

# 74AHC30; 74AHCT30

## 8-input NAND gate

Rev. 4 — 22 July 2015

Product data sheet

### 1. General description

The 74AHC30; 74AHCT30 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL (LSTTL). It is specified in compliance with JEDEC standard No. 7-A.

The 74AHC30; 74AHCT30 provides an 8-input NAND function.

### 2. Features and benefits

- Balanced propagation delays
- All inputs have Schmitt-trigger actions
- Inputs accept voltages higher than  $V_{CC}$
- Input levels:
  - ◆ For 74AHC30: CMOS level
  - ◆ For 74AHCT30: TTL level
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101C exceeds 1000 V
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

### 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AHC30D	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74AHCT30D				
74AHC30PW	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74AHCT30PW				
74AHC30BQ	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	DHVQFN14	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body $2.5 \times 3 \times 0.85\text{ mm}$	SOT762-1
74AHCT30BQ				
74AHC30GU12	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	XQFN12	plastic, extremely thin quad flat package; no leads; 12 terminals; body $1.70 \times 2.00 \times 0.50\text{ mm}$	SOT1174-1



### 4. Marking

Table 2. Marking codes

Type number	Marking
74AHC30D	74AHC30D
74AHCT30D	74AHCT30D
74AHC30PW	AHC30
74AHCT30PW	AHCT30
74AHC30BQ	AHC30
74AHCT30BQ	AHT30
74AHC30GU12	A3 <sup>[1]</sup>

