rating must be observed.

(Note 3) V_{OUT}<GND, V_{OUT}>V_{CC}

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

(Note 4) Data Retention Only
(Note 5) V_{CC} = 0V
(Note 6) High or Low State
(Note 7) V_{CC} = 3.0~3.6V
(Note 8) V_{CC} = 2.7~3.0V

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS (Ta = −40~85°C)

PARAMETER		SYMBOL	TEST CONDITION		V_{CC} (V)	MIN.	MAX.	UNIT
Threshold Voltage	"H" Level	V_P			3.0	1.2	2.2	V
	"L" Level	V_N			3.0	0.6	1.5	
Hysteresis Voltage		V_H			3.0	0.4	1.2	V
Output Voltage	"H" Level	V_{OH}	V_{IN} = V_{IL}	I_{OH} = −100μA	2.7~3.6	V_{CC} −0.2	—	V
				I_{OH} = −12mA	2.7	2.2	—	
				I_{OH} = −18mA	3.0	2.4	—	
				I_{OH} = −24mA	3.0	2.2	—	
	"L" Level	V_{OL}	V_{IN} = V_{IH}	I_{OL} = 100μA	2.7~3.6	—	0.2	
				I_{OL} = 12mA	2.7	—	0.4	
				I_{OL} = 16mA	3.0	—	0.4	
				I_{OL} = 24mA	3.0	—	0.55	
Input Leakage Current		I_{IN}	V_{IN} = 0~5.5V		2.7~3.6	—	±5.0	μA
Power Off Leakage Cuurent		I_{OFF}	V_{IN} / V_{OUT} = 5.5V		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} = 3.6~5.5V		2.7~3.6	—	±10.0	
Increase In I_{CC} Per Input		ΔI_{CC}	V_{IH} = V_{CC} − 0.6V		2.7~3.6	—	500	μA

AC CHARACTERISTICS (Ta = −40~85°C)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	MIN.	MAX.	UNIT
Propagation Delay Time	t_{pLH} t_{pHL}	(Fig.1, 2)	2.7	—	7.5	ns
			3.3 ± 0.3	1.5	6.5	
Output To Output Skew	t_{osLH} t_{osHL}	(Note 9)	2.7	—	—	ns
			3.3 ± 0.3	—	1.0	

(Note 9) Parameter guaranteed by design.
($t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$)

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

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

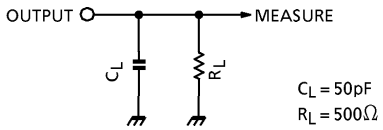
CAPACITIVE CHARACTERISTICS (Ta = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP	UNIT
Input Capacitance	C_{IN}	—	3.3	7	pF
Output Capacitance	C_{OUT}		0	8	
Power Dissipation Capacitance	C_{PD}	$f_{IN} = 10$MHz (Note 10)	3.3	25	pF

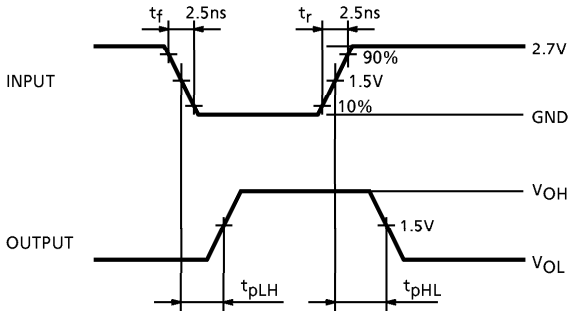
(Note 10) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation :

