

# TC74LCX125F, TC74LCX125FN, TC74LCX125FT

## Low-Voltage Quad Bus Buffer with 5-V Tolerant Inputs and Outputs

The TC74LCX125F/FN/FT is a high-performance CMOS quad bus buffers. Designed for use in 3.3-V systems, it achieves high-speed operation while maintaining the CMOS low power dissipation.

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

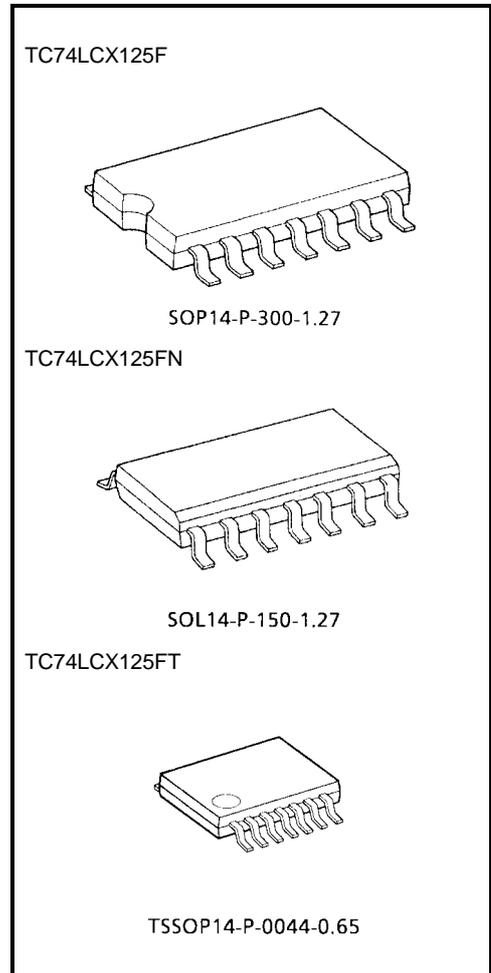
This device requires the 3-state control input  $\overline{OE}$  to be set high to place the output into the high impedance state.

All inputs are equipped with protection circuits against static discharge.

### Features

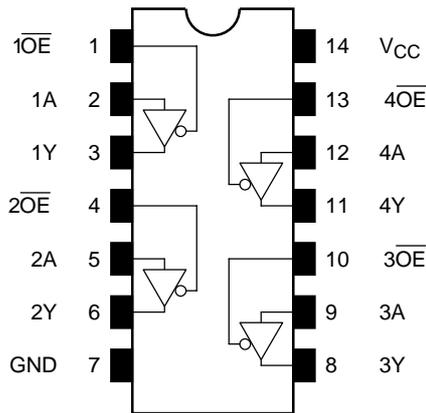
- Low-voltage operation:  $V_{CC} = 2.0$  to  $3.6$  V
- High-speed operation:  $t_{pd} = 6.0$  ns (max) ( $V_{CC} = 3.0$  to  $3.6$  V)
- Output current:  $|I_{OH}|/I_{OL} = 24$  mA (min) ( $V_{CC} = 3.0$  V)
- Latch-up performance:  $\pm 500$  mA
- Available in JEDEC SOP, JEITA SOP and TSSOP
- Power-down protection provided on all inputs and outputs
- Pin and function compatible with the 74 series (74AC/VHC/HC/F/ALS/LS etc.) 125 type

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

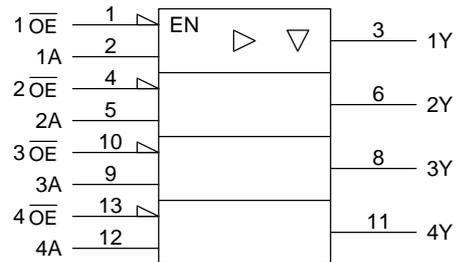


Weight  
 SOP14-P-300-1.27: 0.18 g (typ.)  
 SOL14-P-150-1.27: 0.12 g (typ.)  
 TSSOP14-P-0044-0.65: 0.06 g (typ.)

