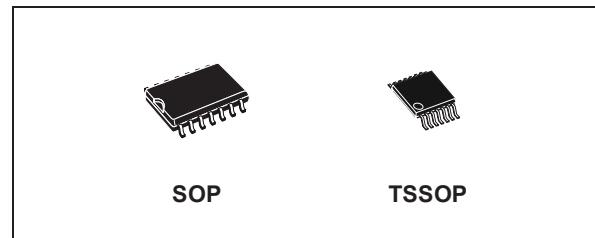


## LOW VOLTAGE CMOS QUAD BUS BUFFER (3-STATE) WITH 5V TOLERANT INPUTS AND OUTPUTS

- 5V TOLERANT INPUTS AND OUTPUTS
- HIGH SPEED:  
 $t_{PD} = 5.2 \text{ ns (MAX.)}$  at  $V_{CC} = 3\text{V}$
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OHI}| = I_{OL} = 24\text{mA (MIN)}$  at  $V_{CC} = 3\text{V}$
- PCI BUS LEVELS GUARANTEED AT 24 mA
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \equiv t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC(OPR)} = 2.0\text{V to } 3.6\text{V}$  (1.5V Data Retention)
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 125
- LATCH-UP PERFORMANCE EXCEEDS 500mA (JESD 17)
- ESD PERFORMANCE:  
HBM > 2000V (MIL STD 883 method 3015); MM > 200V

### DESCRIPTION

The 74LCX125 is a low voltage CMOS QUAD BUS BUFFER fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology. It is ideal for low power and high



**Table 1: Order Codes**

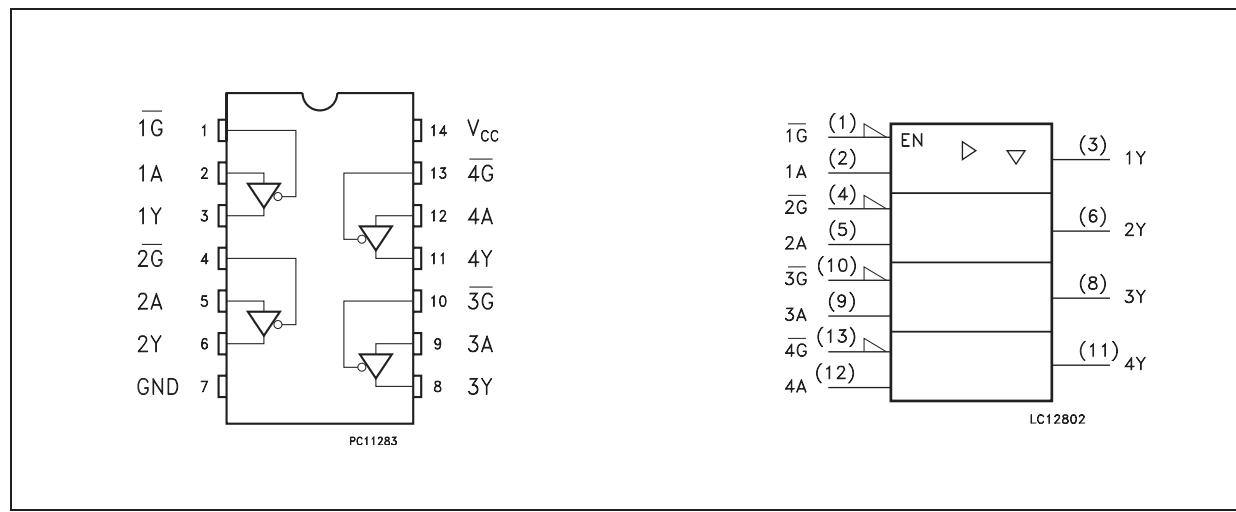
PACKAGE	T & R
SOP	74LCX125MTR
TSSOP	74LCX125TTR

speed 3.3V applications; it can be interfaced to 5V signal environment for both inputs and outputs. The device requires the 3-STATE control input G to be set high to place the output in to the high impedance state.

