74AHC2G08; 74AHCT2G08

Dual 2-input AND gate

Rev. 5 — 27 November 2013 **Product data sheet**

1. General description

The 74AHC2G08; 74AHCT2G08 is a high-speed Si-gate CMOS device.

The 74AHC2G08; 74AHCT2G08 provides two 2-input AND gates.

2. Features and benefits

- Symmetrical output impedance
- High noise immunity
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2 000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101C exceeds 1 000 V
- Low power dissipation
- Balanced propagation delays
- Multiple package options
- Specified from −40 °C to +80 °C and from −40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package				
	Temperature range	Name	Description		Version
74AHC2G08DP	−40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm		SOT505-2
74AHCT2G08DP					
74AHC2G08DC	−40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm		SOT765-1
74AHCT2G08DC					
74AHC2G08GD	−40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body $3 \times 2 \times 0.5$ mm		SOT996-2
74AHCT2G08GD					

4. Marking

Table 2. Marking

Type number	Marking code[1]
74AHC2G08DP	A08
74AHCT2G08DP	C08
74AHC2G08DC	A08
74AHCT2G08DC	C08
74AHC2G08GD	A08
74AHCT2G08GD	C08

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

5. Functional diagram

Fig 1. Logic symbol.

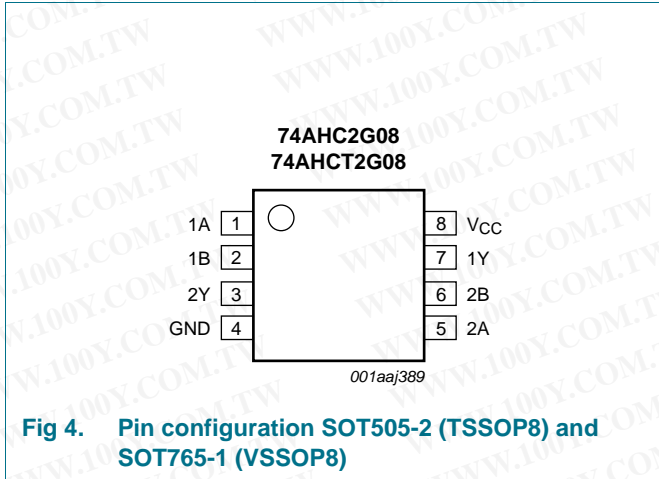Fig 2. IEC logic symbol.

Fig 3. Logic diagram (one gate).

74AHC_AHCT2G08

Product data sheet

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Rev. 5 — 27 November 2013

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2 of 15

6. Pinning information

6.1 Pinning

74AHC2G08
74AHCT2G08

1A [1]   [8] V_{CC}
1B [2]   [7] 1Y
2Y [3]   [6] 2B
GND [4]   [5] 2A

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Fig 4.   Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)

74AHC2G08
74AHCT2G08

1A [1]   [8] V_{CC}
1B [2]   [7] 1Y
2Y [3]   [6] 2B
GND [4]   [5] 2A

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Transparent top view
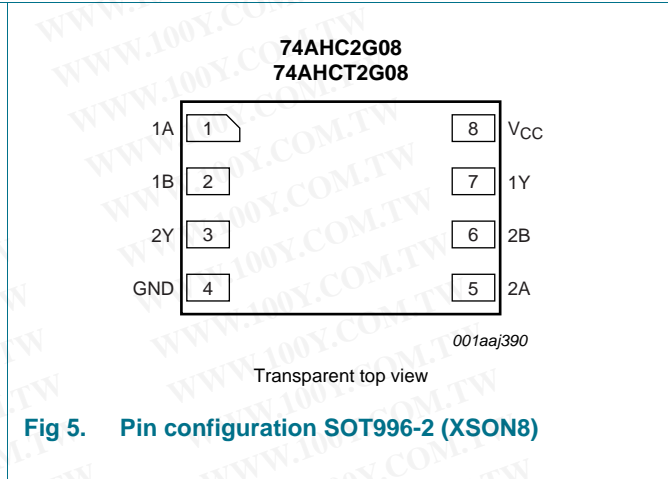
Fig 5.   Pin configuration SOT996-2 (XSON8)