## Pin Assignment (top view)



## IEC Logic Symbol



## Truth Table

Inputs		Outputs
$\overline{OE}$	A	Y
H	X	Z
L	L	L
L	H	H

X: Don't care

Z: High impedance

## Maximum Ratings

Characteristics	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	-0.5 to 7.0	V
DC input voltage	$V_{IN}$	-0.5 to 7.0	V
DC output voltage	$V_{OUT}$	-0.5 to 7.0 (Note 1)	V
		-0.5 to $V_{CC} + 0.5$ (Note 2)	
Input diode current	$I_{IK}$	-50	mA
Output diode current	$I_{OK}$	$\pm 50$ (Note 3)	mA
DC output current	$I_{OUT}$	$\pm 50$	mA
Power dissipation	$P_D$	180	mW
DC $V_{CC}$ /ground current	$I_{CC}/I_{GND}$	$\pm 100$	mA
Storage temperature	$T_{stg}$	-65 to 150	$^{\circ}C$

Note 1: Output in OFF state

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

Characteristics	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	2.0 to 3.6	V
		1.5 to 3.6 (Note 4)	
Input voltage	$V_{IN}$	0 to 5.5	V
Output voltage	$V_{OUT}$	0 to 5.5 (Note 5)	V
		0 to $V_{CC}$ (Note 6)	
Output current	$I_{OH}/I_{OL}$	$\pm 24$ (Note 7)	mA
		$\pm 12$ (Note 8)	
Operating temperature	$T_{opr}$	-40 to 85	°C
Input rise and fall time	dt/dv	0 to 10 (Note 9)	ns/V

Note 4: Data retention only

Note 5: Output in OFF state

Note 6: High or low state

Note 7:  $V_{CC} = 3.0$  to  $3.6$  V

Note 8:  $V_{CC} = 2.7$  to  $3.0$  V

Note 9:  $V_{IN} = 0.8$  to  $2.0$  V,  $V_{CC} = 3.0$  V

## Electrical Characteristics

### DC Characteristics ( $T_a = -40$ to $85^\circ\text{C}$ )

Characteristics		Symbol	Test Condition		$V_{CC}$ (V)	Min	Max	Unit
Input voltage	H-level	$V_{IH}$	—		2.7 to 3.6	2.0	—	V
	L-level	$V_{IL}$	—		2.7 to 3.6	—	0.8	
Output voltage	H-level	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -100 \mu\text{A}$	2.7 to 3.6	$V_{CC} - 0.2$	—	V
				$I_{OH} = -12 \text{ mA}$	2.7	2.2	—	
				$I_{OH} = -18 \text{ mA}$	3.0	2.4	—	
				$I_{OH} = -24 \text{ mA}$	3.0	2.2	—	
	L-level	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 100 \mu\text{A}$	2.7 to 3.6	—	0.2	
				$I_{OL} = 12 \text{ mA}$	2.7	—	0.4	
				$I_{OL} = 16 \text{ mA}$	3.0	—	0.4	
				$I_{OL} = 24 \text{ mA}$	3.0	—	0.55	
Input leakage current		$I_{IN}$	$V_{IN} = 0$ to $5.5$ V		2.7 to 3.6	—	$\pm 5.0$	$\mu\text{A}$
3-state output OFF state current		$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = 0$ to $5.5$ V		2.7 to 3.6	—	$\pm 5.0$	$\mu\text{A}$
Power-off leakage current		$I_{OFF}$	$V_{IN}/V_{OUT} = 5.5$ V		0	—	10.0	$\mu\text{A}$
Quiescent supply current		$I_{CC}$	$V_{IN} = V_{CC}$ or GND		2.7 to 3.6	—	10.0	$\mu\text{A}$
			$V_{IN}/V_{OUT} = 3.6$ to $5.5$ V		2.7 to 3.6	—	$\pm 10.0$	
Increase in $I_{CC}$ per input		$\Delta I_{CC}$	$V_{IH} = V_{CC} - 0.6$ V		2.7 to 3.6	—	500	

**AC Characteristics (Ta = -40 to 85°C)**

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Max	Unit
Propagation delay time	t <sub>pLH</sub>	Figure 1, Figure 2	2.7	—	6.5	ns
	t <sub>pHL</sub>		3.3 ± 0.3	1.5	6.0	
Output enable time	t <sub>pZL</sub>	Figure 1, Figure 3	2.7	—	8.0	ns
	t <sub>pZH</sub>		3.3 ± 0.3	1.5	7.0	
Output disable time	t <sub>pLZ</sub>	Figure 1, Figure 3	2.7	—	7.0	ns
	t <sub>pHZ</sub>		3.3 ± 0.3	1.5	6.0	
Output to output skew	t <sub>osLH</sub>	(Note 10)	2.7	—	—	ns
	t <sub>osHL</sub>		3.3 ± 0.3	—	1.0	

