

# 74ABT04

## Hex inverter

Rev. 3 — 12 August 2016

Product data sheet

## 1. General description

The 74ABT04 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT04 is a hex inverter.

## 2. Features and benefits

- Latch-up protection exceeds 500 mA per JESD78B class II level A
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## 3. Ordering information

Table 1. Ordering information

Type number	Package				Version
	Temperature range	Name	Description		
74ABT04D	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	SO14	plastic small outline package; 14 leads; body width 3.9 mm		SOT108-1
74ABT04DB	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	SSOP14	plastic shrink small outline package; 14 leads; body width 5.3 mm		SOT337-1
74ABT04PW	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm		SOT402-1

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## 4. Functional diagram

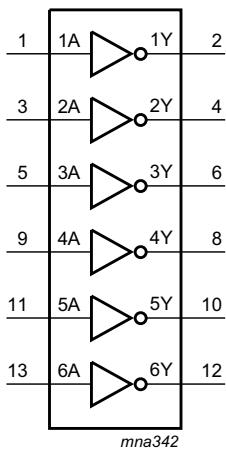


Fig 1. Logic symbol

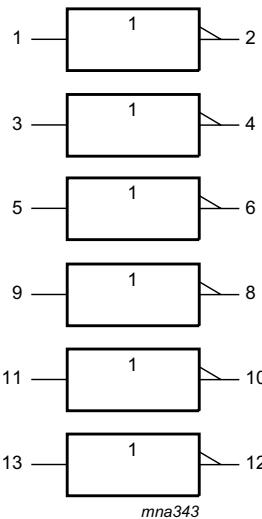


Fig 2. IEC logic symbol

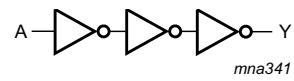


Fig 3. Logic diagram (one inverter)

## 5. Pinning information

### 5.1 Pinning

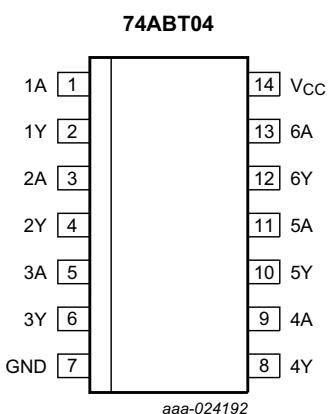


Fig 4. Pin configuration for SO14

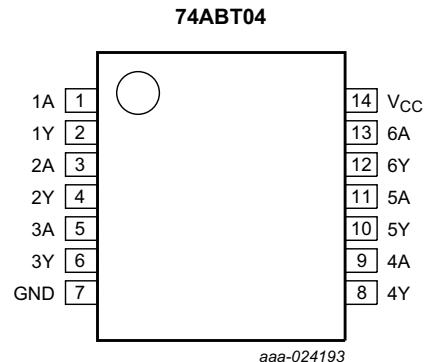


Fig 5. Pin configuration for SSOP14 and TSSOP14

## 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1A, 2A, 3A, 4A, 5A, 6A	1, 3, 5, 9, 11, 13	data input
1Y, 2Y, 3Y, 4Y, 5Y, 6Y	2, 4, 6, 8, 10, 12	data output
GND	7	ground (0 V)
V <sub>CC</sub>	14	supply voltage

## 6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level

Input	Output
nA	nY
L	H
H	L

## 7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
V <sub>CC</sub>	supply voltage		-0.5	+7.0	V	
V <sub>I</sub>	input voltage		[1]	-1.2	+7.0	V
V <sub>O</sub>	output voltage	output HIGH or LOW	[1]	-0.5	+5.5	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-18	-	mA	
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < 0 V	-50	-	mA	
I <sub>O</sub>	output current	output in LOW-state	-	40	mA	
T <sub>j</sub>	junction temperature		[2]	-	150	°C
T <sub>STG</sub>	storage temperature		-65	+150	°C	

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

[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

## 8. Recommended operating conditions

**Table 5. Operating conditions**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	supply voltage		4.5	-	5.5	V
V <sub>I</sub>	input voltage		0	-	V <sub>CC</sub>	V
V <sub>IH</sub>	HIGH-level input voltage		2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage		-	-	0.8	V
I <sub>OH</sub>	HIGH-level output current		-15	-	-	mA
I <sub>OL</sub>	LOW-level output current		-	-	20	mA
Δt/ΔV	input transition rise and fall rate		0	-	5	ns/V
T <sub>amb</sub>	ambient temperature	in free air	-40	-	+85	°C