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

TEST CIRCUIT
Fig.1



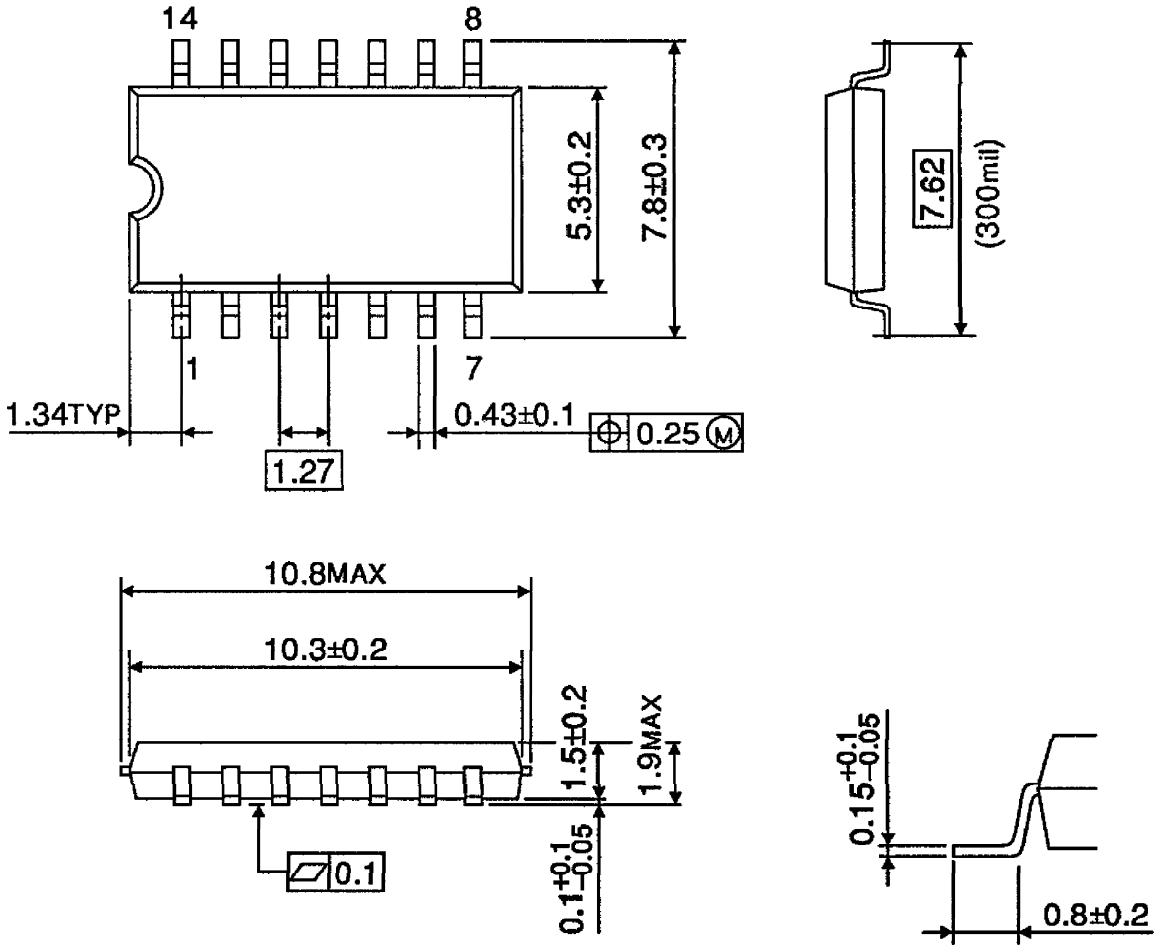
AC WAVEFORM
Fig.2 t_{pLH}, t_{pHL}



OUTLINE DRAWING

SOP14-P-300-1.27

Unit : mm



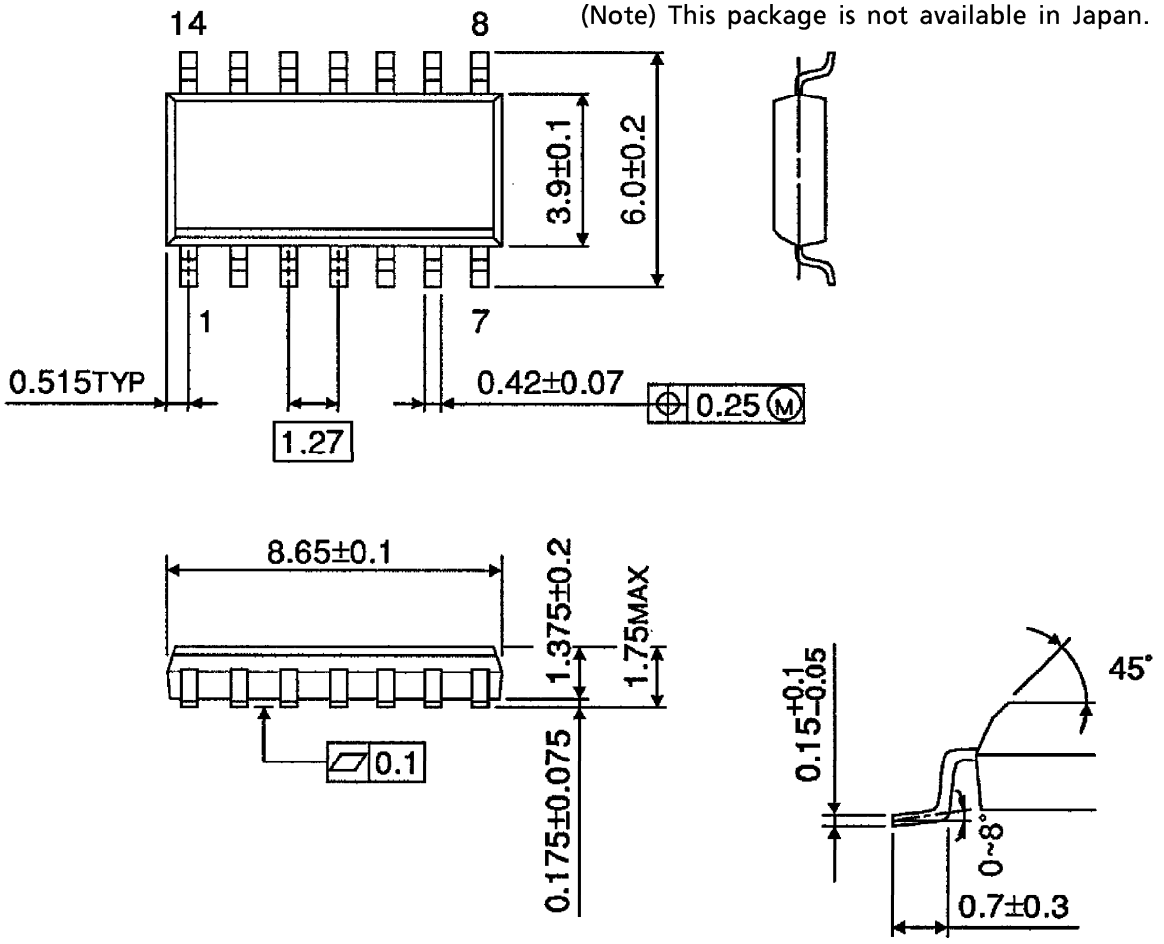
Weight : 0.18g (Typ.)

