#### 1. **General description**

The 74HC30; 74HCT30 is an 8-input NAND gate. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V<sub>CC</sub>.

#### **Features and benefits** 2.

- Complies with JEDEC standard JESD7A
- Input levels:
  - For 74HC30: CMOS level
  - For 74HCT30: TTL level
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

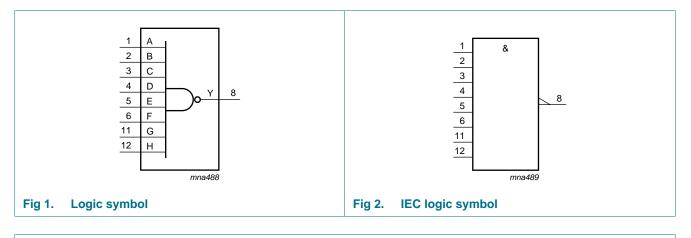
### **Ordering information** 3.

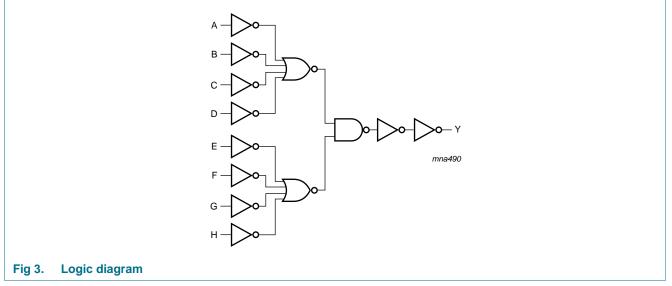
#### Table 1. **Ordering information**

Type number	Package				
	Temperature range	Name	Description	Version	
74HC30N	–40 °C to +125 °C	DIP14	plastic dual in-line package; 14 leads (300 mil)	SOT27-1	
74HCT30N					
74HC30D	–40 °C to +125 °C	SO14	plastic small outline package; 14 leads;	SOT108-1	
74HCT30D			body width 3.9 mm		
74HC30DB	–40 °C to +125 °C	SSOP14	plastic shrink small outline package; 14 leads; body	SOT337-1	
74HCT30DB			width 5.3 mm		
74HC30PW	–40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads;	SOT402-1	
74HCT30PW			body width 4.4 mm		



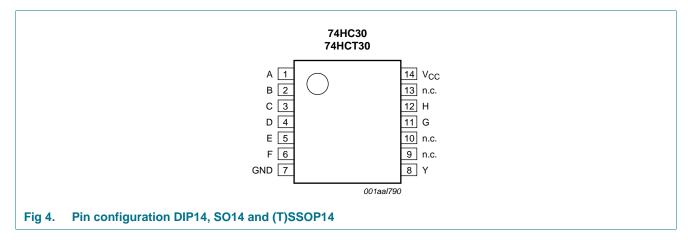
# 4. Functional diagram





# 5. Pinning information

### 5.1 Pinning



## 5.2 Pin description

Table 2.	Pin description	
Symbol	Pin	Description
A	1	data input
В	2	data input
С	3	data input
D	4	data input
E	5	data input
F	6	data input
GND	7	ground (0 V)
Y	8	data output
n.c.	9	not connected
n.c.	10	not connected
G	11	data input
Н	12	data input
n.c.	13	not connected
V <sub>CC</sub>	14	supply voltage

# 6. Functional description

### Table 3. Function table<sup>[1]</sup>

Input								Output
Α	В	С	D	Е	F	G	Н	Y
L	Х	Х	Х	Х	Х	Х	Х	Н
Х	L	Х	Х	Х	Х	Х	Х	Н
Х	Х	L	Х	Х	Х	Х	Х	Н
Х	Х	Х	L	Х	Х	Х	Х	Н
Х	Х	Х	Х	L	Х	Х	Х	Н
Х	Х	Х	Х	Х	L	Х	Х	Н
Х	Х	Х	Х	Х	Х	L	Х	Н
Х	Х	Х	Х	Х	Х	Х	L	Н
Н	Н	Н	Н	Н	Н	Н	Н	L

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care.

