

LOW VOLTAGE HEX INVERTER (OPEN DRAIN)

- HIGH SPEED: $t_{PD} = 4.8 \text{ ns}$ (TYP.) at $V_{CC} = 3.3\text{V}$
- INPUT VOLTAGE LEVEL:
 $V_{IL} = 0.8\text{V}$, $V_{IH} = 2\text{V}$ at $V_{CC} = 3\text{V}$
- LOW POWER DISSIPATION:
 $I_{CC} = 2 \mu\text{A}$ (MAX.) at $T_A = 25^\circ\text{C}$
- LOW NOISE:
 $V_{OLP} = 0.3 \text{ V}$ (TYP.) at $V_{CC} = 3.3\text{V}$
- OPERATING VOLTAGE RANGE:
 $V_{CC} \text{ (OPR)} = 2\text{V to } 3.6\text{V}$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 05
- IMPROVED LATCH-UP IMMUNITY
- POWER DOWN PROTECTION ON INPUTS

DESCRIPTION

The 74LVX05 is an advanced high-speed CMOS OPEN DRAIN HEX INVERTER fabricated with sub-micron silicon gate and double-layer metal wiring C^2MOS technology.

The internal circuit is composed of 3 stages including buffer output, which provides high noise immunity and stable output.

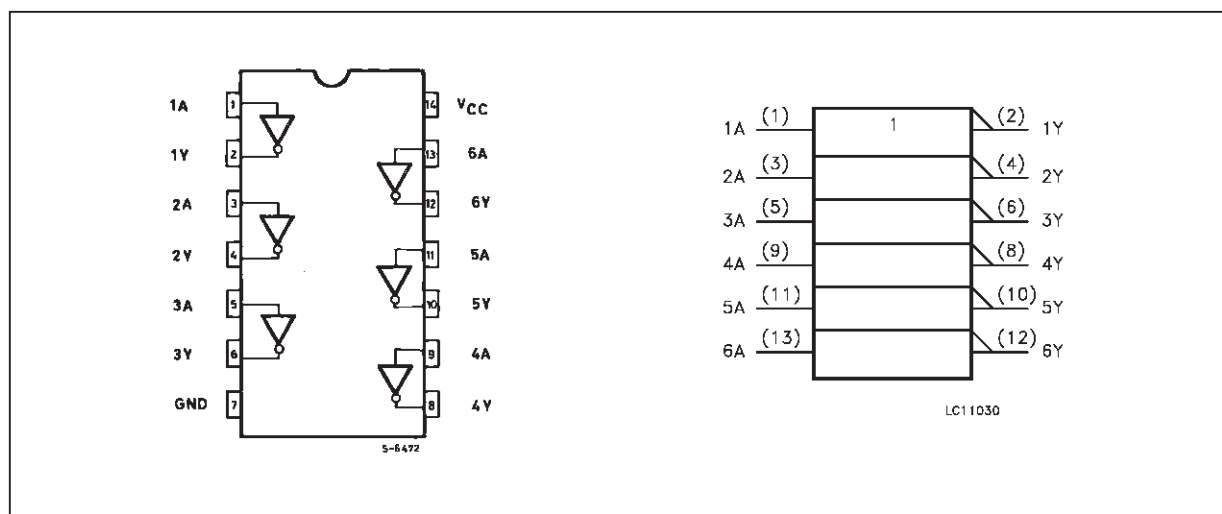


ORDER CODES		
PACKAGE	TUBE	T & R
SOP	74LVX05M	74LVX05MTR
TSSOP		74LVX05TTR

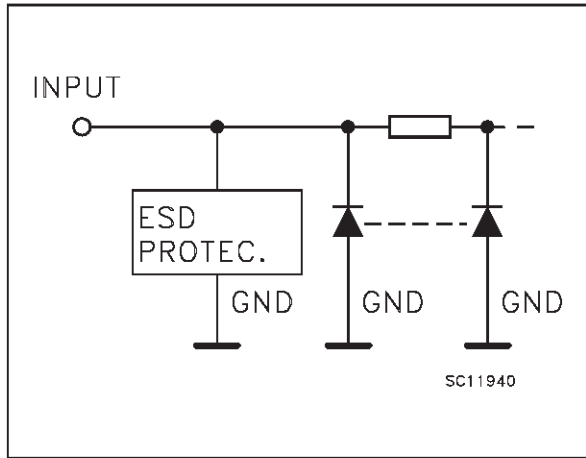
Power down protection is provided on all inputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage. This device can be used to interface 5V to 3V.