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

### 5. Functional diagram

*mna488*

Pin numbers are shown for SO14, TSSOP14 and DHVQFN14 packages only

**Fig 1. Logic symbol**

*mna489*

Pin numbers are shown for SO14, TSSOP14 and DHVQFN14 packages only

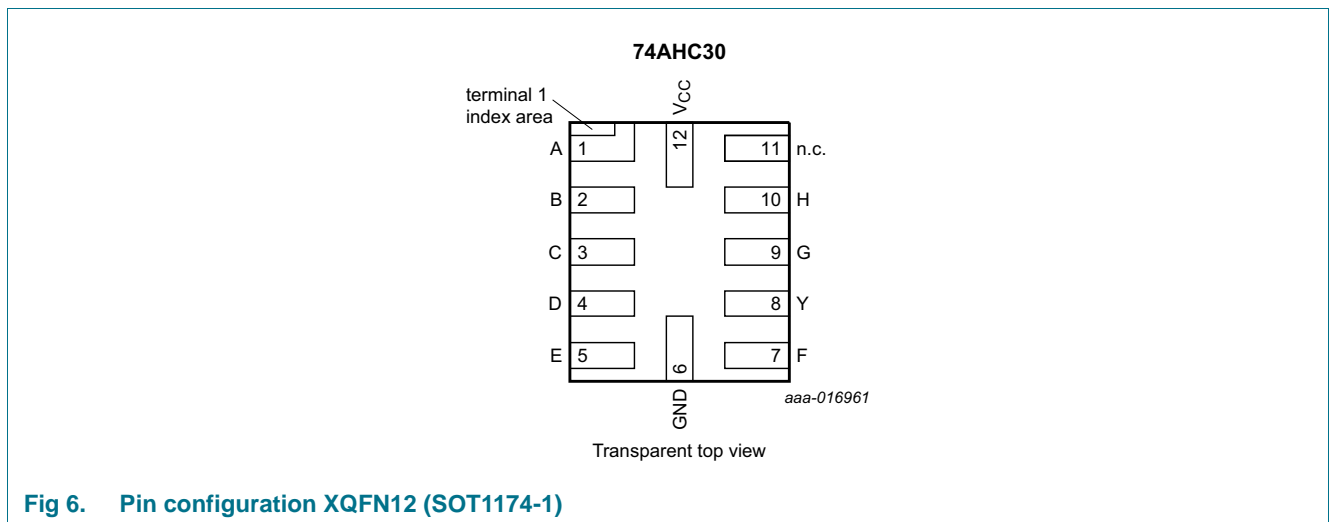
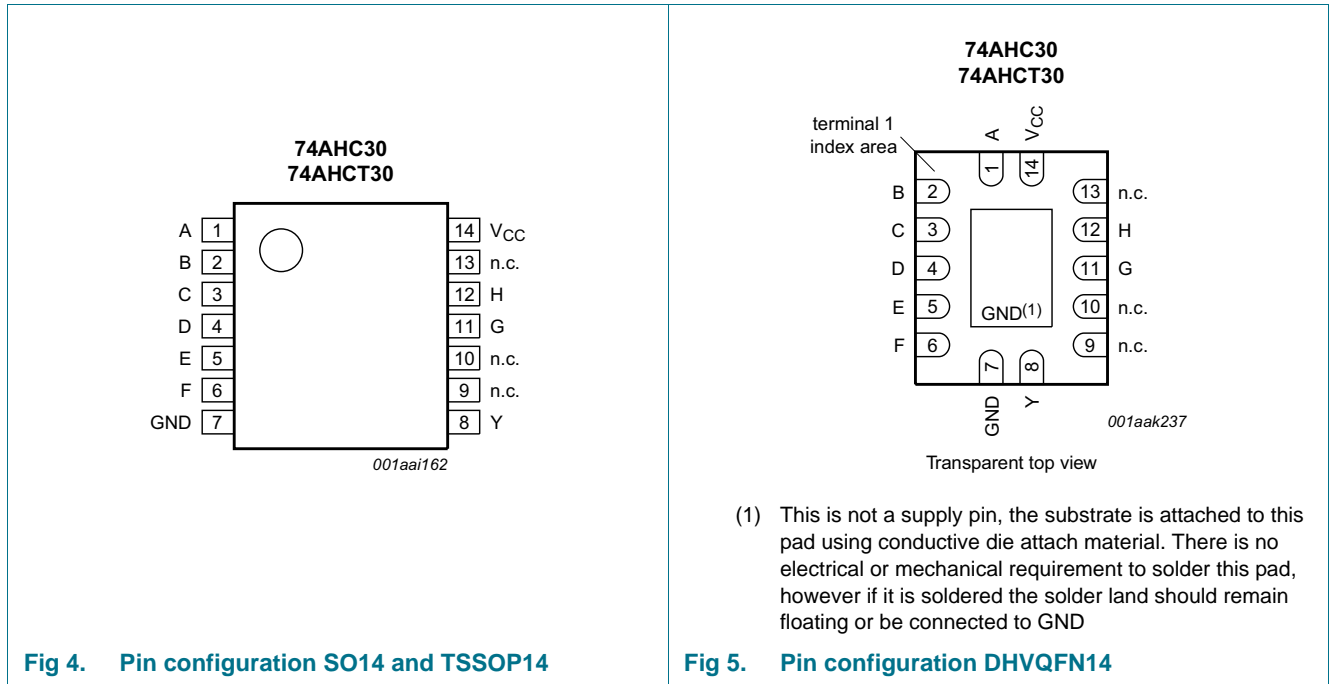
**Fig 2. IEC logic symbol**

*mna490*

**Fig 3. Logic diagram**

## 6. Pinning information

### 6.1 Pinning



## 6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	SO14, TSSOP14 and DHVQFN14	XQFN12	
A	1	1	data input
B	2	2	data input
C	3	3	data input
D	4	4	data input
E	5	5	data input
F	6	7	data input
GND	7	6	ground (0 V)
Y	8	8	data output
n.c.	9	-	not connected
n.c.	10	-	not connected
G	11	9	data input
H	12	10	data input
n.c.	13	11	not connected
V <sub>CC</sub>	14	12	supply voltage

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

Input								Output
A	B	C	D	E	F	G	H	Y
L	X	X	X	X	X	X	X	H
X	L	X	X	X	X	X	X	H
X	X	L	X	X	X	X	X	H
X	X	X	L	X	X	X	X	H
X	X	X	X	L	X	X	X	H
X	X	X	X	X	L	X	X	H
X	X	X	X	X	X	L	X	H
X	X	X	X	X	X	X	L	H
H	H	H	H	H	H	H	H	L

