

74LV08

Quad 2-input AND gate

Rev. 4 — 8 December 2015

Product data sheet

1. General description

The 74LV08 is a low-voltage Si-gate CMOS device that is pin and function compatible with 74HC08 and 74HCT08.

The 74LV08 provides a quad 2-input AND function.

2. Features and benefits

- Wide operating voltage: 1.0 V to 5.5 V
- Optimized for low voltage applications: 1.0 V to 3.6 V
- Accepts TTL input levels between $V_{CC} = 2.7$ V and $V_{CC} = 3.6$ V
- Typical output ground bounce < 0.8 V at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C
- Typical HIGH-level output voltage (V_{OH}) undershoot: > 2 V at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to $+85$ °C and from -40 °C to $+125$ °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LV08D	-40 °C to $+125$ °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74LV08DB	-40 °C to $+125$ °C	SSOP14	plastic shrink small outline package; 14 leads; body width 5.3 mm	SOT337-1
74LV08PW	-40 °C to $+125$ °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1

4. Functional diagram

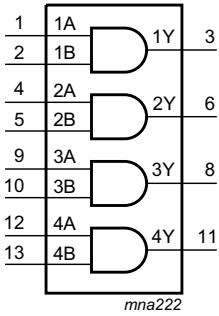


Fig 1. Logic symbol

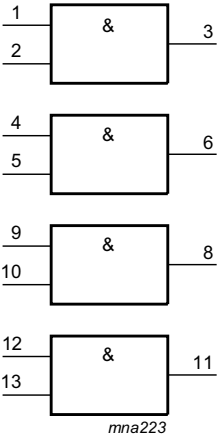


Fig 2. IEC logic symbol

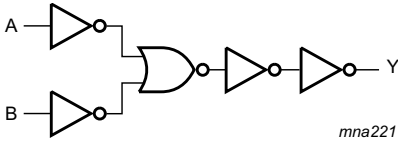


Fig 3. Logic diagram (one gate)

5. Pinning information

5.1 Pinning

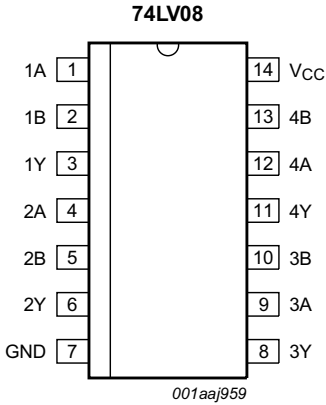


Fig 4. Pin configuration SO14

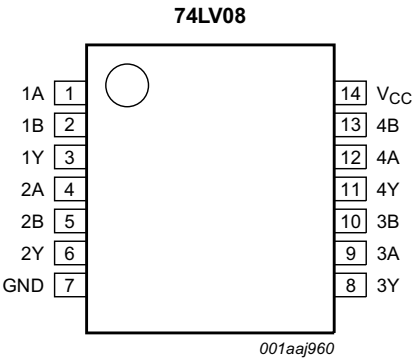


Fig 5. Pin configuration (T)SSOP14

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1A, 2A, 3A, 4A	1, 4, 9, 12	data input
1B, 2B, 3B, 4B	2, 5, 10, 13	data input
1Y, 2Y, 3Y, 4Y	3, 6, 8, 11	data output
GND	7	ground (0 V)
V _{CC}	14	supply voltage

6. Functional description

Table 3. Function selection^[1]

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

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care

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
I _{IK}	input clamping current	V _I < −0.5 V or V _I > V _{CC} + 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]	-	±50	mA
I _O	output current	V _O = −0.5 V to (V _{CC} + 0.5 V)	-	±25	mA
I _{CC}	supply current		-	50	mA
I _{GND}	ground current		−50	-	mA
T _{stg}	storage temperature		−65	+150	°C
P _{tot}	total power dissipation	T _{amb} = −40 °C to +125 °C ^[2]			
		SO14, SSOP14, TSSOP14	-	500	mW

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

[2] For SO14 packages: above 70 °C the value of P_{tot} derates linearly with 8 mW/K.

For (T)SSOP14 packages: above 60 °C the value of P_{tot} derates linearly with 5.5 mW/K.

8. Recommended operating conditions

Table 5. Recommended operating conditions

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage ^[1]		1.0	3.3	5.5	V
V_I	input voltage		0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.0\text{ V to }2.0\text{ V}$	-	-	500	ns/V
		$V_{CC} = 2.0\text{ V to }2.7\text{ V}$	-	-	200	ns/V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	-	-	100	ns/V
		$V_{CC} = 3.6\text{ V to }5.5\text{ V}$	-	-	50	ns/V

- [1] The static characteristics are guaranteed from $V_{CC} = 1.2\text{ V}$ to $V_{CC} = 5.5\text{ V}$, but LV devices are guaranteed to function down to $V_{CC} = 1.0\text{ V}$ (with input levels GND or V_{CC}).

9. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
V_{IH}	HIGH-level input voltage	$V_{CC} = 1.2\text{ V}$	0.9	-	-	0.9	-	V
		$V_{CC} = 2.0\text{ V}$	1.4	-	-	1.4	-	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	2.0	-	-	2.0	-	V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$0.7V_{CC}$	-	-	$0.7V_{CC}$	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 1.2\text{ V}$	-	-	0.3	-	0.3	V
		$V_{CC} = 2.0\text{ V}$	-	-	0.6	-	0.6	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	-	-	0.8	-	0.8	V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-	-	$0.3V_{CC}$	-	$0.3V_{CC}$	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}\text{ or }V_{IL}$						
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 1.2\text{ V}$	-	1.2	-	-	-	V
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$	1.8	2.0	-	1.8	-	V
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 2.7\text{ V}$	2.5	2.7	-	2.5	-	V
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 3.0\text{ V}$	2.8	3.0	-	2.8	-	V
		$I_O = -100\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$	4.3	4.5	-	4.3	-	V
		$I_O = -6\text{ mA}; V_{CC} = 3.0\text{ V}$	2.4	2.82	-	2.2	-	V
		$I_O = -12\text{ mA}; V_{CC} = 4.5\text{ V}$	3.6	4.2	-	3.5	-	V

Table 6. Static characteristics ...continued
 Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	–40 °C to +85 °C			–40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = 100 µA; V _{CC} = 1.2 V	-	0	-	-	-	V
		I _O = 100 µA; V _{CC} = 2.0 V	-	0	0.2	-	0.2	V
		I _O = 100 µA; V _{CC} = 2.7 V	-	0	0.2	-	0.2	V
		I _O = 100 µA; V _{CC} = 3.0 V	-	0	0.2	-	0.2	V
		I _O = 100 µA; V _{CC} = 4.5 V	-	0	0.2	-	0.2	V
		I _O = 6 mA; V _{CC} = 3.0 V	-	0.25	0.40	-	0.50	V
		I _O = 12 mA; V _{CC} = 4.5 V	-	0.35	0.55	-	0.65	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	1.0	-	1.0	µA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	20.0	-	40	µA
ΔI _{CC}	additional supply current	per input; V _I = V _{CC} – 0.6 V; V _{CC} = 2.7 V to 3.6 V	-	-	500	-	850	µA
C _I	input capacitance		-	3.5	-	-	-	pF

[1] Typical values are measured at T_{amb} = 25 °C.

10. Dynamic characteristics

Table 7. Dynamic characteristics
 GND = 0 V; For test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	–40 °C to +85 °C			–40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
t _{pd}	propagation delay	nA, nB to nY; see Figure 6 ^[2]						
		V _{CC} = 1.2 V	-	45	-	-	-	ns
		V _{CC} = 2.0 V	-	15	26	-	33	ns
		V _{CC} = 2.7 V	-	11	17	-	21	ns
		V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF ^[3]	-	7	-	-	-	ns
		V _{CC} = 3.0 V to 3.6 V ^[3]	-	9.0	15	-	19	ns
		V _{CC} = 4.5 V to 5.5 V	-	-	11	-	14	ns
C _{PD}	power dissipation capacitance	C _L = 50 pF; f _i = 1 MHz; V _I = GND to V _{CC} ^[4]	-	10	-	-	-	pF

[1] All typical values are measured at T_{amb} = 25 °C.

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

[3] Typical values are measured at nominal supply voltage (V_{CC} = 3.3 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

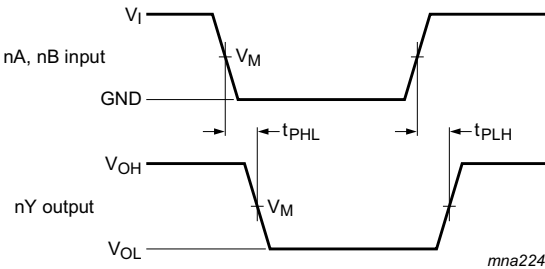
C_L = output load capacitance in pF

V_{CC} = supply voltage in Volts

N = number of inputs switching

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

11. Waveforms

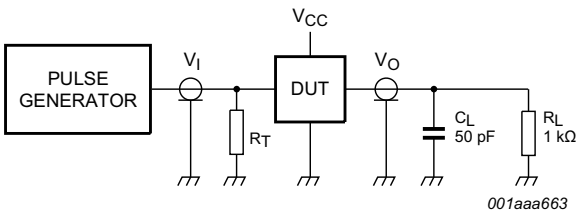


Measurement points are given in [Table 8](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

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

Table 8. Measurement points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
< 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$
2.7 V to 3.6 V	1.5 V	1.5 V
≥ 4.5 V	$0.5V_{CC}$	$0.5V_{CC}$



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.
 R_L = Load resistance.
 C_L = Load capacitance including jig and probe capacitance.

