

74LV32

Quad 2-input OR gate

Rev. 03 — 9 November 2007

Product data sheet

1. General description

The 74LV32 is a low-voltage Si-gate CMOS device that is pin and function compatible with 74HC32 and 74HCT32.

The 74LV32 provides a quad 2-input OR function.

2. Features

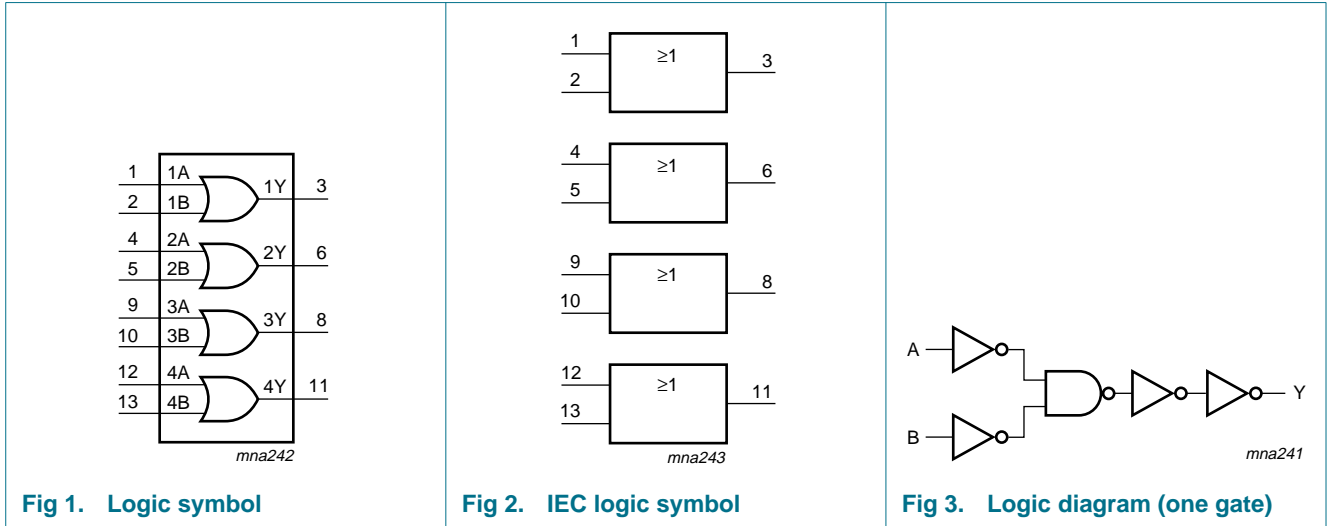
- Wide operating voltage: 1.0 V to 5.5 V
- Optimized for low voltage applications: 1.0 V to 3.6 V
- Accepts TTL input levels between $V_{CC} = 2.7$ V and $V_{CC} = 3.6$ V
- Typical output ground bounce < 0.8 V at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C
- Typical HIGH-level output voltage (V_{OH}) undershoot: > 2 V at $V_{CC} = 3.3$ V and $T_{amb} = 25$ °C
- ESD protection:
 - ◆ HBM JESD22-A114E 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

