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74VHC14

HEX SCHMITT INVERTER

- HIGH SPEED: t_{PD} = 5.5ns (TYP.) at V_{CC} = 5V
- LOW POWER DISSIPATION:
  I_{CC} = 2 μA (MAX.) at T_A=25°C
- TYPICAL HYSTERESIS: V_h = 1V
  at VCC = 4.5V
- POWER DOWN PROTECTION ON INPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}|$ = I_{OL} = 8 mA (MIN)
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
  V_{CC}(OPR) = 2V to 5.5V
- PIN AND FUNCTION COMPATIBLE WITH
  74 SERIES 14
- IMPROVED LATCH-UP IMMUNITY
- LOW NOISE: V_{OLP} = 0.8V (MAX.)

DESCRIPTION

The 74VHC14 is an advanced high-speed CMOS HEX SCHMITT INVERTER fabricated with sub-micron silicon gate and double-layer metal wiring C^{2}MOS technology.

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

Power down protection is provided on all inputs and 0 to 7V can be accepted on inputs with no

SOP   **TSSOP**
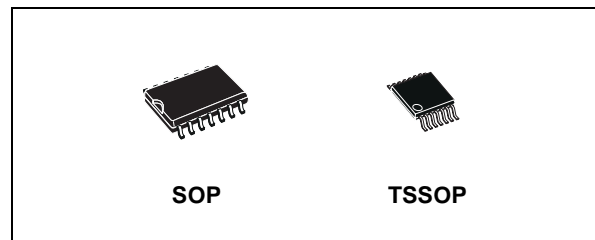
ORDER CODES

| PACKAGE	TUBE	T & R
SOP	74VHC14M	74VHC14MTR
TSSOP		74VHC14TTR

regard to the supply voltage. This device can be used to interface 5V to 3V.

Pin configuration and function are the same as those of the 74VHC04 but the 74VHC14 has hysteresis.
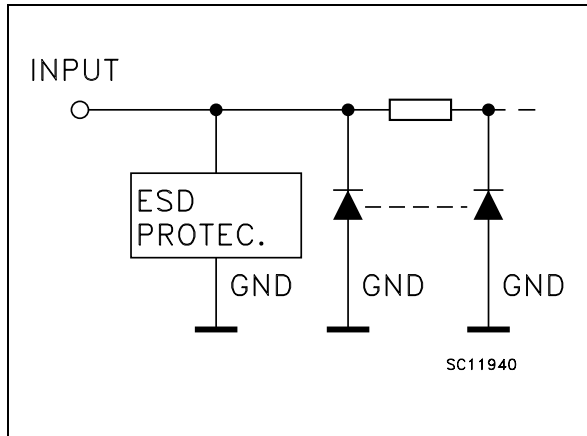
This together with its schmitt trigger function allows it to be used on line receivers with slow rise/fall input signals.

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
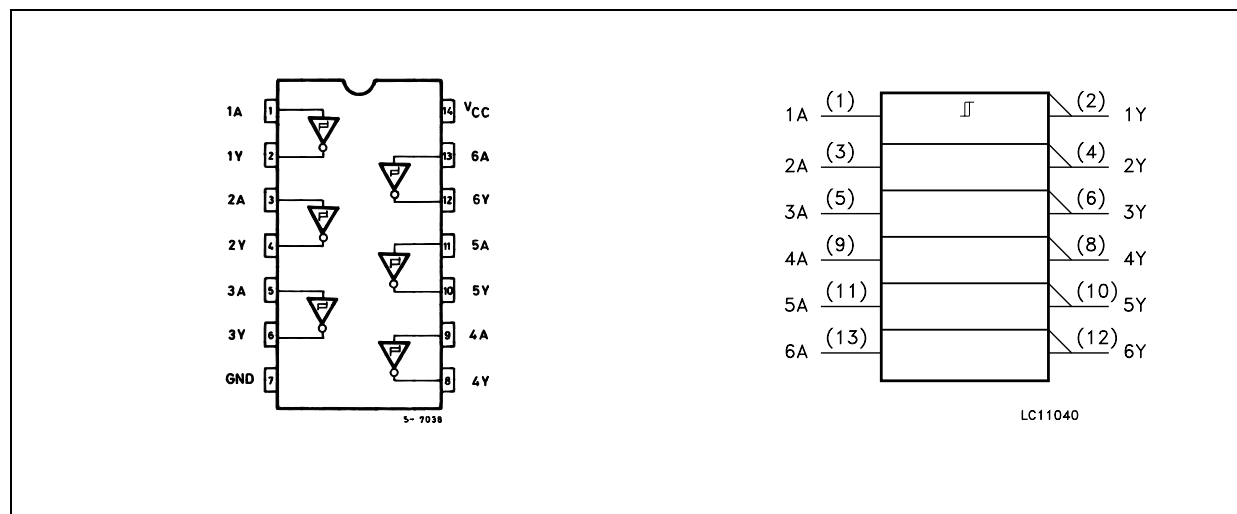
INPUT EQUIVALENT CIRCUIT