6.2 Pin description

Table 3.   Pin description

Symbol	Pin	Description
1A, 2A	1, 5	data input
1B, 2B	2, 6	data input
GND	4	ground (0 V)
1Y, 2Y	7, 3	data output
V$_{CC}$	8	supply voltage

7. Functional description

Table 4.   Function table[1]

Input		Output
nA	nB	nY
L	L	L
L	H	L
H	L	L
H	H	H

[1]   H = HIGH voltage level; L = LOW voltage level.

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
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	mA
I_O	output current	-0.5 V $< V_O < V_{CC} + 0.5$ V		-	±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]	-	250	mW

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

[2]   For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K.
For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K.
For XSON8 package: above 45 °C the value of P_{tot} derates linearly with 2.4 mW/K.

9. Recommended operating conditions

Table 6.   Recommended operating conditions
Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	74AHC2G08			74AHCT2G08			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 ± 0.3 V	-	-	100	-	-	-	ns/V
		$V_{CC} = 5.0$ V ± 0.5 V	-	-	20	-	-	20	ns/V

74AHC_AHCT2G08

Product data sheet

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Rev. 5 — 27 November 2013

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4 of 15

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	
74AHC2G08										
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	-	-	3.8	-	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	-	-	1.0	-	10	-	40	μA
C_I	input capacitance		-	1.5	10	-	10	-	10	pF
74AHCT2G08										
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	-	-	3.8	-	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

74AHC_AHCT2G08

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Product data sheet

Rev. 5 — 27 November 2013

5 of 15

Table 7. Static characteristics *...continued*
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	
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	1.0	-	10	-	40	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 V; for test circuit see Figure 7.

Symbol	Parameter	Conditions		25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
74AHC2G08											
t_{pd}	propagation delay	nA, nB to nY; see Figure 6	[1]								
		$V_{CC} = 3.0$ V to 3.6 V	[2]								
		$C_L = 15$ pF		-	4.6	8.8	1.0	10.5	1.0	12.0	ns
		$C_L = 50$ pF		-	6.5	12.3	1.0	14.0	1.0	16.0	ns
		$V_{CC} = 4.5$ V to 5.5 V	[3]								
		$C_L = 15$ pF		-	3.2	5.9	1.0	7.0	1.0	8.0	ns
		$C_L = 50$ pF		-	4.6	7.9	1.0	9.0	1.0	10.5	ns
C_{PD}	power dissipation capacitance	per buffer; $C_L = 50$ pF; $f_i = 1$ MHz; $V_I = $ GND to V_{CC}	[4]	-	17	-	-	-	-	-	pF

74AHC_AHCT2G08

Product data sheet **Rev. 5 — 27 November 2013** 6 of 15

Table 8. Dynamic characteristics *…continued*

GND = 0 V; for test circuit see Figure 7.

Symbol	Parameter	Conditions			25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
					Min	Typ	Max	Min	Max	Min	Max	
74AHCT2G08												
t_{pd}	propagation delay	nA, nB to nY; see Figure 6	[1]									
		V_{CC} = 4.5 V to 5.5 V	[3]									
		C_L = 15 pF			-	3.6	6.2	1.0	7.1	1.0	8.0	ns
		C_L = 50 pF			-	5.1	7.9	1.0	9.0	1.0	10.5	ns
C_{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f_i = 1 MHz; V_I = GND to V_{CC}	[4]		-	19	-	-	-	-	-	pF

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

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

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

[4] 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;