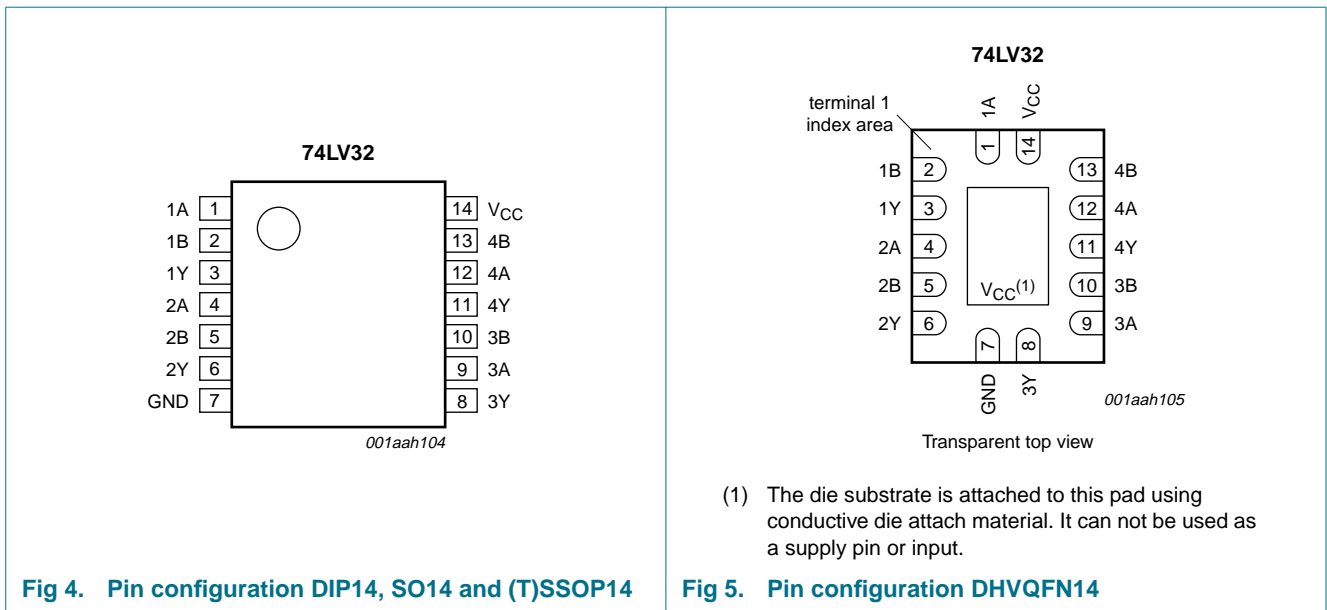
| Type number | Package | | | |
|-------------|-------------------|----------|--|----------|
| | Temperature range | Name | Description | Version |
| 74LV32N | -40 °C to +125 °C | DIP14 | plastic dual in-line package; 14 leads (300 mil) | SOT27-1 |
| 74LV32D | -40 °C to +125 °C | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |
| 74LV32DB | -40 °C to +125 °C | SSOP14 | plastic shrink small outline package; 14 leads; body width 5.3 mm | SOT337-1 |
| 74LV32PW | -40 °C to +125 °C | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |
| 74LV32BQ | -40 °C to +125 °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



5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

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

6. Functional description

Table 3. Function selection

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

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

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 |

Table 4. Limiting values ...continued

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|-------------------------|--|-------|-----|------|
| P_{tot} | total power dissipation | $T_{\text{amb}} = -40\text{ °C to }+125\text{ °C}$ | | | |
| | DIP14 package | | [2] - | 750 | mW |
| | SO14 package | | [3] - | 500 | mW |
| | (T)SSOP14 package | | [4] - | 500 | mW |
| | DHVQFN14 package | | [5] - | 500 | mW |

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

[2] P_{tot} derates linearly with 12 mW/K above 70 °C.

[3] P_{tot} derates linearly with 8 mW/K above 70 °C.

[4] P_{tot} derates linearly with 5.5 mW/K above 60 °C.

[5] P_{tot} derates linearly with 4.5 mW/K above 60 °C.

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 | $V_{\text{CC}} = 1.0\text{ V to }2.0\text{ V}$ | - | - | 500 | ns/V |
| | | $V_{\text{CC}} = 2.0\text{ V to }2.7\text{ V}$ | - | - | 200 | ns/V |
| | | $V_{\text{CC}} = 2.7\text{ V to }3.6\text{ V}$ | - | - | 100 | ns/V |
| | | $V_{\text{CC}} = 3.6\text{ V to }5.5\text{ V}$ | - | - | 50 | ns/V |