SC11940

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	H
H	L

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	$\pm$ 20	mA
I_O	DC Output Current	$\pm$ 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	$\pm$ 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 conditions is not implied

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2 to 5.5	V
V_I	Input Voltage	0 to 5.5	V
V_O	Output Voltage	0 to V_{CC}	V
T_{op}	Operating Temperature	-55 to 125	°C

DC SPECIFICATIONS

Symbol	Parameter	Test Condition			Value							Unit
		V_{CC} (V)		$T_A = 25°C$			-40 to 85°C		-55 to 125°C			
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V_{t+}	High Level Threshold Voltage	3.0		1.2		2.2	1.2	2.2	1.2	2.2		V
		4.5		1.75		3.15	1.75	3.15	1.75	3.15		
		5.5		2.15		3.85	2.15	3.85	2.15	3.85		
V_{t-}	Low Level Threshold Voltage	3.0		0.9		1.9	0.9	1.9	0.9	1.9		V
		4.5		1.35		2.75	1.35	2.75	1.35	2.75		
		5.5		1.65		3.35	1.65	3.35	1.65	3.35		
V_h	Hysteresis Voltage	3.0		0.3		1.2	0.3	1.2	0.3	1.2		V
		4.5		0.4		1.4	0.4	1.4	0.4	1.4		
		5.5		0.5		1.6	0.5	1.6	0.5	1.6		
V_{OH}	High Level Output Voltage	2.0	I_O=-50 µA	1.9	2.0		1.9		1.9			V
		3.0	I_O=-50 µA	2.9	3.0		2.9		2.9			
		4.5	I_O=-50 µA	4.4	4.5		4.4		4.4			
		3.0	I_O=-4 mA	2.58			2.48		2.4			
		4.5	I_O=-8 mA	3.94			3.8		3.7			
V_{OL}	Low Level Output Voltage	2.0	I_O=50 µA		0.0	0.1		0.1		0.1		V
		3.0	I_O=50 µA		0.0	0.1		0.1		0.1		
		4.5	I_O=50 µA		0.0	0.1		0.1		0.1		
		3.0	I_O=4 mA			0.36		0.44		0.55		
		4.5	I_O=8 mA			0.36		0.44		0.55		
I_I	Input Leakage Current	0 to 5.5	V_I = 5.5V or GND			± 0.1		± 1		± 1		µA
I_{CC}	Quiescent Supply Current	5.5	V_I = V_{CC} or GND			2		20		20		µA

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3ns$))

Symbol	Parameter	Test Condition			Value							Unit
		V_{CC} (V)	C_L (pF)		$T_A = 25°C$			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
t_{PLH} t_{PHL}	Propagation Delay Time	3.3(*)	15		8.3	12.8	1.0	15.0	1.0	15.0		ns
		3.3(*)	50		10.8	16.3	1.0	18.5	1.0	18.5		
		5.0(**)	15		5.5	8.6	1.0	10.0	1.0	10.0		
		5.0(**)	50		7.0	10.6	1.0	12.0	1.0	12.0		

(*) Voltage range is 3.3V ± 0.3V
(**) Voltage range is 5.0V ± 0.5V

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition	Value							Unit
			$T_A = 25°C$			-40 to 85°C		-55 to 125°C		
			Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
C_{IN}	Input Capacitance			6	10		10		10	pF
C_{PD}	Power Dissipation Capacitance (note 1)			14						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. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/6$ (per gate)

DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		$T_A = 25°C$			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{OLP}	Dynamic Low Voltage Quiet Output (note 1, 2)	5.0			0.3	0.8					V
V_{OLV}				-0.8	-0.3						
V_{IHD}	Dynamic High Voltage Input (note 1, 3)	5.0	$C_L = 50$ pF	3.5							V
V_{ILD}	Dynamic Low Voltage Input (note 1, 3)	5.0				1.5					V