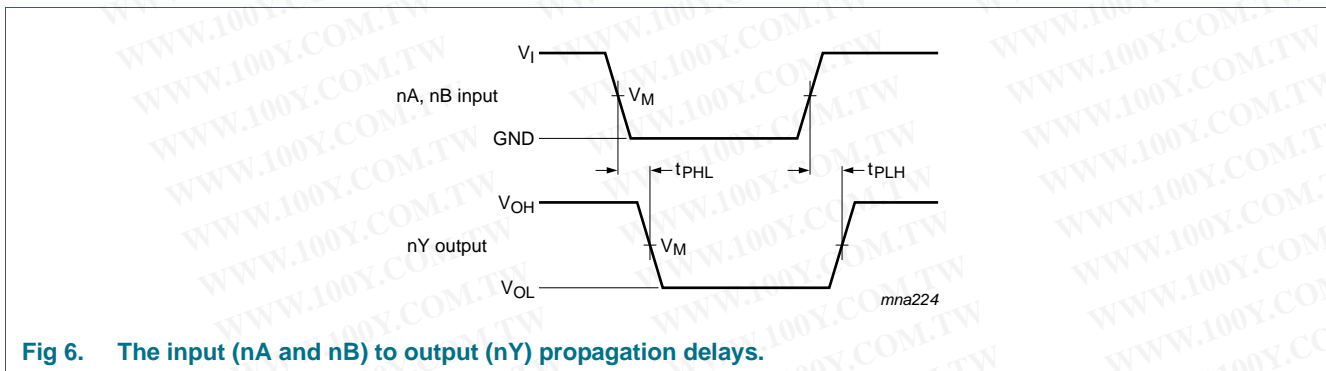$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

12. Waveforms

Fig 6.   The input (nA and nB) to output (nY) propagation delays.

Table 9.   Measurement points

Type	Input	Output
	V_M	V_M
74AHC2G08	0.5V_{CC}	0.5V_{CC}
74AHCT2G08	1.5 V	0.5V_{CC}

