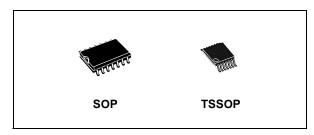


# LOW VOLTAGE CMOS QUAD BUS BUFFERS (3-STATE) WITH 5V TOLERANT INPUTS

- HIGH SPEED: t<sub>PD</sub>=4.4ns (TYP.) at V<sub>CC</sub> = 3.3V
- 5V TOLERANT INPUTS
- POWER-DOWN PROTECTION ON INPUTS
- INPUT VOLTAGE LEVEL: V<sub>IL</sub> = 0.8V, V<sub>IH</sub> = 2V at V<sub>CC</sub> =3V
- LOW POWER DISSIPATION:  $I_{CC} = 2 \mu A \text{ (MAX.)}$  at  $T_A = 25 \text{°C}$
- LOW NOISE:  $V_{OLP} = 0.3V$  (TYP.) at  $V_{CC} = 3.3V$
- SYMMETRICAL OUTPUT IMPEDANCE: |I<sub>OH</sub>| = I<sub>OL</sub> = 4 mA (MIN) at V<sub>CC</sub> =3V
- BALANCED PROPAGATION DELAYS: tplh ≅ tphl
- OPERATING VOLTAGE RANGE:
   V<sub>CC</sub>(OPR) = 2V to 3.6V (1.2V Data Retention)
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 126
- IMPROVED LATCH-UP IMMUNITY

#### DESCRIPTION

The 74LVX126 is a low voltage CMOS QUAD BUS BUFFERs fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology. It is ideal for low power, battery operated and low noise 3.3V applications.



**Table 1: Order Codes** 

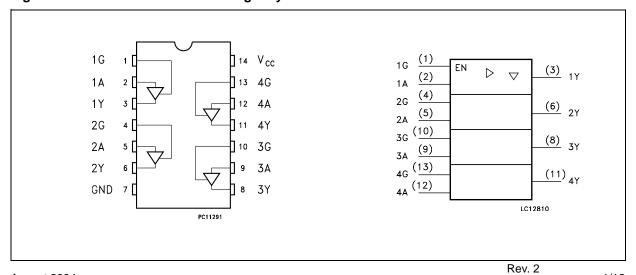
PACKAGE	T & R
SOP	74LVX126MTR
TSSOP	74LVX126TTR

This device requires the 3-STATE control input G to be set low to place the output go in to the high impedance state.

Power down protection is provided on all inputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage. This device can be used to interface 5V to 3V. It combines high speed performance with the true CMOS low power consumption.

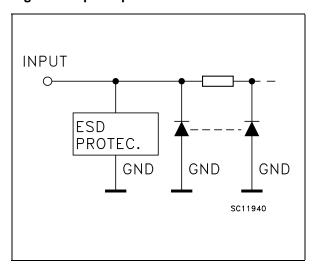
All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

Figure 1: Pin Connection And IEC Logic Symbols



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Figure 2: Input Equivalent Circuit



**Table 2: Pin Description** 

PIN N°	SYMBOL	NAME AND FUNCTION				
1, 4, 10, 13	1G to 4G	Output Enable Inputs				
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** 

Α	G	Υ
Х	L	Z
L	Н	L
Н	Н	Н

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
Vo	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	- 20	mA
l <sub>ok</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Current	± 25	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 50	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
TL	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

**Table 5: Recommended Operating Conditions** 

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage (note 1)	2 to 3.6	V
V <sub>I</sub>	Input Voltage	0 to 5.5	V
Vo	Output Voltage	0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time (note 2) (V <sub>CC</sub> = 3V)	0 to 100	ns/V