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

## 8. Limiting values

**Table 5. 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	+7.0	V
V <sub>I</sub>	input voltage		-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V [1]	-20	-	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V [1]	-20	+20	mA
I <sub>O</sub>	output current	V <sub>O</sub> = -0.5 V to (V <sub>CC</sub> + 0.5 V)	-25	+25	mA
I <sub>CC</sub>	supply current		-	+75	mA
I <sub>GND</sub>	ground current		-75	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C			
		SO14, TSSOP14 and DHVQFN14 [2]	-	500	mW
		XQFN12	-	250	mW

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

[2] For SO14 packages: above 70 °C, the value of P<sub>tot</sub> derates linearly at 8 mW/K.

For TSSOP14 packages: above 60 °C, the value of P<sub>tot</sub> derates linearly at 5.5 mW/K.

For DHVQFN14 packages: above 60 °C, the value of P<sub>tot</sub> derates linearly at 4.5 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	74AHC30			74AHCT30			Unit
			Min	Typ	Max	Min	Typ	Max	
V <sub>CC</sub>	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
V <sub>I</sub>	input voltage		0	-	5.5	0	-	5.5	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 3.3 V ± 0.3 V	-	-	100	-	-	-	ns/V
		V <sub>CC</sub> = 5.0 V ± 0.5 V	-	-	20	-	-	20	ns/V

## 10. Static characteristics

**Table 7. Static characteristics**

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit					
			Min	Typ	Max	Min	Max	Min	Max						
<b>74AHC30</b>															
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	-	-	1.5	-	1.5	-	V					
		V <sub>CC</sub> = 3.0 V	2.1	-	-	2.1	-	2.1	-	V					
		V <sub>CC</sub> = 5.5 V	3.85	-	-	3.85	-	3.85	-	V					
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	-	0.5	-	0.5	-	0.5	V					
		V <sub>CC</sub> = 3.0 V	-	-	0.9	-	0.9	-	0.9	V					
		V <sub>CC</sub> = 5.5 V	-	-	1.65	-	1.65	-	1.65	V					
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>													
		I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V					
		I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V					
		I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V					
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.58	-	-	2.48	-	2.40	-	V					
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>													
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	-	0.1	V					
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 3.0 V	-	0	0.1	-	0.1	-	0.1	V					
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V					
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.36	-	0.44	-	0.55	V					
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA					
		I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	2.0	-	20	-	40	μA			
				C <sub>I</sub>	input capacitance	V <sub>I</sub> = V <sub>CC</sub> or GND	-	3	10	-	10	-	10	pF	
						C <sub>O</sub>	output capacitance	-	4	-	-	-	-	-	pF
								-	-	-	-	-	-	-	pF

**Table 7. Static characteristics ...continued**

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
<b>74AHCT30</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V								
		I <sub>O</sub> = -50 µA	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -8.0 mA	3.94	-	-	3.80	-	3.70	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V								
		I <sub>O</sub> = 50 µA	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	2.0	-	20	-	40	µA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other pins at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C <sub>I</sub>	input capacitance	V <sub>I</sub> = V <sub>CC</sub> or GND	-	3	10	-	10	-	10	pF
C <sub>O</sub>	output capacitance		-	4	-	-	-	-	-	pF

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	Min	Max	
<b>74AHC30</b>										
t <sub>pd</sub>	propagation delay	A, B, C, D, E, F, G, H to Y; see <a href="#">Figure 7</a> and <a href="#">8 [2]</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	5.0	9.5	1.0	11.0	1.0	12.0	ns
		C <sub>L</sub> = 50 pF	-	6.7	12.0	1.0	14.5	1.0	15.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	3.6	6.5	1.0	7.5	1.0	8.0	ns
		C <sub>L</sub> = 50 pF	-	4.9	8.0	1.0	9.5	1.0	10.5	ns
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[3]</sup>	-	10	-	-	-	-	-	pF