Note 10: Parameter guaranteed by design.  
 (t<sub>osLH</sub> = |t<sub>pLHm</sub> - t<sub>pLHn</sub>|, t<sub>osHL</sub> = |t<sub>pHLm</sub> - t<sub>pHLn</sub>|)

**Dynamic Switching Characteristics  
 (Ta = 25°C, input: t<sub>r</sub> = t<sub>f</sub> = 2.5 ns, C<sub>L</sub> = 50 pF, R<sub>L</sub> = 500 Ω)**

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Typ.	Unit
Quiet output maximum dynamic V <sub>OL</sub>	V <sub>OLP</sub>	V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V	3.3	0.8	V
Quiet output minimum dynamic V <sub>OL</sub>	V <sub>OLV</sub>	V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V	3.3	0.8	V

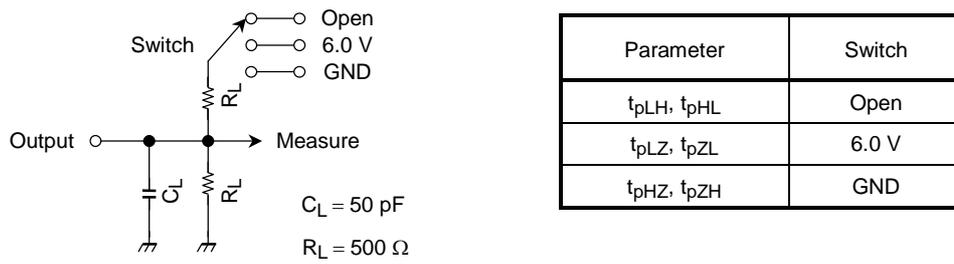
**Capacitive Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Typ.	Unit
Input capacitance	C <sub>IN</sub>	—	3.3	7	pF
Output capacitance	C <sub>OUT</sub>	—	3.3	8	pF
Power dissipation capacitance	C <sub>PD</sub>	f <sub>IN</sub> = 10 MHz (Note 11)	3.3	25	pF

Note 11: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

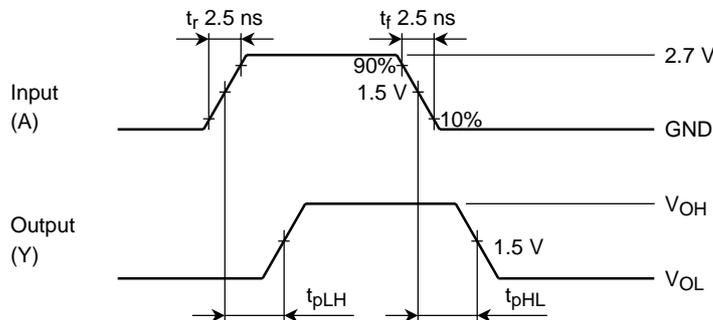
Average operating current can be obtained by the equation:  
 $I_{CC (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4$  (per gate)