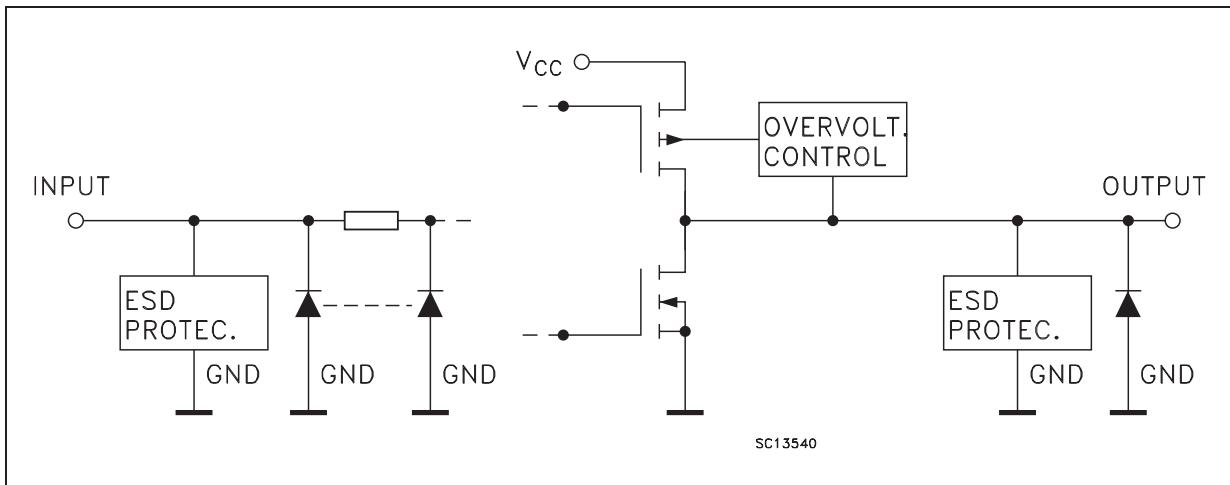
It has same speed performance at 3.3V than 5V AC/ACT family, combined with a lower power consumption.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

**Figure 1: Pin Connection And IEC Logic Symbols**



**Figure 2: Input And Output Equivalent Circuit**



**Table 2: Pin Description**

PIN N°	SYMBOL	NAME AND FUNCTION
1, 4, 10, 13	1G TO 4G	Output Enable Input
2, 5, 9, 12	1A TO 4A	Data Inputs
3, 6, 8, 11	1Y TO 4Y	Data Outputs
7	GND	Ground (0V)
14	V <sub>CC</sub>	Positive Supply Voltage

**Table 3: Truth Table**

A	$\bar{G}$	Y
X	H	Z
L	L	L
H	L	H

X : Don't Care

Z : High Impedance

**Table 4: Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7.0	V
V <sub>I</sub>	DC Input Voltage	-0.5 to +7.0	V
V <sub>O</sub>	DC Output Voltage (OFF State or High Impedance)	-0.5 to +7.0	V
V <sub>O</sub>	DC Output Voltage (High or Low State) (note 1)	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	- 50	mA
I <sub>OK</sub>	DC Output Diode Current (note 2)	- 50	mA
I <sub>O</sub>	DC Output Current	$\pm$ 50	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	$\pm$ 100	mA
I <sub>GND</sub>	DC Ground Current per Supply Pin	$\pm$ 100	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

1) I<sub>O</sub> absolute maximum rating must be observed

2) V<sub>O</sub> < GND

**Table 5: Recommended Operating Conditions**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage (note 1)	2.0 to 3.6	V
$V_I$	Input Voltage	0 to 5.5	V
$V_O$	Output Voltage (OFF State or High Impedance)	0 to 5.5	V
$V_O$	Output Voltage (High or Low State)	0 to $V_{CC}$	V
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 3.0$ to 3.6V)	$\pm 24$	mA
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 2.7$ V)	$\pm 12$	mA
$T_{op}$	Operating Temperature	-55 to 125	°C
$dt/dv$	Input Rise and Fall Time (note 2)	0 to 10	ns/V

