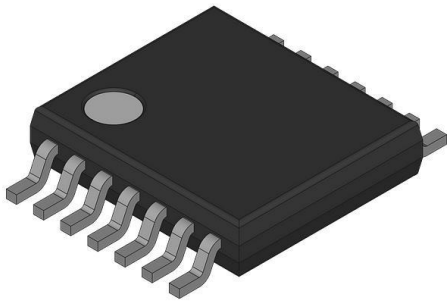


74AHC04PW,118 Datasheet

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DiGi Electronics Part Number	74AHC04PW,118-DG
Manufacturer	NXP Semiconductors
Manufacturer Product Number	74AHC04PW,118
Description	IC INVERTER 6CH 6-INP 14TSSOP
Detailed Description	Inverter IC 6 Channel 14-TSSOP



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Purchase and inquiry

Manufacturer Product Number:

74AHC04PW,118

Series:

74AHC

Logic Type:

Inverter

Number of Inputs:

6

Voltage - Supply:

2V ~ 5.5V

Current - Output High, Low:

8mA, 8mA

Input Logic Level - High:

1.5V ~ 3.85V

Operating Temperature:

-40°C ~ 125°C

Supplier Device Package:

14-TSSOP

Base Product Number:

74AHC04

Manufacturer:

NXP Semiconductors

Product Status:

Active

Number of Circuits:

6

Features:

-

Current - Quiescent (Max):

2 μ A

Input Logic Level - Low:

0.5V ~ 1.65V

Max Propagation Delay @ V, Max CL:

7.5ns @ 5V, 50pF

Mounting Type:

Surface Mount

Package / Case:

14-TSSOP (0.173", 4.40mm Width)

Environmental & Export classification

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

REACH Status:

REACH Unaffected

HTSUS:

8542.39.0001

74AHC04; 74AHCT04

Hex inverter

Rev. 9 — 5 February 2024

Product data sheet

1. General description

The 74AHC04; 74AHCT04 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 74AHC04; 74AHCT04 provides six inverting buffers.

2. Features and benefits

- Balanced propagation delays
- Inputs accept voltages higher than V_{CC}
- Input levels:
 - For 74AHC04: CMOS level
 - For 74AHCT04: TTL level
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 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			
	Temperature range	Name	Description	Version
74AHC04D 74AHCT04D	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74AHC04PW 74AHCT04PW	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74AHC04BQ 74AHCT04BQ	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	DHVQFN14	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body $2.5 \times 3 \times 0.85$ mm	SOT762-1