# 7. Limiting values

### Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

				.0	,
Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		-0.5	+7	V
I <sub>IK</sub>	input clamping current	$V_{\rm I}$ < -0.5 V or $V_{\rm I}$ > $V_{\rm CC}$ + 0.5 V	<u>[1]</u> _	±20	mA
I <sub>OK</sub>	output clamping current	$V_{\rm O}$ < –0.5 V or $V_{\rm O}$ > $V_{\rm CC}$ + 0.5 V	<u>[1]</u> _	±20	mA
Ι <sub>Ο</sub>	output current	$-0.5 \text{ V} < \text{V}_{\text{O}} < \text{V}_{\text{CC}} + 0.5 \text{ V}$	-	±25	mA
I <sub>CC</sub>	supply current		-	50	mA
I <sub>GND</sub>	ground current		-50	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation				
	DIP14 package		[2] _	750	mW
	SO14, (T)SSOP14 packages		[2] _	500	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For DIP14 package:  $P_{tot}$  derates linearly with 12 mW/K above 70 °C.

For SO14 package:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C. For (T)SSOP14 packages:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.

# 8. Recommended operating conditions

### Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	bol Parameter Conditions		74HC30			74HCT30			Unit
			Min	Тур	Max	Min	Тур	Max	
V <sub>CC</sub>	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
VI	input voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
Vo	output voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	-	+125	-40	-	+125	°C
$\Delta t / \Delta V$	input transition rise and fall rate	$V_{CC} = 2.0 V$	-	-	625	-	-	-	ns/V
		$V_{CC} = 4.5 V$	-	1.67	139	-	1.67	139	ns/V
		$V_{CC} = 6.0 V$	-	-	83	-	-	-	ns/V

# 9. Static characteristics

### Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		25 °C		–40 °C t	o +85 °C	–40 °C to	• +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HC30										
VIH	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
	input voltage	$V_{CC} = 4.5 V$	3.15	2.4	-	3.15	-	3.15	-	V
		$V_{CC} = 6.0 V$	4.2	3.2	-	4.2	-	4.2	-	V
V <sub>IL</sub>	LOW-level	$V_{CC} = 2.0 V$	-	0.8	0.5	-	0.5	-	0.5	V
	input voltage	$V_{CC} = 4.5 V$	-	2.1	1.35	-	1.35	-	1.35	V
		$V_{CC} = 6.0 V$	-	2.8	1.8	-	1.8	-	1.8	V
V <sub>OH</sub>	HIGH-level	$V_{I} = V_{IH} \text{ or } V_{IL}$								
	output voltage	$I_O = -20 \ \mu\text{A}; \ V_{CC} = 2.0 \ \text{V}$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_O = -20 \ \mu\text{A}; \ V_{CC} = 4.5 \ \text{V}$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -20 \ \mu A; \ V_{CC} = 6.0 \ V$	5.9	6.0	-	5.9	-	5.9	-	V
		$I_{O}$ = -4.0 mA; $V_{CC}$ = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		$I_{O}$ = -5.2 mA; $V_{CC}$ = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V <sub>OL</sub>	LOW-level	$V_I = V_{IH} \text{ or } V_{IL}$								
	output voltage	$I_{O}$ = 20 $\mu$ A; $V_{CC}$ = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \ \mu\text{A}; \ V_{CC} = 4.5 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \ \mu\text{A}; \ V_{CC} = 6.0 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_{O}$ = 4.0 mA; $V_{CC}$ = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		$I_{O} = 5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	0.16	0.26	-	0.33	-	0.4	V
lı	input leakage current	$V_{I} = V_{CC} \text{ or GND};$ $V_{CC} = 6.0 \text{ V}$	-	-	±0.1	-	±1	-	±1	μA
I <sub>CC</sub>	supply current		-	-	2.0	-	20	-	40	μA

