# 74HC30; 74HCT30

# 8-input NAND gate Rev. 8 — 9 February 2021

**Product data sheet** 

### 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  $V_{CC}$ .

### 2. Features and benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- · High noise immunity
- · Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
  - JESD8C (2.7 V to 3.6 V)
  - JESD7A (2.0 V to 6.0 V)
- 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

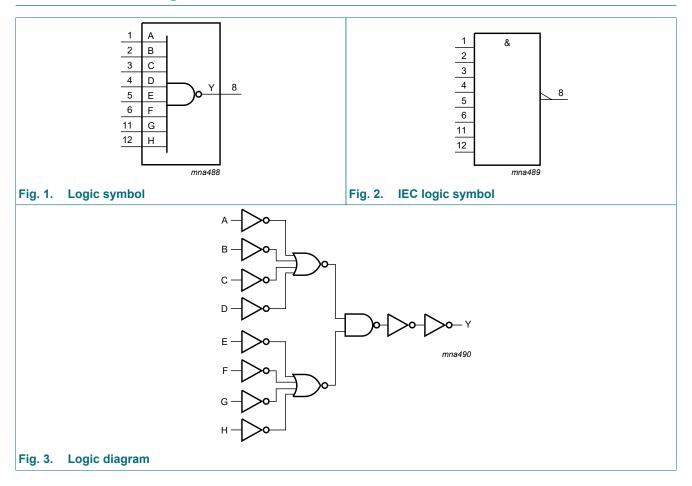
# 3. Ordering information

**Table 1. Ordering information** 

Type number	Package				
	Temperature range	Name	Description	Version	
74HC30D	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads;	SOT108-1	
74HCT30D			body width 3.9 mm		
74HCT30DB			plastic shrink small outline package; 14 leads; body width 5.3 mm	SOT337-1	
74HC30PW	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads;	SOT402-1	
74HCT30PW			body width 4.4 mm		

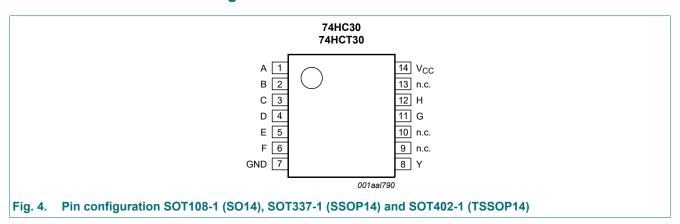


# 4. Functional diagram



# 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)
Υ	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

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level; \ X = don't \ care.$ 

Input								Output
Α	В	С	D	E	F	G	Н	Υ
L	X	Х	Χ	X	Χ	Χ	Χ	Н
X	L	Х	Χ	Х	Χ	Х	X	Н
Χ	X	L	Χ	Χ	Χ	Χ	Χ	Н
X	Х	Х	L	X	Χ	Х	X	Н
X	Х	Х	Χ	L	Χ	Х	Χ	Н
Χ	Х	X	Χ	X	L	Х	Х	Н
X	Х	X	Χ	X	Χ	L	Х	Н
X	Х	X	Χ	X	Χ	Х	L	Н
Н	Н	Н	Н	Н	Н	Н	Н	L

# 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).

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>CC</sub>	supply voltage			-0.5	+7	V
I <sub>IK</sub>	input clamping current	$V_{I} < -0.5 \text{ V or } V_{I} > V_{CC} + 0.5 \text{ V}$	[1]	-	±20	mA
I <sub>OK</sub>	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$	[1]	-	±20	mA
Io	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		[2]	-	500	mW

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

For SOT402-1 (TSSOP14) package: Ptot derates linearly with 7.3 mW/K above 81 °C.