**Table 8. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	Min	Max	
<b>74AHCT30; V<sub>CC</sub> = 4.5 V to 5.5 V</b>										
t <sub>pd</sub>	propagation delay	A, B, C, D, E, F, G, H to Y; see <a href="#">Figure 7</a> and <a href="#">8</a> <sup>[2]</sup>								
		C <sub>L</sub> = 15 pF	-	3.3	6.5	1.0	7.5	1.0	8.0	ns
		C <sub>L</sub> = 50 pF	-	4.7	8.5	1.0	9.5	1.0	10.5	ns
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; <a href="#">[3]</a> V <sub>I</sub> = GND to V <sub>CC</sub>	-	12	-	-	-	-	-	pF

[1] Typical values are measured at nominal supply voltage (V<sub>CC</sub> = 3.3 V and V<sub>CC</sub> = 5.0 V).

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

[3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

f<sub>i</sub> = input frequency in MHz;

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

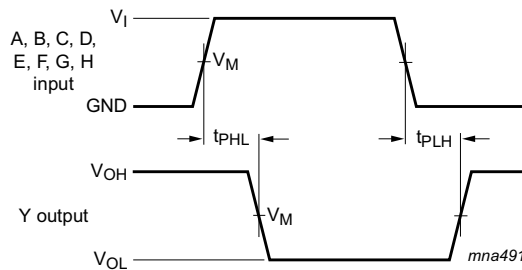
C<sub>L</sub> = output load capacitance in pF;

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

N = number of inputs switching;

∑(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

## 12. Waveforms



Measurement points are given in [Table 9](#).

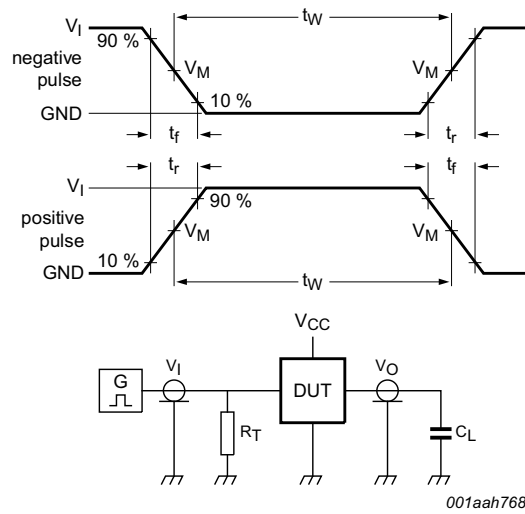
V<sub>OL</sub> and V<sub>OH</sub> are typical voltage output levels that occur with the output load.

**Fig 7. Input to output propagation delays**

**Table 9. Measurement points**

Type	Input	Output
	V <sub>M</sub>	V <sub>M</sub>
74AHC30	0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>
74AHCT30	1.5 V	0.5 × V <sub>CC</sub>





Test data is given in [Table 10](#).

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 8. Test circuit for measuring switching times**

**Table 10. Test data**

Type	Input		Load	Test
	$V_I$	$t_r, t_f$	$C_L$	
74AHC30	$V_{CC}$	$\leq 3.0$ ns	15 pF, 50 pF	$t_{PLH}, t_{PHL}$
74AHCT30	3.0 V	$\leq 3.0$ ns	15 pF, 50 pF	$t_{PLH}, t_{PHL}$