## 9. Static characteristics

**Table 6. Static characteristics**

Symbol	Parameter	Conditions	25 °C		−40 °C to +85 °C		Unit		
			Min	Typ	Max	Min			
V <sub>IK</sub>	input clamping voltage	V <sub>CC</sub> = 4.5 V; I <sub>IK</sub> = −18 mA	−1.2	−0.9	-	−1.2	-	V	
V <sub>OH</sub>	HIGH-level output voltage	V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = −15 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	2.5	2.9	-	2.5	-	V	
V <sub>OL</sub>	LOW-level output voltage	V <sub>CC</sub> = 4.5 V; I <sub>OL</sub> = 20 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	-	0.35	0.5	-	0.5	V	
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or 5.5 V	-	±0.01	±1.0	-	±1.0	μA	
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V	-	±5.0	±100	-	±100	μA	
I <sub>CEx</sub>	output high leakage current	HIGH-state; V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or V <sub>CC</sub>	-	5.0	50	-	50	μA	
I <sub>O</sub>	output current	V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 2.5 V	[1]	−50	−75	−180	−50	−180	mA
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or V <sub>CC</sub>	-	2	50	-	50	μA	
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 5.5 V; one input at 3.4 V; other inputs at V <sub>CC</sub> or GND	[2]	-	0.25	500	-	500	μA
C <sub>I</sub>	input capacitance	V <sub>I</sub> = 0 V or V <sub>CC</sub>	-	3	-	-	-	pF	

[1] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

[2] This is the increase in supply current for each input at 3.4 V.

## 10. Dynamic characteristics

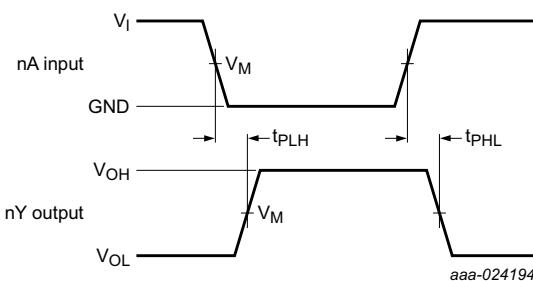
**Table 7. Dynamic characteristics**

GND = 0 V; for test circuit, see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C; V <sub>CC</sub> = 5.0 V			–40 °C to +85 °C; V <sub>CC</sub> = 5.0 V ± 0.5 V		Unit
			Min	Typ	Max	Min	Max	
t <sub>PLH</sub>	LOW to HIGH propagation delay	nA to nY; see <a href="#">Figure 6</a>	1.0	2.2	3.4	1.0	4.1	ns
t <sub>PHL</sub>	HIGH to LOW propagation delay	nA to nY; see <a href="#">Figure 6</a>	1.0	1.6	2.5	1.0	3.0	ns
t <sub>sk(o)</sub>	output skew time		[1]	-	0.4	0.5	-	0.5

[1] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

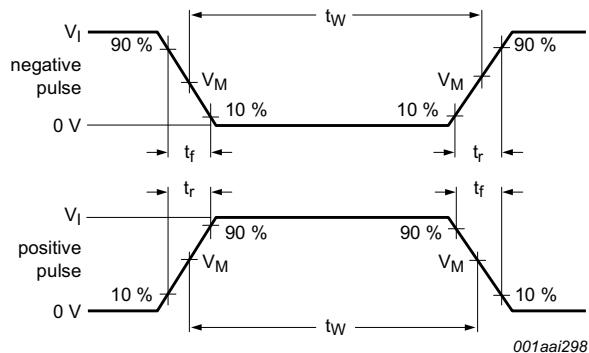
## 11. Waveforms



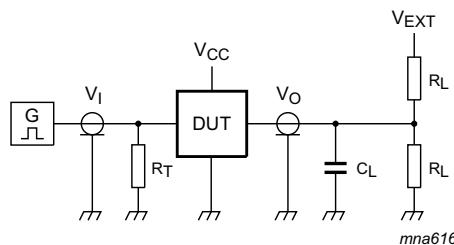
V<sub>M</sub> = 1.5 V

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

**Fig 6. Propagation delay input (nA) to output (nY) and output skew time**



a. Input pulse definition

Test data is given in [Table 8](#). $R_L$  = Load resistance. $C_L$  = Load capacitance including jig and probe capacitance. $R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator. $V_{EXT}$  = External voltage for measuring switching times.

