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TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74LCX86F, TC74LCX86FN, TC74LCX86FT**LOW VOLTAGE QUAD EXCLUSIVE OR GATE
WITH 5V TOLERANT INPUTS AND OUTPUTS**

The TC74LCX86 is a high performance CMOS EXCLUSIVE OR GATE. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

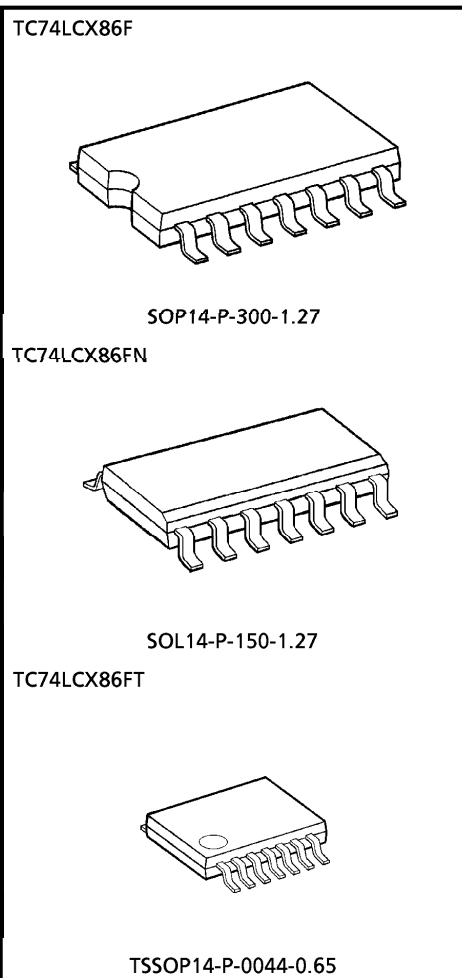
The device is designed for low-voltage (3.3V) V_{CC} applications, but it could be used to interface to 5V supply environment for inputs.

All inputs are equipped with protection circuits against static discharge.

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.) 86 type.

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

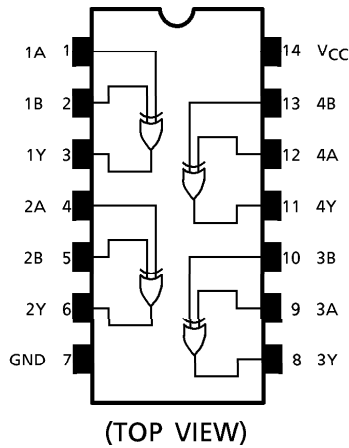


Weight
 SOP14-P-300-1.27 : 0.18g (Typ.)
 SOL14-P-150-1.27 : 0.12g (Typ.)
 TSSOP14-P-0044-0.65 : 0.06g (Typ.)

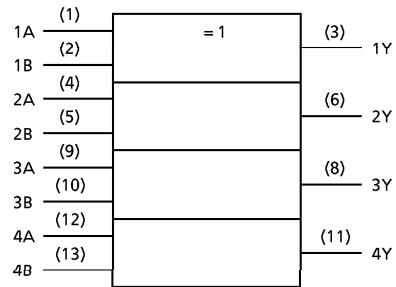
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PIN ASSIGNMENT



IEC LOGIC SYMBOL



TRUTH TABLE

A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

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) $V_{OUT} < GND, V_{OUT} > V_{CC}$

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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) 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
- (Note 9) V_{IN} = 0.8~2.0V, V_{CC} = 3.0V

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	"H" Level	V _{OH}	V _{IN} = V _{IH} or 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 _{IL} or V _{IL}	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 Current	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			
Quiescent 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}	(Fig.1, 2)	2.7	—	7.0	ns
	t _{pHL}		3.3 ± 0.3	1.5	6.5	
Output To Output Skew	t _{osLH}	(Note 10)	2.7	—	—	ns
	t _{osHL}		3.3 ± 0.3	—	1.0	

(Note 10) 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 = 2.5ns, C_L = 50pF, R_L = 500Ω)

PARAMETER	SYMBOL	TEST CONDITION	V _{CC} (V)	TYP.	UNIT
Quiet Output Maximum Dynamic V _{OL}	V _{OLP}	V _{IH} = 3.3V, V _{IL} = 0V	3.3	0.8	V
Quiet Output Minimum Dynamic V _{OL}	V _{OLV}	V _{IH} = 3.3V, V _{IL} = 0V	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	pF
Power Dissipation Capacitance	C _{PD}	f _{IN} = 10MHz (Note 11)	3.3	25	pF