1) Truth Table guaranteed: 1.5V to 3.6V

2)  $V_{IN}$  from 0.8V to 2V at  $V_{CC} = 3.0$ V**Table 6: DC Specifications**

Symbol	Parameter	Test Condition		Value				Unit	
		$V_{CC}$ (V)		-40 to 85 °C		-55 to 125 °C			
				Min.	Max.	Min.	Max.		
$V_{IH}$	High Level Input Voltage	2.7 to 3.6		2.0		2.0		V	
$V_{IL}$	Low Level Input Voltage	2.7 to 3.6			0.8		0.8	V	
$V_{OH}$	High Level Output Voltage	2.7 to 3.6	$I_O = -100 \mu A$	$V_{CC} - 0.2$		$V_{CC} - 0.2$		V	
		2.7	$I_O = -12 mA$	2.2		2.2			
		3.0	$I_O = -18 mA$	2.4		2.4			
			$I_O = -24 mA$	2.2		2.2			
$V_{OL}$	Low Level Output Voltage	2.7 to 3.6	$I_O = 100 \mu A$		0.2		0.2	V	
		2.7	$I_O = 12 mA$		0.4		0.4		
		3.0	$I_O = 16 mA$		0.4		0.4		
			$I_O = 24 mA$		0.55		0.55		
$I_I$	Input Leakage Current	2.7 to 3.6	$V_I = 0$ to 5.5V		$\pm 5$		$\pm 5$	$\mu A$	
$I_{off}$	Power Off Leakage Current	0	$V_I$ or $V_O = 5.5$ V		10		10	$\mu A$	
$I_{OZ}$	High Impedance Output Leakage Current	2.7 to 3.6	$V_I = V_{IH}$ or $V_{IL}$ $V_O = 0$ to $V_{CC}$		$\pm 5$		$\pm 5$	$\mu A$	
$I_{CC}$	Quiescent Supply Current	2.7 to 3.6	$V_I = V_{CC}$ or GND		10		10	$\mu A$	
			$V_I$ or $V_O = 3.6$ to 5.5V		$\pm 10$		$\pm 10$		
$\Delta I_{CC}$	$I_{CC}$ incr. per Input	2.7 to 3.6	$V_{IH} = V_{CC} - 0.6$ V		500		500	$\mu A$	

**Table 7: Dynamic Switching Characteristics**

Symbol	Parameter	Test Condition			Value			Unit	
		V <sub>CC</sub> (V)			T <sub>A</sub> = 25 °C				
			Min.	Typ.	Max.				
V <sub>OLP</sub>	Dynamic Low Level Quiet Output (note 1)	3.3	C <sub>L</sub> = 50pF		0.8			V	
V <sub>OLV</sub>			V <sub>IL</sub> = 0V, V <sub>IH</sub> = 3.3V		-0.8				

1) Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining output is measured in the LOW state.

**Table 8: AC Electrical Characteristics**

Symbol	Parameter	Test Condition				Value				Unit	
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	R <sub>L</sub> (Ω)	t <sub>s</sub> = t <sub>r</sub> (ns)	-40 to 85 °C		-55 to 125 °C			
						Min.	Max.	Min.	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time	2.7	50	500	2.5		6.0		6.9	ns	
		3.0 to 3.6				1.0	5.2	1.0	6.0		
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Time to HIGH and LOW level	2.7	50	500	2.5	1.0	6.0	1.0	6.9	ns	
		3.0 to 3.6				1.0	5.0	1.0	6.0		
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time to HIGH and LOW level	2.7	50	500	2.5	1.0	6.0	1.0	6.9	ns	
		3.0 to 3.6				1.0	5.0	1.0	6.0		
t <sub>OSLH</sub> t <sub>OSHL</sub>	Output To Output Skew Time (note1, 2)	3.0 to 3.6	50	500	2.5		1.0		1.0	ns	

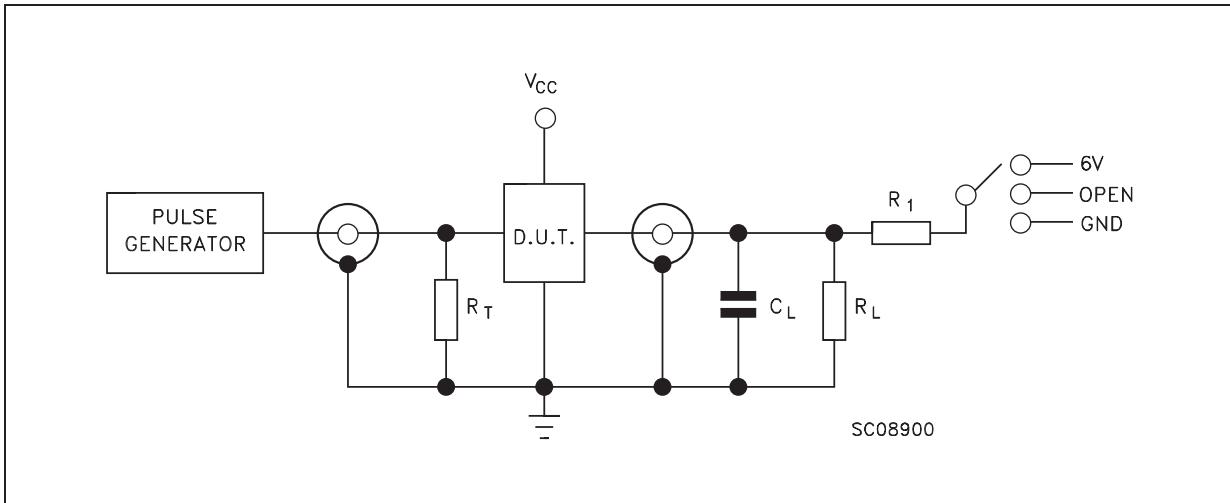
1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW (t<sub>OSLH</sub> = | t<sub>PLHm</sub> - t<sub>PLHnl</sub>, t<sub>OSHL</sub> = | t<sub>PHLm</sub> - t<sub>PHLnl</sub> |)