1) Worst case package.
2) Max number of outputs defined as (n). Data inputs are driven 0V to 5.0V, (n-1) outputs switching and one output at GND.
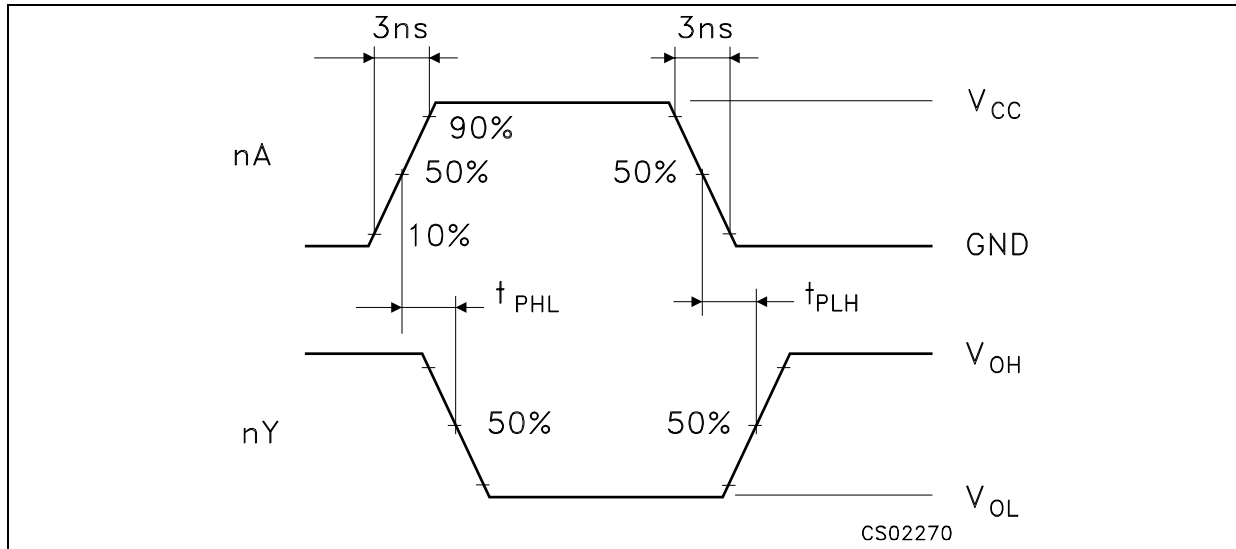3) Max number of data inputs (n) switching. (n-1) switching 0V to 5.0V. Inputs under test switching: 5.0V to threshold (V_{ILD}), 0V to threshold (V_{IHD}), f=1MHz.

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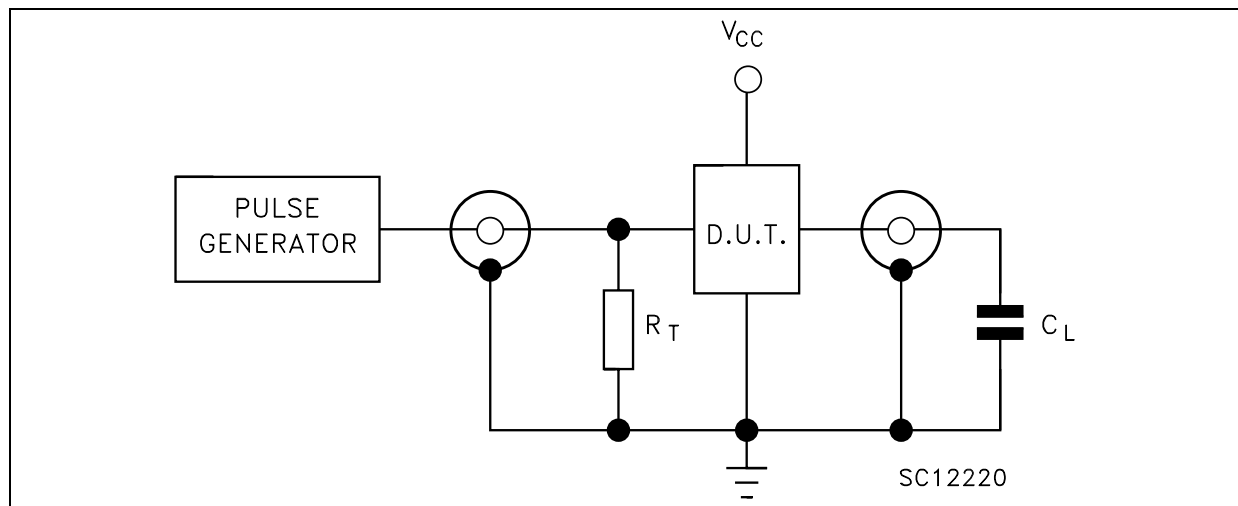
C_L =15/50pF or equivalent (includes jig and probe capacitance)
R_T = Z_{OUT} of pulse generator (typically 50Ω)