[1] The static characteristics are guaranteed from $V_{\text{CC}} = 1.2\text{ V to }V_{\text{CC}} = 5.5\text{ V}$, but LV devices are guaranteed to function down to $V_{\text{CC}} = 1.0\text{ V}$ (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 V | V _{CC} | 0.6 | - | V _{CC} | - | V |
| | | V _{CC} = 2.0 V | 1.4 | - | - | 1.4 | - | V |
| | | V _{CC} = 2.7 V to 3.6 V | 2.0 | - | - | 2.0 | - | V |
| | | V _{CC} = 4.5 V to 5.5 V | 0.7V _{CC} | - | - | 0.7V _{CC} | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 1.2 V | - | 0.4 | GND | - | GND | V |
| | | V _{CC} = 2.0 V | - | - | 0.6 | - | 0.6 | V |
| | | V _{CC} = 2.7 V to 3.6 V | - | - | 0.8 | - | 0.8 | V |
| | | V _{CC} = 4.5 V to 5.5 V | - | - | 0.3V _{CC} | - | 0.3V _{CC} | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | |
| | | I _O = -100 μA; V _{CC} = 1.2 V | - | 1.2 | - | - | - | V |
| | | I _O = -100 μA; V _{CC} = 2.0 V | 1.8 | 2.0 | - | 1.8 | - | V |
| | | I _O = -100 μA; V _{CC} = 2.7 V | 2.5 | 2.7 | - | 2.5 | - | V |
| | | I _O = -100 μA; V _{CC} = 3.0 V | 2.8 | 3.0 | - | 2.8 | - | V |
| | | I _O = -100 μA; V _{CC} = 4.5 V | 4.3 | 4.5 | - | 4.3 | - | V |
| | | I _O = -6 mA; V _{CC} = 3.0 V | 2.4 | 2.82 | - | 2.2 | - | V |
| | | I _O = -12 mA; V _{CC} = 4.5 V | 3.6 | 4.2 | - | 3.5 | - | V |
| 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.

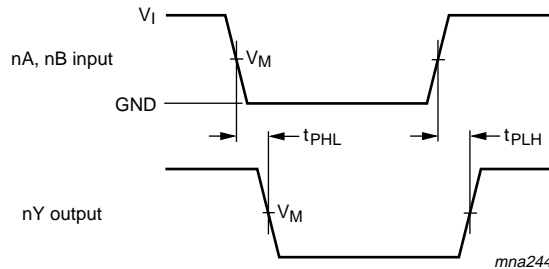
10. Dynamic characteristics

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 | - | 40 | - | - | - | ns |
| | | V _{CC} = 2.0 V | - | 14 | 22 | - | 28 | ns |
| | | V _{CC} = 2.7 V | - | 10 | 16 | - | 20 | ns |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF ^[3] | - | 6.0 | - | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V ^[3] | - | 8.0 | 13 | - | 16 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | - | - | 10 | - | 13 | ns |
| C _{PD} | power dissipation capacitance | C _L = 50 pF; f _i = 1 MHz; V _I = GND to V _{CC} ^[4] | - | 16 | - | - | - | 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 V
 N = number of inputs switching
 Σ(C_L × V_{CC}² × f_o) = sum of the outputs.

11. Waveforms



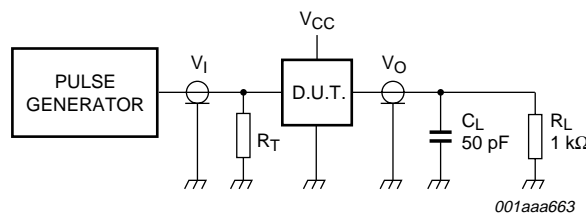
Measurement points are given in [Table 8](#).