4. Functional diagram

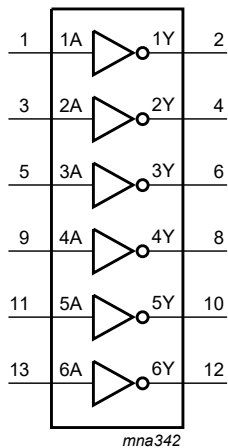


Fig. 1. Logic symbol

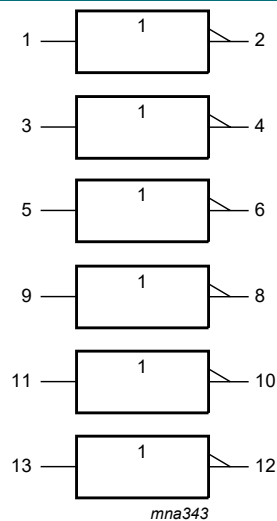


Fig. 2. IEC logic symbol

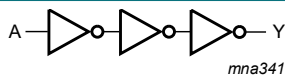
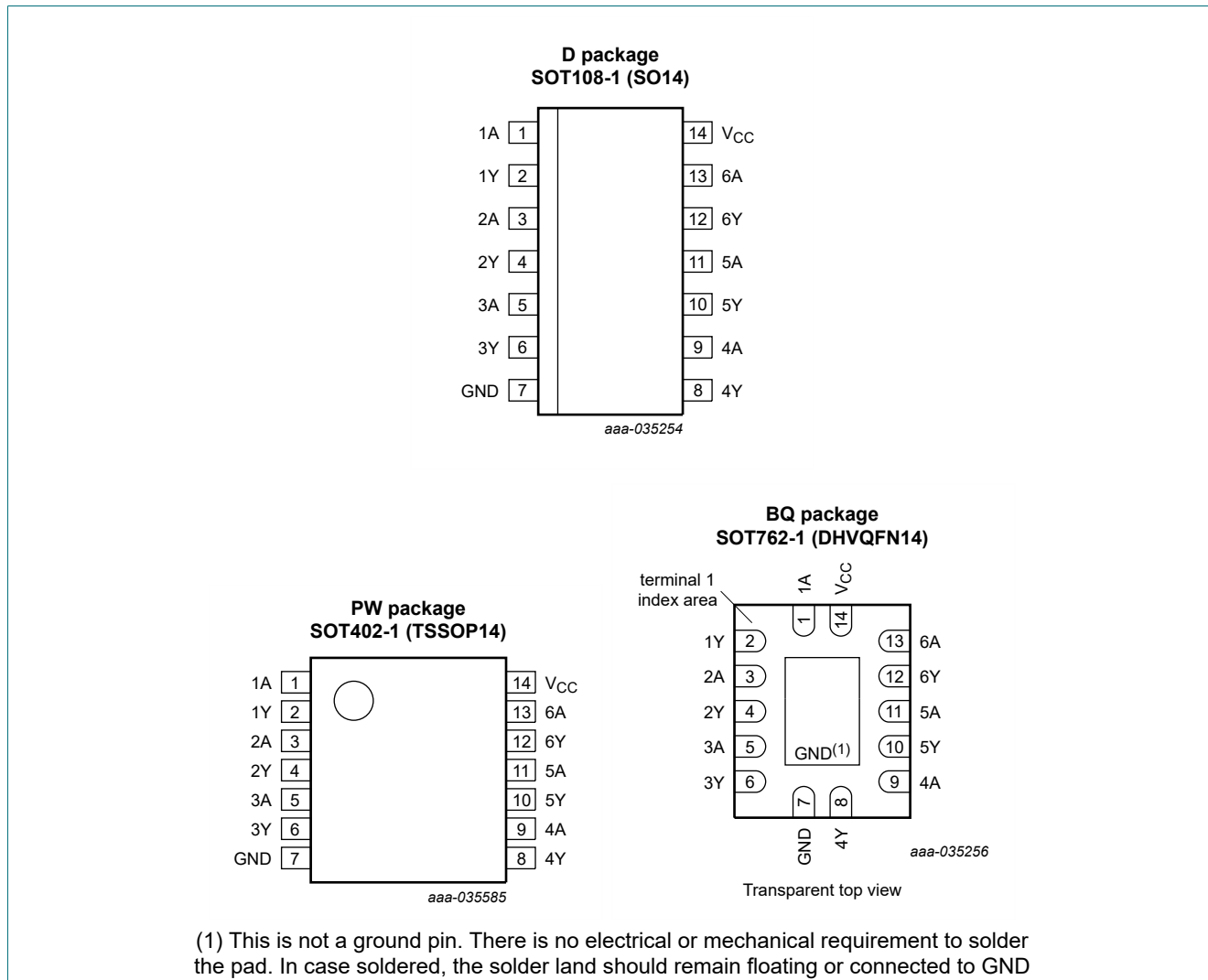


Fig. 3. Logic diagram (one inverter)

5. Pinning information

5.1. Pinning



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 _{CC}	14	supply voltage

6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level.