13. Package outline

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

SOT108-1

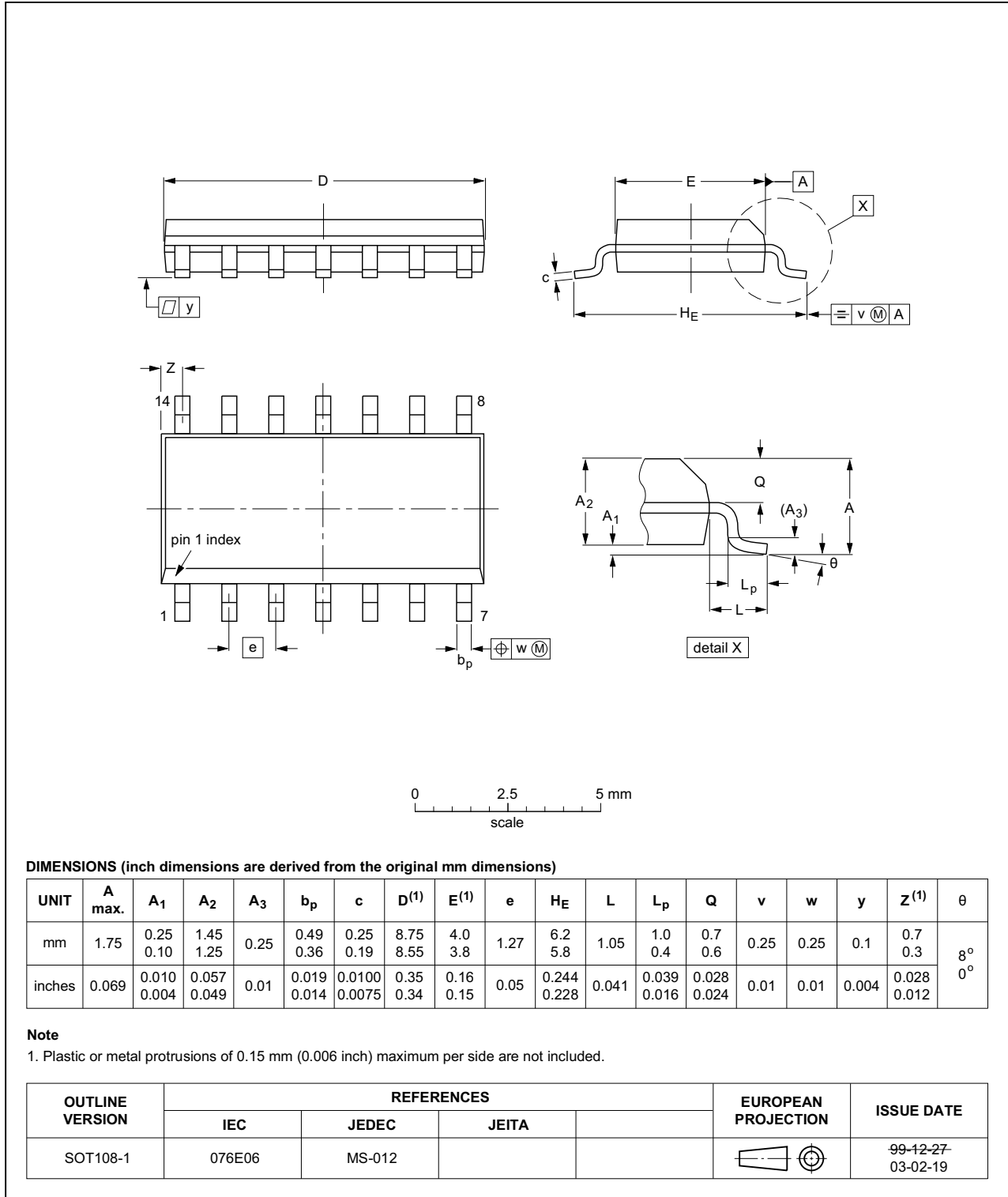


Fig 9. Package outline SOT108-1 (SO14)

