# 74AHC1G125; 74AHCT1G125

Bus buffer/line driver; 3-state Rev. 13 — 11 January 2022

**Product data sheet** 

### 1. General description

The 74AHC1G125/74AHCT1G125 is a single buffer/line driver with 3-state output. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

#### 2. Features and benefits

- Wide supply voltage range from 2.0 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- · High noise immunity
- · Symmetrical output impedance
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- · Balanced propagation delays
- Multiple package options
- Input levels:
  - For 74AHC1G125: CMOS level
  - For 74AHCT1G125: TTL level
- 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 +85 °C and -40 °C to +125 °C

## 3. Ordering information

#### **Table 1. Ordering information**

Type number	Package								
	Temperature range	Description	Version						
74AHC1G125GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads;	SOT353-1					
74AHCT1G125GW			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;	SOT886					
74AHCT1G125GM			no leads; 6 terminals; body 1 × 1.45 × 0.5 mm						



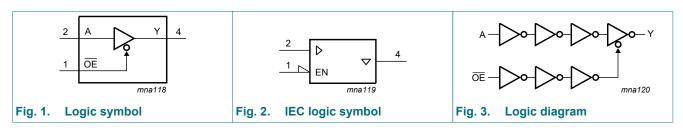
## 4. Marking

#### Table 2. Marking codes

Type number	Marking [1]
74AHC1G125GW	AM
74AHCT1G125GW	CM
74AHC1G125GV	A25
74AHCT1G125GV	C25
74AHC1G125GM	AM
74AHCT1G125GM	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 and SOT753	SOT886	
ŌĒ	1	1	output enable input
A	2	2	data input
GND	3	3	ground (0 V)
Υ	4	4	data output
n.c.	-	5	not connected
V <sub>CC</sub>	5	6	supply voltage

## 7. Functional description

#### **Table 4. Function table**

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state

Inputs OE		Output
ŌĒ	A	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 <sub>CC</sub>	supply voltage		-0.5	+7.0	V
VI	input voltage		-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	$V_1 < -0.5 \text{ V}$ [1]	-20	-	mA
I <sub>OK</sub>	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$ [1]	-	±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		-75	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40  ^{\circ}\text{C} \text{ to } +125  ^{\circ}\text{C}$ [2]	-	250	mW

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

For SOT886 (XSON6) package: Ptot derates linearly with 3.3 mW/K above 74 °C.

<sup>[2]</sup> For SOT353-1 (TSSOP5) package: P<sub>tot</sub> derates linearly with 3.3 mW/K above 74 °C. For SOT753 (SC-74A) package: P<sub>tot</sub> derates linearly with 3.8 mW/K above 85 °C.

## 9. Recommended operating conditions

#### Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74	AHC1G1	25	74	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 <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	V <sub>CC</sub> = 3.3 V ± 0.3 V	-	-	100	-	-	-	ns/V
	fall rate	V <sub>CC</sub> = 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 t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74AHC1	G125		'							
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 <sub>IL</sub>	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 <sub>OH</sub>	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	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
		$I_{O}$ = -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	-	-	3.8	-	3.70	-	V
V <sub>OL</sub>	LOW-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 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 <sub>O</sub> = 50 μA; V <sub>CC</sub> = 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
		$I_O = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.36	-	0.44	-	0.9 1.65	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
lı	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	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	1.0	-	10	-	40	μΑ
C <sub>I</sub>	input capacitance		-	1.5	10	-	10	-	10	pF

Symbol	Parameter	Conditions		25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74AHCT	1G125						,			
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	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 V$								
		I <sub>O</sub> = -50 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -8.0 mA	3.94	-	-	3.8	-	3.70	-	V
V <sub>OL</sub>	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 V$								
		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
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
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	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	1.0	-	10	-	40	μΑ
Δl <sub>CC</sub>	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
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

## 11. Dynamic characteristics

#### **Table 8. Dynamic characteristics**

GND = 0 V; For test circuit see Fig. 8.