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Symbol	Parameter	Conditions		25 °C		–40 °C t	o +85 °C	–40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
CI	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT3	0									
V <sub>IH</sub>	HIGH-level input voltage	$V_{CC}$ = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
VIL	LOW-level input voltage	$V_{CC}$ = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
	output voltage	I <sub>O</sub> = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -4.0 \text{ mA}$	3.98	4.32	-	3.84	-	3.7	-	V
V <sub>OL</sub>	LOW-level	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
	output voltage	I <sub>O</sub> = 20 μA	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4.0 mA	-	0.15	0.26	-	0.33	-	0.4	V
lı	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 V$	-	-	±0.1	-	±1	-	±1	μΑ
I <sub>CC</sub>	supply current		-	-	2.0	-	20	-	40	μΑ
ΔI <sub>CC</sub>	additional supply current	per input pin; $V_I = V_{CC} - 2.4 \text{ V}; I_O = 0 \text{ A};$ other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5 \text{ V}$ to 5.5 V	-	60	216	-	275	-	294	μA
CI	input capacitance		-	3.5	-	-	-	-	-	pF

### Table 6. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

# **10. Dynamic characteristics**

### Table 7. Dynamic characteristics

 $GND = 0 V; C_L = 50 pF;$  for load circuit see <u>Figure 6</u>.

Symbol	Parameter	Conditions		25 °C			-40 °C to +125 °C		Unit
				Min	Тур	Max	Max (85 °C)	Max (125 °C)	_
74HC30									
t <sub>pd</sub> propagation delay		A, B, C, D, E, F, G, H to Y; see <u>Figure 5</u>	<u>[1]</u>						
		$V_{CC} = 2.0 V$		-	41	130	165	195	ns
		$V_{CC} = 4.5 V$		-	15	26	33	39	ns
		$V_{CC} = 5.0 \text{ V}; \text{ C}_{L} = 15 \text{ pF}$		-	12	-	-	-	ns
		$V_{CC} = 6.0 V$		-	12	22	28	33	ns
t <sub>t</sub>	transition time	see Figure 5	[2]						
		$V_{CC} = 2.0 V$		-	19	75	95	110	ns
		$V_{CC} = 4.5 V$		-	7	15	19	22	ns
		$V_{CC} = 6.0 V$		-	6	13	16	19	ns

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Symbol	Parameter	Conditions			25 °C		–40 °C to	o +125 ℃	Unit
				Min	Тур	Max	Max (85 °C)	Max (125 °C)	
C <sub>PD</sub>	power dissipation capacitance	per package; $V_1 = GND$ to $V_{CC}$	<u>[3]</u>	-	15	-	-	-	pF
74HCT30	D								
t <sub>pd</sub>	propagation delay	A, B, C, D, E, F, G, H to Y; see <u>Figure 5</u>	<u>[1]</u>						
		$V_{CC} = 4.5 V$		-	16	28	35	42	ns
		$V_{CC} = 5.0 \text{ V}; \text{ C}_{L} = 15 \text{ pF}$		-	12	-	-	-	ns
t <sub>t</sub>	transition time	$V_{CC}$ = 4.5 V; see <u>Figure 5</u>	[2]	-	7	15	19	22	ns
C <sub>PD</sub>	power dissipation capacitance	per package; V <sub>I</sub> = GND to V <sub>CC</sub> – 1.5 V	[3]	-	15	-	-	-	pF

### **Table 7. Dynamic characteristics** ... continued GND = 0 V: $C_1 = 50$ pE: for load circuit see Figure 6.

 $\label{eq:tpd} [1] \quad t_{pd} \text{ is the same as } t_{PHL} \text{ and } t_{PLH}.$ 

[2]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .

[3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in  $\mu$ W):

 $P_{D} = C_{PD} \times V_{CC}^{2} \times f_{i} \times N + \sum (C_{L} \times V_{CC}^{2} \times f_{o}) \text{ where:}$ 

 $f_i$  = input frequency in MHz;

 $f_o$  = output frequency in MHz;

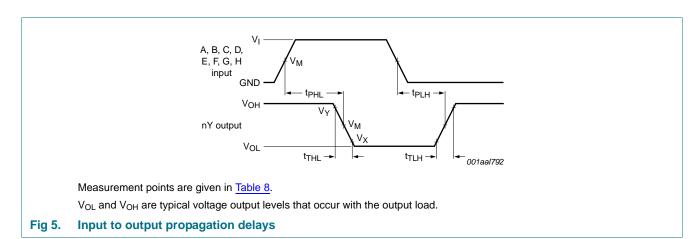
 $C_L$  = output load capacitance in pF;

 $V_{CC}$  = supply voltage in V;

N = number of inputs switching;

 $\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

# 11. Waveforms



### Table 8.Measurement points

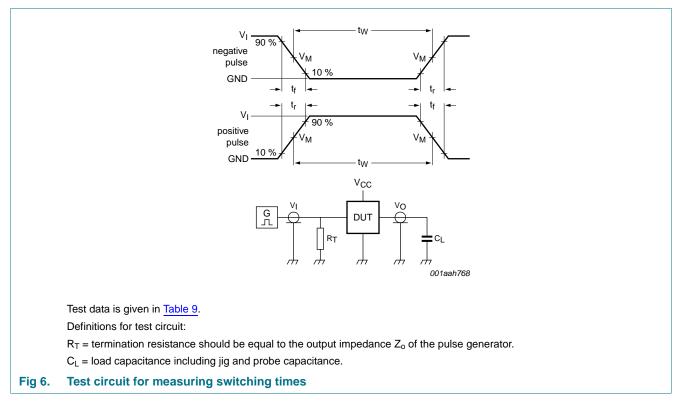
Туре	Input	Output	Output					
	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>				
74HC30	$0.5V_{CC}$	0.5V <sub>CC</sub>	0.1V <sub>CC</sub>	0.9V <sub>CC</sub>				
74HCT30	1.3 V	1.3 V	0.1V <sub>CC</sub>	0.9V <sub>CC</sub>				