Input nA	Output nY
L	H
H	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_{CC}	supply voltage		-0.5	+7.0	V
V_I	input voltage		-0.5	+7.0	V
I_{IK}	input clamping current	$V_I < -0.5$ V [1]	-20	-	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V [1]	-20	+20	mA
I_O	output current	$V_O = -0.5$ V to $(V_{CC} + 0.5)$ V	-25	+25	mA
I_{CC}	supply current		-	+75	mA
I_{GND}	ground current		-75	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to $+125$ °C [2]	-	500	mW

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

[2] For SOT108-1 (SO14) package: P_{tot} derates linearly with 10.1 mW/K above 100 °C.
 For SOT402-1 (TSSOP14) package: P_{tot} derates linearly with 7.3 mW/K above 81 °C.
 For SOT762-1 (DHVQFN14) package: P_{tot} derates linearly with 9.6 mW/K above 98 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

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

Symbol	Parameter	Conditions	74AHC04			74AHCT04			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
V_I	input voltage		0	-	5.5	0	-	5.5	V
V_O	output voltage		0	-	V_{CC}	0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 3.3$ V \pm 0.3 V	-	-	100	-	-	-	ns/V
		$V_{CC} = 5.0$ V \pm 0.5 V	-	-	20	-	-	20	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 to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74AHC04										
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
		V _{CC} = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V _{CC} = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
		V _{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V _{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}								
		I _O = -50 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -50 μA; V _{CC} = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I _O = -50 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -4.0 mA; V _{CC} = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
I _O = -8.0 mA; V _{CC} = 4.5 V	3.94	-	-	3.80	-	3.70	-	V		
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}								
		I _O = 50 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 μA; V _{CC} = 3.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 4.0 mA; V _{CC} = 3.0 V	-	-	0.36	-	0.44	-	0.55	V
I _O = 8.0 mA; V _{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V		
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	2.0	-	20	-	40	μA
C _I	input capacitance	V _I = V _{CC} or GND	-	3	10	-	10	-	10	pF

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74AHCT04										
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		I _O = -50 µA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -8.0 mA	3.94	-	-	3.80	-	3.70	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		I _O = 50 µA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	µA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	2.0	-	20	-	40	µA
ΔI _{CC}	additional supply current	per input pin; V _I = V _{CC} - 2.1 V; other pins at V _{CC} or GND; I _O = 0 A; V _{CC} = 4.5 V to 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C _I	input capacitance	V _I = V _{CC} or GND	-	3	10	-	10	-	10	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 5.

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
74AHC04										
t _{pd}	propagation delay	nA to nY; see Fig. 4 [2]								
		V _{CC} = 3.0 V to 3.6 V								
		C _L = 15 pF	-	4.0	8.5	1.0	10.5	1.0	11.0	ns
		C _L = 50 pF	-	6.0	11.4	1.0	13	1.0	14.5	ns
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	3.0	5.5	1.0	6.5	1.0	7.0	ns
		C _L = 50 pF	-	4.5	7.5	1.0	8.5	1.0	9.5	ns
C _{PD}	power dissipation capacitance	f _i = 1 MHz; V _I = GND to V _{CC} [3]	-	13.5	-	-	-	-	-	pF
74AHCT04										
t _{pd}	propagation delay	nA to nY; see Fig. 4 [2]								
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	3.0	6.7	1.0	7.5	1.0	8.5	ns
		C _L = 50 pF	-	4.5	7.7	1.0	8.5	1.0	10.0	ns
C _{PD}	power dissipation capacitance	f _i = 1 MHz; V _I = GND to V _{CC} [3]	-	13.9	-	-	-	-	-	pF

[1] Typical values are measured at nominal supply voltage (V_{CC} = 3.3 V and V_{CC} = 5.0 V).

[2] t_{pd} is the same as t_{PLH} and t_{PHL}.