**AC Test Circuit**

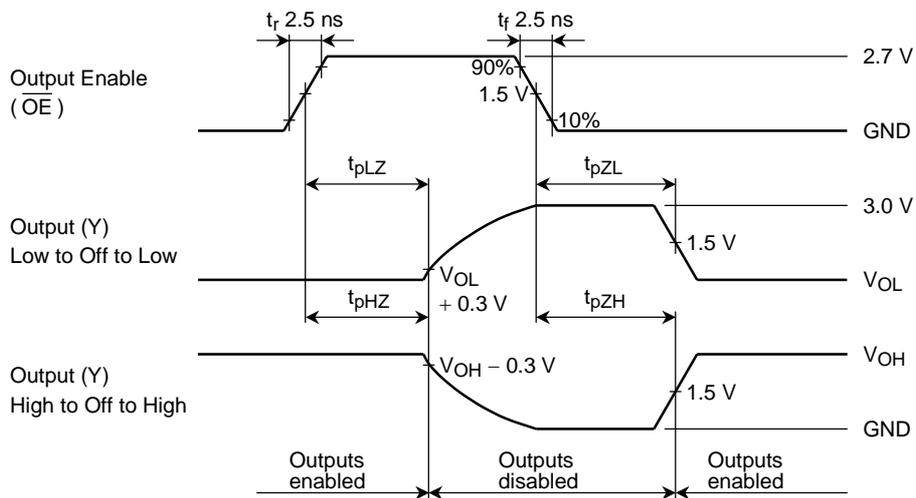


**Figure 1**

**AC Waveform**



**Figure 2  $t_{pLH}$ ,  $t_{pHL}$**

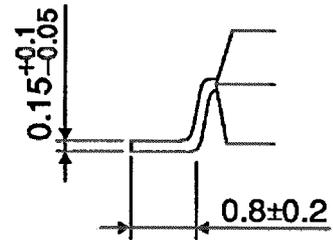
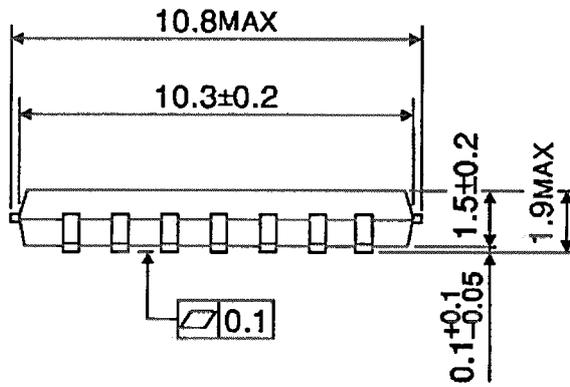
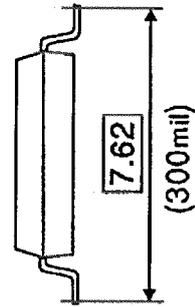
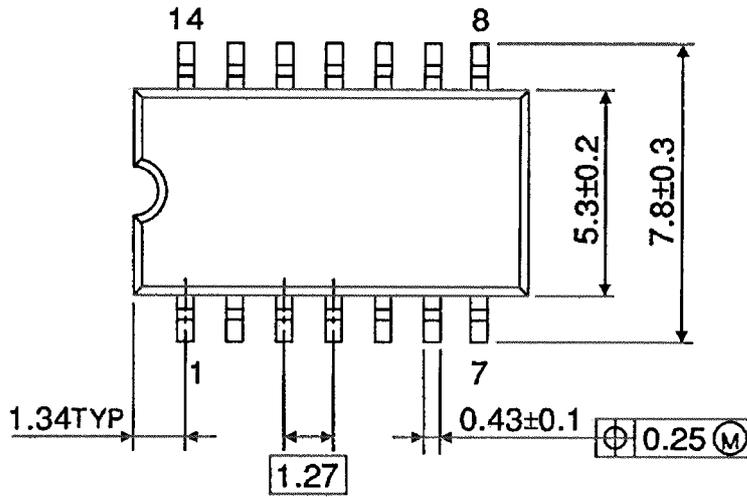