2) Parameter guaranteed by design

**Table 9: Capacitive Characteristics**

Symbol	Parameter	Test Condition			Value			Unit	
		V <sub>CC</sub> (V)			T <sub>A</sub> = 25 °C				
			Min.	Typ.	Max.				
C <sub>IN</sub>	Input Capacitance	3.3	V <sub>IN</sub> = 0 to V <sub>CC</sub>		5			pF	
C <sub>OUT</sub>	Output Capacitance	3.3	V <sub>IN</sub> = 0 to V <sub>CC</sub>		10			pF	
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	3.3	f <sub>IN</sub> = 10MHz V <sub>IN</sub> = 0 or V <sub>CC</sub>		37			pF	

1) C<sub>PD</sub> is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. I<sub>CC(opr)</sub> = C<sub>PD</sub> × V<sub>CC</sub> × f<sub>IN</sub> + I<sub>CC</sub>/4 (per gate)

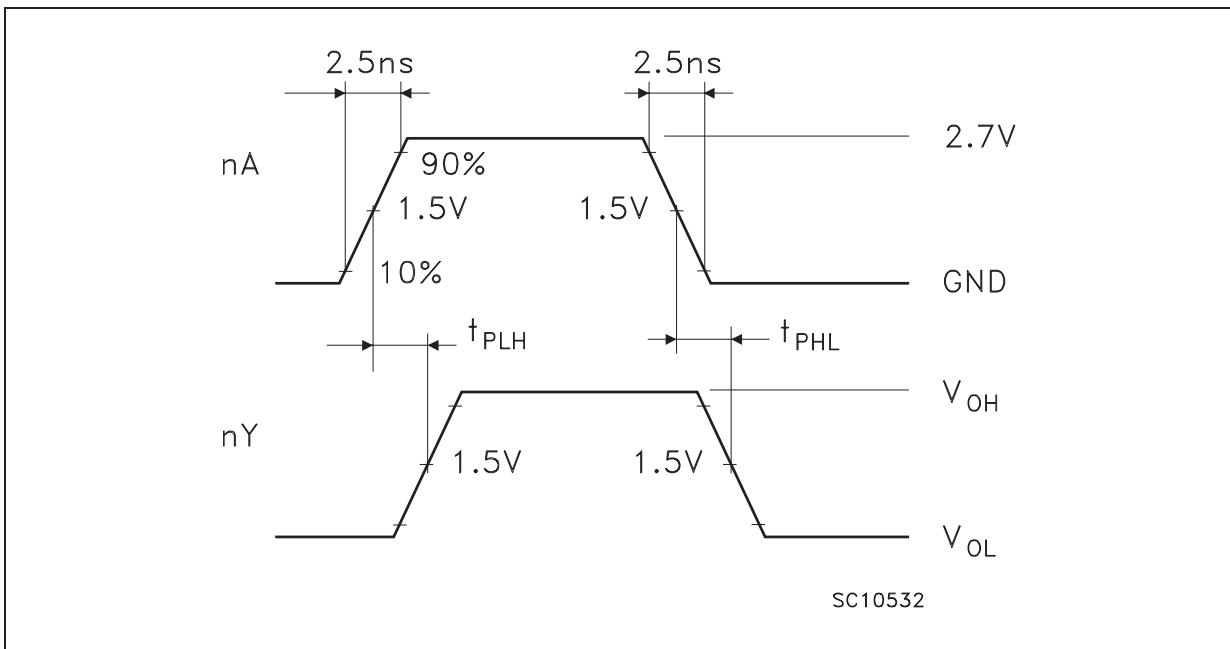
**Figure 3: Test Circuit**

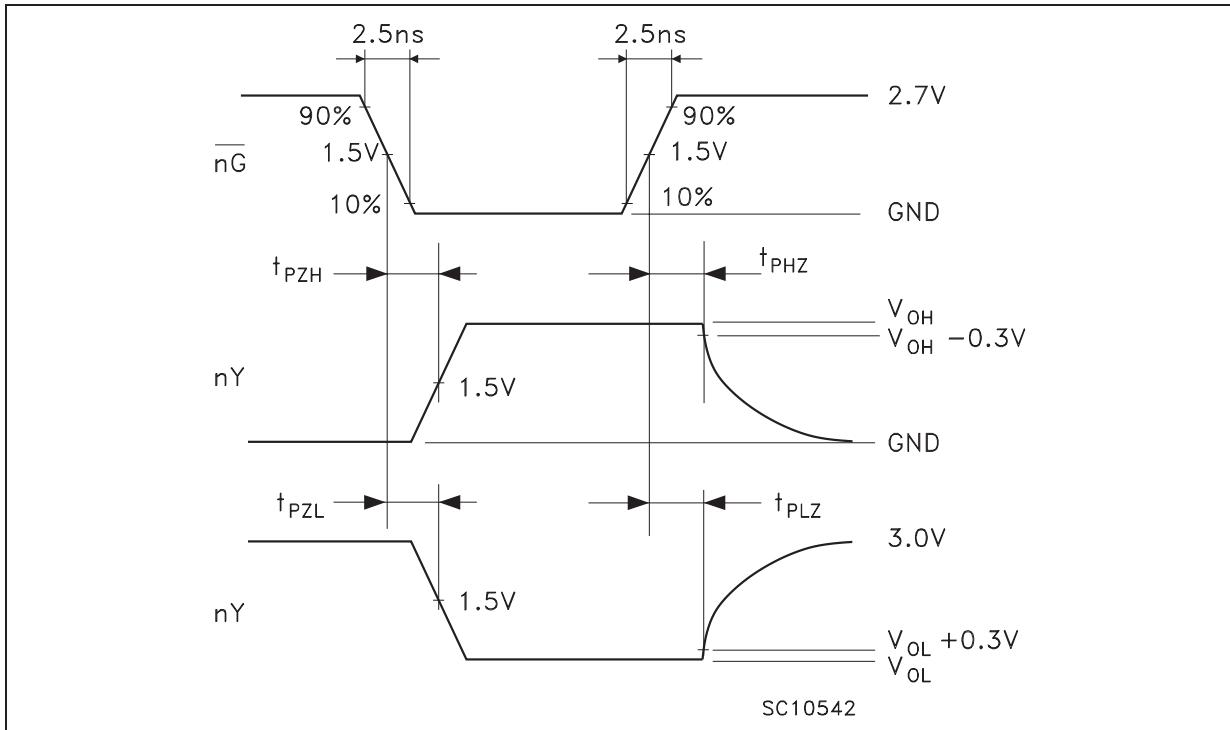
TEST	SWITCH
$t_{PLH}, t_{PHL}$	Open
$t_{PZL}, t_{PLZ}$	6V
$t_{PZH}, t_{PHZ}$	GND

$C_L = 50 \text{ pF}$  or equivalent (includes jig and probe capacitance)

