

# 74ALVC32

## Quad 2-input OR gate

Rev. 02 — 10 December 2007

Product data sheet

## 1. General description

The 74ALVC32 is a quad 2-input OR gate.

Schmitt trigger action on all inputs makes the device tolerant of slow rise and fall times.

## 2. Features

- Wide supply voltage range from 1.65 V to 3.6 V
- 3.6 V tolerant inputs/outputs
- CMOS low power consumption
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standards:
  - ◆ JESD8-7 (1.65 V to 1.95 V)
  - ◆ JESD8-5 (2.3 V to 2.7 V)
  - ◆ JESD8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V

## 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74ALVC32D	−40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74ALVC32PW	−40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74ALVC32BQ	−40 °C to +85 °C	DHVQFN14	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm	SOT762-1

### 4. Functional diagram

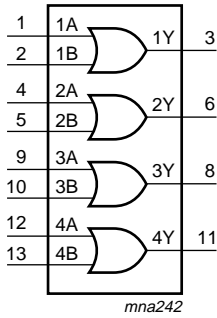


Fig 1. Logic symbol

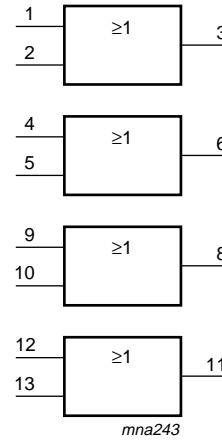


Fig 2. IEC logic symbol

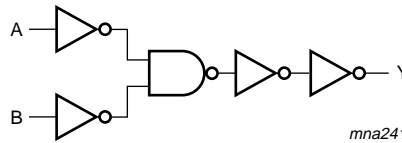


Fig 3. Logic diagram (one gate)

### 5. Pinning information

#### 5.1 Pinning

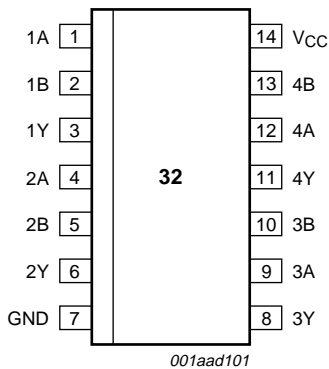


Fig 4. Pin configuration SO14 and TSSOP14

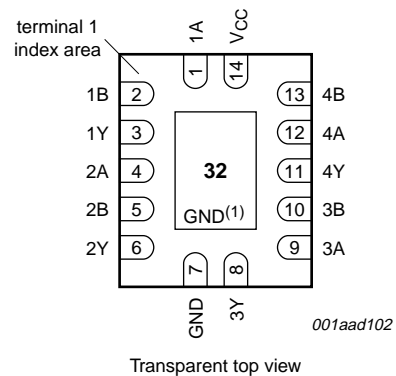


Fig 5. Pin configuration DHVQFN14

## 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
nA	1, 4, 9, 12	data input
nB	2, 5, 10, 13	data input
nY	3, 6, 8, 11	data output
V <sub>CC</sub>	14	supply voltage
GND	7	ground (0 V)

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

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

- [1] H = HIGH voltage level  
L = LOW voltage level

## 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 <sub>CC</sub>	supply voltage		-0.5	+4.6	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-50	-	mA
V <sub>I</sub>	input voltage		-0.5	+4.6	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0 V	-	±50	mA
V <sub>O</sub>	output voltage	output HIGH or LOW state	<sup>[1]</sup> <sup>[2]</sup> -0.5	V <sub>CC</sub> + 0.5	V
		output 3-state	-0.5	+4.6	V
		power-down mode, V <sub>CC</sub> = 0 V	<sup>[2]</sup> -0.5	+4.6	V
I <sub>O</sub>	output current	V <sub>O</sub> = 0 V to V <sub>CC</sub>	-	±50	mA
I <sub>CC</sub>	supply current		-	100	mA
I <sub>GND</sub>	ground current		-100	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +85 °C	<sup>[3]</sup> -	500	mW