74AHC_AHCT2G08

Product data sheet | **Rev. 5 — 27 November 2013** | 7 of 15

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_L = Load resistance.

S1 = Test selection switch.

Fig 7.   Test circuit for measuring switching times
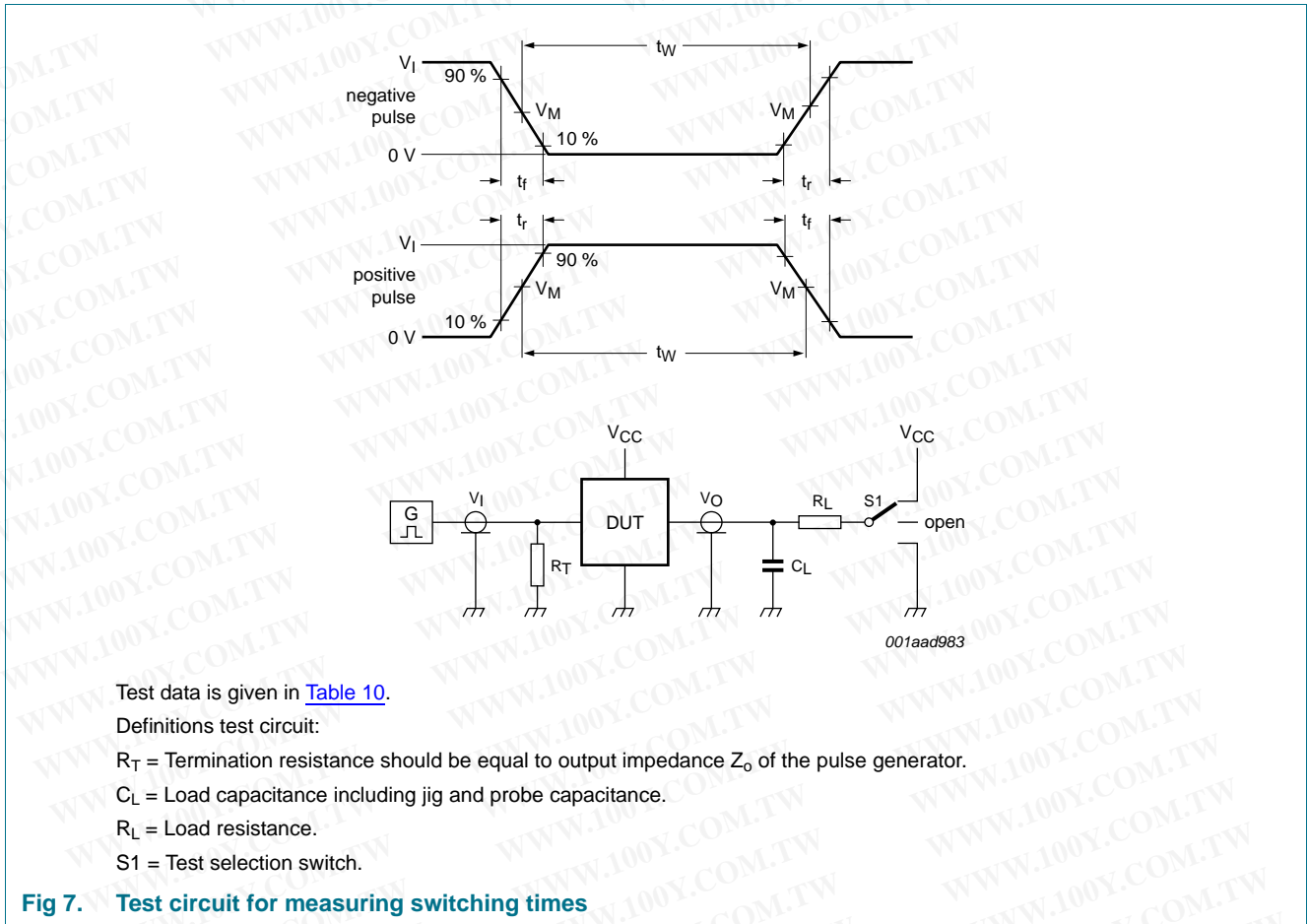
Table 10.   Test data