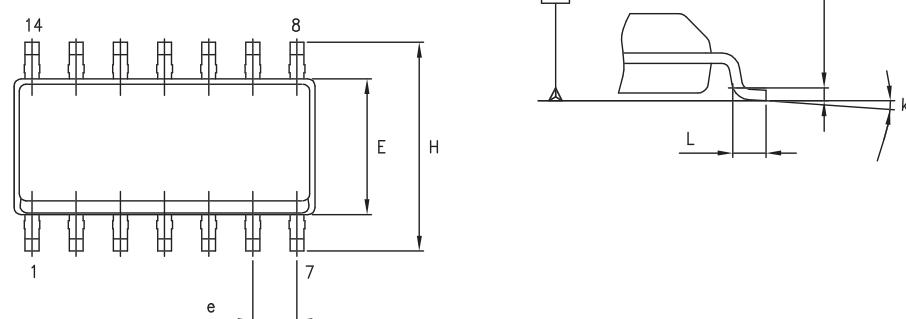
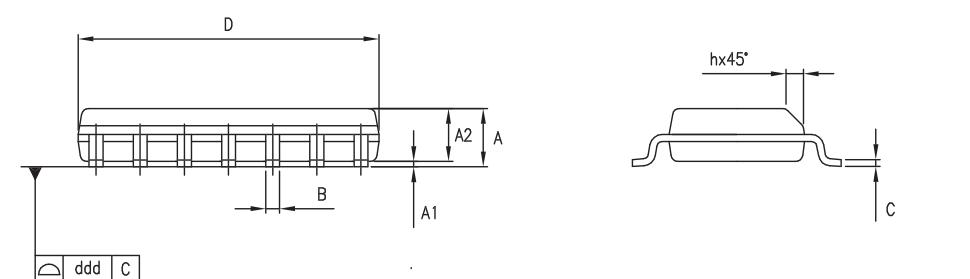
$R_L = R_1 = 500\Omega$  or equivalent

$R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

**Figure 4: Waveform - Propagation Delay (f=1MHz; 50% duty cycle)**

**Figure 5: Waveform - Output Enable And Disable Time (f=1MHz; 50% duty cycle)**

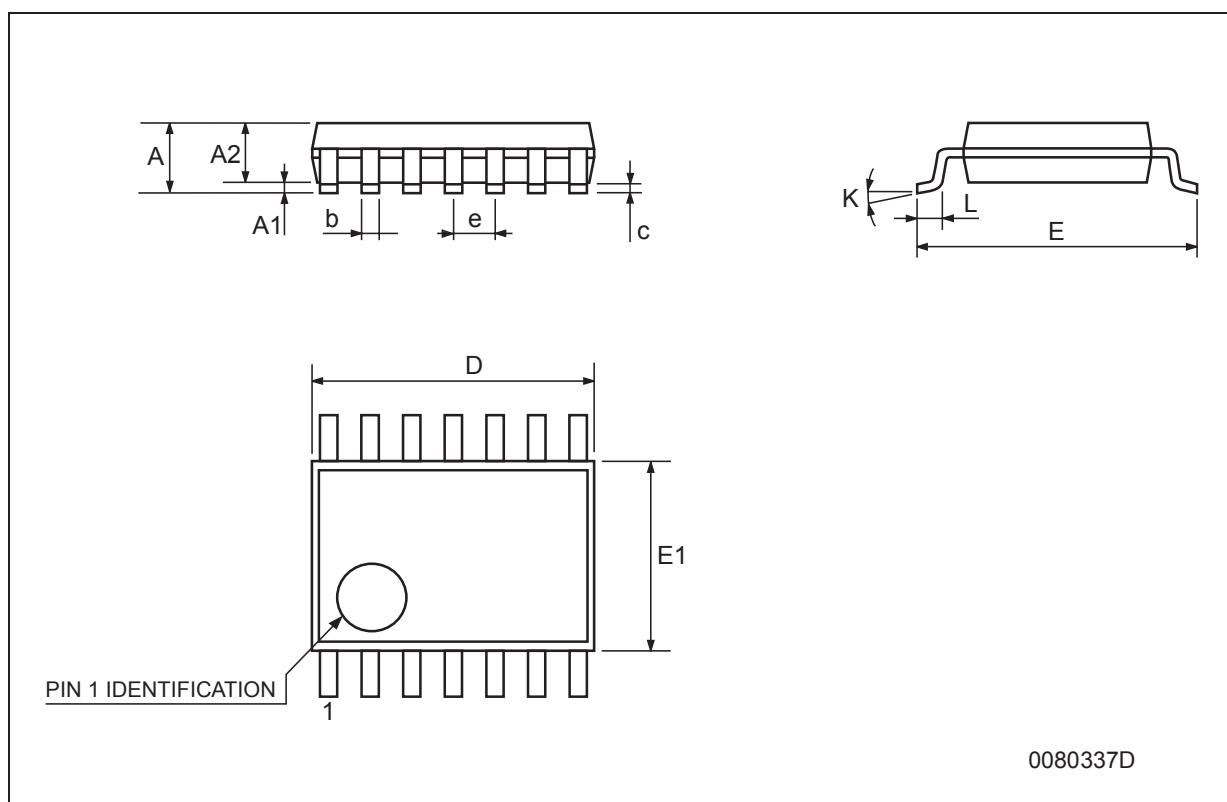
SO-14 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.1		0.25	0.004		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	8.55		8.75	0.337		0.344
E	3.8		4.0	0.150		0.157
e		1.27			0.050	
H	5.8		6.2	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.4		1.27	0.016		0.050
k	0°		8°	0°		8°
ddd			0.100			0.004