74HC_HCT30		
Product	data	sheet

### **NXP Semiconductors**

# 74HC30; 74HCT30

### 8-input NAND gate



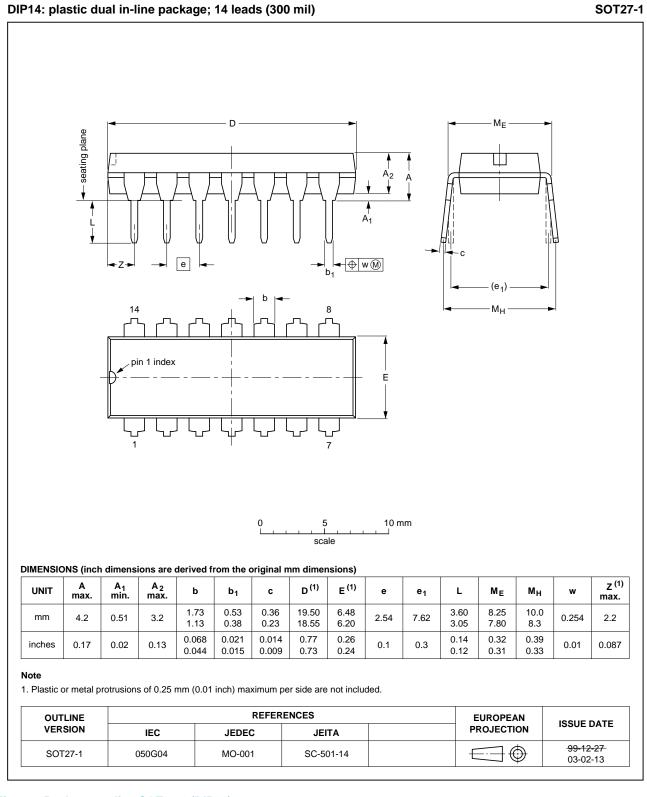
### Table 9. Test data

Туре	Input L		Load	Test	
	VI	t <sub>r</sub> , t <sub>f</sub>	CL		
74HC30	V <sub>CC</sub>	6.0 ns	15 pF, 50 pF	t <sub>PLH</sub> , t <sub>PHL</sub>	
74HCT30	3.0 V	6.0 ns	15 pF, 50 pF	t <sub>PLH</sub> , t <sub>PHL</sub>	

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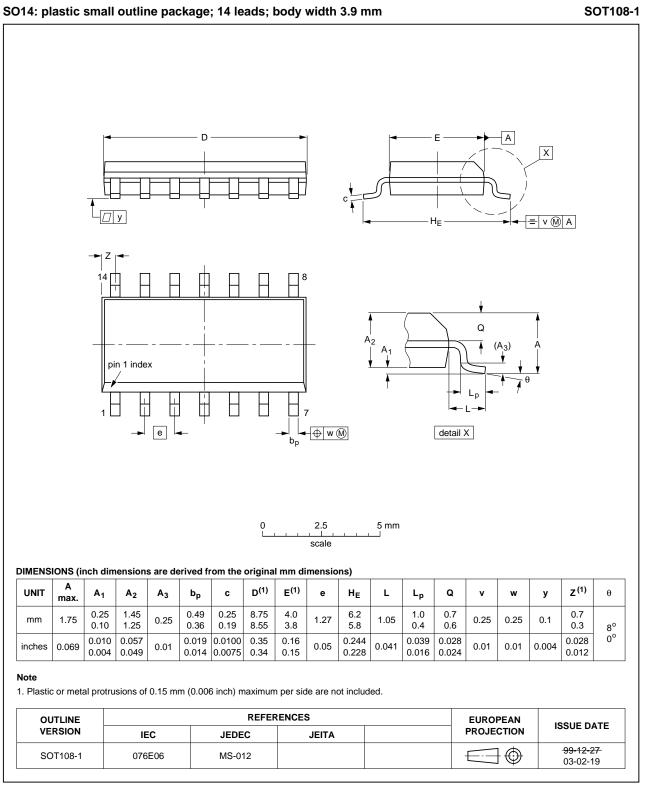
# 12. Package outline



### Fig 7. Package outline SOT27-1 (DIP14)

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Package outline SOT108-1 (SO14) Fig 8.

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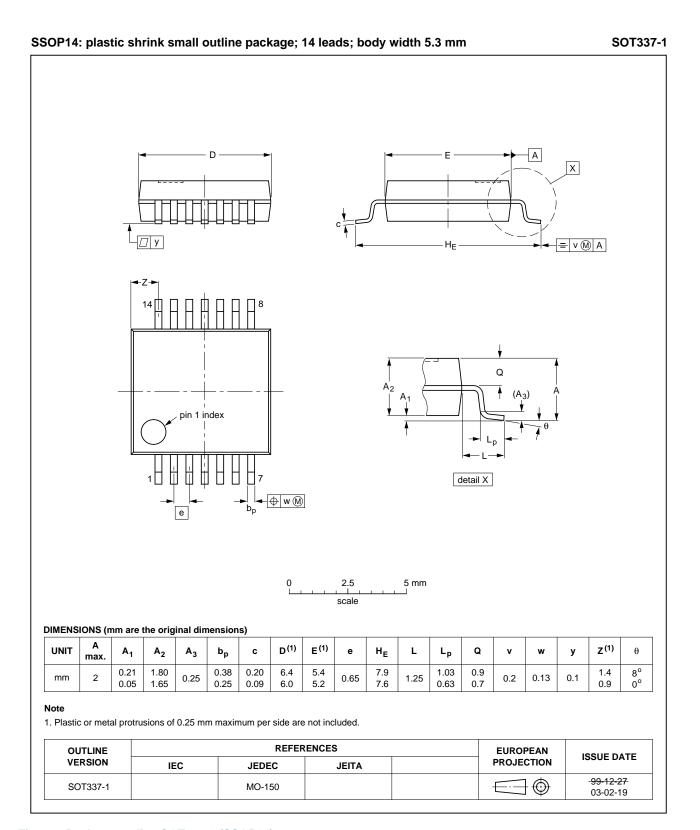


