# 74AHC1G125; 74AHCT1G125

Bus buffer/line driver; 3-state

Rev. 10 — 23 August 2012

Product data sheet

### 1. General description

74AHC1G125 and 74AHCT1G125 are high-speed Si-gate CMOS devices. They provide one non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input ( $\overline{OE}$ ). A HIGH at  $\overline{OE}$  causes the output to assume a high-impedance OFF-state.

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

- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- Multiple package options
- ESD protection:
  - ♦ HBM JESD22-A114F: exceeds 2000 V
  - ♦ MM JESD22-A115-A: exceeds 200 V
  - ◆ CDM JESD22-C101E: exceeds 1000 V
- Specified from -40 °C to +125 °C

## 3. Ordering information

Table 1. Ordering information

Type number	Package	Package									
	Temperature range	Name	Description	Version							
74AHC1G125GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package;	SOT353-1							
74AHCT1G125GW			5 leads; body width 1.25 mm								
74AHC1G125GV	–40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753							
74AHCT1G125GV											
74AHC1G125GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no	SOT886							
74AHCT1G125GM			leads; 6 terminals; body 1 × 1.45 × 0.5 mm								
74AHC1G125GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package;	SOT891							
74AHCT1G125GF			no leads; 6 terminals; body $1 \times 1 \times 0.5$ mm								



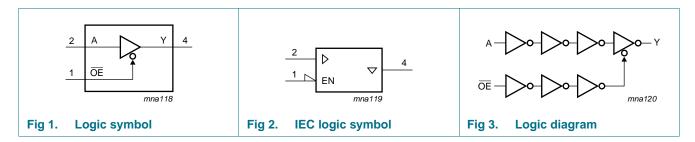
### 4. Marking

Table 2. Marking codes

_	
Type number	Marking <sup>[1]</sup>
74AHC1G125GW	AM
74AHCT1G125GW	CM
74AHC1G125GV	A25
74AHCT1G125GV	C25
74AHC1G125GM	AM
74AHCT1G125GM	CM
74AHC1G125GF	AM
74AHCT1G125GF	CM

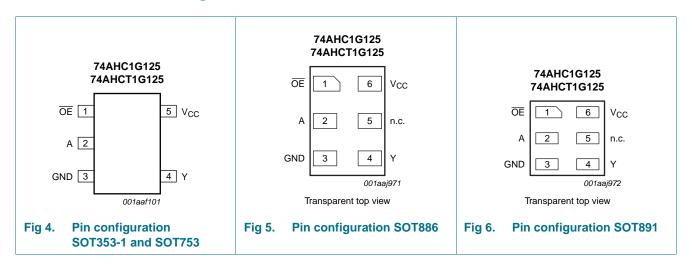
<sup>[1]</sup> The pin 1 indicator is located on the lower left corner of the device, below the marking code.

### 5. Functional diagram



### 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT353-1/SOT753	SOT886/SOT891	
ŌĒ	1	1	output enable input
Α	2	2	data input
GND	3	3	ground (0 V)
Υ	4	4	data output
n.c.	-	5	not connected
$V_{CC}$	5	6	supply voltage

## 7. Functional description

#### Table 4. Function table

 $H = HIGH \text{ voltage level}; L = LOW \text{ voltage level}; X = don't \text{ care}; Z = high-impedance OFF-state}$ 

Inputs OE	Output	
OE	Α	Υ
L	L	L
L	Н	Н
Н	X	Z

# 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
$V_{CC}$	supply voltage		-0.5	+7.0	V
VI	input voltage		-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V	<u>[1]</u> –20	-	mA
I <sub>OK</sub>	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$	<u>[1]</u> _	±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		-	75	mA
I <sub>GND</sub>	ground current		<b>−75</b>	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb}$ = -40 °C to +125 °C	[2] -	250	mW

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

<sup>[2]</sup> For TSSOP5 and SC-74A packages: above 87.5  $^{\circ}$ C the value of P<sub>tot</sub> derates linearly with 4.0 mW/K. For XSON6 packages: above 118  $^{\circ}$ C the value of P<sub>tot</sub> derates linearly with 7.8 mW/K.