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

PIN CONNECTION AND IEC LOGIC SYMBOLS



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 3, 5, 9, 11, 13	1A to 6A	Data Inputs
2, 4, 6, 8, 10, 12	1Y to 6Y	Data Outputs
7	GND	Ground (0V)
14	V _{CC}	Positive Supply Voltage

TRUTH TABLE

A	Y
L	Z
H	L

Z: High Impedance

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	-0.5 to +7.0	V
V _I	DC Input Voltage	-0.5 to +7.0	V
V _O	DC Output Voltage	-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current	- 20	mA
I _{OK}	DC Output Diode Current	± 20	mA
I _O	DC Output Current	25	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current	± 50	mA
T _{stg}	Storage Temperature	-65 to +150	°C
T _L	Lead Temperature (10 sec)	300	°C

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

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage (note 1)	2 to 3.6	V
V _I	Input Voltage	0 to 5.5	V
V _O	Output Voltage	0 to V _{CC}	V
T _{op}	Operating Temperature:	-40 to +85	°C
dt/dv	Input Rise and Fall Time (V _{CC} = 3V) (note 2)	0 to 100	ns/V

1) Truth Table guaranteed: 1.2V to 3.6V

2) V_{IN} from 0.8V to 2V

DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value					Unit
		V _{CC} (V)		T _A = 25 °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
V _{IH}	High Level Input Voltage	2.0		1.5			1.5		V
		3.0		2.0			2.0		
		3.6		2.4			2.4		
V _{IL}	Low Level Input Voltage	2.0				0.5		0.5	V
		3.0				0.8		0.8	
		3.6				0.8		0.8	
V _{OL}	Low Level Output Voltage	2.0	I _O =50 μA		0.0	0.1		0.1	V
		3.0	I _O =50 μA		0.0	0.1		0.1	
		3.0	I _O =4 mA			0.36		0.44	
I _I	Input Leakage Current	3.6	V _I = 5.5V or GND			±0.1		±1	μA
I _{OZ}	High Impedance Output Leakage Current	3.6	V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND			±0.25		±2.5	μA
I _{CC}	Quiescent Supply Current	3.6	V _I = V _{CC} or GND			2		20	μA

DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value					Unit
		V _{CC} (V)		T _A = 25 °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
V _{OLP}	Dynamic Low Voltage Quiet Output (note 1, 2)	3.3	C _L = 50 pF		0.3	0.5			V
V _{OLV}				-0.5	-0.3				
V _{IHD}	Dynamic High Voltage Input (note 1, 3)	3.3				2			
V _{ILD}	Dynamic Low Voltage Input (note 1, 3)	3.3		0.8					

1) Worst case package

2) 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_{ILD}), 0V to threshold (V_{IHD}). f=1MHzAC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3 ns)

Symbol	Parameter	Test Condition			Value					Unit
		V _{CC} (V)	C _L (pF)		T _A = 25 °C			-40 to 85 °C		
					Min.	Typ.	Max.	Min.	Max.	
t _{PZL}	Propagation Delay Time	2.7	15			5.4	7.7		9.0	ns
		2.7	50			6.0	8.7		10.0	
		3.3 ^(*)	15			4.8	7.0		8.1	
		3.3 ^(*)	50			5.3	7.6		8.8	
t _{PLZ}	Propagation Delay Time	2.7	50			10.5	14.7	1.0	15.0	ns
		3.3 ^(*)	50			9.6	13.5	1.0	14.0	
t _{OSLH} t _{OSHL}	Output to Output Skew Time (note 1, 2)	2.7	50				1.5		1.5	ns
		3.3 ^(*)	50				1.5		1.5	