0016019D

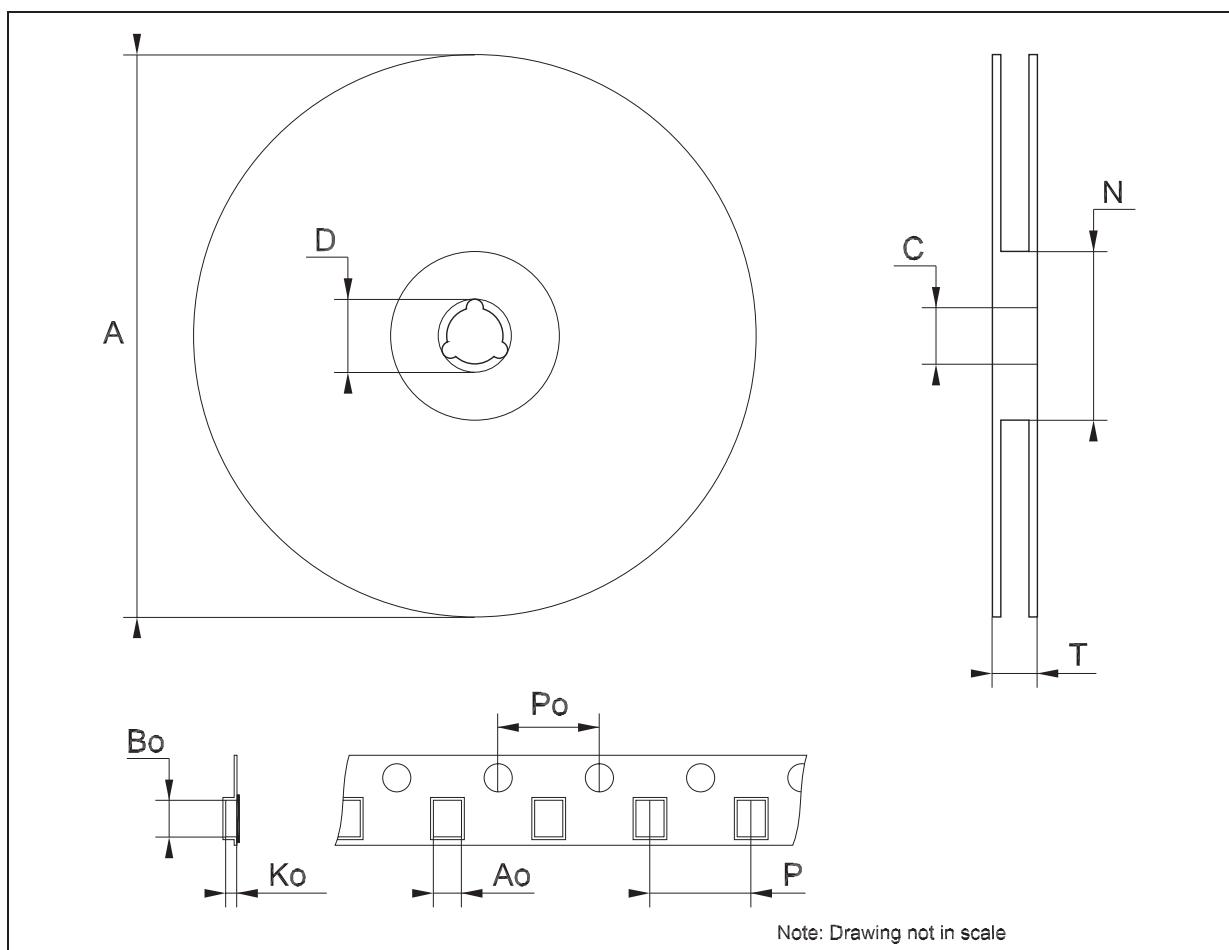
## TSSOP14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030