Symbol	Parameter	Conditions			25 °C			-40 °C to +85 °C		-40 °C to +125 °C	
				Min	Тур	Max	Min	Max	Min	Max	
74AHC1	G125									•	
P	propagation	A to Y; see Fig. 6	[1]								
	delay	V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF	[2]	-	4.7	8.0	1.0	9.5	1.0	11.5	ns
		$V_{CC}$ = 3.0 V to 3.6 V; $C_L$ = 50 pF		-	6.6	11.5	1.0	13.0	1.0	14.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF	[3]	-	3.4	5.5	1.0	6.5	1.0	7.0	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	[3]	-	4.8	7.5	1.0	8.5	1.0	9.5	ns
t <sub>en</sub>	enable time	OE to Y; see Fig. 7	[1]								
		V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF	[2]	-	5.0	8.0	1.0	9.5	1.0	11.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 50 pF	[2]	-	6.9	11.5	1.0	13.0	1.0	14.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF	[3]	-	3.6	5.1	1.0	6.0	1.0	6.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	[3]	-	4.9	7.5	1.0	8.5	1.0	9.5	ns

Symbol	Parameter	Conditions		25 °C				°C to 5 °C	-40 °C to +125 °C		Unit
				Min	Тур	Max	Min	Max	Min	Max	
t <sub>dis</sub>	disable time	disable time $\overline{OE}$ to Y; see Fig. 7 [1									
		$V_{CC}$ = 3.0 V to 3.6 V; $C_L$ = 15 pF	[2]	-	6.0	9.7	1.0	11.5	1.0	12.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 50 pF	[2]	-	8.3	13.2	1.0	15.0	1.0	16.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF	[3]	-	4.1	6.8	1.0	8.0	1.0	8.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	[3]	-	5.7	8.8	1.0	10.0	1.0	11.0	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L$ = 50 pF; f = 1 MHz; $V_I$ = GND to $V_{CC}$	[4]	-	9	-	-	-	-	-	pF
74AHCT	1G125										
t <sub>pd</sub>	propagation	A to Y; see Fig. 6	[1]								
	delay	V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF	[3]	-	3.4	5.5	1.0	6.5	1.0	7.0	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	[3]	-	4.8	7.5	1.0	8.5	1.0	9.5	ns
t <sub>en</sub>	enable time	OE to Y; see Fig. 7	[1]								
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF	[3]	-	3.9	5.1	1.0	6.0	1.0	6.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	[3]	-	5.1	7.5	1.0	8.5	1.0	9.5	ns
t <sub>dis</sub>	disable time	OE to Y; see Fig. 7	[1]								
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF	[3]	-	4.5	6.8	1.0	8.0	1.0	8.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	[3]	-	6.1	8.8	1.0	10.0	1.0	11.0	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L$ = 50 pF; f = 1 MHz; $V_I$ = GND to $V_{CC}$	[4]	-	11	-	-	-	-	-	pF

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

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

- $t_{\rm dis}$  is the same as  $t_{\rm PLZ}$  and  $t_{\rm PHZ}$ . Typical values are measured at V<sub>CC</sub> = 3.3 V.
- Typical values are measured at V<sub>CC</sub> = 5.0 V.
   Typical values are measured at V<sub>CC</sub> = 5.0 V.
   C<sub>PD</sub> is used to determine the dynamic power dissipation P<sub>D</sub> (μW).
   P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> + ∑(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) where:

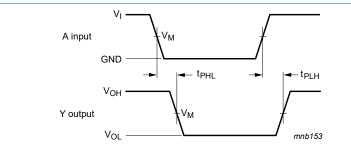
f<sub>i</sub> = input frequency in MHz;

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

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

V<sub>CC</sub> = supply voltage in Volts.

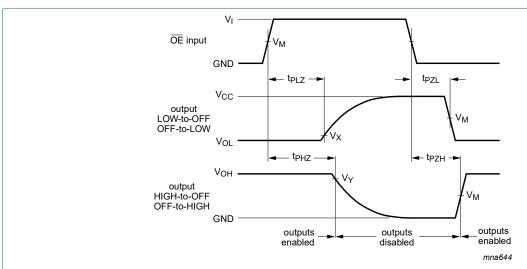
#### 11.1. Waveforms and test circuit



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. 6. Input (A) to output (Y) propagation delays



Measurement points are given in <u>Table 9</u>.