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 [2] When V<sub>CC</sub> = 0 V (power-down mode), the output voltage can be 3.6 V in normal operation.  
 [3] For SO14 packages: above 70 °C derate linearly with 8 mW/K.  
 For TSSOP14 packages: above 60 °C derate linearly with 5.5 mW/K.  
 For DHVQFN14 packages: above 60 °C derate linearly with 4.5 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		1.65	3.6	V
$V_I$	input voltage		0	3.6	V
$V_O$	output voltage	output HIGH or LOW state	0	$V_{CC}$	V
		output 3-state	0	3.6	V
		power-down mode; $V_{CC} = 0$ V	0	3.6	V
$T_{amb}$	ambient temperature	in free air	-40	+85	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65$ V to 2.7 V	0	20	ns/V
		$V_{CC} = 2.7$ V to 3.6 V	0	10	ns/V

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	$0.65 \times V_{CC}$	-	-	V
		$V_{CC} = 2.3$ V to 2.7 V	1.7	-	-	V
		$V_{CC} = 2.7$ V to 3.6 V	2.0	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	-	-	$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3$ V to 2.7 V	-	-	0.7	V
		$V_{CC} = 2.7$ V to 3.6 V	-	-	0.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -100$ $\mu$ A; $V_{CC} = 1.65$ V to 3.6 V	$V_{CC} - 0.2$	-	-	V
		$I_O = -6$ mA; $V_{CC} = 1.65$ V	1.25	1.51	-	V
		$I_O = -12$ mA; $V_{CC} = 2.3$ V	1.8	2.10	-	V
		$I_O = -18$ mA; $V_{CC} = 2.3$ V	1.7	2.01	-	V
		$I_O = -12$ mA; $V_{CC} = 2.7$ V	2.2	2.53	-	V
		$I_O = -18$ mA; $V_{CC} = 3.0$ V	2.4	2.76	-	V
		$I_O = -24$ mA; $V_{CC} = 3.0$ V	2.2	2.68	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 100$ $\mu$ A; $V_{CC} = 1.65$ V to 3.6 V	-	-	0.2	V
		$I_O = 6$ mA; $V_{CC} = 1.65$ V	-	0.11	0.3	V
		$I_O = 12$ mA; $V_{CC} = 2.3$ V	-	0.17	0.4	V
		$I_O = 18$ mA; $V_{CC} = 2.3$ V	-	0.25	0.6	V
		$I_O = 12$ mA; $V_{CC} = 2.7$ V	-	0.16	0.4	V
		$I_O = 18$ mA; $V_{CC} = 3.0$ V	-	0.23	0.4	V
		$I_O = 24$ mA; $V_{CC} = 3.0$ V	-	0.30	0.55	V
$I_I$	input leakage current	$V_{CC} = 3.6$ V; $V_I = 3.6$ V or GND	-	$\pm 0.1$	$\pm 5$	$\mu$ A
$I_{OFF}$	power-off leakage current	$V_{CC} = 0$ V; $V_I$ or $V_O = 0$ V to 3.6 V	-	$\pm 0.1$	$\pm 10$	$\mu$ A

**Table 6. Static characteristics ...continued**

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
$I_{CC}$	supply current	$V_{CC} = 3.6\text{ V}$ ; $V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$	-	0.2	10	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input pin; $V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$ ; $V_I = V_{CC} - 0.6\text{ V}$ ; $I_O = 0\text{ A}$	-	5	750	$\mu\text{A}$
$C_I$	input capacitance		-	3.5	-	pF

[1] All typical values are measured at  $V_{CC} = 3.3\text{ V}$  (unless stated otherwise) and  $T_{amb} = 25\text{ °C}$ .