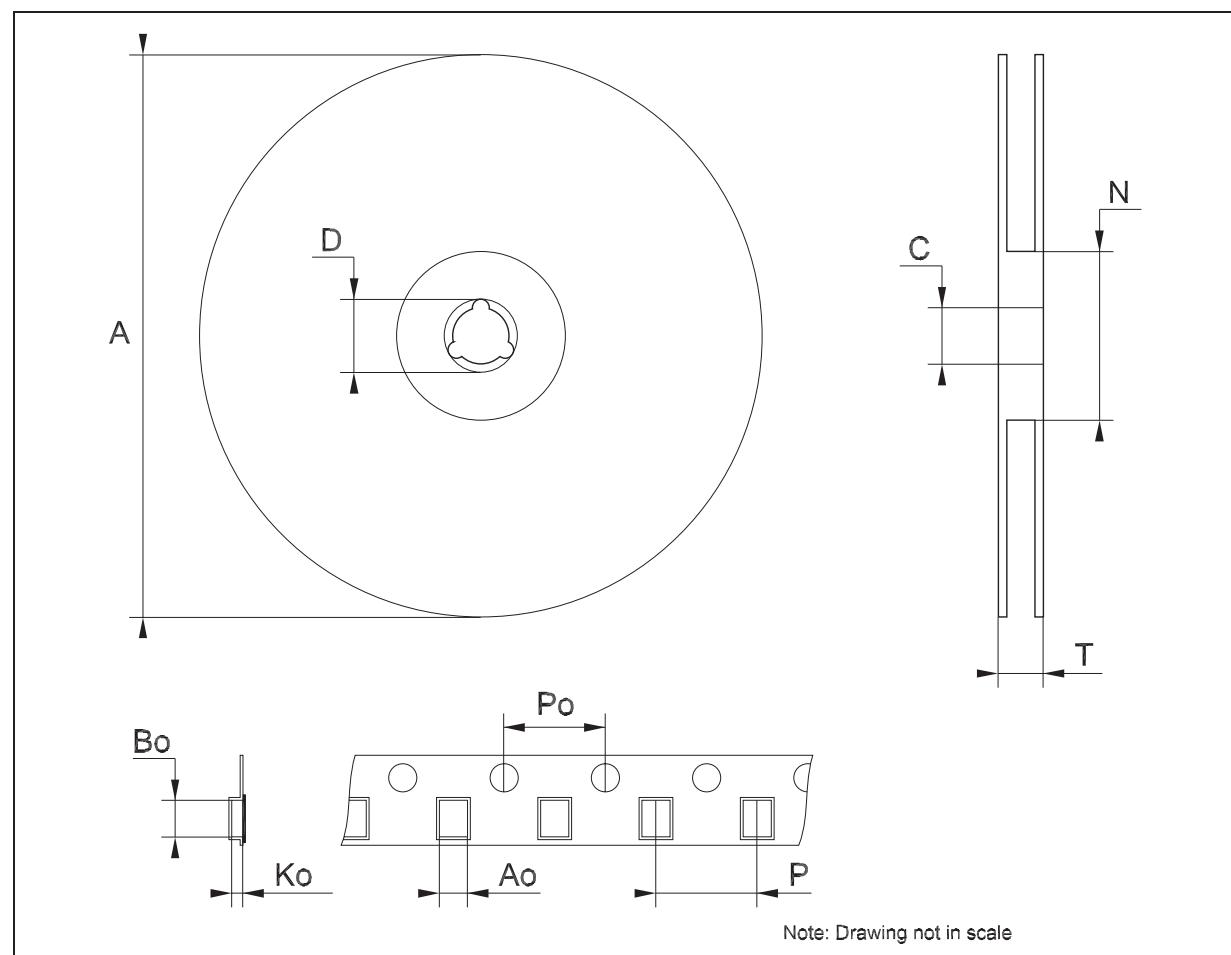


<b>Tape &amp; Reel SO-14 MECHANICAL DATA</b>
--

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.4		6.6	0.252		0.260
Bo	9		9.2	0.354		0.362
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



Tape & Reel TSSOP14 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.7		6.9	0.264		0.272
Bo	5.3		5.5	0.209		0.217
Ko	1.6		1.8	0.063		0.071
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



**Table 10: Revision History**

Date	Revision	Description of Changes
15-Sep-2004	5	Ordering Codes Revision - pag. 1.

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics

All other names are the property of their respective owners

© 2004 STMicroelectronics - All Rights Reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -  
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America  
[www.st.com](http://www.st.com)