b. Test circuit

Fig 7. Test circuit for measuring switching times

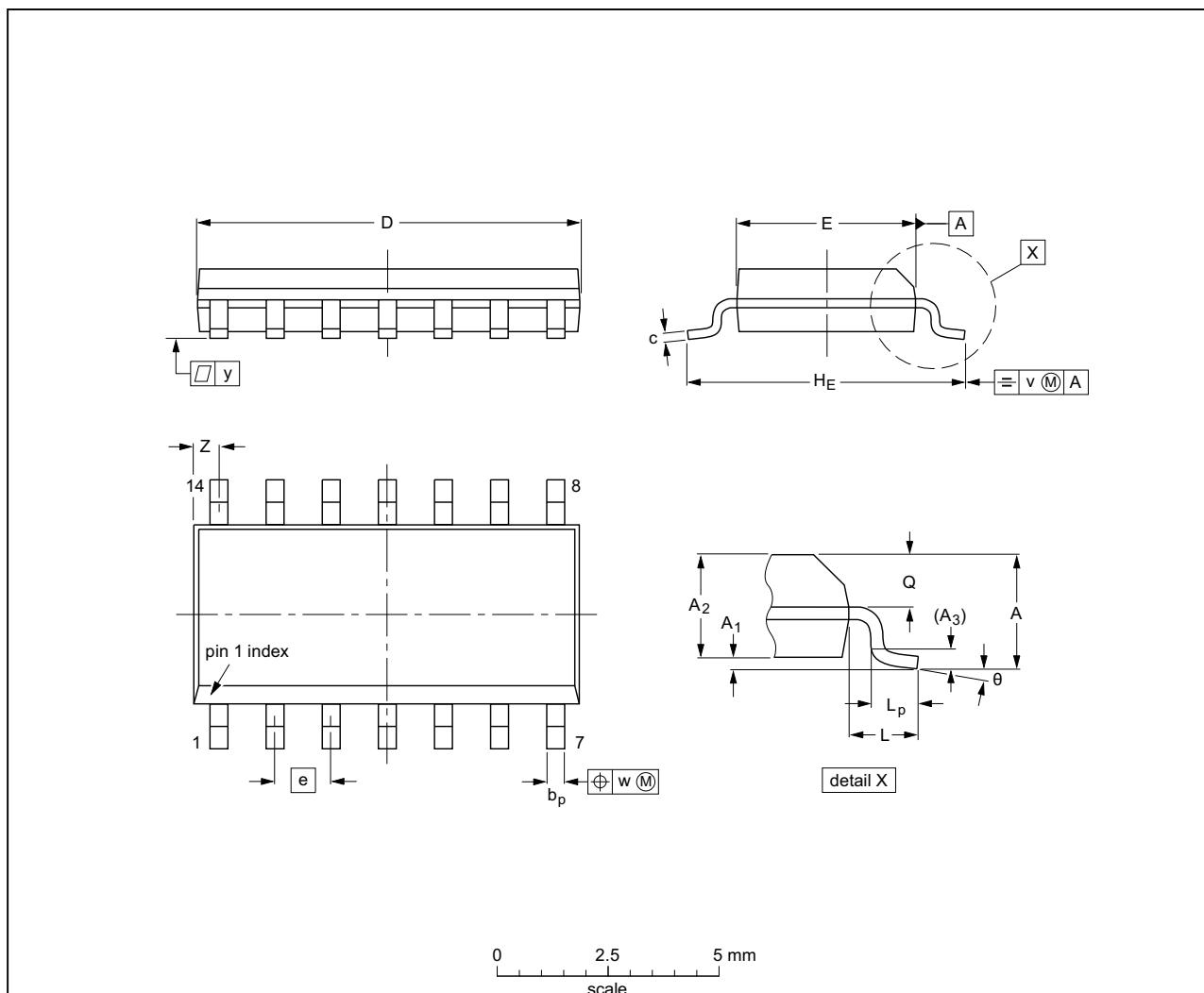
Table 8. Test data

Input				Load		$V_{EXT}$
$V_I$	$f_i$	$t_W$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$
3.0 V	1 MHz	500 ns	$\leq 2.5$ ns	50 pF	500 $\Omega$	open

