

74AHC1G06; 74AHCT1G06

Inverter with open-drain output

Rev. 7 — 18 November 2014

Product data sheet

1. General description

74AHC1G06 and 74AHCT1G06 are high-speed Si-gate CMOS devices. They provide an inverting buffer. The output of these devices is an open-drain and can be connected to other open-drain outputs to implement active-LOW, wired-OR or active-HIGH, wired-AND functions. For digital operation this device must have a pull-up resistor to establish a logic HIGH-level.

The AHC device has CMOS input switching levels and supply voltage range 2 V to 5.5 V.

The AHCT device has TTL input switching levels and supply voltage range 4.5 V to 5.5 V.

2. Features and benefits

- High noise immunity
- Low power dissipation
- SOT353-1 and SOT753 package options
- ESD protection:
 - ◆ HBM JESD22-A114E: exceeds 2000 V
 - ◆ MM JESD22-A115-A: exceeds 200 V
 - ◆ CDM JESD22-C101C: exceeds 1000 V
- Specified from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AHC1G06GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74AHCT1G06GW				
74AHC1G06GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74AHCT1G06GV				



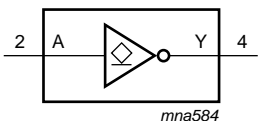
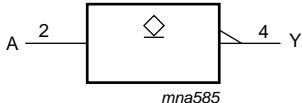
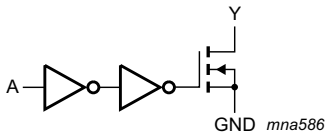
4. Marking

Table 2. Marking codes

Type number	Marking ^[1]
74AHC1G06GW	AR
74AHC1G06GV	A06
74AHCT1G06GW	CR
74AHCT1G06GV	C06

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

5. Functional diagram

 <p>Fig 1. Logic symbol</p>	 <p>Fig 2. IEC logic symbol</p>	 <p>Fig 3. Logic diagram</p>
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6. Pinning information

6.1 Pinning

74AHC1G06
74AHCT1G06

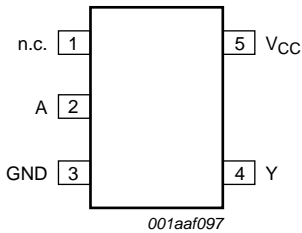


Fig 4. Pin configuration

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
n.c.	1	not connected
A	2	data input
GND	3	ground (0 V)
Y	4	data output
V _{CC}	5	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state

Input	Output
A	Y
L	Z
H	L

8. Limiting values

Table 5. Limiting values

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

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	-20	-	mA
I_{OK}	output clamping current	$V_O < -0.5$ V	[1]	±20	mA
I_O	output current	$V_O > -0.5$ V	-	±25	mA
V_O	output voltage	active mode	[1]	+7.0	V
		high-impedance mode	[1]	+7.0	V
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]	250	mW

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

[2] For both TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74AHC1G06			74AHCT1G06			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	active mode	0	-	V_{CC}	0	-	V_{CC}	V
		high-impedance mode	0	-	6.0	0	-	6.0	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 ± 0.3 V	-	-	100	-	-	-	ns/V
		$V_{CC} = 5.0$ V ± 0.5 V	-	-	20	-	-	20	ns/V

10. Static characteristics

Table 7. Static characteristics

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	
For type 74AHC1G06										
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 _{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 _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±0.25	-	±2.5	-	±10.0	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	1.0	-	10	-	20	μA
C _I	input capacitance		-	1.5	10	-	10	-	10	pF
For type 74AHCT1G06										
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 _{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 _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±0.25	-	±2.5	-	±10.0	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	1.0	-	10	-	20	μA
ΔI _{CC}	additional supply current	per input pin; V _I = 3.4 V; other inputs at V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C _I	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