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
$t_{pd}$	propagation delay	CP to Qn; see <a href="#">Figure 6</a> <sup>[2]</sup>				
		$V_{CC} = 1.65\text{ V}$ to $1.95\text{ V}$	1.0	2.8	4.7	ns
		$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	1.0	2.0	3.1	ns
		$V_{CC} = 2.7\text{ V}$	1.0	2.2	2.9	ns
		$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	1.0	2.0	2.8	ns
$C_{PD}$	power dissipation capacitance	per gate; $V_I = \text{GND}$ to $V_{CC}$ ; $V_{CC} = 3.3\text{ V}$ <sup>[3]</sup>	-	25	-	pF

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

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

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

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

$f_i$  = input frequency in MHz;  $f_o$  = output frequency in MHz

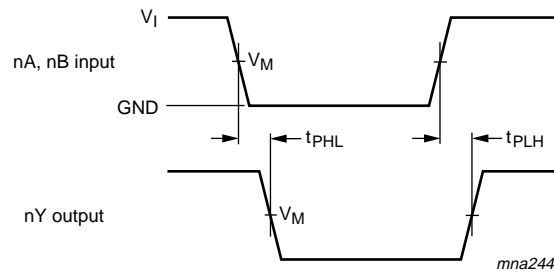
$C_L$  = output load capacitance in pF

$V_{CC}$  = supply voltage in Volts

$N$  = number of inputs switching

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

## 11. Waveforms

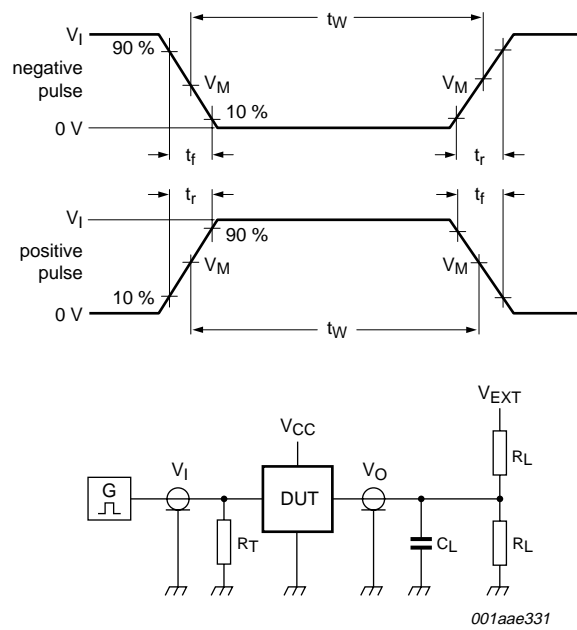


Measurement points are given in [Table 8](#).

**Fig 6. Inputs nA, nB to output nY propagation delay times**

**Table 8. Measurement points**

Supply voltage $V_{CC}$	Input $V_I$	$V_M$
1.65 V to 1.95 V	$V_{CC}$	$0.5V_{CC}$
2.3 V to 2.7 V	$V_{CC}$	$0.5V_{CC}$
2.7 V	2.7 V	1.5 V
3.0 V to 3.6 V	2.7 V	1.5 V



Test data is given in [Table 9](#).

Definitions for test circuit:

$R_L$  = Load resistance.

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

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

$V_{EXT}$  = External voltage for measuring switching times.

**Fig 7. Test circuitry for switching times**

**Table 9. Test data**

Supply voltage $V_{CC}$	Input		Load		$V_{EXT}$		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
1.65 V to 1.95 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	6 V	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	6 V	GND