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

SOT402-1

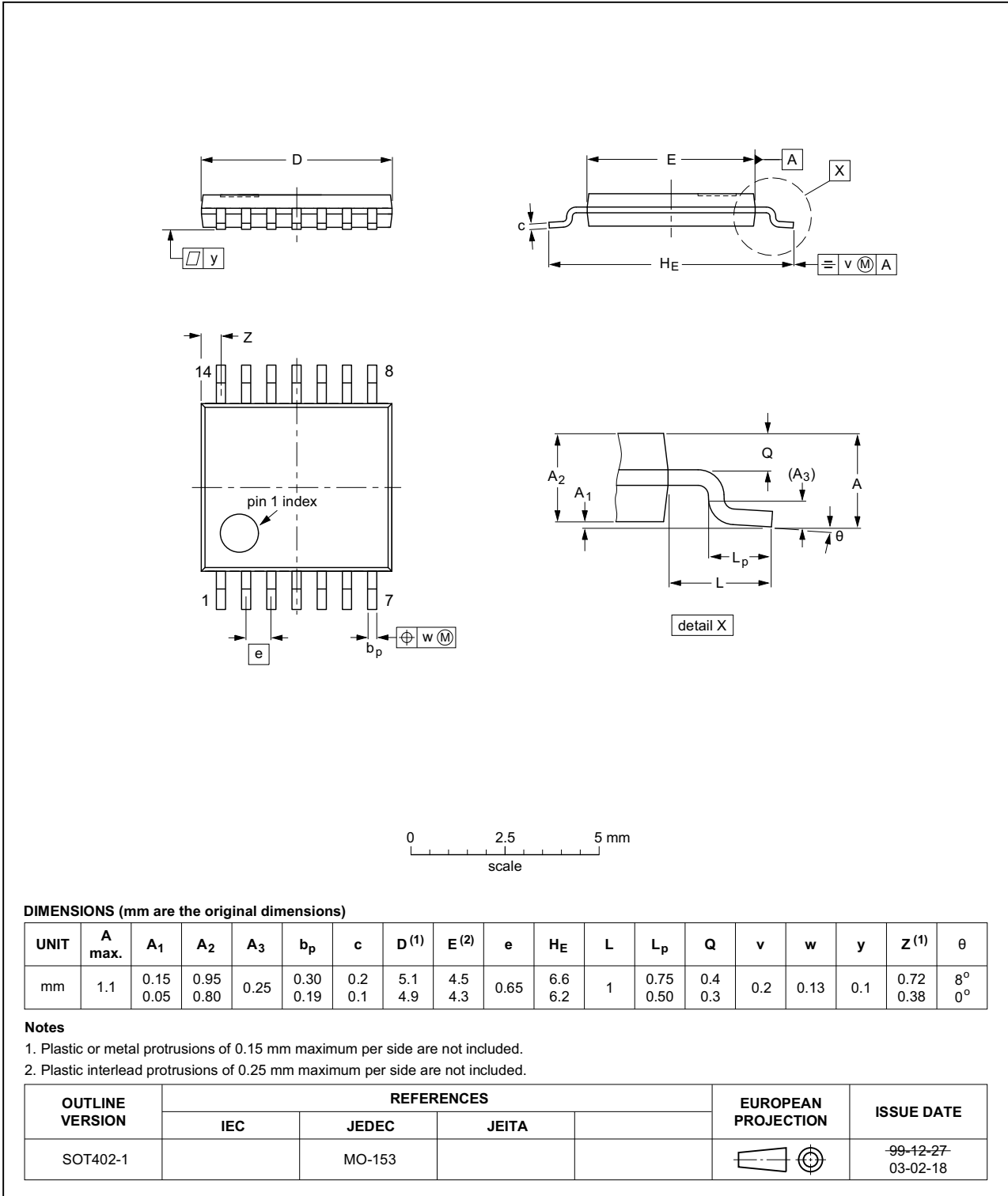


Fig 10. Package outline SOT402-1 (TSSOP14)