$GND = 0\text{ V}$; $t_r = t_f = \leq 3.0\text{ ns}$. For test circuit see [Figure 6](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
For type 74AHC1G06										
t _{PZL}	OFF-state to LOW propagation delay	A to Y; see Figure 5								
		V _{CC} = 3.0 V to 3.6 V [1]								
		C _L = 15 pF	-	3.7	7.0	1.0	7.7	1.0	8.1	ns
		C _L = 50 pF	-	5.2	10.0	1.0	11.0	1.0	11.5	ns
		V _{CC} = 4.5 V to 5.5 V [2]								
		C _L = 15 pF	-	2.7	4.9	1.0	5.3	1.0	5.6	ns
		C _L = 50 pF	-	3.8	7.0	1.0	7.5	1.0	8.0	ns
t _{PLZ}	LOW to OFF-state propagation delay	A to Y; see Figure 5								
		V _{CC} = 3.0 V to 3.6 V [1]								
		C _L = 15 pF	-	4.8	6.4	1.0	6.9	1.0	7.4	ns
		C _L = 50 pF	-	6.9	10.0	1.0	10.5	1.0	11.0	ns
		V _{CC} = 4.5 V to 5.5 V [2]								
		C _L = 15 pF	-	3.0	4.1	1.0	4.6	1.0	5.1	ns
		C _L = 50 pF	-	4.3	6.5	1.0	7.0	1.0	7.5	ns
C _{PD}	power dissipation capacitance	per buffer; C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} [3]	-	3	-	-	-	-	-	pF
For type 74AHCT1G06										
t _{PZL}	OFF-state to LOW propagation delay	A to Y; see Figure 5								
		V _{CC} = 4.5 V to 5.5 V [2]								
		C _L = 15 pF	-	3.0	5.3	1.0	6.0	1.0	6.3	ns
		C _L = 50 pF	-	4.2	7.5	1.0	8.5	1.0	9.0	ns
t _{PLZ}	LOW to OFF-state propagation delay	A to Y; see Figure 5								
		V _{CC} = 4.5 V to 5.5 V [2]								
		C _L = 15 pF	-	3.2	4.6	1.0	5.1	1.0	5.6	ns
		C _L = 50 pF	-	4.5	7.0	1.0	7.5	1.0	8.0	ns
C _{PD}	power dissipation capacitance	per buffer; C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} [3]	-	4.5	-	-	-	-	-	pF

[1] Typical values are measured at V_{CC} = 3.3 V.

[2] Typical values are measured at V_{CC} = 5.0 V.

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

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

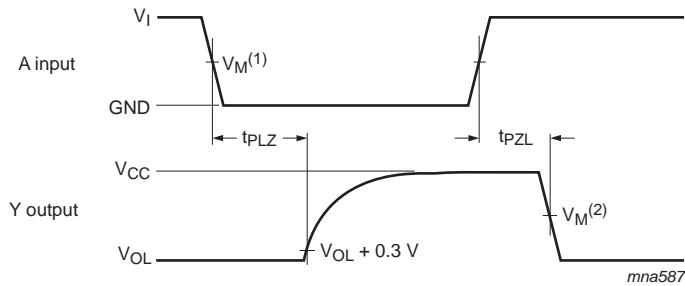
f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts

12. Waveforms

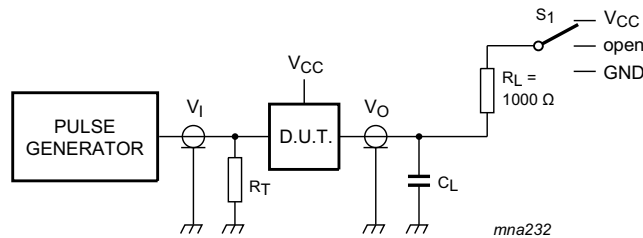


Measurement points are given in [Table 9](#).

Fig 5. Input (A) to output (Y) propagation delays

Table 9. Measurement point

Type	Input		Output
	V _I	V _M ⁽¹⁾	V _M ⁽²⁾
74AHC1G06	GND to V _{CC}	0.5 × V _{CC}	0.5 × V _{CC}
74AHCT1G06	GND to 3.0 V	1.5 V	0.5 × V _{CC}



Test data is given in [Table 8](#). Definitions for test circuit:

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.