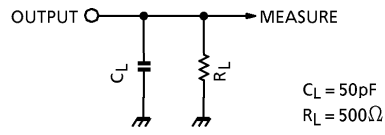
(Note 11) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 4 \text{ (per gate)}$$

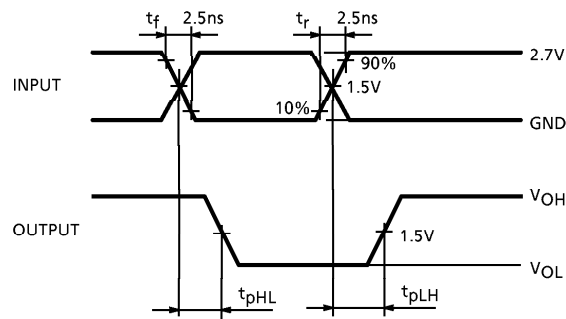
TEST CIRCUIT

Fig.1



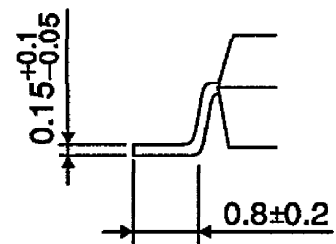
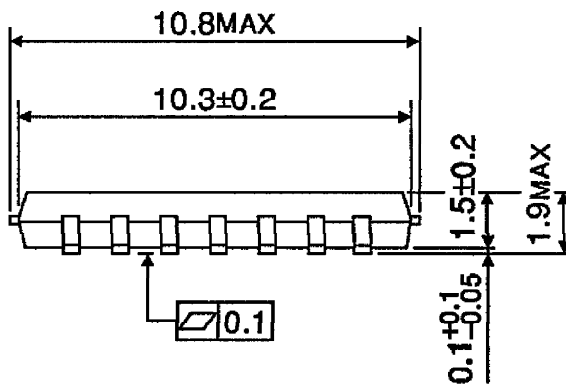
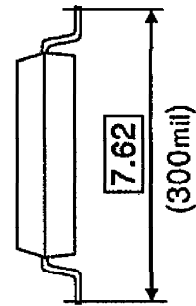
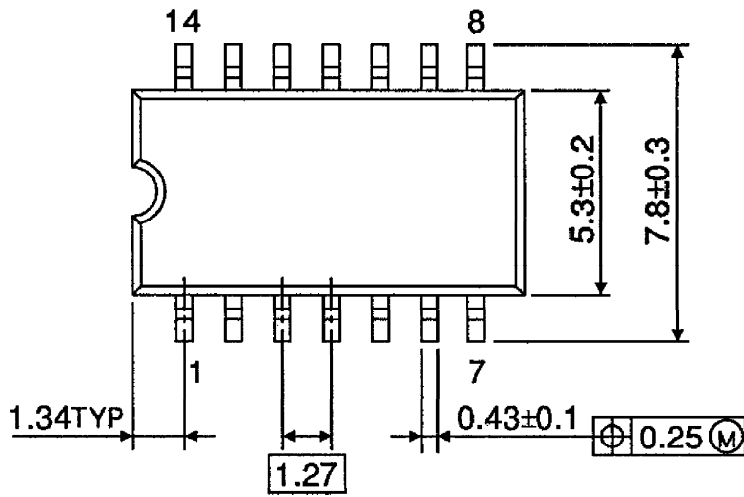
AC WAVEFORM