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 V_{CC} | Input V_M | Output 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. Load circuit for switching times

Table 9. Test data

| Supply voltage V_{CC} | Input 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

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1

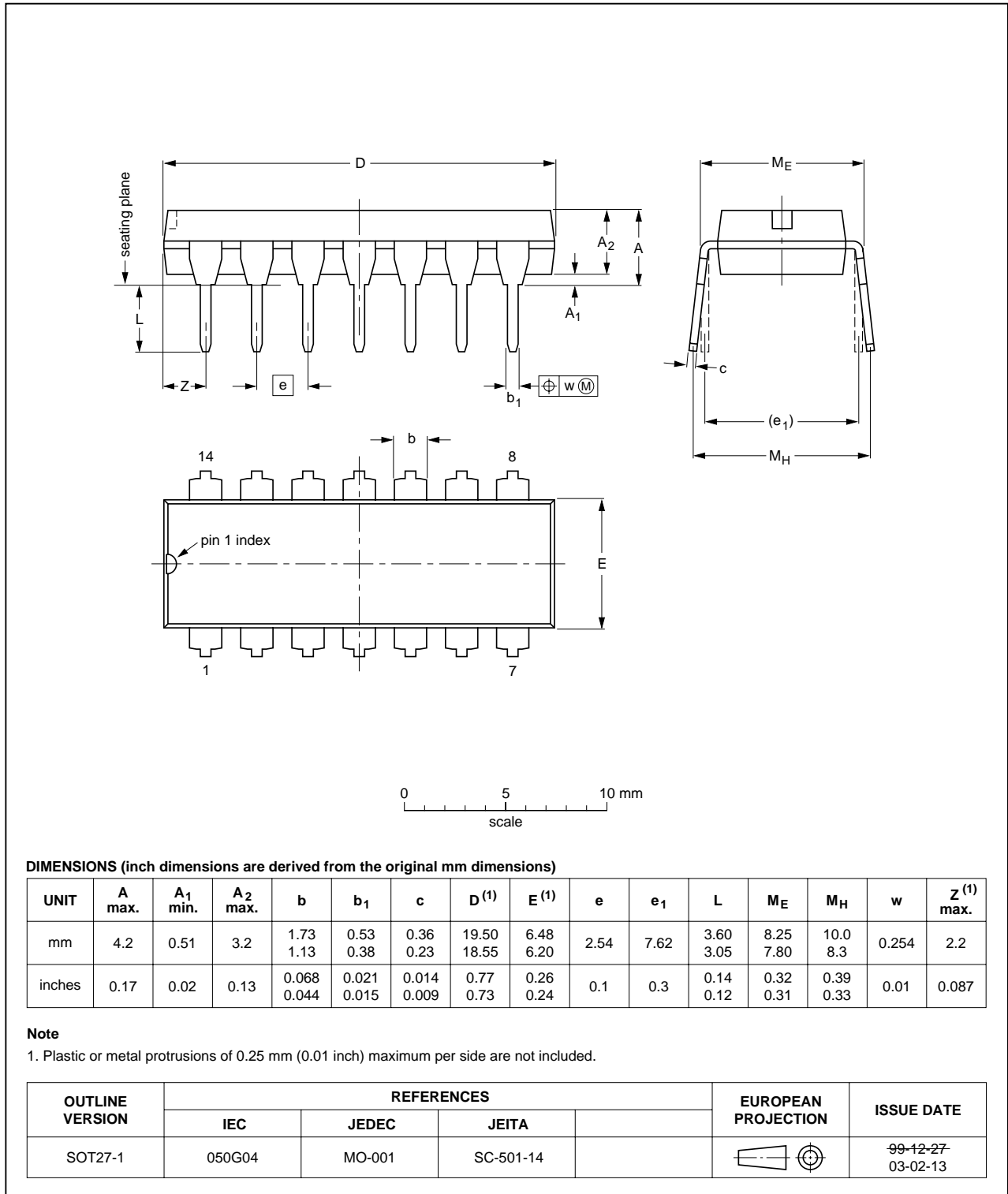


Fig 8. Package outline SOT27-1 (DIP14)