1) Truth Table guaranteed: 1.2V to 3.6V 2)  $\rm V_{IN}$  from 0.8V to 2.0V

**Table 6: DC Specifications** 

		1	Test Condition	Value								
Symbol	Parameter	v <sub>cc</sub>		Т	A = 25°	,C	C -40 to 85°C			125°C	Unit	
		(V)		Min.	Тур.	Max.	Min.	Max.	Min.	Max.		
V <sub>IH</sub>	High Level Input	2.0		1.5			1.5		1.5			
	Voltage	3.0		2			2		2		V	
		3.6		2.4			2.4		2.4			
V <sub>IL</sub>	Low Level Input	2.0				0.5		0.5		0.5		
	Voltage	3.0				8.0		8.0		0.8	V	
						0.8		0.8		0.8		
V <sub>OH</sub>	V <sub>OH</sub> High Level Output Voltage	2.0	I <sub>O</sub> =-50 μA	1.9	2.0		1.9		1.9			
		3.0	I <sub>O</sub> =-50 μA	2.9	3.0		2.9		2.9		V	
		3.0	I <sub>O</sub> =-4 mA	2.58			2.48		2.4			
V <sub>OL</sub>	Low Level Output	2.0	I <sub>O</sub> =50 μA		0.0	0.1		0.1		0.1		
	Voltage	3.0	I <sub>O</sub> =50 μA		0.0	0.1		0.1		0.1	V	
		3.0	I <sub>O</sub> =4 mA			0.36		0.44		0.55		
I <sub>OZ</sub>	High Impedance Output Leakage Current	3.6	$V_I = V_{IH} \text{ or } V_{IL}$ $V_O = V_{CC} \text{ or GND}$			±0.25		± 2.5		± 5	μΑ	
I <sub>I</sub>	Input Leakage Current	3.6	V <sub>I</sub> = 5.5V or GND			± 0.1		± 1		± 1	μΑ	
I <sub>CC</sub>	Quiescent Supply Current	3.6	$V_I = V_{CC}$ or GND			2		20		20	μΑ	

**Table 7: Dynamic Switching Characteristics** 

Symbol Parameter		Т	est Condition	Value							
	Parameter	V <sub>CC</sub>		Т	T <sub>A</sub> = 25°C		-40 to 85°C		-55 to 125°C		Unit
		(V)		Min.	Тур.	Max.	Min.	Max.	Min.	Max.	
V <sub>OLP</sub>	Dynamic Low	3.3			0.3	0.5					
V <sub>OLV</sub>	Voltage Quiet Output (note 1, 2)		C <sub>L</sub> = 50 pF	-0.5	-0.3						
V <sub>IHD</sub>	Dynamic High Voltage Input (note 1, 3)	3.3		2.0							V
V <sub>ILD</sub>	Dynamic Low Voltage Input (note 1, 3)	3.3				0.8					

<sup>2)</sup> Max number of outputs defined as (n). Data inputs are driven 0V to 3.3V, (n-1) outputs switching and one output at GND.

3) Max number of data inputs (n) switching. (n-1) switching 0V to 3.3V. Inputs under test switching: 3.3V to threshold (V<sub>ILD</sub>), 0V to threshold (V<sub>IHD</sub>), f=1MHz.

**Table 8: AC Electrical Characteristics** (Input  $t_r = t_f = 3ns$ )

		٦	Test Co	ondition	Value							
Symbol	Parameter	v <sub>cc</sub>	CL		Т	T <sub>A</sub> = 25°C			85°C	-55 to 125°C		Unit
		(V)	(pF)		Min.	Тур.	Max.	Min.	Max.	Min.	Max.	
t <sub>PLH</sub>	Propagation Delay	2.7	15			5.8	8.0	1.0	9.6	1.0	11.5	
$t_{PHL}$	Time	2.7	50			7.0	10.5	1.0	12.6	1.0	15.0	
	3.3(*)	15			4.4	6.2	1.0	8.5	1.0	9.5	ns	
	3.3(*)	50			5.9	9.7	1.0	12.0	1.0	13.5		
t <sub>PZL</sub>	Output Enable	2.7	15			8.9	11.5	1.0	12.5	1.0	12.5	
$t_{PZH}$	Time	2.7	50			10.0	14.0	1.0	16.0	1.0	16.0	
		3.3 <sup>(*)</sup>	15			8.0	10.4	1.0	11.5	1.0	11.5	ns
		3.3(*)	50			8.9	12	1.0	13.0	1.0	13.0	
t <sub>PLZ</sub>	Output Disable	2.7	50			7.2	11.0	1.0	13.0	1.0	15.6	
$t_{PHZ}$		3.3(*)	50			6.0	8.5	1.0	11.0	1.0	13.0	ns
t <sub>OSLH</sub>	Output to Output	2.7	50			0.5	1.0		1.5		1.5	
toshl	Skew Time (note 1,2)	3.3 <sup>(*)</sup>	50			0.5	1.0		1.5		1.5	ns

