TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

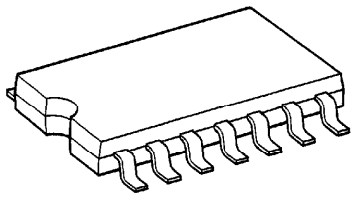
TC74LCX05F, TC74LCX05FN, TC74LCX05FT

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.

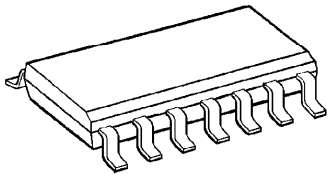
(Note) : The JEDEC SOP (FN) is not available in Japan.

TC74LCX05F



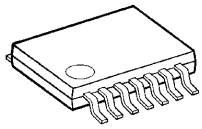
SOP14-P-300-1.27

TC74LCX05FN



SOL14-P-150-1.27

TC74LCX05FT



TSSOP14-P-0044-0.65

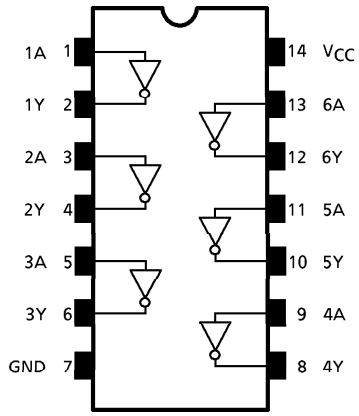
Weight
SOP14-P-300-1.27 : 0.18 g (Typ.)
SOL14-P-150-1.27 : 0.12 g (Typ.)
TSSOP14-P-0044-0.65 : 0.06 g (Typ.)

FEATURES

- Low voltage operation : V_{CC} = 2.0~3.6 V
- High speed operation : t_{pz} = 5.0 ns (max) (V_{CC} = 3.0~3.6 V)
- Output current : I_{OL} = 24 mA (min) (V_{CC} = 3.0 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.

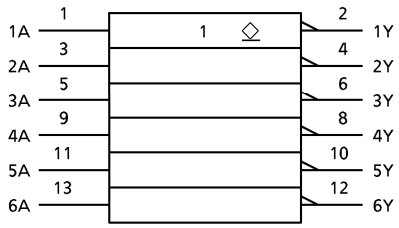
980910EBA1

PIN ASSIGNMENT



(TOP VIEW)

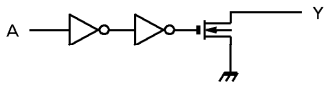
IEC LOGIC SYMBOL



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)	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) : 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} = 3.0~3.6 V
(Note 8) : V_{CC} = 2.7~3.0 V
(Note 9) : V_{IN} = 0.8~2.0 V, V_{CC} = 3.0 V

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS (Ta = −40~85°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)

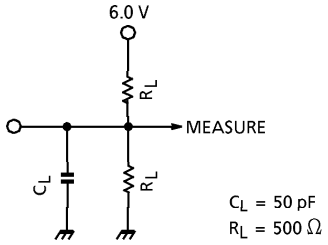
PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	UNIT
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	0.8	V
Quiet Output Minimum Dynamic V_{OL}	$\|V_{OLV}\|$	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	0.8	V

CAPACITIVE CHARACTERISTICS (Ta = 25°C)

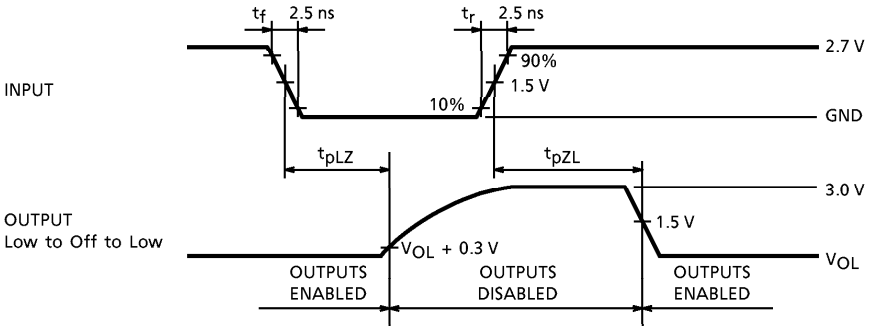
PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	UNIT
Input Capacitance	C_{IN}	—	3.3	7	pF
Output Capacitance	C_{OUT}		3.3	8	pF
Power Dissipation Capacitance	C_{PD}	f_{IN} = 10 MHz (Note 11)	3.3	5	pF