Type	Input		Load		S1 position		
	V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
74AHC2G08	V_{CC}	$\leq$ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}
74AHCT2G08	3 V	$\leq$ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}

13. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm   SOT505-2

DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D[1]	E[1]	e	H_E	L	L_p	v	w	y	Z[1]	θ
mm	1.1	0.15 0.00	0.95 0.75	0.25	0.38 0.22	0.18 0.08	3.1 2.9	3.1 2.9	0.65	4.1 3.9	0.5	0.47 0.33	0.2	0.13	0.1	0.70 0.35	8° 0°

Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT505-2		- - -				02-01-16
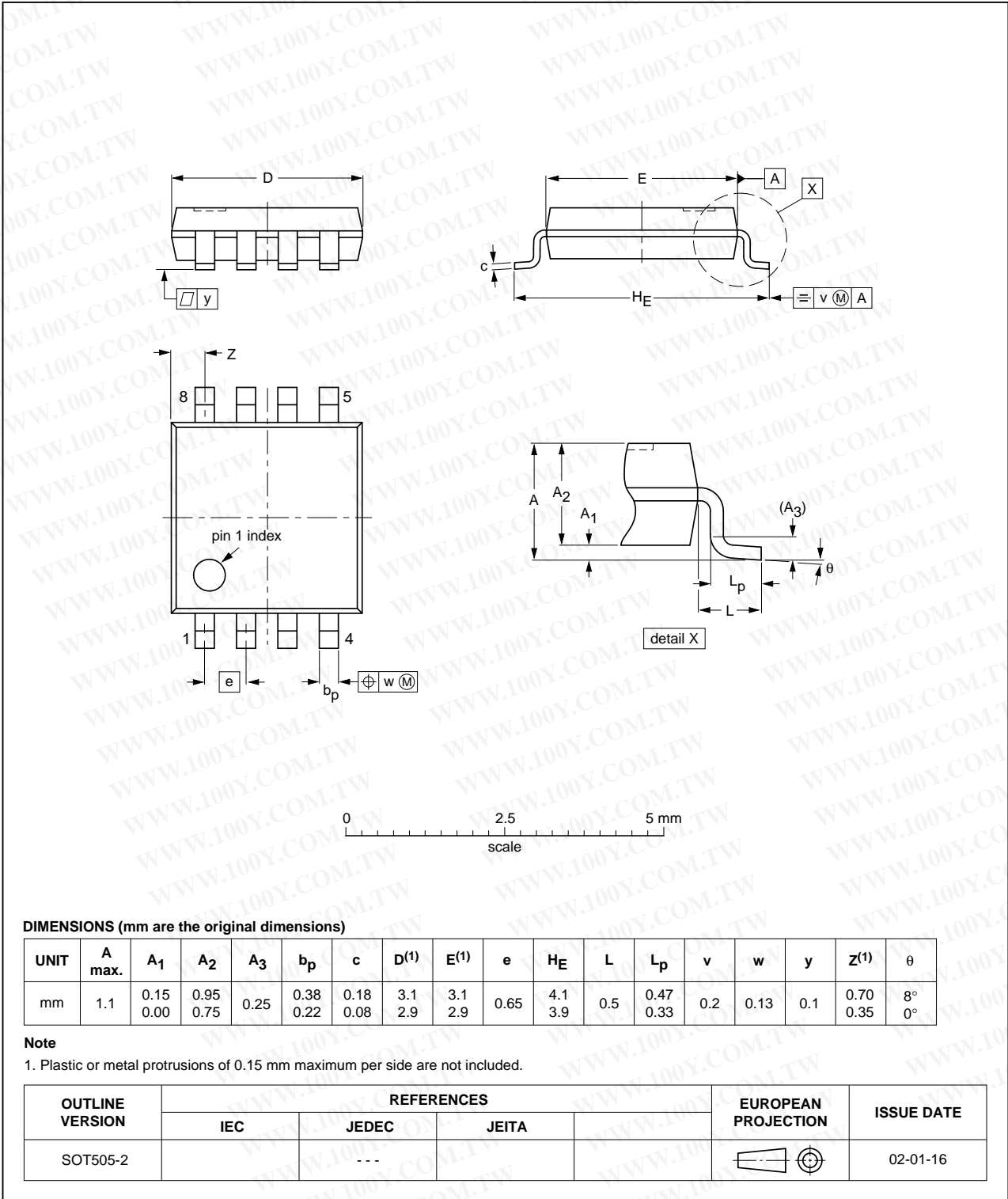
Fig 8.   Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm　　　**SOT765-1**

DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1	0.15 0.00	0.85 0.60	0.12	0.27 0.17	0.23 0.08	2.1 1.9	2.4 2.2	0.5	3.2 3.0	0.4	0.40 0.15	0.21 0.19	0.2	0.13	0.1	0.4 0.1	8° 0°