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

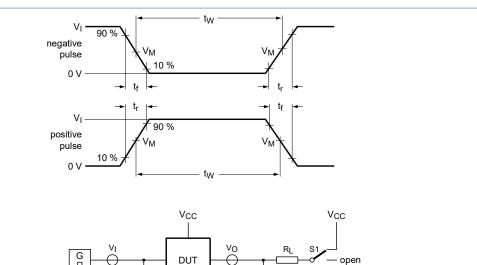
Fig. 7. Enable and disable times

**Table 9. Measurement point** 

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

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#### Bus buffer/line driver; 3-state



Test data is given in Table 10.

Definitions test circuit:

 $R_T$  = Termination resistance should be equal to output impedance  $Z_0$  of the pulse generator.

 $C_L$  = Load capacitance including jig and probe capacitance.

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

S1 = Test selection switch.

#### Fig. 8. Test circuit for measuring switching times

Table 10. Test data

Туре	Input		Load		S1 position		
	V <sub>I</sub>	t <sub>r</sub> , t <sub>f</sub>	CL	R <sub>L</sub>	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 <sub>CC</sub>	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>
74AHCT1G125	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>

## 12. Package outline

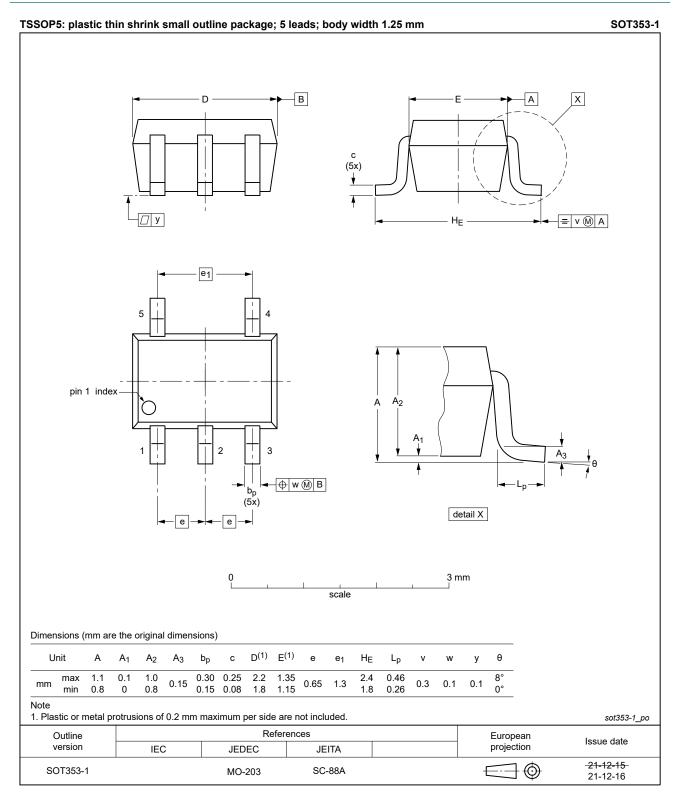


Fig. 9. Package outline SOT353-1 (TSSOP5)