12. Package outline

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

SOT108-1

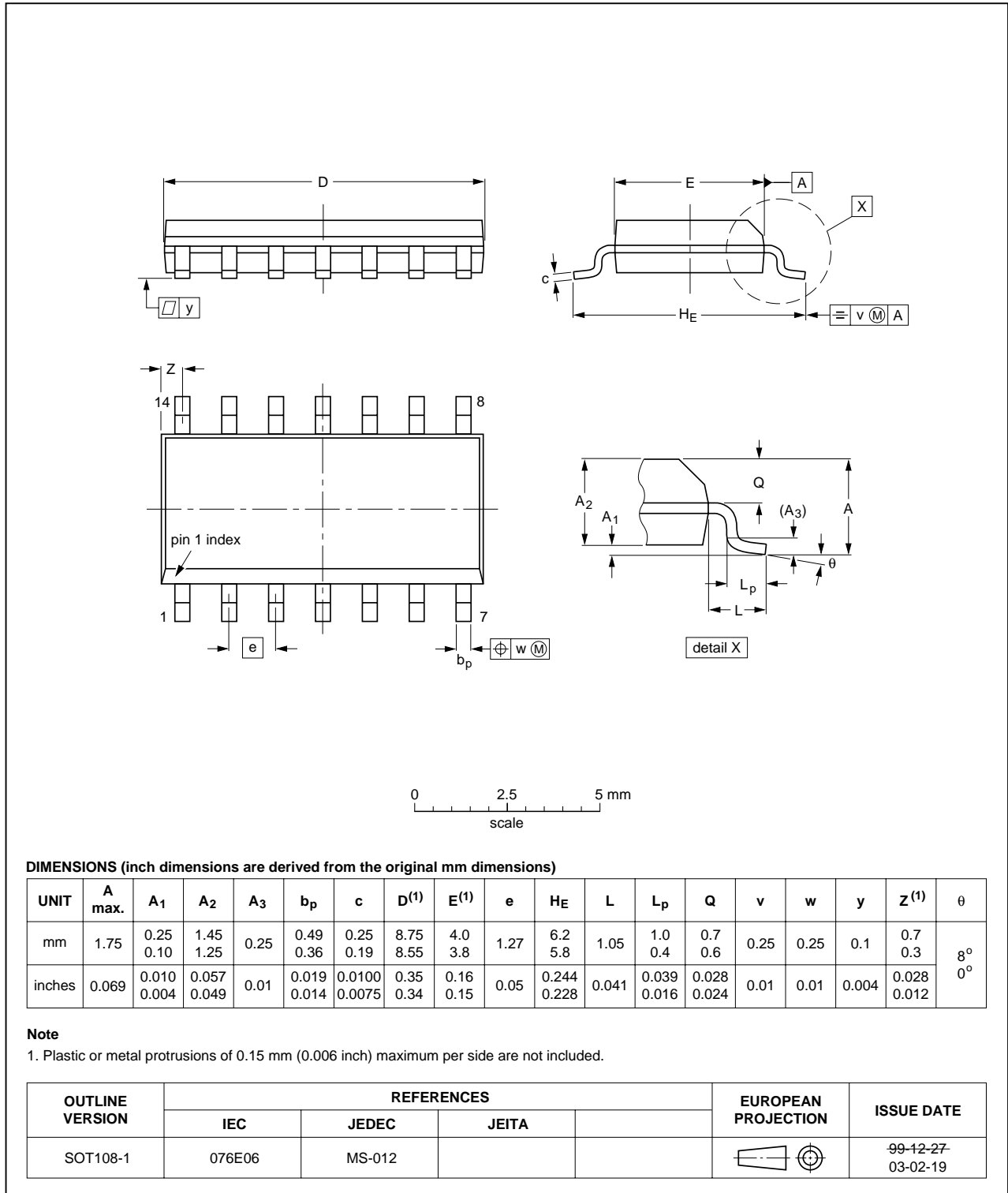


Fig 8. Package outline SOT108-1 (SO14)