Notes
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT765-1		MO-187				02-06-07
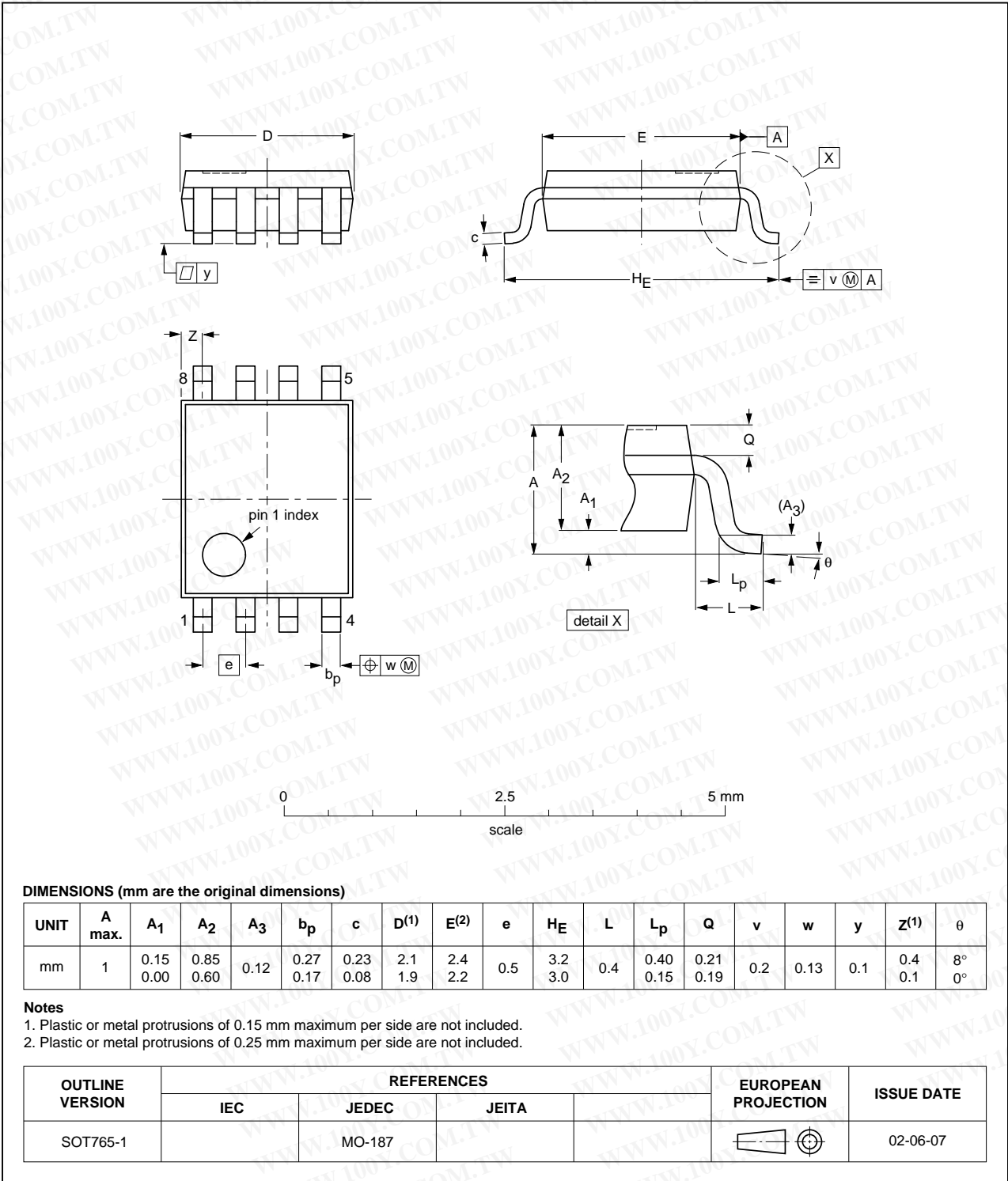
Fig 9.　Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads;
8 terminals; body 3 x 2 x 0.5 mm

SOT996-2

Dimensions (mm are the original dimensions)

Unit[1]	A	A$_1$	b	D	E	e	e$_1$	L	L$_1$	L$_2$	v	w	y	y$_1$
mm max	0.5	0.05	0.35	2.1	3.1	0.5	1.5	0.5	0.15	0.6	0.1	0.05	0.05	0.1
nom														
min		0.00	0.15	1.9	2.9			0.3	0.05	0.4				