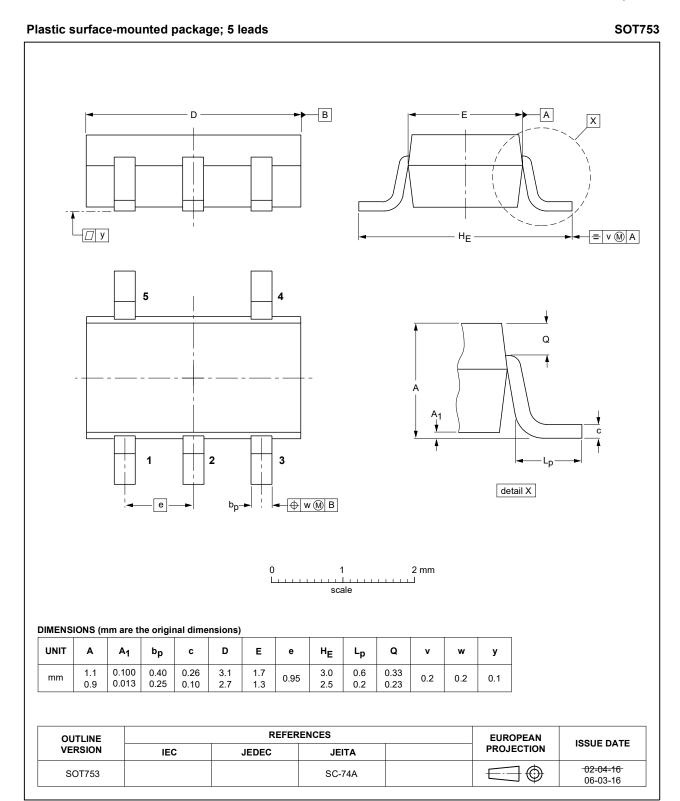


Fig. 10. Package outline SOT753 (SC-74A)

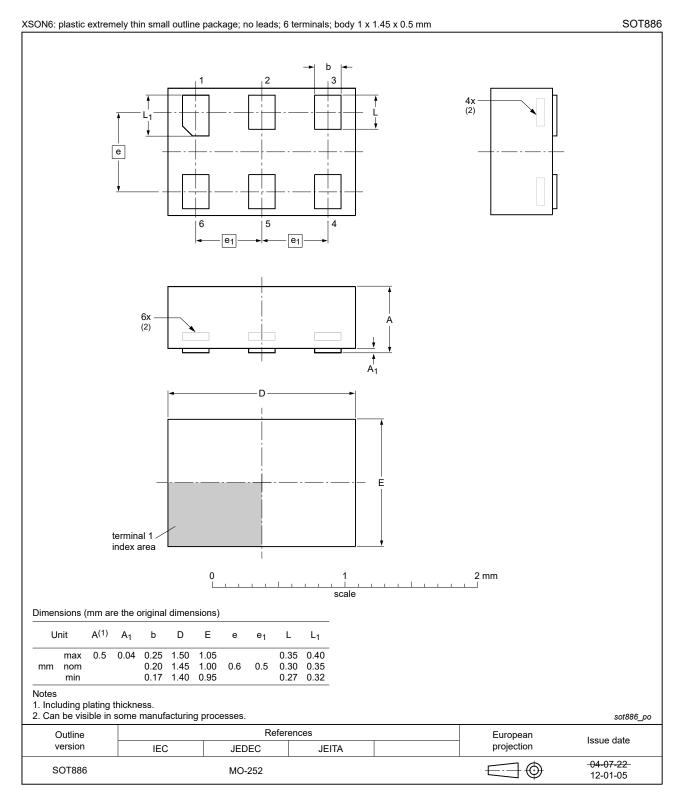


Fig. 11. Package outline SOT886 (XSON6)

## 13. Abbreviations

#### **Table 11. Abbreviations**

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 14. Revision history

#### **Table 12. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74AHC_AHCT1G125 v.13	20220111	Product data sheet	-	74AHC_AHCT1G125 v.12	
Modifications:	Fig. 9: Package outline drawing SOT353-1(TSSOP5) has changed				
74AHC_AHCT1G125 v.12	20210526	Product data sheet	-	74AHC_AHCT1G125 v.11	
Modifications:	Type number 74AHCT1G125GF (SOT891 / XSON6) removed.				
74AHC_AHCT1G125 v.11	20201013	Product data sheet	-	74AHC_AHCT1G125 v.10	
Modifications:	<ul> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Type number 74AHC1G125GF (SOT891 / XSON6) removed.</li> <li>Section 1 and Section 2 updated.</li> <li>Table 5: Derating values for Ptot total power dissipation updated.</li> </ul>				
74AHC_AHCT1G125 v.10	20120823	Product data sheet	-	74AHC_AHCT1G125 v.9	
Modifications:	Package out	tline drawing of SOT886 (	ig. 11) modified.		
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	-	-	

### 15. 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.
Product [short] data sheet	Production	This document contains the product specification.

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Date of release: 11 January 2022

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