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

TEST CIRCUIT
Fig.1

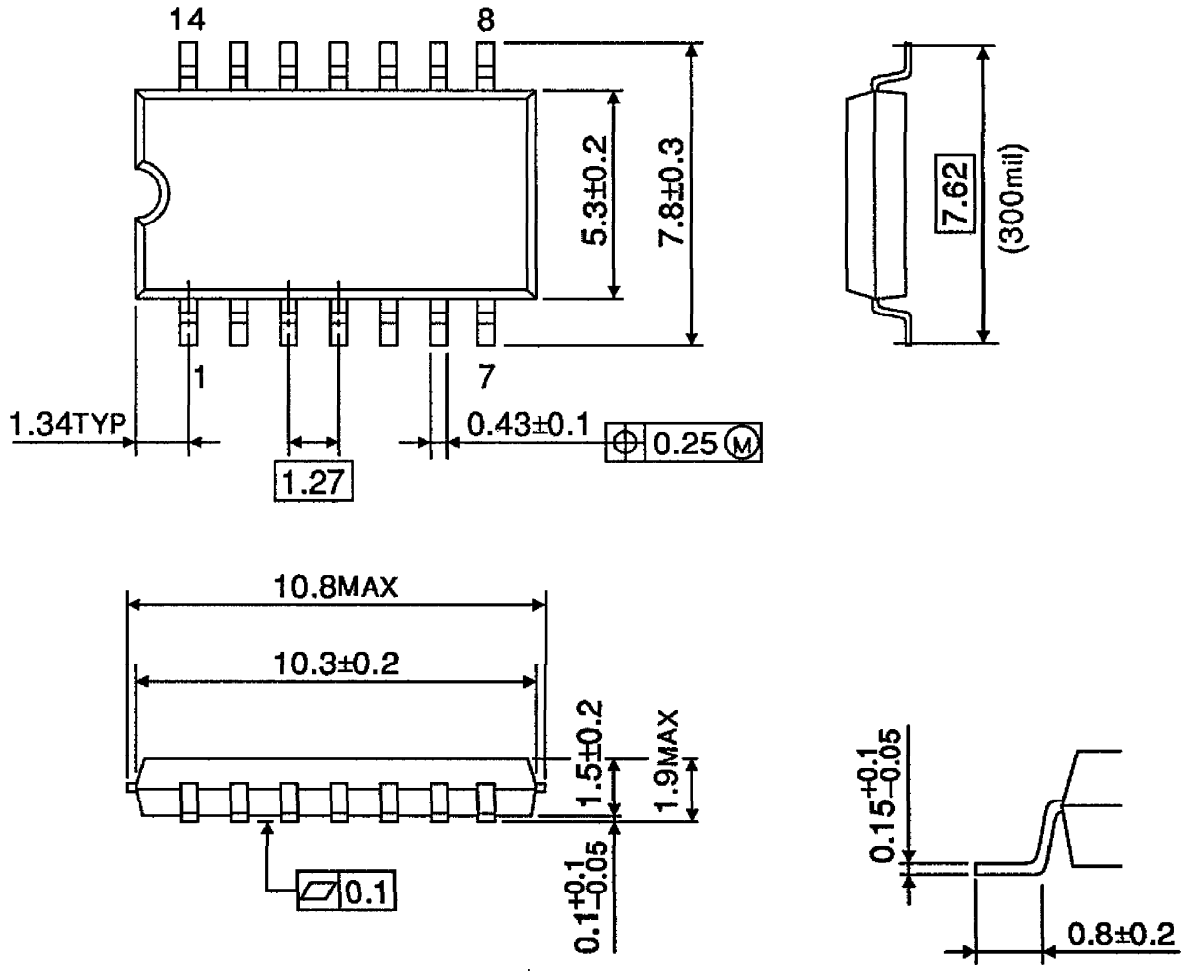


AC WAVEFORM