Fig 7. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input	
V_{CC}	V_I	t_r, t_f
< 2.7 V	V_{CC}	≤ 2.5 ns
2.7 V to 3.6 V	2.7 V	≤ 2.5 ns
≥ 4.5 V	V_{CC}	≤ 2.5 ns

12. Package outline

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

SOT108-1

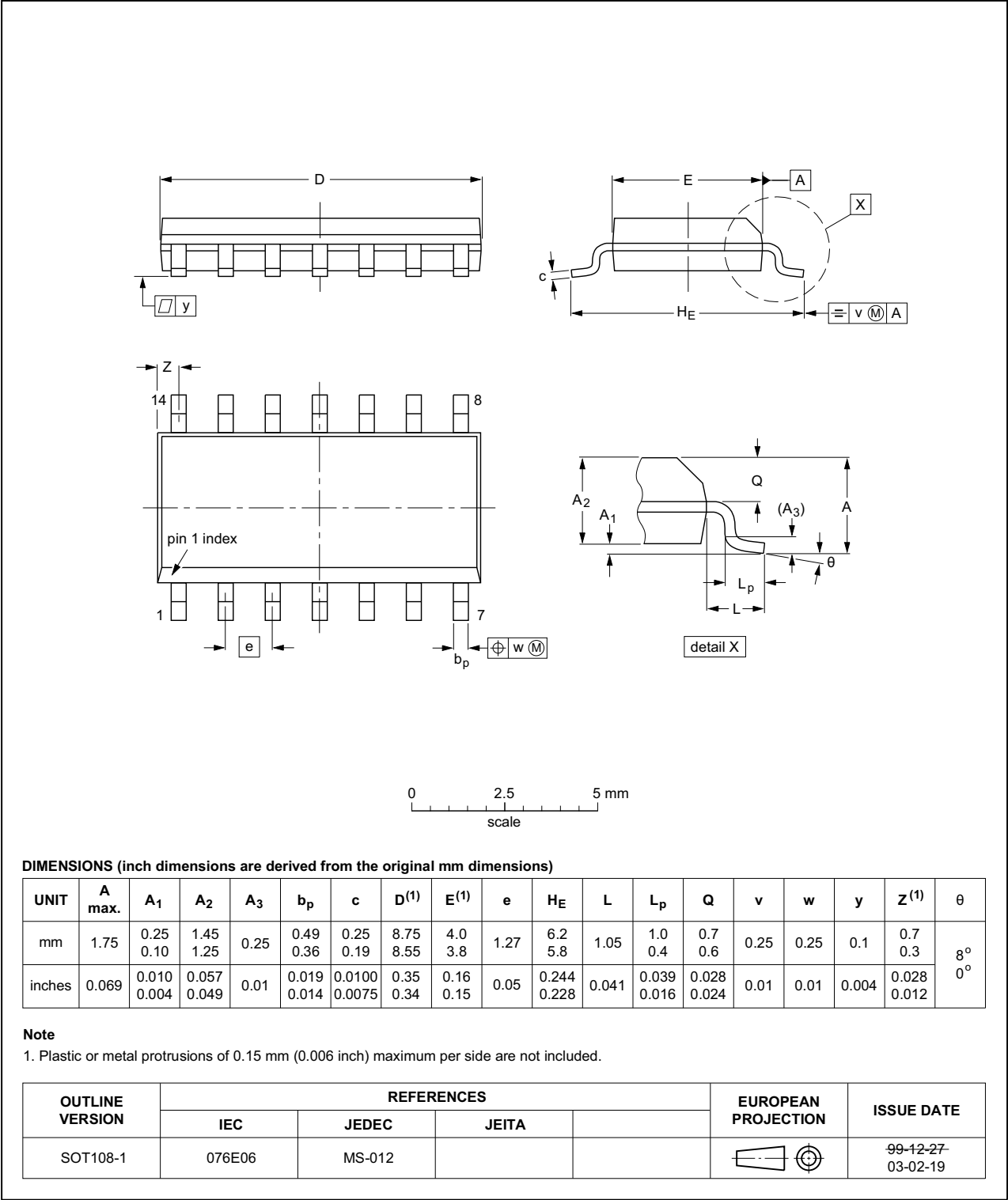


Fig 8. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

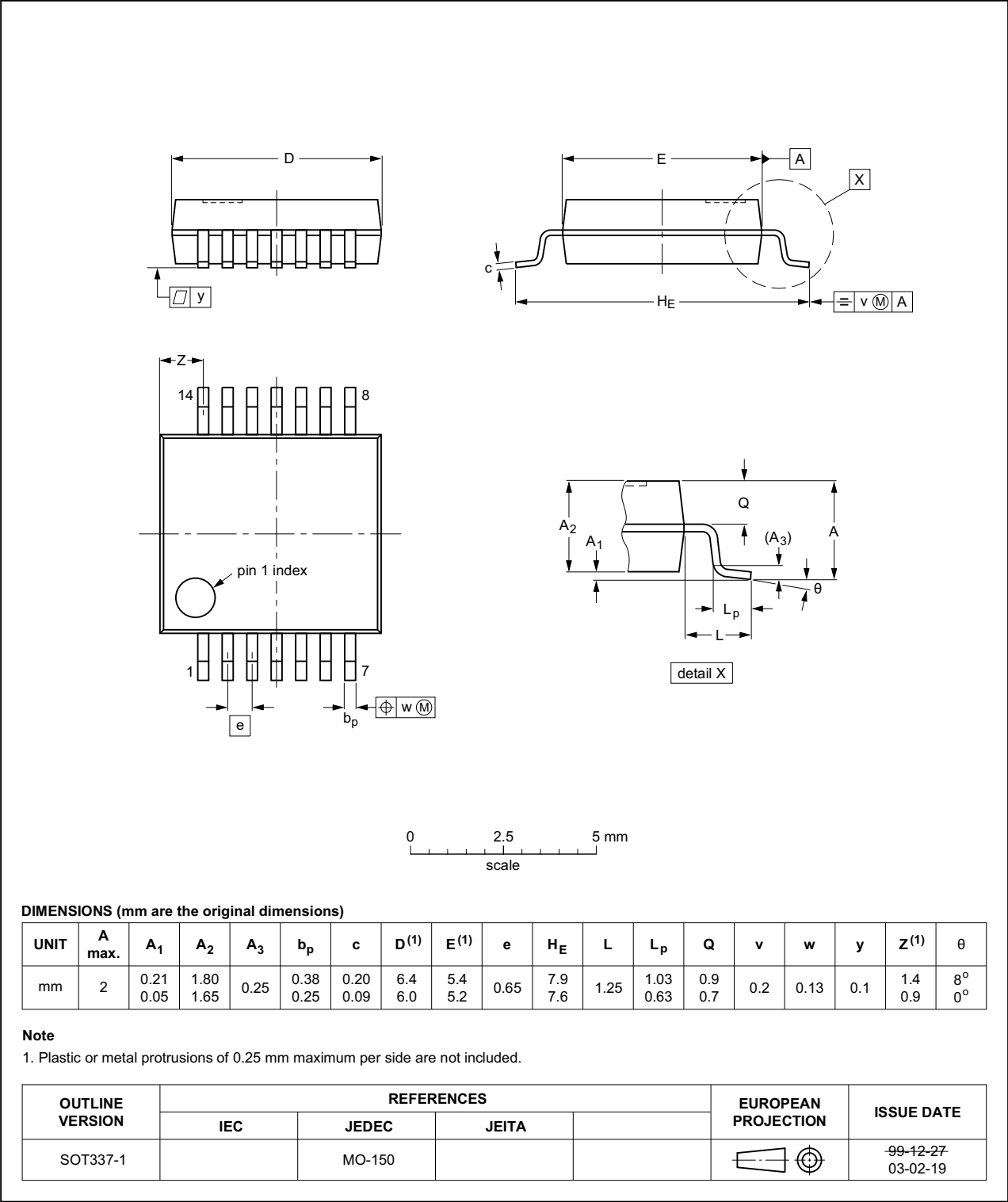


Fig 9. Package outline SOT337-1 (SSOP14)