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1

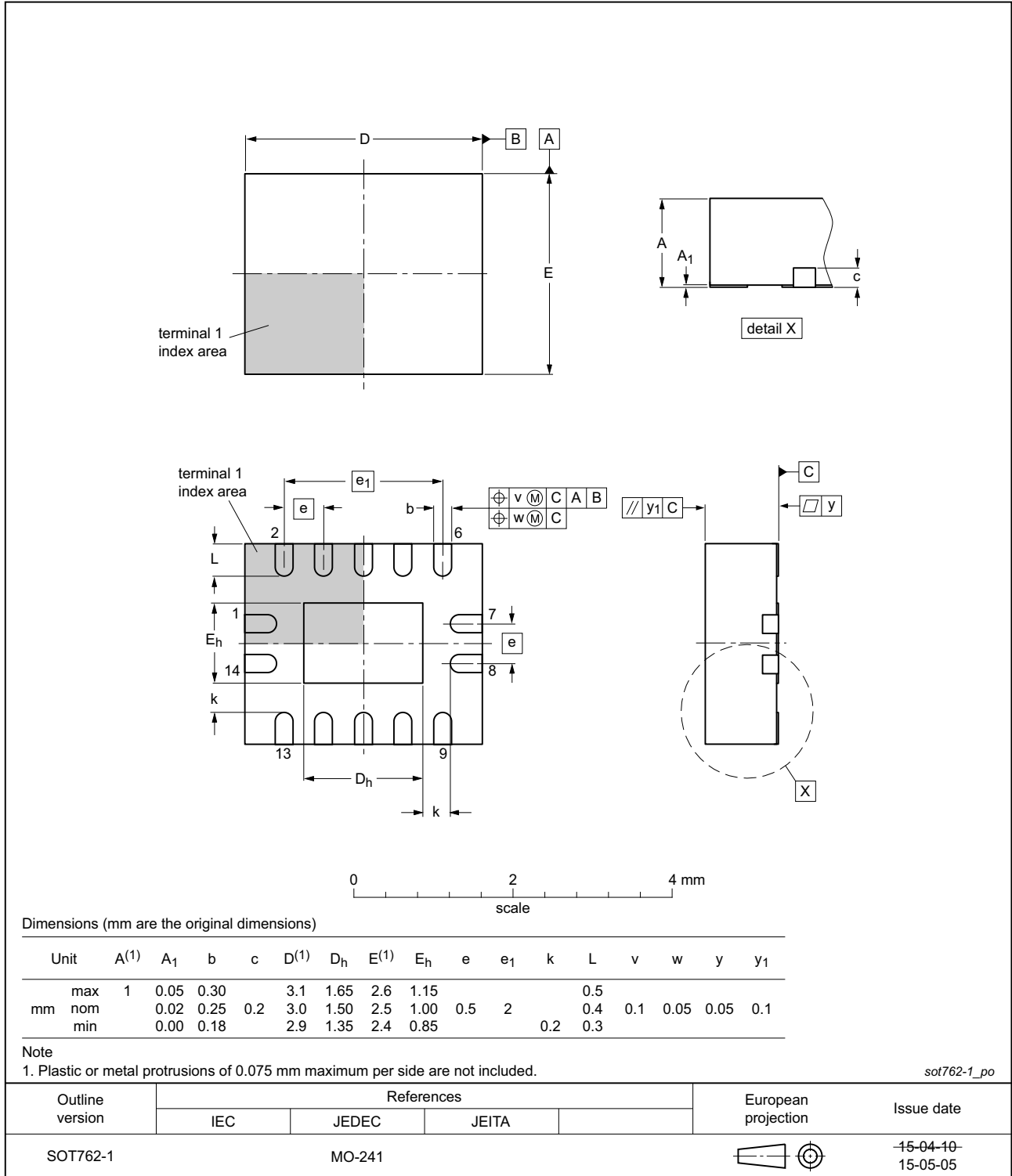


Fig 11. Package outline SOT762-1 (DHVQFN14)

XQFN12: plastic, extremely thin quad flat package; no leads;  
12 terminals; body 1.70 x 2.00 x 0.50 mm