## 12. Package outline

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

SOT108-1



### DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75 0.10	0.25 1.25	1.45	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° 0°
inches	0.069 0.004	0.010 0.049	0.057	0.01	0.019 0.014	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 PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT108-1	076E06	MS-012				99-12-27 03-02-19

Fig 8. Package outline SOT108-1 (SO14)

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

SOT337-1

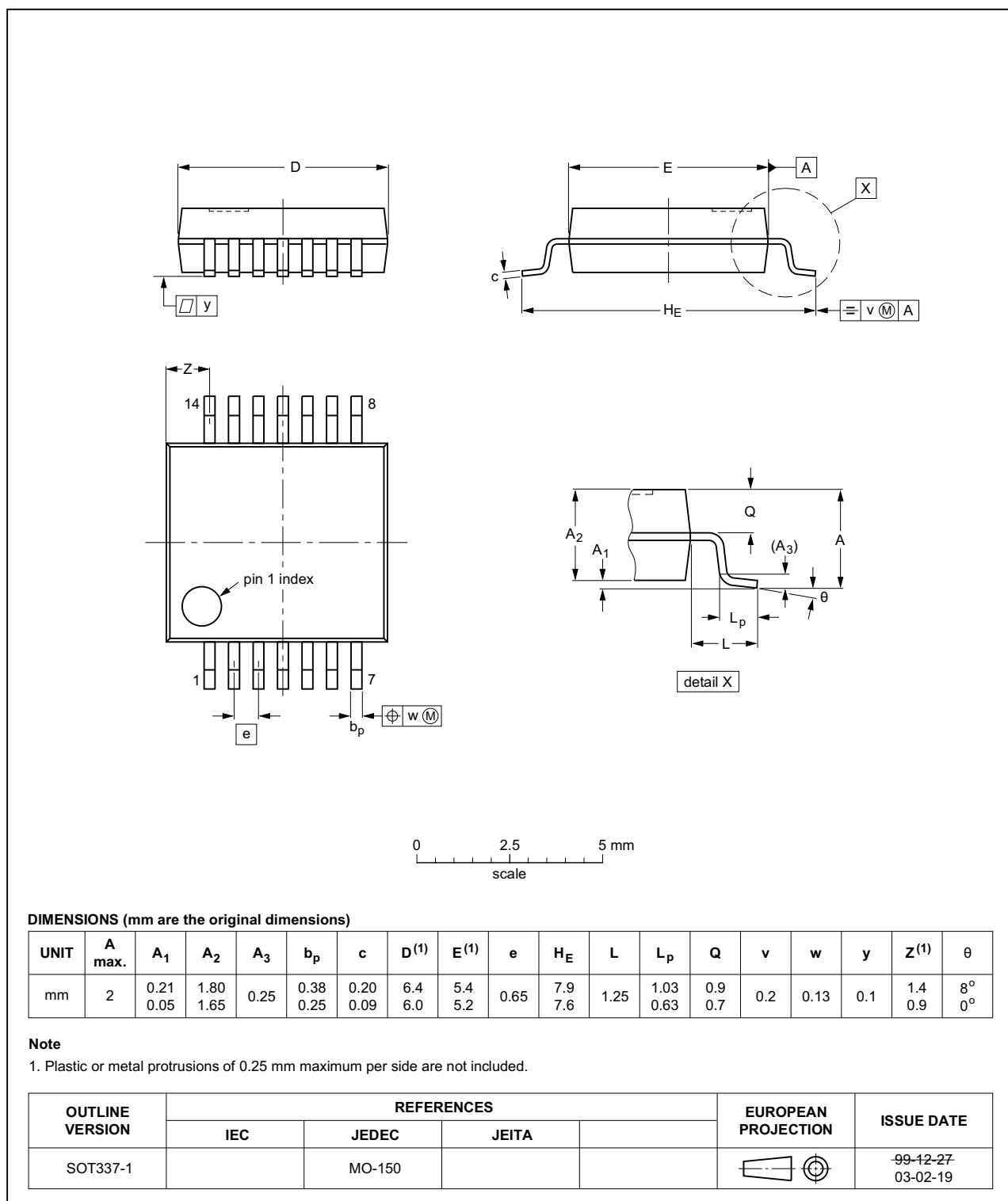


Fig 9. Package outline SOT337-1 (SSOP14)