For t_{PLZ}, t_{PZL}, S₁ = V_{CC}

Fig 6. Test circuit for measuring switching times

13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1

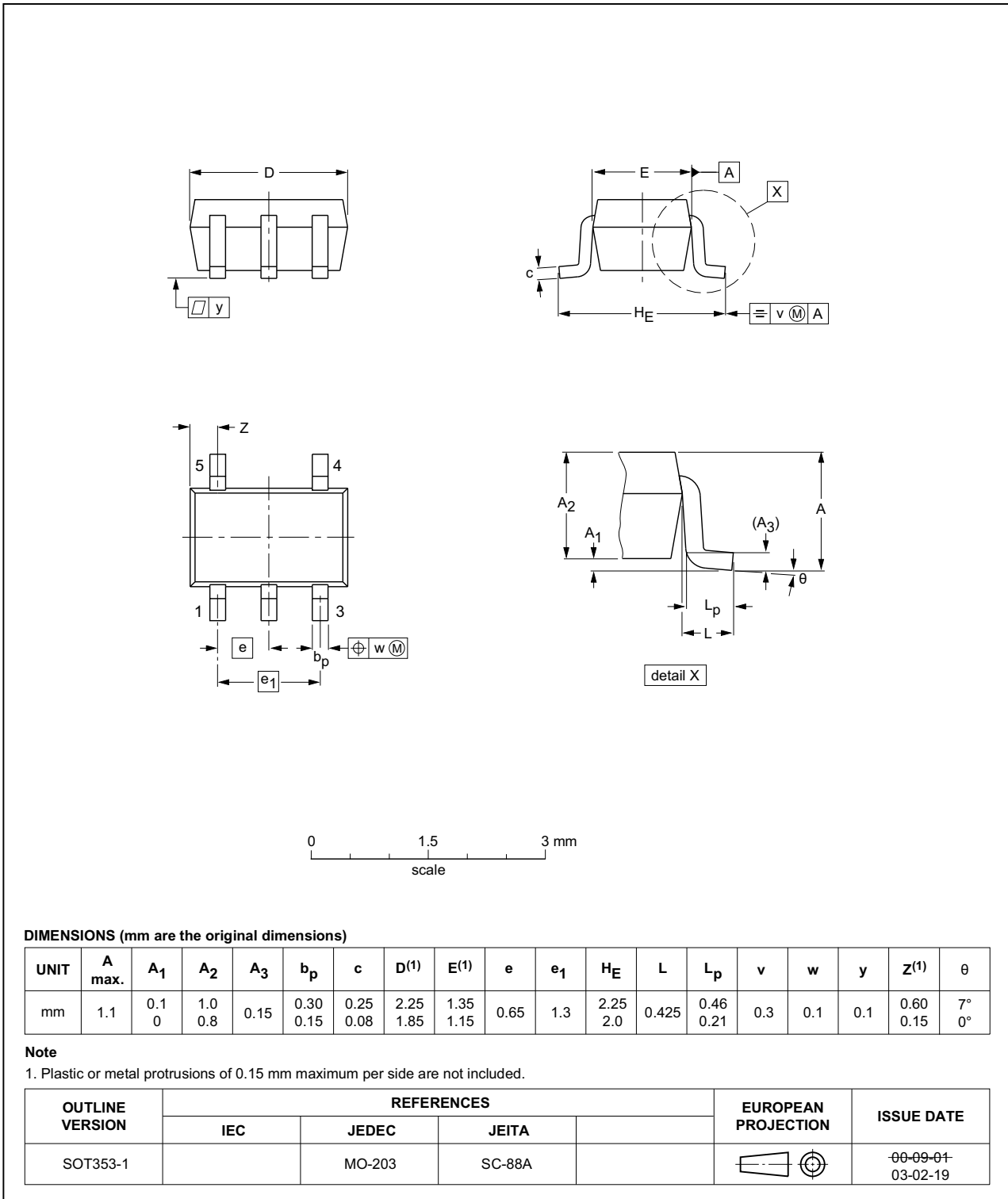


Fig 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

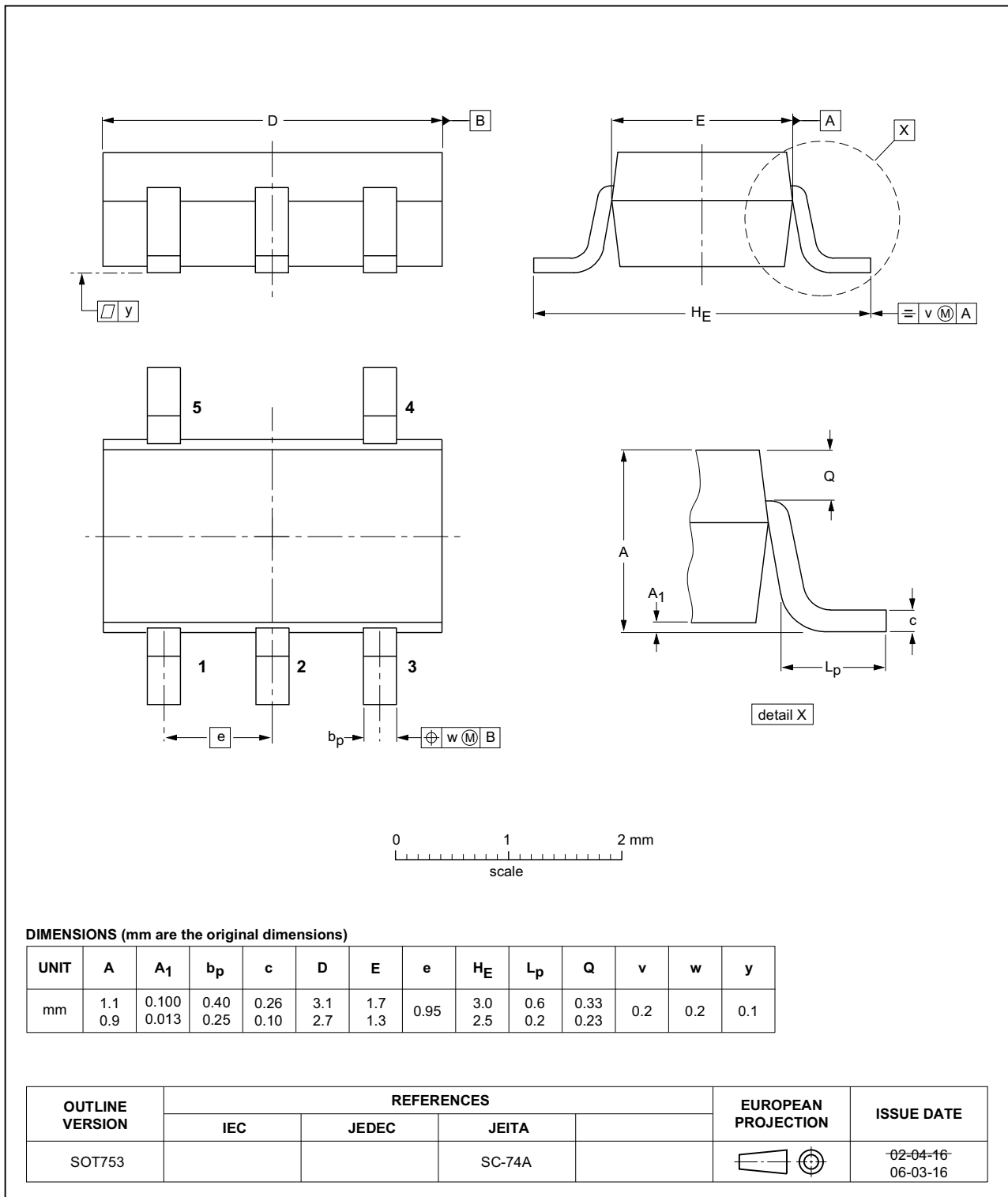


Fig 8. Package outline SOT753 (SC-74A)

14. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT1G06 v.7	20141118	Product data sheet	-	74AHC_AHCT1G06 v.6
Modifications:	<ul style="list-style-type: none"> • Section 4: table note added. 			
74AHC_AHCT1G06 v.6	20070607	Product data sheet	-	74AHC_AHCT1G06 v.5
Modifications:	<ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Package SOT353 changed to SOT353-1 in Section 3 and Section 13. • Quick reference data and Soldering sections removed. 			
74AHC_AHCT1G06 v.5	20021002	Product specification	-	74AHC_AHCT1G06 v.4
74AHC_AHCT1G06 v.4	20020528	Product specification	-	74AHC_AHCT1G06 v.3
74AHC_AHCT1G06 v.3	20020221	Product specification	-	74AHC_AHCT1G06 v.2
74AHC_AHCT1G06 v.2	20010209	Product specification	-	74AHC_AHCT1G06 v.1
74AHC_AHCT1G06 v.1	20000501	Product specification	-	-

16. Legal information

16.1 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.

[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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