

TC74LCX74F, TC74LCX74FN, TC74LCX74FT**LOW VOLTAGE DUAL D-TYPE FLIP FLOP
WITH 5V TOLERANT INPUTS AND OUTPUTS**

The TC74LCX74 is a high performance CMOS D-TYPE FLIP FLOP. 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.

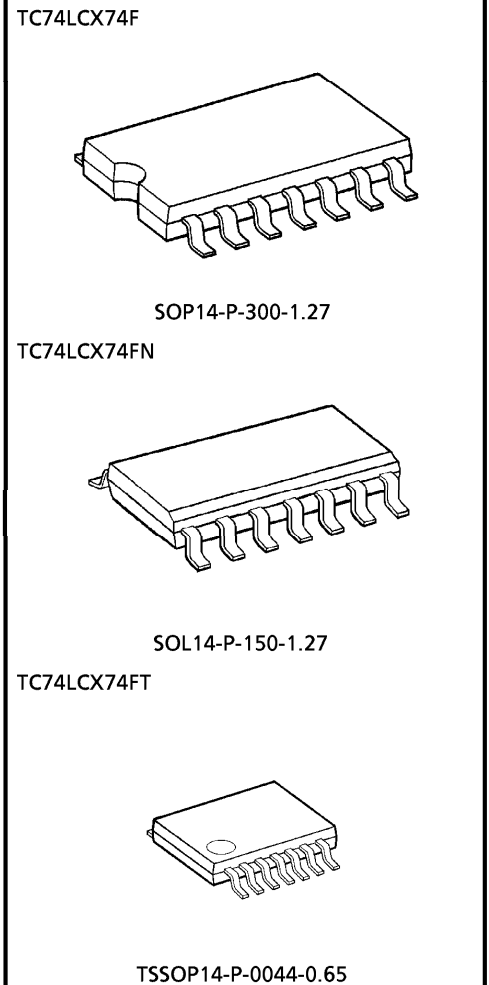
The signal level applied to the D INPUT is transferred to Q OUTPUT during the positive going transition of the CK pulse.

$\overline{CLR}$ and $\overline{PR}$ are independent of the CK and are accomplished by setting the appropriate input low. All inputs are equipped with protection circuits against static discharge.

FEATURES

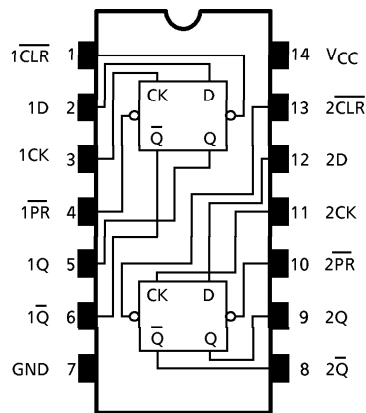
- Low voltage operation : $V_{CC} = 2.0 \sim 3.6V$
- High speed operation : $t_{pd} = 7.0ns$ (Max.)
($V_{CC} = 3.0 \sim 3.6V$)
- Output current : $|I_{OH}| / I_{OL} = 24mA$ (Min.)
($V_{CC} = 3.0V$)
- Latch-up performance : $\pm 500mA$
- Available in JEDEC SOP, JEITA SOP and TSSOP
- Power down protection is provided on all inputs and outputs.
- Pin and function compatible with the 74 series
(74AC/VHC/HC/F/ALS/LS etc.) 74 type.

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

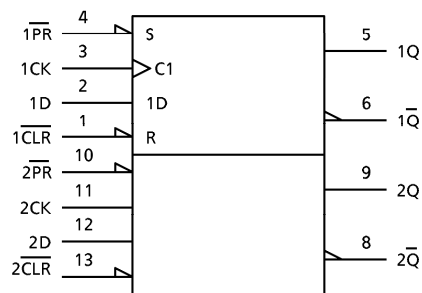
**Weight**

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

PIN ASSIGNMENT



IEC LOGIC SYMBOL



TRUTH TABLE

INPUTS				OUTPUTS		FUNCTION
CLR	PR	D	CK	Q	Q̄	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	PRESET
L	L	X	X	H	H	—
H	H	L		L	H	—
H	H	H		H	L	—
H	H	X		Q _n	Q̄ _n	NO CHANGE

X : Don't care

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
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) $V_{CC} = 3.0\sim 3.6V$ (Note 8) $V_{CC} = 2.7\sim 3.0V$ (Note 9) $V_{IN} = 0.8\sim 2.0V$, $V_{CC} = 3.0V$