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

CS02270

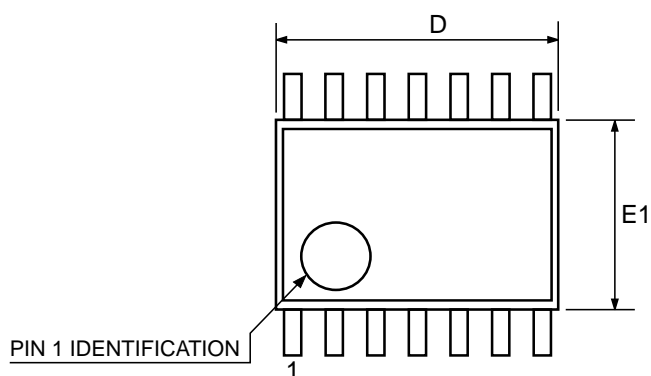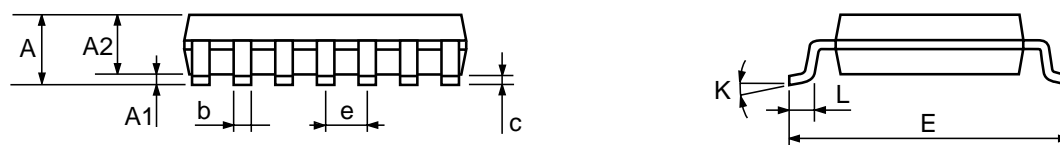## SO-14 MECHANICAL DATA

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.)					
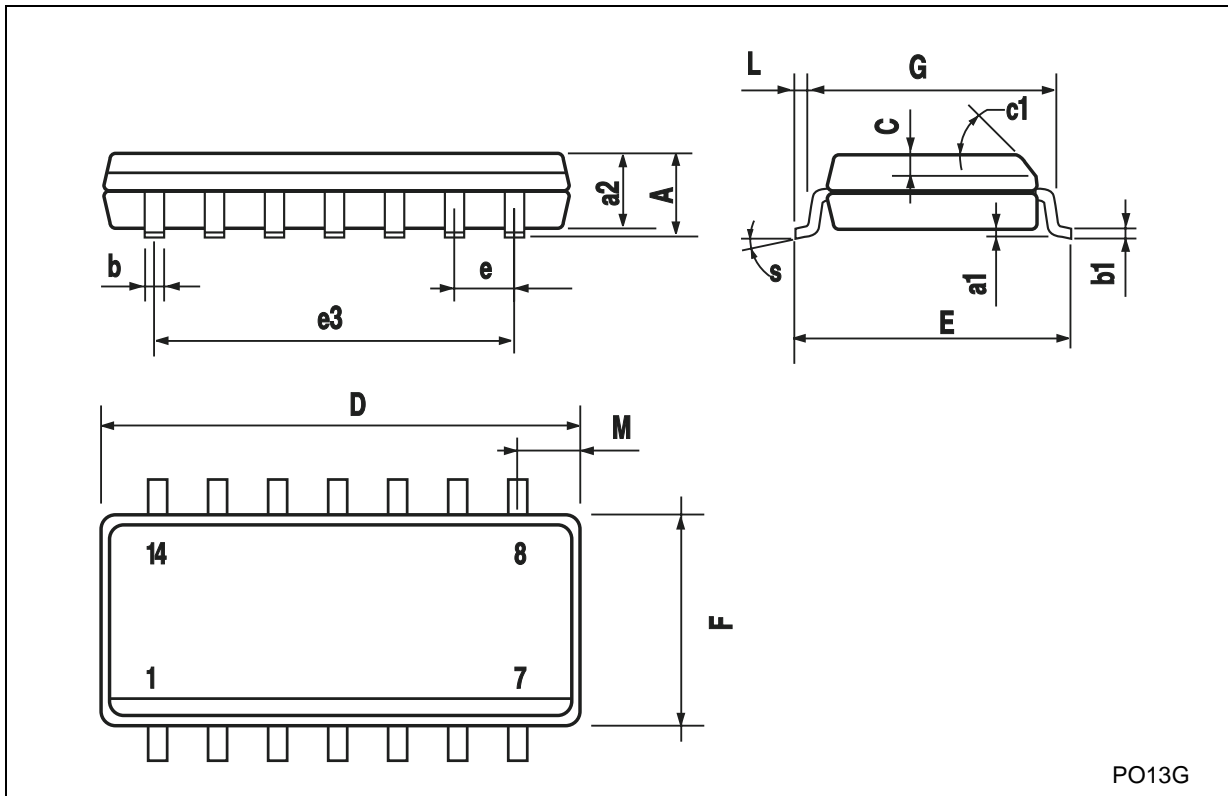
PO13G

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

PIN 1 IDENTIFICATION

0080337D