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

SOT402-1

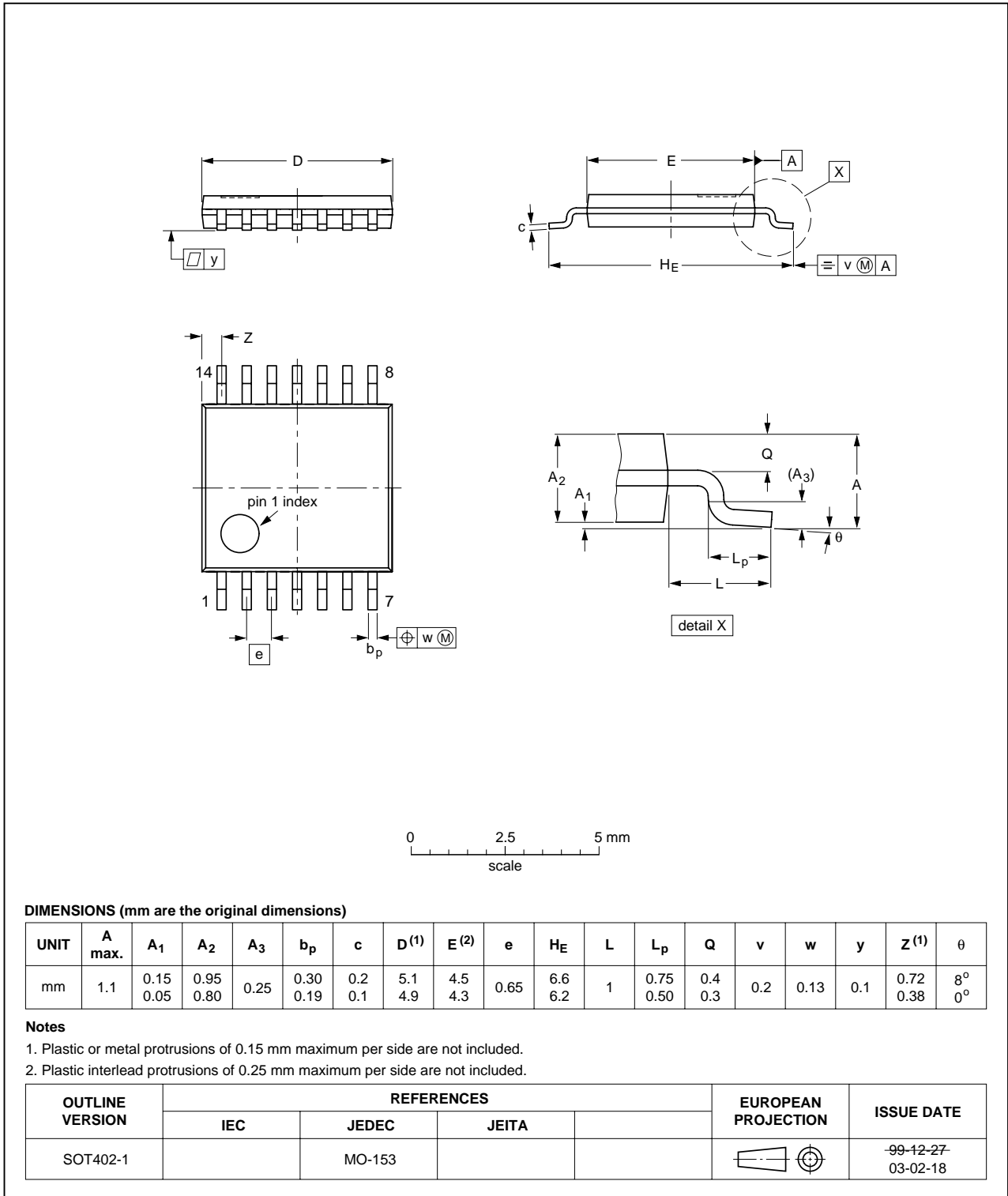


Fig 9. Package outline SOT402-1 (TSSOP14)