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

SOT108-1

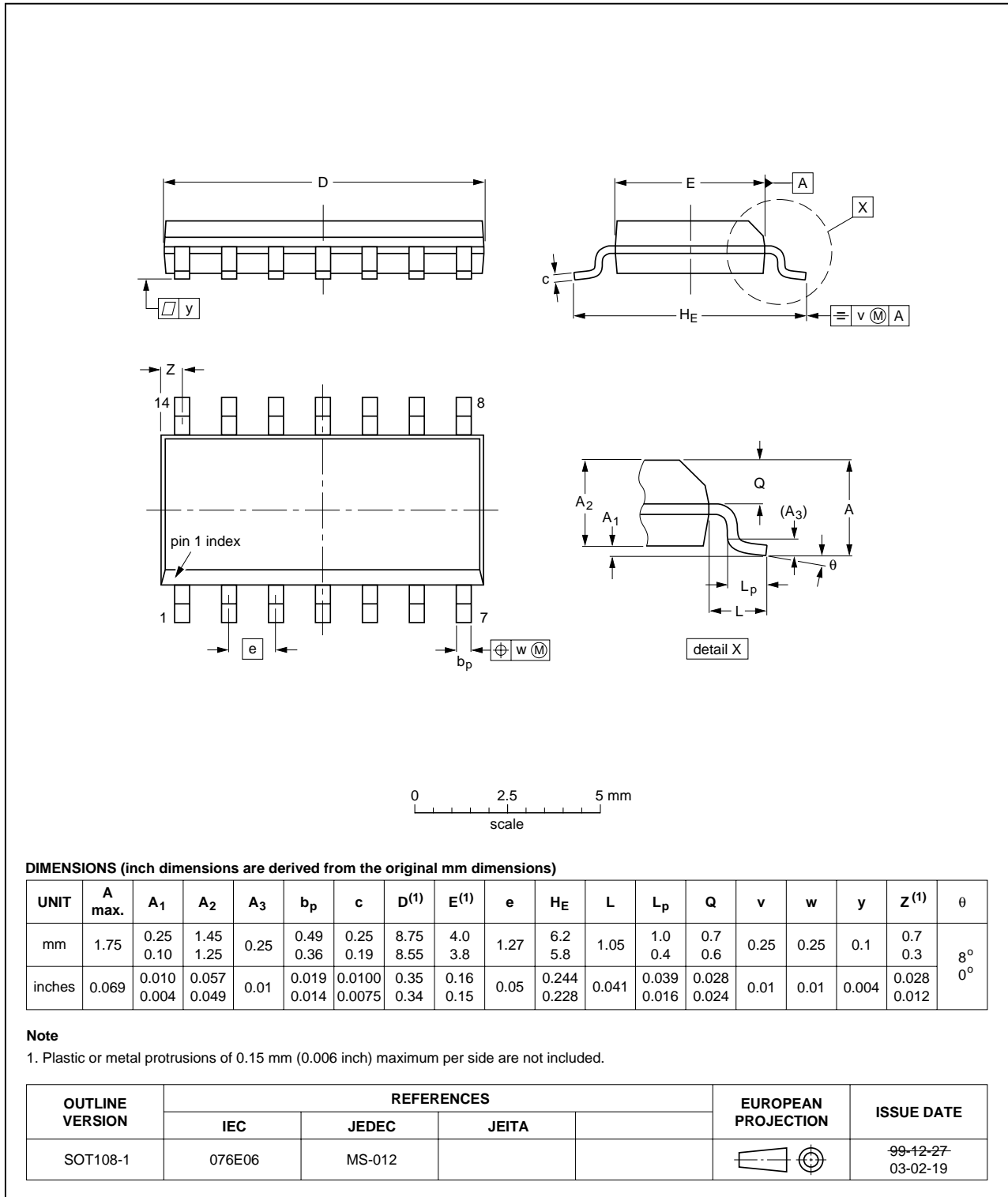


Fig 9. Package outline SOT108-1 (SO14)