ELECTRICAL CHARACTERISTICS

DC characteristics ($T_a = -40\sim 85^\circ C$)

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 _{IH} 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 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	
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
Maximum Clock Frequency	f _{MAX}	(Fig.1, 2)	2.7	—	—	MHz
			3.3 ± 0.3	150	—	
Propagation Delay Time (CK-Q, Q)	t _{pLH} t _{pHL}	(Fig.1, 2)	2.7	—	8.0	ns
			3.3 ± 0.3	1.5	7.0	
Propagation Delay Time (CLR, PR-Q, Q)	t _{pLH} t _{pHL}	(Fig.1, 4)	2.7	—	8.0	ns
			3.3 ± 0.3	1.5	7.0	
Minimum Pulse Width (CK)	t _W (H) t _W (L)	(Fig.1, 2, 3)	2.7	3.3	—	ns
			3.3 ± 0.3	3.3	—	
Minimum Pulse Width (CLR, PR)	t _W (L)	(Fig.1, 2, 3)	2.7	3.6	—	ns
			3.3 ± 0.3	3.3	—	
Minimum Set-up Time	t _s	(Fig.1, 2)	2.7	2.5	—	ns
			3.3 ± 0.3	2.5	—	
Minimum Hold Time	t _h	(Fig.1, 2)	2.7	1.5	—	ns
			3.3 ± 0.3	1.5	—	
Minimum Removal Time	t _{rem}	(Fig.1, 3)	2.7	3.0	—	ns
			3.3 ± 0.3	2.5	—	
Output To Output Skew	t _{osLH} t _{osHL}	(Note 10)	2.7	—	—	ns
			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

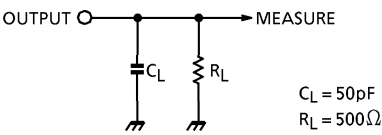
(Note 11) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2 \text{ (per F/F)}$$