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



OUTLINE DRAWING
SOP14-P-300-1.27

Unit : mm

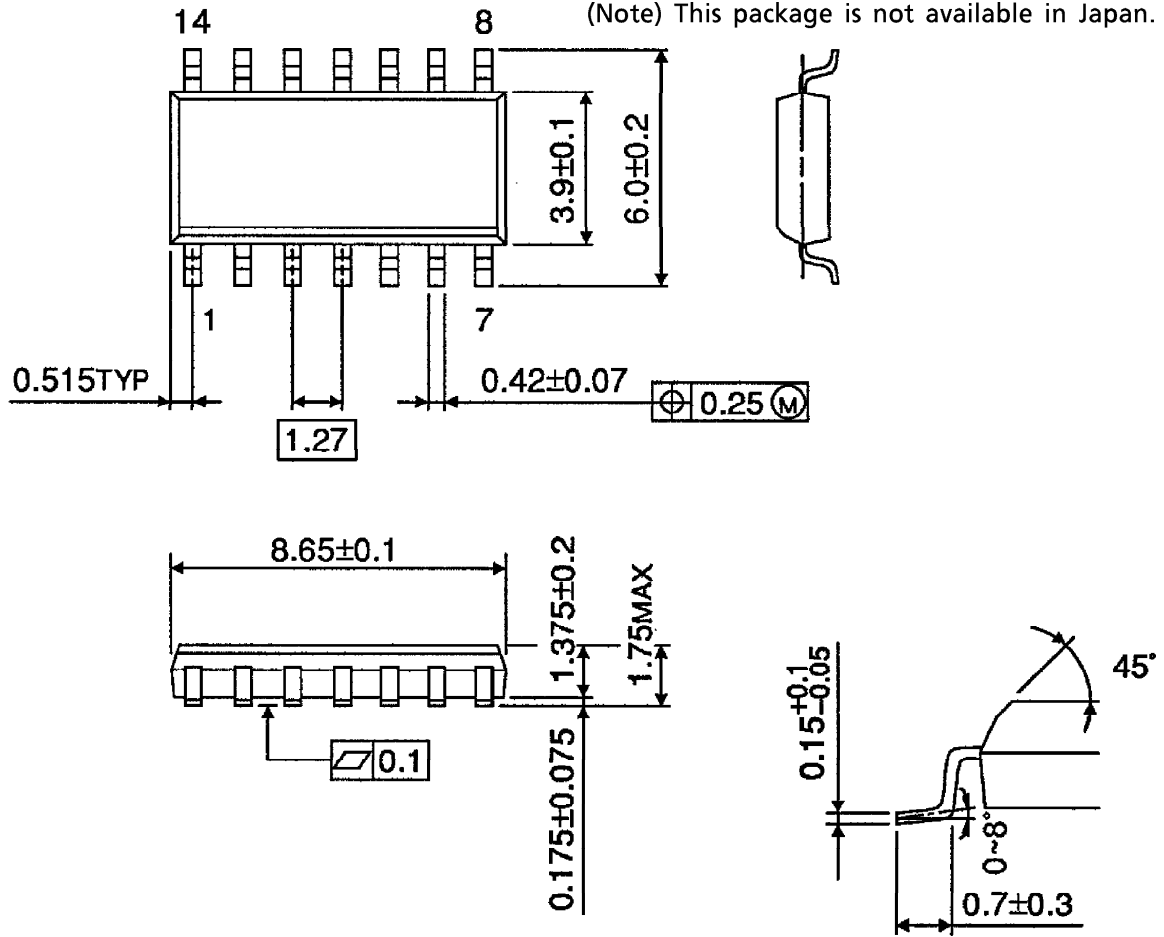


Weight : 0.18g (Typ.)

OUTLINE DRAWING
SOL14-P-150-1.27

Unit : mm

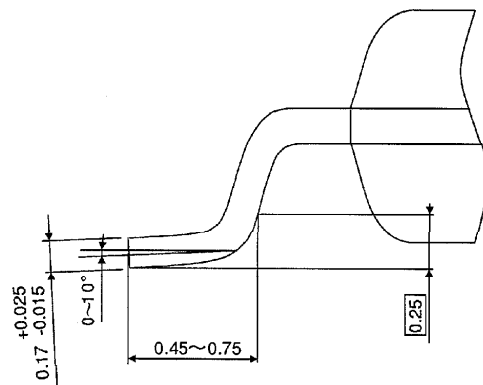
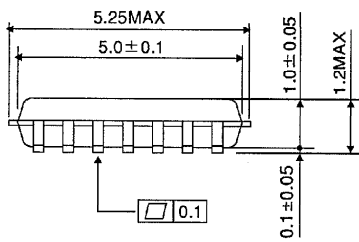
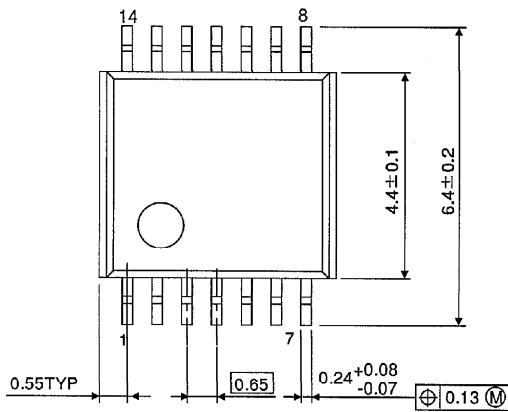
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

OUTLINE DRAWING
TSSOP14-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)