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

SOT337-1

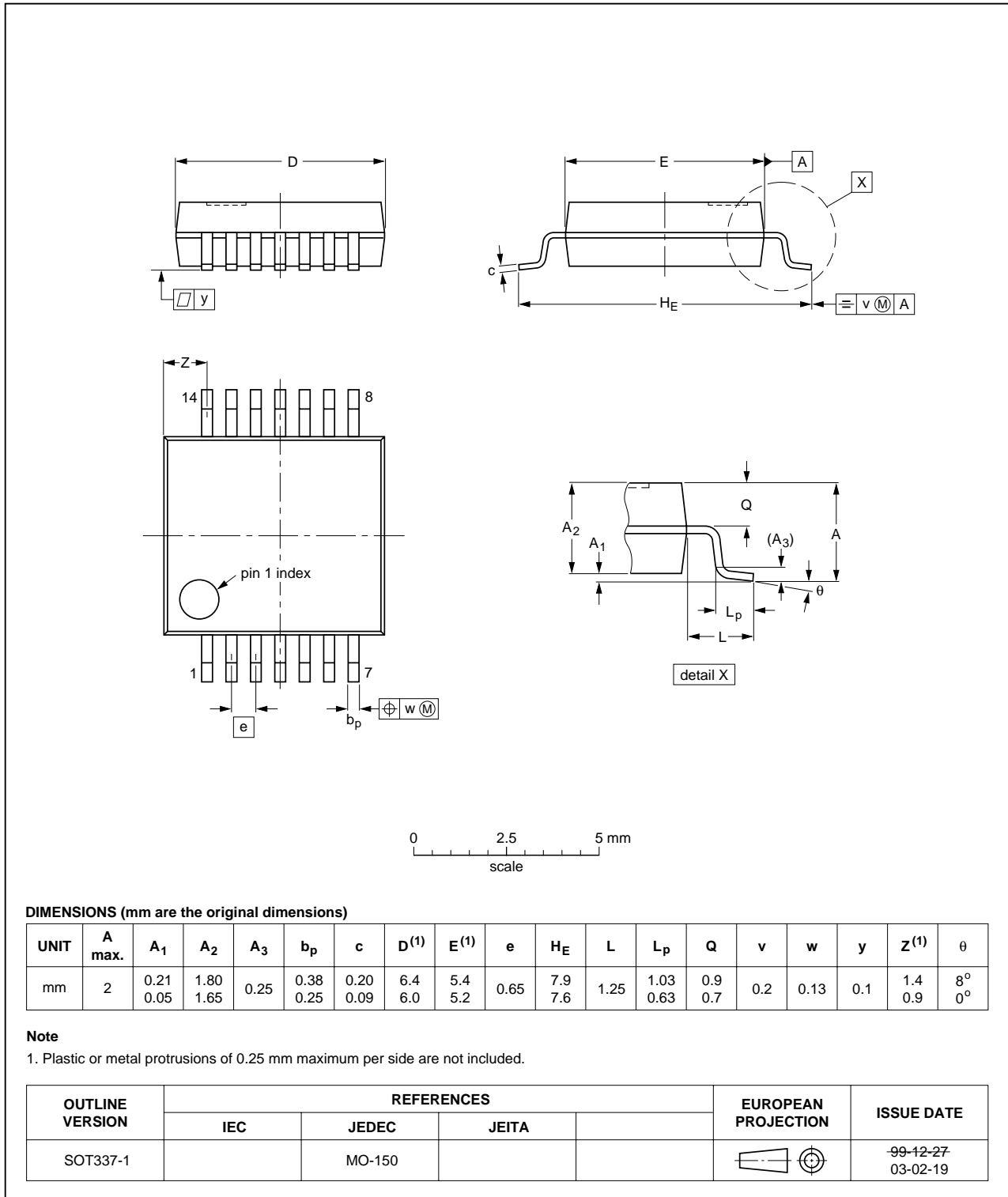


Fig 10. Package outline SOT337-1 (SSOP14)