TEST CIRCUIT

Fig.1



AC WAVEFORM

Fig.2 t_{pLH} , t_{pHL} , t_w , t_s , t_h

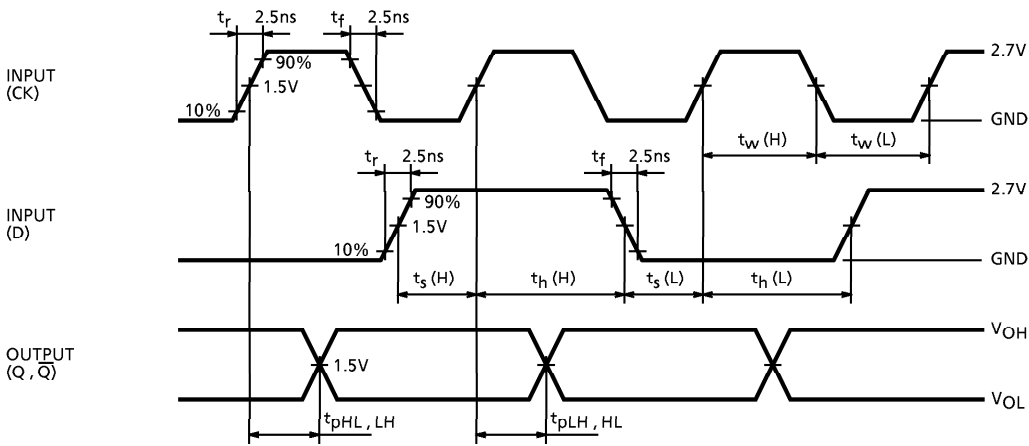


Fig.3 t_{rem}

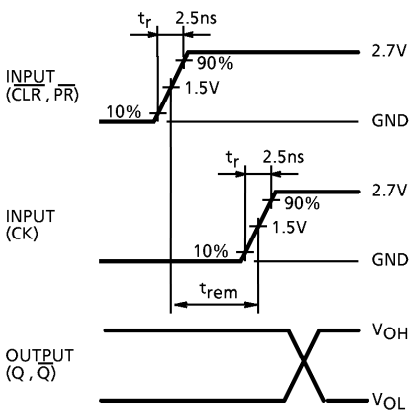
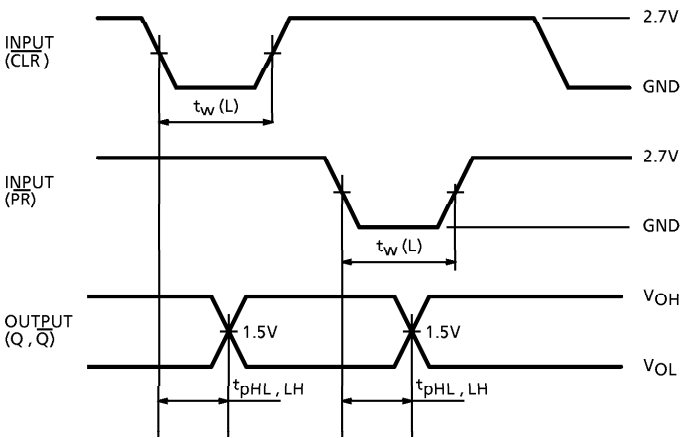
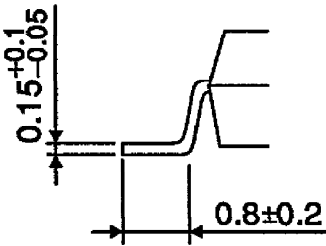
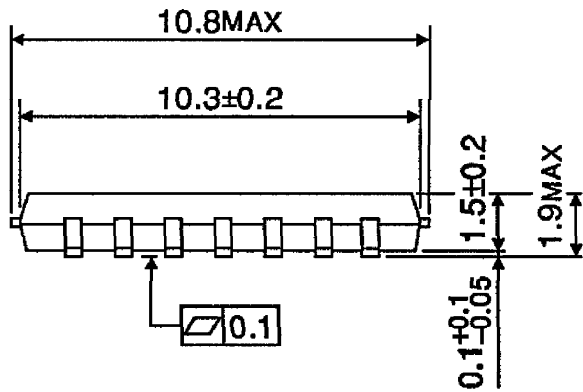
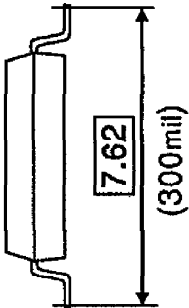
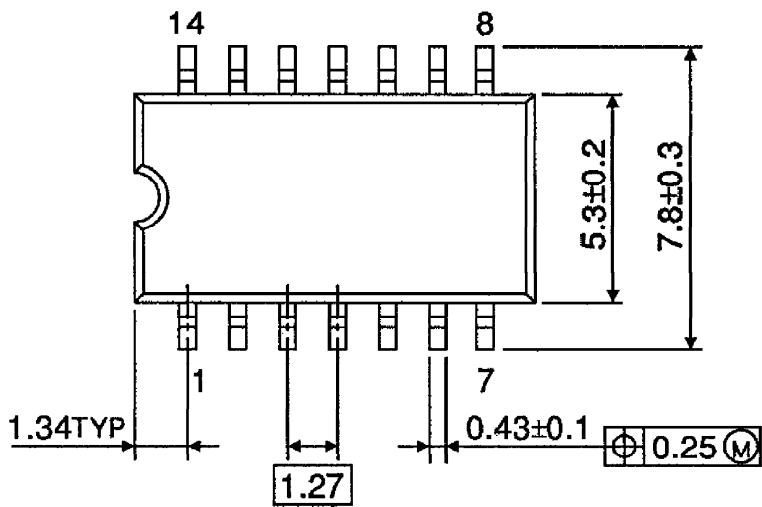