## 8. Recommended operating conditions

#### Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions		74HC30			)	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
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 2.0 V	-	-	625	-	-	-	ns/V
		V <sub>CC</sub> = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V <sub>CC</sub> = 6.0 V	-	-	83	-	-	-	ns/V

<sup>[2]</sup> For SOT108-1 (SO14) package: P<sub>tot</sub> derates linearly with 10.1 mW/K above 100 °C. For SOT337-1 (SSOP14) package: P<sub>tot</sub> derates linearly with 7.3 mW/K above 81 °C.

# 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 to	o +85 °C	-40 °C to	Unit	
			Min	Тур	Max	Min	Max	Min	Max	
74HC30	1		'			1				
V <sub>IH</sub>	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
	input voltage	V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V <sub>IL</sub>	LOW-level	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
	input voltage	V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V <sub>OH</sub>	HIGH-level	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
	output voltage	I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		$I_O = -4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.98	4.32	-	3.84	-	3.7	-	V
		$I_O = -5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.48	5.81	-	5.34	-	5.2	-	V
V <sub>OL</sub>	LOW-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	0.15	0.26	-	0.33	-	0.4	V
		I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
l <sub>l</sub>	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	±0.1	-	±1	-	±1	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0 \text{ V}$	-	-	2.0	-	20	-	40	μΑ
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	-	-	pF

Symbol	Parameter	Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to	+125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74HCT3	0					<u> </u>				
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 V$								
	output voltage	I <sub>O</sub> = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -4.0 mA	3.98	4.32	-	3.84	-	3.7	-	V
V <sub>OL</sub>	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 V$								
		Ι <sub>Ο</sub> = 20 μΑ	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4.0 mA	-	0.15	0.26	-	0.33	-	0.4	V
l <sub>l</sub>	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.1	-	±1	-	±1	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	2.0	-	20	-	40	μΑ
ΔI <sub>CC</sub>	additional supply current	per input pin; $V_1 = V_{CC} - 2.4 \text{ V}; I_O = 0 \text{ A};$ other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5 \text{ V}$ to 5.5 V		60	216	-	275	-	294	μА
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	-	-	pF

# 10. Dynamic characteristics

### **Table 7. Dynamic characteristics**

 $GND = 0 \ V; \ C_L = 50 \ pF;$  for test circuit see Fig. 6.

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				'						
t <sub>pd</sub>	propagation delay	A, B, C, D, E, F, G, H to Y; [1] see Fig. 5								
		V <sub>CC</sub> = 2.0 V	-	41	130	-	165	-	195	ns
		V <sub>CC</sub> = 4.5 V	-	15	26	-	33	-	39	ns
		V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF	-	12	-	-	-	-	-	ns
		V <sub>CC</sub> = 6.0 V	-	12	22	-	28	-	33	ns
t <sub>t</sub>	transition	see <u>Fig. 5</u> [2]								
	time	V <sub>CC</sub> = 2.0 V	-	19	75	-	95	-	110	ns
		V <sub>CC</sub> = 4.5 V	-	7	15	-	19	-	22	ns
		V <sub>CC</sub> = 6.0 V	-	6	13	-	16	-	19	ns
C <sub>PD</sub>	power dissipation capacitance	per package; [3] V <sub>I</sub> = GND to V <sub>CC</sub>	-	15	-	-	-	-	-	pF

Symbol	Parameter	Conditions		25 °C		-40 °C to	o +85 °C	-40 °C to	Unit	
			Min	Тур	Max	Min	Max	Min	Max	
<b>74HCT3</b>	0		•		•		'			
t <sub>pd</sub>	propagation delay	A, B, C, D, E, F, G, H to Y; [1] see <u>Fig. 5</u>								
		V <sub>CC</sub> = 4.5 V	-	16	28	-	35	-	42	ns
		V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF	-	12	-	-	-	-	-	ns
t <sub>t</sub>	transition time	$V_{CC} = 4.5 \text{ V}; \text{ see } \frac{\text{Fig. 5}}{}$ [2]	-	7	15	-	19	-	22	ns
C <sub>PD</sub>	power dissipation capacitance	per package; [3] V <sub>I</sub> = GND to V <sub>CC</sub> - 1.5 V	-	15	-	-	-	-	-	pF