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

SOT402-1

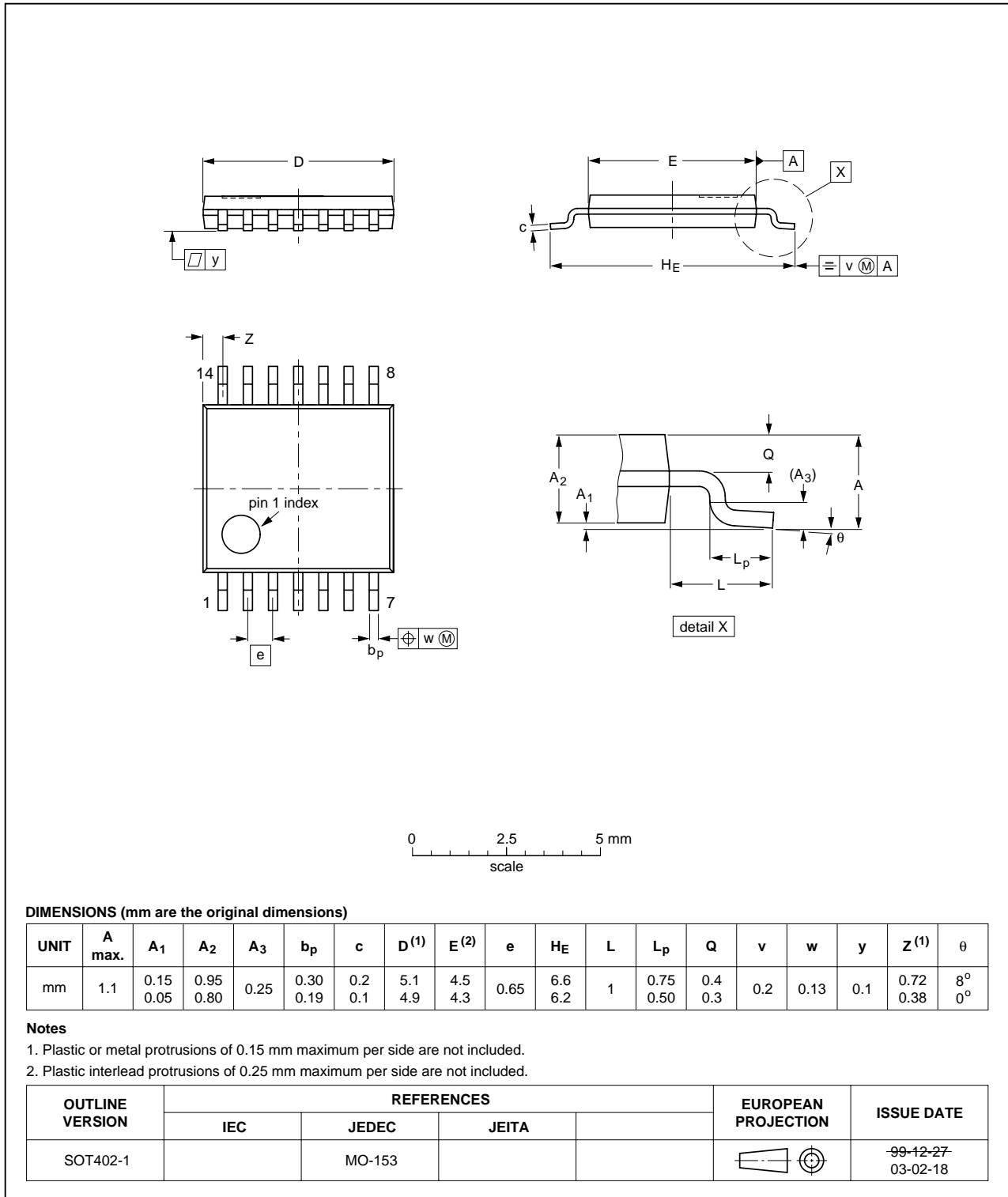


Fig 11. Package outline SOT402-1 (TSSOP14)