**Figure 3  $t_{pLZ}$ ,  $t_{pHZ}$ ,  $t_{pZL}$ ,  $t_{pZH}$**

## Package Dimensions

SOP14-P-300-1.27

Unit : mm



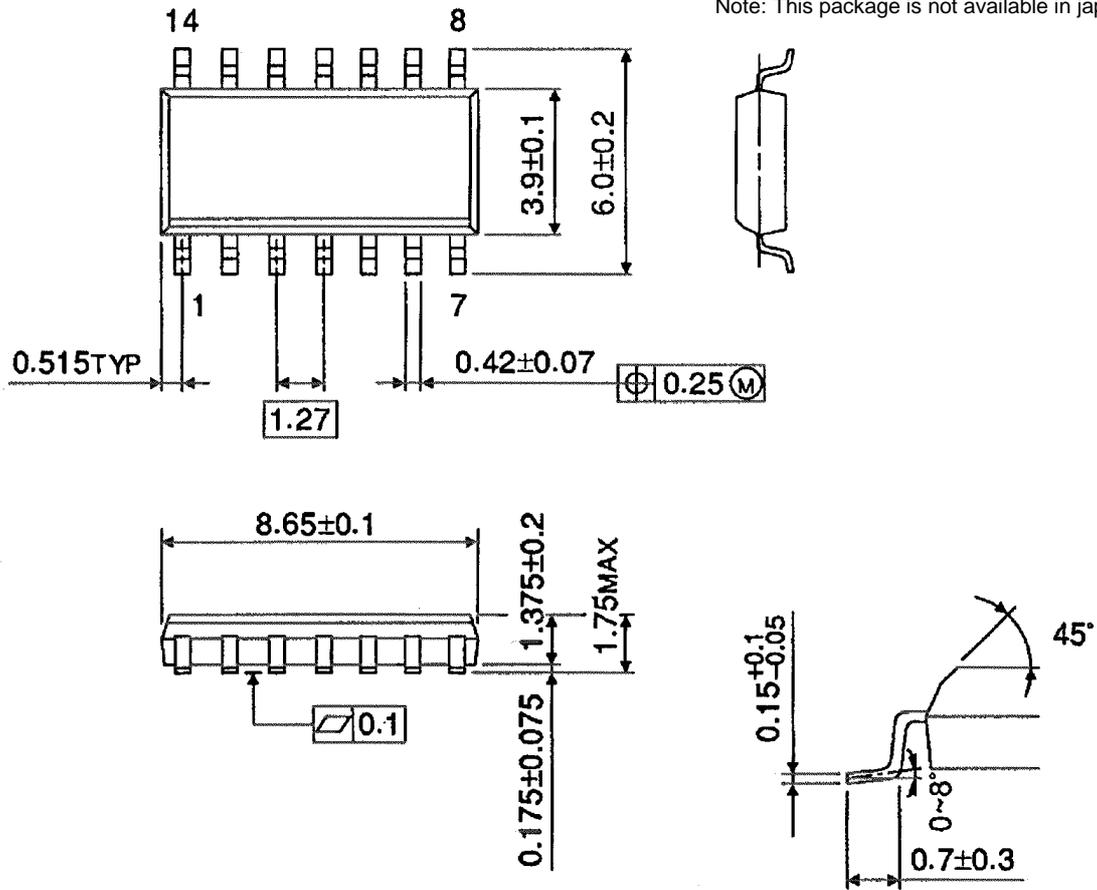
Weight: 0.18 g (typ.)

**Package Dimensions**

SOL14-P-150-1.27

Unit : mm

Note: This package is not available in japan.

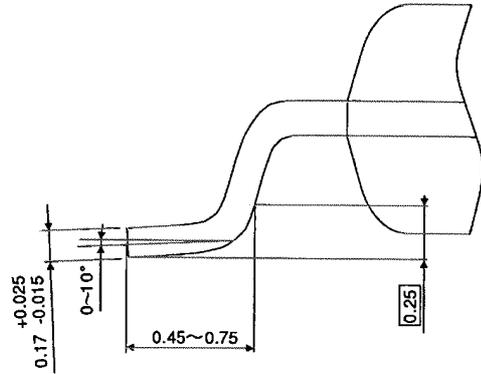
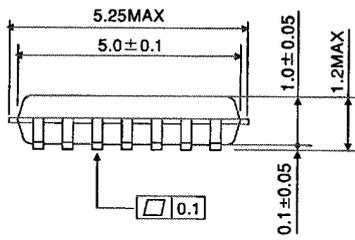
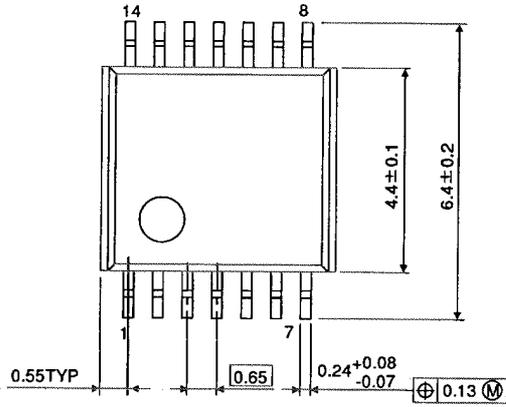


Weight: 0.12 g (typ.)

**Package Dimensions**

TSSOP14-P-0044-0.65

Unit : mm



Weight: 0.06 g (typ.)

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