Fig.2 t_{pLZ}, t_{pZL}



PACKAGE DIMENSIONS

SOP14-P-300-1.27 Unit : mm

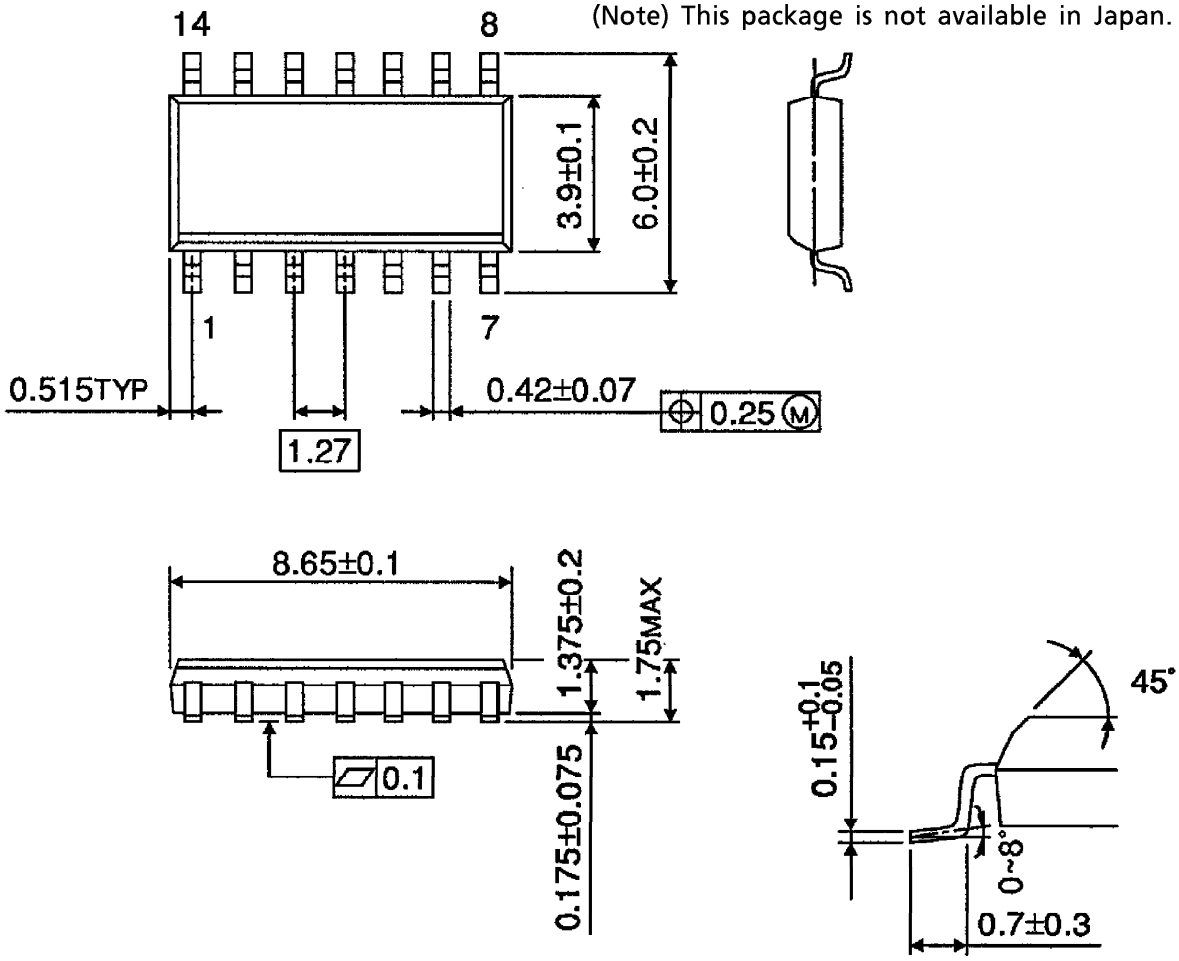


Weight : 0.18 g (Typ.)