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1

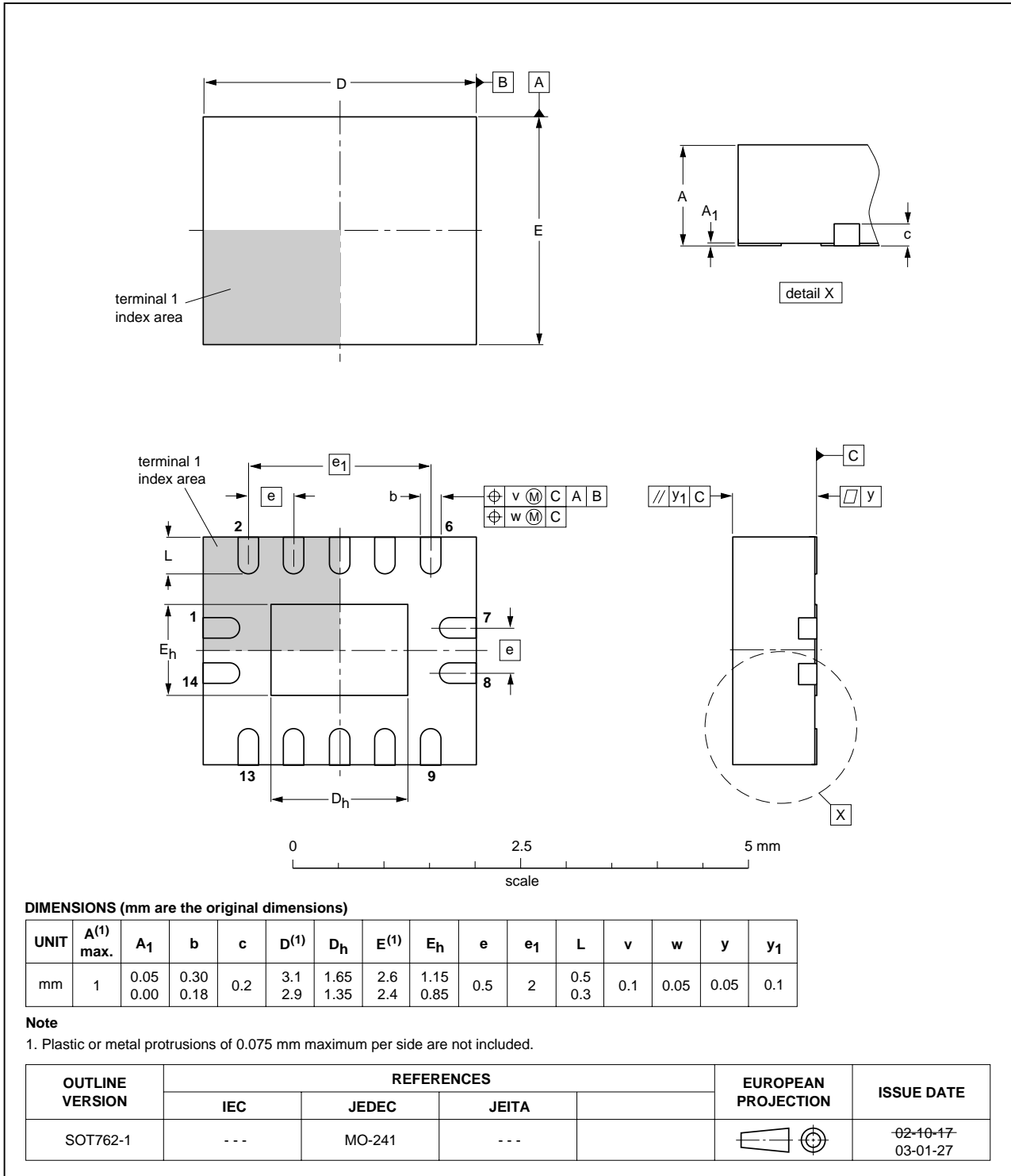


Fig 10. Package outline SOT762-1 (DHVQFN14)

## 13. 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

## 14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ALVC32_2	20071210	Product data sheet	-	74ALVC32_1
Modifications:	<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• <a href="#">Section 3</a>: DHVQFN14 package added.</li> <li>• <a href="#">Section 7</a>: derating values added for DHVQFN14 package.</li> <li>• <a href="#">Section 12</a>: outline drawing added for DHVQFN14 package.</li> </ul>			
74ALVC32_1	20021115	Product specification	-	-

## 15. Legal information

### 15.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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Date of release: 10 December 2007

Document identifier: 74ALVC32\_2