# 9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74AHC1G125			74AHCT1G125			Unit
			Min	Тур	Max	Min	Тур	Max	
$V_{CC}$	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
VI	input voltage		0	-	5.5	0	-	5.5	V
Vo	output voltage		0	-	$V_{CC}$	0	-	$V_{CC}$	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C
'	input transition rise	$V_{CC}$ = 3.3 V $\pm$ 0.3 V	-	-	100	-	-	-	ns/V
	and fall rate	$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	-	-	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 1	to +85 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
<b>74AHC</b> 1	G125							1		
V <sub>IH</sub>	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	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
$V_{IL}$	LOW-level	V <sub>CC</sub> = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
	input voltage	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
$V_{OH}$	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	$I_{O} = -50 \mu A; V_{CC} = 2.0 V$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_{O} = -50 \mu A; V_{CC} = 3.0 V$	2.9	3.0	-	2.9	-	2.9	-	V
		$I_O = -50 \mu A; V_{CC} = 4.5 V$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.58	-	-	2.48	-	2.40	-	V
		$I_{O} = -8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.94	-	-	3.8	-	3.70	-	V
$V_{OL}$	LOW-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	$I_O = 50 \mu A; V_{CC} = 2.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 3.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A$ ; $V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		$I_O = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
l <sub>OZ</sub>	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	0.25	-	2.5	-	10	μΑ
l <sub>l</sub>	input leakage current	$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to 5.5 V}$	-	-	0.1	-	1.0	-	2.0	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ

74AHC\_AHCT1G125

**Table 7. Static characteristics** ...continued Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		25 °C		-40 °C 1	to +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
Cı	input capacitance		-	1.5	10	-	10	-	10	pF
74AHCT	1G125									
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	-	-	2.0	-	2.0	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	8.0	-	0.8	-	0.8	V
$V_{OH}$	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	$I_{O} = -50 \mu A$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_0 = -8.0 \text{ mA}$	3.94	-	-	3.8	-	3.70	-	V
$V_{OL}$	LOW-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	Ι <sub>Ο</sub> = 50 μΑ	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 8.0 \text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
$I_{OZ}$	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	0.25	-	2.5	-	10	μΑ
I <sub>I</sub>	input leakage current	$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	0.1	-	1.0	-	2.0	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ
$\Delta I_{CC}$	additional supply current	per input pin; $V_I = 3.4 \text{ V}$ ; other inputs at $V_{CC}$ or GND; $I_O = 0 \text{ A}$ ; $V_{CC} = 5.5 \text{ V}$	-	-	1.35	-	1.5	-	1.5	mA
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

# 11. Dynamic characteristics

**Table 8. Dynamic characteristics** GND = 0 V; For test circuit see Figure 9.

Symbol	Parameter	eter Conditions			25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
				Min	Тур	Max	Min	Max	Min	Max	
74AHC1	G125					•		'			
1	propagation	A to Y; see Figure 7	<u>[1]</u>								
	delay	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[2]								
		C <sub>L</sub> = 15 pF		-	4.7	8.0	1.0	9.5	1.0	11.5	ns
		$C_L = 50 pF$		-	6.6	11.5	1.0	13.0	1.0	14.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		C <sub>L</sub> = 15 pF		-	3.4	5.5	1.0	6.5	1.0	7.0	ns
		$C_L = 50 pF$		-	4.8	7.5	1.0	8.5	1.0	9.5	ns