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

SOT402-1

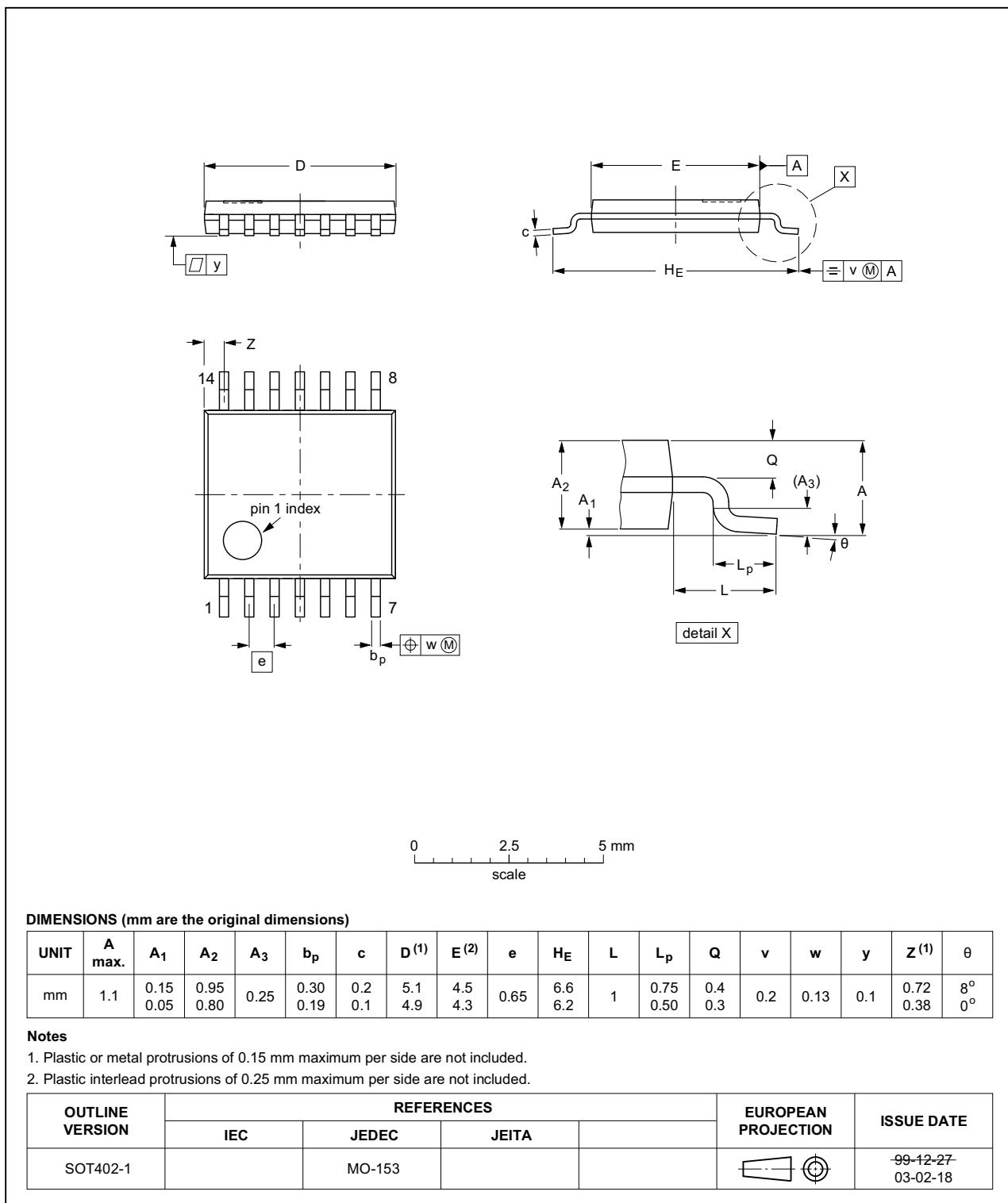


Fig 10. Package outline SOT402-1 (TSSOP14)

## 13. Abbreviations

**Table 9. Abbreviations**

Acronym	Description
BiCMOS	Bipolar Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

## 14. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ABT04 v.3	20160812	Product data sheet	-	74ABT04 v.2
Modifications:	<ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>Legal texts have been adapted to the new company name where appropriate.</li></ul>			
74ABT04 v.2	19950918	Product specification	-	-

## 15. Legal information

### 15.1 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".

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