OUTLINE DRAWING

SOL14-P-150-1.27

UNIT : mm

(Note) This package is not available in Japan.

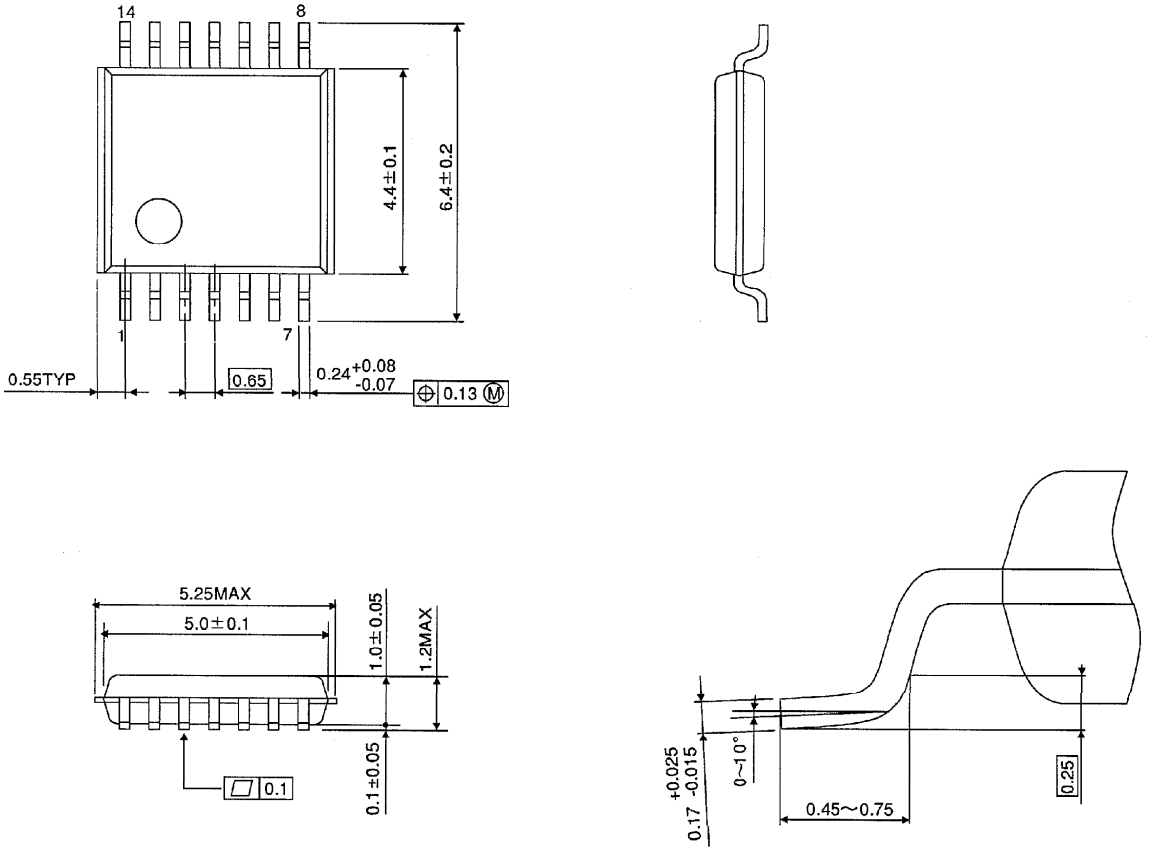


Weight : 0.12g (Typ.)

OUTLINE DRAWING

TSSOP14-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)