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

SOT402-1

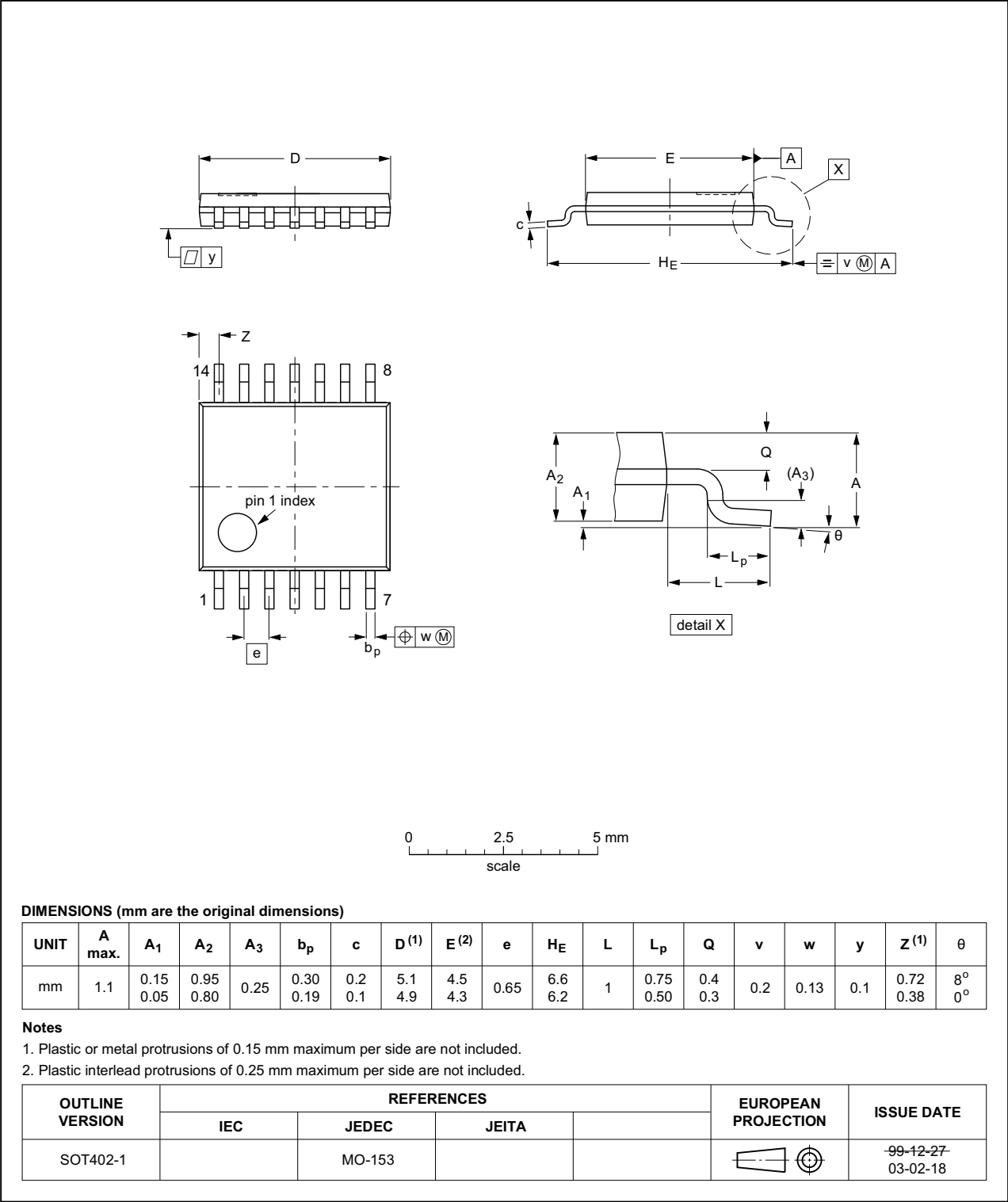


Fig 10. Package outline SOT402-1 (TSSOP14)

13. Abbreviations

Table 10. Abbreviations

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

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LV08 v.4	20151208	Product data sheet	-	74LV08 v.3
Modifications:	Type number 74LV08N (SOT27-1) removed.			
74LV08 v.3	20090406	Product data sheet	-	74LV08 v.2
Modifications:	- 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 when appropriate.			
74LV08 v.2	19980420	Product specification	-	74LV08 v.1
74LV08 v.1	19970203	Product specification	-	-

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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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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17. Contents

1	General description	1
2	Features and benefits	1
3	Ordering information	1
4	Functional diagram	2
5	Pinning information	2
5.1	Pinning	2
5.2	Pin description	3
6	Functional description	3
7	Limiting values	3
8	Recommended operating conditions	4
9	Static characteristics	4
10	Dynamic characteristics	5
11	Waveforms	6
12	Package outline	7
13	Abbreviations	10
14	Revision history	10
15	Legal information	11
15.1	Data sheet status	11
15.2	Definitions	11
15.3	Disclaimers	11
15.4	Trademarks	12
16	Contact information	12
17	Contents	13