Fig.4 t_{pLH} , t_{pHL}



PACKAGE DIMENSIONS
SOP14-P-300-1.27

Unit : mm

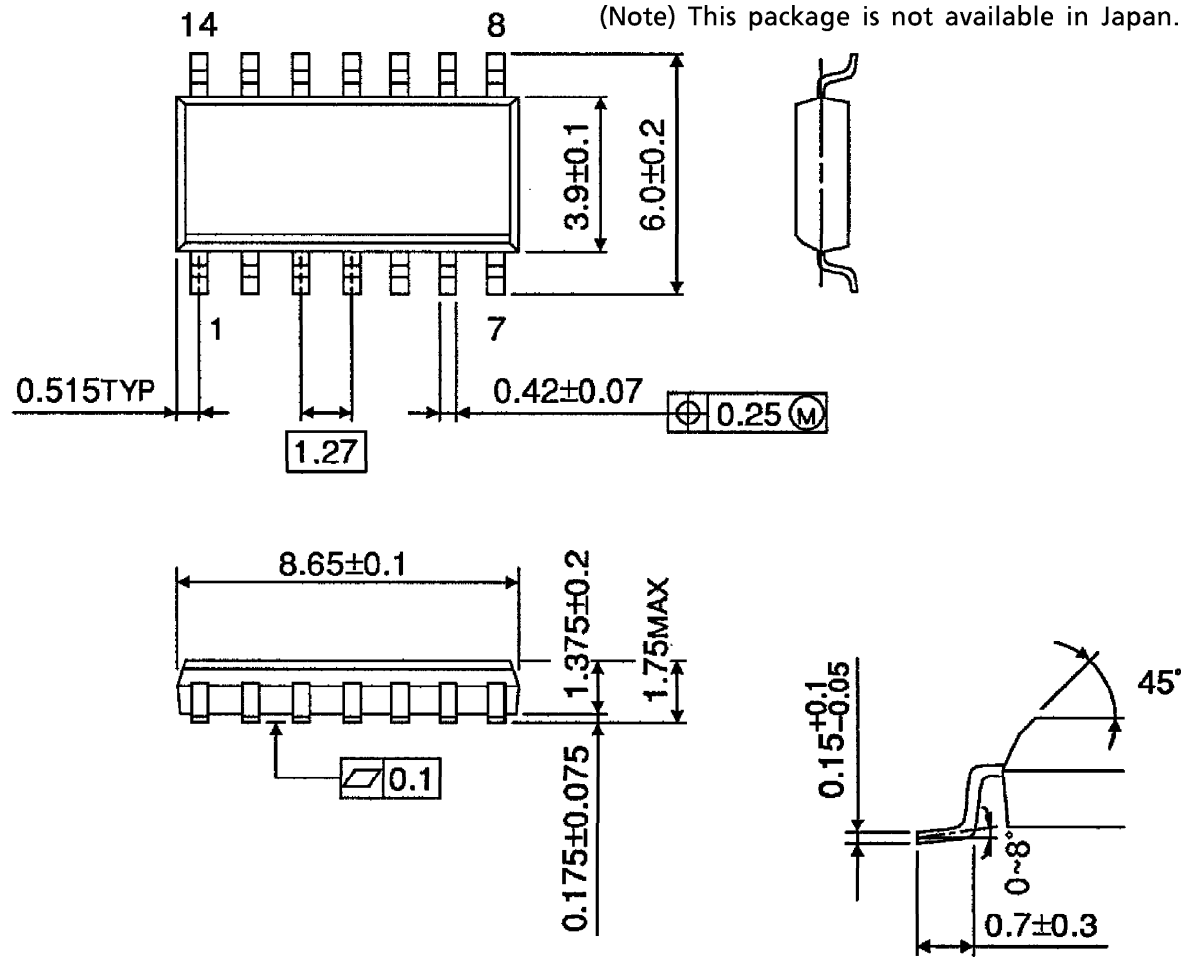


Weight : 0.18g (Typ.)

PACKAGE DIMENSIONS
SOL14-P-150-1.27

Unit : mm

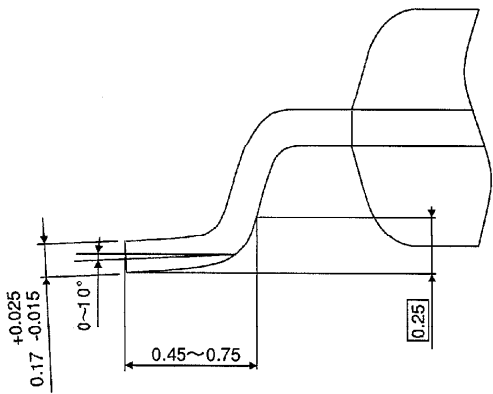
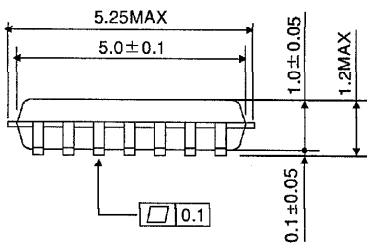
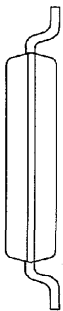
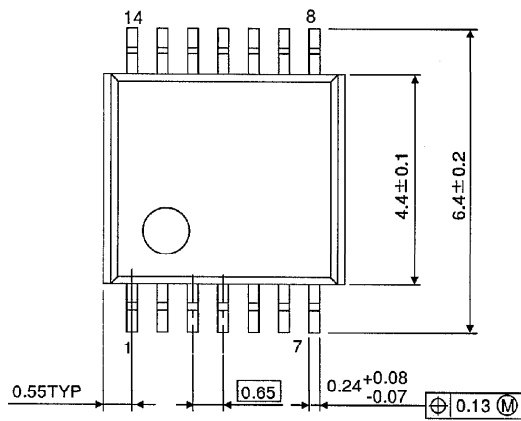
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

PACKAGE DIMENSIONS
TSSOP14-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)

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000707EBA

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