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

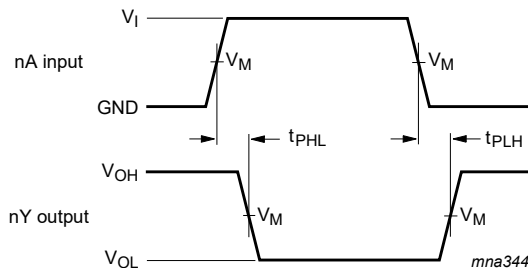
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

10.1. Waveforms and test circuit



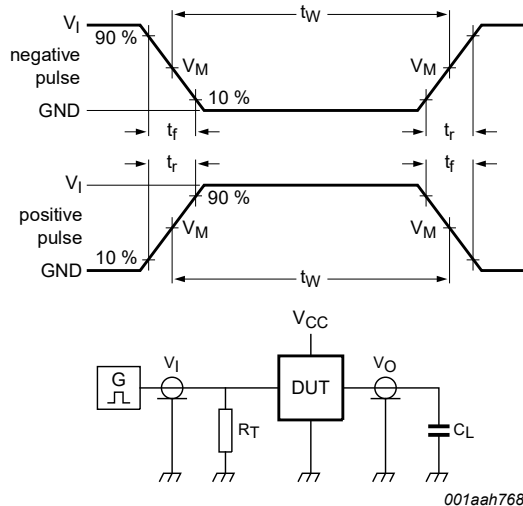
Measurement points are given in [Table 8](#).

V_{OH} and V_{OL} are typical output voltage levels that occur with the output load.

Fig. 4. Input to output propagation delay

Table 8. Measurement points

Type	Input		Output
	V_M		V_M
74AHC04	$0.5 \times V_{CC}$		$0.5 \times V_{CC}$
74AHCT04	1.5 V		$0.5 \times V_{CC}$



Test data is given in [Table 9](#).

Definitions test circuit:

R_T = termination resistance should be equal to output impedance Z_o of the pulse generator.

C_L = load capacitance including jig and probe capacitance.

Fig. 5. Test circuit for measuring switching times

Table 9. Test data

Type	Input		Load	Test
	V_I	t_r, t_f	C_L	
74AHC04	V_{CC}	≤ 3.0 ns	15 pF, 50 pF	t_{PLH}, t_{PHL}
74AHCT04	3.0 V	≤ 3.0 ns	15 pF, 50 pF	t_{PLH}, t_{PHL}