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

2) Parameter guaranteed by design

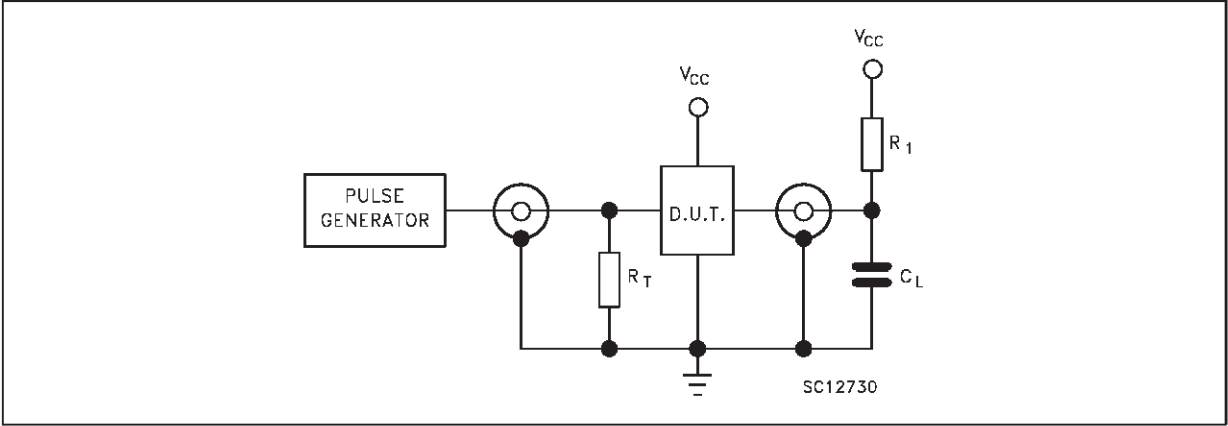
(*) Voltage range is 3.3V ± 0.3V

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value					Unit
		V _{CC} (V)		T _A = 25 °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
C _{IN}	Input Capacitance	3.3			5.4	10		10	pF
C _{OUT}	Output Capacitance	3.3			7.3				pF
C _{PD}	Power Dissipation Capacitance (note 1)	3.3			2.6				pF

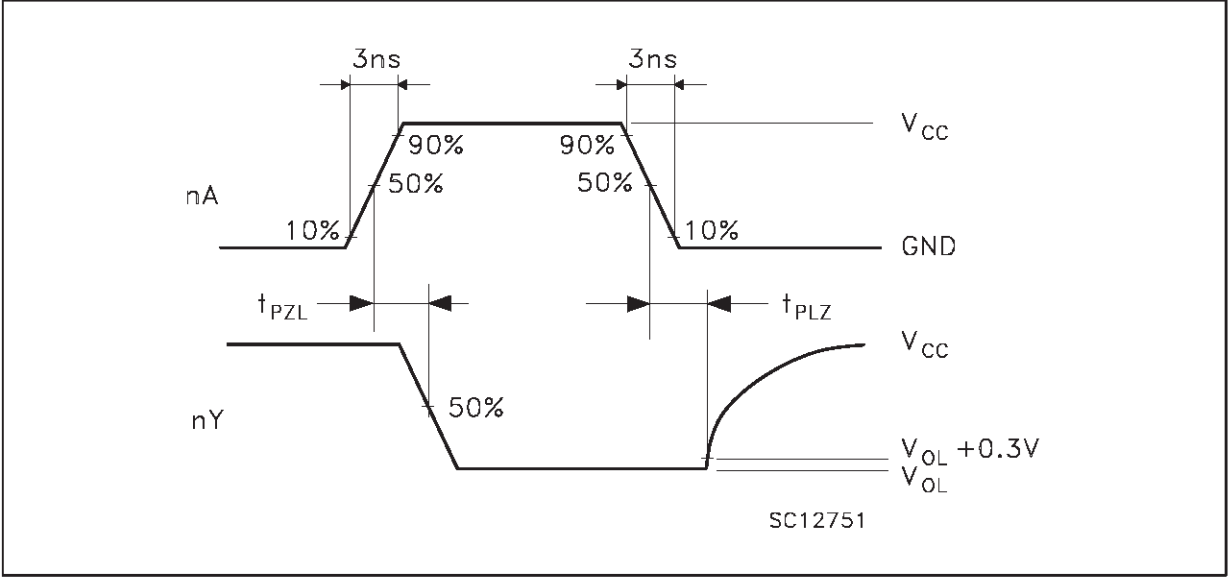
1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. I_{CC(opr)} = C_{PD} • V_{CC} • f_{IN} + I_{CD}/6 (per Gate)