**Table 8. Dynamic characteristics** ...continued GND = 0 V; For test circuit see <u>Figure 9</u>.

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Uni
				Min	Тур	Max	Min	Max	Min	Max	
en	enable time	OE to Y; see Figure 8	<u>[1]</u>							1	
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[2]								
		C <sub>L</sub> = 15 pF		-	5.0	8.0	1.0	9.5	1.0	11.5	ns
		$C_L = 50 pF$		-	6.9	11.5	1.0	13.0	1.0	14.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		$C_L = 15 pF$		-	3.6	5.1	1.0	6.0	1.0	6.5	ns
		$C_L = 50 pF$		-	4.9	7.5	1.0	8.5	1.0	9.5	ns
disable time	OE to Y; see Figure 8	[1]									
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[2]								
		$C_L = 15 pF$		-	6.0	9.7	1.0	11.5	1.0	12.5	ns
	$C_L = 50 pF$		-	8.3	13.2	1.0	15.0	1.0	16.5	ns	
	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]									
		$C_L = 15 pF$		-	4.1	6.8	1.0	8.0	1.0	8.5	ns
		$C_L = 50 pF$		-	5.7	8.8	1.0	10.0	1.0	11.0	ns
$C_{PD}$	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$ ; $f = 1 \text{ MHz}$ ; $V_I = \text{GND to } V_{CC}$	[4]	-	9	-	-	-	-	-	pF
74AHCT	1G125										
pd	propagation	A to Y; see Figure 7	[1]								
	delay	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		$C_{L} = 15  pF$		-	3.4	5.5	1.0	6.5	1.0	7.0	ns
		$C_L = 50 pF$		-	4.8	7.5	1.0	8.5	1.0	9.5	ns
-en	enable time	OE to Y; see Figure 8	[1]								
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		$C_{L} = 15  pF$		-	3.9	5.1	1.0	6.0	1.0	6.5	ns
		$C_L = 50 pF$		-	5.1	7.5	1.0	8.5	1.0	9.5	ns
dis	disable time	OE to Y; see Figure 8	[1]								
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		C <sub>L</sub> = 15 pF		-	4.5	6.8	1.0	8.0	1.0	8.5	ns
		C <sub>L</sub> = 50 pF		_	6.1	8.8	1.0	10.0	1.0	11.0	ns

 Table 8.
 Dynamic characteristics ...continued

GND = 0 V; For test circuit see Figure 9.

Symbol	Parameter	Conditions		25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
$C_{PD}$	•	per buffer; $C_L = 50 \text{ pF}$ ; $f = 1 \text{ MHz}$ ; $V_I = \text{GND to } V_{CC}$	-	11	-	-	-	-	-	pF

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

 $t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .

t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

- [2] Typical values are measured at  $V_{CC} = 3.3 \text{ V}$ .
- [3] Typical values are measured at  $V_{CC} = 5.0 \text{ V}$ .
- [4]  $C_{PD}$  is used to determine the dynamic power dissipation  $P_D$  ( $\mu W$ ).

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

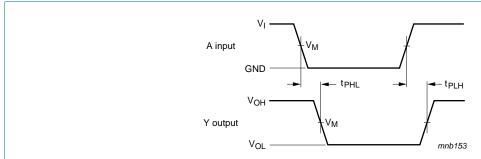
 $f_i$  = input frequency in MHz;

fo = output frequency in MHz;

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

 $V_{CC}$  = supply voltage in Volts.

### 12. Waveforms



Measurement points are given in Table 9.