11. Package outline

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

SOT108-1

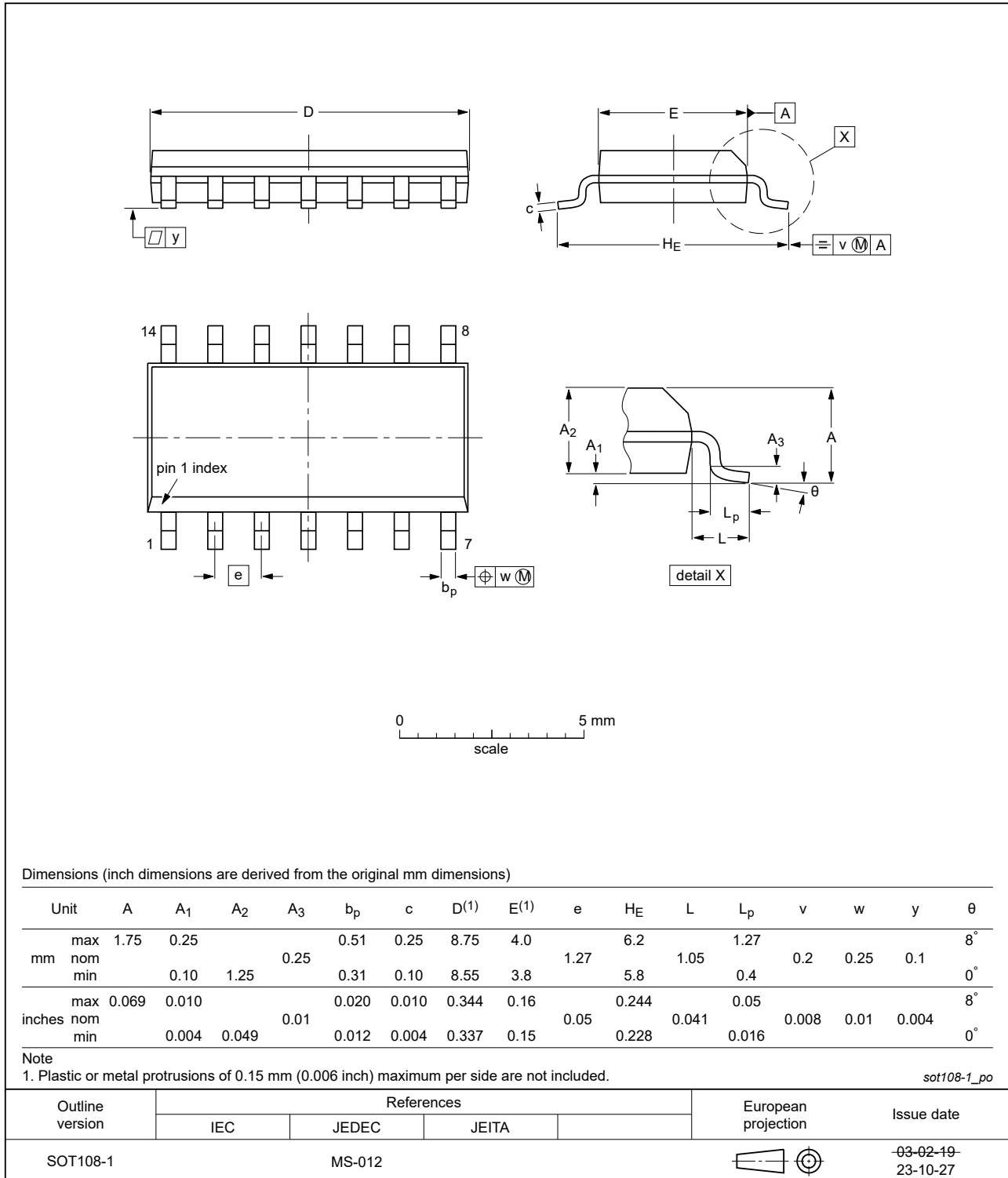


Fig. 6. Package outline SOT108-1 (SO14)