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

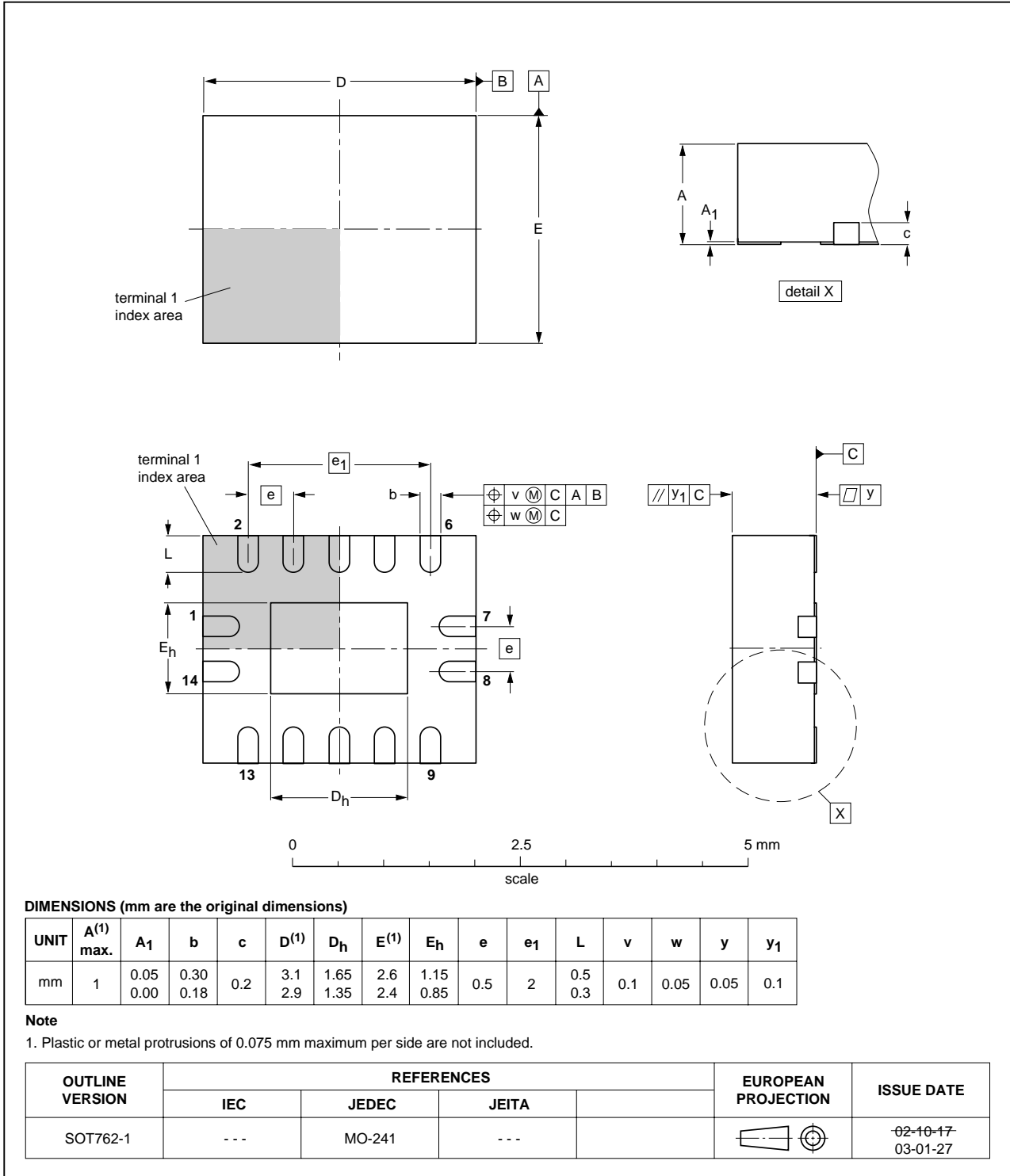


Fig 12. Package outline SOT762-1 (DHVQFN14)

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 |
|----------------|--|-----------------------|---------------|------------|
| 74LV32_3 | 20071109 | Product data sheet | - | 74LV32_2 |
| Modifications: | <ul style="list-style-type: none"> • 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 where appropriate. • Section 3: DHVQFN14 package added. • Section 8: derating values added for DHVQFN14 package. • Section 12: outline drawing added for DHVQFN14 package. | | | |
| 74LV32_2 | 19980420 | Product specification | - | 74LV32_1 |
| 74LV32_1 | 19970203 | Product specification | - | - |

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15.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
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[2] The term 'short data sheet' is explained in section "Definitions".

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