SOT1174-1

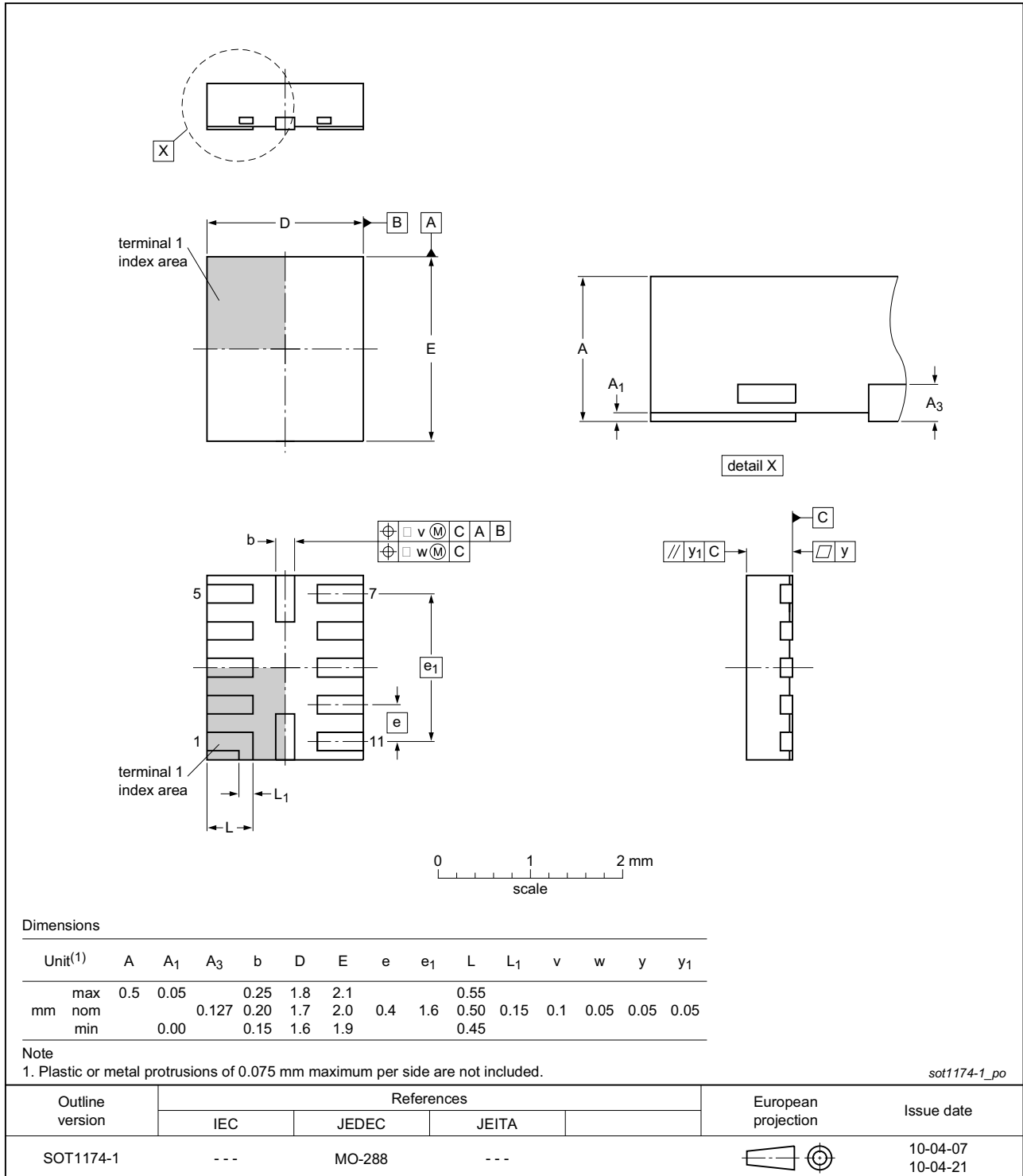


Fig 12. Package outline SOT1174-1 (XQFN12)

## 14. Abbreviations

Table 11. Abbreviations

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

## 15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT30 v.4	20150722	Product data sheet	-	74AHC_AHCT30 v.3
Modifications:	<ul style="list-style-type: none"> <li>Added type number 74AHC30GU12.</li> </ul>			
74AHC_AHCT30 v.3	20090626	Product data sheet	-	74AHC_AHCT30 v.2
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 3</a>: DHVQFN14 package added.</li> <li><a href="#">Section 8</a>: derating values added for DHVQFN14 package.</li> <li><a href="#">Section 13</a>: outline drawing added for DHVQFN14 package.</li> </ul>			
74AHC_AHCT30 v.2	20080530	Product data sheet	-	74AHC_AHCT30 v.1
74AHC_AHCT30 v.1	19991130	Product specification	-	-

## 16. Legal information

### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	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.

[1] Please consult the most recently issued document before initiating or completing a design.

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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