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

Fig 7. Input (A) to output (Y) propagation delays

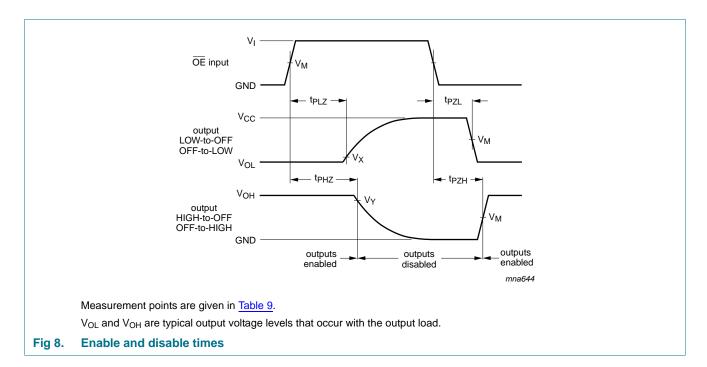
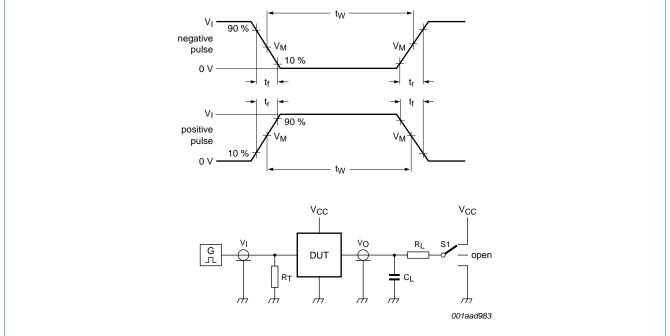


Table 9. Measurement point

Туре	Inputs		Output				
	V <sub>I</sub>	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>		
74AHC1G125	GND to V <sub>CC</sub>	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.3 V	$V_{OH}-0.3~V$		
74AHCT1G125	GND to 3.0 V	1.5 V	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> – 0.3 V		



Test data is given in Table 10.

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.

R<sub>L</sub> = Load resistance.

S1 = Test selection switch.

Fig 9. Test circuit for measuring switching times

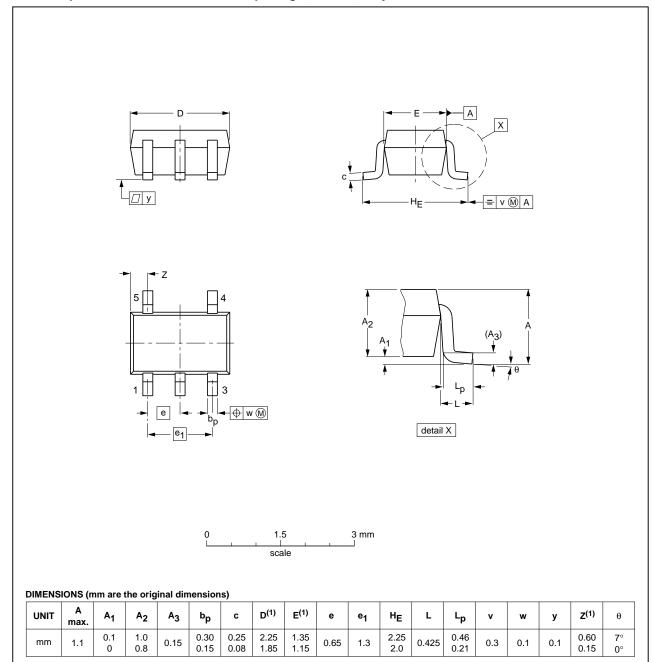
Table 10. Test data

Туре	Input		Load		S1 position		
	VI	t <sub>r</sub> , t <sub>f</sub>	CL	$R_L$	t <sub>PHL</sub> , t <sub>PLH</sub>	t <sub>PZH</sub> , t <sub>PHZ</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>
74AHC1G125	$V_{CC}$	$\leq$ 3 ns	15 pF, 50 pF	1 k $\Omega$	open	GND	V <sub>CC</sub>
74AHCT1G125	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>

### 13. Package outline

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

SOT353-1



1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE	TLINE REFERENCES					ISSUE DATE
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT353-1		MO-203	SC-88A			<del>-00-09-01-</del> 03-02-19

Fig 10. Package outline SOT353-1 (TSSOP5)

74AHC\_AHCT1G125

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#### Plastic surface-mounted package; 5 leads