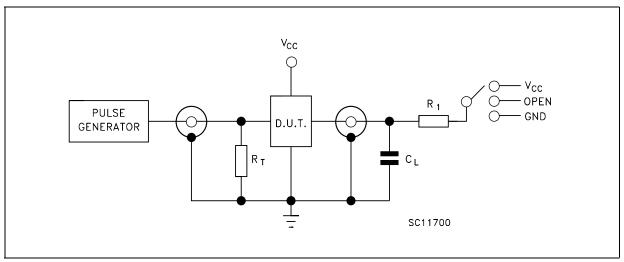
<sup>1)</sup> Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW 2) Parameter guaranteed by design (\*) Voltage range is  $3.3V \pm 0.3V$ 

**Table 9: Capacitive Characteristics** 

		Test Condition		Value							
Symbol Parameter	v <sub>cc</sub>	V <sub>CC</sub>	T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		Unit	
	(V)	Min.	Тур.	Max.	Min.	Max.	Min.	Max.			
C <sub>IN</sub>	Input Capacitance	3.3			4	10		10		10	pF
C <sub>OUT</sub>	Output Capacitance	3.3			6						pF
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	3.3			14						pF

<sup>1)</sup>  $C_{PD}$  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.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$  (per circuit)

Figure 3: Test Circuit



TEST	SWITCH
t <sub>PLH</sub> , t <sub>PHL</sub>	Open
t <sub>PZL</sub> , t <sub>PLZ</sub>	V <sub>CC</sub>
t <sub>PZH</sub> , t <sub>PHZ</sub>	GND

 $C_L$  =15/50pF or equivalent (includes jig and probe capacitance)  $R_L$  = R1 = 1K $\Omega$  or equivalent  $R_T$  =  $Z_{OUT}$  of pulse generator (typically 50 $\Omega)$ 

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

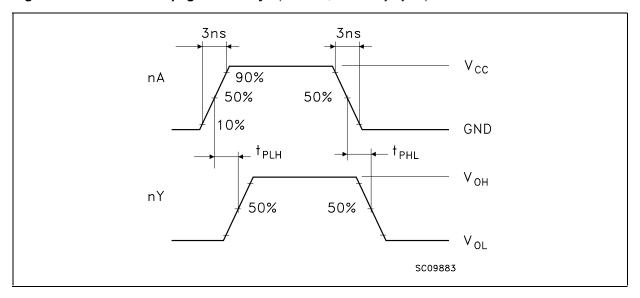
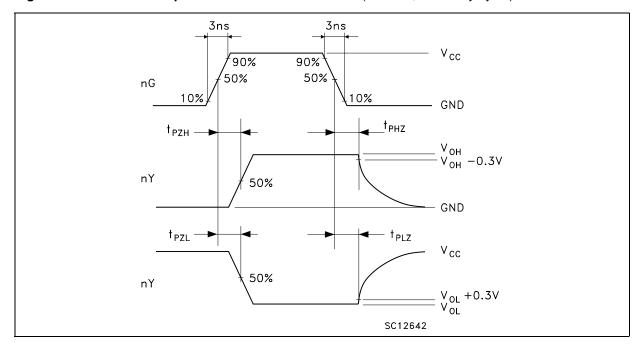
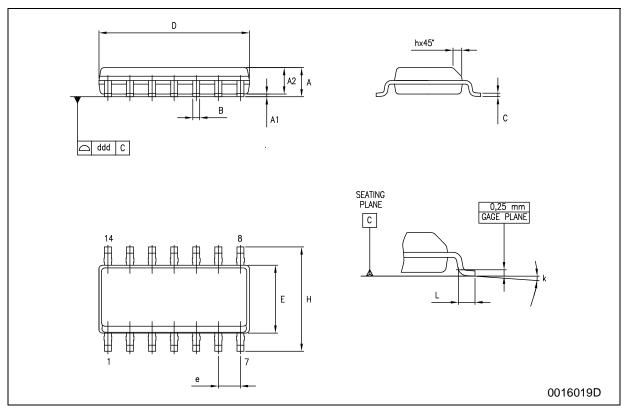


Figure 5: Waveform - Output Enable And Disable Time (f=1MHz; 50% duty cycle)



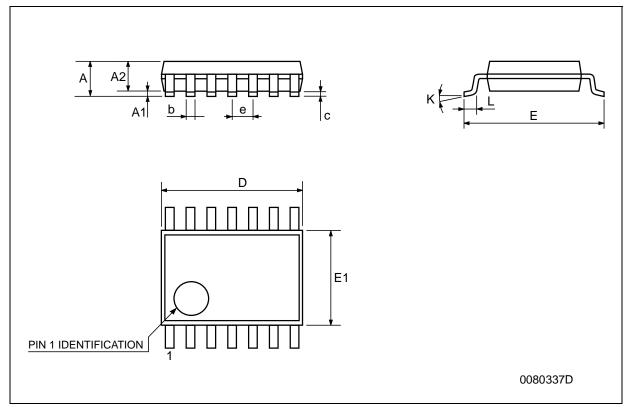
### **SO-14 MECHANICAL DATA**

DIM		mm.		inch				
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.		
А	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		
В	0.33		0.51	0.013		0.020		
С	0.19		0.25	0.007		0.010		
D	8.55		8.75	0.337		0.344		
Е	3.8		4.0	0.150		0.157		
е		1.27			0.050			
Н	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		