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

SOT402-1

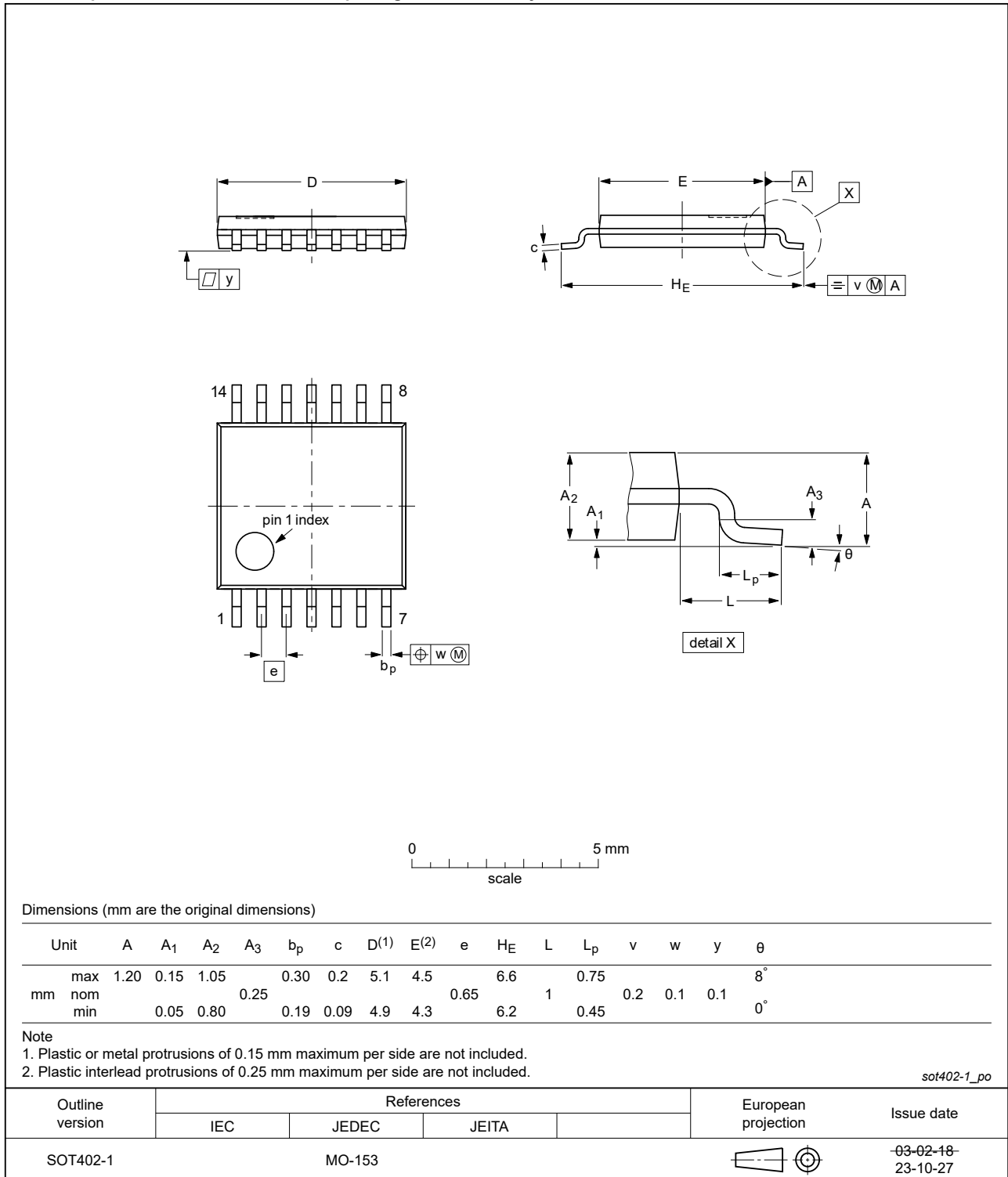


Fig. 7. Package outline SOT402-1 (TSSOP14)

12. Abbreviations

Table 10. 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

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT04 v.9	20240205	Product data sheet	-	74AHC_AHCT04 v.8
Modifications:	<ul style="list-style-type: none"> Fig. 6, Fig. 7: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153. 			
74AHC_AHCT04 v.8	20230901	Product data sheet	-	74AHC_AHCT04 v.7
Modifications:	<ul style="list-style-type: none"> Section 2: ESD specification updated according to the latest JEDEC standard. 			
74AHC_AHCT04 v.7	20200910	Product data sheet	-	74AHC_AHCT04 v.6
Modifications:	<ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Section 2 updated. Table 4: Derating values for P_{tot} total power dissipation have been updated. Package outline drawing of SOT762-1 (Fig. 8) updated. 			
74AHC_AHCT04 v.6	20111107	Product data sheet	-	74AHC_AHCT04 v.5
Modifications:	<ul style="list-style-type: none"> Legal pages updated. 			
74AHC_AHCT04 v.5	20110411	Product data sheet	-	74AHC_AHCT04 v.4
74AHC_AHCT04 v.4	20080514	Product data sheet	-	74AHC_AHCT04 v.3
74AHC_AHCT04 v.3	20050207	Product data sheet	-	74AHC_AHCT04 v.2
74AHC_AHCT04 v.2	19990927	Product specification	-	74AHC_AHCT04 v.1
74AHC_AHCT04 v.1	19990225	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.
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