Fig 9. Package outline SOT337-1 (SSOP14)

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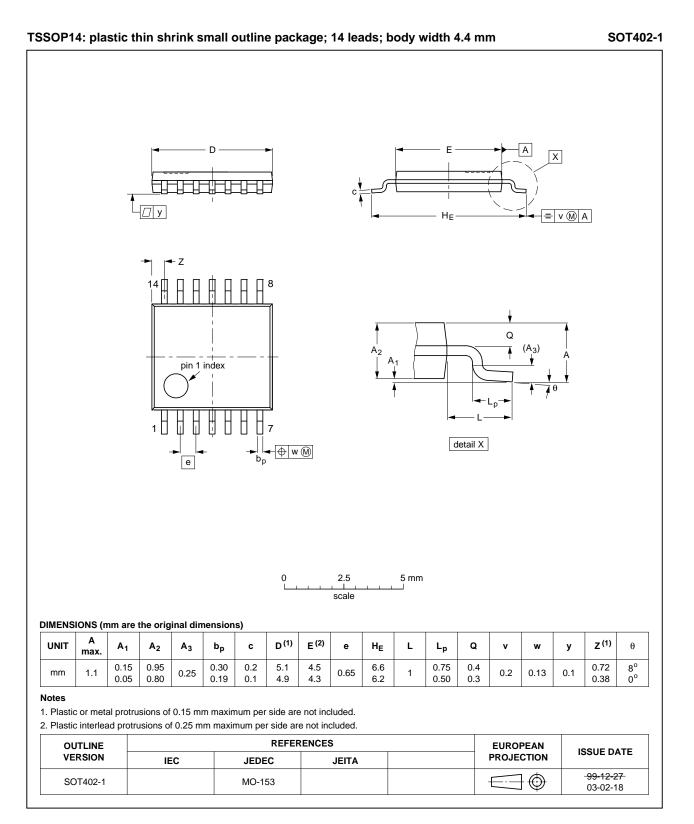


Fig 10. Package outline SOT402-1 (TSSOP14)

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74HC\_HCT30

# **13. Abbreviations**

Acronym CMOS	Description Complementary Metal-Oxide Semiconductor Device Under Test
CMOS	
	Davias Under Toot
DUT	Device Order Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
LSTTL	Low-power Schottky Transistor-Transistor Logic
MM	Machine Model
TTL	Transistor-Transistor Logic

# 14. Revision history

### Table 11.Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT30 v.6	20121227	Product data sheet	-	74HC_HCT30 v.5
Modifications:	<ul> <li>New generation</li> </ul>	al description.		
74HC_HCT30 v.5	20111213	Product data sheet	-	74HC_HCT30 v.4
Modifications:	<ul> <li>Legal pages updated.</li> </ul>			
74HC_HCT30 v.4	20100504	Product data sheet	-	74HC_HCT30 v.3
74HC_HCT30 v.3	20100420	Product data sheet	-	74HC_HCT30 v.2
74HC_HCT30 v.2	19970829	Product specification	-	-

# 15. Legal information

### 15.1 Data sheet status

Document status[1][2]	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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[2] The term 'short data sheet' is explained in section "Definitions".

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### 8-input NAND gate

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