sot996-2_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT996-2					~~07-12-21~~ 12-11-20
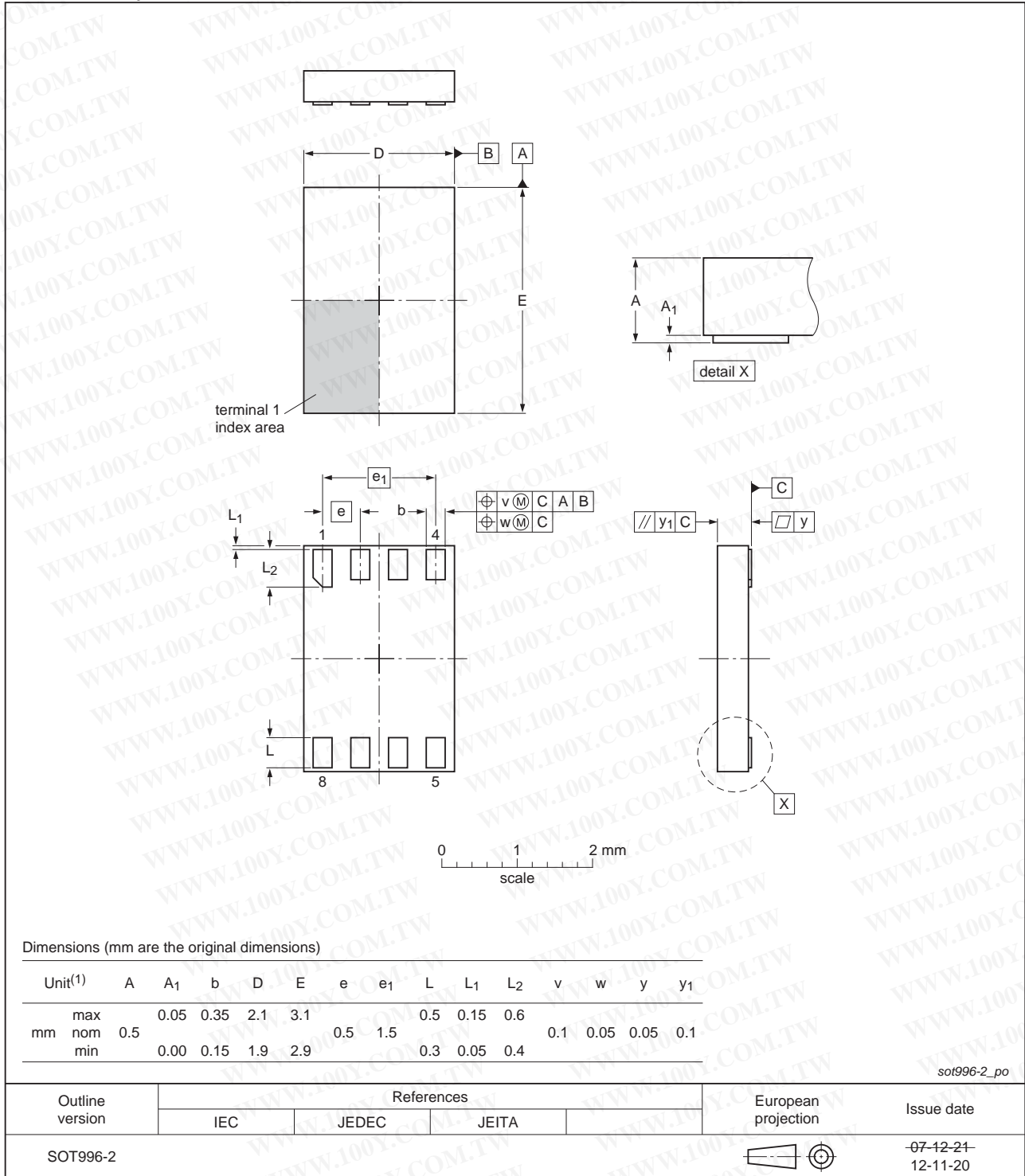
Fig 10. Package outline SOT996-2 (XSON8)

74AHC_AHCT2G08

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Product data sheet

Rev. 5 — 27 November 2013

11 of 15

14. Revision history

Table 11.　Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT2G08 v.5	20131127	Product data sheet	-	74AHC_AHCT2G08 v.4
Modifications:	• General description updated (errata).			
74AHC_AHCT2G08 v.4	20130513	Product data sheet	-	74AHC_AHCT2G08 v.3
Modifications:	• For type number 74AHC2G08GD and 74AHCT2G08GD XSON8U has changed to XSON8.			
74AHC_AHCT2G08 v.3	20090112	Product data sheet	-	74AHC_AHCT2G08 v.2
74AHC_AHCT2G08 v.2	20041018	Product data sheet	-	74AHC_AHCT2G08 v.1
74AHC_AHCT2G08 v.1	20040206	Product specification	-	-

15. Legal information

15.1 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.nxp.com.

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74AHC_AHCT2G08

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Product data sheet

Rev. 5 — 27 November 2013

13 of 15

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Product data sheet

Rev. 5 — 27 November 2013

14 of 15

17. Contents

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