**SOT753** 

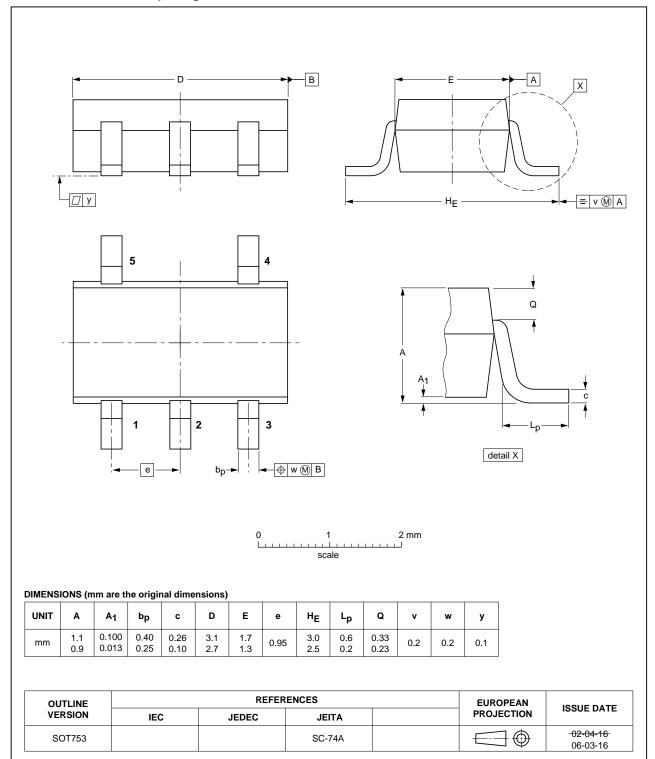


Fig 11. Package outline SOT753 (SC-74A)

74AHC\_AHCT1G125

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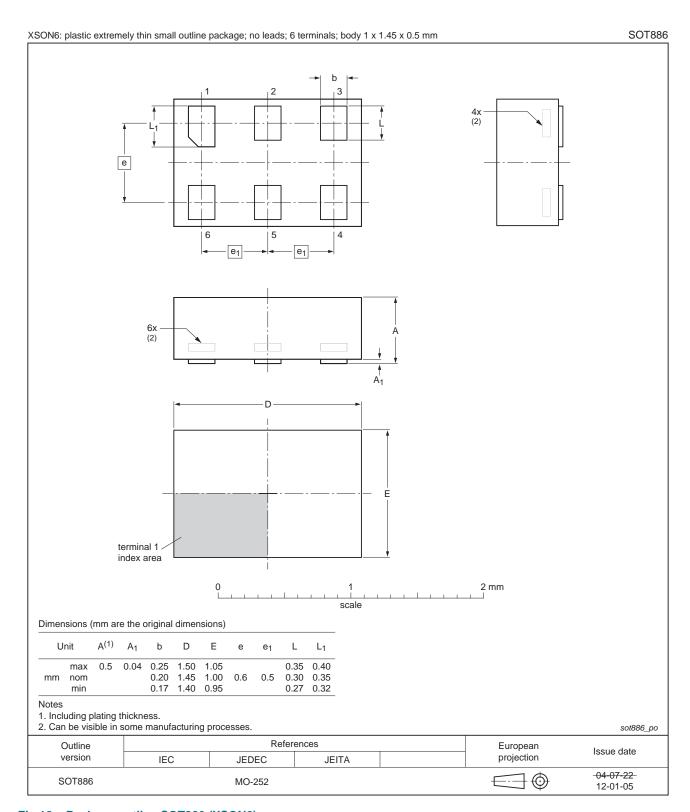


Fig 12. Package outline SOT886 (XSON6)