PACKAGE DIMENSIONS

SOL14-P-150-1.27 Unit : mm

(Note) This package is not available in Japan.

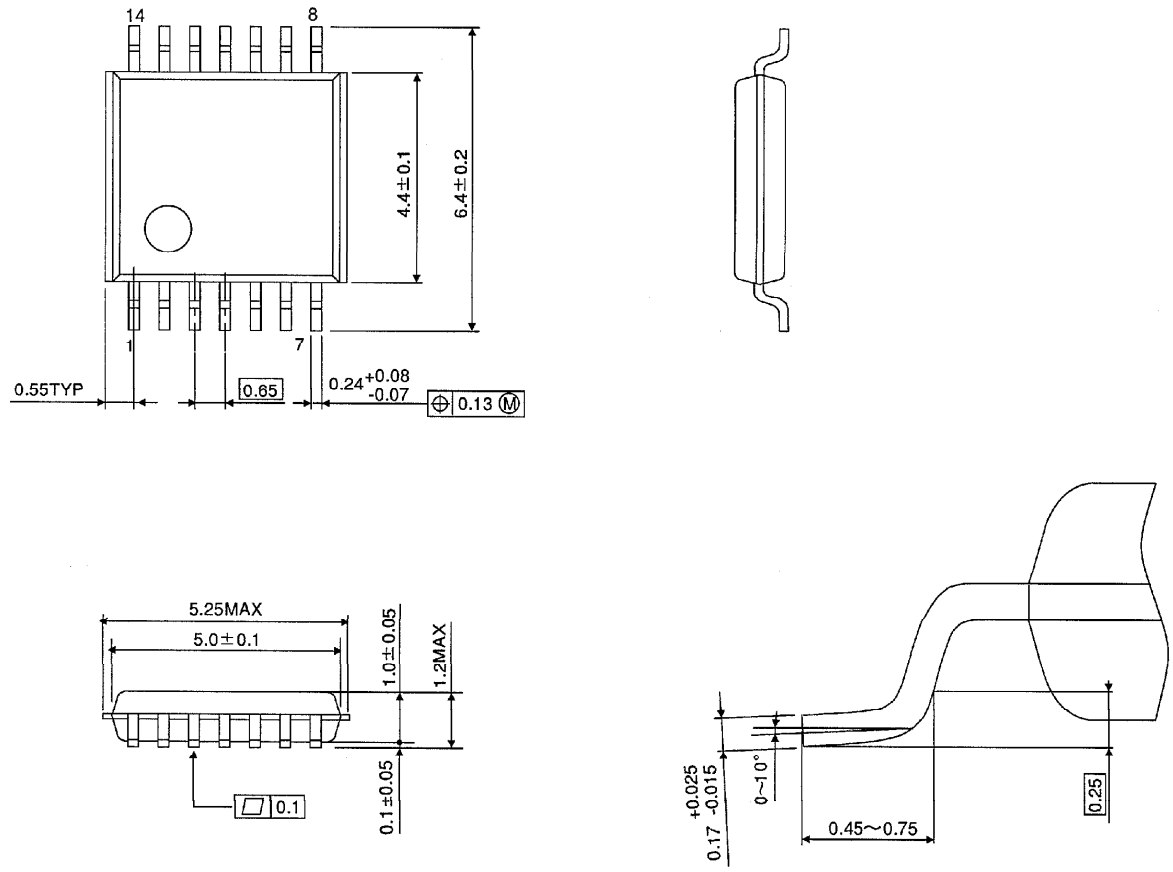


Weight : 0.12 g (Typ.)

PACKAGE DIMENSIONS

TSSOP14-P-0044-0.65

Unit : mm



Weight : 0.06 g (Typ.)