- $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .
- $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ):

 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_o)$  where:

 $f_i$  = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

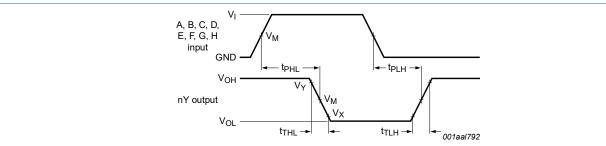
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

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

#### 10.1. Waveforms and test circuit



Measurement points are given in Table 8.

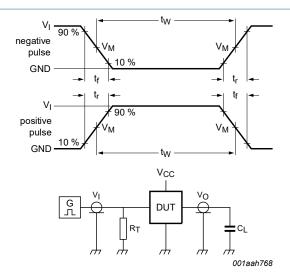
V<sub>OL</sub> and V<sub>OH</sub> are typical voltage output levels that occur with the output load.

Input to output propagation delays and output transition times

**Table 8. Measurement points** 

Туре	Input	Output						
	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>				
74HC30	0.5V <sub>CC</sub>	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>				

7/14



Test data is given in Table 9.

Definitions for test circuit:

 $R_{T}$  = termination resistance should be equal to the output impedance  $Z_{o}$  of the pulse generator.

 $C_L$  = load capacitance including jig and probe capacitance.

### Fig. 6. Test circuit for measuring switching times

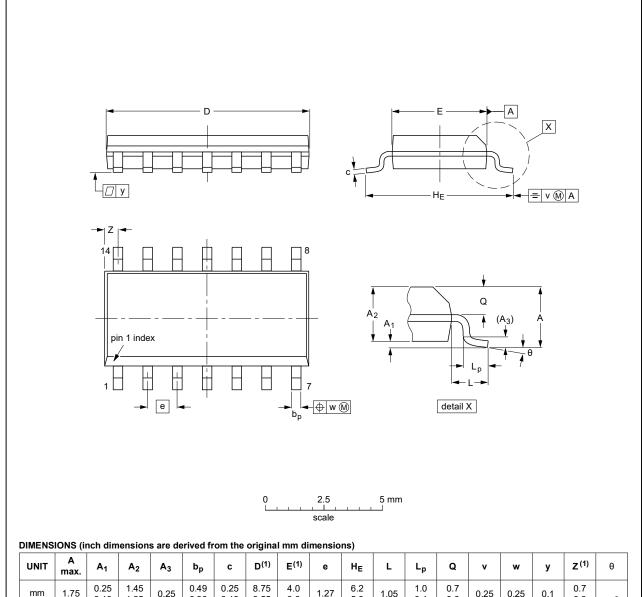
Table 9. Test data

Туре	Input		Load	Test
	V <sub>I</sub>	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>

# 11. Package outline

#### SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



	UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	bp	С	D <sup>(1)</sup>	E <sup>(1)</sup>	е	HE	L	Lp	Q	V	w	у	Z <sup>(1)</sup>	θ
	mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8°
i	nches	0.069	0.010 0.004	0.057 0.049	0.01		0.0100 0.0075	0.35 0.34	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	0°

#### Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN	ISSUE DATE
	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT108-1	076E06	MS-012				<del>99-12-27</del> 03-02-19