74AHC\_AHCT1G125

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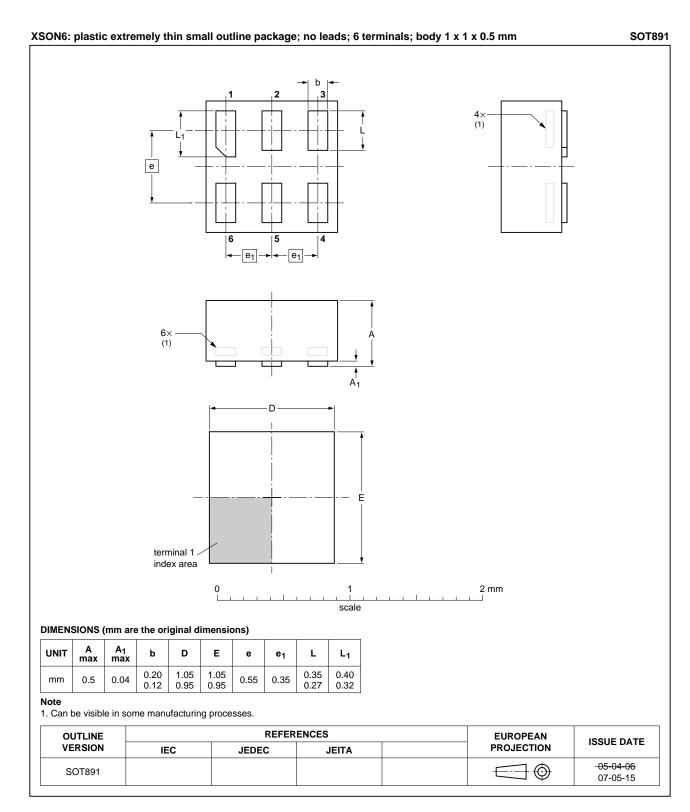


Fig 13. Package outline SOT891 (XSON6)

74AHC\_AHCT1G125

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### 14. Abbreviations

#### Table 11. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
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 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT1G125 v10	20120823	Product data sheet	-	74AHC_AHCT1G125 v.9
Modifications:	<ul> <li>Package out</li> </ul>	line drawing of SOT886 ( <u>Figur</u>	e 12) modifie	ed.
74AHC_AHCT1G125 v.9	20090622	Product data sheet	-	74AHC_AHCT1G125 v.8
74AHC_AHCT1G125 v.8	20090409	Product data sheet	-	74AHC_AHCT1G125 v.7
74AHC_AHCT1G125 v.7	20070707	Product data sheet	-	74AHC_AHCT1G125 v.6
74AHC_AHCT1G125 v.6	20020606	Product specification	-	74AHC_AHCT1G125 v.5
74AHC_AHCT1G125 v.5	20020322	Product specification	-	74AHC_AHCT1G125 v.4
74AHC_AHCT1G125 v.4	20010222	Product specification	-	74AHC_AHCT1G125 v.3
74AHC_AHCT1G125 v.3	19990615	Product specification	-	74AHC_AHCT1G125_N v.2
74AHC_AHCT1G125_N v.2	19981207	Preliminary specification	-	74AHC_AHCT1G125_N v.1
74AHC_AHCT1G125_N v.1	19981125	Preliminary 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"
- [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.nexperia.com.

#### 16.2 Definitions

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# 74AHC1G125; 74AHCT1G125

Bus buffer/line driver; 3-state

### 18. Contents

1	General description
2	Features and benefits
3	Ordering information 1
4	Marking 2
5	Functional diagram
6	Pinning information
6.1	Pinning
6.2	Pin description
7	Functional description 3
8	Limiting values 3
9	Recommended operating conditions 4
10	Static characteristics
11	Dynamic characteristics
12	Waveforms
13	Package outline
14	Abbreviations14
15	Revision history
16	Legal information
16.1	Data sheet status
16.2	Definitions
16.3	Disclaimers
16.4	Trademarks16
17	Contact information 16
18	Contents 17