TEST CIRCUIT



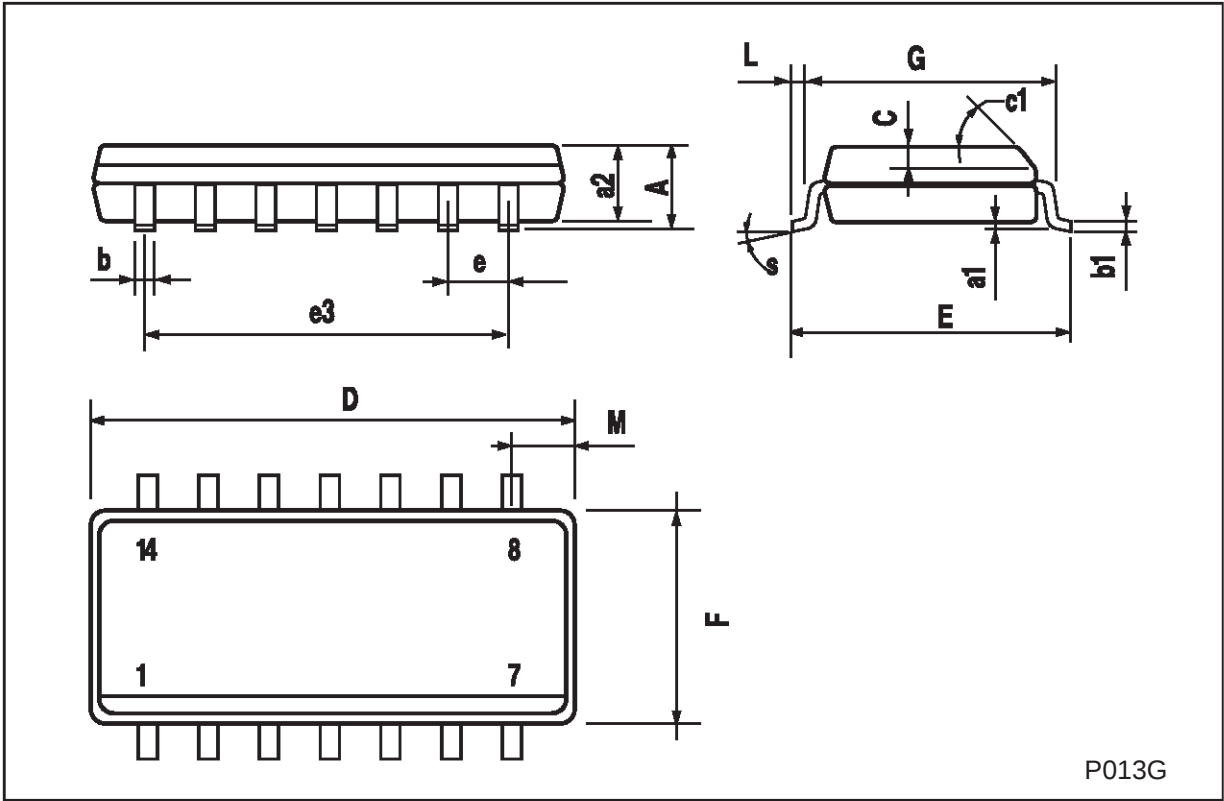
C_L = 15/50 pF or equivalent (includes jig and probe capacitance)
R_L = R₁ = 1KΩ or equivalent
R_T = Z_{OUT} of pulse generator (typically 50Ω)