Fig. 7. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

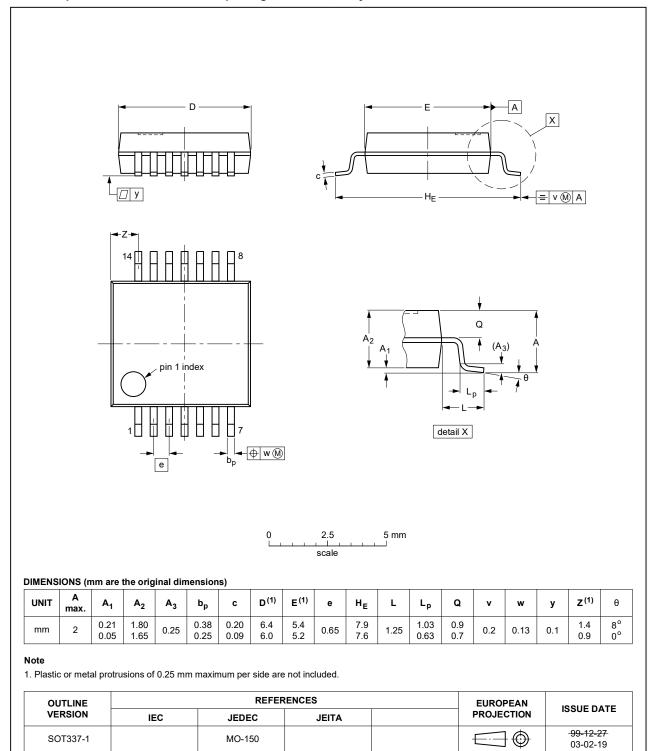
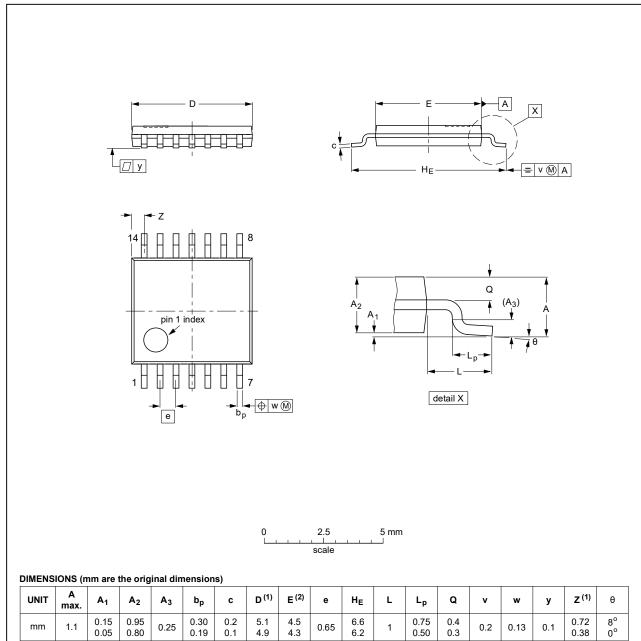


Fig. 8. Package outline SOT337-1 (SSOP14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1



### Notes

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE	REFERENCES				EUROPEAN	ISSUE DATE	
	VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
	SOT402-1		MO-153				<del>99-12-27</del> 03-02-18

Fig. 9. Package outline SOT402-1 (TSSOP14)

### 12. Abbreviations

#### **Table 10. Abbreviations**

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

# 13. Revision history

### Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74HC_HCT30 v.8	20210209	Product data sheet	-	74HC_HCT30 v.7		
Modifications:	Nexperia. Legal texts ha Section 2 upd Section 7: De	<ul> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><u>Section 2</u> updated.</li> <li><u>Section 7</u>: Derating values for P<sub>tot</sub> total power dissipation have changed.</li> </ul>				
74HC_HCT30 v.7	20151202	Product data sheet	-	74HC_HCT30 v.6		
Modifications:	Type numbers	Type numbers 74HC30N and 74HCT30N (SOT27-1) removed.				
74HC_HCT30 v.6	20121227	Product data sheet	-	74HC_HCT30 v.5		
Modifications:	New general	New general description.				
74HC_HCT30 v.5	20111213	Product data sheet	-	74HC_HCT30 v.4		
Modifications:	• Legal pages ι	updated.				
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	-	-		

### 14. Legal information

#### **Data sheet status**

Document status [1][2]	Product status [3]	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.

- Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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