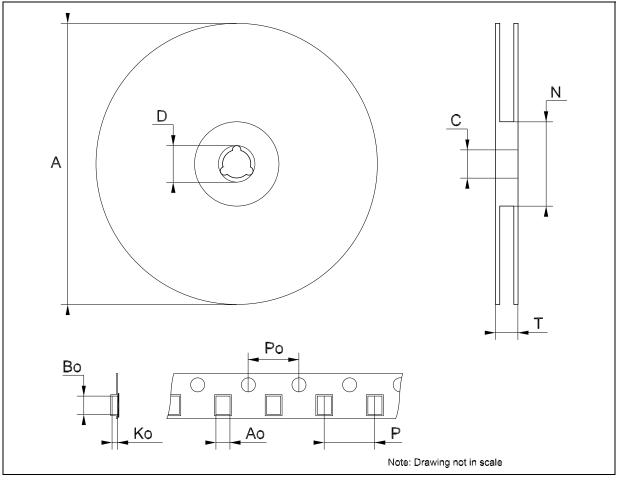
### **TSSOP14 MECHANICAL DATA**

DIM		mm.		inch				
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.		
А			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		
С	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		
е		0.65 BSC			0.0256 BSC			
К	0°		8°	0°		8°		
L	0.45	0.60	0.75	0.018	0.024	0.030		



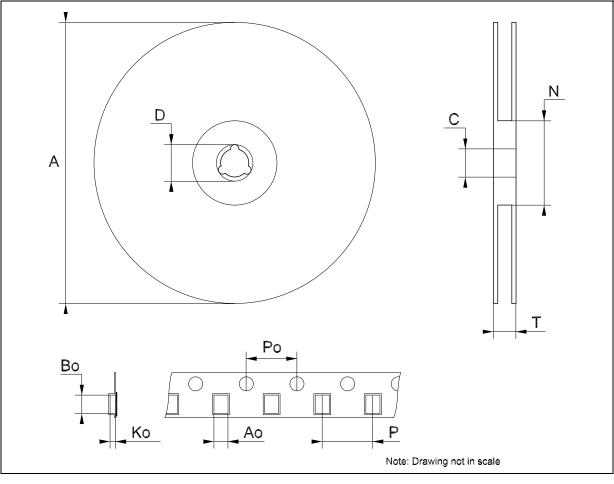
# Tape & Reel SO-14 MECHANICAL DATA

mm.			inch		
MIN.	TYP	MAX.	MIN.	TYP.	MAX.
		330			12.992
12.8		13.2	0.504		0.519
20.2			0.795		
60			2.362		
		22.4			0.882
6.4		6.6	0.252		0.260
9		9.2	0.354		0.362
2.1		2.3	0.082		0.090
3.9		4.1	0.153		0.161
7.9		8.1	0.311		0.319
	12.8 20.2 60 6.4 9 2.1 3.9	MIN. TYP  12.8  20.2  60  6.4  9  2.1  3.9	MIN.         TYP         MAX.           330         12.8         13.2           20.2         60         22.4           6.4         6.6         9           9         9.2           2.1         2.3           3.9         4.1	MIN.         TYP         MAX.         MIN.           330         12.8         13.2         0.504           20.2         0.795         0.795           60         2.362           22.4         6.6         0.252           9         9.2         0.354           2.1         2.3         0.082           3.9         4.1         0.153	MIN.         TYP         MAX.         MIN.         TYP.           12.8         13.2         0.504         0.795



# Tape & Reel TSSOP14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
А			330			12.992
С	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
Т			22.4			0.882
Ao	6.7		6.9	0.264		0.272
Во	5.3		5.5	0.209		0.217
Ko	1.6		1.8	0.063		0.071
Ро	3.9		4.1	0.153		0.161
Р	7.9		8.1	0.311		0.319



#### **Table 10: Revision History**

Date	Revision	Description of Changes
27-Aug-2004	2	Ordering Codes Revision - pag. 1.

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