WAVEFORM: PROPAGATION DELAYS (f=1MHz; 50% duty cycle)



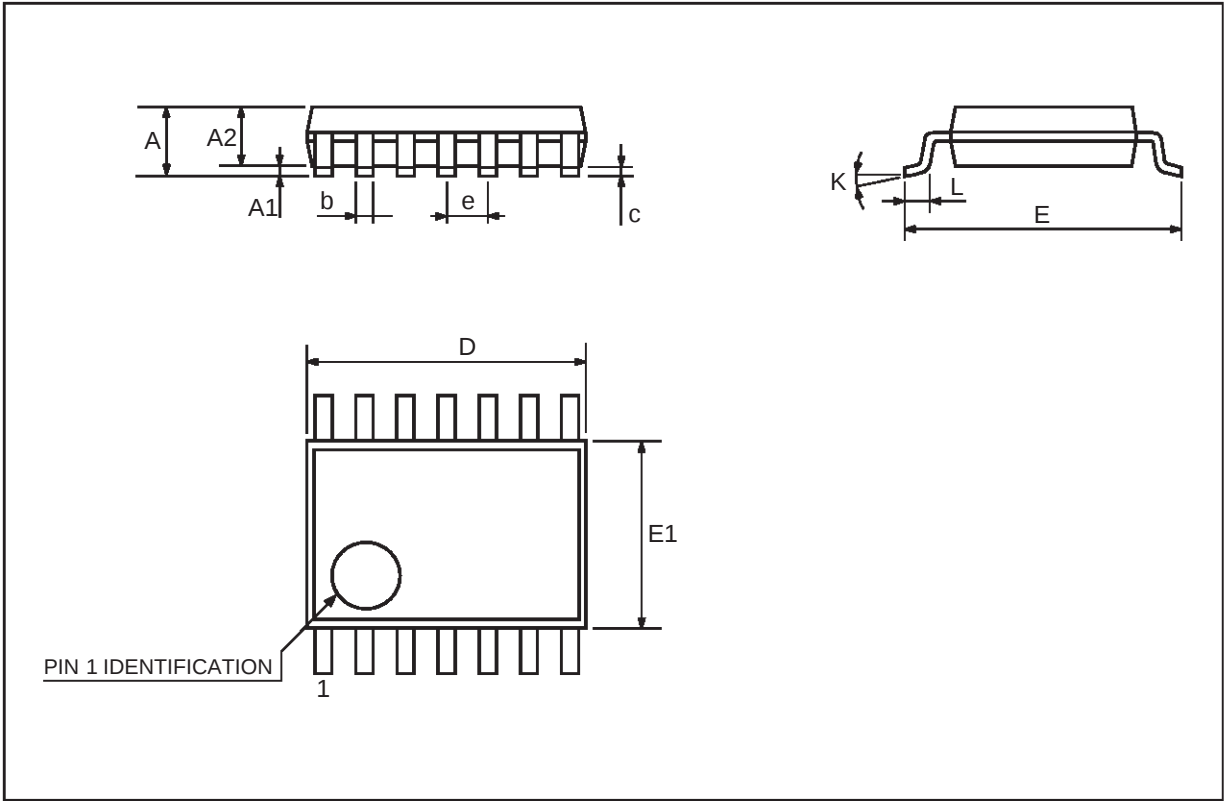
SO-14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45 (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8 (max.)					



TSSOP14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.1			0.433
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	0.85	0.9	0.95	0.335	0.354	0.374
b	0.19		0.30	0.0075		0.0118
c	0.09		0.20	0.0035		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.25	6.4	6.5	0.246	0.252	0.256
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.50	0.60	0.70	0.020	0.024	0.028



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